Minerals yearbook: Area reports: international 1965. Year 1965, Volume IV 1967

Bureau of Mines
Washington, D. C.: Bureau of Mines : United States Government Printing Office, 1967

Minerals Yearbook
1965

Volume IV of Four Volumes

AREA REPORTS: INTERNATIONAL

Prepared by staff of the
BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR • Stewart L. Udall, Secretary

BUREAU OF MINES • Walter R. Hibbard, Jr., Director

Created in 1849, the Department of the Interior—a Department of Conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1967

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 – Price $4.75

Foreword

This issue marks the 100th year since the first publication by the Federal Government of a report on the U.S. mineral industries and the 84th year in which the Minerals Yearbook or its predecessors have been issued on an annual basis. The general content of the four-volume edition follows:

Volume I, Metals and Minerals (Except Fuels), contains chapters on metal and nonmetal mineral commodities except mineral fuels. In addition, it includes a chapter reviewing these mineral industries, a statistical summary and chapters on mining and metallurgical technology, employment and injuries, and technologic trends.

Volume II, Mineral Fuels, contains a chapter on each mineral fuel and on such related products as helium, carbon black, peat, coke and coal chemicals, and natural gas liquids. Also included are data on employment and injuries in the fuel industries and a mineral-fuels review summarizing recent economic and technologic developments.

Volume III, Area Reports: Domestic, contains chapters covering each of the 50 States, the U.S. island possessions in the Pacific Ocean, the Commonwealth of Puerto Rico, the U.S. island possessions in the Caribbean Sea, and the Canal Zone, Volume III also has a statistical summary chapter, identical with that in Volume I, and a chapter on employment and injuries.

Volume IV, Area Reports: International, contains 105 chapters presenting the latest available mineral statistics for more than 130 foreign countries and areas. A separate chapter reviews minerals in the world economy.

The 1965 Minerals Yearbook has been redesigned to achieve a more compact volume and to maximize economy and efficiency in its publication. We believe that the short lines of the text improve readability despite use of the smaller type.

The Bureau of Mines' continuous effort to enhance the Yearbook's value to its wide readership can be aided by constructive comments and suggestions of its users. Such comment is particularly invited during the formative years of the new International review volume.

WALTER R. HIBBARD, Jr., *Director*

Acknowledgments

The Bureau of Mines acknowledges the assistance in the preparation of this volume of many foreign mineral agencies and of the official publications on statistical data and other subjects issued in various countries. Many useful data were obtained from publications of the United Nations and from technical publications originating in the United States and many other countries. Information obtained from dispatches from the Embassies of the Department of State the world over is also acknowledged. Particularly useful were routine and special reports received from technical, mineral, and petroleum attachés who usually report on several countries in their respective areas. The attaché services comprise:

Burton E. Ashley, Attaché, Minerals Officer, Canberra, Australia.
W. Charles Bridgett, Attaché, Petroleum Officer, Caracas, Venezuela.
Bryan R. Frisbie, Attaché, Minerals Officer, Lima, Peru.
James G. Henderson, Attaché, Minerals Officer, La Paz, Bolivia.
William F. Keyes, Consul, Minerals Officer, Johannesburg, Republic of South Africa.
Edgar L. McGinnis, First Secretary, Petroleum Officer, London, United Kingdom.
Charles D. Mueller, Second Secretary, Consul, Minerals Officer, Mexico D. F., Mexico.
Roderick G. Murchison, Jr., Minerals Attaché, Accra, Ghana.
Martin Prochnik, Second Secretary, Minerals Officer, Santiago, Chile.
Alfred L. Ransome, Attaché, Minerals Officer, Rio de Janeiro, Brazil.
Charles W. Sweetwood, Attaché, Minerals Officer, New Delhi, India, beginning September 1965.
Clarence A. Wendel, Attaché, Minerals Officer, Ankara, Turkey.
Dawson S. Wilson, Second Secretary, Minerals Officer, Manila, Philippines.

In addition, attaché contributors to this volume included John Burgess, Jr., formerly at Lima, Peru, and Donald F. Campbell, formerly at La Paz, Bolivia. Bryan R. Frisbie, now at Lima, served as Attaché, New Delhi, India throughout most of 1965 and provided some reports on that country.

Basic data on production and trade of minerals commodities appearing in country chapters were in a number of cases supplied by the International Statistics Staff, supervised by Berenice B. Mitchell, and including Corra A. Barry, Agnes M. Chaney, Marjorie L. Cunningham, Bertha M. Duggan, Virginia G. Hugley, Liela S. Price, Joan F. Shaw, Pearl J. Thompson and Virginia A. Woodson.

The individual chapters of this volume were prepared by the staff of the Division of International Activities with contributions from various members of the Foreign Service. These chapters were coordinated and reviewed by Lester G. Morrell and Charles L. Kimbell. The correlation and final checking of the volume were performed in the Division of Minerals, and this assistance, patricularly that of Paul F. Yopes and Kathleen J. D'Amico, is gratefully acknowledged.

The regimes of some of the countries and areas reviewed in this volume are not recognized by the U.S. Government. The information contained herein is technical and statistical and is not to be construed as conflicting with or contradicting U.S. policies toward these countries.

VIRGIL L. BARR,
Chief, Division of International Activities.

Contents

Minerals in the World Economy

By Stephen C. Brown [1] and L. Nahai [2]

The major developments of the world's mineral economy in 1965 were the continued rise in production and consumption of practically all major minerals, the sharp increase in output of the fertilizer minerals in response to demands for greater food output, the cutback in new investment for steel capacity in Europe and Japan, Europe's continuing decline as a producer of primary minerals, and the emergence of nuclear power as an economically competitive factor in the energy economies of the United States and Western Europe.

In resource development, discovery of new natural gas deposits in the North Sea and the continued development of Australia's bauxite and iron ore resources, making this country a major source for these commodities, were significant.

In nonferrous metal prices, higher prevailing prices for lead favored marginal producers as in the Federal Republic of Germany, and zinc prices remained fairly stable at a level higher than that of 1964. Introduction of producers' price for zinc in July 1964 may have contributed to narrowing the range of movement in the London Metal Exchange (LME) price of this commodity. World market price of copper in 1965 increased from January to April, declined somewhat between April and midyear as major producers started marketing copper at LME prices, and then increased continuously after mid-year so that yearend prices surpassed those of April.

Substantial progress in the Kennedy Round of tariff negotiations was delayed by the French boycott of the Council Meetings of the European Economic Community (EEC). Following the boycott the organization could not negotiate as a unit, however bilateral negotiations were carried out on industrial commodities.

Continuing expansion of the world economy in 1964 and 1965 raised both production and consumption of practically all major minerals to new heights, but there was a distinct slowing of the rate of growth in 1965 as compared with 1964. In 1965, it was chiefly the sustained growth of the United States economy that maintained the expansive forces in the world economy, as growth rates in Western Europe and Japan lagged behind those prevailing in 1964. The effects of this 1965 decline in growth rates were felt in smaller rates of increase in mineral production, consumption, and trade.

Gross national product (GNP) of the United States, in real terms, increased by 5 percent in 1964 and by 5.5 percent in 1965. In the EEC the corresponding rates were 5.6 percent for 1964 and 4 percent for 1965. The slowdown in the economic growth of the European Free Trade Association (EFTA) dominated by the performance of the British economy, was more than that recorded for the EEC. Increase in production in the United Kingdom was marginal. In Scandinavia, only Norway maintained the economic vigor of 1964. In Japan, the economy was still undergoing a recession phase which, however, did not deteriorate, because of increase in public expenditures. Increase in output dropped from about 14 percent in 1964 to about 3 to 4 percent in 1965. Industrial investment remained low but private consumption increased a little. Indices of industrial pro-

[1] International economist, Division of International Activities.
[2] Chief specialist, West Europe Area, Division of International Activities.

duction in these countries showed parallel changes.[3]

Latin America as a whole had favorable economic development and increased exports; in a number of countries inflation was brought under control. Argentina, Mexico and Brazil had the highest rate of expansion with Bolivia, Chile, and Peru following closely. Nonetheless, the less developed countries though still benefiting from high demand for their exports and (in the case of most minerals) rising export prices, were facing possible restrictions on further growth induced by their increasing burden of debt and the possibility of reduced aid from the industrialized countries arising from the latter's balance of payments problems.[4]

Thus the pattern of development exhibited in the past 2 years showed both the industrialized countries of the free world and the developing primary producing countries recording high but declining rates of economic growth, the former at a rate of about 4.5 percent for the 2 years together and the latter at a slightly lower rate. Yet the pattern also showed evidence of some strains. Among the industrialized countries the major problem seemed to be the control of steadily rising inflationary pressures as rapidly growing output overtook supplies of both manpower and capital resources; one after another the industrialized countries (France and Italy in 1963, the United Kingdom and Japan in 1964, a number of the smaller European countries in 1964 and 1965) were forced to take restrictive measures to slow down economic activity and restrain rises in unit costs of production.

World trade continued to grow in value and volume, rising by about 12 percent in 1964 and 8 percent in 1965, with mineral commodities participating in the increase. The reduced 1965 growth rate in volume of trade compared with that of 1964 resulted from protective measures in a number of countries and efforts to correct balance of payments by direct controls. United Kingdom maintained its surcharge and Ireland put a 10 percent surcharge on most consumer imports. Business slowdown in West Europe also was a contributing factor. Price increases for the major nonferrous metals, continuously rising demand for petroleum in Western Europe and Japan, and the rapid shift of European steel mills to dependence on imported ores improved the economic position of the primary producing countries, and together with rising prices for some other primary commodities helped improve their balances of payments and increase their rate of economic growth. Prices of primary products on the average rose about 5 percent in 1964, and export receipts of primary producing countries rose by about 13 percent in that year; in 1965 primary commodity prices declined somewhat, due chiefly to falling prices for agricultural products, but mineral and metal prices with few exceptions remained at high (and in some cases, rising) levels. Petroleum, iron ore, and steel were the chief causes of weak mineral prices.[5]

PRODUCTION

The index of world industrial production (1958=100), a much more accurate guide to world demand for minerals than changes in gross national product, rose by 14.5 percent from 1963 to 1965; while the production index for the mining and extractive industries rose by 9.4 percent the same period. Mining output in the less industrialized countries rose at about twice the rate of increase in the industrialized countries. Similarly, output of the mineral processing industries rose sharply in the 2 years, but with evidence of a considerable slowing down of the rate of increase between 1964 and 1965.

Production of most metals increased in both 1964 and 1965. In 1965, iron ore output rose by 5.4 percent, pig iron output (including ferroalloys) by 6.3 percent, and

[3] National Institute of Economic and Social Research, National Institute Economic Review, No. 33 (August 1965) pp. 22–32; No. 35 (February 1966) pp. 50–76; No. 36 (May 1966) pp. 21–29; U.S. Dept. of Commerce, Survey of Current Business, v. 45, No. 1 (January 1965), v. 46, No. 1 (January 1966); Economic Report of the President, 1966, pp. 31–34, pp. 140–148; EEC Commission, La Situation Economique de la Communaute, No. 1, Mars 1965, No. 1, Mars 1966; International Monetary Fund (IMF), Annual Reports, 1964 and 1965.

[4] National Institute of Economic and Social Research, National Institute Economic Review No. 37 (August 1966) pp. 20–32; IMF, 1965 Annual Report, pp. 3–8, pp. 41–48; IMF, 1966 Annual Report, pp. 3–5, pp. 62–71.

[5] National Institute of Economic and Social Research, National Institute Economic Review, No. 35 (February 1966), pp. 54–56; pp. 77–81. IMF, Annual Report, 1965, pp. 53–78.

Table 1.—United Nations Indexes of production [1]
(1958=100)

Index	1963	1964	1965 [p]
Industrial production total	138	148	158
Industrialized countries	136	147	156
Less industrialized countries	149	163	175
Mining, total	127	134	139
Industrialized countries	112	117	120
Less industrialized countries	172	186	199
Coal, total	100	101	101
Industrialized countries	97	99	97
Less industrialized countries	131	133	138
Metals, total	123	129	136
Industrialized countries	123	131	137
Less industrialized countries	121	127	136
Petroleum and natural gas, total	146	155	163
Industrialized countries	117	121	124
Less industrialized countries	198	216	232
Processing industries:			
Chemical, coal and petroleum products, total	157	172	186
Industrialized countries	158	173	188
Less industrialized countries	151	164	175
Nonmetallic mineral products, total	135	148	154
Industrialized countries	134	148	152
Less industrialized countries	136	152	166
Basic metals, total	136	154	164
Industrialized countries	133	152	161
Less industrialized countries	163	178	190

[p] Preliminary.
[1] World, excluding all Communist nations except Yugoslavia.

Source: United Nations Monthly Bulletin of Statistics, May 1966, Special Table A.

steel output by 5 percent over 1964 levels. Among the nonferrous metals, bauxite production increased by 9.9 percent and aluminum output by 10.3 percent; mine output of copper rose by 4.6 percent, of lead by 5 percent, and of zinc by 7 percent. Among the scarcer metals, tin production (content of ore) rose by 2 percent and silver output by 1.9 percent. Gold production continued its rising trend, increasing by 3.5 percent.

The most notable output increases in 1965 were recorded however by the fertilizer minerals. Potash production rose by 12.5 percent, phosphate rock production by 11.2 percent, and output of elemental sulfur by 9 percent. Of the other major nonmetallics, output of hydraulic cement rose by 4.5 percent.

Crude petroleum production in 1965 was 7 percent greater than in 1964 and natural gas production increased by 6.1 percent, while coal output increased by only 1.7 percent. The output of uranium (a metal, but economically significant as an emerging fuel mineral) declined for the fifth year in a row (by 21 percent), but technological breakthrough in the field of nuclear power and the placing of large orders for power reactors in the United States and Western Europe during 1965 suggested that this trend might be reversed in coming years.

The outlook for increased mineral production is favorable. Copper production capacity is expected to gain by 1.4 million tons per year by 1970 [6] and that for iron ore to increase to 722 million tons per year by 1975. Growth rates of 6 to 7 percent per year for phosphate rock and 5 to 7 percent for potash are predicted. Lead and zinc may have additional mine capacity of 586,000 tons and 849,000 tons per year respectively by 1970.

Significant changes in the geographic distribution of mineral production since 1963 were especially notable in the cases of crude petroleum, zinc, bauxite, lead and iron ore. In the case of crude petroleum, the share of the Western Hemisphere dropped from 48 percent of the 1963 total to 43.8 percent of that for 1965, and the non-Communist European share declined marginally, while the African share increased from 4.6 percent to 7.3 percent, and that for the Middle East and Asia increased marginally. Similar increases in the African share of total output of bauxite and iron ore were recorded, the former rising from 5.8 percent in 1963 to 6.5 percent in 1965,

[6] Engineering and Mining Journal, McGraw Hill Publishing Co., New York, January 1966, pp. 74–88.

Table 2.—World production of selected mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Aluminum:					
Bauxite	r 29,340	r 31,250	r 30,675	r 33,685	37,035
Primary unalloyed ingot	4,705	5,065	r 5,510	r 6,100	6,730
Antimony	r 52	r 54	r 56	r 62	63
Arsenic, white [1 2]	r 54	r 45	r 55	r 59	62
Beryl	12	10	r 7	r 3 5	3 5
Bismuth	3	3	3	4	4
Cadmium [4]	r 12	12	12	13	13
Chromite	4,225	r 4,370	r 3,955	r 4,265	4,900
Cobalt [1 5]	r 14	r 16	r 13	r 14	16
Columbium-tantalum [1]	5	4	4	5	7
Copper:					
Mine [6]	r 4,395	r 4,615	r 4,725	r 4,850	5,075
Smelter	4,640	r 4,845	r 4,950	r 5,195	5,465
Gold, thousand troy ounces	r 39,650	42,300	44,250	46,100	47,700
Iron and steel:					
Iron ore	r 502,641	r 507,650	r 522,404	r 578,479	612,799
Pig iron and ferroalloys [5]	r 256,400	r 265,410	r 281,590	r 318,490	335,670
Steel ingots and castings	r 351,565	r 360,175	r 387,000	r 437,810	460,465
Lead:					
Mine	r 2,390	2,500	r 2,550	r 2,570	2,700
Smelter	r 2,400	r 2,380	r 2,460	2,560	2,630
Magnesium	105	134	145	151	159
Manganese ore [5]	r 13,579	r 14,272	r 14,760	r 15,818	17,612
Mercury, thousand 76-pound flasks	240	245	239	r 255	275
Molybdenum [7]	41	34	41	r 43	52
Nickel	361	356	r 351	382	427
Platinum-group metals, thousand troy ounces	r 1,345	r 1,625	r 1,540	r 2,550	2,960
Selenium [1], metric tons	r 952	950	r 922	r 952	789
Silver [5], thousand troy ounces	r 236,900	r 244,700	r 250,300	r 246,400	251,000
Tellurium [1], metric tons	170	180	144	r 126	153
Tin:					
Mine, long tons	184,100	186,600	r 190,300	r 194,500	199,200
Smelter, do	184,000	189,500	r 191,600	r 188,900	194,100
Titanium concentrates:					
Ilmenite [8]	r 2,115	r 1,969	r 1,987	r 2,348	2,475
Rutile [8]	r 117	r 136	r 201	r 193	3 220
Tungsten concentrate, 60 percent WO_3 basis	r 69	r 66	r 58	r 58	54
Uranium oxide (U_3O_8) [1]	r 33	31	r 28	r 24	19
Vanadium [1]	r 8	7	r 6	r 7	8
Zinc:					
Mine [9]	r 3,490	r 3,585	r 3,700	r 4,020	4,310
Smelter [9]	3,245	3,405	3,475	r 3,730	3,845
Nonmetals:					
Asbestos [5]	2,510	2,770	r 2,870	r 3,220	3,260
Barite [4]	r 2,850	r 3,120	r 2,930	r 3,100	3,450
Cement, hydraulic	r 333,665	r 358,541	r 377,974	r 415,128	434,009
Corundum	7	8	10	8	10
Diamond:					
Gem, thousand carats	7,019	6,347	r 6,594	r 6,977	7,172
Industrial, do	26,234	27,659	30,089	r 29,838	28,342
Diatomite [10]	r 1,495	r 1,510	r 1,580	r 1,720	1,585
Feldspar [11]	r 1,625	r 1,630	r 1,740	r 1,845	1,930
Fluorspar	2,070	r 2,150	r 2,130	r 2,480	2,880
Fertilizer materials, crude:					
Phosphate rock [5]	r 45,480	r 48,280	r 51,210	r 59,050	65,670
Potash, K_2O equivalent of marketable output	9,700	9,800	r 10,800	r 12,000	13,500
Graphite	410	r 535	r 710	r 635	615
Gypsum [5]	r 40,510	r 43,410	r 45,745	r 46,650	46,785
Magnesite	r 7,525	r 7,925	r 8,325	r 9,100	9,700
Mica [5]	165	180	180	185	200
Pumice [12]	r 11,930	r 12,350	r 15,180	r 14,790	15,020
Pyrites (including cupreous) [13]	19,600	20,100	r 19,850	r 20,600	21,500
Salt [5]	r 84,960	r 91,450	r 94,960	r 99,560	107,590
Strontium minerals [1 14]	r 12,616	r 11,659	r 16,618	r 23,024	8,439
Sulfur, elemental:					
Native	r 8,340	r 8,210	r 8,180	r 8,780	9,680
Byproduct, recovered	r 3,310	r 3,940	r 4,590	r 5,290	5,660
Talc, soapstone and pyrophyllite	r 2,805	r 2,770	r 3,090	r 3,485	3,510
Vermiculite [1 15]	r 256	r 268	r 298	r 311	346

See footnotes at end of table.

Table 2.—World production of selected mineral commodities—Continued
(Thousand metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 [p]
Mineral fuels:					
Coal:					
Anthracite	[r] 176,100	[r] 179,100	[r] 182,800	[r] 190,400	189,700
Bituminous	[r] 1,648,472	[r] 1,689,968	[r] 1,757,363	[r] 1,821,696	1,873,194
Lignite	[r] 658,057	[r] 680,943	[r] 713,769	[r] 744,245	740,432
Total	[r] 2,482,629	[r] 2,550,011	[r] 2,653,932	[r] 2,756,341	2,803,326
Coke:					
Metallurgical	[r] 272,035	[r] 272,910	[r] 278,835	[r] 296,207	309,059
Other types [5]	[r] 44,970	[r] 45,450	[r] 45,350	[r] 44,150	41,980
Fuel briquets	113,100	[r] 119,100	[r] 121,500	[r] 121,800	116,500
Peat [5]	[r] 159,600	[r] 142,900	[r] 166,200	[r] 178,600	198,000
Petroleum, crude million 42-gallon barrels	8,184	[r] 8,882	[r] 9,537	[r] 10,309	[r] 11,063

[p] Preliminary. [r] Revised.
[1] Excludes production, if any, by Albania, Bulgaria, mainland China, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Rumania, U.S.S.R., and North Viet-Nam.
[2] Excludes production by Argentina, Austria, Finland, United Kingdom, and Yugoslavia.
[3] Excludes production by United States; data withheld.
[4] Excludes production by Bulgaria.
[5] Excludes data on output, if any, by one or more countries that have not reported output and for which no reasonable basis for estimation exists; such countries however, are believed to have produced only relatively negligible quantities.
[6] Excludes production by Czechoslovakia, Hungary, Iran, Kenya, and Malaya.
[7] Excludes production by Argentina, Nigeria, North Korea, Rumania, South-West Africa, and Spain.
[8] Excludes U.S.S.R.
[9] Excludes production by Czechoslovakia and Rumania.
[10] Excludes production by Hungary and Rumania.
[11] Excludes production by mainland China and Rumania.
[12] Excludes production by Mexico and U.S.S.R.
[13] Excludes production by Brazil.
[14] Excludes production by East Germany, West Germany, Poland, and U.S.S.R.

and the latter rising from 4.1 percent to 6.4 percent. Africa also increased its share of mine copper output from 20.7 percent to 22.1 percent, of mine lead output from 7.4 percent to 8.3 percent, and of mine zinc output from 6.9 percent to 7.3 percent. The Western Hemisphere increased its share of iron ore, mine lead and mine zinc output, with its share of mine copper output rising marginally and of bauxite declining by a similar small margin. In general, the share of Europe in total primary mineral production declined. Oceania's share of total bauxite output rose sharply, from 1.2 percent in 1963 to 3.2 percent in 1965; its share of both mine lead and mine zinc output declined, however, the former from 16.4 percent to 13.4 percent and the latter from 9.9 percent to 8.1 percent. These shifts were all attributable to changes in Australian production.

In general, the relative shares of non-Communist world producers rose slightly during the period, while that of Communist nations of Europe and Asia declined slightly for most mineral commodities. Significant commodity exceptions to this pattern were gem and industrial diamond, mine and smelter lead, ingot aluminum, phosphate rock, pyrites and coal as shown in table 3.

Most of the changes in geographic distribution can be explained by relative rates of economic growth in the respective regions during the 2 years under review. High rates of growth in the United States and Canada stimulated output of most minerals in the Western Hemisphere, while slower growth rates in Europe (and during 1965, in Japan) tended to depress output elsewhere. The decline of mineral output in Western Europe and the contemporaneous rise in Africa's share, however, reflects more basic shifts in the resource positions of the two continents, resulting in growing European dependence on Africa's resources. Shifts in the relative positions of the other areas in general reflect this fundamental shift rather than declines in actual output.

Similar pressures for reliance on overseas ores and fuel products existed in Japan, but since a large part of its total requirements already were being met from Middle Eastern and Asian sources, this pressure is not reflected in statistics showing changes in a real distribution of production during 1963–65.

Details of production of major commodities by principal producing countries appear in tables 14 to 29.

Table 3.—Approximate percentage distribution of world mineral production by major areas in 1965 [1]

Mineral	Western Hemisphere			Eastern Hemisphere						World [2]		
				Europe [3]			Near East, South Asia and Far East [4]					
	North and Central America	South America	Total	Non-Communist	Communist	Africa	Non-Communist	Communist Asia	Oceania	Total	Non-Communist	Communist
Metals:												
Aluminum:												
Bauxite	31.3	19.5	50.8	15.1	16.8	6.5	6.5	1.1	3.2	49.2	82.1	17.9
Ingot	48.7	.4	49.1	19.1	22.5	.8	5.7	1.5	1.3	50.9	76.0	24.0
Antimony	9.2	16.2	25.4	6.9	13.1	24.1	6.5	23.9	.1	74.6	63.0	37.0
Arsenic, white [5]	W	1.2	W	NA	NA	.1	.8	NA	----	NA	100.0	NA
Beryl	NA	26.2	26.2	.8	19.5	26.6	26.7	----	.2	73.8	80.5	19.5
Bismuth	W	W	61.1	5.5	2.6	.2	23.6	7.0	----	38.9	90.4	9.6
Cadmium	47.3	1.7	49.0	14.6	18.5	3.9	9.7	----	4.3	51.0	81.5	18.5
Chromite	1.0	.5	1.5	1.9	36.0	31.5	28.5	.6	(6)	98.5	62.4	37.6
Cobalt [5]	W	----	W	W	8.4	75.7	----	----	.1	W	100.0	NA
Columbium-tantalum [5]	30.3	24.1	54.4	1.7	NA	43.0	.7	----	.2	45.6	100.0	NA
Copper:												
Mine	35.3	15.2	50.5	2.7	16.2	22.1	4.7	2.0	1.8	49.5	81.7	18.3
Smelter	32.2	13.2	45.4	10.0	15.0	19.9	6.3	2.0	1.4	54.6	83.0	17.0
Gold	12.0	1.6	13.6	.7	13.6	67.6	2.0	.4	2.1	86.4	86.0	14.0
Iron and steel:												
Iron ore	20.8	8.8	29.6	22.5	27.1	6.4	6.0	7.3	1.1	70.4	65.6	34.4
Pig iron (including ferroalloys)	26.8	1.2	28.0	27.4	25.2	1.3	10.6	6.2	1.3	72.0	68.6	31.4
Steel ingots and castings	28.4	1.4	29.8	28.2	26.0	.7	10.5	3.6	1.2	70.2	70.4	29.6
Lead:												
Mine	27.0	7.7	34.7	13.2	20.5	8.3	4.0	5.9	13.4	65.3	73.6	26.4
Smelter	27.1	5.0	32.1	21.5	21.3	4.5	4.9	5.7	10.0	67.9	73.0	27.0
Magnesium	52.9	----	52.9	23.6	20.8	----	2.1	.6	----	47.1	78.6	21.4
Manganese ore	1.7	7.9	9.6	.8	46.2	25.3	11.4	5.7	1.0	90.4	47.7	52.3
Mercury	13.6	1.3	14.9	57.0	15.0	.1	3.5	9.5	----	85.1	75.5	24.5
Molybdenum	75.5	8.6	84.1	.4	11.8	NA	.8	2.9	----	15.9	85.3	14.7
Nickel	64.0	.2	64.2	.7	21.1	1.0	.8	----	12.2	35.8	74.9	25.1
Platinum-group metals	16.5	.4	16.9	----	57.4	25.6	.1	----	(6)	83.1	42.6	57.4
Selenium [5]	60.6	1.1	61.7	14.6	NA	3.4	20.1	----	.2	38.3	100.0	NA
Silver	46.4	17.9	64.3	6.5	13.8	2.6	5.5	.6	6.7	35.7	85.6	14.4
Tellurium [5]	83.3	10.7	94.0	----	NA	----	6.0	----	----	6.0	100.0	NA
Tin:												
Mine	.3	12.6	12.9	1.3	11.0	10.3	49.9	12.6	2.0	87.1	76.4	23.6
Smelter	1.8	2.7	4.5	22.0	11.1	6.5	41.4	12.9	1.6	95.5	76.0	24.0
Titanium:												
Ilmenite [5]	55.5	.4	55.9	17.0	NA	.3	8.3	----	18.5	44.1	100.0	NA
Rutile [5 7]	NA	.1	.1	----	NA	----	.6	----	99.3	99.9	100.0	NA
Tungsten	13.7	5.5	19.2	3.9	21.3	1.1	11.3	39.5	3.7	80.8	39.2	60.8
Uranium oxide (U_3O_8) [5]	71.0	.2	71.2	9.2	NA	17.8	NA	----	1.8	28.8	100.0	NA
Vanadium	57.3	NA	57.3	12.1	NA	30.6	----	----	----	42.7	100.0	NA

Zinc:												
Mine	37.6	7.1	44.7	13.2	15.9	7.3	6.1	4.7	8.1	55.3	79.4	20.6
Smelter	33.4	2.2	35.6	24.3	18.9	2.7	8.9	4.3	5.3	64.4	76.8	23.2
Nonmetals:												
Asbestos	41.9	(6)	41.9	3.1	36.9	12.7	1.1	4.0	.3	58.1	59.1	40.9
Barite	38.3	5.7	44.0	31.9	10.2	4.8	3.6	5.2	.3	56.0	84.6	15.4
Cement, hydraulic	18.5	3.7	22.2	32.1	24.3	2.6	14.5	3.2	1.1	77.8	72.3	27.7
Corundum	----	----	----	----	49.5	45.1	5.4	----	----	100.0	50.5	49.5
Diamond:												
Gem	----	3.6	3.6	----	4.2	92.1	.1	----	----	96.4	95.8	4.2
Industrial	----	1.0	1.0	----	11.3	87.7	(6)	----	----	99.0	88.7	11.3
Diatomite	33.5	.9	34.4	26.4	20.1	6.2	12.6	----	.3	65.6	79.9	20.1
Feldspar	33.3	3.3	36.6	42.6	12.0	2.5	5.9	NA	.4	63.4	88.0	12.0
Fluorspar	36.2	.4	36.6	30.3	15.4	2.6	3.9	11.2	----	63.4	73.4	26.6
Graphite	W	W	W	W	10.9	3.0	44.5	17.9	----	W	71.2	28.8
Gypsum	34.5	1.5	36.0	36.4	12.3	2.3	9.8	1.4	1.8	64.0	86.3	13.7
Magnesite	W	W	10.9	28.6	36.0	1.3	3.3	19.6	.3	89.1	44.4	55.6
Mica, including scrap	55.9	.9	56.8	1.6	15.3	1.8	19.1	5.1	.3	43.2	79.6	20.4
Phosphate rock	41.2	.8	42.0	0.1	23.7	24.5	3.0	3.3	3.4	58.0	73.0	27.0
Potash, K_2O equivalent (marketable)	30.6	.1	30.7	36.0	31.0	----	2.3	----	----	69.3	69.0	31.0
Pumice [5]	21.0	1.0	22.0	76.2	NA	.3	.8	----	.7	78.0	100.0	NA
Pyrites, including cupreous	5.7	NA	5.7	34.1	21.4	2.8	25.9	9.1	1.0	94.3	69.4	30.6
Salt	35.8	2.0	37.8	23.3	15.0	1.9	8.8	12.7	.5	62.2	72.3	27.7
Strontium minerals [5]	34.6	NA	34.6	60.1	NA	----	5.3	----	----	65.4	100.0	NA
Sulfur:												
Native	80.1	1.0	81.1	.4	14.7	.1	2.5	1.2	----	18.9	84.1	15.9
By-product, elemental	53.8	----	53.8	33.1	9.8	.2	.8	2.3	----	46.2	87.9	12.1
Talc and soapstone	23.8	2.3	26.1	16.3	13.6	1.4	37.2	4.9	.5	73.9	81.5	18.5
Vermiculite [5]	65.3	1.1	66.4	----	NA	33.4	.2	----	----	33.6	100.0	NA
Mineral fuels:												
Coal, all grades including lignite	17.6	.3	17.9	20.6	40.8	1.8	5.4	11.5	2.0	82.1	47.7	52.3
Coke:												
Metallurgical	21.2	.7	21.9	31.7	30.6	1.0	8.1	5.7	1.0	78.1	63.7	36.3
Other types	.4	.8	1.2	36.1	43.0	.6	16.2	1.0	1.9	98.8	56.0	44.0
Fuel briquets	.4	----	.4	24.5	64.8	(6)	8.7	----	1.6	99.6	35.2	64.8
Peat	.4	(6)	.4	3.1	96.4	----	.1	----	----	99.6	3.6	96.4
Petroleum, crude	30.1	13.7	43.8	1.3	17.1	7.3	29.8	.7	(6)	56.2	82.2	17.8

NA Not available, no estimates have been included in computing percentage distribution.

W Withheld to avoid disclosing individual company confidential data. Data however have been used in determining percentages in total column.

[1] Based on production data (including estimates) presented in world production tables in commodity chapters of Volumes I and II. In some cases, revised figures have been incorporated in individual country chapters of Volume IV, thus percentages given here will not necessarily agree with any totals of production based on data in individual country chapters. Regional divisions of totals conform to those used in the Table of Contents of Volume IV except as noted.

[2] Includes Communist countries of Europe and Asia as listed in footnotes 3 and 4 respectively as well as Cuba.

[3] Of the European countries listed in the Table of Contents of Volume IV, the following are included under the heading Communist Europe in this table: Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania and the U.S.S.R. Yugoslavia, although Communist, is included in non-Communist Europe for Statistical purposes.

[4] Of the Far Eastern countries listed in the Table of Contents of Volume IV, the following are included under the heading Communist Asia in this table: mainland China, Mongolia, North Korea, and North Viet-Nam.

[5] Distribution of output by non-Communist countries, Yugoslavia and Cuba only; no estimate of production for other Communist countries has been made.

[6] Less than 0.05 percent.

[7] U.S. data excluded.

CONSUMPTION AND TRADE

As in the case of production, consumption of most major minerals (except coal) rose significantly in 1965 but at a slower rate than in 1964. Statistical estimates exist for only a few minerals, however. Indicators of consumption changes for the ferrous group of minerals (iron and ferroalloy ores such as manganese, tungsten, vanadium, and molybdenum) are provided by pig iron and steel production data, which showed increases of 5.4 percent and 5 percent respectively. In the case of nonferrous metals, aluminum consumption continued to show the most rapid rate of increase (9.7 percent) in 1965, while copper consumption expanded by 1.5 percent, lead consumption by less than 1 percent and zinc consumption by 2.6 percent. Tin consumption declined by 1.2 percent. The higher levels of consumption for aluminum, copper, lead, and zinc were chiefly the result of large increases by U.S. consumers; demand in other industrialized areas generally declined. Tin consumption in 1965 declined in all industrialized areas except the United Kingdom. U.S. stockpile releases accounted for significant supplies of copper, lead, zinc, and tin coming on the market in both years. Among the nonmetals, consumption of sulfur, phosphates, and potash rose sharply in 1964 and 1965 as production of fertilizers and sulfuric acid reached new highs. Sulfur markets became especially tight as consumption expanded to the limits of output.

With increasing realization of the urgency of greater food production to meet increasing world needs, it is likely that the sharply rising consumption trend of these minerals will continue. One source gives a growth rate of 7 to 8 percent annually through 1980 [7] stating that if all announced projects go on stream as planned, worldwide capacity and demand by 1970 will be as follows:

Commodity	Million tons	
	Capacity	Demand
Nitrogenous fertilizers (nitrogen content)	34	31
Phosphate rock	80	72
Potassic fertilizers (K_2O equivalent)	21.1	19.7

Producers' stocks of lead declined by 45,000 tons in 1964 but rose by 12,000 tons in 1965, while a 1964 decline of 39,000 tons in producers' stocks of zinc was reversed to a gain of 23,000 tons in 1965.[8]

Estimates of overall stock changes of the nonferrous metals in 1965 show increases for copper, zinc, and tin and a decline of 4,000 tons for lead.

A perhaps significant trend in the world's mineral economy is the slow but steady growth of the developing countries' share of total world consumption of major mineral products. Data provided by UNCTAD (United Nations Conference on Trade and Development) commodity studies show, for example, that the developing countries' share of world pig iron output (a guide to iron ore consumption) rose from 3.6 percent in 1961 to 4 percent in 1965. Their share in consumption of primary aluminum rose from 3.5 percent in 1960 to 4.1 percent in 1964; of refined copper, from 4.4 per-

[7] World Fertilizer Review, v. 1, No. 5, July 1966.

[8] United Nations Conference on Trade and Development, TD/B/C.1/PSC/7, 26 May 1966, "Preparation of a Summary of the Current Market Situation in Selected Commodities," pp. 44–46.

Table 4.—Estimated world consumption of major nonferrous metals [1]

Commodity	1963	1964	1965
Aluminum [2] thousand metric tons	r 5,304	5,800	6,363
Copper [3] do	r 5,385	5,909	5,999
Lead do	2,657	2,788	2,810
Tin [4] thousand long tons	161	166	164
Zinc thousand metric tons	3,456	3,850	3,951

r Revised.

[1] Refined metals including secondary; including estimates for U.S.S.R. and Communist nations of Europe and Asia.

[2] Partial.

[3] Source, British Bureau of Non-ferrous Metal Statistics.

[4] As reported by International Tin Council.

Source: Yearbook of the American Bureau of Metal Statistics (Forty-fifth Annual Issue for the Year 1965). Data for aluminum, copper, lead and zinc converted from short tons.

cent in 1960 to 5.3 percent in 1965; of refined lead from 6.4 percent in 1960 to 8.6 percent in 1964; of slab zinc from 7 percent in 1960 to 8.4 percent in 1964; of tin, from 8.3 percent in 1953–1955 to 9.5 percent in 1965.[9] In the case of petroleum, the developing countries have maintained their share of consumption at about 14 percent of the total over the period since 1955. In the cases of most of these commodities it was rising consumption in India and a few of the Latin American countries that accounted for the increasing share of the developing countries.

The significance of this, in a period when total world consumption of most minerals has increased rapidly, should not be underestimated. Many of the developing countries are themselves major producers of the minerals they are now beginning to consume in significant quantities and it is logical to expect that the usual economies of locating mineral processing industries in rapidly growing markets for their products will result in the build-up of mineral processing industries in the developing countries, especially when many of them are also major producers of the mineral raw materials. Such a development might well have effects both on trade patterns and (depending on the location and elasticity of mineral supplies) on the terms of trade.

UN data show that world trade in minerals (mineral fuels, metallurgical ores, and scrap metals) expanded by about 6.5 percent in terms of value in 1963 and again by about 13.5 percent in 1964, the latest year for which this analysis is available. As a proportion of total world trade, the share of these commodities fell from 21 percent in 1962 to 20.3 percent in 1963, but increased again to 20.6 percent in 1964. The addition of trade in nonmetals would raise the total trade in minerals, and probably its proportion of total trade, by a significant amount.

In terms of volume only scanty data are available but UN figures indicate that crude petroleum and petroleum products alone accounted for 54 percent of total international seaborne commerce in 1964, while trade in iron ore acounted for another 13 percent of total world trade in that year.[10]

In 1963 and 1964 of the three industrialized areas North America, western Europe and Japan took an increasing proportion of the world's exports of the major minerals, the combined share of the three areas rising from 67.8 percent in 1962 to 68 percent in 1963 and 69.8 percent in 1964. The shares of western Europe and Japan in the total rose, the former taking nearly half (48.7 percent) of total mineral exports in 1964, and the latter 6.4 percent. The share of North America declined from 17 percent in 1962 to 16.6 percent in 1964. These shifts, as well as the rising proportion of the total going to the three areas, in large part reflect sharply rising European and Japanese imports of petroleum and iron ore from other regions.

Data exhibiting the patterns of international trade in individual mineral commodities confirm the growing importance of western Europe and Japan as importing areas and illustrate the effects of transport costs in determining the directions of trade. A third factor, the partial isolation of the United States markets for some minerals and maintenance of prices below world levels by means of quota restrictions and stockpile releases, is probably reflected also to some extent but its effect is not specifically distinguishable. Tables 30 to 45 show trade patterns for iron ore, steel products, bauxite, solid fuels, crude petroleum, and lead and zinc ores and concentrates, for the most recent years available.

INVESTMENT

Except for figures on iron and steel industry investment, data for 1965 investments in the mineral industries are not available on a worldwide basis. There was a sharp decline however in investments in the European and Japanese steel industries as compared with the period from 1960 to 1962.

[9] United Nations Conference on Trade and Development, Preparation of a Summary of the Current Market Situation in Selected Commodities, TD/B/C.1/PSC/7 add. 1, pp. 8, 65, 78, 90; idem, TD/B/C.1/PSC/7, pp. 49 and 55.

[10] United Nations Monthly Bulletin of Statistics, January 1966, Special Table C; United Nations Conference on Trade and Development; Preparation of a Summary of the Current Market Situation in Selected Commodities, TD/B/C.1/PSC/7/Add 1, p. 201.

Table 5.—World exports of major classes of minerals in 1964, by value and region [1]

(Million dollars)

Exporters	Destinations										
	North America	Latin America	Western Europe [2]	Middle East [3]	Australia, New Zealand South Africa	Central Africa [4]	Japan	Other Free Asia	Eastern Europe [5]	China (mainland), etc. [6]	Other [7]
North America	1,765	322	1,595	37	84	25	466	348	11	---	27
Latin America	1,685	306	1,020	1	14	24	149	6	37	---	740
Western Europe [2]	660	265	7,670	267	161	176	41	211	362	30	158
Middle East [3]	350	62	3,140	380	300	115	780	385	10	---	85
Australia, New Zealand, South Africa	159	3	201	2	65	29	130	40	1	1	16
Central Africa [4]	86	1	865	2	45	20	71	12	11	3	2
Japan	352	80	63	34	59	24	---	19	---	---	---
Other free Asia	174	13	185	8	76	6	335	371	33	1	8
Eastern Europe [5]	12	136	1,047	77	---	7	105	62	2,905	120	10
China (mainland), etc. [6]	---	1	27	3	---	---	74	23	95	---	---
Other [7]	405	81	750	7	8	38	15	12	---	---	70
Total	5,648	1,270	16,563	818	812	464	2,166	1,489	3,465	155	1,116

[1] Includes mineral fuels and related materials (SITC Section 3), metalliferous ores and metal scrap (SITC–Revised, 28) and base metals (SITC–Revised, 67 and 68 less 681 excluding precious metals).
[2] Includes Turkey and Yugoslavia.
[3] Includes Aden, Cyprus, Jordan, Iraq, Israel, Lebanon, Syria, Libya, Ethiopia, Sudan, U.A.R., data covers only exports of mineral fuels.
[4] Africa less Morocco, Algeria, Tunisia, Libya, U.A.R. Sudan, Ethiopia, Somalia, French Somaliland, and South Africa.
[5] U.S.S.R., Albania, Bulgaria, Czechoslovakia, Eastern Germany, Hungary, Poland, and Rumania.
[6] China (mainland), Mongolia, North Korea, and North Viet-Nam.
[7] Includes Morocco, Algeria, and Tunisia. Data covers only exports of mineral fuels.

Source: United Nations, Monthly Bulletin of Statistics, March 1966, Special Table E; Monthly Bulletin of Statistics, May 1966, Special Table B.

Much of the recent European and Japanese investment in steel has been for purposes of rationalization and modernization rather than explicitly for new capacity. A large part has gone into conversion to oxygen processes; in 1964 and 1965 no less than 70 percent of steel mill investment in the European Coal and Steel Community was for this purpose.[11]

The shift to oxygen processes is proceeding rapidly in the world's steel industries. In 1965, over 19 percent of ECSC output was produced by these processes; in Japan 55 percent of 1965 production was accounted for by oxygen process plants, while the corresponding figures for the United Kingdom and United States were about 17 percent in each case.

A second area of investment has been in the expansion of iron ore sintering and pelletization plants. In 1964 about 45 percent of world output of iron ore was agglomerated mainly as sinter, while about 50 million tons was pelletized. Pelletizing capacity, mainly in North America, totaled 57 million tons at the end of 1965, with an additional 22 million tons of capacity under construction. The bulk of both sinter and pelletizing capacity is in the developed countries.

The trend towards beneficiation of ores, plus the opening up of large new deposits such as Australia's Hammersley mines, appears likely to keep total world investments in the iron and steel industry at a high level despite the current cutback (except in the United States) in steel industry expansion.

Finally, a trend in developed countries (particularly in Western Europe) towards the construction of new seacoast steel plants to benefit from the advantages of cheap access to high-grade overseas ores may well contribute a second stimulus to investment in the industry.

Data on investment in the nonferrous metal industries are fragmentary and do not permit construction of a worldwide statistical summary, but evidence from the aluminum, copper, lead and zinc industries suggests a rising level of investment expenditures.

Free world petroleum investments were maintained at a high level in 1963 and 1964; estimates for 1965 are not yet available. Chase Manhattan Bank estimates show total capital expenditures in 1963 of $11,150 million, practically unchanged from 1962; a 10 percent increase, to $12,275 million, is shown for 1964. The industry's capital expenditures were divided about equally between the United States and other free world countries in both years. In 1964, 45.3 percent of the total was invested in production, 15.6 percent in transportation facilities, 12.7 percent in refining, and 17.8 percent in marketing.[12]

United States Department of Commerce estimates of U.S. direct investments in the mining, smelting and petroleum industries outside the United States show a rising trend in the period 1962–1966. Perhaps most notable is the sharply rising trend of mining investments in Australia, attributable to U.S. interest in the development of recently discovered bauxite and iron ore deposits. Similarly, the rising trend of mining and petroleum investment in Africa

[11] European Coal and Steel Community High Authority, 14e Rapport General sur l'activite de la Communaute (Mars 1966), p. 228.

[12] Chase Manhattan Bank, Petroleum Department, Capital Investments by the World Petroleum Industry, 1963; Capital Investments by the World Petroleum Industry, 1964.

Table 6.—Investments in iron and steel

(Billion dollars)

Country or area	1963	1964	1965
United States [1]	1.24	1.69	1.93
European Coal and Steel Community	1.48	1.29	[2] 1.99
United Kingdom	.22	.15	.14
Japan [3]	.52	.53	.51
Total	3.46	3.66	3.57

[1] New plant and equipment expenditures.
[2] Planned as of January 1, 1965.
[3] Fiscal years beginning April 1 and ending March 31 of succeeding year.

Sources: U.S. Department of Commerce, Survey of Current Business, v. 45, No. 9 (September 1965), p. 6; v. 46, No. 9, (September 1966) p. 7; European Coal and Steel Community High Authority, 14th General Report on the Activity of the Community (March 1966), p. 228; The Iron and Steel Board, Annual Report 1965, p. 86; The Foreign Capital Research Society (Tokyo), Japanese Industry 1965, p. 50; U.S. Foreign Service Reports.

Table 7.—U.S. direct investments in mineral industries in foreign countries, plant and equipment expenditures only

(Millions of dollars)

Area and country	1962		1963 r		1964 r		1965		1966 e	
	Mining and smelting	Petroleum	Mining and smelting	Petroleum	Mining and smelting	Petroleum	Mining and smelting	Petroleum	Mining and smelting	Petroleum
Canada	193	325	195	375	220	385	265	503	340	552
Latin America:										
South America	58	233	68	203	61	237	89	NA	NA	NA
Other	5	24	7	42	11	35	13	NA	NA	NA
Total	63	257	75	245	72	272	102	246	169	260
Other Western Hemisphere	32	62	34	62	54	55	55	61	45	76
Europe:										
EEC	(1)	269	1	386	1	395	3	306	2	474
Non-EEC:										
United Kingdom	---	125	1	140	(1)	126	(1)	177	(1)	220
Other	4	100	3	116	2	124	2	120	2	179
Total	4	225	4	256	2	250	2	297	3	399
Total Europe	4	494	5	642	3	645	5	603	5	873
Africa:										
Northern Africa	(1)	137	---	129	---	191	---	176	---	187
Western Africa	43	11	38	8	19	47	27	72	23	124
Central and southern Africa	26	13	20	(2)	44	(2)	74	(2)	57	(2)
Total	69	[3] 176	58	[3] 164	63	[3] 271	101	[3] 284	80	[3] 349
Middle East	---	72	---	125	---	111	---	233	(1)	246
Far East	1	106	2	172	3	169	4	197	3	254
Oceania:										
Australia	9	(2)	29	(2)	45	(2)	145	(2)	182	(2)
Other	---	(2)	---	(2)	6	(2)	2	(2)	2	(2)
Total	9	76	29	64	51	65	147	74	184	72
International shipping	---	65	---	40	---	100	---	66	---	61
Grand total	371	1,633	398	1,889	463	2,073	682	2,267	826	2,743

e Estimates based on company projections. r Revised. NA Not available.
[1] Less than $500,000.
[2] Included in area total.
[3] Includes other Africa.
Note: Details may not add to totals due to rounding.
Source: U.S. Department of Commerce, Survey of Current Business, v. 44, No. 8, (August 1964), p. 13; v. 45, No. 9 (September 1965), p. 30.

is noteworthy, while the expansion of petroleum investments in Europe (chiefly in refining and marketing) continued at a more normal rate.

Earnings on United States mineral investments abroad rose sharply in dollar terms from 1963 to 1965 in the case of mining and smelting industries, but were static in the petroleum industry. As a proportion of total capital invested, earnings in the mining and smelting industries rose from 10.6 percent in 1963 to 15 percent in 1965, while earnings of the petroleum industry declined slightly from 13.4 percent in 1963 to 13.3 percent in 1965.

TRANSPORTATION

Changes in transport facilities during 1964 and 1965 centered mainly around the continuing increase in total tonnage and average size of the world's bulk carrier and tanker fleets, and the expansion of pipeline facilities for petroleum and natural gas both in producing areas and in the main product markets (chiefly Europe). Concurrently plans were made in importing countries (again, chiefly in Europe) for deepening channels and harbors and improving cargo handling facilities to accommodate the newer and larger ships. Also in some European countries plans were made to enlarge shipbuilding yards to enable them to compete with Japanese yards, which hitherto have dominated the construction of very large vessels.

In the two years 1963–64 the deadweight tonnage of the world's bulk carrier fleet increased by 32 percent, from 19.9 million tons to 26.4 million tons. The increase in 1964 alone totaled 2.6 million tons, or 11 percent. At the end of 1964, bulk carriers accounted for 12.4 percent of the world's sea-going merchant fleet. In the first half of 1965 bulk carriers with an additional 1,850,700 deadweight tonnage were delivered and an additional 10.5 million deadweight tons of capacity were under construction or on order. The bulk of this new capacity was in vessels of 30,000 tons and over, and more than 40 percent of the total in vessels of 40,000 tons and over.

Tanker tonnage (deadweight) increased by 17 percent in the 2 years, rising to 81.7 million tons, or 40 percent of the world's merchant fleet, at the end of 1964. An additional 4.2 million tons were delivered in the first half of 1965, and a further 19.2 million tons were under construction or on order at mid-year. The average size of new tankers was rising even more rapidly than that of new bulk carriers; of those on order at mid-year 4.5 million tons were of 100,000 deadweight tons or over.[13]

The principal sea-borne mineral products, by volume, are petroleum and its products, and iron ore. In 1964, petroleum and petroleum products accounted for 800 million tons of cargo, and iron ore for 176.4 million tons, out of a total of 1,520 million tons. Other mineral cargoes important on a tonnage basis included other ores (mainly bauxite and alumina) and coal. The growth of sea-borne trade in iron ore has provided a special stimulus for the increase of the world's bulk carrier fleet.

Limitations on the increase in average size of vessels appear to be more restrictive in the case of bulk carriers than in that of tankers, since the former are restricted not only by harbor depths but also to a greater degree by the cargo-handling capacities of ports and terminals. These facilities are better developed for tankers because of the much larger volume of trade involved.

In the past, the maximum depth of the Suez Canal, the principal international waterway for oil traffic, limited the maximum size of tankers. Development of large producing areas west of Suez and routing of supertankers from the Persian Gulf area around Africa have lessened the influence of Suez on tanker size. Another factor is that there has been a substantial increase in the eastward flow of oil from the Persian Gulf; this does not involve international waterways.

Freight rates for dry cargo and tanker vessel moved in opposite directions in 1965 with dry cargo rates (both trip charter and time charter) moving upwards and tanker rates weakening. Tanker owners, a group of whom in 1963 devised a scheme to stabilize rates by laying up idle vessels, (which has become known as the Tanker Recovery Scheme), attempted to revive the

[13] Data in this and the preceding paragraph are from U.S. Department of Commerce, Maritime Administration. A Statistical Analysis of the World's Merchant Fleet as of December 31, 1964.

Table 8.—U.S. direct foreign investment in mineral industries: value, earnings and income

(Million dollars)

Area and country	Mining and smelting			Petroleum		
	Value	Earnings [1]	Income [1]	Value	Earnings [1]	Income [1]
1963:						
Canada	1,549	94	53	3,134	150	80
Latin American Republics:						
South America:						
Venezuela	(2)	(2)	(2)	2,166	431	422
Other	(2)	(2)	(2)	645	46	41
Total	932	127	122	2,811	477	463
Other	161	20	20	284	3	2
Other Western Hemisphere	210	72	69	541	52	78
Europe:						
EEC	10	(2)	(2)	1,330	47	56
Non-EEC:						
United Kingdom	2	(2)	(2)	886	12	11
Other	43	(2)	(2)	561	8	6
Total Europe	55	4	6	2,776	67	73
Africa:						
Republic of South Africa	63	17	10	(2)	(2)	(2)
Other	286	14	10	(2)	(2)	(2)
Total	349	31	20	702	65	59
Middle East	2	---	1	1,206	926	825
Far East	30	2	1	714	75	68
Oceania:						
Australia	82	8	3	(2)	(2)	(2)
Other	---	---	---	(2)	(2)	(2)
Total	82	8	3	496	4	−4
International shipping	---	---	---	988	10	9
Grand total	3,370	358	295	13,652	1,829	1,653
1964:						
Canada	1,667	191	114	3,187	170	118
Latin American Republics:						
South America:						
Venezuela	(2)	(2)	(2)	2,139	460	461
Other	(2)	(2)	(2)	665	36	35
Total	926	158	151	2,804	496	496
Other	178	26	21	298	14	7
Other Western Hemisphere	250	76	73	488	34	33

Europe:						
EEC	13	(2)	(2)	1,523	−38	24
Non-EEC:						
United Kingdom	2	(2)	---	902	44	28
Other	41	(2)	(2)	677	2	13
Total Europe	56	3	5	3,102	8	64
Africa:						
Republic of South Africa	68	20	15	(2)	(2)	(2)
Other	290	18	17	(2)	(2)	(2)
Total	358	38	32	883	227	223
Middle East	2	---	---	1,240	867	893
Far East	31	3	1	814	45	68
Oceania:						
Australia	100	10	3	(2)	(2)	(2)
Other	---	---	---	(2)	(2)	(2)
Total	100	10	3	453	−6	−6
International shipping	---	---	---	1,064	6	26
Grand total	3,568	505	400	14,333	1,861	1,922
1965:						
Canada	1,755	198	110	3,320	183	122
Latin American Republics:						
South America:						
Venezuela	(2)	(2)	(2)	2,033	405	408
Other	(2)	(2)	(2)	679	71	52
Total	957	181	167	2,712	476	460
Other	157	25	18	322	20	8
Other Western Hemisphere	310	85	82	500	24	18
Europe:						
EEC	16	(2)	(2)	1,617	−32	18
Non-EEC:						
United Kingdom	2	(2)	(2)	1,084	−6	−4
Other	37	(2)	(2)	727	−4	+3
Total Europe	55	8	8	3,429	−42	17
Africa:						
Republic of South Africa	65	34	35	(2)	(2)	(2)
Other	296	27	20	(2)	(2)	(2)
Total	361	61	55	1,020	240	233
Middle East	8	---	---	1,491	816	813
Far East	84	5	2	893	76	107

See footnotes at end of table.

Table 8.—U.S. direct foreign investment in mineral industries: value, earnings and income—Continued

(Million dollars)

Area and country	Mining and smelting			Petroleum		
	Value	Earnings [1]	Income [1]	Value	Earnings [1]	Income [1]
1965—Continued						
Oceania:						
Australia	161	10	3	[2]	[2]	[2]
Other	[3]	−2	−2	[2]	[2]	[2]
Total	162	8	1	499	−6	−11
International shipping	---	---	---	1,133	37	30
Grand total	3,794	571	443	15,320	1,825	1,798

[1] Earnings is the sum of the U.S. share in the net earnings of subsidies and branch profit; income is the sum of dividends, interest, and branch profits.
[2] Combined in other industries.
[3] Less than $500,000.
Note: Details may not add to totals due to rounding.

Sources: U.S. Dept. of Commerce, Survey of Current Business, v. 44, No. 8 (August 1964) pp. 10–11; v. 45, No. 9 (September 1965) pp. 24–25; vol. 46, No. 9 (September 1966) pp. 34–35.

scheme in mid-1965 after it had been dormant since the end of 1964. It was apparently aimed chiefly at stabilizing rates during the summer seasonal slack in trade.

Under the scheme, any tanker of 15,000 deadweight tons and up, built in 1947 or later, is eligible to join; some 7 million tons were said to be eligible at the initiation of the scheme but only about half this tonnage was reported to have joined. Some observers believed that tanker owners relied chiefly on shifting idle vessels to the grain trade in the summer, in which nearly 5.8 million tons of tanker capacity was said to be engaged in August 1965.[14]

The expansion of petroleum and natural gas pipeline capacity continued in 1965, especially in Western Europe. In this area the rapid development of the Netherlands' domestic natural gas network, the commencement of work on gas export lines from the Netherlands to West Germany and Belgium, and expansion of the Mediterranean central Europe crude petroleum lines were the main factors. Work started on the Trans-Alpine pipeline from Trieste, Italy, to Ingolstadt, West Germany, while the line from Genoa to the Danube was completed except for a short section near Lake Constance. Product pipelines in western Europe also continued to multiply.

Meanwhile the Soviet Union continued work on the expansion of its COMECON system to provide petroleum to its East European neighbors. In the producing areas of the Middle East and Africa, additional pipelines for gathering and shipping crude to ports and refineries were planned or under construction.

Table 9.—Indexes of ocean freight rates
(1958=100)

	1963	1964	1965
Trip charter (general):			
Netherlands [1]	88	100	100
United Kingdom	120	124	140
Trip charter (dry cargo):			
West Germany	117	117	128
Norway	109	110	115
Trip charter (tankers):			
West Germany	130	117	115
Norway [2]	135	124	121
Trip charter: United Kingdom:			
Coal trade	127	122	133
Ore trade	99	102	118
Fertilizer trade	97	108	131
Time charter (dry cargo):			
Norway	124	139	155
United Kingdom	123	140	158
London Tanker Brokers Panel (tankers)	71	65	NA

NA Not available.
[1] 1960=100.
[2] £ market.

PRICES

The United Nations export price indexes for minerals (1958=100) rose for the second year in a row, even the index for fuels showing a slight increase. The sharpest rise occurred in the index for metal ores, and within this group, for nonferrous metals.

Table 10.—Minerals export price indexes [1]
(1958=100)

Year	Metal ores	Fuels	Total
1963	96	91	92
1964	104	91	94
1965	110	92	96

[1] United Nations, Monthly Bulletin of Statistics, June 1966, Special Table C II.

As usual, the rise in export prices of all minerals taken as a group benefited the developed countries more than the underdeveloped areas, but the latter benefited significantly from the rise in export prices of nonferrous metals.

The chief features of the metals markets in 1965 were the fluctuations in nonferrous metal prices and the efforts of metal producers and governments of producing countries to manage the prices of these metals. These efforts were particularly notable in

[14] Petroleum Press Service, v. 32, No. 6, June 1965, pp. 219–221; v. 33, No. 4, April 1966, p. 147.

the case of copper, whose price on the free markets fluctuated sharply in response to political events and labor troubles affecting or threatening to affect the availability of supplies, but were also significant in the zinc markets.

Table 11.—Analysis of export price indices [1]

(1958=100)

Year	Developed areas		Underdeveloped areas	
	Minerals	Nonferrous metals	Minerals	Nonferrous metals
1963	99	106	90	116
1964	102	128	92	147
1965	105	143	93	176

[1] United Nations, Monthly Bulletin of Statistics, June 1966, Special Table C III.

The copper market provided an interesting example of the dual price system which had first been introduced by producers in the years of price weakness prior to 1963. During 1965, producers (who supply direct to consumers most of the metal coming on the markets) found it necessary to follow the upward movement of London Metal Exchange quotations for the marginal supplies required by consumers. However, producer prices lagged considerably behind the levels reached by the volatile LME market.

In the case of zinc, producers' price policies were necessarily different. Whereas strong demand and threats of supply interruption led to rising prices of copper on the free markets, with producers' quotations lagging behind, production increases and larger available supplies of zinc caused a downward tendency in zinc prices, and producers adopted a policy of support buying of the metal on the London Metal Exchange, without however attempting to peg prices at a fixed level.

Prices of most other nonferrous metals were firm in 1965. Lead prices showed a rising tendency in the first half but were stabilized at lower levels after U.S. stockpile releases early in the year. Aluminum prices (entirely on a producers' price basis) were relatively unchanged. Tin prices fluctuated within a narrower range than in 1964, but remained at high levels.

One significant fact that became clear during the years 1964 and 1965 was the extent to which the world's reserve stocks of major metals have been held (and of course, financed) by the United States Government through the operation of its stockpiles. In both years these stockpiles were drawn on to a considerable extent to alleviate actual supply shortages in, and to moderate price movements of, copper, lead, zinc and tin, as well as in the case of silver, where releases came from U.S. Treasury rather than stockpile sources.

Table 12.—Nonferrous metal prices in the United States in 1965

(Monthly averages, cents per pound) [1]

Month	Aluminum [2]	Copper [3]	Lead [4]	Zinc [5]	Tin [6]
January	24.500	33.600	16.000	14.500	156.219
February	24.500	33.600	16.000	14.500	154.875
March	24.500	33.600	16.000	14.500	165.011
April	24.500	33.600	16.000	14.500	180.714
May	24.500	35.454	16.000	14.500	192.056
June	24.500	35.600	16.000	14.500	189.136
July	24.500	35.600	16.000	14.500	184.185
August	24.500	35.600	16.000	14.500	187.227
September	24.500	35.600	16.000	14.500	192.196
October	24.500	35.678	16.000	14.500	185.464
November	24.589	36.414	16.000	14.500	177.007
December	24.500	35.861	16.000	14.500	174.339

[1] As reported by Engineering and Mining Journal (New York).
[2] Unalloyed ingot, 99.5 percent.
[3] Electrolytic, domestic refineries, Atlantic seabroad.
[4] Refined lead, New York.
[5] Prime Western slab, f.o.b., East St. Louis
[6] Straits, New York.

Source: Yearbook of the American Bureau of Metal Statistics, Forty-fifth Annual Issue for the year 1965.

Table 13.—Nonferrous metal prices in the United Kingdom in 1965
(Monthly averages, £ per long ton)[1]

Month	Aluminum[2]	Copper[3]	Lead[4]	Zinc[5]	Tin[6]
January	196.000	363.125	126.262	116.937	1,256.325
February	196.000	428.125	141.362	116.258	1,231.675
March	196.000	448.979	143.442	114.629	1,302.175
April	196.000	489.250	128.104	114.658	1,433.000
May	196.000	500.237	109.862	117.525	1,531.429
June	196.000	474.954	101.150	114.113	1,500.692
July	196.000	389.954	98.567	112.608	1,441.113
August	196.000	439.096	98.688	110.204	1,485.596
September	196.000	481.842	104.979	108.754	1,528.067
October	196.000	508.713	111.346	111.650	1,456.429
November	196.000	533.138	108.550	108.408	1,387.771
December	196.000	550.729	109.238	109.917	1,405.113

[1] London Metal Exchange, monthly average settlement prices.
[2] 99.5 percent ingots, producers price.
[3] London Metal Exchange, electrolytic wirebars.
[4] London Metal Exchange, refined pig lead, 99.97 percent.
[5] London Metal Exchange, virgin zinc, 98 percent.
[6] London Metal Exchange, standard tin.

Source: Yearbook of the American Bureau of Metal Statistics, Forty-fifth Annual Issue for the year 1965.

POLICIES AND PROGRAMS AFFECTING MINERAL PRODUCTION AND TRADE

A Third International Tin Agreement, adopted at a United Nations Tin Conference in April 1965, was open for signature by adhering producer and consumer countries until December 31, 1965. Although Malaysia (the chief producer) at first refused to sign, which would have prevented the Agreement from coming into effect, its Government eventually signed at the last moment. Upon ratification by the required number of adherents the Agreement was to become effective as soon after June 30, 1966 as possible. Seven producing countries and 16 consuming countries signed the Third Agreement, including all members of the Second Agreement except India. The United States did not become a member.

The general provisions of the Third Agreement are similar to those of the Second Tin Agreement, which was to expire of its own terms on June 30, 1966. Although it, like the Second Agreement, provides for a buffer stock, the International Tin Council under the Third Agreement will (at least initially) hold no actual metal, the buffer stock having been exhausted long ago and tin prices in the past 2 years so high as to avoid the necessity of buying for the Council's buffer stock. The new Agreement has a duration of 5 years.

In both 1964 and 1965 the Tin Council consulted with the United States Government regarding the latter's tin stockpile disposal policies.

STATISTICAL SUMMARY OF WORLD PRODUCTION AND TRADE FOR MAJOR COMMODITIES

The 30 tables that follow extend statistical series started in the 1963 edition of this chapter. They are provided both as a supplement to the statistical data within the body of the chapter and as a summary of international production and trade data for major commodities covered in greater detail on a commodity basis in individual commodity chapters of volumes I and II of Minerals Yearbook and on a regional basis in individual country chapters of volume IV. For various reasons, data presented here may not correspond exactly to that presented in the individual country chapters of volume IV. In the case of production tables (tables 14 through 29), the foremost of these reasons is that they are shortened versions of world tables prepared for use in volume I commodity chapters. These source tables in most instances were prepared considerably earlier in the year than the individual country production tables, and as a result, may not include revisions based on later receipt of

data. In the case of the trade tables (tables 30 through 45), differences result primarily from the fact that most of these tables have been obtained from single sources which have already processed a wide variety of official and unofficial trade data to reach the listed aggregates, and in some cases, sources used have not been identical with those used in individual country chapters.

Nevertheless, differences in figures in most cases are small enough that for the purposes of the tables—to indicate relative importance of countries and/or regions—they can be regarded as unimportant.

Table 14.—Leading world producers of bauxite [1]

(Thousand metric tons)

Country	1961	1962	1963	1964	1965 [p]
Jamaica	6,770	7,615	7,014	[2] 7,937	[2] 8,651
U.S.S.R. [e] [3]	4,000	4,200	4,300	4,300	4,700
Surinam	[r] 3,453	[r] 3,297	[r] 3,438	[r] 3,993	4,360
British Guiana	2,412	[r] 3,085	2,380	2,508	2,680
France	2,225	2,194	2,029	[r] 2,433	2,652
Guinea, Republic of	1,767	[r] 1,468	1,664	1,678	1,870
United States	1,248	1,391	1,549	1,626	1,680
Yugoslavia	1,232	1,332	1,285	1,293	1,574
Hungary	1,366	1,473	1,362	1,488	1,478
Greece	1,120	[r] 1,287	1,281	[e] 1,300	[e] 1,100
Total	25,593	27,342	26,302	28,556	30,745
All others [4]	3,747	3,908	4,373	5,129	6,290
World total [e]	[r] 29,340	[r] 31,250	[r] 30,675	[r] 33,685	37,035

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Bone dry equivalent of bauxite shipments and bauxite converted into alumina.

[3] Excludes nepheline concentrates and alunite ores.

[4] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 15.—Leading world producers of aluminum [1]

(Thousand metric tons)

Country	1961	1962	1963	1964	1965 [p]
United States	1,727	1,921	2,098	2,316	2,499
U.S.S.R. [e]	890	[r] 900	960	1,000	1,280
Canada	602	626	653	[r] 765	762
France	279	295	298	[r] 316	341
Japan	154	171	224	266	293
Norway	172	206	[r] 216	253	276
Germany, West	173	178	209	220	234
Italy	83	[r] 83	[r] 91	116	124
China, mainland [e]	100	100	100	100	100
Australia	13	16	42	[r] 80	88
Austria	68	74	76	78	79
Total	4,261	4,570	4,967	5,510	6,076
All others [2]	444	495	543	590	654
World total [e]	4,705	[r] 5,065	[r] 5,510	[r] 6,100	6,730

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 16.—Leading world mine producers of copper [1]

(Copper content of ore, recoverable where indicated, thousand metric tons)

Country	1961	1962	1963	1964	1965 p
United States [2]	1,057	1,114	1,101	1,131	1,226
U.S.S.R. e [3]	550	650	700	700	750
Zambia	r 575	562	588	r 632	696
Chile	551	593	604	r 622	583
Canada [2]	398	415	411	r 442	469
Congo, Republic of the (Léopoldville) [3]	295	r 297	271	r 277	289
Peru [2]	198	167	177	176	177
Japan	96	104	107	r 106	107
Australia	97	r 109	r 115	r 106	93
China, mainland e	80	90	90	90	90
Total	3,897	r 4,101	4,164	4,282	4,480
All others [4]	498	r 514	561	568	595
World total e	r 4,395	r 4,615	r 4,725	r 4,850	5,075

e Estimate. p Preliminary. r Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Recoverable.

[3] Smelter output.

[4] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 17.—Leading world producers of iron ore, iron ore concentrates, and iron ore agglomerates [1]

(Thousand metric tons)

Country	1961	1962	1963	1964	1965 p
U.S.S.R. [2]	117,633	r 128,111	r 137,502	r 145,856	153,000
United States [3]	72,474	72,982	74,780	86,198	86,700
France	66,606	66,301	57,892	r 60,938	59,525
China, mainland e [4]	35,000	30,000	35,000	37,000	39,000
Canada	18,469	24,820	27,346	r 34,768	36,097
Sweden	23,593	r 22,526	r 23,637	r 26,660	29,485
India (including Goa)	18,753	18,802	r 19,995	r 20,971	23,391
Brazil	10,220	10,737	11,219	r 16,962	• 17,500
Venezuela	14,565	13,266	11,747	15,650	17,400
Liberia	3,251	3,607	[5] 6,557	10,456	15,959
United Kingdom	16,783	15,522	15,151	r 16,588	15,661
Chile	6,989	8,092	8,507	9,853	11,409
Germany, West	18,866	16,643	12,898	11,613	10,847
Peru	8,737	5,949	6,574	6,605	e 7,312
Malaysia	6,842	6,612	7,381	6,569	6,983
Australia	5,428	4,921	5,603	r 5,760	6,750
Luxembourg	7,458	6,507	6,990	6,680	6,315
Mauritania	([6])	1,000	r 1,678	r 5,080	6,000
Total	451,667	456,398	470,457	524,207	549,334
All others [7]	50,974	51,252	51,947	54,272	63,465
World total e	502,641	r 507,650	r 522,404	r 578,479	612,799

e Estimate. p Preliminary. r Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Data represents concentrates containing approximately 60 percent iron.

[3] Includes byproduct ores.

[4] Roughly equivalent to ore containing 50 percent iron.

[5] Exports.

[6] Less than ½ unit.

[7] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 18.—Leading world producers of steel ingots and castings [1]

(Thousand metric tons)

Country	1961	1962	1963	1964	1965 [p]
United States [2]	88,917	89,201	99,119	115,281	119,259
U.S.S.R.	70,755	[r] 76,306	[r] 80,198	85,038	91,000
Japan	28,268	27,546	31,501	39,799	44,161
Germany, West	33,458	32,563	31,597	37,339	36,821
United Kingdom	22,441	20,320	22,881	26,234	27,439
France	17,428	[r] 17,107	[r] 17,431	[r] 19,505	19,604
China, mainland	9,500	10,000	12,000	[e] 14,000	[e] 15,000
Italy	9,329	9,757	[r] 10,157	9,793	12,681
Belgium	7,011	7,362	7,528	8,731	9,168
Canada	5,886	6,508	7,430	8,283	9,098
Poland	7,234	7,684	8,004	8,572	9,088
Czechoslovakia	7,043	7,639	7,598	8,377	8,880
Total	307,270	312,493	335,444	380,952	402,199
All others [3]	[r] 44,295	[r] 47,682	[r] 51,556	56,858	58,266
World total [e]	[r] 351,565	[r] 360,175	[r] 387,000	[r] 437,810	460,465

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Data from American Iron and Steel Institute. Excludes production of castings by companies that do not produce steel ingots.

[3] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 19.—Leading world mine producers of lead [1]

(Lead content of ore, recoverable where indicated, thousand metric tons)

Country	1961	1962	1963	1964	1965 [p]
U.S.S.R. [e 2]	350	350	350	360	370
Australia	274	376	[r] 417	[r] 382	361
Canada	166	192	181	187	275
United States [3]	238	215	230	259	273
Mexico	181	193	190	[r] 175	170
Peru [3]	136	128	[r] 147	[r] 151	147
Yugoslavia	97	102	[r] 114	[r] 113	106
China, mainland [e]	90	90	100	100	100
Bulgaria	80	94	89	91	[e] 100
South-West Africa [3]	[r] 70	[r] 75	[r] 75	[r] 94	88
Morocco	88	90	[r] 74	[r] 71	77
Sweden	64	68	[r] 71	[r] 68	67
Korea, North [e]	50	50	50	[r] 55	60
Spain	80	71	62	[r] 58	56
Japan	46	53	53	[r] 54	55
Germany, West	[r] 50	[r] 50	[r] 53	[r] 49	48
Poland	38	38	39	38	46
Total	2,098	2,235	2,295	2,305	2,399
All others [4]	292	265	255	265	301
World total [e]	[r] 2,390	[r] 2,500	[r] 2,550	[r] 2,570	2,700

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Smelter production.

[3] Recoverable.

[4] Derived figure; difference between indicated world total and sum of output of individually listed countries.

Table 20.—Leading world producers of manganese ore [1]

(Thousand metric tons)

Country	Percent Mn [e]	1961	1962	1963	1964	1965 [p]
U.S.S.R. [2]	NA	5,972	6,402	6,663	[r] 7,096	[e] 7,800
India (including Goa)	32–50	1,330	[r] 1,313	[r] 1,296	[r] 1,406	1,615
South Africa, Republic of	30+	1,418	1,465	1,308	1,320	1,567
Gabon	50–53	---	203	[r] 637	948	1,286
Brazil	38–50	1,016	1,171	1,254	1,352	1,177
China, mainland [e]	30+	800	800	1,000	1,000	1,000
Ghana (dry weight)	48	[r] 438	[r] 379	[r] 407	[r] 462	604
Congo, Republic of the (Léopoldville)	48+	316	316	270	310	378
Morocco	35–50	571	469	335	341	376
Japan	32–40	304	309	277	[r] 285	307
Mexico [e]	44–46	141	168	172	187	184
Ivory Coast	32–47	125	107	139	136	180
Hungary	30–	125	129	152	[r] 171	[e] 176
British Guiana	40–42	[r] 196	275	143	119	169
Rumania	35	206	189	260	[r e] 100	[e] 100
Total	NA	12,958	13,695	14,313	15,233	16,919
All others [3]	NA	621	577	447	585	693
World total [e]	NA	[r] 13,579	[r] 14,272	[r] 14,760	[r] 15,818	17,612

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Grade unstated.

[3] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 21.—Leading world mine producers of tin [1]

(Tin content of ore, long tons)

Country	1961	1962	1963	1964	1965 [p]
Malaysia	56,028	58,603	59,947	60,004	63,670
China, mainland [2]	30,000	28,000	28,000	25,000	25,000
Bolivia (exports)	20,408	21,492	22,752	[r] 24,186	23,349
U.S.S.R. [2]	17,000	17,000	20,000	20,000	21,000
Thailand	13,270	14,679	[r] 15,585	[r] 15,597	18,843
Indonesia	18,574	17,310	[r] 12,927	16,345	14,823
Nigeria	7,779	8,210	8,723	8,721	9,547
Congo, Republic of the (Léopoldville)	6,314	6,875	6,883	7,688	6,211
Australia	2,745	2,715	[r] 2,860	[r] 3,638	[e] 4,000
South Africa, Republic of	1,430	1,408	1,530	1,586	1,671
Rwanda	1,474	[r] 1,325	1,271	[e] 1,680	1,424
Brazil [e]	582	731	1,150	[r] 1,300	1,400
Total	175,604	178,348	181,628	185,745	190,938
All others [3]	8,496	8,252	8,672	8,755	8,262
World total [e]	184,100	[r] 186,600	[r] 190,300	[r] 194,500	199,200

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Estimated smelter output.

[3] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 22.—Leading world mine producers of zinc [1]

(Zinc content of ore, recoverable where indicated, thousand metric tons)

Country	1961	1962	1963	1964	1965 p
Canada	402	455	451	662	827
United States [2]	421	459	480	522	554
U.S.S.R. e [2]	400	410	410	410	412
Australia	316	343	r 357	350	351
Peru	[2] 174	[2] 162	[2] 196	237	259
Mexico	269	251	240	r 236	225
Japan	168	192	198	r 216	221
Poland	140	145	147	151	185
Congo, Republic of the (Léopoldville)	100	96	104	106	119
Germany, West	r 122	r 113	r 108	r 111	116
Italy	136	r 131	107	r 111	116
Korea, North e	90	90	100	100	105
China, mainland e	100	100	100	100	100
Yugoslavia	60	61	r 88	r 92	92
Total	2,898	3,008	3,086	3,404	3,682
All others [3]	592	577	614	616	628
World total e	r 3,490	r 3,585	r 3,700	r 4,020	4,310

e Estimate. p Preliminary. r Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Recoverable.

[3] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 23.—Leading world producers of hydraulic cement [1]

(Thousand metric tons)

Country	1961	1962	1963	1964	1965 p
U.S.S.R.	r 50,864	57,328	61,018	64,493	72,396
United States (including Puerto Rico)	57,753	60,022	62,832	65,728	66,318
Germany, West	27,144	28,593	29,217	r 33,632	34,132
Japan	24,636	28,787	29,948	r 32,981	32,689
France	15,381	16,882	r 18,134	r 21,537	22,584
Italy	18,031	20,172	22,088	22,840	20,234
United Kingdom	14,376	14,256	r 14,060	16,968	16,968
China, mainland	8,000	8,000	10,000	e 10,500	e 11,000
India	r 8,245	r 8,586	9,355	9,690	10,608
Spain (includes Canary Islands)	6,628	7,294	7,748	r 8,500	9,840
Poland	7,364	7,544	r 7,674	8,761	9,573
Canada (sold or used by producers)	5,630	6,240	6,364	7,176	7,578
Total	244,052	263,704	278,438	302,806	313,920
All others [2]	89,613	94,837	99,536	112,322	120,089
World total e	r 333,665	r 358,541	r 377,974	r 415,128	434,009

e Estimate. p Preliminary. r Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 24.—Leading world phosphate rock production [1]

(Thousand metric tons)

Country	1961	1962	1963	1964	1965 [p]
United States	18,857	19,692	20,174	23,328	26,863
U.S.S.R. [e 2]	8,800	10,000	11,000	13,000	15,500
Morocco	7,950	8,162	8,548	10,098	9,824
Tunisia	1,982	2,097	2,371	2,751	3,040
Naurum Island (exports)	1,303	1,540	1,572	1,849	1,496
Viet-Nam, North	622	712	[e] 975	[e] 1,050	[e] 1,050
Senegal	546	639	596	798	1,002
Togo	118	[r] 192	[r] 515	[r] 752	974
China, mainland [e]	500	600	700	800	900
Jordan	423	[r] 681	[r] 614	[r] 604	828
Christmas Island (Indian Ocean exports)	705	529	662	787	751
South Africa, Republic of	297	307	455	579	610
United Arab Republic (Egypt)	627	602	644	[r] 613	594
Israel	220	210	300	240	388
Ocean Island (exports)	343	261	362	328	375
Makatea Island (French Oceania)	381	317	335	[r] 388	[3] 319
Brazil	659	566	279	[r] 246	[e] 260
Korea, North (apatite) [e]	150	200	200	200	200
Peru (guano)	159	206	192	205	169
Netherlands Antilles (exports)	152	132	128	[r] 120	[e] 112
Poland	47	56	65	[r] 89	[e] 89
Algeria	440	390	348	73	86
Total	45,281	48,091	51,035	58,898	65,430
All others [4]	199	189	175	152	240
World total [e]	45,480	[r] 48,280	[r] 51,210	[r] 59,050	65,670

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Includes output of all major crude mineral sources of phosphate, including apatite, guano, and similar materials. Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Includes a category of material described by the Russians as "sedimentary rock."

[3] Exports.

[4] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 25.—Leading world producers of marketable potash [1]

(Thousand metric tons, K_2O equivalent)

Country	1961	1962	1963	1964	1965 [p]
United States	2,479	2,225	2,598	2,628	2,849
Germany, West	2,044	1,940	1,948	[r] 2,201	[e] 2,400
U.S.S.R. [e]	1,322	1,500	1,530	[r] 1,900	2,300
Germany, East	1,675	1,752	1,845	[r] 1,857	[e] 1,900
France	1,710	1,722	[r] 1,722	[r] 1,868	1,879
Canada	---	[e] 135	569	[r] 779	1,297
Total	9,230	9,274	10,212	11,233	12,625
All others [2]	470	526	588	767	875
World total [e]	9,700	9,800	[r] 10,800	[r] 12,000	13,500

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 26.—Leading world producers of pyrite [1]
(Gross weight, thousand metric tons)

Country	1961	1962	1963	1964	1965 [p]
Japan	3,931	4,016	3,894	[r] 4,146	4,323
U.S.S.R. [e]	2,800	3,000	3,200	3,200	3,300
Spain	2,131	2,129	2,027	[r] 2,393	2,385
China, mainland [e]	1,000	1,100	1,200	1,300	1,500
Italy	1,580	[r] 1,584	[r] 1,402	[r] 1,395	1,401
Cyprus	837	822	919	[r] 666	962
United States	1,003	931	838	861	889
Norway	733	[r] 810	[r] 721	710	709
Portugal	653	641	602	[r] 607	613
Finland	274	[r] 475	[r] 541	547	582
Sweden	[r] 438	[r] 378	[r] 403	[r] 485	[e] 485
Korea, North [e]	300	350	400	420	450
Germany, West	[r] 508	[r] 386	[r] 355	[r] 424	439
South Africa, Republic of	447	441	419	432	428
Rumania	263	305	333	[r] 409	[e] 410
Yugoslavia	[r] 364	[r] 414	[r] 356	[r] 428	407
Czechoslovakia	369	401	347	361	370
Canada (sales)	469	469	432	[r] 319	320
Total	18,100	18,652	18,389	19,103	19,973
All others [2]	[r] 1,500	[r] 1,448	1,461	1,497	1,527
World total [e]	19,600	20,100	[r] 19,850	[r] 20,600	21,500

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Includes cupreous pyrites. Data presented conform to that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Derived figure; difference between indicated world total and sum of output of individually listed producers.

Table 27.—Leading world elemental sulfur producers [1]
(Thousand metric tons)

Country	1961	1962	1963	1964	1965 [p]
United States	6,437	6,020	5,922	6,350	7,449
Canada (sales)	358	631	[r] 1,134	[r] 1,622	1,731
Mexico	1,244	1,447	1,553	1,725	1,585
France	1,097	1,347	[r] 1,409	[r] 1,511	1,522
U.S.S.R. [e]	1,175	1,320	1,350	1,350	1,430
Poland	[r] 133	[r] 210	[r] 235	295	431
China, mainland [e]	[r] 250	[r] 250	[r] 250	250	250
Japan	251	233	[r] 234	[r] 260	233
Germany, East	117	120	120	[e] 120	[e] 120
Germany, West	84	91	86	78	77
Spain	49	43	69	[r] 77	[e] 77
Finland	---	---	38	68	74
United Kingdom	59	53	[r] 47	[r] 55	[e] 55
Chile	45	64	[r] 57	[r] 60	46
Italy	72	[r] 56	[r] 43	[r] 30	37
Netherlands Antilles:					
Aruba and Curacao [e]	40	40	30	30	30
Netherlands	28	31	35	[r] 29	[e] 29
Sweden	[r] 31	30	26	[r] 27	[e] 27
Total	11,470	11,986	12,638	13,937	15,203
All others [2]	180	164	132	133	137
World total [e]	[r] 11,650	[r] 12,150	[r] 12,770	[r] 14,070	15,340

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Includes Frasch-process sulfur, sulfur from sulfur ores, and byproduct sulfur from other ores, natural gas, oil refinery gas, and from oil shale. Data presented conform with that given in world production table in commodity chapter, volume I. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Derived figure; difference betwen indicated world total and sum of output of individually listed producers.

Table 28.—Leading world producers of coal (all grades) [1]

(Million metric tons)

Country	1961			1962			1963			1964			1965 [p]			Percent of world
	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	
U.S.S.R.	134	377	511	r 131	r 386	517	137	r 395	r 532	r 145	r 409	554	150	430	580	20.7
United States	3	379	382	3	395	398	2	431	433	3	455	458	3	475	478	17.0
China, mainland	NA	250	250	NA	250	250	NA	270	270	NA	290	290	NA	e 300	e 300	10.7
Germany:																
East	237	3	240	247	3	250	r 254	2	r 256	257	2	259	251	2	253	9.0
West	97	[2] 146	243	101	[2] 144	245	r 107	[2] 144	251	111	[2] 144	255	102	[2] 137	239	8.5
United Kingdom	---	r 194	194	---	r 201	201	---	199	199	---	197	197	---	191	191	6.8
Poland	10	107	117	11	110	121	15	113	128	20	117	137	23	119	142	5.1
Czechoslovakia	65	26	91	69	27	r 96	73	28	r 101	76	r 28	104	72	28	100	3.6
India	[3]	56	56	[3]	61	r 61	1	r 66	67	2	r 64	66	2	67	69	2.5
France	3	52	55	3	52	r 55	2	48	r 50	r 2	r 53	55	3	51	54	1.9
Australia	17	24	41	17	25	42	19	25	44	r 19	r 28	47	21	32	53	1.9
Japan	1	54	55	1	54	r 55	1	r 52	53	1	r 51	52	1	50	51	1.8
South Africa, Republic of (marketable)	---	40	40	---	41	41	---	42	42	---	45	45	---	48	48	1.7
Hungary	25	3	28	25	3	28	27	4	r 31	27	4	31	27	4	31	1.1
Yugoslavia	23	1	24	24	1	25	26	1	27	28	1	29	29	1	30	1.1
Bulgaria	18	1	19	21	1	22	20	1	21	24	1	25	26	1	27	1.0
Belgium	---	22	22	---	21	21	---	21	21	---	21	21	---	20	20	0.7
Total	633	[4] 1,735	2,368	653	[4] 1,775	2,428	684	[4] 1,842	2,526	715	[4] 1,910	2,625	710	[4] 1,956	2,666	95.1
All others [5]	25	[4] 90	115	28	[4] 94	122	30	[4] 98	128	29	[4] 102	131	30	[4] 107	137	4.9
World total [e]	658	1,825	2,483	681	1,869	2,550	714	1,940	2,654	744	2,012	2,756	740	2,063	2,803	100.0

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume II. In some cases, revised figures for individual countries have been incorporated in individual country chapters of volume IV. Revisions in totals and in figures derived by subtraction have not been indicated by footnote.

[2] Includes pitch coal.

[3] Less than ½ unit.

[4] Derived by subtraction.

[5] Derived figures; difference between indicated world total and sum of individually listed producers.

Table 29.—Leading world producers of crude oil [1]

(Million 42-gallon barrels)

Country	1961	1962	1963	1964	1965 [p]
United States	2,622	2,676	2,753	[r] 2,787	2,849
U.S.S.R.	1,212	1,360	1,504	[r] 1,644	1,786
Venezuela	1,066	1,168	1,186	1,242	1,268
Kuwait	600	669	705	775	792
Saudi Arabia	508	555	595	628	739
Iran	432	482	538	619	688
Iraq	366	367	423	[r] 462	482
Libya	7	67	168	316	445
Canada	221	244	258	275	297
Algeria (including Sahara)	121	158	184	[r] 204	206
Indonesia	155	168	165	[r 2] 169	[2] 178
Kuwait-Neutral Zone	65	89	115	[r] 131	132
Mexico	107	112	115	116	118
Trucial States	---	6	18	67	103
Nigeria	17	25	28	44	99
Argentina	84	98	97	100	98
Rumania	86	88	91	92	94
Qatar	64	68	70	78	84
Colombia	53	52	60	63	73
China, mainland [e]	45	50	55	62	73
Germany, West	45	49	53	[r] 55	57
Total	7,876	8,551	9,181	9,929	10,661
All others [3]	308	331	356	380	402
World total [e]	8,184	[r] 8,882	[r] 9,537	[r] 10,309	11,063

[e] Estimate. [p] Preliminary. [r] Revised.

[1] Data presented conform with that given in world production table in commodity chapter, volume II. In some cases, revised figures for individual countries have been incorporated in country chapters of volume IV.

[2] Beginning May 1, 1963 West Irian transferred to Indonesia, production data for West Irian included for the years 1964 and 1965 under Indonesia.

[3] Derived figure; difference between indicated world total and sum of output of individually listed producers above.

Table 30.—World trade in bauxite in 1963 by areas

(Thousand metric tons)

Exporters	Destination						
	Canada	United States	Europe		Japan	Other countries	Total
			East [1]	West			
United States	123	---	---	25	---	58	206
Caribbean America	---	6,577	---	---	---	---	6,577
South America	1,221	3,316	---	98	33	177	4,845
Europe:							
Communist [1]	---	---	584	91	---	---	675
Non-Communist	---	19	505	1,779	---	25	2,328
Non-Communist Asia	---	---	2	92	1,222	69	1,385
Africa	48	8	---	233	---	---	289
Oceania	---	---	---	37	108	---	145
Total	1,392	9,920	1,091	2,355	1,363	329	16,450

[1] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R. (excludes Yugoslavia).

Table 31.—World trade in bauxite in 1964, by areas

(Thousand metric tons)

Exporters	Destination						
	Canada	United States	Europe		Japan	Other countries	Total
			East [1]	West			
United States	210	---	---	17	---	71	298
Caribbean America	---	7,389	---	---	---	---	7,389
South America	1,196	3,851	---	199	68	13	5,327
Europe:							
Communist [1]	---	---	686	75	---	---	761
Non-Communist	---	30	568	1,732	---	17	2,347
Non-Communist Asia	---	---	5	111	1,378	100	1,594
Africa	53	---	125	386	---	7	571
Oceania	---	---	---	158	243	11	412
Total	1,459	11,270	1,384	2,678	1,689	219	18,699

[1] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania and U.S.S.R. (excludes Yugoslavia).

Table 32.—Exports of unrefined and refined copper by major world producers in 1963 [1]

(Thousand metric tons)

Destinations	Exporting countries											
	Canada	United States	Chile	Peru	Belgium-Luxembourg	West Germany	U.S.S.R.	United Kingdom	Republic of the Congo (Leopoldville)	Zambia	Other countries [2]	Total
United States	67	XX	211	74	10	---	(3)	(4)	(3)	21	22	405
Belgium-Luxembourg	2	3	9	18	XX	4	(3)	31	178	4	6	255
France	6	35	12	(3)	84	6	(3)	(4)	30	25	3	201
West Germany	6	63	69	18	50	XX	(3)	4	1	75	8	294
Italy	2	51	32	---	22	(3)	(3)	(4)	28	53	3	191
U.S.S.R.	(3)	(3)	(3)	(3)	5	10	XX	1	(3)	10	10	36
United Kingdom	90	30	103	22	2	6	(3)	XX	3	221	6	483
Japan	---	14	(4)	(4)	2	---	(3)	---	4	37	13	70
Other	30	89	104	13	73	47	72	23	27	141	11	630
Total	203	285	540	145	248	73	72	59	271	587	82	2,565

XX Not applicable.

[1] Data presented in this table are not exactly comparable to that given in table 41 of 1963 chapter, Minerals in the World Economy, because of change of source.

[2] Mexico, Austria, France, Netherlands, Sweden, Japan and Australia.

[3] Shipments to this destination, if any, included in "Others" column at right.

[4] Less than ½ unit.

Source: Metallgesellschaft Aktiengesselschaft. Metal Statistics 1956–1965, 53rd Annual Issue. Frankfurt am Main, 1966, pp. 135–189.

Table 33.—Exports of unrefined and refined copper by major world producers in 1964 [1]

(Thousand metric tons)

Destinations	Exporting countries											
	Canada	United States	Chile	Peru	Belgium-Luxembourg	West Germany	U.S.S.R.	United Kingdom	Republic of the Congo (Leopoldville)	Zambia	Other countries [2]	Total
United States	77	XX	229	94	1	[3]	[4]	2	1	20	13	437
Belgium-Luxembourg	2	1	15	21	XX	4	[4]	[3]	196	13	7	259
France	14	32	18	[4]	91	5	[4]	4	27	40	4	235
West Germany	3	53	58	26	77	XX	[4]	7	[2]	102	13	339
Italy	2	50	22	[4]	18	1	[4]	1	34	53	1	182
U.S.S.R.	[4]	[4]	[4]	[4]	---	3	XX	---	[4]	1	[4]	4
United Kingdom	100	50	92	10	5	7	[4]	XX	3	236	3	506
Japan	---	19	[4]	[4]	1	---	[4]	---	3	81	11	115
Other	5	87	89	5	57	57	90	25	12	136	10	573
Total	203	292	523	156	250	77	90	39	276	682	62	2,650

XX Not applicable.

[1] Data presented in this table not exactly comparable to that given in table 41 of 1963 chapter, Minerals in the World Economy, because of change in source.

[2] Mexico, Austria, France, Netherlands, Sweden, Japan and Australia.

[3] Less than ½ unit.

[4] Shipments to this destination, if any, included in "Others" column at right.

Source: Metallgesellschaft Aktiengesellschaft. Metal Statistics 1956-1965, 53 Annual Issue. Frankfurt am Main, 1966, pp. 135–189.

Table 34.—World trade in iron ore, concentrates, and agglomerates in 1963, by areas

(Thousand metric tons)

Exporters	Destination							
	Canada	United States	South America	Europe		Japan	Other countries	Total
				East [1]	West			
Canada	---	18,623	---	---	3,604	2,011	---	24,238
United States	5,066	---	---	---	139	1,709	4	6,918
South America (including Mexico)	443	13,148	577	1,132	11,113	7,032	6	33,451
Europe:								
Communist [1]	---	---	---	20,085	721	---	1	20,807
Non-Communist	---	34	---	1,283	44,429	---	5	45,751
Non-Communist Asia	---	---	---	1,561	1,367	13,768	74	16,770
Africa	---	1,357	---	591	12,665	262	660	15,535
Oceania	---	---	---	---	---	1	295	296
Total	5,509	33,162	577	24,652	74,038	24,783	1,045	163,766

[1] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R. (Excludes Yugoslavia).

Table 35.—World trade in iron ore, concentrates and agglomerates in 1964, by areas

(Thousand metric tons)

Exporters	Destination							
	Canada	United States	South America	Europe		Japan	Other countries	Total
				East [1]	West			
Canada	---	25,191	---	---	4,061	1,704	7	30,963
United States	4,912	---	---	---	108	2,053	2	7,075
South America (including Dominican Republic and Mexico)	379	14,400	1,053	635	13,829	8,672	---	38,968
Europe:								
Communist [1]	---	---	---	21,466	919	---	245	22,630
Non-Communist	---	38	---	1,292	50,206	---	44	51,580
Africa	---	3,248	---	717	21,279	1,489	362	27,095
China, mainland and North Korea	---	---	---	---	---	403	1	404
Non-Communist Asia	---	---	---	1,590	1,888	15,502	54	19,034
Oceania	---	---	---	---	---	---	293	293
Total	5,291	42,877	1,053	25,700	92,290	29,823	1,008	198,042

[1] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R.

Table 36.—Major world trade in steel ingots and semimanufactures in 1963, by areas [1]

(Thousand metric tons)

Exporters	Destinations by area									
	North America	Latin America	Europe		Africa	Asia		Oceania	Unallocated	Total, world
			Non-Communist	Communist		Near East [2]	South Asia and Far East [3]			
North America:										
Canada	576.6	136.3	211.5	---	8.0	9.0	83.4	12.4	---	1,037.2
United States	285.2	302.2	247.6	2.8	66.5	68.7	963.7	15.1	---	1,951.8
Total	861.8	438.5	459.1	2.8	74.5	77.7	1,047.1	27.5	---	2,989.0
Europe:										
European Economic Community:										
Belgium-Luxembourg	1,128.0	259.0	5,227.0	98.0	223.0	330.0	163.0	22.0	---	7,450.0
France	395.3	186.4	3,381.8	171.6	571.9	241.4	93.0	16.2	---	5,057.6
Germany, West	592.4	274.2	5,935.9	382.5	204.1	270.9	180.4	7.8	---	[4] 7,848.2
Italy	11.1	163.0	277.1	267.3	82.6	28.1	8.1	.7	12.1	[5] 850.1
Netherlands	14.3	34.5	1,307.6	112.1	40.7	15.4	16.8	.4	---	1,541.8

Subtotal	2,141.1	917.1	16,129.4	1,031.5	1,122.3	885.8	461.3	47.1	12.1	[4] 22,747.7
European Free Trade Association:										
Austria	4.7	6.9	860.3	263.4	1.6	20.8	6.1	.8	7.7	1,172.3
Norway	17.8	.3	242.4	15.3	2.1	4.2	.5	---	---	282.6
Sweden	55.0	14.8	550.1	80.0	39.1	28.4	26.2	3.5	---	797.1
United Kingdom	427.0	229.2	1,367.8	380.6	266.9	143.5	373.5	186.0	---	3,374.5
Subtotal	504.5	251.2	3,020.6	739.3	309.7	196.9	406.3	190.3	7.7	5,626.5
European Communist Nations:										
Czechoslovakia	---	18.6	234.0	1,234.5	40.6	32.8	43.0	---	---	1,603.5
Hungary	---	.1	191.0	391.7	26.0	48.1	54.7	---	---	711.6
Poland	7.0	75.1	184.4	651.8	33.9	47.0	36.2	---	---	1,035.4
U.S.S.R.	---	103.8	382.0	3,006.7	44.2	69.2	244.2	---	59.5	3,909.6
Yugoslavia	.3	---	107.2	54.3	12.0	7.0	7.9	---	---	188.7
Subtotal	7.3	197.6	1,098.6	5,339.0	156.7	204.1	386.0	---	59.5	7,448.8
Total	2,652.9	1,365.9	20,248.6	7,109.8	1,588.7	1,286.8	1,253.6	237.4	79.3	[4] 35,823.0
Africa: Republic of South Africa	98.5	1.9	68.7	---	105.4	.6	.2	.6	.2	276.1
Asia: Japan	1,628.0	411.4	606.5	356.3	163.2	75.1	1,824.6	222.4	---	5,282.5
Oceania: Australia	29.7	12.1	47.5	---	5.0	.5	47.6	166.0	4.4	312.8
Grand total	5,265.9	2,229.8	21,430.4	7,468.9	1,936.8	1,440.7	4,173.1	658.9	83.9	[4] 44,683.4

[1] Based on export data or countries listed in left hand column; although list of exporting countries is not complete, the table covers all significant producers and exporters.
[2] Includes Bahrain, Iran, Iraq, Israel, Kuwait, Lebanon, Saudi Arabia and Syria.
[3] Includes Afghanistan, Burma, Ceylon, mainland China, Hong Kong, India, Indonesia, Japan, Laos, North Korea, North Viet-Nam, Malaysia, Pakistan, Philippines, South Korea, South Viet-Nam, Taiwan, and Thailand.
[4] Excluding 179,900 metric tons exported to East Germany.
[5] Excludes 12,000 tons of railway materials.

Source: United Nations, Statistics of World Trade in Steel 1963. Economic Commission for Europe, New York, 1964. 43 pp.

Table 37.—Major world trade in steel ingots and semimanufactures in 1964, by areas [1]

(Thousand metric tons)

Exporters	Destinations by area									
	North America	Latin America	Europe		Africa	Asia		Oceania	Unallocated	Total, world
			Non-Communist	Communist		Near East [2]	South Asia and Far East [3]			
North America:										
Canada	612.0	214.7	182.2	---	14.6	5.3	20.7	17.8	---	1,067.3
United States	648.4	391.5	781.9	1.0	78.9	37.1	1,163.0	16.9	---	3,118.7
Total	1,260.4	606.2	964.1	1.0	93.5	42.4	1,183.7	34.7	---	4,186.0
Europe:										
European Economic Community:										
Belgium-Luxembourg	1,278.0	364.0	6,184.0	57.0	230.0	284.0	131.0	47.0	---	8,575.0
France	503.7	262.3	4,114.4	161.0	620.5	215.3	120.2	36.6	---	6,034.0
Germany, West	723.8	276.2	6,293.1	381.6	205.5	220.7	203.5	11.9	---	[4] 8,316.3
Italy	50.3	89.8	658.7	254.3	173.8	107.0	32.4	1.4	9.3	[5] 1,377.0
Netherlands	16.5	43.0	1,463.7	15.7	39.6	20.1	46.0	.4	4.8	1,649.8
Subtotal	2,572.3	1,035.3	18,713.9	869.6	1,269.4	847.1	533.1	97.3	14.1	[4] 25,952.1
European Free Trade Association:										
Austria	4.8	9.0	836.6	258.4	2.6	33.8	5.7	.7	7.3	1,158.9
Norway	22.9	2.7	305.0	18.7	4.3	3.5	1.7	---	---	358.8
Sweden	69.7	20.7	748.9	70.5	14.7	19.7	29.6	4.6	---	978.4
United Kingdom	414.4	288.8	1,609.3	156.4	425.0	149.1	430.4	245.1	---	3,718.5
Subtotal	511.8	321.2	3,499.8	504.0	446.6	206.1	467.4	250.4	7.3	6,214.6
European Communist Countries:										
Czechoslovakia	4.8	22.3	394.6	1,402.2	74.7	85.4	60.0	---	---	2,044.0
Hungary	---	---	240.2	396.7	8.2	83.2	35.5	---	---	763.8
Poland	60.3	18.1	177.8	564.5	25.3	72.0	33.8	---	---	951.8
U.S.S.R.	---	149.2	426.4	3,597.9	84.2	84.1	188.5	---	53.6	4,583.9
Yugoslavia	.3	51.9	40.1	45.0	3.5	1.9	13.2	---	---	155.9
Subtotal	65.4	241.5	1,279.1	6,006.3	195.9	326.6	331.0	---	53.6	8,499.4
Total	3,149.5	1,598.0	23,492.8	7,379.9	1,911.9	1,379.8	1,331.5	347.7	75.0	[4] 40,666.1
Africa: Republic of South Africa	14.3	.1	13.9	---	120.4	---	.6	.9	2.2	152.4
Asia: Japan	2,481.0	504.0	469.0	146.0	262.0	136.0	2,139.0	394.0	8.0	6,539.0
Oceania: Australia	49.0	8.9	81.2	---	4.9	.6	80.6	224.7	6.2	456.1
Grand total	6,954.2	2,717.2	25,021.0	7,526.9	2,392.7	1,558.8	4,735.4	1,002.0	91.4	[4] 51,999.6

[1] Based on export data of countries listed in left hand column; although list of exporting countries is not complete, the table covers all significant producers and exporters.
[2] Includes Bahrain, Iran, Iraq, Israel, Kuwait, Lebanon, Saudi Arabia, and Syria.
[3] Includes Afghanistan, Burma, Ceylon, mainland China, Hong Kong, India, Indonesia, Japan, Laos, North Korea, North Viet-Nam, Malaysia, Pakistan, Philippines, South Korea, South Viet-Nam, Taiwan, and Thailand.
[4] Excluding tonnages delivered to Eastern Germany.
[5] Excludes 12,000 tons of railway materials.

Source: United Nations, Statistics of World Trade in Steel 1964. Economic Commission For Europe, New York, 1965. 39 pp.

Table 38.—World trade of lead ores and concentrates in 1964 [1]
(Thousand metric tons of contained metal unless otherwise specified)

Destinations	Exporting regions								
	North America [2]	Latin America [2]	Western Europe [3]	Eastern Europe [3]	Africa	Asia	Oceania	Origin not reported by continent	Total
United States	25.3	37.4	---	---	31.0	---	17.4	0.5	111.6
Western Europe:									
Belgium-Luxembourg [4]	44.2	7.6	4.5	---	12.2	---	---	3.9	72.4
France	9.7	4.3	11.5	1.4	46.1	3.0	19.6	1.1	96.7
West Germany	10.8	16.8	22.2	3.8	7.9	.2	---	---	61.7
United Kingdom	5.2	---	---	---	---	---	11.7	12.9	29.8
Other [5]	---	---	3.0	---	6.0	---	---	4.5	13.5
Total [6]	69.9	28.7	41.2	5.2	72.2	3.2	31.3	22.4	274.1
Japan	1.2	8.4	---	---	---	3.1	12.9	---	25.6
Grand total	96.4	74.5	41.2	5.2	103.2	6.3	61.6	22.9	411.3

[1] Compiled from import data of countries listed in destination column only, therefore incomplete; however, imports by countries not listed are regarded as being relatively small with respect to total.
[2] Mexico included with Latin America.
[3] Eastern Europe comprises Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R.; Yugoslavia included with Western Europe.
[4] Data are for gross weight of ore and concentrates rather than for contained metal and cover period from January through October only.
[5] Includes Austria and Italy only.
[6] Gross weight of ore and concentrate for Belgium-Luxembourg plus contained metal for other countries listed.

Source: International Lead and Zinc Study Group. Lead and Zinc Statistics. V. 5, No. 5, May 1965, p. 24.

Table 39.—World trade of lead ores and concentrates in 1965 [1]

(Thousand metric tons of contained metal unless otherwise specified)

Destinations	Exporting regions								
	North America [2]	Latin America [2]	Western Europe [3]	Eastern Europe [3]	Africa	Asia	Oceania	Origin not reported by continent	Total
United States	21.7	25.2	---	---	1.1	---	13.6	---	61.6
Western Europe:									
Belgium-Luxembourg [4]	10.6	.4	2.7	---	18.3	---	---	3.1	35.1
France	1.5	.7	7.6	---	20.4	0.5	10.5	---	41.2
West Germany	10.3	11.0	23.1	5.4	6.6	2.7	---	---	59.1
United Kingdom	4.3	---	---	---	---	.1	4.4	3.0	11.8
Other [5]	---	---	.9	---	5.3	---	---	---	6.2
Total [6]	26.7	12.1	34.3	5.4	50.6	3.3	14.9	6.1	153.4
Japan	---	2.7	---	---	---	4.1	10.6	---	17.4
Grand total	48.4	40.0	34.3	5.4	51.7	7.4	39.1	6.1	232.4

[1] Compiled from import data of countries listed in destination column only, therefore incomplete; however imports by countries not listed are regarded as being relatively small with respect to total.

[2] Mexico included with Latin America.

[3] Eastern Europe comprises Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R.; Yugoslavia is included with Western Europe.

[4] Data are for gross weight of ore and concentrates rather than for contained metal, and cover January through April only.

[5] Includes Austria and Italy only.

[6] Gross weight of ore and concentrates for Belgium-Luxembourg plus contained metal for other countries listed.

Source: International Lead and Zinc Study Group. Lead and Zinc Statistics. V. 6, No. 11, November 1966, p. 24.

Table 40.—World trade of zinc ores and concentrates in 1964 [1]

(Thousand metric tons of contained metal unless otherwise specified)

Destinations	Exporting regions								
	North America [2]	Latin America [2]	Western Europe [3]	Eastern Europe [3]	Africa	Asia	Oceania	Origin not reported by continent	Total
United States	141.9	162.9	---	---	6.5	---	3.1	9.6	324.0
Western Europe:									
Belgium-Luxembourg [4]	121.5	12.3	135.9	---	68.5	---	---	27.0	365.2
France	28.4	37.6	48.2	---	81.7	9.6	---	---	205.5
West Germany	13.4	5.8	39.4	2.1	2.0	2.0	6.3	---	71.0
United Kingdom	6.7	---	---	---	---	---	98.6	25.4	130.7
Other [5]	20.7	9.5	52.0	---	3.7	1.4	9.7	8.0	105.0
Total [6]	190.7	65.2	275.5	2.1	155.9	13.0	114.6	60.4	877.4
Japan	12.3	100.7	5.1	---	---	12.2	13.6	---	143.9
Grand total	344.9	328.8	280.6	2.1	162.4	25.2	131.3	70.0	1,345.3

[1] Compiled from import data of countries listed in destination column only, therefore incomplete; however, imports by countries not listed are regarded as relatively small with respect to total.

[2] Mexico included with Latin America.

[3] Eastern Europe comprises Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R.; Yugoslavia is included with Western Europe.

[4] Data are gross weight of ore and concentrates rather than for contained metal and cover period from January through October only.

[5] Includes Austria, the Netherlands, and Norway only.

[6] Gross weight of ore for Belgium-Luxembourg plus contained metal for other countries listed.

Source: United Nations, International Lead Zinc Study Group. Lead and Zinc Statistics. V. 5, No. 5, May 1965, p. 25.

Table 41.—World trade of zinc ores and concentrates in 1965 [1]

(Thousand metric tons of contained metal unless otherwise specified)

Destinations	Exporting regions								
	North America [2]	Latin America [2]	Western Europe [3]	Eastern Europe [3]	Africa	Asia	Oceania	Origin not reported by continent	Total
United States	93.9	92.6	---	---	9.7	---	1.9	0.3	198.4
Western Europe:									
Belgium-Luxembourg [4]	64.6	---	---	---	29.3	---	9.0	27.5	130.4
France	21.4	11.9	31.8	---	37.8	3.2	4.2	---	110.3
West Germany	5.3	4.0	10.3	0.8	4.1	3.7	---	---	28.2
United Kingdom	5.3	---	---	---	---	1.0	42.5	6.2	55.0
Other [5]	1.2	.6	19.1	---	2.5	.4	3.4	.2	27.4
Total [6]	97.8	16.5	61.2	.8	73.7	8.3	59.1	33.9	351.3
Japan	2.6	77.3	---	---	---	13.5	9.0	.5	102.9
Grand total	194.3	186.4	61.2	.8	83.4	21.8	70.0	34.7	652.6

[1] Compiled from import data of countries listed in destination column only, therefore incomplete; however imports by countries not listed are regarded as relatively small with respect to total.
[2] Mexico included with Latin America.
[3] Eastern Europe comprises Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R.; Yugoslavia is included with Western Europe.
[4] Data are for gross weight of ore and concentrates rather than for contained metal, and cover January through April only.
[5] Includes Austria, Netherlands, and Norway only.
[6] Gross weight of ore for Belgium-Luxembourg plus contained metal for other countries listed.

Source: International Lead Zinc Study Group. Lead and Zinc Statistics. V. 6, No. 11, November 1966, p. 25.

Table 42.—World movement of solid fuels [1] in 1963

(Thousand metric tons, standard coal equivalent)

Destinations	Exporting regions						
	North America	Western Europe	Africa	Far East	Oceania	Other countries [2]	Total [3]
North America	13,900	40	---	---	---	60	14,000
Caribbean America	60	---	---	---	---	60	120
Other America	1,790	200	60	---	---	90	2,000
Western Europe	25,000	48,000	670	---	15	21,700	95,400
Africa	---	---	---	---	---	---	---
Middle East	40	25	---	---	---	265	330
Far East	6,165	651	340	1,330	3,070	2,080	13,050
Oceania	3	20	6	---	180	---	210
Other countries [2]	160	1,040	---	---	12	32,650	33,900
Total [3]	35,700	45,750	1,950	1,340	3,290	56,900	131,800

[1] Data based on general trade system (that is, including reexports). Lignite, lignite briquets and coke reduced to standard coal equivalent. Bunkers excluded.
[2] Includes Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R.
[3] Reported totals; details do not add to listed total because of inclusion of data for other areas not listed separately.

Source: United Nations. World Energy Supplies 1960–63. Statistical Papers. Ser. J, No. 8, New York 1965, pp. 40–45.

Table 43.—World movement of solid fuels [1] in 1964

(Thousand metric tons, standard coal equivalent)

Destinations	Exporting regions						
	North America	Western Europe	Africa	Far East	Oceania	Other countries [2]	Total [3]
North America	14,180	20	---	---	---	---	14,190
Caribbean America	70	---	---	---	---	60	130
Other America	1,950	300	---	---	---	90	2,340
Western Europe	23,180	41,100	680	---	10	23,200	88,180
Africa	10	40	2,070	---	---	120	2,240
Middle East	20	20	---	---	---	500	540
Far East	6,840	30	320	1,530	4,690	2,090	15,500
Oceania	---	10	20	---	260	---	290
Other countries [2]	370	1,070	---	---	20	35,420	36,880
Total [3]	46,620	42,590	3,090	1,530	4,980	61,480	160,470

[1] Data based on general trade system (that is, including reexports). Lignite, lignite briquets and coke reduced to standard coal equivalent. Bunkers excluded.
[2] Includes Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R.
[3] Reported totals; details do not add to listed total because of inclusion of data for other areas not listed separately.

Source: United Nations. World Energy Supplies 1961–64. Statistical Papers. Ser. J, No. 9, New York 1966, pp. 40–45.

Table 44.—World movement of crude petroleum [1] in 1963

(Thousand metric tons)

Destinations	Exporting regions								
	North America	Caribbean America	Other America	Western Europe	Africa [2]	Middle East [2]	Far East	Other countries [3]	World
North America	12,300	40,700	300	---	90	22,650	2,600	---	[4] 78,700
Caribbean America	---	52,200	160	---	---	3,925	---	3,770	[4] 60,100
Other America	---	6,500	320	---	590	5,250	---	570	[4] 13,200
Western Europe	60	23,200	180	2,040	27,330	180,900	55	12,240	[4] 246,000
Africa [2]	---	---	---	---	375	3,175	---	285	3,835
Middle East [2]	---	10	---	90	35	26,150	---	930	[4] 27,220
Far East	170	420	---	---	---	58,300	10,970	2,030	71,890
Oceania	---	---	---	---	---	10,600	4,260	---	14,860
Other [3]	---	---	---	540	---	230	---	11,000	11,770
World	[4] 12,500	[4] 123,100	960	2,670	[4] 28,770	[4] 311,400	[4] 17,900	[4] 30,800	[4] 528,100

[1] Data based on general trade system (that is, including reexports).
[2] Data for Libya and United Arab Republic are included under Middle East.
[3] Includes Czechoslovakia, East Germany, Hungary, Poland, and U.S.S.R.
[4] Reported totals; details do not add to listed total because of inclusion of data for other areas not listed separately.

Source: United Nations. World Energy Supplies 1960–63. Statistical Papers. Ser. J, No. 8. New York 1965, pp. 74–79.

Table 45.—World movement of crude petroleum [1] in 1964

(Thousand metric tons)

Destinations	Exporting regions								
	North America	Caribbean America	Other America	Western Europe	Africa [2]	Middle East [2]	Far East	Other countries [3]	World
North America	13,680	43,750	---	---	290	21,890	3,150	---	[4] 82,770
Caribbean America	---	56,200	---	---	80	4,160	30	3,430	63,900
Other America	---	6,910	280	---	270	5,220	---	1,880	14,560
Western Europe	40	22,510	160	640	30,230	218,590	530	13,890	[4] 286,600
Africa [2]	---	---	---	---	1,310	7,880	---	300	[4] 9,500
Middle East [2]	---	---	---	20	---	27,270	---	710	28,000
Far East	140	350	40	---	---	70,310	12,280	2,560	[4] 85,670
Oceania	---	---	---	---	---	12,240	3,830	---	16,070
Other [3]	---	---	---	40	---	840	---	14,240	15,120
World	[4] 13,860	[4] 129,720	480	700	[4] 32,180	[4] 368,400	[4] 19,790	[4] 37,010	[4] 602,190

[1] Data based on general trade system (that is, including reexports).
[2] Data for Libya and United Arab Republic are included under Middle East.
[3] Includes Czechoslovakia, East Germany, Hungary, Poland and U.S.S.R.
[4] Reported totals; details do not add to listed total because of inclusion of data for other areas not listed separately.

Source: United Nations. World Energy Supplies 1961–64. Statistical Papers. Ser. J, No. 9, New York 1966, pp. 76–81.

Regional Mineral Industry Review of North America[1]

By Lester G. Morrell [2]

For the fifth consecutive year the trend of growth and expansion continued in virtually all major segments of North America's industrial economy. While growth rates of the minerals and mineral products segments in Canada and United States were slightly below overall industrial growth rates in both countries, overall output, as indicated by value of products, established new records. According to United Nations annual index [3] of industrial production, Canada's mining production rose from 144 in 1964 to 153 in 1965 (1958=100). The corresponding rise for the United States was from 116 to 120. The United Nations continental index for mining, manufacturing, electricity, and gas industries was estimated at 153 in 1965 compared with 141 in 1964, both on a 1958=100 base. As the world economy continued to expand, the growing demands of industrial nations for basic raw materials resulted in increased mine output of many mineral commodities and higher prices for several metals. Prices of nonmetals and fuels showed little change in 1965. According to U.S. Department of Labor indexes, wholesale prices in general were up about 2 percent in 1965.

Total gross national product (GNP) for the United States and Canada, in current dollars, was estimated at $729,300 million in 1965, nearly 8.5 percent above that of 1964. National income in the two countries amounted to $594,900 million in 1965, compared with $550,100 million in 1964. Combined total value of mineral products in the two countries amounted to $24,900 million in 1965, compared with $23,600 million in 1964; thus representing a rise of from 3.4 to 3.5 percent of GNP, and from 4.2 to 4.3 percent in output value. Although mineral fuels accounted for more than 60 percent of the North American mineral product value in both years, the greatest percentage gain in 1965 was in metallic materials which, reflecting larger quantities and higher prices, recorded an annual increase of 11 percent. The year's gains in value of nonmetallic minerals (including construction materials) and fuels amounted to 6.4 percent and 3.4 percent, respectively. Gains were recorded in the output of more than 40 of the principal mineral commodities produced in North America during 1965. Bismuth, mercury, molybdenum, tellurium, and pumice showed annual gains of over 25 percent. Cobalt, manganese ore, nickel, platinum-group metals, zinc ore, phosphate rock, potash, salt, sulfur, and vermiculite were up 10 to 25 percent.

United States or Canada led the world in production of more than 30 of the mineral and metal commodities listed in the U.S. Bureau of Mines World Mineral Production tables for 1965. More than half of the world output of magnesium, mica (including scrap), molybdenum, nickel, natural gas, phosphate rock, selenium, sulfur, tellurium, uranium oxide, and vanadium were produced in North America during the year.

The high level of industrial activity throughout 1965 in North America as a whole resulted in increased numbers of employees and lower rates of unemployment. Labor supply shortages, particularly in the

[1] North America, for this purpose, embraces the Dominion of Canada, the United States including Alaska and insular possessions, and the Danish Colony of Greenland. French islands off the east coast of Canada and United States Pacific possessions, including the State of Hawaii, are insignificant in the continental mineral industry.

[2] North America-South Pacific specialist, Division of International Activities.

[3] United Nations Statistical Office. Monthly Bulletin of Statistics. New York, May 1966, pp. XIV, 18, and 26.

skilled categories, were common in the mining and mineral processing industries of both countries. Shutdowns due to labor troubles were at a relatively low level. Mining industry wage rates were above industry-wide averages in both countries. Average weekly earnings of mine workers were up approximately 5 percent. Hourly earn-

Table 1.—North American contribution to world mineral production

Commodity	1964 r			1965 p		
	Metric tons (unless otherwise specified)	Percent of—		Metric tons (unless otherwise specified)	Percent of—	
		Non-Communist[1] production	World production		Non-Communist[1] production	World production
Metals:						
Aluminum:						
Bauxite	1,626,414	5.9	4.8	1,680,384	5.5	4.5
Metal	3,080,556	64.8	50.5	3,261,154	64.3	46.3
Antimony	1,295	3.6	2.1	1,326	3.6	2.1
Arsenic (white)	147	.2	(2)	136	.2	(2)
Bismuth	181	5.5	4.9	233	6.0	5.5
Cadmium metal [3]	6,001	55.2	45.7	5,752	56.3	45.7
Cobalt	2,121	16.4	15.0	2,456	17.3	15.8
Columbium-tantalum concentrates	1,915	35.9	(2)	2,046	30.3	(2)
Copper:						
Mine (content)	1,572,760	40.1	32.4	1,695,502	41.5	33.4
Smelter	1,584,277	37.1	30.5	1,694,252	37.9	31.0
Gold, troy ounces	5,255,586	13.1	11.4	5,292,358	12.8	11.1
Iron:						
Ore, concentrate, etc., thousand tons	120,966	31.6	20.9	125,349	30.7	20.4
Pig iron and ferroalloys, do.	85,845	39.4	27.0	89,142	38.9	26.6
Steel ingots and castings, do.	123,564	40.0	28.2	128,357	39.8	27.9
Lead:						
Mine (content)	446,668	25.2	17.4	548,438	29.2	20.3
Smelter	545,035	30.7	21.3	548,602	30.1	20.9
Magnesium metal	80,595	68.3	53.4	83,909	67.3	52.9
Manganese ore	23,639	.3	.1	26,542	.3	.2
Mercury, 76-pound flasks	14,215	7.0	5.6	19,602	9.0	7.1
Molybdenum	30,314	85.6	70.7	39,359	88.2	75.3
Nickel [4]	218,341	78.0	57.2	256,140	80.1	60.0
Platinum-group metals, troy ounces	416,725	39.7	16.3	487,089	38.7	16.5
Selenium	632	72.6	(2)	474	66.3	(2)
Silver, thousand troy ounces	66,236	31.4	26.9	71,723	34.0	28.6
Tellurium	101	80.4	(2)	127	83.1	(2)
Tin metal [5], long tons	5,190	3.6	2.7	3,098	2.1	1.6
Titanium concentrate:						
Ilmenite [6]	1,402,371	59.7	(2)	1,374,722	55.5	(2)
Rutile	7,314	3.8	(2)	NA	NA	NA
Tungsten concentrate (60 percent WO_3) [7]	8,386	36.7	14.4	7,211	34.2	13.3
Uranium oxide (U_3O_8)	17,356	71.7	(2)	13,381	71.0	(2)
Vanadium, in ore and concentrate	3,957	55.6	(2)	4,741	57.1	(2)
Zinc:						
Mine (content)	1,183,686	38.4	29.4	1,381,259	41.5	32.0
Smelter	1,171,906	41.7	31.4	1,227,415	42.2	31.9
Nonmetals:						
Asbestos	1,380,602	71.1	42.9	1,366,059	71.2	41.9
Barite	894,348	33.3	28.8	949,829	32.1	27.5
Cement [8], thousand tons	72,904	24.0	17.6	73,896	23.7	17.0
Diatomite	527,454	37.7	30.7	527,506	41.9	32.8
Feldspar	604,918	38.2	32.8	644,448	38.6	33.4
Fluorspar	283,982	15.0	11.5	315,569	14.9	11.0
Gypsum [9], thousand tons	15,192	37.6	32.6	14,738	36.5	31.5
Mica, all forms, including scrap	104,734	72.2	56.6	109,820	68.6	54.9
Phosphate rock, thousand tons	23,328	53.1	39.5	26,863	56.0	40.9
Potash	3,406,779	41.3	28.4	4,145,812	44.6	30.7
Pumice, pumicite, cinder	2,518,760	17.0	(2)	3,160,511	21.0	(2)
Pyrite	1,180,286	7.7	5.7	1,209,060	7.5	5.6
Salt, thousand tons	32,306	44.1	32.4	35,628	45.9	33.1
Sulfur	7,972,220	61.3	56.7	9,179,893	65.1	59.8
Talc, soapstone, pyrophyllite	860,080	29.0	24.7	832,709	27.9	23.7
Vermiculite	205,294	65.9	(2)	226,207	65.3	(2)

Table 1.—North American contribution to world mineral production—Continued

Commodity	1964 r			1965 p		
	Metric tons (unless otherwise specified)	Percent of—		Metric tons (unless otherwise specified)	Percent of—	
		Non-Communist[1] production	World production		Non-Communist[1] production	World production
Mineral fuels:						
Coal:						
Anthracite thousand tons	15,589	20.6	8.2	•13,486	14.7	7.1
Bituminous and lignite do	452,088	37.1	22.5	475,089	39.2	23.0
Peat (includes agricultural)	821,000	9.7	.5	790,000	10.8	.4
Petroleum, crude thousand 42-gallon barrels	3,062,186	36.1	29.7	3,145,511	34.7	28.4
Natural gas million cubic feet	16,780,385	88.1	70.4	17,363,902	88.4	68.7

p Preliminary. r Revised. NA Not available.
[1] Excludes Albania, Bulgaria, mainland China, Cuba, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Rumania, U.S.S.R., North Viet-Nam, and Yugoslavia.
[2] Insufficient data, no estimates on Communist countries.
[3] Includes some secondary metal.
[4] Includes content of ores, smelter products, and oxide in addition to refined nickel.
[5] U.S. production mostly from imported concentrate.
[6] Includes Canadian production of titanium slag.
[7] U.S. production only. Canadian production not reported.
[8] Includes Puerto Rico's production.
[9] Includes anhydrite in Canada and several countries of Europe.

ings during 1965 averaged $2.76 for a 44-hour workweek in the United States and Can$2.43 for a 41-hour workweek in Canada.

Dominated by demands of U.S. industries, consumption of mineral and metal raw materials in North America, remained at a high level through 1965. The trend of industrial consumption for selected mineral and metal commodities is tabulated in table 2. Although consumption of 23 of the 27 listed materials was at a higher quantitative level in 1965 than in 1964, the North American share of non-Communist world production rose in only 13 materials. Nevertheless, United States and Canada absorbed over half of the year's output of eight metals, in addition to sulfur and natural gas, and absorbed over one-fourth of all listed commodities except cement and anthracite coal.

Canada's abundant resources, administered under progressive government policies have long been looked upon as a favorable area for U.S. industrial investment. At the close of 1965 the value of U.S. direct investments in the Dominion of Canada totaled $15,200 million, nearly one-third of the total U.S. private investment in all foreign countries. U.S. investments in the minerals industries of Canada, including $221 million added during the year, amounted to $5,100 million. Approximately two-thirds of this amount represented holdings in the Canadian petroleum industry. U.S. capital was also prominent in iron ore mines, potash, asbestos, and base metals industries. According to Department of Commerce 1965 summaries, U.S. investments in Canada contributed $692 million to U.S. national income. Of this total, minerals accounted for $232 million, a net annual yield of 4.6 percent on the minerals industry investment.

According to United Nations estimates, North America's external trade in 1965, valued at $31,830 million, represented 18 percent of the world total. However, because Canada and the United States continued to be each other's largest sources of supply and markets, a large part of this trade remained on the continent. During 1965, over 20 percent of U.S. total exports and about 23 percent of total imports crossed the common boundary. Of Canada's total foreign trade, 57 percent of exports went to the United States while about 23 percent came from the United States. As a continental unit, and for both countries individually, the overseas trade of North America has traditionally been favorable. The $24,925 million value of merchandise exported from North American ports in 1965 exceeded imports by $6,062 million, about 32 percent.

As summarized in table 3, Canada supplied about one-fourth of U.S. imports of minerals, metals, and fuels in 1964 and 1965. The bulk of this value was in nonferrous metals, iron ore, and petroleum categories. Shipments from United States to Canada which made up slightly over half of that country's minerals, metals, and fuel imports in 1964 consisted largely of iron and steel semimanufactures and coal.

Table 2.—Consumption of minerals and metals in North America [1]

Commodity	1964 r		1965 p	
	Quantity	Percent of non-Communist world [2] production	Quantity	Percent of non-Communist world [2] production
Metals:				
Aluminum—thousand metric tons	3,073	64.6	3,575	70.5
Chromite ores—do	1,335	52.6	1,476	48.3
Copper metal (includes secondary)—do	1,969	46.2	2,054	45.9
Iron ore—do	143,575	37.5	137,523	33.7
Pig iron—do	83,798	38.5	86,602	37.8
Steel ingots and castings (production)—do	125,108	40.5	129,544	40.2
Lead (includes secondary)—do	1,165	65.7	1,208	66.3
Manganese ore—do	2,160	29.5	2,708	32.2
Mercury—76-pound flasks	90,342	44.8	90,545	41.6
Molybdenum (contained Mo)—metric tons	26,159	73.9	31,667	71.0
Nickel—do	139,542	49.8	162,611	50.8
Platinum-group metals [3]—thousand troy ounces	1,140	[4] 44.7	1,187	94.2
Silver—do	141,775	67.3	156,000	73.9
Tin—long tons	63,408	44.2	63,442	43.0
Tungsten (contained W)—metric tons	5,920	32.6	6,688	40.0
Uranium oxide (U_3O_8) [3]—do	10,747	44.4	9,473	50.3
Zinc—thousand metric tons	1,476	52.6	1,668	57.4
Nonmetals:				
Asbestos—do	825	42.5	782	40.8
Cement (production)—do	71,476	23.6	72,779	23.4
Phosphate rock (P_2O_5)—do	18,126	41.3	21,374	44.6
Potash (K_2O)—do	3,044	36.9	3,291	35.4
Salt—do	33,488	45.7	36,450	47.0
Sulfur (elemental)—do	6,862	52.8	7,529	53.4
Mineral fuels:				
Coal:				
Anthracite—thousand metric tons	13,591	18.0	12,233	13.3
Bituminous and lignite—do	410,865	33.7	436,544	36.0
Crude petroleum (refinery receipts)—million 42-gallon barrels	3,566	42.1	3,663	40.4
Natural gas—billion cubic feet	15,957	83.8	16,624	84.6

p Preliminary. r Revised.
[1] Reported or calculated apparent consumption.
[2] Excludes Albania, Bulgaria, mainland China, Cuba, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Rumania, U.S.S.R., North Viet-Nam, and Yugoslavia.
[3] U.S. consumption only.
[4] Percentage of world production. U.S. consumption exceeded non-Communist world output.

Table 3.—The Canadian sector of United States total and mineral commodity trade

(Million U.S. dollars)

Commodity group	Imports for consumption				Exports of domestic products				Standard International Trade Classification Number
	1964		1965		1964		1965		
	Total	From Canada	Total	From Canada	Total	To Canada	Total	To Canada	
Metalliferous ores and metal scrap.	817	316	930	352	498	105	432	101	281 to 286 inclusive.
Iron and steel	783	106	1,231	118	674	165	629	202	671 to 679 inclusive.
Nonferrous metals	1,011	355	1,239	420	506	67	552	80	681 to 689 inclusive.
Nonmetallic minerals, crude.	235	92	234	93	178	44	237	52	271, 273, 274, 275, 276.
Nonmetallic minerals, manufactured.	80	11	87	14	124	41	124	42	661, 662, 663.
Chemical materials	254	89	219	78	219	43	301	64	513, 514, 515.
Coal, coke, briquets, etc.	16	14	15	13	474	135	494	154	321.
Petroleum and products	1,873	266	2,052	282	419	42	418	56	331, 332.
Gas, natural and manufactured.	107	97	114	104	19	3	35	6	341.
Mineral tars	9	1	9	1	80	5	25	2	521.
Total minerals, metals and fuels.	5,185	1,347	6,130	1,475	3,191	650	3,247	759	
Total merchandise	18,600	4,227	21,282	4,813	26,086	4,653	27,003	5,486	

The Mineral Industry of Canada

By Lester G. Morrell [1]

In 1965, the value of Canada's mineral industry output rose an estimated US$323 million [2] to a total US$3,457 million. This represents an increase of 10.3 percent over the value of the previous year and marks the seventh successive annual increase. During the 1955–65 decade, the physical volume index of Canada's mineral production has more than doubled. Canada, in 1965, was the world's leading producer of nickel, zinc, and possibly asbestos. Canada ranked second after United States in uranium, and sulfur production; third in molybdenum, platinum and metallic aluminum output; fourth in lead production; and fifth in copper and iron ore output.

Again in 1965, metals accounted for more than half of the total value and showed the greatest—13.0 percent—annual gain. In general, quantities were higher, markets were firm to strong, and prices were above 1964 averages. Category percentages and total value of minerals produced in recent selected years were as follows:

Year	Share of total value (percent)			Total value (million U.S. dollars)
	Metals	Nonmetals	Mineral fuels	
1955	56.1	20.8	23.1	$1,660
1960	56.4	20.9	22.7	2,306
1961	53.7	21.0	25.3	2,388
1962	52.6	20.0	27.4	2,637
1963	49.5	20.7	29.8	2,822
1964	50.2	20.3	29.5	3,134
1965 p	51.5	19.6	28.9	3,457

p Preliminary.

Crude petroleum accounted for 19.2 percent, nickel 11.7 percent, iron ore 11.3 percent, and copper 10.4 percent of the total value of Canada's 1965 minerals output. In succeeding order were natural gas and gas byproducts totaling 7.8 percent, zinc 6.7 percent, cement 3.9 percent, asbestos 3.7 percent, gold 3.6 percent, and sand and gravel 3.5 percent. The combined value of the additional 53 mineral commodities that complete the list of Canadian mineral products accounted for the remaining 18.2 percent. According to preliminary estimates, annual gains in value were recorded for more than two-thirds of the individual commodities. Outstanding increases were in molybdenum production which more than tripled; potash output increased 75 percent, and lead production was 62 percent above the 1964 level. Eighteen minerals recorded a decline in value during 1965; however, the amounts were small in all except uranium oxide, nearly US$18 million, and gold, US$8 million below the values of the previous year.

The Provinces of Ontario, Alberta, and Quebec, with respectively 26.4 percent, 21.4 percent, and 18.8 percent of total output value, produced two-thirds of the nation's minerals. Saskatchewan accounted for 8.7 percent, British Columbia 7.5 percent, Newfoundland 5.9 percent, and Manitoba 4.9 percent. With the exception of the Yukon, which fell about US$1.7 million, all Provinces and Territories reported increased value of minerals output in 1965. Lead-zinc ores from the new mine at Pine Point on Great Slave Lake credited Northwest Territories with a fourfold increase (US$50.7 million). Expansion in the nick-

[1] North America-South Pacific specialist, Division of International Activities.

[2] Where necessary, values have been converted from Canadian dollars (Can$) to U.S. dollars at the rate of Can$1 equals US$0.925.

el-copper industries was primarily responsible for the US$78.3 million rise in value of Ontario's 1965 mineral output. Increased production of crude petroleum and natural gas contributed largely to the additional US$58.7 million recorded in Alberta. Production from new base metal mines in New Brunswick and potash operations in Saskatchewan resulted in gains of about US$32 million in each of those Provinces.

Preliminary estimates by the Dominion Bureau of Statistics place the 1965 national mineral production index at 347 compared with 327 and 294 in 1964 and 1963 respectively. (Base 1949=100). The estimated per capita value of minerals produced in 1965 was US$176.63, compared with US$162.87 in 1964. Value of mineral production was equal to 7.8 percent of the officially estimated US$48,096 million gross national product and 10.4 percent of the US$35,907 net national income (at factor cost). Salaries and wages paid to mineral industry workers totaled US$627 million in 1965, approximately 2.6 percent of the national payrolls.

General wholesale price indices for minerals and metal categories for 1965 and for 1964 (the latter in parentheses), compared with the 1935–39 base, were nonferrous metals—217.7 (205.9), iron products—264.4 (256.4), nonmetallic minerals—191.6 (190.9), and chemical products—200.0 (191.2). Average hourly pay of mining industry employees was equivalent to US$2.22 in December 1965, compared with $2.19 for the corresponding month of 1964. Profits, before taxes, reported by mining, quarrying, and petroleum producing companies were US$555 million in 1965 compared with US$559 million in 1964. All Canadian industries reported a total of US$4,810 million in 1965 compared with US$4,459 million in 1964. Investment activity in the minerals industry is indicated in a high level of prices for mineral and metal securities. Total construction and equipment expenditures by the mineral and primary metal industries in 1965 has been estimated at US$578 million.

More than a score of new mines were added to the long list of Canadian producers in 1965, and developments underway aim to bring twice that number on stream by 1970. Sixteen new mills started operation during the year. These developments are distributed across the length and breadth of Canada and their products include lead, zinc, copper, molybdenum, nickel, iron, gold and silver, asbestos, potash, sodium sulfate, and the oil sands of Alberta. The outstanding events of 1965 were the initiation of lead-zinc ore shipments from Pine Point in the Northwest Territories, the startup of two new molybdenum producers in British Columbia, and the passing of the million-ton production milestone for Saskatchewan potash. Despite cutback in uranium mining activities, one company has introduced underground bacterial leaching of uranium ore, another has announced plans to construct a new uranium refinery and has begun commercial production of yttrium oxide, a new product for Canada. Of the many new discoveries announced during 1965, those particularly noteworthy included the rushes to new lead-zinc prospects at Pine Point and Ross River in Northwest Territories and the Yukon. In the Maritime Provinces, lead-zinc-silver and copper discoveries respectively on Cape Breton Island and in the Gaspé Provincial Park, were announced, and sulfur was discovered in deep drilling near Truro, Nova Scotia. Drilling during 1965 at Rainbow Lake in northwestern Alberta has indicated what may prove to be Canada's most prolific oilfield. Construction of a 240-mile pipeline to serve the area was started late in the year.

Exploration activity continued at a rapid pace throughout Canada in 1965, with emphasis on the Precambrian shield area of eastern Canada, and the British Columbia-Yukon Cordillera. In the latter region, private industry's field force was estimated at more than 1,000 prospectors, engineers, and geologists maintained by 75 large companies and 250 smaller ones. During the year the Canadian Geological Survey employed a total of 112 field parties: 49 in Ontario and the eastern Provinces, 12 on the western plains, 38 in the Cordillera, 8 in the Arctic Islands, and 5 on general programs. Their scientific functions included reconnaissance, detail geological investigations, glacial and groundwater studies, and paleontological, geophysical, and geochemical projects. The mineral agencies of several Provincial Governments also conducted similar activities; Ontario Depart-

ment of Mines had 25 parties in the field. In addition, the Canadian Department of Mines and Technical Surveys, in cooperation with Provincial agencies, has continued aerial geophysical surveys on an intensified scale.

Federal budgetary expenditures by the Department of Mines and Technical Surveys amounted to US$61.1 million in 1965, compared with US$53.5 million in 1964. Recent emphasis has been on research in geophysical techniques, metallurgy, and rock mechanics. Payments under the Emergency Gold Mining Assistance Act went to 44 of Canada's 54 gold producers in 1965. Subvention payments to coal producers totaled US$20 million, in the 1964–65 fiscal year. The Prospectors' Assistance Program provides US$55,500 annually to prospectors in Yukon and Northwest Territories, and in 1965 Federal roads and aerodrome assistance programs were increased. A loan fund of Can$3 million was established by Department of Northern Affairs and Natural Resources to provide qualified applicants with up to 40 percent of the cost of exploration for petroleum and other minerals in the Territories.

Developments in Quebec dominated Canada's new minerals legislation in 1965. The Mining Act of 1909 has been modernized under Bill 8 (SQ 1965 Chap. 34) to increase the size of claim areas, the former concession system has been replaced by a leasing schedule, a Mining Court has been provided, and workers' safety provisions have been strengthened. Bill 9 provides for higher duties from mineral producers with credits for ore processing and exploration or development. Under Bill 10 Quebec Mining Exploration Company (SOQUEM) is chartered for 10 years to engage in mining exploration and development of mineral resources.

PRODUCTION

Canada's mineral production in 1965 included a total of 63 minerals; 26 metallics, 33 nonmetallic and construction materials, and 4 categories of mineral fuels. Quantitative increases were recorded in more than half of the products, and total value of minerals output in 1965, continuing the trend of recent years, increased 10 percent above that of 1964. Despite smaller quantities actually produced in 1965, several products, notably lithia, quartz, salt, and certain construction materials, returned a higher total value as a result of increased unit prices. The following tabulation omits a number of mineral items and classes that are not separately reported in Dominion Bureau of Statistics lists but are nevertheless regularly produced in Canada. Among these are abrasives, lightweight aggregates, carbon black, mineral pigments, roofing granules, and helium. Recovery of vanadium from imported crude petroleum was initiated, and tungsten mining was resumed in 1964 after a 5-year period of nonproduction.

TRADE

In 1965, Canada's exports of crude and fabricated minerals and metal products were valued at US$2,573 million, about 35 percent more than that of 1964. The minerals industry thus contributed nearly one-third of the total US$7,884 million value of Canadian merchandise exports. As in previous years, the bulk of exported minerals and products went to the United States. Relative percentages in 1965 were: United States—59, United Kingdom—19, European Common Market—8, Japan—4, and other countries—10 percent. Principal export items included: iron ore and concentrates valued at US$334 million, primary aluminum—US$312 million, crude petroleum—US$259 million, primary nickel—US$186 million, asbestos fiber—US$147 million, and refined copper—US$137 million.

Total value of Canadian imports in 1965 amounted to US$7,986 million, compared with US$7,490 million in 1964. The United States share of 1965 total imports approximates 70 percent, made up mostly of fully manufactured products.

Table 1.—Canada: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Aluminum	601,617	626,224	652,616	764,755	762,347
Antimony [1]	604	876	727	722	559
Arsenic, white	190	73	85	147	136
Bismuth [2]	217	193	163	181	233
Cadmium [3]	r 1,008	1,182	1,123	1,258	1,365
Calcium kilograms	32,929	56,024	44,757	62,758	56,013
Cobalt [4]	1,443	1,579	1,372	1,445	1,723
Columbium concentrate (shipments)	54	866	1,221	1,915	2,045
Copper:					
Mine (recoverable)	398,332	414,931	r 415,848	441,706	462,473
Smelter (refined)	368,641	347,330	343,740	370,077	393,311
Gold thousand troy ounces	4,474	4,178	3,972	3,799	3,587
Iron and steel:					
Iron ore thousand tons	18,469	24,820	27,346	34,768	34,208
Pig iron and ferroalloys do	4,594	4,912	5,496	6,084	6,574
Steel ingots and castings do	5,886	6,508	7,430	8,283	9,098
Rolled steel do	6,427	7,220	8,177	9,123	10,005
Lead:					
Mine, ore and concentrate, content	165,612	191,706	180,518	187,205	275,243
Refined, primary	r 155,883	r 138,088	r 140,614	137,322	169,175
Magnesium	6,926	7,998	8,078	8,485	10,100
Mercury 76-pound flasks	------	------	------	73	20
Molybdenum	350	371	378	556	4,264
Nickel [5]	211,365	210,685	r 196,885	207,287	243,884
Platinum and platinum-group metals troy ounces	418,278	470,787	357,651	376,238	452,063
Selenium kilograms	195,321	220,928	212,630	211,659	227,630
Silver thousand troy ounces	31,382	30,669	29,840	29,903	31,917
Tellurium kilograms	35,203	26,637	34,855	35,282	39,129
Tin, mine long tons	500	291	414	157	183
Titanium slag (70–72 percent TiO_2)	420,355	273,470	344,115	494,164	495,248
Uranium (U_3O_8)	8,746	7,648	7,576	6,609	3,908
Zinc:					
Ore and concentrate, content	401,971	455,347	451,032	662,186	826,833
Refined, primary	243,131	254,154	257,658	306,380	325,314
Nonmetals:					
Asbestos thousand tons	1,065	1,103	1,158	1,288	1,259
Barite	173,638	205,567	157,398	153,449	182,668
Cement [6] thousand tons	5,630	6,240	6,364	7,176	7,579
Clays and products [7] value, thousands	Can$36,983	Can$37,817	Can$38,154	Can$40,535	NA
Diatomite	194	191	724	1,037	1,089
Feldspar (shipments)	9,532	9,066	7,809	8,300	9,825
Fluorspar [e]	73,000	68,000	77,000	87,000	97,000
Gypsum and anhydrite thousand tons	4,590	4,897	5,518	5,770	5,694
Lime do	1,284	1,292	1,316	1,398	1,585
Lithium concentrate (Li_2O) [8]	243	227	292	479	469
Magnesite and brucite [e]	111,000	125,000	137,000	139,000	145,000
Mica (shipments)	823	546	537	543	402
Nepheline syenite	218,013	230,803	230,424	263,356	298,294
Potash (K_2O)	------	e 135,000	568,675	778,683	1,297,275
Pyrite and pyrrhotite	469,246	469,291	432,215	319,193	320,062
Salt thousand tons	2,997	3,325	3,358	3,613	4,154
Sand and gravel do	143,605	164,423	171,975	175,804	174,957
Sodium sulfate	227,699	223,776	233,067	302,331	313,886
Stone:					
Crushed thousand tons	40,131	43,140	56,840	63,316	62,737
Cut [9] do	158	182	r 177	179	NA
Sulfur [10] do	841	1,106	1,700	2,025	2,196
Talc, soapstone, and pyrophyllite (shipments)	43,650	41,876	49,215	52,736	49,926
Mineral fuels:					
Coal:					
Bituminous thousand tons	7,429	7,283	7,894	8,460	8,641
Lignite do	2,004	2,047	1,700	1,809	1,872
Coke:					
High temperature do	3,538	3,648	3,883	3,940	3,963
Low temperature do	35	10			
Fuel briquets do	61	50	66	54	63
Natural gas million cubic feet	655,738	r 946,703	r 1,111,478	1,317,718	1,324,149
Peat moss thousand tons	203	216	221	232	242

See footnotes at end of table.

Table 1.—Canada: Production of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Mineral fuels Continued					
Petroleum:					
Crude					
thousand 42-gallon barrels	220,861	244,139	258,435	274,626	293,572
Refinery products:					
Gasoline, total do	104,654	111,239	119,608	124,988	128,652
Kerosine and jet fuels do	22,364	24,433	26,288	25,414	25,379
Distillate fuel oil do	77,085	82,215	93,900	94,139	99,653
Residual fuel oil do	37,349	41,071	45,312	47,635	47,730
Lubricants do	2,164	1,699	1,838	1,816	1,832
Other products do	35,705	29,942	23,606	27,123	28,342
Refinery fuel and loss do	18,497	19,532	20,962	21,266	23,468
Total do	297,818	310,131	331,514	342,381	355,056

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Antimony content of antimonial lead alloys, flue dust, and dore slag.
[2] Refined metal and bullion plus recoverable bismuth content of concentrates exported.
[3] Refined metal from domestic ores plus cadmium content of some exported ores and concentrates.
[4] All forms, excludes the cobalt in nickel sinter shipped to United Kingdom by International Nickel Co., but includes cobalt in Falconbridge nickel-copper matte to Norway.
[5] Refined nickel and nickel in produced oxide and recoverable nickel in matte exported.
[6] Cement shipped or used by producers.
[7] Value including bentonite and products from common, stoneware, fire clay, and other types of clay.
[8] Spodumene concentrates.
[9] Building, ornamental, paving and similar uses of granite, limestone, marble, slate, and sandstone.
[10] Includes sulfur from natural gas and from pyrite, pyrrhotite, and smelting of sulfide ores.

Table 2.—Canada: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Metals:				
Aluminum:				
Alumina, Al content	2,399	4,573	7,048	United States 6,598; Colombia 150.
Scrap	39,504	29,762	35,304	United States 18,684; Italy 10,882.
Pigs, ingots, wire bars, etc.	76,237	569,710	641,850	United States 315,694; United Kingdom 166,514.
Bars, rods, sheets, castings	11,600	16,379	23,969	India 9,455; United States 5,689.
Foil	422	344	395	United Kingdom 176; United States 123.
Fabricated materials, n.e.s. [1]	12,975	9,439	10,543	Nigeria 2,768; Mexico 1,239; Pakistan 1,221.
Bismuth, refined and semirefined	181	136	NA	NA.
Cadmium	880	736	619	United Kingdom 381; United States 201.
Calcium kilograms	41,776	95,618	67,268	United States 34,337; Belgium-Luxembourg 19,958.
Cobalt:				
Metal	335	269	133	United States 120; France 7.
Oxides and salts, gross weight	498	751	641	United Kingdom 618; United States 23.
Columbium concentrate [2] kilograms	852,908	880,039	843,824	United States imports only.
Copper:				
Ore and matte, metal content	84,304	94,847	78,926	Japan 47,677; Norway 14,084.
Scrap, slag, sludge	9,692	12,233	18,650	United States 4,062; Yugoslavia 3,096; West Germany 2,669.
Refinery shapes	195,032	203,459	181,285	United Kingdom 96,252; United States 64,463.
Semimanufactures:				
Bars, rods, shapes, etc.	23,922	31,722	31,971	Norway 8,401; United States 8,027.
Pipe and tubing	6,818	8,104	7,594	United States 2,676; New Zealand 1,857.
Wire and cable	341	769	2,416	Pakistan 778; United States 773.
Iron and steel:				
Iron ore thousand tons	24,238	30,963	31,293	United States 24,136; United Kingdom 2,961.
Pig iron do	437	531	525	United States 443; West Germany 53.

See footnotes at end of table.

Table 2.—Canada: Exports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Metals Continued				
Iron and steel Continued				
Ferroalloys:				
Ferrochrome	2,640	156	186	United Kingdom 107; United States 72.
Ferromanganese	9	3,047	3,463	All to United States.
Ferrosilicon	33,326	41,718	42,118	United Kingdom 30,747; United States 9,932.
Other (type not specified)	1,291	218	1,681	West Germany 1,541; United States 59.
Steel:				
Ingots and other primary forms thousand tons	341	401	276	United States 227; Spain 48.
Hot and cold rolled products do	825	974	NA	NA.
Lead:				
Ore and concentrate, metal content	48,766	72,900	97,037	United States 41,788; Belgium-Luxembourg 35,729.
Pigs, blocks, and shot	88,127	86,970	117,087	United Kingdom 54,863; Netherlands 10,172.
Alloys, scrap, and metal, n.e.s.[1]	4,393	6,484	9,565	United States 4,903; France 1,043.
Magnesium e	5,380	5,781	6,520	United Kingdom 2,683; West Germany 2,160.
Nickel:				
Ore, matte, and speiss, metal content	75,651	67,827	74,687	United Kingdom 42,699; Norway 29,765.
Scrap	868	981	949	United States 781; West Germany 51.
Oxide, metal content	13,796	32,478	37,155	United States 24,557; United Kingdom 6,702.
Ingots and other refined forms	99,024	116,420	122,650	United States 99,916; United Kingdom 13,730.
Fabricated products n.e.s. [1]	3,640	2,321	2,885	United States 2,083; Republic of South Africa 317.
Platinum-group metals:				
Concentrate, residues and matte content troy ounces	506,782	404,891	492,501	United Kingdom 471,238; Norway 16,823.
Scrap do	4,173,992	1,995,607	26,815	United States 25,877; United Kingdom 938.
Metals do	42,845	3,901	53,450	United States 53,039; United Kingdom 156.
Selenium metals and salts, selenium content kilograms	202,168	182,028	204,663	United Kingdom 99,156; United States 89,132.
Silver:				
Ore and concentrate, metal content thousand troy ounces	8,287	9,478	12,246	United States 6,835; Belgium-Luxembourg 2,951.
Refined metal do	10,835	10,583	11,268	United States 11,240; Venezuela 17.
Thorium, metal [2] kilograms	4,264	1,315	2,268	United States imports only.
Tin, ore and concentrate long tons	800	329	216	Mexico 104; United Kingdom 64.
Titanium slag, 70 percent TiO_2 [2]	r 121,458	r 83,004	54,217	United States imports only.
Uranium U_3O_8	6,946	[2] 1,667	653	United States imports only.
Zinc:				
Ore and concentrate, metal content	193,272	365,691	442,207	United States 210,103; Belgium-Luxembourg 142,180.
Blocks, pigs, slabs	181,441	215,981	239,680	United Kingdom 99,398; United States 83,104.
Alloys, scrap, dross, etc.	5,191	7,066	8,295	United States 5,486; Belgium-Luxembourg 1,710.
Fabricated materials, n.e.s. [1]	1,195	1,694	1,533	United Kingdom 855; United States 595.

See footnotes at end of table.

Table 2.—Canada: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Nonmetals:				
Abrasives:				
Fused alumina, crude and grains	138,309	141,237	160,833	United States 142,470; United Kingdom 18,212.
Silicon carbide, crude and grains	66,138	73,536	82,466	United States 80,650; United Kingdom 1,780.
Asbestos:				
Crude	177	194	112	France 50; Japan 24.
Milled fiber, all grades thousand tons	1,094	1,210	1,197	United States 600; United Kingdom 90.
Barite, crude	145,051	141,998	167,857	United States 147,530; Trinidad and Tobago 15,972.
Bentonite, earths and clays [2]	2,817	2,730	4,519	United States imports only.
Cement, portland	247,481	270,044	303,808	United States 287,251; Ceylon 16,390.
Clay and clay products value, thousands	Can$6,874	Can$8,135	Can$8,748	United States Can$6,505; Chile Can$345.
Feldspar	2,977	3,072	3,398	All to United States.
Fluorspar value	Can$7,500	Can$5,625	Can$9,575	All to United Kingdom.
Gypsum, crude thousand tons	4,267	4,588	4,306	United States 4,278; Bahamas 28.
Lime	88,980	96,474	217,122	United States 216,201.
Limestone, crude, crushed and refuse	743,410	996,119	1,146,442	United States 1,146,097.
Nepheline syenite	184,398	205,904	224,255	United States 188,890; United Kingdom 15,788.
Potash materials [2]	512,358	759,909	1,364,050	United States imports only.
Salt [e]	672,000	r 656,500	906,500	United States 860,000.
Sand and gravel	323,074	418,631	624,086	United States 623,996.
Silica, quartzite	43,034	132,635	101,181	All to United States.
Sodium sulfate	59,283	97,358	105,547	United States 105,543.
Stone, cut (granite, marble, slate, and others) value, thousands	Can$870	Can$1,184	NA	NA.
Sulfur, crude and refined	744,742	1,174,423	1,358,908	United States 672,876; Australia 183,620.
Talc and soapstone [2]	1,905	2,143	2,850	United States imports only.
Mineral fuels:				
Coal, bituminous	956,501	1,159,483	1,112,197	Japan 928,167; United States 179,640.
Coke, all types	140,009	109,533	80,405	United States 78,558; United Kingdom 1,834.
Natural gas million cubic feet	340,953	404,143	403,909	All to United States.
Petroleum:				
Crude thousand 42-gallon barrels	90,876	101,259	108,010	All to United States.
Refined products:				
Gasoline, total do	481	1,040	255	United States 244; St. Pierre and Miquelon 11.
Distillate fuel oil do	529	467	266	St. Pierre and Miquelon 167; United States 98.
Residual fuel oil do	1,599	1,846	1,776	All to United States.
Lubricants do	65	32	34	United States 29, St. Pierre and Miquelon 2.
Liquefied gasses do	1,792	4,829	7,855	United States 7,711; Japan 142.
Other petroleum and coal products, n.e.s. [1] value, thousands	Can$6,170	Can$3,908	Can$3,218	United States Can$2,431; United Kingdom Can$448.

[e] Estimate. [r] Revised. NA Not available.
[1] Not elsewhere specified (n.e.s.).
[2] Data given are from United States Import Statistics.

COMMODITY REVIEW

METALS

Aluminum.—Early in 1965 production of primary aluminum by Aluminum Company of Canada Ltd. (ALCAN) [3] was reduced from 94 to 89 percent of capacity to permit reduction of stock inventories and to provide for expansion of facilities at two of the company's plants. As a result, Canada's aluminum output in 1965 was slightly below the 1964 record. Shipments of pri-

[3] Parent company name changed early in 1966 from Aluminum Limited to Alcan Aluminium Limited (in French: Alcan Aluminium Limitée).

Table 3.—Canada: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals:				
Aluminum:				
Bauxite	1,831,959	1,588,776	1,857,094	Surinam 844,651; British Guiana 815,497.
Alumina		790,143	725,734	Jamaica 415,122; United States 173,360.
Cryolite	4,406	2,198	2,196	Denmark 1,900; United States 296.
Scrap aluminum and alloys	1,354	18,245	30,135	All from United States.
Pigs, ingots, shot, slabs, etc.	1,773	3,625	6,300	United States 4,805; Norway 816.
Semimanufactured products	43,675	34,881	42,909	United States 37,765; United Kingdom 2,639.
Pipe, tubes, wire and cable	818	636	797	United States 708; United Kingdom 80.
Manufactured materials value, thousands	Can$15,224	Can$3,178	Can$3,635	United States Can$2,890; United Kingdom Can$338.
Antimony:				
Regulus, metal content	470	NA	NA	NA.
Oxide and salts, metal content	306	322	279	United Kingdom 191; mainland China 55.
Bismuth: Metal, residues, and salts, metal content	6	NA	NA	NA.
Chromite, in ore and concentrate	45,045	18,864	32,122	United States 10,380; Philippines 9,657.
Cobalt oxides, gross weight kilograms	12,833	NA	NA	NA.
Copper:				
Ore, concentrate and scrap, copper content	2,952	2,207	2,141	United States 1,447; United Kingdom 604.
Blocks, pigs, ingots	5,941	6,142	5,213	United States 5,211; Norway 2.
Bars, rods, sheet, tubing, etc.	1,519	1,340	3,885	United States 2,867; United Kingdom 590.
Wire	20	235	255	United States 243; United Kingdom 10.
Oxide and sulfate	578	342	163	United Kingdom 107; United States 42.
Iron and steel:				
Iron ore—thousand tons	4,909	5,317	4,839	United States 4,576; Brazil 263.
Scrap iron and steel	590,848	778,589	926,048	United States 925,731; Italy 233.
Pig iron	16,133	14,416	30,367	U.S.S.R. 19,759; Finland 10,056.
Ferroalloys:				
Ferromanganese	20,538	19,804	31,354	Republic of South Africa 24,315; United Kingdom 5,591.
Silicomanganese	2,136	1,582	714	United States 576; Norway 138.
Ferromolybdenum	57	NA	NA	NA.
Ferrosilicon	3,470	3,114	5,679	United States 4,881; Norway 339.
Ferrotungsten	283	78	161	United Kingdom 76; Austria 63.
Other	8,279	1,355	2,606	United States 1,877; Rhodesia 363.
Steel:				
Ingots and equivalent primary forms	3,828	5,807	26,857	United States 14,714; Netherlands 10,144.
Hot and cold rolled products	881,300	1,425,100	NA	NA.
Lead:				
Primary and fabricated forms	1,668	381	298	United States 225; United Kingdom 72.
Oxide	984	1,379	1,075	United States 521; Mexico 332.
Manganese:				
Ore and concentrate, manganese content	NA	56,984	81,176	Ghana 24,477; Brazil 16,053.
Metallic manganese	NA	2,115	2,907	United States 1,932; Republic of South Africa 731.
Magnesium metal	NA	1,445	1,489	United States 1,485; United Kingdom 4.
Mercury—76-pound flasks	5,889	3,867	14,091	United Kingdom 6,242; Spain 5,268.
Molybdenum: molybdic oxide, gross weight	117	224	345	United States 295; U.S.S.R. 48.
Nickel, unwrought and semimanufactured, including alloys	9,954	11,438	13,653	Norway 10,961; United States 2,588.

See footnotes at end of table.

Table 3.—Canada: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals—Continued				
Platinum and group metals troy ounces	NA	221,557	233,603	United Kingdom 229,029; United States 4,574.
Silver—thousand troy ounces	7,950	5,198	13,413	United States 13,412; United Kingdom 1.
Sodium metal	NA	4,285	4,277	Mostly from United States.
Tin: Blocks, pigs and bars long tons	4,193	4,849	4,993	Malaysia 4,258; United States 734.
Titanium:				
Dioxide, pure and extended	3,055	11,142	10,069	United States 9,360; United Kingdom 646.
Metallic titanium	NA	659	729	United States 698; U.S.S.R. 30.
Tungsten, in ore and concentrate	293	177	162	United States 145; United Kingdom 17.
Zinc:				
Pigs, slabs, blocks, anodes	580	20	15	All from United States.
Bars, plates, sheets, discs, shells	715	1,192	1,242	United States 1,157; Belgium-Luxembourg 54.
Fabricated materials	NA	1,196	1,007	United States 904; Belgium-Luxembourg 46.
Dust and granules	1,062	1,674	1,217	United States 1,049; Belgium-Luxembourg 155.
Nonmetals:				
Barite, ground	3,474	2,908	3,344	United States 3,203; West Germany 141.
Bentonite, clay and drilling mud	NA	103,825	165,256	United States 71,660; Italy 304.
Cement, all types	28,409	29,647	34,128	United States 13,077; United Kingdom 8,912.
Clays, ground or unground	NA	303,262	315,163	United States 247,956; United Kingdom 67,207.
Cryolite, natural	4,406	2,198	2,196	Denmark (Greenland) 1,900; United States 296.
Diamond:				
Unset—thousand carats	63	65	70	Belgium-Luxembourg 40; Israel 16.
Industrial—do	1,123	1,157	1,097	United States 857; United Kingdom 102.
Dust—do	NA	162	189	United States 169; United Kingdom 16.
Fluorspar	60,598	63,490	63,365	Mexico 49,700; United States 10,683.
Fuller's earth	e 4,300	5,655	6,223	United States 6,197.
Gypsum, crude	67,702	73,427	68,431	Mexico 67,441; United States 967.
Lime	40,180	18,862	22,982	United States 22,809; United Kingdom 113.
Magnesium compounds:				
Dolomite, calcined	2,081	13,606	26,995	United States 26,687; Sweden 308.
Magnesia, dead burned	14,830	25,179	32,677	United States 21,598; Yugoslavia 4,586.
Mica, unmanufactured	788	2,422	2,725	United States 2,617; India 70.
Phosphate rock thousand tons	1,177	1,276	1,538	United States 1,532; Netherlands Antilles 6.
Phosphate fertilizers	137,781	159,655	129,905	All from United States.
Potash products, fertilizers	88,664	84,254	73,897	United States 49,912; West Germany 14,829.
Salt and brine	301,715	222,495	400,612	Mexico 172,424; United States 166,941.
Sand and gravel thousand tons	510	538	518	All from United States.
Silica sand—do	714	700	757	United States 749; Norway 5.
Sodium sulfate, and Glauber's salt	17,688	27,994	26,624	United States 14,799; United Kingdom 11,372.
Stone, crushed, including stone refuse—thousand tons	681	955	1,355	United States 1,350; Italy 4.
Stone, cut (granite, marble, slate and other)	NA	30,107	24,536	United States 17,479; Republic of South Africa 3,089.
Sulfur, elemental	136,655	135,684	147,146	United States 147,009; Mexico 91.
Talc and soapstone	24,983	28,665	25,272	United States 24,357; Italy 905.
Vermiculite, crude	e 28,100	23,276	25,886	United States 23,190; Republic of South Africa 2,696.

See footnotes at end of table.

Table 3.—Canada: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Mineral fuels:				
Asphalt and bituminous materials, crude value, thousands	NA	Can$640	Can$398	United States Can$357; West Germany Can$41.
Coal:				
Anthracite thousand tons	769	593	581	United States 576; United Kingdom 5.
Bituminous and subbituminous do	11,361	13,004	14,473	All from United States.
Briquets, coal and coke	5,847	6,477	7,198	Do.
Coke, all types (except briquets) thousand tons	548	686	892	Do.
Natural gas million cubic feet	6,823	9,641	15,673	Do.
Petroleum:				
Crude thousand 42-gallon barrels	147,721	143,531	144,184	Venezuela 88,995; Saudi Arabia 19,207.
Refinery products:				
Gasoline, total do	2,882	2,585	3,108	Panama (reexport) 763; Netherlands Antilles 742; United States 687.
Kerosine and jet fuel do	2,351	2,699	4,587	Netherlands Antilles 1,892; United Kingdom 1,095.
Distillate fuel oil do	9,345	10,244	15,915	Venezuela 10,588; Netherlands Antilles 2,752.
Residual fuel oil do	14,740	20,498	31,028	Netherlands Antilles 16,282; Venezuela 8,127.
Lubricants do	1,167	1,383	1,658	United States 1,430; Trinidad-Tobago 220.
Liquefied petroleum gases do	NA	90	100	Mostly from United States.
Other refinery products do	3,483	2,819	2,289	Do.
Other petroleum and coal products value, thousands	NA	Can$7,030	Can$6,410	United States Can$4,880; United Kingdom Can$1,526.

e Estimate. NA Not available.

mary refined metal to domestic consumer industries were also down, totaling 145,000 metric tons in 1965, compared with about 164,000 tons in 1964. Exports of aluminum ingots and other primary forms were nearly 13 percent higher in 1965 in response to heavy United States demand.

The six aluminum reduction plants, five operated by ALCAN and the sixth by Canadian British Aluminium Co. Ltd. (CBA), had a total capacity of 831,00 tons at the close of the year:

Company and location:	*Metric tons*
ALCAN:	
Arvida, Quebec	338,000
Beauharnois, Quebec	34,000
Shawinigan, Quebec	64,000
Alma (Isle Maligne), Quebec	104,000
Kitimat, British Columbia	193,000
CBA: Baie Comeau. Quebec	98,000
Total	831,000

Raw materials for the Canadian plants were supplied principally by Alcan Jamaica Ltd. which produced 751,000 tons of alumina and the Demerara Bauxite Co. Ltd., in British Guiana, which produced 284,000 tons of alumina in addition to 2,052,000 tons of crude bauxite in 1965. Both companies are wholly owned subsidiaries of ALCAN, and both supply to other than Canadian consumers. ALCAN fluorspar requirements are met by shipments—102,000 tons in 1965—from the subsidiary Newfoundland Fluorspar Ltd. at St. Lawrence, Newfoundland.

Renovations at the Arvida and Beauharnois smelters in Quebec are expected to be completed early in 1966. New facilities which will add about 22,000 tons to the annual ingot capacity at Kitimat, British Columbia, are scheduled to commence production during the second quarter of 1966. The ALCAN subsidiary alumina plant in Jamaica is being expanded, and by mid-1966 will have an annual capacity of about 830,000 tons of alumina; and in

British Guiana additional equipment to reinforce the mine operations of Demerara Bauxite Company Ltd. is being provided.

In research and development, a temporary setback resulted from failure of certain equipment in the new ALCAN monochloride process refinery. Production by the new process cannot be expected before 1967.

Copper.—The Canadian copper industry has enjoyed a good year owing to the worldwide shortage and resultant rising prices, in part brought about by political crises and strikes in producer countries. Both mine production and output of refined copper rose to record levels in 1965, 4 percent and 6 percent above 1964 levels, respectively.

The Department of Mines and Technical Surveys named more than 50 mine producers of copper in eight of Canada's Provinces and Territories in 1965. An additional score of prospective producers are expected to commence operations in the 1966–69 period. Among the year's newcomers were British Newfoundland Corp. Ltd., which began shipments from its 2,000 ton-per-day operation at Whalesback Pond, Newfoundland, the Lorraine Mining Co. Ltd. (400 tons per day) at Belleterre, Quebec, and Cupra Mines Ltd. (1,000 tons per day) at Stratford Place, Quebec. In Ontario, the McLennan, a new mine of the International Nickel Company of Canada Ltd. was opened at Sudbury, the Coppercorp mine near Batchawana began operations, and Metal Mines Ltd., nickel-copper mine at Gordon Lake began production. Rio Algom Mines Ltd. started its 900 ton-per-day mill near La Ronge, Saskatchewan late in the year. The Texas Gulf Sulphur Co. Inc. continued preparation of the big open pit mine project near Timmins, Ontario. According to a recent announcement, the planned capacity of the concentrator being built at Hoyle to process Texas Gulf Sulphur's ore is to be increased from 6,000 to 9,000 tons per day. This operation is expected to commence late in 1966. Although considered, no commitment was made by the company to provide a smelter; in the meantime, copper concentrates will be processed into anode copper by the Noranda Mines Ltd. smelter. Noranda is expanding the capacity of its wholly owned Canadian Copper Refiners Ltd. plant in Montreal, in anticipation of 100 million pounds additional copper annually from Texas Gulf Sulphur's production beginning in 1967.

On November 22, 1965, the Canadian Government applied export control on various forms of copper as a precautionary measure. Since that date, all offshore shipments to destinations other than United States have required export permits. The control applies to copper ores and concentrates, smelter and refinery shapes, and rolled and mill forms including wire mill products, copper base alloys, secondary copper ingot, and copper and copper base alloy scrap. Established exporters will receive quotas which are to be set on a quarterly basis beginning in January 1966.

Consumption of refined copper by manufacturers was estimated at 194,000 tons in 1965, compared with 183,300 tons in 1964. Usage of primary copper in semimanufactured products in 1962 and 1963 (most recent years for which details are available) were reported by Dominion Bureau of Statistics as follows, in metric tons:

	1962	*1963*
Copper mill products—sheet, strip, bars, rolls, pipe, tube, etc	41,783	47,956
Brass mill products—plate, sheet, strip, rods, bars, rolls, pipe, tube, etc	11,498	6,047
Wire and rod mill products	86,820	99,818
Miscellaneous	1,255	1,043
Total	141,356	154,864

Gold.—The downtrend in gold production continued in 1965, with the year's output about 5 percent below that of 1964. Of the 54 lode gold mines that contributed the great bulk of the Canadian production, 3 were new operations. Eight gold mines closed during the year, principally owing to exhaustion of reserves. Among the closures were the famous old Wright-Hargreaves Mines Ltd., and Lake Shore Mines Ltd., both at Kirkland Lake, Ontario, and both with records of over 40 years' uninterrupted operation.

Approximately 82 percent of the gold produced during 1965 was from lode mines, 17 percent from base metal ores, and the balance from placers. Mines in Ontario, including 29 lode gold producers (of which 5 shut down in 1965) accounted for about 1,926,000 troy ounces. The 14

lode gold mines (including 3 which closed during the year) and 20 base metal mines in Quebec are credited with approximately 923,000 ounces. Five lode mines in the Northwest Territories produced 437,000 ounces and about 300,000 ounces came from mines in British Columbia, Yukon, the Prairie Provinces, and the Maritimes.

Outlook for the Canadian gold mining industry is for continuing decline, as a result of ore exhaustion and general rising operation costs and labor shortages which are particularly acute in the gold camps. The Hollinger Consolidated Gold Mines Ltd., at Timmons, Ontario, one of Canada's oldest and historically largest lode gold mines, is expected to close in 1966, and several others are faced with ore exhaustion in the near future. Emergency Gold Mining Assistance payments went to all but 10 of the 54 producing mines in 1965.

The average price paid by the Royal Mint in 1965 was Can$37.73 (equivalent to US$34.90), down slightly from the Can$37.75 average in 1964.

Iron Ore, Pig Iron, and Steel.—Annual productive capacity of Canada's iron mines reportedly increased from 39.6 million metric tons in 1964 to 46.2 million tons in 1965; however, shipments during 1965 remained at about the same level as that of 1964. Mines in Quebec and Newfoundland, including Labrador, accounted for 71.5 percent of total Canadian shipments in 1965, compared with 73.5 percent in 1964. Ontario's mines accounted for 22.7 percent and British Columbia for 5.8 percent in 1965, compared with 21.2 percent and 5.3 percent, respectively, in 1964. Although 17 mining companies and 5 byproduct producers contributed to the year's output, 2 companies accounted for about two-thirds of the national total. Iron Ore Company of Canada (IOCO), the largest Canadian producer, shipped 7.2 million tons of direct shipping ore (54.2 percent Fe) from Shefferville and 7.1 million tons of concentrates and pellets (63–65 percent Fe) from the IOCO-Carol Pellet Co. operations at Labrador City. Quebec Cartier Mining Co. at Gagnon, Quebec, reported shipments of 8.3 million tons of high-grade (64.5 percent Fe) concentrates in 1965. Wabush Mines open pit mine and concentrator at Wabush Lake, Labrador, rated at 5.4 million tons per year, opened in June 1965. Concentrates are hauled by Quebec North Shore and Labrador Railway to the affiliate Arnaud Pellet Co. plant at Point Noire on the St. Lawrence River. Shipments of pelletized concentrates (65 percent Fe) from the Wabush-Arnaud operations totaled 1.9 million tons during the half year. In Ontario, the new Adams Mine and pellet plant, wholly owned by Jones & Laughlin Steel Corp., produced about 710,000 tons of pelletized concentrate (66 percent Fe) in the first full year's operation.

Continuing the trend of recent years, Canada's annual pellet production capacity rose to 14.6 million tons in 1965. Seven pelletizing plants are in operation, and the three plants currently under construction will provide an additional 2.6 million tons by 1969.

Exports of iron ore, including concentrates and pellets, totaling 31.3 million tons in 1965 went to the usual markets in United States, United Kingdom, Japan, and Western Europe. Shipments of Canadian ores to domestic consumers amounted to 4.2 million tons. The Canadian iron and steel industry also absorbed 4.8 million tons of imported ores, nearly all of which came from United States.

Pig iron capacity of the 15 blast furnaces and 10 electric furnaces in use during 1965 was rated at 7.15 million tons per year. Actual 1965 output represented about 92 percent of capacity. Steelmaking facilities as of December 31, 1965, were rated at 10.70 million tons, comprising 10.21 million tons for ingots and 0.49 million tons for steel castings.

The Department of Mines and Technical Surveys lists 23 iron and steel producers in 1965 with a total capacity of 6.7 million tons of pig iron and 9.7 million tons of steel. In addition, about 26 small companies that produce steel castings have a combined annual capacity of about 180,000 tons. Although the industry operated at about 94 percent capacity, domestic production of ingots and castings was approximately 700,000 tons short of the apparent domestic requirement.

Several major expansion and construction projects were initiated or announced during 1965. New electric furnaces were put in service at the Lake Ontario Steel Co. in Ontario, and Horton Steel Ltd., in British Columbia. Consolidated Mining & Smelting Co. of Canada Ltd., Kimberley, British Columbia, is installing a small bas-

Table 4.—Canada: Salient iron and steel statistics
(Thousand metric tons)

	1962	1963	1964	1965
Blast furnace feed:				
Iron ore:				
From Canadian mines	831	697	770	449
Imported	1,646	1,618	1,192	1,317
Sinter, pellets, etc:				
From Canadian mines	1,345	1,831	2,133	2,791
Imported	2,198	2,778	3,341	3,455
Made in iron and steel plants	1,627	1,535	1,648	1,555
Blast furnace output:				
Pig iron	4,798	5,366	5,933	6,409
Ferroalloys	125	130	151	165
Steel furnace feed:				
Pig iron	4,136	4,613	5,131	5,575
Scrap	3,194	3,688	4,200	4,751
Steel furnace output:				
Ingots	6,397	7,316	8,136	8,950
Castings	111	114	147	148
Total	6,508	7,430	8,283	9,098
Rolled steel products:				
Carbon steel:				
Hot rolled	5,017	5,725	6,264	6,872
Cold rolled and coated	2,048	2,265	2,595	2,798
Alloy steel	155	187	264	335
Total	7,220	8,177	9,123	10,005

ic oxygen unit that will commence production of steel in 1966 at an annual rate of about 73,000 tons. Dominion Foundries & Steel Ltd. at Hamilton, Ontario, is replacing its 90-ton basic oxygen furnace with one of 150-ton capacity.

New construction plans recently announced include complete steelworks in New Brunswick and Quebec. The Brunswick Mining & Smelting Corp. Ltd. project, based on the pyrite component of base metal ores is aimed at an annual capacity of 230,000 tons of rolled steel. The Quebec Government-sponsored Sidérurgie de Québec (Sidbec) steel plant at Bécancour, expected to cost $300 million, will include blast furnace, basic oxygen steel unit, and mills for rolled products. Its designed capacity is 600,000 to 1 million tons annually.

Lead and Zinc.—Both lead and zinc set new Canadian production records in 1965 with mine output 47 and 25 percent, respectively, above 1964 levels. On a mine basis, Canada strengthened its position as the world's leading producer of zinc and retained fourth place after Australia and United States in lead output. The 1964–65 list of lead and zinc mines by Department of Mines and Technical Surveys includes 28 companies, 19 of which produced substantial quantities of both metals. By areas, mines in Quebec accounted for 31 percent of the 1965 Canadian zinc output, followed by British Columbia—18 percent, New Brunswick—14 percent, and Northwest Territories—10 percent. British Columbia continued as the principal source of lead, producing 40 percent in 1965. However, reflecting output of the new mines at Pine Point and Bathurst, Northwest Territories and New Brunswick rose to second and third places, respectively, with 26 percent and 16 percent of total mine output of lead.

Shipments of lead-zinc ore during 1965 from the new mine of Consolidated Mining and Smelting Co. of Canada Ltd. (COMINCO)[4] at Pine Point, Northwest Territories totaled 330,214 tons to the company's concentrator at Kimberley and the smelter at Trail, and to the Bunker Hill Co. in Idaho. With the completion of the concentrator at Pine Point, concentrate shipments all of which went to Trail, started in December 1965. Pyramid Mining Co. Ltd. reported a new lead-zinc discovery adjacent to the COMINCO holdings in the Pine Point district.

In New Brunswick, operation of the No. 12 mine and 4,000 ton-per-day concentrator of Brunswick Mining & Smelting Corp. Ltd., near Bathurst, continued at capacity throughout 1965. Construction of the sec-

[4] On May 16, 1966, the name "Consolidated Mining and Smelting Company of Canada Limited" was officially changed to "Cominco Ltd." ("Cominco Ltée" in French.)

ond concentrator, which will treat zinc-lead-copper ore from the No. 6 open pit mine, is scheduled to start operation early in 1966. A subsidiary company, East Coast Smelting & Chemical Co. Ltd., which will include a lead-zinc blast furnace and by-product facilities is expected to commence in 1966. Its designed capacity is 27,000 tons of lead and 28,000 tons of zinc annually.

At yearend the Texas Gulf Sulphur Co., Inc., open pit mine at Kidd Creek, near Timmins, Ontario, was nearly ready for production to begin in 1966, and construction of the concentrator at Hoyle, for which design has been raised from 6,000 to 9,000 short tons ore input daily, was proceeding on schedule. The route of the 17-mile connecting railroad spur has been surveyed.

The COMINCO smelter at Trail, British Columbia, the only Canadian lead refiner, reported production of 169,175 metric tons of lead metal in 1965, 23 percent higher than that of 1964. The three zinc refineries, COMINCO, Flin Flon (Manitoba), and Valleyfield (Quebec), produced a total of 325,314 tons of slab zinc in 1965. During the year the annual capacity of the COMINCO zinc plant was raised to 210,000 tons, and Canadian Electrolytic Zinc Ltd. at Valleyfield was in process of expanding its 65,000 tons annual capacity by about 60 percent.

Molybdenum.—As anticipated, Canada became the world's third largest producer of molybdenum in 1965. Of the seven mines that contributed to the year's record production, two in Quebec and two in British Columbia commenced operation during the year. The 9,000 metric ton-per-day operation of Endako Mines Ltd., in north-central British Columbia, and the 900 ton-per-day plant of Noranda Mines Ltd., at Boss Mountain in the Cariboo district of the same Province, both of which started in May, were largely responsible for the increase. Preissac Molybdenite Mines Ltd. and Anglo American Molybdenite Mining Corp., near Cadillac in northwest Quebec, with mills rated 1,200 and 1,000 short tons per day, respectively, also started production about mid-1965.

Production by companies, in 1965, was as follows:

Company and location	Contained Mo (metric tons)
Molybdenite Corporation of Canada Ltd., Quebec	310
Gaspé Copper Mines Ltd., Quebec (byproduct)	224
Preissac Molybdenite Mines Ltd., Quebec	e 360
Anglo American Molybdenite Mining Corp., Quebec	e 140
Bethlehem Copper Corp. Ltd., British Columbia (byproduct)	e 10
Endako Mines Ltd., British Columbia	e 2,500
Boss Mtn. Noranda Mines Ltd., British Columbia	e 720
Total	e 4,264

e Estimate.

Properties in British Columbia being developed and expected to add to Canada's molybdenum production within the next few years include the Kennecott Copper Corp., subsidiary British Columbia Molybdenum Ltd., at Alice Arm, and Torwest Resources (1962) Ltd., near Rossland. Mills of 5,400 and 360 metric tons per day capacity, respectively, are planned for these properties.

The great bulk of Canada's molybdenum was exported in the form of concentrates. However, molybdic oxide, MoO_3 was produced by Molybdenite Corporation, Preissac Molybdenite Mines, and Endako. Masterloy Products Ltd., in Ottawa, produced calcium molybdate and ferromolybdenum.

Nickel.—Canadian production of nickel in 1965 attained a record 15 percent above the previous peak established in 1961. With use of nickel in coinage by more than 100 countries and growing consumption for metallurgical purposes, the world-wide demand has continued at a high rate through 1965. Canada's mine output comprised 60 percent of the world total in 1965; the Soviet Union contributing about 20 percent and New Caledonia about 12 percent.

The Canadian production was from 18 mines in 4 Provinces. The International Nickel Co. of Canada Ltd. (INCO), operated seven mines in the Sudbury district and metallurgical plants near Sudbury and

at Port Colborne, Ontario; and a mine, smelter, and refinery at Thompson, Manitoba. On December 31, 1965, proven ore reserves in Sudbury and Thompson mines were estimated at 278 million tons with a nickel-copper content of 8.4 million metric tons. During the year 18 million tons of ore were mined and deliveries of principal metallic products totaled 223,623 tons of nickel, 125,147 tons of copper, and 510,800 ounces of platinum-group metals. New mines under development by INCO include Totten (which started producing early in 1966), Copper Cliff North, Kirkwood, Coleman, and Little Stobie, all in the Sudbury district, Ontario, and Birchtree and Soab, near Thompson, Manitoba. The company's foreign activities include nickel deposits being prepared for early production in Australia and Guatemala and exploration in Africa, the United States, and certain South Pacific islands. The current $90 million expansion program for INCO operations will raise production capacity of the company's Canadian plants about 10 percent. A new 20,000 ton-per-day mill is to be built at the Frood-Strobie mine and in the smelter, roasting equipment will be modernized, a nickel oxide sinter facility added, and the oxygen plant will be enlarged. A new metallurgical research laboratory (Sheridan Park Ontario Research Community) will be opened in Toronto in 1966. In November 1965 the company agreed to take 70 million pounds of cathode nickel from U.S. Government surplus stocks over a 5-year period, with 28 million pounds to be delivered by June 1966.

Falconbridge Nickel Mines Ltd. operations near Sudbury included six mines (Falconbridge, East, Onaping, Hardy, Fecunis, and North), three mills, and a nickel-copper matte smelter. The matte is refined by Falconbridge Nikkelverk A/S, in Kristiansand, Norway. In 1965, the mills treated 2,126,430 metric tons of ore. The company reported delivery of 33,105 tons of nickel and 15,337 tons of copper. At yearend, proven ore reserves in the several Falconbridge mines were estimated at 50 million tons with a nickel-copper content of 1,054,000 tons. The new Strathcona mine and 5,400 ton-per-day mill in the Sudbury district is scheduled for production in 1967–68. A second blast furnace was blown in at the smelter in January 1966.

The Sherritt Gordon Mines Ltd. mine at Lynn Lake, Manitoba, and chemical refinery at Fort Saskatchewan, Alberta, reported production of 11,698 tons of nickel, 5,621 tons of copper, and 240 tons of cobalt in 1965. Ore mined during 1965 totaled 1,237,015 tons and recalculation of reserves at yearend showed 11.4 million tons averaging 0.84 percent nickel and 0.49 percent copper. The Fort Saskatchewan refinery reported no production from imported nickel matte during 1965. However, late in the year, 13 million pounds of nickel briquets were bought from the U.S. Government stockpiles for resale to regular customers.

Four small mines contributed to the Canadian nickel production during 1965. Lorraine Mining Co. Ltd. in Belletere area, Quebec, opened a 400 ton-per-day mill in March, with concentrates shipped to INCO's Copper Cliff smelter. Marbridge Mines Ltd., operating at about 350 tons per day, continued shipping concentrates to the Falconbridge smelter. Metal Mines Ltd., at Gordon Lake, Ontario, also continued its 700 ton-per-day operation and shipment of concentrates to Copper Cliff. For the year ending September 30, 1965, Giant Mascot Mines Ltd., near Hope, British Columbia, reported recovery of 1,784 tons of nickel and 932 tons of copper in concentrates (from 29,975 tons of ore treated) for shipment to Japan.

Platinum-Group Metals.—Canada ranked third after the U.S.S.R. and Republic of South Africa in production of platinum-group metals. Reflecting a substantial increase in output of nickel-copper ores with which they are coproduced, and a rise in prices for the individual metals, the value of Canadian production of platinum-group metals in 1965, estimated at US$33 million, was 40 percent higher than that of 1964. While virtually all of the nickel-copper ores mined in Canada are known to contain platinum metals, details by producers are not disclosed. Platiniferous sludges produced in the INCO nickel refineries are exported to the company's precious metals refinery in Acton, England. Falconbridge platinum is contained in nickel-copper matte shipped to Norway. Accordingly, Dominion Bureau of Statistics reported total exports of 492,501 troy ounces of platinum-group metals in concentrates, residues, and matte in 1965; of which 471,238 ounces went to the United Kingdom, 16,823

ounces to Norway, and 4,440 ounces to the United States. Return of refined platinum-group metals to Canada in 1965 is indicated in officially reported imports of 229,029 ounces from United Kingdom and 4,574 ounces from United States.

Silver.—The 7-percent increase in Canadian silver production in 1965 reflected higher output from base metal mines as well as a firm demand and sustained high price. According to 1964 lists, 36 companies, many of which operate several mines, account for the national output. Over 80 percent of the total is derived from ores mined primarily for lead, zinc, and copper. Accordingly, the COMINCO smelter at Trail, British Columbia, recovered and refined 6,415,230 ounces in 1965 (compared with 7,347,590 ounces in 1964) from ores and concentrates mined in western Canada. Nearly half of this was from COMINCO mines. The Noranda copper smelter and its affiliate, Canadian Copper Refiners Ltd., in Quebec, reported recovery of 7,669,340 ounces and 9,647,000 ounces, respectively, in 1965. INCO copper-nickel plants at Copper Cliff, Ontario, recovered 1,581,000 ounces in 1965.

United Keno Hill Mines Ltd., in Yukon Territory, and the COMINCO Sullivan mine at Kimberley, British Columbia, have for many years been the leading Canadian silver producers. On an area basis, however, Ontario, which accounted for 34 percent or over 11 million ounces, was again Canada's largest source of silver. In succeeding order, Quebec contributed 16 percent, British Columbia and Yukon each about 14 percent, New Brunswick 9 percent, and Northwest Territories 4 percent. The year's greatest regional increase resulted from shipments of argentiferous lead and zinc ores and concentrates from the new COMINCO mine at Pine Point, Northwest Territories. The first full year's operation by Brunswick Mining & Smelting Corp. Ltd. was instrumental in virtually doubling New Brunswick silver output.

The five industry-owned silver refineries and the Royal Canadian Mint produced 11,268,110 ounces of silver bullion in 1965, compared with 10,583,439 ounces in 1964. During 1964, domestic consumers absorbed 18.8 million ounces of silver; 13.7 million for coinage, 3.1 million in manufacture of silverware and photographic materials, and 2.0 million for electroplating and other purposes. Exports of silver, most of which went to the United States, totaled 23.5 million ounces in 1965. Canadian imports in 1965 (13,413,000 ounces) were approximately double the annual average of the 2 preceding years.

Thorium and Yttrium.—The uranium ores of the Elliot Lake and Bancroft regions of Ontario have long been known to contain appreciable amounts of thorium and other rare earth oxides. Elliot Lake ores average about 0.05 percent and Bancroft ores 0.02 to 0.2 percent thorium dioxide (ThO_2). Total reserves of the two regions are estimated at 74,000 metric tons of thorium. Rio Tinto Dow Ltd. recovered thorium at the Quirke mine from 1959 until its closure in 1961. Since 1961 thorium recovery has been in a new unit at the Nordic mine. Concentrates from these plants have been refined by Dominion Magnesium Ltd., at Haley, Ontario, and the products exported principally to the United States. Although Canadian production data are not published, United States imports in 1964 and 1965 from Canada included respectively 2,900 pounds and 5,000 pounds of thorium metal.

Recovery of yttrium concentrates from uranium ores was initiated by Stanrock Uranium Mines Ltd. at Elliot Lake late in 1965. Commercial shipments were made during the first months of 1966, but quantities have not been reported.

Uranium.—Continuing the downtrend that has been continuous since 1959 when 21 mines shipped over 14,400 metric tons of uranium oxide (U_3O_8), only 4 companies operated through 1965, and the year's output fell below 4,000 tons.

To maintain production capability in the uranium mines and plants, the Canadian Government in June 1965 announced a new purchase program that will permit the established companies to produce a total of about 4,000 tons annually for the next 5 years. At the same time the Government announced that export permits would be issued only on the basis of agreements with importing countries to the effect that the uranium would be used solely for peaceful purposes.

Three mines in the Elliot Lake area, Ontario, produced a total of about 3,000 tons of U_3O_8 in 1965. Denison Mines Ltd. and the Nordic mine of Rio Algom Mines Ltd. accounted for the bulk of Elliot Lake pro-

duction. Stanrock Uranium Mines Ltd. employed underground bacterial leaching to recover 5 to 7 tons U_3O_8 per month. Eldorado Mining and Refining Ltd. in the Beaverlodge area, Saskatchewan, shipped about 900 tons of U_3O_8 in 1965. This company's operation is geared to contractual commitments that extend through 1966.

Despite the current slump in uranium mining, Rio Algom Mines Ltd. early in 1966 announced plans to build a 150 ton-per-day uranium refinery at its Nordic mine, near Elliot Lake. Of interest in the field of nuclear energy, Canadian Deuterium of Canada Ltd. is constructing a heavy waterplant at Glace Bay, and Canadian General Electric Co. Ltd. has announced plans to build a similar plant on the Strait of Canso, both in Nova Scotia. Heavy water is used as a moderator in reactors employing natural uranium fuel.

NONMETALS

Asbestos.—During 1965 a total of 16 asbestos mines, 1 each in Newfoundland, Ontario, and British Columbia and 13 in Quebec, were operated. The year's production was slightly below the record output of 1964, but well above that of any previous year. Department of Mines and Technical Surveys analysts estimate Soviet production in 1965 may have surpassed Canada's longstanding position as the world's leading source of asbestos.[5]

Although Canadian asbestos producers are confronted with growing competition from foreign producers, new properties under development are expected to raise Canadian production within the next few years. At Asbestos Hill in northern Ungava, Quebec, Asbestos Corp. Ltd. is developing a 20-million-ton deposit that is scheduled for 90,000 ton-per-year production beginning in 1970. At Lake Roberge, near Chibougamau, Quebec, a deposit containing more than 150 million tons with a fiber content averaging 4 percent has been outlined by McAdam Mining Corp. Ltd. Canadian Johns-Manville Co. Ltd. is developing a prospect for underground mining operation in Reeves Township, 43 miles southwest of Timmins, Ontario. A test mill was provided at this prospect in 1965. In the Yukon Territory, Cassiar Asbestos Corp. Ltd., is expected to begin production at 36,000 tons per year at Clinton Creek, 40 miles northwest of Dawson, and to double this output by 1970. Ore reserves are estimated at 13 million tons with a fiber content in the 6 to 7 percent range.

Potash.—During 1965 three companies, with a combined refining capacity of 3 million tons of KCl product, contributed to the national output which was 67 percent above that of 1964. The year's achievements constitute a firm start in the long-range plan that is expected to increase annual Canadian production to 12 million tons of crude product (equivalent to 7.5 million tons K_2O) before 1970.

In 1965, International Minerals & Chemical Corp. (Canada) Ltd. (IMC) raised the capacity of its Yarbo plant, near Esterhazy, Saskatchewan, to 2 million tons of product per year, making it the world's largest. The second IMC project, at Gerald, about 6 miles southwest of Yarbo, scheduled for completion in 1967, will start at 1.5 million and later expand to 2.5 million tons per year. Potash Company of America, after a 6-year suspension during which shaft difficulties were overcome and the refinery redesigned, resumed production in 1965 at full 600,000-short-ton annual capacity. The world's first solution-mining of potash, undertaken by Kalium Chemicals Ltd., at Belle Plain, 25 miles west of Regina, was initiated in 1964 and reportedly operated satisfactorily throughout 1965. Plant capacity is estimated at 600,000 tons per year.

In addition to the present producers, four companies were actively developing and several others were being planned. The developers, all in south-central Saskatchewan, include Alwinsal Potash Co. of Canada Ltd. at Lanigan, designed for 1 million tons of product per year; U.S. Borax & Chemical Corp. at Allan, 1.5 million tons per year; and Consolidated Mining & Smelting Co. of Canada Ltd. at Colonsay, 1.2 million tons yearly.

Exports of Canadian potash are not separately disclosed; however, according to United States records, the great bulk of Canadian shipments are to the United States. In past years small shipments have also gone to Japan and other countries

[5] An official of Canadian Johns-Manville Co. Ltd. who supervised installation of US$7.8 million Canadian-made asbestos equipment in U.S.S.R. and toured Soviet mines in 1964 reported Soviet asbestos production capacity at 1.43 million metric tons annually.

Canadian consumption of potash in 1964 amounted to 163,524 metric tons.

Sulfur.—Spurred by a strong worldwide demand and a substantial price increase in 1965, Canadian production of sulfur, all forms, was 8 percent above the previous record established in 1964. In 1965, Canada probably displaced Mexico as the free world's second largest source of sulfur. The great bulk of 1,730,648 metric tons of elemental sulfur sold in 1965 was extracted from sour natural gas produced in Alberta. In addition, the 1965 total included 465,494 tons contained in liquid sulfur dioxide and sulfuric acid derived from smelting metal sulfide ores and about 160,000 tons in shipments of pyrite and pyrrhotite.

During 1965, 17 companies operated 23 sulfur recovery plants with a total rated capacity of 2.5 million tons of elemental sulfur yearly. With the exception of five plants—three in Ontario and one each in Saskatchewan and British Columbia—representing a combined capacity of 178,000 tons per year, all natural gas sulfur was recovered by facilities in Alberta. The Claus process, or modifications thereof, is employed in all 23 plants.

Two new plants, both in Alberta, started during the year; these were the 120,000 ton-per-year plant of Socony Mobil Oil Co. of Canada Ltd., at Wimborne, and the 64,000 ton-per-year plant of Hudson's Bay Oil and Gas Co. Ltd. at Edson. Several existing plants increased capacity. Construction of the Canadian Oil Sands Ltd. oil refinery, close to the border of Northwest Territories, continued through 1965. When completed in 1967, this plant is expected to recover about 110,000 tons of sulfur annually from bituminous tar sands.

Early in 1966, announcement of a discovery of native sulfur in a dome-like structure near Truro, Nova Scotia, resulted in a rush to acquire land rights. The sulfur occurs in anhydrite at a depth of about 400 feet and was found in exploratory drilling for gypsum conducted by the Nova Scotia Department of Mines.

Canadian consumption of sulfur in 1965, including that converted directly to sulfuric acid, was estimated[6] at 1,025,000 tons compared with 950,000 tons in 1964. Most of the elemental sulfur produced in 1965 was exported to the United States, Australia, Japan, Hungary, Poland, U.S.S.R., Republic of South Africa, and other overseas countries.

MINERAL FUELS

Total Energy.—Use of energy, estimated at a total of 53.3 billion therms[7] in 1964, represents an increase of 8 percent over that of 1963 and a virtual doubling of energy usage in the 1954–64 decade. Throughout the 10-year period the share of solid fuels has fallen from 35 to less than 13 percent of the total, and hydroelectric power from 10 percent to about 7 percent. Energy derived from natural gas has risen from 6.5 percent to 27.7 percent. Despite the virtual doubling in quantity, petroleum's role in the total energy picture since 1954 has remained relatively constant at a little over half the total. Summary details for the 1962–64 years, compared with those of 1954, as developed by the Dominion Coal Board are given in the following tabulation:

[6] Gittinger, L. B., Jr. Sulfur. Eng. and Min. J., February 1966, pp. 146–147.

[7] One therm is equivalent to 100,000 B.t.u.

Source	1954	1962	1963	1964
Total energy—billion therms	24.7	45.3	49.4	53.3
Sources of total energy:				
Coal and lignite:				
Canadian—percent	14.0	5.2	5.0	4.9
Imported [1]—do	20.8	7.7	7.5	7.8
Hydroelectric—do	9.5	7.8	7.1	7.2
Natural gas—do	6.5	24.2	25.7	27.7
Petroleum and products:				
Canadian—do	22.7	34.3	33.7	32.6
Imported—do	26.5	20.8	21.0	19.8
Total—do	100.0	100.0	100.0	100.0

[1] Includes coal coke and briquets.

Coal.—Although production of bituminous coal from mines in the Maritime Provinces, British Columbia, and Yukon declined during 1965, the 408,000-ton higher output from Alberta's subbituminous mines resulted in a national increase of about 2 percent over that of 1964. Production of lignite, all of which is mined in Saskatchewan, also recorded a small increase in 1965. The national coal balance, in million short tons, has been summarized for recent years as follows:

Year	Production	Imports		Total available	Consumption	Exports
		Anthracite	Bituminous			
1961	10.4	1.0	11.1	22.5	21.5	0.9
1962	10.3	.9	11.5	22.7	22.2	.9
1963	10.6	.8	13.9	25.3	23.5	1.1
1964	11.3	.6	14.1	26.0	24.6	1.3
1965	11.6	.6	15.6	27.8	26.6	1.2

Source: Dominion Coal Board and Dominion Bureau of Statistics.

Principal statistics for the Canadian coal mining industry in 1964 as summarized by Industry Division, Dominion Bureau of Statistics[8] (corresponding data for 1963 in parentheses), were as follows: number of mines, 94 (97); average number of employees, 9,087 (8,903); value of production, f.o.b. mines US$67.8 million (US$66.4 million); average production per man-day, total 4.90 (4.28) metric tons, from strip mines, 16.81 (14.81), from underground mines 2.97 (2.98).

During the 1964–65 fiscal year (April 1 to March 31), Dominion Coal Board reported subvention payments totaling US$19.98 million on transportation of 4,406,584 metric tons of coal. As in previous years, the major portion of these payments were on Nova Scotia shipments to Quebec and Ontario. Payments amounted to US$2.7 million on 928,627 tons of British Columbia and Alberta coals for export (to Japan) and ships' stores. Other assistance to the Canadian coal industry during fiscal 1964–65 included $197,000 on 389,948 tons converted to coke for use in production of iron and steel, under the Coal Equity Act; and $2.1 million paid under The Atlantic Provinces Power Development Act to the Power Commissions of Nova Scotia and New Brunswick.

Domestic consumption of coal as estimated by the Dominion Coal Board[9] for recent fiscal periods was distributed as follows:

Consumer	1961–62	1962–63	1963–64	1964–65
Total consumption—thousand metric tons	r 20,750	r 21,564	r 21,988	24,265
Household—percent	21.3	17.2	14.6	12.4
Power and industrial—do	47.1	52.8	53.9	58.5
Railway—do	1.9	1.4	1.3	.9
Coke and gasworks—do	23.8	23.2	23.8	22.0
Bunkers—do	1.1	1.0	1.1	1.2
Colliery and waste—do	.4	.7	.7	.5
Export—do	4.4	3.7	4.6	4.5
Total—do	100.0	100.0	100.0	100.0

r Revised.

Coal consumption in recent years has shown several changing trends. Total consumption, reflecting inroads of gas and petroleum, fell from 40 million tons in 1950 to a low of about 20 million tons in 1961. Since 1961, Government subsidies, research programs, and construction of several electric facilities based on domestic coal have been instrumental in reversing the overall decline. Domestic and household usage, which in 1954 accounted for 27 percent of the national total consumption, took only about 12.4 percent in 1965, and consumption by railroads over the same period fell from 19 percent to less than 1 percent.

Coal technological and market research during 1965 has been intensive. The Cana-

[8] Dominion Bureau of Statistics, Industry Division. The Coal Mining Industry for Calendar Year 1964. Ottawa, January 1966. p. 77.

[9] Dominion Coal Board. Seventeenth Annual Report 1964–65. Ottawa, 1966, p. 30.

dian Advisory Committee on Coal Research, comprised of representatives from Mines Branch, Geological Survey of Canada, Dominion Coal Board, and Provincial research groups, conducted geological investigations in Alberta, rock mechanics studies in Nova Scotia mines, and coal cleaning and combustion research in various laboratories. Several iron and steel producers combined to form the Canadian Carbonization Research Association to study coking processes in cooperation with Department of Mines and Technical Surveys. Briquetting of coals is being studied at the University of British Columbia. The New Brunswick Government, along with the Dominion Coal Board, has undertaken an economic and sociological evaluation of the Minto Coalfield.

Transportation facilities for coal from Sydney, Nova Scotia, via the St. Lawrence River and Seaway to Ontario Hydro Commission powerplants are to be expanded with the addition of a second self-unloading ore carrier. It is expected to start operation early in 1966 and will supplement the SS *Cape Breton Miner* which completed its first full year of service.

Petroleum and Natural Gas[10].—In 1965, production of liquid hydrocarbons averaged 935,890 barrels[11] per day, an increase of 9 percent over the 1964 average rate. Of this total, daily output of crude petroleum and condensates accounted for 813,698 barrels, and natural gas liquids—propane, butane, and pentanes plus—for about 122,000 barrels per day. Natural gas production at a daily rate of 3,952 million cubic feet increased 5.9 percent over the 1964 level.

Approximately two-thirds of the 1965 crude oil output went to 41 Canadian refineries that operated during the year and one-third was exported, all to the United States. Crude oil imports, mostly from Venezuela and Near East countries, for the year amounting to about 395,000 barrels per day, were required to meet national requirements totaling 966,000 barrels per day. Supply of crude oil and equivalent to the petroleum refineries was substantially in excess of their rated total capacity of 1.1 million barrels per day.

Disposition of marketable natural gas averaged 2,963 million cubic feet per day during 1965. About 53 percent of this was absorbed in domestic sales, 37.4 percent was exported to western United States markets, and 9.6 percent went to distributor storage and other purposes. With the addition of 15 new plants in 1965, at yearend, Canadian gas processing facilities included 100 plants having a total capacity of 5,900 million cubic feet per day.

Regional distribution and capacities of operating oil refineries and processing plants as of December 31, 1966, is summarized in the following tabulation:

Province	Oil refineries		Gas processing plants	
	Number	Capacity (thousand 42-gallon barrels per day)	Number	Capacity (million cubic feet per day)
Alberta	7	93,300	85	5,141.2
British Columbia	6	101,170	5	624.0
Manitoba	3	41,100	---	---
New Brunswick	2	45,300	---	---
Nova Scotia	2	72,000	---	---
Ontario	7	320,400	3	6.5
Quebec	6	351,200	---	---
Saskatchewan	6	69,300	7	138.0
Others	2	10,100	---	---
Total	41	1,103,870	100	5,909.7

Extensions and new discoveries during the year resulted in upward revision of reserve estimates, bringing totals for liquid hydrocarbons to 7,710 million barrels and gas to 44,372 billion cubic feet. Drilling activity in 1965 exceeded that of any earlier year. A total of 16,380,477 feet was drilled in 3,772 completed wells, of which approxi-

[10] Bachman, W. A. Canada '66. Oil and Gas J., v. 64, No. 23, June 6, 1966, pp. 89–126.
Canadian Petroleum Association. Statistical Yearbook 1965. Calgary, Alberta. April 1966, p. 117.
Dominion Bureau of Statistics. Service Bulletin, Energy Statistics, Preliminary Review of Crude Petroleum and Natural Gas Production, Year 1965. Ottawa, July 13, 1966, p. 11.

[11] The Canadian unit barrel containing 35 imperial gallons is approximately equivalent to the U.S. barrel of 42 U.S. gallons.

mately 5.2 million feet in 1,140 wells was classified as wildcat. By Provinces, 62 percent of the total footage was drilled in Alberta, 27 percent in Saskatchewan, 6 percent in British Columbia, and the balance in Ontario, Manitoba, and the Northwest Territories. During the peak months of survey activity, 75 seismic, 4 gravity, and 13 surface crews were in the field in western Canada.

The bright prospects of the Rainbow Lake field in northwestern Alberta, extending into British Columbia, continued to dominate the Canadian petroleum and gas scene. Since mid-1964 the 10 oil pools and 12 gas pools that have been indicated in this area by seismic work and drilling are looked upon as Canada's major petroleum discovery in recent years. Banff Oil Ltd. and its partners, Aquitaine Co. of Canada Ltd. and Mobil Oil Corp., are the principal operating companies in the area. Rainbow Pipeline Co. Ltd., late in 1965, started laying a 20-inch pipeline 240 miles from Utikuma Lake to connect the Rainbow field with existing lines to Edmonton. The Mitsue field at the southeast end of Lesser Slave Lake had a full year of production, and about 125 wells were completed in 1965. Some 40 miles to the northwest of Mitsue, the new Nipisi field at Utikuma Lake was discovered almost simultaneously by three companies in January. Two competitive pipelines were laid and 30 wells completed by yearend.

A total of about 2,500 miles of new oil and gas pipelines was laid in 1965; the largest single project was the 173-mile, 30-inch oil line link from Carstairs, near Calgary, to the Edson field, 120 miles west of Edmonton.

Helium.—In keeping with Canadian Government policy, production of helium by the single Canadian producer, Canadian Helium Ltd. near Swift Current, Saskatchewan, has not been disclosed. The company recently announced plans to triple plant production capacity by January 1967, to 36-million cubic feet per year. In April 1966, International Helium Ltd. announced its intention to start immediately on design and construction of Canada's second helium recovery plant. An official of International Cryogenics Inc., Hermosa Beach, California, has been retained as consultant-in-charge of design and engineering. The new plant will be in Saskatchewan and will have an annual capacity of 40-million cubic feet.

The Mineral Industry of Greenland

By Lester G. Morrell [1]

During 1965, mining activities in Greenland were limited to extraction of a small quantity of coal and unreported quantities of construction materials for local use. An official of the Greenland Technical Organization reported that the sharp drop in coal output in 1964 and 1965 has been due to lack of stability in the local labor force. Exports of cryolite continued through 1965 from stockpiles accumulated prior to 1963 when the Øresund Cryolite Co., Inc., operation was suspended. On December 31, 1965, remaining stocks of cryolite were calculated at 500,000 to 600,000 metric tons. The lead-zinc orebody mined by Nordic Mining Co., Inc., at Mesters Vig on Kong Oscars, Fjord, was worked out in 1962, and no export shipments of concentrates have been made since that year.

A Danish company, O. Fink-Jensen, recently announced plans to resume mining of marble at Marmorilik, north of Umanak on Umanak Fjord; previous operations there were discontinued in 1940. The company was seeking cooperation of the Greenland Trade Department in solving transportation problems and planned to market its expected small output of marble in Denmark, Sweden, and Germany.

The molybdenum project, that since 1962 has been the subject of intensive study and diamond drilling by Arctic Mining Co. (owned jointly by Nordic Mining Co., of Denmark, and American Metal Climax, Inc.), appeared closer to realization when plans to aim for mining 3 million tons of ore per year which will yield about 7,500 tons of molybdenum concentrate annually was announced. It is anticipated that production may begin in 1972.

The Greenland Geological Survey and the Danish Atomic Research Station in Risø, Denmark, continued research related to uranium occurrences in the Kvane Mountain area near Godthaab. Preliminary estimates indicate at least 4,000 tons of uranium. Prospects for thorium, beryllium, and columbium are also found in this general area. In the coastal region between Godthaab and Sukkertoppen a government concession has been granted to Øresund Cryolite Co., Inc., to prospect for copper, iron, nickel, and chromium.

Early in 1966 a Canadian press article [2] reported two new exploration programs to be undertaken by Canadian mining companies, beginning in June 1966. The Anderson-Greenland Syndicate, headed by Consolidated Mining and Smelting Co. of Canada Ltd., has been granted a 1,000-square-mile concession on the west coast mainland at Umanak Fjord. Deposits of high-grade lead and zinc ore in this vicinity have been known since 1939. The second project involves a concession covering the 3,000-square-mile area of Disko Island, south of Umanak Fjord, granted to New Quebec Mining and Exploration Ltd. and the Anderson-Greenland Syndicate. The existence of nickel, copper, and bituminous coal has long been known on the island.

[1] North America-South Pacific specialist, Division of International Activities.

[2] The Northern Miner (Toronto, Canada). May 5, 1966, p. 1.

Table 1.—Greenland: Production of metals and minerals
(Metric tons)

Commodity	1961	1962	1963	1964	1965
Metals:					
Lead concentrate:					
Gross weight	13,000	1,900	--------	--------	--------
Metal content	9,166	808	--------	--------	--------
Zinc concentrate:					
Gross weight	12,500	6,200	--------	--------	--------
Metal content	8,000	4,000	--------	--------	--------
Nonmetals:					
Cryolite, crude (exports) [1]	41,775	40,943	67,130	50,882	57,063
Mineral fuels: Coal, bituminous	30,139	26,098	40,000	24,000	20,000

[1] Quantities shown for 1963 and subsequent years are entirely from accumulated stocks.

TRADE

The value of cryolite, amounting to $2.75 million (18.97 million kroner) accounted for over one-fourth of the $10.49 million (72.49 million kroner) value of Greenland's total exports in 1964. The great bulk of exports is made up of fish products. Total imports, valued at $28.53 million (197.04 million kroner) consisted mostly of fully manufactured products, electrical apparatus, and petroleum fuels. The value of 1964 imports of metal and mineral products listed in table 3 amounted to $4.10 million (28.30 million kroner), more than half of which was in kerosine and diesel fuel.

Table 2.—Greenland: Exports of metals and minerals
(Metric tons)

Commodity	1963	1964	Principal destination, 1964
Nonmetals:			
Cryolite, crude [1]	67,130	50,882	Denmark 40,107; United States 10,775.
Salt	30	--------	
Mineral fuels:			
Coal, bituminous	4,687	--------	

[1] Includes quartz, mica, fluorspar, etc.

Table 3.—Greenland: Imports of metals and minerals

(Metric tons)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Iron and steel, semimanufactures [1]	1,898	2,487	All from Denmark.
Nonferrous metals, semimanufactures.[2]	103	130	Do.
Nonmetals:			
Brick, stone, clay products	3,296	2,748	Do.
Cement	763	496	Do.
Expanded clays, etc.	479	739	Do.
Fertilizers, processed	11	55	Do.
Lime (burned)	402	491	Do.
Salt	7,676	3,301	Spain 3,250; Denmark 51.
Other nonmetals, crude	156	597	All from Denmark.
Other nonmetals, processed [3]	3,262	3,836	Do.
Mineral fuels:			
Coal, coke, and briquets	17,208	10,162	United Kingdom 9,505; Denmark 415.
Petroleum refinery products:			
Gasoline	2,818	3,367	Netherlands West Indies 2,109; Venezuela 939; Denmark 319.
Petroleum turpentine	3,478	3,443	Netherlands West Indies 2,479; Denmark 964.
Kerosine and diesel fuel	47,947	57,203	Netherlands West Indies 33,210; Venezuela 23,140; Denmark 853.
Heavy fuel oil	6,822	10,342	Netherlands West Indies 3,399; Venezuela 6,854; Denmark 89.
Other	1,050	1,710	All from Denmark.
Natural gas	136	158	Do.

[1] Bars, rods, plates, sheets, structural shapes, pipes, etc.
[2] Bars, plates, sheets, shapes, etc., of copper, aluminum, lead, zinc, tin, and alloys of these metals.
[3] Exclusive of glass and other ceramic materials.

Regional Mineral Industry Review of Latin America [1]

By Frank E. Noe [2]

Government actions in several of Latin America's more important mineral producing countries dominated industry developments during 1965. Considerable disruption was caused to the world sulfur supply pattern when the Mexican Government restricted exports early in the year.

In Chile, the Government of President Frei battled throughout the year to obtain passage of the Copper Bill, the principal item of the Government's new mining policy. Although passage of the bill had not been completed at yearend, enough of the essential provisions had been approved by November to cause the left-wing-dominated copper union to begin a strike which ultimately caused the loss of 70,000 tons of copper to the world supply.

On the encouraging side, however, Brazil and Bolivia actively undertook the encouragement of private investment, both domestic and foreign. Brazil announced a 10-year master plan to determine the extent and value of mineral resources and to increase production of those minerals most needed by domestic industry. Steps were also taken to attract foreign capital by conclusion of an investment guarantee agreement with the United States and by liberalizing the remittance of profits abroad. The Bolivian Government adapted beneficial measures consisting of a new mining code, new royalty scales for mineral exports, and a new investment code.

Argentina's investment climate appeared more favorable as the Government concluded negotiations with private enterprise on all but four of the petroleum exploration and development contracts abrogated in 1963. At yearend the remaining four were nearing settlement.

The Latin America area's contribution to world mineral supply is summarized in table 1. The region supplied over 20 percent of the world output of antimony, arsenic, bauxite, beryl, bismuth, columbium-tantalum, silver, fluorspar, iodine, natural nitrates, and quartz crystal; it also produced more than 5 percent of world output of an additional 16 mineral commodities.

The principal mineral commodity produced in terms of value was petroleum, and Venezuela supplied about 75 percent of the Latin America output. This country, however, failed to reach the modest target of 3.7 percent increase in production set by the Ministry of Mines and Hydrocarbons. Venezuela maintained first rank among world crude oil exporters. Exports to Western Hemisphere countries continued to rise, but shipments to Europe did not recover from the 1964 decline caused by the competition of lower-priced oil from the Middle East. Among the other Latin countries, Colombia increased petroleum production about 16 percent while minor increases were recorded by Bolivia, Brazil, Ecuador, Mexico, and Trinidad. For a

[1] The term Latin America embraces the Western Hemisphere south of the United States exclusive of U.S. territories and dependencies in the Caribbean. It includes in South America 10 republics and the 3 Guianas: in Middle America 7 republics and 1 British colony on the North American continent (Mexico to Panama), and all the islands, independent and otherwise, of the West Indies other than those belonging to the United States. Cuba has been excluded from statistics for Latin America in this chapter, but has been retained in world totals given.

[2] Acting Chief Latin America specialist, Division of International Activities.

Table 1.—Latin America: [1] Approximate production of selected minerals and metals

(Metric tons unless otherwise specified)

Commodity	1964			1965 [p]			
	Middle America [1]	South America	Total	Middle America	South America	Total	Percent of world total
Metals:							
Aluminum:							
Ore (bauxite)—thousand tons	9,135	6,632	15,767	9,918	7,233	17,151	46.3
Antimony ore	4,788	10,322	15,110	4,467	10,151	14,618	23.3
Arsenic trioxide	14,860	809	15,669	13,778	756	14,534	23.5
Beryllium ore	-----	1,822	1,822	-----	1,345	1,345	26.4
Bismuth	472	1,004	1,476	484	1,042	1,526	35.9
Columbium and tantalum ores	-----	417	417	-----	1,631	1,631	24.2
Copper:							
Mine	66,775	806,118	872,893	83,307	768,004	851,311	16.8
Smelter	51,005	742,020	793,025	67,680	713,559	781,239	14.3
Iron ore—thousand tons	2,321	49,877	52,198	2,543	54,424	56,967	9.3
Lead:							
Mine	182,808	209,551	392,359	180,246	211,628	391,874	14.5
Smelter	166,778	126,389	293,167	164,421	132,975	297,396	11.3
Manganese ore—thousand tons	187	1,510	1,697	184	1,382	1,566	8.9
Mercury—76-pound flasks	12,360	3,585	15,945	19,190	3,368	22,558	8.2
Molybdenum	53	4,289	4,342	81	4,473	4,554	8.7
Silver—thousand troy ounces	45,371	47,460	92,831	44,475	45,390	89,865	35.8
Tellurium—kilograms	-----	21,209	21,209	-----	16,350	16,350	10.7
Tin:							
Mine—long tons	1,207	25,851	27,058	503	25,114	25,617	12.9
Smelter—do	1,145	5,341	6,486	459	5,159	5,618	2.9
Tungsten ore, 60 percent WO_3 equivalent	8	3,130	3,138	183	3,026	3,209	5.9
Zinc:							
Mine	244,171	270,435	514,606	236,854	309,489	546,343	12.7
Smelter	59,426	83,903	143,329	58,706	86,619	145,325	3.8
Nonmetals:							
Barite	326,017	190,922	516,939	368,685	192,856	561,541	16.3
Cement, portland—thousand tons	5,443	15,156	20,599	5,712	16,006	21,718	5.0
Fluorspar	642,872	9,974	652,846	726,716	10,000	736,716	25.6
Graphite, natural	30,337	1,422	31,759	40,414	1,288	41,702	6.8
Gypsum—thousand tons	1,492	630	2,122	1,387	740	2,127	4.5
Iodine	-----	2,161	2,161	-----	2,280	2,280	47.0
Nitrates, natural—thousand tons	-----	1,174	1,174	-----	1,159	1,159	100.0
Salt—do	2,391	1,967	4,358	2,934	2,200	5,134	4.8
Sulfur—do	1,837	105	1,942	1,592	95	1,687	11.0
Mineral fuels:							
Petroleum, crude—thousand barrels	163,307	1,480,858	1,644,165	166,818	1,514,854	1,681,672	15.2

[p] Preliminary.
[1] Excludes data for Cuba.

variety of political and economic reasons, crude petroleum output declined in Argentina, Chile, and Peru. Latin America has gradually declined in importance as a world supplier of crude petroleum since 1962 and, as shown in table 2, accounted for only 15.2 percent of the world output in 1965.

Table 2.—Latin America: Crude petroleum production
(Thousand 42-gallon barrels)

Country	1961	1962	1963	1964	1965 p
Argentina	84,418	98,154	97,221	100,370	98,262
Bolivia	2,989	2,917	3,285	3,195	3,357
Brazil	34,807	33,401	35,714	33,313	34,342
Chile	9,263	11,689	13,206	13,687	12,704
Colombia	53,247	51,918	60,343	62,596	72,670
Ecuador	2,926	2,573	2,465	2,796	2,849
Mexico	106,784	111,830	114,867	115,576	117,959
Peru	19,371	21,134	21,468	23,119	23,068
Trinidad	45,768	48,876	48,678	r 47,731	48,859
Venezuela	1,065,757	1,167,916	1,185,511	1,241,782	1,267,602
Total [1]	1,425,330	1,550,408	1,582,758	1,644,165	1,681,672
World total	8,183,899	8,882,227	9,537,420	10,309,644	11,062,515
Latin America percent of world	17.4	17.5	16.6	15.9	15.2

p Preliminary.
[1] Excludes Cuba, for which estimated production was as follows, in thousand barrels: 1961—80, 1962—90, 1963—228, 1964—272, 1965—not available.

Stimulated by regional industrialization programs and the availability of abundant iron ore deposits in several of the countries, iron and steel production in Latin America has been developing at a substantial pace since 1950. Iron ore production has increased from approximately 5.4 million tons in 1950 to about 57 million tons in 1965. Pig iron and sponge iron output totaled about 5.2 million tons during 1965 compared with 1.1 million tons in 1950, an annual growth rate of about 12 percent. Ingot steel production as shown in table 3 reached 8.3 million tons, an increase of 56 percent from 1961, but only 3.2 percent above 1964 output. The abrupt reduction in the rate of increase of production is explained by the fact that in the years between 1961 and 1964 various new plants came into production and expansion programs were completed at others; while in contrast, 1965 was a period for initiating new expansions which will come into production in 1966 and later years.

Despite the industry's rapid growth since 1961, the annual volume of steel imports has remained between 3 million and 3.2 million tons. However, most of the imports are by nonproducing countries or are types of steel as yet not available in the producing countries of Latin America.

Table 3.—Latin America: Production of ingot steel [1]
(Metric tons)

	1961	1962	1963	1964	1965 p
Distribution by country:					
Argentina	441,487	644,497	894,745	1,264,161	1,368,221
Brazil	2,443,221	2,565,226	2,840,769	3,088,727	3,016,790
Central America	-----	-----	-----	2,470	3,000
Chile	391,110	528,106	521,462	584,013	476,549
Colombia	192,093	156,985	222,331	229,852	241,795
Mexico	1,682,106	1,709,464	2,016,883	2,327,563	2,454,680
Peru	74,898	71,284	76,295	81,596	93,605
Uruguay	9,200	8,567	6,500	14,327	13,476
Venezuela	70,762	142,179	358,400	440,778	624,976
Total	5,304,877	5,826,308	6,937,385	8,033,487	8,293,092
Distribution by process:					
Siemens-Martin	3,484,417	3,993,258	4,699,063	5,270,753	5,345,187
Electric furnace	1,408,079	1,463,238	1,673,855	1,901,652	1,931,377
LD oxygen	258,200	249,535	382,792	652,083	767,907
Bessemer (including Thomas)	154,181	120,277	181,675	208,999	248,621

p Preliminary.
[1] Data are presented as published by ILAFA and differ in some cases from that reported in individual country chapters of this volume and that presented in the world production table in the iron and steel chapter of Minerals Yearbook, Volume I.

In 1965, the United States exported goods to Latin America valued at $4.2 billion and imported materials worth $4.4 billion. The importance of Latin American production and exports of mineral commodities to the import needs of the United States is outstanding as illustrated in table 4.

Latin America ranked second only to Canada as a recipient of mineral industry investment [3] in 1965. The value of total

Table 4.—U.S. imports of selected metals and minerals showing contribution by Latin America

Commodity and unit of measure	1964			1965		
	Total imports	Total from Latin America	Percent from Latin America	Total imports	Total from Latin America	Percent from Latin America
Metals: [1]						
Antimony—short tons	16,718	7,422	44.4	14,879	7,011	47.1
Bauxite—thousand long tons	10,180	10,151	99.8	11,400	11,364	99.7
Beryl—short tons	5,425	2,325	42.9	7,791	1,429	18.3
Bismuth—pounds	1,238,252	1,121,889	91.2	1,378,147	1,294,010	93.9
Columbium-tantalum—do	5,588,785	177,525	3.2	6,105,144	956,476	15.7
Copper—short tons	586,064	385,426	65.8	522,230	351,158	67.3
Iron ore—thousand long tons	42,408	14,301	33.7	45,103	18,169	40.3
Lead—short tons	349,680	145,590	41.7	355,510	143,513	40.4
Manganese—do	3,024,236	1,014,978	33.6	3,855,597	1,817,801	47.1
Mercury—76-pound flasks	41,107	4,113	10.0	17,838	3,774	21.2
Silver—thousand troy ounces	51,674	27,925	54.0	54,709	26,610	48.6
Tin—long tons	36,772	6,182	16.8	40,816	4,018	9.8
Tungsten—thousand pounds	3,148	1,839	58.4	3,618	1,766	48.8
Zinc—short tons	445,553	181,303	40.7	556,893	196,947	35.4
Nonmetals:						
Barite—short tons	601,010	306,572	50.9	712,713	358,784	50.3
Fluorspar—do	687,933	552,505	80.3	816,546	632,367	77.4
Iodine—thousand pounds	2,592	1,759	67.9	2,847	2,111	74.1
Mica, sheet—do	10,912	1,737	15.9	11,874	1,806	15.2
Quartz crystal—pounds	214,332	208,974	97.5	323,530	310,121	95.9
Sulfur—thousand long tons	1,462	891	60.9	1,465	810	55.3
Mineral fuels:						
Crude petroleum—thousand barrels	438,643	183,828	41.9	452,040	173,063	38.3

[1] Excludes content of alloys and all semimanufactures.

direct U.S. investments abroad increased $4,831 million (10.9 percent) to $49,217 million from the end of 1964 to the end of 1965. The largest increases were in manufacturing, up $2,349 million (13.9 percent) to $19,280 million, and in the mineral industries, up $1,211 million (6.7 percent) to $19,114 million. The largest segment of investment in the mineral industries was petroleum, up $986 million to $15,320 million, while mining and smelting advanced $225 million to $3,794 million.

On a geographic basis, although ranking second to Canada in total mineral industry investment, Latin America still led all other areas of the world as a recipient of U.S. investment in petroleum and remained second to Canada in mining and smelting investment. Table 5 indicates the distribution of U.S. investment in Latin America in selected sectors of the mineral industry by geographical segment, and as a percentage of total U.S. world investment.

Venezuela and Colombia were the leading markets in Latin America for U.S. investments in petroleum, while Chile and Peru were the major targets for investment in mining and smelting. Although Venezuela remained the second largest recipient country for U.S. petroleum industry foreign investment funds, total U.S. investment in that country's petroleum industry was reduced $106 million during 1965 in the face of increased tax demands by the Government. Investment in the Mexican petroleum industry was reduced $8 million by U.S. companies. U.S. investment in the mining and smelting industry of Mexico declined $25 million, probably due to the withdrawal of funds following Mexicanization of both the American Smelting and Refining Co. subsidiary and the San Luis Mining Co., plus the acquisition by Mexican investors of the 49 percent American interest in the previously Mexicanized Peñoles Co. Therefore, despite new U.S.

[3] Investment in steel and nonferrous rolling mills as well as fertilizer plants, petrochemical plants and some economically less important mineral processing facilities are not reported separately, but are included in manufacturing, therefore data reported here cover only the mining, smelting, petroleum producing and petroleum refining sectors of the mineral industry.

Table 5.—Latin America: Value of direct U.S. investments in basic mineral industries at yearend 1964 and 1965

(Millon dollars and, in parentheses, percentages of total foreign investment)

Area	1964 r			1965 p		
	Mining and smelting	Petroleum	Total foreign investment	Mining and smelting	Petroleum	Total foreign investment
All foreign areas, total	3,569	14,334	44,386	3,794	15,320	49,217
Latin America:						
Middle America	428	786	3,593	467	822	3,939
South America	926	2,804	6,612	957	2,712	6,869
Total	1,354	3,590	10,205	1,424	3,534	10,808
Percentage	(37.9)	(25.0)	(23.0)	(37.5)	(23.1)	(22.0)

r Revised. p Preliminary.

investment in Peru, Panama, Brazil, Colombia, Chile, and Central America, the net new investment in mining, smelting, and petroleum in Latin America was held to $14 million.

Many Latin American countries are handicapped by small populations and low incomes which limit the demand for industrial products. In an effort to enlarge area markets, two regional groups have been formed which make other countries' markets more accessible to local producers. These two groups are the nine-nation Latin American Free Trade Association (LAFTA)[4] and the five-nation Central American Common Market (CACM).[5] Both have been operating about 5 years but CACM has been more successful than LAFTA in opening national markets to the products of other member countries.

[4] Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, and Uruguay.
[5] Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua.

The Mineral Industry of Mexico

By Burton E. Ashley [1]

The mining industry in Mexico showed overall growth in terms of production value during 1965 despite declines recorded in output of some commodities. In relation to the gross national product (GNP) of slightly more than $19 billion,[2] the minerals industry as a whole contributed about 4 percent (mining alone about 1.8 percent), slightly more on a dollar basis than in 1964. However, growth in other industrial sectors tended to overshadow growth in mining, thereby reducing its relative importance to the economy.

Favorable world prices raised production value in cases of certain mineral commodities for which output volume was less than in 1964. Mexico continued to hold top, or near top, world rank as a source of some half dozen minerals—white arsenic, bismuth, fluorspar, silver, strontium, and sulfur.

The taxation structure in Mexico, particularly with regard to levies on exports, caused some disruption in the normal export trade of graphite, zinc, limestone, marble, alabaster, sand, and gravel.

Little was accomplished with regard to ameliorating certain official attitudes toward mining in Mexico. The industry in general felt that many of the regulations were restrictive. At yearend, new amendments to the mining law of 1961 were put into effect; it was reported that the new rules did little but to tighten loopholes in the Mexicanization program while affording some assistance to small and medium-sized mining companies. The new amendments hardly had been in operation long enough to determine what their effect might be.

In August approximately 5 million hectares of land were released from the national minerals reserve in the States of Baja California, Coahuila, Jalisco, Colima, Michoacan, Guerrero, and Oaxaca.

Cía. Minera Asarco, S.A., a wholly owned subsidiary of American Smelting and Refining Co., was Mexicanized in 1965 by the purchase of a 51-percent interest by a group of Mexican financiers; the new name of the company is ASARCO Mexicana, S.A. It was thought in industry quarters that Government plans to bring various relief measures to the mining industry would be speeded up with Mexicanization of this organization. The reasoning behind this idea was that the already large company would become larger if relief measures were put into effect thereby making it even more difficult for domestic capital to be raised for Mexicanization.

At yearend it was reported that the San Luis Mining Co. was Mexicanized with purchase of all the stock at a price of between $60 million to $70 million. The firm, renamed Cía. Minera de San Luis, S.A., was bought by a group of Mexican investors.

American Metal Climax, Inc., sold its remaining 49 percent interest in Metalúrgica Mexicana Peñales, S.A., to Mexican interests. The Mexican organization is reportedly the country's foremost mining company entirely held by domestic capital.

This leaves only one major U.S. mining company to be Mexicanized—Compañía Minera de Cananea, S.A. de C.V., owned by The Anaconda Mining Co.

There are a few smaller U.S. organizations as yet not Mexicanized.

---

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from Mexican pesos (Mex$) at the rate of Mex$1=US$0.08.

Estimates put the number of persons engaged in the mining, metal, and petroleum industries at about 142,000, including 65,000 in mining, 25,000 in mineral processing, and 52,000 in all aspects of the petroleum industry.

A Canadian study group reported that Mexican mining labor receives $2.24 to $4.80 a day, plus many social benefits.[3] The work week is 6 days, but payment is for 7 days; overtime is paid at double rates, with triple time for holiday work. Total fringe benefits probably amount to 20 to 40 percent of actual wages.

In October 1965, the U.S. Department of Commerce released a publication that gives a clear general picture of the industrial and business guideposts in the country, updating earlier similar reports.[4] Topics covered include Mexican Government policy, rights of aliens, taxation and labor legislation. While not exclusively concerned with the mining industry, the paper would be of value to anyone interested in Mexico from an industrial point of view.

The Mexican Government issued a list of 370 industries which it would like to see developed in the country. Goals for development programs included the maximum use of human and natural resources and the exploitation and conservation of natural resources. Among the listed categories were items of interest to the chemical, petrochemical, iron and steel, ferroalloy, and mineral processing and exploitation industries.

A cooperative mapping venture of the Government of Mexico and the United Nations Special Fund was completed in the State of Sonora. Embracing an area of about 70,000 square kilometers, the survey cost $2.4 million, of which the Special Fund paid $855,700.

It was decided to map an additional 50,000 square kilometers in Sonora with particular emphasis on copper mineralization. The extended survey will cost $531,000, of which the Special Fund will provide $156,200. It was expected that the work would be completed in about a year.

PRODUCTION

Total value of mineral production for 1965 was reported at $768 million. According to the Mexican Mining Chamber, value of mining and metallurgical output was $386.2 million, a rise of 13 percent over that of 1964; the remainder was attributable to the petroleum industry.[5] The gross value figure was 11 percent greater than in 1964. Mexico's increased mineral value was more the result of higher world prices during 1965 than of increased production. Quantity of output was lower for sulfur (9 percent), silver (3 percent), lead (3 percent) and zinc (5 percent) than in 1964. Iron increased 14 percent; copper, 31.7 percent and gold output increased slightly less than 3 percent.

Except for vanadium, for which no production was recorded in 1964, mercury made the most phenomenal percentage rise of the metallic mineral group; quantity of output increased 52.9 percent, while value of output increased nearly 200 percent.

Portland cement output increased in value by nearly 10 percent over the 1964 total, in spite of a decline in output amounting to slightly more than 3 percent. Barite and fluorspar output increased 10 percent and 14 percent, respectively. Graphite, tungsten, and bismuth production also increased while output of cadmium, molybdenum, arsenic, tin, and selenium decreased.

Annual crude oil production was 132.1 million barrels, an increase of 2.6 million barrels over that of 1964; natural gas production also increased by 8.2 billion cubic feet to 493.2 billion cubic feet.

Refinery input was 134.9 million barrels (126.9 million barrels in 1964) with output of 130.1 million barrels. Nearly all categories of products showed output increases; the exceptions were some gasolines, kerosine, and paraffin.

---

[3] Department of Trade and Commerce (Ottawa, Canada). Report of the Canadian Mining Mission to Latin America. Oct. 12–Nov. 17, 1965, 58 pp.

[4] Rice, Katherine E. Establishing a Business in Mexico. U.S. Department of Commerce, Bureau of International Commerce, Overseas Business Reports, OBR 65–71, October 1965, 20 pp.

[5] Camara Minera de Mexico. Asamblea General. 1966, p. 4.

Table 1.—Mexico: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Aluminum:					
Ingots	------	------	4,772	r 15,436	19,507
Alloys	------	------	526	1,232	1,783
Semifinished and finished products	------	------	13,297	r 14,179	15,650
Antimony:					
In untreated ore and concentrate	3,018	3,924	3,899	3,805	3,476
In smelter products	590	842	927	983	985
Total	3,608	4,766	4,826	4,788	4,461
Arsenic trioxide (As_2O_3)	r 16,709	r 14,834	r 12,906	r 15,196	13,778
Arsenic content (as reported)	12,281	10,900	r 9,486	11,169	10,127
Bismuth	e 292	354	427	472	484
Cadmium:					
In zinc concentrates for export e	2,723	2,405	2,149	2,250	2,028
In flue dust r	754	659	681	659	681
Refined metal r	61	62	163	158	69
Chromite	5	------	------	------	------
Copper:					
In ores mined	49,314	47,125	55,861	52,506	69,162
Smelted and refined	r 47,516	r 45,510	r 54,338	r 50,857	67,517
Gold troy ounces	268,684	236,758	237,948	209,976	215,796
Iron ore, 60 percent Fe equivalent	1,145,000	1,818,850	2,328,137	r 2,320,778	2,654,560
Iron content (as reported)	687,000	1,091,310	1,396,882	1,392,467	1,592,737
Iron and steel:					
Pig iron	757,759	r 801,224	833,118	r 926,263	945,947
Sponge iron	r 173,891	r 165,735	r 169,735	r 202,551	r 212,668
Ferroalloys	26,156	25,739	25,917	42,568	43,436
Steel ingots	1,693,076	1,710,662	r 2,026,033	r 2,326,496	2,454,680
Steel castings	13,706	9,382	r 11,684	r 25,754	33,772
Semifinished and finished steel	r 1,329,039	r 1,281,813	r 1,634,187	r 1,885,480	2,032,246
Lead:					
In ore and concentrate for export	4,133	3,110	2,804	3,254	2,473
In smelter and refinery products	176,426	189,100	186,170	166,703	164,307
Manganese, content of ore	64,207	75,111	77,786	85,953	58,810
Mercury 76-pound flasks	18,101	18,855	r 16,302	r 12,549	19,190
Molybdenum ores:					
Molybdenum sulfide (MoS_2) content kilograms	r 3,021	97,218	68,755	r 89,164	80,926
Molybdenum (Mo) content do	r 1,813	58,331	41,253	r 53,498	48,556
Nickel, in ore	132	------	------	------	------
Selenium kilograms	2,559	3,154	2,874	4,239	3,683
Silver thousand troy ounces	40,349	41,249	42,760	r 41,716	40,332
Strontium ore [1]	2,397	4,131	5,875	4,788	2,925
Tin:					
In ores mined long tons	530	576	r 1,055	r 1,207	503
Refined do	559	520	r 1,055	1,145	459
Titanium, ilmenite	------	------	141	------	------
Tungsten ore, 60 percent WO_3 basis	175	80	33	r 8	183
Vanadium	------	------	------	------	1
Zinc:					
In ore and concentrate for export	191,864	169,452	151,454	158,558	143,131
In smelter and refinery products r	79,796	81,764	81,642	86,375	89,744
Nonmetals:					
Agate kilograms	400	NA	NA	NA	NA
Barite	248,708	318,136	r 256,593	r 334,044	368,342
Calcite, optical kilograms	[2] 219	[2] 216	[2] 3,407	NA	29
Cement:					
Gray	2,969,701	3,284,569	r 3,596,291	r 4,241,941	4,207,075
White	65,383	67,540	77,463	r 89,845	111,567
Other	------	------	88,318	r 86,323	3,497
Total	3,035,084	3,352,109	r 3,762,072	r 4,418,109	4,322,139
Clays:					
Kaolin	60,700	NA	46,561	64,225	81,135
Refractory	37,753	NA	NA	NA	NA
Common	5,797	NA	NA	NA	NA
Bentonite	NA	NA	4,245	NA	16,962
Dolomite	68,300	NA	NA	NA	NA
Feldspar	14,833	NA	NA	NA	NA
Fertilizers:					
Nitrogenous	261,832	381,219	434,178	469,320	198,511
Phosphatic	104,031	133,262	161,332	164,055	165,530
Mixed	76,194	83,443	153,949	176,948	NA
Other	------	------	41,451	86,515	NA
Fluorspar: Production	398,514	502,256	481,619	642,872	735,381

See footnotes at end of table.

Table 1.—Mexico: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Nonmetals—Continued					
Graphite, amorphous	18,004	29,023	29,996	30,337	40,413
Gypsum	777,898	794,554	1,097,339	1,165,054	1,081,745
Limestone:					
For cement e thousand tons	3,950	4,360	4,780	5,640	5,595
Other do	1,067	NA	NA	240	NA
Total e do	5,017	NA	NA	5,880	NA
Marble	NA	NA	NA	56,782	6,706
Perlite	7,238	NA	NA	NA	9,620
Refractory material, unidentified	591	NA	NA	NA	NA
Salt thousand tons	1,063	1,292	1,225	1,783	2,200
Sand, silica	136,800	e 145,000	154,978	NA	192,986
Sodium-magnesium-sulfate (blödite)	7,626	NA	NA	NA	NA
Sulfur:					
Frasch processed	1,166,920	1,372,039	1,480,026	1,662,016	1,505,015
Mined r	25,519	27,180	29,433	26,406	30,747
Recovered from natural gas	r 51,906	r 47,292	44,003	r 36,866	46,722
Total r	1,244,345	1,446,511	1,553,462	1,725,288	1,582,484
Talc	4,188	e 4,000	e 4,000	e 4,000	NA
Mineral fuels:					
Bituminous coal thousand tons	1,818	1,893	2,071	r 2,127	2,006
Coal products:					
Coke do	r 781	r 780	r 765	r 786	824
Coke breeze (finos de coque)	------	------	21,265	21,138	20,874
Coal tar	------	------	11,628	12,238	10,708
Creosote	11,145	9,981	10,747	11,877	9,746
Ammonium sulfate	9,733	9,325	8,855	10,633	9,668
Benzol	3,907	4,104	5,190	5,710	5,174
Naphthaline	------	------	273	568	1,757
Synthetic carbon brushes and rings	------	------	12	16	22
Coal gas [2] million cubic feet	------	------	2,971	3,489	5,332
Natural gas:					
Gross production r do	360,557	371,361	401,572	485,057	493,161
Sales r do	156,189	180,670	205,944	234,636	244,594
Petrochemicals:					
Light alkaloids	3,651	6,045	5,056	6,591	10,203
Heavy alkaloids	4,332	6,845	3,844	4,645	5,820
Dodecylbenzene	19,600	27,213	20,584	26,082	36,452
Ammonia	------	57,315	103,393	124,292	121,111
Ammonium sulfate	------	260	217	363	116
Carbon dioxide	------	65,562	125,789	148,818	147,482
Petroleum:					
Crude (includes distillates and natural gas liquids) thousand 42-gallon barrels	116,816	121,559	125,825	r 129,504	132,141
Refinery products:					
Gasoline:					
Aviation do	688	640	648	695	791
Other (including naphthas) do	31,781	32,487	33,860	r 36,002	37,674
Total do	32,469	33,127	34,508	r 36,697	38,465
Jet fuel thousand 42-gallon barrels	494	609	786	955	1,070
Kerosine do	11,601	11,680	11,706	r 12,188	11,906
Distillate fuel oil do	13,716	15,658	16,995	r 20,682	21,020
Residual fuel oil do	47,432	45,185	42,511	r 39,953	41,880
Lubricants, including greases do	1,148	1,141	1,220	1,270	1,409
Asphalts do	1,778	2,061	2,004	2,321	3,173
Liquefied petroleum gas do	5,064	4,652	5,793	6,734	8,452
Other do	1,952	1,891	2,261	2,252	2,519
Total refinery products do	115,654	116,004	117,784	r 123,052	129,894

e Estimate. p Preliminary. r Revised. NA Not available.

[1] U.S. imports.

[2] Exports.

TRADE

Identifiable statistics of mineral exports showed that the United States substantially increased its already leading position as Mexico's best customer. Indicated gross value of U.S. mineral purchases from Mexico in 1965 was $191.7 million, or nearly 64 percent of the gross export value; in 1964, the United States purchased 54 percent of the export value. West Germany and Japan were other major purchasers.

Principal mineral exports in rounded figures were zinc ($63 million), silver ($38 million), lead ($36 million), sulfur ($34 million), fluorite ($16 million), manganese ($6 million), and copper ($4 million).

Imports of nonmetals—kaolin, diatomite, and feldspar—continued but on a lower scale than in 1964. Bauxite, phosphate, and magnesite imports increased.

The United States also supplied the bulk of Mexican mineral imports. Main categories of such trade were petroleum products, scrap iron and steel, aluminum oxide and metal, mineral fuels, and phosphate rock.

The following table shows the relation of total commodity trade to trade in minerals:

	Value (millions)		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1964	$266.3	$1,022.4	26.0
1965	301.0	1,111.0	27.1
Imports:			
1964	15.8	1,492.9	1.1
1965	71.9	1,559.6	4.6
Trade balance:			
1964	+250.5	−470.5	XX
1965	+229.1	−448.6	XX

XX Not applicable.
Source: Anuario Estadístico del Comercio Exterior de los Estados Unidos Mexicanos. 1964 and 1965.

Table 2.—Mexico: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum:			
Alumina	9	5	Mainly to Colombia.
Ingots	---	3,108	All to Argentina.
Semimanufactures	20	329	Mainly to Argentina.
Antimony, content of:			
Ore	11,908	13,687	Mainly to United States.
Mixed bars	201	258	All to United States.
Refined bars	120	37	Do.
Arsenic oxide:			
Black arsenic	127	88	Do.
White arsenic	8,652	11,200	Do.
Total	8,779	11,288	
Bismuth:			
Mixed bars	267	400	Do.
Refined bars	143	173	United States 143; United Kingdom 29.
Cadmium:			
Flue dust	943	850	All to United States.
Refined metal	148	118	Mainly to United States.
Copper:			
Ore	1,901	5,905	All to United States.
Concentrate, precipitate, matte, speiss, etc.	218	1,388	Do.
Sulfate	384	575	United States 327; Brazil 235.
Metal:			
Mixed bars	22,415	15,938	United States 12,727; West Germany 2,005; Italy 800.
Anodes and electrolytic copper	2,779	630	All to United States.
Semimanufactures, including alloys	2,170	1,636	Colombia 756; United States 277; Uruguay 182.
Gold, troy ounces	29,972	22,086	All to United States.
Iron and steel:			
Iron ore	1,112	21,487	All to Belgium.
Scrap	553	1,079	Mainly to United States.
Ferroalloys	4,181	---	
Pig iron	7	---	

See footnotes at end of table.

Table 2.—Mexico: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals—Continued			
Iron and steel—Continued			
Ingots and other primary forms	259	13	Uruguay 7; United States 6.
Semimanufactures:			
Bars	41	95	All to United States.
Plates, sheets and strip	112,520	75,159	United States 72,046; Italy 1,502; Guatemala 638; Uruguay 430; Argentina 406.
Tinplate	3,167	28	Nicaragua 8; Jamaica 5; Martinique 4; Puerto Rico 4; United States 3.
Girders, beams, structural shapes	251	627	Argentina 453; United States 52; Nicaragua 48; Venezuela 46.
Wire and cable	208	377	Colombia 200; Chile 100; El Salvador 41.
Pipes, tubes, and fittings	55,966	31,349	United States 23,303; Chile 2,789; Peru 1,960; Argentina 1,910.
Lead:			
Ore, concentrate, matte, and speiss	2,940	3,176	Mainly to United States.
Chloride	(1)	---	
Oxides:			
Litharge	26,463	28,930	United States 19,237; Netherlands 1,952; Italy 1,830; France 1,226.
Red lead	3,119	3,717	United States 1,297; Italy 779; Netherlands 465; West Germany 458; Belgium 306.
Metal:			
Impure and mixed bars	11,941	11,159	Chile 10,203; Venezuela 715.
Antimonial bars	374	368	United States 100; Belgium 95; West Germany 71; Netherlands 50.
Refined bars	124,398	93,419	United States 91,102; Venezuela 896; Portugal 559; Greece 406.
Manganese ore and concentrate	109,756	120,215	United States 119,686; Guatemala 226; Japan 203.
Mercury—76-pound flasks	18,863	13,392	United States 11,479; Brazil 578; South Korea 500.
Molybdenum concentrate	67	106	United States 86; Netherlands 20.
Silver—thousand troy ounces	46,127	32,389	West Germany 14,980; United States 14,500.
Titanium oxide	1,002	46	Chile 41; Ecuador 5.
Tungsten concentrate	86	14	All to United States.
Zinc:			
Ore, concentrate, slag, and other intermediate products	357,431	320,768	United States 283,860; Japan 22,710.
Oxide, white	2,183	3,253	Mainly to United States.
Sulfate	225	468	Do.
Metal:			
Impure bars	525	49	All to United States.
Refined bars	29,375	29,122	United States 12,413; Brazil 4,918; United Kingdom 3,914.
Other metals and metallic residues	706	840	Netherlands 486; United States 245.
Nonmetals:			
Abrasives, except diamond, n.e.s.:			
Emery	140	341	Guatemala 199; El Salvador 140.
Pumice	6,480	7,164	All to United States.
Asbestos	50	---	
Barite	146,688	177,055	United States 176,999.
Calcite, optical and industrial kilograms	4,337	1,309	Mainly to West Germany.
Cement, portland	10,930	3,549	Mainly to United States.
Clays and earths:			
Bentonite	622	701	Do.
Other clays including refractory	385	137	United States 78; Colombia 25; Venezuela 17.
Earths, all kinds	4	15	Mainly to United States.
Diamond, industrial—carats	65,000	60,000	All to United States.
Diatomite, infusorial earth, tripoli, and chalk	163	164	Do.
Feldspar	259	---	
Fluorspar:			
Acid grade	120,467	166,429	United States 162,781; Canada 3,128.
Metallurgical grade	389,802	462,261	United States 336,540; Canada 124,529.
Graphite, natural amorphous	29,890	31,694	Mainly to United States.
Gypsum:			
Crude	1,060,180	1,136,868	United States 922,743; Canada 80,125; Philippines 4,700.
Calcined	6	13	Mainly to Colombia.

See footnotes at end of table.

Table 2.—Mexico: Exports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Nonmetals—Continued			
Lime	116	1,042	Mainly to United States.
Limestone and dolomite	1,651	1,789	Do.
Perlite	173	344	Chile 261; Colombia 83.
Phosphate rock	23,969	27,895	Mainly to United States.
Quartz	2,534	1,621	All to United States.
Salt—thousand tons	1,004	1,451	Japan 844; United States 459; Canada 148.
Sodium sulfate, blödite, and thenardite	(1)	78	All to United States.
Stones, semiprecious, uncut, agate, jasper, opal, and obsidian—kilograms	99,399	359,933	Japan 343,986; United States 5,921; Canada 5,026; United Kingdom 5,000.
Stone, sand, and gravel, building and industrial:			
Alabaster and marble	6,890	7,633	Mainly to United States.
Granite	8	(1)	
Other stone, type not specified	42,177	48,557	Mainly to United States.
Sand and gravel	2,128	5,692	Do.
Strontium minerals, celestite	6,190	4,892	All to United States.
Sulfur—thousand tons	1,507	1,841	United States 691; Bahama Islands 320; France 260; West Germany 230.
Talc and steatite	2	6	All to Chile.
Mineral fuels:			
Asphalt	20	---	
Coal, powdered	7	1	Mainly to West Germany.
Natural gas—million cubic feet	47,628	59,518	All to United States.
Natural gas liquids—kilograms	262	365	Do.
Petroleum:			
Crude—thousand 42-gallon barrels	7,026	7,802	Mainly to United States.
Refinery products:			
Gasoline—do	176	41	Guatemala 23; United Kingdom 11; Australia 6.
Distillate fuel oil—do	317	96	Japan 31; Guatemala 31; United States 17.
Residual fuel oil—do	11,198	9,620	Mainly to United States.
Lubricants, including greases	257	432	United States 232; Japan 167; Guatemala 31.
Paraffin and wax	1,691	1,822	Mainly to United States.

[1] Less than ½ unit.
Source: Dirección General de Estadística, (Mexico, D.F.). Anuario Estadístico del Comercio Exterior de los Estados Unidos Mexicanos 1964. 1965, p. 1044.

Table 3.—Mexico: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Bauxite	6,000	5,118	United States 3,241; British Guiana 1,877.
Aluminum oxide	22,835	35,813	Mainly from United States.
Metal, all forms	23,719	7,114	United States 3,745; West Germany 1,663.
Antimony, all forms	69	26	Belgium 12; United States 8; Netherlands 4.
Cobalt	11	15	Mainly from Belgium.
Copper and alloys, all forms	777	508	United States 329; West Germany 102; France 58.
Chromite	1	16,393	All from United States.
Gold:			
Wire—troy ounces	1	6	United States 5; West Germany 1.
Sheets—do	3,093	1,963	Mainly from West Germany.
Powder—do	13,179	27,979	Mainly from United States.
Iron and steel:			
Iron ore	2,103	15	All from United States.
Pig iron	38	555	Do.
Scrap	r 455,428	734,631	Mainly from United States.
Ferroalloys	1,465	2,713	Do.
Ingots and equivalent forms	1	1	All from United States.
Semimanufactures:			
Railroad rails and accessories	56,946	105,798	Canada 98,591; Japan 6,995.
Other	38,232	42,300	United States 28,361; West Germany 3,801; United Kingdom 3,160; Sweden 2,353.

See footnotes at end of table.

Table 3.—Mexico: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals—Continued			
Lead, all forms	16	359	Mainly from Belgium.
Magnesium	595	483	United States 377; Canada 103.
Mercury—76-pound flasks	23	26	Mainly from United States.
Nickel:			
Ingots and castings	160	274	Canada 175; United States 91.
Semimanufactures	246	345	Mainly from United States.
Palladium—troy ounces	3,441	4,978	All from United States.
Platinum—do	115	199	Do.
Rutile	---	184	United States 143; Australia 41.
Silver:			
Wire—troy ounces	2,940	1,341	Mainly from United States.
Bars—do	2,636	386	All from United States.
Beaten—do	371	2,006	Mainly from West Germany.
Tin:			
Tin ore—long tons	---	169	United States 119; Canada 50.
Ingots—do	534	347	All from United States.
Semimanufactures—do	4	317	Mainly from United States.
Tungsten, all forms	2	3	All from United States.
Uranium, thorium, plutonium, and other substances	2	8	United States 5; Canada 2.
Zinc, all forms	33	48	Belgium 19; United States 11; West Germany 11.
Zircon	---	694	United States 358; Australia 336.
Other: [1]			
Ores and concentrates	6,665	---	
Metals and alloys	221	1,640	Mainly from United States.
Scrap of nonferrous metals [2]	28	30	All from United States.
Nonmetals:			
Abrasives: Carborundum and emery in powder and grains	1,006	1,652	United States 947; Norway 338; West Germany 139.
Asbestos, crude	19,983	24,095	Canada 18,746; United States 4,418.
Barite	556	449	Netherlands 193; United States 107; West Germany 97.
Cement	777	1,441	Mainly from United States.
Clays:			
Fuller's earth	3,641	3,916	United States 2,308; West Germany 1,607.
Kaolin	10,103	9,340	Mainly from United States.
Nonrefractory	3,708	4,594	Do.
Refractory	55,927	79,238	Do.
Cryolite, natural or artificial	1,977	445	Do.
Diamond, industrial:			
Stones—carats	102,585	131,225	United States 89,450; West Germany 23,975; Netherlands 14,550.
Powder—do	65,605	28,885	United States 25,000; Netherlands 3,000.
Diatomite	1,227	1,126	Mainly from United States.
Dolomite	159	45	All from United States.
Feldspar	1,368	1,435	Do.
Fertilizer and fertilizer raw materials:			
Nitrogenous:			
Sodium nitrate	2,970	---	
Ammonium nitrate	6,228	19,135	All from United States.
Phosphatic:			
Phosphate rock	199,256	203,662	Do.
Superphosphates	6,056	756	Do.
Potassic: Potassium chloride	20,300	27,387	Mainly from United States.
Graphite	61	67	United States 56; West Germany 10.
Gypsum, calcined	238	229	Mainly from United States.
Limestone	1,175	1,737	United States 1,411; Switzerland 200.
Magnesite, calcined	r 900	32,430	All from United States.
Marble, crushed, crude and cut	2,121	3,000	Mainly from Italy.
Mica:			
Crude and powder	108	134	United States 89; Argentina 40.
Scrap	120	35	Mainly from United States.
Pumice	9	128	All from United States.
Salt	1,250	1,052	Mainly from United States.
Sand, (excluding glass sand) and gravel	47,360	18,661	Do.
Glass sand	46,284	17,766	Do.
Semiprecious stones, uncut—carats	4,065	15,195	Mainly from France.
Stone:			
Building and ornamental	33	129	Mainly from Belgium.
Grinding balls	69	38	Mainly from United States.
Unspecified, crude	12	1,520	Do.
Sulfur, ground and unground	153	346	Do.
Talc and pyrophyllite:			
Talc:			
Crude	31,448	39,618	Do.
Powdered	173	376	Do
Pyrophyllite	61	89	Do.

See footnotes at end of table.

Table 3.—Mexico: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—Continued			
Vermiculite	373	616	Mainly from United States.
Other nonmetallic minerals	27,181	1,081	Do.
Mineral fuels:			
Coal	44,762	49,674	Do.
Coke	21,245	27,604	All from United States.
Natural gas—million cubic feet	9,386	9,300	Do.
Natural gas liquids thousand 42-gallon barrels	3,588	2,703	Mainly from United States.
Petroleum:			
Crude—do	146	576	Mainly from Venezuela.
Refinery products:			
Aviation gasoline—do	28	33	Netherlands Antilles 28; United States 5.
Motor gasoline—do	62	84	Mainly from United States.
Kerosine—do	1	1	All from United States.
Distillate fuel oil—do	2	199	Venezuela 118; United States 81.
Residual fuel oil—do	1,094	1,422	All from United States.
Lubricants including greases	[3] 9,065	10,539	Mainly from United States.
Asphalt	[3] 965	769	Do.
Paraffin and vaseline	25,229	21,956	Do.

[r] Revised.
[1] Molybdenum and various alloys.
[2] Copper, brass, and tin.
[3] Reported incorrectly in Minerals Yearbook Volume IV for 1964 in kilograms.

COMMODITY REVIEW

METALS

Aluminum.—Alumex, S.A., in which American and Foreign Power Co., Inc., and American Metal Climax, Inc., reportedly have an interest, will construct an aluminum sheet plant at Puebla. Initial capacity is planned for 3,500 tons annually.

Gold and Silver.—According to trade journal reports, Sunshine Mining Co. was reopening the Los Pericos gold and silver mine in the Promontorio, Durango area. Crews were retimbering the main drift and repairing the shaft. After the rehabilitation work is finished, geological mapping and sampling will proceed.[6]

Cía. Minera Guazapares was reported to be interested in the Palmarejo mines in Chinipas, Chihuahua. Construction was begun on a 100-ton-a-day flotation mill.[7]

Iron and Steel.—*Iron Ore.*—Despite numerous rumors that the Pena Colorado iron ore deposits would be developed, no substantiation of the reports was forthcoming at yearend. The deposits, located in the State of Colima, are said to contain reserves of around 130 million tons of 60 percent iron ore, carrying 2.4 percent sulfur. Total tonnage of the deposit has been reported as high as 3 billion tons.

Pig Iron, Ingot Steel and Semimanufactures.—Four firms produced about 90 percent of Mexico's steel in 1965, which totaled 2,454,680 tons, up 5.8 percent over the 1964 figure. The firms and their individual output were: Altos Hornos de Mexico, S.A.—1,110,812 tons; Cía. Fundidora de Fierro y Acero de Monterrey, S.A.—448,176 tons; Hojalata y Lamina, S.A. (HyL)—409,657 tons; and Tubos de Acero de Mexico, S.A.—220,296 tons. Altos Hornos, after Brazil's Volta Redonda, was Latin America's second company to produce over 1 million tons of steel a year. This firm expanded operations in 1965 to the extent of some $25 million. Further planned expansion will raise annual capacity to around 1.6 million tons in 1966.

It was also reported that HyL borrowed about $16 million from French sources in order to build a new steel plant at Puebla; French equipment was to be installed. The plant, to cost about $50 million, will have an annual capacity of about 200,000 tons of steel in the form of bars, billets, rods, shapes, and structurals.

According to the National Iron and Steel Chamber, apparent consumption of ingot steel in 1965 amounted to 2.7 million tons, 9.1 percent more than in 1964. Requirements for finished steel products increased

[6] World Mining Magazine. V. 18, No. 2, February 1965, p. 61.
[7] Page 62 of work cited in footnote 6.

to 2 million tons, 9.2 percent above the previous year's level.

In order to protect local industry, the Mexican Government decreed a duty on imports of stainless steel powder early in 1965. The tariff, at 55 percent ad valorem plus $1.20 per gross kilo, reportedly stopped nearly all imports of the material.

HyL put its new electrolytic tinning line into operation in 1965, bringing its annual electrolytic tinplate capacity to 60,000 tons. The company's total annual capacity was 75,000 tons, and Mexican national tinplate output capacity was put at 150,000 tons per year.

HyL also was raising its steelmaking capability by adding one electric furnace to its facilities. Annual capacity for steelmaking and hot-rolling by 1966 should be 750,000 tons, and for cold-rolling 240,000 tons; sponge iron capacity was being increased to 240,000 tons per year.

Manganese.—In order to meet growing domestic requirements for manganese, Cía. Minera Autlan de C.V. planned to expand its production and processing programs. The $22.4 million expansion expenditure will be made over a period of some 2 years. The program called for development of known deposits and for a more vigorous prospecting program. In addition, a new processing complex was to be built at Tlanchinol near Pauchuca. Some tax relief was approved by the State in accordance with the Hidalgo Industrialization Laws.[8]

Mercury.—Demand for mercury put many small sporadic operations back into business in 1965, but details are not available as to which properties may have been affected. However, small mines in the States of Durango, Zacatecas, and Jalisco, which were worked only in times of greater than normal demand, were activated.

Because of Mexico's high export tax on mercury, smuggling mercury out of Mexico became a profitable business. It was reported that the metal was flown into the Southwestern United States and sold at less than east coast prices. Marketing in the United States presented little difficulty, as the U.S. import tax was paid.

Substantiation of smuggling rumors was afforded by confiscation of certain overland shipments in Nogales, and Cd. Juarez by Mexican authorities. It was also reported that nonexistent lots of mercury were being sold to unwary buyers in Mexico from time to time.

Actual mercury output in Mexico increased by more than 50 percent in volume and by nearly 200 percent in value over 1964 levels.

Tin.—Tin ore production in Mexico is only by individual miners working alluvial or relatively shallow lode deposits. No company mines tin, and sales of ore to smelters are made by the individual "gouger."

Four tin smelters were in operation in the country, three in San Luis Potosí and one in Tlalnepantla, Mexico D.F. These facilities processed all domestically produced ore as well as concentrates imported from Bolivia, Burma, and Canada.

Mexico's largest tin smelter was Estaño Electro, S.A. de C.V., in the Mexico City area. This plant, owned by four individuals, had three gas-fired furnaces with a monthly capacity of 80 tons; production was about equal to capacity. Raw materials from domestic sources assaying about 38 percent tin are combined with imported ores from Bolivia and Canada, averaging 53 percent tin. The firm was considering plant expansion to a productive capability of 120 tons per month.

The family-owned Metales Potosí smelter, with a monthly capacity of about 60 tons, produced about 10 to 12 tons of metal monthly in 1965. Equipment consisted of two diesel-fired brick furnaces; an electric furnace of 1-ton-per-day capacity was being installed. Raw material supply was from purchases of domestic alluvial and lode ore, running 40 to 60 percent tin.

Fundadora de Estaño, S.A., a stock company, had a smelter capacity of 50 tons of metal per month, and 1965 output was at the rate of about 35 tons monthly. There were two 1½-ton diesel-fired furnaces, using equal portions of domestic ore containing 40 percent tin and imported ore containing 70 percent tin.

The individually owned Estaños Mexicanos smelter had a capacity of about 30 tons per month, which was being fully utilized. There was a single diesel-fired 2-ton capacity furnace. Raw material came from domestic sources containing 30 to 60 percent tin. Expansion plans called for installation of a 40-ton-capacity furnace.

---

[8] Mining Journal (London). Dec. 31, 1965, p. 482. Engineering and Mining Journal. V. 166, No. 3, March 1965, p. 143.

NONMETALS

Cement.—At yearend 1965, the 23 producing cement plants in Mexico had an installed annual capacity of 5.1 million tons. Despite this potential, output in 1965 fell slightly more than 3 percent below 1964 output. Capacity utilization in 1965 was about 82 percent compared with the 1964 figure of about 94 percent. However, at a reported 1965 price of $20.80 per ton, output was of higher total value than 1964 sales at $18.28 per ton.

Expansion plans for increased production were being contemplated for eight of the existing plants, while at the same time, six entirely new plants were either being built or being planned. If all projects are completed on schedule, annual capacity in 1967 will be 6,798,000 tons with additional annual capacity of 1,170,000 tons becoming available by 1968.

The most commonly produced cements were the types of Portland I, II, and III; in addition, about nine other types were available from domestic plants.

Fertilizer Materials.—The fertilizer industry in Mexico continued to grow rapidly. The Mexican Government has promoted the use of fertilizers through educational extension services and by affording loans for greater fertilizer use. The Rockefeller Institute also has conducted an educational program to promote the use of soil nutrients.

In terms of nutrient units, Mexican production of nitrogen and phosphoric fertilizers increased 56 percent and 33.5 percent, respectively, from 1962 to 1964. Over the same period, imports of phosphate rock (all from the United States) increased nearly 59 percent.

The foregoing is indicative of the growth of the fertilizer industry in Mexico. In addition, it was reported that the Government was consolidating and combining many of its own fertilizer operations in the interest of increased operating efficiency and economy.

Guanos y Fertilizantes de Mexico, S.A. (G. y F.), was building a plant in Coatzacoalcos, Veracruz, with installed capacity of 50,000 tons of ammonium sulfate per year. Another G. y F. plant was under construction at Torreon, Coahuila, with planned capacity of 72,000 tons per year. The G. y F. plant at Cuautitlan was being expanded to produce 73,000 tons per year, while a 250-ton-per-day plant was planned in Chihuahua to produce urea.

G. y F. reportedly had plans to establish production facilities at Guaymas, Sonora, for urea, ammonium sulfate, and ammonium phosphate; at Guadalajara, Jalisco, for ammonium sulfate; and at Leon, Guanajuato, for urea.

Fertilizantes Fosfatados, S.A., was planning a $44 million complex at Coatzacoalcos, Veracruz, to produce about 365,000 tons of phosphatic fertilizers, part of which will be for export. Participants in this company are Pan American Sulphur Co., Kuhn Leob and Co., Carl M. Leob, Rhoades and Co., and the Banco Nacional de Mexico.

Fosfatos del Golfo, S.A., was also planned as a combined private and public venture. Initial investment in this phosphatic fertilizer enterprise was put at $16 million with possible eventual outlay reaching $240 million. Participants were reported to be Nacional Financiera, S.A., Guano y Fertilizantes, S.A., Hooker Chemical Corp., and Martin Garcia Urtiaga. Projected capacity has not been announced.

Projections attributed to Nacional Financiera, S.A., put 1970 consumption of fertilizer, in nutrient tons, at 445,000 for nitrogen and at 167,000 for phosphatic acid. Consumption figures for 1964 were about 300,000 tons and 90,000 tons, respectively.

Surface area upon which fertilizers were used in 1964 amounted to about 3 million hectares; it is expected that about 5 million hectares will be fertilized in 1970.

Fluorspar.—The Bureau of Customs, U.S. Treasury Department, clarified its changed position in sampling and classifying trainload lots of fluorspar imports for tariff purposes. The original procedure of sampling for tariff purposes was to classify such ore on a car-by-car basis. It was found that such a method was not required for proper determination of the shipment. Under the revised procedure, a sample from each car will be combined into a composite sample; the chemical assay thus determined will determine the assay of the entire trainload of ore as a composite shipment. It was expected that the revised method would

cut handling costs, and also tend to insure that the shipments would contain not less than 97 percent CaF_2. Under the U.S. tariff schedule, fluorspar imports containing less than 97 percent CaF_2 are levied at $8.40 per ton, while only $2.10 per ton is payable on imports containing more than 97 percent CaF_2.

Graphite.—For the purpose of levying export taxes on amorphous graphite, the Mexican Government sets an export evaluation. The set evaluation has apparently been unrealistically high and consequently, exporters of amorphous graphite reached the point in mid-1965 where at least some operations would have to shut down for lack of profitable income.

Two U.S.-based companies have been trying to get some tax relief for the industry for a number of years. The Mexican Government had granted no relief by yearend; however, in the face of possible mine shutdowns, with consequent loss of mine jobs and income, indications were that relief would be granted in 1966.

Sulfur.—In April the Government placed quantitative restrictions on the export of sulfur from the Isthmus of Tehuantepec in order to protect reserves and provide for an adequate domestic supply. Export quotas were made dependent on the discovery of new reserves. As a result of this measure, exploration efforts during the year increased sulfur reserves by 11 million tons. Export formulae were issued to the two producing companies and stated export tonnages were assigned.

Additional results were the formation of new companies, predominantly capitalized with Mexican funds, to explore for and exploit sulfur and the formation of projects to promote domestic sulfur-consuming industries such as chemical fertilizer plants.

MINERAL FUELS

Petroleum.[9]—Drilling activity decreased by 43 percent in 1965, with 361 wells drilled during that year compared with 631 in 1964. Of the 361 wells drilled, 222 were development wells and 139 were wildcats; the results were 209 wells capable of producing oil or gas and 152 dry holes. Of the 209 producing wells, 173 were successfully completed for oil and 36 for gas. There were 15 discoveries of new fields and 5 discoveries and 1 extension in or around known pools. Total footage drilled was 2,992,661.

There were 43 exploratory crews in the field, an increase of 4 crews over the preceding year; the exploration crews were made up as follows: Seismic 21; surface geology 17; gravity meter 4; and magnetometer 1.

Seismic methods accounted for the discovery of 11 new fields; subsurface geology and seismic methods combined accounted for 3 new fields; and surface geology and seismic techniques combined accounted for 1 new field.

Proved reserves of oil and gas equivalent as of January 1, 1966, were put at 5,077 million barrels (5,000 cubic feet of gas equals 1 barrel of oil).

Refinery operations showed an overall 5.6 percent increase over those of 1964; the more significant operations in terms of output were asphalt, liquefied petroleum gas, residual fuel oil, and some types of gasoline.

Petroleum storage tanks in Mexico numbered 2,796 with a capacity of 3,671,702 cubic meters. Of the total, 1,147 tanks were at sales agencies, 861 at refineries, and 788 at oilfields.

[9] Bulletin of the American Association of Petroleum Geologists. V. 50, No. 8, August 1966. Uhink, Federico Mina. Petroleum Development in Mexico 1965, pp. 1533–1563.

The Mineral Industry of Central American Areas

By Burton E. Ashley [1]

Contents

BRITISH HONDURAS

The very limited mineral industry in British Honduras produced limestone and sand and gravel, all for local use, with an estimated value of $671,349 [2] in 1965.

While the Government of British Honduras was making a determined effort to invigorate the economy and improve various internal conditions, efforts were directed primarily toward agricultural projects. In plans and hopes enunciated by the Government for raising the gross national product and improving the general welfare, little attention was paid to the development of mineral resources.

Under existing conditions of poor communications and lack of access to much of the interior, little mineral industry development could be expected.

In a geological study of part of the country,[3] attention was drawn to occurrences of zircon, ilmenite, magnetite, tourmaline, tin, and gold. In addition, deposits of limestone, sandstone, clays, and stone suitable for construction purposes are known, and barite occurrences have also been studied. Investigation of various deposits in the past has revealed nothing of economic importance with the exception of some construction materials.

PRODUCTION

Recorded mineral output has been confined to limestone and sand and gravel as follows:

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from British Honduran dollars (BH$) to U.S. dollars at the rate of BH$1.40=US$1.

[3] Dixon, C. G. Geology of Southern British Honduras. Government Printer, Belize, British Honduras, undated, 85 pp. and unnumbered bibliography, index, and maps.

Commodity	Cubic yards				Metric tons
	1961	1962	1963	1964	1965
Limestone	6,976	37,945	25,481	23,332	57,376
Sand and gravel	NA	NA	NA	NA	[1] 84,400

NA Not available.
[1] Reportedly comprises about 50 percent sand and 50 percent gravel.

Source: U.S. Embassy, Belize, British Honduras. Department of State Airgram A-104, Apr. 20, 1966, 2 pp.

TRADE

Exports of all commodities totaled $23.9 million in 1964, while in 1963 exports were valued at $21.6 million. In terms of 1964 commodity trade, imports of all commodities were valued at $47.5 million, compared with the 1963 level of $38.6 million.

Recorded exports were limited to scrap metal—154 tons in 1963 and 8,698 tons in 1964. In addition, minor reexports of petroleum products and cement were reported. Exports and reexports of cement, metals, and petroleum products were valued at slightly over $400,000 in 1964.

Imports of mineral fuels, mostly petroleum products, were valued at about $2.2 million in 1964. Other mineral commodity imports comprised modest amounts of building materials, salt, steel products, and fertilizer materials. In 1964, the United States was a source of about 38 percent of total British Honduras imports, by value, while slightly over 32 percent of exports were directed to the United States.

Table 1.—British Honduras: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Iron and steel semimanufactures	1,727	2,265	United Kingdom 1,080; Belgium 528.
Nonferrous semimanufactures	29	41	Mainly from United Kingdom.
Nonmetals:			
Cement	7,697	7,124	Jamaica 4,166; Honduras 2,925.
Fertilizer materials:			
Nitrogenous	1,589	2,389	Trinidad and Tobago 1,297; West Germany 755.
Phosphatic	307	1,603	All from United States.
Potassic	263	82	West Germany 48; United States 34.
Other, not specified	892	243	United States 125; West Germany 104.
Lime	162	156	Mainly from United Kingdom.
Salt	623	499	United Kingdom 320; Canada 172.
Sand	---	3	All from United States.
Stone, building and monumental	---	(1)	All from United Kingdom.
Mineral fuels:			
Coal and coke	15	19	United Kingdom 10; United States 9.
Natural gas liquids	261	293	Mexico 237; Guatemala 36; United States 20.
Petroleum refinery products thousand 42-gallon barrels	208	200	Trinidad and Tobago 87; Jamaica 53; Aruba 42.
Road oil and asphalt products	1,430	72	Jamaica 37; United States 30; United Kingdom 5.

[1] Less than ½ unit.

COMMODITY REVIEW

Petroleum.—Exploration activity was reinitiated in 1965 after having been suspended for nearly 2 years and seemed to offer the only immediate hope for significant expansion of mineral industry activities. Marine seismic surveys were conducted by British Honduras Shell Petroleum Co., Ltd. (Shell) and Esso Belize, Inc. (Esso). Esso, Shell, and the Phillips Petroleum Co. all held acreage offshore of the British Honduras coast. Belize Chevron Oil Co. was awarded exploration rights over some 4,125 square miles, which comprises much of the northern half of the country.

At yearend Phillips Petroleum Co. held about 1.3 million acres under lease, and Shell held just slightly less.

It was expected that exploration completed in 1965 would lead to a drilling program in 1966.

COSTA RICA

Incomplete returns of mineral output in Costa Rica indicated a minimum production value of $3.8 million[4] in 1965. No reasonable estimate of total value could be made with available information.

The gross national product, estimated at $593 million, rose 7.6 percent over the 1964

[4] Where necessary, values have been converted from Costa Rican colones (C) to U.S. dollars at the rate of C6.65=US$1.

level. It is evident that value of mineral output had little impact on the total Costa Rican economy.

Some interest in mineral investigation was expressed in 1965, but no new production was established. Output of manganese ore and iron ore was considered possible in the near future.

The Government continued to welcome foreign investment, particularly in joint ventures with domestic interests. The Government Department of Geology, Mines and Petroleum actively assisted in exploration work. The U.S. Agency for International Development also provided help for prospectors, and the United Nations was expected to start a program of mineral resource evaluation. However, the planned U.N. program had not received final Costa Rican Government approval by yearend.

It was reported that a road construction program was planned in conjunction with agricultural and forest development. Improved access within the country could well be a spur to mineral prospecting and development.

PRODUCTION

As in previous years, only estimates of volume of building material output were available. Production was in the hands of many small operators, and apparently records were not kept in all cases.

Ordinarily, output figures for cement, salt, and diatomite are considered reliable. The reason for the indicated sharp fall in 1965 salt production is not evident; whether production actually decreased, or returns for 1965 were incomplete, is not known.

Table 2.—Costa Rica: Approximate production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Gold [e] troy ounces	3,000	3,000	3,000	3,000	570
Manganese ore	-----	-----	600	-----	-----
Nonmetals:					
Cement	-----	-----	-----	33,000	119,000
Diatomite [e]	650	750	1,900	3,600	3,000
Lime [e]	3,800	3,800	5,000	6,500	12,000
Limestone [e]	24,800	25,600	30,000	126,200	219,000
Salt	11,500	8,950	5,698	20,000	1,848
Sand and gravel	NA	NA	NA	[e] 50,000	[e] 75,000
Stone, crushed and broken	NA	NA	NA	[e] 50,000	[e] 172,000

[e] Estimate. NA Not available.

TRADE

Total commodity exports in 1965 were valued at $111.8 million, compared with like imports valued at $178.2 million, which created an adverse balance of $66.4 million for the period. This was a significantly higher deficit than was recorded for 1964. In 1965 the United States supplied about 40 percent of Costa Rican commodity imports and was a destination for 50 percent of its exports.

The 1964 estimated value of mineral imports was $20.7 million, and that of mineral exports was $7.1 million.

In 1965, the most valuable mineral imports were manufactured fertilizers, $11.7 million, and petroleum products, $8.7 million.

Table 3.—Costa Rica: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Gold troy ounces	129	---	
Iron and steel, all forms	10	1,203	Nicaragua 1,025; Honduras 137; Japan 27.
Lead, all forms	---	14	All to Guatemala.
Zinc and alloys	12	17	All to Nicaragua.
Nonferrous metals and alloys, all forms, n.e.s.	17	36	West Germany 17; Japan 11; Guatemala 8.
Nonmetals:			
Cement	---	604	Mainly to Nicaragua.
Clay and clay products	61	120	Do.
Fertilizers, manufactured	8,193	82,155	El Salvador 57,116; Guatemala 14,139.
Stone:			
Dimension	30	53	Nicaragua 35; Honduras 18.
Industrial	1	(1)	All to Nicaragua.

[1] Less than ½ unit.

Table 4.—Costa Rica: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys, all forms	518	681	United States 204; West Germany 169; Japan 83.
Copper and alloys:			
Metal, all forms	246	172	United States 34; Japan 29; Canada 27; West Germany 27.
Sulfate	11	27	United States 12; Belgium-Luxembourg 9.
Gold, troy ounces	96	---	
Iron and steel:			
Ingots and equivalent forms	6,664	2,654	West Germany 1,544; Belgium-Luxembourg 932.
Semimanufactures	29,437	34,911	Japan 10,685; West Germany 9,391; France 6,463.
Scrap	4	3	Panama 2; United States 1.
Lead and alloys, all forms	205	83	West Germany 31; Belgium-Luxembourg 22.
Nickel and alloys, all forms	5	3	United Kingdom 1; West Germany 1.
Platinum-group metals and alloys, all forms, troy ounces	1,157	2,990	All from United States.
Silver and alloys, do	1,961	3,440	Mainly from United States.
Tin and alloys, all forms, long tons	17	23	Do.
Zinc and alloys, all forms	381	663	Netherlands 299; West Germany 175.
Other:			
Nonferrous ore and concentrates, not further classified	3	4	United States 3.
Nonferrous metals and alloys, not further classified	2	(1)	Mainly from West Germany.
Nonmetals:			
Abrasives, natural	46	7	Italy 3; United States 2; West Germany 2.
Asbestos	32	151	Mainly from Canada.
Cement:			
Asbestos	1,582	680	El Salvador 536; Guatemala 104.
Portland	87,961	74,713	Colombia 23,365; Venezuela 21,521.
Clay and clay products:			
Kaolin	1,222	102	Mainly from United States.
Refractory and common	215	681	United Kingdom 490; United States 185.
Nonrefractory brick	3	46	Mainly from Nicaragua.
Refractory brick	372	724	Denmark 445; United States 278.
Diatomite	385	1,295	Mainly from United States.
Feldspar, fluorspar, cryolite	14	9	All from United States.
Fertilizers:			
Nitrogenous	11,672	12,140	West Germany 8,815; Netherlands 1,608.
Phosphatic	393	2,596	United States 2,024; El Salvador 561.
Potassic	683	4,283	United States 1,575; West Germany 1,202.
Mixed	52,018	23,857	West Germany 10,694; Netherlands 6,931.
Graphite	2	1	Mainly from West Germany.
Gypsum:			
Crude	4	361	Mainly from Nicaragua.
Calcined	158	106	Mainly from West Germany.
Lime, all types	10	28	United Kingdom 15; United States 10.
Marble	117	110	All from Italy.
Mica	3	1	All from United States.
Pigments, mineral	(1)	8	West Germany 7; Belgium-Luxembourg 1.
Quartz	1	3	United States 2; West Germany 1.
Salt, all forms	105	276	Nicaragua 114; United States 96.
Stone, sand and gravel:			
Dimension	54	33	All from Italy.
Industrial, type not specified	(1)	3	West Germany 2; France 1.
Sand, gravel, crushed rock	60	20	Mainly from United States.
Sulfur	45	41	All from West Germany.
Talc	135	104	France 61; Italy 36.
Mineral fuels:			
Coal, all types	37	46	All from United States.
Coal and coke briquets	16	---	
Coke	151	139	Mainly from West Germany.
Mineral tars and products	56	86	Mainly from United States.
Natural gas liquids	1,568	1,490	Mainly from Venezuela.
Petroleum:			
Crude and partially refined	15,312	---	
Refinery products:			
Gasoline	63,017	62,978	Curacao 20,481; Aruba 17,053; El Salvador 15,439.
Kerosine	13,613	12,338	Aruba 4,673; Curacao 4,199; Venezuela 1,723.
Distillate fuel oil	101,568	138,199	Venezuela 48,983; Curacao 42,077.
Lubricants including greases	10,629	11,068	United States 10,313; Curacao 726.
Paraffin, vaseline, waxes	1,746	1,801	Mainly from United States.
Asphalt and coke	2,887	7,304	Venezuela 6,463; United States 767.

[1] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Bauxite.*—The contract between the Aluminum Co. of America (Alcoa) and the Costa Rican Government for Alcoa to extract bauxitic laterite was validated upon publication of the agreement in the Government's Gaceta of February 10, 1965, Number 32.

Alcoa was continuing its program of exploration and development at yearend.

Gold.—Interest in gold recurred during the year, partly as a result of an article in a popular U.S. magazine and partly because of reports of nuggets said to have been sold to a local bank. The area on which interest was focused was the Isla de Los Violines near the Peninsula de Osa, a region that has been the site of sporadic alluvial gold finds in the past.

Activity and reports of samples in 1965 were viewed cautiously because the romantic lure of gold often interferes with factual reports of finds.

Iron and Steel.—A feasibility report concerning the establishment of a steel mill near Puntarenas was given to the President. Estimated cost of the complex was about $30 million. It was expected that financing would come from local sources supported by U.S. and West German investors.

A consumer tax on iron rods of national and foreign origin was established in mid-1965. The rate decreed was $0.75 per quintal of 46 kilograms. It was expected that the assessment would be added to the price. Armaduras de Acero Ltda. and Aceros Nacionales Ltda., two companies which produced over 90 percent of total domestic requirements for this product, did not believe the tax would affect sales.

Price per quintal (46 kilograms) of rods at the time the tax decree was announced was $7.37 for the local product and $8.12 for imported material.

Metales y Cía., S.A., announced expansion of its galvanizing-line annual capacity by 20,000 tons to a total of 30,000 tons; estimated consumption of galvanized steel sheets in the five countries of the Central American Common Market was 22,500 tons annually. Output will be to USG–22 and USG–37 specifications.

A survey of the magnetite sands along the coastal areas under the auspices of the Costa Rican Geological Survey[5] developed calculated reserves of 3.7 million tons of iron. It was thought that adequate reserves could be established to supply a steel industry for some time.

Manganese.—It was reported in late 1965[6] that a U.S. company planned to build a plant to manufacture dry cell batteries in Costa Rica. Output of the $1.5 million plant was expected to replace U.S. exports to the Central American Common Market.

Another source[7] indicated that a manganese dioxide supply will be developed in Costa Rica.

Nonmetals.—*Cement.*—Industria Nacional de Cemento, S.A., increased production by 261 percent in 1965 over the 1964 level.

Domestic requirements for type I portland were fully met in 1965. Local price was about $1.20 per 42.5-kilogram bag. The only exports were to Nicaragua. Trucks bringing gypsum from Nicaragua to the cement plant were used to ship cement as return cargo thus obtaining a more favorable transportation rate than if the trucks returned empty.

In mid-1965 various industry representatives met in San José to form the Cámara del Cemento del Istmo Centroamericano. Countries represented, in addition to Costa Rica, were El Salvador, Guatemala, Honduras, Nicaragua, and Panama. The object of the Cámara is to promote the use of cement generally in construction projects, and in particular to encourage the Government and municipalities in each country to use concrete in highway construction.

The various member companies planned to cooperate in exchanging ideas and to collaborate in the supply of materials and replacement parts in case of short supply in any of the plants.[8]

Productos de Concreto, S.A., as the leading manufacturer of concrete products in the Central American Common Market area, found that demand for its products had reached the point where expansion was necessary.[9] Therefore, funds were being

---

[5] Ministerio de Industrias, Dirección de Geología, Minas y Petróleo. Depósitos Costeros de Arenas Magnetíticas En Las Playas del Litoral Pacífico de Costa Rica. San José, Costa Rica, October 1965, 33 pp.

[6] American Metal Market. Nov. 17, 1965, p. 17.

[7] Beausset, V. S. de. Industrial Development of Costa Rica, Costa Rica, December 1965, p. 103.

[8] U.S. Embassy, San José, Costa Rica. Department of State Airgram A–647, and enclosure. June 30, 1965, 3 pp.

[9] International Finance Corp. Press release No. 65/9, Sept. 17, 1965, 1 p.

raised through a number of sources to carry out a $500,000 expansion and modernization program.

Fertilizer Materials.—Fertica, S.A., reportedly was finding it difficult to meet competition from imported fertilizers.[10] European shippers were able to absorb tariff charges, nullifying any advantage that Fertica, S.A., might have expected to enjoy through such protection.

Abonos Superior, S.A., was producing about 15,000 tons of complex chemical fertilizers annually; it imports fertilizer materials for local mixing.

Mineral Fuels.—At yearend the facilities of Refinadora Costarricense de Petróleo were still under construction, with completion scheduled for 1966.

In September 1965, the Ministry of Industry authorized construction of a petroleum products pipeline from the refinery at Limón to Ochomogo. The cost of the 100-kilometer pipeline was estimated at $3.5 million. It was expected that the 6-inch line would take 18 months to complete. No petroleum exploration activity was reported for 1965.

[10]E&MJ Metal and Mineral Markets. V. 36, No. 28, July 12, 1965, p. 8.

EL SALVADOR

El Salvador's economy in 1965 expanded, with an increase of 6.3 percent in the gross national product over figures from the previous year. Manufacturing was a major contributor to the country's growth, while sustained building activity was responsible for production increases of the few indigenous minerals which are worked.

Various metallic minerals have been reported, and sporadically mined, in El Salvador, but little information is available about 1965 activities. Exports of silver concentrates in 1964 presumably originated within the country.

Crude oil runs to the refinery declined about 8 percent from 1964 levels.

PRODUCTION AND TRADE

Domestic mineral output was virtually limited to salt and a few components used in the construction and ceramic industry.

Output of refined petroleum products declined 7 percent from 1964 levels.

There were some exports of locally mined construction materials and silver ores and concentrates. The remaining exports were largely commodities made from imported raw or semifinished materials, or reexports. An import upon which the duty has been paid becomes a "national article;" if it is subsequently sent out of the country, it becomes an export for statistical purposes.

Table 5.—El Salvador: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals:					
Cement	r 73,283	r 63,834	r 66,188	r 53,588	r 67,980
Clay	14,400	13,000	13,900	11,200	14,300
Lime	r 610	r 645	e 650	e 150	e 150
Limestone and seashells	96,200	r 100,316	r 93,200	r 75,500	r 95,900
Salt, marine	15,000	18,140	e 18,000	r 21,984	NA
Mineral fuels:					
Petroleum refinery products:					
Motor gasoline thousand 42-gallon barrels	---	---	793	1,024	991
Kerosine ---do---	---	---	124	238	353
Distillate fuel oil ---do---	---	---	644	851	992
Residual fuel oil ---do---	---	---	211	1,119	664
Liquefied petroleum gas ---do---	---	---	13	32	34
Total ---do---	---	---	1,785	3,264	3,034

e Estimate. r Revised. NA Not available.

While the value of mineral output is estimated to supply less than 1 percent by value of the gross national product, trade in minerals assumed greater proportions. The trade imbalance, particularly in minerals, is shown in the following table:

	Value (million dollars) [1]		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1963	5.6	153.8	3.6
1964	6.5	178.1	3.6
Imports:			
1963	28.0	151.7	18.5
1964	38.3	191.1	20.0
Trade balance:			
1963	−22.4	+2.1	XX
1964	−31.8	−13.0	XX

XX Not applicable.

[1] Where necessary, values have been converted from El Salvadoran colones (C) to U.S. dollars at the rate of C1=US$0.40.

In 1964 the United States supplied about 35 percent of El Salvador's imports and took about 26 percent of its exports.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Siderúrgica Salvadoreña, S.A., continued production of reinforcing rods ranging from ¼ inch to 1½ inches, and of small shapes. Output in 1963, the latest year for which figures are available, was 2,677 tons.

Nonmetals.—*Cement.*—Cementos de El Salvador, S.A., the country's only cement producer, continued to move its plant from Acajutla to Metapan, where limestone deposits were expected to be adequate for over 150 years' operation. The second kiln, with capacity of 240 tons a day, was moved in 1965. A new Schmidt kiln with a daily capacity of 500 tons was on order at year-end.

Gypsum is imported from Honduras or Guatemala. While the plant was closed because of the move, cinder was imported from Guatemala for local grinding.

Fertilizer Materials.—It was reported that Fertica, S.A., projected expansion of its facilities to produce 150 tons a day of nitric acid and 300 tons a day of ammonium nitrate.

Table 6.—El Salvador: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum, semimanufactures	---	28	Guatemala 22; Nicaragua 6.
Copper and alloys, all forms [1]	(2)	1	Mainly to Guatemala.
Iron and steel:			
Scrap	19	15	United States 8; Guatemala 5.
Primary forms and semimanufactures [1]	556	519	Honduras 368; Guatemala 135.
Silver:			
Ore and concentrate	17	27	All to United States.
Metal and alloys...troy ounces	3,385	64	Do.
Other nonferrous metals:			
Scrap [1]	45	56	Japan 30; West Germany 24.
Other	---	8	All to West Germany.
Nonmetals:			
Abrasives, natural	---	10	Mainly to Honduras.
Cement:			
Asbestos	2,240	3,326	Honduras 1,306; Nicaragua 1,142; Costa Rica 783.
Portland	5,013	8,018	Honduras 5,523; Nicaragua 2,474.
Clay and clay products:			
Common brick	56	115	Honduras 62; Guatemala 53.
Refractories	---	2	All to Honduras.
Fertilizers, manufactured	348	4,535	Guatemala 2,232; Honduras 1,744.
Lime	77	103	Mainly to Honduras.
Marble [1]	1	1	Mainly to Nicaragua.
Salt	1,918	3,074	Guatemala 1,518; Honduras 1,362.
Stone:			
Dimension	19	120	Mainly to Nicaragua.
Industrial	5	13	All to Nicaragua.
Other nonmetallic minerals	3	1	Mainly to Honduras.
Mineral fuels:			
Petroleum:			
Refinery products [1]	200,706	222,083	Guatemala 159,611; Honduras 33,458.
Gas liquids	227	1,048	Guatemala 802; Honduras 246.

[1] Includes reexports of "nationalized" goods, defined as those materials upon which duties have been paid.
[2] Less than ½ unit.
Source: Anuario Estadístico. V. I, Comercio Exterior 1964.

Table 7.—El Salvador: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys:			
Unwrought	614	505	United States 493; Italy 12.
Semimanufactures	330	362	United States 118; Italy 56; West Germany 53.
Copper and alloys:			
Sulfate	8	11	United States 9.
Metal, all forms	104	596	United States 555; West Germany 12.
Iron and steel:			
Pig iron, ferroalloys, scrap	480	130	United States 101; Belgium 20.
Ingots and other primary forms	342	1,400	West Germany 899; Belgium 356.
Semimanufactures	32,204	35,707	Belgium 17,895; United States 4,810.
Lead and alloys:			
Unwrought	102	57	Belgium 25; West Germany 21; United States 7.
Semimanufactures	91	137	Guatemala 47; Belgium 45; Mexico 14.
Platinum-group metals, troy ounces	71	16	All from United States.
Silver and alloys, do	10,079	8,784	United States 5,585; Mexico 2,218.
Tin and alloys:			
Unwrought, long tons	4	4	United States 2; Guatemala 1; United Kingdom 1.
Semimanufactures, do	12	18	United Kingdom 17; Denmark 1.
Zinc and alloys, all forms	61	72	Nicaragua 61; United States 6.
Nonmetals:			
Abrasives, natural:			
Diamond, industrial, carats	150,000	75,000	Belgium 70,000; United States 5,000.
Pumice, emery, corundum	1	3	United States 2; West Germany 1.
Tripoli	1	---	
Asbestos:			
Crude, washed or ground	840	826	Canada 623; Republic of South Africa 181.
Plates, sheets, cord	106	85	United States 44; West Germany 17.
Cement:			
Asbestos	383	1,162	United States 659; Guatemala 293.
Portland	39,445	46,179	Guatemala 29,793; Honduras 14,327.
Clay and clay products:			
Kaolin and clayey earths	367	392	United States 212; Guatemala 161.
Refractory earths and rocks	49	34	United States 31; Guatemala 3.
Common brick	101	107	Guatemala 80; Honduras 27.
Refractory brick	291	491	United States 393; Guatemala 42.
Diatomite	337	436	United States 295; Guatemala 109.
Feldspar, fluorspar, cryolite	1	1	All from United States.
Fertilizer:			
Nitrogenous	78,278	102,699	Costa Rica 37,561; Netherlands 19,126; Belgium 17,918.
Phosphatic	1,406	17,133	Mainly from United States.
Potassic	1,147	438	West Germany 374; United States 64.
Mixed	34,450	48,015	Costa Rica 16,750; West Germany 14,000.
Graphite	1	2	United Kingdom 1; United States 1.
Gypsum:			
Crude	1,014	1,000	Honduras 648; Guatemala 351.
Calcined, powder	49	47	West Germany 22; United States 11.
Lime, all types	744	1,185	Guatemala 1,115; United Kingdom 37.
Marble	1,271	1,137	Mainly from Guatemala.
Mica	9	13	All from United States.
Pigments, mineral	1	2	Netherlands 1; West Germany 1.
Salt, all types	2,855	4,270	Honduras 4,166; United States 89.
Sand, gravel, crushed rock	49	48	United States 36; Italy 11.
Sodium carbonate	151	291	West Germany 165; Netherlands 66.
Sodium hydroxide	2,120	3,154	Netherlands 1,283; United States 1,140.
Stone:			
Dimension	253	261	Guatemala 214; Italy 38.
Industrial	70	118	Guatemala 60; United States 58.
Sulfur	3,475	44	Netherlands 38; United States 6.
Talc	54	99	United States 78; Norway 8.
Other nonmetallic minerals	443	561	United States 550; Norway 10.
Mineral fuels:			
Coal, all types	57	99	West Germany 97.
Coke	207	263	West Germany 193; Belgium 25; Netherlands 25.
Briquets	9	9	All from United States.
Mineral tars and products	1,022	851	United States 783; United Kingdom 64.
Natural gas liquids	911	390	Mainly from Venezuela.
Petroleum:			
Crude and semirefined	374,043	474,680	Do.
Refinery products:			
Gasoline	42,160	18,726	Curacao 16,103; Netherlands 1,179.
Kerosine	37,913	26,916	Curacao 16,459; Netherlands 5,338.
Fuel oil, all types	32,271	9,058	Curacao 8,051; Guatemala 1,007.
Lubricants, including greases	5,020	4,761	United States 4,499; Curacao 247.
Paraffin, vaseline, waxes	1,493	1,458	Mainly from United States.
Asphalt and coke	5,239	6,356	Venezuela 5,319; United States 1,036.

Source: Anuario Estadístico, V. I, Comercio Exterior 1964.

GUATEMALA

Guatemala's economic growth in 1965 continued as the gross national product reached an estimated $1,380 million.[11] Of this figure, commerce accounted for about 30 percent, agriculture nearly 28 percent, and industry 30 percent.

The contribution of the part of the mineral industry based on domestic raw materials remained insignificant, but with two petroleum refineries in operation, mineral industries based on imported raw materials presumably made an increasingly valuable contribution to the local economy as well as to export trade. However, income from the latter source was partly offset by necessary increases in crude oil imports.

Projected development of nickel deposits offered some promise of expanded activities in the field of metal mining and processing.

A mineral survey under the auspices of the United Nations was announced. The project was expected to take about 3 years and cost slightly over $1 million.

Decree Law 342, Guatemala's new mining code, was published on May 4, 1965, and became effective 30 days after publication. The stated object of the law is "to have legislation which gives impetus to the effective development of the nonrenewable natural resources of the country. . . ." [12]

The law annulled all previous mining legislation and Presidential Decrees that were inconsistent with the code.

Minerals found within the national territory or maritime limits were declared property of the State. Regulations for prospecting, exploration, and exploitation rights were defined. Rights may be granted to either foreigners or Guatemalans; however, Guatemalan entities having more than 51 percent national capitalization will be favored in the granting of exploration concessions. Exploitation rights may be granted to foreign-owned corporations formed in Guatemala.

Concession size and time limits for which concessions are effective were stated; license fees and tax requirements were also enumerated. Income tax exoneration under provisions of the Industrial Development Law may be claimed by mining companies which establish installations for processing minerals within the country.

In its entirety, the code is divided into 23 chapters containing 152 articles.

At yearend the law had not been in effect long enough to be appraised in regard to workability, but it was reported that certain aspects of the code were not entirely clear.

PRODUCTION

Crude mineral production in Guatemala remained largely dependent upon cement output, since this is the end use for limestone, clays, and gypsum as well as other components of total production.

Output of refined petroleum products showed a considerable increase; aviation gasoline entered the list of refined products for the first year.

TRADE

Figures pertinent to mineral trade for 1965 were not available, but obviously imports far exceeded exports. In 1964, values of mineral and metal imports were some $27 million higher than export values for similar categories.

In overall commodity trade, Guatemala showed a deficit of about $40 million in 1965.

Preliminary figures for commodity trade for 1964 indicate that Guatemalan exports amounted to $164.3 million compared with imports of $202.1 million. Of the totals, the United States took about 32 percent of exports and supplied 44 percent of imports.

---

[11] Where necessary, values have been converted from Guatemalan quetzales (Q) to U.S. dollars at the rate of Q1=US$1.

[12] U.S. Embassy, Guatemala City, Guatemala. Enclosure to Department of State Airgram A-70, Aug. 10, 1965 (Translation of the Mining Code of Guatemala, May 4, 1965, 33 pp.).

Table 8.—Guatemala: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Antimony, content of concentrate [1]	64	29	28	-----	-----
Cadmium, in zinc concentrate kilograms	[2] 42,731	[1] 12,400	[1] 7,100	-----	-----
Chromite	100	20	-----	-----	-----
Iron ore [3]	[e] 5,000	[e] 5,000	[e] 6,000	[e] 7,000	8,469
Lead:					
Concentrate for export	8,580	968	748	1,207	30
Local smelter production	56	63	47	[r] 75	114
Silver troy ounces	[2] 515,905	370,595	64,173	[e] 10,000	[e] 18,000
Zinc, concentrate	7,926	816	1,169	[4] 844	[4] 867
Nonmetals:					
Cement thousand tons	125	117	157	186	235
Clays [3]	10,650	10,267	15,292	41,044	31,906
Gypsum [3]	12,094	9,748	14,794	7,101	9,393
Limestone [e] thousand tons	673	583	702	1,071	[3] 370
Quartz [3]	8,716	NA	11,001	21,936	28,431
Salt thousand tons	16	17	19	[e] 18	NA
Mineral fuels:					
Petroleum refinery products:					
Aviation gasoline thousand 42-gallon barrels	-----	-----	-----	-----	126
Motor gasoline do	-----	-----	217	447	893
Kerosine do	-----	-----	36	76	210
Distillate fuel oil do	-----	-----	116	251	719
Residual fuel oil do	-----	-----	208	223	1,027
Liquefied petroleum gases do	-----	-----	12	27	31
Total do	-----	-----	589	1,024	3,006

[e] Estimate. [r] Revised. NA Not available.

[1] U.S. imports from Guatemala.

[2] Recoverable.

[3] Materials used in cement production. Other production not available.

[4] Exports.

Table 9.—Guatemala: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964
Metals:				
Iron and steel:				
Ore and concentrate	---	1	---	
Scrap	---	299	(1)	All to El Salvador.
Semimanufactures	60	---	378	El Salvador 157; Nicaragua 149; Honduras 66.
Lead and alloys, all forms	27	NA	57	El Salvador 51; Costa Rica 6.
Lead, ore and concentrate	2,976	1,414	917	Mainly to Japan.
Nonferrous ore and concentrate	4,044	11	1,207	Mainly to Canada.
Nonferrous metal and scrap, n.e.s.	1	70	56	United States 41; El Salvador 15.
Zinc, ore and concentrate	4,357	2,966	844	Belgium-Luxembourg 427; United States 417.
Nonmetals:				
Cement	3,342	NA	30,892	Mainly to El Salvador.
Gypsum	963	1,030	345	Do.
Lime	358	NA	1,330	All to El Salvador.
Marble	128	373	1,317	Mainly to El Salvador.
Salt	NA	14	2	All to El Salvador.
Stone:				
Construction	NA	144	47	Do.
Industrial	5,188	364	538	Mainly to El Salvador.
Other nonmetal minerals	(1)	NA	18	All to El Salvador.

NA Not available.

[1] Less than ½ unit.

Source: Dirección General de Estadística, Ministerio de Economia. Anuario de Comercio Exterior, 1964.

Table 10.—Guatemala: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys: Semimanufactures	290	551	United States 190; Switzerland 76; United Kingdom 54; El Salvador 48.
Copper and alloys:			
Unwrought, electrolytic, powder	11	11	Mainly from United States.
Semimanufactures	84	187	Mexico 63; United States 61; Canada 28.
Sulfate	12	15	United States 6; Belgium 5; Canada 4.
Iron and steel:			
Pig and sponge iron, powder	2	1,064	West Germany 516; France 499.
Scrap	18	(1)	Mainly from United States.
Ferroalloys	(1)	(1)	All from United States.
Semimanufactures	45,423	57,562	Belgium 21,857; Japan 8,522; West Germany 8,065.
Castings and forgings	2	37	Mainly from Nicaragua.
Other	565	941	Mexico 369; United States 333.
Lead and alloys:			
Unwrought	24	21	United States 16; El Salvador 5.
Semimanufactures	13	6	Costa Rica 5; United States 1.
Nonferrous base metals: Ores and concentrates	148	611	United States 410; Mexico 200.
Silver and alloys, troy ounces	2,508	20,351	Mexico 19,676; West Germany 514.
Tin and alloys, all forms, long tons	13	48	United States 23; West Germany 10.
Zinc and alloys:			
Unwrought	8	3	Mainly from United States.
Semimanufactures	---	15	Do.
Nonmetals:			
Abrasives, natural:			
Diamond, industrial, carats	5,000	350,000	Mainly from Canada.
Emery, pumice, corundum	11	6	United States 4; West Germany 2.
Asbestos:			
Crude, washed or ground	287	460	Canada 367; Rhodesia 91.
Sheets, cord, plates, pure or mixed	12	12	El Salvador 4; West Germany 4.
Semimanufactures	76	80	Mainly from United States.
Cement:			
Portland	1,230	788	Denmark 407; Honduras 173.
Asbestos	91	60	Mainly from El Salvador.
Clays:			
Kaolin and clayey earth	306	280	Mainly from United States.
Refractory earth and rocks	41	92	Do.
Ordinary brick	13	86	Mainly from El Salvador.
Refractory brick	914	436	United States 264; Canada 83; Denmark 57.
Diatomaceous earth	144	189	United States 158; West Germany 31.
Fertilizers:			
Nitrogenous	16,476	17,426	West Germany 8,042; United States 2,126; Belgium-Luxembourg 1,997.
Phosphatic	3,174	5,518	Mainly from Italy.
Potassic	75	837	Mainly from West Germany.
Mixed	12,672	17,402	Costa Rica 8,434; United States 4,243.
Graphite	(1)	(1)	Mainly from United States.
Gypsum, calcined, powder	---	19	Do.
Lime	1	17	Do.
Marble	1	122	All from Italy.
Mica, uncut	6	8	All from United States.
Quartz, crude	62	45	Mainly from United States.
Salt, rock or sea:			
Crude	28	1,460	Mainly from El Salvador.
Refined	55	102	El Salvador 69; United States 27.
Sand and gravel and crushed stone	4	21	Mainly from United States.
Sodium carbonate	193	157	Do.
Sodium hydroxide	2,912	3,654	Do.
Stone:			
Dimension	4	6	Do.
Industrial	43	32	All from United States.
Sulfur, all forms	36	2	West Germany 1; United States 1.
Talc	116	118	Mainly from United States.
Mineral fuels:			
Asphalt, natural	1	3	Do.
Coal	64	33	West Germany 20; United States 13.
Coke	218	141	West Germany 98; United States 43.
Briquets	---	3	All from United States.
Gas, manufactured	---	(1)	Mainly from West Germany.
Natural gas, all forms	5,645	5,985	Mainly from Venezuela.
Petroleum:			
Crude and partially refined	160,436	191,795	Venezuela 160,893; Netherlands Antilles 26,788.

See footnotes at end of table.

Table 10.—Guatemala: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Mineral fuels—Continued			
Petroleum—Continued			
Refinery products:			
Gasoline	98,668	91,357	Netherlands Antilles 47,234; El Salvador 34,305.
Kerosine	50,725	45,068	Netherlands Antilles 30,734.
Diesel, gas oil, others	183,521	275,384	El Salvador 153,983; Netherlands Antilles 43,156.
Lubricants, including greases	9,500	10,015	Mainly from United States.
Paraffin, vaseline, waxes	5,924	7,469	Do.
Asphalt, coke, others	4,291	6,205	All from El Salvador.

[1] Less than ½ unit.
Source: Anuario Estadístico Centroamericano de Comercio Exterior—1964.

COMMODITY REVIEW

Metals.—*Copper, Lead, and Zinc.*—Existence of reserves of shipping-grade ores of copper, lead, and zinc carrying commercial values of silver and gold were reported. While no developmental activity was described, principals were actively seeking solutions to the economics of shipping to custom smelters in the United States.

Iron and Steel.—INTUPERSA, S.A., which manufactures steel pipe and shapes, reportedly increased its capitalization by $600,000.

Galvanizadora Centro Americana, S.A., began operations in Guatemala City in late 1965. Guatemalan, Japanese, and U.S. interests combined in the $1.5 million plant, which was able to produce about 1,000 tons of galvanized sheet steel monthly. Planned production schedules allowed progressive doubling of that capacity.

The iron and steel industry in Guatemala generally has not reecived a great deal of attention. Output in the past has been limited to steel reinforcing rods, nails, tin cans, and some pipe and tubing.

In 1958, the latest year for which statistics were available, 107 firms were engaged in the metal or metallurgical industry, but more than half of them were plumbing or welding shops and few employed more than 10 workers.

Interest in metals manufacturing apparently quickened in 1965, and it was expected that more interest would be taken in supplying the growing local demand.

Nickel—Exploraciones y Explotaciones Mineras Izabal, S.A. (EXMIBAL), held by International Nickel Co. (80 percent) and Hanna Mining Co. (20 percent), was granted 40-year mining rights to about 385 square kilometers in northeastern Guatemala. Under the agreement, the company is to invest a total of $50 million and export at least 25 million pounds of nickel equivalent annually. A plant was planned for the production of ferronickel.

Average nickel content of all ore is reported to be 0.7 percent metal, but initial operations will be based on material containing 1.25 percent nickel. Reserves are considered to be fully adequate for long-term output.

This investment will create one of the largest single private enterprises in the country. In addition to the direct benefit of being a source of foreign exchange, the project will employ about 700 persons and open an important new section of the country for development.

It appeared at yearend that U.S. interests were also becoming interested in nickel-bearing laterite deposits adjacent to EXMIBAL's property.

Nonmetals.—*Mica.*—Mica de Guatemala mines and exports green mica, but output statistics were not available. The firm's chief activities were centered in the Zacualpa area in Quiché Department. Mica deposits of potential value are known to exist elsewhere. Output is exported to Japan and Europe in the form of block and scrap.

Mineral Fuels.—*Petroleum.*—The Abularach No. 1 San José well, reported in Volume IV of the Minerals Yearbook for 1964, suspended drilling operations in May. Casing was run to total depth of 1,727 feet. The test remained inactive for the remainder of 1965.

Esso Standard (Guatemala), Inc., was awarded exploration rights over a 396,968-hectare offshore block on the Pacific Ocean side of the country. Exploration work was initiated immediately.

Texaco, Inc., began operations at its new refinery in early 1965, helping to account for the country's 194 percent increase in refined products for the year. Capacity of the installation is rated at about 8,500 barrels a day, of which about 8,000 barrels is being used.

Refineria Petrolera de Guatemala-California, Inc., was tripling its capacity to 12,500 barrels a day. Upon completion of the planned expansion, total Guatemalan refining capacity will be about 21,000 barrels a day, compared with domestic consumption of some 10,000 barrels daily. Local consumption of products was increasing at 4 to 5 percent annually, which suggests a need for export markets if total refining capacity is to be utilized.

HONDURAS

The small mineral industry of Honduras increased output in terms of both tonnage and value in nearly all commodities in 1965. New industry starts were made in steel rolling and marble quarrying and dressing. An integrated steelmaking facility and a petroleum refinery were being considered.

The economy generally functioned on a rising scale. The 1965 gross national product, an estimated $504 [13] million (at current prices), was more than 9.5 percent greater than in the previous year, while the value of mineral output in 1965 was estimated at $13.7 million.

While only a few mining companies were actually in production in Honduras, 37 mining or petroleum firms were officially reported.

In 1965 about 1,200 persons were employed in mining; salaries were valued at $1.7 million. Taxes paid by mining companies to the Honduran Government amounted to slightly under $1 million.

Although no new laws concerning mining or petroleum were passed during 1965, a useful compendium of laws affecting business was published in English during the year. Included in the volume were translations of the mining law of 1937, amended in 1950, and of the petroleum law of 1962.[14]

PRODUCTION

The increased value of apparent mineral production in 1965, about 24.5 percent over 1964 levels, was accounted for largely by increased output of precious and base metals. Statistics on mineral production and value were incomplete in regard to nonmetals and building materials.

Silver, valued at $4.7 million, accounted for 34.3 percent of estimated total value of mineral production.

[13] Where necessary, values have been converted from Honduran lempiras (L) to U.S. dollars at the rate of L1=US$0.50.

[14] Zacapa, J. F., R. A. Zacapa, P. Callejas, and A. R. Hernández. A Statement of the Laws of Honduras in Matters Affecting Business. Pan American Union, General Secretariat, Organization of American States, 342-E-4370 Washington, D.C., 1965, 275 pp.

Table 11.—Honduras: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Cadmium, content of concentrate	4.6	14.0	e 87.0	e 104.6	97
Gold, troy ounces	2,274	2,811	3,070	3,401	4,090
Iron and steel semimanufactures	---	---	---	---	[1] 2,331
Lead, content of concentrates	6,134	5,917	e 8,300	7,484	9,654
Silver, thousand troy ounces	3,545	3,180	3,164	e 3,220	3,671
Zinc, content of concentrate	6,644	6,584	[2] 9,900	8,568	11,126
Nonmetals:					
Cement	41,890	55,913	60,480	72,843	93,966
Lime, calcined	10,433	[3] 684	[3] 544	[3] 916	[3] 840
Limestone	NA	NA	NA	118,114	115,215
Salt [2]	984	1,906	3,190	5,909	NA

e Estimate. NA Not available.
[1] Production commenced in May 1965.
[2] Exports.
[3] Consumption at El Mochito mine only.

TRADE

Values of mineral imports and exports, as determinable from available sources, were $10.7 million and $8.7 million, respectively, in 1965. Total commodity imports were valued (c.i.f. basis) at $121.9 million and exports (f.o.b. basis) at $126 million.

The United States supplied about 47 percent of total Honduran imports and received 57 percent of that country's exports by value in 1965.

Nonmetallic mineral exports were supplied to neighboring countries, but except for petroleum products, relatively few commodities came from Central American and Caribbean sources.

Honduran trade within the Central American Common Market group is not expected to show much increase until industrial expansion increases within the country.

COMMODITY REVIEW

Metals.—*Cadmium, Gold, Lead, Silver, Zinc.*—Increases in output of all metals mined except cadmium were attributed to expanded operations at El Mochito mine of New York and Honduras Rosario Mining Co. New records were set in tonnages mined and milled and in mill recovery percentages. Metallurgical results for gold and silver recovery were improved by finer grinding and better washing efficiency of pulp in the cyanide circuit.

An expansion plan was furthered during the year to bring milling capacity to over 700 tons daily.

Assured and probable ore reserves as of December 31, 1965, were 1,025,061 tons containing 19.1 million ounces of silver, 20,166 ounces of gold, over 70,000 tons of lead, and more than 71,000 tons of zinc.

El Mochito had 892 employees during 1965, an increase of 47 from the 1964 level.

Iron and Steel.—Aceros Industriales, S.A., commenced reinforcing-rod production at its plant near San Pedro Sula early in 1965. While the plant operated, 2,331 tons of rods was produced. The plant operated on billets imported from Europe. Only 1 shift a day was being worked, but if the planned 3 shifts are put on, monthly output of about 1,200 tons can be expected.

Plans were announced to expand production lines to include angles and shapes.

In April 1965, the Banco Central de Honduras issued a résumé of efforts to establish a local steel plant.[15] Plans at the time the report was made called for a 50,000 ton-a-year facility founded on domestic iron ore, charcoal, and limestone resources.

An iron ore source had been acquired and eucalypt plantations were started on an experimental scale as a source of charcoal. At yearend indications were that the Honduran Government was serious about establishing a domestic steel industry.

[15] Humberto León, and Ricardo Alduvín. Proyecto Siderúrgico de Honduras. Banco Central de Honduras, Comisión Siderúrgica, Tegucigalpa, D.C., Apr. 30, 1965. 5 pp.

Table 12.—Honduras: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Gold—troy ounces	3,044	3,255	All to United States.
Iron and steel scrap	329	28	Japan 14; El Salvador 9; Guatemala 5.
Lead, ore and concentrate	9,900	10,387	All to United States.
Silver, all forms—troy ounces	4,856,499	3,220,371	Do.
Zinc, ore and concentrate	10,730	10,860	Do.
Other:			
Nonferrous ores and concentrates	1,660	1,814	Do.
Nonferrous scrap	42	35	West Germany 18; Japan 17.
Nonmetals:			
Cement:			
Asbestos	110	191	El Salvador 186; Nicaragua 5.
Portland	22,767	22,338	El Salvador 14,384; British Honduras 3,102.
Fertilizers, all types	14	---	
Gypsum	---	1,654	All to El Salvador.
Lime	21	9	Do.
Salt	3,190	5,909	El Salvador 4,184; Nicaragua 1,705.
Stone:			
Dimension	9	33	Nicaragua 23; El Salvador 9.
Industrial, type not specified	137	38	All to El Salvador.
Other nonmetallic minerals	18	4	Guatemala 3; El Salvador 1.

Table 13.—Honduras: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys, all forms	152	234	United States 173; El Salvador 23.
Copper and alloys:			
Metal, all forms	51	49	Mainly from United States.
Sulfate	35	34	Do.
Iron and steel:			
Pig iron	5	2	All from United States.
Scrap	3	3	Mainly from El Salvador.
Ingots and equivalent forms	965	1,895	United States 1,319; Czechoslovakia 480.
Semimanufactures	12,957	13,565	United States 6,502; Belgium 2,796.
Lead and alloys, all forms	24	44	United States 36; Belgium 5.
Silver and alloys, all forms troy ounces	900	772	United States 740; West Germany 32.
Tin and alloys, all forms long tons	5	5	Mainly from United States.
Zinc and alloys, all forms	99	49	Do.
Other:			
Nonferrous minerals	1	4	Mexico 3; United States 1.
Nonferrous metals	2	1	All from United States.
Nonmetals:			
Abrasives:			
Corundum and emery	(1)	(1)	
Diamond, industrial carats	195,000	35,000	All from United States.
Asbestos	186	970	Mainly from Canada.
Cement:			
Asbestos	1,059	565	El Salvador 523; United Kingdom 33.
Portland	5,361	5,804	Mainly from El Salvador.
Clay and clay products:			
Kaolin	6	6	Guatemala 4; United States 2.
Refractory and common	4	66	All from United States.
Nonrefractory brick	55	34	El Salvador 24; Spain 9.
Refractory brick	482	175	United States 126; Mexico 45.
Diatomaceous earth	77	86	Mainly from United States.
Fertilizers:			
Nitrogenous	12,619	14,799	West Germany 7,863; Netherlands 3,655.
Phosphatic	47	3,204	United States 1,634; West Germany 1,524.
Potassic	1,738	5,991	Mainly from United States.
Mixed	1,017	2,859	Costa Rica 1,779; United States 620.
Graphite	3	3	United States 2; France 1.
Gypsum:			
Crude	---	(1)	Mainly from Mexico.
Calcined	17	16	Mainly from United States.
Lime, all types	273	556	United States 303; El Salvador 134.
Marble	17	10	Guatemala 8; Italy 2.
Quartz	11	45	All from United States.
Salt, all forms	1,784	1,646	El Salvador 1,413; United States 233.
Sodium carbonate	20	50	United States 30; United Kingdom 20.
Sodium hydroxide	878	922	United Kingdom 446; United States 414.
Stone:			
Industrial, type not specified	313	---	
Sand and gravel, crushed rock	2	24	Mainly from El Salvador.
Sulfur, all forms	46	111	Mainly from United States.
Talc, natural or ground	25	17	Italy 12; United States 3; West Germany 2.
Mineral fuels:			
Coal	96	189	United States 139.
Coke	3	10	All from West Germany.
Mineral tars and products	74	2,481	Mainly from United States.
Natural gas liquids	1,215	1,289	Mainly from Venezuela.
Petroleum:			
Crude and partially refined	68,275	69,613	Netherlands Antilles 54,644.
Refinery products:			
Gasoline	44,712	51,464	Netherlands Antilles 44,708.
Kerosine	13,611	15,158	Netherlands Antilles 12,895.
Distillate fuel oil	94,126	84,885	Netherlands Antilles 78,584.
Lubricants, including greases	4,465	4,138	United States 4,031.
Paraffin, vaseline, waxes	761	648	Mainly from United States.
Asphalt and coke	449	2,746	United States 1,789.

[1] Less than ½ unit.

Nonmetals.—An unnamed Italian group was nearly ready to start processing local marble in San Pedro Sula. The marble, said to be of excellent quality, will be quarried, cut, and polished for local and export sale.

Mineral Fuels.—*Petroleum.*—Slightly less than 10.5 million hectares were under concession for oil and gas rights during 1965. Concession boundaries must be modified by May 27, 1966, in order to conform to the 1962 petroleum code that limits the

number of hectares in a concession and requires boundaries to bear north-south and east-west.

No geological or geophysical exploration activity was reported in Honduras during the year.

International Geophysical Explorations, Inc., drilled three tests on the north coast about 30 kilometers east of Tela. Two of the tests were less than 1,000 feet in depth and bottomed in igneous or metamorphic basement. Results of the third test were unreported.[16]

It was announced in late 1965 that Gulf Oil Corp. was seeking approval to build a refinery at Puerto Cortés; proposed daily capacity was to be 6,000 barrels to supply local consumption estimated at 5,000 barrels a day.[17] Estimated cost of the refinery was $12 million.

Texaco Caribbean, Inc., was also interested in establishing a refinery in Honduras at the Puerto Cortés site. It was understood at yearend that Texaco had received government approval of its project.

NICARAGUA

The economy of Nicaragua showed sustained growth in 1965 with an increase in the gross domestic product (GDP) of 9.7 percent over 1964 levels,[18] but the mineral industry did not keep pace with this growth rate. Mining, with a contribution of about $7.5 million,[19] accounted for 3.1 percent of the GDP. While the actual value of mining output rose in 1965 by 2.7 percent over that of 1964, the contribution to the GDP declined from the 1964 contribution of 10.8 percent.

No new metal mines were reported to have been put in operation during the year. However, geological surveys for mineral resources were being carried on. Results may be announced in 1966.

The largest part of mining and petroleum refining investment was held by U.S. and Canadian interests.

The Government continued to welcome foreign investment and placed no restrictions on incoming capital. Joint ventures with domestic capital were favored but were by no means obligatory.

Decree 1067 of March 20, 1965, enacted the Special Law on the Exploration and Exploitation of Mines and Quarries.[20] Publication date of the law in La Gaceta was March 24–27, 30, 1965.

The new legislation, consisting of 177 articles, replaced the Mining Code of 1906 and supplemented the General Law on the Exploitation of Natural Resources of 1958.

The newly constituted National Mining Commission was to establish fiscal and performance standards for concessionaires under the new law. Additionally it was to serve as an advisor to the Ministry of Economy on mining matters. The Minister of Economy was to serve as Chairman of the Commission. Other members named were the Minister of Finance, the President of the Central Bank of Nicaragua, and the general manager of the National Development Institute; the mining industry was to be represented by one member chosen by the President of the Republic from a list of five names submitted jointly by mining enterprises in the country. The minority party was to have a member on the Commission.

Under the new law, the Office of the Director General of Natural Resources was to be responsible for inspection and supervision of mining and quarrying operations.

Rules for exploration and exploitation of concessions were laid down, payments of guarantees, fees, and taxes were described, and measures to protect land owners, principals, and the Government were described.

Mines were differentiated from quarries; definitions and rules governing each type of activity were stated.

Industrywide reaction to the new law was not available. One company expected that "operating conditions will be not less favorable than under our present contract with the Government of Nicaragua."[21]

[16] Bulletin of the American Association of Petroleum Geologists. V. 50, No. 8, August 1966, p. 1602.

[17] Petroleum Press Service. November 1965, p. 435.

[18] U.S. Embassy, Managua, Nicaragua. Department of State Airgram A–47, Aug. 13, 1966, 13 pp.

[19] Where necessary, values have been converted from Nicaraguan córdobas (C$) to U.S. dollars at the rate of C$7=US$1.

[20] Marenco, J. J. Lugo. A Statement of the Laws of Nicaragua in Matters Affecting Business. Pan American Union, General Secretariat, Organization of American States, Washington, D.C., 3d ed., 1965, pp. 177–186 (English translation).

[21] La Luz Mines Limited. 27th Annual Report for the Year Ended Sept. 30, 1965. 16 pp.

PRODUCTION

Gains of 10 percent and 14 percent were made in copper and silver production, respectively, while declines of 12 percent in gold output and 8 percent in petroleum refinery products were registered.

Preliminary figures published by the Banco Central de Nicaragua[22] put the value of metallic minerals produced at $14.8 million. Of this total, copper accounted for 51 percent, gold for 46 percent, and silver for 3 percent. Nonmetallic mineral output was valued at $5.1 million, and the value of petroleum refinery products was reported at $6.3 million. This figure includes the value of refinery fuel and losses.

Table 14.—Nicaragua: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Copper concentrate, metal content	6,277	7,272	7,283	9,240	10,189
Gold, troy ounces	226,251	221,984	204,769	225,581	198,152
Silver, do	417,253	500,050	405,252	r 332,370	380,377
Nonmetals:					
Cement	39,019	45,906	53,812	61,052	65,859
Diatomaceous earth	e 2,722	1,283	e 1,600		
Gypsum	NA	3,250	2,500	5,500	5,000
Lime	25,460	26,013	28,400	26,392	26,684
Limestone [1], thousand tons	110	122	140	148	157
Salt, marine	12,474	9,467	16,495	17,319	17,582
Mineral fuels: Petroleum refinery products:					
Motor gasoline, thousand 42-gallon barrels	---	---	399	606	674
Kerosine and jet fuel, do	---	---	116	163	152
Distillate fuel oil, do	---	---	240	404	471
Residual fuel oil, do	---	---	371	583	308
Liquefied petroleum gas, do	---	---	11	18	27
Total, do	---	---	1,137	1,774	1,632

e Estimate. r Revised. NA Not available.
[1] For cement and lime production only.

TRADE

Preliminary figures for 1965 showed that Nicaragua's net foreign trade balance was a positive $6.3 million. The total value of exports was $143.0 million (f.o.b. basis), and that of imports was $136.7 million (f.o.b. basis). Exports of gold, silver, and copper totaled $11.3 million. There were also minor amounts of nonmetals, zinc, and scrap metals exported for which value was not available. Petroleum refinery activity was reflected in declining imports of selected products.

Metal exports went chiefly to the United States, Canada, and Europe. There were minor mineral exports to neighboring Central American countries.

In 1965 the United States supplied about 45 percent of all of Nicaragua's imports by value and took nearly 23 percent of its exports.

Trade among the Central American Common Market countries continued to increase; various trade advantages for products manufactured within the community provided incentive for manufacturing and fabricating firms to initiate new plants.

[22] Banco Central de Nicaragua. Informe Anual 1965. Managua, Nicaragua, 1966, 248 pp.

Table 15.—Nicaragua: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Copper concentrates, gross weight	12,748	34,083	West Germany 31,961; United States 2,122.
Gold, bars and ingots, troy ounces	203,386	200,749	United States 80,377; United Kingdom 64,751.
Iron and steel:			
Ingots and semimanufactures	284	1,943	Costa Rica 1,171; Guatemala 472.
Scrap	46	73	Netherlands 32; Japan 22; West Germany 19.
Silver, bars and ingots, troy ounces	203,514	168,791	United States 135,548; United Kingdom 17,554.
Zinc, all forms	328	104	El Salvador 62; Costa Rica 34.
Nonmetals:			
Lime	9	11	All to Costa Rica.
Salt	211	96	Do.

Table 16.—Nicaragua: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys: Semimanufactures	275	286	United States 93; El Salvador 79.
Copper and alloys:			
Metal, semimanufactures	73	156	United States 76; Mexico 41; Canada 19.
Sulfate	15	27	United States 18; Netherlands 8.
Iron and steel:			
Iron ore	---	2	All from United States.
Scrap	13,356	755	Do.
Pig iron	10	10	All from West Germany.
Ingots and equivalent primary forms	1,502	95	United States 64; United Kingdom 14.
Semimanufactures	18,578	32,016	Japan 9,464; Belgium 8,096; United States 5,873.
Lead and lead alloys:			
Unwrought	55	92	West Germany 44; United States 21.
Semimanufactures	8	4	Mainly from United States.
Silver and alloys, all forms troy ounces	6,912	8,359	United States 8,102; United Kingdom 257.
Tin and alloys:			
Unwrought long tons	17	18	United Kingdom 16; United States 2.
Semimanufactures do	3	5	United Kingdom 3; United States 1; West Germany 1.
Zinc and alloys:			
Unwrought	619	713	West Germany 253; Belgium 201; United States 199.
Semimanufactures	66	39	United States 31; Guatemala 7.
Other nonferrous minerals, metals, and scrap	3	5	Mainly from Honduras.
Nonmetals:			
Abrasives, natural	1	3	Italy 1; United Kingdom 1; United States 1.
Asbestos	33	56	Mainly from United Kingdom.
Cement:			
Asbestos	1,768	3,510	Italy 2,036; El Salvador 1,018.
Portland	3,628	12,474	West Germany 4,967; Honduras 2,449.
Clay and clay products:			
Common and refractory	202	252	United States 236; United Kingdom 8.
Common clay brick	34	2	All from Costa Rica.
Refractory clay brick	294	247	United States 146; Costa Rica 35; Italy 26.
Feldspar, fluorspar, cryolite	4	---	
Fertilizers:			
Nitrogenous	12,361	4,322	Costa Rica 2,022; Netherlands 903.
Phosphatic	1,968	4,620	Netherlands 2,982; United States 1,638.
Potassic	366	771	West Germany 636; United States 135.
Mixed	7,191	16,286	United States 11,077; Costa Rica 2,986.
Graphite	2	[1]	
Lime, all types	974	1,747	Mainly from United States.
Mica	2	---	
Salt	589	1,970	Honduras 1,497; United States 287.
Sand and gravel, and crushed rock	5	12	All from United States.
Sodium carbonate	220	317	United States 220; United Kingdom 60.
Sodium hydroxide	1,336	2,071	United Kingdom 1,572; United States 370.
Stone:			
Dimension	239	1,331	Italy 1,035; Guatemala 142.
Industrial	20	25	West Germany 11; Italy 8; United States 6.
Sulfur	6,832	280	United States 150; West Germany 130.
Mineral fuels:			
Coal	14	14	United States 11; West Germany 3.
Coke	71	42	All from West Germany.
Mineral tars and products	730	5,193	United States 4,024; Venezuela 1,145.
Natural gas liquids	277	37	All from United States.
Petroleum:			
Crude and partially refined thousand 42-gallon barrels	1,003	1,884	All from Venezuela.
Refinery products:			
Gasoline do	356	124	Netherlands Antilles 103; El Salvador 12.
Kerosine do	137	82	Mainly from Netherlands Antilles.
Fuel oil, all types do	460	63	Netherlands Antilles 43; United States 20.
Lubricants including greases	4,017	6,388	Mainly from United States.
Paraffin, vaseline, waxes	930	1,125	Do.
Asphalt and coke	2,957	3,945	Venezuela 3,442; United States 352.

[1]Less than ½ unit.

COMMODITY REVIEW

Metals.—*Copper.*—Byproduct copper concentrate production began in March at the La Luz gold-silver-copper mine of La Luz Mines Limited. The flotation circuit operated successfully and was reportedly responsible for improvement in silver recovery as well. Operations at Rosita copper mine were maintained at the expense of La Luz during a period of inadequate power.

Copper output for the fiscal year at Rosita showed an 18.8-percent increase over that of the preceding fiscal year; copper production for the calendar year 1965 increased 10.3 percent over that of 1964. Reserves at Rosita as of September 30, 1965, totaled 1.5 million tons averaging 3.91 percent copper and 0.079 ounce of gold per ton, sufficient for 5½ years' operation at plant capacity. The total number of employees during the fiscal year averaged 477.

Gold and Silver.—The tonnage of ore milled by La Luz Mines Limited during the fiscal year ended September 30, 1965, declined 2.5 percent from that milled in 1964. The decline was reportedly the result of lack of power during the dry season, maintenance work on the hydroelectric plant, and failure of the skip hoist motor.

Gold output for the fiscal year was 56,048 troy ounces, and silver output totaled 26,641 ounces.

Positive ore reserves for 1965–66 were put at 3.0 million tons averaging 0.101 ounce of gold; possible reserves were announced at 4.2 million tons averaging 0.096 ounce.

Employment averaged 1,133 persons during the year.

Empresa Minera de El Setentrion, controlled by Noranda Mines Ltd., produced 56,072 ounces of gold and 14,638 ounces of silver.

Production at the Neptune Gold Mining Co. of the American Smelting and Refining Co. was not made public in 1965.

Iron and Steel.—Rheen International, Inc., expected to establish a joint venture with domestic interests for the manufacture of steel drums for lubricants and chemicals.

The Dutch firm of Van Leer also expected to establish a steel drum and cylinder manufacturing facility.

A new firm, Aceros Nacionales, S.A., was established to produce steel rods and angles.

Nonmetals.—*Chemicals.*—A base for establishing a chemical complex in Nicaragua was created in September by the formation of Electro-Quimica Pennsalt, S.A. (ELPESA) and Hercules de Centroamerica, S.A. (HERCASA). ELPESA will produce caustic soda, chlorine, hydrogen, and hydrochloric acid. HERCASA will manufacture chlorinated camphene insecticides. Both firms are joint investments of U.S. and Central American capital, with the latter holding the majority interest.

The Central American Bank for Economic Integration authorized loans of $1.7 million and $1.1 million for ELPESA and HERCASA, respectively.

Nicaragua was granted monopoly status for the caustic soda-insecticide complex by the Central American Common Market in accordance with its Protocol.

The two plants represented an investment of $6.4 million.

Fertilizer Materials.—Interore de Centro America S.A., owned in equal shares by local farmers and the Occidental Petroleum Corp. of Los Angeles, was formed to produce mixed fertilizers. The compounding and mixing plant will be located at Corinto, 144 kilometers from Managua. Initial capacity will be 75,000 tons of mixed fertilizers a year.

Mineral Fuels. — *Petroleum.* — Interest in offshore leasing increased during 1965. Although only 300,000 hectares were held under lease in early 1965, it was reported that at yearend 1.2 million hectares were held in concessions and an additional 1.2 million hectares had been filed upon.

Applications covered the offshore areas on both the Atlantic and Pacific coasts.

Only 2½ party-months of marine seismic work was done in 1965, but it was expected that the various companies involved would start prospecting work as applications were granted.

Esso Standard Oil S.A. Ltd. refined 1.7 million barrels of crude oil in 1965 at its refinery near Managua. Plans were announced to double the plant's refining capacity to approximately 11,000 barrels of crude oil per day. Cost of the expansion was estimated at $4.6 million.

Esso, with the only refinery in the country, supplied the three other distributors, Texas Petroleum Co., Shell Oil Co., and Standard Oil Co. of California (Chevron).

PANAMA

Except for refined petroleum, Panama's limited mineral industry produced only salt, construction materials, and semimanufactures of aluminum and steel. The metals and petroleum refining segments were founded on imported raw materials.

Value of domestic mineral production in relation to the gross domestic product is minuscule.

In August 1965 the Government and the United Nations Special Fund agreed to conduct a minerals survey over 20,000 square kilometers covering the Azuero Peninsula and a belt north to the Caribbean coast. The survey was scheduled to take 3 years and to cost about $1.4 million.[23]

The purpose of the project is to assess mineralized zones in order to outline a mining development plan which, it is hoped, will attract investment. The plan calls for airborne geophysical surveys, regional geological and geochemical examinations, and in-service training of selected staff members of the Panama Department of Mineral Resources.

The Agency for International Development is sponsoring a minerals investigation program to determine the resources of the Santiago-Chitre-Aguadulce area. Exploration will be aimed primarily at agricultural-use minerals for local consumption. The contract was signed in October 1965, but status of the work was not known at yearend.

A consortium of three companies planned a rural cadastral survey. Financing was to be partly provided by the Agency for International Development in accord with an Alliance for Progress Loan Agreement between the Republic of Panama and the United States. While this survey is not aimed primarily at mineral resources, the nature of the work does not preclude discovery.

Some interest in acquiring concessions covering the mining of gold, iron-bearing beach sands, manganese, and copper was reported, but there were no concrete plans for development in evidence by yearend.

Late in 1965, it was announced by Panamanian interests that financing had been arranged for test drilling on oil concessions held in the Provinces of Panama and Darien.

The Government of Panama was trying to promote interest in local bauxite resources. Two U.S. companies examined the deposits some years ago but apparently were not particularly impressed by the results.

There were no significant changes in government mineral legislation or policy.

PRODUCTION

Output of minerals, metals, and petroleum products showed irregular movement for 1965 in comparison with 1964 results. Banner performances on the plus side were shown in volumetric output of cement and petroleum refinery products with increases of 32.3 percent and 12.5 percent, respectively; production of motor gasoline alone increased 19.4 percent over the previous year.

Some new aluminum products were added to the aluminum manufactures, particularly low-pressure cylinders for bottled gas. A widespread market was expected to develop in Central and South America for the cylinders.

In achieving record production in 1965, Cemento Panamá, S.A., reportedly operated at 80 percent capacity. Some thought was apparently given to increasing the plant's capacity by 500 tons per day; this would bring theoretical daily production capability to 1,130 tons.

Expansion was also reported at the locally owned plant of Concreto, S.A. Production statistics are not available, but the firm was the major Panamanian supplier of concrete pipe and forms and ready-mixed concrete.

TRADE

Total imports during 1965 amounted to $208.5 million, compared with total exports of $69.0 million, resulting in a negative trade balance of $139.5 million.

The United States was Panama's best customer, receiving about 61 percent of all exports; Panama imported 42.3 percent of all its goods from the United States. This is in accordance with traditional trade patterns.

---

[23] Where necessary, values have been converted from Panamanian balboas (B) to U.S. dollars at the rate of B1=US$1.

Table 17.—Panama: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals: [1]					
Aluminum extrusions, pipe, tubes, bars, etc.	---	---	45	360	338
Steel reinforcing rods and small shapes [2]	---	e 4,000	6,350	12,500	11,000
Nonmetals: [3]					
Asbestos cement	NA	NA	e 545	409	978
Cement	113,867	122,406	141,713	125,178	165,640
Clay and shale	e 30,000	e 35,000	e 35,000	r 43,227	133,707
Limestone and siltstone, for cement	202,316	e 210,700	217,748	e 211,700	208,991
Salt	r 7,727	r 11,231	10,082	r 11,020	11,480
Mineral fuels: Petroleum refinery products:					
Motor gasoline thousand 42-gallon barrels	---	1,192	2,241	2,047	2,445
Jet fuel do	---	30	200	375	377
Kerosine do	---	628	524	581	770
Distillate fuel oil do	---	1,381	4,398	4,525	3,235
Residual fuel oil [4] do	---	3,119	6,368	6,714	6,378
Other do	---	307	NA	367	3,225

e Estimate. r Revised. NA Not available.

[1] Fabricated or processed from imported raw materials.

[2] Fiscal year ending Oct. 31.

[3] Panama also produces sand and gravel and crushed rock.

[4] Does not include fuel oil consumed in refinery.

Trade in crude petroleum and products comprised the largest part of Panama's overseas business by value. In 1965, value of imported crude and partly refined petroleum was $40.8 million, and that of products was $2.3 million. In the same year, products valued at $23.7 million were exported.

About 96 percent of crude imports came from Venezuela, and Colombia supplied the remainder. Product exports went chiefly to Canada, the Canal Zone, the United States, and the United Kingdom.

Recorded petroleum exports to the Canal Zone must be considered with care and are probably not a true reflection of trade. The reason for this is that ordinarily an undetermined quantity of products is merely stored in the Canal Zone for eventual reentry into Panama. Fuel sold at the airport for international jets is not tabulated as an export.

The following table compares imports of petroleum commodities for 1964 and 1965:

Commodity	Value (thousand dollars) 1964 (f.o.b. basis)	1965 (c.i.f. basis)
Crude oil	33,725	40,841
Refinery products:		
Aviation gasoline	193	[1] 82
Motor gasoline	25	
Kerosine	43	48
Distillate fuel oil	427	634
Residual fuel oil	445	
Lubricants, including greases	807	1,285
Gasoline additives	---	(1)
Other	171	126

[1] Gasoline additives included with gasoline.

COMMODITY REVIEW

Metals.—*Aluminum.*—The name of the only aluminum extrusion plant in Panama, Ingeniera Amado, S.A., was changed to Aluminio de Panamá, S.A., although ownership was retained by the Amado family. In addition to various types of aluminum tubing, frames, bars, and jalousies, the company manufactured corrugated aluminum and galvanized roofing. The roofing segment of the business had sales of about $400,000 in 1965, while sales value of other aluminum products totaled between

Table 18.—Panama: Exports and reexports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Exports:			
Metals: Nonferrous scrap	---	1,104	Japan 414; Italy 398.
Nonmetals: Cement	---	36	All to Nicaragua.
Mineral fuels: Petroleum refinery products thousand 42-gallon barrels	4,758	10,040	United States 3,375; Canal Zone 2,802; Netherlands 1,989.
Reexports:			
Metals:			
Copper sulfate	73	---	
Iron and steel:			
Scrap	1,000	---	
Primary forms	2	---	
Semimanufactures	50	474	Mainly to Colombia.
Nonferrous scrap	623	---	
Platinum, unworked troy ounces	129	---	
Nonmetals:			
Cement	---	179	All to Costa Rica.
Lime	7	---	
Mineral fuels: Lubricants 42-gallon barrels	30	12	Costa Rica 7; Dominican Republic 4.

Source: Anuario de Comercio Exterior, 1962 and 1963.

Table 19.—Panama: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Aluminum and alloys:			
Unwrought	---	109	All from United States.
Semimanufactures	362	741	United States 666; Argentina 24.
Copper and alloys:			
Sulfate	11	---	
Semimanufactures	119	189	United States 135; Canada 27.
Iron and steel:			
Pig	1	1	All from United States.
Scrap	607	385	All from Canal Zone.
Ferroalloys	2	7	Mainly from West Germany.
Primary forms	r 2,558	7,149	Venezuela 5,112; West Germany 2,027.
Semimanufactures:			
Bars, rods, shapes	r 4,571	3,882	Belgium 1,697; United States 524.
Plates and sheets, all types	8,526	10,653	Japan 3,866; United States 3,663; Belgium 1,180.
Pipe and tubes	r 9,448	6,929	United States 2,286; Costa Rica 2,189.
Other	r 2,317	2,295	Belgium 758; United States 703; West Germany 574.
Lead metal, all forms	r 163	199	Denmark 101; United States 61.
Platinum and platinum-group metals troy ounces	353	4,115	All from United States.
Silver, bars, ingots, sheets ---do---	9,259	7,523	Do.
Tin metal, all forms ---long tons---	27	25	Netherlands 12; West Germany 6.
Zinc metal, all forms	20	3	Mainly from United States.
Other nonferrous metals	1	---	
Nonferrous scrap	313	79	All from Canal Zone.
Nonmetals:			
Asbestos, raw, washed or ground	187	4	Do.
Abrasives:			
Emery, corundum, pumice	60	8	France 5; United States 2.
Industrial diamond ---carats---	20,000	---	
Cement:			
Portland	1,394	2,291	West Germany 1,279; Colombia 977.
White	1,588	2,138	United Kingdom 1,283; France 468; Belgium 177.
Clays:			
Unprocessed	240	232	All from United States.
Refractory bricks	626	164	United States 145.

See footnotes at end of table.

Table 19.—Panama: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal sources, 1963
Nonmetals—Continued			
Fertilizers:			
Natural:			
Phosphate rock	2	5	All from Denmark.
Sodium nitrate	10	24	All from Chile.
Manufactured:			
Nitrogenous	11,649	15,565	Netherlands 7,884; West Germany 4,980.
Phosphatic	1,577	1,228	Netherlands 618; United States 465.
Potassic	460	579	West Germany 577.
Mixed	3,277	2,655	United States 1,643; Netherlands 904.
Gypsum:			
Crude	5,074	6,358	Dominican Republic 6,345; United States 13.
Calcined	875	33	All from United States.
Infusorial earth, not as abrasive	118	203	United States 202.
Lime	357	828	United Kingdom 643; United States 159.
Marble, block and ground	313	395	All from Italy.
Mica, untrimmed	(1)	(1)	
Salt, all types	287	387	United States 143; West Germany 100.
Sand	149	32	Belgium 25; United States 5.
Sodium carbonate	160	252	United Kingdom 150; United States 92.
Sodium hydroxide	1,024	737	United States 546; United Kingdom 176.
Stone:			
Dimension, worked and unworked	78	176	Canada 73; United States 73.
Industrial	227	476	Italy 357; United States 119.
Sulfur	8	8	West Germany 4; Netherlands 3.
Talc	208	121	United States 77; West Germany 30.
Other nonmetal minerals	9	12	All from United States.
Mineral fuels:			
Coal, coke, briquets	241	365	United States 213; Belgium 78.
Mineral tar	9	35	United States 26.
Petroleum:			
Crude and partially refined thousand 42-gallon barrels	r 7,736	14,704	Venezuela 13,645; Argentina 721.
Refinery products:			
Aviation gasoline do	136	133	All from Canal Zone.
Motor gasoline do	539	48	Canal Zone 44.
Jet fuel do	330	142	All from Canal Zone.
Kerosine do	178	13	Canal Zone 9; Costa Rica 4.
Distillate fuel oil do	320	95	All from Canal Zone.
Residual fuel oil do	1,099	642	Canal Zone 636; Curacao 6.
Lubricants including greases	5,150	2,121	United States 1,745; Curacao 160.
Other	4,450	3,341	United States 1,757; Canal Zone 1,537.

r Revised.
1 Less than ½ unit.

Source: Anuario de Comercio Exterior, 1962 and 1963.

$600,000 and $700,000. Over 65 percent of sales were made in the domestic market, with some exports to Costa Rica and Nicaragua. Extrusions are manufactured from imported billets, and roofing sheets are made from imported aluminum and galvanized sheets.

An aluminum anodizing facility was installed during the year.

Sealgas, S.A., jointly owned by Aluminio de Panamá and Tropigas of Miami, Fla., began production of low-pressure aluminum cylinders for the bottled gas trade. Demand for such containers was high, and the value of 1965 production was reported at about $300,000. The cylinders were made from sheet aluminum imported principally from Japan. About one-half of the first year's output was sold in Central American countries.

Iron and Steel.—At yearend, Productora de Acero y Afines Asociada, S.A., was organized to engage in the manufacture of iron and steel products. Ownership reportedly was held by Panamanian, U.S., and Jamaican interests. The proposed plant location was on Las Minas Bay, adjacent to property owned by Refinería Panamá, S.A.; arrangements were made to use the dock facilities of the refinery.

The plant was planned to operate on imported steel ingots (100,000 tons annually) and produce reinforcing rods, beams, angles, and other semimanufactured products. At yearend, there were no reports of plant construction.

Acero Panamá, S.A., the only operating steel establishment in Panama, began the installation of its 3-ton Brown Boveri electric furnace and two Sulzer diesel genera-

tors, which were expected to permit the processing of as much as 24 tons of scrap metal daily. In 1965, the mill worked on ingots principally imported from Belgium. Production of barbed wire, staples, and cyclone fencing was inaugurated during the year, using imported galvanized wire as a base. The company was investigating the possibility of producing drawn wire; a galvanized iron pipe facility was also under consideration, probably to be under a joint-venture arrangement.

The company output of reinforcing rods, small shapes, and other products was 11,000 tons for its fiscal year ended October 1965; this was a slight decrease from the previous year's attainment.

Nonmetals.—*Cement.*—Cemento Atlántico, S.A., which had been expected to enter into production in 1965, did not complete its facilities. Work on the plant and port amenities was still in progress at yearend.

Salt.—Production, refining, and distribution of solar salt is controlled by the Government's Institute for Economic Development. Value of production in 1965 was estimated at about $280,000. Imports of specialized salt forms supplement local output.

Mineral Fuels.—*Petroleum.*—No drilling or exploration activity was reported in 1965. Some petroleum concessions were allowed to lapse during the year, but it was believed that some 2.5 million hectares were held by local companies and individuals.

Refinería Panamá, S.A., the only petroleum refinery in Panama, was jointly owned by the Continental Oil Co. and National Bulk Carriers, Inc. It was reported [24] that Ultramar, Ltd., had begun to exercise an option to acquire a one-third interest in the refinery. When Ultramar completely exercises its option, the three companies will each hold a one-third interest in Refinería Panamá, S.A.

Consumption of petroleum products in Panama continued to rise in 1965. Rough estimates put the increased use of selected fuels over 1964 figures, in terms of percentage, as follows: Aviation gasoline 4, motor gasoline 10, jet fuel 10, and kerosine 3 to 4.

Refinería Panamá, S.A., processed 16.9 million barrels of crude and partly refined oil during 1965.

[24] Petroleum Press Service. V. 33, No. 12, December 1966, p. 459.

The Mineral Industry of the Islands of the Caribbean

By Burton E. Ashley [1]

Contents

CUBA

Information on mineral production, processing, and trade of Cuba remained scanty throughout 1965; statistics presented in this chapter are incomplete, estimated, and/or unverified but they are considered it is felt, adequate to make comparisons with mineral industry activities of previous years.

Late in 1966, information relating to production and trade of selected mineral commodities for 1963 and 1964 became available from Cuban Government sources.[2] This was the first official production data available to the Bureau of Mines since about 1960.

In terms of percentage contribution to the State industrial production in 1964, petroleum and derivatives accounted for 9.4 percent, mining 2.5 percent, and construction materials 3.9 percent; metallurgy combined with metal manufacturing contributed a total of 4.5 percent.

The monthly average number of persons at work in the mining industry in 1962, 1963, and 1964 was 16,936, 18,677, and 14,375, respectively; the average monthly salary in the mining industry during 1964 was $161.[3] Average monthly salaries in other industries during 1964 ranged from $151 in textiles and leather to $254 in electrical energy. Petroleum workers averaged $250 monthly, near the top of the wage scale.

PRODUCTION

Production data for 1961 and 1962 are estimates identical to those published in the Minerals Yearbook, volume IV, for 1964; data for 1963 and 1964 are revised from earlier Cuban publications and were taken from official Cuban Government sources; while figures for 1965 are estimates based on January to June output totals released by Cuban sources.

The preliminary total value of State industrial gross production in 1964 was reported as $2,516 million. Part of this total was made up of mining output, $62.4 million; production of petroleum and its derivatives, $236.2 million; construction materials output, $98.1 million; and chemical production, $242.2 million. Output of metallurgical and metal manufacturing facilities reportedly totaled $111.8 million.

Data in the production table for nickel and cobalt are listed as recoverable content in oxides and sulfides. These figures are based on gross weights of nickel and cobalt oxides and sulfides reported by Cuban authorities. The figures for recoverable content were arrived at by using factors of 78 percent combined nickel-cobalt in the

[1] Physical scientist, Division of International Activities.

[2] Junta Central de Planificacíon (JUCEPLAN), Dirección General de Estadística. Boletín Estadística de Cuba (Havana), 1965.

[3] Where necessary, values have been converted from Cuban pesos to U.S. dollars at the official rate of 1 peso equals US$1.00.

Table 1.—Cuba: Estimated production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963 [1]	1964 [1]	1965
Metals:					
Chromite, refractory grade	25,000	35,000	56,628	32,852	NA
Cobalt, in nickel sulfides	----	164	470	700	[2] 800
Copper, in concentrate	5,000	5,500	6,523	5,837	NA
Iron ore	2,000	1,000	NA	NA	NA
Iron and steel:					
Castings:					
Iron	NA	NA	8,656	14,418	NA
Steel	NA	NA	1,232	1,948	NA
Pipe and connections	NA	NA	NA	12,787	NA
Welding rods	NA	NA	NA	573	NA
Manganese ore:					
Chemical grade, 81 percent MnO_2	NA	NA	3,300	NA	NA
Metallurgical grade, 35 to 45 percent Mn	NA	NA	[3] 37,504	[3] 70,347	NA
Total	42,000	75,000	40,804	70,347	NA
Nickel:					
In oxide with cobalt, recoverable	14,805	14,716	14,625	14,712	[2] 18,350
In sulfide, recoverable	----	1,887	5,161	7,703	[2] 9,000
Total	14,805	16,603	19,786	22,415	[2] 27,350
Nonmetals:					
Cement, portland	400,000	300,000	811,600	805,600	NA
Dolomite	NA	NA	NA	1,964	NA
Gypsum	19,000	19,000	26,707	25,273	NA
Kaolin	1,000	3,000	5,800	NA	NA
Lime:					
Burned	NA	NA	5,426	4,711	NA
Hydrated	NA	NA	4,672	10,194	NA
Limestone, thousand tons	2,000	2,000	2,100	NA	NA
Marble:					
Block	NA	NA	6,513	9,522	NA
Rough slabs, square meters	NA	NA	28,450	47,968	NA
Finished slabs, do	NA	NA	18,846	21,245	NA
Pyrite, 48 percent sulfur	20,000	26,000	33,700	NA	NA
Sulfur content	9,000	11,700	15,200	NA	NA
Salt	60,000	70,000	80,000	87,000	NA
Sand:					
Silica, cubic meters	NA	NA	397,184	422,561	NA
Other, do	NA	NA	420,454	389,590	NA
Sodium hydroxide	NA	NA	1,259	1,396	NA
Sodium sulfate	NA	NA	1,602	1,536	NA
Stone, cubic meters	NA	NA	431,740	425,410	NA
Mineral fuels:					
Asphalt	NA	NA	49,489	49,112	NA
Gas, manufactured, million cubic feet	NA	NA	2,260	10,455	NA
Petroleum:					
Crude, thousand 42-gallon barrels	80	90	228	272	NA
Refinery products:					
Gasoline, do	4,780	6,170	6,605	6,392	NA
Kerosine, do	1,090	1,280	1,186	1,387	NA
Distillate fuel oil, do	3,910	4,790	3,611	3,447	NA
Residual fuel oil, do	10,440	12,400	14,799	13,007	NA
Lubricants, do	NA	NA	259	378	NA
Liquefied petroleum gas, do	NA	NA	534	545	NA
Other, do	870	800	NA	NA	NA

NA Not available.

[1] Junta Central de Planificacion (JUCEPLAN), Dirección General de Estadística. Boletín Estadística de Cuba. Havania, 1965.

[2] Based on official data for 6 months.

[3] Reported as sinter.

oxide and 55 percent nickel and 5 percent cobalt in the sulfide material (dry basis).

TRADE

No official statistics on Cuban trade are available for 1965; the most recent official trade reports cover 1963 and 1964 but are incomplete. These data indicate that 1964 exports of nickel industry products were valued at about $32.3 million while values for other mineral exports were: Other nonferrous metal products—$7.0 million, petroleum products—$185,723, and nonmetallic mineral products—$4,498.

Table 2.—Cuba: Exports of selected mineral commodities
(Metric tons)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Chromite	507	18,015	All to Czechoslovakia.
Copper concentrate [1]	16,349	22,369	Czechoslovakia 7,611; Poland 6,814; mainland China 3,888.
Manganese:			
Chemical Grade	2,948	915	All to Czechoslovakia.
Sinter	49,513	60,590	Czechoslovakia 35,664; Poland 24,926.
Nickel and cobalt oxide	1,501	494	All to Czechoslovakia.
Nickel and cobalt:			
Sinter	16,485	14,992	U.S.S.R. 13,563; mainland China 1,429.
Sulfide	9,095	15,884	All to U.S.S.R.
Nonmetals:			
Marble, all forms	NA	242	Netherlands 195; France 20.
Mineral fuels: Fuel oil	NA	22,447	All to Guyana.

NA Not available.
[1] Copper content reported at 29 percent.

Source: Junta Central de Planificacíon, Dirección General de Estadística. Comercio Exterior de Cuba. Havana, 1965.

Exports of all commodities from Cuba to non-Communist countries (as measured by import statistics of these countries) went primarily to Morocco, Spain, Japan, the United Kingdom and France, and totaled $123.1 million in 1965. However, in this total, Spain received no minerals, and Japan's receipts were almost entirely iron and steel scrap.

Polish trade publications provide the following data on imports from Cuba for 1964 and 1965 in metric tons. The 1964 data generally correspond to reported Cuban exports but include some materials not reported in Cuban sources.

Commodity	1964	1965
Chrome ore	---	4,223
Copper concentrate	6,489	4,410
Manganese ore	25,015	45,807
Nonferrous concentrates, other	---	299
Phosphatic fertilizers	49,000	54,000

Official Cuban import data for 1963 and 1964 do not provide information on the sources of commodities. However, comparison of data published in Soviet sources indicate that through 1964, the U.S.S.R. was by far the largest supplier of Cuban imports. Moreover, these sources indicate that Soviet shipments of most mineral commodities to Cuba in 1965 exceeded those of 1964. Also, Soviet sources list exports to Cuba of mineral commodities that do not appear in the partial Cuban trade returns.

The value of Soviet mineral exports to Cuba in 1965 as reported in Soviet sources totaled $98 million,[4] slightly more than 9 percent greater than in 1964.

Inconsistencies apparently are due to the time lag between shipments and receipt of the material in question.

In addition to the U.S.S.R., other Communist nations also report exports of mineral commodities to the island. Yugoslavian sources record the shipment of about 1,900 tons of metals valued at $222,000 in 1965, including copper pipe and tube, aluminum sheet and plate, and steel barbed wire and wire netting. Polish sources report exports of 36,000 tons of coal, 5,000 tons of coke, 5,000 tons of salt, and about 800 tons of petroleum products during the two years, 1964 and 1965.

Canada, the United Kingdom, Spain, France, and the United Arab Republic (Egypt) reported total commodity exports valued at $152.1 million to Cuba in 1965. Among these imports were relatively minor quantities of mineral commodities, the most prominent of which were fertilizers, iron and steel semimanufactures, and sulfur.

[4] Where necessary, values have been converted from rubles to U.S. dollars at the rate of 1 ruble =US$1.10.

Table 3.—Cuba: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964
Metals:		
Aluminum, all forms	3,447	3,729
Copper, all forms	4,129	2,750
Iron and steel:		
Bars and shapes	41,480	51,690
Pipe and fitting	26,588	26,117
Plates	22,664	39,620
Nonmetals:		
Cement:		
Portland	16,621	33,424
Other	---	10,804
Fertilizer materials:		
Nitrogenous:		
Ammonium nitrate	20,501	72,766
Ammonium sulfate	181,211	168,557
Urea	5,150	61,552
Phosphatic:		
Superphosphate	68,358	111,889
Triple superphosphate	4,545	57,852
Potassic:		
Potassium chloride	38,914	56,711
Potassium sulfate	11,900	8,406
Mixed	---	158,656
Anhydrous ammonia	10,279	8,566
Sulfur	45,784	51,228
Mineral fuels:		
Coal:		
Anthracite	48,191	61,645
Other	22,106	28,671
Coke:		
Metallurgical	28,318	19,164
For gas	---	12,781
Petroleum:		
Crude, thousand tons	3,709	3,469
Refinery products:		
Gasoline, do	154	85
Distillate fuel oil, do	11	186
Residual fuel oil, do	159	766
Lubricants, do	53	65

Source: Junta Central de Planificacion, Direccion General de Estadística. Comercio Exterior de Cuba. Havana, 1965.

Table 4.—U.S.S.R. mineral exports to Cuba

(Metric tons unless otherwise specified)

Commodity	1964		1965	
	Quantity	Value (thousand rubles)	Quantity	Value (thousand rubles)
Metals:				
Aluminum and alloys, all forms	3,600	2,798	4,300	3,028
Copper and alloys, all forms	3,700	3,089	5,100	4,848
Iron and steel:				
Pig iron	26,600	975	32,300	1,261
Ferroalloys	400	57	1,300	136
Semimanufactures:				
Pipe	17,900	2,817	24,100	3,737
Tinplate	24,200	4,963	24,100	5,240
Other rolled steel	72,500	8,110	81,000	9,728
Lead	1,700	336	700	286
Zinc	300	58	200	80
Nonmetals:				
Asbestos	1,900	277	2,800	353
Cement	e 625	5	56,000	445
Fertilizer:				
Superphosphate	77,100	1,382	51,600	925
Potassic	54,300	1,032	59,200	1,125
Refractory materials	3,400	308	1,600	114
Sulfur	70,000	1,150	55,500	1,337
Mineral fuels:				
Coke, thousand tons	31	690	31	659
Petroleum, crude, do	3,427	35,147	3,513	36,948
Petroleum refinery products:				
Gasoline, do	137	3,521	133	3,167
Distillate fuel oil, do	192	4,022	208	3,864
Residual fuel oil, do	752	6,601	811	7,381
Lubricants, including greases, do	51	4,117	61	4,211
Paraffin	1,200	163	1,800	251

e Estimate.

Source: Vneshnyaya Torgovlya S.S.S.R. za 1965 god (Foreign Trade of the U.S.S.R. for 1965).

The value of Cuba's foreign trade (as available) for all commodities is shown in the following table:

	(Million dollars)		
	Communist countries	Other countries	Total
Imports:			
1964	592	285	877
1965	NA	208	NA
Exports:			
1964	416	293	709
1965	NA	185	NA

NA Not available.

Source: International Trade Analysis Division, Bureau of International Commerce, United States Department of Commerce.

Reported administrative changes in Cuban foreign trade involve two new agencies. Cubaexport will deal with all commodities except sugar and tobacco and will work toward increasing exports. Ferriimport will manage the import of all hardware; in addition, this agency will also have the responsibility for domestic distribution of such imports. Whether Cubaexport has replaced Cubametals is not known.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Expansion of Cuba's iron and steel industry was progressing. In Santa Clara a steel foundry was being built for Fabric Aguilar Noriega. Costing an estimated $700,000, the plant was slated to produce 5,000 tons of steel annually for the fabrication of parts. Equipment for the plant was to be obtained from Poland.[5]

Three other plants, La Antillana de Acero, Cabillas Cubanas, and Aceros Unidos were also reported to be undergoing modernization and expansion. Antillana de Acero's annual capacity will be raised from 80,000 to 350,000 tons. The total program, to be phased over an unspecified period of time, will require investment of $59 million.[6]

Nickel.—Late in 1965 press reports announced that Société Le Nickel of France had made purchases of Cuban nickel. This posed a problem with regard to imports of nickel-bearing materials into the United States from France, as any materials containing Cuban nickel would be barred from U.S. markets. After various discussions between representatives of the French and U.S. Governments, the matter was resolved, and it was agreed that technical and control measures could be satisfactorily applied which would preclude products with Cuban nickel content reaching the United States.

Nickel sinter was produced at Nicaro, and output there was reported to be 14,790 tons in 1963 and 15,701 tons in 1964. Sinter was not reported on the production table in order to avoid duplication.

Nonmetals.—*Fertilizer materials.*—Production of some fertilizer materials was recorded in the Cuban statistics for 1963 and 1964. Output of "complex fertilizers" decreased from 16,989 tons in 1963 to 8,016 tons in 1964. In 1964 fertilizer classified only as "for cane" amounted to 159,036 tons; during the same year, 262,961 tons, also unidentified, were produced for use in "other cultivation."

Mineral Fuels.—Cuba and the U.S.S.R. concluded a treaty to conduct offshore marine seismic surveys to determine possibilities for petroleum production. Toward this end, the Soviet survey ship "Vladimar Obruchev" was reportedly assigned to Cuban waters. The ship is rated at about 800 tons and carries about 70 technicians and crew. It was reported that no Cubans were assigned to the craft. Exploration, not expected to commence until early 1966, will be conducted over a period of 2 years; it was expected that about 500 kilometers of profiles would be recorded during the investigation. Reported estimated cost of the complete job was $1.4 million.

Some onshore drilling was completed during 1965, but seemingly there were no significant discoveries. A years' program of marine exploration work was being conducted by Cuban nationals with Soviet advice and technical help. Three crews, each of 25 to 30 men, were carrying out oil exploration programs on land.

Salary scale for exploration personnel reportedly ranged from $120 to $150 a month for laborers and between $175 and $200 a month for men working on instruments; a geophysicist receives a higher rate.

[5] Mining Journal (London). Feb. 4, 1966, p. 81.
[6] Mining Journal (London). Mar. 4, 1966, pp. 154–155.

DOMINICAN REPUBLIC

Incomplete data on mineral commodity production in the Dominican Republic during 1965 showed decreases in nearly all categories. The one bright facet was the nearly 24-percent tonnage increase in bauxite shipments compared with those recorded in 1964. In 1965 the Dominican Republic accounted for about 2.5 percent of world bauxite output. Other minerals were not produced in quantities of world significance, but requirements for mineral construction materials and salt were largely satisfied by domestic production. Lower output levels for such mineral commodities were no doubt attributable to interruptions in output stemming from the civil disturbances which began in April. The increased quantities of bauxite that were shipped indicate that this segment of the industry escaped interruption, probably because of its isolation from the principal areas of disturbances.

Production values of the various mineral and metal commodities have not been available since 1962. However, the contribution of the industry to the gross domestic product, estimated at $700 million in 1965, could not be reckoned as significant.

Late in 1965 an Emergency Fund was established by the Provisional Government to stimulate recovery in the industrial and agricultural sectors that had experienced interruption because of civil disorder. It was reported that applications for a share of these funds had been made by the salt and other unspecified mineral industries.

Yearend 1965 brought the expiration of the law requiring payment of a special duty at the rate of 50 cents a sheet on imports of corrugated iron and galvanized steel. It was expected, however, that this law would be repromulgated.

PRODUCTION

Shipments of bauxite increased nearly 24 percent over those of 1964; actual production figures were not available, and it is expected that shipments will be recorded in the future, but because there is no domestic consumption, shipments are regarded as a reasonable measure for actual salable output.

Figures for salt production during 1964 and 1965 were obviously incomplete. This is particularly evident in respect to 1964 when official trade figures which became available in 1965 recorded salt exports of more than 21,000 tons and no salt imports.

Table 5.—Dominican Republic: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals: Bauxite dry equivalent: Shipments	711,760	717,111	773,088	760,290	941,756
Nonmetals:					
Amber—kilograms	[1] 98	[1] 61	[1] 261	[1] 320	[e] 300
Cement	236,762	242,746	228,170	297,515	211,974
Clays	[2] 13,213	[2] 12,603	[e] 12,000	[e] 12,000	NA
Fertilizers, chemical	50,927	51,081	[e] 50,000	[e] 50,000	NA
Gravel and crushed rock—cubic meters	[2] 36,246	[2] 52,464	[e] 50,000	[e] 50,000	NA
Gypsum	408,765	439,406	35,318	109,695	89,499
Lime	6,475	7,433	[e] 7,000	[e] 7,000	NA
Limestone	317,723	311,831	[e] 310,000	[r] 398,470	[3] 271,667
Salt:					
Marine	20,099	9,896	[e] 10,046	[e] 10,000	[e] 10,000
Mined	75,702	32,213	22,754	2,471	1,225
Total	95,801	42,109	32,800	12,471	11,225
Sand	58,983	83,907	NA	NA	[2] 46,674
Stone, dimension and crushed:					
Granite	137	244	NA	NA	NA
Marble—cubic meters, Travertine—do	88	124	NA	[4]	NA

[e] Estimate. [r] Revised. NA Not available.
[1] Exports.
[2] Domestic consumption of national production.
[3] For cement only.
[4] Production of quarried slabs reported as 3,757 square meters of marble and 3,757 square meters of travertine.

TRADE

The Dominican Republic's total trade is given in the following tabulation for the most recent years for which data are available:

	Value (thousand dollars)		Mineral commodities share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1963	$9,899	$174,136	5.7
1964	9,069	179,383	5.1
Imports:			
1963	31,831	160,285	19.9
1964	26,130	192,373	13.6
Trade balance:			
1963	−21,932	13,851	XX
1964	−17,061	−12,990	XX

XX Not applicable.

Source: Republica Dominicana, Oficina Nacional de Estadística. Comercio Exterior—1964. V. 12, Santo Domingo, February 1966, 323 pp.

Import value of mineral fuels in 1964, the latest year for which statistics are available, amounted to $13.4 million, which was equivalent to about 51 percent of all mineral imports; in relation to total imports, mineral fuels accounted for 0.7 percent of value.

Bauxite, all of which went to the United States, was the largest single mineral export by value and accounted for 97.7 percent of total mineral export value in 1964. In terms of total trade, the United States took 63.1 percent of the country's exports in 1964 and furnished slightly more than 50 percent of all imports.

In regard to petroleum imports, the United States furnished a substantial part of lubricants required; Venezuela and the Netherlands Antilles supplied the bulk of all other products.

Incomplete figures for 1965 indicate the likelihood of a considerable decrease in exports compared with 1964 statistics. It was estimated that total 1965 exports by value might show a decline of about 40 percent from the previous year's level although export sales of bauxite were higher than in 1964 by about $2 million.

COMMODITY REVIEW

Metals.—*Bauxite.*—No change was reported in the bauxite operations of the Aluminum Company of America in the Dominican Republic in 1965; all shipments were consigned to Point Comfort, Tex. The company employed about 375 persons.

Nickel.—Pilot plant operations of Falconbridge Nickel Mines Ltd. subsidiary, Minera y Beneficiadora Falconbridge Dominicana C. por A., were still in progress and experimental production continued. The company reported that unsettled conditions within the country resulted in postponement of plans for a commercial plant, although a decision was made to enlarge the pilot plant. Diesel generators and other unspecified equipment were ordered for the proposed expansion. Shutdowns were necessary in March and December of 1965 for major repairs.

Table 6.—Dominican Republic: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum ore: Bauxite	946,921	923,615	All to United States.
Iron ore	---	5,656	All to Japan.
Iron and steel scrap	641	833	United States 389; Puerto Rico 247.
Nonmetals:			
Amber—kilograms	261	---	
Cement	21,324	13,720	Virgin Island 9,391; Guadeloupe 3,258.
Clay products:			
Brick	33	63	All to Puerto Rico.
Roofing tile	51	32	Do.
Pottery	22	7	Do.
Gypsum	48,768	96,453	Puerto Rico 82,858; Panama 5,255.
Salt	142	21,182	United States 21,017.
Stone, dimension:			
Granite	---	(1)	
Marble	5	2	All to Puerto Rico .

[1] Less than ½ unit.

Source: Republica Dominicana, Oficina Nacional de Estadística, Comercio Exterior—1964. V. 12, 1966, 323 pp.

Table 7.—Dominican Republic: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Copper and its alloys and manufactures	1,004	968	United States 225; Canada 173; France 124.
Gold, silver, platinum, and their manufactures—kilograms	1,252	2,200	West Germany 1,642; United States 336.
Iron and steel products:			
Construction materials:			
Large pieces	3,510	5,166	Belgium 2,412; United States 1,477.
Galvanized sheet	14,242	18,395	Belgium 7,218; France 4,309; Japan 4,156.
Other	13,703	17,667	Belgium 12,825; West Germany 2,260.
Rails and railway material	2,421	620	United States 268; West Germany 253.
Pipes and fittings	6,868	6,007	United Kingdom 1,775; West Germany 1,589; United States 942.
Wire, smooth	5,472	4,671	West Germany 2,252; Belgium 1,238; France 520.
Tin, lead, zinc, and other metals and metal manufactures	1,410	1,280	United States 407; Puerto Rico 306; West Germany 195.
Nonmetals:			
Cement	2,452	3,653	United Kingdom 1,376; Japan 958; West Germany 796.
Ceramics: China, porcelain, pottery	3,606	3,085	Japan 1,752; United States 439; United Kingdom 359.
Stone, earth and their manufactures	2,404	1,675	United States 660; Canada 302; Venezuela 300.
Mineral fuels:			
Coal, coke and briquets	637	728	Netherlands 248; United States 233; West Germany 222.
Petroleum refinery products:			
Gasoline			
thousand 42-gallon barrels	1,197	1,322	Netherlands Antilles 1,214.
Kerosine—do	253	204	All from Netherlands Antilles.
Fuel oil—do	1,500	2,284	Venezuela 1,348; Netherlands Antilles 852.
Lubricating oil	7,866	9,435	United States 7,074; Netherlands Antilles 1,725.
Other	28,810	38,634	Venezuela 31,448; United States 3,383.

Source: Republica Dominicana, Oficina Nacional de Estadística, Comercio Exterior—1964. V. 12, 1966, 323 pp.

According to various trade magazines, total expenditure to mid-1965 amounted to some $6 million. Estimated daily output was about 1 ton of ferronickel containing about 50 percent nickel.

Metal Manufactures.—The joint project of the Corporación de Fomento Industrial and Camer International, S.A., to establish a complex of seven light industries to manufacture metal products had not been completed by yearend. A portion of the machinery had arrived and some construction had been completed. Project delay reportedly was due to financing problems.

Nonmetals.—*Fertilizer Materials.*—It was reported late in 1965 that Sun Ray DX Oil Co. of Tulsa, Okla., was interested in the possibility of establishing a plant to produce nitrogenous fertilizers in the Dominican Republic. Estimated cost of the proposed plant was between $7 million and $10 million.

Salt.—Gonzales, C. por A. reportedly had plans to increase salt output to supply the domestic market. A loan of $13,000 was requested from the President's Emergency Fund to expand facilities.

Mineral Fuels. — *Petroleum.* — Exploratory oil well drilling, which started in 1964, was suspended early in 1965 because of the outbreak of the civil disturbance; drilling had not been resumed at yearend. La Sorpresa-1, 14 kilometers southeast of La Vega, was shut down at 1,400 feet; Bani-1, 4 kilometers from Bani, had been drilled to 2,487 feet before suspension of operation.

No progress was reported in regard to construction of proposed refinery capacity described in Volume IV of the 1964 Minerals Yearbook. Political and economic conditions in the country during 1965 brought such investment activity to a halt.

HAITI

The mineral industry of Haiti continued to have significance only in relation to the domestic economy. Value and quantity of production made little impact when compared with world figures; as a source of bauxite and copper, Haiti supplied only 0.9 percent and 0.1 percent, respectively, to world markets in 1965.

Haiti's trade in minerals and metals was kept in favorable balance by exports of bauxite and copper although nearly all domestic requirements for mineral industry products were met by imports.

Because of incomplete data, it is not possible to determine the exact contribution of the mineral industry to the Haitian gross domestic product in 1965, but the apparent absence of any great change in the nation's economy leads to the assumption that this was close to the plus 2 percent share that the industry provided in 1964 and 1963.

There were some indications of possible increases in activity in the minerals field. A proposal was made for investment from the United States in marble quarrying. Furthermore, a joint venture was undertaken by three U.S. companies and one Canadian company to carry out a minerals exploration program in northern Haiti. It was also reported that Haitian and Canadian interests were forming an association to develop a gold prospect in northern Haiti.

No progress has been reported on construction of the proposed oil refinery.

PRODUCTION

Output of all reported mineral categories decreased in 1965. Bauxite, Haiti's most valuable mineral export, showed a production loss of 14.1 percent, and copper contained in concentrates decreased 21.3 percent in production. Cement output was nearly 25 percent lower than in 1964.

Available information does not explain the decreased production in any particular case. However, it was reported that during the year, business in general was slow, unusually heavy rains fell, and in some cases, new labor contracts were negotiated; any or all of these factors might have had a slowing effect on mining activities.

Table 8.—Haiti: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum ore: Bauxite, dry equivalent	266,800	376,300	332,500	378,600	325,205
Products of copper mining:					
Ore milled	165,146	255,825	254,478	241,189	212,934
Concentrate produced	10,658	15,422	16,181	12,655	10,223
Content of concentrate:					
Copper	2,861	4,280	5,884	5,029	3,960
Gold troy ounces	4,341	7,149	6,778	8,090	NA
Silver do	61,424	94,761	107,022	92,057	NA
Nonmetals:					
Cement	44,435	51,352	45,798	55,704	42,129
Lime e	160,000	160,000	160,000	160,000	160,000
Limestone e	379,000	389,000	393,000	394,000	NA
Salt, marine e	10,400	10,400	10,400	10,400	10,400

e Estimate. NA Not available.

Sources: Canadian Mines Handbook 1966–67. Page 90. Other: Department of State Airgram A–372. May 6, 1966, Port-au-Prince, 2 pp.

TRADE

The following table shows the relationship of mineral trade to total commodity trade for Haiti for 1963 and 1964, the latest years for which complete data were available:

	Value (thousand dollars)		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1963	$7,478	$43,212	17.3
1964	6,984	37,962	18.4
Imports:			
1963	4,178	36,014	11.6
1964	4,417	35,901	12.3
Trade balance:			
1963	+3,300	+7,198	XX
1964	+2,567	+2,061	XX

XX Not applicable.

Note: Data are for fiscal years ending September 30.

Source: L'Administration Générale des Douanes. Rapport Annuel, pour L'Exercise Octobre 1963-Septembre 1964. Undated. 123 pp.

Bauxite and copper concentrate remained the only mineral commodities produced in Haiti for which exports were recorded. In 1964, value of bauxite exports was listed as $3.9 million and that of copper as $3.0 million. In addition, slightly less than $10,000 worth of scrap iron was shipped overseas. The United States and Japan remained the chief destinations of exports.

Imports to the extent of $4.4 million went to satisfy Haiti's need for minerals and metals in 1964. Of the total, $3.0 million, or 67 percent, was expended on imports of mineral fuels and petroleum. The next largest single category of imports by value was iron and steel semimanufactures. Crude oil and petroleum products came mostly from Trinidad and the Netherlands Antilles while the United States, Belgium, and West Germany supplied most of Haiti's metal requirements.

In terms of 1964 trade, the United States supplied 58.4 percent of all Haitian imports and took 47.4 percent of all exports.

COMMODITY REVIEW

Metals.—*Copper.*—Consolidated Halliwell Limited reported ore reserves as of January 1, 1965, as 285,310 tons, averaging 2.12 percent copper, with an additional possible 54,000 tons averaging 2.2 percent metal. Announcement was made in early 1965 that a combine of four firms would become associated in an exploration program over the northern part of Haiti. Participants in the venture were Guggenheim Exploration Co., Reynolds Metals Co., Cerro Corp., and Consolidated Halliwell Limited. Halliwell's present mining property and an adjacent property are to be excluded from the deal.

Mineral Fuels.—*Petroleum.*—There was no exploration or drilling for oil carried out in Haiti during 1965.

Consumption of refined petroleum products in Haiti has been reported as follows, in 42-gallon barrels:

Products	1963	1964	1965
Aviation gasoline	9,000	10,186	5,699
Aviation jet fuel	NA	NA	16,977
Motor gasoline	235,000	227,453	214,370
Distillate fuel oil	296,000	364,448	295,252
Residual fuel oil	156,000	195,067	151,695
Lubricants	16,000	19,270	11,133
Other	5,000	12,384	[1] 39,307
Total	717,000	828,808	734,433

NA Not available.

[1] Includes kerosine (22,242 barrels).

Table 9.—Haiti: Exports of metals and minerals [1]

(Metric tons)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum ore, bauxite	519,395	457,655	All to United States.
Copper concentrate	12,377	15,045	Japan 12,245.
Iron, scrap	730	80	Japan 45; United States 31.

[1] For fiscal years ending Sept. 30.

Source: L'Administration Générale des Douanes. Rapport Annuel pour L'Exercise Octobre 1962–Septembre 1964. Undated, 123 pp.

Table 10.—Haiti: Imports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum, including alloys, all forms	108	88	United States 66.
Copper, including alloys, all forms	22	10	Germany 4; United States 4.
Iron and steel:			
Iron ore and concentrate	1	2	Japan 1; United States 1.
Pig iron, sponge iron, ferroalloys and steel powders	13	100	All from Germany.
Ingots and other primary forms	18	101	Germany 100.
Semimanufactures	6,510	6,981	Belgium 2,574; United States 1,814.
Lead, including alloys, all forms	1	2	All from Belgium.
Platinum and platinum group metals, unworked or partly worked troy ounces	2,058	579	United States 418.
Silver, unworked or partly worked do	129	322	United States 290.
Tin, including alloys, all forms long tons	84	80	All from United States.
Zinc, including alloys and semimanufactures	(2)	14	Do.
Nonferrous metals, ore and concentrate, not specified	(2)	3	Belgium 2.
Nonmetals:			
Abrasives, natural, including industrial diamond kilograms	60	226	All from United States.
Asbestos cement building materials	242	200	Belgium 176; United States 24.
Cement, not further specified	516	258	Denmark 102; United States 51.
Clay and similar refractory materials	36	63	Germany 36; United States 27.
Clay products, nonrefractory	125	132	United States 72; Spain 27.
Fertilizer materials:			
Nitrogenous	157	6	Netherlands 5.
Phosphatic	10	46	Germany 30; United States 16.
Potassic	837	25	Germany 20.
Mixed and unspecified	57	---	
Gem stones kilograms	56	8	United States 5.
Graphite kilograms	282	99	All from United States.
Lime	3	2	Do.
Mica, worked kilograms	1,625	---	
Refractory brick and similar products	63	55	United States 53.
Salt	58	71	United States 34; Canada 29.
Sodium carbonate (soda ash)	39	40	France 20; United States 20.
Stone, sand and gravel	38	3	United States 2; Italy 1.
Sulfur	3	3	Mainly from United States.
Other, not specified	9	11	Netherlands 6; United States 3.
Mineral fuels:			
Coal and coke	r 93	75	Germany 56; United States 18.
Asphalt, natural	730	52	Germany 26; United States 24.
Mineral tar and crude chemicals from coal, petroleum and natural gas	166	8	United States 6.
Petroleum:			
Crude and partly refined	64	44	All from United States.
Gasoline 42-gallon barrels	252,186	270,590	Netherlands Antilles 167,217; Trinidad and Tobago 87,540.
Kerosine do	25,670	27,510	Netherlands Antilles 17,233; Trinidad and Tobago 10,043.
Fuel oils	28,269	51,360	Netherlands Antilles 32,140; Trinidad and Tobago 18,203.
Lubricants	1,547	1,263	United States 1,151.
Paraffin and vaseline	207	256	United States 139; Netherlands 86.
Other [3]	28	40	United States 38.

r Revised.
[1] Fiscal year ended September 30.
[2] Less than ½ unit.
[3] May include some products derived from coal and natural gas.
Note: Haiti trade returns do not differentiate between East and West Germany.

Source: L'Administration Générale des Douanes. Rapport Annuel pour L'Exercise Octobre 1963–Septembre 1964. Undated, 123 pp.

JAMAICA

Jamaican bauxite mining operations set new production records in 1965, keeping the nation ahead of all other producers and accounting for 23.4 percent of total world output. The island's mineral industry remained undiversified, essentially consisting of bauxite mining and alumina producing, petroleum refining, and a construction materials sector. In total, the output of these operations was valued at $81.0 million [1] in 1965, 12 percent higher than the $72.2 million figure recorded for 1964 output. For comparison, Jamaica's gross domestic product (GDP) for 1965 was valued at $818.7. Of the 1965 mineral product value total, $73 million was attributed to the bauxite and alumina producing sector of the minerals industry.

The petroleum refining industry completed its first full year of production in 1965; as a result, the combined contribution of quarrying and refining sectors rose sharply from $5.0 million in 1964 to $8.0 million in 1965. Increased refinery requirements for crude and partly refined oil were reflected by the increase in value of imports of these commodities from $8.4 million in 1964 to $27.7 million in 1965.

Construction activity maintained a high level in 1965 as reflected in general production gains of construction materials.

Jamaica's general economic situation continued to expand, with the exception of agriculture, but unemployment, estimated at 16 percent, and balance of payments showed no improvement over the previous year. Per capita income in 1965 was $407.68, a rise of about 3.5 percent over the 1964 level.

PRODUCTION

Bauxite output (in net dry tons) reached new records with an increase of 9.6 percent over the 1964 total. Recorded alumina production, however, decreased 0.5 percent from the 1964 figure to 753,000 tons in 1965.

For fiscal years 1964–65, government revenue from bauxite and alumina in the form of royalty and taxes amounted to $18.5 million.

Increased output of cement and construction materials were indicative of sustained construction activity. Local cement sales rose more than 18 percent above 1964 sales.

Esso West Indies Ltd. contributed significantly to the economy by supplying petroleum products for local use, as well as for export.

[1] Where necessary, values have been converted from Jamaican pounds (J£) to U.S. dollars at the rate of J£1 equals US$2.80.

Table 11.—Jamaica: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Bauxite, dry equivalent:					
Produced for export	5,054,648	6,084,796	5,244,391	r6,062,894	6,893,353
Converted to alumina	1,715,415	1,530,623	1,769,519	1,873,574	1,757,668
Cement grade	---	---	---	---	48,293
Total	6,770,063	7,615,419	7,013,910	r7,936,468	8,699,314
Alumina (exports)	714,774	637,719	737,193	780,656	732,361
Nonmetals:					
Cement, common portland	215,710	200,162	200,721	281,339	312,582
Clays, for cement	NA	NA	NA	55,221	95,684
Gypsum	226,625	228,923	231,968	195,212	211,846
Limestone	NA	1,708,000	NA	4,300,656	[1]429,058
Marble, cut and/or polished	NA	NA	NA	136,623	NA
Phosphates	63	57	14	NA	NA
Sand and gravel:					
Common sand	NA	NA	NA	273,000	310,428
Glass sand	NA	6,648	5,011	10,474	7,301
Gravel, natural	NA	NA	NA	668,400	790,214
Mineral fuels: Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	---	---	---	1,033	1,614
Kerosine [2]—do	---	---	---	528	993
Distillate fuel oil—do	---	---	---	r1,208	1,777
Residual fuel oil—do	---	---	---	3,852	4,561
Liquefied petroleum gases—do	---	---	---	55	97
Asphalt—do	---	---	---	24	54
Other—do	---	---	---	NA	247

r Revised. NA Not available.

[1] For use in cement production only.

[2] May include jet fuel.

TRADE

The following table compares the value of total trade with trade in mineral commodities and shows the importance of minerals, particularly exports, in the pattern.

	Value (thousand dollars)		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1963	$84,864	$201,922	42
1964	100,449	218,096	46
Imports:			
1963	38,905	225,519	17
1964	52,925	281,765	19
Net trade balance:			
1963	+45,959	−23,597	XX
1964	+47,524	−63,669	XX

XX Not applicable.
Note: Conversion of values made at the rate of J£1 equals $2.80.

Source: Jamaica Department of Statistics. External Trade of Jamaica—1964. 1965, 375 pp.

While total commodity trade showed an unfavorable balance, trade in mineral commodities remained favorable because of the 1965 value of bauxite exports, $49.8 million, and alumina exports, $48.7 million. All bauxite exports were directed to the United States; Canada and Norway received the bulk of alumina shipments.

Export sales of gypsum in 1965 totaled $634 million, all of which went to the United States. Other Jamaican mineral products of export importance included cement, fertilizer materials, and petroleum.

Exports of petroleum products, all produced from imported crude oil, showed a substantial increase in 1965. Except for some fuel oil and lubricants consigned to the United States, petroleum product trade was directed to neighboring islands of the West Indies.

Imports of petroleum products, mostly from Venezuela, the Netherlands Antilles, and Trinidad, decreased considerably.

Imports came mostly from the United Kingdom and Canada, but the United States supplied construction materials and some chemicals. Fertilizer materials and some metals came from Europe. In terms of total visible trade, United Kingdom, United States, and Canada received approximately 81 percent of Jamaica's exports and supplied 66 percent of its imports. The United States ranked first among Jamaica's trading partners in 1965 in terms of both exports and imports. Venezuela, supplying $22.1 million worth of crude petroleum in 1965, ranked fourth as a trading partner.

COMMODITY REVIEW

Metals.—*Alumina and Bauxite.*—Alcan Jamaica Ltd., one of the island's four bauxite producers and its only alumina producer, recorded a slight decline in alumina output in 1965, but alumina plant expansion announced in 1964 was well into its second phase by yearend. Construction of three of the five planned precipitator tanks was underway, and work on the new thickener tanks was nearing completion. The company reported that its total annual alumina capacity in Jamaica would be 830,074 tons when construction is completed.

Alcoa Minerals of Jamaica, Inc., attained a production rate in 1965 of 60,963 dry tons of bauxite a month. Shipments, in net dry tons, for the year totaled 727,310 tons, of which 152,616 tons went to the U.S. stockpile.

Kaiser Bauxite Co. mined a record 5,030,083 tons of bauxite (wet) during 1965, of which 48,293 tons of high silica material was destined for use by non-Jamaican producers. The company continued premining development work on its Dry Harbour Mountain property on the north coast. Shipping and rail facilities were still under construction at yearend.

Reynolds Jamaican Mines, Ltd., announced plans for an additional ore conveyor system which could double the present annual shipments of approximately 2 million tons. Proposals call for a 10.4-kilometer conveyor system from the ore driers at Lydford to the port at Ochos Rios; mining and storage facilities will also be expanded.

The four operating bauxite companies in Jamaica were served with a 31-point claim by the National Workers Union, which represents some 5,000 workers. Chief demands were for a profit sharing scheme based on the companies' international position, a cost of living escalation clause, and a 15-percent end-of-project bonus for construction workers. At yearend there had not been any report of action taken.

The Jamaican Bauxite Union called for greater alumina output within the country in order to help the domestic economy.

There were indications of the formation of a consortium to produce additional alumina in Jamaica, but no firm announcement had been made by yearend.

The agreement between Jamaica and the United States under which bauxite shipments to the U.S. stockpile were contracted was fulfilled late in 1965.

Iron and Steel.—The Caribbean Steel Co. purchased a 33-acre plant site for a steel mill at Gilpin, Spanish Town. It was reported that site preparation, access roads, office building and fencing had been completed. Major machinery was ordered and contracts were set for plant erection.

The mill, due for completion in 1966, will operate on scrap; planned annual ingot capacity is 30,000 tons, with rolling mill capacity for 18,000 tons of reinforcing bars. The plant will operate on a one-shift basis. Products will receive protection under the Industrial Incentives Law.

Cost of the plant was estimated at around $2.8 million. Caribbean Cement Co., Ltd., announced that it had purchased one-half of the equity capital. Other financing will come from Jamaican Government sources, and possibly through public subscription in Jamaica.

Table 12.—Jamaica: Exports and reexports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Domestic products:			
Aluminum:			
Bauxite	5,244,411	6,062,984	All to United States.
Alumina	737,259	780,413	Canada 483,493; Norway 167,857.
Metal and alloys, semimanufactures	1	20	Mainly to United Kingdom.
Iron and steel:			
Scrap	5,129	20	Japan 15; West Germany 5.
Nonferrous metal scrap	1,869	1,359	Netherlands 665; Japan 346.
Reexports:			
Copper sulfate	51	---	
Iron and steel:			
Ingots and equivalent forms	(1)	1	All to Puerto Rico.
Semimanufactures	1,265	733	Mainly to Cayman Islands.
Nonferrous metals:			
Unwrought	29	81	United Kingdom 46.
Semimanufactures	76	103	United Kingdom 50; United States 28.
Nonmetals:			
Domestic products:			
Cement, portland	38,035	38,251	Bahama Islands 22,018; British Honduras 4,489.
Clay and clay products:			
Clay, not further specified	1	---	
Brick and tile	75	373	United States 304; Canada 42.
Fertilizer materials, not further specified	8	254	All to Haiti.
Gypsum	136,651	139,715	Mainly to United States.
Mica:			
Sheet, block, scrap, or ground kilograms	5,446	846	Mainly to United States.
Manufactures do	7,671	5	All to Puerto Rico.
Sand, gravel, crushed rock	8,977	6	All to British Honduras.
Sodium carbonate (soda ash)	7	---	
Stone, dimension	85	50	Mainly to United States.
Other, not specified	1	---	
Reexports:			
Fertilizer materials	16	6	Barbados 5.
Salt	27	22	All to Cayman Islands.
Other, not elsewhere specified	21	2	Mainly to Cayman Islands.
Mineral fuels:			
Coal and coke	4	3	All to Turks and Caicos Islands.
Petroleum refinery products:			
Gasoline [2] thousand 42-gallon barrels	76	302	Bahamas 151; Bermuda 115.
Kerosine [3] do	411	84	Mainly to Cayman Islands.
Distillate fuel oil do	235	536	Bermuda 311; Bahamas 118.
Fuel oil, other do	18	344	United States 169; Dominican Republic 58.
Lubricants do	4	1	Mainly to United States.
Other do	3	11	Do.

[1] Less than ½ unit.
[2] Where necessary, conversion has been made to volumetric units based on conversion factors in use by the Bureau of Mines.
[3] May include jet fuel.

Source: Jamaica, Department of Statistics. External Trade of Jamaica—1964. Undated, 275 pp.

Table 13.—Jamaica: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Alumina	13	e 3	Mainly from Switzerland.
Metal, including alloys, all forms	1,249	1,997	Mainly from United Kingdom.
Copper:			
Sulfate—kilograms	278	202	Do.
Metal, including alloys, all forms	156	209	United Kingdom 121.
Gold, nonmonetary—value	$71,669	---	
Iron and steel:			
Scrap iron and steel	508	702	Mainly from Barbados.
Pig and sponge iron	213	596	Mainly from United Kingdom.
Ingots and equivalent primary forms	113	950	Do.
Semimanufactures, including castings and forgings	49,426	79,439	United Kingdom 34,900; Belgium-Luxembourg 18,500.
Lead, including alloys:			
Unwrought	156	202	United Kingdom 99; Canada 73.
Semimanufactures	77	113	United Kingdom 97.
Nickel, including alloys, all forms—kilograms	2,286	4,470	United Kingdom 1,788; Canada 1,519.
Platinum and platinum group metals, unworked and partly worked—value	$907	$2,005	United Kingdom $739; Canada $490.
Silver, unworked and partly worked—do	$1,314	$4,304	United Kingdom $2,304; Canada $1,411.
Tin, including alloy and solder:			
Unwrought—long tons	35	234	Canada 171; United Kingdom 54.
Other semimanufactures—do	5	3	Mainly from United Kingdom.
Zinc, including alloys, all forms	124	104	Japan 62; United Kingdom 23.
Other—value	$6,535	$13,334	United Kingdom $4,651; United States $2,554.
Nonmetals:			
Abrasives, natural, including industrial diamond	5	12	United Kingdom 6; Canada 4.
Asbestos:			
Crude fiber	115	174	Canada 95; United Kingdom 78.
Building materials	1,111	555	United Kingdom 280; Italy 166.
Cement:			
Portland	1,253	2,003	United Kingdom 1,022; Denmark 701.
Refractory	191	407	Mainly from United Kingdom.
Other	23	58	United States 55.
Clay and clay products:			
Clay, not further specified	1,413	276	United States 226.
Brick, tile, pipe, and similar products	744	1,093	United Kingdom 975.
Fertilizers, mineral and chemical:			
Nitrogenous:			
Ammonium sulfate	25,773	34,022	Trinidad and Tobago 23,772; Puerto Rico 4,556.
Other	3,371	4,815	Trinidad and Tobago 1,500; Italy 1,022; West Germany 977.
Phosphatic:			
Natural phosphates	---	40	United States 37.
Superphosphates, Thomas slag, other manufactured phosphates	2,108	2,978	United States 1,368; Netherlands 1,184.
Potassic:			
Potash salts	6,528	9,345	West Germany 6,170; France 2,440.
Other, not specified	5	969	France 361; Trinidad and Tobago 356.
Mixed and other, nonspecified	19,291	32,476	Netherlands Antilles 14,784; Netherlands 10,578.
Gem stones, including diamond:			
Uncut—value	$770	---	
Cut, unset—do	$5,891	$10,217	Barbados $4,399; United Kingdom $2,019.
Graphite, natural—kilograms	1,839	2,168	All from United Kingdom.
Gypsum, limestone, other industrial stone	358	141	United Kingdom 118.
Magnesite	---	11	All from United Kingdom.
Mica:			
Sheet, block, scrap, or ground—kilograms	65	92,134	Norway 68,179.
Manufactures—do	382	122	United Kingdom 67; Canada 50.
Refractory brick and similar products	4,302	3,452	United States 1,657; United Kingdom 1,105.
Salt	11,626	11,606	Turks and Caicos Islands 3,465; United Kingdom 3,042.

See footnotes at end of table.

Table 13.—Jamaica: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—Continued			
Sand, gravel, crushed rock	951	662	Belgium-Luxembourg 578; United States 43.
Sodium carbonate (soda ash)	1,354	2,853	United States 2,734.
Sodium hydroxide (caustic soda)	42,948	85,689	Mainly from United States.
Stone, dimension	290	56	Italy 47.
Sulfur	1,120	1,020	Mainly from United States.
Other	452	625	United Kingdom 219; United States 179.
Mineral fuels:			
Coal	161	91	United Kingdom 86.
Coke	668	784	West Germany 624.
Briquets of coal, coke, lignite or peat	16	68	United Kingdom 65.
Gases, liquefied	5,809	3,556	Venezuela 2,235; United States 947.
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	---	6,772	All from Venezuela.
Refinery products:			
Gasoline:			
Aviation ---do---	136	107	Netherlands Antilles 66; Trinidad and Tobago 41.
Motor ---do---	---	324	Trinidad and Tobago 318.
Other ---do---	733	---	
Kerosine [1] thousand 42-gallon barrels	599	386	Trinidad and Tobago 212; Netherlands Antilles 174.
Distillate fuel oil ---do---	1,009	515	Netherlands Antilles 304; Trinidad and Tobago 165.
Residual fuel oil ---do---	3,518	3,143	Venezuela 1,980; Netherlands Antilles 786.
Lubricants ---do---	40	46	United States 27; Netherlands Antilles 11.
Other ---do---	3	3	Mainly from Netherlands.
Asphalt	8,582	12,428	Netherlands Antilles 7,293; United Kingdom 2,414.
Natural asphalt	3,869	6,737	All from Trinidad and Tobago.
Mineral tar and crude chemicals from coal petroleum and natural gas	135	4,379	Mainly from Netherlands Antilles.

[e] Estimate.
[1] May include jet fuel.

Source: Jamaica, Department of Statistics. External Trade of Jamaica—1964. Undated, 275 pp.

Nonmetals. — *Cement.* — The Caribbean Cement Co., Ltd., set new production and sales records in 1965. Gross revenue of $8.1 million increased $1.2 million over the 1964 figure. Despite higher sales, earnings of $1.6 million were only the third highest registered by the company as a result of higher wages and depreciation charges as well as increased cost of reconditioning operating equipment.

Clays.—A study and classification of Jamaican clays aimed at increasing the utilization of this resource was proposed but by yearend no concrete action had apparently been taken.

Fertilizer Materials.—It was announced in the press that Albatros Chemical Co. of the Netherlands and Imperial Chemical Industries, Ltd., of Great Britain planned establishment of a facility in Jamaica to produce about 40,000 tons of nitrogenous, potassic, and phosphatic fertilizers annually. Estimated cost of the plant is between $3 million and $4 million.

Mineral Fuels.—Supplementing information published in the 1964 chapter, it has become evident that the lubricating oil plant run in connection with Esso West Indies Ltd.'s oil refinery is strictly a blending facility. Base stocks are imported from the United States for blending and packaging. The plant is not owned by Esso West Indies but rather by Esso Standard Oil, Ltd., S.A., an affiliate of Standard Oil Co. of New Jersey.

No petroleum exploration activity was reported in Jamaica during 1965, nor were any leases held.

H. R. Greiner of the University of New Brunswick, Canada, prepared a report on the gas and petroleum possibilities of the island. According to advance notices, Mr. Greiner's study was to be based largely on the results of previously completed exploration. Publication of the report was scheduled for early in 1966.

THE NETHERLANDS ANTILLES

The economic strength of the Netherlands Antilles continued to depend largely upon the petroleum refining industry: Shell Curaçao, N.V., located on the island of Curaçao, and Lago Oil and Transport Co., Ltd. (Lago) on the island of Aruba. Unemployment was one of the immediate problems of the Netherlands Antilles; it is estimated that a quarter of the country's work force was unemployed in 1965. This situation was aggravated by the decreasing number of jobs available in the petroleum industry, which in 1965 employed some 6,300 persons. This was about one-half of the number of jobs available in 1960. It was expected that this erosion of refinery jobs would continue into 1966.

In 1965, oil refineries made a direct contribution of 24 percent to net national product of $221.5 million.

A new pension plan was put into effect by Lago in 1965. Under the plan, funds are to be contributed by both employer and employee. The new plan was in addition to the previous plan of which the company paid the entire cost.

No expansion of the mineral producing industries was announced during 1965. However, it was announced in 1966 that plans for the erection of an aluminum plant on Curaçao have been abandoned. This was to have been a joint effort involving Société Tréfimétaux, Kaiser Aluminum and Chemical Co., and the Netherlands Government.

It was reported that subsequent to a survey the construction of a $800,000 iron smelting furnace was being considered by the Zoellner Corp. on Aruba, however, no further details were available at yearend.

It was also reported that S.E.L. Maduro and Sons planned to erect a plant to process byproducts from the Shell refinery. Unidentified foreign capital was reportedly slated to participate in the project.

Table 14.—Netherlands Antilles: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals:					
Limestone---cubic meters	11,703	21,389	e 20,000	31,964	1 38,273
Nitrogenous fertilizers	---	---	---	NA	84,000
Phosphate rock r---thousand tons	146	131	124	111	112
Salt	134	121	281	93	e 2,000
Sulfur, recovered e	40,000	40,000	r 40,000	r 40,000	e 40,000
Mineral fuels: Petroleum refinery products:					
Aviation and motor gasoline thousand 42-gallon barrels	44,240	46,804	43,462	41,200	43,145
Kerosine and jet fuel---do	24,455	19,624	18,683	19,380	18,116
Distillate fuel oil---do	46,548	48,908	52,027	41,187	32,762
Residual fuel oil---do	145,894	157,534	153,442	161,801	161,636
Lubricants---do	2,592	2,811	2,774	2,891	2,763
Other---do	18,120	14,154	19,215	20,231	21,705

e Estimate. r Revised. NA Not available.
1 Sales.

Source: U.S. Consulate, Curaçao, Netherlands Antilles. Department of State Airgram A-95, May 20, 1966, 5 pp. Netherlands Antilles Statistical Yearbook 1966. Undated, p. 47.

TRADE

Total Netherlands Antilles' imports and exports declined again in 1965, with mineral imports and exports recording an even more rapid decline than the totals, thus mineral commodities were less significant in total trade in 1965 than heretofore. Despite these declines, however, mineral commodities, almost entirely petroleum and its products, retained their position of overwhelming dominance in trade, accounting for 97.8 percent of all exports and 82.8 percent of all imports in 1965 as shown below:

	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1963	652.3	658.4	99.1
1964	622.1	629.9	98.8
1965	589.6	602.8	97.8
Imports:			
1963	589.8	695.3	84.8
1964	546.0	647.6	84.3
1965	510.1	616.0	82.8
Net trade balance:			
1963	+62.5	−36.9	XX
1964	+76.1	−17.7	XX
1965	+79.5	−13.2	XX

XX Not applicable.

Source: Statistical Office of the United Nations.

Petroleum and its products accounted for more than 98 percent of total mineral commodity exports and imports in each year from 1963 to 1965 and for more than 96 percent of all commodity exports and 81 percent of all commodity imports in each year for that period.

The United States was the primary destination for petroleum exports, having taken 42.4 percent by value; the United Kingdom, with 7.9 percent, ranked second, and Canada, with 6.9 percent, ranked third as a destination. Petroleum imports valued at $473.4 million were supplied primarily by Venezuela, accounting for slightly more than 94 percent of all petroleum imports.

Exports of phosphate rock in 1965 at 112,152 tons showed a 6.2 percent decrease from 1964 exports. In 1965, exports amounting to 89,798 tons went to the United States, and the remainder to Europe.

COMMODITY REVIEW

Nonmetals.—*Limestone.*—Data on limestone output in 1965 are incomplete; however, 48,626 tons were sold to local consumers, and 10,481 tons were exported.

Nitrogenous Fertilizers.—The Aruba Chemical Industries announced late in 1965 that it was expanding its facilities in order to produce calcium ammonia nitrate using Aruba limestone.

Salt.—Salt output was reported at an estimated 2,000 tons, but the reason for the large indicated increase was not apparent. The 1965 production was reported from Curaçao; the new works inaugurated on Bonaire in mid-1964 was not expected to begin production for some years.

Mineral Fuels.—It was reported that Shell Curaçao N.V. had a modernization program in progress costing an estimated $2 million. A number of old stills were to be replaced with a new crude unit. Overall capacity will remain unchanged.

Table 15.—Netherlands Antilles: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Metalliferous ores, not otherwise specified	223	55	All to Iran.
Iron and steel:			
Scrap	17,140	31	Japan 13; Venezuela 10.
Other	30	33	Venezuela 20.
Nonferrous metals and alloys	49	---	
Nonferrous scrap	1,166	936	Netherlands 358; Japan 264; West Germany 167.
Nonmetals:			
Lime	104	16	All to Venezuela.
Phosphate rock	128,280	119,554	United States 94,915; Belgium 24,639.
Salt	108	48	Trinidad 38; Surinam 10.
Nonmetals, n.e.s.	3,151	---	
Mineral fuels:			
Petroleum:			
Crude—thousand tons	294	486	United States 272; United Kingdom 142.
Refinery products:			
Aviation gasoline—do	1,588	1,583	Brazil 150; United Kingdom 103; France 93; Canada 92.
Motor gasoline—do	2,548	2,870	United States 1,069; United Kingdom 307.
Kerosine and white spirit—do	930	811	Canada 181; United Kingdom 97; Chile 58.
Jet fuel—do	2,418	2,928	United States 1,629; Canada 172.
Distillate fuel oil—do	6,270	5,249	Argentina 533; Canada 522; Japan 488.
Residual fuel oil—do	21,054	22,209	United States 15,621; Canada 1,662; United Kingdom 1,014.
Lubricants including greases—thousand tons	850	874	United Kingdom 399; Netherlands 162.
Vaseline, paraffin, and wax—do	30	43	United Kingdom 34; France 9.
Asphalt—do	821	921	United States 601; Denmark 68.
Other [2]—do	673	34	Ecuador 11; Nigeria 6.

[1] Includes process oil and cutbacks.

Table 16.—Netherlands Antilles: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys, all forms	129	111	United States 42; West Germany 32.
Copper and alloys, all forms	225	250	Netherlands 78; United States 74.
Iron and steel:			
Castings and forgings	134	64	Netherlands 34; United States 17.
Shapes and sections	2,462	2,562	Netherlands 1,344; Belgium 674.
Hoop and strip	289	11	United States 7; Netherlands 4.
Plate and sheet	3,750	4,171	Netherlands 1,048; United Kingdom 922; Belgium 904.
Wire	96	75	Netherlands 34; United States 21.
Pipes, tubes, and fittings	4,625	5,716	West Germany 1,710; United States 1,537.
Other	192	54	Netherlands 48.
Lead and alloys, all forms	86	61	Netherlands 38; United Kingdom 18.
Nickel and alloys, all forms	3	3	United Kingdom 2; United States 1.
Silver and platinum group metals, all forms—troy ounces	2,757	696	Switzerland 482; Netherlands 178.
Tin and alloys, all forms—long tons	5	8	Netherlands 4.
Zinc and alloys, all forms	114	102	Netherlands 42; Belgium 40.
Metalliferous ores, n.e.s.	230	481	Surinam 466.
Nonferrous metal scrap	r 64	28	Venezuela 26.
Other nonferrous metals and alloys	9	38	United States 15; Netherlands 12.
Nonmetals:			
Cement	38,106	34,679	Venezuela 22,886; Colombia 6,209.
Clay and clay products:			
Common and fire clay	3,380	4,586	United States 4,130; West Germany 274.
Common bricks	4,536	18,143	West Germany 16,329; Czechoslovakia 1,814.
Refractory brick	1,526	757	United States 473; United Kingdom 170.
Fertilizer:			
Natural	1,990	8,773	Mainly from United States.
Manufactured	189	27,025	United States 11,350; Bahamas 11,005.
Lime	338	155	United Kingdom 120.
Salt	531	586	United States 569.
Sand	2,935	716	Mainly from Surinam.
Sodium carbonate	252	93	Netherlands 52; United States 28.
Sodium hydroxide	29,412	35,420	Netherlands 18,214; United States 13,774.
Stone, dimension	63	73	Italy 54.
Sulfur	3,462	1,990	All from United States.
Nonmetals, n.e.s.	1,173	2,117	United Kingdom 1,336; United States 261.
Mineral fuels:			
Coal, coke and briquets	51	38	All from Netherlands.
Mineral tars and derivatives	39	55	Netherlands 30; United States 16.
Petroleum:			
Crude—thousand tons	38,884	40,834	Venezuela 40,023; Colombia 753.
Natural gasoline—do	88	64	All from Venezuela.
Aviation gasoline—thousand tons	491	711	United States 388; Venezuela 204.
Other gasoline—do	463	218	Venezuela 175; United Kingdom 42.
Kerosine and jet fuel—do	48	102	Venezuela 82; Netherlands 17.
Distillate fuel oil—do	195	68	Venezuela 66.
Residual fuel oil—do	2,738	2,583	Venezuela 2,487; Netherlands 29.
Lubricants, including greases—do	9	3	All from United States.
Butane—do	66	60	All from Venezuela.
Other [1]—do	1,327	---	

r Revised.
[1] Includes process oil and asphalt.

TRINIDAD AND TOBAGO

The petroleum industry, keystone in the economic arch of Trinidad and Tobago, remained strong in 1965. Of an estimated GDP of $661 million in 1965, the petroleum industry accounted for about 26 percent. The industry further contributed about 85 percent of all exports by value and 35 percent of Government revenues. The industry also provided employment for about 15,000 people.

While crude oil output declined about 2 percent over the 1964 figure, production during the last 3 months of 1965 showed a reversal of the downward trend. The daily production of 141,472 barrels during December 1965 was reported to be the highest attained in the last 2½ years.

According to Trinidad and Tobago Government sources, total refinery throughput for 1965 increased 7.5 percent over that of 1964.

It was reported late in 1965 that the Government was considering introducing new taxes. The result of the proposals, if enacted, would have the effect of putting a tax rate of about 61 percent on foreign investment.

Industrial stability improved following the 1965 enactment of the Industrial Stabilization Act (ISA). The act gave the Government broad powers to control strikes; to review, challange, and otherwise adjust terms and wages of any collective bargaining agreement; to control prices, and where necessary, to examine corporate records.

PRODUCTION

Despite the slight decline in total crude oil output in 1965, increases in daily production during the last quarter suggest that annual production in the immediate future will level off at around the production figures of the last 3 years. Refinery output gained 7.5 percent over that of 1964.

Cement output was nearly 7.5 percent greater compared with the 1964 record; other nonpetroleum commodities indicated some slackness. Sulfur production eased, possibly reflecting the effect of increased imports. Although reported statistics indicate sharply decreased output of sand and gravel, limestone, and diorite for 1965, it is believed that no appreciable decline occurred and that the apparent decline can be attributed to a change in the reporting policy.

Sulfur was produced by Texaco Trinidad Inc. at its Pointe-á-Pierre refinery. About one-half of the output reportedly goes to Federation Chemicals, Ltd.; a small portion is distributed to the sugar industry and minor users, with the remainder consumed in Texaco's refinery operations.

Table 17.—Trinidad and Tobago: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals:					
Cement—thousand tons	98	165	162	176	189
Clays—thousand cubic meters	173	73	78	53	71
Diorite—do	4	6	8	9	6
Gypsum—do	2	3	2	2	1
Limestone—do	565	542	526	525	435
Nitrogenous fertilizer [e]—thousand tons	98	85	80	100	120
Porcellanite—thousand cubic meters	37	51	39	31	55
Sand and gravel—do	583	454	470	606	245
Sulfur	6,583	7,272	6,736	5,408	3,783
Mineral fuels:					
Asphalt, natural and similar materials:					
Natural asphalt—thousand tons	178	165	172	195	171
Pitch sand—thousand cubic meters	18	14	10	19	15
Natural gas—million cubic feet	102,282	99,948	99,376	110,732	111,503
Natural gas liquids—thousand 42-gallon barrels	398	194	170	200	197
Petroleum:					
Crude—do	45,768	48,876	48,678	49,730	48,859
Refinery products:					
Aviation gasoline—do	3,826	3,833	970	977	864
Motor gasoline—do	12,671	12,955	18,302	17,747	17,208
Kerosine and jet fuel—do	10,406	10,601	9,482	11,845	17,101
Distillate fuel oil—do	16,472	17,502	20,055	19,658	19,447
Residual fuel oil—do	56,346	60,457	66,271	71,287	75,442
Liquefied petroleum gases—do	48	71	109	146	182
Lubricating—do	1	2	2	406	835
Other—do	7,762	951	693	840	822

[e] Estimate.
Note: Figures for clay, diorite, gypsum, limestone, porcellanite, sand and gravel, and pitch sand have all been revised for the years listed and are now shown in units of cubic meters.

Sources: U.S. Embassy, Port-of-Spain. A–199, May 5, 1966, 5 pp. Ministry of Petroleum and Mines. Monthly Bulletin of the Trinidad and Tobago Petroleum Industry. December 1965, 20 pp.

TRADE

Total value of exports and reexports of metals and minerals in 1964 was $350 million, of which nearly 98 percent was accounted for by petroleum, mainly refinery products but including sizable quantities of crude and partly refined oils.

The role of mineral commodity trade in Trinidad and Tobago's total trade in terms of value for 1963 and 1964 is reflected by the following data:

	Value (thousand dollars)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1963	320,396	377,000	85
1964	349,982	409,800	85
Imports:			
1963	197,981	379,200	52
1964	236,518	427,700	55
Net trade balance:			
1963	+122,415	−2,200	XX
1964	+113,464	−17,900	XX

XX Not applicable.
[1] Approximate.

Source: U.S. Embassy, Port-of-Spain. A–168, Mar. 8, 1966. A–109, Oct. 22, 1964.

Although complete data on 1965 trade are not available, no significant changes in relationships were believed to have occurred, although trade in petroleum and its products generally increased. Exports of refined petroleum products in 1965 were reported by the Ministry of Petroleum and Mines at 127.9 million barrels, an increase of some 11 percent over the 1964 figure. The Ministry estimated that 4.5 million barrels of crude oil were exported in 1965, a very slight decrease from the 1964 level.

Canada was the principal destination for crude oil and lubricants, including greases. The United States and Europe took most of the remaining exports, there being no significant changes in traditional destinations.

Small-scale exports of scrap metal, fertilizers, and building materials in 1964 were virtually unchanged from those of the preceding year.

The Ministry of Petroleum and Mines announced that 93.4 million barrels of crude oil were imported in 1965; about half came from Venezuela, with Saudi Arabia, Colombia, and the United Arab Republic (Egypt) supplying the remainder. Indonesia, which supplied less than 250,000 barrels in 1964, was not a source in 1965. Crude oil imports for 1965 increased about 12 percent compared with those for 1964.

Imports of refined products in 1965, at 651,751 barrels, increased about 42 percent over those of 1964. The bulk of imports was in the form of unfinished oils; no gasoline or gas oil was imported in 1965. This was a change from the 1964 import pattern.

COMMODITY REVIEW

Metals.—No metal production was recorded for Trinidad and Tobago, and all requirements were again satisfied by imports.

Nonmetals.—Requirements for nonmetallic building materials continued to be satisfied from local sources. Needs for industrial nonmetals, including salt, barite, and sulfur again were largely met by imports. It was reported that Federation Chemicals, Ltd. (a subsidiary of W. R. Grace and Co.) produced 189,601 metric tons of anhydrous ammonia in 1965; in addition, the same company also recorded output of 79,651 tons of ammonium sulfate and 39,281 tons of urea. An additional ammonia plant designed to produce 635 tons per day is expected to be commissioned in 1966.

Mineral Fuels.—*Natural Gas.*—Output of natural gas in 1965 increased over that of 1964, but the rate of increase for the period slackened from more than 11 percent for 1963 to 1964 to less than 1 percent for 1964 to 1965. Gas used as process gas in 1965 increased over that of 1964 by more than 6 percent.

Petroleum.—Total footage drilled in 1965 was 1,057,445 feet, only 1,111 feet more than that drilled in 1964; however, there were 214 well completions recorded in 1965; this is 24 more well completions than were recorded in the previous year. Many of 1965's completions were shallow, and drilling activity measured in rig months was essentially the same in 1964 and in 1965.

Texaco Trinidad Inc. and Trinidad Petroleum Development Co., Ltd., both reportedly increased production in 1965, while other operating companies showed slight decreases. Increased production was accounted for partly by the use of modernized technology and partly as a result of newly drilled wells.

The refining industry continued to grow and expand. Daily throughput at the Pointe-à-Pierre complex of Texaco Trinidad Inc. averaged 323,560 barrels in 1965 compared with 298,500 barrels in 1964. Shell Trinidad Ltd. also raised daily throughput at its Point Fortin refinery from 49,900 barrels in 1964 to 52,000 barrels in 1965.

Tabel 18.—Trinidad and Tobago: Exports and reexports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum:			
Scrap	16	13	United Kingdom 8; West Germany 5.
Metal and alloys, other forms	731	28	Barbados 14; Dominica 5.
Copper:			
Scrap	191	30	All to Netherlands.
Metal and alloys, other forms	3	7	British Guiana 3; Belgium-Luxembourg 2.
Iron and steel:			
Scrap	r 754	3,953	Mainly to Japan.
Pig, sponge and primary forms	2	6	Mainly to British Guiana.
Semimanufactures:			
Structural shapes	254	68	St. Vincent 26; Barbados 23; Montserrat 8.
Plates and sheets, all types	326	160	Jamaica 41; Guadeloupe 33; Grenada 30; stores and bunkers 22.
Other	60	242	St. Kitts Nevis 111; Antigua 34; Surinam 27; United Kingdom 17; Barbados 12.
Lead:			
Ore	---	1	All to stores and bunkers.
Scrap	128	---	
Metal and alloys, other forms	(1)	60	Mainly to Denmark.
Nickel and alloys, wrought	2	8	Mainly to Venezuela.
Tin:			
Ore—long tons	---	1	All to stores and bunkers.
Tin and tin alloys—do	(1)	1	Mainly to Montserrat.
Zinc, zinc alloys and scrap	8	(1)	All to Surinam.
Nonferrous scrap, unclassified	r 226	4,155	Mainly to Italy.
Nonmetals:			
Cement	---	4	Mainly to St. Lucia.
Clay and clay products:			
Clays	(1)	(1)	Mainly to stores and bunkers.
Common brick	18	60	Grenada 43; St. Vincent 11.
Fertilizer materials:			
Natural	2	(1)	
Manufactured:			
Nitrogenous	84,213	84,046	Jamaica 26,145; British Guiana 14,049; Barbados 7,868; Guadeloupe 5,182.
Phosphatic	4	1	All to St. Vincent.
Potassic	4	8	St. Vincent 7; Grenada 1.
Mixed	2	13	Dominica 7; Barbados 3.
Gravel and crushed rock	763	15	Barbados 7; Grenada 6.
Lime	1,069	1,012	Barbados 611; St. Kitts Nevis 152.
Salt	275	29	Mainly to stores and bunkers.
Sand	46	155	British Guiana 118; St. Lucia 32.
Stone	1	2	Mainly to British Guiana.
Other nonmetals	814	865	Mainly to stores and bunkers.
Mineral fuels:			
Coal and coke	290	436	Barbados 301; British Guiana 108.
Gas, manufactured	5,517	7,748	Guadeloupe 4,449; Surinam 738; Barbados 726.
Mineral tar	2	4	Mainly to stores and bunkers.
Natural asphalt	68,814	80,349	Mainly to United Kingdom.
Petroleum:			
Crude—thousand 42-gallon barrels	3,773	4,571	All to Canada.
Partly refined—do	3,659	6,297	United States 4,859; Puerto Rico 1,438.
Refinery products:			
Aviation gasoline—do	10,999	13,978	Spain 4,303; France 2,171; United States 1,795; United Kingdom 1,595; Curacao 871.
Motor gasoline—do	10,383	8,998	Mainly to United Kingdom.
Kerosine—do	972	1,242	United Kingdom 175; Nigeria 161; French Africa 133; Jamaica 133; France 122; Netherlands 118.
Distillate fuel oil—do	19,076	19,921	Netherlands 6,464; United Kingdom 3,838; Sweden 2,448; stores and bunkers 1,491.
Residual fuel oil—do	64,659	72,721	United States 36,287; United Kingdom 11,738; stores and bunkers 10,842.
Lubricants, including greases	645	52,633	Canada 20,823; Brazil 11,195; United Kingdom 9,368; Belgium-Luxembourg 5,928.
Asphalt	36,690	26,590	Republic of South Africa 9,868; Guadeloupe 4,804; Jamaica 3,560; Chile 1,892.
Tar oil	21,739	51,347	Netherlands 19,753; United Kingdom 18,351; United States 8,655; West Germany 4,529.
Other	7,762	11,571	Barbados 2,126; British Guiana 1,436; Peru 1,081; French Guiana 968; Grenada 950.

r Revised.
1 Less than ½ unit.

Source: Central Statistical Office Government of Trinidad and Tobago. Overseas Trade. Pt. A, 1963 and 1964.

Table 19.—Trinidad and Tobago: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys, all forms	451	1,652	Mainly from United Kingdom.
Copper:			
Metal and alloys, all forms	165	195	United Kingdom 121; United States 37.
Sulfate	37	15	Mainly from United Kingdom.
Gold, unrefined and partly worked troy ounces	5,699	14,570	Mainly from United Kingdom.
Iron and steel:			
Ore and concentrate	9	22	United Kingdom 15; United States 7.
Scrap	33	41	All from Venezuela.
Pig, sponge, and primary forms	r 960	294	United Kingdom 135; Belgium-Luxembourg 116.
Semimanufactures:			
Structural shapes	10,267	14,173	Belgium-Luxembourg 6,730; United Kingdom 5,143; France 1,098.
Plates and sheets, all types	32,523	11,830	United Kingdom 4,344; Australia 2,871; Netherlands 2,458.
Pipes and tubes	35,026	32,699	United Kingdom 25,438; United States 4,596; West Germany 1,239.
Other	r 658	753	Mainly from United Kingdom.
Lead:			
Ore	1	---	
Scrap	4	(1)	All from Barbados.
Metal and alloys, all forms	r 139	127	United Kingdom 88; Barbados 36.
Nickel and alloys, all forms	6	3	Canada 2; United Kingdom 1.
Platinum, all forms troy ounces	21	37	United Kingdom 24; United States 13.
Silver, including partly wrought do	13,637	17,675	Mainly from United Kingdom.
Tin and alloys, all forms long tons	769	2,639	United Kingdom 1,905; Canada 536.
Zinc and alloys, all forms	35	42	United Kingdom 28; Canada 12.
Nonferrous metals, scrap and ores	24	10	Mainly from United States.
Nonmetals:			
Abrasives, natural	2	2	All from United Kingdom.
Asbestos, crude	---	3	Austria 2; United Kingdom 1.
Barite, crude and ground	41,051	52,542	Brazil 46,926; Canada 5,487.
Cement	18,390	16,633	Venezuela 12,097; United Kingdom 3,657.
Clay and clay products:			
Clay	556	571	United Kingdom 280; United States 216.
Common brick	27	55	All from United Kingdom.
Refractory brick	936	827	Mainly from United Kingdom.
Feldspar	50	42	All from United Kingdom.
Fertilizer materials:			
Natural	70	1	Mainly from Netherlands.
Manufactured:			
Nitrogenous	1,385	289	All from West Germany.
Phosphatic	390	320	All from Netherlands.
Potassic	3,018	2,711	West Germany 1,611; East Germany 899.
Mixed	943	1,981	Italy 971; West Germany 472; Netherlands 472.
Graphite	(1)	(1)	All from United Kingdom.
Gravel and crushed rock	400	178	Italy 123; United States 50.
Lime	r 49	3	All from United Kingdom.
Magnesite	32	81	Mainly from Netherlands.
Mica	7	10	Mainly from Norway.
Salt	6,976	7,284	United Kingdom 3,144; Canada 1,673; Anguilla 1,765; St. Kitts Nevis 381.
Sand	74	47	United Kingdom 22; United States 12; Norway 10.
Sodium carbonate	1,357	2,395	Mainly from United Kingdom.
Sodium hydroxide	2,325	3,242	Do.
Stone:			
Dimension	178	486	Italy 424; Canada 57.
Industrial	6,827	6,886	Venezuela 3,390; Dominican Republic 2,032; Barbados 1,400.
Sulfur	11,308	16,678	Mainly from United States.
Other nonmetals	316	2,122	Canada 1,524; United Kingdom 396.
Mineral fuels:			
Coal and coke	505	1,034	Mainly from United States.
Gas, manufactured	26	24	Do.
Mineral tar	23	36	Mainly from United Kingdom.
Mineral wax	10	---	
Petroleum:			
Crude and partly refined thousand 42-gallon barrels	69,863	86,301	Venezuela 40,931; Saudi Arabia 31,484; Colombia 12,949.

See footnotes at end of table.

Table 19.—Trinidad and Tobago: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Mineral fuels—Continued			
Petroleum:—Continued			
Refinery products:			
Aviation gasoline_____do____	16	---	
Motor gasoline_____do____	107	---	
Distillate fuel oil_____do____	(1)	228	All from Venezuela.
Residual fuel oil_____do____	(1)	2	Canada 1; United States 1.
Lubricants, including greases_	8,807	8,957	United Kingdom 4,531; United States 3,894.
Vaseline and paraffin_____	170	226	United States 112; West Germany 73; Netherlands 29.
Tar oils_____	23,395	36	Mainly from United Kingdom.
Other_____	3,080	17,216	Venezuela 13,833; United Kingdom 3,311.

r Revised.
1 Less than ½ unit.

Source: Government of Trinidad and Tobago. Central Statistical Office. Overseas Trade. Pt. A, 1963 and 1964.

Early in 1965 two new processing plants were placed on stream. Texaco Trinidad Inc. began operating a 1,500-barrel-per-day paraffin plant; products include a range of normal paraffins, which are exported. Shell Trinidad Ltd. commissioned its new hydrotreater-hydrogenerator complex to produce high-octane gasoline and high-quality kerosines.

Costs of the plants were reported as $7.7 million and $3 million, respectively.

Late in 1965, BP (Trinidad) Ltd. completed its natural gas complex to supply gas to Federation Chemicals Ltd. The new 14-inch gasline reportedly delivers 25 million cubic feet of gas a day.

Consumption of petroleum products during 1965 totaled 219,507 barrels. Gas oil and diesel oil made up 48 percent of consumption, and fuel oil 40 percent. International bunkering accounted for 12.3 million barrels, of which 85 percent was fuel oil. The consumption figures given above are subject to revision but are the best ones presently available.

In 1964, 90.7 percent of domestic gasoline supplies came from Texaco's refinery, and 9.3 percent from that of Shell. During the first half of 1965, the market share of gasoline in Trinidad and Tobago was divided as follows: Texaco (Trinidad) Ltd., 35.5 percent; Shell Trinidad Ltd., 27.9 percent; BP Caribbean Ltd., 9.5 percent. The Report of the Commission of Enquiry into the Marketing of Petroleum Products in Trinidad and Tobago was issued in mid-1966 but was largely applicable to 1965. The report was requested by the Governor-General because of a gasoline "price war" that started in December 1964. Part I of the 1965 report was concerned entirely with the aspect of domestic gasoline refining and distribution and went into some detail on the effect of a price war on the individual distributor, the refiner, and the Government. While the scope was domestic in approach, international oil companies were involved. The study appeared to be a good case history that might be generally applicable in other areas with similar conditions.

The Mineral Industry of Argentina

By Charles L. Kimbell [1]

The Republic of Argentina remained relatively unimportant among world producers of both crude and processed mineral commodities in 1965. Moreover, the domestic mineral industry as a whole was only a modest contributor to the nation's economy, with the extractive sector (mining, quarrying, and crude oil production) contributing only about 1.5 percent of the gross national product (GNP), and the mineral processing sector making only a slightly larger contribution, insofar as can be determined. Also, the entire industry (extractive and processing) employed less than 2 percent of the total labor force, which was estimated at 7.3 million in 1965.

The importance of mineral commodities to the nation's economic growth, however, is reflected in the relationship of mineral imports to total imports; in 1964, the last year for which complete data are available, mineral commodity imports with a value of $308.3 million constituted 28.6 percent of total imports, and preliminary figures indicate that this may have exceeded $360 million in 1965.

Salient statistics on the nation's general economy and on value of mineral production are presented in the following tabulation:

	1962	1963	1964	1965
Gross national product:				
National currency, current prices ---- billion pesos	1,409	1,740	2,521	e 3,150
U.S. currency:				
Current prices ---- million dollars	10,440	10,130	11,160	e 12,300
1962 prices ---- do	10,440	10,000	10,840	e 11,750
Exchange rate (free rate) [1] ---- pesos per U.S. dollar	134.1	132.5	150.9	188.5
Value of crude mineral production:				
National currency ---- million pesos	43,411	54,907	r 50,922	[2] 58,003
U.S. dollars, converted at exchange rates above [3] ---- million dollars	r 323.7	r 414.4	r 337.5	[2] 307.7
Percentage distribution of total output value by commodity group:				
Metal ores and concentrates ---- percent	3.6	3.1	4.0	[2] 5.6
Nonmetals:				
Construction materials [4] ---- do	7.2	7.6	8.2	[2] 10.1
Other [4] ---- do	2.7	2.0	2.7	[2] 4.1
Total ---- do	9.9	9.6	10.9	[2] 14.2
Mineral fuels ---- do	86.5	87.3	85.1	[2] 80.2
Grand total ---- do	100.0	100.0	100.0	[2] 100.0

e Estimate.
r Revised.
[1] As reported by the U.S. Agency for International Development.
[2] Excludes value of 8 commodities that were not reported in 1965 but that in 1964 accounted for only 0.3 percent of total.
[3] Data differs from that reported in Minerals Yearbook, Volume IV for 1964 because of the use of different exchange rates.
[4] Construction materials as reported here include those commodities listed in Argentine sources as "rocas de aplicación"; all clays are included under other.

[1] Physical scientist, Division of International Activities.

Despite the industry's relative unimportance in the sense of its direct role in the economy in 1965, it remained quite diversified, and efforts were being made for expansion of productive capacity so as to better meet anticipated growth in internal demand. Relatively small programs of facility expansions were completed in the steel industry, the petroleum refining industry and the cement industry in 1965, and generally increased production of nonmetallic minerals probably reflected other unreported efforts to increase production.

More ambitious plans for further expansions, some announced in 1964 and others reported for the first time in 1965, were undergoing further study, were being held in abeyance until sufficient capital was available for a start, or were moving into preliminary development stages. Among such projects were a major iron mining venture, a manganese-gold-silver mining project, a sizeable lead-zinc mining expansion, major expansion of the existing integrated San Nicolas steel plant, erection of two new integrated steel plants, erection of a new cement plant, sizeable expansion of mineral fertilizer production facilities, establishment of a significant petrochemical industry, expansion of the borate industry, and overall expansion of the petroleum industry, both crude oil production and refining capacity.

There was also hope that discoveries of porphyry copper resulting from United Nations Special Fund studies and of uranium resulting from exploration by National Atomic Energy Commission technologists would add to the country's economically minable mineral resource, but the commercial feasibility of these deposits had not been positively proven at yearend.

Notable developments in the area of governmental actions, policies and programs included intensification of efforts to settle problems created by annulments of oil exploration and development contracts in late 1963 with the result that by yearend, only 4 of the original 11 disputes remained unresolved, and these were being negotiated. Also of significance were the legislative action to insure maximum use of domestic coal resources; governmental approval of several industrial expansion programs; and continued mineral and petroleum exploration efforts by Government entities on their own and with contracted assistance.

PRODUCTION

Argentina's mineral industry as a whole increased output on a quantitative basis in 1965. Although complete data were not available, value of total output also presumably increased but this value increase was attributable primarily to elements of the processing sector, chiefly the iron and steel industry, the nonferrous metal smelters, the cement industry, and the petroleum refining industry. Despite quantitative increases in production of most commodities by the extractive industry, value of total extractive industry output fell by almost $30 million.

Considering extractive industry output by major commodity sectors, the value decline was attributed entirely to the fuels sector, and was the result of a 2 million barrel decline in crude oil output as well as to a lower unit value for crude oil. Coal production increased marginally but was slated for a greater increase in 1966 in response to government efforts to curtail imports of higher quality coal which enjoyed market preference to the domestic product.

Among metallic commodities, the steel output increase was made possible by increased domestic iron ore output as well as by increased imports of both iron ore and manganese ore, the latter in response to both increased Argentine demand and lower domestic output. Production of lead in concentrates was higher in 1965 than in any year except 1959, and output of zinc in concentrates, although considerably short of the record level of 1959, was higher than in 1963 and 1964. Moreover, the lead and zinc in concentrate output increases were achieved despite the fact that the mine which through 1963 had ranked as the nation's second largest lead producer, approached, if it did not reach, exhaustion of reserves during 1965. Argentine smelter lead and zinc production also reached new highs in 1965, as a result of higher mine output levels and curtailed concentrate exports.

As a result of the gains in metal mine output noted above and increases in a few other minor commodities, the total value of extractive industry metal production increased by over 28 percent, despite declines in gold and manganese output and cessa-

tion of production of concentrates of bismuth, columbium-tantalum and vanadium.

Among industrial nonmetals, higher levels of sulfur and borate production, both derived from deposits in the high Andes, apparently indicated better than average climatic conditions permitting a prolonged mining season. The higher borate output also was a result of expansion of facilities by the nation's principal borate producer. The sizable improvement in salt production also was apparently attributable to better than normal climatic conditions in the principal producing areas of Buenos Aires Province, Chubut Province, and Salta Province. Increases in output of these commodities together with most less-prominent Argentine industrial nonmetals and most major as well as a number of minor nonmetallic construction materials accounted for the 23 percent increase in the total value of crude nonmetallic minerals produced.

Table 1.—Argentina: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Beryl, about 11 percent BeO	[1] 1,350	224	377	189	330
Bismuth:					
Gross weight of ore—kilograms	19,676	19,590	3,750	20	----
Metal content of ore—do	r 3,758	3,223	610	4	----
Columbite-tantalite—do	r 600	240	600	----	----
Copper:					
Gross weight of ore	4,591	3,179	4,001	6,564	[2] 10,942
Metal content of ore	r 632	405	391	345	[2] 481
Gold—troy ounces	2,251	r 827	r 313	303	68
Iron and steel:					
Iron ore—thousand tons	139	r 123	r 100	95	113
Pig iron and ferroalloys—do	396	397	424	r 589	663
Crude Steel:					
Ingots—do	r 444	r 643	r 896	1,250	1,346
Castings and forgings—do	r 30	r 16	r 17	17	e 22
Total—do	r 474	r 659	913	r 1,267	1,368
Semifinished steel:					
Blooms—do	250	46	108	299	172
Billets—do		375	433	504	767
Slabs—do	2	33	110	52	54
Total—do	252	454	651	855	993
Steel semimanufactures:					
Angles and sections—do	r 110	90	r 61	r 119	136
Reinforcing bars—do	208	175	r 138	212	265
Wire rods—do	215	172	r 209	252	231
Rounds, squares, hexagonals—do	67	48	36	81	96
Flats—do	89	73	49	95	113
Sheets (hot rolled)—do	14	35	r 143	400	498
Hot strips—do	102	78	66	r 75	70
Seamless pipe—do	100	89	62	84	93
Other—do	r 5	3	r 5	r 11	21
Total—do	r 910	763	r 769	r 1,330	1,543
Lead:					
Gross weight of concentrate	r 37,032	38,382	34,235	33,911	38,836
Metal content of concentrate	r 28,420	29,580	26,465	25,924	29,632
Smelter production	28,000	24,500	24,000	23,000	32,000
Manganese ore:					
30 to 40 percent manganese	17,893	12,629	11,282	19,400	21,003
Under 30 percent manganese	22,011	16,616	17,933	17,868	7,765
Total	39,904	29,245	29,215	37,268	28,768
Silver—thousand troy ounces	1,431	2,086	r 1,943	r 1,943	2,286
Tin:					
Gross weight of concentrate—long tons	1,496	1,378	1,311	1,929	2,775
Metal content of concentrate—do	r 257	231	225	343	497
Tungsten:					
Gross weight of concentrate	747	500	144	56	130
Standard 60 percent WO_3 equivalent of concentrate	809	r 562	r 167	r 61	146
Uranium:					
Gross weight of concentrate	3,136	943	4,669	21,757	29,604
Uranium oxide (U_3O_8) content of concentrate	5	r 4	r 9	34	47

See footnotes at end of table.

Table 1.—Argentina: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals—Continued					
Vanadium:					
Gross weight of concentrate	600	400	240	260	----------
Metal content of concentrate	e 4	r 8	r 2	r 2	----------
Zinc:					
Gross weight of concentrate	61,346	60,230	56,189	45,261	58,485
Metal content of concentrate	r 32,215	r 31,424	r 28,737	22,913	29,324
Smelter production	14,400	16,771	19,700	22,200	23,600
Nonmetals:					
Asbestos	----------	184	331	492	220
Barite	28,555	12,536	22,997	r 14,505	15,031
Borates; tincal and ulexite	6,836	18,551	24,215	r 16,115	45,700
Cement thousand tons	2,903	2,948	2,519	2,817	3,216
Clays:					
Bentonite do	32	29	34	r 37	43
Foundry mold earth do	2	1	2	2	2
Fuller's earth do	4	4	5	4	5
Kaolin do	36	39	36	r 43	73
Refractory clay do	124	94	76	94	109
Miscellaneous do	228	268	234	289	467
Diatomite	r 3,477	3,394	5,675	7,772	6,095
Dolomite	37,123	61,494	123,580	r 120,102	98,632
Feldspar	11,658	7,361	12,801	r 9,273	20,140
Fertilizer materials: Natural: Guano	161	182	811	180	120
Fluorspar	r 10,274	12,518	9,762	r 11,524	11,924
Garnet (almandite)	----------	60	150	90	60
Graphite	778	425	278	r 222	116
Gypsum	r 192,004	214,989	196,098	r 154,502	204,272
Lime thousand tons	e 1,000	NA	NA	NA	NA
Limestone do	7,137	7,045	6,549	r 6,598	7,242
Lithium minerals	402	450	1,436	725	622
Mica	55	49	89	r 674	211
Pigments, mineral: Ocher	92	129	70	25	48
Rhodochrosite, ornamental	172	----------	----------	----------	122
Salt:					
Rock thousand tons	2	1	3	2	3
Other do	415	556	272	391	725
Total do	417	557	275	393	728
Stone, sand and gravel, (n.e.s.):					
Carbonate:					
Calcite	7,389	4,950	19,970	r 6,763	NA
Calcium carbonate, natural	r 18,288	24,181	18,481	33,685	NA
Marble and related materials:					
Aragonite	----------	416	----------	----------	NA
Marble and crystalline limestone	14,553	10,689	21,632	r 12,116	10,973
Onyx	954	896	r 409	300	565
Travertine	3,238	2,794	4,356	3,387	2,656
Marble rubble	25,822	28,563	20,395	r 23,907	52,976
Silicate:					
Quartz thousand tons	59	31	30	r 21	36
Quartzite do	774	864	894	r 767	730
Sandstone do	29	35	29	26	22
Sand for construction do	3,177	3,711	5,867	r 5,203	5,606
High purity silica sand do	121	100	82	99	127
Other:					
Basalt and related rocks do	118	103	188	183	177
Granite and related rocks do	1,810	r 2,028	2,549	r 2,196	2,470
Serpentine	7,298	6,816	15,739	r 17,295	8,800
Slate	----------	----------	600	81	NA
Volcanics: Ash, pumice and pozzolana	29,321	11,717	r 12,217	r 3,976	5,194
Rubble, coarse thousand tons	1,351	r 1,136	1,799	r 1,320	NA
Strontium mineral: Celestite	----------	----------	540	30	598
Sulfur, elemental, refined [3]	22,539	22,661	22,696	22,307	23,766
Sulfates, hydrous:					
Aluminum (alum)	8,513	7,732	10,926	12,716	7,139
Iron (melanterite)	452	----------	----------	----------	900
Magnesium (epsomite)	1,541	1,942	2,447	r 2,637	2,420
Sodium (mirabilite)	11,199	11,249	9,856	r 9,242	16,215
Talc, soapstone, and pyrophyllite:					
Pyrophyllite	10,357	13,473	8,918	7,245	NA
Steatite		200	3,080	6,409	NA
Talc	18,711	15,035	16,063	r 11,144	14,472
Vermiculite	r 3,555	2,687	2,780	r 3,693	1,685
Water, mineral	12,418	12,870	11,622	10,436	NA
Zeolites	----------	----------	70	80	63

See footnotes at end of table.

Table 1.—Argentina: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Mineral fuels:					
Asphaltites:					
Raphaelite	1,076	1,972	2,557	1,969	354
Other	3,671	1,066	2,875	2,432	3,203
Total	4,747	3,038	5,432	4,401	3,557
Carbon black	NA	NA	5,815	11,400	14,500
Coal, bituminous thousand tons	344	r 212	r 209	332	374
Coke:					
Oven and beehive	335	347	315	451	461
Low temperature e	60	60	60	60	NA
Gas, natural, marketed 4 million cubic feet	87,937	110,090	125,564	r 139,987	NA
Peat	1,000	2,250	10,825	3,877	3,652
Petroleum:					
Crude thousand 42-gallon barrels	84,418	r 98,206	r 97,141	r 100,276	98,276
Natural gasoline do	r 81	86	r 1,098	r 896	1,160
Refinery products:					
Aviation gasoline do	412	400	322	r 384	190
Motor gasoline do	19,046	23,563	22,048	r 24,148	30,581
Jet fuel do	221	492	609	r 779	943
Kerosine do	7,735	9,236	7,572	r 7,569	6,947
Distillate fuel oil do	12,378	14,973	19,368	r 17,958	28,643
Residual fuel oil do	38,834	39,429	36,804	r 46,868	52,906
Lubricants, including greases do	1,096	1,062	860	r 979	1,112
Other liquid products do	4,376	8,020	8,086	r 4,585	3,828
Petroleum coke thousand tons	(5)	(5)	(5)	351	356
Liquefied gas do	(5)	(5)	(5)	317	323

e Estimate.
p Preliminary.
r Revised.
NA Not available.
1 Exports.
2 Excludes 6 tons of cement copper, with a copper content of 76.9 percent.
3 Excludes production from petroleum refineries.
4 Converted from cubic meters to cubic feet at the rate of 1 cubic meter equals 35.38 cubic feet.
5 Converted to barrels and included with other liquid products.

TRADE

Preliminary and incomplete trade returns indicate that the value of Argentina's 1965 mineral commodity exports fell below the 1964 level of $30.6 million, possibly to as low as $20 million, while the value of imports of these commodities unquestionably exceeded the 1964 level of $308.3 million by a sizable amount, perhaps exceeding $360 million in total. Thus, the nation remained a major importer of mineral commodities in 1965 as it was in 1964, when a trade deficit of $277.7 million was recorded for these goods, compared with an overall positive trade balance of $333.2 million as shown in the following tabulation:

	Value, million dollars		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1963	33.9	1,365.1	2.5
1964	30.6	1,410.3	2.2
Imports:			
1963	200.4	980.7	20.4
1964	308.3	1,077.1	28.6
Trade balance:			
1963	r−166.5	+384.4	XX
1964	−277.7	+333.2	XX

r Revised.
XX Not applicable.

Source: Statistical Office of the United Nations.

Dominant mineral commodity import groups in 1965 were iron and steel, crude oil, iron ore, distillate fuel oils, and lubricating oils.

Dominant mineral commodity exports in 1965 in terms of value were residual fuel oil, steel semimanufactures, complex tin ores with high silver content, and salt; these commodities together apparently accounted for about 90 percent of total 1965 mineral commodity export value. Residual fuel oil exports nearly doubled those of 1964 on a value basis, while the value of salt exports increased by 5 percent and that of tin ore exports moved upward by 3.6 percent. Steel semimanufacture exports, although remaining the nation's second most important mineral industry export commodity, were 40 percent below those of 1964 on a value basis. Exports of zinc in the forms of concentrates and unwrought metal, which had been the country's third through 1964, fell sharply and their contribution to the 1965 total was quite modest.

Principal destinations for mineral exports in 1965 were not available, but it is presumed that they remained about the same as in 1964, when almost 30 percent of the total on a value basis was destined for the United States, 18 percent for Venezuela, 9 percent for Paraguay, 9 percent for Uruguay, and 8 percent for Brazil.

As is the case with destination data for exports, information on 1965 source countries for mineral imports are not available, but it is believed that there were no radical changes from the 1964 distribution, when the United States ranked first, accounting for 18 percent of the total value, followed by Venezuela with 9.5 percent, the United Kingdom with 9.3 percent, Italy with 9.1 percent, West Germany with 8.9 percent, Trinidad and Tobago with 6.4 percent, and the Netherlands Antilles with 6.0 percent.

Table 2.—Argentina: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum and alloys, all forms	1,757	1,316	Sweden 1,000; Panama 118; Venezuela 47; Denmark 28.
Beryl	748	401	All to United States.
Cadmium kilograms	NA	3,057	Netherlands 1,894; United States 1,163.
Copper:			
Concentrates:			
Straight copper	2,155	1,313	West Germany 767; Japan 499.
Copper-silver	57	40	All to Japan.
Matte	17	354	All to West Germany.
Metal and alloys, all forms	r 6,004	22	Uruguay 11.
Iron and steel:			
Scrap	2	1	All to Paraguay.
Ingots, blooms, billets and slabs	70	217	Uruguay 215.
Semimanufactures:			
Structural shapes	2,382	3,791	Uruguay 3,499.
Wire bar	r 65,838	53,352	United States 41,190; Brazil 7,737; Uruguay 4, 275.
Other bars and rods	r 1,777	14,167	Ecuador 6,052; Uruguay 5,018.
Plates and sheets	r 881	623	Paraguay 327; Uruguay 256.
Hoop and strip	r 990	1,296	Uruguay 1,170.
Wire	r 2,026	2,933	Paraguay 2,244.
Pipes, tubes and fittings	r 28,710	5,922	Venezuela 29,156; United States 14,134; Chile 5,020.
Other	r 107	53	Uruguay 39.
Lead:			
Ore and concentrate	270	314	West Germany 182; Belgium 132.
Metal and alloys, all forms	3	----------	
Manganese ore	1,042	----------	
Silver:			
Ingots, bars, thousand troy ounces grains, and other forms.	731	252	Brazil 247.
Residue, dross, and powders, including those of gold and platinum.	19	22	United Kingdom 19; Belgium 3.
Tantalite kilograms	2,050	----------	
Tin:			
Tin concentrate long tons	47	70	All to United Kingdom.
Tin-silver concentrates do	1,384	1,749	Do.
Tin and silver dross and residue do	11	----------	
Tungsten ore	1,475	401	All to United States.

See footnotes at end of table.

Table 2.—Argentina: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals—Continued			
Zinc:			
Concentrate	47,372	29,855	United States 23,479; Japan 6,188.
Metal and alloys, all forms	3,184	1,088	Brazil 1,076.
Other:			
Ores, not elsewhere specified	729	1,630	Italy 852; West Germany 588; Belgium 127.
Drosses, skimmings, residues, powder	274	694	Belgium 395; Netherlands 220; Spain 52.
Metals and alloys	18	1	All to Paraguay.
Nonmetals:			
Asbestos kilograms	291	1,200	All to Paraguay.
Barite	26	55	Paraguay 30; Uruguay 15.
Borates	5,410	946	Brazil 281; Uruguay 230; East Germany 200.
Cement	415	1,136	Chile 700; Paraguay 254; Bolivia 182.
Clays:			
Bentonite	5,298	5,638	Brazil 3,043; Chile 1,195; Bolivia 1,067.
Kaolin	60	50	All to Chile.
Common	88	131	Brazil 100; Paraguay 20.
Dolomite	695	500	All to Chile.
Feldspar	11	----	
Fertilizer materials:			
Crude, all types	501	255	Unspecified West Europe.
Ammonia, anhydrous	28	39	Unspecified Latin America.
Fluorspar	557	678	Chile 599; Uruguay 79.
Gypsum and plasters	8,370	9,268	Uruguay 9,070; Paraguay 198.
Lime	394	78	Bolivia 76; Peru 2.
Mica	484	912	France 620; Italy 177; United States 65.
Onyx	46	105	West Germany 39; Italy 30; United States 20.
Pigments, mineral	50	97	Uruguay 90.
Quartz	1	10	Uruguay 5; Paraguay 5.
Salt	57,404	67,495	Uruguay 47,653; Paraguay 19,752.
Stone, sand and gravel dimension stone, crude:			
Marble and other calcareous	89	310	Italy 135; Paraguay 66; Portugal 57.
Other	4,064	2,556	Italy 1,921; Japan 601.
Other nonmetals	4,109	682	Paraguay 532; Chile 96; Uruguay 47.
Mineral fuels:			
Carbon black	----	247	Chile 162; Brazil 85.
Coal	----	503	All to Uruguay.
Coke	30	10	All to Paraguay.
Asphalt, natural, including asphaltite (raphaelite).	4,165	3,171	Paraguay 2,101; United Kingdom 375; Brazil 277; Libya 272.
Natural gas	15,592	989	France 786; Paraguay 203.
Natural gas liquids	3,039	95	All to Paraguay.
Petroleum:			
Crude	101,869	16,216	Uruguay 16,190.
Refinery products:			
Gasoline	51,358	21,637	Brazil 12,748; Paraguay 8,889.
Kerosine	7,490	75	All to Paraguay.
Distillate fuel oil	34,210	335	Paraguay 334.
Residual fuel oil	619,960	477,405	United States 188,507; Canada 172,400; Paraguay 51,444.
Lubricants, including greases	49	108	Uruguay 36; Paraguay 29; Nigeria 22.
Other	1,018	1,498	Chile 550; Brazil 355; Uruguay 84.

NA Not available.
r Revised.

Table 3.—Argentina: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Bauxite	4,292	31,275	Surinam 20,045; British Guiana 8,680; Brazil 2,550.
Alumina and aluminum hydroxide	3,578	4,381	West Germany 3,876; France 423.
Metal and alloys, all forms	15,075	33,706	United States 12,626; Canada 4,723; France 4,612.
Antimony:			
Ore and concentrate	376	505	Bolivia 347; Peru 131; United States 20.
Regulus	(1)	1	All from United States.
Arsenic, white	404	530	Belgium-Luxembourg 237; Sweden 159; West Germany 109.
Bismuth, metal and compounds kilograms	2,545	8,916	Peru 6,688; United States 1,610.
Cadmium and salts	1	1	All from United States.
Chromium and compounds	1	5	United States 2; West Germany 2.
Cobalt:			
Metal	22	47	Belgium-Luxembourg 46.
Oxides and hydroxides	4	8	Belgium-Luxembourg 4; United Kingdom 3.
Copper, including alloys:			
Unwrought	16,527	25,878	Chile 10,781; West Germany 7,976; United Kingdom 2,497.
Semimanufactures	947	1,600	West Germany 620; United Kingdom 484; Chile 220.
Gold foil troy ounces	----------	285	All from Netherlands.
Iron and steel:			
Iron ore thousand tons	757	1,019	Brazil 613; Chile 209; Peru 175.
Scrap do	9	143	United States 137; Paraguay 4.
Pig iron, including cast iron do	(1)	24	Finland 20.
Ferroalloys, including spiegeleisen	198	345	Republic of South Africa 220; Brazil 48.
Ingots and equivalent primary forms thousand tons	93	166	United States 50; Brazil 21; West Germany 19; Belgium-Luxembourg 18.
Semimanufactures:			
Bars and rods do	27	72	West Germany 18; United Kingdom 11; United States 9; France 7.
Structural shapes do	6	17	West Germany 8; Brazil 5.
Plate and sheet:			
Heavy and medium do	7	32	Brazil 26; Chile 5.
Thin:			
Tinned do	94	115	United Kingdom 48; United States 21; Japan 19; Canada 12.
Other, coated and uncoated do	114	188	United Kingdom 41; Japan 31; West Germany 26; United States 24.
Hoop and strip do	4	2	Mainly from United States and West Germany.
Rails and accessories do	2	2	West Germany 1.
Wire do	3	2	Belgium-Luxembourg 1.
Pipes and tubes do	137	82	Italy 76.
Lead and alloys, unwrought and semimanufactures.	3,302	885	Mexico 873.
Manganese oxides	1,946	2,168	United States 922; India 790; United Kingdom 418.
Mercury 76-pound flasks	r 501	2,844	Mexico 2,666; Peru 137; Chile 30.
Nickel and alloys, unwrought and semimanufactures.	203	515	United States 177; Canada 167; Norway 145.
Selenium	3	6	Canada 2; Sweden 2.
Tin:			
Oxide long tons	5	9	United Kingdom 7.
Metal and alloys, unwrought and semimanufactures. do	1,189	1,476	Malaya 1,433; United Kingdom 32.
Titanium oxides	2,933	7,274	West Germany 2,003; Netherlands 965; United Kingdom 865.
Zinc and alloys, unwrought and semimanufactures.	504	654	Belgium-Luxembourg 385; Mexico 115.
Other:			
Ore and concentrate	924	684	Australia 647.
Metals and alloys	10	8	Peru 7.
Nonmetals:			
Asbestos	----------	12,830	Canada 9,106; Rhodesia and Nyasaland 1,517; France 1,205.
Barite	16	59	West Germany 48; Belgium 10.
Cement	530	3,183	All from Uruguay.
Chalk	59	38	United States 32.

See footnotes at end of table.

Table 3.—Argentina: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—Continued			
Clay and clay products:			
Refractory earth	17,005	18,977	Uruguay 12,590; British Guiana 3,070.
Kaolin	6,455	10,620	United States 8,039; United Kingdom 2,359.
Other earths	15	15	Mainly from West Germany.
Clay products:			
Nonrefractory	316	----------	
Refractory brick	7,730	10,924	Austria 5,725; Italy 1,188; United States 918.
Diamond, industrial:			
Stones—carats	1,430	905	West Germany 580; United States 140.
Powder—do	2,775	12,060	United States 11,000; United Kingdom 600.
Emery	1,116	2,428	West Germany 795; France 711; Austria 239.
Fertilizer materials:			
Crude:			
Nitrogenous	8,350	8,438	Chile 8,308; West Germany 130.
Phosphatic	79	417	Netherlands 306; United States 111.
Potassic	551	1,018	West Germany 412; United States 288.
Manufactured:			
Nitrogenous	24,576	39,183	Italy 19,863; West Germany 9,065; Netherlands 8,408.
Other	38,908	83,528	Italy 31,586; Netherlands 21,530; West Germany 19,439.
Graphite	210	151	United Kingdom 41; Norway 33; West Germany 24.
Gypsum	48	28	West Germany 23.
Lime	----------	39	All from Paraguay.
Kyanite	51	----------	
Lithium and its compounds	4	21	United States 9; Netherlands 6.
Magnesite	2,405	4,790	Austria 3,380; Brazil 702; Canada 168.
Mica	13	19	United States 12; United Kingdom 7.
Pigments, mineral	378	220	United States 186.
Pumice	----------	1	All from Italy.
Salt	2	----------	
Sodium and potassium compounds not elsewhere specified:			
Caustic soda	10,670	15,951	United States 8,280; United Kingdom 3,215; France 1,400.
Caustic potash and peroxides of sodium and potassium.	807	3,383	West Germany 1,846; Netherlands 593.
Stone, sand and gravel:			
Dimension stone	860	708	Italy 440; Uruguay 253.
Gravel and crushed stone—thousand tons	221	325	Paraguay 232; Uruguay 93.
Sand—do	500	502	Mainly from Uruguay.
Sulfur	13,975	45,189	United States 45,119.
Talc	71	193	Uruguay 87; mainland China 75; United States 10.
Other nonmetals:			
Fluorine, bromine and iodine	124	207	Israel 131; Chile 51.
Crude, not elsewhere specified	7,187	25,679	Brazil 25,574.
Mineral fuels:			
Asphalt, natural	173	244	United States 243.
Carbon black	3,244	5,451	United States 4,608; West Germany 745.
Coal—thousand tons	769	691	United States 665; Poland 25.
Coke—do	2	69	West Germany 41; Netherlands 11; United States 11.
Gas, natural and manufactured—do	32	86	Chile 38; Venezuela 37; Bolivia 6.
Petroleum:			
Crude—do	869	1,478	Venezuela 873; Iran 236; Iraq 112.
Refinery products:			
Gasoline—do	35	29	Netherlands Antilles 26.
Kerosine—do	28	16	All from Netherlands Antilles.
Distillate fuel oil—do	461	1,047	Netherlands Antilles 574; Venezuela 236; United Kingdom 116.
Lubricants, including greases—do	74	69	United States 40; Venezuela 24.
Other—do	(1)	1	Mainly from Uruguay.
Crude chemicals derived from distillation of coal, petroleum, or gas.	8,477	25,823	Colombia 12,377; West Germany 5,404; United States 3,423.

r Revised.
1 Less than ½ unit.

Source: Statistical Office of the United Nations for most data, with additional detail from: Dirección Nacional de Estadística y Censos. Comercio Exterior Argentina 1963 and 1964. Vol. II.

COMMODITY REVIEW

METALS

Aluminum.—No significant steps were taken with regard to the establishment of a facility to extract aluminum, iron, and titanium concentrates from Missiones Province lateritic clays. Proposals for such a facility, reported in Volume IV of Minerals Yearbook for 1964, were predicated upon the commercial feasibility of a separation process of Australian design. Reports indicate that otherwise unidentified foreign groups were considering the possibility of further exploring for suitable deposits and obtaining Government authorization to establish production facilities, but no details were given.[2]

Similarly, no positive action evidently was taken with regard to three 1961–62 proposals to establish any of the alumina reduction facilities that were summarized in the 1964 edition of Minerals Yearbook, Volume IV.

Copper.—The United Nations-Fabricaciones Militares (Argentine Government Agency) $3 million exploration program, underway since 1963, began more detailed study of some of the areas delineated for further examination by preliminary geophysical, photogeological and geochemical methods. Of five areas reportedly having some promise, one, at Paramillos, was the site of three reconnaissance drill holes, each about 700 feet deep. The borings here, on a rolling plateau about 10,000 feet above sea level near the paved highway from Mendoza, Argentina, to Santiago, Chile, were claimed to definitely demonstrate the existence of porphyry copper mineralization, however, economic feasibility of exploitation reportedly hinged upon more and deeper drilling. Other areas, not drilled, were near Santa Clara ravine in Mendoza Province and at Leoncito in San Juan Province. At yearend, it was announced that in 1966, the United Nations group expected to subcontract for further drilling work on these porphyry deposits, which have been described as being similar to the type found in Chile and in the Western United States.[3]

According to the original United Nations-Fabricaciones Militares agreement, the latter has the right to reserve to its domain 10 percent of the most promising areas surveyed, while the remainder of the areas would be opened for international bidding.

Elsewhere in Argentina, the Instituto Nacional de Geología y Minería began planned studies in the Provinces of Salta, Jujuy, Catamarca and La Rioja, and by yearend reported a copper discovery of unspecified size and grade in Catamarca. Further results on reportedly promising discoveries during 1964 by The Mineral Department of San Juan Province in that Province and by an unidentified group in Santa Cruz Province were not available.

Iron Ore.—Imported ore continued to be the overwhelmingly dominant source of iron for Argentina's steel industry in 1965, as receipts from abroad increased 2.8 percent to 1,032,519 tons. However, the small domestic iron ore industry recorded a 19 percent gain in output, thus providing slightly over half of the increase in ore availability (gross weight basis) in 1965 as compared to its 1964 performance, when imports cut into domestic ore markets.

The bulk of domestic output again apparently was obtained from the Zapla deposit in Jujuy Province, captive mines which supply ore to the nation's second ranked steel producer, Establecimiento Altos Hornos de Zapla. The large Sierra Grande iron ore deposit of Río Negro Province remained unexploited, although studies relating to its development continued. Data on reserves previously reported have been modified; the latest available source[4] gives the following data based on a study completed in 1964 by a private consulting firm employed by S.A. Minera y Siderúrgica Patagónica Sierra (MISIPA), the private joint stock corporation charged with exploration and development of the deposit: Measured ore—48.35 million tons, indicated ore—30 million tons, inferred ore—15.34 million tons, total ore—93.69 million tons. Ore grade reported was as follows in percent: Iron—58.04, silica—5.95, alumina (Al_2O_3)—4.85, phosphorus—1.43, sulfur—0.44, calcium—3.27.

Tentative studies on this project indicate that establishment of this deposit as a producer of 1 million tons of pellets as blast

[2] U.S. Embassy, Buenos Aires, Department of State Airgram A–279, Oct. 22, 1966, p. 4.
[3] Drilling of Argentine Copper Deposits Will be Intensified. American Metal Market, Mar. 23, 1966, p. 11.
[4] Pages 3–4 of work cited in footnote 2.

furnace feed, including mining, beneficiation and pelletizing facilities, will cost between $35 million and $60 million, but at yearend, no detailed economic and financial feasibility study had been carried out. There were indications however, that MISIPA would accept bids for such studies during 1966.

Iron and Steel.—The Argentine iron and steel industry set new production records in 1965 in response to domestic market demand that remained strong until the latter part of the year. Pig iron output, 12.5 percent higher than in 1964, was again obtained from two operating companies: Sociedad Mixta Siderúrgica Argentina (SOMISA) produced 589,600 tons (7.8 percent more than in 1964) while Fabricaciones Militares' Establecimiento Altos Hornos de Zapla produced 73,600 tons (73.5 percent more than in 1964) using only 2 of its 4 furnaces. Altos Hornos Güemes, the nation's only other facility capable of pig iron production, reportedly remained idle during 1965 although there was an indication that production might start again in 1966.[5] Of total pig iron output, 643,400 tons was used for steelmaking; the remaining 19,800 tons was foundry iron.

Crude steel production increased nearly 8 percent in 1965; of total output, SOMISA accounted for 768,955 tons, Zapla for 71,629 tons, and the country's 10 semi-integrated steel companies for 505,637 tons. (In addition, small foundries produced an estimated 22,000 tons of steel castings which are not included in reported steel output). The decline in the growth rate relative to that of past years was due to the fact that no new furnaces were added by any of the producers, the entire gain being attributed to better utilization of existing installations and to relatively minor improvements in these facilities.

Production of semimanufactures, totaling over 1.5 million tons, was 16 percent greater than in 1964, with output of every class of semimanufacture increasing except for hot-rolled strips (down 7.9 percent with respect to the 1964 level) and wire rod (down 8.3 percent). The greatest increase for any single type of semimanufacture was again, as in 1964, in the case of hot-rolled sheets, but the 1965 increase (24.5 percent) was more modest than that of 1964.

SOMISA was the nation's leading producer of semimanufactures, accounting for 30.8 percent of the total. The second-ranked producer of semimanufactures was the partly integrated Industria Argentina de Aceros, S.A. (ACINDAR), with 19.5 percent of the total. The remaining 9 partly integrated plants together produced 24.6 percent of all semimanufactures while two firms engaged only in rolling operations provided 22.2 percent. The Zapla integrated steelworks accounted for the remaining 2.9 percent of 1965 steel semimanufactures output.

Apparent consumption of steel semimanufactures totaled 2.12 million tons, almost 19 percent above that of 1964, and 37 percent greater than recorded production. This calculation of apparent consumption takes into account both direct imports of semimanufactures and the steel semimanufacture equivalent of finished goods imported.[6]

At yearend, the nation's capacity for iron and steel production in general terms was estimated as shown in the following tabulation compared with projected capacity in 1972 under long range plans:

Commodity	Capacity (thousand tons)			
	1965			1972 projected
	Active	Inactive	Total	
Pig iron	744	44	788	3,365
Crude steel	1,689	10	1,699	4,641
Hot-rolled steel	2,310	141	2,451	4,134

[5] Gilberti, Enrique. Argentina. Mining Annual Review 1966. Min. J. (London) May 1966, p. 211.

[6] Centro de Industriales Siderúrgicos. La Siderúrgia Argentina en 1965, p. 30.

Development plans aimed at attaining the 1972 goals included SOMISA's $33 million emergency project that was started in October and that was aimed at raising the firm's crude steel capacity from 850,000 to 1,100,000 tons, mainly by providing for oxygen blast in the open hearth furnaces. Port construction for the SOMISA San Nicolas steel plant also was started in 1965. Aside from these SOMISA projects, several firms (ACINDAR, Santa Rosa S.A., Dálmine Siderca S.A., and La Cantábrica S.A.) reported improvements in their existing steel furnaces aimed at increasing output, but no firms reported major new installations underway through yearend.

The two major projects for new integrated steel plants, that were pending at yearend 1964 remained in that status at yearend 1965. There were indications that at least part of the financial backing required for both the ACINDAR and the Propulsora Siderúrgica plants had been obtained by yearend, but no actual work was underway on either. The ACINDAR proposal calls for a plant to produce 500,000 tons of pig iron and 650,000 tons of steel annually, thereby fully integrating ACINDAR's operations. The Propulsora project calls for facilities to produce 1.4 million tons of pig iron, 1.3 million tons of ingot steel and 1.1 million tons of rolling mill feed.

Lead and Zinc.—Increases in output of lead and zinc in concentrates were apparently entirely the result of expanded operations at the Aquilar mine of Cía. Minera Aquilar in Jujuy Province. This company, the Argentine affiliate of St. Joseph Lead Co. (United States), increased its dominance over the nation's lead-zinc industry in 1965, accounting for 91 percent of total lead concentrate output and nearly 99 percent of total zinc concentrate production, with the entirety of its output coming from the Aquilar property. (In 1964, the Aquilar mine produced about 82 percent of total lead concentrate output and 91 percent of total zinc concentrate output.) In May, it was reported that engineering and design work was underway for an expansion of the Aquilar mine.[7] Preliminary plans called for increasing the capacity of the operation by a minimum of 50 percent and it was hoped that the additional capacity would be achieved in early 1968.

No details were available on activities of other producers, but the decline in production of both lead and zinc concentrates by other firms indicates that output, if any, by the Castaño Viejo mine of the National Lead Co. (United States) affiliate, Cía. Minera de Castaño Viejo, was considerably reduced even from the 1964 level. This mine in San Juan Province, formerly the nation's second ranked source of lead and zinc concentrates, lost its second ranking in lead concentrates during 1964 to the Gonzalito mine in Río Negro Province, and indications at that time were that the Castaño Viejo orebody was virtually exhausted.

Manganese.—Despite the considerable attention that has been directed to the Aqua de Dionisio (or Farallon Negro) manganese ore deposits of Catamarca Province, Argentina's production of this commodity apparently again was largely derived from a few relatively small mines in Córdoba and Mendoza Provinces. There was increased reliance on imported ores as domestic output fell by 8,502 tons from that of 1964. Argentine mine production in 1964 (the most recent year for which exact ore grade data are available) had an average manganese content of 32.9 percent, which significantly exceeded the 12 to 18 percent manganese content that has been reported for the Aqua de Dionisio occurrences. Moreover, recently completed surveys of the deposit indicated lower values of precious metals than had originally been indicated. A total of nearly 1.4 million tons of measured and indicated ore was reported to contain 12 percent manganese, 6 grams per ton of gold and 114 grams per ton of silver. This compares unfavorably with earlier reports indicating as much as 18 percent manganese, 10 to 12 ounces per ton of gold and 200 ounces per ton of silver. In view of the apparent poor competitive position of existing domestic producers of ore containing over 30 percent manganese, it appears questionable that the Aqua de Dionisio property could be developed and enter successfully into a competitive market, despite the precious metal values.

Nevertheless, the Government entity, Yacimientos Mineros Aqua de Dionisio (YMAD) reportedly was continuing exploration work in the northeast part of the Angalgalá area of Catamarca through yearend 1965, and reportedly had prepared a preliminary report for the Argentine President containing conclusions of a detailed technical-economic study of the area. With-

[7] Engineering and Mining Journal. V. 167, No. 5. May 1966, p. 148.

out any indication of the likelihood of such development, it was reported [8] that the development project proposed for the area would involve an investment of 2,200 million pesos spread over 28 months and would include development of the necessary infrastructure such as roads.

There were no indications that any decision was made with regard to some 30 propositions submitted for development of the Aqua de Dionisio deposits under a public auction called by YMAD in 1964 and reported in Volume IV of Minerals Yearbook for that year.

Uranium.—Argentine output of uranium concentrates in 1965 increased 36 percent to 29,604 tons in 1965, reflecting the continuation of domestic interest in the field of nuclear materials. The mine product as sold to the Argentine National Atomic Energy Commission reportedly averaged about 0.16 percent U_3O_8, a roughly comparable grade to that of 1963 and 1964. Output apparently continued to come chiefly from Jujuy Province as it did in 1964, when that area accounted for 99 percent of the total. Other producers in 1964 were located in La Rioja, San Luis and Mendoza Provinces. During 1965, deposits near Cosquín and Los Gigantes in Córdoba Province reportedly were being studied. These deposits, originally discovered in 1958, were undergoing apparently extensive evaluation studies by technologists from The National Atomic Energy Commission. Specific information on exploration results were not reported, but on the basis of drillings to a depth of 65 meters and completion of otherwise undescribed underground works, ". . . the occurrences are said to present tremendous possibilities for the future of mining in this zone." [9]

NONMETALS

Borates.—Broquímica Argentina, the Republic's largest producer of borate minerals, completed a major expansion of its facilities at Campo Quijano, Salta Province, in early 1965, and reportedly had further plans for increases in output. Work completed in 1965 included raising capacity of the plant from 12,000 to 18,000 tons, improvement of the mountain roads from the deposits (some in Jujuy Province) to Campo Quijano, and expanded employee housing. A further increase to 24,000 tons per year was under study.

Despite difficulties of Argentine product in international marketing owing to the high costs of mining the ore in the high Andes and moving the product to consuming centers in the country and to ports for export, producers seemed to feel that demand increases anticipated would justify the expansions completed and projected, including a 2 year, $150,000 exploration program aimed at locating deposits nearer existing rail lines and/or locating sodium borate deposits which could be exploited in lieu of the calcium borate deposits now mined.

Cement.—Argentine portland cement capacity was increased by 45,000 tons in 1965, reaching 4,937,000 tons as the result of modifications and additions to existing plants. These numbered 15 in all, including 1 facility (location not reported) completed in the latter part of 1964 but not reported in Volume IV of the Minerals Yearbook for that year. The development of the portland cement industry in the past 5 years is reflected in the following table of salient statistics:

	1961	1962	1963	1964	1965
Number of plants	13	13	14	15	15
Installed annual capacity, thousand tons	3,967	3,977	4,523	4,892	4,937
Production, do	2,876	2,920	2,495	2,878	3,272
Shipments, do	2,871	2,899	2,511	2,858	3,271
Consumption [1], do	2,872	2,903	2,510	2,860	3,270
Utilization of capacity, percent	72.3	74.5	55.3	58.8	66.3
Total employment, persons	7,277	7,296	7,344	7,384	7,120
Salaries and wages [2 3], million pesos	1,159	1,519	1,876	2,364	3,580
Value of output [3], do	NA	7,897	8,600	10,796	15,200

NA Not available.
[1] Shipments minus exports plus imports.
[2] Includes social benefits.
[3] Values not converted because of varying exchange rates.

Sources: Except for consumption, Asociación de Fabricantes de Cemento Portland, La Industria Argentina del Cemento Portland Anuarios for 1963, 1964 and 1965. Place and date of publication not reported; consumption data derived from shipments as reported by the above sources and official trade data.

[8] Work cited in footnote 5.

[9] Work cited in footnote 5.

On December 31, Government approval of plans for erection of a 16th cement plant was formalized by publication of Decree No. 11884 in the Boletín Oficial. This 100,000-ton-per-year facility is due to be built in Zapla, Neuquén Province, with at least a part of the machinery and equipment to be imported. Under an earlier decree, expenditure of about $2.8 million for imports was authorized.

Fertilizer Materials.—The Republic continued to depend heavily on imports to meet its growing requirements for fertilizer materials in 1965, but expansion of the domestic industry was approaching reality as the Inter-American Development Bank announced approval of a 9½ year, $10,525,000 loan to Petrosur S.A.I.C., a private company established in 1961 to set up a major fertilizer operation in the country. The major shareholders in Petrosur are American and Foreign Power Co., Inc.; Shell CAPSA; Archilnit SRL; and Techint S.A. The company's plant, to be completed in early 1968 at Campana, Buenos Aires Province, will produce ammonia and sulfuric acid both for its own use in the production of urea, ammonium sulfate and compound fertilizers, and for sale to other companies.

In addition to the Petrosur plant, which will have the annual capacity to produce 55,000 tons of urea, 50,000 tons of ammonium sulfate and 30,000 tons of nitrogenous-potassic-phosphatic mixed fertilizers, at least 3 other expansion projects were in the planning stage. The Government entity, Fabricaciones Militares, which in 1965 produced about 12,000 tons of ammonium sulfate, plans a $25 million expansion that will enable it to produce annually 50,000 to 100,000 tons of ammonia, 36,300 tons of ammonium nitrate, 42,900 tons of urea, 15,000 tons of Thomas slag (16 percent P_2O_5) and 59,400 tons of complex fertilizers.

The Government oil operation, YPF, was considering installation of an $11 million ammonia and urea plant at Chapapoyas (90 tons of ammonia and 150 tons of urea daily), and of a $30 million facility at San Lorenzo to produce daily 500 tons of ammonia, 350 tons of nitric acid, 450 tons of ammonium nitrate and 600 tons of complex fertilizers. The latter plant would produce more ammonia than it would need and the balance would be for sale. Phosphate rock for mixed fertilizer production would be imported.

Finally, Impagro, S.A.I.C. reportedly signed a contract with Cooperativas Agrícolas in Bahía Blanca for establishment of a facility to produce annually 100,000 tons of ammonia, 60,000 tons of ammonium nitrate, and 80,000 tons of urea.

These expansion plans are postulated on anticipated growth of domestic demand for fertilizers, in terms of nutrient content indicated as follows:

Nutrient	Metric tons	
	Reported sales 1963–64 crop year	Forecast demand in 1970
Nitrogen (N)	22,116	102,200
Phosphorus pentoxide (P_2O_5)	6,736	75,700
Potassium oxide (K_2O)	5,009	23,800

MINERAL FUELS

Coal.—The Río Turbio property of the Government entity, Yacimientos Carboníferos Fiscales (YCF) remained Argentina's only coal producer in 1965. Output of the mine in western Santa Cruz Province was stepped up in 1965 and plans called for further increases in 1966. Gross production totaled 540,597 tons in 1965, yielding 374,216 tons of washed coal; comparable figures for 1964 were 423,898 tons and 332,007 tons respectively.[10]

The high ash content and low calorific value of the Río Turbio coal continued to mitigate against any marked displacement of imported coals in existing markets, as did the long distance between the coal mine and established producing centers which contributed to even higher costs per unit of heat energy. Principal consumers of Río Turbio coal remained other government owned or controlled entities—powerplants, the railroads, and the SOMISA steel plant.

To attempt to force greater utilization of Río Turbio coal, the Argentine Congress on September 2 passed a law making it obligatory for consumers having appropriate facilities to use domestic coal, and further providing that new installations using coal either as a fuel or as a nonfuel raw material must be of a type that can use domestic coal to a maximum degree.[11] Under the law the percentage of total coal to be obtained from domestic resources will be redetermined

[10] U.S. Embassy. Buenos Aires. Department of State Airgram A–279, Oct. 22, 1966, 10 pp.
[11] U.S. Embassy, Buenos Aires. Department of State Airgram A–228, Sept. 9, 1965, 2 pp.

each year after YCF prepares and submits a report of projected production, transportation and price data, and consumers who do not comply will be subject to fines, the income from which, if any, will be placed in a special fund for YCF's benefit. Although the law was passed in September, implementing regulations were not prepared much before yearend and the law therefore had no effect in 1965. Moreover, it was believed that the limitations of production and shipping facilities at Río Turbio and quality considerations with regard to the coal would moderate the effect on major industrial operations in the near future.

Petroleum.—Declining domestic production and growing internal petroleum product demand led to increased oil imports in 1965. These import increases, however, were confined to crude oil receipts; Argentine refineries, processing both domestic and foreign crude oil, met an increased share of total national requirements and petroleum product imports declined.

Of both national and international significance were the out-of-court settlements during the year between the Argentine Government (through its oil entity, Yacimientos Petrolíferos Fiscales—YPF) and several foreign-controlled private firms that held differing exploration, development operating and drilling contracts with YPF which were annulled by the Government in 1963. By yearend, agreements had been reached with Tennessee Argentina S.A., Union Oil Co. of California, Shell Production Co. of Argentina Ltd., Esso Argentina, Inc., Continental Oil Co. of Argentina-Marathon Petroleum Argentina Ltd., and Transworld Drilling Co. Ltd.[12] In the cases of Tennessee, Union, Shell, and Esso, YPF agreed to refund a total of between $117.9 million and $122 million[13] (in U.S. dollars and British pounds) and an additional M$N228.6 million (in Argentine currency) in repayment of investments, plus interest in amounts of 6 to 6.75 percent of the unpaid balance. The Transworld settlement called for YPF to refund as debit balance $4.5 million in 24 months with 6.25 percent interest on the balance. Under the settlement with Continental-Marathon, the firms, having assumed the mining risk, renounced all reimbursement of expenses and investment in exchange for permission to withdraw any or all equipment and financial assets in Argentina and a provision under which income tax claims against them will be paid up by YPF.

At yearend, Pan American Argentina Oil Co., Argentina Cities Service Development Co., Cía. Argentina para el Desarrollo de la Industria del Petróleo y Minerales S.A. (CADIPSA) and Soc. Azionaria Italiana Perforazioni e Montaggi—SAIPEM (an affiliate of the Italian State oil entity, Ente Nazionale Idrocarburi) were still engaged in negotiations with respect to their contracts. In 1964, Cía. Argentina de Petróleo S.A. (ASTRA) had reached an agreement that provisionally called for payment of about US$16.1 million in Argentine currency.

Exploration, Development, and Reserve.—YPF had 22 seismic crews, 2 gravimetric crews, 5 geological parties and 8 topographic survey parties in the field in 1965, which in all performed 436 party months of work. In addition to these onshore projects, a 2-month marine reflection-seismic study was carried out in the Gulf of San Jorge. Activities of survey parties resulted in completion of 7,330 kilometers of seismic profiles, 94,300 square kilometers of gravimeter surveys, 8,654 square kilometers of gravimeter-magnetometer surveys, 17,520 square kilometers of geological mapping, and the detailing of 240 kilometers of stratigraphic sections.

Exploration and development drilling during 1965 is summarized in the following table:

	Exploration drilling	Development drilling	All drilling
Footage drilled, thousand feet	701	2,184	2,885
Well completions:			
Successful, number	18	419	437
Oil, do	18	419	437
Gas, do	2		2
Dry holes and abandoned, do	58	58	116
Percent success	26	88	79

Source: Sass, Louis C., and C. H. Neff. Review of 1965 Petroleum Development in South America and the Caribbean Area. Bull. Amer. Assoc. Petr. Geol., v. 50, No. 8, August 1966, pp. 1566–1568.

[12] Contract transferred from Kerr-McGee Oil Industries S.A.

[13] Final amount remained to be fixed in the case of Union and Esso.

Of 16 discovery oil wells listed, the largest producer was rated at about 500 barrels per day; the average was rated at about 235 barrels per day.

YPF's 1966 drilling program announced near yearend called for 323 wells, including 153 in the Huincul area of Neuquén Province, 125 near Comodoro Rivadavia in Chubut and Santa Cruz Provinces and 45 near Viscacheras in Mendoza Province.

Crude oil reserves were estimated at about 2,000 million barrels [14] and natural gas reserves at about 7.06 trillion cubic feet.[15]

Field Production.—Total 1965 crude oil production in five of Argentina's seven producing Provinces was lower than that recorded for 1964. The overall decline in these Provinces, 11.4 million barrels, was only partly compensated by increased output by the other two, totaling 9.4 million barrels, with the result that national production was 2 million barrels less than in 1964. On a company and field basis, the output decline was distributed between most producers; only the Río Negro Province operations of YPF, the Mendoza Province fields operated under contract for YPF by Argentine Cities Service, and the Santa Cruz concessions formerly held by the Argentine private firm, Astra, showed production gains.

The 2 percent decline in crude oil output was exceeded by the 5 percent decline in gross natural gas production in 1965, while output of natural gasoline increased by nearly 30 percent, as shown in the following tabulation:

Province	Crude oil production (thousand barrels)		Natural gasoline production (thousand barrels)		Gross natural gas production (million cubic feet) [1]	
	1964	1965	1964	1965	1964	1965
Santa Cruz	42,535	34,586	----	----	102,928	94,199
Mendoza	21,638	25,421	63	84	2,931	3,097
Chubut	20,327	19,061	29	28	13,952	14,103
Salta	6,017	5,404	800	1,044	95,069	90,432
Neuquén	5,001	4,891	4	4	14,357	13,699
Tierra del Fuego	4,464	3,035	----	----	3,799	2,591
Río Negro	294	5,878	----	----	106	2,796
Total	100,276	98,276	896	1,160	233,142	220,917

[1] Converted from cubic meters at the rate of 1 cubic meter equals 35.38 cubic feet, assuming that cubic meter measurement was on the basis of 1 atmosphere and 15° C.

As shown, only Mendoza, Río Negro and Chubut Provinces showed production gains in 1965 in gas output.

Despite lower total output for the year as a whole, the crude oil production rate increased throughout the last 5 months of the year, and averaged 291,000 barrels per day in December, compared to overall yearly averages of 269,000 barrels per day for 1965 and 275,000 barrels per day for 1964.

Refining.—Most of the nation's petroleum refineries operated at or in excess of their rated capacities in 1965; total crude runs in 1965 were reported provisionally as 122,620,000 barrels, 13,872,000 barrels more than in 1964 and 24,344,000 barrels more than was produced domestically. Refinery capacity at yearend was rated at 333,300 barrels daily [16] of which about 60 percent was in the six refineries owned by YPF and 40 percent was in the nine refineries owned by eight private firms. Several projects were underway at yearend to increase refining capacity.

Consumption and Trade.—Argentine domestic demand for petroleum products reportedly reached a new high of 127.8 million barrels in 1965, 6.8 percent higher than in 1964. Of reported 1965 sales (which totaled 102.9 million barrels), about 38 percent was residual fuel oil, 26 percent was gasoline, 26 percent was distillate fuel oil, 7 percent was kerosine and the remaining 3 percent was all other products.

[14] Data is as of 1964, as reported in Oil and Gas Journal, v. 62, No. 52, Dec. 28, 1964, p. 106, but is believed to have changed but little.

[15] Argentina—Most Private Companies Reach Out-of-Court Settlements. World Petroleum. Mar. 15, 1966, p. 56.

[16] Petroleum Press Service. World Petroleum Report. Mar. 15, 1966, p. 56. Elsewhere, refinery capacity has been reported as high as 370,000 barrels daily.

Preliminary data indicate that imports of refinery products totaled about 9.6 million barrels, or slightly under the 1964 level. These comprised mainly gas oil (about 60 percent), liquefied petroleum gas (about 15 percent) and lubricants (about 10 percent), while exports, totaling about 5.6 million barrels, were almost all residual fuel oil, the one refinery product produced in Argentina in excess of local demand.

Pipelines.—The 1,700-kilometer Pico Truncado-Buenos Aires 30-inch natural gas pipeline, completed in 1964 and rated as South America's largest, was equipped with a $9 million microwave communication system to relay vocal and/or written communications with regard to operations and maintenance of the line and its valve and pumping stations. Line capacity is reported as 175 million cubic feet daily.

The Mineral Industry of Bolivia

By Charles D. Hoyt [1]

Tin continued to be by far the most important of Bolivia's mineral products in 1965. The metal accounted for three-quarters of the value of mineral exports which in that year totaled almost $125 million,[2] 16 percent higher than in 1964.

Other significant minerals produced, in order of decreasing importance, were antimony, lead, silver, copper, gold, tungsten, and bismuth.

Mineral exports continued their overwhelming dominance of the Bolivian export scene. In 1965, they represented 95 percent of the value of all exports compared with 90 percent in 1961.

Mineral exports in Bolivia again were nearly equivalent to production because practically all output is exported. The actual tonnage of minerals exported in 1965 was almost 70,500 tons, an increase of 3.4 percent over that of 1964. The much larger increase in total value of mineral exports was mainly due to the higher average price for tin during 1965.

The mineral industry contributed 14.7 percent of the Gross Domestic Product of $610 million in current dollars; this was divided between mining (11.6 percent) and petroleum (3.1 percent). At yearend there were an estimated 43,000 workers employed in the mining industry of which about 53 percent were employed by the State-owned Bolivian Mining Corp. (COMIBOL) and the remainder were employed by the private mining industry. In addition, there were an estimated 5,000 employees in the petroleum industry, including 4,540 employed by the State petroleum operation, Yacimientos Petroliferos Fiscales Bolivianos (YPFB).

COMIBOL in 1965 produced materials that accounted for 61 percent of the gross value of mineral exports compared with 64 percent for 1964. The private sector produced the remaining 39 percent of the gross value of exports. This sector is divided by the Government into medium-size mines and small mines which produced 22 percent and 17 percent, respectively, of the total value of mineral exports.

The following table presents the distribution of output by commodity among the private (medium-size mines and small mines) and public (COMIBOL) sectors.

[1] Program manager, Heavy Metals Program.
[2] Where necessary, values have been converted from the peso (B$) at the rate of B$12 equals US$1.

Commodity	Total 1965 value (million dollars)	Mining sectors' contribution (percent of total)		
		COMIBOL	Medium-size mines	Small mines
Tin, concentrate	79.6	67	18	15
Tin, metal	13.4	86	---	14
Antimony	5.9	(1)	68	32
Lead, concentrate	5.7	41	14	45
Lead, metal		90	---	10
Silver	5.3	83	6	11
Zinc	4.2	30	20	50
Copper	3.5	37	50	13
Gold	2.9	(1)	100	---
Tungsten	2.2	14	72	14
Bismuth	1.5	97	(1)	(1)
Sulfur	.19	---	100	---
Cadmium	.04	---	100	---
Mercury	.02	40	5	55
Salt	NA	---	100	---
Gypsum	NA	---	100	---

NA Not available.
[1] Insignificant.

In 1965, for the first time since nationalization in 1953, the COMIBOL mines as a group finally operated at a profit, although a number of individual properties continued to show operating losses. Specifically the corporation showed a profit of slightly over $160,000 for the year and in December 1965 paid $255,300 in export taxes to the Bolivian Government. This contrasted with losses in 1964 of from $6 to $8 million. The reasons for this change were twofold. First, during 1965 substantially higher prices for tin prevailed ($1.78 per pound average New York market) than during the past decade. In 1953, average tin prices on the New York market were at a low of 95.8 cents per pound and then slowly increased to a level of over $1.57 per pound in 1964. The second and equally important reason for COMIBOL operating at a profit was the strong set of measures instituted by the Bolivian Government.

These measures, passed in May, provided reduced labor union domination in the mines (Decree 07171), established discipline in the mines, lowered and standardized wages (Decree 07188), and provided regulations to lease some of COMIBOL's properties to miner's cooperatives or unemployed COMIBOL workers (Decree 07187). The net effect of these regulations was to allow management to finally begin to operate after many years of little or no control over operations.

There was a continuation of negotiations begun in 1964 between the Bolivian Mining Bank (Banco Minero) and the U.S. Agency for International Development (AID) for a development loan. On April 14, a formal application was submitted to AID for a $5.7 million loan. At yearend the approval of the loan appeared to be imminent. It should be mentioned that the new mining code which was implemented in mid-1965 eliminated the virtual monopoly that required the small miners to sell only to the Banco Minero. These mines may now sell to private ore buyers.

A major program of financial assistance to COMIBOL was instituted in August 1961 by the U.S. Government, the Inter-American Development Bank, and the West German Government. This plan is referred to as the "triangular plan" because of the three parties funding the program. This program was divided into two phases and a third phase has been under consideration since early 1964. By December 1965, about $472,000 remained unspent out of more than $43.7 million. Of this latter sum, the United States provided almost 64 percent, the Inter-American Development Bank loaned 21 percent, and West Germany supplied 15 percent. A third phase loan under the triangular plan contemplates an additional $10.1 million to be spent over a 2-year period. It should also be mentioned that Argentina provided $1 million assistance under this plan.

The Government also passed several important Supreme Decrees aimed at providing a stimulus to expand the private mining sector and to attract foreign investment to Bolivian mining ventures. The most important change of this nature in 1965 was the new mining code that became effective July 6, 1965. This Decree (07148) substantially assists the private sector and had already begun to attract needed capital investment by yearend.

Three other Supreme Decrees, passed during 1965, also greatly assisted the private sector. Decree 07150 opened 20 new areas for exploitation by private enterprise. Decree 07360 lowered by 30 percent the export taxes on tin effective November 1, 1965. The last action of this type taken in 1965 was Decree 07447 that lowered the export taxes on all minerals about 40 percent. This decree, effective January 1, 1966, should encourage the mining industry to increase production and to develop new mines.

PRODUCTION

Production statistics represent actual COMIBOL production plus exports by the small and medium-size mines and the smelters except in the case of gold. Since the exports of gold were obviously not representative of production, a more representative figure was obtained by adding the production of South American Placers, Inc. (SAPI), the purchases by the mining bank, the exports of medium mines other than SAPI, and COMIBOL production.

Table 1.—Bolivia: Approximate production of metals and minerals [1]
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Antimony, content of—					
Ore and concentrate	6,733	6,665	7,549	9,620	9,622
Metal [2]	2	---	---	r 38	6
Beryl [2]	60	79	---	30	---
Bismuth, content of ore and concentrate kilograms	227,716	303,904	r 254,748	271,870	269,000
Cadmium, content of ore and concentrate do	---	---	---	---	5,740
Copper, content of ore and concentrate	2,232	2,408	3,001	4,734	4,736
Gold troy ounces	80,191	35,034	153,019	128,576	94,314
Iron ore [2]	---	63	---	---	---
Lead, content of—					
Ore and concentrate	18,937	18,484	19,041	16,493	16,251
Refined metal and solder	4	125	254	461	936
Manganese, content of ore [2]	48	264	---	---	---
Mercury 76-pound flasks	---	[2] 11	[2] 105	[3] 32	58
Silver, content of concentrate thousand troy ounces	3,649	3,884	4,443	4,517	3,955
Tin, content of—					
Concentrate long tons	20,399	21,271	22,209	24,319	23,036
Refined metal, solder, dross [4] do	2,015	2,023	2,463	3,610	3,406
Tungsten concentrate, 60 percent WO_3 equivalent	2,887	2,482	2,194	2,006	1,820
Zinc, content of concentrate	4,885	3,634	4,229	9,592	13,321
Nonmetals:					
Asbestos	[2] 105	[2] 52	[2] 11	[3] 139	[3] 178
Cement thousand tons	45	49	62	64	60
Fluorite [2]	---	---	---	9	---
Gypsum [2]	---	---	200	700	475
Mica [2]	---	7	---	---	---
Salt [2]	NA	NA	350	3,563	16,566
Sulfur [2]	4,975	7,363	9,950	10,806	9,455
Mineral fuels:					
Natural gas million cubic feet	NA	[5] 5,110	[6] 3,853	[6] 4,145	[6] 3,454
Natural gasoline barrels	NA	NA	r 25,160	r 64,321	54,605
Petroleum:					
Crude thousand 42-gallon barrels	2,989	2,917	r 3,404	3,290	3,357
Refinery products:					
Motor gasoline do	920	1,028	1,009	r 1,116	1,182
Kerosine do	399	431	404	467	512
Distillate fuel oil do	356	439	424	r 506	596
Residual fuel oil do	503	633	594	790	819
Other do	---	65	205	r 13	49
Total do	2,178	2,596	2,636	r 2,892	3,158

p Preliminary. r Revised. NA Not available.
[1] COMIBOL production plus exports by small and medium mines and smelters unless otherwise noted. Figures differ slightly from those in volume I, which uses total exports as indicative of actual production.
[2] Exports by small and medium mines.
[3] Purchases by Banco Minero.
[4] Contains unspecified amount of tin reported also in tin in concentrates production.
[5] Gross production.
[6] Commercial production, processed for domestic fuel and for export.

TRADE

During 1965 Bolivia did not maintain a favorable balance of trade. The value of total exports was $131.8 million of which minerals accounted for 95 percent. Total imports were valued at almost $133.9 million which provided an unfavorable trade balance of nearly $2.1 million. The United States continued to be the principal source of imports providing almost 44 percent by value of the products. The United Kingdom, Bolivia's main customer for exports, received practically all the tin that was exported. The exported tin was valued at $58.8 million or 44.6 percent of the total value of exports.

Among exports of other minerals (gold, silver, copper, lead, zinc, tungsten, antimony, and bismuth) the United States was the principal buyer and received $56.2 million (42.6 percent) in exports from Bolivia. As in the past, the ultimate destinations for antimony exports were Japan and West Europe, despite the fact that export statistics list the United States as the destination. Other significant customers for Bolivian exports were West Germany, Japan, Belgium, and the Netherlands.

Table 2.—Bolivia: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965 p	Principal destinations, 1965
Metals:				
Antimony, content of ore and concentrate, impure bars	7,563	9,640	8,766	Mainly to United States.
Beryl, gross weight	---	30	---	
Bismuth, content of concentrate	280	r 275	297	United States 220; Belgium 34; Peru 29.
Cadmium, content of concentrate	---	---	6	All to United States.
Copper, content of concentrate	2,994	r 4,703	4,731	United States 3,145; Japan 1,444.
Gold—troy ounces	153,034	50,043	84,945	United States 57,100; United Kingdom 27,746.
Lead, content of—				
Concentrate	19,432	r 17,437	16,599	United States 10,381; Belgium 4,104.
Refined bars, solder, slag	731	r 489	938	United States 872; United Kingdom 66.
Total	20,163	r 17,926	17,537	
Mercury—76-pound flasks	105	---	52	NA.
Silver, content of concentrate—thousand troy ounces	4,869	4,823	4,083	United States 3,151.
Tin, content of—				
Concentrate—long tons	20,290	r 20,487	20,421	United Kingdom 14,406; United States 4,362.
Refined bars, solder, dross—do	2,462	3,610	3,406	Mainly to United States.
Total—do	22,752	r 24,097	23,827	United Kingdom 14,705; United States 7,435.
Tungsten, content of concentrate, 60 percent WO_3 equivalent	2,281	2,073	1,853	Mainly to United States.
Zinc, content of concentrate	4,648	r 9,759	13,688	United States 8,493; Japan 4,972.
Nonmetals:				
Asbestos	9	6	7	Chile 3; United States 3.
Fluorspar	---	9	---	
Gypsum	200	700	475	All to Brazil.
Salt	350	r 3,563	16,566	Do.
Sulfur	9,950	10,806	9,455	All to Chile.
Mineral fuels:				
Natural gas—million cubic feet	1,956	1,139	630	All to Argentina.
Petroleum, crude—thousand 42-gallon barrels	747	299	263	Do.
Refinery products:				
Distillate fuel oil	73,656	---	---	

p Preliminary. r Revised. NA Not available.

Source: Ministerio de Hacienda, Dirección General de Estadística y Censos. Boletín Estadístico 1965, No. 91.

COMMODITY REVIEW

METALS

Antimony.—Higher metal prices resulted in an 8-percent increase in the value of total antimony exports in 1965, despite a 9-percent decline in tonnage exported. As in the past, private mines produced nearly all of the national output; the medium-size mines accounted for about two-thirds of the total output. The single largest antimony producer in Bolivia and the Western Hemisphere continued to be the Empresa Minera Unificada, S.A. (EMUSA) which produced ores and concentrates containing 3,566 tons of metal in 1965, about two-fifths of the country's total production.

Bismuth.—An 8-percent increase in the quantity of bismuth exported coupled with much higher prices for the metal in 1965 resulted in a 62-percent increase in the value of exports. About 97 percent of total bismuth output came from COMIBOL's Tasna mine.

Gold.—Bolivian gold output is estimated to have dropped about 27 percent owing to a 50-percent decrease in production by the leading producer, SAPI. This company operated a dredge which processed almost 2.3 million cubic yards to recover 33,861 ounces of gold in 1965. SAPI reserves were stated to be 26.8 million cubic yards at $0.37 per cubic yard. As in the past, almost all gold production came from the Tipuani and Kaka Rivers in the northeast part of the La Paz Department. On December 22, 1965, a flash flood in the Tipuani gold dis-

Table 3.—Bolivia: Selected imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963		1964		1965	
	Quantity	Value	Quantity	Value	Quantity	Value
Metals:						
Aluminum, all forms	282	$242,546	220	$178,395	654	$504,240
Copper, all forms	188	181,034	54	60,381	404	471,007
Iron and steel, all forms	29,393	7,511,172	25,527	5,476,857	64,253	14,829,032
Lead, all forms	29	14,104	33	13,609	19	15,270
Tin, alloys—long tons	13	20,806	5	4,655	2	7,681
Zinc, all forms	172	39,172	84	24,522	25	10,292
Other nonferrous metals	12	13,199	2	7,892	3	9,431
Metallurgical minerals, slags, ashes	2	1,215	5	2,155	75	14,920
Nonmetals:						
Fertilizer, all types	2,037	204,403	2,966	240,749	3,695	399,032
Other [1]	13,507	475,776	2,522	196,502	10,916	531,237
Mineral fuels:						
Coal and coke	1,285	76,815	1,258	56,098	773	58,343
Petroleum refinery products:						
Aviation gasoline	12,122	880,913	12,731	925,686	10,737	761,151
Motor gasoline	68	12,138	112	8,771	44	5,027
Kerosine	84	16,223	9	64	90	13,887
Diesel oil	66	7,442	327	17,349	512	58,960
Fuel oil	100	9,421	54	7,926	214	14,010
Other	7,038	872,701	3,973	678,192	6,144	796,366
Total	20,763	1,875,653	18,464	1,694,086	18,514	1,707,744
Total:						
Value of principal metal and mineral imports	---	10,579,080	---	7,899,803	---	18,499,886
Value of all imports [2]	---	103,773,528	---	102,692,728	---	133,945,701
Metals and minerals share in total imports percent	---	10.2	---	7.7	---	13.8

[1] Salt, sulfur, gypsum, lime, cement, earths, and stone not separately identified.
[2] Cost, insurance, and freight.

trict wiped out two mining camps with a loss of 30 lives. The Cangalli section where the accident occurred is a major gold producer. Therefore, output in 1966 will be affected by this disaster.

In late 1965, a United Nations sponsored Special Fund Technical Assistance project was approved to provide a pilot project for gold mining in the Tipuani River area. This operation is scheduled to begin in early 1966.

At practically all of the existing small gold mining placer operations in the Tipuani area, primitive hand panning methods are used to recover the gold, and estimated recovery is only 20 percent.

Exploration drilling and other work by Tidewater Oil Co. in the Mapiri, Kaka, and Alto Beni Rivers revealed nothing of interest.

Lead.—Exports in 1965 of lead in concentrates declined about 5 percent, whereas metallic lead exports increased over 92 percent compared with those of 1964. Output from the COMIBOL mines declined nearly 11 percent, while the output of lead from small mines in 1965 increased about 9 percent. Nevertheless because of higher lead prices during the year, the total 1965 return from lead exports increased almost 14 percent.

Tin.—Tin remained the dominant mineral in the Bolivian economy. In 1965 tin exports provided more than 70 percent of the country's foreign exchange. Mine production by COMIBOL was down slightly due to serious labor troubles in May and September when troops had to be used to restore order at the mines.

COMIBOL operations in 17 tin-producing mines contributed almost 70 percent of the nation's total tin output. The combined output from six COMIBOL mines was 78 percent of the total COMIBOL production. These mines and their 1965 production of contained tin were: Catavi (4,370 tons), Huanuni (2,256 tons), Unificada (1,985 tons), Colquiri (1,927 tons), The Empresa Minera Quechisla's Chorolque mine (1,235 tons), and San José (1,115 tons). Two of these operations, Quechisla and Unificada, showed profits in 1965, while the remaining four recorded operating losses.

Table 4.—Bolivia: Exports of tin by groups
(Long tons of contained tin)

Group	1963	1964	1965
Tin contained in concentrates:			
Corporación Minera de Bolivia	13,933	14,182	13,673
Medium-size mines	3,223	r 3,512	3,861
Banco Minero (small mines)	3,134	r 2,793	2,887
Smelter products (refined metal and solder):			
Fundición de Estaño de Oruro (Peró)	1,760	2,958	2,923
Metabol	702	652	483
Total	22,752	r 24,097	23,827

r Revised.

In 1965 COMIBOL mined almost 2.7 million tons of various ores with an underground labor force of 8,900 for an average productivity of about 1 ton per man-day underground. Total employment at yearend was 23,000, a reduction of about 8 percent below the total employment of 1964.

The two national smelters continued operations in 1965. One operated by Fundición de Estaño de Oruro (known as the Peró smelter) is affiliated with COMIBOL and refined almost 3,000 long tons of metal in 1965. The other smelter, Metabol, is owned and operated by the Banco Minero and had an output of 483 long tons in 1965.

Despite a number of proposals to expand Bolivian tin smelter capacity, the bulk of the concentrates continued to be exported for smelting.

About 10,000 tons of tin in concentrates are smelted annually in the United Kingdom by Williams Harvey, a subsidiary of Consolidated Tin Smelters, Ltd. Additional tonnages of lower grade concentrates are smelted in the United Kingdom at Capper Pass, Ltd., and in the United States by Wah Chang Corp.

Tungsten.—In 1965 exports of tungsten were down 11 percent compared with those of 1964; yet owing to higher prices, the value increased over 54 percent. Medium-size mines in the private sector produced over 70 percent of the output with the balance distributed about equally between the small mines and COMIBOL. Despite higher prices for tungsten, the Bolivian mining industry remained hesitant to expand output of tungsten owing to its unstable price history.

Zinc.—Exports in 1965 increased 40 percent over those of 1964. The major increases took place in the private, medium-size and small mines. The number of zinc mines increased, and recovery of zinc as an accessory mineral increased. The Matilde mine near Lake Titicaca, owned by COMIBOL, has the greatest long-range potential. It contains 3 million tons of fully developed ore that averages 17.5 percent zinc and 2 percent lead. During 1965, negotiations and competition continued among West German, Japanese, and U.S. groups with the Government of Bolivia for the concession to develop the Matilde deposit. At yearend no decision had been reached.

NONMETALS

Asbestos.—During 1965, Bolivia's principal asbestos mine, the property of A. A. Wormald Asbestos Mining Company in the Chapare region of the Cochabamba Department, substantially increased its output of crocidolite. It was reported that the U.S. concern, Philipp Brothers Corp., has contracted to market most of the Bolivian asbestos in the United States.

MINERAL FUELS

Natural Gas.—The total output of natural gas for direct fuel use in Bolivia and for export in 1965 was reported at 3,454 million cubic feet. Over 80 percent came from the Government petroleum concern YPFB and the balance from the Madrejones field (shared equally by YPFB and the Bolivian Oil Co. (BOC)) at Yacuiba near the Argentine border. Exports of natural gas were 630 million cubic feet, all of which came from the Madrejones field and was sent to Argentina. A major portion of the total natural gas produced by YPFB is consumed in the oilfields for secondary recovery methods (gas lift).

The amount of natural gas processed by YPFB for use as a fuel and in gas lift operations in 1965 was 2,824 million cubic feet, compared with 3,006 million cubic feet

in 1964. Some 2,294 million cubic feet of natural gas also were treated to recover 54,605 barrels of natural gasoline.

Petroleum.—During 1965 there were three oil companies active in Bolivia. The Government-owned YPFB accounted for almost 99 percent of total production as it increased output 6 percent over that of 1964. The balance of the 1965 output was provided by the BOC which produced from the Madrejones field. Output of crude oil at this field declined about 44 percent in 1965.

The third oil company operating in the country was the Bolivian Gulf Oil Co. (BOGOC) which has had underway a large development program for the past 10 years. As of the end of 1965 BOGOC had invested almost $92 million, and since 1958 has drilled 138 wells; 31 wells were completed in 1965. Discoveries in the Santa Cruz area (Caranda, Colpa, Rio Grande, Palmar and Santa Cruz) have been developed to the point where 30,000 barrels per day could be produced. Output from the Colpa and Caranda fields will be shipped via a 10- to 12-inch pipeline that was built during 1965 from Santa Cruz to Sica Sica, north of Oruro, at an estimated cost of $25 million. From Sica Sica the oil will be piped to the port of Arica in Chile via a YPFB pipeline. At yearend no oil had been shipped, but it was expected that by mid-1966 about 15,000 barrels a day would be exported from the BOGOC operations.

During 1965 BOGOC and its contractors employed slightly over 400 persons. Exploration work by the firm in 1965 discovered a new oil and gas field, called La Peñas, about 32 kilometers southeast of Santa Cruz. The initial well produced from 11,300 feet and was estimated to be capable of producing 260 barrels of condensate and 8 million cubic feet of gas per day.

Comprehensive exploration activities (surface geology, gravimetric studies, seismic work, aeromagnetometry, and aerial photographic work) were conducted by both BOGOC and YPFB throughout the year. Total reserves in Bolivia have been estimated at 400 million barrels.

During 1965 YPFB reported no new oil or gas discoveries although their drilling activity increased 15 percent to 122,600 feet for the year with 11 drill rigs in use, 4 rigs less than were used in 1964. Out of 28 drill holes finished in 1965 (18 exploitation and 10 exploration), 10 were productive, 13 were abandoned, and 5 were being tested further. There were 130 wells producing in mid-1965.

YPFB operates one large refinery at Cochabamba that accounts for over two-thirds of total Bolivian refinery output, as well as five smaller refineries at Sucre, Santa Cruz, Camiri, Sanandita, and Bermejo. Total Bolivian crude throughput in 1965 was 3.2 million barrels, while estimated total refinery capacity was 12,200 barrels per day. Output from these refineries provided about 97 percent of the domestic consumption which increased about 9 percent over that of 1964. The balance of domestic consumption was provided by imports which consisted mainly of aviation gasoline from Chile and lubricating oils and greases from the United States.

In 1965 exports of crude oil, all of which went to Argentina, were 12 percent lower than those in 1964. YPFB provided about 96 percent of these exports and the balance came from the BOC.

Table 5.—Bolivia: Crude petroleum production by company and field

(Thousand 42-gallon barrels)

Company and field	1963	1964	1965
Yacimientos Petroliferos Fiscales Bolivianos:			
Camiri-Guairuy	2,679	r 2,644	2,432
Bermejo-Toro	402	321	256
Sanandita-Camatindi	r 67	71	59
Tataranda	---	66	562
Buena Vista	2	30	13
Total	r 3,150	3,132	3,322
Bolivian Oil Co.: Madrejones	r 129	62	35
Bolivian Gulf Oil Co.: Caranda	116	96	---
Unspecified companies and fields	9	---	---
Grand total	r 3,404	3,290	3,357

r Revised.

Table 6.—Bolivia: Consumption [1] of petroleum refinery products
(Thousand 42-gallon barrels)

Product	1963	1964	1965
Aviation gasoline	81	120	131
Motor gasoline	947	1,020	1,131
Kerosine	405	447	499
Gas oil	NA	58	75
Diesel oil	423	448	497
Fuel oil	653	673	725
Lubricants	20	29	NA
Naphtha	NA	r 80	77
Other products	3	1	NA
Total	2,532	r 2,876	3,135

r Revised. NA Not available.
[1] Figures refer to actual military and civilian consumption through sales to consumers, including YPFB consumption.

The Mineral Industry of Brazil

By Garn A. Rynearson [1] and F. William Wessel [1]

The relative position of the mineral industry in the Brazilian economy is not easily determined, largely because of incomplete and inexact statistical records. However, it is only fair to say that more persons in positions of official authority and representatives of industry appeared to be recognizing the problem and were actively seeking to improve the situation.

In 1964 mineral production accounted for 1.73 percent of the gross national product of which petroleum alone was 0.56 percent. Insufficient data were available to calculate similar comparative figures for 1965, but it is doubtful if any appreciable trend up or down will be noted when final figures are released.[2]

Sharp increases in iron and manganese ore exports and continued export of substantial portions of the world supply of quartz crystal and mica were the most significant aspects of Brazil's mineral industry performance in 1965. In addition, the columbium operation at Araxá became an important source of exports of both pyrochlore concentrate and ferrocolumbium. Plans to expand aluminum production were announced.

The official government attitude toward mineral development continued favorable during the year. Private interest in mineral enterprise accordingly increased somewhat but gains in this area were modest probably because of caution of foreign investors and the lack of risk capital of Brazilian origin; the latter was partially due to some economic recession during the year.

Decree 55,837, signed March 12, approved a plan to survey and evaluate the nation's mineral resources over a 10-year period. The plan is to be implemented by the Departamento Nacional de Produção Mineral (DNPM).

Resolution 3/65, released on May 13 by the Comissão Nacional de Energia Nucleár, raised to 0.08 percent the permissible thoria content of ilmenite concentrates for export. This is an attainable level and makes possible the exploitation of Brazil's monazite-ilmenite beach sands.

Responsibility for mineral production statistics, under Law 4904, Article 32, Title VII, has been shifted from the Ministério da Agricultura to the Ministério da Minas e Energia; DNPM henceforth will be the operating agency.

The principal sources of data presented in this chapter are the various official documents and reports released by Brazilian Government agencies, unclassified despatches prepared by officers of the U.S. Embassy at Rio de Janeiro and U.S. Consulates elsewhere in Brazil, annual reports of companies operating in Brazil, and such periodicals as Boletim do Instituto Brasileiro de Siderurgia, Revista do Sindicato Nacional da Indústria do Cemento, Conjuntura Econômica, and Engenharia Mineração Metalurgia.

PRODUCTION

The mineral industry in 1965 regained much of the ground lost in 1964, and in many cases exceeded 1963 production figures. Significant output gains were recorded in copper, gold, iron ore, lead ore, tantalite, and pyrochlore among the metals and ores. Tin and nickel maintained their position, and aluminum showed marked improvement over 1964.

Among nonmetals, barite, magnesite, and nitrogenous fertilizers showed major increases; production of mica and quartz crystal also improved. Production of cement

[1] Physical scientist, Division of International Activities.

[2] U.S. Embassy, Rio de Janeiro. Department of State Airgram A-198, Aug. 26, 1966, encl. 1, p. 1.

and phosphatic fertilizers showed little change from 1964; salt production regained its 1963 level, but dolomite production continued to decline, and lime output was somewhat less than in 1964. Data for gypsum in 1965, while showing a decline, are thought to be incomplete as reported production is less than the quantity required by the cement producers.

Petroleum production showed a modest increase, although refinery throughput was off slightly. Coal output was up slightly, and natural gas withdrawals showed a major gain.

Table 1.—Brazil: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity [2]	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Bauxite	111,394	190,708	169,636	131,650	155,968
Alumina	36,139	38,792	42,698	50,921	55,355
Metal, unwrought	20,029	20,141	17,610	26,640	p 29,590
Semimanufactures	7,170	3,105	r 20,471	2,734	p 25,451
Arsenic, white	58	149	293	188	256
Beryl (exports)	3,178	3,011	r 1,968	1,421	1,113
Bismuth (exports)—kilograms	1,000	----------	----------	----------	----------
Chromite	15,456	24,839	[3] 17,053	[3] 9,440	[3] 16,960
Columbium and tantalum:					
Pyrochlore concentrate	1,528	102	----------	323	1,196
Columbite-tantalite concentrates:					
Columbite	[4] 14	[4] 14	[4] 20	[5] 11	[5] 40
Tantalite	[4] 94	[4] 125	[4] 111	[5] 82	[5] 165
Total	108	139	131	[5] 93	[5] 205
Ferrocolumbium	----------	----------	----------	18	276
Copper:					
Ore:					
Gross weight	68,773	74,829	84,760	110,631	126,227
Copper content [e]	1,700	1,600	1,500	2,000	2,200
Refined metal	1,659	2,000	p 2,000	p 3,000	e 3,000
Gold bullion [6]—thousand troy ounces	119	127	132	142	r 171
Iron and steel:					
Iron ore—thousand tons	10,220	10,737	11,219	16,972	18,160
Pig iron [7]—do	r 1,976	2,009	2,375	2,449	2,237
Cast iron—do	151	371	342	p 334	NA
Ferroalloys [8]—do	r 35	r 41	r 47	42	51
Ingot steel [7]—do	r 2,443	2,565	r 2,824	r 3,016	r 2,983
Cast steel [7]—do	33	34	41	40	41
Rolled steel r—do	[7] 1,797	[7] 1,911	[8] 2,321	[8] 2,422	[8] 2,161
Lead:					
Ore:					
Gross weight	175,422	204,193	240,282	236,144	266,919
Lead content [e]	14,000	15,200	17,400	r 14,700	NA
Metal, primary, smelter	12,578	13,689	15,643	13,204	9,665
Manganese ore—thousand tons	1,016	1,171	1,254	r 1,349	1,396
Nickel:					
Ore, garnierite	4,431	15,852	52,997	54,494	59,311
Nickel content of ferronickel	r 90	r 240	1,030	c 1,000	1,114
Rare-earth metals and compounds:					
Monazite [9]	1,146	3,879	2,221	665	597
Rare-earth salts (exports)	6,160	1,063	865	899	4,329
Metals and alloys (exports) [10]—kilograms	4,500	2,250	1,500	2,500	3,000
Silver bullion—thousand troy ounces	232	250	r 281	305	228
Tin:					
Cassiterite concentrates:					
Gross weight—long tons	969	1,219	1,922	1,905	2,788
Tin content [11]—do	582	732	1,150	r 790	1,810
Metal, smelter—do	1,525	1,835	2,051	1,731	p 1,753
Titanium ores:					
Ilmenite [12]	r 4,778	5,344	r 5,782	8,271	9,794
Rutile	383	352	389	286	360
Tungsten concentrate, scheelite:					
Gross weight	1,029	1,034	463	r 319	318
60 percent WO_3 equivalent	1,235	1,241	556	r 383	382

See footnotes at end of table.

Table 1.—Brazil: Production of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity [2]	1961	1962	1963	1964	1965
Metals—Continued					
Zinc:					
Ore and concentrate	NA	NA	NA	[5] 483	[e] 15,000
Metal					[e] 75
Zirconium:					
Zircon	459	648	962	1,756	1,156
Baddeleyite-caldasite	6,613	2,320	325	516	493
Nonmetals:					
Agate, rough (exports)—kilograms	240,244	276,187	219,006	337,654	446,074
Asbestos minerals [13]	3,100	4,400	[r] [3] 1,342	[r] [3] 1,088	[3] 1,092
Barite	62,445	54,650	34,111	33,537	64,048
Cement: [14]					
Portland, common—thousand tons	4,678	5,039	5,154	5,530	5,545
Portland, high resistance—do	1				
Portland, white—do	30	33	30	34	32
Total	4,709	5,072	5,184	5,564	5,577
Corundum and emery, natural (exports)	4	7	1	4	2
Diamond:					
Gem [e]—thousand carats	175	175	175	175	175
Industrial [e]—do	175	175	175	175	175
Diatomite [e]	3,000	3,200	3,200	3,200	3,200
Dolomite	313,053	421,327	477,805	330,387	223,209
Feldspar [e]	40,000	40,000	40,000	40,000	40,000
Fertilizer materials:					
Nitrogenous fertilizers, manufactured:					
Ammonium nitrate	305	2,089	3,667	[r] 5,085	6,538
Ammonium calcium nitrate	59,638	57,045	56,272	[r] 26,486	57,687
Ammonium sulfate	6,802	8,282	9,570	9,742	11,295
Phosphate fertilizers, natural:					
Ores and concentrates, as reported:					
Apatite	243,908	310,117	215,288	195,077	191,836
Phosphate rock	415,513	255,440	63,506	51,142	86,908
Total	659,421	565,557	278,794	246,219	278,744
Marketable concentrates [15]	225,309	192,442	146,754	149,355	137,140
Fluorspar	365	NA	NA	NA	NA
Gemstones (exports) [16]—kilograms	243,007	397,389	417,799	702,534	762,293
Graphite	1,445	1,610	[e] 1,500	[e] 1,150	1,172
Gypsum	156,035	108,079	105,620	84,405	72,538
Lime—thousand tons	1,280	1,186	1,208	[r] 1,439	1,220
Lithium ores and compounds:					
Spodumene (exports)		150	25		6,815
Lithium carbonate (exports)	71	19			
Magnesite	76,702	93,756	90,298	93,740	124,642
Marble, dimension stone	48,911	59,393	53,011	50,952	46,500
Mica, muscovite	4,128	1,762	1,492	[5] 1,741	[5] 2,263
Mineral water—thousand liters	108,685	98,870	128,516	[r] 101,504	112,975
Quartz crystal (exports)	2,105	1,587	1,246	1,685	2,119
Salt [17]—thousand tons	920	1,240	1,193	754	1,196
Sulfur, elemental	2,605	4,561	5,750	NA	5,022
Talc, soapstone, pyrophyllite	23,776	38,300	34,915	48,115	57,648
Mineral fuels:					
Coal:					
Mine-run—thousand tons	2,390	2,508	[18] 2,571	[18] 3,246	[18] 3,383
Coke:					
High temperature—do	699	720	858	912	904
Gas-house—do	285	[e] 285	[e] 285	[e] 280	219
Gas:					
Manufactured [19]—million cubic feet	13,106	NA	NA	NA	13,351
Natural, gross withdrawal [19]—do	19,660	19,082	[r] 18,801	19,844	25,495
Natural gas liquids—42-gallon barrels			563,803	831,776	945,426
Petroleum:					
Crude:					
Production—thousand 42-gallon barrels	34,807	33,401	35,710	33,313	34,327
Refinery runs to stills—do	79,980	103,888	111,298	113,654	111,356

See footnotes at end of table.

Table 1.—Brazil: Production of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity [2]	1961	1962	1963	1964	1965
Mineral fuels—Continued					
Petroleum—Continued					
Refinery products:					
Gasoline---thousand 42-gallon barrels	23,688	30,782	32,799	36,536	36,555
Kerosine---do	3,945	4,364	4,053	4,546	4,123
Distillate fuel oil---do	15,071	19,625	22,324	23,910	22,984
Residual fuel oil---do	28,896	38,762	41,094	39,290	35,314
Lubricants---do	13	19	52	3	35
Asphalt---do	1,271	1,428	1,596	1,288	1,817
Solvents---do	817	803	748	795	735
Liquefied gases---do	3,161	3,421	4,113	5,417	6,593
Other---do	563	697	725	507	484
Total refinery products---do	77,425	99,901	107,504	112,292	108,640
Carbon black	16,995	19,700	24,850	23,904	22,580

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Includes export data on some commodities for which production data are not available and on commodities for which export data are more representative than incomplete data on production.

[2] In addition to commodities tabulated, Brazil produces antimony, bentonite, china and refractory clays, glass sand, kyanite, limestone, pyrite, ocher, thorium compounds, tungsten metal, uranium oxide, and vermiculite, as well as clay, sand, gravel, and stone for construction purposes, but data on quantities are not available.

[3] Preliminary figure for State of Bahia only.

[4] Production of columbite and tantalite is not separately reported; total production for 1961–1963 allocated on basis of export ratio for year.

[5] Exports.

[6] Reported official production for Minas Gerais and Paraná for 1961-64. Data for 1965 includes unofficially reported output for Minas Gerais, Bahia, and Goiás only. Perhaps as much as 60 percent of total gold recovered in Brazil is not reported statistically.

[7] Data from Instituto Brasileiro de Siderurgia.

[8] Data from Instituto Latinoamericano del Fierro y el Acero. Excludes ferrocolumbium, which is listed under columbium.

[9] Includes production of Comissão Nacional de Energia Nuclear (CNEN) for all years, but CNEN was the only producer during 1964-65.

[10] Data on actual production not available except that for 1964–65, when it was reported as 13 tons for each year.

[11] Average tin content of concentrates estimated as 60 percent for 1961–63 and 65 percent for 1964–65.

[12] Production of Comissão Nacional de Energia Nuclear only.

[13] Includes anthophyllite, chrysotile, and tremolite fiber. Data shown for 1961–62 are estimates, as ore rather than fiber is reported as production for some mines.

[14] Data from Sindicato Nacional de Indústria do Cimento (SNIC).

[15] Production of marketable apatite and phosphate rock is not reported separately; however, relative quantities produced are indicated by concentrates sold under government subsidy as follows: Apatite, 1961—95,002 tons; 1962—100,286 tons; 1963—63,422 tons; phosphate rock, 1961—116,753 tons; 1962—90,839 tons; 1963—76,835 tons.

[16] Includes rough and cut (but unset) stones except diamonds and rough agate.

[17] Data provided by Instituto Nacional do Sal.

[18] Data from Plano do Carvão Nacional. Merchantable (cleaned) coal produced was 1,798,000 tons in 1963, 1,782,000 tons in 1964, and 1,985,000 tons in 1965.

[19] Converted from cubic meters at rate of 1 cubic meter=37.32 cubic feet.

TRADE

Brazil's favorable overall trade balance of 1964 tripled during 1965. Exports of mineral commodities, up 49 percent (in U.S. dollars) over 1964, accounted for 12 percent of all exports; mineral commodities imported, off 4 percent from 1964, accounted for 33½ percent of all imports. The unfavorable balance for all mineral commodities was cut from US$296.4 million in 1964 to US$217.2 million in 1965—a 27-percent reduction. For nonfuel mineral commodities, a favorable balance of $11.7 million was recorded in 1965, compared with an unfavorable balance of $38.2 million in 1964.

Major factors in this improvement in trade position were the increased export of metals and ores and the decreased import of mineral fuels. Significant increases over 1964 exports were attained in iron ore (28 percent), iron and steel (160 percent), and manganese ore (42 percent). Significant decreases from 1964 imports developed in coal and coke (24 percent), crude petroleum (8 percent), and refined petroleum products (20 percent).

Exports of columbium and tantalum concentrates increased sharply in 1965 and may become an important export item. Exports of beryl and barite declined, but other export commodities maintained or improved their contribution to trade. Imports of aluminum and zinc increased moderately, and imports of copper increased 24 percent in value from 1964. In the nonmetals, the principal item of increased import was the fertilizer group, up 29 percent to US$31.2 million in 1965.

Table 2.—Brazil: Value of trade in metals and minerals

(Thousand U.S. dollars)

Exports	1964 [1]	1965	Imports	1964 [1]	1965
Metals:			Metals:		
Beryl, industrial	409	322	Aluminum	9,895	11,143
Columbium and tantalum [2]	370	1,861	Copper	22,207	27,552
Iron ore	80,638	102,979	Iron and steel	51,823	47,969
Iron and steel	17,235	44,877	Zinc	11,540	13,870
Manganese ore	20,615	29,219	Other	16,308	15,780
Other	776	3,582	Total	111,773	116,314
Total	120,043	182,840	Nonmetals:		
Nonmetals:			Asbestos	3,076	3,500
Barite	471	177	Caustic soda	12,566	10,261
Diamond, industrial	50	290	Nitrogenous fertilizers	10,744	15,672
Gem stones, including agate	966	2,152	Phosphatic fertilizers	7,649	6,927
Mica	841	1,195	Potassic fertilizers	5,696	8,568
Quartz crystal	1,568	2,583	Salt	756	3,583
Other	619	1,867	Sulfur	4,242	7,075
Total	4,515	8,264	Other	6,279	6,272
Mineral fuels:			Total	51,008	61,858
Distillate fuel oil	2,648	----	Mineral fuels:		
Other	16	8	Coal and coke	29,539	22,584
Total	2,664	8	Crude petroleum	170,366	156,441
Grand total	127,222	191,112	Refined petroleum products	58,127	46,220
			Other	2,785	3,750
			Total	260,817	228,995
			Grand total	423,598	407,167

[1] Data for 1964 revised in part to correct inadvertent errors in data shown in 1964 Minerals Yearbook.
[2] Excludes ferrocolumbium which is included under iron and steel with other ferroalloys. Exports of ferrocolumbium were valued at $13,104 in 1964 and $622,001 in 1965.

Table 3.—Brazil: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum:				
Bauxite	2,300	3,550	2,200	Argentina 2,550; Uruguay 1,000.
Oxide	26	32	403	All to Argentina.
Metal:				
Unwrought	----	----	697	
Semimanufactures	(1)	4	3	All to Paraguay.
Beryl	1,969	1,421	1,113	Mainly to United States.
Columbium and tantalum:				
Pyrochlore concentrate [2]	765	43	1,259	United States 25; Austria 10; Japan 8.
Columbite kilograms	19,399	11,178	40,061	United States 9,878; United Kingdom 1,300.
Tantalite do	104,781	82,000	165,322	All to United States.
Iron and steel:				
Iron ore thousand tons	8,268	9,730	12,731	West Germany 3,496; United States 1,050; Italy 1,044.
Slag, scrap and other residues	230	379	27,122	All to Japan.
Pig iron	46,994	148,953	101,296	Japan 85,246; United States 63,187.
Ferroalloys:				
Ferrochrome	----	----	47	
Ferrocolumbium	----	5	211	All to United States.
Ferromanganese	----	----	7,260	
Ferronickel	43	1,511	1,810	Mainly to Colombia.
Ferrosilicon	----	70	1,051	All to Uruguay.
Ingot steel	[3] 166	10,231	10,597	Mainly to Japan.
Semimanufactures	6,475	89,060	360,082	Argentina 77,903; Venezuela 7,986.
Lead ore and concentrate	----	----	12,925	
Manganese ores	840,709	832,918	1,067,763	United States 541,376; United Kingdom 104,848; West Germany 49,856.
Rare-earth metals:				
Ferrocerium kilograms	1,500	2,500	3,000	All to Argentina.
Cerium chloride	865	889	4,312	Japan 499; Austria 200; United States 136.
Unspecified compounds	----	10	17	Mainly to Japan.

See footnotes at end of table.

Table 3.—Brazil: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals—Continued				
Tungsten:				
Scheelite concentrate	798	329	426	France 108; Netherlands 108.
Estimated 60 percent WO_3 equivalent of scheelite concentrate.	960	395	511	NA.
Metal, all forms—kilograms	544	179	545	Mainly to Chile.
Zinc ores	----	483	522	All to Netherlands.
Zirconium silicate (zircon)—kilograms	7,000	13,500	34,000	All to Argentina.
Other [4]	62	39	214	Mainly to United Kingdom.
Nonmetals:				
Abrasives [5]	92	234	786	Mainly to Argentina.
Agate, rough—kilograms	219,006	337,654	446,074	West Germany 126,536; United States 84,585; Japan 59,327.
Asbestos:				
Fiber	----	20	----	Mainly to Bolivia.
Construction materials	3	15	----	All to Paraguay.
Asbestos cement products	----	4	----	All to Bolivia.
Barite	27,112	58,888	22,087	Trinidad and Tobago 46,924; Venezuela 11,964.
Cement, portland	2,628	464	2,739	Paraguay 412; Bolivia 52.
Clays and clay products:				
China clay	200	722	1,405	All to Uruguay.
Nonrefractory clay products	255	50	128	Mainly to United States.
Diamond:				
Industrial—carats	305	4,105	22,670	Argentina 2,245; United States 1,835.
Gem, uncut—do	----	1,240	5,520	All to United States.
Gem, cut but unset—do	----	(1)	2,395	Do.
Gem stones: [6]				
Rough or uncut—kilograms	335,229	422,687	304,295	United States 157,563; West Germany 80,916; Hong Kong 69,782.
Cut, unset—do	5	10	189	Belgium-Luxembourg 5; United States 3.
Other [7]—do	82,566	279,834	457,809	United States 184,097; West Germany 34,800; Japan 32,786.
Lithium compounds: Spodumene	25	----	6,815	
Magnesite	584	1,966	12,361	Belgium-Luxembourg 800; Argentina 665; France 501.
Magnesium oxide	200	----	----	
Mica, muscovite:				
Sheet, block, scrap, or ground	1,252	1,741	2,263	Mainly to United States.
Manufactures	15	10	6	Do.
Quartz crystal:				
Electronic and optical	172	140	278	United States 88; United Kingdom 28; France 14.
Lasca (fusing grade)	1,175	1,545	1,841	West Germany 751; Japan 359; United Kingdom 197.
Refractory bricks and similar products.	33	658	2,052	Mainly to Argentina.
Salt	30	30	(1)	All to Bolivia.
Stone, dimension:				
Natural or roughly worked:				
Granite	4,183	6,910	8,010	Italy, 2,655; United States 1,581; Japan 1,261.
Marble	5	57	66	Paraguay 21; Japan 17; Chile 13.
Worked stone, not further specified	10	375	183	Mainly to United States.
Talc, industrial	11	236	546	Mainly to Colombia.
Other [4]	7	108	15	Paraguay 58; Uruguay 50.
Mineral fuels:				
Petroleum:				
Crude—thousands tons	360	----	----	
Refinery products:				
Distillate fuel oil	----	122	----	West Germany 78; Argentina 44.
Residual fuel oil—do	32	1	----	All to Uruguay.
Other	9	8	14	Uruguay 4; Paraguay 3.
Pitch coke	----	----	3	

[1] Less than ½ unit. NA Not available.

[2] Brazil includes pyrochlore under trade classification 2.37.79—Minérios metálicos, n.e. (metalliferrous ores not specified). Starting in 1963 most, if not all, material exported under this category was pyrochlore concentrate. The quantity shown for 1963 was pyrochlore, but those shown for 1964 and 1965 have not been completely verified and might include small amounts of other commodities.

[3] Other sources indicate most, if not all, of quantity shown was ferronickel.

[4] Includes material not identified by commodity in source and commodities not listed separately in table.

[5] Includes emery, artificial corundum, and diamond and other gem stone dust. Excludes grindstones and industrial diamond.

[6] Excludes diamonds and rough agate.

[7] Probably represents rejected material suitable for tumbling and mineral suites.

Source: Serviço de Estatística Econômica e Financeira, Comércio Exterior.

Table 4.—Brazil: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum:				
Oxide	571	40	1,035	Mainly from United States.
Metal:				
Unwrought	25,815	18,549	21,844	Canada 8,594; Norway 5,107; United States 2,668; Sweden 1,049.
Semimanufactures	456	254	381	West Germany 112; United States 63; United Kingdom 28.
Antimony:				
Ores	80	65	272	Mainly from Peru.
Oxide	35	15	35	Netherlands 7; United Kingdom 5.
Metal, unwrought and wrought	589	160	73	Mainland China 108; Peru 30; Belgium-Luxembourg 22.
Arsenic:				
Sulfides, natural	2	----------	----------	
White	755	302	114	Sweden 102; France 100; West Germany 100.
Metal	5	15	21	All from Sweden.
Bismuth metal, all forms--kilograms	10,271	2,502	12,218	Mexico 1,497; West Germany 1,005.
Cadmium metal, all forms-----do	46,692	28,123	33,472	Mexico 21,823; West Germany 3,000.
Chromium:				
Oxides	182	113	95	West Germany 64; Poland 16; Denmark 10.
Metal, all forms	6	3	4	Mainly from United States.
Cobalt:				
Oxides	36	31	31	United Kingdom 23; Belgium-Luxembourg 7.
Metal, all forms	90	78	84	Mainly from Belgium-Luxembourg.
Copper:				
Sulfate	4,147	3,389	2,757	United Kingdom 1,534; West Germany 1,015; Greece 449.
Metal:				
Scrap	----------	29	----------	All from Paraguay.
Refined, unalloyed	48,117	27,810	22,777	Chile 22,407; Peru 4,036.
Alloys, unwrought	93	1	13	All from United States.
Semimanufactures, including alloys.	383	341	448	United States 198; West Germany 117.
Gold:				
Bullion----------troy ounces	561	1,261	129	West Germany 643; Sweden 295.
Semimanufactures----------do	39	31	----------	All from United States.
Iron and steel:				
Scrap	162	24	72	Mainly from United States.
Sponge, powder, granules	686	595	473	Do.
Ferroalloys	1,563	804	577	Sweden 288; United States 117; Japan 91.
Semimanufactures	397,746	227,921	210,997	Japan 69,233; West Germany 29,767; Poland 29,703; United States 19,088.
Lead:				
Oxides	1,249	73	36	Mainly from Mexico.
Metal, all forms	15,839	4,216	2,171	Peru 2,926; Mexico 1,290.
Magnesium metal, all forms	1,807	1,502	1,330	Norway 779; United States 712.
Manganese:				
Oxides	1,638	1,681	879	United States 722; Greece 476; Japan 417.
Metal, all forms	16	15	21	United States 8; Japan 5.
Mercury----------76-pound flasks	3,357	3,003	17,305	Mainly from Mexico.
Molybdenum metal, all forms--kilograms	6,512	7,466	7,934	Mainly from United States.
Nickel:				
Sulfate	353	219	264	Mainly from West Germany.
Metal:				
Scrap	23	----------	1	
Refined	327	357	277	Mainly from United States.
Semimanufactures	333	325	285	United States 208; West Germany 33.
Platinum-group metals:				
Platinum, unwrought.----------troy ounces	23,545	13,430	1,073	Hungary 6,494; France 3,408.
Platinum, semimanufactures.----------do	267	193	75	All from United States.
Platinum, manufactures [1]----do	r 4,662	257	96	All from West Germany.
Other, unwrought----------do	9,780	27,103	7	Mainly from Hungary.
Other, semimanufactures----do	123	225	18	All from United States.

See footnotes at end of table.

Table 4.—Brazil: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Radioactive and associated materials:				
Radium—milligrams	359	459	25	United States 319; Canada 140.
Other radioactive chemical—value—elements and their isotopes and compounds.	$82,567	$29,179	$35,296	United States $22,934; Canada $4,366; United Kingdom $1,879.
Staple isotopes and their—value—compounds.	$623	$121	----------	All from United Kingdom.
Other compounds of—kilograms—thorium and uranium and of rare earth metals.	140	234	10,841	West Germany 128; United States 98.
Selenium—do	4,091	2,150	1,687	Canada 922; United States 553; Sweden 300.
Silicon metal	258	174	272	Norway 70; France 69; Sweden 20.
Silver:				
Bullion—troy ounces	1,195,300	1,512,371	734,001	Peru 1,054,351; Mexico 260,196.
Semimanufactures—do	55,668	49,641	31,379	West Germany 23,277; United States 10,127; Netherlands 7,491.
Sodium metal—kilograms	5,404	10,062	5,303	Mainly from West Germany.
Tantalum, semimanufactures—do	9	9	11	All from United States.
Tellurium—do	136	----------	(2)	
Tin:				
Cassiterite concentrates—long tons	2,942	922	1,184	All from Thailand.
Oxides—do	59	58	33	United Kingdom 33; West Germany 25.
Metal, all forms—do	8	5	2	United States 3; Japan 2.
Titanium:				
Rutile, concentrates	10	----------	----------	
Oxides, manufactured	7,095	6,568	6,559	West Germany 2,375; United Kingdom 1,758; Japan 692.
Tungsten:				
Wolframite concentrates	20	10	----------	All from Peru.
Metal, all forms—kilograms	7,094	2,899	2,539	United States 1,582; Netherlands 694; West Germany 554.
Zinc:				
Oxides	122	72	305	Poland 35; Bulgaria 15; United States 13.
Lithopone	7,832	6,587	6,078	Mexico 2,296; Netherlands 927; Mainland China 856; Austria 699.
Metal:				
Scrap	2	----------	----------	
Refined	38,902	30,707	31,574	Peru 14,983; Mexico 4,741; Argentina 2,801.
Semimanufactures	448	349	443	Belgium-Luxembourg 245; Poland 38; West Germany 36.
Metallic oxides, not specified	266	105	177	United States 49; United Kingdom 30; West Germany 14.
Other [3]	2	103	19	Mainly from Mexico.
Nonmetals:				
Abrasives:				
Natural [4]	37	55	59	Italy 27; Greece 18; United States 8.
Corundum, artificial	467	312	271	West Germany 198; Italy 90.
Silicon carbide	158	151	175	Norway 74; United States 53.
Carbides, not specified	7	9	17	Mainly from Sweden.
Asbestos:				
Fiber	20,206	13,334	15,151	Canada 11,283; Rep. of South Africa 1,224.
Construction materials	268	240	108	United States 148; West Germany 45.
Barium compounds: [5]				
Barite	35	24	30	All from United States.
Sulfate	598	398	539	Mainly from West Germany.
Oxide—kilograms	5,442	10,928	7,301	Mainly from United States.
Boron:				
Borax, crude	----------	----------	50	
Sodium borates, purified	8,073	8,022	7,209	Argentina 5,807; United States 2,180.
Boric acid	982	1,020	879	Mainly from United States.
Bromine—kilograms	156	201	185	Mainly from West Germany.
Caustic potash	1,565	745	586	France 265; East Germany 156; Poland 143.
Caustic soda	158,644	116,602	96,309	United States 50,322; United Kingdom 18,871; West Germany 13,654.
Cement:				
Portland, common	6,375	26,157	42,683	All from Uruguay.
Magnesian	40	4	----------	All from West Germany.
Refractory	1,319	2,329	306	Mainly from United States.
Nonspecified cements	518	242	539	France 117; West Germany 91; Yugoslavia 30.
Chalk, natural	2,763	2,353	1,409	Denmark 1,438; France 599; Sweden 174.

See footnotes at end of table.

Table 4.—Brazil: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Clays:				
Bentonite	6,214	8,198	4,548	United States 4,726; Argentina 3,447.
China clay	237	111	96	Mainly from United States.
Refractory clay	153	50	3	All from United States.
Nonspecified clays	584	595	448	United States 490; Argentina 100.
Cryolite:				
Natural	564	977	1,003	All from Denmark.
Synthetic	799	1,214	703	All from Canada.
Diatomite and infusorial earth	1,679	1,206	1,694	United States 1,050; West Germany 156.
Fertilizer materials:				
Nitrogenous:				
Chilean nitrates	51,552	32,501	52,757	All from Chile.
Other	200,834	172,350	223,000	West Germany 91,188; United States 34,286; Belgium-Luxembourg 27,186.
Phosphatic:				
Phosphate rock, natural	221,832	181,763	154,718	United States 157,096; Togo 12,992.
Superphosphate	9,780	5,507	5,776	Mainly from Netherlands.
Triple superphosphate	71,410	49,266	49,731	Mainly from United States.
Thomas slag	4,725	5,881	5,635	Belgium-Luxembourg 4,140; West Germany 1,741.
Other	6,906	6,183	2,726	Japan 4,423; Belgium-Luxembourg 1,700.
Potassic:				
Potassium chloride	146,497	110,504	155,356	France 26,467; West Germany 23,319; Israel 22,876.
Other compounds	4,943	4,698	7,969	East Germany 1,790; Israel 1,325; Belgium-Luxembourg 1,069.
Mixed and nonspecified fertilizers	299	80	----------	All from Japan.
Fluorspar	450	----------	----------	
Graphite, natural	3	135	180	Japan 70; United States 61.
Gypsum	40	930	855	Mainly from West Germany.
Iodine—kilograms	10,588	11,321	16,375	Argentina 4,950; Chile 4,550.
Magnesium oxide	119	104	80	West Germany 36; France 35; United Kingdom 15.
Mica:				
Sheet, block, scrap, or ground.—kilograms	300	227	318	All from United States.
Manufactures—do	26,664	6,647	21,892	Switzerland 3,492; United States 2,245.
Mineral pigments:				
Iron oxides, natural or synthetic	1,390	1,171	760	West Germany 677; Spain 473.
Earth colors—kilograms	3,376	6,809	10,807	Mainly from France.
Phosphorus, elemental	112	118	148	West Germany 62; United Kingdom 37.
Refractory bricks and similar products.	20,162	3,390	3,629	United States 1,961; Austria 515; Italy 484.
Salt	178	52,213	249,509	West Germany 39,834; East Germany 10,600.
Silex or flintstone, crude	532	420	83	France 250; Denmark 170.
Soda ash	51,692	6,023	4,606	United Kingdom 4,250; Rumania 1,751.
Sodium sulfate	4,595	5,295	10,476	East Germany 4,040; Chile 1,192.
Stone, dimension: Marble, worked or not.	150	11	92	All from Argentina.
Sulfur:				
Crude	176,603	140,801	192,337	United States 109,823; Canada 13,890; Mexico 12,331.
Refined	393	275	571	Mainly from United States.
Other [3]	31	12	7	Do.
Mineral fuels:				
Carbon black	4,449	2,872	2,815	Do.
Coal:				
Anthracite	817	3,563	1,633	Do.
Bituminous	865,487	1,348,429	1,046,176	Do.
Peat	6	----------	----------	
Coal coke	39,226	152,576	124,808	Mainly from West Germany.
Mineral waxes	442	446	281	Mainly from United States.
Petroleum:				
Crude—thousand tons	10,374	10,803	10,247	Venezuela 4,501; Iraq 1,989; U.S.S.R. 1,623.
Refinery products:				
Gasoline—do	523	293	163	Netherlands Antilles 160; Trinidad and Tobago 47; U.S.S.R. 38.
Kerosine—do	17	3	2	All from United States.
Jet fuel—do	237	246	276	Venezuela 130; Netherlands Antilles 106.
Distillate fuel oil—do	54	----------	----------	
Residual fuel oil—do	----------	----------	19	
Lubricants—do	228	272	217	United States 184; Netherlands Antilles 60.
Liquefied petroleum gas—do	262	233	165	Mainly from Venezuela.
Paraffin and vaseline—do	18	16	14	East Germany 8; United States 4.

See footnotes at end of table.

Table 4.—Brazil: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Mineral fuels—Continued				
Petroleum—Continued				
Refinery products—Continued				
Petroleum coke	5,216	8,124	11,150	All from United States.
Asphalt and asphalt mixtures	29	556	377	Argentina 312; United States 182.
Other refinery products	8,204	15,895	1	United States 6,261; Netherlands Antilles 5,482; Venezuela 3,286.
Mineral tar and crude chemicals from coal, petroleum, and natural gas.	29,154	21,625	51,061	Mainly from United States.

r Revised. [1] Excludes jewelry and other ornamental items.
[2] Less than ½ unit.
[3] Includes some materials not identified by commodity in source and commodities not listed separately in table.
[4] Includes emery, pumice, and diamond and other gem stone dust. Excludes millstones and grindstones.
[5] Excludes lithopone, which is listed under zinc.

Source: Serviço de Estatística Econômica e Financeira, Comércio Exterior.

COMMODITY REVIEW

METALS

Aluminum.—The Montecatini Co., of Italy, in midyear announced a technical assistance agreement with the Companhia Brasileira de Alumínio to expand that company's operations. A construction program already underway at Sorocaba, São Paulo State, will by 1970 increase annual capacity to 100,000 tons of alumina and 50,000 tons of ingot from present levels of 30,000 tons and 14,000 tons, respectively. Cost of the expansion is estimated at US$60 million.

Expanded facilities also are being constructed at Saramenha, near Ouro Prêto, Minas Gerais, for the Alumínio Minas Gerais, S.A. (ALUMINAS), an affiliate of Alcan Aluminium Ltd. of Canada. Existing annual capacity totaled about 32,000 tons of alumina and 15,500 tons of ingot. It is proposed to increase the ingot potential to 22,000 tons by 1968, and ultimately to 44,000 tons thereafter. The company also produces ferroalloys.

A new aluminum company was formed during the year, Companhia Mineira de Alumínio (ALCOMINAS), a joint venture of Brazilian capital, Aluminum Company of America, and Hanna Mining Co. The plant is to be located at Poços de Caldas, and is to draw its bauxite from a reported 16-million-ton reserve in the vicinity.

Columbium.—The pyrochlore mining operation at Araxá, Minas Gerais State, operated throughout 1965, producing 1,197 tons of 57 to 58 percent columbium pentoxide (Cb_2O_5) concentrate. Technologic improvements instituted during 1964 resulted in this improved product; the grade formerly was 54 percent. A better product and a yearend price of US$0.85 per pound, part of a general price increase due to the tight world supply situation, enabled Brazil to double its share of the United States' market.

Production of ferrocolumbium, started in 1964, was actively continued; 277 tons of alloy was produced by a batch thermit-type process. The alloy may be exported without special export licensing since it contains no uranium or thorium.

The management plans to attain monthly production rates of 454 tons of concentrate and 11 tons of ferroalloy.

The Wah Chang Corp. early in 1965 sold its 25 percent interest in the Distribuidora e Exportadora de Minérios e Adubos, S.A. (DEMA), the Araxá operating company, to Molybdenum Corp. and Pato Consolidated Gold Dredging, Ltd., at a reported price of US$1.8 million. The new acquisitions, added to shares already owned by the two purchasers, will be held by the Niobium Corp., a New York company owned two-thirds by Molybdenum Corp. and one-third by Pato, and represent the 50 percent of DEMA held by non-Brazilians.

The Brazilian Government set a maximum export quota of 2,500 tons of concentrate for 1965, but allowed additional export of 1 ton of concentrate for every ton of ferrocolumbium exported.

Ore reserves at Araxá are reported to be at least 185 million tons of 3 percent Cb_2O_5 content.

Copper.—The major source of copper in Brazil continued to be the Mina de Camaquã in the State of Rio Grande do Sul. Concentrates were shipped to the company's smelter

at Itapeva in São Paulo State, and the resultant primary copper was refined at Utinga, also in São Paulo. Production from this mine and the Caraiba deposit in Bahia, both owned by the Cia. Brasileira de Cobre, represented not over 10 percent of domestic demand; consequently, copper remained a major import item.

The company during 1965 contracted with Mitsubishi Metal Mining Co. for technical assistance in the further development of these two mines and a third mine owned by the company but not in production. Additional reserves were developed during the year.

To alleviate the chronic short supply, the DNPM has completed a geochemical exploration project in Bahia, conducted jointly with the U.S. Geological Survey. Two large mineralized areas were outlined. As a result of this and similar continued effort, it is hoped that Brazil will supply half its demand with domestically produced metal by 1972.

Gold.—Production of gold in Brazil in 1965 increased 20 percent over the 1964 level. Of the official total of 171,011 troy ounces, lode mines in Minas Gerais, Bahia, and Goiás produced 93 percent and placer operations in Minas Gerais the remainder. The major producer continued to be the four mines of the Morro Velho group in Minas Gerais, which accounted for 87 percent of the national total.

A new mine began production in May, the lode operation of Mineração Norte Central, Ltda., near Dianópolis, Goiás State. A 135-foot shaft was sunk on the property, followed by crosscuts on the veins. A small (1 ton per hour) amalgamation mill was built and was reportedly producing at the rate of 16 troy ounces per shift.

Much—perhaps more than half—of Brazil's gold production is never reported. Production by the many prospectors in Brazil may have been as much as 240,000 troy ounces in 1965. An informed estimate spoke of about 10,000 troy ounces per month being produced in the Alto Tapajós region of the State of Pará in 1965. It was reported in February that the influx of miners and prospectors into the region had reached the proportions of a gold rush. Other areas of Brazil may yield placer gold equal in amount to that mined in Tapajós.

Iron Ore.—Brazil's output of iron ore in 1965 reached 18,159,922 tons, a 7-percent increase over 1964, and exports totaled a recordbreaking 12.7 million tons.

The Companhia Vale do Rio Doce (CVRD), a government-controlled company, produced 11.5 million tons of which 4.05 million tons were fines. The company exported just over 10 million tons—8.9 million for its own account and 1.12 million for S.A. Mineração da Trindade (SAMITRI) and FERTECO S.A. Administração e Fomento Industrial under the contracts concluded in 1964. These exports were loaded in the port of Vitória, Espirito Santo. Reportedly 16 percent was fines.

Companhia Siderúrgica Nacional (CSN) produced 2.40 million tons from its Casa da Pedra mine during 1965. The blast furnaces at Volta Redonda received 1.27 million tons; the remainder was fine ore, most of which was stockpiled.

While SAMITRI and FERTECO shipped their export ore over the CVRD railroad to the port of Vitória, the St. John del Rey Mining Co. and Companhia Auxiliar de Emprêsas de Mineração (CAEMI) shipped over the Government railroad, Estrada de Ferro Central do Brasil, to the port of Rio de Janeiro. These companies in 1965 accounted for about 1.1 million of the port's 2.6-million-ton iron ore capacity; other mines in the Paraopeba Valley provided the balance.

CVRD continued construction of its new, modern port facilities for iron ore and coal at Ponta do Tubarão, near Vitória and planned to be able to load 6,000 tons per hour by April 1, 1966. Expansion of the port of Rio de Janeiro to 3 million tons capacity was underway.

It was announced in December that the St. John del Rey Mining Co., a Hanna Mining Co. subsidiary, and the Cia. Auxiliar de Emprêsas de Mineração, the Augusto Antunes group, merged to form a new company, Mineraçoes Brasileiras Reunidas (MBR). Iron ore will be mined and steel produced at the new company's holdings in Minas Gerais. A 2-million-ton pelletizing plant will be included, and a 10-million-ton deepwater port is planned for Sepetiba Bay, near Rio de Janeiro.

During the year, discovery of a ferriferous district in the Rio Jatapu area of northeastern Amazonas was announced.[3] The iron ore occurs in sediments probably equivalent to the Minas series. The mineralization is a mixture of hematite and magnetite. A composite sample from outcrops and test pits contained 56.9 percent iron, 3.6 percent silica, and 1.0 percent phosphorus. Preliminary estimates indicate that reserves could exceed 200 million tons.

[3] Da Costa, Heitor Façanha. Novo Distrito Ferrifero No Brasil: Rio Jatapu, Amazonas. Engenharia Mineração Metalurgia. September 1965, pp. 113–119 and November 1965, pp. 209–212, Rio de Janeiro, Brazil.

Iron and Steel.—Decreased demand for ferrous metals in 1965 brought about production declines of 10.4 percent for pig, 1.5 percent for ingot, and 2.7 percent for shapes.

Ten integrated steel plants operated during the year. The dominant producer was Companhia Siderúrgica Nacional (CSN), a government corporation, which produced more than one-third of the nation's pig iron, more than two-fifths of its ingots, and about half its rolled shapes. Following a rising trend, iron smelted with coke accounted for 62 percent of the total pig, while iron smelted with charcoal accordingly declined to 33 percent. Under existing law, iron producers using coke were required to blend domestic and imported coals at a minimum ratio of 3:2 but because of the relatively inferior quality of the domestic coal, this regulation was eased somewhat in order to reduce the cost of pig iron.

Production by States in 1965 is shown in the following table:

State	Thousand tons	
	Pig iron	Steel ingots
Minas Gerais	1,315	1,143
Rio de Janeiro	985	1,399
Bahia, Matto Grosso, Paraná, Pernambuco, Rio Grande do Sul, São Paulo	55	354
Total [1]	2,355	2,896

[1] Data differs slightly from that given in table 1 because of difference in sources.

Source: Anuário Estatístico do Brasil, 1966, p. 152.

Imports of iron and steel in 1965—largely stainless steel and the more complex shapes—showed no increase over 1964. Exports, largely to Japan and Argentina and other Latin American Free Trade Association (LAFTA) members, continued to increase.

Zinc.—In 1965 zinc metal was produced commercially in Brazil for the first time. The Companhia Mercantil e Industrial INGÁ began production late in the year from a plant of 7,200 tons annual capacity located at Ilha de Madeira in Sepetiba Bay, Rio de Janeiro State. Zinc was extracted from calamine (zinc silicate) ore, mined at Vazante, Minas Gerais, and containing about 30 percent zinc. Indústrias Votorantim, S.A., was building a plant of 18,000 tons annual capacity at Três Marias, Minas Gerais, designed to operate on similar ore; this facility was not yet in production.

NONMETALS

Cement.—Twenty-nine cement plants, many in São Paulo State, operated at 83 percent of industry capacity in 1965. Several additional plants were under construction or planned.

Diamond.—Mineração Tejucana, S.A., was preparing to dredge diamonds from the Jequitinhonha River in Minas Gerais State.

Potash.—Oil-well drilling at Carmópolis, Sergipe State, penetrated a thick stratum of rock salt at a relatively shallow depth. The bottom 30 meters of the salt bed, about 500 meters below the surface, contained potash in the form of carnallite and sylvite. In view of 1965 imports of 155,356 tons of potassium chloride, a 41-percent increase over 1964 imports, the Carmópolis discovery may prove significant.

Quartz Crystal.—Early in the year, some quartz crystal of commercial grade was discovered near Cristalina, Goiás State.

MINERAL FUELS

The market pattern of mineral fuels in Brazil in 1965 featured increased production of both mine-run coal and crude petroleum, 3.5 and 3.3 percent, respectively. Imports of these commodities declined by 22.4 and 5.1 percent.

Coal.—Brazil's coal industry improved performance in several respects during 1965. Compared with 1964, production of mine-run and cleaned coal gained 4.2 and 11.4 percent, respectively. Again about two-thirds of the production came from the State of Santa Catarina. Coal cleaning ratios are shown in the following table comparing the producing States:

State	Ratio of cleaned coal to mine-run coal		
	1963	1964	1965
Paraná	0.828	0.785	0.843
Santa Catarina	.659	.471	.467
Rio Grande do Sul	.750	.676	.819
National average	.699	.549	.587

Source: Comissão do Plano do Carvão Nacional.

The iron and steel industry and powerplants remained the dominant coal consumers, as shown in the following table:

Industry	1965 coal consumption (thousand metric tons)		
	Domestic	Imported	Total
Iron and steel	578	830	1,408
Electric power	1,000	--------	1,000
Manufactured gas	58	295	353
Railroads	102	--------	102
Steamships	10	--------	10
Total	1,748	1,125	2,873

Source: Instituto Brasileiro do Geografia e Estatística. Anuário Estatístico do Brasil, v. 27, 1966, p. 298.

The first of two 50,000 kilowatt units planned for the thermal powerplant at Tubarão, Santa Catarina State, began operating in April. This plant is expected to be an important consumer of steam coal (heretofore stockpiled), but markets for much of the power remained to be developed.

Petroleum.—President Castello Branco, on July 9, 1965, revoked the decree of March 13, 1964, that expropriated the six privately owned oil refineries. The refineries had been operated by their owners under permission of the court during the 16-month period.

Resolutions enacted by the Conselho Nacional de Petróleo (CNP) in May opened petrochemical production and oil shale resource development to private industry; the Council reserved the right to approve such proposed projects and maintained other controls.

Prices of petroleum products, increased by CNP on December 11, 1964, were raised again, effective March 1, 1965.

Sixteen drill rigs of various types were ordered from Rumania, for first quarter 1965 delivery, by Petróleo Brasileiro, S.A. (PETROBRÁS), the Government petroleum corporation. Of these drills, three were reportedly capable of drilling to 14,100 feet (4,500 meters), and five others to 4,700 feet (1,500 meters). The first five of these drills were delivered in February.

The first shipment of crude oil from the Carmópolis field was reported in March 1965. Production was expected to reach 15,000 barrels per day by June, but inadequate transportation facilities deterred a more rapid output increase. Near yearend, PETROBRÁS contracted with Servipetrol and Brantley Drilling to drill 240 development wells in the Carmópolis field over a 2-year period.

PETROBRÁS drilled 225 wells during 1965, including 97 for exploration and 128 for development. Total footage increased 11.7 percent over 1964 to a total of 964,477. The discovery of oil in the Miranga field, in the Recôncavo Basin, Bahia State, was considered the most important find of the year. At yearend, the Miranga field was producing 4,400 barrels per day. A showing of oil also was found at 4,500-foot depth in the São João field of the Barreirinhas Basin, along the Maranhão coast.

During 1965 the PETROBRÁS budget included US$38.5 million for exploration, $15 million for production, $24 million for refining, $16.5 million for terminals and pipelines, $8.5 million for marine transport, $14.5 million for petrochemicals, and $5.5 million for oil shale research.

PETROBRÁS planned to explore the Continental Shelf from Maranhão to Espírito Santo. The first target area is off the Alagoas coast, to be drilled during the last half of 1967. Producing wells in 1965 included about 200 offshore wells in All Saints Bay, Bahia State.

The daily rate of oil production increased to 94,000 barrels, 3.3 percent greater than in 1964. The various fields in Bahia State accounted for 99.4 percent of total production; the States of Alagoas and Sergipe, the remainder. Natural gas production averaged 66.0 million cubic feet per day, 28.2 percent over the 1964 rate.

The rate of crude petroleum consumption was estimated at 305,200 barrels per day, 1.7 percent less than in 1964. Refinery throughput included 91.1 million barrels by PETROBRÁS and 20.3 million by privately owned refineries. Imported crude oil amounted to 73 percent of the total supply in 1965, and was obtained from the following sources:

Source	Quantity (million 42-gallon barrels)	Percent of total
Venezuela	29.78	39.3
U.S.S.R.	16.53	21.8
Iraq	13.91	18.4
Kuwait	8.00	10.6
Saudi Arabia	5.41	7.2
Peru	.70	.9
Netherlands Antilles	.52	.7
Nigeria	.45	.6
Colombia	.36	.5
Total	75.66	100.0

The Mineral Industry of British Guiana[1]

By Garn A. Rynearson [2]

The most significant developments in the mineral industry of British Guiana during 1965 again were contributed by the bauxite industry which continued to dominate all other elements of the mining and quarrying sector. Mine output of crude bauxite attained a record high of nearly 3 million tons, and the production of calcined bauxite (abrisive and refractory grades), dried chemical-grade bauxite, and alumina for the export market also reached record levels. In addition, the industry invested more than $9 million [3] in expansion projects during 1965 and announced plans for even larger investments during 1966–68.

Other developments of potential importance to the mineral industry included granting of oil exploration concessions for onshore and offshore areas to four oil companies and recognition of some mineralized areas of potential commercial significance as the result of geophysical, geochemical, and drilling investigations carried out jointly by the Geological Survey and the United Nations Development Programme (Special Fund).

The newly elected coalition Government initiated a number of programs and policies that could have significant effect on developments in the mineral industry. During the year it attained a measure of political and economic stability and undertook programs to improve transportation and communications. To prepare for independence in 1966, the Government enlisted the services of an international team to draw up a seven year development program (1966–72). The plan anticipates the expenditure of approximately $177 million on development projects during 1966–72, and it was estimated that about $201 million would have to be raised during the period to finance the plan and to support consequential current expenditures and debt charges.

To assure a substantial increase in national income, the development program places first priority on diversification of domestic output and points out that the most likely prospects for new industries are (a) import substitution (mainly foodstuffs, textiles, footwear); (b) raising of beef for export; (c) growing bananas for export; (d) production of aluminum metal, which will require extensive feasibility surveys and the eventual expenditure of large sums of capital for the development of hydroelectric facilities to provide adequate sources of cheap electric power; and (e) expansion of the bauxite industry as well as discovery and exploitation of other possible mineral resources such as oil, gas, gold, molybdenum, iron ore, columbite-tantalite, and possibly copper.

The diversification-of-output aspect of the plan was pursued vigorously during 1965 by the Industrial Development Corp.,

[1] Although British Guiana did not become the independent nation of Guyana until May 26, 1966, the new name and corresponding adjective (Guyanese) came into general and at least partly official use during 1965. For example, in preparation for independence, a new Central Bank of Guyana was established, the Government established the Guyana Development Corp., and the Guyana dollar was issued to replace the British West Indies dollar, at par value, as the new monetary unit. Therefore, for standardization, Guyana has been used throughout this chapter wherever use of British Guiana was not required for technical reasons.

[2] Physical scientist, Division of International Activities.

[3] Where necessary, values have been converted from British West Indies dollars (BWI$) or Guyana dollars (G$) to U.S. dollars at the rate of BWI$1.00 and G$1.00 both equal US$0.58.

a government agency created late in 1963 to promote the establishment of new industries. In 1965, the responsibility and authority of this agency expanded to include commercial agriculture, fisheries, forestry, and mining in addition to promotion of manufacturing and tourism, and its name was changed to Guyana Development Corp. The corporation will be the sole agency authorized to promote industrial development, will coordinate all Government activities to encourage and assist enterprises, and will supervise all investments in which the Government has an equity interest. The corporation approved several projects involving minerals during 1965, and will exert considerable influence on future mineral industry development. It can offer incentives to attract new investments, including a 5-year tax holiday on new industries, tariff concessions to protect new industries, accelerated writeoffs of building and equipment costs, duty-free imports of capital investment goods, and a variety of services.

The 7-year development plan also made provisions for, and placed a high priority on, a series of government basic resource surveys, with the expectation that some technical and financial assistance would be forthcoming from the United Nations as well as foreign governments. Several of these surveys will be of prime importance to the future mineral industry development. For example, aerial mapping surveys and hydrologic investigations will be made of areas that offer the best possibilities for developing the hydroelectric power required to establish an aluminum industry as well as other potential projects involving minerals and other commodities. United Nations' participation in these power development surveys has been approved.

Systematic geological investigations during recent years have been geared largely to an aerial geophysical survey project conducted jointly by the United Nations Development Programme (Special Fund) and the Guyana Geological Survey Department. Begun in mid-1962, the project was completed late in 1965 at a total cost of $1.3 million; the United Nations provided approximately $600,000 for airborne contracts, equipment, and specialist services while Guyana contributed nearly $700,000, mainly for ground followup operations (geochemical prospecting, ground geophysics, and drilling in areas of known gold or geochemically indicated base metal mineralization) and local services.

The Geological Survey and the United Nations team were optimistic over the preliminary results of the project, which located areas that appeared to have prospects for copper-gold, copper-zinc, gold, nickel, and molybdenum. The Geological Survey assembled a brochure [4] summarizing preliminary results of the project and including a list of Geological Survey publications and maps issued as of 1965, as well as many of the most recent geological and geophysical maps available.

Because of insufficient technical and financial capabilities to make a reasonably early assessment of more than a few of some 200 target areas indicated by the first Special Fund project, Guyana submitted a request for a 3-year followup project in December. This project was programed for the expenditure of approximately $1.04 million by the United Nations and $1.08 million by Guyana; early approval of the project was expected.

During 1965, Guyana also received assurance that at least 12 man-months of specialist services by the U.S. Geological Survey would be provided under the auspices of the U.S. Agency for International Development (AID). The first project, a geochemical assessment of a promising molybdenum-bearing area at Eagle Mountain in the central part of the country was begun in October.

To further induce private enterprise to engage in exploration and development of the country's mineral resources, the Government began extensive revision of the existing regulations governing mining, exploitation of other natural resources, and investment in industrial enterprises utilizing raw materials of domestic origin.

During the latter part of 1964 and early 1965, a study directed toward revising the mining laws was undertaken under the auspices of the United Nations Technical Assistance Board. Although it was indicated that numerous changes in the laws pertaining to concessions, rents, royalties, and taxes were recommended, any such revisions that may have been legalized in 1965 were not made public as of yearend.

[4] Martin-Kaye, P. H. A. British Guiana: Developments in Mineral Exploration. Geological Survey of British Guiana, February 1966, 27 pp.

After several years of negotiations, new long-term agreements were made by the Government with the two long-established bauxite companies, and special exploration concessions were granted to several oil companies during 1965. All details of these agreements were not made public, but there were indications that some terms concerning the granting of mining and mineral processing concessions may be subject to negotiation.

Preliminary results of a manpower and labor force survey carried out early in 1965 estimated a total labor force of 174,605 of which 36,444 were unemployed as of March. The bauxite industry employed 5,122 persons or about 3.7 percent of the employed labor force. Bauxite companies paid the highest minimum wages in the country, for example, G$9.20 ($4.37) a day for unskilled labor compared with the minimum of G$4.00 ($2.32) paid by the Government for unskilled workers. Worker income from wages and salaries in the bauxite (including alumina) and manganese mining industries rose from $6.9 million in 1961 to an estimated $10.1 million in 1965, following an almost straight-line curve except for 1963, when a crippling general strike decreased workers' total income to $7.25 million compared with a total of $7.71 million in 1962, or about $1 million less than the income that might have accrued if the strike had not occurred.

PRODUCTION

The mineral industry in general increased output of mineral raw materials as well as its relative importance in the overall economy of the country. Increases in production of bauxite (16.3 percent), manganese ore (42 percent), and quarried stone (estimated as roughly 20 percent) accounted for most of the overall gain by the industry during the year. Gold recovery continued at a low level, slightly less than that of the previous year and appreciably less than pre-1959 high. Diamond output rose only a little less than 3 percent, but the quantity recovered was greater than that for any year since 1929.

Official statistics are not available for the actual production of dried bauxite, calcined bauxite, and alumina. Data shown in table 1 for these items are shipments for export and were obtained from various sources. These data indicate that both production and export of dried and calcined bauxite increased, and that of alumina declined. However, it is probable that output of alumina in reality also increased.

Recent economic surveys published by the Government [5] contained data on overall value of mineral production and relative

[5] British Guiana (Guyana) Development Programme (1966–72). The Government Printery, Georgetown, British Guiana, 1966, pp. XII–30, XVI–2. Statistical Bureau, Ministry of Economic Development, Georgetown, British Guiana. Economic Survey of British Guiana, 1965, pp. 5, 18.

Table 1.—British Guiana: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Bauxite:					
Crude ore [2]	2,411,712	r 2,762,637	2,379,883	2,507,774	2,918,693
Dried [3]	1,255,387	1,488,784	989,805	854,056	1,277,783
Calcined [3]	376,712	361,995	370,395	470,413	493,736
Alumina [3]	122,090	r 218,084	r 225,650	296,255	279,070
Gold, troy ounces	1,702	1,903	2,848	2,111	2,077
Manganese ore and concentrate	196,136	275,454	142,728	118,757	168,861
Nonmetals:					
Diamond, gem and industrial [4] carats	112,680	100,145	99,748	109,682	112,874
Stone, rough or crushed	57,664	35,507	11,892	NA	94,688

r Revised. NA Not available.
[1] In addition to commodities tabulated, Guyana produces clay, sand, gravel, additional quantities of stone, and several types of macadam materials, but data on quantity are not available.
[2] Production on which royalties were collected by the Government. Data apparently not corrected for free moisture content.
[3] Data for actual output not available; therefore, shipments for export are the best available measure of output. Data shown for 1961–62 are official export figures. Data for 1963–65 are company shipments reported by Reynolds Metals Co. and Barclays Bank D.C.O. of Georgetown. For details by source, see text on Aluminum.
[4] Approximately 55 to 60 percent of production is estimated to be of gem quality.

contribution of mining and quarrying to the gross domestic product (GDP). The contribution of the mining and quarrying sector (including the processing of bauxite to dried and calcined forms and to alumina) to the GDP during 1961–65 was reported as follows, in mililons of dollars unless otherwise indicated:

	1961	1962	1963	1964	[1] 1965
GDP at current factor cost:					
Total value	$168.1	$178.2	$160.8	$175.0	$189.6
Mining and quarrying:					
Total value	21.7	29.0	20.4	30.8	36.1
Percent of GDP	12.9	16.3	12.7	17.6	19.1

[1] Provisional.

Mining and quarrying has been the fastest growing sector of the economy since 1960, partly because of the start of manganese mining that year, but mainly because of the increasing output of alumina since 1961 when production of this commodity was initiated. As a result of this growth, this sector's contribution to the GDP has rapidly approached that of the nearly stagnant agricultural sector including livestock, which contributed 21.4 percent of the GDP in 1964 compared with 17.6 percent for mining and 21.0 percent in 1965 compared with 19.1 percent for mining. Expansion planned for the next few years may well result in the mining industry becoming the dominant productive sector of the economy.

TRADE

Complete official statistics on foreign trade, have not been published for years subsequent to 1962. No official statistics on 1963 trade have been published but some data on total trade and a few principal commodities were obtained for 1963 through Barclays Bank D.C.O. and the U.S. Consulate General in Georgetown. Partial accounts have been published for 1964 and 1965 trade by the Statistical Bureau of the Ministry of Economic Affairs.

From available trade data, some of which have been revised from previously reported figures, the total value of exports of domestic goods increased from $93.0 million in 1964 to $95.5 million in 1965, a gain over the 1962 total of $93.4 million but still considerably below the record high of $100.2 million recorded for 1963. Reexports, never very significant, varied little during the 4-year period. The value of exports during 1965 was lower than anticipated, owing to low prices paid for Guyana's sugar and rice; however, increased mineral exports more than compensated for these shortfalls. In fact, exports of the bauxite industry (dried and calcined bauxite, alumina), which first exceeded the value of sugar exports in 1964, surpassed the combined value of sugar and rice exports in 1965. In 1965, exports of the major mineral commodities (bauxite, alumina, manganese, and diamond) accounted for 47.3 percent of the total value of exports compared with 40.9 percent in 1964.

Comparative values of trade in selected metals and minerals for 1962–65 were as follows:

	Value (thousand dollars)			
	1962	1963	1964	1965
Exports: [1]				
Metals [2]	35,105	32,733	35,343	41,949
Nonmetals [3]	2,150	2,051	2,614	3,235
Total	37,255	34,784	37,957	45,184
Imports:				
Metals: [4]				
Iron and steel	1,824	NA	2,303	3,105
Nonferrous	290	NA	398	NA
Total metals	2,114	1,614	2,701	NA
Nonmetals [5]	4,294	NA	5,186	4,813
Mineral fuels	7,586	6,983	8,402	9,300
Total	13,994	NA	16,289	NA

NA Not available.
[1] Excludes reexports.
[2] Dried and calcined bauxite, alumina, and manganese ores and concentrates.
[3] Diamonds, uncut and cut but unset.
[4] Excludes gold, all scrap and all metallic ores.
[5] Includes asbestos building materials, cement, agricultural lime and limestone, manufactured fertilizers, and sodium hydroxide.

Table 2.—British Guiana: Exports of principal metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Bauxite:				
Dried	[2] 989,805	[2] 854,056	1,283,769	NA.
Calcined	[2] 370,395	[2] 470,413	502,309	NA.
Total	[2] 1,360,200	[2] 1,324,469	1,786,078	Canada 591,561; United States 479,750.
Alumina	219,962	249,130	279,628	Canada 121,437; Norway 63,568.
Manganese ore and concentrate	194,972	138,309	160,137	Trinidad and Tobago 130,642. [3]
Nonmetals:				
Diamond, uncut and cut but unset—carats	98,503	103,796	102,577	United Kingdom 47,041; Venezuela 26,725; Netherlands 13,939; United States 13,301.
Stone: [4]				
Broken stone, gravel, macadam	1,830	1,977	1,283	All to Surinam.
Other	64	-----	-----	

NA Not available.

[1] In addition to commodities tabulated, Guyana exports relatively small quantities of ferrous and nonferrous metal scrap, a few ounces of locally produced gold, minor amounts of clay.

[2] Company shipment data.

[3] In transit. Most of quantity shown was destined for transshipment to the United States.

[4] Imports from Guyana by Surinam.

Sources: The Statistical Bureau, Ministry of Economic Affairs, British Guiana: Monthly account relating to external trade, December (cumulative) 1964 and 1965; Barclays Bank D.C.O., London: The external trade of British Guiana for 1963 and 1964, Overseas Review, May 1965; Geological Survey Department, British Guiana: Report on the Geological Survey Department for the year 1963.

Table 3.—British Guiana: Imports of selected metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962	1964	1965	Principal sources, 1964
Metals:				
Aluminum and alloys: Semimanufactures	257	412	NA	NA.
Copper and alloys: Semimanufactures	19	37	NA	NA.
Iron and steel:				
Pig iron, ingots and equivalent primary forms	192	233	NA	NA.
Bars, rods, angles, shapes and sections	2,964	6,750	5,135	United Kingdom 2,589; Belgium 1,738; France 1,021.
Universals, plates and sheets:				
Uncoated	2,103	3,767	3,186	United Kingdom 2,138; West Germany 1,135.
Galvanized, corrugated	1,761	1,470	3,091	United Kingdom 949; Belgium 432.
Steel tubes and fittings	2,365	1,371	1,602	United Kingdom 791; Canada 293.
Cast iron pipes and fittings	743	NA	NA	NA.
Other	652	NA	NA	NA.
Lead and alloys: Semimanufactures	20	17	NA	NA.
Platinum group metals, wrought and partly wrought—troy ounces	87	NA	NA	NA.
Silver, wrought and partly wrought—do	2,656	3,260	NA	NA.
Tin and alloys: Unwrought and semimanufactures—long tons	15	19	NA	NA.
Other nonferrous metals, n.e.s.	37	NA	NA	NA.
Nonmetals:				
Asbestos and asbestos-cement building materials	1,358	914	NA	United Kingdom 879; Belgium 22.
Cement	26,085	24,583	30,375	Trinidad and Tobago 18,631; Venezuela 5,583.
Fertilizer materials:				
Nitrogenous:				
Ammonium sulfate	21,035	17,195	21,775	Trinidad and Tobago 12,165; West Germany 3,810.
Other	2,663	NA	NA	NA.
Phosphatic:				
Superphosphates	559	1,249	NA	Mainly from Netherlands.
Other	468	1,428	NA	NA.

See footnotes at end of table.

Table 3.—British Guiana: Imports of selected metals and minerals [1]—Continued
(Metric tons unless otherwise specified)

Commodity	1962	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Fertilizer materials—Continued				
Potassic	3,924	2,037	NA	NA.
Mixed and other nonspecified fertilizers	749	NA	NA	NA.
Lime	2,373	1,670	1,330	Mainly from United Kingdom.
Limestone, ground for agricultural purposes	10,685	13,808	9,801	Barbados 12,620; Trinidad and Tobago 1,031.
Salt	2,924	2,604	NA	NA.
Sodium hydroxide	40,801	51,818	41,074	United States 51,436.
Mineral fuels:				
Asphalt, natural	765	194	NA	NA.
Coal	138	147	NA	NA.
Coke	85	3	NA	NA.
Fuel briquets	86	105	NA	NA.
Petroleum refinery products:				
Gasoline:				
Aviation thousand 42-gallon barrels	37	NA	NA	NA.
Other do	157	176	194	All from Trinidad and Tobago.
Kerosine do	168	162	182	Mainly from Trinidad and Tobago.
Gas oil do	294	330	326	All from Trinidad and Tobago.
Diesel oil do	88	58	60	Trinidad and Tobago 55.
Residual fuel oil do	1,153	1,719	1,666	Trinidad and Tobago 1,585.
Lubricating oil do	19	17	24	United Kingdom 10; United States 6.
Lubricating greases	278	241	355	Trinidad and Tobago 93; United States 75; United Kingdom 73.
Paraffin	26	34	NA	NA.
Petroleum jelly	69	55	NA	NA.
Road oil	535	662	NA	NA.
Asphalt, refinery	1,456	1,573	NA	NA.
Mineral tar, origin not specified	175	140	NA	NA.

NA Not available.
[1] Official statistics on imports by commodities have not been published for 1963. The latest complete statistics published are those for 1962, whereas official data published for 1964 and 1965 do not include detail for numerous classifications. For some commodities, supplementary data from other sources are shown for 1964 and 1965.

Sources: The Customs and Excise Department, British Guiana: Annual account relating to external trade for the year 1962; The Statistical Bureau, Ministry of Economic Affairs, British Guiana: Monthly account relating to external trade, December (cumulative) 1964 and 1965; Overseas Geological Surveys, Mineral Resources Division, London: Statistical Summary of the Mineral Industry, world production, exports, and imports, 1959–64.

Increased economic activity was reflected to a greater extent by a 19.4 percent increase in the total value of imports, which attained a record high of $103.7 million in 1965 compared with the previous high of $86.9 million in 1964. Although imports were greater in every general trade section, the major increases occurred in machinery and transport equipment, manufactured goods in general (especially metals and metal manufactures), and petroleum products. A considerable part of these imports were destined for use in the large expansion projects underway in the bauxite industry and the road-building and other construction projects that were begun or about to be started in the public sector.

With one exception, the relative ranking and volume of trade between Guyana and its principal trading partners, United Kingdom, United States, Canada, and Trinidad and Tobago, remained virtually the same as for 1964; the United Kingdom (24.8 percent) replaced Canada (23.1 percent) as Guyana's principal customer for its domestic goods, with the United States (18.5 percent) and Trinidad and Tobago (9.0 percent) remaining in third and fourth place, respectively. Among these countries, however, Canada was the only one with which Guyana enjoyed a favorable balance of trade, purchasing only 8.1 percent of its imports from Canada compared with 31.0 percent from the United Kingdom, 24.3 percent from the United States, and 10.9 percent from Trinidad and Tobago.

On December 15, 1965, the Governments of Antigua, Barbados, and Guyana signed an agreement establishing the Caribbean Free Trade Area (CARIFTA) with the intent to reduce and eventually eliminate trade barriers between the three countries. The agreement was scheduled to become effective by September 1966.

COMMODITY REVIEW

METALS

Aluminum.—The country's two bauxite-producing companies, Reynolds Metals Co. and Demerara Bauxite Co. Ltd. (DEMBA), both signed long-term agreements with the Government and announced major expansion programs for 1965. These companies invested between $10 million and $15 million in new facilities during 1965, and announced that contemplated investments during 1966 and 1967 may amount to several times those of 1965.

In February, Reynolds signed a 25-year agreement with the Government (effective as of January 1, 1965) which assured increased government revenues through minimum income tax schedules based mainly on anticipated increases in production. The Government in turn pledged that it would not increase the mutually agreed upon income tax rate, and established fixed royalties and export duties. As a result of this agreement, Reynolds undertook a $4.5 million expansion program to include additional equipment for overburden stripping, mining, river transport, a third bauxite drying kiln (which began operating in September), a dry ore storage building and unloading and loading facilities at Everton.

At yearend, Reynolds announced plans to install a calcining kiln and ancillary facilities at Everton and additional mining and crushing equipment at Kwakwani. The kiln will produce 400 tons of refractory and abrasive bauxite daily beginning in late 1966 or early 1967.

Further expansion plans by Reynolds hinge primarily on the dredging of a deep-water channel through the bar at the mouth of the Berbice River, so that large ocean-going vessels may enter the river mouth to take on full loads of bauxite or other cargo. As of 1965, the maximum depth of the channel was about 17 feet and Reynolds had to transport its bauxite products on 6,500-ton barges to Puerto de Hierro, Venezuela, for transfer to larger vessels; the extra cost of this transfer operation has been estimated at $3 to $4 per ton of bauxite (at a 750,000-ton-per-year shipping rate) whereas the cost of dredging an adequate channel has been estimated at about $3.15 million and maintenance at $700,000 in addition per year.

Although Reynolds 1965 total output was above that of the previous 2 years it fell far short of the record 1962 output. Company shipments, reported as follows, reflect increased crude ore output and success of efforts to capture a larger share of the chemical-grade bauxite market:

Year	Shipments [1] (thousand metric tons)		
	Crude ore from Kwakwani to Everton	Processed ore from Everton	
		Metal-grade	Chemical-grade
1963	272	270	31
1964	315	228	85
1965	381	247	36

[1] All reported in terms of dry bauxite equivalent, calculated to eliminate all free moisture. In actual practice, metallurgical-grade bauxite normally is dried to contain about 5 percent and chemcial-grade to about 3 percent free moisture.

DEMBA, a wholly-owned subsidiary of Alcan Aluminium, Ltd., still is by far the largest bauxite producer, and the only alumina producer, in Guyana. In 1965, the company shipped 895,384 tons of dried bauxite (apparently all of metal grade), 493,753 tons of calcined bauxite, and 279,070 tons of alumina, compared with 553,000 tons of dried bauxite, 466,000 tons of calcined bauxite, and 292,000 tons of alumina in 1964.

DEMBA also implemented major expansion of its facilities during the year with the investment of about $8 million, and at yearend announced plans to invest more than $21 million in additional plant facilities. This latter decision undoubtedly was influenced by the long-term agreements reached between DEMBA and the Government in October.

During 1965, DEMBA commissioned its new 300,000-ton tailings recovery plant to rework old washing plant rejects for additional bauxite. It also completed a new 50,000-ton synthetic mullite plant, although only small quantities of this high quality refractory material were produced on an experimental basis. By midyear, the company's third bucketwheel excavator—a 150-liter machine—was installed to assist in overburden removal. A new evaporator unit was installed at the alumina plant to improve the removal of impurities in the process liquor. The company also experimented successfully with seismic methods for exploration work, and decided to in-

corporate the technique in its regular program. In October, the Guyana Assembly passed a bill permitting DEMBA to start construction of a 770-foot-long bridge across the Demerara River, between Mackenzie and Wismar, and a 4.5-mile-long railway which will provide better access to bauxite mining areas near Christianburg on the west side of the river; the bridge is scheduled for completion by early 1967.

The large investments earmarked for 1966–67 are intended to maintain and expand the company's production levels. Contemplated major projects included: 1. Acquisition of a large walking dragline ($1.2 million), 2. Acquisition of one 300-liter and one 600-liter bucketwheel excavators ($2.3 and $5.5 million, respectively), 3. Installation of an oil-fired boiler and a 12,500-kilowatt turbine to provide additional electric power ($2.6 million), 4. Installation of a 150-ton-per-day calcining kiln (DEMBA's seventh) and ancilliary facilities to increase total calcining capacity to about 700,000 tons per year ($3.2 million), and 5. Construction of the bridge and railway across the river ($1.75 million).

The high production levels attained by the bauxite industry in 1965 were partly abetted by the relative peaceful labor situation that prevailed during most of the year. Reynolds signed an agreement with the Mine Workers' Union in July, increasing wages for some 250 workers. Nonetheless mine operations at Kwakwani were halted for a short time in September when more than 400 workers staged a wildcat strike. The DEMBA operations at Mackenzie were forced to a brief standstill in mid-March by a wildcat strike of 3,000 workers while the company and the union were negotiating the apportionment of a 19.4-percent package wage and fringe benefit increase. Agreement was reached on April 8. Another wildcat strike forced closure of the DEMBA alumina plant in December and subsequently all bauxite operations were suspended as 4,500 workers joined the strike. A back-to-work agreement was reached on January 15, 1966.

Gold.—Gold returns for 1965 showed a slight decrease in total output compared with that of the previous year, but returns by district for 10 months (October and November not reported) indicate that Northwest District output decreased considerably from the 1964 level of 955 troy ounces (which was about average for recent years) but the district again became the major gold-producing area as gold recovery in the Mazaruni District continued to decline to perhaps less than half the abnormally high output of 1,111 ounces recorded for 1963. These decreases were offset by increases to more normal levels in the Cuyuni and Potaro Districts and by the highest output in recent years in the Rupununi District, probably resulting from increased diamond recovery operations during 1965.

Gold output recorded during 1965 was won by individuals or small groups of prospectors working alluvial deposits, mostly by hand washing or a combination of suction dredging and manual recovery of gold and diamond values. Increased mechanization might raise alluvial gold output.

The Geological Survey carried out geochemical and drilling programs in several well known lode gold districts, using panned gold values as one of the controlling factors limiting the areas investigated. The most promising of the areas investigated included the old Peter's Mine and the Jubilee, Million Mount, and other old gold prospects along the Puruni River about midway between the Mazaruni and Cuyuni Rivers. The Peter's Mine operated from 1905 to 1909 and reopened briefly in 1915 and 1916, producing a total of nearly 41,000 ounces of gold. The mine was worked to a maximum depth of 300 feet with gold values still in evidence, but was abandoned because of unfavorable economic factors, including very difficult accessibility and poor recovery (79 percent from 1-ounce-per-ton ore) due to inadequate equipment.

In 1964, the Geological Survey outlined the gold-rich near-surface area at the Peter's Mine by numerous drillholes, and early in 1965, seven diamond-drill holes, totaling 5,316 feet, were drilled. Three of the four holes drilled to intersect the lodes below the lowest mined level yielded cores containing visible gold. Two holes drilled several hundred feet to the north across the strike encountered mineralized lodes but no visible gold. The last hole was drilled to test a nearby magnetic anomaly which proved to be a belt of relatively unmineralized andesite. Although analyses and evaluation of all the data collected had not

been completed by yearend, the Geological Survey was optimistic that the area held possibilities for profitable lode-gold mining.

Manganese Ore.—The production of manganese ore and concentrates by Manganese Mines Management, Ltd., a subsidiary of Union Carbide Corp., at the Matthews Ridge mine in northwest Guyana, increased substantially over annual output of the previous 2 years but was still below that of either 1961 or 1962. During the latter part of 1965, cumulative production from the deposits surpassed the million-ton mark, and cumulative exports of ore by yearend nearly attained that same level. Although the ore reserve reportedly is at least several times that already mined, the product exported has been relatively low-grade, containing only 40 to 42 percent manganese with rather high silica and aluminum content. The low ore grade, coupled with high transport costs, probably will preclude any marked increase in production levels in the near future.

The company began a program of more thorough investigation of its exploration concession to similar, but smaller, manganese deposits at Pipiani on the south side of the Barama River about 25 miles east-southeast of Matthews Ridge.

NONMETALS

Construction Materials.—Increased activity in both the public and the private sectors of the construction industry was an important factor in the economic recovery achieved during 1965. Many new public buildings were built and many others rehabilitated or extended. Construction continued on the new Bank of Guyana, residential construction increased markedly, and private industrial building was about double that of 1964. In addition, some 30 miles of coastal roadway were constructed during the year. Although much of the material required was imported (for example, all the cement, lime, reinforcing rods, structural shapes, sheet, and pipe), output of domestic mineral raw materials such as sand, gravel, stone, as well as various roadbuilding materials apparently was sufficient to satisfy demand. In fact, the Dalli Quarry northeast of Bartica was reactivated to augment the supply of stone necessary for road projects and repair of sea walls. Statistics on output of these construction materials are either incomplete or not available; however, quarrying firms indicated their output was about 20 percent greater than in 1964, and iron and steel and cement imports for 1964 and 1965 were considerably greater than those during the previous 2 years.

The Guyana Development Corp. approved several concessions to establish new industries to produce construction materials, such as clay brick, concrete blocks, and tile. A West German interest was granted a concession to establish a $1.1 million glass plant in the Georgetown area. This plant will utilize white sand of the Berbice Formation which is readily available in the nearby Atkinson area. Guyana has practically inexhaustible resources of this white sand suitable for clear bottle and window glass manufacture. By means of electrostatic separation, a product containing between 0.007 and 0.008 percent Fe_2O_3 can be obtained, and even the strictest grain-size specifications would require rejection of only 30 percent of the crude sand. The projected plant probably will absorb part of the market of about 9 million bottles now imported annually and perhaps produce bottles for export to Guyana's new trading partners, Antigua and Barbados. This or some future plant might also enter into the manufacture of window glass, 826,000 square feet of which was imported by Guyana in 1964, as well as plate glass and other glassware now imported.

The Minister of Trade and Development announced that a British cement firm, The Rugby Portland Cement Co., Ltd., is prepared to install bulk loading, storage, and packing facilities in Guyana upon completion of negotiations for a suitable riverside plant site. Rugby apparently hopes that bulk imports and local bagging will help secure a firmer hold on the major part of the Guyana cement market for its Trinidad subsidiary plant, Trinidad Cement, Ltd., which must compete with suppliers from Venezuela, Jamaica, and possibly Barbados. Guyana does not have readily available raw materials to produce cement locally.

Diamond.—Diamond returns for 1965 registered an increase of slightly more than 8 percent in the number of stones recovered to 112,874 but an increase of only 3 percent in total carats, because the average size of stones found in two of the principal

producing districts was somewhat smaller. Although returns showing data by district for October and November were not available, extrapolation of data indicates that output of all producing districts increased except that of the Potaro District. The marked decrease in its output had been predicted on the basis of the relatively small quantity of diamondiferous alluvial material available along the Potaro River and its tributaries.

The Mazaruni District continued to supply nearly 70 percent of total output and accounted for most of the apparent increase. On the other hand, the Cuyuni District more than doubled its output to the order of about 12,000 carats, and the relatively minor Rupununi District approached an output level of nearly 5,000 carats for the first time since 1958; these two districts thereby roughly compensated for the loss in output of the Potaro District.

Government sources have indicated two basic factors that have influenced the higher level of diamond output which started in 1958. One has been increased accessibility to the remote interior areas via new airstrips and landing pools; construction of 30 new interior landing strips is provided for in the development program for 1966–72. The other has been increased utilization of various types of suction dredges in addition to and in place of the traditional water-dogging (diving) and other essentially manual techniques. Perhaps as many as 200 such dredges were employed in diamond recovery operations during the course of the year. Most of these units were small, and the possible introduction of larger and more efficient equipment, including more refined gravity recovery systems, may lead to increased production of diamond as well as the possible recovery of more gold and other valuable minerals from the alluvial materials processed.

Virtually all of Guyana's diamond output of gem as well as industrial qualities has been exported. Government efforts to promote a cutting industry in the country resulted in the granting of an initial concession to cut and polish diamonds to a West German firm, T. Steiman and Co. Ltd.

MINERAL FUELS AND ENERGY

Petroleum.—Active exploration for commercial deposits of oil and gas in the continental shelf area off the Guyana coastline was renewed as exploration concessions were granted to several firms. Guyana Shell Ltd., a subsidiary of the Royal Dutch/Shell Group, was granted a concession on the shelf area from the Surinam border approximately to the mouth of the Demerara River near Georgetown. Continental Overseas Oil Co. Ltd. obtained a contiguous concession extending northwest roughly to the Waini River; and Globe Petroleum Ltd. received a concession to the smaller area betwen the Continental concession and the Venezuela border. Shell and Globe also reportedly applied for onshore concessions adjacent to their offshore holdings. Guyana Shell Ltd. commenced reconnaissance seismic work in August when two ships under contract to Western Geophysical Co. began surveying the offshore areas. Both Shell and Continental hoped to complete their preliminary seismic surveys by early 1966 and anticipated the start of stratigraphic drilling later in the same year.

Further work in the Takatu basin of the Rupununi District was undertaken during 1965, and the Geological Survey drilled several shallow stratigraphic holes. Geophysical indications of a sequence of several thousand feet of sedimentary rocks in the basin, suggested the possible existence of petroleum and perhaps some evaporite deposits. The Phoenix Canada Oil Co. Ltd. applied for an oil exploration license covering an area of 2,600 square miles of the basin area, but the expected approval still was pending at yearend.

In 1965, the Geological Survey published a history of oil explorations in Guyana prior to 1962.[6] The study, under the auspices of the United Nations, includes a historical and technical review of all material available in 1962 pertaining to the search for oil in the coastal and offshore areas of the country. The published report includes seven maps and charts and recommendations for the type and location of future exploratory work.

Guyana continued efforts to promote a local oil refinery, and to this end a U.S. AID expert advised the Government and the Guyana Development Corp. on this

[6] Simakov, S. N., and V. V. Fedynsky. United Nations Technical Asistance Board. Report on the Prospecting for Oil in British Guiana. Geological Survey of British Guiana, Bull. No. 36, 1965. 48 pp.

matter. In December the Minister of Trade and Development announced that he had discussions with representatives of a large and reputable oil company during a trip to the United Kingdom and the United States, and that the firm made a proposal to complete the erection of a refinery within 2 years should Government approval be granted and a local company formed.

Electric Energy.—The Government has emphasized the urgency for expansion of Guyana's capacity to generate electric energy as a requisite to more rapid industrial development and to a general rise in the standard of living of both urban and rural inhabitants. All electricity generated has been from thermal plants fueled largely by imported fuel oils; however, the country possesses a large, but virtually unappraised, hydroelectric potential. Development of a significant part of this potential as a source of low-cost power conceivably would permit establishment of aluminum smelters, a caustic soda plant (for the alumina industry), and other industries that require relatively large amounts of cheap power.

Government, United Nations, and private experts have made superficial studies of the hydroelectric potential, and two sites for initial feasibility surveys have been suggested: (1) Tiboku Falls on the Mazaruni River, with an estimated potential of 100 to 250 megawatts, and (2) a site at Tiger Hill on the Demerara River, with an estimated potential of 36 to 144 megawatts. A United Nations Special Fund project was approved for a major power survey starting in 1966. This survey will include studies of water power and also the need for development of additional thermal power capacity.

The largest supplier of electricity during 1965 was the Guyana Electricity Corp., a public corporation with plants at Georgetown, Kingston, Ruimveldt, and Anna Regina, which has generated roughly half the electricity consumed in recent years. The municipality of New Amsterdam produces electric power for local use, and the Bookers Sugar Estates owns and operates a small plant at Bartica producing power mainly for residential use. In addition, a number of industrial enterprises, such as the bauxite and manganese companies and sugar and rice mills, generate electricity for their internal use. The following table shows available data on generation and consumption of electricity by sector for the period 1960–65, including that produced at Bartica but excluding the relatively small unreported output of plants at 11 sugar estates and 3 rice mills:

Year	Million kilowatt-hours			
	Total generated	Consumption		
		Residential	Commercial and industrial	Other
1960	88.0	23.2	53.3	2.4
1961	95.8	24.4	57.9	2.9
1962	105.5	27.4	66.1	2.6
1963	101.4	27.9	60.8	3.1
1964	170.6	24.5	130.2	4.5
1965 [1]	194.0	30.0	148.4	4.4

[1] Estimates based on data for first 3 quarters of the year.

The notable increases in production and consumption for the years 1964 and 1965 were largely attributable to corresponding increases in output of calcined bauxite and alumina. A government source estimated that the bauxite industry consumes approximately 40 million kilowatt-hours of electricity per year, roughly one-fifth of total consumption during 1965.

The Mineral Industry of Chile

By Lester R. Brown, Jr.[1]

Chile, one of the more economically developed countries of Latin America, increased its gross national product (GNP) in real terms by 5.8 percent in 1965 over that of the previous year. At current prices, however, the GNP increased 37 percent reaching 20,435 million escudos as compared with 14,882 million escudos in 1964. Although actual value data are not available by sectors of the economy, it has been reported[2] that the mining industry was a significant contributor to the overall economic growth, as the value of its contribution to the GNP during 1965 rose by 24 percent over the 1964 level. Other sectors of the economy recorded individual percentage increases in value contributed to the GNP as follows: Utilities—18, agriculture—7, transportation—4, and industry—3.

Chile continued to be a major supplier of certain mineral commodities in 1965. Although mine and smelter production of copper, Chile's most important product, was lower in 1965 than in 1964, the nation maintained its position as the third largest producer in the free world; Chile also ranked third in the output of molybdenite and remained the world's only producer of nitrates from mineral sources and the largest producer of iodine. Output of iron ores and beneficiated products registered a sizable gain over the previous year. The importance of Chile's major mineral commodities relative to total South American and world production in 1965 is shown in the accompanying table.

In 1965, the value of exports of mineral commodities was about $637 million, or approximately 93 percent of the total Chilean export value of $688 million, while imports of commodities in this group were of minor significance.[3]

Commodity	Chile's share of total (percent)	
	South American production	World production
Copper:		
Mine production	76	12
Smelter production	78	10
Nitrogen compounds:		
Natural nitrates	100	100
All types, including natural nitrates	88	1
Iodine	100	47
Iron ores and beneficiated products	21	2
Molybdenum	85	7

Wildcat strikes during the year in the copper industry were largely responsible for the 8-percent decrease in copper production. A strike was likewise reported in the cement producing industry.

Provisional data released by the Central Bank indicated that the international reserve and payment position at the end of 1965 was the strongest since that of 1959. Factors influencing the 1965 economic advancement included the expansion of trade as a result of the increased world demand for copper, substantial foreign economic assistance, continued political stability, and increased private and public investments in facilities for production of copper, iron ore, and industrial machinery.

The Government was successful in reducing the rate of inflation on the basis of cost of living data. Consumer prices in-

[1] Foreign minerals specialist, Division of International Activities.

[2] U.S. Embassy, Santiago, Chile. State Department Airgram A-103 and enclosure. Aug. 22, 1966. 25 pp.

[3] U.S. Embassy, Santiago, Chile. Department of State Airgram A-1045 (attachment), June 10, 1966, 3 pp.
Banco Central de Chile, Santiago, Chile. Boletin Mensual, No. 460, June 1966, p. 954.

creased only 25.9 percent in 1965 compared with 38 percent in 1964 and 45 percent in 1963. The Chilean escudo depreciated in terms of the U.S. dollar during the year as the average buying rates of the Central Bank, on the Bankers Market Spot Rate and Futures Rate, respectively, increased from Esc2.372 and Esc2.741 per US$1 in 1964 to Esc3.128 and Esc3.130 in 1965. Exchange rates in December 1965 were Esc3.450 and Esc3.544 on the Bankers Market Spot Rate and Futures Rate, respectively.[4]

In January 1965, a measure to establish new norms for the production, manufacture, and sales of copper was introduced in the Chilean Congress. This bill was designed to implement agreements with the large U.S.-owned companies active in Chile and was a vital part of the Administration's program to increase export earnings from copper and gain a greater share of control of the industry for Chile.

Support for the measure was not forthcoming, and it was held up in Congress until the March elections, when the Partido Demócrata Cristiano, (PDC) (Christian Democratic Party), the party of the Administration, obtained a large majority in the Chamber of Deputies and increased representation in the Senate, and the bill was reintroduced to debate. Opposition developed not only from the Left but also from the more Central of the Frente de Acción Popular (FRAP) parties, the Right was only lukewarm in support, and a split on the issue was reported in the PDC itself. At yearend the measure remained unpassed.

Empresa Nacional de Minería, (ENAMI), the State Mining Enterprise, made public a plan to increase production from the smaller and medium-sized properties, by a program of loans, technical assistance, and joint investment with private capital and capital from other agencies such as Corporación de Fomento de la Producción (CORFO) the Government agency for stimulating production. During 1965, loans were made in the amount of $285 million.

The United Nations Special Fund Mineral Survey Project, scheduled to finish its activities in Chile in early 1966, completed the mineral survey of Coquimbo Province in 1965. Five areas of interest relating to copper were studied: Arqueros, Combarbalá, Tilama, Varillar, and Cerro Loica. At Cerro Loica, 70 kilometers southwest of Ovalle, detailed geologic mapping, geochemical, and geophysical studies delineated interesting areas that were later drilled. At yearend, results indicated some sections containing commercial thickness of ore, but the overall extent and importance of the mineralized body was not yet known. The ore appeared to be chalcopyrite finely dispersed in granodiorite.

At other locations in the Province, studies were made with varying degree of success. An airborne magnetic survey from south of Ovalle to the northern limits of Aconcagua Province found some interesting anomalies that were mapped and surveyed on the ground. Indications showed several small iron ore deposits. Sedimentary phosphate beds in the Tongoy Bay area, northwest of Ovalle, were drilled with negative results. Geophysical and geochemical surveys at the Los Mantos de Punitaque mine, south of Ovalle, pointed out favorable areas for new exploitation.

In 1965, Instituto de Investigaciones Geologicas (IIG), (the Government Institute of Geologic Investigations) continued regional geologic mapping and studies of the factors controlling the characteristics and distribution of the country's mineral resources. These studies, concentrated in the north and central regions of the country, placed increased emphasis on economic geology, thus coordinating the work to the immediate development plans of Chile.[5]

PRODUCTION

The production of iron ore and beneficiated products increased 16 percent in 1965 over that of 1964. Both molybdenum and zinc-in-concentrates showed increases, but in lesser amounts. In the nonmetals category, borates, barite, guano, and iodine registered tonnage increases.

The 1965 copper production tonnage equaled only 92 percent of the previous year's total. Most of the decrease was in the Gran Minería sector of the industry, which reported only 91 percent of the pre-

[4] U.S. Embassy, Santiago, Chile. Department of State Airgram A-677, Jan. 22, 1966, 21 pp.

[5] U.S. Embassy, Santiago, Chile. Department of State Airgram A-970 and annex, June 8, 1966, 46 pp.

vious year's tonnage, while the Medium and Small Mines sectors came within 98 percent of their 1964 totals. Gold production in ores, concentrates, and placer output, manganese in ore, and silver in ores and concentrates also decreased in 1965. Cement production, nitrates, and contained sulfur also were below 1964 levels. Crude petroleum production also declined.

Production results for 1965 were obtained from various preliminary sources and will be subject to certain revisions on publication of the 1965 "Anuario" of the State Mine Service of Chile.

Table 1.—Chile: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p 1
Metals:					
Copper content of—					
Ore, concentrate, and precipitates, not further processed	26,396	35,723	r 46,679	r 46,088	28,084
Matte and slags	62	-----	96	r 181	-----
Blister	299,007	294,589	r 298,424	308,998	265,701
Refined metal	225,408	262,636	258,942	278,076	288,791
Total	550,873	592,948	604,141	r 633,343	582,576
Gold content of—					
Gold ore and concentrate troy ounces	8,904	10,682	21,793	r 9,299	216
Copper ore, concentrate, metal troy ounces	45,779	53,367	53,420	r 54,497	r 57,068
Lead ore do	101	63	26	15	-----
Silver ore do	-----	-----	5	-----	-----
Placer gold do	198	71	113	27	45
Refined metal (other than in above) troy ounces	1,517	826	1,937	1,155	-----
Total do	r 56,499	65,009	r 77,294	r 64,993	r 57,329
Iron and steel:					
Iron ore thousand tons	r 6,989	8,092	8,507	9,853	11,409
Average iron content percent	63.03	63.69	64.43	64.40	63.91
Smelter and mill products:					
Pig iron thousand tons	285	383	418	437	308
Ferroalloys do	NA	16	17	NA	NA
Steel ingots do	r 391	r 528	r 521	r 584	467
Semifinished products do	302	413	442	474	NA
Flat rolled products do	267	346	366	379	NA
Pipe and structural shapes thousand tons	10	9	10	9	NA
Lead—content of—					
Ore and concentrate, not further processed	2,043	1,454	868	1,116	r 809
Smelter products	480	254	220	-----	-----
Total	2,523	1,708	1,088	1,116	r 809
Manganese ore	31,762	43,162	46,479	r 19,861	16,588
Average manganese content percent	45.62	45.50	44.26	r 46.25	46.77
Mercury 76-pound flasks	1,509	791	613	r 267	428
Molybdenum concentrate:					
Gross weight	3,245	4,278	5,234	r 6,853	6,958
Content:					
Molybdenum sulfide (MoS_2)	3,054	3,977	4,842	r 6,350	6,449
Molybdenum (Mo)	1,831	2,384	2,903	r 3,807	e 3,866
Silver content of ore and concentrate of—					
Silver thousand troy ounces	-----	-----	4	-----	NA
Copper (including blister) do	2,129	2,261	2,710	r 3,041	NA
Lead and zinc do	23	10	39	r 52	NA
Gold do	5	5	15	r 4	NA
Total do	2,157	2,276	2,768	r 3,097	r 2,995
Zinc	162	496	505	r 1,005	1,111
Nonmetals:					
Barite	1,407	1,049	1,020	r 1,091	2,851
Borates: Ulexite, 33 percent boron oxide (B_2O_3)	160	3,814	5,964	r 3,314	9,203

See footnotes at end of table.

Table 1.—Chile: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p [1]
Nonmetals—Continued					
Cement, hydraulic:					
Portland—thousand tons	883	1,022	1,166	r 1,266	1,195
Pozzolan—do	57	109	129	141	142
Total—do	940	1,131	1,295	r 1,407	1,337
Clays:					
Kaolin	14,151	30,464	36,899	r 45,963	30,100
Other	NA	NA	25,675	17,083	NA
Diatomite	NA	NA	NA	NA	129
Feldspar	2,317	1,156	424	r 827	415
Gypsum:					
Crude	79,903	115,212	r 116,328	r 119,160	107,158
Calcined	34,811	33,554	47,893	r 44,063	67,142
Iodine	1,843	2,348	2,156	2,161	2,280
Lapis lazuli—kilograms	3,200	9,100	3,100	r 16,500	19,665
Limestone—thousand tons	1,493	1,840	1,846	r 1,923	1,767
Nitrates:					
Sodium—do	849	1,013	993	1,070	1,050
Potassium—do	83	107	143	104	109
Total—do	932	1,120	1,136	1,174	1,159
Phosphates:					
Apatite	13,924	12,492	13,909	13,138	13,686
Guano:					
Red	13,210	12,132	18,248	11,464	17,958
White	6,514	3,914	3,947	3,587	3,848
Total	19,724	16,046	22,195	15,051	21,806
Total phosphates	33,648	28,538	36,104	28,189	35,492
Quartz	91,490	58,713	80,380	r 119,111	93,644
Salt, common	46,112	51,013	48,242	r 93,959	99,985
Sodium sulfate	4,629	12,986	32,421	r 30,685	56,338
Sulfur:					
Refined and in caliche	44,700	r 61,173	r 43,437	43,878	34,978
Content of sulfuric acid	NA	r 14,739	r 13,873	15,675	10,635
Total	NA	r 75,912	r 57,310	59,553	r 45,613
Talc	1,865	1,901	2,582	r 2,760	1,489
Other	[2] 32,188	[2] 35,727	[3] 16,035	[4] r 42,099	NA
Mineral fuels:					
Coal, bituminous and lignite:					
Mine run—thousand tons	1,764	1,855	1,719	1,789	1,727
Marketable—do	1,622	1,723	r 1,604	1,677	1,629
Coke:					
Oven and beehive—do	e 203	e 236	249	246	213
Gashouse—do	e 86	e 86	99	83	e 81
Natural gas (gross) [5] million cubic feet	r 89,538	r 125,048	r 181,111	r 220,663	218,321
Natural gas liquids thousand 42-gallon barrels	247	519	1,017	1,221	1,950
Petroleum:					
Crude—do	9,263	11,689	13,209	13,687	12,704
Refinery products:					
Aviation gasoline—do	319	441	369	r 415	320
Motor gasoline—do	4,676	5,899	5,679	6,068	6,386
Kerosine—do	1,183	1,604	1,837	1,910	1,865
Diesel oil—do	1,928	2,407	2,541	3,063	3,037
Residual fuel oil—do	2,008	2,492	2,643	r 4,072	3,766
Liquid petroleum gas do	370	407	428	r 511	539
Solvents [6]—do	30	44	39	129	-----
Other [7]—do	47	45	61	26	180
Total—do	10,561	13,339	13,597	[8] r 16,194	[8] 16,093

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Although data are considered preliminary, figures in some cases supersede those given in commodity chapters of Volume I, 1965.

[2] Includes clay (other), iron oxide pigment, and silica sand.

[3] Includes iron oxide pigments and silica sand.

[4] Includes iron oxide pigments, marble, silica sand, and mica.

[5] Calculated at 35.13 cubic feet per cubic meter.

[6] White gasoline and naphtha.

[7] Includes mineral turpentine, asphalt, and miscellaneous petroleum products.

[8] Includes estimate on Manantiales topping plant production.

TRADE

The value of mineral commodity exports in 1964, the latest year for which complete comparative figures are available, amounted to approximately $556 million. This represented approximately 89 percent of the total export value of $626 million. Imports of mineral commodities in 1964 amounted to $60 million, or about 10 percent of the total import value of $609 million.

The value of the copper exports in 1964, approximately $419 million, amounted to 67 percent of the total Chilean export figure.

In 1965, copper retained its dominant position in Chilean exports, although tonnages were lower than in 1964. Exports of copper in refined forms by the Gran Minería sector of the industry, as indicated by the Monthly Bulletin of the Chilean Central Bank, amounted to approximately 416,000 tons valued at $323 million in 1965, compared with 534,000 tons valued at $371 million in 1964. However, exports of blister copper by the Medium and Small Mines sector increased from approximately 30,400 tons in 1964 to 76,800 tons in 1965, valued at $15.2 million and $84.9 million, respectively.[6]

The export of molybdenum concentrate was lower in 1965 than in 1964 because for the first time a Chilean processing firm, Compañía Carburo y Metalurgia S.A., took a significant part of the country's molybdenum output. In terms of contained molybdenum, 3,072 tons was exported in 1965, compared with 3,984 tons in 1964.

Chilean exports of manganese rose sharply in 1965, 12,168 tons was exported, compared with 3,522 tons in 1964. The increase was credited to improved foreign exchange returns.

Iron ore exports were increased in 1965 over the previous year. Iron ores and beneficiated products exported in 1965 amounted to 10,724,533 tons, compared with 9,113,557 tons in 1964, Japan again was the largest recipient.

Nitrate exports in 1965 amounted to 922,229 tons, compared with 908,427 tons for 1964. There were no significant changes in the market pattern except that mainland China moved into the sixth position in rank of customers.

Iodine export was somewhat smaller in 1965 than in 1964, apparently the result of further Japanese entry into world markets.

Largely owing to import controls, total Chilean imports for 1965 amounted to approximately $604 million, down from $609 million for 1964.

[6] Banco Central de Chile, Santiago, Chile. Buletin Mensual, No. 460, June 1966, p. 954.

Table 2.—Chile: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Copper:			
Ore and concentrate	34,522	25,350	Japan 17,969; Belgium 3,231.
Cement	9,479	8,818	Japan 3,445; Spain 3,445.
Precipitates	8,499	6,906	West Germany 4,731; Japan 1,575.
Oxide	---	115	All to Japan.
Slag, dross, skimmings	3,028	1,556	All to Sweden.
Ingot and other primary forms:			
Blister	293,395	325,321	United States 223,191; West Germany 43,285.
Fire refined	79,516	71,205	United Kingdom 30,833; Italy 8,917; West Germany 8,168.
Electrolytic	168,804	138,402	Netherlands 28,827; United Kingdom 21,126; Sweden 18,220.
Semimanufactures:			
Unalloyed:			
Bars and rods	70	110	West Germany 50; Colombia 35; Uruguay 20.
Plates and sheets	121	22,234	United States 9,584; Netherlands 3,884; West Germany 3,696.
Wire	1,948	25,545	Japan 6,675; Netherlands 6,228; United States 6,153.
Pipes and tubes	245	513	United States 282; Venezuela 113.
Alloyed	326	154	United States 130; Peru 16.

Table 2.—Chile: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals—Continued			
Gold, gold-copper, gold-silver, gold-silver-copper, and gold-silver-lead ore and concentrate	66,140	25,719	Belgium 5,770; Poland 4,939; West Germany 4,450.
Iron and steel:			
Iron ore—thousand tons	7,092	9,114	Japan 5,392; United States 2,750.
Ferroalloys	11,081	5,637	Mainly to United States.
Semimanufactures	30,088	19,564	Argentina 13,112; Peru 2,955; Uruguay 2,511.
Lead ore and concentrate	r 2,864	1,627	West Germany 1,005; Belgium 561.
Manganese ore and concentrate	4,725	3,522	Mainly to West Germany.
Mercury—76-pound flasks	388	35	All to Argentina.
Molybdenum concentrate	5,939	7,680	West Germany 3,528; United Kingdom 1,416.
Silver-copper and silver-lead ore and concentrate	38,426	48,024	West Germany 30,727; Sweden 13,853.
Zinc:			
Concentrate	99	3,712	All to Belgium.
Slag	---	79	All to West Germany.
Nonmetals:			
Cement	8	257	All to Peru.
Iodine	1,758	1,992	United States 833; United Kingdom 466.
Lapis lazuli—kilograms	3,775	5,275	Hong Kong 1,786; Italy 1,483; West Germany 1,160.
Marble	---	33	All to Japan.
Nitrates:			
Potassium	91,724	83,542	United States 47,800; Netherlands 20,622.
Sodium	805,265	824,885	United States 306,561; Spain 137,767; Netherlands 106,185.
Salt, common:			
Crude	1,200	1,000	All to Japan.
Refined	500	2,317	All to Peru.
Sodium borates	160	---	
Sodium sulfate	r 1,082	1,066	Mainly to Brazil.
Sulfur	525	250	All to Peru.
Mineral fuels:			
Coal	1,033	101	All to Bolivia.
Coal briquets	5	---	
Coal tar or pitch	11	---	
Coal tar products (oils and greases)	1,097	635	All to Argentina.
Natural gas liquids: Propane	37,745	61,567	Argentina 45,221; Brazil 15,139
Petroleum refinery products:			
Diesel oil	68	---	
Lubricating oil	7	8	Italy 6; Denmark 2.

r Revised.

Source: Dirección de Estadística y Censos (Santiago, Chile). Comercio Exterior, Años 1963 y 1964.

COMMODITY REVIEW

METALS

Copper.—Chilean copper production in 1965 was 8 percent below the previous year's output. Contributing to the reduced production were legal and illegal work stoppages affecting the large, medium, and small mining groups, severe weather, and damages resulting from an earthquake in March. Increased production of electrolytic copper in the large mines group reflected the increased output of the Andes Copper Mining Co. Potrerilles refinery, while the increase in blister copper production by the medium and small mines group resulted from production by the new Chilean Government processing plant at Las Ventanas.

Table 3.—Chile: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Ingots	3,092	2,542	United States 1,840; Canada 461.
Filings	39	127	United States 119; Canada 8.
Semimanufactures	258	177	United States 68; Canada 38.
Antimony, all forms	53	33	United Kingdom 16; mainland China 14.
Arsenic, metallic	2	8	Belgium 6; United Kingdom 2.
Bismuth, all forms	5	---	
Cadmium, all forms	1	2	All from Mexico.
Chromium, all forms	39	37	France 26; Norway 9.
Copper and its alloys, semimanufactures	13	30	United States 22; United Kingdom 5.
Gold, semiwrought and wrought troy ounces	r 8,103	3,536	West Germany 3,215; Italy 167.
Iron and steel:			
Pig iron	7	51	All from United States.
Ferroalloys	r 266	376	Norway 289; West Germany 61.
Bars	r 4,818	2,498	United States 855; West Germany 556; Belgium 412.
Structural shapes and sections	2,916	2,301	United States 779; West Germany 505; Belgium 500.
Plates and sheets	r 10,049	4,196	United States 1,952; West Germany 865.
Straps and hoops	329	205	West Germany 100; United Kingdom 40.
Special alloy iron and steel	1,264	1,184	West Germany 635; Austria 137.
Lead:			
Ingot:			
Unalloyed	1,561	1,802	Peru 794; United States 410.
Alloyed	20	242	United States 180; Peru 62.
Semimanufactures	124	58	Mainly from United Kingdom.
Mercury 76-pound flasks	14	16	United Kingdom 10; West Germany 5.
Molybdenum, all forms	1	3	All from United Kingdom.
Nickel:			
Ingots	41	12	Mainly from Canada.
Electrolytic, in pieces	64	25	Canada 10; France 10.
Semimanufactures	22	46	Mainly from United States.
Platinum, all forms troy ounces	211	937	Mainly from West Germany.
Silver, all forms do	53,320	---	
Tin: Ingots long tons	612	795	Mainly from United Kingdom.
Zinc:			
Ingots	5,322	7,881	United States 3,664; Mexico 2,888.
Semimanufactures	305	231	United States 105; West Germany 72.
Other ores and concentrates, n.e.s.	51	73	Australia 40; Austria 20.
Other metals, n.e.s.	14	12	Sweden 7; West Germany 4.
Nonmetals:			
Abrasives:			
Emery and carborundum	172	74	West Germany 51; United States 12.
Other	95	91	United States 60; West Germany 27.
Asbestos	9,392	7,341	Canada 4,959; United States 1,198.
Cement	11,365	9,428	United Kingdom 6,874; West Germany 1,526.
Chalk	6	30	Mainly from United States.
Clays:			
Refractory	1,432	483	United States 398; West Germany 78.
Kaolin	295	245	United States 177; Argentina 61.
Other, n.e.s.	1,509	2,735	United States 1,337; United Kingdom 905.
Diatomite	812	500	United States 201; Mexico 167.
Dolomite	11,749	36,888	Mainly from United States.
Feldspar	21	347	All from Curaçao.
Fertilizers:			
Guano	2,022	2,024	All from Peru.
Potassic	15,255	15,261	United States 6,047; West Germany 4,673.
Phosphates	r 113,761	75,752	United States 31,436; Belgium 28,153.
Superphosphates	76,390	69,884	Mainly from United States.
Fuller's earth	429	673	Argentina 398; United States 275.
Graphite	147	172	United States 65; West Germany 48.
Gypsum	4	2	West Germany 1; United States 1.
Lime	11	35	Austria 30; United Kingdom 3.
Magnesite:			
Raw	53	45	United Kingdom 29; United States 12.
Calcined	3,461	10,446	United States 9,443; Austria 831.
Mica	23	10	India 5; West Germany 2.
Mineral wool	(1)	25	All from United States.
Potassium hydroxide	323	221	United States 73; Belgium 67.
Quartz	12	5	United States.
Salt	r 26	18	Mainly from United States.
Sand	397	61	United Kingdom 21; United States 15.

See footnotes at end of table.

Table 3.—Chile: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—Continued			
Sodium carbonate	14,993	8,730	West Germany 4,227; United Kingdom 1,767.
Sodium hydroxide	11,508	11,572	United Kingdom 6,807; West Germany 1,888.
Stone, dimension:			
Marble	(1)	34	West Germany 21; Brazil 13.
Other	144	155	Belgium 137; United States 18.
Talc	279	144	Argentina 65; Italy 58.
Other nonmetals, n.e.s.	3,771	466	United States 363; Australia 43.
Mineral fuels:			
Coal:			
Anthracite	3	10	All from United States.
Bituminous	103,395	437,211	Do.
Coke, metallurgical	347	105	Do.
Petroleum:			
Crude	954,375	804,057	Venezuela 321,380; Curaçao 197,892.
Refinery products:			
Gasoline:			
Aviation	607	731	All from Peru.
Motor	12,813	14,184	Mainly from Curaçao.
Kerosine	73,028	48,529	Curaçao 35,723; Netherlands 11,030.
Diesel oil	142,573	281,594	Peru 156,500; Curaçao 54,979.
Fuel oil	12,120	116,746	Curaçao 59,337; United States 49,467.
Lubricants, including greases	r 33,798	38,925	United States 26,558; Curaçao 7,599.
Asphalt	1,428	440	United Kingdom 360; United States 41.
Paraffin	13,582	7,913	United States 5,665; Indonesia 1,107.
Other	370	261	Mainly from United States.

r Revised.
[1] Less than ½ unit.

Source: Direccion de Estadistica y Censos (Santiago, Chile). Comercio Exterior, Anos 1963 y 1964.

Details on Chilean copper production by mining groups and products are shown in table 4.

Table 4.—Distribution of Chilean copper production by producing group and type

(Metric tons)

Producing group and product	1964 [1]	1965 p [2]
Large mines (Gran Minería):		
Blister	271,338	210,816
Fire refined	78,933	77,430
Electrolytic	177,835	190,971
Total	528,106	479,217
Medium and small mines:		
Blister	37,660	54,885
Fire refined	21,309	20,390
Ores, concentrates, precipitates, and other crude forms	46,268	[3] 28,084
Total	105,237	103,359
Grand total	633,343	582,576

p Preliminary.
[1] Anuario de la Minería de Chile, 1964.
[2] Corporación del Cobre, 1965.
[3] Exports.

The Chuquicamata mine, operated by the Chile Exploration Co., a subsidiary of The Anaconda Company of the United States, reported a copper production of 252,720 tons in 1965, compared with 288,044 tons in 1964. The mine handled a total of 24,028,213 tons of ore materials and 20,280,552 tons of waste, giving an ore to waste ratio of 1.18:1.00.

As this property is located in Chile's northern desert region, it was significant that a fifth 300-foot-diameter tailings thickener to conserve more water for concentrator operation was completed at yearend. This additional water will enable the plant to operate at its rated capacity of 55,000 tons per day. A project has been undertaken to test the feasibility of re-treating leach-ore residue, which might then become an important source of low-cost copper.

The El Salvador mine of the Andes Copper Mining Co., another subsidiary of The Anaconda Company, reported a total copper production of 74,139 tons in 1965, compared with 76,454 tons in 1964. The com-

pany processed 6,945,572 tons of ore with an average grade of 1.465 percent copper. The initial development work was completed on the underground ore-handling system to reduce haulage and increase plant feed.

Despite the 37-day work stoppage, the mine-mill production of the Braden Copper Co., a subsidiary of the Kennecott Copper Corp. of the United States, reached the highest annual rate in the company's history. Smelter production of fine copper was adversely affected by the strike and by a slightly lower grade of mill concentrates. Salient figures for comparison of 1964 and 1965 follow:

	1964	1965
Operating days	344	325
Ore processed ---dry metric tons--	10,510,484	10,933,595
Ore milled ---metric tons--	10,442,949	10,896,557
Copper in heads ---percent--	1.882	1.796
Copper in concentrates ---do---	32.33	32.27
Blister produced ---metric tons--	84,623	75,372
Refined copper produced ---do---	78,994	77,496

The enlargement and concreting of shaft B advanced approximately 350 feet, and was scheduled to enter into operation in mid-1967. Elevator cages will then be able to transport 250 passengers or a fully loaded 25-ton-capacity railroad car.

Empresa Nacional de Minería (ENAMI) owns and operates the Paipote smelter near Copiapo in Atacama Province and the Las Ventanas smelter and refinery on Quintero Bay, just north of Valparaiso. ENAMI also has flotation plants at Aguirre Cerda, Cabildo, Osvaldo Martinez, Illapel, and Cerro Negro and leaching installations at Taltal, Elisa de Bordos, and El Saldo. Through yearend, feed was drawn from medium and small mines of Tarapacá and Antofagasta Provinces in the north to Aisén and Magallanes in the south. Copper concentrates purchased in 1965 amounted to 363,289 tons compared with 232,000 tons in 1964, and tonnages purchased for copper leaching increased to 50,405 tons in 1965 from 19,212 tons in 1964.[7]

Cía. Minera Disputada de las Condes, S.A., a subsidiary of Société Minière et Metallurgique de Penarroya, a French corporation, continued to operate its Disputada and El Soldado mines. The Disputada, northeast of Santiago, reported 1965 production of 1,107,000 tons of ore averaging 1.43 percent copper, while El Soldado recorded a 1965 output of 573,000 tons of ore averaging 2.14 percent copper. The company processed 52,770 tons of resultant concentrate at its Chagres smelter producing 15,712 tons of blister copper. The remaining 23,430 tons of concentrate was exported.

Empresa Minera de Mantos Blancos, S.A. (Mauricio Hochschild y Cía. S.A.I.C.) followed the same pattern as that found in the Gran Minería sector, achieving record production rates, but total output was lower due to strikes. Comparative tonnages for 1964 and 1965 follow:

Product	Quantity (metric tons)	
	1964	1965
Total refined copper products	r 21,309	20,389
Cement copper	3,150	3,127
Refinery slags	181	140
Total	24,640	23,656

Anticipating that from 1968 onward, the grade of the ore will have been reduced to 1.6 percent copper, the company was studying plans to increase monthly plant capacity to 175,000 tons to maintain production at 1965 levels.

The Santiago Mining Company, a subsidiary of The Anaconda Company of the United States, produced 283,926 tons of ore from its La Africana mine near Santiago, and processed this to obtain 27,850 tons of concentrate with a grade of 25.38 percent copper which was shipped to the Government smelter at Las Ventanas.

Production from the mines and plants of Cía. Minera y Comercial Sali Hochschild was approximately 600 tons of copper per month in cement copper and concentrate. Previous to 1965, the company had spent

[7] Bank of London & South America, Limited. Fortnightly Review. V. 31, Apr. 30, 1966, p. 237.

Table 5.—Chile: Iron ore exports and local shipments by companies and destinations in 1965

(Metric tons)

Company	Japan	United States	Chile	Low countries
Cía. Minera Santa Fe S.A.	894,562	1,123,752	-----	374,610
Cía. Minera del Pacífico [1]	378,699	-----	-----	-----
Cía. Minera San Andrés [2]	824,972	8,837	-----	-----
Subtotal	2,098,233	1,132,589	-----	374,610
Cía. de Acero del Pacífico	1,933,925	1,082,513	-----	49,388
Bethlehem-Chile Iron Mines Co.	1,498,368	473,172	684,788	-----
Cía. Minera de Atacama Ltda.	664,156	-----	-----	-----
Cía. Minera Santa Bárbara	655,811	93,008	-----	-----
Cía. Minera de Exportacion	9,013	-----	-----	-----
Total	6,859,506	2,781,282	684,788	423,998
Percent of total	60.1	24.4	6.0	3.7

Company	Germany	Argentina	Total	Percent of total
Cía. Minera Santa Fe S.A.	294,403	317,899	3,005,226	26.3
Cía. Minera del Pacífico [1]	-----	-----	378,699	3.3
Cía. Minera San Andrés [2]	-----	-----	833,809	7.3
Subtotal	294,403	317,899	4,217,734	36.9
Cía. de Acero del Pacífico	-----	-----	3,065,826	26.9
Bethlehem-Chile Iron Mines Co.	-----	-----	2,656,328	23.3
Cía. Minera de Atacama Ltda.	-----	-----	664,156	5.8
Cía. Minera Santa Bárbara	47,445	-----	796,264	7.0
Cía. Minera de Exportacion	-----	-----	9,013	.1
Total	341,848	317,899	11,409,321	100.0
Percent of total	3.0	2.8	100.0	-----

[1] Santa Fe subsidiary.
[2] Owned 60 percent by Santa Fe and 40 percent by Santa Barbara.
Sources: Bethlehem Chile Iron Mines Co: H. O. costing sheets. Other companies: Chilean customs.

approximately $4.5 million in developing a new copper property in the coastal range in the Michilla area of Antofagasta Province with reserves reportedly approaching 2.0 million tons of 2.5 to 3.0 percent copper. The mill for the property will be constructed at Michilla Bay. The mine to mill road has been completed, and the mill is expected to be finished in 1968.

Iron Ore.—The Chilean iron ore industry in 1965 recorded the best year-to-year gain in tonnage produced since 1960 in spite of strikes, severe weather, and damage from the March earthquake. Exports of iron ore and beneficiated products also increased during the year to 10,724,533 tons, approximately two-thirds of which was shipped to Japan.

Compañía de Acero del Pacífico S.A., (CAP), the largest producer of iron and steel in Chile and the owner and operator of the Algarrobo iron mine near Huasco in northern Chile, reported the following results of mining activities for 1964 and 1965:

Ore type	Quantity (metric tons)	
	1964	1965
Lump	1,392,471	1,322,977
Blast furnace	1,352,937	2,035,683
Premium fines	85,081	143,170
Total	2,830,489	3,501,830

Through 1965, the following ore processing scheme was used: The ore is sent to a primary crusher and then screened. The coarse ore is classified as open-hearth feed, and the fines are rescreened at a smaller size. Products of this screening are magnetically concentrated; the oversize concentrate is used for blast furnace feed while the finer concentrate is sold for agglomeration. Nonmagnetic rejects are stored for future treatment.

Compañía Minera Santa Fe S.A. recorded a 6.6-percent increase in production of iron ore in 1965, reaching 3,846,184 tons. Producing properties were the Carmen, El Dorado, Cerro Negro Norte, and Desvio Norte mines, all in the Chañaral, Copiapó, and Coquimbo areas.

The ore-processing plants are of a simple construction, generally portable and readily dismantled and reinstalled with a minimum of concrete work. The process generally consists of classification as a preconcentrating step followed by magnetic beneficiation where necessary. Equipment purchased during the year to increase production and transportation capacities included two Reich drills, seven Harnischfeger, P&H 955A shovels, 35-ton pit-trucks, and 32-ton haul trucks.

Santa Fe also owned El Laco, an iron ore deposit 400 kilometers east of Antofagasta in the high Andes mountains that reportedly contains reserves of 300 million tons.

Bethlehem-Chile Iron Mines Co., a subsidiary of the Bethlehem Steel Corp. of the United States, owned and operated the Romeral and the El Tofo mines in Coquimbo Province near La Serena. The Romeral mine produced 2,587,274 tons of beneficiated ore averaging 63.98 percent iron. Romeral ore shipments totaled 2,494,418 tons. Waste and stripping material removed during the year totaled 5,896,782 tons. The El Tofo mine produced 122,330 tons of beneficiated furnace ore averaging 65.24 percent iron and an additional 153,566 tons of lump ore averaging 67.31 percent iron. A wet magnetic beneficiation plant was put in operation at El Tofo during 1965. The company shipped 684,788 tons of its production to the Huachipato steel complex of the Cía. Acero del Pacífico S.A., and exported the remainder.

The Chilean State Mining Service published the following list of iron ore reserves with the qualifications that they assayed 60 percent iron or higher and were of magmatic origin. The reported tonnages were felt to be conservative estimates but should not be considered to be proven ores: [8]

Company	Deposit	Mineral resources (thousand metric tons)	
		Reserves	Mineral potential
Cía. de Acero del Pacífico, S.A.	Algarrobo	70,000	-----
Bethlehem-Chile Iron Mines Co.	El Romeral	16,000	-----
Cía. Minera Santa Fe, S.A.	Various	40,000	520,000
Do.	El Laco	-----	-----
Cía. Minera Santa Bárbara	Various	9,000	-----
Cía. Minera de Atacama Ltda.	Las Adrianitas	10,000	-----
Soc. Minera Cerro Imán	Cerro Imán	4,000	-----
Soc. Minera San Javier	Various	1,000	-----
Soc. Minera Cerro Colorado	Los Colorados	2,000	-----
Cía. Minera de Exportación	Various	500	-----
Cía. Minera Confar	----do	1,500	-----
Various	----do	5,000	5,000
Total		159,000	525,000

Production of the Huachipato plant of Compañía de Acero del Pacifico S.A. (CAP), Chile's major steelmaker, was as follows for the past 3 fiscal years: [9]

Product	Quantity (metric tons)		
	1962–63	1963–64	1964–65
Hot metal	404,922	429,643	406,138
Steel ingots	496,462	502,406	541,095
Semifinished products	414,246	434,659	462,751
Finished products (rolled)	351,803	382,075	363,249
Pipe	7,740	10,245	12,018

The company indicated that, owing to the growth in the domestic consumption of iron and steel products plus the potential export market, acceleration of the expansion programs of the Huachipato plant was warranted. These programs to increase steel production capacity with the consequent lowering of costs will have favorable effects on the rather tight financial results currently derived from Huachipato operations. A plan was devised to raise steel ingot production, starting about 1969 and reaching 1 million tons per year in 1971. This would include increased production of hot metal and crude and semifinished steel with ensuing increases in rolling and finishing mill capacities. In 1965 company profits from the Algarrobo mine considera-

[8] U.S. Embassy, Santiago, Chile. Department of State Airgram A–3, July 1, 1966, p. 1.
[9] Compañía de Acero del Pacífico S.A. (Santiago, Chile). Memoria Anual, 1964/1965.

bly exceeded those obtained from the Huachipato plant complex.

Lead and Zinc.—Empresa Minera Aisén, a subsidiary of Corporación de Fomento de la Produccion (CORFO), remained Chile's sole important lead producer and only known zinc producer in 1965. The Puerto Cristal mines in the Department of Aisén shipped 1,127 dry tons of lead concentrate averaging 56.48 percent lead and 2,174 tons of 51 percent zinc concentrate for processing. This represented a considerable decrease in lead production from the previous year, but an increase in zinc production.

Manganese.—Compañía Manganesos Atacama, S.A. in the Province of Coquimbo, was Chile's sole producer of manganese in 1965, recording an output of 16,588 tons averaging 46.77 percent manganese. Exports for the year totaled 12,168 tons, of which 8,886 tons went to the United States and the remainder to West Germany. Cía Carburo y Metalurgia, S.A. (CARBOMET) reported that it manufactured 4,285 tons of ferromanganese and 3,713 tons of silicomanganese during 1965. CARBOMET exported 2,853 tons of ferromanganese to Colombia, the United States, and Peru and 1,640 tons of silicomanganese to the United States in 1965.

Mercury.—Los Mantos de Punitaqui mine, south of Ovalle in the Province of Coquimbo, remained Chile's only mercury producer in 1965. The company was assisted in the location of additional deposits of mercury by technicians from CORFO, and the United Nations Mineral Survey Team operating in Chile during the year.

Molybdenum.—The 1965 production of molybdenum sulfide, based on preliminary data, exceeded the 1964 figure by a slight amount.

The first Chilean molybdenum mine, the Rosario property, northeast of Rengo in O'Higgins Province, started operations in October and sent a trial shipment of concentrates to Germany.

A Chilean processing firm took a significant part of the country's molybdenum output for the first time; domestic deliveries of contained molybdenum totaled 616 tons. The Compañía y Carburo Metalurgia, S.A., started production of molybdenum oxide and ferromolybdenum, and outputs totaled 1,253 and 100 tons, respectively. Chilean molybdenum shipments to overseas destinations for 1964 and 1965 follow:

Destination	Contained molybdenum (metric tons)	
	1964	1965
West Germany	1,788	1,144
United Kingdom	814	898
Netherlands	528	460
Sweden	532	325
France	185	160
Japan	137	85
Total	3,984	3,072

Table 6.—Chile: Molybdenum concentrate production by producing companies and mines

(Metric tons)

Producer	Mine	1964			1965 p		
		Concentrate, gross weight	Content		Concentrate, gross weight	Content	
			Molybdenum disulfide	Molybdenum		Molybdenum disulfide	Molybdenum
The Anaconda Company:							
Chile Exploration Co.	Chuquicamata	3,151	2,861	1,715	2,894	2,614	1,567
Andes Copper Mining Co.	El Salvador	1,748	1,661	996	1,592	1,521	912
Kennecott Copper Corp.:							
Braden Copper Co.	El Teniente	1,954	1,828	1,096	2,472	2,314	e 1,387
Total		6,853	6,350	3,807	6,958	6,449	e 3,866

e Estimate. p Preliminary.

Sources: 1964—Ministerio de Minería, Santiago, Chile. Anuario de la Minería de Chile, 1964. 1965—U.S. Embassy, Santiago, Chile. State Department Airgram A-970 and annex, June 8, 1966, 46 pp.

NONMETALS

Cement.—Chilean cement production in 1965 was 5.6 percent below the 1964 figure. Much of this reduction was credited to work stoppages during the year, but a part was also charged to reduced demand.

Empresas Industriales El Melón S.A. reported a 1965 production of 474,161 tons of cement, charging a loss of some 130,000 tons of output to a strike in November and December. The company continued with its expansion program which included the installation of a primary crusher, a battery of silos for cement storage, and a packaging plant for railroad shipments.

Cemento Cerro Blanco de Polpaico, S.A., reported 483,291 tons of cement produced in 1965, a small decrease from the previous year's output. Production from its mining properties totaled 791,045 tons of limestone, 15,509 tons of kaolin, 7,434 tons of iron oxide, and 141,606 tons of pozzolan.

Cemento Bio-Bio, in Concepción, produced 148,235 tons of cement in 1965, a considerable drop from the previous year's 167,200 tons.

Fertilizer Materials.—*Nitrogenous.*—Production of Chilean nitrate, which had been projected to increase in 1965, actually decreased slightly from that of 1964, because of work stoppages in April and May.

The Anglo-Lautaro Nitrate Company accounted for approximately 88 percent of the total Chilean nitrate output in 1965. The company continued to invest approximately $2 million annually in modernization. In process of completion were the new granulation facilities at the Maria Elena plant, which will have a capacity of 1,000 metric tons daily. Production of boric acid from the new installation at the Coya Sur plant was about 2,400 tons annually.

The Empresa Salitrera Victoria, operating under the Governmental mining enterprise ENAMI, produced an additional 8 percent of the year's total, while the remainder was accounted for principally by Oficina Alemania of the Cía. Salitrera Iquique and Oficina Flor de Chile of the Cía. Salitrera Pedro Perfetti.

Chilean exports of nitrate by destination in 1965 follow:

Destination:	*1965 nitrate export (metric tons)*
United States	398,956
Spain	119,185
Netherlands	67,036
Brazil	57,727
France	47,314
Mainland China	37,366
Others	194,645
Total	922,229

Phosphatic.—The Compañía Salitrera de Tarapacá y Antofagasta, Chile's sole producer of apatite rock, continued in liquidation and limited its 1965 activities to operating its mine and phosphate plant in Coquimbo. Production reached 13,686 tons of "phosphato pelicano" containing 20 percent soluble phosphorus pentoxide (P_2O_5). The process required 11,430 tons of apatite with a grade of 26 percent P_2O_5.[10]

The Sociedad Chilena de Fertilizantes, Ltda., a Government-operated company established by the Empresa de Comercio Agricola and CORFO, continued to be Chile's sole guano producer, operating two mixing plants at Iquique and Mejillones. Both are modern and fully mechanized. Red or fossil guano production in 1965 amounted to 17,958 tons, while the white or recent type came to 3,848 tons.[11]

Iodine.—Chilean iodine production in 1965 amounted to 2,280 tons, of which 2,122 tons came from Cía. Minera Anglo-Lautaro. The ENAMI operation, Empresa Salitrera Victoria, produced an additional 126 tons, while the remainder came from Oficina Alemania and Oficina Flor de Chile operations.

Exports in 1965 totaled 1,751 metric tons, valued at approximately $2.78 million, and were distributed as follows: United States, 681 tons; United Kingdom, 481 tons; France, 225 tons; the Netherlands, 170 tons; West Germany 115 tons; and others, 79 tons.

Lapis Lazuli.—Cía. Minera Carén, Chile's sole producer of lapis lazuli, was able to operate its mine only 5 months during 1965, owing to severe weather conditions. It was reportedly becoming more difficult to recruit labor for this remote and uncomfortable site in the high Andes east of Ovalle. During the year, 19,665 kilograms of material were mined, and since markets

[10] Work cited in footnote 5.
[11] Work cited in footnote 5.

were found for only about half of this amount it was considered doubtful if mining activities would be resumed in 1966.[12]

Limestone.—Chilean limestone production declined slightly from that of 1964. Cemento Cerro Blanco de Polpaico, S.A., reported a production of 791,045 tons during 1965, and Empresas Industriales El Melón, S.A., reported 611,663 tons, for use in their respective cement manufacturing plants. Most of the remainder came from the Guarello Island properties of Cía. de Acero del Pacífico S.A. for the company's iron and steel complex at Huachipato.[13]

Salt.—Chilean salt production reportedly increased 6 percent over the previous year's total. Cía. Sal-Chile, a new company that has acquired the properties of Salinas Punta de Lobos, was planning to expand production from its deposits in the Salar Grande area south of Iquique, in the Province of Tarapacá. Chilean salt needs are estimated at 80,000 tons per year. About half were supplied by Sal-Chile, while the remainder came from Leandro Antonijevic Ltda. and Fistonic, Kinast y Cía., operating in the same area.[14]

Sodium Sulfate.—Chilean sodium sulfate production for 1965 increased 84 percent over the 1964 figure. Most of the production came from the properties of Sociedad Minera Canchones Ltda. near Iquique, with the bulk of the remainder supplied by Sr. Hector Rojas A., who reported a 1965 production of 1,300 tons of 87 percent sodium sulfate and 3,300 tons of 84 percent.[15]

Sulfur.—Chilean sulfur production declined about 23 percent from that of 1964. The country's largest producer, Sociedad Azufrera Aucanquilcha S.A., reduced production from 33,350 tons in 1964 to 28,034 tons in 1965. It was reported that Mauricio Hochschild y Cía. S.A.I.C. and associated companies had purchased additional shares in the Aucanquilcha Corporation during the year. This was to assure an adequate amount of sulfuric acid for the copper treating facilities of Cía. Minera Mantos Blancos.[16]

In addition to Chile's mined sulfur, the Chile Exploration Co. and the Braden Copper Co. each recovered approximately half of an estimated 10,635 tons of sulfur (sulfur content of acid) from smelter gases and pyrite roasting.

MINERAL FUELS

Coal and Coke.—Gross Chilean coal production was slightly lower than that of 1964. Carbonifera Lota-Schwager S.A., in producing 1,293,661 tons, retained its traditional share of total Chilean output. Production for 1965 by mines follows:[17]

Mine	1965 production (metric tons)		Coal type
	Run-of-mine	Marketable	
Lota-Schwager	1,293,661	1,210,873	Bituminous
Colico Sur [1]	132,250	127,305	Do.
Pilpilco [1]	74,405	70,215	Do.
Victoria de Lebu [1]	93,190	92,553	Do.
Plegarias	25,071	22,603	Do.
Nueva Aurora	20,536	20,494	Do.
Pupunahue	11,072	10,493	Lignitic
Catamutun	19,589	19,589	Do.
Pecket Harbor	31,554	30,095	Do.
Others	25,676	24,335	Do.
Total	1,727,004	1,628,555	XX

XX Not applicable.
[1] Operated by CORFO.

An estimate of coal consumption by major consumer groups for 1965 follows:

Consumer group	*Consumption thousand metric tons*
Industry and mining	416
Railroads	322
Coke plants	313
Public utility powerplants	165
Domestic consumption and other	162
Cement plants	160
Gasworks	141
Total	1,679

The Lota-Schwager operation continued to show losses in spite of an intensive modernization program. High mining costs were attributed to the depth of the coal seams, their distance from the mine shafts, and the costs of wages, salaries, and benefits. The company indicated that personnel has been reduced approximately 40 percent in the past 10 years, from 15,600 persons in 1955 to 9,300 in 1965.

[12] Work cited in footnote 5.
[13] Work cited in footnote 5.
[14] Work cited in footnote 5.
[15] Work cited in footnote 5.
[16] Work cited in footnote 5.
[17] Work cited in footnote 5.

Chilean metallurgical coke production, reported at approximately 212,600 tons for 1965, was the result of blending imported U.S. medium-volatile bituminous and locally produced high-volatile bituminous coals. The blend ratio remained about the same as in previous years, with 125,000 tons imported for mixing with 188,000 tons of Chilean coal. Gashouse coke production was estimated at 81,000 tons in 1965, a slight reduction from that of 1964.

Natural Gas.—Chilean natural gas production declined about 1 percent from 1964 output. Of total 1965 production, 72 percent, or 157,582 million cubic feet, was reinjected for repressuring or storage. The remainder was flared or was used for heating or power generation at the Empresa Nacional del Petróleo (ENAP) facilities for operation of a small generating plant at Punta Arenas.

Petroleum.—Chilean petroleum production in 1965 decreased 7.2 percent from that of 1964 after registering a 3.6-percent gain in 1964 over that of 1963. Some of this reduction was charged to an 8-day strike in April at ENAP facilities, and part was credited to a lack of new wells being brought into production. The nation's 1965 output probably ranked Chile sixth among South American producers, following Venezuela, Argentina, Colombia, Brazil, and Peru. The Daniel oilfield (on the Chilean mainland) remained the largest producer in 1965, though its percentage of total production decreased from 37 to about 35 percent. Approximately 49 percent of total production came from mainland fields in 1965, compared with 52 percent in 1964.

According to ENAP's annual report, exploratory wells drilled in 1965 were generally unproductive though some gas accumulations were found. In the Magallanes Zone, 4 seismic crews operated during the year, and some 40 exploration and extension wells were recommended for the Terciaria and Springhill districts. Magallanes Zone drilling during 1965 was reported as follows:

Type of well	Number of completions			
	Petroleum	Gas	Dry	Total
Exploration	—	—	4	4
Extension	3	3	12	18
Development	12	4	5	21
Total	15	7	21	43

In the Central-South Zone, two seismic crews which had been operating during 1965 finished work in November. Four exploratory wells had been put down with generally negative results. A program for future exploration calls for drilling in the Provinces of Llanquihue, Cautín, Ñuble, and Arauco.

Part of Chile's output of crude oil and gas was processed by the topping plant in the Manantiales area and the gas plant at the Cullen field on the Island of Tierra del Fuego. The major Chilean refinery at Concón, was only lightly affected by the March earthquake and processed 16,857,200 barrels of crude oil during 1965. Feed to the plant was 70 percent Chilean crude oil and 30 percent imported. The combined output of these plants enabled the country to be self-sufficient in motor and aviation gasolines, kerosine, and liquid petroleum gas. About 85 percent of the demand for diesel and 50 percent of that for fuel oil were also met by the domestic refineries.

Construction work on the new refinery at Concepción, which will have a daily throughput capacity of 35,850 barrels, progressed on schedule, and at yearend the marine terminal at San Vicente, associated with the refinery, was equipped.

Prior to 1965, the Concón-Maipu pipeline[18] had been completed to San Fernando, and studies had been approved for the construction of a pipeline from Concepción to San Fernando, where it would join with the Concón-Maipu line. Thus, the refinery at Concón and the new plant under construction in Concepción would be connected and able to supply the demands of the Central Valley of Chile. At yearend, these studies had been completed, and construction was projected to start in early 1966.

During 1965, development of plans continued for the projected Chilean petrochemical industry, which will be under the direction of CORFO and ENAP.[19]

[18] Property of Sociedad Nacional de Oleoductas, of which ENAP is an associate.

[19] Empresa Nacional del Petróleo, Corporación de Fomento de la Producción (Santiago). Annual Report, 1965.

The Mineral Industry of Colombia

By Frank E. Noe [1]

The 16-percent rise in Colombia's output of crude petroleum in 1965 resulted in a growth rate of 13.0 percent in the crude mineral-producing sector, the highest ever registered, and increased that sector's share in the gross domestic product to 3.8 percent (at constant 1958 prices). According to preliminary figures, production of metals and nonmetals generally declined in volume, but the value of mineral production, excluding petroleum, increased 23.6 percent to Col$1,042 million.[2] The value of crude oil, natural gas, and petroleum refinery production was not available, but crude oil production has regularly accounted for an estimated 80 percent of all crude mineral output.

Although Colombia remained the leading producer of gem emeralds and the fifth ranked producer of platinum in the world, Colombia's mineral production was important only to the country's rapidly expanding industrial sector.

Through most of 1965, continued uncertainty regarding the interpretation of 1961 modifications of the Petroleum Code caused a decline in most oil company exploration activities. Production and exports of crude oil increased during the year, but new development and growth of the Colombian petroleum industry was generally sluggish, because the controversy between the Government and the private companies continued regarding the interpretation of Law 10 and its regulatory Decree 1348 of 1961 and regarding the applicability of Decree 2140 of 1955, which provided special depletion allowances and other incentives. The issue arose in 1963 when the Government unilaterally interpreted the tax provisions of the law and the validity of contracts established under previous legislation. This problem developed into a public debate which extended to the question of fairness and adequacy of the Government's share in the income and profits of the private operators. The question quickly assumed a political character, a factor which kept it alive and without resolution through 1965. In September, new Ministers of Finance and of Mines and Petroleum took office as the result of a cabinet change. The new Ministers placed a high priority on the resolution of the oil question, and as a result, Decrees 2526 of September 24 and 2760 of October 21 were issued. These instruments interpreted the applicability of Decree 2140 allowances and incentives incorporated in existing contracts and provided for uniformity in the use of the petroleum exchange rate for all transactions including payment of taxes. The legislation also called for the use of one crude oil price (either posted price or the realized price) for calculation of both depletion allowance and income tax. The two decrees in general were favorably accepted by the private companies. With the correction and clarification of the private companies' legal tax position, Government-industry relations appeared to be on a firmer basis than they had been for a long time.

The National Mineral Inventory, financed in part by a $2 million loan by the Agency for International Development, continued at an accelerated pace in all zones covered by the survey. The Government signed a contract in August with Geophoto Services, Inc., and Geophysical Service, Inc., for photointerpretation of three areas totaling 36,900 square kilometers, based on material supplied by Colombia. The National Mineral Inventory will

---

[1] Acting Chief Latin America specialist, Division of International Activities.

[2] Throughout this chapter values are given in currencies as reported because of differing conversion rates. Free rate of exchange in 1965 averaged Col$16.99 (pesos) per US$1; in 1964 it was Col$10.54 per US$1.

cover four zones containing approximately 70,000 square kilometers which will be systematically studied and mapped geologically. Mineral deposits will be investigated and evaluated as to possible economic development. The four zones consist of (1) Sierra Nevada de Santa Marta (15,500 square kilometers); (2) the central and eastern part of the Departamento de Antioquia, the northern and eastern part of the Departamento de Caldas, and a small portion of the northern part of the Departamento del Tolima (38,385 square kilometers); (3) Departamentos Santander and Norte de Santander (16,625 square kilometers); and (4) Departamento de Cundinamarca (5,330 square kilometers).

In Zone 1, geologic mapping of 7,525 square kilometers was completed. Mineral prospects which warranted further study included limestone, phosphates, talc, kaolin, iron ore, granites, and marble.

In Zone 2, 3,500 square kilometers were mapped, and various mineral deposits investigated. Superficial surveys were made of andalusite (chiastolite), kaolin, mercury, and talc occurrences. Detailed studies were made in areas containing deposits of wollastonite, talc, iron-nickel laterites, and asbestos, and of an altered andesite area containing copper-lead-zinc-silver mineralization.

Activities in Zone 3 were hampered by lack of personnel, and it was not until the middle of November that the program in this area got under way.

In Zone 4, the work was oriented towards the detailed mapping and study of the geologic condition of the salt deposits of the Sabana of Bogotá for the determination of their origin, age, location within the different geologic structures, extension, and the location of new salt deposits to increase reserves which have been very dangerously decreased. At the same time, a study was made of the possibilities of using industrially the residues from the salt-concentrating plants at Zipaquirá and at Nemocón. The search for phosphates was intensified. Superficial studies in the area of Alto del Trigo indicated that the occurrence, concentration, location, and potentiality of the deposit justified more advanced studies, and six holes were drilled at the Quebrada Santibañez. Drill cores were being studied and prepared for chemical analyses. In drill hole 3, the core presented a positive phosphate reaction in greater or lesser degree over almost its entirety, but between 270 and 280 feet a rich phosphatic section was encountered which contained visible grains of collophanite. In hole 6, a 35-foot-thick section beginning at 110 feet also contained visible grains of collophanite. Other phosphate-bearing areas were investigated in the region of Utica-Guaduero, in the area Zipaquirá-Pacho, and in the region of Pandi.

In August the West German Government sent two geologists to inspect coal deposits and certain mineral areas, which were not included in the zones under study by the Mineral Inventory program. After visiting a large part of the country, a program of collaboration was informally proposed which would consist of a Colombian-West German commission made up of six Colombian geologists and four West German advisers, all working under the direction of the Mineral Inventory. At yearend a formal proposal had not been received from the West German Government.

In November three members of Technical Cooperation of France visited the Director of the Mineral Inventory with the suggestion that the Government of France collaborate with the Government of Colombia in a geologic-mining study of an area not covered by other Colombian projects. A 3-year program for the geologic mapping of a 16,000-square-kilometer area in the Department of Boyacá was suggested along with the economic evaluation of such prospects as appeared to have possibilities. The approximate cost of the program was to be Col$10 million of which France would supply 75 percent and Colombia the remainder. The technical team would be made up of six Colombian geologists and two French advisers. The proposal was submitted to the French Government for study, and at yearend the Colombian Government was awaiting a reply.

At yearend the Technical Advisory Committee of the Mineral Inventory was negotiating also with the Government of Canada for technical assistance in connection with the study of the most promising areas of the central Cordillera.

Statistical data for this chapter were derived from official publications of the Ministerio de Minas y Petróleos, Banco de la República, the Departamento Administrativo Nacional de Estadística (DANE),

the Centro de Información de la Industria Petrolera, and the Statistical Office of the United Nations. Further information was obtained from U.S. Embassy, Bogotá, dispatches and from articles and notes appearing in such trade magazines as Petroleum Press Service, World Petroleum Report, World Oil, Petróleo Interamericano, World Mining, and the annual reports of Pato Consolidated Gold Dredging Ltd., International Mining Corp., and Acerías Paz del Rio.

PRODUCTION

Except for a slight increase in the output of mercury and steel ingots, production of all metals and metallic minerals declined during 1965. Production by Acerías Paz del Rio, S.A., and Empresa Siderúrgica, S.A., continued on about the same level as in 1964 while both companies were actively engaged in expansion programs.

The production of nonmetallic mineral commodities and products continued to dominate the nonfuel mineral field; cement production reached a new high and was by far the most valuable industrial mineral commodity. Sulfur production increased approximately 50 percent, also a new high. Salt output declined slightly in volume but increased 27 percent in value reflecting an increase in the local sales price.

Table 1.—Colombia: Reported value of mineral production [1]

(Thousand pesos [1])

Commodity [2]	1964	1965
Metals:		
Gold	127,646	149,458
Iron ore	39,050	38,836
Lead concentrate	967	876
Mercury	5	634
Platinum	r 14,337	7,736
Silver	932	1,430
Zinc ore	440	248
Total	r 183,377	199,218
Nonmetals:		
Barite	1,122	968
Cement	308,044	445,794
Clays:		
Kaolin	4,841	4,980
Industrial	3,584	24,324
Diatomite	231	200
Dolomite	221	796
Emeralds	r 9,218	7,353
Feldspar	1,393	1,296
Gypsum	11,825	12,320
Lime	9,980	10,800
Limestone	21,364	23,340
Magnesite	44	38
Marble	650	1,700
Quartz, quartzite, sand	2,700	3,000
Salt	49,716	63,171
Sulfur	6,370	9,663
Talc	110	60
Other	2,283	1,577
Total	r 433,696	611,380
Mineral fuels:		
Coal	167,000	170,500
Coke	58,800	60,900
Total	225,800	231,400
Grand total	r 842,873	1,041,998

r Revised.
[1] Free rate of exchange in 1964 averaged Col$10.54 per US$1; in 1965 it was Col$16.99 per US$1.
[2] Excludes values of petroleum, petroleum products, natural gas, and chromite which were not available.

Table 2.—Colombia: Production of metals and minerals

(Metric tons unless otherwise specified)

	1961	1962	1963	1964	1965 p
Metals:					
Antimony concentrate	---	---	30	---	---
Chromite	185	140	110	400	260
Gold—thousand troy ounces	401	397	325	365	319
Iron and steel:					
Iron ore—thousand tons	676	680	695	710	706
Pig iron—do	r 169	r 145	r 203	r 202	r 199
Steel ingots and castings—do	192	157	222	220	r 230
Lead concentrate	1,290	670	500	806	730
Mercury—76-pound flasks	191	---	3	3	46
Platinum, crude—troy ounces	20,160	14,100	22,983	r 20,647	11,141
Silver—do	127,942	131,599	106,279	130,353	113,451
Zinc:					
Ore and concentrate	2,200	431	600	710	400
Slab	1,250	194	---	---	---
Nonmetals:					
Barite	10,226	8,000	10,500	10,200	8,800
Cement:					
Portland—thousand tons	1,572	1,725	1,810	1,940	2,848
White—do	20	21	25	32	35
Total—do	1,592	1,746	1,835	1,972	2,883
Clays:					
Kaolin—do	50	70	75	81	83
For cement—do	320	350	360	360	420
For construction—do	NA	NA	NA	NA	1,300
Other industrial use—do	90	105	110	112	117
Diatomite	300	150	2,200	231	200
Dolomite	2,000	2,680	5,100	3,217	11,704
Emerald:					
Gem—thousand carats	38	51	51	e 55	42
Moralla—do	89	294	2,004	e 214	403
Feldspar—thousand tons	15	16	13	12	15
Gypsum—do	75	83	102	108	112
Lime—do	82	85	97	100	108
Limestone—do	2,950	3,200	3,400	4,273	3,890
Magnesite	100	100	250	220	190
Marble—cubic meters	200	650	800	650	1,700
Quartz, quartzite, industrial sand—thousand tons	118	125	130	135	150
Salt:					
Terrestrial—do	267	266	r 263	289	280
Marine—do	70	39	34	51	46
Total—do	337	305	297	340	326
Sulfur	10,100	10,207	13,000	12,134	18,405
Talc	550	650	650	730	400
Mineral fuels:					
Coal:					
Anthracite	NA	NA	NA	[1] 2,000	NA
Bituminous—thousand tons	2,800	3,000	3,200	3,000	3,100
Coke—do	325	360	400	420	[2] 470
Natural gas—million cubic feet	78,775	78,424	82,979	r 84,687	91,662
Natural gas liquids—thousand 42-gallon barrels	1,266	1,334	1,392	1,658	2,189
Petroleum:					
Crude—do	53,247	r 51,908	60,343	62,596	r 72,670
Refinery products:					
Aviation gasoline—thousand 42-gallon barrels	537	601	566	540	786
Motor gasoline—do	10,885	10,779	10,858	11,312	12,377
Jet fuel—do	121	174	153	195	244
Kerosine—do	1,596	1,856	1,809	1,793	1,940
Distillate fuel oil—do	3,767	4,069	4,075	r 4,123	4,437
Residual fuel oil—do	8,892	10,478	9,193	8,742	10,884
Lubricants, including greases—do	118	136	140	372	448
Liquefied petroleum gas—do	279	322	356	r 485	837
Other—do	2,057	2,050	2,318	r 4,375	2,889
Total—do	28,252	30,465	29,468	r 31,937	34,842

p Preliminary. r Revised. e Estimate. NA Not available.

[1] Exports.

[2] Includes 35,000 tons of coke breeze.

TRADE

Although complete, detailed official trade returns have not been published by the Colombian Government for years subsequent to 1963, it is evident from available sources that petroleum, petroleum products, and cement remained Colombia's principal mineral exports in 1965. The value of Colombia's 1965 petroleum exports, as reported by the Petroleum Industry Information Center, was US$96.8 million, of which US$88.2 million was from the sale of crude oil and US$8.6 million from refined products. Petroleum accounted for about 17.9 percent of Colombia's total export value of US$539.1 million. In addition cement exports were valued at US$2.2 million and platinum at US$890,000.

Colombia continued to import a large percentage of its iron and steel requirements mainly in the form of steel mill products. In recent years, Colombia's steel imports have fluctuated around 175,000 tons per year. The chief import items in terms of tonnage have been sheets, pipes, and tinplate although there has been a wide variety of finished steel imports, many of which were imported in comparatively minor volumes.

The United States continued to be Colombia's principal trading partner in 1965 with regard to total trade, supplying approximately 47.8 percent of Colombia's imports by value and receiving about 48 percent of Colombia's exports on the same basis. The Colombian exports to the United States in 1965 were chiefly crude oil and petroleum products. The United States ranked first among recipients of these commodities, accounting for 37 percent. Trinidad ranked second as a destination for all petroleum commodities, taking 29 percent, and the United Kingdom, which did not import Colombian crude oil in 1964, took about 18 percent of the total crude oil exports.

Trinidad was the leading market for total Colombian mineral exports in 1964, receiving 35.7 percent by value compared with 35.2 percent purchased by the United States. Trinidad received only crude oil; the United States purchased a variety of mineral commodities, of which crude oil and petroleum products accounted for approximately 90 percent by value.

Japan ranked second to the United States in supplying Colombia's mineral imports, accounting for 14.2 percent by value of 1964 imports, principally in iron and steel products. The U.S. share of the minerals imported was 36.7 percent, principally in iron and steel, chemical fertilizers, and petroleum products. The following tabulation shows the role of mineral commodities in overall foreign trade of Colombia:

	Value (thousand dollars)		Mineral commodities share of total commodity trade (percent)
	Mineral commodities	Total commodity trade	
Exports:			
1963	85,416	446,657	19.1
1964	89,006	548,136	16.2
Imports:			
1963	79,813	506,022	15.8
1964	94,751	586,291	16.2
Trade balance:			
1963	+5,603	−59,365	XX
1964	−5,745	−38,155	XX

XX Not applicable.

Source: Statistical Office of the United Nations.

COMMODITY REVIEW

METALS

Gold.—Gold production decreased 12.6 percent in 1965, marking the lowest country production in more than 40 years. However, the value of production reportedly increased Col$22 million above that for 1964. The International Mining Corp. through subsidiaries and affiliated companies continued to be the principal gold producer. Production from the wholly owned mining companies of the corporation was 109,686 ounces, of which 80,750 ounces came from the underground operations of the Compañía Frontino Gold Mines Ltd., and 28,936 ounces came from dredging operations. The decreased production reportedly was due to the lower grade of gravels worked, as well as to lengthy moves by the dredges to new areas. In addition to output noted above, Pato

Table 3.—Colombia: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Iron and steel:			
Semimanufactures	9	278	Panama 129; Ecuador 127.
Scrap	33	---	
Platinum—troy ounces	22,983	20,647	All to United States.
Nonferrous metals, including scrap	21	615	Mainly to United States.
Metallic waste and slags	20	NA	
Ores and minerals, not further specified	20	219	All to United States.
Nonmetals:			
Cement	122,347	185,733	United States 131,486; Costa Rica 38,320.
Clay and clay products:			
Kaolin	12	NA	
Common brick	r 164	120	NA.
Refractory products	183	70	NA.
Diamond, industrial—carats	25,000	NA	
Fertilizer materials, manufactured: Ammonia	---	9,859	All to Costa Rica.
Mica, sheet and film, simply cut	12	NA	
Mineral fuels:			
Coal, all types	238	2,401	Mainly to Belgium-Luxembourg.
Coke	449	893	All to Venezuela.
Coal tar and mineral pitch	24,723	53,514	Argentina 28,760; United Kingdom 24,754.
Petroleum:			
Crude—thousand 42-gallon barrels	31,171	30,712	Trinidad 12,244; United States 10,153; Netherlands 5,389.
Refinery products:			
Motor gasoline—do	16	95	Dominican Republic 51; Peru 44.
Kerosine—do	17	---	
Distillate fuel oil—do	123	37	Mainly to Panama.
Residual fuel oil—do	2,257	4,520	United States 2,017; Netherlands 1,178; Peru 849.
Lubricants including greases—do	31	---	
Asphalt	1,442	1,403	All to Ecuador.
Other	r 12,686	11,427	Mainly to United Kingdom.

r Revised. NA Not available.

Sources: 1963—DANE, Anuario de Comercio Exterior 1963; 1964—Statistical Office of the United Nations and DANE Boletín Mensual de Estadística, Abril 1966, 168 pp.

Consolidated Gold Dredging Ltd., an affiliate of International Mining Corp. and the largest gold dredging operation in Colombia, operated a fleet of seven dredges which dug approximately 30.5 million cubic yards, a company record, and produced a gold-silver product described as equivalent to 115,367 ounces of gold. The company's presently developed reserves all require digging depths in excess of 80 feet and are sufficient for approximately 15 years for the five large dredges.

The bonus of Col$15 per ounce of gold that had been instituted by the Government in August of 1964 was abolished in mid-1965. However, the Banco de la República continued to purchase gold on the basis of US$35 per ounce, payable 25 percent in U.S. dollars and 75 percent in pesos at the average free exchange rate of the previous week. The bonus was effective for the first half of the year, but as a result of the cancellation of the bonus, gold sales averaged approximately US$35.83 an ounce compared with US$36.28 in 1964.

Iron and Steel.—During 1965, consumption growth continued to outpace expansion of local steelmaking capacity although Acerías Paz del Rio and Empresa Siderúrgica, S.A., were actively engaged in plant expansions. Consumption of finished steel for the year was estimated to be 400,000 tons with an annual growth rate projected at 6.5 percent. Colombia produces roughly half of the country's consumption requirements, while the other half is imported at an annual cost of about US$40 million. Sheets, tubes, and tinplate are the chief import items.

Acerías Paz del Rio, S.A., continued to be the dominant steel producer in Colombia, with an output of 193,000 tons of finished products, 12,000 tons above the 1964 level. The total production was composed of 18,100 tons of flat products,

Table 4.—Colombia: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Bauxite	7,200	4,484	Surinam 3,330; British Guiana 1,100.
Alumina	101	NA	
Metal and alloys:			
Ingots, castings, and scrap	r 6,812	6,262	United States 3,554; Canada 2,705.
Semimanufactures	r 940	1,201	United States 324; United Kingdom 249, Finland 208.
Antimony and alloys, unwrought	67	NA	
Copper:			
Copper sulfate	51	NA	
Ingots and other primary forms:			
Unalloyed	312	528	Mexico 218; Chile 142; Spain 60.
Alloyed	130	114	All from Mexico.
Semimanufactures	4,569	5,987	Finland 1,697; United Kingdom 833; United States 805.
Iron and steel:			
Pig iron and scrap	5,332	9,566	United States 9,410; Venezuela 156.
Ferroalloys	3,693	3,502	Republic of South Africa 1,298; West Germany 719; Canada 584.
Ingots, blooms, and billets	1,152	45,386	Belgium-Luxembourg 27,297; Venezuela 18,064.
Semimanufactures	169,314	222,374	Japan 90,680; United States 40,886; West Germany 20,044.
Lead:			
Ore	254	97	All from Peru.
Ingots and plates	1,397	1,406	Mexico 541; Denmark 282; United States 244.
Semimanufactures	44	32	Mainly from United States.
Litharge	444	663	Mexico 412; United States 240.
Magnesium and alloys, unwrought	1	23	Canada 8; United States 4.
Manganese oxide	21	516	United States 273; United Kingdom 100.
Mercury, 76-pound flasks	172	203	Italy 116; United States 58.
Nickel:			
Ingots and anodes	49	38	United States 30; West Germany 5.
Castings and forgings	238	---	
Semimanufactures	109	133	United States 57; West Germany 47; Mexico 18.
Platinum, unwrought, troy ounces	64	NA	
Silver:			
Ingots, bars, and powder, do.	50,477	61,086	Peru 35,366; Mexico 19,355.
Semimanufactures, do.	3,665	NA	
Tin and alloys:			
Ingots, long tons	r 291	115	West Germany 35; Malaya 26; United States 21.
Semimanufactures, do.	r 17	---	
Zinc:			
Ore	194	---	
Slabs, plates, and pellets	4,815	4,370	Mexico 2,000; United States 1,510.
Scrap	12	NA	
Semimanufactures	150	170	United States 58; Belgium-Luxembourg 40; Spain 40.
Other ores and minerals	979	930	United States 540; Canada 250.
Other metals and alloys	9	31	Canada 14; United States 13.
Nonmetals:			
Abrasives, not elsewhere specified:			
Crude	250	108	United States 34.
Grinding stones and wheels	249	257	Mexico 90; Brazil 53; West Germany 40.
Asbestos, crude	12,933	8,013	Canada 7,017.
Barite and witherite	17	NA	
Borax, refined	977	769	United States 587; West Germany 181.
Cement	566	309	West Germany 159; United States 122.
Clay and clay products:			
Bentonite	2,641	2,229	NA.
Kaolin	3,422	3,231	NA.
Other, crude, calcined, washed or ground:			
Refractory	756	1,175	NA.
Nonrefractory	155		
Refractory brick, all types	2,960	1,855	United States 1,022; Austria 452.
Cryolite	4	NA	
Dolomite	4,800	4,596	All from Belgium-Luxembourg.
Feldspar and fluorspar	518	205	United States 150.

Table 4.—Colombia: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—continued			
Fertilizers:			
Nitrogenous	20,154	7,352	Mainly from West Germany.
Phosphatic	54,009	57,215	United States 25,868; Netherlands 3,475.
Potassic	35,284	46,630	United States 34,194; West Germany 4,828; France 4,159.
Mixed	33,747	55,739	United States 32,409; Netherlands 10,623; West Germany 7,208.
Graphite	45	40	NA.
Gypsum	471	8,608	Dominican Republic 8,000.
Infusorial earth	870	1,184	United States 983; Mexico 190.
Lime	2	NA	
Magnesite	37	NA	
Mica:			
Crude	136	118	All from United States.
Worked	10	10	NA.
Pigments, mineral	30	120	All from Spain.
Quartz:			
Ground	93	319	Belgium-Luxembourg 176; France 143.
Grinding balls	236	NA	
Salt	7	---	
Sand	668	493	All from United States.
Slate	129	157	Spain 94; Portugal 63.
Sodium carbonate	7,817	8,535	NA.
Sodium hydroxide	22,572	41,521	Mainly from United States.
Stone, building and monumental	7	NA	
Sulfur:			
Crude	1,011	1,562	Mexico 1,500.
Refined	2,389		
Talc and steatite	1,006	997	United States 461; Italy 326; Brazil 159.
Inorganic bases, not elsewhere specified	NA	831	NA.
Mineral fuels:			
Asphalt, natural: Gilsonite	9	---	
Carbon black	5,645	4,961	United States 4,525.
Coal, anthracite	15	267	All from United States.
Coke	11	---	
Mineral tars and products	129	NA	
Petroleum refinery products:			
Gasoline:			
Aviation, thousand 42-gallon barrels	281	375	Mainly from Netherlands Antilles.
Motor, do	---	7	NA.
Kerosine and jet fuels, do	r 3	7	Mainly from United States.
Distillate fuel oil, do	r 1	2	Mainly from United States.
Lubricants including greases	30,631	18,435	Mainly from United States.
Vaseline and paraffin	26,000	28,819	East Germany 11,481; United States 10,966; West Germany 5,898.
Other	1,129	452	United Kingdom 295; United States 157.
Other crude chemicals from oil, coal, and gas distillation.	1,828	2,785	United States 1,645; Netherlands 915.

r Revised. NA Not available.

143,400 tons of nonflat products, and 31,500 tons of wire products.

During the year, the first expansion stage was initiated with the distribution to various Colombian firms of the contracts for the preparation of the grounds, excavations, foundations, and other complementary civil engineering steps. The first expansion stage, which is to be completed in 1968, will permit improved efficiency and increase the capacity of production to some 220,000 tons of finished products per year. Machinery to be installed in this stage include a 42- by 108-inch blooming and slabbing mill, a 56-inch reversing hot-strip finishing mill, a 1,200-ton-per-day sinter plant, a crushing and mixing plant to supply raw materials used in the sintering operation and for charging the blast furnace, a turboblower, soaking pits, and a 25-ton-per-day oxygen plant.

The second largest manufacturer of iron and steel products was the Empresa Siderúrgica, S.A., of Medellin. In 1965 it pro-

duced a total of slightly over 51,000 tons of products, both finished and steel ingot. Ingot production from locally available and imported scrap was 22,518 tons. The firm fabricates reinforcing rods, galvanized water pipes and accessories, electrical conduit, castings for machinery, railroad wheels, and light products from its own ingots. At the end of 1964, an installation was completed for the production of forged grinding balls. At yearend the plant was equipped with six electric furnaces with a capacity for handling a total of 120 tons of steel scrap per day as well as one small cast iron cupola that is run once a week. Two small rolling mills which can produce rods up to four inches in diameter provided stock for the ball plant and for sale. The grinding ball plant consisted of one Hill-Acma ball machine for production of balls from ¾ inch to 2 inches in diameter, and one Chamberburg forge hammer to produce balls from 2½ to 4 inches in diameter. In 1965, 5,554 tons of galvanized pipe and 1,576 tons of electrical conduit were produced on two Yoder tube mills. The pipe and conduit was made from skelp imported from Japan.

In 1965, the company obtained a US$3.95 million loan from the Export-Import Bank for the purchase of U.S. equipment to expand and modernize the Medellin plant. New equipment that will permit an increase in production of steel ingots from 25,000 to 60,000 tons per year include a 25- to 30-ton Lectromelt electric furnace, an electrolytic tinning line, a Concast-type continuous casting machine, and two high-frequency resistance pipe welders. Engineering services and financial and technical advice will be provided by the Forel Equipment Corp. of New York. The expansion is expected to be completed by 1967.

Mercury.—The Southern Union Production Co. of Dallas began exploration for mercury in northern Caldas with reportedly encouraging results.

Nickel.—The Hanna Mining Co. (United States) continued its study of nickel-bearing laterites in northern Colombia while awaiting resolution of legal problems caused by overdenouncement of Hanna's concession by Colombian nationals who filed claims for the exploitation of metals other than nickel.

Platinum.—The Compañía Minera Chocó Pacífico, a subsidiary of the International Mining Corp., accounted for approximately 73 percent of total Colombian platinum production, although output dropped to 8,097 ounces, a decrease of approximately 14 percent from 1964 production. The downward trend in platinum production reflects the lower metal content of ores processed.

Silver.—The Frontino mine of the International Mining Corp., Colombia's largest producer of silver, reported production of 138,336 troy ounces in 1965. However, total country production was reported by the Ministry of Mines and Petroleum as only 113,451 ounces, a decrease of 16,902 ounces. At the same time, the value of 1965 silver production was reported as Col$498,000 above the 1964 value.

NONMETALS

Fertilizer Materials.—The fertilizer plant of Indústria Colombiana de Fertilizantes, owned 65 percent by Colombian Government agencies, ceased operation in September having reportedly lost approximately US$20 million during the firm's 3 years of operation.

Petroquímica del Atlántico proposed an ammonia and urea complex to be built at Barranquilla. Total investment, including plant and equipment and pipelines, was set at US$55 million. A 12-inch pipeline from the Antex Oil & Gas Co. El Difícil oilfield was under construction. Production was scheduled to begin in late 1968 and was projected at 900 tons per day of ammonia and 400 tons per day of urea, with storage facilities for 60,000 tons. As an interim operation to utilize gas from the Antex field, Petroquímica del Atlántico was considering the acquisition of a package ammonia plant on skids. This plant would be installed at Plato, Magdalena, and a 6-inch pipeline would be constructed to connect the plant with the Antex oilfield. The plant would cost US$3 million and would be moved for incorporation into the Barranquilla plant after the latter began production.

Amoniaco del Caribe (AMOCAR), owned by International Petroleum (Colombia) Ltd. (INTERCOL), exported 36,000 tons of ammonia, the only ammonia exports from Colombia, during the first 11 months of 1965.

263-927 O-67—15

Colombia also became an exporter of complete fertilizers with the exportation of a total of 13,500 tons to South Viet-Nam, India, Mexico, Peru, and Argentina by Abonos Colombianos.

MINERAL FUELS

Carbon Black.—Cabot Colombiana, a subsidiary of Cabot Corp., Boston, began production of four grades of carbon black in its Mamonal plant on September 19, 1965. The plant receives natural gas from the San Andrés Development Company and INTERCOL pipeline and aromatic tars from the Cartagena petroleum refinery. The present operating capacity of 5,700 tons per year will be increased by 1,150 tons by the spring of 1967.

Coal.—Acerías Paz del Rio produced 498,000 tons of run-of-mine coal from which 288,000 tons of washed coal was obtained. The company's coal reserves at the end of the year were 22.974 million tons proven, and 36 million tons probable.

Coke.—Acerías Paz del Rio consumed 265,200 tons of coke during the year, 218,200 tons of which were produced in their own installations and the remainder purchased from nearby beehive producers. To augment its byproduct coke oven production, the company constructed 60 beehive ovens at Samacá. Company production of beehive coke was 4,400 tons.

Natural Gas.—Gross production of natural gas in 1965 was 8.3 percent higher than in 1964. The country's second gasline began operations in April when the San Andres Development Co., a John W. Mecom subsidiary, together with INTERCOL, completed a 10-inch, 200-kilometer gasline from Jobo-Tablon field to the industrial complex at Mamonal on Cartagena Bay. This gas, 99.5 percent methane, is transported without the aid of compressors since the pressure at which it is produced is sufficient. Although the ultimate capacity of the pipeline is 50 million cubic feet per day, only 10 million cubic feet per day was run during 1965. At yearend Colombia-Cities Service Petroleum Corp. had finished a gas-processing plant in the Payoa field, and deliveries of gasoline, butane, and propane from this plant were scheduled to begin early in 1966 through the company's new products pipeline to the Barrancabermeja terminal.

Table 5.—Colombia: Natural gas production and disposition
(Million cubic feet)

Concessionaire	Well production	Transformed	Injected	Sold to industry	Used as fuel	Flared
Empresa Colombiana de Petróleos (ECOPETROL):						
1964	32,506	1,393	10,400	---	6,825	13,888
1965	30,455	1,744	16,483	---	6,635	5,593
Colombian Petroleum Co. (COLPET):						
1964	24,719	853	---	10,267	2,571	11,028
1965	19,341	834	---	11,557	2,705	4,245
Shell-Cóndor, S.A.:						
1964	4,206	---	---	1,023	710	2,473
1965	4,564	---	---	1,099	1,029	2,436
Texas Petroleum Co. (TEXPET):						
1964	4,031	---	---	---	1,726	2,305
1965	4,859	---	---	---	1,631	3,228
Antex Oil & Gas Co.:						
1964	8,213	1,097	---	---	292	6,824
1965	8,512	436	3,026	---	226	4,824
International Petroleum (Colombia) Ltd. (INTERCOL):						
1964	31	---	---	---	1	30
1965	74	---	---	---	12	62
Sinclair Colombian Oil Co.-INTERCOL:						
1964	10,064	---	377	---	143	9,544
1965	17,971	---	8,178	---	654	9,139
Richmond Petroleum Co.:						
1964	917	---	---	---	18	899
1965	3,600	---	---	---	83	3,517
Magdalena Oil Co. [1]	415	---	---	298	117	---
San Andres Development Co. [1]	1,871	---	---	1,538	333	---
Total:						
1964	84,687	3,343	10,777	11,290	12,286	46,991
1965	91,662	3,014	27,687	14,492	13,425	33,044

[1] Production began in April 1965.

Petroleum.—Crude petroleum production in 1965 was the highest in Colombia's history, approximately 16 percent above the previous record set in 1964. Exports of crude petroleum increased approximately 30 percent to 40.7 million barrels. The increased production of crude oil was due in part to the first full year of operation of the Rio Zulia field, discovered in 1962 by The Sociedad Richmond Petroleum Co. which averaged 30,000 barrels per day during 1965, and also in part to the recovery of production by some companies whose 1964 production was abnormally low due to strikes and to difficulties in the river transport of the crude oil.

Table 6.—Colombia: Salient statistics of the petroleum industry

	1963	1964	1965
Crude oil:			
Production—thousand 42-gallon barrels	60,343	62,596	72,670
Delivered to refineries—do	28,035	30,715	33,487
Exported—do	31,861	31,208	40,682
Export value—thousand U.S. dollars	79,049	76,281	88,169
Refinery products:			
Refinery output—thousand 42-gallon barrels	29,468	31,937	34,842
Consumption—do	22,931	23,810	24,988
Exports—do	2,769	4,543	5,219
Export value—thousand U.S. dollars	5,111	8,226	8,626
Employment (monthly average):			
Concessions—number of persons	11,661	11,173	NA
Pipelines—do	1,104	1,050	NA
Wages and salaries—thousand Colombian pesos	319,652	382,863	NA

NA Not available.

Sources: 1963–1964—Memorias del Ministro de Mines y Petróleos 1964 and 1965. 1965 data from Centro de Información de la Industria Petrolera.

There was a moderate overall decrease in exploration activity both in total surface exploration party months and in wildcats drilled. Development drilling also declined during the year. For the first time in Colombia, INTERCOL initiated offshore seismic exploration on the Pacific coast.

In May, Colombia-Cities Service completed the building of a 4½-inch products pipeline from Payoa field to Barrancabermeja. This line has a capacity of 2,500 barrels per day of liquefied petroleum gas (LPG). In addition, the same company has added three 30,000-gallon tanks for storage of LPG at the pipeline terminal. Oleoducto del Zulia, a subsidiary of Richmond Petroleum Co., completed an 8-inch, 200-kilometer branch oil line, with an ultimate capacity of 16,000 barrels per day, from the village of Ayacucho on Richmond's main Rio Zulia-Santa Marta pipeline to Barrancabermeja. At yearend, this line was delivering 6,000 barrels per day of waxy Rio Zulia crude oil to the Empresa Colombiana de Petróleos (ECOPETROL) refinery. ECOPETROL, together with the Department of Caldas, signed a contract with three Mexican firms for the construction of a pipeline to be known as Oleoducto de Caldas. The first 50 kilometers from Salgar to Mariquita will be 8 inches in diameter with a capacity of 12,000 barrels per day. From Mariquita to Armenia, the pipeline will have a diameter of 6 inches and a daily capacity of 6,000 barrels. The line will cross the 12,000-foot-high Andes and will have four pumping stations. Total length of the line will be about 240 kilometers and will cost approximately US$8 million, of which US$7 million has been lent by a Mexican financial group. A consortium composed of Texaco Petroleum Co. and Colombian Gulf Oil Co. announced near yearend that the combined oil venture planned to invest US$70 million over the next 17 years in facilities at Putumayo and in the construction of an oil pipeline across the Andes by way of Cali to the Pacific Ocean at Tumaco or Buenaventura. Sixteen wells have been drilled in the Putumayo field since its discovery in 1964. This major oil strike, centered in the area between Puerto Asis and the San Miguel River, is the first to be found in the Amazon River basin. Because the region is isolated all materials and provisions for the 700 employees on the exploration project must be taken in by heli-

copter. Production potential by 1970 may be 50,000 barrels per day.

Marathon Petroleum Co. Ltd., signed an exploration agreement with ECOPETROL, the State oil company, for a 6-year exploration concession covering 76,000 hectares in middle Magdalena Valley. If a commercial discovery is made, Marathon will be granted a development concession for 25 years after which the property and installations will revert to ECOPETROL. Marathon will bear all exploration costs, but any commercial production will be shared on a 50-50 basis with ECOPETROL, who will also meet half of the development costs. These terms and those relating to royalty payments are similar to those contained in the agreement reached last year between ECOPETROL and Tennessee Colombia, S.A.

ECOPETROL pushed ahead with its ambitious 5-year program, launched at the end of 1964, aiming at a big increase in the company's exploration and development activities, the construction of more pipelines, and expansion in refining capacity and the building of new petrochemical plants and improvement in export terminal facilities. The total cost is estimated at US$140 million of which less than half will be financed from ECOPETROL's own resources and the rest from foreign investors.

Table 7.—Colombia: Crude oil production and exports by companies

(Thousand 42-gallon barrels)

Company	1963		1964		1965	
	Production	Exports	Production	Exports	Production	Exports
ECOPETROL	9,473	657	10,206	1,281	10,354	2,230
COLCITCO (Cities Service)	8,697	3,960	7,870	2,656	6,610	1,476
COLPET (Mobil and Texas)	13,223	10,426	12,882	10,041	10,594	8,091
Shell-Cóndor S.A.	9,880	8,171	7,846	5,766	10,840	9,027
Antex Oil & Gas Co.	185	---	354	---	404	---
INTERCOL (Jersey Standard)	101	---	161	---	273	---
Sinclair-BP-INTERCOL	8,045	2,619	9,480	3,590	11,630	4,339
Compañía Petrolera Nueva Granada (United Fruit)	59	---	53	---	37	---
Richmond Petroleum Co.	---	---	2,807	2,374	11,275	9,585
TEXPET	10,680	6,028	10,937	5,500	11,206	5,934
Total	60,343	31,861	62,596	31,208	[1] 73,223	40,682

[1] Includes natural gasoline and other liquid products from COLPET and Antex. Net crude production was 72,669,591 barrels.

Source: 1963–1964—Memorias del Ministro de Minas y Pertoléos 1964 and 1965; 1965 data from Centro de Información de la Industria Petrolera.

In midyear, work was begun on the doubling of the Barrancabermeja refinery's capacity to 75,000 barrels per day. A US$4 million steam recovery unit being built there will enable the production of 20,000 tons of ethylene and 10,000 tons of propylene annually beginning in 1967. Up to September 1965, expenditure on this part of the program had reached US$12.5 million and Col$33.6 million. The expansion is due for completion in March of 1967. Expansion of the alkylation plant begun in 1964 should also be completed by 1967, doubling its capacity to 3,000 barrels per day. As a result of these two expansion projects, Colombia's aviation gasoline needs will be met from local supplies. Preliminary technical-economic studies connected with the construction of a small refinery at Neiva to process crude oil from Dina were completed, but the decision as to whether the capacity of this plant would be 2,500 or 5,000 barrels per day had not been made by yearend.

The Mineral Industry of Peru

By Bryan R. Frisbie [1] and Lester R. Brown, Jr.[2]

The Peruvian mineral industry continued to grow and prosper in 1965 as the value of mineral production, excluding iron and steel but including refined petroleum, increased from $459 million [3] in 1964 to approximately $469 million in 1965. Total trade registered a net negative balance of $60 million for the year, but mineral and metal exports exceeded similar imports by approximately $188 million.

In spite of a deficit in the overall trade balance, Peru ended the year with a favorable net foreign balance because of a heavy inflow of investment capital both public and private. Although a major portion of this inflow went into manufacturing industries, investment in the mining sector was also of importance as United States, Japanese, and Peruvian companies increased their investments in facilities for production of copper, lead, zinc, iron ore, cement, and petroleum products. Indicators of the general economic progress of Peru follow:

		1963	1964	1965
Gross national product (GNP)	million U.S. dollars	r 2,937	r 3,563	e 4,281
Population	millions	r 11.0	r 11.3	11.7
GNP per capita	dollars	r 267	r 315	e 366
Cost of living index, Lima (1958=100)		148	164	191
Commodity trade:				
Exports f.o.b.	million U.S. dollars	542	667	670
Imports c.i.f.	do.	557	r 579	730
Trade balance	do.	−15	r 88	−60
Net foreign balance, inflow minus outflow	do.	r +59	r −9	e +140
Total mineral production	do.	359	459	e 469
Mineral production as percentage of GNP		r 12.2	r 12.9	e 11.0

e Estimate. r Revised.

Peru continued to maintain a prominent position among the world's mineral producers during 1965, as shown in the following tabulation of some principal products which includes the percentage of each provided by Peru, and that country's rank among world producers.

Commodity	Approximate percent of total world output	Rank
Bismuth	18	1
Silver	14	3
Copper:		
Mine	3	7
Smelter	3	9
Lead:		
Mine	5	6
Smelter	3	13
Zinc:		
Mine	6	5
Smelter	2	14

The value of mineral industry output was equivalent to about 11 percent of the gross national product (GNP) in 1965, a decline from that of 1964 probably due to increased contributions to the GNP by the manufacturing sector. Distribution of principal values within the mineral industries follows:

A number of laws affecting the mineral industry were promulgated during 1965. Law 15584, passed by the Peruvian Congress on June 11, 1965, modified certain articles in Peru's Mining Code. It provides for increased ground rentals for all

[1] Minerals Attache, United States Embassy, Lima, Peru.

[2] Foreign minerals specialist, Division of International Activities.

[3] Where necessary, values have been converted from soles (S/) to U.S. dollars at the rate of S/26.82 = US$1.00.

Commodity	Value (thousands of U.S. dollars)	Percent of total mineral value
Metals:		
Antimony	378	0.08
Bismuth	5,498	1.17
Copper	134,181	28.60
Gold	3,388	.72
Iron ore	42,818	9.12
Lead	37,758	8.05
Molybdenum	1,791	.38
Silver	42,419	9.04
Zinc	54,015	11.51
Other	2,632	.56
Total	324,878	69.23
Nonmetals:		
Cement	22,562	4.81
Guano	5,034	1.07
Salt	2,283	.49
Sand and gravel	1,031	.22
Other	7,009	1.49
Total	37,919	8.08
Fuels:		
Coal	1,034	.22
Coke	1,854	.40
Petroleum, sales	e 103,600	22.07
Total	106,488	22.69
Grand total	469,285	100.00

e Estimate.

exploitation concessions as well as penalties in the form of annually increasing ground rentals for exploitation concession holders that do not adequately develop or exploit holdings within 5 years.

The law also authorizes the Mining Bank of Peru to participate up to 30 percent of its capital with small- and medium-size mining producers in exploration and exploitation work under regulations set for this participation, including a provision restricting Mining Bank participation in any individual venture to 50 percent of net expenses.

Supreme Decree No. 34–F of June 19, 1965, authorized the formation of a subsidiary company of the Mining Bank of Peru, to be known as Centro Metalúrgico del Peru, S.A., and empowered this company to proceed with the construction of an industrial complex for electrolytic refining of zinc and production of associated byproducts and fertilizers. The law gave legal authority to the Mining Bank to organize, finance, administer, and operate the industrial complex.

PRODUCTION

Although in general there were no large increases in the tonnages of the various minerals and metals produced, improved prices of some metals and increased output of iron ore in more valuable forms (concentrates and pellets) resulted in a higher value for 1965 mineral production. Production of nonmetals remained fairly constant although bentonite and cement output were exceptions registering significant tonnage increases. In fuel production, bituminous coal production showed a small gain but anthracite tonnage decreased, while crude petroleum production in 1965 held about equal to that of the previous year.

Production statistics have been obtained mainly from the Instituto Nacional de Investigación y Fomentas Mineras, and data furnished are qualified with the statement that there will possibly be a revision of some of these statistics when the Anuario de la Industria Minera del Peru—1965 is published.

Statistics on metals essentially represent the recoverable content in all forms. In calculating recoverable metal, the Peruvian

Table 1.—Peru: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Antimony content of:					
Refined bars	400	242	352	359	264
Antimonial lead bars	27	42	29	25	16
Lead-tin-antimony bars	2	---	---	---	---
Total smelter products	429	284	381	384	280
Ore and concentrate for export	360	238	230	298	250
Total recoverable antimony	789	522	611	r 682	530
Arsenic oxide (white arsenic)	352	519	620	621	500
Bismuth content of:					
Refined metal kilograms	387,950	436,811	475,730	r 674,770	656,040
Bismuth-lead bars do	78,785	51,512	84,161	46,377	89,256
Total smelter products kilograms	466,735	488,323	559,891	721,147	745,296
Concentrate for export do	1,284	3,479	4,550	r 17,542	9,957
Total recoverable bismuth kilograms	468,019	491,802	564,441	r 738,689	r 755,253
Cadmium content of:					
Refined bars do	105,240	106,507	173,359	197,105	214,592
Zinc concentrate for export:					
From Cercapuquio kilograms	25,708	21,244	19,137	r 29,790	32,752
From other mines e do	475,000	387,000	402,000	r 521,000	585,000
Total recoverable cadmium e kilograms	606,000	515,000	594,000	r 748,000	832,000
Copper content of:					
Refined bars	33,798	34,419	36,913	37,811	40,460
Blister	146,712	113,414	118,295	114,246	115,605
Matte	1,561	1,778	2,285	---	---
Zinc-copper-aluminum bars	---	2	8	10	2
Total smelter products	182,071	149,613	r 157,501	r 152,067	156,067
Copper sulfate	397	365	468	668	533
Ore and concentrate for export	14,722	15,939	21,330	22,825	20,257
Cement copper for export	862	873	765	885	510
Total recoverable copper	198,052	166,790	r 180,064	176,445	177,367
Gold content of:					
Refined bars troy ounces	50,820	46,749	43,680	38,227	37,391
Gold-silver bars do	22,344	18,983	7,604	r 8,984	6,113
Copper bars do	4,125	1,253	1,268	r 1,236	686
Total smelter products troy ounces	77,289	66,985	52,552	r 48,447	44,190
Placer gold e do	3,215	3,215	8,241	r 7,691	16,896
Ore and concentrate for export troy ounces	56,914	52,785	40,225	r 36,365	35,777
Total recoverable gold e troy ounces	137,418	122,985	101,018	r 92,503	96,863
Iron and steel:					
Iron ore and concentrate thousand tons	8,737	5,949	6,574	r 6,528	6,465
Pig iron do	51	38	29	27	30
Steel ingots and castings do	75	r 71	r 76	r 82	93
Lead content of:					
Refined bars	76,147	67,922	r 80,773	89,466	86,590
Antimonial-lead bars	216	406	298	227	189
Bismuth-lead bars	53	34	56	31	60
Lead-tin-antimony bars	17	---	---	---	---
Total smelter products	76,433	68,362	81,127	89,724	86,839
Ore and concentrate for export	59,965	59,814	68,070	60,950	60,261
Total recoverable lead	136,398	128,176	r 149,197	150,674	147,100
Manganese ore, 45 percent manganese equivalent	3,519	6,716	483	411	560
Mercury 76-pound flasks	3,001	3,483	3,092	3,275	2,841

See footnotes at end of table.

Table 1.—Peru: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals—Continued					
Molybdenum:					
Molybdenum sulfide content of ores and concentrates	----------	8	r 898	r 659	1,121
Molybdenum content, recoverable	----------	5	1 538	r 355	672
Selenium, refined kilograms	7,396	8,338	8,977	7,619	8,602
Silver content of:					
Refined bars thousand troy ounces	15,955	16,228	19,081	20,604	19,460
Sterling bars do	798	618	615	655	812
Gold-silver bars do	520	448	479	r 334	1
Copper bars do	1,522	785	809	r 757	772
Matte do	471	454	469	----------	----------
Total smelter products thousand troy ounces	19,266	18,533	21,453	r 22,350	21,045
Ore and concentrate for export thousand troy ounces	14,896	14,398	15,347	14,468	14,050
Total recoverable silver thousand troy ounces	34,162	32,931	36,800	r 36,818	r 35,095
Tellurium, refined kilograms	34,600	22,894	12,081	21,209	16,350
Tin content of:					
Lead-tin-antimony bars long tons	r 6	----------	----------	----------	----------
Ore and concentrate for export long tons	7	11	r 21	r 36	36
Total recoverable tin do	r 13	11	r 21	r 36	36
Tungsten ore and concentrate, gross weight	NA	363	426	2 577	2 546
60 percent WO_3 equivalent	r 432	r 439	r 516	r 2 682	2 662
Recoverable WO_3 content	233	237	279	2 368	2 357
Vanadium concentrate	----------	3 360	----------	----------	----------
Zinc content of:					
Refined metal slabs	31,757	32,753	53,905	59,742	62,674
Powder	----------	----------	778	922	----------
Zinc-copper-aluminum bars	----------	186	865	1,039	270
Total smelter products	31,757	32,939	r 55,548	61,703	62,944
Sulfate	117	137	r 168	r 217	491
Concentrate for export	141,995	129,164	r 139,180	r 174,740	195,957
Total recoverable zinc	173,869	162,240	r 194,896	r 236,660	259,392
Nonmetals:					
Barite	111,165	114,551	124,790	132,389	103,157
Bentonite	401	265	371	603	5,020
Cement	593,500	700,568	754,056	r 813,445	1,022,547
Clays:					
Common	241,624	248,630	250,000	252,000	e 265,000
Refractory	3,308	6,216	9,271	8,800	7,221
Kaolin	466	350	294	330	390
Diatomite	1,858	1,473	2,479	2,500	2,795
Dolomite	884	978	567	1,500	2,204
Feldspar	1,008	292	220	850	941
Gypsum:					
Crude	63,700	61,200	r 52,112	r 50,036	76,330
Calcined	28,713	31,247	r 29,977	r 32,869	41,139
Lime	69,500	r 80,000	85,000	e 92,500	e 95,000
Limestone:					
Crude:					
For cement manufacture	753,677	888,836	r 1,174,353	r 1,287,303	e 1,320,000
For lime manufacture	98,954	99,578	r 118,754	r 89,935	e 338,000
For metallurgical fluxing	39,439	22,130	r 25,500	r 60,990	
Total crude	892,070	1,010,544	r 1,318,607	r 1,438,228	e 1,658,000
Marble, dimension stone	1,300	1,708	756	640	250
Mineral water thousand liters	8,137	6,006	5,628	6,424	5,968
Phosphate, guano:					
Rich	142,937	NA	181,671	187,087	160,000
Poor	16,261	NA	10,170	18,004	8,700
Total	159,198	206,061	191,841	205,091	168,700

See footnotes at end of table.

Table 1.—Peru: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Nonmetals—Continued					
Pyrophyllite	2,602	1,434	2,432	2,500	4,797
Salt:					
Marine	70,707	76,700	63,500	r 112,349	NA
From saline springs or wells	7,572	6,092	10,017	r 10,823	NA
Mined rock salt	9,065	10,849	13,900	r 9,715	NA
Total	87,344	93,641	87,417	r 132,887	123,669
Sand and gravel—thousand tons	814	1,041	1,090	1,364	1,840
Slate			23		
Stone, crushed:					
Pegmatite	800				
Quartz and marble	6,650	11,300	334	300	500
Silica	18,200	11,155	64,568	60,000	e 65,000
Total	25,650	22,455	64,902	60,300	65,500
Talc	334	286	172	170	285
Mineral fuels:					
Anthracite	20,922	22,469	9,600	31,737	5,500
Bituminous coal	146,186	140,379	121,559	115,347	p 120,086
Coke	35,989	39,500	38,448	25,568	27,401
Natural gas—million cubic feet	33,710	42,320	40,150	45,134	44,335
Natural gas liquids thousand 42-gallon barrels	1,053	1,081	1,078	1,082	1,156
Petroleum:					
Crude—do	19,371	21,134	21,468	23,119	23,068
Refinery products:					
Aviation gasoline—do	54	63	48	46	54
Motor gasoline—do	4,992	5,368	5,443	r 6,089	5,980
Jet fuel—do	329	493	486	725	789
Kerosine—do	3,060	3,000	2,989	r 3,139	3,270
Distillate fuel oil—do	5,478	5,989	5,791	r 5,958	6,254
Residual fuel oil—do	2,410	2,770	4,531	r 5,042	5,431
Lubricants—do	83	75	60	80	84
Asphalt—do	87	130	93	129	198
Coke—do	2		1		27
Other—do	4	4	3	r 87	155
Total refinery products—do	16,499	17,892	19,445	r 21,295	22,242
Refinery fuel and losses—do	290	304	1,111	r 128	202

e Estimate. p Preliminary. r Revised. NA Not available.
[1] May represent total rather than recoverable molybdenum content.
[2] Includes small Morococha production.
[3] Exports.

Department of Mines reportedly deducts from the assay metal content of ores and concentrates 5 percent in the cases of copper and lead, 10 percent for zinc, iron, manganese, molybdenum, and tungsten; and 35 percent for arsenic, bismuth, cadmium, and tin; these deductions are based on average recoverability experience.

TRADE

The value of mineral exports in 1965 exceeded that of 1964 by 8.76 percent or $24 million and also increased the share of mineral exports in total exports by 3.4 percent.

Preliminary data on the value of 1965 exports [4] are as follows:

Commodity	Value (million dollars)	Percentage of total export
Selected minerals:		
Copper	$121.2	18.1
Iron	47.0	7.0
Silver	39.1	5.8
Lead	37.9	5.7
Zinc	35.8	5.3
Total	281.0	41.9
All other commodities	388.6	58.1
Total	$669.6	100.0

[4] U.S. Embassy, Lima, Peru. State Department Airgram A-507, Mar. 9, 1966, 1 p.

In 1965, the United States was the source of approximately 40 percent by value of Peru's total imports and was a market for about 34 percent by value of Peruvian exports.

The role of mineral trade in Peru's total foreign trade for recent years is illustrated by the following tabulation:

	Value (million dollars)		Mineral commodities share of total trade
	Mineral commodities	Total trade	
Exports:			
1963	202	542	37.3
1964	274	667	41.1
1965	p 298	p 670	44.5
Imports:			
1963	e 50	557	9.0
1964	71	579	12.3
1965	p 110	p 730	15.1
Net trade balance:			
1963	+152	−15	XX
1964	+203	+88	XX
1965	+188	−60	XX

e Estimate. p Preliminary. XX Not applicable.

Table 2.—Peru: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Antimony, gross weight:			
Ore	1,145	1,109	West Germany 326; Belgium 280; Japan 163.
Refined bars	263	426	All to United States.
Antimony, content of:			
Ore	r 634	594	West Germany 172; Belgium 137; Japan 89.
Refined bars	250	400	All to United States.
Bismuth, content of:			
Mixed bars [1]	57	74	West Germany 63; Argentina 11.
Refined bars	447	668	United States 415; United Kingdom 96; France 70.
Cadmium, refined bars	149	212	United States 76; Netherlands 44; Sweden 29.
Copper:			
Gross weight:			
Ore and concentrate	52,070	77,514	Japan 29,948; United States 18,759; West Germany 7,755.
Cement	1,682	1,392	United States 964; Japan 428.
Matte	5,280	1,280	All to Japan.
Blister	114,645	117,027	United States 69,962; Belgium 21,449; West Germany 15,648.
Content of:			
Ore and concentrate	r 15,899	22,375	(2).
Cement	1,074	929	(2).
Matte	2,191	560	All to Japan.
Blister	113,990	115,659	(2).
Mixed bars	165	--------	
Refined bars	5,374	9,395	United States 7,108; Brazil 1,011; Argentina 838.
Electrolytic sheet	24,676	30,776	United States 17,727; Netherlands 7,817; West Germany 2,885.
Total copper content	r 163,369	179,694	
Gold, content of:			
Ores, various ---troy ounces	3,600	2,064	(2).
Concentrates, various ---do	36,597	34,783	(2).
Mixed bars [1] ---do	2,353	1,111	(2).
Blister bars ---do	1,305	1,376	(2).
Total ---do	43,855	39,334	
Iron and steel:			
Iron ore	5,748,663	5,205,190	Japan 2,773,947; Netherlands 734,040; West Germany 550,711.
Bars, plates, and sheets	36	1	All to Ecuador.
Lead:			
Gross weight:			
Ore	6,370	6,453	United States 4,215; Canada 956; West Germany 620.
Concentrate	122,348	115,807	United States 54,050; West Germany 20,982; Canada 15,138.
Content of:			
Ore	r 3,103	2,937	(2).
Concentrate	62,428	61,689	(2).
Mixed bars	38	49	(2).
Refined bars	54,971	102,063	United States 27,268; Japan 18,144; Italy 8,402.
Total lead content	120,540	166,738	
Manganese ore	705	844	All to United States.
Mercury ---76-pound flasks	2,607	3,866	United States 3,716; Argentina 150.
Molybdenum:			
Sulfide, ore and concentrate	951	901	France 386; United Kingdom 278; Belgium 185.
Sulfide (MoS_2) content of concentrate	848	785	France 336; United Kingdom 242; Belgium 161.
Molybdenum (Mo) content of concentrate.	508	471	France 202; United Kingdom 145; Belgium 96.
Selenium:			
Crude metal ---kilograms	9,054	11,177	United Kingdom 3,372; Netherlands 3,293; United States 2,357.
Selenium content ---do	8,965	11,103	United Kingdom 3,349; Netherlands 3,269; United States 2,339.

See footnotes at end of table.

Table 2.—Peru: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals—Continued			
Silver:			
Gross weight:			
Ore	57	--	
Refined thousand troy ounces	15,658	22,877	West Germany 10,037; United States 4,142; Netherlands 2,724.
bars.			
Content of:			
Ores, of silver and other do	395	406	(2).
metals.			
Concentrate do	r 13,771	14,008	(2).
Copper matte do	501	125	All to Japan.
Blister bars do	827	854	(2).
Mixed bars do	459	340	(2).
Refined bars do	15,658	21,315	(2).
Total silver content do	r 31,611	37,048	
Tellurium:			
Cakes and bars kilograms	963	10,458	Netherlands 8,267; Belgium 998; Norway 794.
Tellurium content of refined do	962	10,429	Netherlands 8,240; Belgium 997; Norway 793.
bars.			
Tin content of concentrate long tons	r 26	39	United States 25; United Kingdom 14.
Tungsten:			
Ore and concentrate	244	814	United States 321; West Germany 265; Japan 187.
WO_3 content[3]	175	587	United States 234; West Germany 188; Japan 136.
Ore, 60 percent WO_3 equivalent	292	978	United States 390; West Germany 313; Japan 227.
Zinc:			
Gross weight of concentrate	269,856	377,207	Japan 118,492; United States 116,649; Poland 42,074.
Content of:			
Concentrate	148,138	202,759	(2).
Refined bars, slabs, and sheets	r 38,793	72,217	Brazil 19,925; Netherlands 12,129; United Kingdom 11,109.
Total zinc content	r 186,931	274,976	
Mixed metals, ingots and bars, gross weights:			
Bismuth, with lead and silver	95	123	All to United States.
Copper, with silver and gold	165	--	
Silver, with gold troy ounces	485,862	356,487	All to West Germany.
Nonmetals:			
Barite, crude	90,151	126,973	United States 102,101; Netherlands 22,494; Chile 1,463.
Bentonite	6	96	All to Ecuador.
Cement:			
Portland	17	--	
Refractory	32	44	All to Bolivia.
Chalk	20	5	All to Ecuador.
Guano, rich	11,673	8,658	Japan 4,703; United States 3,550; Belgium 405.
Gypsum, calcined	1	--	
Salt	587	342	All to Ecuador.
Stone: Ornamental, porphyry, onyx, marble.	88	42	All to Japan.
Mineral fuels:			
Anthracite	7,000	9,794	Japan 9,734; Bolivia 60.
Coke	3	1	All to Bolivia.
Petroleum:			
Crude	376,834	399,866	United Kingdom 147,765; Brazil 97,027; Argentina 62,024.
Liquid petroleum gas	(4)	--	
Petroleum refinery products:			
Aviation gasoline	--	229	All to Ecuador.
Motor gasoline	40	1	All to Ecuador.
Kerosine	327	41	All to Chile.
Distillate fuel oil	99,022	69,098	Chile 50,567; United Kingdom 6,816; bunkers 4,913.
Residual fuel oil	30,293	28,284	All to bunkers.
Lubricants	2,626	1,387	Chile 1,315; bunkers 61; Bolivia 11.
Other	324	419	Argentina 241; Brazil 125; United Kingdom 50.

r Revised.
[1] See "Mixed metals" listed at end of "Metals" section of table for gross weights.
[2] Country distribution not separately reported.
[3] Official report of these figures as metal (W) content believed to be in error.
[4] Less than ½ unit.

Table 3.—Peru: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and its alloys:			
Ingots	637	879	Canada 613; United States 256.
Semimanufactures	1,870	2,432	United States 824; United Kingdom 735; West Germany 356.
Cadmium metal—kilograms	--	127	Mainly from United Kingdom.
Copper and its alloys:			
Refined bars, rods, sheets, bands, pipes, wire, and powder.	771	606	West Germany 100; United States 76; United Kingdom 58.
Phosphor copper, Muntz metal, and other alloys.	204	47	United States 18; Austria 15; Mexico 5; Netherlands 5.
Gold:			
Bars—troy ounces	90,818	205,416	Canada 187,572; United States 16,879; Switzerland 965.
Plates, sheets, foil, etc—do	722	932	United States 655; West Germany 208.
Iron and steel:			
Iron ore	59	137	All from United States.
Iron and steel scrap	289	583	Mainly from United States.
Ferroalloys	436	630	Mainly from Republic of South Africa.
Semimanufactures:			
Bars, rods, and structural shapes.	24,234	20,703	Belgium 10,926; United States 3,786; West Germany 2,718; Sweden 682.
Rails and fittings	3,646	18,619	United Kingdom 14,637; West Germany 2,186; Belgium 767; United States 652.
Plates, sheets, strips, bands, and hoops:			
Uncoated	56,185	39,085	Japan 15,156; West Germany 10,170; Belgium 5,745; United States 5,185; France 1,465.
Galvanized	11,520	15,350	Japan 10,400; Belgium 2,836; United States 1,561.
Tinplate and terneplate	17,700	23,859	Canada 7,107; Japan 5,527; United States 4,754; Netherlands 2,509; France 2,441.
Wire	6,942	3,262	Belgium 805; United Kingdom 783; West Germany 558; France 504; Italy 277; United States 206.
Pipe and fittings	21,275	16,450	Japan 5,156; United States 3,328; France 3,313; Mexico 1,657; West Germany 1,194.
Cast iron	82	1,069	Mainly from United Kingdom.
Lead and alloys, all forms	90	52	Mainly from Denmark.
Magnesium metal—kilograms	1,997	1,326	Italy 791; United States 525.
Mercury—76-pound flasks	16	31	West Germany 11; Italy 6; Switzerland 6; United States 6.
Nickel and alloys, all forms	51	43	Norway 19; United States 19.
Platinum group metals:			
Platinum, unmanufactured.	280	174	West Germany 165; United States 9.
Other platinum group metals.	64	77	Mainly from West Germany.
Silver ingots, dust, sheets, etc—do	207,404	4,887	United Kingdom 2,958; United States 1,415; Italy 322.
Tin and alloys:			
Refined unalloyed—long tons	136	100	Malaya 40; United Kingdom 31; Bolivia 13; United States 8.
Babbitt—do	21	18	United States 9; United Kingdom 5; Canada 2; Denmark 2.
Other alloys solder—do	52	28	Mainly from United States.
Zinc:			
Refined ingots, bars, scrap	10	43	Mainly from United States.
Lithographic plates, bands, rods, strips.	255	161	West Germany 99; Belgium 30.
Granular	1	14	United Kingdom 12; United States 2.
Other:			
Ores of ferroalloying metals	10	54	Mainly from United States.
Nonferrous ores, scorias, not elsewhere specified.	1	1	Mainly from United States.
Nonferrous base metals and alloys, not elsewhere specified.	43	22	Mainly from United States.
Nonmetals:			
Abrasives, natural	1,031	1,769	United States 1,219; West Germany 361; United Kingdom 142.
Asbestos, crude	2,611	2,907	Canada 1,960; Republic of South Africa 583; Southern Rhodesia 136.
Cement:			
Portland	11,559	22,970	Venezuela 9,371; West Germany 6,500; United Kingdom 4,828; Belgium 1,290.
White (for stucco)	1,792	1,686	Denmark 477; France 317; West Germany 314; Japan 302.

See footnotes at end of table.

Table 3.—Peru: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—Continued			
Clays:			
Ceramic and modeling clays	226	305	United States 101; Canada 93; West Germany 34.
Kaolin and refractory earth	916	2,054	Mainly from United States.
Fuller's earth, crude	2,221	1,511	West Germany 779; United States 376; United Kingdom 267.
Cryolite	13	12	Mainly from West Germany.
Fertilizers and fertilizers raw materials:			
Nitrogenous:			
Anhydrous ammonia	47	66	Mainly from United States.
Potassium nitrate	9	97	Netherlands 51; West Germany 39.
Sodium nitrate	4,726	6,612	Mainly from Chile.
Other nitrogen fertilizers	95,408	87,053	West Germany 35,471; Belgium 15,105; Netherlands Antilles 10,827; United States 10,335.
Phosphatic:			
Phosphate rock	11,792	14,341	Mainly from United States.
Phosphatic fertilizers	209	1,263	United States 773; West Germany 490.
Potassic, all forms	2,462	1,955	France 617; West Germany 605; United States 364; Chile 302.
Graphite:			
Crude	37	89	West Germany 52; United Kingdom 22.
Lubricants	30	27	Japan 15; United States 11.
Gypsum, calcined	112	150	United States 96; West Germany 40.
Magnesite, crude or calcined	957	1,006	Mainly from United States.
Mica, all forms	102	131	United States 102; Republic of South Africa 18.
Salt, crude	3,494	3,324	Bahamas 2,500; Chile 610; United States 136.
Sands, silica or other	605	2,502	Mainly from United States.
Stone, ornamental and construction	265	444	Mainly from Italy.
Sulfur, all forms	12,949	12,256	Mainly from United States.
Talc and steatite	612	743	United States 256; Italy 214; Netherlands 95; France 79.
Witherite (barium carbonate), crude	10	107	Mainly from United Kingdom.
Other nonmetals	35	1,267	British Guiana 800; United States 336.
Mineral fuels:			
Peat	10	7	All from West Germany.
Coke	8,535	2,721	West Germany 1,865; United Kingdom 626; United States 205.
Petroleum:			
Crude and partially refined	122	104	Venezuela 81; United States 23.
Refinery products:			
Aviation gasoline	28,403	29,483	Mainly from Netherlands Antilles.
Motor gasoline	47,895	78,335	Venezuela 61,780; Netherlands Antilles 8,520; Colombia 5,034.
Kerosine	----	19,935	All from Venezuela.
Distillate fuel oil	448	543	Netherlands Antilles 212; Colombia 132; Venezuela 97; United States 46.
Lubricants, including greases	17,394	16,533	Mainly from United States.
Asphalt	358	2,738	Trinidad and Tobago 2,371; United States 342.
Vaseline, paraffin, waxes	10,241	10,776	India 6,174; United States 3,765; Indonesia 479.
Other	r 955	764	Mainly from United States.
Total refinery products	r 105,694	159,107	

r Revised.

COMMODITY REVIEW

METALS

Bismuth. — The Julcani operation of Cía. de Minas Buenaventura, S.A., produced 96 tons of bismuth in ores and concentrates compared with 103 tons in 1964. The Julcani operation consists of the Tentodora, Lucrecia, Mimosa, and Herminia mines in the Department of Huancavelica. The Pablo G. Vidalon tunnel, 150 meters below the 420-meter level of the Herminia mine in Julcani was completed to make possible exploitation at greater depth.

Cerro de Pasco Corporation (Cerro-Peru), a Cerro Corp. subsidiary operating in Peru, remained the world's leading bis-

muth metal producer. Its 1965 output of 743.9 tons was exported chiefly to the United States to supply increased demand by traditional bismuth users and manufacturers of a catalyst for production of acrylonitrile used by makers of acrylic textile fibers.

Cadmium —The Cercapuquio mine, of Minas de Cercapuquio, S.A., in the Department of Junín in central Peru produced 33 tons of cadmium in zinc concentrates which were exported. Cerro-Peru increased its production of refined cadmium metal to a total of 215 tons in the form of bars.

Recoverable cadmium content of zinc concentrates for export totaled an estimated 618 tons,[5] which when added to refined cadmium production in Peru gives a total recoverable cadmium output for 1965 of 832 tons, 11.1 percent more than in 1964.

Copper. — Peruvian recoverable copper production increased 0.5 percent over that of the previous year. Improved copper prices during the year caused a 17.2 percent increase in value to approximately $134 million. The Southern Peru Copper Corporation (SPCC) had nearly normal operations in 1965 and increased blister copper production about 3 percent over that of 1964. The Toquepala property in the Department of Tacna, the largest open pit mine in Peru, operated 15 shovels (12 P & H 1,800 electric and 3 P & H diesel) and 120 off-the-highway trucks; 118 KW-Dart trucks, 25- to 100-ton capacity, and 2 Unit Rig Electra Haul trucks, 85-ton capacity. Approximately 180,000 tons of mine material is moved per 24-hour period, using a combination of truck and rail haulage. At yearend, the mine bottom was at an elevation of 3,175 meters; final programed bottom elevation is 3,000 meters, but under existing plans, excavation will not reach below 3,100 meters for 15 years.

Operations of SPCC at Toquepala in recent years have been as follows:

	1963	1964	1965
Ore and waste mined—metric tons	53,802,000	51,130,000	51,790,000
Ore mined—do	10,084,939	10,079,677	10,166,766
Ore-to-waste ratio	1:4.3	1:4.1	1:4.1
Copper content of—			
Milled ore—percent	1.37	1.34	1.29
Blister copper recovered at Ilo smelter—metric tons	119,443	115,665	119,100

Southern Peru Copper Corp. reportedly completed feasibility studies for bringing into production the nearby Cuajones deposit, with an estimated 530-million-ton reserve of 1 percent copper ore. Electrical generating capacity at the company powerplant at Ilo has been increased to 110,000 kilovolt amperes, sufficient for the Cuajones operation when it is brought into production.

Cerro-Peru established a new record for refined copper production, 40,459 tons, 7 percent more than in 1964. The Yauricocha mine, a Cerro-Peru property in the Department of Lima, but near the town of Huancayo in the Department of Junín, was being converted from a producer of relatively high-grade direct-smelting copper ore to a producer of a copper-zinc-lead-silver ore. A 750-ton-per-day concentrator will be placed in operation at the mine in early 1966. Plans also have been completed for bringing into production a mine and concentrator at the Cobriza copper deposit, about 185 kilometers southeast of La Oroya.

The Northern Peru Mining Co., a subsidiary of the American Smelting and Refining Company, (ASARCO), was the third largest copper producer in Peru. In 1965, the Quiruvilca mine, 160 kilometers east of Trujillo, Peru, in the Department of La Libertad, exported 19,668 tons of concentrates and 837 tons of cement copper. In 1965, ASARCO continued evaluation of the Michiquillay copper deposit east of Cajamarca. In August, ASARCO optioned claims from Lampa Mining Co. Ltd., covering the Barenguela copper deposit near Santa Lucia, about 55 kilometers west of Juliaca, and hired the Boyles Bros. Co. to test drill these holdings.

The Anaconda Company, through its

[5] Estimated on the basis of reported output of zinc concentrate for export multiplied by an average cadmium content of 0.24 percent and a recovery factor of 65 percent.

subsidiary, the Andes Exploration Co. of Maine, proceeded with an extensive drilling program at the Cerro Verde copper deposits near Arequipa, in southern Peru. It was anticipated that a decision regarding bringing the property into production would be made in 1966.

Japanese interests were active in Peru during 1965. The Chapi mine, about 64 kilometers from Arequipa, was taken over by a group consisting of Overseas Mineral Resources Development Co., Mitsui Mining & Smelting Co. Ltd., Nippon Mining Co. Ltd., and Toho Zinc Co. Ltd.

Gold and Silver.—Peruvian gold production increased almost 5 percent in 1965; of total output, 39 percent or 37,399 troy ounces was from the Oroya refinery of Cerro-Peru. The Natomas Company of Peru, a subsidiary of the Natomas Company of California, produced 14,773 ounces from 2,328,950 cubic yards of dredged material. The balance was supplied by Andaray Gold Mines Co., Southern Peru Copper Corp., and Cía. Minera San Juan de Lucanas, and as well as by small and medium mines whose gold output was contained in lead and copper concentrates.

Peru's 1965 silver output maintained the country's position as the third largest silver producer in the world behind Mexico and the United States.

Cerro-Peru accounted for almost 58 percent of the total recoverable silver with 20,272,000 troy ounces reported in Cerro's 1965 Annual Report. The company's metallurgists reportedly were making studies for the recovery of silver contained in reserves of oxidized silver-lead ores located on and near the surface at the Cerro de Pasco mine.

Iron Ore.—The Marcona Mining Co. mined iron ore and operated two processing plants on the Peruvian coast about 335 kilometers south of Lima, in the Department of Ica.

The orebodies, covered by a thin mantle of beach deposits, are distributed in a band roughly 5 kilometers wide by 21 kilometers long. The ore of the upper zone is composed largely of hematite, while the underlying primary ore is massive magnetite.

A multimillion dollar expansion program completed in 1963 included a pellet plant with initial annual capacity of over 1 million tons. During 1965, Marcona continued the construction of a second pelletizing plant at San Nicolas with an annual capacity of 2 million tons.

The company sold 5,588,275 tons of iron ore products in 1964 and increased this to 6,807,535 tons in 1965. The 1965 total included 4,917,682 tons of beneficiated products of which 955,087 tons were in the form of pellets. This reflects an increase from 4,805,917 tons of beneficiated products in 1964. Two ports, San Nicolas and San Juan, were used for shipment of Marcona products. The dock at San Nicolas Bay can accommodate ships of up to 100,000 deadweight tons. Ships of up to 50,000-ton size can be loaded at San Juan Bay.

Panamerican Commodities, S.A., Peru's other iron ore producer, operated the Acarí Mine, 56 kilometers from the port of San Juan in the Department of Arequipa, and produced 800,104 tons of ore in 1965.

Iron and Steel.—The Chimbote plant of Sociedad Siderúrgica de Chimbote, S.A., Peru's only integrated steel plant, recorded advances in 1965 over the previous year. Output of steel billets from this facility in the Department of Ancash, 520 kilometers northwest of Lima, increased 6,000 tons to 81,400 tons from which 73,700 tons of rolled steel products were produced.

Expansion of facilities continued during the year. Construction work advanced well while the installation of electrical and mechanical equipment proceeded at a somewhat slower pace. The steel structure for the blast furnace was completed as were the coke bins. A Linz-Donawitz steel plant, a continuous casting plant, and an oxygen plant were in final phases of construction at yearend. Ten water wells to supply industrial water have been completed in the Santa Valley. The belt-conveyor system which will move iron ore from the new pier to the storage area was partially completed.

Lead and Zinc.—Production of recoverable lead in 1965 was approximately 2 percent lower than the 1964 total, while total zinc output registered a 9.6 percent increase over that of 1964, as Cerro-Peru's production of zinc concentrates for export was increased noticeably.

Cerro-Peru's smelting and refining complex at La Oroya, the country's only producer of refined metal, recorded output of

86,559 tons of lead and 61,317 tons of zinc in 1965.[6] In addition 71,051 tons of zinc in concentrates was reportedly produced for export by company mines and mills, some 8,856 tons more than in 1964. As in 1964, Cerro's operations were free from work stoppages. The Graton Tunnel project, a twin-bore, 11.2-kilometer drainage and ventilation tunnel at the Casapalca mine, in the Department of Lima, was slowed by a continuous flow of hot water with temperatures as high as 140° being recorded.

Compañía Minerales Santander, Inc., wholly owned subsidiary of the St. Joseph Lead Co. of New York, reported increased production for 1965 with 10,827 tons of lead concentrate and 54,717 tons of zinc concentrate. The company's mine, Santander, about 185 kilometers northeast of Lima, in the Department of Lima, has been operating as an open pit mine, but preparations were underway for a gradual transfer to underground operations.

Mercury.—The Santa Barbara mine, in the Department of Huancavelica of Sociedad Minera El Brocal, S.A., continued to be the only producer of mercury in Peru.

Molybdenum.—The Southern Peru Copper Corp. produced molybdenite concentrate as a byproduct at its copper flotation mill. Preliminary statistics show that 1,316 tons of concentrate containing 85.19 percent MoS_2 was produced.

Tin.—The Lampa Mining Co. Ltd. of Liverpool, Peru's only tin producer, reported that significant exploration was underway at its San Rafael mine in the Department of Puno. Ore from the five working levels at San Rafael yielded 15 to 17 tons of copper concentrate and 0.2 long tons of tin concentrate daily. The 1965 production was reported at 36.336 long tons of recoverable tin.

Tungsten.—The Pasto Bueno mine of F. Málaga Santolalla e Hijos in the Department of Ancash, continued as Peru's foremost tungsten producer. A small additional amount was obtained by treating mill tailings of Cerro-Peru's Morococha unit.

Other.—Antimony, selenium, tellurium, copper sulfate, and zinc sulfate were produced as byproducts at Cerro de Pasco's smelter and refinery plant at La Oroya.

NONMETALS

Barite.—Exports, totaling 108,000 tons in 1965, exceeded production by about 5,000 tons; domestic requirements and the difference between exports and production presumably was obtained from indigenous stocks.

Bentonite.—Production which averaged only 378 tons per year during 1960–64 increased to over 5,000 tons in 1965. Much of the increase reportedly was consumed by the Marcona Mining Co. in its iron ore concentrate pelletizing plant.

Cement.—Peruvian cement production increased almost 26 percent over the 1964 figure, extending the trend of increasing output that dates from 1961. The new cement plant under construction at Yura, near Arequipa in southern Peru, was expected to begin production about mid-year 1966 at a rate of 500 to 800 tons per day.

Salt.—Estanco de la Sal remained Peru's principal salt producer; Alkalis Peruanos, S.A., (a subsidiary of W. R. Grace & Co.), and Quimica del Pacifico, S.A., produced relatively minor amounts for consumption in their own chemical plants. Most of the salt was produced by solar evaporation of salt brine, much of which was pumped from underground sources.

Fertilizer Materials.—On June 14, an agreement for exploitation of the phosphate and potash deposits in the Sechura Desert of northern Peru, Department of Piura, was signed by Minera Bayovar, S.A. and the Peruvian Government. Bayovar, S.A. is a United States corporation owned jointly by Texada Mines Ltd., a Canadian corporation and Minerales Industriales del Peru, S.A. (much of which is owned by Midepsa Industries, Ltd., a Canadian corporation). The concession comprises some 850 claims within the coastal area of the Sechura Desert. The area was explored for petroleum in the 1920's, and drilling at that time indicated phosphates to a depth of 700 feet; in some places, there are 30 meters of overburden. Reportedly, the deposit contains ore varying from 1.5 to 23 percent phosphorus pentoxide (P_2O_5); drilled reserves contain the equivalent of 561 million tons of 31 percent P_2O_5 phosphate rock and probable reserves are equivalent to 861 million tons of phosphate

[6] Data from corporation annual report for 1965; these figures differ slightly from official Peruvian statistics on lead and zinc metal output.

rock containing 31 percent P_2O_5. In the second half of 1965, Bayovar completed a 200-ton-per-day phosphate pilot plant consisting of a scrubbing unit, classifiers, and flotation equipment.

In the Sechura Desert just northeast of the phosphate deposit is an extensive flat shallow basin forming a brine reservoir filled with permeable and porous sediments saturated with brines containing potassium chloride and magnesium chloride. Within this basin there are three areas under consideration for brine production. Reserves have been calculated as follows:

Area	Million metric tons		
	Brine	Potassium chloride	Magnesium chloride
Zapayal	1,542	6.31	52
Ramon	815	8.15	70
Namuc	684	2.87	25
Total	3,041	17.33	147

Experimental ponds covering 160,000 square meters for recovery by solar evaporation have been built. As projected, output of potassium products will eventually reach approximately 250,000 tons annually which will require 16 square kilometers of evaporation ponds.

MINERAL FUELS

Coal and Coke.—The Northern Peru Mining Co. produced 5,500 tons of anthracite coal for heat and fuel in its camps. Bituminous coal production amounted to 120,086 tons, most of which came from Cerro-Peru's mine at Goyllarizquizga. The run-of-mine material was washed and utilized by the company. From a portion of this coal, the company produced 27,401 tons of metallurgical coke for use at the La Oroya smelter.

The Mining Bank of Peru did considerable exploration work in the anthracite fields in the Santa River region and brought a French Coal Mission to Peru late in 1965 to make a study on the feasibility of increasing anthracite production.

Petroleum.—Total crude petroleum production decreased slightly in 1965 as compared with that of 1964; the increased production from the Continental Shelf Zone was not sufficient to offset the decrease in the Coastal Zone. The percentage of total production from the La Brea y Pariñas fields continued to decline.

Table 4.—Distribution of crude petroleum production by zone and company

(42-gallon barrels)

Zone and company	Production		
	1963	1964	1965
Continental Shelf:			
Belco Petroleum Corp	386,740	555,624	1,063,863
Cabeen Exploration Co	[1] 74,152	[1] 50,022	72,133
Total	460,892	605,646	1,135,996
Coastal:			
Belco Petroleum Corp	181,952	180,181	122,372
Empresa Petrolera Fiscal	2,048,192	2,654,771	2,629,616
International Petroleum Co.,[2]	8,893,016	10,292,890	10,557,893
La Brea y Pariñas	8,603,843	8,114,793	7,357,637
Petrolera Amotape	20,215	16,337	12,578
Total	19,747,218	21,258,972	20,680,096
Eastern:			
Cía. Peruana "El Oriente", S.A	505,337	534,163	583,211
Cía. Petrolera Ganso Azul	754,553	720,271	668,686
Total	1,259,890	1,254,434	1,251,897
Grand total	21,468,000	23,119,052	23,067,989

[1] Formerly Peruvian Pacific Petroleum Co.
[2] Concessions jointly held with Cía. Petrolera Lobitos (Burmah Oil Co.), but operated by International Petroleum Co.

Details of petroleum trade for 1965 are as follows:

Commodity	Thousand U.S. 42-gallon barrels	
	Import	Export
Crude oil	810	2,438
Residual fuel oil	3,018	---
Aviation gasoline	402	---
Diesel fuel oil	6	535
Naphtha (for further refining or blending)	1,739	---
Other	523	27
Total	6,498	3,000

Exploration drilling totaled 32 wells in 1965 as compared with 8 in 1964. Of the 1965 total, 22 were in the Coastal Zone. Development wells totaled 125 for 1965. The Belco Petroleum Corp. erected the first offshore drilling platform in Peruvian waters and completed four wells therefrom by yearend.

Peru's petroleum product consumption pattern changed in 1965 as the fishmeal industry, Peru's largest consumer of residual fuel oil, operated below capacity, and the Lima Light & Power Co. brought its Huinco hydroelectric plant into more complete operation. As a result, consumption of residual fuel oil and diesel fuel oil decreased 7.4 and 5 percent, respectively; however, consumption of motor gasoline, aviation gasoline, turbine fuel, kerosine, and others increased at an annual rate of about 8 percent.

The bulk of Peru's refinery product output was produced by International Petroleum Co.'s Talara plant. The crude oil for this refinery was produced from the La Brea-Pariñas and the InterLob concessions. Rated capacity of this plant at yearend was 55,000 barrels of crude oil per day, but certain modifications should bring it to 57,000 barrels per day during 1966. The 8,500 barrel-per-day capacity of the Conchan Refinery, (Refineria Conchan California, S.A.), south of Lima was not fully utilized because the company's markets were not large enough to absorb rated capacity output.

In the Eastern Zone, Cía. Petrolera Ganso Azul operated a topping plant at Pucallpa, at a rate of 15 percent above that of 1964, processing 225,571 barrels Empresa Petrolera Fiscal at Iquitos increased production 16.5 percent over that of 1964 to 324,814 barrels.

Mobil Oil Co. and its West German associates completed a feasibility study on bringing natural gas to the Lima area from their indicated gas structures at Aguaytía, Pisqui, and Tahuaya, about 50 kilometers northwest of Pucallpa.

Late in 1965, the Government of Peru's Empresa Petrolera Fiscal signed an agreement with Japanese interests for construction of a new 20,000-barrel-per-day refinery at La Pampilla, near Callao, estimated to cost $14,515,000.

At yearend, the longstanding dispute between the International Petroleum Co. and the Gorvernment of Peru over the La Brea property was still unresolved, but it was hoped that a settlement would be reached in 1966.

The Mineral Industry of Surinam

By Garn A. Rynearson [1]

The bauxite-dominated mineral industry of Surinam in 1965 not only surpassed all previous records for output of dried and calcined bauxite products for the export trade, but also inaugurated an important new refinery and smelter complex in which a part of the country's bauxite resources will be processed to higher unit value alumina and some to ingot aluminum as well. Initial production and export of these two commodities late in 1965 brought to fruition the principal goals of the Brokopondo Agreement, signed by the Surinam Government and the Suriname Aluminum Co. (Suralco) in 1958, whereby Suralco agreed to finance, construct, and operate Surinam's first major hydroelectric facility and to expand its bauxite operations to include alumina and aluminum plants. Although the overall project by yearend still was considerably short of capability to operate at or near planned capacities, both Government and industry could take pride in the results of their cooperative efforts.

A United States-French consortium obtained formal approval for joint operations in an offshore petroleum exploration concession and continued geophysical surveys preparatory to resumption of wildcat drilling activity during 1966. In the meantime, the possibility of developing a petroleum industry based on domestic crude oil was stimulated by the accidental discovery of at least a small quantity of recoverable crude oil while drilling a water well in an onshore coastal area. At yearend, however, the existence of commercial deposits of either crude oil or natural gas had not been definitely established.

Planning and feasibility surveys for several new development projects involving utilization of potential but untapped mineral and hydroelectric resources progressed well during 1965. However, much time and effort will be necessary before these projects can have a substantial effect on Surinam's economy. The country's first 10 year plan, which had provided most of the funds to initiate these projects, ended in 1964, but committed funds still were available during 1965, and an interim loan from the Netherlands Government will permit continuation of development programs until yearend 1966. Meanwhile, a new National Development Plan has been drawn up by the Surinam Planning Bureau and submitted to Netherlands experts for study.

The high-level bauxite deposits discovered by the Geological and Mining Service in the Adampada-Kabalebo area of the Bakhuis Mountains in the western part of Surinam are the focal point for the most ambitious of the Government's development programs. It is hoped that these virgin bauxite deposits, with estimated reserves in excess of 400 million tons, will provide the basic incentive for integrating a large and virtually uninhabited part of Surinam into the money economy of the country. The Government has clearly indicated its intent to maintain firm control over the exploitation of bauxite and other resources in the region to assure the concomitant creation of an infrastructure that will permit the country to derive maximum benefit from the existing potential.

Pronouncements by various Government officials emphasized that concessions to exploit Bakhuis bauxite will be granted only on the condition that a portion of the ore be processed to metal in Surinam. To this end, much attention was given to studies and plans to develop the hydroelectric potential of western Surinam to provide

[1] Physical scientist, Division of International Activities.

power for smelters and other industrial and domestic purposes. The Bureau of Waterpower as well as the West German firm of Salzgitter Baugesellshaft m.b.H., the Netherlands Engineering Consultants, and several Government consultants and commissions were engaged in various activities concerning the development of power and transportation facilities in the region. As the result of preliminary studies, the Government apparently envisions one or more hydroelectric dams along the lower Kabalebo River, the main damsite to be at Avanavero, with a total generating capacity of 1.5 million kilowatts. At one time, it was planned to divert water from the Corantijn River into the Kabalebo basin to provide the additional water needed, but this procedure would involve prior settlement of disputed border problems with Guyana; Surinam claims all water rights of the Corantijn River which constitutes the common boundary of the two countries. Later, a less controversial plan was announced which would involve diversion of water to the Kabalebo River from rivers located within the physical boundaries of Surinam.

The development of an adequate transportation network will be a formidable and lengthy process, inasmuch as the western part of Surinam south of the narrow lowland coastal strip is virtually inaccessible except by air to several jungle airstrips or by difficult boat travel along some rivers. Little progress in this sector was accomplished by yearend except at the planning level. The village of Apoera, on the Corantijn River about 50 kilometers north of Avanavero, was mentioned as a possible site to develop a loading port for alumina and other export products that might be produced in the region if and when the Kabalebo project becomes a reality.

Although representatives of the Government and the several interested aluminum companies discussed various proposals and possibilities for exploitation of Bakhuis bauxite either by individual companies or by a consortium, no definite agreements were reached during the year. Nevertheless, in October a consortium comprising Suriname Aluminum Co. (Alcoa subsidiary), N.V. Billiton Maatschappij, Surinam Minerals Corp. (Ormet Corp. subsidiary), and Alcan Aluminium, Ltd., was issued an orientation permit for 1 year (valid until October 1966) to allow the members to evaluate the deposits and make preliminary appraisals of the feasibility of exploitation projects. Although the Kaiser Aluminum Co. was not included in this consortium, this company, and perhaps others as well, reportedly has indicated a definite interest in a smelter operation connected with the Kabalebo development project. In the meantime, the Geological and Mining Service continued its mapping and other investigations in the area.

The Government's development plans also include two other dam projects of lesser importance but which might well be of more immediate significance to the economy, inasmuch as they would provide some relief to an aggravated unemployment problem arising partly out of completion of the Brokopondo construction projects. The Stondansie Dam project on the Nickerie River is essentially an irrigation venture but may also involve a small hydroelectric power facility. The Torarica Dam project, on the Suriname River between Paranam and the Afobaka Dam, will be a multipurpose project. Damming the river at this point will make possible (1) the generation of additional electric power for use in the expanding Paranam-Paramaribo consumer market; (2) the irrigation and leaching (of salt-water contaminated soils) of potential agricultural areas east and west of the river; (3) a bridge connection between roads on each bank; and (4) a lock system at the damsite which will make the river navigable from Paramaribo to Afobaka and greatly facilitate the transport of mineral construction materials (for example, stone from Phedra), as well as forestry and agricultural products from the interior to the coastal area. The lake to be formed in the sandy terrain above the dam would also provide the basis for the formation of an important recreation area. Cost of the Torarica project has been estimated at roughly $10 million,[2] and it would provide employment for approximately 700 workers.

A substantial increase in funds was allocated to the mining sector for 1966, and the Geological and Mining Service expected to increase the tempo of its program of evalu-

[2] Where necessary, values in this chapter have been converted from Surinam guilders or florins (Sur. f) at the rate of Sur. f1.00 equals US$0.535.

ating the mineral resource potential of the country. Systematic geologic mapping of the drainage areas of the Kabalebo, Lucie, Coeroenie, and the upper Saramacca and Tapanahony rivers was to continue, and new areas were to be added to the geophysical exploration and diamond-drilling program being conducted under a United Nations Special Fund project. In addition, the Service planned to introduce geochemical techniques to augment its exploration and research capabilities.

The Central Air Mapping Service, which already has made available aerial photogrammetric maps of a large part of the country, planned to undertake large-scale mapping in the southeastern corner of Surinam during 1966, as well as the preparation of special maps needed for the surveys of mineral and waterpower potentials that are in progress or planned for the near future.

Information concerning the mining and processing operations of the bauxite companies was summarized from company reports, consular dispatches, and consultations with company officials. Other information presented in this chapter is based on various government and industry sources in their original versions or as reviewed by consular dispatches. Reports of the Central Bank van Suriname and the Stichting Planbureau Suriname as well as materials prepared by the Consulate General of The Netherlands at New York were especially useful. Information on petroleum exploration was based in part on material published in the August 1966 issue of the Journal of the American Association of Petroleum Geologists.

PRODUCTION

Dried and calcined bauxite produced and exported from Surinam during 1965 was valued at $43.1 million, compared with $38.9 million in 1964. The initial output of alumina and aluminum for the export market was valued at $3.3 million and $0.5 million, respectively. Royalties on bauxite paid to the Government amounted to $1.82 million during the year. In addition, the bauxite companies paid a large share of the total income tax collected. The bauxite-aluminum industry not only overshadowed all other aspects of the mineral industry, but continued to be one of the largest, if not the largest, contributors to total government income and again accounted for the largest share of any sector in the gross national product of the country. Although the amount of bauxite produced for export probably will not increase, and might even decrease slightly, full operation of the alumina refinery and aluminum smelter at Paranam within the 1966–67 period should result in continued dominance by this industry in Surinam's economy.

The value of gold output in 1965 decreased nearly $70,000 to $220,127. Although the value of reported output of sand, gravel and crushed stone increased markedly from about $64,000 in 1964 to nearly $400,000 in 1965, data for these and other construction materials remained incomplete. Moreover, no value data are available for the manufactured gas produced nor for the electric energy which is generated at Afobaka and several diesel-electric plants located in Paramaribo, Paranam, Moengo, and perhaps a few other scattered localities. Official statistics for electrical energy produced show a gradual increase from 94.8 million kilowatt-hours in 1961 to 128 million in 1964, then a sharp increase to 243.7 million in 1965, which presumably reflects at least a part of the initial below-capacity output of the Afobaka powerplant in the latter part of the year.

Production statistics were derived mainly from data compiled by the General Bureau of Statistics for Surinam, from data gathered by the U.S. Consulate General at Paramaribo, and from data supplied by the bauxite companies. In some instances data given by these and other sources do not agree, especially data pertaining to bauxite and its subproducts. In such cases, company-supplied data were given precedence. Company-reported shipments or official trade data were used to reflect output of some commodities for which actual production figures were considered confidential or simply were not available.

Table 1.—Surinam: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Bauxite:					
Crude, dry bauxite equivalent: [1]					
For conversion to alumina	-----	-----	-----	-----	277,032
For road surfacing and similar uses	46,833	50,207	70,198	113,372	NA
Processed, for metallurgical, chemical, abrasive, and refractory uses:					
Production, all grades, gross weight	3,453,000	3,297,000	3,438,000	3,993,000	4,360,000
Shipments, for export market:					
Dried, gross weight	3,253,309	3,060,738	3,271,815	3,748,773	4,125,466
Calcined, gross weight	150,303	189,749	210,374	235,465	243,452
Total	3,403,612	3,250,487	3,482,189	3,984,238	4,368,918
Dry bauxite equivalent [2]	3,373,300	3,242,200	3,477,800	r3,977,300	4,346,200
Alumina: [3]					
Shipments, for export market	-----	-----	-----	-----	59,356
Delivered to smelter	-----	-----	-----	-----	12,538
Metal, unwrought (exports)	-----	-----	-----	-----	1,253
Columbium-tantalum ore	-----	-----	[4] 2	NA	[5] 7
Gold, troy ounces	r4,011	r2,598	3,548	8,258	6,269
Tin: Cassiterite concentrate, long tons	-----	-----	[4] 2	NA	NA
Nonmetals:					
Clay brick, cubic meters	841	1,316	2,316	1,827	2,599
Lithium minerals: Amblygonite (exports)	431	750	515	NA	NA
Sand and gravel:					
Common sand	NA	NA	NA	NA	149,748
Quarry sand	8,895	8,366	7,671	5,725	10,423
Natural gravel	NA	NA	NA	NA	34,034
Stone, crushed	18,750	17,006	14,782	9,629	13,807
Mineral fuels: Gas, manufactured [r 6] million cubic feet	146	155	161	170	176

r Revised. NA Not available.

[1] Data are not available for crude bauxite produced for processing into dried and calcined products.

[2] Calculated on the basis of known average moisture content of dried bauxite shipped by Suriname Aluminum Co., an approximate moisture content of 3 percent for dried bauxite shipped by N.V. Billiton Maatschappij, and an estimated average of 30 percent for the chemically combined water content of bauxite that was calcined. Figures do not include dry equivalent of crude bauxite delivered to alumina refinery or used as road metal or other similar uses.

[3] Additional quantities may have been produced and stocked or converted to stocked metal at yearend.

[4] Imports from Surinam by the Netherlands. The Netherlands also imported 11 tons of unspecified metallic ores from Surinam in 1963, most or all of which was cassiterite or columbite-tantalite or both.

[5] U.S. imports for consumption from Surinam.

[6] Original data reported in thousand cubic meters. Converted at rate of 1 cubic meter equal to 35.315 cubic feet.

TRADE

The sharp upward trend in Surinam's foreign trade continued in 1965 as the total value of exports of all commodities of domestic origin increased by $10.5 million to a new high of $58 million, and value of all commodity imports increased by $14.8 million to a record high of $96.1 million; reexports of foreign goods also increased but did not quite reach a total value of $1 million. The major part of the 22-percent increase in exports was attributed to greater exports of bauxite and the addition of small, but significant, initial output of alumina and aluminum to the list of export goods; however, a strong recovery in exports of agricultural products also was a notable factor in the overall increase. Although the rise in imports was not as remarkable as that registered during 1964, the 18-percent increase again reflected mainly the import of goods essential to expansion of the bauxite industry.

Surinam's chronic deficit trade balance, which increased abruptly from $5 million in 1960 to a level of $12 million annually for 1961–63 and to $33.1 million in 1964, amounted to $37.2 million in 1965. For the most part, the relatively large trade deficits

Table 2.—Surinam: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum:				
Bauxite, all grades	3,482,142	3,983,969	4,368,771	United States 3,371,009; Canada 604,168.
Alumina	-----	-----	59,356	
Metal:				
Unwrought (domestic)	-----	-----	1,253	
Unwrought (reexports) [1]	2	-----	11	
Semimanufactures (reexports)	1	12	-----	Mainly to Europe.
Copper, unwrought (reexports) [1]	60	61	86	All to West Germany.
Iron and steel (reexports):				
Unwrought [1]	1,150	-----	1,930	
Semimanufactures	10	108	1	French Guiana 98.
Lead, unwrought (reexports) [1]	17	46	72	Netherlands 23; West Germany 23.
Metallic ores, slag, ash, not elsewhere specified	[2] 10	[3] 105	[4] 52	West Germany 100.
Nonmetals:				
Amblygonite	515	([5])	([5])	
Cement (reexports)	21	-----	-----	
Salt (reexports)	30	-----	-----	
Sand, clay, earth	4,978	2,156	4,523	Brazil 1,490; Netherlands Antilles 665.
Other (reexports) [6]	4	([7])	1	All to Jamaica.
Mineral fuels (reexports):				
Petroleum refinery products:				
Gasoline 42-gallon barrels	-----	598	975	All to French Guiana.
Kerosine ---do	17	69	340	Do.
Distillate fuel oil ---do	-----	25	13	Do.
Lubricating oil ---do	385	129	383	British Guiana 56; French Guiana 51; St. Kitts 22.
Liquefied petroleum gas (LPG)	-----	3	-----	British Guiana 2; Trinidad and Tobago 1.
Other 42-gallon barrels	([7])	1	133	All to French Guiana.
Asphalt, natural bitumens, mixtures	5	([7])	2	All to Netherlands Antilles.
Mineral tar [8]	8	11	([7])	All to British Guiana.

[1] Apparently includes scrap derived from imported metal and metal products.
[2] Excludes amblygonite exports to West Germany. Netherlands data on imports from Surinam indicate that most, if not all, of quantity shown was cassiterite and columbite-tantalite concentrates.
[3] Commodity not specified. Supplemental information from source indicates that at least part of quantity shown was amblygonite.
[4] Excludes alumina exports included under this classification. Amount shown may include a small quantity of columbite-tantalite imported from Surinam by the United States, and the remainder may represent continued exports of amblygonite to West Germany.
[5] Actual quantity and destination not identified in source. See footnotes 3 and 4.
[6] Largely miscellaneous construction materials and fertilizers.
[7] Less than ½ unit.
[8] Includes domestic as well as reexported products.
Source: Algemeen Bureau voor de Statistiek, Suriname: Maandstatistiek van de in-en uitvoer per goederensoort en per land, December (cumulative), 1963–65.

Table 3.—Surinam: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum:				
Unwrought	([1])	([1])	31	All from United States.
Semimanufactures	200	1,283	2,066	United States 1,197.
Beryllium, all forms ---kilograms	---	125	---	All from Netherlands.
Copper:				
Unwrought	1	1	([1])	All from Netherlands.
Semimanufactures	58	91	111	United Kingdom 43; Netherlands 25; United States 18.
Iron and steel:				
Unwrought	([1])	22	48	Mainly from Netherlands.
Semimanufactures	12,021	23,426	23,951	Japan 7,602; Netherlands 6,636; Belgium 4,619.
Gold, unwrought ---troy ounces	1,622	---	257	

Table 3.—Surinam: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Lead:				
Unwrought	---	---	3	
Semimanufactures	39	27	40	Netherlands 25.
Magnesium, semimanufactures kilograms	400	(1)	500	All from Netherlands.
Mercury 76-pound flasks	8	3	3	Mainly from Netherlands.
Nickel, semimanufactures	(1)	10	(1)	All from Netherlands.
Tin, all forms long tons	5	7	7	Mainly from Netherlands.
Zinc, all forms	(1)	2	38	All from Netherlands.
Metallic ores, slag, ash, not further specified	2,264	---	3	
Nonmetals:				
Abrasives, natural	2	2	1	Mainly from Netherlands.
Asbestos and asbestos-cement building materials	732	1,154	1,692	Netherlands 550; United States 329; Belgium 149.
Cement:				
Refractory	14	315	640	United States 291.
Other	49,390	42,445	50,248	Venezuela 37,694; United States 4,458.
Chalk	162	212	231	Netherlands 144; Belgium 60.
Clay building materials, nonrefractory	413	680	929	Netherlands 327; Czechoslovakia 267.
Earths, pigment and siliceous	7	58	55	Netherlands 29; United States 28.
Fertilizer materials:				
Nitrogenous	2,683	3,170	2,969	Netherlands 1,710; Netherlands Antilles 960; United States 494.
Phosphatic	59	63	190	Mainly from Netherlands.
Potassic	74	52	18	United States 40; Netherlands 12.
Not specified	289	314	417	Netherlands 264; West Germany 50.
Total	3,105	3,599	3,594	Netherlands 2,048; Netherlands Antilles 960; United States 534.
Lime	264	182	4,726	Netherlands 137.
Refractory brick and similar products	327	754	1,372	United States 678.
Salt	1,196	1,177	1,285	West Germany 847; Netherlands 281.
Sand, clays, earth, not further specified	159	737	739	United States 665; Trinidad and Tobago 68.
Stone:				
Dimension, not worked and worked	215	890	5,478	Venezuela 740; Netherlands 143.
Broken stone, gravel, macadam	5,609	3,386	10,605	British Guiana 1,977; Venezuela 1,400.
Other	92	117	161	Netherlands 110.
Other [2]	26	37	4,368	United States 19; Netherlands 12; Trinidad and Tobago 5.
Mineral fuels:				
Solid fuels:				
Coal	37	37	22	Netherlands 30; United States 7.
Other, not specified	51	78	7,703	Netherlands 56; United States 22.
Gases, liquefied:				
Natural and refinery	1,651	656	1,475	All from Trinidad and Tobago.
Manufactured	72	86	146	Trinidad and Tobago 79; United States 7.
Petroleum refinery products: [3]				
Gasoline:				
Aviation thousand 42-gallon barrels	9	24	19	Trinidad and Tobago 23.
Other do	139	122	139	Trinidad and Tobago 120.
Kerosine do	42	41	44	Mainly from Trinidad and Tobago.
Distillate fuel oil do	501	514	577	Trinidad and Tobago 508.
Residual fuel oil do	546	657	996	All from Trinidad and Tobago.
Lubricating oil do	25	21	26	United States 16; Netherlands Antilles 2.
Paraffin and vaseline	42	69	52	United States 36; Netherlands 25.
Other thousand 42-gallon barrels	2	19	4	United States 11; Trinidad and Tobago 7.
Asphalt, natural bitumens, mixtures [4]	536	1,270	1,476	Trinidad and Tobago 1,192.
Benzol, toluol, xylol	58	27	35	Netherlands 24.
Mineral tar, pitch, pitch coke	77	81	273	Netherlands 73.

[1] Less than ½ unit.
[2] Includes some materials not identified by commodity in source and commodities not listed separately in table.
[3] Excluding petroleum asphalt and liquefied refinery gases.
[4] May include some refinery asphalt.

Source: Algemeen Bureau voor de Statistiek, Suriname: Maandstatistiek van de in-en uitvoer per goederensoort en per land, December (cumulative), 1963–65.

of recent years reflected the inflow of capital for expenditures on the Brokopondo project. This trend should reverse markedly during 1966 as these investments begin to pay off in large-scale output and export of alumina and ingot aluminum as well as supplemental capacity to produce bauxite for export, and it may even be possible for Surinam to realize a trade surplus in 1966 or 1967.

Comparative values of trade in metals and minerals for 1963–65 were as follows:

	Value (thousand dollars)		
	1963	1964	1965
Exports:			
Domestic goods:			
Metals	35,373	38,883	46,938
Nonmetals	52	5	63
Total	35,425	38,888	47,001
Reexports:			
Metals	37	54	95
Nonmetals	4	(1)	(1)
Mineral fuels	18	8	19
Total	59	62	114
Imports:			
Metals	2,982	5,638	6,684
Nonmetals	1,623	1,917	3,558
Mineral fuels	5,281	5,741	6,613
Total	9,886	13,296	16,855

[1] Less than $500.

The products of the bauxite companies—dried and calcined bauxite, alumina, and aluminum ingot—represented 99.9 percent of the value of all domestic metal and mineral exports and 80.9 percent of all exports of domestic goods. These percentages were virtually the same as those for 1964, but the relative importance of dried and calcined bauxite products decreased from 82 to 74 percent of total export value, and will continue a downward trend until the Paranam refinery-smelter complex attains optimum utilization of its installed or planned production capacities for high-unit value alumina and aluminum metal.

The total value of metal and mineral imports was 26.8 percent greater than that of 1964 and represented 17.5 percent of all imports. These figures are minimal in that they exclude the value of some raw materials, imported for use in the alumina and aluminum plants (for example: Caustic soda, cryolite, various forms of carbon), that cannot be separately identified in Surinam trade statistics. One such entry, listed as "other inorganic compounds" increased in value by $2.1 million and probably represented raw materials that were an essential element of the mineral industry. Imports of machinery and transport equipment, much of which was destined for use in some phase of the mineral industry, increased in value by $2.3 million. Thus, imports of materials for or closely related to the mineral industry, that is, metals and minerals, certain chemical compounds, and some machinery and transport equipment, accounted for about $7.9 million of the total increase of $14.8 million in imports during 1965.

Official export statistics do not indicate all countries that receive Surinam bauxite products; part of that credited to the United States is eventually consumed by customers in Canada as well as 10 or more unidentified countries on other continents. The United States and Canada, however, consume the bulk (97 percent) of the bauxite exported from Surinam. The consumption patterns for the alumina and aluminum now produced in Surinam are ex-

Table 4.—Bauxite shipments from Surinam
(Metric tons)

Company and destination	1964	1965
Suriname Aluminum Co.:		
United States and Canada	2,427,629	2,645,910
Europe	80,346	85,271
Others	16,772	13,367
Total	2,524,747	2,744,548
N.V. Billiton Mij.:		
United States	846,531	893,734
Canada	604,168	705,856
Europe	2,080	20,005
Others	6,712	4,775
Total	1,459,491	1,624,370
Grand total	3,984,238	4,368,918

pected to be somewhat different. The alumina produced in 1965 and most of the output for 1966 will be consumed mainly by United States and Netherlands customers or affiliates of Suralco and Billiton in both countries, and most of the aluminum produced by Suralco during the same period probably will be sold to Alcoa customers in Europe because of the advantages accruing from Surinam's associate status in the European Economic Community.

COMMODITY REVIEW

METALS

Aluminum.—The industrial highlight of the year in Surinam was the dedication on October 9 of the new 60,000-metric-ton aluminum smelter of Suriname Aluminum Co. (Suralco), one of the most important foreign subsidiaries of Aluminum Company of America. Her Majesty, Queen Juliana of the Netherlands, officiated at the ceremonial pouring of Surinam's first aluminum in the presence of guest dignitaries from Surinam, the Netherlands, and the United States. Alumina for the smelter was supplied by Suralco's new refinery at Paranam, whose first 200,000-metric-ton unit began shakedown operations with little fanfare in July. The company's integrated Paranam complex was widely publicized as the world's first aluminum operation incorporating mining, refining, and smelting at a single site.[3] The year was studded with numerous other milestones of achievement by the company, culminating with the first export shipment of Surinam aluminum ingots on the last day of December.

In March and August, respectively, Suralco announced it had been authorized to add a third and a fourth unit to the alumina refinery, thus expanding total planned capacity to 800,000 metric tons. The second 200,000-ton unit was completed and started operating late in September, and shipments of alumina from the first two units began early in October. The third unit was scheduled for completion by mid-1966, and the fourth was expected to be operational early in 1967.

Although the gates of Suralco's dam on the Suriname River at Afobaka were closed early in 1964, an extended drought period continued to affect that part of Surinam, and the accumulation of water behind the dam was much slower than had been hoped. One of five 30,000-kilowatt turbine-generator units on line was put into operation in June, but at yearend powerplant operations still were limited to less than one-third of capacity owing to the low water level. Nonetheless, sufficient power was available to start smelting operations on schedule; however, only about two-thirds of one of the two installed potlines was actually in operation at yearend, and it was anticipated that the smelter would have to operate well below capacity during much of 1966, or at least until the drought is broken and the water level rises substantially at Afobaka. The company reportedly has seriously considered installation of standby steam-generating facilities at Paranam to offset the further possibility of drought-caused shortfalls in hydroelectric power.

The Suralco bauxite mines and processing plants in the Moengo and Paranam areas attained record levels of production, resulting in total export shipments of 2,744,548 metric tons of dried and calcined products —representing the equivalent of 2,770,606 metric tons of bone-dry bauxite ore—as well as deliveries of 277,032 tons (calculated to bone-dry basis) of bauxite to the Paranam alumina refinery. In terms of dry bauxite equivalent, total effective bauxite production was 3,047,368 tons which was 18.2 percent higher than that of 1964.

---

[3] This claim might well be disputed by Alumínio Minas Gerais S.A. (Aluminas), an affiliate of the Brazilian subsidiary of Alcan Aluminium Ltd., which has produced alumina and aluminum since 1951 at its plant at Saramenha, Minas Gerais from baxuite mined at deposits only a few kilometers distant from the reduction plant and with power generated mostly at its own hydroelectric plants; the original operator of the Saramenha plant, Electra-Química S.A. (Elquisa) produced about 800 tons of aluminum in 1945, the only year this company operated.

Table 5.—Surinam: Suralco export shipments of bauxite by grade and plant [1]
(Metric tons)

Grade	1964		1965	
	Moengo	Paranam	Moengo	Paranam
Metallurgical	1,546,246	686,430	1,746,674	708,756
Chemical	56,606	------	41,607	4,059
Calcined grades	193,493	41,972	196,252	47,200
Total	1,796,345	728,402	1,984,533	760,015

[1] Gross weight as shipped.

Suralco's new Adjoema mine in the Moengo area was in full operation during the year while the nearly depleted Ricanau Hill mine was worked only on a small-scale, cleanup basis. Plans were finalized at year-end to utilize the high-iron portions of the Adjoema deposit in the circuit at the Paranam refinery rather than consider export or other disposal possibilities; the company plans to move this ore to Paranam, utilizing a new push-boat tug and barges, and has adapted equipment previously used to unload Rorac ore to handle that from Adjoema. A previously announced decision to discontinue production of chemical-grade bauxite at Moengo was reaffirmed by company officials; however, output of abrasive-grade bauxite was to be expanded by adding another calcining kiln, the completion of which is scheduled for April 1967.

Mining operations by the company in the Paranam area were largely focused on the Onoribo II and Onoribo IV mines, both of which were in full operation during the year, whereas the ore deposits at Rorac were virtually depleted, and the company expected to close down this mine early in 1966. Preliminary measures in connection with development of a new mine to open the Lelydorp deposit were begun, including land acquisition activities, some detailed drilling, surveying, and road studies. The Lelydorp deposit, like the original Onoribo II deposit, is near the surface and is reflected by a slight topographic elevation. Although appreciable overburden will have to be removed to expose the ore, the deposit will be relatively simple to develop for mining compared with the 10-year effort involved in gaining access to the Onoribo IV deposit, which was not only deeply buried but also adversely located with respect to local fluvial features and therefore presented some rather challenging engineering problems for Suralco to overcome.

N.V. Billiton Maatschappij also produced and shipped record amounts of bauxite in 1965 as gross shipments totaled 1,624,370 metric tons, representing an estimated dry bauxite equivalent of 1,575,640 tons, which are increases of 11.3 percent over the corresponding figures for 1964. The company reported making considerable new investments for improvements in the capacity and efficiency of its production facilities and in the application of more selective mining practices. One of the two bucket-wheel excavators employed to strip overburden was seriously damaged by a landslide in the latter half of the year, but stripping operations were well advanced by that time, and the accident did not disrupt or delay ore mining schedules.

Billiton reportedly has secured long-term contracts covering the marketing of its entire remaining reserve of ore, either in the form of graded bauxite or as alumina to be made on a toll basis at the Suralco refinery from Billiton bauxite. The alumina contracts commit Billiton to begin shipments to Phelps Dodge Corp. in the United States and to Aluminum Delfzijl N.V. in the Netherlands early in 1966; Billiton has a one-sixth interest in the new Delfzijl aluminum smelter.

Both bauxite companies concluded mutually satisfactory agreements with the bauxite workers unions (including Moengo Mijnwerkers Bond and Paranam Werknemers Bond) under which significant wage increases and additional fringe benefits were granted to most employees, including construction workers but excluding staff members and clerical and secretarial help. According to Centrale Bank van Suriname, the bauxite companies employed 2,916 workers in mining and processing operations and 2,557 workers on the Brokopondo projects at the end of 1964. By the end of 1965, however, many phases of the Brokopondo works were finished or nearing com-

pletion, necessitating the layoff of many construction workers; Suralco reported that its construction work force comprised only 1,781 at the end of 1965. On the other hand, the Bank reported that yearend employment in production activities increased appreciably to a record high total of 4,034 workers.

Gold.—The districts along the Marowijne River and its upper tributaries in eastern Surinam continued to be the principal sources of the gold produced. Output in 1965 decreased in all districts except Tapanahony, where output has nearly tripled since 1960. The sharp decline in total production was largely attributed to lower output by the principal producer, Lawa Goudvelden Maatschappij (formerly Northshore Goldfields, Ltd.); operational time of its dredge was limited due to the unusually long dry season and, in addition, the area dredged had been previously worked by other methods. The company planned to dredge more promising ground during 1966 and hoped to increase output considerably, providing weather conditions are such that ample water will be available.

The relatively small amounts of placer gold recovered in districts other than Lawa was won mostly by individual prospectors using hand methods. Preliminary reports indicate that one or more new mechanized gold recovery operations may be undertaken in eastern Surinam in the near future. Late in 1965, Gulf States Lands and Industries, Inc., parent company of Colmar Surinam Oil Co., established the Marowijne Mining Co. (Mijnbouw Maatschappij Marowijne N.V.) and obtained a gold mining concession on which sampling and other exploratory work was planned for 1966.

MINERAL FUELS

Petroleum.—Exploration activities in connection with the possible existence of commercial deposits of petroleum or gas in Surinam territory, both offshore and onshore, generated considerable interest in the country during 1965. On March 1, the original 14-million-acre offshore exploration concession held by Colmar Surinam Oil Co., in which Gulf States Land and Industries, Inc. held a 90-percent interest, was formally revised to permit a consortium of French interests, led by Petropar, to participate as an equal partner with Colmar under a new concession agreement. Colmar in turn acquired a 50-percent interest in the 8.6-million-acre offshore concession the French group held in French Guiana. The new Surinam concession reportedly was granted for a 50-year period and included a provision requiring the drilling of at least three test wells during 1966 and a provision that a portion (at least 500,000 tons) of any crude oil found in the offshore area must be refined in Surinam.

The French interests involved formed an operating company called Suriname Petroleum Maatschappij (Petrosur), based in Paramaribo. Active exploration was resumed in mid-1965 with a conventional marine seismic survey, resulting in a total of 4,358 kilometers of profile which covered most of the Surinam shelf on a reconnaissance pattern and included additional detail over indicated closures. The survey was conducted by Western Geophysical Co. under the joint supervision of Petrosur and Colmar. Joint operations by the Colmar and French groups also were conducted in adjoining French Guiana offshore areas during the year.

A flurry of excitement was caused by the accidental discovery on October 14 of an onshore oil-bearing horizon at the village of Calcutta in Saramacca District, about 60 kilometers west of Paramaribo. The find was made at a depth of about 150 meters by a government crew while drilling for

Table 6.—Surinam: Production of native gold by river district
(Troy ounces)

River district	1961	1962	1963	1964	1965
Marowijne	698	347	425	228	20
Lawa	2,664	1,618	2,269	6,958	5,204
Tapanahony	320	275	575	718	906
Suriname	299	311	226	174	121
Saramacca	30	47	53	180	18
Total	4,011	2,598	3,548	8,258	6,269

potable water in a school enclave. Two other holes drilled nearby also encountered petroliferous strata; all three wells registered a slight flow of a few barrels per day after strainer pipes had been installed. An analysis of a sample of the oil indicated a gravity of 17° (API) and a high-paraffin base of 25.3 percent.

Although neither the lateral nor the vertical extent of the petroliferous area at Calcutta had been adequately explored by yearend, and the quantity of oil then in evidence was not commercially significant, the actual discovery of recoverable petroleum bolstered hopes of eventually finding commercial deposits somewhere in the coastal or continental shelf areas of Surinam. Ironically, the Calcutta area was included in an onshore concession previously held by Colmar, but the company had permitted its concession rights to expire only a few weeks prior to the discovery.

The Mineral Industry of Venezuela

By Benjamin H. Lim [1]

Performance of the various sectors of Venezuela's mineral industry in 1965 was mixed. Production of petroleum and iron ore, the country's major minerals, increased slightly, but output of gold and diamonds decreased significantly. Crude petroleum output in 1965 amounted to 1,268 million barrels, officially valued at $1,558 million,[2] compared with the 1964 output of 1,242 million barrels valued at $1,537 million. In terms of value the crude petroleum industry contributed 20.3 percent to Venezuela's 1965 gross national product (GNP) of $7,692 million and 21.3 percent[3] of 1964's GNP. The country retained third place among world crude oil producers behind the United States and the U.S.S.R. and remained the leading world petroleum export country, accounting for approximately one-fifth of the world's total. Exports of crude oil and products provided more than 90 percent of the country's total export earnings for the same years.

Iron ore output increased to 17.65 million in 1965, but the industry's contribution to the GNP remained less than 1 percent.

During the latter part of 1965, several proposals were made to amend Venezuela's Law of Eminent Domain. Two of the proposed provisions caused considerable concern. The first of these called for amendment of article 1 of the law to read as follows:

> Article 1: Necessary expropriation will be carried out according to the present law, except for that decreed in Special Laws.
>
> First Paragraph: The State concessionaires that have the right to expropriate through special legislation, due to the public utility of their activities, must conserve to turnover to the nation, without compensation, the lands and permanent works, including accessory installations and equipment which form an integral part of them, which they have acquired through any title, should the concessions be abolished for any reason.

The second proposal of concern was to amend article 51 of the existing law to read, in part, as follows:

> Article 51: When the project is one of those excepted from the formality of a prior designation as a public utility because its condition as such is self-evident, in accordance with the specifications contained in this law, and the agency charged with its execution considers it a matter of urgency, the Court which has jurisdiction in the expropriation proceedings may, within three days after the appropriate petition is filed, and at the request of the expropriating agency, agree to the prior occupation of the property to be expropriated, provided that the petitioner deposits, in money or securities, in a bank or branch or agency of a bank within the district of the Court, the amount at which the petitioner values the property.
>
> If the owner is in agreement with the amount put in escrow and there is no justified opposition, the case will be considered closed.[4]

At yearend, these proposals and others had not been passed by the legislature, but still were being considered.

In October 1965, Venezuela published a National Plan for the period 1965–68. Some of the mineral industry projects included

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from bolívares (Bs) to U.S. dollars at the rate of Bs4.50=US$1.

[3] Revised from 26.0 percent as reported in the 1964 Minerals Yearbook, Volume IV.

[4] U.S. Embassy, Caracas, Venezuela. Department of State Airgram A-561, Jan. 21, 1966.

263-927 O-67—17

in the National Plan for the period 1965–66 were as follows: Development of the San Isidro hill iron ore deposit, in Bolívar State; erection of a 15,000-ton-per-year plant to process nickeliferous laterite ore from the deposits of Loma de Hierro in Aragua and Miranda States; and continuation of projects to modernize gold mining facilities of the Government-owned Minas de Oro de El Callao, C.A. (MOCCA), including extensive geological studies to evaluate gold-bearing ores.

The National Plan (1965–68) included a significant section devoted to the crude petroleum producing sector; goals set for this sector were as follows:

	1964	1965	1968
Value of production:			
By sector:			
Private—million bolívares at 1960 prices	8,092	8,415	9,339
Public—do	15	20	166
By commodity:			
Petroleum—do	8,033	8,354	9,397
Natural gas—do	74	81	108
Total—do	8,107	8,435	9,505
Value of gross product:			
By sector:			
Private—do	6,795	7,072	7,850
Public—do	13	17	139
By commodity:			
Petroleum—do	6,740	7,016	7,892
Natural gas—do	68	73	97
Total—do	6,808	7,089	7,989
Value of exports—do	5,605	5,851	6,646
Fixed gross investments:			
Private sector—million bolívares at current prices	803	795	896
Public sector—do	35	37	62
Total—do	838	832	958
Employment:			
Private sector—thousand persons	33.1	33.0	35.5
Public sector—do	0.6	0.8	1.8
Total—do	33.7	33.8	37.3
Contribution to GNP—percent	20.9	20.3	18.6
Quantity produced:			
Crude oil—42-gallon barrels	1,242	1,291	1,453
Natural gas—million cubic feet	1,388	1,441	1,621
Reserves, crude oil—million 42-gallon barrels	16,982	18,869	23,901

Source: Ministerio de Minas e Hidrocarburos, Venezuela. Carta Semanal (English transl.), V. 9, No. 3, Jan. 15, 1966, p. 17.

At yearend the Minister of Mines and Hydrocarbons commented that the deterioration of oil prices during the last several years had slowed in 1965. He attributed this slackening of price erosion to the various measures taken by the Government's Coordinating Commission on Conservation and Marketing of Hydrocarbons. The Minister also commented that the country's oil revenues had not risen in proportion to the increased rate of production. He attributed this to the fact that the country exported more of the lower priced heavy crude and residual oils and less of the higher priced light crude and production oils.

PRODUCTION

The value of Venezuela's total mineral output in 1965 increased as petroleum output was some 25 million barrels above that of the preceding year, and iron ore production increased by 2 million tons.

Gold output declined 29 percent, presumably as a result of lower ore grades. Diamond production was 21 percent below that of 1964 despite the small gain made in the case of bort.

The decline in coal production was largely attributed to the unsuitability of the coal for blast furnace use.

Production of steel ingots and castings in 1965 was 2.5 times that of 1964, indicating completion of new steelmaking installations.

Table 1.—Venezuela: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Gold—troy ounces	30,071	28,774	26,947	33,536	23,660
Iron ore—thousand tons	14,565	13,266	11,747	15,650	17,650
Iron and steel:					
Pig iron—do	5	123	302	324	319
Steel ingots and castings—do	75	225	364	440	1,085
Semimanufactures—do	NA	83	159	399	347
Nonmetals:					
Asbestos	590	------	------	------	------
Cement—thousand tons	1,513	1,535	1,619	1,894	2,074
Diamond:					
Gem—carats	60,495	93,971	38,400	57,467	46,222
Industrial—do	68,413	75,867	27,597	48,816	34,858
Bort—do	5,268	6,655	3,676	9,321	9,874
Total—do	134,176	176,493	69,673	115,604	90,954
Gypsum:					
For cement manufacture e	53,000	52,900	54,500	66,300	78,500
For other uses	7,033	9,936	9,967	e 10,000	e 12,000
Total e	60,000	63,000	64,500	76,300	90,500
Lime	34,706	44,764	r 50,143	r 67,609	63,997
Limestone:					
For cement e	1,967,000	1,963,000	2,028,000	2,462,000	2,655,000
For lime, agriculture and construction e	r 62,000	r 80,000	r 90,000	r 121,000	114,000
Total e	r 2,029,000	r 2,043,000	r 2,118,000	r 2,583,000	2,769,000
Salt—thousand tons	133	145	r 76	r 203	172
Mineral fuels:					
Coal, bituminous—thousand tons	31	27	42	36	31
Gas, natural:					
Usable production:					
Sold—million cubic feet	66,467	76,207	83,933	87,049	100,876
Producers' fuel and losses—do	116,065	117,409	125,432	130,909	143,122
Transformed into products—do	17,652	20,638	20,825	19,458	20,004
Injected for repressuring—do	487,250	511,470	607,122	598,219	661,311
Subtotal—do	687,434	725,724	837,312	835,635	925,313
Flared—do	548,791	629,029	560,882	551,146	599,060
Total—do	1,236,225	1,354,753	1,398,194	1,386,781	1,524,373
Natural gas liquids:					
Natural gasoline—thousand 42-gallon barrels	2,349	3,348	3,251	2,500	3,647
Liquid petroleum gas—do	5,764	4,758	5,088	1,649	e 2,000
Total—do	8,113	8,106	8,339	4,149	e 5,647
Petroleum:					
Crude—do	1,065,757	1,167,910	1,185,511	1,241,782	1,267,602
Refinery products:					
Gasoline and naphthas—do	42,580	48,578	50,795	45,014	52,308
Kerosine—do	10,847	10,182	8,849	9,880	9,582
Distillate fuel oil:					
Diesel oil—do	43,169	48,917	54,757	48,316	73,655
Gas oil—do	20,511	26,238	24,857	29,392	
Residual fuel oil—do	188,260	212,282	214,573	233,951	256,946
Lubricating oil—do	3,688	4,054	4,402	4,638	4,930
Jet fuel—do	(1)	(1)	(1)	13,678	15,805
Refinery gas, liquid equivalent—thousand 42-gallon barrels	4,581	4,541	4,607	4,522	4,539
Asphalt—do	6,548	6,727	5,275	5,443	5,519
Other—do	19,203	13,755	12,663	r 5,786	5,486
Total—do	339,387	375,274	380,778	400,620	428,771

e Estimate. r Revised. NA Not available.
[1] Not reported separately, included with other commodities apparently including gasoline, kerosine, and other.

TRADE

The dominant role of mineral exports in Venezuela's overall foreign trade picture is revealed by the following tabulation, covering the most recent years for which data are available:

	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1963	1,907.2	1,957.1	97.5
1964	2,011.9	2,053.6	97.9
Imports:			
1963	85.2	822.9	10.4
1964	106.7	1,101.8	9.7
Trade balance:			
1963	+1,822.0	+1,134.2	XX
1964	+1,905.2	+951.8	XX

XX Not applicable.

The distribution of exports by major commodities and commodity groups for 1963 and 1964 was as follows:

Commodity group and commodity	Value (million dollars) [1]	
	1963	1964
Metals:		
Iron ore	73	119
Iron and steel semimanufactures	16	7
Other	2	(2)
Total	91	126
Nonmetals:		
Cement	2	3
Diamond	2	3
Other	(2)	(2)
Total	4	6
Mineral fuels: Petroleum and petroleum refinery products	1,812	1,880
Grand total	1,907	2,012

[1] Data for 1963 differ from that published in Volume IV of Minerals Yearbook for 1964 because a different conversion rate was used in converting Bolívares to U.S. dollars.
[2] Less than ½ unit.

Source: República de Venezuela. Ministerio de Fomento. Dirección General de Estadística y Censos Nacionales, Boletin de Comercia Exterior.

The distribution of import expenditures was as follows, by commodity groups:

Commodity group	Value (million dollars)	
	1963	1964
Metals:		
Iron and steel	61	77
Other	11	14
Nonmetals:		
Fertilizer materials	3	2
Construction materials	2	4
Other	2	1
Mineral fuels:		
Solid	2	3
Petroleum and products	4	6
Total	85	107

COMMODITY REVIEW

METALS

Aluminum.—Construction of Venezuela's first integrated aluminum plant moved a step closer to realization when the Export-Import Bank in July 1965 authorized a $12.5 million loan, under the Alliance for Progress, to Aluminio de Caroní, S.A. (ALCASA). The loan made up approximately one-half of the investment required to complete the project and was to be used to finance the purchase in the United States of machinery, equipment, supplies, and services for construction of the initial phases of the proposed plant. ALCASA, a recently organized firm, is jointly owned by Corporación Venezolana de Guayana (CVG), an agency of the Venezuelan Government, and by Reynolds International, Inc.

Ground breaking for the complex was expected in February 1966. Completion date of the initial phases of the plant has been scheduled for late 1967 or early 1968. These phases include the construction of a reduction plant in the Ciudad Guayana industrial complex near the confluence of the Orinoco and Caroní rivers. The reduction plant will use the Bayer-Hall process rather than the direct reduction process, as announced during early months of planning. Alumina for the plant will be supplied from the United States. Capacity of the plant will be approximately 10,000 tons of ingots and billets per year. Tentative plans for doubling this capacity have been drawn and the cost for the additional installations was estimated at $7 million.

In addition to the projected new reduction plant, other installations in the initial phases of construction include hot- and cold-rolling mills, sheet finishing facilities, and facilities for manufacturing electrical

cables.[5] The related semifabricating facilities will have annual capacities of 27,200 tons of hot-rolled sheets, 13,600 tons of cold-rolled sheets, and 11,340 tons of rods. Production of the plant will substitute for some of the aluminum imports, which in total have cost Venezuela about $2.3 million annually in foreign exchange.

At yearend 1965, four significant companies were engaged in aluminum semifabrication: Alcan de Venezuela, an affiliate of Aluminium Ltd., Canada, in La Victoria; Aluminio Nacional S.A. (ALNASA), an affiliate of Kaiser Aluminum and Chemical Corp., in Guacara; Corporación Venezolana de Aluminio (COVENAL), an affiliate of Società Montecatini, Milan, Italy, and of Aluminum Company of America (Alcoa), in Mariara; and Reynolds Aluminum Extrusions Co., an affiliate of Reynolds Metals Co., in Maracaibo. None of these above companies use aluminum slabs as starting material in the production of semimanufactures which consisted mainly of thin sheets and foil. The basic raw materials for these products were hot- and cold-rolled coil sheets imported mainly from the United States, Belgium, the Netherlands, and the United Kingdom. Combined annual output of the four companies was approximately 15,000 tons of various aluminum semimanufactures.

Gold.—Venezuela's entire gold production in 1965 was from the El Callao region of the State of Bolívar. During the latter part of 1965, the Venezuelan Minister of Mines announced that a new state company, in which private capital would be allowed to participate, was to be formed to replace the Government-owned gold mining company, Minas de Oro de Callao, C.A.

[5] Rannells, K. Aluminum Project for Venezuela Moving Ahead. Am. Metal Market, V. 72, No. 140, July 23, 1965, pp. 1, 13.

Table 2.—Venezuela: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Iron and steel:			
Iron ore—thousand tons	12,319	14,893	United States 10,118; West Germany 2,117.
Cast iron	89,733	82,017	Japan 60,185; Italy 10,364; South Korea 10,312.
Steel ingots and equivalent primary forms	133,605	36,565	Colombia 20,000; Belgium-Luxembourg 6,307.
Seamless tubes	5,277	4,954	All to United States.
Nonferrous base metals, unwrought and semimanufactures, not further described	5,924	3,664	United States 2,087; Netherlands 631.
Nonmetals:			
Cement	185,882	203,375	Surinam 43,163; Martinique 22,772; Costa Rica 19,654.
Diamond—thousand carats	90	170	United Kingdom 60; United States 60.
Gypsum, crude	5,660	3,478	All to Trinidad and Tobago.
Sand, all types	45	-------	
Other nonmetals	162	-------	
Mineral fuels:			
Gas, fuel, natural and manufactured:			
Liquefied petroleum gas—thousand 42-gallon barrels	r 3,450	4,271	Brazil 2,396; United States 578; Argentina 575.
Petroleum:			
Crude—do	r 810,616	857,307	United States 175,405; Aruba 150,115.
Refinery products:			
Gasoline—do	r 11,710	12,429	Brazil 1,702; United Kingdom 1,662.
Kerosine—do	r 11,296	14,489	United States 8,309; Brazil 1,104; France 943.
Distillate fuel oil—do	r 58,313	49,128	United Kingdom 9,219; Switzerland 6,357.
Residual fuel oil—do	r 208,667	231,140	United States 147,523; United Kingdom 19,954.
Lubricants—do	r 1,815	1,660	United Kingdom 472; Argentina 224; Australia 217; Singapore 185.
Bitumen—do	r 3,084	2,947	United States 2,376; Canada 123.
Other—do	r 11	72	Barbados 65.
Tar, mineral, and other crude chemicals from coal, petroleum, and natural gas distillation: Naphtha—do	r 3,775	3,797	United States 2,101; United Kingdom 611.

r Revised.
Source: República de Venezuela. Ministerio de Fomento. Dirección General de Estadística y Censos Nacionales, Boletin de Comercio Exterior, 1963 and 1964.

Table 3.—Venezuela: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys:			
Unwrought	868	2,003	United States 1,908; Canada 54.
Semimanufactures	5,872	6,234	Belgium-Luxembourg 2,014; United States 1,446.
Antimony, all forms	17	14	France 10; Japan 4.
Chromite	121	62	All from United States.
Copper and alloys:			
Unwrought	92	118	United States 112.
Semimanufactures	5,948	6,479	United States 2,173; Canada 1,803; Peru 1,504.
Iron and steel:			
Iron ore and concentrate	(1)	1	All from United States.
Scrap	19,264	7	West Germany 3; Italy 2, United States 2.
Pig iron	6,457	98	France 48; United States 38.
Ferroalloys	2,005	4,022	France 3,051; Norway 418; Canada 321.
Steel ingots and equivalent forms	6,608	1,023	United States 530; Sweden 182; Austria 89.
Semimanufactures:			
Bars, rods, and structural sections	50,036	78,975	Belgium-Luxembourg 43,861; West Germany 12,459.
Plates and sheets:			
Uncoated	57,289	110,076	Japan 62,663; Belgium-Luxembourg 14,364.
Coated:			
Tinplate	53,776	63,868	France 32,776; Canada 13,150; Netherlands 10,800; United States 5,710.
Galvanized and other	22,037	48,317	Japan 17,104; Belgium-Luxembourg 16,927.
Hoop and strip	770	1,137	United States 687; West Germany 152.
Wire	32,352	49,386	West Germany 27,335; Belgium-Luxembourg 15,069.
Pipes and fittings	166,764	132,177	United States 36,398; Argentina 32,625.
Rails and accessories	3,993	1,414	United States 1,379.
Various semimanufactures reported as plated with precious metals	2,614	1,632	United States 1,449; Belgium-Luxembourg 151.
Other	1,273	1,262	United States 382; Netherlands 375.
Lead and alloys:			
Unwrought	r 2,810	2,717	Mexico 1,281; United States 869; Denmark 171.
Semimanufactures	r 151	368	Belgium-Luxembourg 108; United States 68.
Mercury—76-pound flasks	413	43	United Kingdom 17; United States 11.
Nickel and alloys, all forms	61	53	United States 21; United Kingdom 12; Canada 7.
Platinum-group metals and their alloys, unworked and semimanufactures—troy ounces	36,523	12,603	United States 10,545.
Silver and alloys:			
Unwrought—do	371,052	72,275	West Germany 19,483; United States 18,551.
Semimanufactures—do	103,815	108,284	United Kingdom 43,821; United States 36,009.
Tin and alloys:			
Unwrought—long tons	r 226	58	United Kingdom 20; West Germany 16.
Semimanufactures—do	r 27	149	United Kingdom 66; West Germany 33.
Zinc and alloys:			
Unwrought	r 332	3,060	Mexico 849; United States 705; Belgium-Luxembourg 598; Canada 549.
Semimanufactures	r 318	788	United States 407; Australia 280.
Nonferrous metals, semimanufactures reported as plated with precious metals	35	13	All from United States.
Nonferrous metals, not otherwise described:			
Ores, concentrates, and scrap	2,116	8,051	British Guiana 2,598; United Kingdom 2,591.
Metal and alloys:			
Unwrought	107	177	Switzerland 174.
Semimanufactures, other	r 462	47	United States 16; West Germany 15; Canada 6.
Nonmetals:			
Abrasives	r 90	159	West Germany 91; United States 54.
Asbestos, crude, washed or ground	2,626	4,717	Canada 4,032; Rep. of South Africa 273.
Barite	54	17,332	Canada 7,416; Brazil 6,096; Morocco 3,775.
Borates	542	1,539	Belgium-Luxembourg 951; United Kingdom 365.

See footnotes at end of table.

Table 3.—Venezuela: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—Continued			
Clays:			
Bentonite	2,829	4,613	United States 4,159; United Kingdom 371.
China clay (kaolin)	4,144	6,072	United States 4,901; United Kingdom 1,009.
Fire clay	3,572	5,898	United States 5,555; United Kingdom 248.
Cryolite	1	4	West Germany 2; United Kingdom 2.
Diamond, industrial [2] thousand carats	7,555	120	United States 90; United Kingdom 20.
Diatomaceous earth	1,962	2,644	United States 2,558.
Feldspar	5,006	7,990	United States 4,905; Canada 3,084.
Fertilizer materials:			
Nitrogenous	18,902	6,041	West Germany 2,469; Italy 2,303.
Phosphatic	5,790	565	United States 410; Belgium-Luxembourg 155.
Potassic	6,986	12,956	United States 5,268; France 4,509.
Mixed	20,975	20,003	West Germany 9,892; Italy 4,010.
Fluorspar	388	482	United States 261; Rep. of South Africa 160.
Fuller's earth	446	558	United States 409; United Kingdom 83.
Graphite	89	187	United States 112; West Germany 56.
Gypsum, crude and calcined	54	84	United States 63; West Germany 19.
Magnesite	645	817	United States 463; Netherlands 252; Austria 63.
Mica	142	298	United States 289.
Refractory earths and rocks, not further described	1,864	4,667	British Guiana 3,638; Belgium-Luxembourg 606.
Sand	2,671	5,882	United States 5,861.
Stone, industrial, not further described	8,641	11,360	United States 11,217.
Sulfur:			
Unrefined	9,883	22,019	Canada 21,951.
Refined	566	721	United States 476; West Germany 95.
Talc	1,945	2,777	United States 994; Italy 962; Norway 393.
Vermiculite	284	340	United States 320; Rep. of South Africa 20.
Mineral fuels:			
Bitumen, natural	180	240	United States 227.
Carbon black	r 1,073	889	United States 753; Canada 116.
Coal	14,940	705	United States 660.
Coke	126,900	181,937	United Kingdom 81,867; West Germany 56,315.
Coal and coke briquets	148	68	United States 66.
Petroleum:			
Crude and partly refined	10	---	
Refinery products:			
Gasoline, kerosine, and gas-diesel oil 42-gallon barrels	r 680	1,176	Netherlands 560; Canada 384; United Kingdom 112.
Gasoline additives	3,127	16,330	United States 14,602; United Kingdom 1,636.
Lubricants 42-gallon barrels	r 58,877	57,288	United States 46,578; Netherlands 8,533.
Solvents do.	r 6,960	9,880	United States 8,944.
Paraffin and wax	5,858	9,287	United States 9,238.
Vasoline and other petroleum jellies	716	870	United States 824.
Asphalt	675	2,474	United States 2,466.
Other	1,840	2,219	United States 2,081.

r Revised.
[1] Less than ½ unit.
[2] Approximate, based on data reported in kilograms.

Source: República de Venezuela. Ministerio de Fomento. Dirección General de Estadística y Censos Nacionales, Boletin de Comercio Exterior, 1963 and 1964.

(MOCCA). Before formation of a new company, however, officials decided to make further studies and to complete various projects concerning government-operated gold mining facilities. These projects included exploration for new reserves. Liquidation of MOCCA, which started operations in 1953, began at yearend. Chief reason for liquidation was that it had been showing losses every year for some time. Gold output by various producers in Venezuela during 1964 and 1965 was as follows:

Producer	Troy ounces	
	1964	1965
MOCCA	32,275	22,777
Open operations	1,045	593
Other	216	290
Total	33,536	23,660

Source: Ministerio de Minas e Hidrocarburos, Venezuela. Carta Semanal (English transl.), V. 9, No. 9, Feb. 26, 1966, 15 pp.

Iron Ore.—Venezuela's iron ore industry in 1965 continued the upward production trend of the previous year. The industry's gross income in 1965, based on a preliminary production figure [6] of 17.4 million tons, aggregated $134.3 million compared with $115.1 [7] million in 1964. Of this total, $126.3 million ($107.6 million in 1964) was attributed to sales, $6.0 million ($5.6 million in 1964) to Boca Grande Canal tolls; and $2.0 million to services. Net profits of the industry in 1965 also based on preliminary data amounted to $42.4 million compared with $34.0 million in 1964. Costs and operating expenses of the industry in 1965 amounted to $48.2 million ($49.0 million in 1964) while tax revenue totaled $42.3 million ($33.5 million in 1964). The increases in gross income and in net profits were reportedly attributed to increase in sales of 2.3 million tons in 1965 over the 1964 level and to a $0.38 per ton reduction in production costs. Specific taxes levied on the industry in 1964 and 1965 are given as reported in the source in the following tabulation:

Tax item	Thousand dollars	
	1964	1965
Law of mines	622.7	755.1
Consular	494.4	468.3
Municipal and other	314.4	381.3
Total	1,431.5	1,604.7
Income tax reserves	32,072.4	40,666.7
Grand total	33,503.9	42,271.4

Source: Ministerio de Minas e Hidrocarburos, Venezuela. Venezuelan Iron Ore Industry Operations in 1965. Carta Semala (English transl.), V. 9, No. 12, Mar. 19, 1966, p. 9.

Domestic sales of iron ore in 1965 totaled 632,000 tons compared with 574,223 tons in the previous year. Of the 1965 total, 627,022 tons was purchased by Siderúrgica del Orinoco (Matanzas steel plant). The remainder was bought by C.A. Venezolana de Cementos and Siderúrgica Venezolana, S.A. (SIVENSA). Foreign sales of iron ore in 1965 totaled 17.1 million tons, an increase of 15 percent over the previous year. The United States, West Germany, and the United Kingdom imported 73, 11, and 10 percent, respectively, of the total iron ore exported by Venezuela during 1965. The remaining 6 percent was shared by Japan, Italy, Netherlands, and Canada. Thus, of the total sales in 1965, 96 percent was exported and 4 percent was sold in the domestic market. Statistical details on production, domestic sales, and trade for years 1963–65 were as follows:

[6] Financial data relating to revised official production figure of 17.65 million tons are not available.

[7] Revised from figure given in the 1964 Minerals Yearbook, volume IV, on the basis of new data.

	Metric tons		
	1963	1964	1965
Orinoco Mining Co. (subsidiary of U.S. Steel Corp.):			
Production	10,040,305	13,675,884	[1] 14,430,000
Sold in Venezuela	334,323	453,125	403,388
Exported to:—			
United States	7,051,193	8,386,567	9,851,673
West Germany	1,044,117	2,149,468	1,887,530
United Kingdom	1,383,746	1,685,785	1,762,775
Italy	597,439	885,294	689,971
Japan	-----	-----	128,904
Netherlands	-----	34,542	59,313
Canada	-----	-----	19,834
Total	10,076,495	13,141,656	14,400,000
Iron Mines Co. of Venezuela (subsidiary of Bethlehem Steel Corp.):			
Production	1,706,747	1,980,437	[1] 2,970,000
Sold in Venezuela	108,668	121,098	228,612
Exported to United States	2,277,206	1,751,743	2,741,388
National total:			
Production	11,747,052	15,656,321	[1] 17,400,000
Sold in Venezuela	442,991	574,223	632,000
Exported	12,353,701	14,893,399	17,141,388
Total sales	12,796,692	15,467,622	17,773,388

[1] Preliminary data; differs with total given in table 1. (Detail by producer for total production figure in table 1 not available.)

Source: Ministerio de Minas e Hindrocarburos, Venezuela. Carta Semanal (English transl.), V. 9, No. 6, Feb. 5, 1966, 15 pp; No. 7, Feb. 12, 1966, 13 pp; No. 8, Feb. 19, 1966, 16 pp; No. 12, Mar. 19, 1966, 15 pp.

Stocks of iron ore on hand as of December 31, 1965, as reported by the mining companies, were as follows: Orinoco Mining Co., 1,001,431 tons; Iron Mines Co. of Venezuela, 586,441 tons.

At yearend 1965, Venezuela's iron ore concessions in force totaled about 29,000 hectares. During 1965 no iron ore concession areas were either relinquished or granted, but the concession held by Oswaldo de Sala was credited to C.A. Barlovento Minera in 1965 reports. Of the existing concessions, the only areas worked during 1965 were held by Orinoco Mining Co. and Iron Mines Co. of Venezuela. Of the total iron ore mining concession area held in 1965, only 4,300 hectares or about 15 percent of the total was under exploitation. The remaining concessions were not sufficiently developed.

Venezuela's most important iron ore reserves are in the so-called Bolívar Iron Bearing Quadrangle and in Cerro Bolívar and El Pao. Orinoco Mining Co. had the Quadrangle concession while Iron Mines Co. of Venezuela has concessions in the latter two areas. Approximately 93 percent of the known iron ore deposits in Venezuela are in these areas. The remaining 7 percent of the deposits are in the States of Miranda and Monagas. At yearend 1965, proved iron ore reserves under concession totaled some 940 million tons, representing an increase of 15 percent above the 1964 level. Total proven reserves including those owned by the Venezuelan Government were 1,616 million tons.[8]

According to the Ministry of Mines and Hydrocarbons, the Venezuelan Government was considering plans for the installation of two iron ore reduction plants to be jointly operated by CVG and foreign-private firms. One project, a part of a larger proposal advanced early in 1964 by Orinoco Mining Co., will include facilities to raise the iron content of the salable product from 60 to 85 percent. The facilities are to be located at Puerto Ordaz and the cost of the project was estimated originally at about $40 million. The other project involves a process developed by Standard Oil Co. of New Jersey. As both processes will use substantial quantities of natural gas, construction of a network of pipelines from the eastern oilfields to the Guayana area has also been planned. The network will supply other natural gas consumers in the area as well as the previously mentioned facilities.

Iron and Steel.—Venezuela's iron and steel industry in 1965 completed some projects begun in earlier years and started others. New projects included rolling mills and reduction facilities.

Siderúrgica Venezolana, S.A. (SIVENSA), and the Government-owned Siderúrgica del Orinoco, S.A. (SIDOR), a part of the Corporación Venezolana de Guayana (CVG), continued as the only significant iron and steel producers. Data for SIVENSA production, as published in the firm's 1965 annual report, indicated output for the period November 1, 1964, to October 31, 1965. During this period, SIVENSA produced 88,928 tons of ingots and 88,567 tons of rolled products.

Unofficial 1965 production data for the SIDOR facilities were as follows:

Product	*Metric tons*
Pig iron	318,604
Ingots	537,437
Blooms	460,506
Semimanufactures:	
Structural shapes	36,251
Wire rod	12,435
Drawn wire	22,083
Seamless pipe	132,387
Bars and rods	55,006

In late 1965, SIVENSA was constructing a new plant near the existing complex at Carretera de Antimano near Caracas. The new plant will have two Lectromet arc furnaces and two Concast S-1, two-strand continuous casting machines with a total annual capacity of 120,000 tons. The machines will be built by Compagnie des Ateliers et Forges de la Loire (CAFL) of France and are scheduled for full production in early 1966.

On July 2, 1965 SIDOR's cumulative ingot steel output reached 1 million tons. This total included 68,563 tons of steel produced in 1962, 287,891 tons in 1963, 359,882 tons in 1964, and 283,664 tons produced in the first 6 omnths of 1965. The principal installations of the plant included

[8] Ministerio de Minas e Hidrocarburos, Caracas, Venezuela. Monthly Bulletin. V. 1, No. 1, July 1, 1966, 28 pp.

mixing plants, electric furnaces, thermoelectric generators, and sheet, tube, and wire mills. The complex has an annual designed capacity of 750,000 tons of steel ingots and 600,000 tons of various semifinished products. Individual product capacities of the plant's components at yearend 1965 were as follows:

Product	*Annual capacity (Metric tons)*
Iron:	
Cast pipe	30,000
Ingot molds and bases	20,000
Total	50,000
Steel:	
Bars and rods	86,150
Structural shapes	70,000
Sheets and plates	10,350
Wire	27,000
Seamless pipe	295,000
Rails and accessories	61,500
Total	550,000
Grand total	600,000

Source: República de Venezuela. Corporación Venezolana de Guayana (CVG). Informe Anual, 1965, p. III–8.

Much of the plant's pipe production is used in the country's petroleum industry. No new facilities were brought into operation at SIDOR during 1965, and the operation of the Strategy-Udy system was finally abandoned because the process was unsuitable to raw materials used.

Apparent consumption of iron and steel products in Venezuela is shown in the following tabulation:

Commodity	Thousand metric tons	
	1964	1965
Pig iron	e 316	317
Ingot steel	440	625
Bars, rods, and other nonflat products except pipe	355	355
Flat products	227	262
Pipes and tubes:		
Seamless	NA	139
Cast iron	NA	42
Galvanized and seamed	NA	77
Other	NA	7
Total	203	265
Grand total	785	882

e Estimate. NA Not available.

Source: Instituto Latinoamericano del Fierro y el Acero (ILAFA). Revista Latinoamericano Siderúrgia No. 78. October 1966, p. 45.

NONMETALS

Clay.—In 1965, the clay industry consisted of 23 ceramic plants and over 100 producers of brick and similar construction materials. The three largest ceramic firms were Ceramicas Carabobo S.A., Sanitarios Maracay S.A., and Venezolana de Ceramica C.A. These firms, all located in the Valencia-Maracay industrial complex, have a total capitalization of over $10 million and employ about 1,500 workers. Ceramicas Carabobo S.A. produces mainly bathroom tiles while the other two manufacture chiefly porcelain bathroom fixtures. Other ceramic factories small in comparison, produce mainly bathroom fixtures and other products.

The Venezuelan Institute for Technical Investigations (INVESTI) has studied the possibilities of using lightweight clay aggregates for the construction of low-cost housing and also the use of local clays for ceramic manufacturing.[9]

Fertilizer Materials.—Instituto Venezolano de Petroquímica (IVP), the large Government-owned petrochemical complex at Morón, announced in early 1965 that it planned to increase chemical fertilizer output to more than 107,000 tons during the year. This complex, capable of producing all of Venezuela's basic fertilizer requirements, except potash, was expected to supply 80 percent of the domestic demand in 1965, and all of it in 1966. Production in 1964 and the estimated output in 1965, by product, was reported as follows:

Product	Metric tons	
	1964	1965 e
Ammonium nitrate	11,000	21,600
Ammonium sulfate	46,000	50,000
Ordinary superphosphate	12,000	4,800
Triple superphosphate	15,600	19,200
Urea	12,700	12,000

e Estimate.

Production of the country's other three fertilizer mixing companies was as follows:

Company and plant location	*Daily output (metric tons)*
Pennsalt-Comanil C.A.:	
Maracay	200
Commercial Agropecuario:	
Maracay	150
Casa Agricola: Valencia and Barquisimeto	25

[9] U.S. Embassy, Caracas, Venezuela. Department of State Airgram A–596, Mar. 12, 1965.

Installed capacity of the five fertilizer mixing plants in Venezuela at yearend 1964 was reported to be adequate to supply domestic demand for nitrogenous and phosphatic fertilizers. However, the industry reportedly has been operating at only 80 percent of capacity.

To anticipate future needs and to diversify exports, the Government announced in late 1964 a 5-year petrochemical program with a projected cost of about $2,600 million. The program includes the construction of several petrochemical complexes to be located in Zulia, Falcón, Carabobo, and Anzoátegui States. The installations will consume many domestic raw materials that have been either left unused or exported unprocessed. Projects envisaged under the program include expansion of ammonia and sulfuric acid facilities and expansion of national fertilizer production capacity from the present 150,000 tons per year to 500,000 tons per year.

At yearend 1964, IVP had in its fertilizer component approximately 20 plants producing ammonia, ammonium sulfate, and nitrate, nitric and sulfuric acids, and triple superphosphates. In 1965 the Institute broke ground for a fertilizer plant in Táchira State to process locally available phosphorite minerals for consumption in the local area and for export to neighboring Colombia. It also made tentative plans to build an ammonia plant in the Guayana region with a daily capacity of 1,000 tons. The entire production of this plant is planned for export.[10]

In mid-1965, Krebs & Cie., a French firm, and Wellman-Lord Inc., a U.S. firm, submitted lowest bids to IVP to construct two sulfuric acid plants at Morón. The bids were $4.94 million and $4.96 million, respectively. Construction time was estimated at 15 months. Annual capacity of the plants will total approximately 400,000 tons of sulfuric acid with each plant capable of producing 600 tons per day. It was indicated that the output of these plants will be exported.

In addition to the Government-owned plants, Quimica Tapa-Tapa C.A. near Maracay produced sulfuric acid at a daily rate of 50 tons.[11]

MINERAL FUELS

Coal.—Venezuela's coal production continued to decline. Peak recorded production was achieved in 1963. Output was mostly volatile bituminous coal and all but a small amount came from the State of Táchira. C.A. Minas de Carbón de Lobatera, accounted for over 80 percent of total output in the past few years. Other coal producers in the country included C.A. Minas de Carbón de Naricual, C.A. Cementos Táchira, Ponciano Ruiz, G. Omaña, and Cabonera Taguay.

Petroleum and Natural Gas.—Venezuela's average daily crude oil output in 1965 reached 3.5 million barrels and total annual production was about 26 million barrels more than in 1964. The five largest producers in the country in 1965, Creole Petroleum Corp., Cía. Shell de Venezuela Ltd., Mene Grande Oil Co., Venezuelan Sun Oil Co., and Mobil Oil Co. of Venezuela, together produced 87 percent of total crude output, with Creole alone accounting for 37 percent of the total.

During 1965, 673 wells were completed, 16 percent more than in 1964, and as a result of these completions together with recalculations of reserves elsewhere, the total national proven reserve at yearend 1965 was reported as 17,400 million barrels, 200 million barrels more than at yearend 1964.

Creole, Cía Shell de Venezuela, and Mene Grande continued their dominance over the Nation's petroleum refining industry, together accounting for 86 percent of total refining capacity as shown in the following tabulation:

---

[10] U.S. Embassy, Caracas, Venezuela. Department of State Airgram A-711, Mar. 17, 1966.

[11] Sulphur. No. 59, August 1965, p. 6.

Company	1964		1965	
	Capacity (Thousand 42-gallon barrels daily)	Percent of total capacity	Capacity (Thousand 42-gallon barrels daily)	Percent of total capacity
Creole Petroleum Corp	507	42.9	509	42.4
Cía. Shell de Venezuela Ltd	342	28.9	352	29.3
Mene Grande Oil Co	159	13.5	159	13.3
Mobil Oil Co. of Venezuela	75	6.3	81	6.8
Chevron Oil Co. of Venezuela	46	3.9	46	3.8
Others	53	4.5	53	4.4
Total	1,182	100.0	1,200	100.0

Source: Oficina Técnica de Hidrocarburos, Ministerio de Minas e Hidrocarburos, Venezuela. Informe Sobre las Actividades, 1965. Caracas, Venezuela, 1966, p. 36.

Actual refinery throughput was at almost 98 percent of rated capacity, and for the year totaled 429 million barrels of which Creole processed nearly 170 million barrels.

At midyear, the managing director of the Venezuelan Petroleum Corp. (CVP) announced the award of a contract to Japan Gasoline Co. for enlargement of the CVP refinery at Morón. Facilities to be installed include a 14,000-barrel-per-day crude oil distillation unit, a catalytic refining unit, and three fractionating units. The expansion was slated for completion by September 1966, and the cost reportedly was to total $3.1 million of which a part was to be paid to the Japanese firm in the form of CVP crude oil.[12]

As indicated previously under fertilizer materials, IVP announced plans for expansion of Venezuela's petrochemical industry at yearend 1965. Aside from fertilizer commodities summarized previously, announced product capacities for projected facilities were as follows:

Commodity	*Annual capacity (metric tons)*
Ethylene	150,000
Propylene	90,000
Polyvinyl chloride	50,000
Synthetic rubber	50,000
Polyethylene	40,000

The IVP announcement indicated that the following foreign firms were discussing petrochemical possibilities in the country: Allied Chemical Corp., Union Carbide Corp., B.F. Goodrich Co., American Cyanamid Co., W.R. Grace and Co., Dow Chemical Co., Phillips Petroleum Co., International Minerals and Chemical Corp., Imperial Chemical Industries, Ltd., and Shell Oil Co.

[12] U.S. Embassy, Caracas, Venezuela. Department of State Airgram A–76, July 3, 1965.

Table 4.—Venezuela: Distribution of petroleum production, exports, refinery feed, and landholdings by companies, 1965

Company	Parent company		Quantity (thousand 42-gallon barrels)				Concessions [1] and assignations [2] as of Dec. 31, 1965 (hectares)		
	Name	Nationality	Crude production	Crude exports	Product exports	Refinery throughput	Eastern [3]	Western [4]	Total
Private:									
Creole Petroleum Corp	Standard Oil Co. (N.J.)	United States,	473,666	323,525	131,367	[5] 169,658	425,778	294,731	720,509
Cía. Shell de Venezuela, Ltd	Royal Dutch-Shell Group	British, and Netherlands.	351,259	254,843	101,769	136,737	19,500	434,428	453,928
Mene Grande Oil Co	Gulf Oil Corp	United States	150,005	49,188	35,742	40,804	668,158	96,721	764,879
Venezuelan Sun Oil Co	Sun Oil Co	do	77,559	63,508	5,219	5,935	-------	20,000	20,000
Mobil Oil Co. of Venezuela	Socony Mobil Oil Co	do	53,195	27,519	18,983	22,479	148,191	33,520	181,711
Texas Petroleum Co	Texaco, Inc	do	30,203	14,267	15,817	18,945	112,875	14,099	126,974
Chevron Oil Co. of Venezuela [6]	Chevron Oil Co	do	20,205	14,857	9,288	12,427	-------	135,158	135,158
Phillips Petroleum Co	Phillips Petroleum Co	do	26,886	25,029	-------	1,345	63,110	13,840	76,950
Sinclair Venezuelan Oil Co	Sinclair Oil Corp	do	18,464	5,716	10,495	12,218	105,935	65,712	171,647
Texaco-Maracaibo, Inc	Texaco, Inc	do	36,103	36,214	-------	-------	-------	3,147	3,147
Venezuelan Atlantic Refining Co	Atlantic Refining Co	do	2	-------	5,874	7,300	24,359	11,276	35,635
San Jacinto Venezolana, C.A	San Jacinto Petroleum Corp	do	6,759	5,815	-------	-------	-------	797	797
Signal Oil and Gas of Venezuela	Signal Oil and Gas Co	do	5,499	3,455	1,085	-------	-------	8,784	8,784
S.A. Petrolera Las Mercedes	Texaco, Inc.-Ultramar	United States-British	2,856	-------	-------	-------	63,026	-------	63,026
Coro Petroleum Co	Texaco, Inc	United States	6,610	3,284	455	365	60,740	800	61,540
Caracas Petroleum, S.A	Ultramar Co., Ltd	British	3,669	2,789	-------	-------	39,208	-------	39,208
Talon Petroleum, C.A	Kirby Petroleum Co	United States	1,425	1,366	-------	-------	58,092	2,075	60,167
International Petroleum Co	Standard Oil Co. (N.J.)	do	-------	19,717	-------	-------	4,633	1,500	6,133
Continental Oil Co. of Venezuela	Continental Oil Co	do	-------	-------	-------	-------	36,786	-------	36,786
Cía. Española de Petróleos, S.A	Cía. Española de Petróleos	Spanish	-------	-------	-------	-------	7,728	2,818	10,546
Pan American Venezuela Oil Co	Standard Oil Co. (Indiana)	United States	-------	-------	-------	-------	5,500	-------	5,500
Pancoastal Petroleum Co		do	-------	-------	-------	-------	5,000	-------	5,000
King Mill Oil Co	King Mill Oil Co	do	-------	-------	-------	-------	-------	4,970	4,970
Adela de Martin	[7]	Venezuelan	-------	-------	-------	-------	2,187	-------	2,187
V.a.i.o.p.a. (Venezuelan American Independent)	Venezuelan American	United States	-------	-------	-------	-------	-------	841	841
Total private companies			1,264,365	851,092	336,094	428,213	1,850,806	1,145,217	2,996,023
Venezuelan Government: Corporación Venezolana del Petróleo (C.V.P.)			3,237	-------	-------	813	30,980	340,989	371,969
Grand total			1,267,602	851,092	336,094	429,026	1,881,786	1,486,206	3,367,992

[1] To private companies.
[2] To the Government.
[3] States of Guárico, Anzoátegui, Monagas, and Sucre, and Territory of Delta Amacuro.
[4] States of Barinas, Zulia, Trujillo, Mérida, and Falcón.
[5] Includes 1,449,000 barrels refined for Signal Oil Co.
[6] Formerly Richmond Exploration Co.
[7] Individual owner.

Source: Ministerio de Minas e Hidrocarburos, Venezuela. Memoria y Cuenta, Año 1965. Caracas, Venezuela, March 1966.

The Mineral Industry of Other South American Areas

By Burton E. Ashley [1]

Contents

ECUADOR

Ecuador remained an unimportant source and a modest consumer of minerals and mineral products in 1965. Output of the few categories of base and precious metals that were produced in 1965 continued to decline. Actual value of production is not determinable from available sources; however, the Central Bank of Ecuador recorded that in 1965 exploitation of mines and quarries accounted for about 2 percent of the gross domestic product. Domestic requirements for minerals again were largely met by imports, and exports were confined to modest quantities of nonferrous metal ores and concentrates, ferrous scrap, and crude petroleum.

Mineral prospecting was carried out during 1965 by both foreign and local interests. U.S. firms were interested in placer gold and were reported to have applied for concessions. Existing placer gold operations were also being studied for possible extension.

The Government of Ecuador joined with the United Nations Special Fund in a $1.4 million program to explore seven major zones of potential mineralization. Part of the program was aimed at training local technicians in geological prospecting. The need for technicians was also recognized by the agreement made between the National Geological and Mines Service and the Central University of Quito to cooperate in the development of engineers and technical personnel.

Pessimism was expressed regarding the near future of base metal mining, and it was indicated that base metal ore at Portovelo was becoming exhausted. The company that works these mines called on the Government for assistance in keeping the mines open and/or finding alternative employment for the miners.

U.S. and British companies prospected actively for oil using modern geophysical methods. Some expansion of refining capability was also announced, chiefly for the production of liquefied gas and asphalt. In addition, two lubricating oil mixing plants were planned to cater to the domestic market.

Recently published figures show that, of 1,477,851 persons employed in 1962, 3,547 worked in the mining and quarrying industry. However, this is not likely a true reflection of the entire mining and minerals industry, since workers in petroleum and metals presumably are excluded from the category listed.

At yearend 1965, an industrial development law was promulgated to encourage certain industries in Ecuador. Various industrial activities are categorized into "Special," 'A," or "B" divisions which receive certain incentive benefits. Briefly, the benefits extend certain tax exemptions and

[1] Physical scientist, Division of International Activities.

freedom from paying duties on necessary materials which must be imported to maintain operations. At yearend 1965, the Special category included production of iron and steel, caustic soda, chemical fertilizers, and sulfuric acid, and salt refining and iodizing. The law does not apply to mining activities in the extraction phase.

A decree concerning petroleum regulations was also published. (See section on "Commodity Review.")

PRODUCTION

Metallic mineral production fell drastically in 1965. Declines of 42 percent and 38 percent were recorded for cadmium (contained in zinc concentrates) and zinc in concentrates, respectively. The general downward trend in output that has been evident for a number of years presumably will continue.

Cement output continued to rise and gained 13 percent over the 1964 figure, and crude petroleum showed a very slight production gain. Rises were also registered in refinery output. Statistics on nonmetallic minerals, particularly those used in the building industry, are ordinarily unavailable.

TRADE

Comparison of total commodity trade and trade in mineral commodities in terms of value for 1963 and 1964 is shown in the following tabulation (data for mineral trade in 1965 are not yet available):

	Value (thousand dollars) [1]		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1963	1,244	128,437	1.0
1964	1,452	130,364	1.1
1965	NA	133,800	NA
Imports:			
1963	30,660	128,911	24.0
1964	23,016	151,916	15.0
1965	NA	170,800	NA
Trade balance:			
1963	−29,416	−474	XX
1964	−21,564	−21,552	XX
1965	NA	−37,000	XX

NA Not available. XX Not applicable.

[1] Where necessary, values have been converted from sucres (S/) to U.S. dollars at the rate of S/18=US$1.

Sources: República del Ecuador, Comercio Exterior 1963 and 1964. Memoria del Gerente General del Banco Central del Ecuador—1965.

Table 1.—Ecuador: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Cadmium, in zinc concentrate—kilograms	-----	931	2,008	2,141	1,239
Copper, in concentrate	101	r 176	284	184	129
Gold, in concentrate—troy ounces	15,210	20,591	21,041	r 17,681	11,512
Lead, in concentrate	111	124	164	r 166	114
Silver, in concentrate—troy ounces	101,190	127,739	121,784	117,126	69,966
Zinc, in concentrate	112	164	358	380	236
Nonmetals:					
Cement	219,165	214,220	258,394	287,806	325,000
Clay, kaolin	545	377	352	208	218
Gypsum	81	32	NA	NA	NA
Ocher	2	2	1	NA	NA
Salt	r 31,500	r 32,000	e 35,000	e 35,000	e 35,000
Sulfur	112	NA	203	NA	232
Mineral fuels:					
Lignite	250	99	65	35	33
Petroleum: Crude thousand 42-gallon barrels	2,926	2,573	2,465	2,796	2,849
Refinery products:					
Gasoline—do	1,399	1,467	1,811	r 2,037	2,157
Kerosine and jet fuel—do	319	321	437	478	627
Distillate fuel oil—do	748	698	813	859	963
Residual fuel oil—do	1,490	1,218	1,167	1,296	1,480
Other—do	219	201	67	r 153	236
Total—do	4,175	3,905	4,295	r 4,823	5,463

e Estimate. r Revised. NA Not available.

Source: U.S. Embassy, Quito.

Imports were largely made up of iron and steel semimanufactures and petroleum. The United States, with sales of $68.6 million and purchases of $65.6 million, was Ecuador's chief trading partner in terms of total value. Imports of metals largely came from Belgium, West Germany, France, or the United Kingdom; nonmetallic minerals and petroleum products were generally supplied by the United States.

Table 2.—Ecuador: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Copper: Scrap	---	5	All to Netherlands.
Gold telluride—calaverite	5	5	All to United States.
Iron and steel scrap	283	52	United States 42; Colombia 10.
Lead concentrate	760	2	Mainly to West Germany.
Zinc concentrate	967	864	France 591; Belgium 273.
Mineral fuels: Petroleum, crude thousand 42-gallon barrels	185	531	All to Argentina.

Source: República del Ecuador. Anuario de Comercio Exterior, 1964.

Table 3.—Ecuador: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum, unwrought and semimanufactures	512	527	Austria 247; United States 99; West Germany 57.
Copper, unwrought and semimanufactures	364	553	Chile 272; Mexico 96; United States 63.
Gold, unwrought and powder troy ounces	225	386	West Germany 321; United States 65.
Iron and steel:			
Pig iron	20	95	All from West Germany.
Ferroalloys	2	103	West Germany 52; Switzerland 49.
Ingot, block	-----	15	All from Norway.
Semimanufactures:			
Bars, beams, sections	23,657	22,568	Belgium 15,718; West Germany 4,808.
Sheets and plates:			
Corrugated	3,539	4,054	Belgium 3,396.
Plain	r3,819	4,385	Belgium 2,138; West Germany 1,138.
Galvanized and enameled	1,506	2,335	Belgium 1,047; France 814.
Tinplate	2,262	2,856	United States 1,972; Canada 556.
Hoops or straps	233	237	Belgium 159; West Germany 41.
Wire	6,921	8,554	Belgium 2,411; France 1,868; West Germany 1,856.
Pipes and fittings	4,600	5,130	France 1,540; United Kingdom 1,100; Belgium 833.
Rails	376	323	West Germany 292; Belgium 32.
Other	370	394	United States 167; United Kingdom 101.
Lead, unwrought and semimanufactures	259	260	United Kingdom 60; Mexico 50; West Germany 45.
Mercury 76-pound flasks	4	11	West Germany 3; Peru 2; United Kingdom 2.
Nickel	1	1	United States and Canada.
Silver troy ounces	65,620	514	Italy 321; United Kingdom 193.
Tin, unwrought and semimanufactures long tons	25	26	United Kingdom 18; United States 5.
Zinc, unwrought and semimanufactures	33	53	West Germany 18; United States 13.
Other	-----	3	Mainly from United States.
Nonmetals:			
Abrasives, natural	10	18	West Germany 15.
Asbestos, crude, washed or ground	325	787	Canada 651; Republic of South Africa 133.
Cement:			
Aluminous	40	66	Mainly from United States.
White	1,541	1,868	West Germany 953; Denmark 354.
Other	27	24	Denmark 13; United States 9.

Table 3.—Ecuador: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals: Continued			
Clays:			
Bentonite	127	358	United States 337.
Kaolin	56	5	United States 2; West Germany 1.
Other	42	77	United States 42; United Kingdom 28.
Diatomaceous earth	284	242	West Germany 107; United States 85.
Graphite	1	2	United Kingdom 1.
Gypsum	51	39	United States 28.
Magnesite, crude or calcined	6	11	West Germany 10.
Marble	143	138	Italy 102.
Mica, all forms	12	15	United States 14.
Salt	287	263	United States 237.
Sand	57	1,377	United States 1,363.
Sulfur	88	136	United States 129.
Talc	167	171	United States 89; Canada 47.
Other nonmetallic minerals	32	123	United States 59; Mexico 45.
Mineral fuels:			
Coal	168	175	Netherlands 65; United States 51.
Coke	338	278	Belgium 130; United States 79.
Other solid hydrocarbons:			
Tar and pitch	119	132	United Kingdom 124.
Natural asphalt	8,782	2,053	Netherlands Antilles 1,769; United States 284.
Petroleum:			
Crude thousand 42-gallon barrels	r 1,924	2,836	Mainly from Venezuela.
Refinery products:			
Gasoline ---do---	214	86	Mainly from United States.
Kerosine and jet fuel ---do---	3	71	All from United States.
Lubricants, including greases ---do---	46	58	Mainly from United States.
Other ---do---	34	134	Do.
Total ---do---	297	349	

r Revised.

Source: República del Ecuador. Anuario de Comercio Exterior, 1964.

COMMODITY REVIEW

Metals.—*Aluminum.*—Two firms announced in late 1965 that they would install facilities for the manufacture of aluminum doors and window frames. Aluminio Manufacturas Industrias Cía. Ltda. will be located in Quito, and Aluminio Architectónico S.A. in Guayaquil.

Iron and Steel.—The Atlantic Community Development Group for Latin America (ADELA) announced that it had allocated $400,000 to Acerias Nacionales del Ecuador, S.A., for the construction of structural steel fabrication facilities at Guayaquil.

Silver.—It was reported in trade journals that over $1.5 million in silver had been recovered from silver-copper coins for the Ecuadorian Government. Refining was reportedly done by Spiral Metal Co., Inc., of South Amboy, N. J.

Nonmetals.—*Cement.*—The cement plant at Guapán began operations after installation of diesel generating equipment. Empresa Industrias Guapán, S.A., which owns the cement plant, is owned in turn by various government bodies as follows: Caja del Seguro Social, Caja de Pensiones, Instituto de Recuperación Económica, Banco Nacional de Fomento, Consejo Municipal de Cuenca, Consejo Cantonal de Biblián, and Consejo Cantonal de Azogues. Construction of the cement plant started in 1961 and proceeded without undue delay; however, a source of power was not available for the programed startup, and it was only in mid-1965 that actual operations began. Cost of the plant was reported at $4 million plus the cost of a 2,500-kilowatt diesel generating plant. Planned capacity was 200 tons of portland cement daily, a quantity sufficient to supply about 15 percent of the country's requirements.

Fertilizer Materials.—ADELA approved investment of $650,000 in Fertilizantes Ecuatorianos, S.A., for production of sulfu-

ric acid, ammonium sulfate, and various manufactured fertilizers.

Salt.—Industria Salinera Inversionista Dariegas continued its salt production enterprise on San Salvador Island, but at yearend no reports of progress were available. Investment was reported as about $500,000.

Salinera Ecuatoriana, S.A., is progressing with the establishment of its solar salt works northeast of Salinas on the Santa Elena Peninsula. Cost of the project was reportedly around $300,000.

It was reported in early 1965 that the Morton Salt Co., with domestic financial investors, was negotiating for a solar salt site in the vicinity of Salinas. Estimated cost of the plant was $1.5 million. Production was expected to begin in 1967 with a planned annual capacity of 40,000 to 45,000 metric tons. It was indicated that manufacture of caustic soda may also be considered.

Mineral Fuels.—*Petroleum.*—The Minister of Industry and Commerce distributed an open letter to "all oil companies in the world" inviting interest in oil exploration in Ecuador. All available geologic and petroleum data in the Ministry were offered for use of interested parties. Inquiries were to be directed to the Dirección de Minas e Hidrocarburos, Ministerio de Industrias y Comercio, Avenida 10 de Agosto 666, Quito, Ecuador, S.A.

The French Institute of Petroleum agreed with the Ecuador National Geologic Service to conduct a survey of the petroleum potential of Ecuador. Cost of the program was reported at $285,000, of which $217,000 will be furnished by the French and the remainder by Ecuador.

In mid-1965 Supreme Decree 1464, in reference to the petroleum industry, was issued, setting minimum investment standards, limiting the size of concessions to 500,000 hectares, requiring government approval of annual work plans, and levying special taxes on petroleum.

Incentive for petroleum exploration in Ecuador doubtless has been prompted by estimates that known reserves will be exhausted by 1973 at the projected consumption rate.

Production from Ecuador fields averaged 7,998 barrels per day in 1965, a slight increase over 1964 production of 7,876 barrels daily. There were 49 wells completed during 1965, of which 21 were exploration wells and 28 were field wells; successful completions numbered 10 and 27, respectively.

A discovery, not yet fully evaluated, was made on the Carmela claim, north of the Ancón field. Cautivo, Empresa Petrolera Ecuatoriana C.A. had drilled seven successful wells by yearend and had two rigs following a systematic stepout drilling program.

Active prospecting was being carried out by a number of companies in various parts of Ecuador. Added interest in northeast Ecuador was spurred by discoveries over the border in Colombia.

FRENCH GUIANA

With the possible exception of building materials, the mineral potential of French Guiana showed little progress toward the production stage in 1965.

Bauxite output had not started by yearend, and the status of then-existing agreements was in doubt. Gold production lapsed completely in 1965, although it was reported that one prospect was being readied for production in 1966.

An offshore seismic program was carried out in a search for petroleum possibilities.

The Bureau de Recherches Géologiques et Minières (BRGM) continued its geologic mapping program and also carried on ground water investigation for domestic and agricultural uses. Quarry sites were examined as a source of building material; sources of laterite, used in roadbuilding, were also appraised.

Much of the need for construction material was prompted by the choice of Kourou as the site for the space center to be established by the French. It was reported that by 1970 the community would number at least 6,000 people. The space center will doubtlessly have considerable impact on the country, considering all the interrelated amenities that will be required.

PRODUCTION AND TRADE

The only mineral production reported in 1965 was 850 kilograms of columbite-tantalite concentrates. Some nonmetallic building materials were also produced during the year, but quantitative data on this output, if collected, were not reported through official channels.

Trade in mineral commodities remained of little significance, and the value of mineral commodity exports was much smaller than that of mineral commodity imports. Except for columbite-tantalite exports, outgoing mineral products are largely limited to reexports of petroleum and steel items.

In 1964 the United States imported 1,923 kilograms of columbite-tantalite concentrates valued at $7,780; in 1965 the figures had fallen to 406 kilograms valued at $1,452.

Mineral and metal imports in 1965 were valued at $1.7 million; petroleum products made up the largest single category. Other imports were common base and ferrous metals, fertilizers, chemicals, and some construction materials. One necessity which does not appear separately in any of the statistics is salt.

Gold, valued at $23,000, was imported from France in 1965.

In 1965, France supplied 75 percent of French Guiana's imports of all commodities, followed by the United States with 11 percent. Over 71 percent of total exports were directed to the United States, with 23 percent going to France.

The following tabulation shows the relation between trade in all commodities and mineral trade:

	Value (thousand dollars) [1]		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1964	[2] 8	683	1.2
1965	17	2,899	.6
Imports:			
1964	1,398	15,958	8.8
1965	1,755	20,053	8.8
Trade balance:			
1964	−1,390	−15,275	XX
1965	−1,738	−17,154	XX

XX Not applicable.
[1] Source has converted francs to dollars at the rate of 1,000 francs=US$202.55.
[2] To United States only.

Source: European Economic Community, Statistical Office. Overseas Associates, Foreign Trade Statistics. 1966, No. 4.

COMMODITY REVIEW

Metals.—*Bauxite.*—No bauxite production had been initiated by yearend 1965, and no reports were available as to the plans of Kaiser Aluminum and Chemical Corp. (See Minerals Yearbook, Volume IV, 1964, for details.)

Gold.—BRGM investigated anomalies on the eastern edge of the Ininí quadrangle, finding irregularly occurring quartz veinlets carrying low gold values.

Gold production was supposed to have been resumed at Paul Isnard, 90 kilometers

Table 4.—French Guiana: Production and exports of metals and minerals

Commodity	1961	1962	1963	1964	1965
Metals:					
Columbite-tantalite:					
Production—kilograms	-----	-----	2,282	1,000	850
Exports—do	-----	-----	2,282	[1] 1,923	[1] 406
Gold:					
Production:					
Native gold—troy ounces	NA	NA	6,993	NA	-----
Gold content—do	7,944	5,273	NA	4,823	-----
Exports:					
Native gold—do	10,063	6,302	3,601	NA	-----
Gold content—do	8,649	5,369	2,636	NA	-----
Apparent average fineness	859	852	732	NA	-----
Nonmetals: Stone, all types: Production cubic meters	NA	NA	NA	26,000	NA

NA Not available.
[1] U.S. imports.

Table 5.—French Guiana: Selected imports of metals and minerals

(Metric tons)

Commodity	1964	1965	Principal sources, 1965
Metals:			
Aluminum, all forms	65	39	France 31.
Copper, all forms	34	6	All from France.
Iron and steel:			
Bars and shapes	1,139	1,258	France 1,252.
Pipe and fittings	462	299	France 283.
Plate and sheet	558	422	France 317.
Castings	665	41	France 40.
Lead, all forms	10	6	All from France.
Zinc, all forms	7	4	Do.
Nonmetals:			
Cement, lime and other building materials	12,471	11,391	Venezuela 4,100; France 3,268; United States 2,662.
Fertilizer materials:			
Natural	27	-----	
Manufactured	81	85	France 83.
Sand, gravel, and stone	104	14	All from France.
Other raw or unfinished mineral products	655	351	France 329.
Mineral fuels:			
Gas, natural and manufactured	356	337	France 165; Trinidad and Tobago 89; Martinique 79.
Tars, mineral, and raw chemical derivatives	16	20	France 16.
Petroleum products	11,069	13,290	Trinidad and Tobago 12,054; Netherlands Antilles 696.
Other	-----	10	All from France.

Source: European Economic Community, Statistical Office. Overseas Associates, Foreign Trade Statistics. 1965, No. 32; 1966, No. 4.

south of Saint Laurent-du-Maroni, but by yearend no reports of activity had been received.

Nonmetals.—*Construction Materials.*—Of an estimated 12,000 persons employed in 1965, nearly 14 percent were categorized in "construction and public works." Thus, output of construction materials may be of some significance to the local economy, even if such output is not statistically recorded. It is known that laterite is used for road surfacing. Construction material to the value of over $600,000 was reported to have been extracted from one quarry in the vicinity of Kourou.

Mineral Fuels.—Two and one-half crew months of marine seismic work was reportedly done in 1965 by Compagnie Générale de Géophysique and Gulf States Land and Industries of New York. A reconnaissance pattern totaling 3,200 kilometers of line was completed. No specific results were announced.

PARAGUAY

Paraguay's mineral industry output continued to be confined to nonmetallic minerals through yearend 1965, and output was almost entirely for domestic use with only very small tonnages being traded.

At yearend the petroleum refinery was still under construction, but nearing completion.

There was some interest in petroleum exploration, but no definite programs were begun during the year.

While exports of minerals were of negligible value, imports made up nearly 20 percent of Paraguay's total import trade. Purchases of petroleum products, which constituted the bulk of such trade, should show a significant decline in 1966 because of the contribution which may be expected from domestic refinery operations. The refinery, however, will require imports of crude oil as feedstock.

Paraguay's foreign trade has been hampered for some time by limited port facilities at Asunción. With expected increase in exports, improvements in port facilities are urgently required. It was announced at yearend that the World Bank had approved a loan equivalent to $2.8 million

for doubling the capacity of the present port and speeding up port operations in general. The project is expected to take 4 years to complete and will cost nearly $4 million. Funds required in excess of those loaned by the World Bank will be met through port charges and Government of Paraguay contributions.

The port project is related to planned improvement of penetration and access roads.

PRODUCTION

Output of construction materials showed rises in most cases. The most significant increases were in the cases of cement and sand for construction uses, up 28 percent and 24 percent, respectively. A measure of Paraguay's modernization may be detected in the leveling off, or decrease, in the use of forest products for fuel, and the increased reliance on petroleum products as indicated by rising trade figures.

Value of production as published in official government sources lists only lime and cement, totaling $1.6 million. However, more complete data supplied by the U.S. Embassy in Asunción show a mineral production value of $5.2 million for 1965. This is a slight rise over the total reported in 1964.

TRADE

The role of mineral commodity trade in total trade in recent years appears in the following tabulation:

	Value (thousand dollars)		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1964	277	49,771	0.6
1965	351	57,267	.6
Imports:			
1964	7,590	39,821	19.0
1965	9,274	51,669	17.9
Trade balance:			
1964	−7,313	+9,950	XX
1965	−8,923	+5,598	XX

XX Not applicable.

Source: Banco Central del Paraguay, Departamento de Estudios Economicas. Boletin Estadistico Mensual. No. 99, Agosto 1966.

Paraguay's most important trading partners in terms of value of total trade, in 1964 and 1965, were Argentina and the United States. Out of total exports of $57.3 million in 1965, $14.8 million went to Argentina and $14.5 million to the United States; the remaining 49 percent of total value was accounted for largely by Uruguay and by the United Kingdom, Spain, Italy, and other European countries.

Table 6.—Paraguay: Production of selected minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Cement	15,737	r 15,900	r 17,600	22,500	28,800
Clay: [1]					
Kaolin	NA	NA	NA	55	57
Other	NA	NA	NA	300,000	320,000
Gypsum	NA	NA	NA	780	2,200
Lime	r 16,900	r 17,100	r 17,400	17,800	18,500
Limestone:					
For cement [1]	28,500	32,000	33,600	40,500	40,000
For lime [1]	21,000	22,000	19,000	26,700	30,000
Ocher [1]	NA	NA	NA	55	60
Sand, for construction [1]	NA	NA	NA	185,000	230,000
Stone:					
Crushed rock	NA	NA	NA	730,000	510,000
Rough stone	NA	NA	NA	450,000	490,000
Building stone, semidressed	NA	NA	NA	35,000	37,000
Flagstone	NA	NA	NA	15,000	17,000
Paving blocks	NA	NA	NA	150	200
Talc	NA	NA	NA	47	140

r Revised. NA Not available.
[1] Based on industry or government estimates.

Sources: Banco Central del Paraguay, Departamento de Estudios Economicas. Boletin Estadístico Mensual. No. 99, Agosto 1966. U.S. Embassy, Asunción.

Total import value in 1965 was $51.7 million, of which the United States supplied $10.0 million and Argentina $9.0 million. Imports from Germany were higher in 1965 than usual, with a value of $9.0 million. About $2.6 million in value came from the Netherlands Antilles and presumably represented petroleum products.

Petroleum products remained the most important category of mineral imports in Paraguay, and in 1964 and 1965 accounted for over one-half the value of such trade. The next ranking category of import importance in 1965 was iron and steel semimanufactures, followed by nonferrous metals.

During 1964 and 1965, Paraguay's mineral and metal exports and reexports were limited to cement, lime, ocher, aluminum ingots, and scrap iron.

COMMODITY REVIEW

Nonmetals.—*Cement.*—The cement plant of Vallemí, S.A., closed for about 2 months for general renovation. While some shortage of cement was reported during that period, annual production increased. Imports of cement, however, were necessary to satisfy domestic demand.

There were rumors of plans for a competing cement plant. Such rumors may be well founded in view of the progress being made on the Acaray hydroelectric project.

Table 7.—Paraguay: Selected imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964 [1]
Metals:				
Aluminum, all forms	14	10	13	Argentina 4; Germany 2; United Kingdom 2.
Copper, wire	208	174	146	United States 69; Germany 36; Belgium 34.
Iron and steel:				
Bars, rods, sheets	2,966	3,408	4,954	Argentina 1,939; Belgium 517; Germany 472.
Tinplate and manufactures thereof [2]	5,457	4,412	3,898	United States 1,954; United Kingdom 1,557; Canada 757.
Tubes, pipes, fittings	402	634	935	Argentina 216; Germany 182; United Kingdom 110.
Wire and manufactures thereof [3]	2,361	4,278	3,833	Argentina 2,883; Belgium 907; Germany 249.
Lead, all forms including solder	102	75	96	United Kingdom 46; Germany 13; United States 11.
Tin, all forms, long tons	5	2	15	Germany 1; United Kingdom 1.
Nonmetals:				
Cement, portland	634	523	776	Argentina 182; Germany 65; Uruguay 51.
Gypsum	459	NA	198	
Salt	17,446	15,777	21,617	All from Argentina.
Stone, clay, earth, and manufactures thereof	2,148	2,091	2,284	Argentina 743; Uruguay 363; Belgium 236.
Mineral fuels:				
Coal	61	121	60	Belgium 95; United States 16.
Liquefied petroleum gases [4]	172	NA	431	
Petroleum refinery products: [5]				
Gasoline	40,944	41,579	41,620	Netherlands Antilles 27,591; Argentina 9,479.
Kerosine	19,311	17,691	24,148	Netherlands Antilles 16,344; Argentina 215.
Distillate fuel oil	16,809	12,706	18,260	Netherlands Antilles 10,799.
Residual fuel oil	54,415	64,920	89,902	Argentina 46,383; Netherlands Antilles 16,614.
Lubricants	3,238	2,560	4,131	United States 1,654; United Kingdom 963.
Asphalt	9,700	2,310	2,505	Argentina 2,304.

[1] Source does not differentiate between East and West Germany.
[2] As reported by source. (Data for prior years from another source indicate containers and other manufactures constitute less than 10 percent of total listed.)
[3] Includes nails, fencing, wire, and other manufactures of wire.
[4] Argentina exports to Paraguay.
[5] Excludes refinery gases and asphalt.

Source: Banco Central del Paraguay. Departamento de Estudios Economicos. Boletin Estadístico Mensual. No. 99, Agosto 1966.

Mineral Fuels.—Petroleum.—Paraguay's only petroleum refinery, Refinería Paraguaya, S.A., had not gone on stream by yearend. However, construction had progressed to the point where production was certain in 1966. A firm source of crude oil was not announced, nor were domestic marketing arrangements settled.

It was reported that U.S. interests were negotiating for oil exploration concessions in northwestern Paraguay. Government interest was reportedly evident.

URUGUAY

The mineral industry of Uruguay continued its uneven pace in 1965, showing mixed gains and losses in output and trade. No discoveries of consequence were announced, nor was any sector of the operating industry greatly expanded. Two announcements concerning heavy mineral beach sands and uranium prospects might lead to future interest and development.

Construction activity in Montevideo eased, but was compensated by greater activity in the interior of the country.

The economy in general grew little, and inflation was evident. After fluctuating considerably and reaching a low of 77 Uruguayan pesos (Ur$) to the U.S. dollar (from around UR$25 to the U.S. dollar), Uruguayan currency was officially stabilized at Ur$58.90 buying and Ur$59.90 selling, per U.S. dollar.

It was reported that the mineral industry afforded employment to about 4,000 persons, of whom about one-half were engaged in the extraction of marble and granite.

The Uruguayan mineral industry has little impact upon world trade, but the local economy benefited from domestically produced cement and other primary construction material. Marble, granite, dolomite, and talc appear to have greater export market potential which remains to be developed.

PRODUCTION

The mineral and metal industry of Uruguay is limited to output of nonmetallic construction material, petroleum refinery products, and some secondary production of aluminum and ferrous metals. Volume of production has generally been on the rise over the last few years, with sporadic interruption in various commodities.

There are no official figures or estimates on the value of production; informal estimates place such value at less than 1 percent of the gross national product, which in 1963 was approximately $1.3 billion.

TRADE

In overall exports, the United States replaced Great Britain as Uruguay's principal customer with 1965 purchases amounting to $32 million. In terms of mineral trade there was little change in direction, with exports going largely to neighboring countries.

The following tabulation shows the relation of mineral trade to overall trade for 1964 and 1965:

	Value (thousand dollars)		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1964	r 1,500	178,940	0.8
1965	1,037	191,165	.5
Imports:			
1964	r 35,000	r 198,292	17.7
1965	35,100	150,654	23.3
Trade balance:			
1964	−33,500	−19,352	XX
1965	−34,063	+40,511	XX

r Revised. XX Not applicable.

COMMODITY REVIEW

Metals.—*Heavy Mineral Beach Sands.*—Beach sands in the Department of Rocha have been studied for some time. An ore reserve of 3 million tons has been reported containing ilmenite, rutile, and monazite. The monazite reserve is expected to contain 6,000 tons of thorium dioxide (ThO_2) and 350 tons of uranium trioxide (U_3O_8). Other areas along the coast may contain as much as 20 million tons of "black sands" which could be the basis of a $500 million industry. Ilmenite concentrates carrying 50.5 percent titanium dioxide (TiO_2) have been obtained on an experimental basis. Evaluation of the deposits was being encouraged by Administración Nacional de Combustibles, Alcohol y Portland (ANCAP), a government company.

Table 8.—Uruguay: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Secondary metal	NA	NA	NA	150	150
Semimanufactures	NA	NA	NA	1,500	1,035
Iron and steel:					
Iron ore	NA	NA	1,031	1,667	e 1,700
Crude steel [1]	9,200	8,567	6,500	14,327	13,476
Ferrosilicon	NA	NA	NA	e 800	1,500
Rolled products	NA	[1] 23,563	[1] 21,970	e 39,000	[1] 36,300
Nonmetals:					
Alum schist	168	136	79	35	114
Barite	100	NA	NA	NA	NA
Cement	389,095	374,420	339,727	412,164	431,433
Clays:					
Refractory	66,351	1,681	3,217	484	4,679
Other [2]	16,047	9,286	NA	36,000	48,418
Dolomite	11,324	[3] 703	26,806	26,937	20,413
Feldspar	891	703	287	897	1,247
Gem stones, exports [3]	72	81	92	103	54
Lime [e]	NA	32,400	30,000	42,000	60,000
Limestone	698,071	601,356	NA	750,394	746,509
Mica	NA	NA	43	NA	NA
Phosphate rock [5]	-----	-----	-----	100	NA
Quartz	1,748	739	1,681	1,256	292
Sand and gravel:					
Common sand	551,174	513,416	470,667	441,906	657,056
Quarry sand	23,438	30,881	32,401	35,234	34,463
Gravel	114,654	108,473	32,624	47,447	113,776
Stone:					
Granite, exports	942	1,775	896	1,236	2,301
Marble	1,557	1,188	2,043	1,140	2,710
Paving blocks	693	53	1,173	1,068	2,153
Rough stone	62,565	94,807	39,738	61,087	46,869
Ballast	430,473	341,997	321,877	344,857	214,495
Talc	1,685	1,715	1,715	2,124	2,375
Mineral fuels:					
Coke, gashouse	23,476	22,561	21,160	20,850	19,563
Gas, manufactured—million cubic feet	1,105	1,123	1,059	1,059	NA
Petroleum refinery products: [6]					
Gasoline—thousand 42-gallon barrels	2,054	2,477	2,328	2,385	2,273
Jet fuel—do	58	121	88	107	115
Kerosine—do	1,370	1,323	1,434	1,509	1,288
Distillate fuel oil—do	1,558	1,739	1,998	2,330	2,106
Residual fuel oil—do	4,442	4,474	4,130	4,367	4,907
Liquefied petroleum gas (LPG)—do	26	83	53	183	74
Asphalt—do	71	123	81	61	80
Other—do	6	46	108	63	201

e Estimate. NA Not available.
[1] As reported by Revista Latinoamericana de Siderurgia (ILAFA), No. 76, August 1966.
[2] Variously reported as common clay or clay for cement; data probably do not represent total production of either category.
[3] As reported.
[4] Mostly agate, but probably includes some amethyst.
[5] As reported. Probably represents guano-phosphatized volcanic or other igneous rock.
[6] Data are derived from quarterly refinery reports and may not agree exactly with data adjusted on an annual basis.

Iron and Steel.—Some renewed interest has been shown in iron ore deposits in Rivera. It was reported that Cia. de Acero del Pacifico of Chile was to establish a rolling mill in Uruguay; capacity was not announced.

Uranium.—In late 1965 the Uruguayan Atomic Energy Commission announced that uranium had been found by a French prospecting team. The uranium occurs in a clay along the Rio Negro in central Uruguay. Samples testing 0.08 percent uranium gave hope for finding higher values.

Nonmetals.—Cement.—In mid-1965, the Uruguayan Government ended price controls on cement.

Construction Materials.—Toward year-end 1965 a report was issued called a "Study on the Marble, Granite, Dolomite and Talc Situation in Uruguay." The study was sponsored by the U.S. Agency for International Development.

Table 9.—Uruguay: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal destinations, 1965
Metals: Iron pipe and fittings	3,244	1,852	All to Argentina.
Nonmetals:			
Cement:			
Asbestos	-----	49	Paraguay 48.
Portland	24,694	36,698	Brazil 34,923.
Dolomite	13,937	4,800	All to Argentina.
Gem stones:			
Rough [1]	103	54	West Germany 25; United States 13.
Cut kilograms	1	-----	
Sand, gravel, broken stone:			
Sand	748,571	-----	
Gravel	92,896	-----	
Stone, broken	81,020	151	Undisclosed.
Stone, dimension:			
Granite	1,236	2,301	Japan 782; Belgium-Luxembourg 484; France 443.
Marble	248	204	All to Argentina.
Talc, ground	-----	10	All to Chile.
Mineral fuels: Liquefied petroleum gas (LPG)	5,374	508	All to Brazil.

[1] Variety unspecified, probably agate but may include some amethyst.

Source: Banco de la República Oriental del Uruguay, Departamento de Investigaciones Economicas. Exportaciones Cumplidas 1964 and 1965, Cuadro 10.

Table 10.—Uruguay: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1964	1965
Metals:		
Aluminum:		
Bauxite	1,008	500
Alumina	18	141
Hydrated alumina	-----	800
Metal:		
Unwrought	2,014	405
Powder	86	13
Semimanufactures	29	2
Antimony:		
Oxide	2	3
Metal, unwrought	-----	1
Arsenic, white	78	78
Chromium oxide	26	16
Copper: Metal, including alloys:		
Unwrought	168	26
Powder	3	2
Semimanufactures	1,043	170
Gold bullion troy ounces	12,892	3,240
Iron and steel:		
Oxides	166	136
Scrap	41	20
Powder	-----	25
Ferroalloys	143	243
Pig iron and ingot steel	4,612	15,010
Semimanufactures:		
Bars, rods, angles, sections	6,720	7,163
Plates and sheets:		
Uncoated	19,547	14,215
Tinplate	7,264	4,569
Other	100	163
Hoop and strip	2,886	352
Rails and railway material	19	80
Wire	6,235	12,042
Tubes, pipes, fittings	3,901	123
Lead:		
Oxide	99	129
Metal, all forms	1,672	943
Manganese oxides	4	27
Mercury 76-pound flasks	27	2
Nickel	10	8
Platinum and palladium troy ounces	15,542	192
Silver bullion [1] do	21,386	2,413

Table 10.—Uruguay: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity		1964	1965
Metals—Continued			
Tin:			
Unwrought	long tons	51	46
Babbit metal		6	3
Titanium dioxide		555	396
Zinc:			
Oxide		14	7
Lithopone		458	287
Metal:			
Unwrought		1,413	690
Semimanufactures		135	57
Other metal, n.e.s.		300	78
Nonmetals:			
Abrasives		-----	62
Alums		29	15
Asbestos		1,122	1,297
Barium compounds:			
Barite, natural		5	20
Barium sulfate, precipitated		45	37
Borates, including boric acid		198	125
Calcium carbide		156	-----
Caustic potash		368	50
Caustic soda		3,663	2,723
Cement:			
Refractory		39	50
Special, not specified		41	-----
Chalk		10	-----
Clays:			
Bentonite		11	6
Kaolin		1,415	1,208
Other		180	133
Cryolite		22	2
Feldspar		3	6
Fertilizer materials:			
Nitrogenous:			
Sodium and potassium nitrates		1,143	26
Ammonium sulfate		13,599	5,388
Phosphates:			
Phosphate rock and Thomas slag, unground		42,361	33,430
Thomas slag, ground		-----	2,000
Dicalcium phosphate		-----	4,000
Other		2,174	4,549
Fluorite		108	50
Graphite		8	2
Gypsum		9,200	12,682
Infusorial earths		2,218	257
Mica and micanite		2	302
Refractory bricks and similar products		692	337
Salt		15,316	5,725
Soda ash		4,011	7,704
Sulfur		9,649	8,580
Talc		1	12
Mineral fuels:			
Asphalt		9	73
Carbon black		1,457	663
Coal		33,529	32,955
Coke		2,316	1,933
Petroleum:			
Crude	thousand 42-gallon barrels	10,655	11,151
Refinery products:			
Gasoline	do	63	144
Kerosine	do	-----	103
Distillate fuel oil	do	25	166
Residual fuel oil	do	137	1,152
Lubricants	do	95	101
Other	do	5	8

[1] Minor recorded quantity omitted because of value discrepancy.

NOTE.—Quantity figures may be incomplete in some cases because source sometimes shows small additional import value only.

Source: Banco de la República Oriental del Uruguay, Departamento de Investigaciones Economicas. Importaciones Cumplidas 1964 and 1965, Cuadro 27.

The paper dealt with the important aspects of extraction, treatment, marketing, and shipping of dimension stone and talc. Problems peculiar to the Uruguayan industry were discussed, and detailed suggestions including proposed expenditures were made for more efficient, high-output extraction and marketing.

The study should be of great interest to the Uruguayan industry.

Sand.—The glass container manufacturing industry uses locally produced sand. Sand for high-quality glass has been obtained from the Rio Uruguay in the Departments of Paysander and Salto. Sand for lower quality glass comes from the Rio de la Plata. Soda ash must be imported. The four glass container manufacturers, all located in Montevideo, have supplied essentially all of Uruguayan demand. Imports are negligible and enter the country under a high tariff levy.

Mineral Fuels. — *Petroleum.* — Refinery throughput by ANCAP was 11.2 million barrels in 1965. Arrangement for future crude oil supplies was made between ANCAP and British Petroleum (BP) whereby BP will supply 18.9 million barrels of Nigerian and Middle Eastern crude oil over a period of 3 years; ANCAP has the option of taking another 6.3 million barrels during the fourth year. The contract was said to be worth $38 million. Part of the arrangement included a BP loan to ANCAP of $5 million at 6 percent interest.[2]

Contract price of the oil was reported elsewhere as $1.975 per barrel from Kuwait and $2.15 from Nigeria.

In late 1965, it was reported in trade journals that ANCAP purchased 120,000 barrels of Soviet crude oil at $1.68 per barrel, f.o.b., and a similar amount of Algerian crude at $1.85 per barrel, f.o.b. These shipments were considered to be of an experimental nature for refinery suitability tests.

ANCAP was reported to have spudded a wildcat test in Cerro Largo, northeastern Uruguay, in October 1965. Results of this test had not been released at yearend; some doubt was expressed in trade journals about the suitability of the geological environment for success.

[2] Petroleum Press Service. V. 32, No. 5, May 1965, pp. 195–196.

Regional Mineral Industry Review of Europe[1]

By L. Nahai [2] and Roman V. Sondermayer [3]

Overall mineral industry productive activity in Europe increased in 1965, following general upward trends in gross national product and total industrial production [4] recorded. The gross national product of non-Communist Europe in market prices in 1965 was estimated at $572 billion and that of Communist Europe at $409 billion. However, the extractive sectors of the mineral industries generally did not fare as well as the processing sectors. In fact, a number of countries recorded lower production levels in this sector in 1965 than in 1964 and most countries had a lower growth rate in extractive industry output than in overall industrial output.

Among the non-Communist nations of Europe, a general decline in coal production and lower levels of iron ore output in France, West Germany, and Luxembourg contributed significantly to the smaller growth rates or declines in extractive indexes. Where higher indexes were registered, this generally resulted from the performance of the petroleum and natural gas industry; exceptions were Greece, Norway, and Sweden. The decline recorded for Czechoslovakia was attributable entirely to poorer performance by that nation's coal industry.

Detailed indexes of production activity by the mineral processing sectors, including metallurgical plants, cement kilns, petroleum refineries, and coal byproduct plants, are not recorded for all countries in Europe; however, these industries constitute a significant part of the overall manufacturing sector, and for this reason, the general manufacturing production indexes together with the overall industrial production indexes have been included for comparative purposes in table 1. Manufacturing production indexes increased in all countries except Luxembourg.

In terms of volume of output, Communist Europe's production of a number of ores exceeded that of non-Communist Europe principally because of the contributions of the U.S.S.R. These included ores of iron, manganese, aluminum, copper, lead, zinc, tin, beryllium, molybdenum, nickel, and tungsten. The situation with regard to metals was mixed, with the Communist nations exceeding in the production of aluminum, antimony, cadmium, copper, gold, platinum, and silver but lagging in production of bismuth, pig iron, steel, magnesium, mercury, tin, and zinc; smelter lead production was about equal. A similar situation prevailed in the nonmetals with non-Communist Europe leading in the production of barite, cement, diatomite, feldspar, fluorspar, gypsum, potash, pyrite, salt, byproduct sulfur, and talc, and with Communist Europe leading in output of asbestos, corundum, gem and industrial diamond, magnesite, mica, phosphate rock, and elemental sulfur. Although solid fuel output of Communist Europe was considerably higher than that of non-Com-

[1] For purposes of this chapter, non-Communist Europe comprises Austria, Belgium, Denmark, Finland, France, the Federal Republic of Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom. Communist Europe comprises Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, the U.S.S.R. (including the U.S.S.R. in Asia) and Yugoslavia.

[2] Chief specialist, West Europe area, Division of International Activities.

[3] Foreign minerals specialist, Division of International Activities.

[4] Luxembourg recorded no gain; data on Albania are not available, therefore, the level of industrial activity in this country in 1965 cannot be compared with that of previous years.

Table 1.—Europe: Index numbers of industrial production by sector and country [1]

Country	Extractive industries			Manufacturing industries			All industries		
	1963	1964	1965	1963	1964	1965	1963	1964	1965
West Europe:									
Austria	[2] 110	r 119	122	[3] 132	[3] 142	147	131	141	145
Belgium	[4] 88	[4] 92	85	r 143	150	157	r 135	r 145	148
Finland	149	155	161	151	162	168	150	161	169
France	98	107	108	131	140	142	129	138	141
Germany, Federal Republic of	104	105	103	140	152	162	137	149	158
Greece	[5] 115	[5] 118	132	130	144	155	138	154	167
Ireland	r 180	r 194	184	143	157	163	144	158	164
Italy	121	129	125	r 168	170	178	r 166	168	176
Luxembourg	100	95	90	114	127	127	113	124	124
Netherlands	110	115	126	142	r 155	163	141	r 154	163
Norway	127	136	145	130	141	151	133	142	152
Portugal	91	87	82	147	165	180	145	162	175
Spain	93	90	95	154	178	189	r 149	171	182
Sweden	128	141	154	133	146	156	r 133	r 145	156
Switzerland	NA	NA	NA	142	150	152	141	148	152
United Kingdom	95	95	92	120	130	134	119	128	132
Yugoslavia [6]	152	164	168	176	208	226	173	201	217
East Europe:									
Bulgaria	NA	NA	249	NA	NA	NA	196	219	249
Czechoslovakia	[7 8] 124	[7 8] 126	123	[8] 143	[8] 149	161	143	148	160
East Germany	[9] 113	[9] 117	117	[9] 144	[9] 153	163	142	150	159
Hungary	[10] 128	[10] 132	134	r [10] 164	r [10] 176	189	159	171	177
Poland	126	133	136	154	169	185	153	167	181
Rumania	147	157	166	191	219	247	189	216	244
U.S.S.R.	NA	NA	NA	NA	NA	NA	158	169	184

r Revised.
NA Not available.
[1] Data on Albania and Denmark not available. The categories "Extractive industries" and "Manufacturing industries" as used in this table are defined as in Divisions 1, 2, and 3, respectively, of the International Standard Industrial Classification (I.S.I.C.). Major deviations from "Extractive industries" definition are indicated by footnotes to the country entries; footnotes covering similar deviations from "Manufacturing and from the category: All industries" (given as reported in source) are generally omitted.
[2] Includes activities of petroleum refineries and magnesite product producers.
[3] Includes activities of stones, clay, and sand quarries.
[4] Metal mining excluded.
[5] Magnesite roasting included.
[6] This tabulation follows the practice of United Nations practice of including Yugoslavia with the countries listed.
[7] Includes coal and lignite only.
[8] Crude petroleum, natural gas, ferrous and nonferrous ore mining included under manufacturing.
[9] Coking and coal briquetting included under mining; stone quarrying and sand pits included under manufacturing.
[10] Coal briquet plants included under mining, sand pits, clay pits, and stone quarries included under manufacturing.

Source: United Nations. Monthly Bulletin of Statistics. New York, August 1966, pp. 18–27.

munist Europe, a substantial part of it was brown coal or lignite. Quality considerations apply in a reverse manner to iron ore; Communist Europe's output is reported on the basis of material containing 55 percent iron, which is higher than the average of iron ore produced in non-Communist Europe.

While primary smelter copper output is larger in Communist Europe, refined copper production in this area is about 140,000 tons less annually than in non-Communist Europe.[5] Similarly, for refined lead, non-Communist European output was 320,000 tons more than that of Communist Europe. Cement production in non-Communist Europe totaled about 135 million tons and production capacity at the end of 1965 totaled about 160 million tons. The corresponding production figure for Communist Europe was 109 million tons; complete data on capacity was not available.

While non-Communist Europe's crude oil production was only 1.3 percent of world total, compared with 17.1 percent provided by Communist Europe, refinery crude throughput in the West exceeded 347 million tons compared with an estimated 260 million tons for the Communist nations.

[5] The British Bureau of Non-Ferrous Metal Statistics. World Non-Ferrous Metal Statistics. Birmingham, England. June 1966, 44 pp.

Table 2.—Approximate European contributions to world mineral supplies in 1965

(Percent of world production [1])

Commodity	Non-Communist Europe				Communist Europe			All Europe
	European Economic Community	European Free Trade Association	Other	Total	U.S.S.R.	Other	Total	
Metals:								
Aluminum:								
Bauxite	7.9	----------	3.0	10.9	12.7	8.3	21.0	31.9
Ingot	10.4	7.3	.8	18.5	19.0	4.1	23.1	41.6
Copper:								
Mine	(2)	.8	.7	1.5	14.8	2.6	17.4	18.9
Smelter (primary)	6.6	1.2	1.2	9.0	13.7	2.3	16.0	25.0
Iron and steel:								
Iron ore	12.5	8.4	1.2	22.1	24.9	2.6	27.5	49.6
Pig iron and ferroalloys	18.9	7.1	1.0	27.0	19.7	5.9	25.6	52.6
Steel ingots and castings	18.8	8.1	.9	27.8	19.8	6.6	26.4	54.2
Lead:								
Mine	3.8	2.9	2.6	9.3	13.7	10.7	24.4	33.7
Smelter (primary)	13.3	2.1	2.2	17.6	14.1	11.1	25.2	42.8
Manganese ore	.3	(2)	.5	.8	44.3	1.9	46.2	47.0
Tin:								
Mine	.2	1.0	.1	1.3	10.5	.5	11.0	12.3
Smelter (primary)	12.3	8.8	.9	22.0	10.8	.3	11.1	33.1
Zinc:								
Mine	5.9	2.7	2.5	11.1	9.5	8.5	18.0	29.1
Smelter (primary)	17.2	4.5	1.4	23.1	12.1	8.0	20.1	43.2
Nonmetals:								
Cement, hydraulic	20.0	7.8	3.6	31.4	16.7	8.3	25.0	56.4
Gypsum	18.2	11.1	6.8	36.1	9.2	3.4	12.6	48.7
Magnesite	(2)	18.7	4.5	23.2	29.9	11.5	41.4	64.6
Phosphate rock	.1	----------	----------	.1	23.6	.1	23.7	23.8
Potash (K_2O equivalent, marketable)	33.1	----------	2.9	36.0	17.0	14.0	31.0	67.0
Pyrite	9.1	8.6	14.5	32.2	15.4	7.9	23.3	55.5
Salt	14.0	7.4	1.7	23.1	8.8	6.4	15.2	38.3
Sulfur	29.2	2.4	1.9	33.5	17.9	6.6	24.5	58.0
Mineral fuels:								
Coal, all grades	11.6	7.1	.8	19.5	20.7	21.2	41.9	61.4
Coke:								
Metallurgical	24.1	6.3	.9	31.3	22.0	9.0	31.0	62.3
Other	13.1	22.3	.7	36.1	8.3	34.7	43.0	79.1
Fuel briquets	22.1	1.1	1.3	24.5	7.5	57.3	64.8	89.3
Gas, natural, marketed	2.5	.2	(2)	2.7	19.0	3.2	22.2	24.9
Petroleum, crude	1.0	.2	----------	1.2	16.1	1.1	17.2	18.4

[1] Based on production data reported in commodity chapters of volumes I and II Minerals Yearbook, which may differ slightly from that given in country chapters of volume IV as a result of inclusion of revised figures in the latter.
[2] Less than 0.05 percent.

Mineral and mineral product trade continued to account for a significant part of total trade in both major areas of Europe, but the volume of total trade was much greater for non-Communist Europe than for Communist Europe. The former had imports (c.i.f.) totaling $90.4 billion and exports (f.o.b.) of $79.8 billion; corresponding figures for Communist Europe were $20.6 billion [6] and $20.0 billion, respectively. Non-Communist Europe's mineral imports were dominated by crude petroleum, iron ore, and nonferrous ore and metals for refining. The U.S.S.R. and other countries of Communist Europe supplied some of these commodities in exchange for machinery and industrial equipment.

As in 1964, crude oil exports from the U.S.S.R. and refinery product exports from Rumania were the most important items of Communist Europe's mineral trade. The U.S.S.R. exported nearly 13.4 million tons of crude oil to non-Communist Europe, mainly to Italy and West Germany. Chromite, manganese, and pig iron were also exported from the U.S.S.R. and coal from Poland.

[6] Imports of U.S.S.R., Albania, Bulgaria, East Germany, and Poland are f.o.b.; those of Czechoslovakia, Hungary, and Rumania are c.i.f.

NON-COMMUNIST EUROPE [7]

The productive performance of the mineral industry by sectors for non-Communist Europe during 1965 relative to that in past years and to the performance of all industry in the area is summarized in table 3 on the basis of production index numbers. For comparative purposes, similar index numbers for the European Economic Community (EEC)[8] as a group have been included.

In 1965 the gross domestic product of non-Communist European countries increased at rates varying from 1.4 percent for Luxembourg to 11.3 percent for Portugal and about 12 percent for Spain. Denmark, Finland, West Germany, the Netherlands, and Norway recorded gross domestic product growths of 4.5 to 5.5 percent; Switzerland recorded a 4.1-percent increase; Austria, Belgium, France, Ireland, Italy, and Sweden each showed a gross domestic product growth of 2.5 to 3.5 percent, while that of the United Kingdom increased by 2.1 percent.[9] Restrictive measures directed against inflation in France and Italy kept the growth rate down in the first half of the year and the construction industry in Italy continued depressed, adversely influencing the cement industry. In both countries, however, growth of the economy resumed in the second half of the year. Similar but less marked deceleration of economic growth was noted in some of the smaller countries. Restrictive measures were taken or left in force in Belgium, Denmark, West Germany, the Netherlands, and the United Kingdom.

The overall increase in the general European price level may have averaged about 4 percent. Price rises slowed however, particularly in countries such as Belgium, Italy, and France where production increased relatively little.[10]

Price increases were brought about by increased exports and rising overall domestic demand; the latter was more significant in West Germany and the Netherlands than in other EEC countries. Credit restrictions and reduction in planned increases in Government spending were resorted to in Germany; the bank rate was also increased from 3.5 to 4 percent.

[7] Prepared by L. Nahai.
[8] Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands.
[9] Gross domestic product data are on constant market price basis, with base years as follows: 1954—Austria, Finland, West Germany, Luxembourg; 1955—Denmark; 1958—Belgium, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Switzerland, United Kingdom; 1959—France, Sweden. Percentages given are based on data presented in United Nations Monthly Bulletin of Statistics. New York, August 1966, pp. 180–181.
[10] National Institute of Economic and Social Research. National Institute Economic Review (London). No. 35, February 1966, p. 51.

Table 3.—Western Europe: [1] Index numbers of mineral industry production by sectors and total industry production

(1958=100)

	Extractive industries				Basic metal industries	Nonmetallic mineral product manufacturing	Chemicals, petroleum and coal products	All industry [2]
	Metal mining	Coal mining	Crude oil and natural gas production	Total				
Western Europe:								
1961	113	93	166	102	126	127	139	123
1962	112	94	181	104	125	135	154	129
1963	105	93	195	105	128	141	169	135
1964	112	94	213	108	143	159	191	145
1965	119	90	225	108	152	163	206	152
European Economic Community:								
1961	105	93	169	104	132	127	145	126
1962	100	92	184	105	139	137	163	133
1963	86	91	198	105	145	141	179	140
1964	87	92	216	109	153	158	204	149
1965	87	88	224	109	159	159	223	156

[1] Europe excluding Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and the U.S.S.R.
[2] Mining, manufacturing, electricity, and gas.

Source: United Nations. Monthly Bulletin of Statistics. New York, August 1966, p. 18.

MINERAL EXPLORATION AND INDUSTRY DEVELOPMENT

As in 1964, the North Sea, particularly off the coast of the United Kingdom and West Germany, was the area of greatest activity in search of oil and gas in non-Communist Europe. Exploration was carried out in the offshore areas of West Germany, the Netherlands, and the United Kingdom and in the latter area a gas discovery was made late in the year. The Continental Shelf boundaries between the United Kingdom and Norway, the United Kingdom and the Netherlands, Denmark and the Netherlands, and Denmark and Norway were fixed and accepted by the respective Governments. The boundary between the Netherlands and West Germany was agreed upon only as far north as latitude 54° N and only a small section of the Danish-West German boundary was settled.[11] During the year 13 wells were completed in the offshore areas of the United Kingdom and West Germany; in the latter area no success was reported. Norway issued petroleum regulations and awarded hydrocarbon exploration rights to nine companies.

The United Kingdom granted additional offshore areas as follows: 37 licenses comprising 127 blocks, with an area totaling 25,900 square kilometers (10,000 square miles), were awarded to 18 companies, bringing the total of concession areas granted to about 107,000 square kilometers (45,000 square miles). Drilling in the Dutch waters was held back pending issuance of implementing regulations of the Continental Shelf Mining Act. And onshore exploration in the Netherlands stopped after December 15 pending the revision of the Mining Law of 1810. The area surrendered by the North German Consortium was divided into six blocks that were granted to 15 companies operating in various combinations.

Petroleum refining capacity increased in practically all non-Communist countries. Annual refining capacity at yearend totaled about 415 million tons, with Italy having the largest capacity (98 million tons), followed by West Germany (about 80 million tons), the United Kingdom and France (each about 70 million tons), and the Netherlands (30 million tons). With the completion of the Calvo Sotelo refinery, Spain's capacity reached 16 million tons and was expected to increase by 7 million tons more by yearend 1967.

In addition to the major oil and gas search in northern West Europe, notable exploration projects included mineral programs in Ireland (mainly for lead and zinc in County Longford), Norway (copper and pyrite in northern Norway, jointly by the three principal Norwegian pyrite producers), Sweden (iron ore, copper, and other nonferrous metals in northern and central Sweden), and Finland (copper, nickel, iron, pyrite, apatite, and other minerals). In the latter country it was planned to mine the Kemi chromite deposit on a commercial scale.

In Spain, efforts continued to achieve goals set forth for the mineral sector of the economy in the nation's economic and social development plan for 1964–67. These goals included modernization and expansion of productive facilities for the country's principal mineral products—pyrite, lead, zinc, iron ore, iron and steel, potash, and cement. The principal feature of the mineral economy was a large increase in imports and decrease in exports to meet the normal requirements of Spain's expanding economy plus the added requirements of the expansion program itself.

In view of the rapid increase of nuclear power capacity, uranium availability to meet the requirements has become a matter of concern. At the Second Foratom Congress, held in Frankfort in September, the cumulative uranium requirements of non-Communist Europe were estimated at 650,000 tons by the year 2000[12] compared with reserves (excluding Sweden) of 48,000 tons measured and 38,000 tons probable. For the six countries of the EEC, the European Atomic Energy Community (Euratom) has estimated natural uranium requirements at 54,000 tons for 1970–80 and 332,000 tons for 1970–2000.[13] In 1965 uranium ore was produced only in France, Spain and Sweden.

These large uranium requirements focused attention increasingly on the fast breeder reactor. Euratom and the French Atomic Energy Commission were jointly

[11] King, Robert E., Petroleum Production and Exploration in Europe. Bull. Am. Assoc. Petroleum Geol., August 1966, pp. 1549–1884.
[12] The Second Foratom Congress. Nuclear Engineering. Heywood-Temple Industrial Publications Limited, London, November 1965, pp. 415–420.
[13] Bulletin of the European Atomic Energy Community. V. 5, No. 2, June 1966, pp. 33–64.

making studies on fast neutron reactor and were building the Rapsodie and Masurca reactors. Rapsodie, a plutonium reactor with liquid sodium coolant, is scheduled to go critical in 1966. This unit will irradiate fuel elements for the Masurca critical assembly.

Reprocessing of initial fuel charge will be carried out in the Eurochemie plant at Mol, Belgium, which became partially operative in 1965. This plant, which received several tons of irradiated fuel for reprocessing in 1965, is owned by the European Company for the Chemical Processing of Irradiated Fuels in which 13 member countries of the Organization for Economic Cooperation and Development (OECD)[14] participate. The "Dragon" High-Temperature Gas Cooled Reactor Experiment built at Winfrith Heath, England, and completed in 1964 is another joint undertaking of the OECD and has been operating since then.

Non-Communist Europe's steel industry underwent a recession in the year mainly as a result of overcapacity. In the European Coal and Steel Community (ECSC),[15] the excess capacity is expected to persist through 1969. There were a number of moves to improve the competitive position of the area's steel industry. In West Germany, following the merger of Thyssenhütte and Phoenix Rheinrohr in 1964, Hoesch AG and Dortmund Hörder Hüttenunion prepared for a merger slated to actually take place in 1966. The two companies will also collaborate in production with Koninklijke Nederlandsche Hoogovens en Staalfabrieken (Royal Netherlands Blast Furnaces and Steelworks). Steel semimanufactures will be made in the coastal plants of the Dutch firm and fabricated goods will be made in the plants of the West German firm.

In France the largest producers are to merge into two groups with an eventual annual production capacity of 14.6 million tons of crude steel out of France's total steel capacity of 22.5 million tons. Usinor and Lorraine Escaut will combine in one unit (6.3 million tons annual capacity) and De Wendel and Sidelor in another (with 5.6 million tons current capacity and 8.3 million tons upon completion of the Gandrange plant being built by Sacilor, a company owned wholly by De Wendel and Sidelor).

In Luxembourg, Aciéries Réunies de Burbach-Eich Dudelange (Arbed) bought the French company Pont à Moussin's interest in Luxembourg's other major steel producer Hauts Fournaux et Aciéries de Differdange Ingbert-Rumelange (Hadir). To take advantage of availability of foreign ores, a consortium of West German and Belgian producers was planning a 15-million-ton-per-year iron ore processing plant at Rotterdam from which enriched and pelletized ore will be shipped inland. A proposal has been made by the West German steel industry to the High Authority of the European Coal and Steel Community that four selling agencies would handle all West German steel orders, scheduling them between plants according to types.[16]

PRODUCTION

Total industrial production in non-Communist Europe increased by about 4.8 percent in 1965,[17] while the productive performance of the various sectors of the mineral industry was mixed. The extractive sector in total showed no change from that of 1964; however, this was as a result of increases in metal mining and crude oil and natural gas output (6.3 percent and 5.6 percent, respectively) that compensated for declining coal output (4.3 percent lower than in 1964 on the basis of the production index). Mineral processing sectors of industry all recorded gains: 7.9 percent for petroleum and coal products (together with other chemicals), 6.3 percent for the basic metals, and 2.5 percent for the nonmetals. Performance of the individual countries' extractive industries, manufacturing industries, and total industries is given in table 1.

Pig iron and steel production in non-Communist Europe increased by 3.9 and 4.5 percent, respectively, during 1965. The increase in pig iron output was mainly attributable to Italy, with Spain, the Netherlands, and Finland contributing smaller amounts. Similarly, Italy's increased steel output accounted for 51.6 percent of the total increase for West Europe. The Nether-

[14] The OECD comprises all of non-Communist Europe except Finland, and the following nonregional countries: Turkey, Canada, the United States, and Japan.

[15] Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands.

[16] The Economist (London). Re-Shuffling European Steel. V. 219, No. 6406, June 4–10, 1966, pp. 1103–1104.

[17] Growth calculated on the basis of United Nations industrial production index numbers, which include data for Yugoslavia.

lands, Spain, Belgium, and Sweden also had notable steel output increases. It is estimated that non-Communist West European consumption may have increased by 4.3 percent. A number of factors influenced steel consumption. Investment in capital goods in West Germany, Sweden, and the United Kingdom showed an upward trend while Government stabilization programs in France and Italy held back capital goods investment in these countries. Production of passenger cars increased in West Germany by 3 percent while in the United Kingdom the industry operated at the same level as in 1964; in France and Italy the increase was about 10 percent. The low level of construction activity in Italy and increases in France (5 percent), the Netherlands (3.4 percent), West Germany, and the United Kingdom also affected steel consumption.

Total 1965 production of and approximate effective annual capacity for pig iron and crude steel at yearend in non-Communist Europe were as follows:

	Million metric tons	
	Production	Capacity
Pig iron	90.86	106.96
Crude steel	127.37	149.10

Effective annual capacity for production of certain categories of rolled products (sections, wire rod in coils, sheet, and plates, and hot rolled hoop, strip, and skelp) increased to about 106 million tons.

The downward trend in investment in the iron and steel industry continued. In 1965 investment totaled about $1.3 billion compared with $1.7 billion in 1964. Production capacities were already high in relation to demand; it is estimated that 85 percent of the steel capacity was utilized in 1965. In most countries rolling mills accounted for the largest share of expenditures. Non-Communist European steel companies were giving attention mainly to rationalization of their investment schemes and to intercompany agreements and mergers in order to improve their competitive position.

Generally, raw materials for the iron and steel industry were in plentiful supply. Trade in iron ore between European countries decreased slightly, while imports from outside increased by nearly one-fifth. Of 97.2 million tons of iron ore imports into non-Communist European countries in 1965, about 45 percent was from countries outside the OECD compared with 40 percent in 1964. In European OECD countries use of sinter per ton of pig iron produced increased to 1,130 kilograms from 1,085 kilograms in 1964, but expansion of sintering capacity was leveling off.

Production of aluminum (primary and secondary), refined copper, lead, zinc, tin, and nickel in non-Communist Europe increased. Although production of primary smelter copper in the area remained a modest percentage of world total, refined copper output was close to 19 percent of world output. Total production of copper and copper alloy semimanufactures increased 2.2 percent in the main producing countries concerned (Austria, Belgium, France, West Germany, United Kingdom, Italy, Scandinavia, and Switzerland) to 2,806,000 tons.[18] This was the highest annual level reached, although the increase was considerably less than the 11 percent registered in 1964.

Non-Communist Europe's share of world refined lead production was also larger than smelter production—about 26.4 percent. Principal producers of refined lead in the area and their share of world output in 1965 were West Germany 7.2; United Kingdom 5.5; France 4.1; Belgium 3.2; Sweden and Spain 1.7 percent each. Corresponding figures for zinc slab were Belgium 5.9; France 4.8; West Germany 4.5; United Kingdom 2.7; and Italy 2.0.[19]

Potash production increased in all the four principal producing countries of non-Communist Europe. The 4.8 million tons of K_2O equivalent produced in West Europe was 11 percent more than in 1964. Similarly, in 1965 all countries with the exception of Switzerland increased nitrogenous fertilizer production; total output increased 11 percent to about 6 million tons. Phosphatic fertilizer output in the area (comprising simple superphosphate, Thomas slag, and other phosphatic fertilizers) totaled 4.5 million tons of P_2O_5 equivalent, 8.5 percent more than in 1964.

Production of cement in non-Communist Europe increased to about 137 million tons (132.5 million tons in 1964). West Germany was the largest producer, followed

[18] The British Non-Ferrous Metals Federation. Annual Report, 1966. Birmingham, England, 1966, p. 9.

[19] The British Bureau of Non-Ferrous Metal Statistics. World Non-Ferrous Metal Statistics. Birmingham, England, June 1966, pp. 27, 33.

by France, Italy, and the United Kingdom which together accounted for 68 percent of the area's output.

Sulfur consumption in non-Communist Europe in all forms is estimated at 5.34 million tons compared with a production of 5.86 million tons. However, consumption of native sulfur (1,939,000 tons) exceeded production of this form of sulfur by about 58,000 tons.

In the field of energy, both crude oil and natural gas output increased in non-Communist Europe. Supply of refined products (refinery output plus imports) in the European countries of the OECD totaled about 425 million tons[20] of which EEC countries accounted for 270 million tons and European Free Trade Association (EFTA) countries together with Finland for 134 million tons. Petroleum product deliveries for inland consumption totaled 191 million tons in EEC countries, 111 million tons in EFTA countries (including Finland), and 319 million tons in all of the European countries of the OECD.

The coal industry had a difficult year in non-Communist Europe and bituminous coal output fell in all countries except Spain; the decline in the Netherlands, however, was small. Employment in the industry also decreased while coal stocks in major producing countries increased.

A number of governments took measures to assist the industry. In the United Kingdom, the National Coal Board (NCB) was relieved temporarily of the obligation to contribute $28 million per year towards the difference between depreciation at the historic rate and replacement cost. The Coal Industry Act of 1965 canceled 415 million pounds sterling ($1,162 million) of NCB's $2,688 million capital debt to the treasury at end of March 1965. Use of coal in public buildings was to be promoted and the Government was to consider capital reconstruction of the industry.[21] The NCB announced in 1965 an accelerated mine closure program—150 mines were to be closed in the next 2 or 3 years.

The EEC approved members' financial assistance to the coal industry estimated in 1965 to have amounted to $4.20 per ton in West Germany, $4.70 in France, $5.40 in Belgium, and $0.80 in Netherlands for extra social costs (retired miners, etc.) borne by the coal mining industry. In addition subsidy payments for rationalization were made as follows: 40 cents per ton in West Germany and 80 cents per ton in Belgium and France. In West Germany reduction of production targets was accepted by industry and measures were under consideration for giving premiums for mine closing. In Belgium four anthracite mines in the southern basin were closed. Financial assistance to the industry amounted to about $20 million. Reduction of coal output in France followed closely the development plan.

In Spain, the "Fondo de Fomento de la Mineria de Hulla" was established to make available a subsidy totaling $26,500,000 over a 4-year period through 1968. The subsidy will take the form of a specified amount per ton of coal which will vary from year to year and will be paid only to firms which have accepted the converted action plan for coal.

Concurrent with the decline in the coal industry, nuclear capacity in production in non-Communist Europe increased by about 1,200 MW(e)[22] to approximately 4,430 MW(e) distributed as follows: United Kingdom 3,400; Italy 610; France 330; West Germany 71; Belgium 10; Sweden 9. In addition, plants with an estimated total capacity of nearly 4,340 MW(e) under construction as follows by country: United Kingdom 1,875; France 1,060; West Germany 810; Belgium 265; Spain and Sweden each 140; Netherlands 50; and Switzerland 7.[23] In the latter country, a utility company ordered a 350 MW(e) pressurized water reactor during the year and the project for a second 300 MW(e) plant progressed. The utilities forecast 1,500 MW(e) installed capacity by 1975. The United Kingdom fuel policy, published in October 1965, called for a nuclear power program of 8,000 MW(e) in a 6-year period. The 1,200 MW(e) Dungeness B plant of the Central Electricity Generating Board is the first power station under the new program. The Advanced Gas-cooled Reactor design was chosen. The French Fifth Plan of National Development envisages new facilities with 2,500 to 4,000

[20] Organization for Economic Cooperation and Development. Supply and Disposal Oil Statistics. 1965, p. 15.

[21] National Institute of Economic and Social Research. National Institute Economic Review (London). No. 35, February 1966, pp. 87, 90.

[22] Megawatts of electric power generating capacity.

[23] Organization for Economic Cooperation and Development, European Nuclear Energy Agency. Seventh Report of the Activities of the Agency. Paris, France, December 1965, 123 pp.

MW(e) capacities. In pursuit of this program at 500 MW(e) plant (EDF 5) has been decided upon.

TRADE

In the general area of trade policies, there was little progress in the Kennedy Round of tariff negotiations because the EEC could not participate in the negotiations after June when France announced its decision not to take part in Council meetings following disagreement on how to finance EEC's common agricultural policy. Tariff disparities and the exceptions list [24] remained the main issue in negotiation for industrial products. The EEC also objects to calculating tariffs on chemical products on the basis of the American Selling Price valuation. Steel tariffs have also presented problems because these tariffs vary between countries and types of steel.

Mineral commodities continued to constitute more than 17 percent of the total exports and 25 percent of the corresponding imports of the countries of the area in 1965. Both total exports (f.o.b. basis) and imports (c.i.f. basis) reached new highs, $77,748 million and $88,041 million respectively, and mineral commodities in general followed these trends as shown in table 4.

Although EEC, the European Free Trade Association (EFTA), and other area nations have shown increases in both aggregate exports and imports of mineral commodities in both 1964 and 1965, the growth rates have not been uniform. The relative positions of the different trading groups are indicated in table 4. The rank of the various commodity groups is shown in table 5, which indicates the primary position of iron and steel followed by nonferrous metals and petroleum among exports and of petroleum and nonferrous metals among imports. The area had an adverse balance of trade for all but iron and steel and manufactured fertilizers.

Intra-ECSC trade in steel as a whole did not show its customary increase; higher West German imports of semifinished products were balanced by marked drop in those of Italy. ECSC exports to other West European countries rose as a whole. Outside the ECSC, Spain's steel imports increased by about 135 percent. The United Kingdom's exports increased slightly—an appreciable increase in exports to the United States partly offset decreases in export to other countries.

Of mineral commodity exports by non-Communist European countries in 1965, 70.5 percent on a value basis were exports to other non-Communist European countries (intraregional trade), the corresponding figure for imports was 44.4 percent (table 6).

Although the total value of exports to other world areas increased in both 1964 and 1965, the share of exports to these areas has fluctuated from 29.0 percent in 1963 down to 27.4 percent in 1964 and back up to the 1965 figure of 29.5 percent. On the other hand, imports from other areas have shown a steady increase from 55.2 percent in 1963 to 55.6 percent in 1965.

The Near East continued its position as the largest supplier of mineral commodities in view of the dominance of crude oil imports. However, Africa's share was growing at the expense of the Near East. Canada and the United States ranked first among the destinations of West European mineral exports, primarily as a result of large iron and steel exports to the United States.

REGIONAL ECONOMIC ORGANIZATIONS

The European Economic Community (EEC).—France's absence from the Council of Ministers after June 30 slowed Community activities in the second half of the year. There was an additional 10-percent cut in internal tariffs taking effect on January 1. Thus, duties for industrial goods were lowered to 30 percent of their 1957 level. It is expected that the customs union will be complete on July 1, 1968. On April 8 the six countries concluded a "Treaty Establishing a Single Council and Single Commission of the European Communities." [25] However, at yearend the instruments

[24] List submitted in November 1964 by major countries enumerating the industrial products they wanted excepted from the 50-percent linear tariff cut.

[25] The ECSC, Euratom, and the EEC. Each of these has now a separate executive body.

Table 4.—Non-Communist Europe: Comparison of mineral commodity trade and total trade

(Million dollars)

	European Economic Community [1]			European Free Trade Association [1]		
	Value (million dollars)		Mineral commodities share of total (percent)	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities [2]	All commodities		Mineral commodities [2]	All commodities	
Exports: [3]						
1963	7,583	37,543	20.2	3,006	22,146	13.6
1964	8,505	42,559	20.0	3,287	23,979	13.7
1965	9,634	47,904	20.1	3,577	26,513	13.5
Imports:						
1963	10,692	40,361	26.5	5,986	26,393	22.7
1964	12,193	44,891	27.2	6,878	30,107	22.8
1965	13,054	48,991	26.6	7,343	32,226	22.8
Trade balance:						
1963	−3,109	−2,818	XX	−2,980	−4,247	XX
1964	−3,688	−2,332	XX	−3,591	−6,128	XX
1965	−3,420	−1,087	XX	−3,766	−5,713	XX

	Other non-Communist Europe [1]			Total [1]		
	Value (million dollars)		Mineral commodities share of total (percent)	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities [2]	All commodities		Mineral commodities [2]	All commodities	
Exports: [3]						
1963	212	2,710	7.8	10,801	62,399	17.3
1964	265	3,163	8.4	12,057	69,701	17.3
1965	316	3,331	9.5	13,527	77,748	17.4
Imports:						
1963	1,122	4,826	23.2	17,800	71,580	24.9
1964	1,327	5,608	23.7	20,398	80,606	25.3
1965	1,679	6,824	24.6	22,076	88,041	25.1
Trade balance:						
1963	−910	−2,116	XX	−6,999	−9,181	XX
1964	−1,062	−2,445	XX	−8,341	−10,905	XX
1965	−1,363	−3,493	XX	−8,549	−10,293	XX

XX Not applicable.

[1] Countries included in this tabulation are as follows: European Economic Community—Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands; European Free Trade Association—Austria, Denmark, Norway, Portugal, Sweden, Switzerland, and the United Kingdom; other non-Communist Europe—Finland, Greece, Ireland, and Spain.

[2] Includes values for all commodities in the following categories of The Standard International Trade Classification (revised): Divisions 27, 28, 32, 33, 34, 52, 56, 67, and 68; Groups 661 and 662; Subgroups 513.2 (except Item 513.21), 513.5, 513.6 (except item 513.66), 663.1 and 663.4; Items 513.32, 513.33, 513.36, 513.37, and 599.93.

[3] Including reexports of the United Kingdom.

Source: Statistical Office of the United Nations.

of ratification could not be deposited because the so-called Merger-Treaty was awaiting ratification by three of the six national parliaments. Installation of the merged executives, scheduled for January 1, 1966, had to be deferred.

Study and formulation of the medium-term economic policy for the period 1966–70 engaged the attention of the Medium-Term Economic Policy Committee whose recommendations to each member state were adopted. A first report on regional economic policy was adopted by the Commission and submitted to the Council of the EEC. The Council reached agreement on general principles for a common transport policy. The agreement comprises a two-stage transitional period ending in December 31, 1972, during which two systems of rate brackets with upper and lower limits will be used. Progress toward freedom to establish firms and supply services across

Table 5.—Non-Communist Europe: Distribution of mineral commodity [1] trade by commodity group

(Million dollars)

Commodity group	Exports			Imports		
	1963	1964	1965	1963	1964	1965
Metals:						
Iron and steel:						
Ore and concentrate	299	335	330	706	872	942
Scrap	152	174	207	200	259	310
Ingots and semimanufactures	4,316	4,911	5,545	3,305	3,801	3,876
Other:						
Ores and concentrates	66	90	106	576	795	913
Scrap	111	165	216	167	253	371
Ingots and semimanufactures	1,567	1,917	2,376	2,654	3,417	4,031
Total	6,511	7,592	8,780	7,608	9,397	10,443
Nonmetals:						
Fertilizer materials:						
Crude	6	7	7	200	230	253
Manufactured (including anhydrous ammonia)	536	570	665	356	381	436
Other:						
Crude	396	436	474	611	717	803
Processed [2]	624	853	840	608	727	844
Total	1,562	1,866	1,986	1,775	2,055	2,336
Mineral fuels:						
Coal, coke, peat, and briquets thereof	939	766	781	1,588	1,526	1,389
Petroleum: Crude and products	1,701	1,735	1,866	6,710	7,287	7,740
Gas: Natural and manufactured, including LPG	38	38	47	36	39	71
Crude petrochemicals, natural asphalt, carbon black, and gas carbon	50	60	67	83	94	97
Total	2,728	2,599	2,761	8,417	8,946	9,297
Grand total	10,801	12,057	13,527	17,800	20,398	22,076

[1] Excludes gold and partly worked and worked but unset diamond and other precious stones.
[2] Includes some minor metals and some metal oxides (including alumina) classified by the United Nations among chemicals (Division 51 of the Standard International Trade Classification, revised).

Source: Statistical Office of the United Nations.

national boundaries was slow and problems of competition policy remained in the forefront.

In 1965 the gross national product of the EEC increased by about 4 percent in constant prices (1958=100) and 7.4 percent in current prices.

Total imports in 1965 were $48,991 million and total exports were $47,904 million (in current prices), 10.9 percent and 12.5 percent higher, respectively, than in 1964. Intracommunity trade accounted for 41.6 percent of all imports and 43.4 percent of all exports. In value intracommunity trade grew by 12 percent against 14.5 percent in the preceding year. The shares of EFTA and the United States in the Community's total imports were 14 percent and 12 percent, respectively; corresponding figure for exports to these destinations were 20 percent and 7 percent, respectively. The Community had a $2.71 billion favorable balance of trade with EFTA but exported $2.26 billion less to the United States than it imported.

Table 6.—Non-Communist Europe: Geographic distribution of aggregate mineral commodity trade [1]

(Million dollars)

	Exports			Imports		
	1963	1964	1965	1963	1964	1965
Intraregional trade:						
European Economic Community countries	4,850	5,550	5,896	5,653	6,462	7,019
European Free Trade Association countries	2,336	2,648	2,892	2,157	2,423	2,546
Other non-Communist European countries	486	550	745	166	212	242
Total	7,672	8,748	9,533	7,976	9,097	9,807
Extraregional trade:						
Canada and the United States	753	804	1,155	1,658	2,058	2,105
Latin America	288	337	388	1,156	1,197	1,287
Communist Europe	516	486	552	1,116	1,178	1,318
Africa	560	566	642	2,032	2,708	3,262
Near East	259	253	314	3,130	3,370	3,491
Far East (including South Asia):						
Non-Communist	319	349	376	234	290	319
Communist	53	39	145	34	34	49
Australia and New Zealand	96	117	127	105	143	140
Not distributed [2]	285	358	345	359	323	298
Total	3,129	3,309	3,994	9,824	11,301	12,269
Grand total	10,801	12,057	13,527	17,800	20,398	22,076

[1] Excludes gold and partly worked and worked but unset diamond and other precious stones.
[2] As reported in source. Includes most territorial possessions and colonies of sovereign nations regardless of their geographic location. Major areas included are Jamaica, Trinidad and Tobago, Netherlands Antilles, Bermuda. British Guiana, Surinam, Panama Canal Zone, French Guiana, and numerous islands of the South Pacific, Notable exceptions are Aden, Angola, Hong Kong, Mozambique, other Portuguese Africa, and Portuguese Asia. which are included with the appropriate region. This quantity also includes shipments to undisclosed destinations,

Source: Statistical Office of the United Nations.

Table 7.—European Economic Community (EEC): Geographic distribution of aggregate mineral commodity trade [1] of member nations

(Million dollars)

Source or destination	Exports			Imports		
	1963	1964	1965	1963	1964	1965
Other EEC countries	3,714	4,325	4,620	3,694	4,295	4,497
Non-EEC countries:						
Canada and United States	457	486	748	897	1,034	1,063
Latin America	218	246	251	636	643	661
Non-Communist Europe:						
EFTA countries	1,533	1,685	1,844	1,139	1,218	1,231
Other non-Communist	286	332	488	98	125	128
Communist Europe	311	307	329	577	540	587
Africa	416	399	456	1,425	1,855	2,194
Near East	189	184	237	1,894	2,117	2,296
Far East (including South Asia):						
Non-Communist	163	175	219	150	203	219
Communist	39	23	111	24	25	32
Australia and New Zealand	21	29	28	34	39	41
Not distributed [2]	236	314	303	124	99	105
Total	3,869	4,180	5,014	6,998	7,898	8,557
Grand total	7,583	8,505	9,634	10,692	12,193	13,054

[1] Excludes gold and partly worked and worked but unset diamond and other precious stones.
[2] As reported in source. Includes most territorial possessions and colonies of sovereign nations regardless of their geographic location. Major areas included are Jamaica, Trinidad and Tobago, Netherlands, Antilles Bermuda, British Guiana, Surinam, Panama Canal Zone, French Guiana, and numerous islands of the South Pacific. Notable exceptions are Aden, Angola, Hong Kong, Mozambique, other Portuguese Africa, and Portuguese Asia, which are included with the appropriate region. This quantity also includes shipments to undisclosed destinations.

Source: Statistical Office of the United Nations.

Table 8.—European Economic Community: Distribution of mineral commodity[1] trade by commodity groups

(Million dollars)

Commodity group	Exports			Imports		
	1963	1964	1965	1963	1964	1965
Metals:						
Iron and steel:						
Ore and concentrate	91	93	85	500	612	665
Scrap	112	138	184	181	222	259
Ingots and semimanufactures	3,162	3,616	4,137	2,147	2,347	2,264
Other:						
Ores and concentrates	19	25	27	303	449	510
Scrap	82	127	156	134	201	283
Ingots and semimanufactures	836	1,054	1,370	1,562	1,958	2,306
Total	4,302	5,053	5,959	4,827	5,789	6,287
Nonmetals:						
Fertilizer materials:						
Crude	6	6	7	111	132	145
Manufactured (including anhydrous ammonia)	453	472	545	133	153	163
Other:						
Crude	259	282	302	406	480	533
Processed[2]	432	518	573	306	365	424
Total	1,150	1,278	1,427	956	1,130	1,265
Mineral fuels:						
Coal, coke, peat, and briquets thereof	798	763	703	1,171	1,110	1,004
Petroleum: Crude and products	1,258	1,328	1,445	3,659	4,084	4,413
Gas: Natural and manufactured, including LPG	36	36	45	27	25	28
Crude petrochemicals, natural asphalt, carbon black, and gas carbon	39	47	55	52	55	57
Total	2,131	2,174	2,248	4,909	5,274	5,502
Grand total	7,583	8,505	9,634	10,692	12,193	13,054

[1] Excludes gold and partly worked and worked but unset diamond and other precious stones.
[2] Includes some minor metals and some metal oxides (including alumina) classified by the United Nations among chemicals (Division 51 of the Standard International Trade Classification, revised).

Source: Statistical Office of the United Nations.

Figures in table 4 reflect the role of minerals in total EEC trade on a value basis; tables 7 and 8 give geographic and commodity group distribution of Community trade in mineral commodities. The Community's coal imports from the United States (19.43 million tons) accounted for 70.5 percent of its total coal imports. Although over 93 percent of the coal imports from the United States was coking coal, only 7.29 million tons was used in the steel industry.

Investment expenditures in the coal and steel industry of the Community during 1964 totaled $1,617 million compared with $1,842 million in 1963. The 1964 total was distributed as follows, in percent: Iron and steel industry, 79.8; coal industry, 18.7; and iron mines, 1.5. There was a further reduction in investment envisaged as of January 1, 1965, for the year to a total of $1,377 million with 72 percent for the iron and steel industry, 25.7 percent for coal, and 2.3 percent for iron mines. Of the investment envisaged for the iron and steel industry, 50.1 percent was assigned to rolling mills.[26]

In EEC countries, 699,700 were employed in coal mines (734,800 in 1964), 587,300 in iron and steel plants (591,000 in 1964), and 31,500 in iron mines (34,700 in 1964), for a total of 1,318,500. The reduction of 42,000 in total employment in these industries was more than 3 times the previous yearly drop of 12,000 and is attributed mainly to lower coal industry employment.

[26] European Coal and Steel Community, The High Authority. 14th General Report on the Activities of the Community. (February 1, 1965–January 31, 1966). Luxembourg, March 1966, pp. 219–232.

Energy.—Main features of the EEC's energy economy were the same as in 1964: an increase in petroleum consumption, a decline in coal consumption, and the important role of electricity as an energy form, accounting for about a quarter of energy consumption. Nuclear energy's share remained less than 1 percent.

There were no important developments in implementing the Council of Ministers resolution on adopting a common energy policy. The report of the Consultative Committee on the Fusion of the European Communities suggested that energy, like transportation, be treated as a single sector and its provisions listed in a special chapter in the treaty which would merge the Communities. The report urged that the rules of competition, applied to coal under the ECSC Treaty, be extended to other forms of energy.

Gross internal or apparent energy consumption by the Community in 1965 increased by 10.4 percent to 626 million tons of standard coal equivalent (SCE) from 1964 consumption of 600 million tons. This consumption was distributed by commodity as follows in millions of tons of SCE: Coal, 227; lignite, 33; natural gas, 21; crude petroleum, 304; and primary electricity, 41.[27] About 605 million tons of SCE was converted as follows, in million tons: Powerplants, 108; briqueting plants, 22; coke and gas ovens, 107; blast furnaces, 20; and refineries, 348.

While gross internal energy consumption of the Community increased by 4 percent, petroleum consumption for the Community as a whole increased by 11.3 percent. Coal consumed for electricity production decreased from about 57.0 million tons of SCE to 53.9 million tons, although total primary fuel transformed into electricity remained the same at about 108 million tons of SCE. Favorable hydraulic conditions caused only a small (1.2-percent) increase in thermal electricity production although total electricity output increased by about 6.3 percent. Coal consumption in industry, other than iron and steel, and for domestic use also declined.

Net fuel imports of the Community (including allowance for bunker exports) from non-Community sources increased by about 33 million tons, almost the same as the increase in net imports of petroleum and petroleum products (35 million tons of SCE). Net energy imports were equivalent to 49.9 percent of gross internal energy consumption.

Intra-Community trade in solid fuels consisted of 16.3 million tons of coal, 1.2 million tons of coal briquets, and 9.8 million tons of coke. Intra-Community trade in petroleum products totaled 17.6 million tons. Total yearend pithead stocks of coal stood at 23,169,000 tons, an increase of 8,670,000 tons during the year.

As a result of the rationalization effort, the number of producing coal mines of the Community at yearend showed a further decline to 240. Coal produced from fully mechanized mines (both mining and loading mechanized) accounted for 70.5 percent of total output. In some coal basins the figure was as high as 90 percent. Improvement has been achieved through mining at longface and self-advancing supports. Output of coal per underground man-shift increased by 2.7 percent to 2,461 kilograms; this rate of increase was almost the same as that in 1964, which was the lowest since 1961. Production cost, including interest and amortization, increased 5.5 percent mainly as a result of increased wage scales in 1965; wage increases compared with 1964 levels varied from 6.3 to 9.7 percent. For 1964, manpower cost accounted for 57 percent of production cost of net output in Belgium and West Germany; the corresponding figure for France was 65 percent.[28]

The petroleum refineries of the Community processed 244 million tons of crude oil, 16 percent more than in 1964, and produced 226 million tons of petroleum products, of which 207 million tons was energy products.[29] Crude distillation capacity in member countries increased from 269 million tons at yearend 1964 to 299 million tons at yearend 1965.

Additional export contracts for delivery of Netherlands gas to France and Germany were being negotiated or concluded during

[27] Office Statistique des Communautés Européennes. Statistiques de l'Energie, Brussels, Belgium, 1966. No. 4, 1966, pp. 13, 21.

[28] Economic Commission for Europe. Coal Committee. Group of Experts on Coal Statistics. Coal/S/Working Paper No. 18, Jan. 31, 1966, p. 12.

[29] Office Statistique des Communautés Européennes. Statistiques de l'Energie, 1966. Brussels, Belgium, No. 4, 1966, p. 116.

the year. Starting in 1967, Gas de France will receive 5 billion cubic meters of gas annually. An agreement between Ruhrgas and Nederlandsche Aardolie Maatschappij (NAM) Gas Export of the Netherlands, signed in November, is to run 25 years. Deliveries are scheduled to begin in late 1966 increasing to 3 billion cubic meters by 1975. Negotiations between NAM Gas Export and Gas-Union G.m.b.H. of Frankfurt and Gasversorgung Sued-Deutschland G.m.b.H. of Stuttgart, West Germany, envisage gas delivery within 3 years which would increase 5 to 6 billion cubic meters by 1975. These long-term contracts bring the total of projected exports to 22 to 23 billion cubic meters per year. By 1975 natural gas is expected to supply 8 percent of all the energy requirements of the EEC, with nearly 60 percent of the gas supplied from the Netherlands.

Iron Ore.—Iron ore production in the EEC declined by 3.3 percent to 74.7 million tons of marketable ore (78.75 million tons of mine run ore) but the decline rate was higher in Luxembourg and West Germany, about 8 percent. Of the marketable tonnage 7,307,000 tons was obtained from beneficiation plants. The entire production of iron ore in West Germany was captive and French iron ore fell to 10 percent of total world output. Yearend stocks of ore were 11.8 million tons at mines. Intra-Community trade in iron ore, 20.9 million tons, was about the same as in 1964.

Imports from third countries increased 12.8 percent to 53.7 million tons, mainly because of the greater requirements of Italy and the Netherlands. On the basis of iron content non-EEC ore production was 57 percent of total iron consumption. Of iron ore imports from third countries, West Germany took 55.0 percent followed by Luxembourg 16.7 percent; Italy 14.7 percent; France 7.0 percent; and the Netherlands 6.6 percent. Important supplying countries in 1965 and quantities imported into EEC from these sources were as follows, in thousand tons: Sweden 16,819; Liberia 10,440; Brazil 6,092; Mauretania 4,375; Venezuela 2,811; Peru 2,105; and Canada 2,045.

Share of iron ore of all types used as sinter in the steel industry increased to 55.4 percent (51 percent in 1964). Of 125,534,000 tons of iron ore consumed, 69,519,000 tons was sintered and 54,551,000 tons fed directly to the blast furnace, and the remainder was used in steel plants. Sinter consumption per ton of pig iron increased to 1,086 kilograms (1,031 kilograms in 1964); 68,996,000 tons of sinter was produced.

Average price of imported ore (c.i.f. Community ports) was US17.7 cents per unit of iron (US18.0 cents in 1964). Lorraine ore price ex-mine was US9.68 cents per unit of iron, but this lower price was not sufficient to compensate for the low grade compared with imported ores.

Iron and Steel.—Capacity of steel production exceeded 100 million tons, 8 million tons having been added during 1965; it is expected to reach 118 million tons by 1969. Production capacity was utilized at an average rate of 86 percent. Increase in steel production in 1965 was almost entirely due to increased output in Italy and the Netherlands; output in other countries remained practically unchanged, except for a small increase in Belgium. The share of steel produced by basic oxygen process increased to 19.1 percent (12.6 percent in 1964) at the expense of Thomas and open-hearth processes. Special high-grade and alloy steel showed a further 7.4-percent increase to 6.4 million tons, 7.5 percent of all steel output. Almost half of these steels are produced in Germany.

In 1965 for the first time since the establishment of the Community, cold-rolled sheet less than 3 millimeters thick accounted for about one-fifth the total output of rolled products (excluding pipes). A steady increase in the relative importance of hot-rolled medium sheet and plate and finished coil has been noted since 1963 in contrast with a reduction in the percentage of hot-rolled sheet less than 3 millimeters thick.

Real consumption in terms of crude steel increased 3.9 percent to 71 million tons, but demand did not equal this figure because of drawdown on stocks. Rate of increase in steel consumption continued to trail the industrial production increase. Demand for export was strong.

Community trade in iron ore, scrap, pig iron and ferroalloys, ingots, blooms and billets, and semifinished steel accounted for 6.5 percent of all the imports and 9.2 percent of all exports of the EEC by value in 1965. Intra-Community trade in these commodities accounted for 64 percent of the import and 46 percent of the export of the

Table 9.—European Economic Community: Salient iron and steel statistics

(Thousand tons unless otherwise specified)

	1963	1964	1965
Sinter:			
Production	53,934	62,905	68,966
Consumption per ton of pig iron	1,010	1,031	1,086
Pig iron and ferroalloys:			
Production:			
Pig iron	49,015	56,309	58,602
Foundry iron	2,970	3,210	3,326
Spiegel	212	166	165
High-carbon ferromanganese	548	643	643
Other pig iron	462	454	466
Total	[1] 53,206	60,783	[1] 63,202
Percent of crude steel production	72.5	72.8	73.3
Raw material consumption:			
Iron ore:			
In sintering plant	21,553	25,944	29,980
In blast furnaces	21,125	23,075	21,954
Total including steel mills	43,380	49,896	52,810
Manganese [2]	1,493	1,688	1,731
Pyrite cinder	4,056	3,951	3,911
Scrap	2,021	1,939	1,505
Coke:			
Sinter plants	3,382	4,131	4,335
Blast furnaces	40,946	44,573	44,348
Other uses	1,006	807	692
Total	45,334	49,511	49,375
Per ton of pig excluding coke used in sinter plant	769	733	702
Steel ingots and metal for casting:			
Production:			
Thomas	33,348	34,717	32,141
Open hearth	25,249	27,939	26,874
Electric	r 8,974	r 9,610	10,334
Other steel—mainly LD and other oxygen steel	5,501	10,442	16,521
Bessemer	147	149	122
Total	r 73,218	r 82,856	[1] 85,992
Of which carbon and special steel	5,350	5,975	6,409
Thomas slag	7,652	8,345	8,041
Raw material consumption in steel mills:			
Scrap [3]	30,078	33,375	34,391
Pig iron	49,423	56,498	58,795
Spiegeleisen and blast furnace ferroalloys	657	698	703
Per ton of steel:			
Scrap ..... kilograms	415	307	403
Pig iron ..... do	691	697	698
Finished steel:			
Production	51,973	r 58,553	60,362
Imports: [4]			
From the Community	11,477	13,401	12,830
From other countries	3,560	2,963	2,183
Exports:			
To the Community	11,332	13,307	12,914
To other countries	11,393	r 12,826	17,044
Apparent consumption, in terms of crude steel	64,718	70,922	69,683
Investments:			
Facilities for production of pig iron ..... million dollars	r 258	r 223	162
Steel furnaces ..... do	r 175	r 158	128
Rolling mills ..... do	r 726	634	425
General services ..... do	r 320	r 300	220
Total ..... do	r 1,480	r 1,315	935

r Revised.
[1] Detail do not add to total because of rounding.
[2] Includes small tonnages used in steel plants.
[3] Total scrap consumption including in steel foundries 1963—33,096; 1964—36,336; 1965—36,884.
[4] Includes also non-Treaty items (forged and drawn items, cold drawn wire, steel pipes, and steel pipes accessories) but excludes cast iron pipes and old rails.

Community of these commodities. Compared with 1964, the Community increased its iron and steel exports 11.4 percent by value, with exports to the United States having increased 70 percent on a similar basis. Intra-Community trade in rolled steel items covered by the ECSC treaty totaled 11.8 million tons (12.3 million in 1964),[30] but exports to third countries, totaling 14.3 million tons, exceeded that of 1964 by 3.8 million tons. Decline in the Community's steel imports from third countries is attributable mainly to decline in Italian imports; this country became a net steel exporter instead of a net importer in 1965.

As a result of smaller unit consumption of scrap for pig iron and steel production and larger scrap generation within the Community, scrap imports from third countries were reduced to 1,473,000 million tons from 2,118,000 million tons in 1964. Intra-Community scrap totaled 4,945,000 tons (3,580,000 tons in 1964). Except for small quantities, the ban on export of scrap from the Community remained in force.

Steel prices were lower particularly in the export market. The following lowest listed prices for a number of rolled products indicate the trend:

Type	Price, dollars per ton	
	1964	1965 (December)
Reinforcing rods [1]	94	80
Merchant sheets [1]	96	90
Sections	[2] 97.75	[1] 90
Wire bars [1]	90	89
Plates	[3] 106.3	[1] 89
Thin sheets (hot rolled)	130	108

[1] Belgium.
[2] France.
[3] Netherlands.

The above, mainly Belgian producers' list prices, whose flexibility permits them to follow changes in the market closely, were much lower in part than that of producers in other Community countries which had to aline increasingly with Belgian producer prices. Prices of steel in November 1965 f.o.b. Antwerp were as follows, in dollars per ton: reinforcing bars 70–80; merchant bars 79–81; beams 72–77; wire rods 79–83; steel strip 80–85; plates 79–85; thick sheets 79–85; thin sheets, hot-rolled 101–102, and cold-rolled 100–103. Sales by alinement of Community prices of rolled steel with quoted prices of similar products from third countries averaged 47,400 tons per month.

Action taken by the High Authority in February 1964, increasing steel tariffs of the five member states of the Community to the high level of the Italian customs duties and establishing quotas for import of pig iron and rolled steel from countries with state-controlled trading regimes, were extended to the end of 1965.

The High Authority organized a second conference on steel for October 26–28 with the theme of progress in steel utilization. The conference dealt with five topics: Steel and industrial esthetics, steel surface protection, cold forming of steel, modern methods of assembling steel, and problems of steel utilization in developing countries The High Authority plans to organize a third steel conference in Luxembourg October 26–28, 1966, with the theme of steel in agriculture.

The European Free Trade Association (EFTA).[31]—The problem of establishing close cooperation between EFTA and EEC and avoiding the consequences of a continued separate evolution of the two regional organizations were of concern to the EFTA ministerial meetings in Vienna during May and in Copenhagen during October, respectively. It was felt that a meeting at ministerial level between the two organizations would be desirable to consider means to facilitate the removal of trade barriers and promote economic cooperation in Europe. On the specific issue of tariffs, however, it was hoped that the removal of tariff discrimination between the two trading groups could be achieved within the Kennedy Round negotiations. The EEC crisis made an EFTA initiative for a ministerial meeting with EEC members not feasible.

The Economic Committee of EFTA which was established in December 1964 held meetings in July 1965 and December

[30] Office Statistiques des Communautés Européennes. Sidérurgie (Luxembourg). No. 4, 1966, pp. 100–101.

[31] Austria, Denmark, Norway, Portugal, Sweden, Switzerland, and the United Kingdom are full members; Finland since 1961 has been an associate member. In statistical presentations in this chapter, Finland generally has been excluded, following the practice of the Statistical Office of the United Nations. Where Finland has been included, it has been appropriately noted.

1965, the later at the request of Finland. The purpose of this committee is to examine the economic and financial situation of member states and review their economic and financial policies, the implementation of these policies, and their impact on member states' economies. During the year the Economic Committee studied problems, drawbacks, and benefits of long term planning. The Committee also examined detailed papers on long-run structural problems in some member states.

The 15-percent import surcharge which the British Government imposed in October 1964 was reduced to 10 percent in April 1965. This surcharge applied to imports of most manufactured and semimanufactured goods from any source including EFTA countries. A further 10-percent cut in tariffs on industrial goods traded among the eight EFTA countries was scheduled to go into effect on December 31, 1965; this will bring the tariffs to 20 percent of their 1960 level. The final 20 percent will be eliminated on December 31, 1966. Protective quotas will also be eliminated at the same time as tariffs reach zero. Finland, having become associated with EFTA 1 year after the Stockholm convention came into force, will reduce its tariffs to zero by the end of 1967.[82] During 1965 work continued on the abolition of nontariff trade barriers within EFTA.

Intra-EFTA export of all commodities increased 10.9 percent to $5,825 million in 1965. The EFTA's exports to third countries increased 11.1 percent over those of 1964. Intra-EFTA imports of all commodities increased by 11.0 percent and from third countries by 6.3 percent. With the exception of the United Kingdom and Switzerland, all EFTA countries in 1965 increased their imports in total commodity trade from their partners by 10 to 20 percent. The United Kingdom's surcharge caused the country to import only 7 percent more from other EFTA countries than in 1964; Switzerland increased its imports with other EFTA countries by only 2.5 percent.

Despite increases in intra-EFTA trade, the bulk of the total commodity trade of

[82] EFTA Reporter (Washington, D.C.). December 8, 1965, p. 1.

Table 10.—European Free Trade Association (EFTA): Geographic distribution of aggregate mineral commodity trade[1] of member nations

(Million dollars)

Sources or destination	Exports			Imports		
	1963	1964	1965	1963	1964	1965
Other EFTA countries	747	890	951	817	976	1,042
Non-EFTA countries:						
Canada and the United States	276	296	377	688	924	917
Latin American Republics	67	83	80	469	498	555
Non-Communist Europe:						
EEC countries	1,062	1,121	1,163	1,672	1,834	2,012
Other non-EFTA	198	213	248	66	83	105
Communist Europe	187	164	200	353	398	472
Africa	132	154	170	555	750	941
Near East	67	66	73	995	1,017	934
Far East (including South Asia):						
Non-Communist	153	164	146	66	69	71
Communist	13	16	33	10	8	15
Australia and New Zealand	75	88	98	69	102	96
Not distributed [2]	29	32	38	226	219	183
Total	2,259	2,397	2,626	5,169	5,902	6,301
Grand total	3,006	3,287	3,577	5,986	6,878	7,343

[1] Excludes gold and partly worked and worked but unset diamond and other precious stones.
[2] As reported in source. Includes most territorial possessions and colonies of sovereign nations regardless of their geographic location. Major areas included are Jamaica, Trinidad, and Tobago, Netherlands Antilles, Bermuda, British Guiana, Surinam, Panama Canal Zone, French Guiana, and numerous islands of the South Pacific. Notable exceptions are Aden, Angola, Hong Kong, Mozambique, other Portuguese Africa, and Portuguese Asia, which are included with the appropriate region. This quantity also includes shipments to undisclosed destinations.

Source: Statistical Office of the United Nations.

this group remained with third countries as seen from the following tabulation:

	Million dollars		
	1963	1964	1965
Imports:			
From EFTA	4,700	5,525	6,096
From other	21,693	24,582	26,130
Total	26,393	30,107	32,226
Exports:			
To EFTA	4,545	5,311	5,825
To other	17,601	18,668	20,688
Total	22,146	23,979	26,513

EFTA's trade deficit with the EEC for all commodity trade totaled about $2,933 million, 13 percent more than in 1964. While imports from the EEC increased by 9.3 percent in 1965, EFTA's export to this destination increased by only 7.9 percent.

With regard to trade in minerals, EFTA exports of minerals and metals to the EEC shown in table 7, totaled $1.2 billion in value or almost 12 percent of total exports to that area and 32.5 percent of all mineral exports. Among mineral commodity exports, pig iron, ferroalloys and steel were the most important group, followed by nonferrous metals, refined petroleum, and iron ore. The EFTA's mineral commodity imports from the EEC totaled $2,012 million or 32 percent of imports from all sources. On a commodity basis, refined petroleum was the most important category followed by iron and steel, nonferrous metals, nonferrous metal ores, and coal.

Table 11.—European Free Trade Association: Distribution of mineral commodity [1] trade by commodity group

(Million dollars)

Commodity group	Exports			Imports		
	1963	1964	1965	1963	1964	1965
Metals:						
Iron and steel:						
Ore and concentrate	193	226	232	199	251	257
Scrap	39	34	22	9	20	27
Ingots and semimanufactures	1,121	1,248	1,350	893	1,132	1,136
Other:						
Ores and concentrates	29	42	50	251	307	362
Scrap	25	34	55	22	39	62
Ingots and semimanufactures	699	818	954	1,002	1,345	1,564
Total	2,106	2,402	2,663	2,376	3,094	3,408
Nonmetals:						
Fertilizer materials:						
Crude	74	84	104	59	66	71
Manufactured (including anhydrous ammonia)				137	137	164
Other:						
Crude	113	124	138	173	196	225
Processed [2]	170	191	202	253	309	333
Total	357	399	444	622	708	793
Mineral fuels:						
Coal, coke, peat, and briquets thereof	138	106	76	325	307	278
Petroleum: Crude and products	394	366	381	2,631	2,727	2,799
Gas: Natural and manufactured, including LPG	1	1	1	7	10	35
Crude petrochemicals, natural asphalt, carbon black, and gas carbon	10	13	12	25	32	30
Total	543	486	470	2,988	3,076	3,142
Grand total	3,006	3,287	3,577	5,986	6,878	7,343

[1] Excludes gold and partly worked and worked but unset diamond and other precious stones.
[2] Includes some minor metals and some metal oxides (including alumina) classified by the United Nations among chemicals (Division 51 of the Standard International Trade Classification, revised).

Source: Statistical Office of the United Nations.

COMMUNIST EUROPE [33]

Exacting appraisals of the mineral industries and mineral economies of the Communist countries of Europe, as well as detailed comparison of their performance with that of other countries is hampered by the paucity of certain types of information. Notably, there are virtually no quantitative statistics on capacity to produce or production of nonferrous base metals and precious metals, while trade of these commodities and others are only partly reported for a number of these countries. Reserve data reported are often incomplete with regard to grade and content of deleterious materials. Moreover, mine output of many commodities is reported in terms of gross weight of run-of-mine ore without data on grade, and in general, there is insufficient data on efficiency of recovery of metals and other usable products from crude mine output as well as on efficiency of utilization of these products in manufacturing.

Published official information on the mineral industries of Communist countries in Europe (including the U.S.S.R. in Asia) showed an upward trend for output of most commodities, but the growth was moderate. The stress continued to be on production of basic materials for heavy industry and consumption of minerals for consumer goods remained considerably lower than in the countries of non-Communist Europe. The growth of mineral output value in 1965 was 4 to 6 percent with respect to that of 1964, compared with annual growth rates of 10 to 14 percent during the late 1950's. The lower growth rate in recent years was attributed chiefly to the larger bases to which successive increases must be added, indicating that the minerals economy of the region as a whole has matured considerably.

The U.S.S.R. remained the principal mineral producing country of the area, accounting for 85 to 90 percent of the total output value in 1965. As members of CEMA (Council for Mutual Assistance, or in Russian, Soviet Ekonomicheskoy Vzaimopomoshchi—SEV), the U.S.S.R., Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and Rumania continued to cooperate in economic and industrial developments under the leadership of the Soviet Union. Albania, although a member of CEMA, was not participating in the organization's work. Yugoslavia remained independent of CEMA, but cooperated with CEMA and its members bilaterally. Yugoslavia also maintained stronger relations with non-Communist countries than did the members of CEMA, and although investments of foreign capital in the classical sense were not possible in Yugoslavia, a number of financial arrangements were made for development of mineral resources during 1965 that involved foreign loans to be repaid with mineral products.

Of the Communist European production totals, the U.S.S.R. accounted for more than 90 percent of the iron ore and crude oil, more than 80 percent of the aluminum and copper, more than 70 percent of pig iron and steel, more than 60 percent of cement, and more than 50 percent of lead and zinc. In output of most other mineral commodities, the U.S.S.R. also remained dominant. Thus shortages and surpluses in the U.S.S.R. dominated the regional supply picture. Communist European mineral trade with the outside world was smaller than might be expected considering the magnitude of territory, mineral resources, and industries. Nonetheless, mineral industry products accounted for a sizable part of the region's total trade in 1965. The total value of Communist Europe mineral trade in 1964, the last year for which complete data are available, was about $1,000 million, with exports accounting for more than $800 million of the total. Communist Europe was a source of raw material for highly industrialized non-Communist Europe, but supplies from this area in most cases could not be considered vital. Significant exports included crude petroleum, manganese, chromite, crude fertilizer materials, and precious metals, and to a lesser extent, pig iron, steel ingots, and high-rank coals.

Generally, earnings from exports to non-Communist countries have been used to obtain machinery and equipment not available in sufficient quantities with in the Communist sector. Because of the apparent shortage of suitable foreign exchange, mineral imports from non-Communist countries were restricted to a few commodities.

[33] Prepared by Roman V. Sondermayer.

Mineral commodity imports were valued at about $200 million and consisted chiefly of nonferrous metal semimanufactures, tin, tungsten, and certain rolled steel shapes.

In the case of mineral trade between Communist countries, that of the U.S.S.R. was dominant and was characterized by large exports of mineral fuels and raw minerals from the U.S.S.R. and imports of semimanufactured products by the U.S.S.R. The U.S.S.R. was a vital supplier of mineral industry commodities to European Communist countries.

Practically all Communist countries were searching for new methods to increase productivity. The profit concept was introduced in some cases as a way of measuring the efficiency of operations. Some of these nations, such as Yugoslavia, considered that profitability was the only justification for operation of a mine or plant, while others, such as the U.S.S.R. remained very cautious in introducing this factor in their mineral industries. Nevertheless, the search for and testing of new methods to increase productivity was underway in 1965.

In the case of Yugoslavia, early reports on the results of the introduction of this concept reflected increased unemployment, higher prices for products and declines in output of some commodities. The decline in employment apparently resulted from layoff of at least some unessential workers, while price increases may be attributed to improved product quality and increased demand. The lower output levels evidently reflected elimination of some inefficient production units. However, the long-term effects on the economy could not be evaluated. Similarly, the effects of economic reforms introduced in East Germany could not be appraised.

Major changes in physical facilities and significant planning changes during 1965 in the mineral industries of the Communist countries are presented on a country-by-country basis as follows:

In the U.S.S.R. development of ferrous and nonferrous metallurgical facilities and the new 7-year plan were among the most notable. Aluminum was in the center of Soviet metal industry activities. The second stage of the Krasnoyarsk aluminum plant, the largest in the country, went on stream in April 1965. The two stages of the plant in operation at yearend produced at 80 percent of capacity. Construction of the Bratsk aluminum plant in Siberia, which reportedly will have an annual output capacity of 800,000 tons of aluminum, was underway. Reports indicated that production would begin in 1966.

In the iron and steel sector of the Soviet mineral economy, the commissioning of the Sokolovsko-Sarbay mining and concentrating combine in Kazakhstan was reported. The combine, with an annual capacity of 26.5 million tons of ore, was reportedly the largest mining and beneficiation combine in the country.

In the area of nonmetals, the first stage of Dzhetygara asbestos plant in Kazakhstan with an annual capacity of 200,000 tons was commissioned at yearend, and new cement plants at Ust'-Kamenogorsk and Achinsk increased Soviet cement capacity by about 1.2 million tons.

Tartar and Bashkir A.S.S.R. were the largest producers of crude oil in the U.S.S.R. but most of the exploratory activities were conducted in western Siberian fields in Tyumen Oblast and on the Mangyshlak Peninsula in Kazakhstan. First shipments of oil were reported in 1965 from these two areas. It is expected that these two areas eventually will become largest producers of oil in the country.

The Albanian mineral industry generally remained an insignificant contributor to the world mineral economy during 1965. Chromite remained its only product of international note. Relatively small developments in its nonferrous metals industry did not change the nation's role in the overall world or the Communist European mineral picture.

Bulgaria continued to develop its mineral resources at a fast pace. The iron and steel plant at Kremikovtsi started operation of a second blast furnace and its first electric furnace for steel production. The completion of a plant for anthracite beneficiation near the Tompson railroad station in the Balkan Mountains was the highlight of Bulgaria's mineral fuels industry.

The mineral industry of Czechoslovakia had a year of moderate expansion, accomplished mostly by improving existing facilities rather than by completing new ones. Construction of the East Slovakian ironworks was the principal project of the mineral industry.

263-927 O-67—20

The Hungarian mineral industry, modest by world standards, continued to develop facilities for bauxite and alumina production. Completion of the first stage of Almafuzito alumina plant, and expansion and completion of the cold-rolling mill at the Dunajvaros ironworks were highlights for 1965.

East Germany continued to expand facilities for production of mineral fuels, petrochemicals, and iron and steel. The construction of Schwartze Pumpe coal combine near Cotobus, commissioning of a second stage in the Schwedt refinery raising capacity to 4 million tons of crude oil per year, commissioning of a new steel rolling mill at Eisenhuettenstadt and opening of a new cadmium plant complete the list of important mineral industry facilities installed during 1965.

Reports indicated that the Polish mineral economy in general lagged behind overall industrial economic growth through 1965. Leading developments in the mineral industry included the beginning of operation of a converter facility and two coking batteries at the Lenin Iron and Steel Plant at Nowa Huta, the start of production in the second processing plant at the Tarnobrzeg sulfur deposits and expansion of facilities at the Plock petroleum refinery.

Although Rumanian output of crude oil ranked second in Europe to that of the U.S.S.R., the industry still accounted for only a minor part of total world crude oil output. In an effort toward diversification, the Rumanian Government was developing other mineral industry facilities. The country's first aluminum plant was commissioned in the summer of 1965 near Saltina. The facility has an annual capacity of 25,000 tons of aluminum which reportedly will be increased to 50,000 tons in the near future. In addition to the Slatina aluminum plant, mineral industry highlights in 1965 included new copper mining and beneficiation facilities at Moldava Nova, the lead-zinc complex at Copsa Mica, and two plants for production of liquefied natural gas, one in Moreni and the second at Olteni.

Yugoslavia remained one of the leading nonferrous metal producers in Europe. Shortages of liquid fuels and high-rank coals that have proved troublesome in the past continued during 1965. The most important mineral developments included the decision to build a new lead-zinc smelter in Titov Veles in Macedonia, the discovery of reportedly significant uranium deposits near Zletovo in Macedonia, and the completion of a new oil refinery in Urje near Rijeka.

The Mineral Industry of Albania

By Roman V. Sondermayer [1]

During 1965 Albania remained a small producer of minerals and mineral products in terms of total world production. The mineral extraction and processing industry had virtually no world significance except in the case of chromite, of which the country produced about 7 percent of the world output in 1965. The industry, however, remained of substantial importance to the country's economy, contributing about 17.5 percent of the nation's social product.[2] In addition to chromite, Albania produced copper ore and blister copper, iron-nickel ores, crude petroleum, asphalt, and small quantities of cement and brown coal. Information on performance of the mineral industry was scarce. Official Albanian sources indicated fulfillment of plans in the mineral industry in 1965 only. Most of the mineral industry products were exported as the local economy did not provide a sufficient market for minerals produced in the country. As a result, minerals accounted for more than 50 percent of the total export of the country. Mainland China and Czechoslovakia were the principal buyers of Albanian mineral products.

The major developments in the mineral industry of Albania in 1965 were completion of some sections of the copper plant at Kukesh Rreth, construction of the cement plant at Elbasan, and construction of the superphosphate plant in Kruje Rreth at Lac. Since the political break with the Soviet Union, Albania's political leadership has stressed the necessity to develop its own technical and natural resources without the aid of the Soviets, but relying on Chinese experience.

PRODUCTION

Statistics on 1965 mineral production of Albania were not available. Albanian sources indicate that plans were fulfilled in all branches of the mineral industry. According to sectors, fulfillment was as follows: Fuel industry 100 percent; copper industry 104 percent; iron-nickel ore industry 100 percent. No information was made public on chromite production. Efforts in production of minerals were concentrated in expansion of existing facilities and exploration.

TRADE

Mineral commodities accounted for an important part of total Albanian foreign trade; however, the small volume of this trade made it chiefly of significance to the domestic economy, rather than to world mineral supplies.

Chromite, crude oil, asphalt, copper ore, blister copper, and iron-nickel ore were the principal export items. Coke, iron and steel semimanufactured products, cement, and sulfuric acid were the principal imports.

Mainland China remained the most significant trade partner in 1965. Czechoslovakia followed China in the volume of mineral commodity trade. More than 80 percent of toal trade was with Communist countries.

Among non-Communist countries, Italy remained Albania's principal trade partner; the trade exchange amounted to about $13 million in 1964. France and Finland also imported Albanian mineral products.

[1] Foreign minerals specialist, Division of International Activities.

[2] Data on gross national product (GNP) for Albania are not available; the social product is the closest reported equivalent but does not correspond directly to the GNP.

Table 1.—Albania: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 e
Metals:					
Chromite	232,458	251,297	293,000	310,000	315,000
Copper:					
Ore	80,491	135,972	e 140,000	150,000	160,000
Blister	1,289	1,860	1,870	1,950	2,000
Iron-nickel ore	358,465	425,047	e 300,000	350,000	370,000
Nonmetals: Cement	119,764	119,243	129,000	140,000	150,000
Mineral fuels:					
Coal—thousand tons	289	r 310	e 300	e 330	350
Petroleum:					
Crude—do	771	786	750	800	800
Refinery products:					
Gasoline—do	56	48	NA	NA	NA
Gas oil—do	63	76	NA	NA	NA
Diesel oil—do	3	2	NA	NA	NA
Unspecified—do	263	356	NA	NA	NA
Total—do	385	482	e 480	e 480	480

e Estimate. r Revised. NA Not available.

Table 2.—Albania: Export of selected minerals and metals

(Metric tons unless otherwise specified)

Commodity	1962	1963	Principal destinations, 1963
Metals:			
Chromite	269,100	247,800	Mainland China 66,000; Czechoslovakia 46,700.
Copper blister	1,569	1,935	Mainland China 1,002; Hungary 441; Czechoslovakia 151; North Korea 129; Poland 60; Bulgaria 50.
Iron-nickel ore	417,300	80,200	Czechoslovakia 43,500; mainland China 20,000; Hungary 16,700.
Nonmetals: Bitumen (natural asphalt)	11,400	11,400	Czechoslovakia 7,800; Yugoslavia 1,900.
Mineral fuels:			
Petroleum:			
Crude—thousand tons	273	310	Mainland China 117; Italy 107; East Germany 86.
Refinery products—do	137	196	NA.

NA Not available.

Source: Vietari Statistikor I.R.P.S.H. 1964 (Statistical Yearbook of the Peoples Republic of Albania for 1964). Tirana, Albania 1964, 483 pp.

Table 3.—Albania: Import of selected minerals and metals

(Metric tons)

Commodity	1962	1963	Principal sources, 1963
Metals:			
Iron and steel:			
Pig iron	5,040	2,951	Poland 2,651; North Korea 300.
Steel, ingots	3,466	5,982	Mainland China 4,098; Czechoslovakia 1,229; West Germany 397.
Semimanufactures:			
Pipes, all kinds	9,224	16,755	Mainland China 7,749; Czechoslovakia 5,818; Poland 1,948.
Other	40,216	42,193	Not available.
Total	49,440	58,948	Mainland China 24,828; Czechoslovakia 18,246; Poland 11,969.
Nonmetals:			
Cement	28,500	41,900	Rumania 13,200; Hungary 12,800; Poland 8,900.
Sulfuric acid	1,229	1,958	Mainland China 1,877.
Mineral fuels: Coke	17,966	5,486	All from Poland.

Source: Vietari Statistikor I.R.P.S.H. 1964 (Statistical Yearbook of the Peoples Republic of Albania for 1964). Tirana, Albania 1964, 483 pp.

COMMODITY REVIEW

METALS

Chromite.—Albania again ranked second to the U.S.S.R. among Communist nations as a producer of chromite. The center of activities was the large mine of Bulqiza. To improve the existing reserve situation and to permit rational expansion of output, exploration was intensive, but results were not announced.

Most of the chromite produced was exported to Czechoslovakia, mainland China, and Yugoslavia.

Copper.—The small copper production of Albania was significant to Communist countries as a group because of the shortage of copper and copper semimanufactures in that part of the world.

The Rubik copper plant in the Mirdit region was the center of copper activities. Construction continued at this facility, which started production in 1964. New equipment was added in several sections and annexes. In the refinery, electrolytic cells were completed, and a new boiler was installed. Apparently the construction continued throughout 1965.

The electric wire plant at Shkoder underwent expansion during 1965. A new section reportedly was under construction, but no information was available on capacity of the plant, either before or after expansion. The plant was built under supervision of technicians from mainland China.

NONMETALS

Cement.—Basic construction work on the 100,000 ton per year cement plant at Elbasan reportedly was near completion at yearend. The installation of equipment should start in 1966.

Fertilizers.—Construction of the superphosphate factory at Lac continued. The plant was built by technicians from the Italian firm, Montecatini, Soc. Generale per l'Industria Mineraria e Chimica and mainland China financed the project. The builders completed the section for production of sulfuric acid and a workshop. No date was reported for the beginning of production.

MINERAL FUELS

Coal.—Lignite and low-rank bituminous coals produced were consumed in the country. A new coal mine of unreported capacity started production near Tepene.

Petroleum.—Production of crude petroleum was of the same order of magnitude as in 1964. Information on activities of the petroleum industry was meager.

A new petroleum institute for research and training personnel was organized in Stalin Town. The institute was staffed by personnel transferred from oilfields and from the former Central Research Laboratory in the same town.

Without disclosing the exact location of a new gasfield Albanian sources reported a strong blowout of natural gas which was successfully brought under control.

The Mineral Industry of Austria

By Justin B. Gowen [1]

Austria's output of marketable ores and minerals derived from domestic resources during 1965 had an estimated value of nearly $250 million, representing an increase of about 4.5 percent over that of 1964. It was equivalent to 2.7 percent of the gross national product estimated at $9,189 million at current prices. However, the importance of the Austrian mineral industry continued to be its capability to process crude minerals into sophisticated semimanufactures and finished materials.

Notable among these products were iron and steel (including high-grade and special steels and their products); aluminum; special alloys and products of molybdenum and tungsten; and high- grade refractories based principally on magnesite.

With an output of salable products valued at more than $500 million, iron and steel lead all other industrial sectors of the Austrian economy. Next among the mineral based industries was petroleum (with an estimated $90 million worth of refinery products) followed by magnesite with more than 1 million tons of salable products valued at about $80 million.

The value in millions of dollars of mine and quarry production for the years 1961–65 follows:

	1961	1962	1963	1964	1965 [1]
Petroleum and natural gas [1]	71.9	74.2	80.3	83.4	89.4
Stone and industrial minerals	66.2	60.0	56.4	69.1	74.8
Coal	40.3	42.3	45.6	44.4	43.0
Metallic ores	33.5	34.3	34.8	35.2	34.9
Salt and brine	6.5	6.7	7.2	7.0	7.2
Total	218.4	217.5	224.3	239.1	249.3

[e] Estimate.
[1] Includes oil shale.

The average of industrial employment increased 3 percent to 624,000, or 26.2 percent of the country's total employment, which increased 0.75 percent to 2,381,500 during 1965. Employment in the minerals and metals industries accounted for about 20 percent of the total of industrial employment.

Important developments affecting minerals industries included initiation of work on the Austrian section of the Transalpine oil pipeline and the passage of an amendment to Austria's foreign trade law. The latter was designed to remove export and/or import restrictions on many commodities including a large number of mineral based products. The new regulations were to become effective on January 1, 1966.

PRODUCTION

Declines were again registered in coal and iron ore production; increases were shown in industrial minerals, some construction materials, and petroleum. Production of crude steel increased only 1 percent and the output of nonferrous metals from all sources declined about 4 percent from that of 1964.

[1] West Europe specialist, Division of International Activities.

Table 1.—Austria: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Alumina fused	e 15,000	e 15,000	e 12,000	14,850	17,993
Aluminum:					
Primary	67,654	74,088	76,464	77,697	78,735
Secondary	r 28,500	31,880	34,736	39,241	31,072
Semimanufactures, aluminum, and aluminum alloys	30,528	31,896	30,723	31,983	32,281
Antimony:					
In concentrates, recoverable	606	696	497	531	394
Crude	262	300	423	411	380
Bauxite	18,013	16,961	17,830	3,708	------
Cadmium—kilograms	19,000	22,100	18,800	19,000	21,000
Copper:					
In concentrates	1,910	1,987	1,885	1,565	1,522
Copper sulfate	2,785	2,073	618	594	NA
Electrolytic (primary)	11,833	12,869	13,050	r 14,722	16,282
Other refined (secondary)	3,208	2,038	2,832	2,882	1,986
Semimanufactures, copper, and copper alloys	38,892	34,800	37,480	42,482	37,717
Iron and steel:					
Iron ore (31 to 32 percent iron)—thousand tons	3,693	3,751	3,734	3,563	3,536
Pig iron—do	2,262	2,118	2,106	2,204	2,200
Ferroalloys—do	4	3	4	5	4
Crude steel:					
L–D [1]—thousand tons	1,819	1,829	1,849	1,964	1,969
Open hearth—do	904	814	747	823	840
Electric—do	378	327	351	407	414
Total—do	3,101	2,970	2,947	3,194	3,223
Semimanufactures for further processing elsewhere—thousand tons	78	29	28	29	29
Semimanufactures:					
Wire rod—do	208	216	220	236	259
Other bars and rods—do	388	388	296	403	450
Sections (excluding rails)—do	47	47	42	48	56
Universals and heavy plates (plus 4.75 millimeters)—thousand tons	446	389	303	312	1,275
Medium plates and sheets (3 millimeters to 4.75 millimeters)—thousand tons	74	57	58	79	
Fine plates and sheets (less than 3 millimeters)—thousand tons	409	398	497	520	
Sheet coils—do	390	436	409	425	
Other hoop and strip (hot rolled)—do	102	108	153	194	177
Rails and railway track material—do	55	58	54	59	69
Total semimanufactures—do	2,119	2,097	2,032	2,276	2,286
Pipe (welded) and fittings—do	45	47	48	62	59
Wire, single strand—do	125	112	112	133	137
Cold strip—do	46	41	47	55	49
Rough forgings—do	70	65	66	76	77
Lead and zinc ores (wet)—do	193	194	188	197	197
Lead:					
In ores	6,118	5,981	5,529	5,924	5,891
Recoverable in concentrates	5,489	5,312	4,993	5,195	5,038
Smelter production including secondary and antimonial	12,342	12,172	9,782	13,306	12,494
Semimanufactures including alloyed	3,732	3,624	3,634	4,064	3,961
Manganese content of iron ores	70,600	71,200	71,600	r 68,786	67,456
Nickel sulfate	180	183	209	e 225	NA
Silver—troy ounces	58,193	68,481	68,803	73,947	76,519
Tungsten concentrate (60 percent tungsten trioxide basis)	288	290	223	105	195
Zinc:					
In ores	8,193	8,853	9,170	9,763	------
Recoverable in concentrates	6,034	6,590	7,091	7,261	6,903
Electrolytic	12,067	12,088	11,861	12,896	13,113
Fire refined	643	576	574	676	1,156
Semimanufactures including alloyed	1,476	1,428	1,589	1,525	1,778
Nonmetals:					
Asbestos	512	456	579	------	------
Barite, marketable	2,464	1,081	2,049	1,139	2,302
Cement—thousand tons	3,084	3,057	3,304	3,769	4,034

See footnotes at end of table.

Table 1.—Austria: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals—Continued					
Clays, refractories and their products (except magnesite):					
China clay—thousand tons	344	336	349	368	328
Bentonite—do	4	3	3	3	4
Illite—do	29	66	66	71	68
Other—do	40	52	49	48	51
Refractory brick—do	67	57	59	71	75
Building brick—million pieces	1,016	991	1,006	1,054	1,059
Roofing tile—do	53	52	45	39	33
Diatomite	5,437	4,185	3,936	3,832	4,034
Feldspar	3,970	5,056	2,110	1,629	1,419
Graphite:					
Crude	80,971	89,282	99,589	102,237	85,755
Salable products, by type:					
Crude [2]	55,574	66,766	76,487	77,059	57,052
Foundry grade	1,274	1,168	810	520	332
Electrode grade	22,728	20,478	21,525	22,457	24,346
Floated (for grinding)	170	170	256	518	857
Gypsum and anhydrite—thousand tons	680	684	585	568	618
Lime:					
For construction—do	596	570	575	607	578
For agriculture—do	115	101	113	121	107
Magnesite:					
Crude—do	1,799	1,607	1,313	1,657	1,816
Sintered or dead burnt—do	542	484	411	522	566
Caustic calcined—do	182	181	170	192	198
Magnesite and chrome magnesite refractories—do	295	275	223	277	282
Mica	88	15	------	------	------
Pigments (specular hematite)	3,516	3,308	4,120	4,304	5,283
Pumice (trass)	37,055	27,847	21,182	22,882	20,426
Quartz and quartzite	76,630	73,927	65,859	68,897	76,922
Quartz sand—thousand tons	198	190	199	197	307
Salt:					
Rock—do	3	5	5	1	1
Evaporated—do	139	147	166	167	186
Other—do	115	137	173	224	218
Sand, industrial—do	57	50	47	56	67
Stone, crushed—do	5,962	5,809	6,274	7,036	6,800
Sulfur, all forms	NA	NA	NA	29,500	30,200
Talc and soapstone	84,948	75,771	65,644	71,872	75,902
Mineral fuels:					
Coal:					
Bituminous—thousand tons	106	99	104	103	59
Lignite—do	5,661	5,712	6,052	5,761	5,450
Coke:					
High temperature—do	1,782	1,654	1,634	1,607	1,550
Low temperature—do	254	315	343	325	288
Gas, natural and liquefied petroleum gas—million cubic feet [3]	54,951	57,733	59,990	61,653	60,871
Oil shale	551	616	325	45	580
Petroleum:					
Crude—thousand tons	2,356	2,394	2,620	2,663	2,855
Refinery products:					
Gasoline—do	245	353	413	514	644
Kerosine—do	46	37	58	86	67
Gas oil—do	638	784	845	859	850
Fuel oil—do	957	1,214	1,392	1,767	1,820
Lubricants—do	89	119	111	198	194
Asphalt and bitumen—do	87	113	127	162	188
Other—do	4	4	3	----	------

e Estimate. p Provisional. r Revised. NA Not available.
[1] Linz-Donawitz oxygen process.
[2] Crude graphite consumed mainly in blast furnaces.
[3] Calculated at 15° C and 760 millimeters of mercury.

TRADE

The importance of Austria's mineral commodities to overall trade is reflected in the following table:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities trade	Total trade	
Exports:			
1963	r 356.5	1,325.2	26.9
1964	420.8	1,444.4	29.1
1965 p	459.4	1,600.3	28.7
Imports:			
1963	r 394.0	1,675.5	23.5
1964	r 451.1	1,863.4	24.2
1965 p	479.7	2,100.6	22.8
Trade balance:			
1963	−37.5	−350.3	XX
1964	r −30.3	−419.0	XX
1965 p	−20.3	−500.3	XX

r Revised. p Preliminary. XX Not applicable.

Iron and steel continued to be the country's principal foreign exchange earner followed by the nonmineral classes including wood and cork, paper, clothing, and then nonmetals.

The European Economic Community (EEC) continued to be Austria's most important customer, both in gross trade and in the exchange of mineral products. The Federal Republic of Germany was the leading supplier as well as the leading individual customer.

Table 2.—Austria: Value of mineral trade by major commodity groups and partner countries [1]

(Million dollars)

Commodity group	1963 Total	1964 Total	1965						
			Europe [2]				United States and Canada	Other	Total
			EEC	EFTA	East Europe	Other			
Exports:									
Metals:									
Ores and scrap	3.9	4.6	4.2	0.1	0.1	0.3	-----	0.3	5.0
Iron and steel	193.5	200.8	86.0	29.8	63.3	11.3	6.3	18.8	215.5
Nonferrous metals	r42.8	48.9	27.4	10.6	5.2	2.6	1.8	2.6	50.2
Nonmetals:									
Crude	16.2	20.8	15.9	2.8	1.6	.3	2.8	.9	24.3
Manufactures:									
Fertilizers [3]	.3	.1	.1	.1	.5	-----	-----	-----	.7
Other [4]	57.6	68.0	31.1	15.5	5.9	6.4	6.0	7.1	72.0
Chemical elements and compounds [4 5]	10.9	34.7	5.0	4.9	20.8	4.6	.6	3.4	39.3
Fuels and energy:									
Mineral fuels	r7.6	7.6	2.3	.2	3.4	.3	-----	.6	6.8
Electric energy	23.7	35.3	39.1	1.2	-----	5.3	-----	-----	45.6
Total minerals, metals and energy	r356.5	420.8	211.1	65.2	100.8	31.1	17.5	33.7	459.4
All other commodity groups	968.7	1,023.6	535.5	215.9	143.6	68.7	61.3	115.9	1,140.9
Total exports	1,325.2	1,444.4	746.6	281.1	244.4	99.8	78.8	149.6	1,600.3
Imports:									
Metals:									
Ores and scrap	27.5	35.6	10.0	1.1	8.7	1.2	4.9	13.9	39.8
Iron and steel	49.2	59.9	40.5	11.8	15.3	2.2	1.4	.6	71.8
Nonferrous metals	43.5	51.9	29.6	9.8	3.6	3.2	4.6	6.5	57.3
Nonmetals:									
Crude:									
Fertilizer raw materials	9.3	10.8	1.5	-----	4.2	.3	.1	3.2	9.3
Other	13.7	15.9	5.2	1.3	3.8	2.0	6.6	1.3	20.2
Manufactures:									
Fertilizers [3]	11.5	13.7	13.8	-----	1.4	-----	-----	-----	15.2
Other [4]	25.1	29.6	27.8	3.1	2.5	.7	.6	.6	35.3
Chemical elements and compounds [4 5]	49.2	69.3	50.8	5.9	6.8	2.4	4.1	5.8	75.8
Mineral fuels:									
Coal, coke and briquets	r100.8	95.5	32.1	-----	56.6	.3	2.5	-----	91.5
Petroleum products [6]	62.2	65.5	29.7	4.1	21.3	5.1	.7	-----	60.9
Other [7]	2.0	r3.4	.7	1.6	.2	.1	-----	-----	2.6
Total minerals and metals	r394.0	r451.1	241.7	38.7	124.4	17.5	25.5	31.9	479.7
All other commodity groups	1,281.5	r1,412.3	1,001.6	270.5	102.0	42.8	80.8	123.2	1,620.9
Total imports	1,675.5	1,863.4	1,243.3	309.2	226.4	60.3	106.3	155.1	2,100.6

r Revised.

[1] Groups listed are those of the Standard International Trade Classification-Revised (SITC-R) as specified in the United Nations publication, Standard International Trade Classification Revised. Statistical Papers, Series M, No. 34. New York 1961, 135 pp.

[2] Europe has been subdivided as follows: EEC—Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands; EFTA—Denmark, Norway, Portugal, Sweden, Switzerland, and the United Kingdom; East Europe—Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and the U.S.S.R; Other—Finland, Greece, Ireland, Spain, Turkey, Yugoslavia.

[3] Excludes nitrogenous fertilizers.

[4] Includes some commodities not usually covered in the "Minerals Yearbook."

[5] Grouping as reported is not readily divisible between "Metals" and "Nonmetals."

[6] Excludes mineral tar and crude chemicals produced from petroleum.

[7] Includes peat, natural and manufactured gas, mineral tar, and crude chemicals produced from coal, petroleum, natural gas and electric power.

Table 3.—Austria: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodities	1963	1964	Principal destinations, 1964
Metals:			
Aluminum:			
Bauxite	6,855	2,378	All to West Germany.
Aluminum oxide and hydroxide	12,897	10,945	Poland 2,690; United Kingdom 1,596; Italy 1,363; West Germany 1,307.
Metal and alloys:			
Scrap	4,204	4,277	West Germany 2,765; Italy 1,512.
Ingots and equivalent forms	35,388	33,861	West Germany 22,867; Italy 4,063; Poland 2,492.
Semimanufactures	19,512	22,074	West Germany 4,404; Bulgaria 2,975; United Kingdom 2,500.
Antimony ore and concentrate	819	833	Belgium-Luxembourg 766.
Chromite	414	645	All to West Germany.
Copper and copper alloys:			
Scrap	605	311	West Germany 168; Italy 97; Hungary 40.
Unwrought:			
Unalloyed, refined	1,391	2,751	West Germany 2,262.
Alloys	1,258	953	West Germany 755.
Semimanufactures	6,898	8,145	Sweden 2,387; Israel 953; United States 781; West Germany 678; Rumania 656.
Gold:			
Bullion, troy ounces	3,247	4,598	West Germany 3,408; Italy 740.
Semimanufactures, do	3,922	3,665	West Germany 3,376.
Iron and steel:			
Iron ore and roasted pyrites	1,039	198	West Germany 178.
Ashes and residues	41,949	60,183	West Germany 59,625.
Scrap	3,440	3,886	Switzerland 2,247; Belgium-Luxembourg 813.
Pig iron [1]	1,213	909	Italy 740.
Ferroalloys	2,399	3,398	West Germany 1,275; United States 534; Sweden 450; Poland 238.
Steel:			
Ingots and other primary forms, thousand tons	17	9	West Germany 5; Switzerland 2.
Coils for rerolling, do	375	376	West Germany 314.
Bars, rods, and sections, do	139	154	West Germany 30; Rumania 22; Switzerland 19; Italy 17; Bulgaria 9.
Plates and sheets	515	495	West Germany 108; U.S.S.R. 107; United Kingdom 64; Switzerland 51.
Hoop and strip	79	73	Switzerland 34; Italy 9.
Railway track material	25	25	Switzerland 20.
Wire (exclusive of wire rod)	39	41	Hungary 9; West Germany 6; Italy 6.
Tubes, pipes and fittings	22	32	West Germany 8; Poland 4.
Castings and forgings, rough	1	3	Switzerland 1.
Lead:			
Lead oxide	1,055	600	Czechoslovakia 500; Italy 100.
Metal and alloys:			
Scrap	6	14	All to West Germany.
Ingots and equivalent forms	1,761	3,811	Italy 3,777.
Semimanufactures	24	27	West Germany 5; Sweden 5; Netherlands 4.
Magnesium, all forms	280	310	West Germany 126; India 41; United Kingdom 31.
Manganese oxide	181	317	Brazil 141; West Germany 140.
Mercury, 76-pound flasks	334	241	West Germany 180.
Molybdenum:			
Scrap	33	26	All to West Germany.
Semimanufactures	130	217	United Kingdom 93; Hungary 58; West Germany 33.
Nickel and nickel alloys:			
Matte and speiss	21	-------	
Scrap	194	161	West Germany 141; United Kingdom 11; Netherlands 9.
Semimanufactures	78	48	Yugoslavia 11; West Germany 10; Netherlands 9.
Platinum group metals, all forms, troy ounces	1,736	1,833	West Germany 772; Bulgaria 579; Italy 257; Hungary 127; Switzerland 96.
Silver:			
Bullion, do	99,667	1,382	All to West Germany.
Semimanufactures, do	51,441	418	Netherlands 161; West Germany 96; Yugoslavia 96.

See footnotes at end of table.

Table 3.—Austria: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodities	1963	1964	Principal destinations, 1964
Metals—Continued			
Tantalum:			
Scrap—kilograms	100	1,600	West Germany 1,000; United States 600.
Semimanufactures—do	1,400	2,500	United Kingdom 1,200; France 600.
Tin:			
Oxide—long tons	r 186	129	Czechoslovakia 122.
Metal, all forms—do	41	59	West Germany 36; Netherlands 19.
Tungsten:			
Ore and concentrate	210	81	All to West Germany.
Scrap	65	52	France 48.
Ingots and semimanufactuers	30	33	United Kingdom 7; France 7; Czechoslovakia 7.
Zinc:			
Ore and concentrate	--------	1,587	Poland 1,567; West Germany 20.
Metal:			
Scrap	872	1,017	Yugoslavia 585; West Germany 410; Italy 22.
Ingots and equivalent forms	2,780	4,164	Italy 4,032; West Germany 130.
Semimanufactures	25	566	Czechoslovakia 520.
Nonferrous ores and concentrates not elsewhere specified.	63	42	Japan 23; Netherlands 18.
Nonferrous ashes and residues not elsewhere specified.	6,400	9,982	West Germany 4,150; Italy 3,181; Yugoslavia 2,261.
Other ashes and slag including kelp	3,907	4,239	Italy 3,351; West Germany 815.
Salts and compounds of unspecified rare-earth elements.	158	151	NA.
Other base metals not elsewhere specified, all forms.	24	27	Switzerland 10; United States 9.
Nonmetals:			
Abrasives, pumice and other natural	11	9	Ireland 5; Yugoslavia 3.
Asbestos:			
Crude	r 160	16	All to West Germany.
Cement and cement products	11,383	10,688	West Germany 9,834.
Other asbestos products, excluding friction materials.	1,596	1,924	Italy 391; Poland 208; West Germany 153; Sweden 138; France 132.
Barite and witherite	20	6	All to Lebanon.
Cement, hydraulic	35,962	60,813	Switzerland 37,049; West Germany 23,753.
Chalk	5,028	4,137	West Germany 2,545; Italy 686; Czechoslovakia 614.
Clays and refractories (except magnesite):			
Bentonite	36	53	West Germany 38.
China clay	39,156	34,953	Italy 17,467; West Germany 8,201; Switzerland 5,728.
Fire and dinas clays, crude	1,100	4,008	Hungary 3,409; Italy 557.
Other refractory clays	151	1,468	Italy 1,232.
Cryolite and chiolite, natural	100	50	Mainly to Italy.
Diatomite and other siliceous earths	164	135	Bulgaria 56; Yugoslavia 43.
Diamond and other gem stones, except pearls:			
Uncut—thousand carats	950	30	All to Switzerland.
Other—do	55	55	Mainly to Netherlands.
Dolomite:			
Crude	7,539	13,124	West Germany 13,104.
Sintered, including mortar	10,634	19,904	United Kingdom 6,964; West Germany 6,933; Denmark 1,140; Argentina 1,003.
Other	680	746	France 156; Hungary 125; United Kingdom 120.
Feldspar	562	655	Switzerland 380; Italy 164.
Graphite, natural	19,520	19,153	West Germany 9,450; Italy 6,915; Yugoslavia 728.
Gypsum:			
Crude and sintered	49,686	57,992	West Germany 49,042; Switzerland 8,804.
Gypsum products	25	575	West Germany 570.
Lime, hydraulic and slaked	182	221	West Germany 106; Turkey 60; Switzerland 53.
Limestone, industrial	41	12,894	All to West Germany.

See footnotes at end of table.

Table 3.—Austria: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodities	1963	1964	Principal destinations, 1964
Nonmetals—Continued			
Magnesite:			
Crude	420	766	West Germany 416; Netherlands 200; Switzerland 105.
Sintered	164,293	236,966	West Germany 103,717; United States 43,556; United Kingdom 30,832.
Caustic calcined	94,574	101,467	West Germany 84,599; Italy 4,058; Switzerland 3,562.
Bricks	107,097	123,328	West Germany 23,782; France 21,388; United Kingdom 13,760; Sweden 10,732.
Other products, not burnt, including chrome-magnesite products.	90,564	119,130	West Germany 40,513; France 21,139; Rumania 9,852; Italy 7,059.
Mica and mica products	38	16	Yugoslavia 7; West Germany 5.
Pigments, earth	2,250	2,572	West Germany 1,235; United Kingdom 522; Netherlands 260.
Quartz and quartzite	181	340	West Germany 241; Netherlands 58; Czechoslovakia 40.
Refractories not elsewhere specified:	498	440	Czechoslovakia 190; West Germany 111.
Heat insulating bricks, etc.			
Fireclay bricks and tiles	1,033	2,542	Czechoslovakia 675; West Germany 636; Denmark 236; Yugoslavia 203.
Other	15	26	U.S.S.R. 20.
Salt brine	1,264	3	Mainly to West Germany.
Sand:			
Quartz	716	314	West Germany 240.
Other	22,248	80,283	West Germany 69,318.
Slate	15	11	All to West Germany.
Stone:			
Marble and other calcareous stone, sawn or crude cut.	50,445	70,662	West Germany 70,161.
Granite and other igneous rock, broken, sawn, or crude cut.	78,933	57,420	West Germany 55,637.
Crushed stone, gravel, macadam	324,259	387,466	West Germany 361,415; Switzerland 24,909.
Talc and soapstone	51,619	55,796	West Germany 27,896; Italy 7,128; Belgium-Luxembourg 5,150.
Vermiculite and mineral wool	86,664	75,994	West Germany 74,122.
Other nonmetals not elsewhere specified:			
Ceramic scrap	393	672	West Germany 652.
Other	326	1,045	West Germany 849.
Mineral fuels:			
Lignite—thousand tons	20	17	All to West Germany.
Coal tar and other mineral tar	413	406	All to West Germany.
High-temperature coal tar distillation products.	3,036	4,435	West Germany 2,662; Italy 1,771.
Pitch and pitch coke	2,426	406	Italy 187; West Germany 119; Hungary 100.
Petroleum refinery products:			
Gasoline	53	60	Czechoslovakia 40; Yugoslavia 15.
Distillate fuel oil	205,927	130,991	West Germany 130,832.
Lubricants	15,176	77,082	East Germany 22,324; Czechoslovakia 20,626; Hungary 9,918; Poland 9,579.
Other mineral oils	r 831	1,182	East Germany 529; Switzerland 155; Poland 113.
Mineral jelly, wax, bitumen, and asphalt.	633	575	West Germany 300; Yugoslavia 124; Switzerland 76.
Electric energy—million kilowatt hours	2,505	3,570	West Germany 2,944.

r Revised. NA Not available.
[1] Includes shot, powder, and sponge.

Table 4.—Austria: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and aluminum alloys:			
Bauxite	13,281	16,857	Surinam 11,953.
Alumina	151,619	141,846	NA.
Aluminium hydroxide	5,638	5,693	West Germany 4,943; East Germany 740.
Metal:			
Scrap	108	171	Czechoslovakia 146.
Ingots and equivalent forms	666	2,043	U.S.S.R. 1,218; Hungary 543.
Semimanufactures	2,766	4,448	West Germany 1,736; Switzerland 1,442.
Antimony metal, all forms	268	164	Belgium-Luxembourg 144.
Arsenic oxides and acids	34	50	West Germany 25; France 15; East Germany 10.
Beryllium metal, all forms—kilograms	100	100	All from the United Kingdom.
Cadmium:			
Ingots and equivalent forms—do	3,600	3,700	Belgium-Luxembourg 2,000; Netherlands 1,500.
Semimanufactures—do	11,700	8,500	West Germany 8,000.
Chromium:			
Chromite	47,158	50,274	Turkey 34,776; Iran 11,871.
Oxides and hydroxide	123	137	West Germany 126.
Cobalt oxide and hydroxide—kilograms	3,000	3,200	United Kingdom 1,800; Belgium-Luxembourg 700; West Germany 600.
Copper and copper alloys:			
Ore and concentrate	303	275	All from Italy.
Metal:			
Scrap	1,576	4,593	West Germany 2,307; Switzerland 1,373.
Blister	5,091	6,040	Republic of South Africa 4,714; Rhodesia-Nyasaland [1] 713.
Ingots and equivalent forms:			
Refined	16,098	18,343	West Germany 12,206; Rhodesia-Nyasaland [1] 4,233.
Alloys, including master alloys.	398	485	West Germany 232; Netherlands 135; Switzerland 71.
Semimanufactures	2,766	4,179	West Germany 2,590; Belgium-Luxembourg 353; Switzerland 317.
Gold and gold alloys:			
Bullion—troy ounces	754,610	685,679	United Kingdom 490,717; Republic of South Africa 77,001; Switzerland 49,383; West Germany 45,140; U.S.S.R. 23,406.
Semimanufactures—do	2,604	2,443	West Germany 2,154; Belgium-Luxembourg 289.
Iron and steel:			
Ores and concentrates—thousand tons	989	1,107	U.S.S.R. 432; Brazil 267; West Germany 266.
Roasted pyrites—do	362	374	Italy 364.
Pig iron and castings [2]—do	101	196	U.S.S.R. 126; East Germany 22; Hungary 21; West Germany 14.
Ferroalloys:			
Ferrochrome—do	12	15	Yugoslavia 4; Norway 2; Sweden 2.
Ferromanganese—do	10	12	Norway 7; Yugoslavia 2.
Ferrosilicon—do	8	9	U.S.S.R. 2; Norway 1; Czechoslovakia 1; Poland 1; Yugoslavia 1.
Other—do	4	5	Norway 3; France 1.
Scrap—do	53	144	West Germany 130.
Steel ingots and other primary forms—thousand tons	23	7	Hungary 5; West Germany 2.
Semimanufactures:			
Iron and steel shapes—do	26	38	West Germany 25; Italy 10.
Plates and sheets—do	31	37	West Germany 13; Belgium-Luxembourg 10; France 8.
Tubes, pipes and fittings—do	65	76	West Germany 44; Hungary 8.
Other—do	15	19	West Germany 11.
Lead and lead alloys:			
Ore and concentrate	3,700	5,440	All from Italy.
Lead oxide	342	153	West Germany 81; Yugoslavia 30; Mexico 19.
Metal:			
Scrap	44	457	Switzerland 362; West Germany 95.
Ingots and equivalent forms	12,091	12,220	Yugoslavia 6,907; U.S.S.R. 1,443; Bulgaria 1,112.
Semimanufactures	311	296	West Germany 201; Yugoslavia 63.

See footnotes at end of table.

Table 4.—Austria: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals—Continued			
Magnesium:			
Ingots and scrap	431	503	Italy 451.
Semimanufactures and manufactures	15	11	West Germany 6; United Kingdom 2.
Manganese:			
Ore and concentrate	692	631	West Germany 514; Ghana 50; Netherlands 46.
Oxides	139	140	Japan 120.
Mercury 76-pound flasks	693	386	Mainland China 232; Italy 84; Yugoslavia 41.
Molybdenum:			
Oxides	296	300	United States 151; West Germany 130.
Metal, all forms	2	40	Netherlands 18; U.S.S.R. 9; United States 5; United Kingdom 5.
Nickel and nickel alloys:			
Matte speiss	297	391	France 185; Canada 115; United States 61;
Ingots and scrap	3,093	2,841	United Kingdom 1,719; Canada 646; France 341.
Semimanufactures	366	429	West Germany 292; United Kingdom 104.
Platinum group metals, all forms. troy ounces	7,588	3,794	West Germany 3,119; United Kingdom 611.
Silver:			
Bullion thousand troy ounces	6,086	2,090	United States 1,051; West Germany 842.
Semimanufactures do	113	158	West Germany 87; United Kingdom 36; Switzerland 35.
Tantalum, all forms kilograms	2,700	800	West Germany 500; United States 300.
Tin and tin alloys:			
Ingots and equivalent forms. long tons	781	632	Netherlands 261; mainland China 112; Malaysia 103; West Germany 96.
Semimanufactures do	36	37	West Germany 16; Switzerland 9.
Titanium oxide	4,289	4,892	West Germany 3,696; Italy 310; Finland 300.
Tungsten:			
Ore and concentrate	2,897	3,280	U.S.S.R. 1,237; South Korea 1,028 mainland China 327; Hungary 213.
Metal, all forms	45	80	West Germany 42; United Kingdom 27.
Salts and compounds of uranium, thorium and rare-earth elements.	1,059	949	India 586; Brazil 300.
Zinc:			
Ore and concentrate	12,641	13,580	All from Italy.
Oxide (zinc white)	491	520	West Germany 461.
Ingots and equivalent forms	5,629	8,426	Bulgaria 2,842; West Germany 1,695; Yugoslavia 1,430.
Semimanufactures	428	510	Yugoslavia 310; West Germany 131.
Nonferrous ores and concentrates not elsewhere specified.	4,122	3,980	Australia 2,284; United States 1,243.
Nonferrous ashes and residues not elsewhere specified.	7,716	9,822	West Germany 4,211; Hungary 2,630; Czechoslovakia 1,814.
Other ashes and slags not elsewhere specified.	312	569	Belgium-Luxembourg 198; Norway 120; Sweden 65.
Nonmetals:			
Abrasives:			
Natural:			
Dust and powder from gem stones. thousand carats	5	2,005	West Germany 1,000; United Kingdom 995.
Pumice	355	709	West Germany 479; Italy 230.
Emery and corundum	107	116	Greece 83; Netherlands 20; Italy 11.
Other	8	22	Greece 13; West Germany 9.
Artificial corundum	2,606	3,445	West Germany 2,736; France 340.
Asbestos:			
Crude	21,323	21,429	Canada 14,572; U.S.S.R. 2,258; Rhodesia-Nyasaland [1] 2,027.
Cement and cement products	5,848	7,658	West Germany 7,434.
Other products, including friction materials.	350	512	West Germany 271; United Kingdom 81; Yugoslavia 60.
Barite and witherite	8,414	8,556	West Germany 3,579; Yugoslavia 4,599; Italy 378.
Boron salts, natural	3,963	5,534	United States 4,142; Turkey 1,392.
Cement, hydraulic	16,033	14,781	West Germany 4,653; France 3,850; Belgium-Luxembourg 2,889.

See footnotes at end of table.

Table 4.—Austria: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—Continued			
Chalk	390	522	France 381; West Germany 61; East Germany 59.
Clays and refractories:			
Bentonite, not activated	10,137	13,822	Hungary 13,543.
China clay (kaolin)	9,461	12,978	Czechoslovakia 4,594; United Kingdom 4,120; West Germany 4,014.
Fire and dinas clays, crude	311	254	West Germany 244.
Crude refractories	4,272	5,953	Czechoslovakia 3,877; West Germany 1,969.
Andalusite, sillimenite, and other clays, crude or burnt.	106,541	108,087	Czechoslovakia 64,266; West Germany 38,346.
Cryolite and chiolite, natural	491	441	All from Denmark.
Diatomite and other siliceous earths	1,445	1,668	United States 1,088; West Germany 285.
Diamond and other gem stones:			
Uncut—thousand carats	2,600	9,440	West Germany 7,470; France 1,100.
Industrial diamonds—do	170	245	West Germany 195; Netherlands 20.
Other gem stones, thousand carats, crude or cut but not mounted.	2,520	2,735	West Germany 2,325.
Dolomite, crude and sintered	2,510	3,134	Italy 1,830; Norway 781; West Germany 486.
Graphite:			
Natural	144	222	West Germany 211.
Refractories	162	177	West Germany 107; United Kingdom 60.
Gypsum and anhydrite, crude and sintered	13,659	7,734	Poland 5,584; West Germany 2,141.
Lime, hydraulic and slaked	2,785	1,215	West Germany 1,211.
Limestone, industrial	4,806	380	West Germany 338.
Magnesite:			
Crude	10,792	26,164	Turkey 26,162.
Sintered	708	1,276	Greece 1,264.
Caustic calcined	211	610	Netherlands 540.
Magnesite and chrome-magnesite products, unfired.	160	150	Italy 107; France 31.
Mica:			
Crude and scrap	371	338	Norway 89; West Germany 87; India 82.
Manufactures	20	29	Switzerland 23.
Pigments, mineral:			
Ochre	188	240	France 207.
Other crude, burnt or mixed	126	87	Hungary 40; Italy 36.
Phosphates:			
Phosphate rock:			
Crude	162,090	227,912	All from Morocco.
Ground	36,057	42,234	West Germany 41,256.
Thomas slag	321,481	350,172	France 196,299; Belgium-Luxembourg 111,648.
Other	9,907	10,493	Netherlands 10,187.
Potash:			
Crude salts	199,439	183,975	East Germany 180,773.
Potassium chloride	39,944	60,563	France 38,127; West Germany 13,448; East Germany 8,988.
Potassium sulfate	14,703	11,997	West Germany 9,228; East Germany 2,409.
Potassium-magnesium sulfate	40,812	34,447	West Germany 34,355.
Other potash fertilizers	4,111	16,627	U.S.S.R. 16,202.
Pyrites, unroasted	24,801	30,091	Greece 12,646; U.S.S.R. 12,160; Italy 5,075.
Quartz and quartzite	r 11,773	14,302	West Germany 11,515.
Refractory products, not elsewhere specified:			
Dinas bricks	538	609	West Germany 587.
Bricks and plates of fire clay	12,762	10,615	West Germany 10,124.
Other forms or materials	3,825	3,542	West Germany 3,028.
Salt, including brine	370	91	Yugoslavia 72; West Germany 19.
Sand:			
Quartz	101,444	107,084	West Germany 73,757; East Germany 16,451; Czechoslovakia 11,001; Hungary 4,504.
Other	32,137	29,943	West Germany 13,720; Belgium-Luxembourg 6,405; Czechoslovakia 4,596.
Slate:			
Crude or rough cut	407	435	West Germany 309.
Slate products	48	51	Italy 47.

See footnotes at end of table.

Table 4.—Austria: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—Continued			
Sulfur:			
Elemental	86,146	90,083	United States 27,093; Mexico 18,285; Poland 15,546; France 14,198.
Sublimed	123	72	West Germany 54.
Talc and soapstone	1,118	897	Italy 399; Norway 228; India 119.
Trass	3,526	4,562	West Germany 4,544.
Vermiculite and mineral wool	595	887	West Germany 725.
Other nonmetals, not elsewhere specified:			
Ceramic scrap	6,460	7,196	West Germany 6,221.
Other	19,416	21,417	West Germany 18,239.
Mineral fuels:			
Coal and briquets:			
Bituminous and anthracite. thousand tons	3,991	3,835	Poland 1,537; U.S.S.R. 886; West Germany 814.
Subbituminous and lignite do	743	735	East Germany 406; West Germany 197; Czechoslovakia 93.
Peat do	7	8	West Germany 6.
Coke and coke breeze do	963	909	West Germany 439; Czechoslovakia 181.
Natural asphalt, bitumen, etc. do	2	2	Trinidad and Tobago 1; United States 1.
Gas:			
Natural, including LPG	7,431	4,405	West Germany 2,578; France 1,083; Yugoslavia 744.
Manufactured	2,220	1,451	All from West Germany.
Petroleum:			
Crude and topped crudes. thousand tons	908	901	U.S.S.R. 535; Yugoslavia 252; Czechoslovakia 106.
Refinery products:			
Gasoline do	523	476	Italy 302; Czechoslovakia 60; West Germany 55.
Kerosine do	7	7	Italy 6.
Distillate fuels do	70	81	Italy 76.
Residual fuel oils do	1,024	1,242	Italy 262; Hungary 233; Czechoslovakia 228.
Lubricants do	45	50	Netherlands 19; West Germany 10; United Kingdom 8.
Mineral jelly and wax do	7	7	West Germany 4; East Germany 1.
Other including products of coal, oil shale, bitumen, and asphalt:			
Nonlubricating oils, not elsewhere specified. thousand tons	31	89	Hungary 44; Rumania 26; Yugoslavia 19.
Pitch and tar thousands tons	3	3	Mainly from West Germany.
Pitch coke do	14	15	All from West Germany.
Petroleum coke do	9	11	West Germany 9; Italy 1.
Petroleum and shale oil residues. do	109	116	Italy 68; Hungary 31.
Bituminous mixtures do	1	2	Mainly from West Germany.
Electric energy million kilowatt hours	213	281	West Germany 157; Switzerland 119.

r Revised. NA Not available.
1 As reported in source; further details on origin (Southern Rhodesia, Zambia, and Malawi) not available.
2 Includes spiegeleisen, shot, powder, and sponge.

COMMODITY REVIEW

METALS

Iron and Steel.—Austria's 1965 output of 3.5 million tons of iron came from two mines in Styria and one mine in Carinthia, all owned and operated by the nationalized Oesterreichisch-Alpine Montangesellschaft. Most important of the three in international economic significance was the Steirischen Erzberg (Styrian Ore Mountain) mine at Eisenerz, Styria, which accounted for nearly 90 percent of Austria's total output of marketable iron ore.

The deposit is the largest of several more or less similar spathic iron ore deposits in the area, which lies between the Northern Limestone Alps and the Central Alps and extends from the vicinity of Semmering into Tyrol. Reserves at Eisenerz are estimated at about 300 million tons of minable ore of all classes. The deposit attains a thickness of 200 meters and forms the major part of an isolated mountain which rises 840 meters above the valley floor.

The mine comprises about 60 opencast

benches covering three sides of the mountain, and an underground mining section for the recovery of ore from below the valley floor. During the 5-year period, 1960–64, the mine produced a daily average of 11,515 tons of marketable iron ore of which about 76 percent came from the opencast workings and 26 percent from underground mining. From the opencast section , 4:0 tons of waste was removed for each ton of marketable ore produced. Underground the ratio was 0.8 ton of waste for 1 ton of ore.

The ore varies from place to place and may be predominantly limonite, siderite, ankerite or ferruginous dolomite, or mixtures of these. Processing consists of heavy media separation and flotation which produce an end product averaging 31 to 32 percent iron and 1.80 to 1.85 percent manganese. Roasting or sintering raises the grade to about 46 percent iron. A roasting plant at Eisenerz treats 300,000 to 400,000 tons annually to meet the requirements of the Donawitz blast furnace works. The remainder is further processed at the Linz-Donau works of Vereinigte Oesterreische Eisen - und Stahlwerke A.G. (VOEST). Current research is designed to develop a process for the recovery of a satisfactory product from the lower grade ore not now included as minable reserve. A successful process would add to the reserves about 60 million tons averaging 20 percent iron.

The replacement of one old blast furnace and the installation of a sinter plant were included in a modernization program being carried out at yearend by Alpine at the Donwitz works. At the beginning of 1965 the blast furnace works consisted of four furnaces, three of which were constructed prior to World War II. Production during the first 6 months of 1965 was at the rate of 746,000 tons of pig iron annually.

In early 1965 a new investment program was approved for VOEST's Linz-Donau works which includes an additional 50 ton Linz-Donawitz (L-D) steel converter in the No. 2 plant, and a continuous steel-casting plant with a capacity of 300,000 tons annually. Although the L-D converter is intended to replace one of two existing 200-ton open hearth furnaces, it would increase the L-D steelmaking capacity by about 600,000 tons while about 150,000 tons of basic open hearth capacity would be liquidated.

Nonferrous Metals.—It was announced that exploration at the Bleiberg-Kreuth lead-zinc mine has disclosed adequate reserves to maintain the operations of the nationalized Bleiberger Bergwerks Union Klagenfurt for 25 to 30 years in the future.

Austrian consumption of nonferrous metals has been reported as follows:

	Thousand metric tons				
	1961	1962	1963	1964	1965 p
Aluminum, primary	37.6	34.1	41.7	46.0	48.2
Copper, refined	33.0	30.0	30.5	33.0	35.6
Lead, refined	18.8	22.1	20.1	20.6	21.4
Nickel, refined	2.7	2.1	3.1	2.8	1.8
Tin, refined	.8	1.1	.8	.6	.6
Zinc, refined	14.1	15.2	14.8	17.2	16.8

p Preliminary.
Source: Organization for Economic Cooperation and Development. The Nonferrous Metals Industry. Paris, France, 1963 pp. 11–16; 1964 pp. 5–10.

NONMETALS

Magnesite. — Nine mines owned and operated by four companies produced 1,815,607 tons of crude magnesite in 1965 establishing a new record high output for this mineral. The previous high was 1,798,681 tons produced in 1961. The Oesterreichisch-Amerikanische Magnesit-Aktiengesellschaft Radenthein was again the principal producer, accounting for about 55 percent of the total output. Veitscher Magnesitewerke Aktiengesellschaft accounted for about 39 percent.

Exports of magnesite and magnesite products (including chrome-magnesite) in 1965 amounted to about 625,000 tons, valued at nearly $57 million, an increase of about 7.5 percent in quantity and 12.8 percent in value.

Table 5.—Austria: Consumption of primary energy by sources

(Billion kilocalories)

	1960	1961	1962	1963	1964
Bituminous coal	32,403	31,072	31,373	34,830	33,263
Lignite	23,841	22,532	23,478	25,302	24,094
Total coal	56,244	53,604	54,851	60,132	57,357
Petroleum	26,979	31,028	38,753	43,421	50,809
Natural gas	13,039	13,923	15,842	16,449	16,940
Hydropower	31,223	30,420	31,747	32,484	33,142
Fuelwood	7,739	6,797	6,902	7,550	6,027
Peat	56	56	37	19	19
Total	135,280	135,828	148,132	160,055	164,294

Source: Supreme Mining Authority, Federal Ministry for Commerce and Reconstruction. Oesterreichiches Montan-Handbuch. (Austrian Mining Handbook), for 1962, 1963, 1964 and 1965, Mining Publishers, Vienna. 1963, 1964, 1965 and 1966.

MINERAL FUELS

Coal (bituminous and lignite) remained Austria's most important source of energy, in terms of heat content and in its effect on the regional economy, through yearend 1964. However, preliminary data for 1965 indicated that its share of the total energy consumed continued to decline as it has each year since 1960 except for 1963, and that during 1965 the energy supplied by petroleum and its derivities had closely approached, or possiblv surpassed that derived from coal and lignite. During 1964 the percentage distribution of total energy consumption by energy sources was as follows: bituminous coal 20.25; lignite 14.66; total coal 34.91; petroleum 30.93; natural gas 10.31; hydropower 20.17; fuelwood 3.76; peat 0.01.

Coal.—The Gruenbach mine, Austria's only bituminous coal mine, was closed down in October because of high costs.

Petroleum.—In December 1965, the Felbertauern tunnel, highest of three tunnels in Austria designed to carry the Trans Alpine pipeline across Alpine ridges, penetrated the crest of the Hohentauern range at an elevation of 5,084 feet. The Ploecken tunnel, crossing the Italian-Austrian border at about 3,050 feet, and the Hahnenkamm tunnel near Kitzbuehel at about 3,300 feet, were expected to be completed early in 1966.

Projected for early construction was the Adriatic-Vienna pipeline, to connect with the Trans Alpine Line at Wuermlach, near the Austrian end of the Ploecken tunnel, and to extend via Arnoldstein-Ferlach, Soboth and Wechsel to the Oesterreichische Mineraloelverwaltung (OMV), refinery at Schwechat, near Vienna. OMV a state-owned organization, will have a 51 percent controlling interest in the pipeline, while the remaining 49 percent will be divided among Socony Mobil Oil Company (Mobil), Bataafse Petroleum Maatschappij N.V. (Shell), British Petroleum Company (BP), Standard Oil Co. of New Jersey (Esso), Cie. Française des Pétroles (CEP) and Ente Nazionale Idrocarburi (ENI).

Refinery capacity remained essentially unchanged at 91,500 barrels per day during 1965, distributed as follows: Mobiloil Austria A.G.-Kagran 3,400 barrels; OMV-Schwechat 84,000 barrels; Shell Austria-Floridsdorf 4,500 barrels.

Oil and gas reserves at the beginning of 1965 were as follows:

Petroleum:		
Positive	million tons	27
Probable	do	8
Total	do	35
Natural Gas:		
Dry:		
Positive	billion cubic feet	487
Probable	do	42
Petroleum gas	do	406
Total	do	935

Table 6.—Austria: Supplies and consumption of selected fuels

(Thousand metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Solid fuels:					
Supplies:					
Bituminous coal:					
From domestic mines	103	95	99	95	53
From imports	3,496	3,671	3,929	3,821	3,590
Total	3,599	3,766	4,028	3,916	3,643
Lignite:					
From domestic mines	5,292	5,535	5,779	5,546	5,115
From imports	597	687	759	736	714
Total	5,889	6,222	6,538	6,282	5,829
Coke:					
From imported coal	2,029	1,959	1,965	1,906	1,838
From imports	722	768	963	906	951
Total	2,751	2,727	2,928	2,812	2,789
Grand total	12,239	12,715	13,494	13,010	12,261
Coal consumed in production of coke from imported coal listed above	2,154	2,119	2,081	2,119	NA
Net solid fuels available for consumption	10,085	10,596	11,413	10,891	------
Consumption:					
Transportation thousand tons, standard coal equivalent (SCE)	806	817	855	782	NA
Powerplants ---do	1,004	1,123	1,242	1,321	NA
Heating plants ---do	56	62	121	195	NA
Gas works ---do	295	426	476	415	NA
Industry:					
Mining ---do	68	56	55	46	NA
Blast furnaces ---do	1,691	1,469	1,399	1,445	NA
Other ---do	1,535	1,445	1,422	1,344	NA
Total ---do	3,294	2,970	2,876	2,835	NA
Household ---do	1,686	2,087	2,574	2,202	NA
All consumption	7,141	7,485	8,144	7,750	NA
Fuel oil:					
Supplies:					
From domestic production ---thousand tons	860	1,184	1,379	1,590	NA
From imports ---do	778	855	1,024	1,222	NA
Total ---do	1,638	2,039	2,403	2,812	NA
Consumption:					
Railroads ---do	20	22	24	26	NA
Powerplants ---do	108	240	351	358	NA
Industry ---do	1,186	1,402	1,603	1,952	NA
Small consumers ---do	324	375	425	476	NA
Natural gas:					
Production ---million cubic meters	54,951	57,733	59,998	62,288	NA
Deliveries:					
Powerplants ---do	15,142	14,976	15,168	14,435	NA
Heating plants ---do	281	328	387	367	NA
Gas works ---do	9,809	11,175	11,803	12,286	NA
Industry ---do	21,392	22,184	22,769	24,302	NA
Petrochemicals ---do	140	390	697	754	NA
Small consumers ---do	651	720	795	839	NA
Tank farms ---do	122	82	58	37	NA
Total ---do	47,537	49,855	51,677	53,020	NA

NA Not available.

The Mineral Industry of Belgium

By Stephen C. Brown [1]

The continued expansion of Belgium's mineral industries was largely responsible for the country's 3-percent growth of gross national product in real terms during 1965. Though the general index of industrial production (1958=100) only rose from 145 in 1964 to 147 in 1965, the production index for the steel industry rose from 147 to 152, for the nonferrous metals industry from 162 to 175, for the petroleum refining industry from 206 to 241, and for the metal-fabricating industries from 160 to 165. Production in the extractive industries (mining and quarrying) and in the nonmetallic mineral industries declined, the index dropping from 92 to 85 for the former, and from 151 to 147 for the latter.[2]

The 3-percent growth for the gross national product (GNP) was a sharp decline from the 5.2-percent growth in 1964, reflecting both a weakening of internal consumer demand and an actual decline, in real terms, of gross domestic fixed investment. High external demand for the products of Belgium's metal industries, caused by threats of a steel strike in the United States and by continuing worldwide scarcities of the major nonferrous metals, provided the principal stimulus both for the mineral industries and for the economy as a whole.[3] Construction lagged, however, and this as well as the growing difficulties of the coal industry was reflected in the declining index for the extractive industries.

Data showing the share of the mineral industries in total gross domestic product (GDP) in 1965 were not available, but 1964 figures indicate that the extractive, iron and steel, and nonferrous metals industries accounted for 4.7 percent of GDP (or 4.6 percent of GNP) in that year. Adding the contributions of the building materials industry (cement, lime, etc.), the fertilizer industry, and the petroleum refining industry would raise this share substantially. The extractive industries alone accounted for 2.5 percent of GNP in 1964, the same share as in 1963.[4]

Employment in the mineral industries in 1965 declined compared with that of 1964. Total employment in these industries at yearend [5] is estimated at about 223,000, compared with 232,000 in 1964. The decline was more than accounted for by a reduction of nearly 10,000 in coal mining.

PRODUCTION

Production of crude steel rose 5 percent in 1965, of pig iron and ferroalloys 3.9 percent, and of iron and steel semimanufactures 7.3 percent. Nonferrous metal output expanded more sharply, refined copper production rising 8.1 percent, smelter lead 32.9 percent, and smelter zinc 7.8 percent. Tin output declined 23.2 percent, reportedly because of a shortage of ores from the Democratic Republic of the Congo (Léopoldville). Output of copper semimanufactures rose 9.5 percent, but production of semimanufactures of most other nonferrous metals was relatively unchanged.

Coal output declined about 1.5 million

[1] International economist, Division of International Activities.

[2] Banque Nationale de Belgique. Bulletin d'Information et de Documentation, XLIme année. V. 1, No. 4, April 1966, p. 452.

[3] European Economic Community Commission. La Situation Economique de la Communauté. No. 4, 1965; No. 1, 1966.

[4] Banque Nationale de Belgique. Bulletin d'Information et de Documentation, XLIme année. V. 1, No. 4, April 1966, p. 446. Statistical Office of the European Economic Community. General Statistical Bulletin. No. 11, 1965, p. 6B.

[5] Including coal mining and other extractive industries, iron and steel, nonferrous metals, fertilizers, petroleum refineries, cement, and diamond industries. See Institut Nationale de Statistique Bulletin, No. 3, March 1966, pp. 378–381.

Table 1.—Belgium: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Aluminum:					
Secondary	1,860	2,842	3,547	r 3,460	3,192
Semimanufactures	71,700	r 80,736	r 86,232	r 123,456	135,538
Copper:					
Refined, including secondary	221,600	221,434	271,444	r 286,129	309,356
Semimanufactures	r 126,960	r 114,240	r 124,080	r 153,852	168,470
Sulfate e	17,000	15,000	13,000	NA	NA
Iron and steel:					
Iron ore thousand tons	115	80	96	61	91
Pig iron and ferroalloys r do	6,459	6,773	6,958	8,121	8,436
Steel:					
Ingots and castings r do	7,002	7,351	7,525	8,725	9,162
Semimanufactures do	4,935	5,499	5,769	6,475	6,947
Lead:					
Smelter, including secondary	99,890	93,151	98,433	r 83,317	110,757
Semimanufactures	r 27,396	r 27,828	r 26,844	r 25,980	26,633
Precious metals:					
Unworked 1 thousand troy ounces	13,172	12,325	12,965	13,622	14,163
Semimanufactures do	634	609	609	668	803
Tin:					
Smelter, including secondary long tons	6,372	9,505	8,280	r 6,804	5,227
Semimanufactures do	394	492	689	787	e 1,126
Titanium dioxide e	10,000	10,000	12,000	NA	NA
Zinc:					
Smelter, including secondary	245,548	206,156	r 206,329	r 222,542	239,800
Semimanufactures	43,600	45,700	43,800	r 46,300	e 46,200
Other nonferrous metals 2	4,620	4,811	4,418	4,222	4,348
Nonmetals:					
Cement thousand tons	4,754	4,788	4,709	5,846	5,905
Clays do	258	208	r 270	203	NA
Dolomite:					
Raw do	490	586	r 649	908	860
Calcined do	300	296	r 321	337	315
Feldspar	NA	156	NA	--------	NA
Fertilizer raw materials:					
Phosphates	14,016	17,304	r 13,325	r 22,055	NA
Thomas slag thousand tons	1,294	1,368	1,337	1,622	NA
Flint	14,455	8,034	r 12,004	14,924	NA
Lime 3 thousand tons	1,923	2,036	r 2,180	2,299	2,294
Plaster	69,800	79,900	r 77,274	r 91,236	74,919
Quarry products:					
Limestone thousand tons	4,849	5,320	r 8,127	9,899	10,205
Marble:					
Natural calcareous 4 do	910	876	829	1,010	1,069
In blocks cubic meters	5,069	5,144	r 6,946	r 7,272	7,098
Slabbed, including worked 5 do	9,790	9,091	9,150	11,280	11,540
Crushed and other	27,518	26,150	r 30,050	32,824	32,974
Petit granit (Belgian bluestone):					
Quarried cubic meters	204,246	336,386	311,391	409,602	326,826
Sawed do	62,611	64,875	r 28,908	104,633	77,483
Worked do	17,008	16,339	r 12,366	32,296	18,275
Rough stone, crushed and other cubic meters	270,713	314,302	r 287,087	381,971	287,036
Porphyry:					
Paving and mosaic stone thousand tons	5	--------	--------	--------	---------
Rough stone, including crushed thousand tons	3,356	4,085	r 4,290	5,355	5,109
Quartz and quartzite	377,193	282,522	r 350,690	304,572	NA
Sand and gravel:					
Construction sand thousand tons	2,716	3,174	r 3,082	r 5,171	4,254
Foundry sand do	975	1,039	r 1,137	1,379	1,266
Glass sand do	1,190	1,378	r 1,634	1,332	1,461
Other sand, including dredged do	1,610	1,751	r 1,863	2,765	2,771
Gravel (dredged) do	3,309	3,568	r 5,144	7,844	6,527
Sand stone:					
Rough stone, including crushed thousand tons	1,134	1,216	r 1,253	1,547	1,369
Paving and mosaic stone do	11	9	8	8	17
Other do	81	77	r 79	86	81
Slate, roofing and other	10,200	11,200	r 11,444	r 11,750	10,931
Whetstone	57	57	r 52	49	41
Sulfur:					
Recovered	500	2,000	5,000	5,000	NA
Sulfuric acid, 100 percent thousand tons	1,350	1,232	1,236	1,348	1,487

See footnotes at end of table.

Table 1.—Belgium: Production of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Mineral fuels:					
Coal:					
Anthracite----thousand tons	5,520	5,751	5,986	6,062	5,438
Bituminous and semibituminous----do	16,019	15,475	15,432	15,242	14,348
Briquets----do	1,164	1,602	2,299	1,433	1,074
Distillate [6]----do	273	282	282	299	e 301
Coke (high-temperature)----do	7,252	7,195	7,204	7,398	7,334
Methane (firedamp) [7]--thousand cubic meters	70,080	70,176	70,248	66,180	79,068
Manufactured gas [8]----million cubic meters	3,459	3,619	3,756	4,001	4,109
Petroleum refinery products:					
Aviation fuels----thousand tons	181	220	229	247	276
Motor gasoline----do	1,290	1,307	1,482	1,617	1,930
Kerosine----do	228	240	329	429	493
Distillate fuel oil----do	2,389	2,545	3,762	4,162	4,759
Residual fuel oil----do	2,486	2,615	3,952	4,283	5,351
Liquefied petroleum gas----do	143	176	228	252	e 449
Bitumen----do	342	387	481	512	411
Lubricants----do	28	30	31	37	44
Other----do	321	435	893	1,035	1,087
Total----do	7,408	7,955	11,387	12,574	14,800
Refinery fuel and loss----do	518	547	783	775	798

e Estimate. r Revised. p Preliminary. NA Not available.
[1] 80 to 90 percent silver.
[2] Includes antimony, cadmium, cobalt, nickel, and other unspecified metals.
[3] Not including annual production of artificial hydraulic lime (5,000 to 6,000 tons per year in 1960–63 and 8,582 tons in 1964).
[4] Including chalk, marl, and travertine.
[5] Converted from production data in thousand square meters of 20-millimeter slabs.
[6] About 98 percent crude coal tar.
[7] At 0° C., 760 millimeters of mercury, and 8,500 kilocalories per cubic meter.
[8] Coke oven and gas plant gas; gross output including gas for own consumption; includes gas produced from hydrocarbons.
[9] Including commercialized refinery gas.

tons, or 7.1 percent, while production of refined petroleum products increased nearly 18 percent. Production of cement and lime was relatively unchanged, while stone and sand and gravel output declined, affected by the decline in construction.

TRADE

The foreign trade of Belgium is not reported separately, being incorporated with that of Luxembourg in the official trade returns of the Belgium-Luxembourg Economic Union (BLEU). Hence the following discussion refers to the trade of both countries rather than to that of Belgium alone.

Increases were recorded in value of mineral trade, both exports and imports, for the BLEU in 1965, but the gains were not as great as were those for total commodity trade, and as a result, the share of total trade accounted for by minerals declined from 1964 to 1965. The Union continued to have a positive trade balance with respect to mineral commodities, and in fact showed a greater net export in 1965 than in 1964, as exports increased $238 million (10.6 percent) while imports increased only $105 million (5.8 percent). The important role of mineral commodities in the overall trade of the Economic Union is shown in the following tabulation:

	Value (million dollars)		Mineral commodities share of total percent
	Mineral commodities [1]	Total commodity trade	
Exports:			
1963	1,943	4,839	40.2
1964	2,238	5,590	40.0
1965	2,476	6,382	38.8
Imports:			
1963	1,573	5,112	30.8
1964	1,808	5,923	30.5
1965	1,913	6,374	30.0
Trade balance:			
1963	+370	−273	XX
1964	+430	−333	XX
1965	+563	+8	XX

XX Not applicable.
[1] Data include values for all commodities listed in tables 2 and 3 of this chapter except gold.

Source: Statistical Office of the United Nations.

Of the total 1965 mineral exports of the Union, principal commodity groups were iron and steel, $1,144 million; copper, $296 million; diamond and other precious stones (including industrial), $292 million; petroleum refinery products, $162 million; and manufactured fertilizers, $139 million.

Principal destinations for 1965 mineral exports and the value of exports to these countries were West Germany, $482 million; France, $385 million; the Netherlands, $335 million; and the United States, $230 million. The European Economic Community (EEC) as a whole took somewhat over half of total mineral exports of the Economic Union.

Of total 1965 mineral imports, major commodity groups were crude oil and petroleum products, $360 million; metal ores and scrap, $303 million (including iron ores and concentrates, $139 million); diamond and other precious stones (including industrial), $281 million; coal, coke, and briquets, $216 million; unwrought copper, $214 million; and iron and steel, $198 million.

Principal sources of imports on a value basis were West Germany, $279 million; France, $249 million; Democratic Republic of the Congo (Léopoldville), $194 million; the Netherlands, $157 million; Iran, $99 million; and the United States, $81 million.

Trade, both imports and exports, in most commodity groups followed the overall upward trend, with coal, coke, and briquets being the only notable exception.

Table 2.—Belgium-Luxembourg: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals: [1]				
Aluminum:				
Scrap	5,121	6,605	8,496	West Germany 3,410; France 1,911; Netherlands 970.
Ingots	826	1,074	2,358	West Germany 397; Netherlands 310; United Kingdom 207.
Semimanufactures	70,158	84,357	93,390	United States 17,535; Netherlands 10,010; United Kingdom 8,938.
Antimony oxide	1,155	1,794	1,635	United States 1,023; West Germany 301; Netherlands 276.
Bismuth [2]	122	149	85	France 78; West Germany 44; Netherlands 19.
Cadmium	881	843	735	West Germany 329; France 296; Netherlands 92.
Chromite	143	-------	11	
Copper:				
Scrap	9,895	12,699	16,302	West Germany 6,020; Netherlands 2,780; France 2,217.
Refined	248,301	249,818	263,159	France 90,800; West Germany 76,770; Netherlands 19,312.
Semimanufactures	60,373	82,378	90,169	Netherlands 33,626; West Germany 19,927.
Germanium:				
Oxide kilograms	11,700	24,100	17,000	Japan 11,700; Netherlands 6,800.
Metal do	3,800	6,100	6,300	West Germany 3,000; United Kingdom 1,500.
Gold, including semimanufactures. thousand troy ounces	55	55	55	Switzerland 16; United States 13; United Kingdom 13.
Iron and steel:				
Iron ore thousand tons	275	226	67	France 207.
Pyrite cinder do	214	188	199	West Germany 180.
Blast furnace slag and waste. do	1,763	2,126	1,879	West Germany 1,173; Netherlands 718.
Scrap do	521	617	720	West Germany 303; France 262.
Pig iron, including cast iron, sponge, powder. do	140	66	80	France 39; West Germany 22.
Ferro-alloys, including spiegeleisen. thousand tons	37	43	47	United States 18; West Germany 9; France 8.
Ingots and other primary forms. thousand tons	733	1,114	1,201	France 529; West Germany 320.
Semimanufactures:				
Shapes (bars, rods, angles, shapes, sections). thousand tons	3,647	4,020	4,377	United States 927; West Germany 755; Netherlands 574.
Universals, plate, sheet. thousand tons	1,989	2,304	2,679	West Germany 687; France 547.
Hoop and strip. thousand tons	620	748	739	West Germany 198; France 173.
Railway material. do	117	68	116	Netherlands 13; Greece 10; Italy 9; France 7.
Wire do	280	303	318	United States 99; Netherlands 37; West Germany 32.
Tubes, pipes, fittings. do	195	218	246	West Germany 49; Netherlands 44; United States 30.
Castings do	17	18	24	West Germany 7; Netherlands 4.
Lead:				
Ore and concentrate	-------	600	263	All to France.
Ashes and residues containing lead.	1,482	2,845	2,103	Netherlands 1,369; West Germany 701; Sweden 460.
Scrap	2,122	3,351	2,239	West Germany 2,578. France 532.
Pig	70,557	49,614	71,810	West Germany 16,445; Netherlands 12,334; France 12,312.
Semimanufactures	6,453	6,309	7,863	Netherlands 2,441; West Germany 918; Sweden 898.
Oxides	4,454	3,735	3,663	Netherlands 3,153.
Magnesium [2]	272	440	451	United Kingdom 269; United States 131.
Manganese ore	2,477	2,019	7,516	United Kingdom 1,143; France 522; Netherlands 354.
Mercury 76-pound flasks	377	290	319	Netherlands 165; France 52.
Molybdenum:				
Metal [2] kilograms	400	15,800	4,900	West Germany 11,700.
Nickel:				
Unwrought [2]	621	533	470	Netherlands 245; West Germany 115.
Semimanufactures [3]	128	118	166	Netherlands 69.
Platinum and platinum-group metals all forms. value, thousands	$663	$368	$1,025	France $125; West Germany $81; United Kingdom $38; Netherlands $42.
Selenium kilograms	24,500	39,500	42,200	United Kingdom 11,800; United States 8,000; France 7,100.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals—Continued				
Silicon	-------	400	700	United Kingdom 200; Netherlands 200.
Silver:				
Unwrought, partly worked. thousand troy ounces	10,529	10,870	8,131	West Germany 6,771; France 1,897.
Tantalum [2] value, thousands	$15	$35	$157	NA.
Tellurium and arsenic. kilograms	NA	1,000	4,800	NA.
Tin:				
Ore and concentrate. long tons	-------	24	48	All to Spain.
Scrap do	342	317	223	West Germany 106; Netherlands 78; Spain 76.
Ingot do	6,379	4,574	4,110	France 2,239; Netherlands 1,250; West Germany 749.
Semimanufactures do	359	209	179	Spain 79; Switzerland 20.
Oxides do	207	245	198	West Germany 185; Netherlands 41.
Titanium dioxide	6,327	1,588	3,275	France 531; Netherlands 528; Greece 200.
Titanium, vanadium, molybdenum, tantalum, and zirconium ores.	79	8	59	NA.
Tungsten:				
Ore	1	6	25	Mainly to Netherlands.
Metal [2]	7	1	3	Do.
Oxide and hydroxide	11	NA	NA	
Uranium and thorium:				
Ore kilograms	-------	13,100	-------	All to India.
Metal [2] do	900	100	-------	NA.
Other radioactive materials. do	10,900	1,200	3,100	NA.
Zinc:				
Ore	51,113	21,036	12,247	France 8,564; West Germany 6,593; Japan 4,015.
Ashes and residues containing zinc.	20,164	14,095	19,987	West Germany 10,741; Japan 1,531; France 675.
Scrap	5,835	8,575	7,474	France 7,193; West Germany 680.
Slab	122,814	126,742	129,656	West Germany 55,954; France 11,331; United Kingdom 9,613; Italy 7,654.
Dust (blue powder)	15,667	16,136	16,436	France 3,937; West Germany 3,313; United States 2,963.
Semimanufactures	15,600	16,392	17,223	Netherlands 4,357; West Germany 4,248; France 1,866.
Other nonferrous ores	2	1	9	NA.
Other nonferrous waste and scrap	70,239	110,127	170,151	Netherlands 53,255; France 49,246.
Other base metals	7,102	7,985	10,305	United States 3,483; Japan 1,450.
Waste and scrap of precious metals. kilograms	NA	800	NA	Netherlands 300; United Kingdom 200; France 200.
Nonmetals:				
Asbestos	396	130	-------	NA.
Barite	21	194	212	NA.
Building stone:				
Marble and other calcareous stones. thousand tons	837	1,021	915	Netherlands 983.
Other, including worked. thousand tons	154	263	265	Netherlands 253.
Cement thousand tons	1,196	1,435	1,726	Netherlands 1,005; Ivory Coast 93.
Chalk	58,605	76,646	77,866	Netherlands 35,259; France 15,182; West Germany 12,447.
Clays, crude:				
Kaolin	328	72	406	NA.
Nonrefractory	8 275	18,348	25,208	Netherlands 11,420.
Refractory	14,026	9,492	12,616	France 5,747; Netherlands 3,136.
Clay construction materials:				
Nonrefractory	194,726	236,109	212,406	Netherlands 135,734; West Germany 45,024; France 35,306.
Refractory	38,274	41,073	45,068	France 20,451; Netherlands 9,739; Italy 2,760.
Diamond:				
Industrial, including worked. thousand carats	r 8,534	7,834	8,139	United Kingdom 2,367; United States 2,239; Netherlands 777.
Gem:				
Rough do	r 484	1,109	1,235	India 326; Israel 255; United States 218; United Kingdom 153.
Polished do	1,347	1,521	1,561	United States 590; Hong Kong 206; United Kingdom 166.
Diatomite	810	966	941	France 557; Netherlands 197; West Germany 155.

See footnotes at end of table.

Table 2.—Belgium-Luxembourg: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Nonmetals—Continued				
Dolomite	448,763	496,803	551,458	Netherlands 265,625; France 167,485.
Feldspar, leucite, etc	226	86	42	NA.
Fertilizer materials:				
Nitrogenous:				
Sodium nitrate, natural	250	-------	-------	
Manu- thousand tons factured.	660	549	763	France 140; West Germany 107.
Phosphatic:				
Phosphate rock	25,458	29,088	31,203	Netherlands 13,962; Switzerland 2,957.
Thomas thou. tons slag.	1,745	1,797	1,873	France 589; West Germany 416; Netherlands 190.
Manufactured do	215	282	220	France 158; mainland China 20.
Potassic:				
Potassium salts	5,603	12,843	322	Netherlands 9,912; United States 2,631.
Manu- thousand tons factured.	1,072	967	923	United Kingdom 184; United States 178; Japan 111.
Fluorspar	7	-------	13	
Graphite	13	45	8	NA.
Gypsum and plasters	14,493	15,849	16,464	Netherlands 14,704.
Lime	300,564	341,502	357,640	Netherlands 266,113; France 73,901.
Limestone	716,600	836,060	913,566	Netherlands 636,578; France 189,714.
Lithium minerals	28	-------	26	
Mica	9	23	14	NA.
Precious and semi- kilograms precious stones (except diamond).	8,257	5,161	6,073	United States 2,020; Hong Kong 1,750; Italy 801.
Quartz and quartzite	2,218	40,638	63,667	Netherlands 14,182; West Germany 6,150; Italy 4,706; France 4,516.
Salt	534	1,775	3,448	France 1,615.
Sand, gravel, crushed stone:				
Sand thousand tons	2,804	3,064	3,224	France 1,013; Netherlands 770; West Germany 301.
Gravel and crushed do stone.	3,622	5,575	5,792	Netherlands 3,274; France 1,881.
Slate, including worked	3,667	4,265	5,104	Netherlands 1,804; West Germany 1,482.
Sulfur	8,097	7,809	8,084	Portugal 1,281; India 990; Pakistan 954.
Other mineral substances	58,157	93,861	86,547	Netherlands 74,518; France 4,648.
Mineral fuels:				
Asphalt and bitumen (natural)	196	260	249	NA.
Coal, including thousand tons briquets.	2,659	2,575	1,978	France 1,381; Netherlands 603; West Germany 325.
Coke (from coal) do	485	404	511	France 192; Sweden 103; Denmark 43.
Pitch and pitch coke [4]	26,609	15,411	6,473	France 12,620; Netherlands 2,679.
Gas, petroleum and natural	49,215	47,509	50,404	Netherlands 23,446; France 21,033.
Peat, including briquets	280	337	195	NA.
Petroleum:				
Crude	1	29	-------	NA.
Refinery products (including bunkers):				
Gasoline thou. tons	846	624	862	West Germany 188; Netherlands 145; United Kingdom 114.
Kerosine, in- do cluding white spirit.	209	403	442	Netherlands 245; United Kingdom 53.
Distillate thou. tons fuel oils.	1,314	1,436	1,528	Switzerland 451; Netherlands 411; West Germany 180; France 146.
Residual fuel do oils.	2,258	2,178	2,148	Bunkers 1,436; Netherlands 444; France 158.
Lubricants do	153	143	165	Netherlands 48; Switzerland 29; West Germany 18.
Petrolatum and wax	1,483	940	473	Nigeria 450; Israel 62.
Petroleum coke	27,991	41,058	25,633	France 19,955; United Kingdom 16,318.
Liquefied thou. tons petroleum gas and other gaseous hydrocarbons.	49	48	50	Netherlands 23; France 21.
Bitumen thou. tons and other.[5]	299	276	207	West Germany 137; Netherlands 82.
Carbon black	3,490	3,660	4,414	NA.

r Revised. NA Not available.
[1] Generally, includes alloys.
[2] Including scrap.
[3] Does not include anodes, which are unreported.
[4] From coal and other mineral tars.
[5] Including bituminous mixtures.

Table 3.—Belgium-Luxembourg: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals: [1]				
Aluminum and aluminum alloys:				
Bauxite	3,251	5,152	7,244	British Guiana 4,272.
Aluminum oxide and hydroxide.	10,388	12,225	11,117	West Germany 6,705; France 5,028.
Scrap	2,352	2,678	3,772	Netherlands 945; France 434; West Germany 346; Austria 326.
Unwrought	89,055	112,633	117,020	France 81,274; United States 9,721; U.S.S.R. 4,821.
Semimanufactures	16,616	18,237	18,668	West Germany 7,607; Netherlands 3,536; France 3,452.
Antimony:				
Oxides	216	291	90	U.S.S.R. 201; United Kingdom 62.
Metal	242	165	113	U.S.S.R. 71; mainland China 35; Netherlands 33; France 20.
Arsenic:				
Oxides and acids	14	75	46	NA.
Beryllium, all forms..kilograms..	400	600	100	All from Netherlands.
Bismuth [2]	120	72	38	South Korea 41; United Kingdom 18.
Cadmium	488	226	332	Republic of the Congo (Léopoldville) 164; Netherlands 19.
Chromium:				
Ore and concentrate	1,031	1,435	987	Philippines 1,008.
Oxide and hydroxide	329	420	353	West Germany 266; France 117.
Metal	72	29	NA	United Kingdom 15; West Germany 11.
Cobalt:				
Oxides and hydroxides. kilograms..	1,100	200	500	NA.
Copper and copper alloys:				
Ore and concetrate	4,024	2,175	2,227	Morocco 1,269; Peru 350; Ecuador 324.
Scrap	36,503	48,945	67,674	West Germany 14,855; France 11,805; Netherlands 11,071.
Ingot, including alloys	280,384	321,929	317,383	Republic of the Congo (Léopoldville) 220,642; Republic of South Africa 22,202.
Semimanufactures	7,047	8,433	9,024	Netherlands 3,407; West Germany 2,613; France 1,365.
Germanium [2]	17	36	26	Netherlands 35.
Gold and gold alloys:				
Unwrought....troy ounces..	318,000	417,960	1,321,395	United Kingdom 212,195; Republic of the Congo (Léopoldville) 192,905.
Semimanufactures....do....	NA	35,366	16,075	United States 28,936.
Iron and steel:				
Iron ore and concentrate. thousand tons..	19,720	22,897	23,745	France 14,453; Sweden 5,742; Liberia 783; Brazil 466.
Pyrite cinder	44,180	115,013	153,811	France 64,673; Spain 38,471.
Blast furnace slag and waste	232,693	233,817	235,359	France 126,426; West Germany 47,202; Netherlands 43,087.
Scrap	87,345	156,684	145,069	Netherlands 67,044; France 51,182; United Kingdom 16,125.
Pig iron, including cast iron, sponge, powder, etc.	476,513	289,433	234,977	West Germany 139,182; France 92,027; East Germany 45,631.
Ferroalloys, including spiegeleisen.	104,860	126,288	119,426	France 56,608; Norway 32,087; West Germany 9,628.
Ingots and other primary forms. thousand tons..	392	592	433	France 199; Netherlands 174; West Germany 78.
Semimanufactures:				
Shapes (bars, rods, angles, shapes, sections). thou. tons..	271	323	353	France 134; West Germany 118; Netherlands 38.
Universals, plate, sheet. do....	210	256	261	West Germany 118; France 98.
Hoop and strip...do....	22	26	28	France 10; West Germany 9; Netherlands 5.
Railway material. do....	24	5	4	France 1; West Germany 1.
Wire.....do....	8	11	11	West Germany 4; France 4; United Kingdom 1.
Tubes, pipes, fittings. do....	44	54	58	West Germany 25; Netherlands 14; France 7.
Castings.....do....	2	2	3	France 1.
Lead:				
Ore	125,605	101,613	197,449	Canada 67,897; Peru 9,005; Republic of South Africa 6,858; Morocco 6,382.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Lead—Continued				
Oxides	997	1,176	1,489	Mexico 630; West Germany 253; France 215.
Ashes and residues containing lead.	28,967	36,102	35,522	France 9,605; West Germany 9,044; Netherlands 3,659; Australia 3,534.
Scrap	4,052	17,721	20,965	Netherlands 7,752; West Germany 4,330.
Unwrought, including alloys	18,997	17,255	14,635	West Germany 5,741; United States 2,760; Republic of South Africa 2,697; Peru 2,152.
Semimanufactures	825	836	914	West Germany 517; Netherlands 210.
Magnesium:				
Scrap	166	296	387	West Germany 251; Netherlands 39.
Ingot	487	725	718	Canada 290; Italy 227; Norway 175.
Semimanufactures	64	38	48	United States 16; France 9; West Germany 5; Austria 5.
Manganese:				
Ore	223,208	271,087	310,369	Republic of the Congo (Léopoldville) 74, 514; Republic of South Africa 67,550; India 54,195.
Oxide	675	998	1,859	Netherlands 789.
Mercury—76-pound flasks	3,104	1,653	3,568	Mainland China 35; Italy 13; United Kingdom 4.
Molybdenum:				
Metal, including semimanufactures.[2]	9	28	20	United States 14; France 6; Netherlands 5.
Nickel:				
Matte, speiss	-------	-------	28	
Oxide and hydroxide	31	39	60	United Kingdom 29.
Scrap	409	355	531	France 107; Netherlands 89; Hungary 75.
Ingot, including alloys	1,139	1,340	1,187	United Kingdom 1,095; Norway 163.
Semimanufactures	621	700	689	United Kingdom 198; West Germany 138; United States 120.
Platinum and related metals, including rolled.	troy ounces 16,075	25,721	57,871	NA.
Phosphorus	291	313	343	West Germany 286; Sweden 15.
Selenium—kilograms	1,300	700	300	NA.
Silicon	NA	176	NA	Sweden 30; Netherlands 25; France 22.
Silver:				
Metal, unwrought and partly wrought.	thou. troy ounces 6,861	7,530	7,787	United Kingdom 3,739; West Germany 2,842; Peru 322.
Tantalum [2]—kilograms	100	300	200	Netherlands 100.
Tellurium, and arsenic	26	28	33	Poland 10; Sweden 9; Netherlands 6.
Tin:				
Ore—long tons	8,630	6,561	5,616	Republic of the Congo (Léopoldville) 4,534; Burundi and Rwanda 2,027.
Scrap—do	45	15	1	Netherlands 7.
Ingot, including alloys.	do 2,573	3,171	2,380	Republic of the Congo (Léopoldville) 1,476; Netherlands 1,230; United Kingdom 72.
Semimanufactures—do	118	130	152	Netherlands 112; United Kingdom 10.
Oxide—do	16	26	25	Japan 10; West Germany 9; United kingdom 4.
Titanium dioxide	6,500	6,972	8,407	West Germany 4,044; United Kingdom 1,100; Japan 909.
Titanium, vanadium, molybdenum, tantalum, zirconium ores.	2,930	1,523	3,094	Australia 1,175.
Tungsten:				
Ore	11	3	43	NA.
Metal, including semimanufactures.[2]	17	10	247	Netherlands 6.
Uranium and thorium:				
Ore—kilograms	NA	NA	22,000	NA.
Metal, including alloys.	do 900	100	100	NA.
Other radioactive materials, including elements.	do NA	8,200	NA	Mainly from United Kingdom.
Vanadium pentoxide	506	984	409	Netherlands 268; Republic of South Africa 241; West Germany 203; Mozambique 172.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Zinc:				
Ore	422,826	449,520	509,775	Canada 161,994; Finland 82,002; Republic of the Congo (Léopoldville) 74,029.
Ashes and residues containing zinc.	69,207	145,401	50,535	Spain 31,233; France 30,497; West Germany 26,863; Netherlands 17,484.
Oxide and peroxide	1,976	1,944	1,803	Netherlands 783; East Germany 352; Poland 290.
Scrap	412	1,028	1,421	Netherlands 467; West Germany 272; United Kingdom 106.
Dust (blue powder)	305	855	235	West Germany 807.
Slab	24,408	26,132	12,281	Canada 5,738; Australia 5,489; West Germany 4,748; Bulgaria 3,550.
Semimanufactures	132	119	164	Netherlands 54.
Zirconium [2] kilograms	NA	1,100	900	France 700; Sweden 200.
Other metals	r 7,563	7,925	8,292	Republic of the Congo (Léopoldville) 7,698.
Other ores	9,340	10,826	10,791	Morocco 3,774; Bolivia 2,995; Austria 807.
Other nonferrous waste and ashes	128,557	137,640	111,798	West Germany 36,657; Canada 26,308; France 22,371; Netherlands 19,400.
Alkaline and rare-earth metals. kilograms	12,400	20,500	35,000	Canada 12,100; France 2,400; Netherlands 100.
Nonmetals:				
Abrasives, natural	210,616	191,469	210,829	West Germany 188,477.
Asbestos	49,857	55,909	61,026	Canada 35,267; Republic of South Africa 9,242.
Barite, including witherite	27,213	23,839	25,641	West Germany 17,824; France 3,236; United Kingdom 1,058.
Borates, crude	208	937	1,508	Netherlands 810; United States 127.
Bromine kilograms	12,500	16,700	13,600	Netherlands 5,000.
Building stone:				
Marble and other calcareous stones.	60,026	79,895	103,428	France 37,574; Italy 18,852; Portugal 10,513.
Other, including worked	138,130	60,457	103,191	France 36,691; West Germany 8,452; Norway 3,242.
Cement	38,673	43,817	24,028	France 9,942; West Germany 8,219; East Germany 4,476.
Chalk	36,315	35,130	40,818	France 21,474; Netherlands 12,729.
Clays, crude:				
Kaolin	52,320	58,414	64,560	United Kingdom 48,588; West Germany 3,563; United States 2,520.
Nonrefractory	90,814	130,286	153,528	West Germany 100,626; Netherlands 22,298.
Refractory	131,563	136,345	143,729	West Germany 57,358; France 55,690; United Kingdom 16,451.
Clay construction materials:				
Refractory	67,177	80,785	78,748	West Germany 50,275; United Kingdom 7,724.
Nonrefractory	95,668	132,035	117,270	Netherlands 74,935; France 25,503; West Germany 22,477.
Cryolite, natural	89	143	143	Demark 136.
Diamond:				
Industrial, including worked. thou. carats	8,406	9,440	8,827	United Kingdom 3,793; United States 1,838; Ghana 1,081.
Gem:				
Rough stones do	4,421	5,080	5,764	United Kingdom 3,837; United States 451.
Worked do	299	429	485	Israel 138; United Kingdom 66; India 51; Republic of South Africa 43.
Diatomite	6,455	7,711	8,529	United States 2,767; West Germany 1,440; France 1,348.
Dolomite	13,107	16,640	19,017	West Germany 6,566; France 5,496; Norway 4,225.
Earth pigments	672	711	616	NA.
Feldspar, including leucite, nepheline, etc.	25,814	30,910	30,400	France 14,634; Sweden 6,125; Netherlands 4,637.
Fertilizer materials:				
Nitrogenous:				
Sodium nitrate, natural	21,022	31,675	16,128	Mainly from Chile.
Manufactured	109,874	114,111	151,347	West Germany 58,299; France 46,052.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Fertilizer materials—Continued				
Phosphatic:				
Phosphate rock. thou. tons	1,010	1,179	1,286	Morocco 999; U.S.S.R. 107.
Manufactured	825	2,114	886	Netherlands 822; France 675.
Potassic:				
Potassium salts	66,281	250,950	86,624	France 120,381; West Germany 83,932; East Germany 25,200.
Manufactured. thou. tons	1,318	1,126	1,345	France 947; East Germany 33; West Germany 18.
Unspecified manufactured	44,159	46,725	64,964	France 29,431; Italy 7,160; West Germany 3,939.
Fluorspar	6,430	8,134	7,173	France 4,745; mainland China 1,509; West Germany 881.
Graphite	884	1,013	901	Austria 494; France 225; Netherlands 104.
Gypsum and plaster	356,832	430,009	440,384	France 398,425; Netherlands 508.
Iodine, crude	117	NA	NA	NA.
Lime	52,681	83,767	94,937	France 62,633; West Germany 18,706.
Limestone	57,148	69,557	68,794	France 69,295.
Lithium minerals	120	92	231	Netherlands 77.
Magnesite	3,630	4,116	6,409	Austria 1,410; Netherlands 1,068; Brazil 900.
Meerschaum, including amber and jet.	10	11	42	NA.
Mica	760	1,057	1,371	United Kingdom 287; Norway 233; United States 112; Netherlands 105.
Precious and semiprecious stones, natural:				
Dust and powder. value, thousands	$1,277	$1,515	$1,894	United Kingdom $554; United States $540; Ireland $217.
Other kilograms	1,785	3,322	6,110	West Germany 1,506; United Kingdom 69.
Pyrites, unroasted	302,100	282,026	268,078	Portugal 182,845; Spain 43,776; U.S.S.R. 40,328.
Quartz and quartzite	14,756	15,509	14,423	West Germany 7,603; Netherlands 2,102.
Salt	773,153	824,159	793,264	West Germany 411,339; Netherlands 325,405.
Sand, gravel, crushed stone:				
Sand thousand tons	5,344	6,321	6,345	Netherlands 5,819.
Gravel and crushed stone. do	2,461	2,994	3,554	Netherlands 1,681; West Germany 1,036.
Slate, including worked	12,513	15,133	17,105	France 6,028; Portugal 3,707; Netherlands 2,478.
Sulfur	179,688	213,972	274,393	United States 112,487; Mexico 55,969; France 42,085.
Talc and steatite	16,083	16,958	16,243	Norway 4,960; Austria 4,960; France 4,524.
Other mineral substances	67,718	103,156	162,442	Netherlands 45,893; West Germany 18,286; East Germany 17,376.
Mineral fuels:				
Asphalt and bitumen (natural)	4,333	5,051	3,453	West Germany 2,153; United States 1,800; Trinidad and Tobago 767.
Coal, including briquets. thousand tons	7,834	7,255	7,243	West Germany 2,859; United States 1,770; Netherlands 1,077.
Coke (from coal) do	3,893	4,313	4,064	West Germany 3,499; Netherlands 734.
Lignite, including briquets. do	250	227	199	West Germany 222.
Peat, including briquets do	37	41	41	Netherlands 26; West Germany 15.
Pitch and pitch coke [3]	103,908	95,006	17,550	West Germany 23,257; U.S.S.R. 20,082; Netherlands 16,088.
Petroleum:				
Crude thousand tons	12,153	13,284	15,467	Iran 5,348; Iraq 1,939; Kuwait 1,923; Libya 1,135.
Refinery products:				
Gasoline do	349	273	330	Netherlands 169; West Germany 33.
Kerosine, including white spirit. do	22	29	17	Mainly from Netherlands.
Distillate fuel oils. do	1,141	1,165	1,531	Netherlands 278; Italy 236; Venezuela 149.

See footnotes at end of table.

Table 3.—Belgium-Luxembourg: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Mineral Fuels—Continued				
Petroleum—Continued				
Residual fuel oils. thous. tons	2,203	2,838	2,185	Netherlands 811; West Germany 425; Spanish North Africa 364, Netherlands Antilles 324; Venezuela 313.
Lubricants do	218	227	215	United States 134; Netherlands 50.
Petrolatum and wax. do	8	9	9	West Germany 3; United States 2; Indonesia 2.
Petroleum coke do	80	83	86	United States 82.
Bitumen and other.[4] do	108	70	98	France 32; West Germany 17; Netherlands 9.
Petroleum gases and other gaseous hydrocarbons. do	263	281	246	Netherlands 133; West Germany 81; France 63.
Carbon black	12,611	14,488	16,978	Netherlands 4,788; West Germany 2,991; France 2,745; United States 2,087.

r Revised. NA Not available.
[1] Generally, includes alloys.
[2] Including scrap.
[3] From coal and other mineral tars.
[4] Including bituminous mixtures.

COMMODITY REVIEW

METALS

Aluminum. — Production of secondary aluminum decreased 7.7 percent in 1965, but output of semimanufactures rose nearly 10 percent to more than 135,000 tons. Imports and exports of both ingots and semimanufactures likewise increased. A report in mid-1965 indicated that a feasibility study for a large aluminum ingot plant in Belgium had been undertaken on behalf of unnamed principals, believed to be a consortium of Belgian and U.S. firms. Details were lacking, but it was reported that the project, if realized, would not be completed until 1970. The raw materials reportedly will be imported from North America. If the project goes through, this would be the first primary aluminum plant in Belgium.

Copper.—Belgium's refined copper production in 1965 rose to a new high of 309,356 tons, 8.1 percent above the level of 1964. Output of semimanufactures increased by about 9.5 percent. Exports of refined copper rose 6 percent, with the EEC taking three-fourths of the total. France and West Germany remained the principal markets.

The electrolytic refinery of Societé Général Métallurgie de Hoboken, S.A. at Olen worked at full capacity throughout the year. The semicontinuous slab-casting unit and the continuous casting unit for billets were completed. When completed, the overall rationalization and expansion program in progress at yearend at the Olen plant is expected to increase total casting capacity for copper in merchant shapes by 25 percent to about 350,000 tons per year.

Iron and Steel.—Despite a decline in domestic sales, Belgian steel production rose by 5 percent in 1965 in response to an increase in export demand. Pig iron production increased by only 3.9 percent.

The trend to declining utilization of Lorraine ores continued, while consumption of non-EEC ores of higher grade (chiefly Swedish ore) continued to increase steadily. Two ore carriers, one of 32,000 tons and the other of 54,000 tons were commissioned in 1965, and a third was under construction at yearend. Similarly, the trend towards increased consumption of agglomerated ores and declining utilization of crude ores continued. Scrap consumption per ton of steel increased slightly, while consumption of coke per ton of pig iron continued to decline.

Perhaps the most significant development of the year was the sharp increase in output of oxygen steel by various processes; the production of Linz-Donawitz (LD) steel more than doubled in 1965. Production of LD steel accounted for 16

percent of the total in 1965, compared with 7 percent in 1964.

Despite the high levels of output and exports, the Belgian steel industry continued to be in difficulties as prices weakened on both domestic and export markets and labor costs continued to rise. Exports rose 9.6 percent in quantity, while imports declined 8.9 percent. Apparent domestic consumption declined to 2.9 million tons, of which about 60 percent was supplied by the Belgian steel industry.

A number of investment programs in progress during recent years were concluded in 1965. A new LD steel plant of S.A. Cockerill-Ougrée at Seraing, with two 180-ton oxygen converters, was opened in July, and an oxygen steel plant of S.A. Forges de la Providence at Marchienne-au-Pont was completed in March. A second hot-rolling mill at the new steel plant of S.A. Métallurgique d'Espérance-Longdoz at Chertal went into operation at the beginning of 1965, and cutting facilities for coils and heavy sheets were being expanded during the year.

Société Métallurgique Hainaut-Sambre S.A. planned the construction of two 150-ton LD convertors for the modernization of its mill near Charleroi, but no date was announced for the beginning of construction.

The recipient of the bulk of steel industry investment in Belgium, however, continued to be the entirely new plant being erected at Zelzate near Ghent by Sidérurgie Maritime, for which equipment orders valued at about $70 million were placed during the year. Construction of the new plant was on schedule; the cold-rolling mill went into operation in January 1966, and the plant's first blast furnace was scheduled to begin operations in March 1967, with the second to follow in early 1968. The steelworks and hot-rolling mills were also expected to go into operation by the end of the first quarter of 1967.

Lead and Zinc.—Sharp increases in imports of lead and zinc ores and concentrates in 1965 kept Belgian smelters busy and resulted in a 33-percent increase in output of smelter lead and a 7.8-percent rise in output of zinc. Substantial rises in deliveries of ores and concentrates from Canada, the Republic of South Africa, and Finland accounted for the increased imports of lead ores, while a nearly 100,000-ton increase in imports from Canada more than accounted for the rise in imports of zinc ores and concentrates.

As in the case of copper, strong worldwide demand for lead and zinc kept prices strong and enabled the Belgian refining companies to show good financial results. Société Métallurgie de Hoboken S.A. planned to build a new, larger lead refinery as part of its modernization program, while Société des Mines et Fonderies de Zinc de la Vieille-Montagne (Belgium's largest zinc refinery) renovated its roasting and sulfuric acid division at Balen, and extended the direct fabrication of zinc powder at its Liége works. Compagnies des Métaux d'Overpelt-Lommel et de Corphalic (the second largest zinc producer) invested about $1.8 million in new buildings and equipment.

Exports of refined lead (including alloys) recovered from 1964 levels and rose sharply, with West Germany and the Netherlands providing the principal markets. Exports of refined zinc (including alloys) rose more modestly. Trade in semimanufactures was relatively unchanged.

Tin.—Belgian tin production declined 23.2 percent in 1965, with falling deliveries of ores and concentrates from both the Democratic Republic of the Congo (Léopoldville) and Rwanda-Burundi, Belgium's chief suppliers. Imports and exports of both refined tin and semimanufactures likewise decreased.

Uranium.—In September 1965, Eurochemie (Société Europeene pour le Traitement Chimique des Combustibles Irradiées) inaugurated a plant at Mol for the chemical reprocessing of irridated fuels, reportedly representing an investment of $28 million. Contracts were signed with French and Belgian authorities for the treatment of 23 tons of uranium.

Information on trade and consumption of uranium and other radioactive materials is not available. With inauguration of the nuclear powerplant at Chooz, uranium consumption should increase.

Other Nonferrous Metals.—Cobalt prices increased in 1965, and the expanding market for this metal, especially for special cobalt products, was expected to lead to an increase in the capacity of Métallurgie Hoboken's plant at Olen, where consideration was being given to new treatment procedures. In the case of germanium and

Table 4.—Belgium: Salient iron and steel statistics

(Thousand metric tons unless otherwise specified)

	1963	1964	1965
PIG IRON			
Number of blast furnaces:			
Available	53	53	52
In operation	43	44	43
Production:			
For steelmaking	6,803	7,931	8,243
Foundry	75	91	100
Spiegeleisen and carbon ferromanganese	80	99	93
Total [1]	6,958	8,121	8,436
Raw material consumed in production of pig iron:			
Iron ore (direct to furnaces)	9,676	9,418	8,684
Iron ore (in agglomeration plants)	5,062	6,569	7,194
Total iron ore	14,738	15,987	15,878
Manganese ore (direct to furnaces)	170	235	199
Coke [2]	5,586	6,143	5,890
Scrap	327	279	229
STEEL			
Number of steelworks:			
Thomas converters:			
Available	55	56	51
In operation	51	52	47
Open hearth furnaces:			
Available	21	21	17
In operation	13	12	6
Electric furnaces:			
Available	32	29	29
In operation	17	17	16
Linz-Donawitz converters (in operation)	5	7	9
Crude steel capacity	8,840	9,845	[3] 10,370
Production of crude steel:			
Thomas	6,574	7,206	6,894
Open hearth	497	446	385
Electric	291	414	413
Oxygen	138	637	1,449
Bessemer and other	26	21	21
Total [1]	7,525	8,725	9,162
Ingots	7,423	8,627	9,059
Castings	102	98	103
Raw materials consumed in production of steel:			
Pig iron [4]	7,031	8,079	8,383
Scrap	1,497	1,768	1,888
Iron ore	29	51	58
Rolled steel production:			
Rails and accessories	64	43	73
Heavy sections	317	431	402
Bars and rods	2,048	2,089	2,147
Wire rod	722	866	918
Products for tubes	-------	14	21
Wide plates	34	32	38
Hot-rolled sheets, 3 mm or more	533	750	974
Hot-rolled sheets, less than 3 mm	231	208	168
Cold-rolled sheets, 3 mm or more	7	8	5
Cold-rolled sheets, less than 3 mm	1,275	1,464	1,387
Hoop and strip, including pipe strip	347	376	382
Coils (finished products)	119	126	177
Total [1]	r 5,699	r 6,409	6,694
Galvanized sheet [5]	r 348	364	340
Tinplate [5]	226	225	200
Magnetic sheet [5]	42	41	41
Tube products (seamless and welded)	r 235	272	256
Cold-drawn wire (deliveries) [5]	r 629	r 681	NA
Cold-rolled strip (outside ECSC Treaty)	199	243	NA
Scrap consumed in independent steel foundries	85	78	84
Scrap consumed in rolling mills	16	12	8
Total employment, iron and steel industry (end of year) [6]	59,713	61,499	60,596

See footnotes at end of table.

Table 4.—Belgium: Salient iron and steel statistics—Continued

r Revised. NA Not available.
1 Detail may not add because of rounding.
2 Total in blast furnaces and agglomerating plants.
3 Preliminary figure established at beginning of year.
4 Including spiegeleisen and carbon ferromanganese.
5 Not additive to rolled steel because of duplication.
6 Including workers and office employees.

Sources: Statistical Office of the European Communities. Iron and Steel. No. 2; 1966 Institut National de Statistique. Bulletin de Statistique. No. 3, March 1966.

silicon, demand was increasingly concentrated on the more highly processed products.

NONMETALS

Cement and Construction Materials.—Cement output increased 1 percent in 1965, and lime output was practically unchanged from 1964 levels, but production of all other construction materials (stone and sand and gravel) was down sharply from the 1964 levels. Production of glass sand, on the other hand, rose 10 percent. Imports of building materials (except lime) declined sharply, while exports rose substantially, cement leading the way with an increase of 20 percent.

Diamond.—Imports of industrial diamond declined 6.5 percent in 1965, while imports of gem stones rose by 13 percent, total diamond imports remaining at the level of about 15 million carats. Exports rose 16 percent to 12,160,713 carats, with exports of industrial stones showing a rise of 19.5 percent.

Exports of rough gem stones totaled 1,090,001 carats in 1964 and 1,235,136 carats in 1965, having thus reached a level of from three to four times the quantity exported in 1963, before elimination of export controls on unfinished stones. Imports of rough gem stones by 1965 had risen, however, 1.3 million carats, thus more than equaling the rise in exports since 1963. The Belgian industry's supply position in rough stones thus appears not to have been seriously affected.

The diamond trade continued to be an important exchange earner for Belgium, with imports in 1965 valued at about $275 million and exports at about $288 million.[6]

Fertilizers.—Output of Thomas slag rose 3.1 percent, while production of manufactured nitrogenous and phosphatic fertilizers continued to grow. The potassic content of mixed fertilizer output declined by 6 percent. Belgium-Luxembourg imports of nitrogenous and potassic fertilizers rose by 33 percent and 2 percent, respectively, while exports of Thomas slag and manufactured nitrogenous fertilizers rose sharply.

Sulfur.—Imports of elemental sulfur increased by 9 percent, and production of sulfuric acid increased by 10 percent. Exports of sulfur increased by 3.5 percent, but both imports and exports of sulfuric acid declined sharply, indicating a substantial increase in consumption.

MINERAL FUELS

Coal continued to lose ground during 1965 to petroleum in the Belgian energy markets, accounting for 53 percent (as against 59 percent in 1964) of total consumption of primary energy. The share of petroleum and its products in the market rose to 42.8 percent from 40.6 percent in 1964. Total consumption of primary energy in 1965 was estimated at 43.0 million tons of standard coal equivalent, an increase of about 3.6 percent.

Domestic output of coal, natural gas, and electric energy accounted for 43 percent of this total, compared with 47 percent in 1964. Thus, as in most other European countries, the energy revolution in Belgium (though slower than elsewhere) involves both a shift from coal to petroleum-based energy and a shift from domestic sources to imported sources.

Coal.—The continuing decline of the Belgian coal industry is illustrated by comparative 1964 and 1965 figures for production, number of workers, and active mines. In 1965 total production was 19,786,000 tons, the total number of workers (at yearend) 75,073, and total number of active mines 54. Comparison with 1964 figures shows a reduction of 1.5 million tons of output, 9,918 workers, and 4 in active mines. Notwithstanding the clos-

[6] Where necessary, values have been converted from Belgian francs (BF) to U.S. dollars at the rate of BF50=US$1.

Table 5.—Belgium: Energy balance

(Thousand tons standard coal equivalent—SCE)

	1962	1963	1964	1965
Production, primary sources:				
Coal	19,619	19,615	19,374	18,361
Natural gas	80	77	78	92
Electric power	65	73	63	100
Total	19,764	19,765	19,515	18,553
Imports:				
Coal, coke and briquets	5,193	7,994	7,820	7,792
Lignite and briquets	66	71	52	54
Crude petroleum	12,283	17,261	19,276	22,613
Petroleum refinery products (energy products only)	7,479	6,415	6,955	6,323
Gas, manufactured	4	6	4	4
Electric power	103	164	137	159
Total	25,128	31,911	34,244	36,945
Producers and importers stock changes, all forms of energy [1]	+3,146	+1,555	−779	−605
Exports and bunkers:				
Coal, coke and briquets	3,668	3,357	3,305	2,855
Petroleum refinery products (energy products only)	5,722	7,535	7,961	8,706
Gas, manufactured	31	34	31	31
Electric power	288	363	270	166
Total	9,709	11,289	11,567	11,758
Available for domestic distribution, all forms of energy	38,329	41,942	41,413	43,135
Consumer stock changes, all forms of energy [1]	+87	−142	+94	−134
Gross consumption, primary sources basis:				
Coal and equivalent	NA	NA	23,351	22,825
Lignite and equivalent	NA	NA	52	54
Crude petroleum and equivalent	NA	NA	18,096	19,938
Natural gas	NA	NA	78	92
Electric power	NA	NA	−70	92
Total	38,416	41,800	41,507	43,001
Conversion and consumption:				
Converted to other forms of energy, primary basis:				
Coal and derivatives	19,348	19,902	19,542	18,802
Natural gas	16	12	10	10
Petroleum and energy derivatives	13,219	18,933	21,304	24,706
Total	32,583	38,847	40,856	43,518
Energy products derived:				
Coal briquets	1,602	2,299	1,433	1,074
Coke	7,195	7,204	7,398	7,334
Industrial and manufactured gas, all types	4,274	4,173	4,372	4,325
Petroleum energy products	10,588	14,932	16,581	19,814
Refinery fuels	766	1,097	859	1,003
Heat	155	166	179	192
Electric power	6,795	7,220	7,862	7,864
Total	31,375	37,091	38,684	41,606
Consumption:				
Primary sources:				
Consumed in production of primary sources	4,184	4,400	4,345	4,293
Losses in system	436	508	523	543
Losses in conversion to other forms	1,206	1,691	2,172	1,912
Consumption of non-energy derivatives	136	156	170	171
Converters' stock changes and adjustments	+687	+854	+265	−136
Total	6,649	7,609	7,475	6,783
Final consumption by end user:				
Iron and steel	5,675	5,899	6,642	6,668
Other industries	9,113	9,128	9,963	10,919
Transportation	4,048	4,146	4,422	4,697
Domestic household and small business	12,931	15,018	13,005	13,934
Total	31,767	34,191	34,032	36,218
Final consumption by energy source:				
Coal	8,525	9,231	7,260	6,628
Briquets	1,417	1,695	1,155	1,265
Coke	4,339	4,537	4,768	4,654

See footnote at end of table.

Table 5.—Belgium: Energy balance—Continued
(Thousand tons standard coal equivalent—SCE)

	1962	1963	1964	1965
Consumption—Continued				
Final consumption by energy source—Continued				
Lignite	67	71	51	54
Petroleum	10,255	11,062	12,513	14,897
Manufactured gas	1,905	1,972	2,001	2,231
Heat	155	166	179	192
Electric power	5,104	5,457	6,105	6,297
Total	31,767	34,191	34,032	36,218
Grand total consumption	38,416	41,800	41,507	43,001

NA Not available.
[1] Plus+denotes withdrawals from stocks; minus−denotes additions to stocks.

Source: Statistical Office of the European Communities. Energy Statistics. 1964 Annual Yearbook, 225 pp; and 1966, No. 6, 151 pp.

ing of four mines and the reduction of output, pithead stocks grew by over 900,000 tons. Despite a resulting recovery in productivity (output per man-shift), practically the whole Belgian coal industry remained financially dependent on government subsidies, whose amount was constantly growing.

Production in the Campine field (at 9.7 million tons) declined only 4.3 percent from 1964 levels and increased in share of total output from 47.6 percent in 1964 to 49.1 percent in 1965. Output of the southern fields (at 10 million tons) showed a decline of 10 percent. The four mines closed during 1965 were in the southern fields (two at Charleroi and two at Liége).

Imports declined in 1965 about 37,000 tons, and exports declined 483,000 tons; apparent total Belgian consumption was down 540,000 tons (2.2 percent) to 24.5 million tons. Belgian coal provided 17.2 million tons (70 percent) of this total, a decline of 871,000 tons from 1964. Imports of anthracite from non-EEC countries were restricted by quota after April, while quotas on industrial coal from these countries remained in force; total non-EEC imports thus showed a decrease for the year of 460,000 tons (14.4 percent); this, however, was almost completelv offset by an increase of 423,000 tons (10 percent) in imports from the European Coal and Steel Community.

Coke ovens (35.8 percent), thermal powerplants (22.8 percent) and domestic uses (18.5 percent) remained the principal markets for Belgian coal, but both the coke ovens, and domestic markets decreased their takings of Belgian coal and increased their consumption of imported coal. Coke oven imports of coal from the United States for custom coking rose from 522,000 tons in 1964 to 680,000 tons in 1965. Only the thermal power market, which increased its consumption of Belgian coal and used less imported coal, seemed to remain firmly in the hands of the domestic industry.

The Belgian Government, pressed by the financial burden of subsidies, both imposed new quotas on imports and by withdrawing subsidies from two enterprises, brought about the closure of the four mines mentioned previously. In April it suspended the recruiting of foreign miners, and at yearend it announced a new subsidy program for the coal mines involving an expenditure of about $32 million in 1966, an increase of $12 million over that of 1965. The program requires the closing of six mines during 1966, eliminating a total capacity of 2.4 million tons or 12 percent of total production. Five of these mines (Gosson, Esperance, Boubier, Ans-Rocour, and Tertre) are in the southern fields, and one (Zwartberg) is in the Campine field. The net effect of these closures, to be phased over the year, is expected to be a reduction of 1.1 million tons in 1966 output, while reduction in employment is estimated at about 9,800. Funds are to be made available for retraining workers, and special efforts (including fiscal and other incentives) are to be made to foster new investment in the affected regions to absorb the displaced workers and offset the economic effect of the mine closures. According to one report, discussions between the Government and the industry for establishment of a

single mining company in the Campine field, with Government participation, were underway in the last quarter.[7]

A large portion of mine labor, however, consists of foreign workers recruited from other countries; at yearend, 65 percent of underground workers and 53 percent of the total labor force consisted of foreigners.

The rapid decline of the Belgian coal industry is due not only to competition from other fuels and rising wage costs but also to the fact that deposits and mining conditions are less favorable than elsewhere, even within the Coal and Steel Community. Coal seams are said to be deeper and less adapted to mechanization. Productivity per man-shift, in physical terms, in recent years has been the lowest in the Community, while per-ton costs and prices have been the highest. At the same time, the shift from coal to other energy sources has proceeded less rapidly in Belgium than in other Community countries, so that restrictions on imports of third-country coal (common throughout the Community) are offset by imports of cheaper coal from neighboring Community countries. At the same time, growing pressures from steel and other industries for cheaper fuel, plus the prospects of early imports of large quantities of Dutch natural gas, are expected to further decrease domestic demand for Belgian coal.[8]

Natural Gas and Manufactured Gas.—Production of methane (firedamp) recovered from coal mines increased by about 19 percent in 1965, and a larger proportion was sold to gas companies. Manufactured gas output rose by 2.7 percent. Total gas production reached 83 million cubic meters.

Towards yearend final agreement was reached with NAM Gas Export of the Netherlands for deliveries of Dutch natural gas to Belgium, to begin at the end of 1966. The Belgian Government had objected to the terms of an earlier (1964) agreement between NAM Gas Export and Distrigaz, a Belgian distributing company, providing that Esso and Shell (partners in NAM) would each take a 25-percent participation in Distrigaz. Objections were also raised, according to reports, to the proposed prices for Dutch gas, and the Belgian Government is reported to have lodged a complaint with the EEC Commission on this score, which however was not pressed and was withdrawn when final agreement was reached.

Under the agreement, Distrigaz is to be reorganized with the Belgian Government participating for one-third, Belgian investors for one third, and Esso and Shell for one-sixth each. Distrigaz is to take over Savgaz, the other Belgian gas distribution company. By the mid-1970's, deliveries of Dutch gas to the public distribution network are expected to reach 3 billion cubic meters per year, with additional quantities going to industries. According to reports, the principle of parity between wholesale prices in Belgium and the Netherlands has been established, and the EEC Commission may be requested to settle any disagreements between the parties on prices or other terms of the contract.[9]

Petroleum.—Crude petroleum throughput in Belgian refineries increased 16.8 percent to 15.6 million tons, while output of finished products rose slightly more (17.7 percent) to 14.8 million tons. Domestic consumption rose 13 percent, to 11.6 million tons. The share of petroleum in energy consumption rose by 5.4 percent, to nearly 43 percent of the total. Petroleum and its products continued to rank first in terms of value among mineral imports, while petroleum products ranked fourth in value among exports. The trade deficit on petroleum account rose only slightly and remained approximately $200 million.

Electric Power. — The Franco-Belgian nuclear power station at Chooz, on which work proceeded on schedule in 1965, is scheduled to go into operation in 1966. Its capacity is rated at 266 megawatts of electricity output. Plans were announced during the year by Belgian utilities for two additional nuclear power stations, each of 600 megawatts. The first is to be built on the left bank of the Scheldt below Antwerp and the second on the Meuse near Hug. Plans call for the Antwerp station to go into operation by 1971.[10]

[7] Société Générale de Belgique. Annual Report 1965. P. 39.

[8] For excellent reviews of the problem, see Competoir Belgedes Charbons, l'Industrie Charbonniere en 1965; and Directoire Nationale de l'Industrie Charbonniere, Le Probleme Charbonnier.

[9] World Petroleum Report, Mar. 15, 1966; Petroleum Press Service, December 1965, p. 470.

[10] Société Générale de Belgique. Annual Report 1965. P. 43.

Power demand in Belgium increased by 6.4 percent in 1965, but the increase in northern Belgium (Antwerp, Ghent, and Bruges) was reported to be substantially higher.[11] Thermal power stations accounted for 98.7 percent of power output in 1965; of this total, coal-fired plants accounted for 64.1 percent and oil and gas-fired plants for 34.6 percent.

[11] Fédération Professionnelle des Producteurs et Distributeurs d'Electricité de Belgique, Statistiques Provisiones 1965. Societe Generale de Belgique. Annual Report 1965. P. 43.

Table 6.—Belgium: Salient statistics of the coal and coal product industry

(Thousand metric tons unless otherwise specified)

	1961	1962	1963	1964	1965
Coal:					
Production:					
Anthracite	5,520	5,751	5,986	6,062	5,438
Semibituminous	1,928	1,874	1,781	1,840	1,760
Bituminous	14,091	13,601	13,651	13,402	12,588
Total	21,539	21,226	21,418	21,304	19,786
Imports:					
From EEC countries	3,213	3,433	3,534	3,770	4,094
From third countries	830	1,320	3,814	3,197	2,739
Total	4,043	4,753	7,348	6,967	6,833
Producers and importers stock changes [1]	+2,779	+3,624	+1,821	+325	+256
Remainder available for distribution	28,361	29,603	30,587	28,596	26,875
Exports and bunkers:					
To EEC countries	2,171	1,863	1,621	1,889	1,610
To third countries	682	823	247	272	191
To ships bunkers	13	13	8	3	1
Total	2,866	2,699	1,876	2,164	1,802
Available for domestic distribution	25,495	26,904	28,711	26,432	25,073
Consumers' stock changes [1]	+238	+76	−155	−180	−460
Consumption:					
Direct use:					
At mines	340	345	358	286	264
Transportation	661	575	443	304	206
Other industries	1,840	1,562	1,041	1,466	1,138
Household, small business and other domestic	5,585	6,122	7,262	5,490	5,284
Total	8,426	8,604	9,104	7,546	6,892
Converted to other forms of energy:					
Electricity	6,729	7,310	7,788	7,529	7,023
Briquets	1,105	1,505	2,108	1,411	1,019
Coke	9,473	9,561	9,556	9,766	9,679
Total	17,307	18,376	19,452	18,706	17,721
Total consumption	25,733	26,980	28,556	26,252	24,613
Briquets:					
Production	1,164	1,602	2,299	1,433	1,074
Imports	153	163	195	233	330
Producers and importers stock changes [1]	+15	+13	−1	−55	+25
Remainder available for distribution	1,332	1,778	2,493	1,611	1,429
Exports and bunkers	179	327	757	427	135
Available for domestic distribution	1,153	1,451	1,736	1,184	1,294
Consumption:					
Briquet plants own consumption	31	35	40	29	29
Converted to other forms of energy	1	1	1		
Iron and steel industry	16	14	11	7	7
Other industries	51	54	37	35	34
Railroads	63	46	32	18	9
Household, small business and other domestic	991	1,301	1,615	1,095	1,215
Total	1,153	1,451	1,736	1,184	1,294
Coke:					
Production	7,252	7,195	7,204	7,398	7,334
Imports:					
From EEC countries	252	245	363	536	625
From third countries	2	24	51	84	4
Total	254	269	414	620	629
Producers and importers stock changes [1]	+7	+44	+71	−15	+55
Remainder available for distribution	7,513	7,508	7,689	8,003	8,018
Exports:					
To EEC countries	695	530	601	467	699
To third countries	179	111	122	247	219
Total	874	641	723	714	918
Available for domestic distribution	6,639	6,867	6,966	7,289	7,100
Consumers stock changes and statistical adjustments [1]	+47	−14	−5	+7	−7

See footnotes at end of table.

Table 6.—Belgium: Salient statistics of the coal and coal product industry—Continued
(Thousand metric tons unless otherwise specified)

	1961	1962	1963	1964	1965
Coke—Continued					
Consumption:					
Direct use:					
Coking plants own consumption	67	67	70	21	23
Iron and steel works	3,263	3,384	3,364	3,787	3,645
Other industries	672	644	717	682	705
Railroads	14	16	26	15	16
Household and other small domestic	238	281	394	285	290
Total	4,254	4,392	4,571	4,790	4,679
Converted to other forms of energy:					
In electric powerplants	50	33	57	46	40
In gas works	11	7	5		
In blast furnaces	2,371	2,421	2,328	2,460	2,374
Total	2,432	2,461	2,390	2,506	2,414
Total consumption	6,686	6,853	6,961	7,296	7,093
Stocks at yearend: [2]					
Coal:					
Producers	4,394	1,351	454	1,489	2,419
Importers	17	23	61	188	107
Consumers	1,560	1,447	1,586	1,499	1,626
Total	5,971	2,821	2,101	3,176	4,152
Briquets (all producers)	18	5	6	53	38
Coke:					
Producers	266	218	148	162	121
Consumers	110	122	125	118	120
Total	376	340	273	280	241
Employment:					
Coal mines in operation	64	61	59	58	54
Employment at yearend:					
Labor:					
Underground thou. persons	61.2	59.1	59.3	60.6	52.6
Surface at collieries do	22.0	20.4	19.9	19.1	17.6
Associated industries do	1.0	1.2	1.2	1.0	1.1
Total do	84.2	80.7	80.4	80.6	71.3
Technical and administrative do	10.8	10.3	10.2	10.0	9.4
Total employed do	95.0	91.0	90.6	90.6	80.7
Production per man shift underground kilograms	1,714	1,818	1,820	1,763	1,874

[1] Plus+denotes withdrawals for stocks: minus−denotes additions to stocks.
[2] Stock changes may differ from those shown in preceding tables because of statistical adjustments as carried in books, and/or differences due to rounding.

Source: Statistical Office of the European Communities. Energy Statistics. 1964 Annual Yearbook, 225 pp; and 1966, No. 6, 151 pp.

The Mineral Industry of Bulgaria

By Roman V. Sondermayer [1]

Nonferrous metals, low-rank coals, and construction materials remained the principal mineral products of Bulgaria in 1965. Lead output comprising about 3.4 percent of the world total and zinc production constituting about 2 percent of the world total were the most prominent minerals. The country also supplied between 1 percent and 0.1 percent of the world's total production of barite, cement, coal (all grades in total), chromite, copper, diatomite, fluorspar, gypsum, iron ore, manganese ore, pig iron, pyrite, salt, steel ingots, and sulfur.

During 1965 the mineral industry contributed approximately 10 percent to the social product [2] of Bulgaria, and the industry and its related facilities employed about 182,000 persons, or roughly 9 percent of the total Bulgarian labor force.

Bulgaria's mineral commodity trade was significant for the economy of the country. Mineral industry exports, predominantly ores, concentrates and ingot lead, zinc, copper, and bismuth, continued to be an important source of foreign exchange. Imports, mostly of mineral fuels, iron ore, apatite, and semimanufactured metal products, were vital for the domestic industry. Although the U.S.S.R. and other Communist countries were the predominant trading partners of Bulgaria, both in export and import, some trade was registered with France, Japan, West Germany, and Austria.

The most important developments in 1965 concerned iron and steel and nonferrous metals. The Kremikovtsi iron and steel plant started operation of a second blast furnace and its first electric furnace for production of steel. The Medet copper combine near Pirodop remained the focal point of the Bulgarian copper industry. The discovery of lead and zinc deposits near Kyustendil and expansion of the Dimitur Blagoev zinc plant near Plovdiv were the high points in lead and zinc activities.

The field of mineral fuels was highlighted by discovery of new brown coal deposits in the central part of Rodopi Mountain, and by completion of the first plant for anthracite beneficiation near the Thompson railroad station in the Balkan Mountains.

Soviet assistance in developing the mineral resources of Bulgaria continued, but participation of other Communist countries increased during 1965. East Germany and Czechoslovakia assisted in development of the Medet project and supplied equipment for open pit mines. The slow pace of construction, shortages of materials, lack of worker's incentives, and political interference in management slowed developments.

[1] Foreign mineral specialist, Division of International Activities.

[2] As in other Communist countries of East Europe, Bulgaria does not report on its gross national product (value of all final goods and services produced) but rather publishes a figure for the social product, which generally excludes items such as banking fees, rent, education, defense, public administration, and health services.

PRODUCTION

Output of most metals and minerals increased in 1965. The share of total output obtained from low-grade ores was higher than in past mineral production of Bulgaria. Mass production methods began to be introduced in surface and underground mining. The operation of beneficiation plants for nonferrous metals was under scrutiny of Soviet and Bulgarian specialists. As a result of the study, the rate

Table 1.—Bulgaria: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965 [p]
Metals:					
Copper:					
Ore, gross weight—thousand tons	1,461	1,786	2,109	2,202	2,368
Content of ore—do	18	19	19	20	[e] 22
Concentrate (20 percent)	81,538	93,174	91,887	91,500	[e] 100,000
Blister	18,917	19,439	20,522	21,100	[e] 23,000
Electrolytic	15,013	18,287	[r] 19,797	20,600	[e] 22,000
Rolled products	10,833	11,245	12,115	13,722	[e] 14,000
Iron and steel:					
Iron ore, gross weight—thousand tons	418	635	655	[r] 722	1,801
Iron content of ore—do	193	258	[r] 254	[r] 257	[e] 530
Pig iron and ferroalloys—do	206	223	[r] 265	[r] 457	691
Steel ingots—do	340	423	461	475	588
Rolled products—do	271	330	353	363	431
Lead:					
Lead-zinc ore, gross weight—do	3,457	4,239	4,189	4,361	[e] 4,700
Lead content of ore	80,040	94,400	88,900	[r] 101,100	[e] 110,000
Lead concentrate (70 percent)	114,343	134,857	127,053	130,400	[e] 143,000
Refined	40,913	[r] 43,700	[r] 51,332	[r] 87,499	[e] 96,100
Manganese ore	37,000	35,000	38,000	52,000	62,000
Zinc:					
Zinc content of ore [2]	73,900	80,500	73,600	81,300	[e] 89,000
Zinc concentrate (52 percent)	106,703	120,594	111,359	123,500	[e] 135,000
Refined	22,122	51,725	[r] 56,064	58,600	[e] 63,000
Nonmetals:					
Cement:					
Portland—thousand tons	1,676	1,825	2,120	2,586	NA
Pozzolan—do	73	68	85	47	NA
Total—do	1,749	1,893	[r] 2,205	2,633	2,681
Fertilizers:					
Nitrogenous, nitrogen content	87,727	94,015	100,947	205,394	[e] 220,000
Phosphatic, phosphorus pentoxide content	55,764	69,640	70,571	90,290	[e] 100,000
Gypsum:					
Crude—thousand tons	135	117	100	129	[e] 135
Calcined—do	15	13	12	16	[e] 17
Kaolin—do	NA	61	77	83	90
Lime, crude—do	633	695	753	[r] 834	[e] 840
Pyrite concentrate (42 percent)	121,707	142,303	129,933	146,800	[e] 150,000
Refractories, all types	73,300	81,200	86,300	100,100	[e] 110,000
Sulfur	[r] 5,028	[r] 5,590	[r] 6,392	6,828	[e] 7,000
Mineral fuels:					
Coal:					
Anthracite—thousand tons	190	197	217	[r] 221	NA
Bituminous—do	401	439	441	[r] 586	NA
Brown—do	9,931	9,624	9,814	10,762	NA
Lignite—do	7,035	9,480	10,461	13,966	NA
Total—do	17,557	19,740	[r] 20,933	[r] 25,535	26,212
Coke—do	20	8	128	[r] 471	733
Petroleum:					
Crude—do	207	199	173	160	229
Refinery products:					
Gasoline—do	NA	NA	68	307	NA
Kerosine	NA	NA	8,369	41,853	NA
Diesel fuel—thousand tons	NA	25	117	494	NA
Fuel oil—do	48	42	265	1,000	NA
Lubricants—do	NA	23	34	45	NA

[e] Estimate. [p] Preliminary. NA Not available.

[1] In addition to reported commodities Bulgaria is known to produce gold, silver, asbestos, barite, clays, and salt.

[2] For gross weight of ore, see lead entry.

Sources: Statisticheski Godishnik na Narodna Republika Bulgaria—1965 (Statistical Yearbook of the Peoples Republic of Bulgaria for 1965). Sofia, 1965, 559 pp. Rabotnichesko Delo (Sofia). Jan 29, 1966.

of feed to Soviet-built flotation machines has been increased, and reportedly recovery of metals was higher than in the past.

In the petroleum industry the Bulgarians used conventional rotary drilling and turbodrill. Shutdown time, transportation, and production testing time of an average Bulgarian drilling rig averages about 70 percent of total available rig time. Bulgarians used conventional methods for production of crude oil. Reservoir pressure maintenance projects were not reported.

TRADE

With small exceptions, data on foreign trade in minerals were not made public in Bulgaria during 1965. Partial information from Bulgarian, Soviet Union, and United Nations sources were compiled to produce tables 2 and 3. Most of the figures are incomplete and do not represent the total Bulgarian mineral trade.

The imports of minerals and related products accounted for roughly one-fifth of total imports in 1964. Fuels and metal semimanufactures were principal import items. Exports of minerals contributed one-tenth of total Bulgarian export value in 1964. Nonferrous metals were the principal export items.

Table 2.—Bulgaria: Export of selected metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum [2]			
Scrap	NA	249	All to United Kingdom.
Metal and alloys unwrought	NA	162	All to Belgium.
Copper, refined [2]	NA	502	All to West Germany.
Iron and steel:			
Iron ore	14,322	10,822	All to Rumania.
Pig iron [2]	NA	99,288	Japan 83,936; Austria 8,029; Yugoslavia 3,833; Greece 1,427.
Steel:			
Primary forms [2]	NA	19,122	Turkey 17,442; West Germany 1,680.
Semimanufactures	NA	[3] 27,080	Yugoslavia [2]14,354; Greece [2]6,015; Turkey [2]2,820; Rumania 2,579; Syria 1,312.
Lead:			
Ore and concentrate [2]	NA	1,514	All to Belgium-Luxembourg.
Metal and alloys unwrought	23,513	52,786	U.S.S.R. 16,769; Poland 8,418; Czechoslovakia 7,945; West Germany 4,085; East Germany 3,729; Netherland [2]2,907; Italy [2]2,287; Austria [2]1,112.
Zinc	42,763	44,590	Czechoslovakia 8,672; East Germany 5,117; Italy [2]4,967; United Kingdom [2]4,497; Belgium-Luxembourg [2]3,551; Austria 3,216; West Germany 1,799; Netherlands 1,083; Japan [2] 1,062; France [2]1,006.
Nonmetals:			
Barite [4]	20,800	27,500	All to U.S.S.R.
Cement	230,848	514,741	Yugoslavia 116,027; Pakistan 19,502; Sudan 13,071.
Feldspar [2]	NA	1,310	All to Yugoslavia.
Fertilizer materials: Nitrogenous	77,185	100,181	Hungary 46,283; Greece 12,732; Czechoslovakia 10,840; Cuba 9,948; Yugoslavia [2]9,314.
Refractory clay [2]	NA	1,310	All to Yugoslavia.
Talc, natural steatite [2]	NA	3,896	Do.
Mineral fuels:			
Coal, bituminous	35,870	--------	
Petroleum:			
Crude	79,658	40,822	Greece 27,904; Hungary 12,868.
Refinery products: [2]			
Petroleum partly refined	NA	22,934	All to Italy.
Residual oils	NA	2,923	All to Yugoslavia.
Lubricants	NA	3,290	Do.

NA Not available.

[1] Because Bulgaria publishes only limited data on foreign trade in minerals, this table has been compiled from several sources. Information except as noted is from Statisticheski Godishnikna Narodna Republika Bulgaria—1965 (Statistical Yearbook of the Peoples Republic of Bulgaria for 1965). Sofia 1965 557 pp.

[2] Statistical Office of the United Nations. 1964 Supplement to the World Trade Annual: Trade of the Industrialized Nations with Eastern Europe and the Developing Nations. Part I. Eastern Europe. Walker and Co., New York, 1965, 341 pp.

[3] Derived by addition of figures from United Nations and Bulgarian sources.

[4] Vneshnyaya Torgovlya S.S.S.R. za 1964 god (Foreign trade of the U.S.S.R. for 1964). Moscow, 294 pp.

Table 3.—Bulgaria: Imports of selected metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Ingots	[2] 2,000	[3] 4,500	U.S.S.R. [2]4,000; Spain [4]500.
Semimanufactures	[2] 1,589	[3] 7,857	U.S.S.R. [2]3,072; Austria [4]2,975; Spain [2]750 West Germany [4]722.
Antimony metal[2]	190	1,179	All from U.S.S.R.
Copper semimanufactures	[2] 1,445	[3] 1,651	U.S.S.R. [2]1,405; Finland [4]98; Austria [4]97; France [4]11.
Iron and steel;			
Iron ore[2]—thousand tons	211	346	All from the U.S.S.R.
Pig iron[2]—do	132	132	Do.
Ferroalloys[2]—do	5	6	Do.
Semimanufactures—do	NA	[2] 463	U.S.S.R. [2]353; Italy [4]40; West Germany. 37; Austria [4]20; Belgium-Luxembourg [4]4;
Magnesium unwrought[4]	NA	185	All from Italy.
Mercury[4]—76-pound flasks	NA	493	Italy 377; West Germany 116.
Nickel[4]	NA	166	Italy 96; West Germany 70.
Tin[4]—long tons	NA	175	All from United Kingdom.
Nonmetals:			
Asbestos[2]	10,600	15,800	All from the U.S.S.R.
Apatite, concentrate[2]	138,800	132,600	Do.
Borates, crude	NA	5.150	All from Turkey.
Fertilizer materials: Phosphatic, manufactured	[2] 30,700	[3] 90,483	U.S.S.R. [2]29,800 Yugoslavia [4]19,996 Belgium-Luxembourg 14,637; France; 12,310; Italy 5,660; Portugal 8,080.
Graphite[2]	1,200	1,200	All from the U.S.S.R.
Refractory materials, all kinds[4]	NA	576	Austria 291; Yugoslavia 285.
Sulfur[4]	NA	798	All from West Germany 798.
Mineral fuels:			
Bituminous coal[2]—thousand tons	1,283	1,994	All from U.S.S.R.
Coke, metallurgical—do	317	352	U.S.S.R. 177; Czechoslovakia 133; Poland 43.
Petroleum:			
Crude[2]—thousand tons	464	1,799	All from the U.S.S.R.
Refinery products:			
Gasoline[2]—thousand tons	408	215	All from the U.S.S.R.
Kerosine[2]—do	18	10	Do.
Diesel fuel[2]—do	408	230	Do.
Heating oil[2]—do	747	808	Do.
Lubricants—do	[2] 38	[3] 41	U.S.S.R. [2]40.
Paraffin[2]—do	2	2	All from the U.S.S.R.
Bitumen[2]—do	15	20	Do.
Total—do	1,636	1,326	U.S.S.R. 1,325.

NA Not available.

[1] Because Bulgaria publishes only limited data on foreign trade in minerals, this table has been compiled from several sources. Information except as noted is from Statisticheski Godishnik na Narodna Republika Bulgaria–1965 (Statistical Yearbook of the Peoples Republic of Bulgaria for 1965), Sofia, 559 pp.

[2] Vneshnyayatorgovlya S.S.S.R. za 1964 god (Foreign Trade of the U.S.S.R. for 1964). Moscow, 1965, 294 pp.

[3] Derived by addition of figures from U. N. and Soviet sources.

[4] Statistical Office of the United Nations. 1964 Supplement to the World Trade Annual: Trade of the Industrialized Nations with Eastern Europe and the Developing Nations. Part I. Eastern Europe. Walker and Company, New York, 1965, 341 pp.

COMMODITY REVIEW

METALS

During 1965 Bulgaria had a significant production of nonferrous metals by European standards. The ferrous branch of mineral industry was modest, although much effort and money were put into development of its facilities.

Copper.—Intensive exploration and development of facilities for copper production were characteristic for Bulgaria during 1965. Medet remained the focal point for copper production. The Balkan Mountains area was the primary target of exploration crews.

As a result of intensive exploration, a new copper ore deposit has been discovered near the town of Etropole in the Balkan Mountains. Preliminary results indicated a large copper deposit by Bulgarian standards. The metal content of the ore is reportedly low, but content of gold, selenium, and other rare metals make the economic aspects of production more attractive. According to reports a new open

pit mine and a beneficiation plant were planned. By 1970 the mine and plant should be capable of processing 8 to 10 million tons of ore annually.

Although commissioned at yearend 1964, the Medet combine was not in full operation by the end of 1965. Difficulties with new plant equipment bottlenecks in technology hampered the operations of the combine. Ore production came from the open pit mine and reached a level of over 2 million tons. Output of copper concentrate was around 100,000 tons. According to Bulgarian reports the annual production of the Medet project was planned as follows: Copper ore, 3 to 4 million tons; copper concentrate—150,000 tons, molybdenum concentrate, 500 tons, pyrite concentrate—55,000 tons; and feldspar concentrate, 50,000 tons. The Medet project was a result of joint efforts by mining experts and machine building industries from Czechoslovakia, U.S.S.R., and East Germany in the framework of the SEV [3] economic cooperation. The expansion of the Georgy Damyanov copper combine at Pirodop continued during 1965. When work is completed, the combine will have a capacity of 55,000 tons of electrolytic copper, and sulfuric acid will be produced at the rate of 80,000 tons per year. Most of the Medet concentrates will be smelted and refined here.

Iron and Steel. — The construction of Kremikovtsi iron and steel integrated combine continued in 1965. The project remained the central point in the development of the Bulgarian iron and steel industry. About nine-tenths of the total capital investments in ferrous metallurgy went into the Kremikovtsi metallurgical combine. The work on the open pit mine continued. Reserves were estimated to be around 247 million tons of ore with metal content that varies from 30 to 46 percent iron and variable amounts of barites, silver, and manganese. When completed, the mine is scheduled to produce 5 million tons per year.

Lead and Zinc.—The production of lead, zinc and associated metals was higher by 10 percent than in 1964.

Most of these increases were achieved by better utilization of existing facilities, especially flotation plants. However, activities were not limited to production only. Extensive exploration for lead and zinc was conducted.

Near Kyustendill in the Ossegovo foothills new lead and zinc deposits were disclosed. Reserves and ore quality were not reported, but apparently the deposits must be of fair size with good ore because a mine and beneficiation plant will be built in the near future. Capacity of the new development will be 1.2 million tons of ore per year. The Dimitur Blagoev zinc plant near Plovdiv which employed about 3,000 workers has been expanded. A plant for production of zineb (zinc-ethylene-*bis*-dithiocarbamate) was under construction. The new facility will have an annual capacity of 12,000 tons of zineb. The output will cover the needs of all Communist countries for this important fungicide.

Manganese.—Large deposits of manganese have been discovered near Oboriste village in the Tolbukhin Okrug. Reserves and quality of ore were not reported. According to Bulgarian sources an ore processing plant will be constructed sometime in the future.

NONMETALS

Cement.—Endowed with large quantities of raw materials for production of cement, Bulgaria continued to modernize existing cement plants and build new facilities during 1965. With an annual production of 2.6 million tons and a modest domestic consumption, approximately one-fifth of the output was exported. Targets for 1970 call for an output of 5.5 million tons. The new facilities were built primarily to support more aggressive export of cement.

In the vicinity of Pleven a new cement plant was under construction. It is expected that the first stage of construction will be completed in 1966 with a capacity of 500,000 tons per year. After completion of the second stage, the plant will turn out 1 million tons of cement annually. The plant will be mechanized and its completion was planned for the end of 1968.

Fertilizers.—Having problems with agriculture, the Bulgarian authorities forced development of facilities for production of fertilizers. Plants at Dimitrov Grad and Stara Zagora remained the principal pro-

[3] SEV: Council of Mutual Aid. It includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Rumania, and the U.S.S.R.

ducers of nitrogenous fertilizers. The construction of Vratsa chemical combine continued. According to the Bulgarian news agency, Bulgarian Telegraph Agency (BTA), the Vratsa plant should start production in the fourth quarter of 1966, and production targets for 1966 were set at 12,000 tons of nitrogen fertilizers.

Fluorspar.—The first Bulgarian fluorspar concentrating plant was under construction in southwestern part of the Rodopi Mountains during 1965; the exact location of the plant was not disclosed. It is expected that production will start early in 1966. When in full operation, the plant will cover all domestic needs and provide 10,000 to 12,000 tons of fluorspar for export. The plant was designed by (Niproruda) Industrial Ores Scientific Research Designing Institute. The plant is supposedly highly mechanized and equipped with machinery produced in Bulgaria.

Gypsum.—The new gypsum mine near Vidin went into production at the beginning of 1965. At yearend the production totaled about 50,000 tons of gypsum.

Salt.—Exploratory drilling led to discovery of salt deposits near Mirovo. Reportedly the total thickness of the salt beds runs about 1,400 meters. At yearend exploration was not concluded, but calculated reserves indicated a large deposit.

MINERAL FUELS

Coal.—With token production of oil and gas, coal remained Bulgaria's principal source of energy during 1965. However, importing of high-rank coals was necessary because the country's production of solid mineral fuels consisted mostly of brown coal and lignite.

Bulgarians were active in exploration and development of new production facilities. Exploration crews discovered a new brown coal deposit in the central part of the Rodopi Mountains. Coal from the new deposit has a calorific value of 5,500 calories per kilogram and an average ash content of about 35 percent; reportedly sulfur content is low. No information on reserves were disclosed. The Georgi Dimitrov coal trust started work on a new open pit mine near Buchino village. In 1970 when the mine is scheduled to be in full operation, production will reach 1.5 million tons of coal per year. The decision for mine development was based on reserves of about 19 million tons of coal.

To equip this and other open pit operations, long term arrangements were made with East Germany for delivery of excavators and conveyors belts. The capacity of each excavator will be about 5,000 cubic meters per hour.

At the beginning of 1965 the first plant for beneficiation on anthracite mined in the Svoge anthracite basin was commissioned in the Iskur gorge of the Balkan Mountains, near the Thompson railroad station. The name of the plant is Tsentralno Obogatitelnaya Fabrika Thompson (Ts. O. F. Thompson) (Thompson Central Beneficiation Factory). The French firm Preparation Industrielle des Combustibles (PIC) designed the plant. In a wet plant with crushing facilities, two beneficiation methods are used, gravitation and flotation. The plant's design capacity was about 300,000 tons of raw anthracite per year.

Petroleum and Natural Gas.—Although efforts were made to expand both crude production and refining, the Bulgarian oil industry remained insignificant by world standards during 1965.

Imports of crude oil and refined petroleum products covered most of the domestic needs. The majority of liquid fuel imports came from the U.S.S.R.

During 1965 Dolni Dubnik area, near Pleven, and Tyulenovo, at the Black Sea shore, remained centers of oil industry activities. Development of the Dolni Dubnik oilfield continued. Several new producing oil wells were drilled, and new facilities for storage of oil have been added in the area. Preparation for exploratory offshore drilling in the Black Sea near Shabla village, in the general area of Tyulenovo, was underway in the fall of 1965. The location of the first group of wells is approximately 1,300 meters from the shore line. Plans were made to build an artificial island from which several directional wells can be drilled. The development of the Chiren gas field continued. A new gas horizon was discovered at 1,930 meters during 1965. Based on this deposit of natural gas, a pipeline 19 kilometers long will be built to connect the field with industry at Vratsa.

The refinery part of the Bulgarian petroleum industry was the better part of the oil operation. The new refinery at

Burgas which operates on Soviet crude oil was expanded during 1965. Atmospheric distillation capacity was increased by 500,000 tons per year. Equipment for the new plant was imported from the U.S.S.R. Plans were made to increase the refinery capacity from 2 million to 5 million tons per year in the near future.

On the basis of expected development drilling in the Dolni Dubnik field, Bulgarian authorities were planning industrial development of the whole area. A new refinery was planned at Dolni Dubnik. The plant will have a capacity of 1 million tons of crude oil per year. The second stage of construction will include a petrochemical plant. No date was fixed for the beginning of operations.

The Mineral Industry of Czechoslovakia

By Roman V. Sondermayer [1]

The general economic recovery of Czechoslovakia was partially reflected in higher output of the country's principal mineral industries and related facilities during 1965.

Mineral resources remained relatively limited, except for coal, kaolin, and magnesite. Substantial imports of mineral raw materials, primarily from other Communist countries, were necessary to cover the needs of its extensive metallurgical and fabrication facilities.

The 1965 mineral output value was about 3 percent larger than that of 1964. New incentive awards and more liberal governmental rules in managing the economy contributed to better performance of the mineral industry. The output of more prominent mineral and metal products expressed in approximate percentages of the total world production were as follows: Magnesite 5.8; coke 3.8; pig iron 1.8 and steel 1.9; antimony 3.2.

Few important mineral developments occurred, chiefly because emphasis was given to improvement of existing facilities and to imports of raw material. The construction of East Slovakian Iron Works continued, and modernization of coal and magnesite mines and related facilities was underway.

PRODUCTION

According to official reports, the mineral industry fulfilled its plans for 1965. Compared with the 1964 increase, a production increase was noted in Czechoslovakia's principal mineral commodities, such as coal and products of the iron and steel industry. Coal was the largest mine product by volume. Because brown coal and lignite together comprised the bulk of the country's coal production, approximately 70 percent of all coal produced was obtained by open-pit mining.

TRADE

Mineral trade was of great importance to the Czechoslovakian economy during 1965. Mineral exports, limited to metal semimanufactures, coal, coke, kaolin, and magnesite, constituted about a quarter of total exports by value.

The country's mineral imports consisted mainly of raw materials. Value of mineral imports were approximately $0.8 billion[2] in 1964. Most of the country's requirements for nonferrous metals, iron ore, crude petroleum, and bituminous coal were met by imports.

Published materials on the foreign trade of Czechoslovakia are incomplete and do not include information on destination of export or the origin of imports. Tables on exchange with the U.S.S.R. show the importance of the U.S.S.R. as a trading partner. Moreover, Soviet statistics show the export of certain commodities to Czechoslovakia that are not recorded in Czechoslovakian import publications.

COMMODITY REVIEW

METALS

Aluminum.—Czechoslovakia's only plant for production of aluminum, near Ziar nad Hronom in central Slovakia, received

[1] Foreign mineral specialist, Division of International Activities.

[2] Where necessary, values have been converted from Korunas (Kcs) to US dollars at the rate of Kcs 7.2=US $1.00.

Table 1.—Czechoslovakia: Production of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965 [p]
Metals:					
Aluminum ingot including secondary	50,000	60,000	60,000	60,000	62,000
Antimony	1,600	2,000	2,000	2,000	2,000
Copper	4,960	NA	NA	NA	5,000
Iron and steel:					
Iron ore—thousand tons	3,294	3,477	3,411	2,846	3,017
Pig iron and blast furnace ferroalloys—do	4,971	5,177	5,254	5,716	6,059
Electric furnace ferroalloys—do	46	51	52	55	60
Steel ingots—do	7,043	7,639	7,598	8,377	8,880
Rolled products except pipe—do	4,672	5,066	5,100	5,663	6,003
Pipe—do	742	763	731	NA	NA
Lead:					
Mine (content of ore) [e]	6,500	13,500	13,500	13,500	14,000
Smelter [e]	9,100	14,000	14,000	14,000	14,500
Manganese ore	101,000	83,000	85,000	84,000	89,000
Mercury [e]—76-pound flasks	725	725	725	725	730
Tin, mine (content of ore) [e]—long tons	200	200	200	200	220
Nonmetals:					
Cement—thousand tons	5,343	5,710	5,178	5,493	6,823
Fertilizers:					
Nitrogenous (N content)	146,200	153,916	153,811	158,000	167,000
Phosphatic (P_2O_5 content)	167,421	180,460	203,191	241,000	e 250,000
Gypsum:					
Raw	354,000	373,000	302,000	351,000	372,000
Calcined	27,000	24,000	22,000	26,000	e 27,000
Kaolin	300,000	319,000	321,000	313,000	332,000
Lime—thousand tons	2,357	2,369	2,254	2,347	2,488
Magnesite [e]—do	500	525	525	525	550
Pyrite—do	369	401	347	361	e 370
Salt—do	188	182	187	184	195
Mineral fuels:					
Coal:					
Bituminous—thousand tons	26,233	27,149	28,296	28,202	34,879
Brown—do	62,068	65,818	r 69,326	r 71,472	75,760
Lignite—do	3,235	3,667	r 3,977	4,133	4,381
Coal briquets—do	870	787	778	784	831
Coke:					
From brown coal—do	2,155	2,111	2,114	1,929	NA
From bituminous coal—do	8,537	8,930	9,299	9,421	9,660
Gashouse—do	513	518	451	305	e 300
Gas, manufactured—million cubic feet	157,535	175,875	187,530	199,960	e 200,000
Petroleum:					
Crude—thousand tons	154	177	180	195	207
Refinery products:					
Kerosine—do	86	118	90	NA	NA
Diesel fuel—do	1,364	1,467	1,653	1,779	1,886
Lubricants—do	86	96	103	93	99
Asphalt, from all sources—do	273	324	344	398	e 400

e Estimate. p Preliminary. r Revised. NA Not available.
[1] In addition to the commodities listed, Czechoslovakia is believed to produce arsenic, silver, uranium, barite, feldspar, and graphite.

bauxite from Yugoslavia, Hungary, and British Guiana. Production was 2,000 tons more than in 1964.

Copper.—A new copper mine and a flotation plant of unreported capacity went into production at Zlaté Hory, north Moravia, in the fall of 1965. The mine was producing ore from a depth of 286 meters.

To achieve more economical operations, the management closed two shafts and slowed down production from a third in polymetallic mines in Banská Štiavnica. Although only two shafts are now in production, output in this area reportedly was increased, and production costs went down.

Gallium.[3]—The first pure gallium (about 2.7 kilograms) was produced by the Julius Fucik Plant of the Spolana Chemical Enterprise in Kaznějob; production of larger quantities of gallium reportedly will start in coming years.

Iron and Steel.—Iron ore production, although higher than that recorded for 1964, remained below the record high recorded in 1963. Economic factors influenced authorities to turn toward importing iron ore and abandoning the production of low-grade domestic ores. Nevertheless, discovery of iron ore deposits in the vicinity of the village of Vyhne was announced, and plans were set to start production in

[3] Source: Bratislavia; newspaper Pravda, p. 1.

Table 2.—Czechoslovakia: Officially reported export of selected metals and minerals
(Thousand metric tons)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Steel:			
Rolled products, except pipe	1,316	1,756	Hungary 521; Poland 227; U.S.S.R.[1] 192; West Germany 117.
Pipe	244	242	U.S.S.R. 131; Rumania 15; Poland 5.
Nonmetals:			
Kaolin	163	166	Poland 49; West Germany 37; East Germany 24; Hungary 6; Switzerland 6.
Magnesite	103	144	Poland 40; Hungary 37; West Germany 33; East Germany 16; Rumania 6.
Mineral fuels:			
Coal:			
Bituminous	2,333	2,583	East Germany 1,114; Hungary 791; Austria 344; Rumania 254.
Brown	1,792	1,410	West Germany 1,241; Austria 102.
Coke	1,758	1,888	East Germany 852; Hungary 303; Rumania 164.

[1] Data from Vneshnyaya Torgovlya S.S.S.R. za 1964 god (Foreign Trade of the U.S.S.R. for 1964), Moscow, 1965, 294 pp.
Source: Except as noted, Statisticka Rocenka C.S.S.R. 1965 (Statistical Annual of the C.S.S.R. for 1965), Prague, 1965.

1967. Iron ore reserves and capacity of the new mine were not disclosed. To make import of iron ore more independent from foreign shipping companies, the Government of Czechoslovakia ordered a 35,000-deadweight-ton bulk carrier in the United Kingdom. The value of the contract was around $2 million.

The steel industry was modernized, and new equipment for continuous casting was purchased from Sweden. Construction of the East Slovakian Iron Works continued. Equipment was tested in the wide-sheet hot rolling mill of the plant. The line will have a capacity of 400,000 tons of sheet per year. The overall construction was behind planned targets. This delay may offset the advantage gained by completion of a wide-gage railway line from the Soviet border to the plant to eliminate the need for reloading imported ore at the border. The 88-kilometer railroad line was ready for testing in fall of 1965.

NONMETALS

Traditionally self-sufficient in major nonmetals, Czechoslovakia continued efforts to improve quality and increase quantity of its production with an aim to expand export.

Diamond.—Exploration for diamonds was

Table 3.—Czechoslovakia: Officially reported imports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Iron and steel:			
Iron ore—thousand tons	9,333	9,309	U.S.S.R. 7,657; India 810; Brazil 422; Sweden 144; Morocco 108.
Pig iron—do	189	118	U.S.S.R. 51; mainland China 34; East Germany 20.
Manganese ore—do	236	319	U.S.S.R. 136; India 100; Brazil 16.
Nonmetals:			
Asbestos	22,665	24,517	U.S.S.R. 16,624; Austria 2,042; mainland China 510.
Fertilizers:			
Nitrogenous (N content)	44,000	50,000	East Germany 3,000; U.S.S.R. 1,000; Undisclosed 46,000.
Phosphatic (P_2O_5 content)	211,000	260,000	U.S.S.R. 151,000 Lebanon 25,000; United Arab Republic (Egypt) 12,000.
Potassic (K content)	253,000	348,000	East Germany 281,000; U.S.S.R. 67,000.
Pyrite (S content)	110,000	131,000	Yugoslavia 54,000; Norway 24,000; U.S.S.R. 16,000.
Sulfur (elemental)	174,000	189,000	Poland 96,000; U.S.S.R. 33,000; mainland China 5,000.
Sulfuric acid	19,000	1,000	All from U.S.S.R.
Mineral fuels:			
Coal, bituminous—thousand tons	4,346	5,044	U.S.S.R. 3,382; Poland 1,662.

Source: Statisticka Rocenka C.S.S.R. 1965 (Statistical Annual of the C.S.S.R. for 1965), Prague, 1965.

Table 4.—Czechoslovakia: Imports of selected mineral commodities from the U.S.S.R.
(Metric tons unless otherwise specified)

Commodity	1963	1964
Metals:		
Aluminum:		
Metal	10,200	14,800
Rolled products [1]	1,209	3,901
Cadmium	159	210
Chromite	44,000	15,000
Copper:		
Unwrought	18,200	19,100
Rolled products	454	771
Iron and steel:		
Iron ore, thousand tons	6,914	7,638
Pig iron, do	122	50
Ferroalloys, do	27	25
Steel:		
Rolled products, except pipe	283,300	293,200
Pipe	900	1,200
Lead	13,100	15,900
Manganese:		
Ore	104,000	130,000
Peroxide	600	1,000
Nickel	2,800	1,700
Zinc	9,700	11,900
Nonmetals:		
Apatite:		
Ore	51,500	45,000
Concentrate	216,100	370,400
Asbestos	15,600	17,300
Cement	103,000	------
Graphite	102	101
Sulfur:		
Elemental	20,700	32,500
Acid	46,000	24,800
Mineral fuels:		
Coal:		
Anthracite, thousand tons	201	333
Bituminous, do	2,574	2,776
Coke, do	32	68
Petroleum:		
Crude, do	4,222	4,759
Refinery products:		
Gasoline, do	101	108
Kerosine, do	261	236
Paraffin, do	1	2
Others, do	7	32
Total	370	378

[1] Including alloyed.
Source: Vneshnyaya Torgovlya S.S.S.R. za 1964 god (Foreign Trade of the U.S.S.R. for 1964) Moscow, 1965, 294 pp.

conducted in northwest Czechoslovakia. Through yearend results were not announced, but reports hinted at the possibility of large discoveries, because the geological structures of this area and those in Yakutia, U.S.S.R., are similar.

Fertilizer Materials.—The expansion of facilities for mineral fertilizer production continued during 1965. Construction of a new plant was started at Lovosice, northern Bohemia. The plant will be completed in 1968, and its annual capacity will be 250,000 tons of combined fertilizer. The factory will be part of the North Bohemia Chemical Enterprise.

A nitrogen plant of unreported capacity was under construction at Strážce in east Slovakia. The new nitrogen factory is part of the East Slovak Chemical Combinat. The basic raw material, natural gas, will be supplied by the U.S.S.R. through the new gas line connecting Soviet fields with Czechoslovakia.

Graphite. — Czechoslovakian authorities announced the beginning of production of pure graphite in a new plant at Tyn nad Vltavou, but capacity was not disclosed. The plant products were for use as lubricants, in atomic energy reactors, and in unspecified aerospace applications.

Iodine.—A plant for iodine extraction was under construction at the Doubrava coal mine in Orlova. The technology for iodine production was developed by the Institute at Kutná Hora. The raw material is water from the mines in the Ostravsko-

Karvinská Pánev (Ostrava Kravina Basin). Average content of iodine is 10 to 25 milligrams per liter of mine water. The plant was scheduled to start partial production in late 1966.

Limestone.—The new limestone quarry at Včelary southwest of Košice was under development during 1965. The completed quarry will have a capacity of 5 million tons of crushed limestone per year and will be a highly automated operation. The East Slovakian Iron and Steel Works will be the primary consumer of the quarry's output.

Magnesite.—During 1965 facilities for production of magnesite were modernized, and output was increased.

Perlite.—Facilities for production of expanded perlite underwent modernization. Plans called for a production of expanded perlite eight times higher than the present undisclosed level by 1970.

Geologists from the town of Nová Baňa presented the Košice Ceramics Enterprise with verification of deposits of over 2 million cubic meters of perlite. These deposits initially reported in 1963 are located in the vicinity of Lehôtka pod Brehy in Okres Ziar nad Hronom.

Silica.—Deposits of high-grade silica have been discovered near Švedlar, eastern Slovakia. The discovery was significant because silica deposits near Lučenec in central Slovakia were exhausted. The quarry will be operated by the ceramic plant at Košice.

MINERAL FUELS

Although completion of crude oil pipeline to Czechoslovakia from the U.S.S.R. pushed up the participation of crude oil in the country's overall energy balance, coal remained the principal source of energy during 1965.

Coal.—Bituminous and brown coals accounted for about 80 percent of the energy supply in 1965. The chronic shortage of mine laborers continued and prompted efforts for increased use of mining machinery bought in West Germany, Belgium, Sweden, and Switzerland. Difficulties persisted in the field of coal preparation, and the quality of coal was below the Czechoslovak standards. Weather conditions and lack of storage facilities caused decomposition of coal. Large quantities of coal dust were available in all mines at the end of 1965.

New economic reform and the new system of bonuses forced management to make serious examination of the economic aspects of mine operations. As a result, the Czechoslovak Army Coal Mine in Rynholec, and the Týnec Coal Mine near Plzen were closed. Miners were transferred to operations in the Kladenská Panev (Kladno Basin).

While closing inefficient mines, the Government was also developing new mines and washing facilities in the Northern Mining District near Bílina. A new open-pit mine in this district will have an annual capacity of 15 million tons of coal when completed in 1969.

Czechoslovak authorities announced discovery of coal seams 10 meters thick between Frenštát pod Radhoštem and Trojanovice in the Beskids Mountains of north Moravia.

Petroleum and Natural Gas.—During 1965, crude oil production remained unimportant. Refined petroleum output, while much larger, was still a minor part of the energy supply. The Druzhba pipeline brought most of the crude oil from the U.S.S.R. Drilling activities were concentrated in the eastern part of the country. While drilling on a location near the village of Stretava in the Okres Michalovce, a gas blowout occurred and a fire started. The blowout created a crater, and the rig was lost. After a month of firefighting, when the pressure of the reservoir dropped, the fire died. According to reports, the blowout was caused by a local accumulation of high-pressure gas at the depth of 300 meters.

The Mineral Industry of Denmark [1]

By F. L. Klinger [2]

Denmark's small but active mineral industry continued to expand in 1965. Since the exploited mineral resources of the country were limited to nonmetallic construction materials, lignite, and a little bog iron ore, mining and quarrying accounted for only a fraction of 1 percent of the gross domestic product, estimated at $10.8 billion in 1965 (at market prices).[3]

Expansionary developments in the mineral industry were largely concerned with processing imported materials. Plants were completed or under construction in 1965 in the iron and steel, petroleum refining, fertilizer, and cement industries. The volume of sales of major mineral industry commodities was greater than in 1964 with the exception of structural clay products and solid fuels. In Jutland, development of subsurface salt deposits was well underway and exploration drilling for oil and gas was about to begin. Offshore (North Sea) boundary agreements were also successfully negotiated by Denmark with Norway, Netherlands, and the United Kingdom in 1965, and a limited agreement was reached with West Germany.

The mineral industry employed an estimated 18,000 persons in 1965, including about 3,500 in mining and quarrying.

PRODUCTION

The gross value of crude minerals produced by Denmark in 1965 was estimated at $24 million. Of this value, nonmetals (mainly stone, sand and gravel, and diatomaceous earth) [4] constituted 70 percent; fuels (lignite and peat), 29 percent; and metals (bog iron ore), 1 percent.

In mineral and metal processing, the principal increase in production occurred in petroleum products, output of which rose by more than 20 percent, compared with 1964. In the basic metal industry (iron, steel, and nonferrous metals), turnover increased nearly 15 percent to $75 million, while the volume of output rose 9 percent. In the large nonmetallic mineral processing industry (stone, clay, and glass products), turnover increased 6 percent to $215 million, and the volume of output rose 3 percent. Output of structural clay products was less than in 1964, while production of phosphatic fertilizer was again valued at $30 million.

In 1963, the gross value of production of the mineral industry [5] was estimated at $313 million, equivalent to 8 percent of total industrial output and 3.6 percent of gross national product.

[1] Excluding Greenland, covered under North America section.

[2] Physical scientist, Division of International Activities.

[3] Det Statistiske Departement (Copenhagen). Statistiske Efterretninger. V. 58, No. 15, March 29, 1966. Values in Danish kroner converted to U.S. dollars, using DKr6.907 equals US$1.00.

[4] Not including materials for manufacture of ordinary brick.

[5] Including manufactures of the peat and lignite, primary metals, petroleum and coal, fertilizer, and the stone and clay industries from domestic and imported raw materials. Does not include glass, porcelain, or manufactures of precious metals or stones.

Table 1.—Denmark: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Iron and steel:					
Iron ore (less than 42 percent iron)[1]	85,000	95,000	85,000	e 90,000	e 65,000
Pig iron	65,638	68,576	69,368	e r 75,000	e r 77,954
Iron castings, including malleable iron	127,268	143,252	132,661	NA	NA
Steel, crude, total	r 317,000	r 367,000	r 359,000	r 396,000	412,000
Ingots	279,500	320,600	316,100	r 350,800	364,900
Castings	30,477	31,749	28,649	NA	NA
Rolled products:					
Heavy and medium plates	113,200	148,400	147,900	174,300	184,300
Light and heavy sections	117,600	111,700	119,500	137,200	140,500
Welded tubes[2]	27,536	28,165	28,923	NA	NA
Nonferrous metals, including alloys:					
Ingots and bars	36,890	30,422	30,350	NA	NA
Semimanufactures	34,002	39,205	26,301	NA	NA
Alloy castings	7,017	7,745	6,980	NA	NA
Nonmetals:					
Asbestos-cement products	169,000	212,000	152,000	e 175,000	NA
Cement:					
Portland—thousand tons	1,375	1,424	1,287	e r 1,650	e 1,725
Other—do	210	208	234	e r 230	e 230
Chalk:					
Crude, for sale	10,688	11,433	14,396	e 14,000	NA
Washed or precipitated	29,700	33,205	32,121	e 35,000	e 35,000
Diatomaceous materials:					
Diatomite—cubic meters	39,000	36,000	20,000	NA	NA
Moler	193,100	209,400	192,000	191,200	200,000
Fertilizer:					
Superphosphate, 16 to 18 percent phosphorus pentoxide	56,560	NA	17,309	NA	NA
Potash superphosphate	644,533	778,278	737,512	NA	NA
Maganese sulfate[3]	1,217	809	1,333	NA	NA
Flint:					
Pebble grade	5,040	r 4,543	2,545	NA	e 3,500
Other	160,000	165,000	165,000	NA	NA
Kaolin:					
Crude, for refractory products	7,772	7,395	12,061	NA	11,000
Washed (including pressed)	11,919	13,443	6,600	NA	9,500
Lime:					
Quicklime	146,907	146,753	151,824	e 160,000	e 160,000
Agricultural	NA	NA	310,000	370,000	410,000
Stone, sand and gravel:					
Granite:					
Total quarry production	458,648	549,557	630,153	NA	NA
Dimension stone, rough and finished	41,074	36,821	33,639	NA	NA
Other worked stone value, thousand dollars	$311	$210	$203	NA	NA
Limestone and marl thousand tons	3,239	3,332	3,150	NA	NA
Sandstone	3,301	----	NA	NA	NA
Gravel—thousand cubic meters	3,745	3,500	3,500	3,600	4,200
Mineral fuels:					
Coke—thousand tons	405	418	505	424	347
Lignite—do	2,163	2,025	1,999	r 1,939	NA
Lignite briquets—do	NA	NA	NA	44	40
Peat, for fuel—do	113	61	50	40	20
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	674	2,059	3,531	4,993	5,719
Kerosine—do	NA	131	359	430	646
Distillate fuel oil—do	368	1,966	3,157	5,405	6,899
Residual fuel oil—do	r 946	4,449	6,486	9,678	11,380
Liquefied petroleum gases—do	244	315	NA	951	1,082
Lubricants, including greases do	17	19	15	7	NA
Bitumen—do	186	157	NA	157	160
Other—do	241	987	1,322	1,379	2,159
Total—do	2,676	10,083	14,870	23,000	28,046
Refinery fuel and loss—do	94	NA	465	718	NA

e Estimate. r Revised. NA Not available.

[1] Quantities of merchantable iron ore, as given by United Nations and Organization for Economic Cooperation and Development (OECD) publications, are 20,000 to 29,000 tons less than the figures shown for 1961 through 1964.

[2] Made from imported strip.

[3] Manganese obtained from domestic bog iron ore.

TRADE

Liquid fuels and rolled steel continued to be the principal items in Denmark's mineral commodity trade in 1965. These materials jointly accounted for 47 percent of the value of exports and 62 percent of the value of imports.

Metals accounted for 44 percent of the value of mineral commodity exports, followed by nonmetals and fuels with 28 percent each. Iron and steel, copper, construction materials, and petroleum products were the principal items. Of the value of imports, fuels accounted for 49 percent and metals for 40 percent; the ranking commodities, in order of importance, were rolled steel, petroleum products, fertilizer materials, copper, and aluminum.

	Million dollars		Mineral commodities' share (percent)
	Mineral commodities	Total trade	
Export:			
1964	74.8	2,085	3.6
1965	78.7	2,276	3.4
Import:			
1964	608.7	2,612	23.3
1965	638.0	2,815	22.6
Balance:			
1964	-533.9	-527	XX
1965	-559.3	-539	XX

XX Not applicable.

Source: Det Statistiske Departement (Copenhagen). Vareomsaetningen med udlandet, v. 56, No. 12; December 1965.

The relative importance of metal and and mineral commodities to total Danish trade is shown by the following tabulation:

Sweden was the principal market for Danish exports [6] of mineral commodities, followed by West Germany and Norway. Exports to Sweden were valued at $27.7 million in 1965, of which petroleum products accounted for 58 percent.

West Germany was the principal supplier of Danish imports,[7] with mineral commodities valued at $118 million, followed by the United Kingdom and Norway. Of the value of British and Norwegian shipments, fuels and fertilizers, respectively, made up more than 60 percent.

Danish exports to Iceland, valued at $258,000, consisted mostly of metal semimanufactures. Imports from Iceland (mostly metal scrap) were valued at $10,000.

The countries of the European Common Market (Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands) accounted for over one fourth of all Danish mineral commidity exports and provided almost two fifths of all imports of these commodities.

[6] Not including nonmetallic mineral manufactures or precious and semiprecious stones S.I.T.C. (Standard International Trade Classification (Revised), Division 66). Exports of these commodities were valued at $24 million, and imports were valued at $47 million, in 1965.

[7] See footnote 6.

Table 2.—Denmark: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum:				
Oxide and hydroxide [1]	120	98	111	United Kingdom 54; New Zealand 26.
Unwrought, including scrap [2]	2,506	2,245	3,517	Sweden 1,790; West Germany 312.
Semimanufactures [2]	741	695	909	West Germany 184; United Kingdom 81; Norway 71.
Antimony	30	15	NA	Trinidad-Tobago 15.
Copper: [2]				
Ashes and residues	2,200	1,957	NA	Sweden 1,244; Belgium-Luxembourg 713.
Scrap	5,198	3,357	4,530	West Germany 2,334; Belgium-Luxembourg 442; Sweden 438.
Unwrought	424	708	475	West Germany 527; Italy 96; Sweden 75.
Semimanufactures	797	1,586	1,766	Sweden 497; Israel 396; West Germany 197.
Iron and steel:				
Iron ore	50,973	57,774	36,100	United Kingdom 26,967; West Germany 23,254.
Roasted pyrite	85,796	103,636	95,003	West Germany 89,909; United Kingdom 13,727
Slag, dross, scale, etc.	4,453	646	NA	All to West Germany.
Scrap, pig iron, and ferroalloys [3]	38,851	49,726	42,780	West Germany 31,882; Norway 9,746; Sweden 6,973.
Ingots and other primary forms	3,802	3,382	3,135	Norway 3,309.
Semimanufactures:				
Bars, rods, sections	27,012	29,703	28,546	West Germany 20,685; Sweden 6,416.
Plates and sheets	66,117	105,467	102,265	Sweden 51,330; Norway 44,314; West Germany 9,308.
Tubular products	8,521	8,661	9,004	Sweden 4,760; Poland 1,142; Norway 743.
Castings and forgings	6,490	5,465	NA	Sweden 1,844; West Germany 1,358.
Other	636	936	637	West Germany 278; Sweden 270.
Total semimanufactures	108,776	150,232		
Lead: [2]				
Ore	---	300	NA	All to West Germany.
Oxides	22	15	NA	Sweden 13.
Unwrought, including scrap	4,074	4,909	4,721	Norway 1,831; Switzerland 533; Sweden 509; United Kingdom 305.
Semimanufactures	319	308	276	Norway 211; Sweden 80.
Magnesium, including scrap	54	55	78	United States 31; United Kingdom 10.
Nickel, scrap and semimanufactures [2]	237	206	179	United Kingdom 78; India 71; West Germany 38.
Radioactive materials. value, thousand dollars	$22	$10	NA	Common Market $4; North America $2.
Silver and platinum group metals:				
Silver, including semimanufactures. troy ounces [4]	r 16,075	r 49,191	56,907	Netherlands 31,507; Finland 6,400; Norway 6,400.
Waste and scrap kilograms	39,100	32,400	36,220	West Germany 11,100; United Kingdom 9,700; Switzerland 5,000; Sweden 4,700.
Other ashes and residues containing precious metals. kilograms	33,000	---	NA	(1963: All to Sweden).
Tin:				
Unwrought [2], including scrap. long tons	r 709	r 774	998	Norway 151; Italy 148; Venezuela 114; Sweden 78.
Semimanufactures do	27	31	38	Sweden 27.
Titanium dioxide	89	250	NA	Sweden 188; Norway 57.

See footnotes at end of table.

Table 2.—Denmark: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Zinc:				
Ashes and residues	1,978	2,299	NA	Netherlands 1,138; West Germany 658; Belgium-Luxembourg 503.
Oxide	2	16	33	Sweden 8; Iceland 7.
Scrap, including dust (blue powder).	1,949	2,234	1,807	Japan 664; West Germany 479; United Kingdom 352; Norway 305.
Unwrought and semimanufactures[2].	1,358	1,249	694	Brazil 890; West Germany 83; Norway 59.
Other:				
Metalliferrous ores, ashes and residues, not elsewhere specified.	414	1,355	406	West Germany 886; Belgium-Luxembourg 340.
Base metals, including semimanufactures, not elsewhere specified.	22	30	14	United Kingdom 19; West Germany 10.
Nonmetals:				
Asbestos:				
Crude fiber and manufactures (nonfriction).	86	104	162	Sweden 88; West Germany 7.
Asbestos and fiber-cement articles	10,570	7,215	7,567	Norway 4,566; Sweden 1,318.
Cement	142,198	r 150,702	94,648	United Kingdom 44,751; United States 14,632; Sweden 13,272; Israel 10,638; Lebanon 6,953; Pakistan 6,831.
Chalk	33,727	r 31,053	23,936	West Germany 16,558; Sweden 8,272; Finland 3,407.
Clay:				
Kaolin	207	74	48	Iceland 37; Sweden 23.
Refractory and other	2,447	2,446	5,548	Finland 1,443; Sweden 752.
Construction materials (brick, tile etc.):				
Refractory[5]	40,659	42,282	51,751	West Germany 9,342; United Kingdom 8,588; Netherlands 5,683.
Nonrefractory	188,840	194,444	150,548	West Germany 99,567; Sweden 57,701; Norway 31,239.
Cryolite and chiolite, natural	25,259	24,373	26,145	NA (from values, mostly Japan, United Kingdom and Norway).
Diamond and other precious and semiprecious stones:				
Industrial diamond. value, thousand dollars	----------	(6)	NA	All to Sweden.
Other diamond unset. value, thousand dollars	$55	$204	NA	Belgium-Luxembourg $80; West Germany $56.
Other kilograms	21	18	NA	West Germany 15.
Dust and powder, including synthetic stones. kilograms	13	7	NA	Norway 6.
Diatomite and other siliceous earths	92,522	91,100	112,888	West Germany 42,362; United Kingdom 38,095; Sweden 4,296; Norway 2,183.
Fertilizer (manufactured), all types	340	282	6,343	Sweden 172.
Flint	26,606	35,039	42,390	West Germany 23,269; Sweden 3,703 Czechoslovakia 2,745.
Lime	17,375	21,880	20,226	Sweden 10,718; Norway 9,919; Iceland 1,162.
Limestone (for cement, flux, etc.)	50,039	58,658	65,895	Sweden 28,383; West Germany 19,242.
Quartz and quartzite	42	150	858	West Germany 130.
Salt	237	249	347	Iceland 202.
Stone, sand, and gravel:				
Dimension stone:				
Unworked, all types	90,558	83,084	109,624	West Germany 82,790.
Worked, all types	5,094	3,545	1,988	Belgium-Luxembourg 1,147; Norway 806; Sweden 744.
Gravel and crushed stone. thousand tons	1,783	1,934	1,857	West Germany 1,917.

Footnotes on next page

Table 2.—Denmark: Exports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Sand:				
Foundry and glass sand	3,165	25,727	166,097	Sweden 20,533; West Germany 1,534.
Other	121,173	95,963		West Germany 76,196; Sweden 15,931.
Mineral substances, not elsewhere specified.	2,496	2,438	2,503	West Germany 1,746; United Kingdom 225.
Slag and ash, not elsewhere specified	54,160	78,486	104,696	All to West Germany.
Mineral fuels:				
Asphalt, natural, including manufactures.	729	2,525	773	Japan 1,261; Finland 914; Sweden 153.
Coal derivatives	23,364	17,953	33,135	Netherlands 8,186; West Germany 4,752.
Coke	53,145	44,531	51,046	Sweden 16,537; Norway 15,358.
Lignite, including briquets	51,536	44,266	15,021	West Germany 44,247.
Peat, including briquets and litter	6,543	6,064		West Germany 6,006.
Petroleum refinery products:				
Gasoline	87,272	r 176,837	264,137	Sweden 159,203; United Kingdom 15,634.
Kerosine, including white spirit	r 18,799	r 7,436	4,660	Norway 4,419; Sweden 1,534.
Distillate fuel oil	42,714	111,438	213,624	Sweden 109,622.
Residual fuel oil	218,986	313,698	196,169	Sweden 258,306; Norway 32,105.
Lubricants, including grease	r 5,841	r 6,446	12,822	Norway 5,596; Sweden 2,326.
Liquefied petroleum gases	r 1,079	2,714	2,972	West Germany 1,091; Sweden 918.
Bitumen and other	3,169	4,068	2,050	Sweden 1,457; West Germany 803.
International bunkers:				
Distillate fuel oil	179,000	186,000	168,000	
Residual fuel oil	259,000	352,000	333,000	

r Revised. NA Not available.
[1] Including synthetic corundum.
[2] Including alloys.
[3] Including spiegeleisen and grit, sponge, or powder of iron or steel.
[4] Estimated from quantities reported in units of 100 kilograms.
[5] Including those of magnesite, diatomite, and other refractory materials.
[6] Less than ½ unit.

Table 3.—Denmark: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum:				
Bauxite, oxide and hydroxide [1]	760	759	3,246	British Guiana 406; United States 173.
Scrap [2]	1,234	936	1,273	Sweden 742; United States 159.
Unwrought [2]	5,802	7,237	9,310	Norway 4,670; Canada 1,172.
Semimanufactures [2]	11,577	14,970	14,209	Sweden 3,693; France 1,818; Norway 1,666; West Germany 1,659; Belgium-Luxembourg 1,604; United Kingdom 1,387.
Antimony, all forms	318	108	NA	Mainland China 82; U.S.S.R. 25.
Arsenic, including oxides	34	30	NA	Sweden 25; mainland China 5.
Beryllium kilograms	NA	100	1,000	Mainly from United Kingdom.
Cadmium, all forms	29	21	NA	Norway 7; Belgium-Luxembourg 7.
Chromium:				
Metal kilograms	500	1,400	NA	United Kingdom 900; Sweden 400.
Oxide and hydroxide	167	294	289	West Germany 171; United Kingdom 74.
Cobalt:				
Metal	10	26	NA	Belgium-Luxembourg 25.
Oxide and hydroxide	3	3	22	Mainly from United Kingdom.
Columbium value, thousand dollars	----	$2	NA	All from United States.
Copper: [2]				
Unwrought, including scrap	r 4,017	r 4,629	4,091	Belgium-Luxembourg 2,406; West Germany 1,535.
Semimanufactures	r 21,701	r 24,092	29,530	Sweden 9,155; Belgium-Luxembourg 4,758; West Germany 3,757; Canada 1,783.
Cuprous oxide	194	190	200	West Germany 140; Norway 41.
Iron and steel:				
Iron ore	1,111	1,071	2,975	Sweden 1,044.
Roasted pyrite and pyrrhotite	975	2,025	5,103	All from Norway.
Slag, dross, scale, etc.	14,284	15,275	22,290	United Kingdom 15,184.
Scrap	1,191	2,251	275	United States 890; Sweden 798; Norway 480.
Pig iron and cast iron [3]	82,856	120,072	110,005	East Germany 41,194; U.S.S.R. 32,309; Finland 15,441; West Germany 15,143; Sweden 9,002.
Ferroalloys	6,008	7,150	6,692	Norway 6,053; West Germany 264; Sweden 211.
Ingots and other primary forms	r 12,359	r 36,945	66,869	Norway 18,373; Sweden 17,350.
Semimanufactures:				
Bars, rods, sections [4]	254,564	353,809	384,936	Common Market 261,136; Sweden 28,732; Czechoslovakia 19,971.
Plates and sheets	315,063	438,603	477,993	Common Market 294,136; Sweden 62,284; United Kingdom 59,972.
Hoop and strip	59,284	67,226	73,589	Common Market 58,512; United Kingdom 3,334.
Rails and accessories	14,416	22,134	22,922	Common Market 18,949; Sweden 2,225.
Wire	16,231	20,634	14,799	Common Market 14,560; United Kingdom 4,687.
Tubular products	99,575	143,211	139,972	Common Market 78,664; United Kingdom 23,289.

See footnotes at end of table,

Table 3.—Denmark: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Castings	100	10	74	United Kingdom 7.
Total semimanufactures	759,233	1,045,627	1,114,285	West Germany 327,852; Belgium-Luxembourg 231,603; France 133,548; Sweden 106,313; United Kingdom 105,773.
Iron oxide and hydroxide	2,425	3,068	3,441	West Germany 2,528; Spain 335.
Lead:				
Oxides	1,421	1,364	1,255	West Germany 400; Mexico 330.
Scrap	3,690	r 4,647	5,498	Norway 2,043; Malaysia 1,024; Kenya 612.
Unwrought [2]	13,946	15,260	14,500	Sweden 4,081; Belgium-Luxembourg 2,369; Republic of South Africa 1,930; Mexico 1,320; Yugoslavia 1,300.
Semimanufactures [2]	886	807	731	France 361; West Germany 187.
Magnesium, all forms	28	124	152	Norway 66; Italy 26.
Manganese:				
Ore	6,429	8,586	6,360	India 5,812; West Germany 907; mainland China 901.
Oxides	628	531	1,033	Japan 451; Netherlands 43.
Mercury ---76-pound flasks	740	1,015	609	Italy 609; Turkey 148; Yugoslavia 84.
Molybdenum, all forms ---kilograms	600	1,900	3,000	United States 1,000; Netherlands 300.
Nickel:				
Ore and matte	2	72	17	United Kingdom 51; Sweden 21.
Unwrought, including scrap [2]	77	35	126	United Kingdom 33.
Semimanufactures [2]	577	588	695	United Kingdom 301; Sweden 114; Norway 56.
Silver and platinum group metals:				
Silver:				
Unwrought --- thousand troy ounces [5]	668	675	812	West Germany 338; United Kingdom 254.
Semimanufactures ---do---	2,514	3,475	3,645	United Kingdom 1,514; West Germany 1,029; Switzerland 611.
Platinum and platinum group metals --- troy ounces [6]	1,865	r 2,380	6,398	West Germany 930; United Kingdom 380; Netherlands 350.
Waste and scrap ---kilograms	3,900	2,700	2,700	Norway 1,700; Finland 1,000.
Other ashes and residues containing precious metals --- kilograms	400	1,200	NA	All from Sweden.
Tantalum, all forms --- value, thousand dollars	$5	$7	$5	Mostly from West Germany.
Tin:				
Scrap ---long tons	279	124	70	Norway 73; Belgium-Luxembourg 24.
Unwrought [2] ---do---	749	1,179	948	Mainland China 401; Netherlands 191; West Germany 182; Italy 142.
Semimanufactures [2] ---do---	111	108	94	United Kingdom 68; West Germany 34.
Titanium dioxide	4,785	5,448	5,793	West Germany 1,535; United Kingdom 937.
Tungsten ---kilograms	1,600	3,100	4,000	Sweden 2,400; France 200.
Uranium and other radioactive materials:				
Uranium --- value, thousand dollars	$3	$1	NA	United Kingdom.
Other, including stable isotopes --- kilograms	4,500	10,030	NA	United Kingdom 9,010.
Zinc:				
Oxides	1,450	1,491	1,392	West Germany 640; East Germany 310; Poland 130.

See footnotes at end of table.

Table 3.—Denmark: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Dust (blue powder) and scrap	201	383	385	Norway 193; United Kingdom 59.
Unwrought [2]	9,551	11,668	11,704	Norway 4,185; Belgium-Luxembourg 3,473; Netherlands 2,000.
Semimanufactures [2]	r 5,012	r 6,254	6,558	Poland 2,965; Belgium-Luxembourg 1,141.
Other:				
Metalliferous ores, ashes, residues, not elsewhere specified.	17	113	NA	Australia 61; West Germany 35.
Base metals, including semimanufactures, not elsewhere specified.	21	21	NA	Norway 6; Sweden 5; United Kingdom 4.
Pyrophoric alloys	4	5	5	United States 2; Austria 2.
Nonmetals:				
Asbestos:				
Crude	17,418	19,433	26,589	Canada 7,513; Republic of South Africa 3,217; Cyprus 2,916; U.S.S.R. 2,473; British South Africa 2,032.
Manufactures (excluding friction materials)	1,768	1,553	NA	United Kingdom 799; West Germany 314.
Asbestos and fiber-cement articles	1,073	7,455	13,153	Sweden 4,912; Czechoslovakia 1,161.
Barite	737	665	622	West Germany 647.
Borates, natural	812	940	1,375	All from United States.
Boric acid	106	137	132	United States 72; France 51.
Cement	1,362	57,087	38,963	Finland 30,969; Norway 13,974; West Germany 11,299.
Chalk	811	937	1,217	West Germany 426; United Kingdom 279.
Clay:				
Kaolin	31,593	35,346	31,293	United Kingdom 24,500; Czechoslovakia 9,291.
Other refractory	27,380	25,778	29,842	United Kingdom 16,054; Czechoslovakia 5,396.
Bleaching	513	715	455	West Germany 330; United Kingdom 244.
Other	6,898	8,858	8,523	West Germany 5,219; United Kingdom 1,820.
Construction materials (brick, tile, etc):				
Refractory	24,256	24,127	25,050	West Germany 7,885; Austria 5,958; Sweden 5,927.
Nonrefractory	19,819	25,613	35,439	West Germany 11,265; Sweden 7,081; East Germany 3,384.
Corundum (artificial)	414	446	446	West Germany 438.
Diamond and other precious, semiprecious stones:				
Industrial diamond:				
Natural	$7	$3	NA	All from United Kingdom.
Synthetic	$21	$17	NA	All from West Germany.
Other diamond, unset	$738	$1,022	NA	Belgium-Luxembourg $278; Israel $195; Netherlands $165; Switzerland $162.
Other stones, natural	482	514	NA	West Germany 269; mainland China 79; India 43; Switzerland 38.
Dust and powder, including synthetic stone.	138	277	NA	United States 74; West Germany 53; Netherlands 48; Switzerland 42.
Diatomite and other siliceous earths	1,343	1,760	1,776	United States 1,204; West Germany 271.
Dolomite, including calcined	16,937	18,109	15,620	Norway 7,497; Belgium-Luxembourg 4,003; West Germany 3,336.
Earth pigments	950	855	366	Netherlands 491; Cyprus 181.
Emery and other natural abrasives	2,743	4,336	3,265	West Germany 1,867; Italy 1,161.

See footnotes at end of table.

Table 3.—Denmark: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Feldspar	6,292	4,259	e 5,499	Norway 3,694; Sweden 514.
Fertilizer materials:				
Crude:				
Phosphate rock	312,731	283,888	342,697	Morocco 235,337; Tunisia 17,522; U.S.S.R. 16,428; United States 14,558.
Potash salts	400	580	745	All from West Germany
Sodium nitrate	20,979	37,153	32,400	All from Chile.
Manufactured:				
Nitrogenous	716,021	659,482	632,894	Norway 568,418; West Germany 89,342.
Phosphatic, including Thomas slag.	112,135	98,373	90,178	Netherlands 42,023; West Germany 15,984; Norway 15,046.
Potassic	286,255	286,245	282,148	West Germany 176,049; East Germany 77,916; France 25,977.
Flint	99	173	47	Sweden 141; France 22.
Fluorspar	463	480	e 500	West Germany 195; mainland China 155; East Germany 122.
Graphite	371	411	367	Norway 167; West Germany 154; United Kingdom 71.
Gypsum and anhydrite, including calcined.	r 57,264	r 85,902	100,633	Poland 64,727; West Germany 10,916; France 9,592.
Lime	139	1,343	89	West Germany 909; Poland 216.
Limestone (for cement, flux, etc.)	41,607	42,864	44,230	Sweden 41,735; Norway 956.
Magnesite, including calcined	3,367	3,816	4,714	Austria 3,068.
Mica:				
Scrap, ground, and other crude	231	191	268	United Kingdom 108; Norway 76.
Manufactures	50	58	73	West Germany 23; United Kingdom 15; France 10.
Pyrite	132,471	134,662	142,719	Spain 85,107; Norway 49,547.
Quartz and quartzite	18,469	24,608	41,010	Sweden 22,701; Norway 1,602.
Salt	170,478	165,778	193,041	West Germany 91,825; Netherlands 30,173; United Kingdom 28,353; East Germany 9,975; Poland 4,547.
Silicon	460	472	NA	Norway 286; Sweden 185.
Stone, sand, and gravel:				
Dimension stone:				
Granite, gneiss etc., unworked.	27,346	24,235	40,968	Sweden 20,559; West Germany 3,317.
Marble and other calcareous, unworked.	10,559	8,985	11,622	Sweden 6,727; Italy 1,461.
Slate, unworked	5,482	7,040	7,053	Norway 2,998; Sweden 1,996; West Germany 1,542.
Worked, all types	8,774	7,729	8,741	Portugal 5,319; Sweden 1,455.
Gravel and crushed stone	69,046	132,246	173,368	Sweden 120,666; West Germany 7,407.
Sand:				
Foundry and glass sand	54,686	55,396	76,223	Belgium-Luxembourg 45,214; Sweden 8,253.
Other	7,709	10,285		Sweden 3,867; Belgium-Luxembourg 3,173.
Sulfur:				
Elemental, all forms	r 12,534	r 10,965	13,831	United States 8,587; West Germany 2,183.
Dioxide and sulfuric acid	2,321	2,707	2,423	West Germany 1,791.
Talc and steatite	11,079	13,173	13,282	Norway 11,497; Sweden 929.
Mineral substances, not elsewhere specified.	2,968	4,946	13,603	Sweden 1,190; United States 931; West Germany 826.

See footnotes at end of table.

Table 3.—Denmark: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Slag and ash, not elsewhere specified	16	2,226	NA	Norway 2,225.
Mineral fuels:				
Asphalt and bitumen:				
Natural, crude	2,008	2,513	1,493	West Germany 779; United States 545.
Manufactures	1,829	1,702	1,425	West Germany 1,179; Sweden 490.
Carbon black	1,637	1,870	1,894	United Kingdom 931; United States 427.
Coal, including briquets thousand tons	r 3,975	r 3,781	3,440	Poland 2,436; United Kingdom 659; U.S.S.R. 645; United States 22; West Germany 17.
Coal tar and other derivatives	13,526	19,594	18,106	United Kingdom 6,170; West Germany 5,979.
Coke thousand tons	1,421	1,167	888	West Germany 652; U.S.S.R. 247; United Kingdom 168.
Lignite, including briquets	193,674	160,085	150,682	East Germany 159,144.
Peat, including briquets and litter	4,107	11,329	7,559	Sweden 7,687; West Germany 3,642.
Petroleum:				
Crude and partly refined thousand tons	1,779	3,040	3,396	Kuwait 1,477; Iran 453; Saudi Arabia 434; Lebanon 288; Libya 166; Iraq 106.
Refinery products:				
Gasoline thousand tons	945	1,059	1,130	Netherlands 248; United Kingdom 242; Venezuela 201; West Germany 178.
Kerosine, including white spirit thousand tons	r 416	392	413	United Kingdom 188; Netherlands 86.
Distillate fuel oil thousand tons	2,393	2,492	2,779	United Kingdom 789; Netherlands 505; Netherlands Antilles 284; Bahrain 231; West Germany 219; Venezuela 153.
Residual fuel oil thousand tons	2,417	2,696	2,769	United Kingdom 707; Netherlands 636; U.S.S.R. 430; Bahrain 196; Netherlands Antilles 186; Venezuela 120; Norway 110.
Lubricants, including grease thousand tons	68	85	83	United Kingdom 30; United States 25; Netherlands 12.
Liquefied petroleum gases thousand tons	84	81	86	West Germany 61; Netherlands 11; Norway 8.
Bitumen and other thousand tons	128	179	204	West Germany 78; Netherlands Antilles 63; Sweden 28.
Total do	6,451	6,984	7,464	

r Revised figure. • Estimate. NA Not available.
[1] Not including synthetic corundum.
[2] Including alloys.
[3] Including spiegeleisen, grit, sponge, and powder of iron or steel.
[4] Including wire rod.
[5] Estimated from quantities reported in units of 100 kilograms.
[6] Calculated from quantities reported in kilograms.

COMMODITY REVIEW

METALS

Iron and Steel.—*Iron Ore.*—Production and exports of bog iron ore from south Jutland were sharply reduced in 1965, compared with previous years. Depletion of reserves may have been responsible for the decline in output. Previous reports had indicated that the deposits would be largely mined out by 1969. Mined on a commercial scale since 1951, the ore has been used chiefly for gas purification in Denmark, Sweden, and the United Kingdom. A small proportion of annual output, containing 10 percent or more of manganese, was used to produce manganese sulfate for the fertilizer industry.

Pig Iron.—Cement-Jern Konsortiet, a subsidiary of the F. L. Smidth Co., continued to account for all Danish production of pig iron. Capacity of the company's rotary furnaces at Aalborg was reported to be 80,000 tons annually in 1965. Using scrap, pyrite cinder, chalk, gashouse coke fines, and fuel oil, the company produces hematite pig iron and an estimated 25,000 to 30,000 tons of cement clinker annually.

Imports of pig iron and ferroalloys in 1965 were 8 percent less than in 1964, while the level of stocks remained at about 60,000 tons throughout the year.

Scrap.—Domestic iron and steel scrap continued to provide the principal raw material for the Danish iron and steel industry. Stocks of scrap increased during 1965 to 193,000 tons at yearend, despite rising metal production and an increase in net exports.

In 1964, scrap consumption for steelmaking was 290,000 tons, of which 91 percent was used in open hearth furnaces and the remainder in electric furnaces. An additional 72,000 tons was used for making pig iron.

Steel.—Danish production, imports, and apparent consumption of steel continued to rise in 1965.

The distribution of production remained the same as in 1964. The principal Danish producer, Det Danske Staalvalsevaerk (DDS), continued to account for all reported output of ingots, bars, sections, and plates. The company accounted for an estimated 90 percent of total domestic output from its open-hearth furnaces and rolling mills at Frederiksvaerk in North Zealand. The remaining 10 percent consisted of castings, mostly produced by the Copenhagen firm of Burmeister & Wain Maskin-og Skibsbyggeri A/S and by Varde Staalvaerke A/S on the west coast of Jutland. The latter two firms also account for most of Denmark's steel production from electric furnaces, which amounted to 22,000 tons in 1964. Total Danish productive capacity for crude steel in 1965 was estimated at 410,000 tons annually.

Imports of steel increased by 9 percent in 1965. The quantity of ingots and other crude forms was doubled, and imports of plates and sections rose by 70,000 tons. Total imports included 42,000 tons of carbon and alloy steel semimanufactures. The total value of all steel imports in 1965 was $183 million ($167 million in 1964), while exports were valued at $17 million ($19 million in 1964).

Apparent domestic consumption of steel, reportedly 1,454,000 tons in 1964, was estimated to have increased by 5 percent in 1965. Consumption in 1964 had been 23 percent higher than that in 1963.

A 22-stand section and wire rod mill was completed in 1965 at the Frederiksvaerk plant of DDS. Also under construction was a hot blast cupola furnace scheduled to begin production in 1966. Total employees at Frederiksvaerk in 1965 numbered 1,608, approximately three-fourths of total employees in Danish iron and steel works.

Nonferrous Metals.—Imports of nonferrous metals,[8] including alloys, in 1965 increased to 100,000 tons, as compared with 93,000 tons in 1964. Semimanufactures made up slightly more than half of this quantity. Copper and aluminum continued to account for the bulk of imported semimanufactures, and lead and zinc accounted for most of the imports of unwrought metal. Net imports of unwrought and scrap metal in 1965 included 15,000 tons of lead, 9,500 tons of zinc, and 7,000 tons of aluminum. At the end of the year,

[8] Unwrought, scrap, and semimanufactures.

metal stocks totaled 46,543 tons, about half of which consisted of copper.

Metal consumption for remelting in Danish nonferrous works in 1963 (latest year for which statistics were available) was 80,000 tons (82,000 tons in 1962), including 34,000 tons of scrap and 23,000 tons of copper and copper alloys. In November of 1963, the nonferrous works employed 1,400 persons.

NONMETALS

Cement and Other Construction Materials.—Building activity, including industrial construction, was reportedly at a record level during the first 9 months of 1965. As compared with 1964, imports of most construction materials increased, while exports of cement, gravel, and structural clay products declined. Estimates by the Organization for Economic Cooperation and Development (OECD) indicated that a 350,000-ton increase in annual productive capacity for cement was expected during 1965, raising the total annual capacity to 2,175,000 tons by yearend. Domestic consumption of cement in 1964 was estimated at 1,784,000 tons, of which 61 percent was delivered in bags and 39 percent in bulk. Ready-mixed concrete accounted for nearly 20 percent of total deliveries.

Nearly all Danish cement continued to be produced in the Aalborg area of north Jutland, by A/S Aalborg Portland Cement-Fabrik, and Dansk Andels Cement-Fabrik. The former company, which accounts for about 85 percent of domestic production, also operated a plant near Copenhagen. The industry employed an estimated 1,900 persons in 1965.

Fertilizer Materials. — Early in 1965, Dansk Svovlsyre-og Superphosphatfabrik A/S, Danish producer of sulfuric acid and fertilizers, announced plans to build a nitric acid plant at Fredericia, Jutland. Upon completion of the plant in early 1967, the company plans to produce nitrogenous - phosphatic - potassic fertilizers. The company is also part owner of Dansk-Norsk Kvaelstoffabrik A/S, a Danish-Norwegian fertilizer firm which completed a plant at Grenaa, Jutland, in late 1964. Annual production capacity of the latter plant was rated at 75,000 tons of ammonium nitrate and 10,000 tons of anhydrous ammonia. In the fertilizer year 1964–65, Danish consumption of fertilizers was equivalent to 168,800 tons of nitrogen; 150,200 tons of potassium; and 54,100 tons of phosphorus.

Salt.—Production of salt at the rate of 150,000 tons per year was expected to begin near Mariager, east Jutland, in late 1966. Dansk Salt I/S, a company formed by the Øresund Cryolite Co. and a Dutch firm, will extract the salt by a solution process from subsurface deposits. Completion of the plant was scheduled for mid-1966.

MINERAL FUELS

Solid Fuels.—Production of lignite and peat, the only natural mineral fuels produced in Denmark, has been gradually declining for several years and this trend apparently continued in 1965, although statistical data on 1965 output was not yet available. Thermal powerplants remained the major lignite consumers. In 1964, consumption in powerplants was 100,000 tons less than in 1963.

Total imports of solid fuels by Denmark in 1965 declined 12 percent in volume and 15 percent in value, compared with 1964. Imports of coal from Poland remained at the 1964 level while deliveries from the United Kingdom and the Soviet Union decreased by 220,000 tons and 90,000 tons, respectively. Imports of coke from British sources were less than half the volume of 1964, although West Germany remained the principal supplier, and shipments from the U.S.S.R. increased.

Petroleum. — *Exploration.*—The Dansk Undergrunds Consortium planned to spud in its first exploration well in November 1965, in east Jutland. The well was identified as Ronde 1, near Folle. The drilling contract was awarded in July to the U.S. firm of Reading and Bates Offishore Drilling Co. of Houston, Tex.

The consortium was joined by two more companies (Standard Oil Co. of California, and Texaco Inc.) in 1965, bringing the number of participating firms to five. The consortium previously consisted of Danish (A. P. Møller) interests (40 percent), Gulf Oil Co. of Denmark (30 percent),

and Shell Denmark Ltd. (30 percent). The concession to explore for hydrocarbon resources in Denmark was granted in 1961 by the Danish Government to the A. P. Møller interests for a period of 50 years.

During 1965, Denmark negotiated agreements with the governments of Norway, Netherlands, and the United Kingdom concerning offshore international boundaries in the North Sea. The agreements were based on the median line principle. A limited agreement was also reached with West Germany in March, extending the Danish-West German land boundary westward about 30 miles to a point equidistant from Blåvandshuk, Denmark, and the West German island of Sylt. Beyond that point, no agreement had been reached by yearend.

Crude Oil Trade.—Imports of crude petroleum were 12 percent more than in 1964. Kuwait continued to be the principal supplying country.

Petroleum Products.—Dansk Esso A/S continued to be the leading producer of petroleum products in 1965 and accounted for 56 percent of Danish production. Output of the company's Kalundborg refinery was 14 percent more than in 1964, with fuel oils accounting for most of the increase. The refinery had a capacity of 25,000 barrels per day.

Gulf Oil Refinery A/S increased its share of production to 37.5 percent in 1965 (33.8 percent in 1964). The company's 30,000-barrel-per-day refinery at Stigsnaes increased production by 33 percent in 1965. Output of distillate fuel oil was 1.2 million barrels more than that of 1964.

At Fredericia in western Jutland, the 40,000 barrel-per-day refinery of Dansk Shell A/S was nearly completed by yearend. The plant was expected to come on stream in early 1966.

The remainder of Danish production, consisting mainly of naphtha, petrochemical feedstocks, liquefied petroleum gases, lubricants, and asphalt was produced by the Maersk refinery (A. P. Møller, associated with Gulf Oil Co.), and several smaller plants. A 5,300-ton tanker was commissioned in February by the Møller-Gulf interests, and a second tanker was being fitted out at yearend.

Imports of petroleum products increased by 10 percent in 1965 and were valued at $177 million. Inland consumption of petroleum products in 1964 was 5,065,000 metric tons, of which distillate and residual oils made up 70 percent and motor gasoline comprised 22 percent. It was estimated that liquid fuels provided 70 percent of Danish energy requirements in 1965. Principal sources for imports of refined products in 1965 were again the United Kingdom and the Netherlands.

Electric Power.—Consumption of electric power in 1965 was 8.8 billion kilowatthours, of which 80 percent was produced by Danish thermal plants, and the remainder was imported mainly from Sweden. In 1965, a 183-kilometer power transmission line (direct current 250 kilovolts, single phase) was completed between Aalborg in Jutland and Goteborg in Sweden. This line, (known as the Konti-Skan connection), connects the Scandinavian power grid with the continental net through West Germany's Nordwestdeutsche Kraftwerke system.

Installed production capacity of Danish powerplants at the end of 1964 was 2,370 megawatts, with an additional 295 megawatts scheduled to be provided by new plants in 1965. Thermal powerplants comprised more than 99.5 percent of the total capacity.

The Mineral Industry of Finland

By F. L. Klinger [1]

The year 1965 was one of continuing growth for the Finnish mineral industry. The volume of production of the mining industry increased 4 percent over that of 1964, and the gross output of the country's 11 metal mines increased by 16 percent. Output of the basic metals industry increased 14 percent as production of pig iron reached the million-ton level. The reduced output of nonferrous metals was partly offset by more favorable prices. The chemical and building materials industries increased production by 7 and 9 percent, respectively. These developments contributed to 5-percent increases in Finland's industrial production and gross national product (GNP) in 1965.

A full year's production was realized at the Raajärvi, Korsnäs, and Metsämonttu mines, all of which were opened in late 1964. Mine development was continued at the Luikonlahti copper deposit; additional ore reserves were announced at the Kotalahti mine (nickel) and at Outokumpu (copper). Modifications intended to increase productive capacity were underway at the Otanmäki and Vihanti mines. In 1965 exploratory work on deposits of copper, nickel, iron, sulfur (pyrite), apatite, graphite, and talc was reported by several companies.

A significant development in 1965 was the announcement by Outokumpu Oy. that the chromite deposits near Kemi would be mined on a commercial scale, and that a ferrochromium plant would be built at Tornio. The Finnish deposits are the most significant resource of chromium known in West Europe.

New plants, completed in 1965, included a new blast furnace at Turku, a phosphoric acid and fertilizer plant at Uusikaupunki, and a sulfuric acid plant at Harjavalta. Construction was continued on the Raahe steelworks and on the petroleum refinery near Porvoo. A large feldspar processing plant neared completion at Kimito. A cobalt recovery plant was also being built at the Kokkola pyrite works.

Employment in the industry was slightly higher than in 1964. Wages increased 3.8 percent at the beginning of 1965 and were expected to rise another 5 percent during 1966. Labor agreements, reached during 1965, were expected to establish a 40-hour workweek throughout Finnish industry by 1970.

A new law, governing offshore explorations, was passed in March. Details were not available.

PRODUCTION

The value of Finnish mine and quarry production in 1965 was estimated at $63.4 million. Metals, principally copper, zinc, iron, and vanadium, constituted 78 percent of this value, followed by nonmetals (principally limestone) with approximately 22 percent, and fuels (peat) less than 1 percent.

The gross value of metals and mineral products,[2] made from indigenous and imported raw materials, was estimated at $228 million in 1965. Metals,[3] (principally iron, steel, and copper) accounted for 54 percent of this value, followed by mineral fuels (petroleum products and coke) with 32 percent, and nonmetals (mostly cement), accounted for 14 percent.

---

[1] Physical scientist, Division of International Activities.

[2] Excluding sulfur compounds, fertilizers, coal chemicals, and manufactured gas.

[3] Including oxides of titanium and iron, and nickel sulfate.

Table 1.—Finland: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Cobalt [1]	r 1,840	r 1,805	r 1,730	r 1,525	1,435
Copper:					
Concentrate (10 to 26 percent copper)	165,185	176,942	155,079	147,342	129,358
Metal content of concentrate	34,003	35,142	33,809	32,263	30,160
Cathodes	34,300	33,930	37,797	33,177	30,522
Sulfate (metal content)	230	245	228	e 220	e 176
Gold—thousand troy ounces [2]	21	15	20	22	18
Iron and steel:					
Iron ore:					
Magnetite concentrate (56 to 68 percent iron)—thousand tons	282	296	362	477	658
Pyrite concentrate:					
Kokkola product (65 to 68 percent iron)—do	---	6	152	204	227
Other roasted (50 to 60 percent iron e) [3]—do	207	172	167	125	108
Pig iron—do	152	331	375	r 592	934
Steel, crude—do	298	331	326	371	363
Rolled products—do	288	284	286	328	351
Lead:					
Concentrate (51 to 69 percent lead)	4,725	4,181	1,645	3,009	9,596
Metal content	3,120	2,868	1,145	1,890	6,573
Nickel:					
Concentrate (5 to 6 percent nickel)	34,698	44,912	54,439	58,773	55,318
Metal content of concentrate	1,999	2,431	2,929	r 3,204	2,989
Electrolytic	1,804	2,329	2,694	2,943	2,776
Sulfate, metal content	161	162	156	147	162
Rare earth oxides	---	---	NA	NA	NA
Selenium—kilograms	6,031	5,351	6,993	6,577	5,705
Silver—thousand troy ounces [2]	456	380	580	608	582
Titanium:					
Ilmenite concentrate (44 percent titania)	19,298	87,190	93,858	116,063	107,000
Dioxide	6,041	e 12,000	e 16,000	e 17,000	e 20,000
Tungsten concentrate (30 percent WO_3 e)	101	---	---	---	---
Vanadium pentoxide, content of concentrate	1,134	r 1,030	1,248	1,756	1,721
Uranium concentrate	73	---	---	---	---
Zinc:					
Concentrate (47 to 55 percent zinc)	85,388	96,045	119,988	114,510	126,638
Metal content of concentrate	46,596	52,171	66,353	62,991	69,010
Nonmetals:					
Asbestos	9,380	9,860	r 9,254	10,533	12,202
Cement—thousand tons	1,349	1,357	1,419	1,559	1,755
Diatomite	730	1,200	r 1,179	2,170	950
Feldspar	14,788	15,060	13,280	10,730	11,872
Fertilizer (phosphatic, 20 percent phosphorus pentoxide)	354,200	339,500	471,700	520,400	440,900
Lime, unslaked—thousand tons	220	220	212	240	245
Limestone and dolomite—do	3,100	2,900	3,200	3,500	3,800
Marble	400	500	600	800	200
Pyrite—thousand tons	274	475	541	551	585
Quartz	NA	NA	30,000	NA	35,312
Soapstone—square meters	1,100	880	800	964	NA
Sulfur:					
Content of pyrite	116,000	218,000	252,000	260,000	283,700
Elemental, recovered from pyrite	---	4,757	38,214	68,139	73,771
Sulfuric acid (100 percent)	229,100	237,800	333,200	355,564	383,208
Talc	6,320	6,430	6,756	6,000	7,000
Wollastonite (80 percent)	NA	2,000	2,000	3,000	2,393
Mineral fuels:					
Coke—thousand tons	133	318	164	145	142
Gas (manufactured)—thousand cubic meters	63,265	67,999	77,421	70,849	71,706
Peat (water content 35 percent)—do	105	90	112	110	100
Fuel briquets—do	11	15	18	17	28
Petroleum refinery products: [4]					
Gasoline—thousand tons	365	425	526	553	637
Kerosine—do	25	16	17	13	13
Distillate fuel oil—do	224	245	396	421	396
Residual fuel oil—do	344	483	992	1,048	1,208
Liquefied petroleum gases—do	20	27	31	34	47
Bitumen and other—do	182	160	167	292	287
Total refinery products—do	1,160	1,356	2,129	2,361	2,588
Total crude oil processed—do	1,285	1,501	2,342	2,554	2,744

r Revised. e Estimate. NA Not available.

[1] Estimated content of concentrates from Outokumpu, Kotalahti, and Otanmäki mines.

[2] Calculated from quantities reported in kilograms.

[3] Exports.

[4] Source: Neste Oy. Statistical office.

TRADE

The relative importance of mineral commodities to total Finnish trade is reflected in the following tabulation:

	Trade value (million dollars)		Share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1964	74	1,291	5.7
1965	98	1,427	6.8
Imports:			
1964	335	1,505	22.2
1965	394	1,646	23.9
Net trade balance:			
1964	−261	−214	XX
1965	−296	−219	XX

XX Not applicable.
Sources: Statistical Bureau, Board of Customs (Helsinki). Foreign Trade (Ulkomaankauppa). December 1964 and 1965, pp. 56. United Nations. Commodity Trade Statistics, 1964. Series D, v. 14, New York, 1965, pp. 3823–3858.

The increased deficit in 1965 was principally due to the larger imports of liquid fuels, fertilizer materials, and steel semimanufactures.

Metals (principally iron and steel, copper, and zinc) continued to account for more than 95 percent of total mineral commodity exports, followed by nonmetals (3.7 percent) and mineral fuels (0.7 percent). Of the total value of mineral commodity imports, metals (principally iron and steel, aluminum, and copper), accounted for 45 percent, closely followed by mineral fuels, with 42.3 percent. Nonmetal imports were valued at $49 million in 1965, of which approximately $28 million was for fertilizer materials.

Sweden, the principal buyer of Finland's exports of minerals and metals, accounted for more than twice the value of any other country in this category. The Soviet Union, while importing only about $5.6 million worth of Finnish metals and minerals, retained its preeminent position as the major supplier. Principally because of crude oil and coal imports, Finnish purchases from the U.S.S.R. were valued at more than $137 million, almost four times as much as from any other country. For commodities other than fuels, Finland's imports from the Soviet Union were approximately equal in value to those from Sweden, West Germany, and the United Kingdom.

Table 2.—Finland: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum: [1]			
Scrap	914	649	West Germany 408.
Unwrought	77	800	Sweden 377; West Germany 108.[2]
Semimanufactures	1,058	1,201	Denmark 329; Sweden 228; U.S.S.R. 169.
Copper: [1]			
Scrap	18	21	Mainly to West Germany.[2]
Unwrought	8,917	6,848	Poland 1,784; France 1,783; West Germany 1,674.
Semimanufactures	5,731	9,340	Sweden 4,884; Norway 1,251; Colombia 1,000; Denmark 611.
Iron and steel:			
Iron ore	211,349	316,629	West Germany 153,542; Poland 109,456; Belgium-Luxembourg 28,937.
Roasted pyrite and pyrrhotite	166,484	124,778	West Germany 116,448.
Scrap	3,033	4,240	West Germany 1,417; Japan 1,149.
Pig iron, including cast iron	233,634	480,782	Sweden 107,138; United Kingdom 82,001; United States 65,237; Italy 52,230; Argentina 34,694.
Ferroalloys	36	39	Poland 20.
Ingots and other primary forms	340	10,688	West Germany 6,172; Sweden 2,010; Greece 1,746.
Semimanufactures:			
Bars, rods and sections	7,517	13,696	Denmark 6,678; Norway 3,018; Sweden 2,004.
Tubes and pipes	2,348	2,949	Norway 1,095.
Other	311	600	NA.
Lead: [1]			
Scrap	---	127	West Germany 119.
Ore	---	1,840	Belgium-Luxembourg 1,509.[r] [2]
Unwrought and semimanufactures	2	89	Mainly to West Germany [2].

Table 2.—Finland: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals—Continued			
Nickel:			
Unwrought	2,366	3,172	West Germany 1,091; Netherlands 623; Poland 350; Sweden 276.
Semimanufactures	16	---	
Sulfate	617	757	NA.
Selenium—kilograms	5,000	7,000	NA.
Silver and platinum-group metals:			
Ore and concentrate	64	8	West Germany 3; other West Europe 5.
Metal—troy ounces [3]	418	1,318	West Germany 1,222.
Tin [1], unwrought, including scrap—long tons	r 80	47	West Germany 23; United Kingdom 20.
Titanium:			
Ilmenite concentrate	63,305	50,584	Italy 22,000; United Kingdom 17,000; East Europe 11,000.
Dioxide	15,037	15,205	United States 7,812; Sweden 1,990.
Tungsten (wire)	1	1	NA.
Uranium and thorium	---	2	Sweden 1.
Vanadium compounds	1,585	2,222	NA.
Zinc:			
Ore	142,943	147,255	Belgium-Luxembourg 79,433; West Germany 38,100; Sweden 16,125; Netherlands 7,500; France 4,045; Poland 2,052.
Scrap	512	114	United Kingdom 71.
Unwrought	242	---	
Semimanufactures [1]	25	---	
Other nonferrous ore, not elsewhere specified	---	15	NA.
Ashes and residues bearing nonferrous metals	NA	758	West Germany 111; other West Europe 647.
Other base metals, not elsewhere specified	86	14	NA.
Nonmetals:			
Abrasives, natural, including industrial diamond	101	120	NA.
Asbestos:			
Crude fiber	5,744	7,554	West Germany 2,215; Sweden 1,908; U.S.S.R. 502.
Asbestos board	549	686	Sweden 517 [2].
Cement	[4] 381	28,832	Denmark 25,396.
Clay and refractory building materials (brick, tile, etc.)—value, thousands	$177	$281	Sweden $268.
Diamond, nonindustrial, unset—carats [3]	5,000	5,000	All to European Free Trade Association.
Feldspar	7,946	5,530	Mainly to East Europe.
Lime	NA	3,763	Mainly to Sweden.
Limestone (for flux, cement, etc.)	389	---	
Mica, including waste and splittings	60	50	NA.
Pyrite	54,623	78,701	West Germany 71,788.
Stone, sand and gravel:			
Building stone (granite and gneiss):			
Unworked	6,389	7,270	France 1,317; Italy 913 [2].
Worked	906	1,112	United States 735.
Sand and gravel, and other crushed stone	e 15,600	e 64,000	Sweden 40,113 [2]; West Germany 23,070 [2].
Sulfur	1,807	2,178	All to Sweden.
Other mineral materials	340	3,979	Mainly to European Economic Community.
Mineral fuels:			
Coal, including briquets	17,808	18,621	Sweden 17,521.
Coal tar and other derivatives	1,556	8	All to Sweden.
Coke	8,832	9,517	Do.
Gas (liquefied)	655	647	Sweden, 550.
Petroleum refinery products:			
Gasoline [5]	184	220	All to U.S.S.R.
Kerosine [5]	18	7	Mostly to U.S.S.R. and Sweden.
Distillate fuel oil	146	249	
Residual fuel oil	13	42	
Lubricants, including grease	301	186	U.S.S.R. 158.
Bitumen and other	NA	139	All to Sweden.
International bunkers:			
Distillate fuel oil	5,822	3,582	
Residual fuel oil	13,036	10,366	

r Revised. e Estimate. NA Not available.

[1] Including alloys.

[2] Figure from import statistics of country indicated. Source for Common Market countries: European Economic Community (EEC), Luxembourg. Tableaux Analytiques, Import 1964.

[3] Calculated from quantities reported in kilograms.

[4] Includes lime.

[5] Estimated from quantities reported in cubic meters.

Table 3.—Finland: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum: [1]			
Oxide and hydroxide	8,605	11,640	European Economic Community 5,160.[2]
Unwrought, including scrap	4,059	6,344	U.S.S.R. 5,085; Canada 298; Norway 173.
Semimanufactures	10,995	13,352	Sweden 3,287; United Kingdom 3,097.
Antimony	89	139	NA.
Cadmium	6	11	NA.
Chromium:			
Chromite	20	36	NA.
Oxide and hydroxide	331	105	Italy 100; France 5.
Cobalt	33	(3)	NA.
Columbium	---	(3)	NA.
Copper: [1]			
Unwrought	2,739	5,755	Rhodesia and Nyasaland 3,719; Chile 1,133; United Kingdom 876.
Semimanufactures	2,112	2,004	West Germany 644; United Kingdom 529; Sweden 497.
Iron and steel:			
Iron ore	390,751	513,575	Sweden 503,516.
Scrap	82,374	140,890	U.S.S.R. 140,691.
Pig iron, including cast iron	7,059	14,310	U.S.S.R. 10,000; Norway 4,014.
Powder, sponge, shot, etc	670	1,495	Sweden 629.
Ferroalloys	10,027	7,220	Norway 3,072 [4]; U.S.S.R. 2,903.
Ingots and other primary forms	60,010	36,665	U.S.S.R. 23,924; Sweden 11,233.
Semimanufactures:			
Bars, rods, sections	78,587	107,432	Poland 22,690; West Germany 16,467; Sweden 13,539; Czechoslovakia 10,458; Hungary 9,925.
Plates and sheet	246,606	322,044	U.S.S.R. 110,565; United Kingdom 61,767; Belgium-Luxembourg 38,088; France 30,631; West Germany 24,591.
Hoop and strip	16,953	27,380	West Germany 9,768; United Kingdom 9,052.
Rails and accessories	62,488	50,979	U.S.S.R. 49,982.
Wire	13,666	15,537	France 3,661; Sweden 3,115; Belgium-Luxembourg 2,929; United Kingdom 2,614.
Tubes and pipes	62,630	79,938	West Germany 28,160; France 15,415; United Kingdom 10,011; Sweden 6,690.
Castings and forgings	289	127	NA.
Total semimanufactures	481,219	603,437	
Oxide and hydroxide	823	1,130	West Germany 822 [2].
Lead: [1]			
Unwrought	15,499	11,028	U.S.S.R. 9,358; Sweden 1,288.
Semimanufactures	696	653	West Germany 435.
Oxide	445	444	Sweden 306.
Magnesium, unwrought, including scrap	r 20	18	NA.
Manganese:			
Ore	NA	26,762	U.S.S.R. 21,512; Sweden 3,385.[2]
Oxide	211	301	West Germany 174; France 35.
Mercury ---76-pound flasks	754	435	Mexico 290.
Molybdenum	3	1	NA.
Nickel:			
Unwrought [1]	147	231	U.S.S.R. 154; United Kingdom 70.
Nickel-alloy scrap	---	125	All from West Europe.
Semimanufactures	100	180	United Kingdom 87; other West Europe 69.
Radioactive materials [5] ---value, thousands	$55	$127	NA.
Silver and platinum-group metals:			
Silver ---thousand troy ounces [6]	1,138	745	U.S.S.R. 322; West Germany 220.
Platinum-group metals ---do		5	West Europe 3; U.S.S.R. 2.
Tin: [1]			
Unwrought ---long tons	330	314	Mainland China 194; United Kingdom 62.
Semimanufactures ---do	25	30	United Kingdom 7; other West Europe 23.
Titanium dioxide	1,089	1,550	Japan 830; West Germany 295.
Tungsten, unwrought and semimanufactures	3	2	All from United Kingdom.
Vanadium	1	---	

Table 3.—Finland: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals—Continued			
Zinc: [1]			
Oxides	409	272	East Germany 91; U.S.S.R. 70.
Unwrought, including scrap	5,863	3,842	U.S.S.R. 1,919; Belgium-Luxembourg 1,681.
Semimanufactures	307	384	European Economic Community 243.
Metalliferous ore and concentrate, not elsewhere specified	NA	239	NA.
Nonferrous metal scrap, not elsewhere specified	NA	289	All from West Europe.
Other nonferrous base metals, not elsewhere specified	9	14	NA.
Nonmetals:			
Abrasives, natural, other than diamond	1,614	1,409	NA.
Asbestos:			
Crude	6,088	6,755	U.S.S.R. 4,039; Canada 1,923.
Manufactures (nonfriction)	332	406	Mainly from West Europe.
Asbestos and other fiber-cement articles	529	246	West Germany 123.
Asphalt and bitumen:			
Crude, natural	1,272	1,206	NA.
Manufactured articles	663	1,208	Mainly from Denmark.
Carbon black	1,834	2,048	United Kingdom 866; Netherlands 577.[2]
Cement	6,780	9,847	U.S.S.R. 3,308; Denmark 2,621.
Chalk	9,953	9,269	Sweden 2,600.[2]
Clay:			
Kaolin	113,529	134,732	Mainly from United Kingdom.
Other refractory earths	58,708	61,483	
Construction materials (brick, tile, etc.):			
Refractory	15,940	26,142	U.S.S.R. 11,143; Austria 4,130; Sweden 3,297.
Nonrefractory	NA	13,602	U.S.S.R., Denmark, and Sweden.
Diamond and other precious, semiprecious stones:			
Diamond:			
Industrial—carats [6]	NA	30,000	NA.
Nonindustrial, unset—do	NA	35,000	Mainly from Sweden.
Other, including synthetic—kilograms	NA	1,605	About half from West Germany.
Earth pigments	90	47	NA.
Fertilizer materials:			
Phosphate:			
Raw phosphate	233,759	325,034	U.S.S.R. 173,485; Morocco 130,446; United States 17,453.
Basic slag	10,532	10,031	Netherlands 21,508; Spain 14,695; Sweden 10,331.
Superphosphate (less than 20 percent P_2O_5)	16,197	35,655	
Other phosphatic	1,699	848	
Potassium salts (minimum 48 percent K_2O)	139,791	173,938	U.S.S.R. 61,172; East Germany 55,285; West Germany 35,180.
Nitrogenous	138,311	141,782	Norway 93,444; West Germany 23,347; Netherlands 13,842.
Feldspar and fluorspar [7]	NA	4,391	Mainly from West Europe.
Flint	87	36	NA.
Gypsum and anhydrite, including plasters	122,803	122,186	France 13,802 [2].
Lime	16	36	NA.
Limestone, for cement, flux, etc	74,017	206,903	Mainly from Sweden.
Mica manufactures	27	24	United Kingdom 15.
Quartz and quartzite	2,550	1,900	Belgium-Luxembourg 1,012 [2].
Salt	267,334	307,154	Netherlands 142,767; East Germany 51,269; Poland 28,324.
Stone, sand and gravel:			
Building stone, including worked stone	1,152	738	West Germany 606 [2]; Italy 85 [2].
Sand:			
Quartz sand	54,838	41,688	Belgium-Luxembourg 42,022 [2].
Other sand	r 19,074	r 23,619	
Sulfur, elemental, all forms	r 59,929	r 70,725	United States 32,701; France 20,387; U.S.S.R. 8,973.
Talc and steatite	2,583	3,826	NA.
Other crude minerals:			
Slag, scale, ash, etc	NA	23,099	Sweden 18,033.
Other	27,981	18,860	NA.
Mineral fuels:			
Coal, including briquets—thousand tons	2,183	2,414	Poland 1,670; U.S.S.R. 731; United States 7.
Coal tar and other derivatives	14,817	16,573	U.S.S.R. 7,722; Poland 6,534.
Coke—thousand tons	352	887	U.S.S.R. 597; West Germany 142; Poland 73; United Kingdom 55.
Gas (liquefied)	509	680	Mainly from Norway.
Lignite, including briquets	8,300	6,086	Mainly from East Germany.
Petroleum:			
Crude—thousand tons	2,231	2,581	U.S.S.R. 1,866; Iran 436; Abu Dhabi 143; Venezuela 135.

Table 3.—Finland: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Mineral fuels—Continued			
Refinery products:			
Gasoline [8]	20,000	12,500	Netherlands 8,200; Netherlands Antilles 1,750; United States 1,550.
Kerosine	26,982	22,766	U.S.S.R. 15,079; Netherlands 3,051.
Distillate fuel oil—thousand tons	1,358	1,335	U.S.S.R. 1,327; Czechoslovakia 7.
Residual fuel oil—do	586	893	U.S.S.R. 734; Rumania 159.
Lubricants, including grease	51,247	64,372	United Kingdom 20,029; Sweden 16,877; United States 8,773.
Petroleum and wax	9,006	8,589	West Germany 4,096; United States 1,242; U.S.S.R. 1,041.
Bitumen and other	NA	68,782	Venezuela 44,977; European Economic Community 12,103.

r Revised. e Estimate. NA Not available.
[1] Including alloys.
[2] Figure from export statistics of indicated country.
[3] Less than ½ unit.
[4] Not including ferromanganese.
[5] Including compounds and mixtures of uranium, thorium, and rare-earth metals.
[6] Calculated from quantities reported in kilograms.
[7] Includes crude mica and cryolite.
[8] Estimated from quantities reported in cubic meters.

COMMODITY REVIEW

METALS

Aluminum.—Apparent consumption of aluminum in all forms increased in 1965. Imports of unwrought aluminum for the metal industry and of hydroxide for the chemical industry again increased by approximately 2,000 tons, while exports of wire manufactures (mostly cable) were 40 percent less than in 1964. Total value of imports (excluding metal manufactures) rose to about $16 million. Kuusakoski Oy., a producer of aluminum ingots from scrap, was increasing the capacity of its plant at Kauklahti, near Helsinki.

Chromite.—The Elijärvi chromite deposits were being prepared for commercial production by Outokumpu Oy. In the spring of 1966 the company will begin construction of a plant at Tornio, to produce ferrochromium for domestic consumption and export. The plant is scheduled for completion in late 1967, at which time mining at Elijärvi will be at the rate of 100,000 to 150,000 tons of ore per year. The entire mine output will be processed at Tornio.

Outokumpu's decision came after several years of geological and metallurgical research. The Elijärvi deposits are the only known source of chromite in northwest Europe, and reportedly contain about 20 million tons of ore averaging between 20 and 25 percent chromic oxide. The low chromium to iron ratio in the chromite has presented the main obstacle to exploitation of the deposits.

Cobalt.—In 1965 a plant for recovery of cobalt was under construction at the Kokkola works of Outokumpu Oy. The metal will be recovered from pyrite concentrates which have been exported, mainly to West Germany, for many years. The recovery process to be used at Kokkola was developed by Sherritt Gordon Mines Ltd., of Canada. The principal source of cobaltiferous pyrite will probably be the Outokumpu mine, but the mineral also occurs in ore at Kotalahti, Otanmäki, Nivala, and elsewhere in Finland. During 1965, some cobalt was recovered as hydroxide in the nickel refinery at Harjavalta.

Copper.—The 7-percent decrease in copper output by Finnish mines in 1965 was mainly due to ore production cutbacks at the Outokumpu mine, where output was reduced for the fourth successive year. All the principal mines, except the Pyhäsalmi mine, produced less copper in 1965. Metallurgical results at Pyhäsalmi in 1965 were markedly better than in previous years; the copper content of concentrate increased to 22.5 percent, as compared with 15 to 18 percent in previous years. This resulted in a 7-percent increase in mine copper production at Pyhäsalmi despite a 25-percent reduction in the tonnage of concentrate.

Reduced mine output was accompanied by unusually heavy imports of refined cop-

per—double the quantity imported in 1964—and domestic consumption increased by 30 percent to about 29,000 tons. This situation arose from the increased utilization of copper by Outokumpu Oy. for the company's semifinished and finished product lines, with consequent importations of copper by the Finnish Cable Works (Suomen Kaapelitehdas Oy.). Finland maintained a trade surplus in copper in 1965, but it was reduced to less than $2 million as compared with $9 million in 1964.

In October, Outokumpu Oy. began installing facilities at its Harjavalta smelting works to recover copper from slag. This was expected to increase copper recovery to nearly 100 percent as compared with the present level of 97 to 98 percent.

In 1965 development of the Luikonlahti copper deposit was continued by the private firm, Malmikaivos Oy. Mining of the deposit, reportedly containing 8 million tons of ore with 1.5 percent copper, 1 percent zinc, and smaller amounts of nickel and cobalt, was scheduled to begin in 1968. The ore also contains 50 to 55 percent of pyrrhotite and 5 percent of pyrite. The deposite is about 40 kilometers northwest of Outokumpu.

The Virtasalmi copper deposit, discovered in 1964 southwest of Varkaus, was estimated to contain 1 million tons of ore that has an average copper content of 1.25 percent. Discovery of a new copper deposit, 5 kilometers east of the Outokumpu mine, was announced by Outokumpu Oy. The deposit was reported to consist of a narrow but deep orebody similar in grade to the ore mined at Outokumpu. Mining is expected to start by 1969.

At yearend the Ylöjärvi mine was nearing exhaustion and was scheduled to be shut down in the summer of 1966. At the Pori copper works, brass production increased 20 percent to 16,000 tons, and output of the tube mill increased 50 percent.

Iron and Steel.—*Iron ore.*—Increased production of iron ore in 1965 was due mainly to a full year's operation of the Raajärvi mine of Otanmäki Oy. in north Finland. The opencast mine, which started production in September 1964, produced almost 250,000 tons of concentrate in 1965 from 476,000 tons of crude ore. Preparations for underground mining continued and shaft sinking reached a depth of 356 meters. Small increases in production were also realized at the Kärväsvaara mine and at the Kokkola plant of Outokumpu Oy. At the Otanmäki mine there was a slight drop in production in 1965 as expansion of production facilities was begun. The mine and concentrator are scheduled to increase productive capacity 20 percent by 1967.

The Otanmäki company continued investigations of iron deposits at Kolari and of manganiferous iron ore in the Porkkonen-Pahtavaara region. The company was also granted rights to drill for iron ore in the Gulf of Bothnia, 16 kilometers from Raahe. A strong magnetic anomaly was found in this area.

The Jussarö mine of Oy. Vuoksenniska Ab. produced 112,670 tons of magnetite concentrate in 1965 from 286,000 tons of crude ore.

Imports of iron ore in 1965 were 455,000 tons greater than those of 1964. Exports of magnetite concentrate were virtually eliminated, reducing total exports by one-half. The increased domestic consumption was due to the first full year's operation of the new blast furnace at Raahe and to operation of a new blast furnace completed at Turku in September by Oy. Vuoksenniska Ab.

Pig Iron and Ferroalloys.—Production and exports of pig iron in 1965 increased 65 percent over those of 1964. Production averaged about 80,000 tons per month, with a record 95,000 tons produced in November. Completion of the Vuoksenniska company's blast furnace at Turku in September brought the total Finnish capacity to more than 1 million tons annually. Exports totaled 797,000 tons and consisted primarily of Martin cast iron (510,000 tons) and hematite pig iron (240,000 tons).

Imports of ferroalloys reached a record total of 11,000 tons in 1965, mainly due to increased shipments of ferrosilicon, ferrosilicomanganese, and ferrochromium. Utilization of domestic chromite is expected to eliminate imports of ferrochromium by 1968.

Steel.—Production of crude steel and rolled products again showed a modest increase when compared with those of 1964. Imports of scrap, the principal raw material used in Finnish steelworks, were slightly less than in 1964. In the spring, a new casting unit with an annual capacity of 100,000 tons of steel bar was placed in

operation at the Imatra works of Oy. Vuoksenniska Ab.

Construction of the new steelworks at Raahe was continued, with test operations scheduled to begin in 1967. A $1.4 million contract for a 200-ton-per-day oxygen plant was awarded to Air Products Ltd. of the United Kingdom by Rautaruukki Oy. The plant is scheduled to be completed by the end of 1966.

Imports of steel were increased in 1965. The principal items were ingots (up to 24,000 tons) and a 62,000-ton increase in total receipts of bars and sections, sheets and plate, and tubes. Net imports of all semimanufactures increased only 14,000 tons because of a 50,000-ton reduction in rails. Imports of high-carbon and alloy steel increased 37 percent to 22,000 tons, including 12,000 tons of stainless steel sheets and plates. There were no exports of stainless steel.

Lead and Zinc.—Output of mine lead was more than tripled in 1965, as a full year's production was obtained from the Korsnäs and Metsämonttu mines, both of which were reopened in late 1964. The Korsnäs mine produced 6,671 tons of lead concentrate, and the Vihanti mine produced 2.925 tons. A rare-earth metal concentrate was also produced at the Korsnäs mine.

Malminetsijä Oy., a prospecting company, reported discovery of lead deposits near Ilomantsi in a relatively remote area.

A record quantity of mine zinc was produced in 1965. The major share of production continued to come from the Vihanti mine, although output was about 10 percent less than in 1964 because of a drop in ore grade. The increase in overall production was due largely to the improved recovery of zinc from the Pyhäsalmi mine (85 percent as compared with less than 65 percent in 1964). The improved recovery at Pyhäsalmi resulted in a 40-percent increase in output of mine zinc with only a 2-percent rise in the total metal content of ore mined. The Metsämonttu mine produced 7,300 tons of concentrate in 1965, and another 3,300 tons of concentrate was obtained from the Outokumpu mine. Zinc flotation at Outokumpu was started in February, 1964; the ore contains approximately 0.75 percent zinc, 40 to 50 percent of which is recovered in concentrate. At the Metsämonttu mine, development was in progress on the 380-meter level.

Exports of zinc concentrates in 1965 were valued at nearly $12 million and continued to rank second to copper among Finnish nonferrous metal exports.

Nickel.—A drop of 167 tons in refined nickel production in 1965 was exceeded by a 400-ton reduction in exports. Imports, mostly of nickel alloy scrap, increased approximately 400 tons.

As of mid-1965, ore reserves at the Kotalahti mine were reportedly sufficient to last 15 years at the current rate of production. The mine shaft was deepened to 680 meters. At Hitura in the Nivala area, an exploration shaft was completed at a depth of 200 meters and drifting was begun.

Titanium.—Output of ilmenite concentrate at the Otanmäki mine decreased slightly in 1965, but exports increased to 84,000 tons. Apparently drawing on ore stocks, the Mäntyluoto plant of Vuorikemia Oy. increased production of titania; exports were approximately 25 percent more than in 1964 and were valued at about $8 million.

Vanadium.—Production and exports of vanadium pentoxide decreased slightly in 1965, although the value of exports was $500,000 more than in 1964. Expansion of Otanmäki production facilities, started in 1965, will increase the production capacity for vanadium pentoxide 20 percent by 1967.

NONMETALS

Cement and Other Construction Materials.—Activity in the construction industry increased considerably in 1965 and the gross value of production was estimated to be 10 percent greater than that of 1964. By the end of the third quarter, completion of industrial, commercial, and public buildings was running 9 percent ahead of the 1964 level and the number of building starts was 21 percent higher. At yearend, partly because of a severe winter and because of rationalization efforts, unemployment was greater than in the corresponding period of 1964.

An ambitious highway construction program was also underway in 1965. Assisted by a $28.5 million loan from the World Bank in 1964, road construction was greatly increased in 1965, and $117 million was budgeted by the Government for new high-

263-927 O-67—25

way construction in 1966. An additional loan was being sought from the World Bank. According to the Finnish Board of Public Roads and Waterways, 10,000 kilometers of surfaced highway will be needed by 1974 to meet the expected volume of traffic.

The 200,000-ton increase in cement production in 1965 was accompanied by a threefold increase in exports. Imports of all mineral construction materials were valued at $10.6 million in 1965 as compared with $9.6 million in 1964.

Paraisten Kalkkivuori Oy. announced plans to build a 200,000-ton-per-year cement plant at Kolari in north Finland near the Swedish border. If the present railroad is extended from Kauliranta to Kolari, production will begin in mid-1968.

Feldspar.—By yearend a feldspar processing plant being constructed at Kimito (Kemiö) by Lohjan Kalkkitehdas Oy. was nearing completion. The plant will reportedly produce about 50,000 tons of feldspar and 20,000 tons of quartz annually, mostly for export.

Fertilizer Materials.—Typpi Oy., the state-owned nitrogen and fertilizer company, increased nitrogen production by 19 percent in 1965 to a record 72,472 tons. The company was also conducting investigations of apatite deposits in the Siilinjarvi area of east-central Finland where it has an 18-month option on deposits owned by Lohjan Kalkkitehdas Oy.

The phosphoric acid plant of Rikkihappo Oy. at Uusikaupunki was completed, and production began in December. Annual production capacities of the plant include 33,000 tons of phosphoric acid, 100,000 tons of sulfuric acid, and 100,000 tons of complex fertilizers. In 1966, fertilizer production capacity will be increased and a nitric acid plant will be installed.

Pyrite and Sulfur.—Pyrite production at the Pyhäsalmi mine increased for the fourth successive year, rising to 382,500 tons in 1965. The increased output from Pyhäsalmi compensated for declining production at Outokumpu. Pyrite concentrate will be produced at the Vihanti mine in 1967, reportedly at the rate of 240,000 tons per year. Investigation of pyrite deposits in the Eno, Tuupovaara, and Kiihtelysvaara areas will be undertaken by the Outokumpu company during the next 2 years. Exports in 1965 included 62,500 tons of pyrite and 107,500 tons of roastings.

Production of sulfur and sulfur dioxide at the Kokkola smelter increased in 1965, with a total sulfur output of 146,000 tons. Sulfur production was 86 percent of rated plant capacity compared with 80 percent in 1964. Production at Kokkola is expected to increase approximately 50 percent when the cobalt recovery works is completed.

Imports of elemental sulfur increased to 72,400 tons in 1965, and apparent consumption rose to 143,000 tons. Increasing consumption of sulfur in all forms was reflected by the rising production of cellulose, fertilizer. titania, and other products of the chemical industry. A new sulfuric acid plant was placed in operation at Harjavalta by Rikkihappo Oy.

The flash smelting process, developed for pyrite by the Outokumpu company, will be used by Brunswick Mining and Smelting Corp. Ltd. of Canada in a $63 million plant at Belledune, New Brunswick. Licensing arrangements were made through the Lummus Company of New York. The process also has been licensed in Japan.

Talc and Soapstone.—In 1965, Lohjan Kalkkitehdas Oy., Suomen Malmi Oy. (the State ore company) and a group of paper firms were investigating the feasibility of substituting Finnish talc for imported kaolin in the paper industry. If talc can be substituted for one-third of the kaolin, Lohjan Kalkkitehdas intends to produce talc from deposits near Sotkamo.

Soapstone production was discontinued in 1965 when the Nunnanlahti mine of Suomen Vuolukivi Oy. was closed early in the year.

MINERAL FUELS

Coal.—Consumption of coal continued to decline in 1965, although imports rose by 100,000 tons and consumption of anthracite increased as compared with 1964. Total consumption was 1.9 million tons. The overall 6-percent decline was due mostly to the increasing use of liquid fuels for space heating and diesel locomotives.

Coke.—Consumption of coke increased by approximately 15 percent in 1965, exceeding 1 million tons for the first time. The increase was due mainly to the requirements of the new blast furnace at

Raahe. Total coke consumption for metals reduction in 1965 increased 30 percent (to 756,000 tons), while consumption for space heating dropped 15 percent as compared with 1964. Imports of coke totaled 832,000 tons in 1965.

Petroleum.—Imports of crude oil increased 7 percent in 1965. The Soviet Union and Iran remained the principal suppliers. Deliveries from Iran increased by approximately 60 percent.

Consumption of liquid fuels increased 18 percent in 1965. The Naantali refinery of Neste Oy. was able to supply most of the demand for gasoline but only part of the demand for fuel oils. Imports of fuel oils were 30 percent greater than in 1964. A 90,000-ton increase in bitumen imports in 1965 was due to the increased activity in road construction. Total imports of refinery products increased by 31 percent as compared with 1964.

Neste Oy.'s second refinery, under construction at Sköldvik, began test runs in September. The refinery was expected to begin production on a limited scale in February, 1966. When completed, the plant is expected to process 2.2 to 2.5 million tons of crude oil per year. Estimated cost of the project is $56 million.

Oy. Esso Ab., a Finnish subsidiary of the Standard Oil Co. of New Jersey, planned to invest $2 million for expansion of its marketing facilities.

Electric Energy.—Consumption of electric power increased approximately 8 percent in 1965 to 14.6 billion kilowatt hours. Hydroelectric power again accounted for about two-thirds of production. At the end of 1964 the total installed capacity of Finnish powerplants was 3,876 megawatts, with thermal plants accounting for 52 percent and hydroelectric plants for 48 percent. Of additional capacity scheduled for installation during 1965 (390 megawatts), two-thirds was to be installed in thermal plants.

According to Imatran Voima Oy., the State-owned power company, Finland's first atomic powerplant will be located in Loviisa, about 50 miles east of Helsinki. A second site, on the Landskatan peninsula 20 miles north of Pori, was also being considered. Plants for nuclear powerplants of 300- to 350-megawatt capacity reportedly were being developed by Imatran Voima Oy. as well as by a private firm, Ydin Oy.

The TRIGA Mark II research reactor at Otaniemi continued to be operated in 1965, using enriched uranium fuel.

The Mineral Industry of France

By L. Nahai[1]

The mineral industry of France in 1965 generally proved more active than other sectors of the nation's industrial economy. Most sectors of the mineral and energy-producing industry recorded gains in production indexes that for the year as a whole exceeded that of the overall industrial production index. However, solid fuels and metal ore mining recorded declines with respect to 1964 index figures.

During the year, the Government's basic economic policy was a continuation of the stabilization program started in 1963. The nation's economy was generally lethargic in the first half of the year but began to pick up after June. For the year as a whole, the volume of French gross domestic output increased 2.5 percent from the 1964 level. Price increases were limited — wholesale prices increased by 1.2 percent and retail prices by 2.8 percent.

The value of crude mineral output in 1964, the last year for which complete data are available, was about $1,768 million.[2] Distribution of this total by commodity groups was as follows: Energy products (including uranium), $919 million; quarry products, $481 million; metallic minerals, $212 million; and nonmetallic minerals other than quarry products, $156 million. Among major commodities, solid fuels ranked first in value ($741 million), followed by iron ore ($186 million) and sand and gravel ($162 million). As in 1963, the value of crude mineral output was equivalent to 2.2 percent of the gross domestic product (production intérieure brut),[3] which totaled $79 billion in 1964 prices.

The position of France as a consumer of nonferrous metals remained essentially unchanged from that of 1964, as did the degree to which domestic smelter production met French requirements for principal nonferrous metals. Aluminum smelter production exceeded consumption by about 142,000 tons. Domestically refined copper production was equal to about 21 percent of consumption (excluding direct-use scrap), but zinc smelter output was close to consumption and that of lead was equal to about 68 percent of consumption.

As of December 31, 1964, personnel registered in the extractive industry, other than quarrying and slate production, totaled 238,486 (245,846 on December 31, 1963), distributed as follows: Coal and lignite 191,822; iron mining 21,777; other metal mining 5,275; potash 11,906; crude oil, natural gas, asphaltic limestone, and bituminous schist operations 5,648; and other, 2,058. Employment dropped in all categories of mining except in metal mines other than iron ore. About 97,000[4] were engaged in quarrying. Cement and lime plants employed 15,350. Petroleum exploration, production, and refining accounted for 26,769.[5] Among metallurgical plants, the iron and steel industry (exclusive of foundries) employed an average of 130,806 production workers and 42,176[6] salaried employees; ferroalloy plants employed 3,900 and nonferrous metal plants 9,000. The total of personnel listed above, 563,486, was about 3 percent of total French labor force as of January 1, 1965.[7]

[1] Chief specialist, West Europe Area, Division of International Activities.

[2] Where necessary, values have been converted from francs (Fr) to U.S. dollars at the rate of Fr.1 = U.S.$0.20.

[3] Exclusive of value added by financial intermediaries, civil servants, domestic servants, and nonprofit organizations.

[4] This figure includes also workers engaged in making products made of concrete and asbestos cement.

[5] There is some duplication between this figure and the 5,648 employed in the production of crude petroleum, natural gas, asphaltic limestone, and bituminous schist. In addition about 90,000 were employed in petroleum distribution.

[6] Includes salaried employees of activities associated with the iron and steel industry.

[7] Institut National de la Statistique et des Études Économiques. Annuaire Statistique de la France 1965. Paris, France, 1966, p. 75.

PRODUCTION

The index of overall industrial production stood at 142 in 1965 compared with 138 in 1964; indexes for various sectors of the mineral industry, other than petroleum with a 13.2-percent increase, showed only small changes. Solid fuels and metal mining were lower than in 1964 while other sectors were higher.

The steel industry almost maintained its record output of the previous year, and smelter production of many nonferrous metals increased. The highest increase recorded was for magnesium, which almost tripled, followed by aluminum (up 10.8 percent) and lead and zinc (each about 10.6 percent greater than in 1964). Secondary producers again contributed important tonnages of copper, lead, and zinc to total metals supply. Except for iron ore, output of metallic minerals also increased. The index of building and public works also increased but not to the same extent as in 1964; 594,200 permits for construction of dwellings were issued, compared with 575,100 in 1964, and activity in this field favorably influenced output of construction materials and cement. The latter rose 3.3 percent. Among the energy industries, the increase in output of petroleum and refined products was less than that achieved in 1964, while solid fuels output showed a small decline. Production of electricity increased by 8 percent, from 91,344 million kilowatt-hours in 1964 to 98,712 million kilowatt-hours in 1965. Because rainfall conditions were favorable to hydropower generation, thermal plants accounted for only 54 percent of the total in 1965 compared with 63 percent in 1964.

Table 1.—France: Indexes of industrial production

(1959 = 100)

	1964 [1]	1965 [1]	Variation 1964–65 (percent)
All industrial production including construction	138	142	2.8
All industrial production excluding construction	137	140	2.1
Solid fuels	92	90	−2.1
Petroleum and refined products	181	205	13.2
Electricity	147	159	8.1
Metal ore mining	102	101	−1.0
Mining and preparation of miscellaneous minerals	121	125	3.3
Construction material mining	145	154	6.2
Metal production	130	131	.7
Ceramics and fabrication of building materials	153	159	3.9
Chemical industry	166	184	10.8
Building and public works	142	150	5.6

[1] Monthly average.

Source: Ministère de l'Industrie. Bulletin Mensuel de Statistique Industrielle. Paris, France, August-September 1965 and 1966.

Table 2.—France: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 [p]
Metals:					
Aluminum:					
Bauxite:					
For alumina—thousand tons	2,053	2,058	1,911	2,329	2,519
For other uses—do	172	136	118	104	143
Total—do	2,225	2,194	2,029	2,433	[r] 2,662
Alumina:[1]					
Hydrated	[r] 634,070	[r] 651,502	[r] 726,900	[r] 805,683	NA
Calcined	[r] 584,475	[r] 602,088	[r] 649,543	[r] 741,139	772,928
Metal, primary	279,456	295,097	298,365	[r] 315,900	340,598
Metal, secondary	43,200	46,900	49,500	50,340	NA
Rolled and extruded, including foil	138,700	157,100	165,000	189,300	NA
Castings	70,800	71,400	81,400	NA	NA

See footnotes at end of table.

Table 2.—France: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals—Continued					
Antimony, smelter	2,265	778	703	639	446
Arsenic [2]	7,077	4,786	7,982	8,595	NA
Beryllium kilograms	r 14,227	r 15,164	r 6,201	14,281	NA
Bismuth, smelter do	58,107	55,216	43,400	56,065	48,000
Cadmium	254	257	297	r 492	r 430
Chromium	708	352	531	460	NA
Cobalt, smelter	549	631	752	749	889
Copper:					
Mine (metal content)	365	225	274	r 267	419
Secondary blister	4,364	6,227	6,458	7,600	NA
Refined:					
Electrolytic	22,853	25,966	27,200	30,700	30,200
Secondary from scrap	11,598	11,545	6,500	7,200	11,088
Total	34,451	37,511	r 33,700	37,900	41,288
Gold-silver ore	124,313	136,771	150,034	149,107	NA
Gold troy ounces	45,976	45,751	54,560	r 53,434	51,537
Iron and steel:					
Iron ore thousand tons	66,606	66,301	57,892	r 60,938	59,531
Pig iron and blast furnace ferroalloys do	14,566	13,959	14,306	15,863	15,769
Spiegeleisen and high carbon ferromanganese thousand tons	r 407	r 410	r 368	r 412	432
Other ferroalloys [3]	r 250	r 210	r 201	218	247
Steel ingots and metal for casting thousand tons	17,570	17,240	17,557	19,780	19,604
Rolled steel do	13,465	13,086	13,198	14,619	14,793
Lead:					
Ore	29,153	21,643	10,626	r 15,595	24,940
Contained metal in lead and zinc concentrates	18,856	14,275	8,396	r 12,190	NA
Smelter, primary	70,808	70,567	r 77,627	89,790	98,356
Secondary	10,790	9,107	10,202	14,475	29,215
Antimonial lead [4]	16,006	14,621	17,770	17,415	
Total refined lead	97,604	94,295	r 105,599	r 121,680	127,571
Magnesium	2,075	2,120	1,743	r 989	2,841
Manganese:					
Ore	906	1,361	1,306	1,277	NA
Metal	816	1,119	925	1,734	NA
Nickel, metal content of pure nickel, ferronickel, and nickel oxide	10,443	10,244	9,612	r 7,661	NA
Silicon	19,215	16,707	15,445	r 21,245	NA
Silver, content of metallurgical plant final products thousand troy ounces	2,610	2,414	3,843	r 3,688	3,302
Tantalum kilograms		445	308	170	NA
Thorium	163	74	227	180	NA
Tin concentrate:					
Gross weight long tons	220	446	370	655	602
Metal content do	r 154	r 314	r 272	486	461
Titanium	23	18	19	13	NA
Tungsten concentrate, gross weight	657	624			NA
Uranium:					
Ore:					
Gross weight	823,796	795,503	793,829	773,800	784,200
Metal content	1,104	1,041	1,083	1,009	1,072
Concentrate (chemical):					
Gross weight	3,420	4,044	4,700	4,441	NA
Metal content	1,246	1,521	1,529	1,470	1,516
Metal	960	1,032	1,205	1,843	NA
Zinc:					
Ore	28,549	31,787	25,781	25,205	38,638
Mixed concentrate (lead and zinc)			9,514	7,411	
Zinc content of zinc and lead concentrates	15,680	14,275	18,198	16,841	NA
Smelter including secondary	162,032	164,220	169,100	190,236	192,036
Zinc dust	4,963	4,923	4,254	4,120	4,330
Remelted zinc	31,819	31,656	33,821	[5] 42,102	34,596
Zirconium kilograms	23,200	38,500	73,300	112,000	NA
Nonmetals:					
Alabaster	1,260	1,030	1,300	820	NA
Asbestos	27,892	25,731	24,172	22,035	6,800
Barite	86,189	83,978	74,460	83,821	NA
Beach pebble	159,143	198,708	193,320	174,943	NA
Building stone:					
Granite and similar rocks thousand tons	870	953	896	1,034	NA
Limestone do	2,977	2,636	2,886	3,850	NA

See footnotes at end of table.

Table 2.—France: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Nonmetals—Continued					
Building stone—Continued					
Marble—thousand tons	180	165	199	245	NA
Other stones—do	127	109	124	127	NA
Crushed limestone and granite—do	2,414	2,464	2,812	4,080	NA
Cement, all types	15,381	16,882	18,134	21,537	22,584
Chalk and similar calcareous rocks—thousand tons	3,960	3,253	3,853	3,676	NA
Clays:					
Bentonite—do	26,736	18,367	19,959	17,328	NA
Brick and tile clay—do	7,557	7,902	8,555	9,993	NA
Ceramic and pottery clay	220,449	284,429	391,306	355,162	NA
Clay and marl for cement industry—thousand tons	5,817	6,194	6,678	8,370	NA
Kaolin and kaolinitic clay	257,026	240,059	271,792	287,475	NA
Refractory clay—thousand tons	1,057	893	912	1,057	NA
Diatomaceous earth	107,437	127,090	132,725	133,083	NA
Dolomite:					
For agriculture	85,649	121,533	106,177	92,495	NA
Crude for calcining	541,187	474,958	476,386	611,552	NA
Other	142,879	249,816	367,518	416,150	NA
Feldspar and pegmatites	173,205	172,924	173,504	196,361	240,000
Fluorspar	194,987	139,765	145,428	220,000	NA
Fly ash—thousand tons				4,583	NA
Gypsum:					
For agriculture	8,835	11,130	11,073	8,134	NA
Plaster and cement—thousand tons	3,798	3,898	4,107	4,790	NA
Anhydrite	28,371	87,441	95,637	113,974	NA
Lava	10,081	10,265	10,029	13,388	NA
Lime:					
Hydraulic	801,404	770,752	739,453	791,443	NA
High-grade (fat lime)—thousand tons	2,946	2,792	2,648	2,917	2,720
Limestone:					
For agriculture—do	641	763	724	749	NA
For iron and steel industry—do	3,917	3,994	4,317	5,071	NA
For lime and cement—do	16,659	18,213	19,227	21,339	NA
For sugar mills—do	528	544	639	735	NA
Total—do	21,745	23,514	24,907	27,894	NA
Marl	230,341	305,096	215,775	217,272	NA
Mica	138	86	173	293	NA
Millstones and grindstones	1,441	1,357	1,267	1,113	NA
Mine fill—thousand tons	11,499	12,073	10,212	12,719	NA
Ochre and mineral pigments	7,772	5,698	4,747	5,265	NA
Phosphatic chalk	81,500	67,442	50,423	43,109	37,563
Potash:					
Gross weight of mine run ore—thousand tons	10,860	11,024	11,058	11,406	11,832
K_2O equivalent—do	1,904	1,922	1,914	1,983	2,037
Pumice	1,320	1,702	770	916	NA
Pozzolana and lapilli	440,642	473,325	545,661	585,631	489,600
Pyrite	285,438	303,954	r 252,310	191,341	134,361
Quartz	347,646	268,394	263,429	302,165	NA
Road building foundation and ballast materials (other than sand and gravel):					
Ballast—thousand tons	39,914	42,392	45,965	52,279	NA
Foundation material—do	2,394	2,583	3,224	5,329	NA
Paving block and curbing—do	178	163	152	230	NA
Ground rock for road fillers—do	541	475	306	87	NA
Total—do	43,027	45,613	49,647	57,925	NA
Salt—do	3,845	4,258	3,694	4,032	3,860
Sand and gravel (alluvial only):					
By dredging—do	46,404	47,516	53,527	61,918	NA
By other winning methods—do	23,302	27,629	35,196	48,490	NA
Total—do	69,706	75,145	88,723	110,408	NA
Sand, industrial:					
Glass—do	1,105	1,236	1,211	1,438	NA
Foundry—do	1,617	1,610	1,741	1,692	NA
Miscellaneous—do	355	395	282	451	NA
Total—do	3,077	3,241	3,234	3,581	NA
Slate:					
Roof	106,865	114,972	119,046	121,319	NA
Other	40,668	44,145	47,156	45,700	NA

See footnotes at end of table.

Table 2.—France: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Nonmetals—Continued					
Sulfur thousand tons	1,108	1,355	r 1,417	1,521	1,531
Talc	222,648	187,000	158,121	205,400	198,000
Mineral fuels:					
Bituminous and asphaltic material	100,189	106,363	109,225	107,608	117,000
Bituminous and anthracite coal thousand tons	r 52,363	r 52,369	47,762	r 53,030	51,345
Lignite do	2,906	2,882	2,475	2,241	2,689
Peat do	30	31	r 32	47	NA
Coke oven coke do	13,753	13,785	13,735	14,303	13,650
Gas coke do	429	247	138	61	20
Coal briquets do	6,091	6,949	8,014	6,650	5,806
Natural gas [6] million cubic feet	212,838	247,509	265,977	280,871	279,845
Petroleum:					
Crude thousand tons	2,163	2,370	2,522	2,845	2,988
Refinery products [7] do	34,948	37,609	44,094	50,376	57,596
Carbon black	46,000	63,000	76,200	84,200	NA

p Preliminary. r Revised. NA Not available.
[1] Hydrated and calcined alumina are successive stages of alumina production and are not to be added.
[2] Arsenic content of final products.
[3] Ferromolybdenum, ferrotungsten, and ferrovanadium data are for contained metal.
[4] Lead content.
[5] Based on first 6 months' production.
[6] Natural gas reported at 15° C and an atmospheric pressure of 760 millimeters of mercury in France, has been converted to cubic feet at 60° F (15.56° C) and 14.7 pounds per square inch (760 millimeters of mercury) by multiplying by 35.37865.
[7] Gross refinery output.

TRADE

Mineral commodity trade continued to be a significant part of total French commodity trade in 1965 as shown in the following tabulation:

	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	1,568	8,080	19.4
1964	1,792	8,990	19.9
1965	1,989	10,048	19.8
Imports:			
1963	2,628	8,724	30.1
1964	2,960	10,067	29.4
1965	3,091	10,336	29.9
Trade balance:			
1963	−1,060	−644	XX
1964	−1,168	−1,077	XX
1965	−1,102	−288	XX

XX Not applicable.
[1] Includes commodities listed in tables 4 and 5 of this chapter except gold and cut, but unset gems.

Iron and steel (including scrap), petroleum products, and nonferrous metals (including semimanufactures) were the most important export items in the mineral field accounting for about 10.2, 2.8, and 2.3 percent, respectively, of all French exports. Mineral fuels remained dominant among imports in both tonnage and value, accounting for 52 percent of the value of the tabulated mineral and metal imports and 15 percent of the value of all imports.

In 1965, the value of imports of all nonferrous metals and semimanufactures, ore, and scrap showed a further increase compared with that of 1964. Larger imports of chromium ore and metal, manganese ore and metal, scrap and refined copper, mercury, nickel matte, platinum, tungsten ore, and radioactive materials were contributory factors.

Imports of copper and copper alloy ingots and semimanufactures in 1965 were valued at $250 million; corresponding figures for other principal nonferrous metals were, in million dollars, aluminum 50.4, silver and platinum 46.1, tin 39.2, nickel 21.5, lead 9.6, and zinc 6.2.

There was little change in France's trade pattern as far as destinations were concerned. The other countries of the European Economic Community (EEC) [8]

[8] The EEC includes Belgium, France, Italy, Luxembourg, the Netherlands, and West Germany.

Table 3.—France: Summary of mineral commodity trade in 1965

Commodity	Imports		Exports	
	Quantity (thousand metric tons)	Value (thousand dollars)	Quantity (thousand metric tons)	Value (thousand dollars)
Metals:				
Iron and steel:				
Iron ore, including pyrite cinder	3,985	44,735	20,990	72,097
Scrap	494	18,909	1,832	68,732
Pig iron, ferroalloys, sponge iron, powder, shot and grit	170	26,135	387	54,198
Primary steel forms and iron and steel semimanufactures	3,878	522,912	6,664	912,194
Other:				
Ores	1,858	137,101	214	6,611
Scrap and other metal-bearing waste	62	17,750	128	52,817
Metal oxides for paint and other uses	56	13,839	164	21,424
Metals including semimanufactures:				
Precious, except gold	1	46,050	(1)	11,607
Mercury, metaloids, alkali, alkaline earth and rare	1	8,787	13	4,689
Other base	448	399,964	336	217,675
Total	10,953	1,236,182	30,728	1,422,044
Nonmetals:				
Abrasives, natural, including industrial diamond	52	8,176	17	2,410
Cement, lime, worked dimension stone and other building materials	302	14,416	965	22,423
Fertilizer materials:				
Crude	2,916	46,092	140	2,402
Manufactured, including Thomas slag	1,583	50,906	2,344	81,320
Stone, sand and gravel, except worked dimension stone	3,682	18,164	8,387	18,669
Other	2,975	121,815	2,352	119,021
Total	11,510	259,569	14,205	246,245
Mineral fuels and related commodities:				
Carbon black	40	8,703	41	8,039
Coal, lignite, coke, peat and briquets thereof	17,210	364,211	1,002	18,200
Gas, natural and manufactured	189	11,297	392	12,706
Petroleum:				
Crude	58,556	1,087,609	(1)	18
Products	3,905	116,220	9,581	277,981
Crude chemicals distilled from coal, petroleum, and/or natural gas	209	6,975	77	3,945
Total	80,109	1,595,015	11,093	320,889
Grand total	102,572	3,090,766	56,026	1,989,178

[1] Less than ½ unit.

Source: Statistical office of the United Nations.

and the countries of the European Free Trade Association (EFTA) [9] remained France's most important trading partners. In 1965, 40.9 percent of all exports of France were to other EEC countries and 15.6 percent were to EFTA countries. The corresponding import figures were 38.9 percent from EEC countries and 11.0 percent from the EFTA countries. For the minerals and metals tabulated, France's exports to other EEC nations were 49 percent of the total; those to the EFTA countries were 18 percent. For the same commodities, imports from the EEC countries were 36 percent of the total; those from the EFTA countries were 5 percent.

The principal mineral and metal exports of France in 1964 to other EEC countries were substantially the same as in 1963. French steel exports to this market were equivalent to 42 percent of France's steel exports to all destinations in value. The United States was an important market for aluminum semimanufactures, arsenic anhydride, chromium metal, iron and steel semimanufactures, industrial and gem diamonds, and coal chemicals; for the commodities tabulated France's exports to

[9] The EFTA includes Austria, Denmark, Norway, Portugal, Sweden, Switzerland, and the United Kingdom.

United States totaled about $143 million. EFTA countries (principally United Kingdom) were the largest market for French sulfur and accounted for 51.3 percent of the exports; these countries also received 17 percent of primary steel and semimanufactures and 27 percent of chemical potassic fertilizers. Switzerland took nearly 17 percent of France's exports of coal and coal briquets, 7 percent of steel (including primary forms), and 25 percent of petroleum products. For the latter, Switzerland was France's largest single customer but only by a small margin compared with West Germany.

Iron and steel, solid fuels, copper, lead, and zinc were France's principal imports from its EEC partners. Belgium supplied the bulk of France's imports of cadmium, cobalt, lime, manufactured fertilizers, and dolomite and was an important source of refined copper and semimanufactures, pig lead, slab zinc, and diamonds. Imports from United States included nickel, lead and steel scraps, magnesium, manganese oxide, molybdenum ore, selenium, silver, tantalum, titanium metal, uranium metal and other radioactive materials, zirconium oxide, borates, sulfur, talc, and coal; value of these and other commodities totaled $140 million. Algeria remained the largest source of crude petroleum which, valued at $332 million, was equivalent to 54 percent of France's total imports from the country. Morocco supplied France with phosphates and metallic ores valued at about $53 million, equivalent to 23 percent of all imports to France from Morocco.

Table 4.—France: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	Total export			1964 destinations	
	1963	1964	1965	EEC [1]	Principal destinations
Metals:					
Aluminum:					
Oxide and hydroxide [2]	171,540	156,584	131,730	12,785	Switzerland 74,571; Spain 60,382.
Bauxite	205,901	199,634	201,784	140,913	West Germany 136,421; United Kingdom 53,491.
Metallurgical residues	1,838	1,705	2,981	1,705	West Germany 1,308; Italy 227.
Metal, including alloys:					
Scrap	12,368	11,425	12,377	11,186	West Germany 8,402; Italy 2,431.
Ingots	124,691	125,163	182,699	97,900	Belgium-Luxembourg 83,147; United States 12,364; Netherlands 6,697.
Semimanufactures	33,269	42,458	42,596	18,023	Italy 5,737; United States 5,305; West Germany 4,526.
Antimony:					
Ore	100	51	NA	51	All to Italy.
Metal, including scrap	266	94	74	20	Belgium-Luxembourg 20; Algeria 19; Spain 15.
Arsenic (anhydride)	9,562	9,466	10,375	1,161	United States 2,937; Japan 1,880; United Kingdom 1,106.
Beryllium	3	5	6	—	United States 4; United Kingdom 1.
Bismuth	47	61	59	8	United Kingdom 51; Netherlands 6.
Cadmium	65	77	104	70	Belgium-Luxembourg 45; West Germany 21.
Chromium:					
Oxide and hydroxide	579	570	750	268	Belgium-Luxembourg 149; Netherlands 105; Czechoslovakia 101.
Ore	30	160	403	133	NA.
Metal	277	186	340	83	United States 89; West Germany 50.
Cobalt	458	573	649	86	United States 432; West Germany 44; Netherlands 38.
Columbium	value, thousands	NA	$13	$1	$9	NA.

See footnotes at end of table.

Table 4.—France: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total export			1964 destinations	
	1963	1964	1965	EEC [1]	Principal destinations
Metals—Continued					
Copper:					
Metallurgical residues	10,278	7,286	7,505	7,138	Belgium-Luxembourg 5,906; West Germany 1,201.
Matte	r 894	808	1,663	743	West Germany 433; Belgium-Luxembourg 158; Italy 91.
Metal and alloys:					
Blister and other unrefined.	14,732	11,850	18,634	11,547	Belgium-Luxembourg 6,474; West Germany 5,015.
Scrap	33,576	45,580	41,199	40,949	West Germany 25,059; Belgium-Luxembourg 10,527; Italy 4,600.
Refined	2,677	7,288	10,583	6,668	West Germany 4,731; Italy 1,133.
Semimanufactures	18,723	20,836	34,352	6,117	United States 3,849; West Germany 2,625; Switzerland 1,820.
Gallium [3]—value, thousands	$162	$188	$170	$4	Switzerland $150; Bulgaria $28.
Germanium	4	10	7	10	All to Belgium-Luxembourg.
Gold:[4]					
Metal, including alloys troy ounces	24,531	21,605	16,847	5,465	Algeria 5,562; Netherlands 4,276.
Ashes and sweepings. do	3,472	4,244	3,890	----------	Martinique 3,633; Switzerland 579.
Other metal (temporary imports and exports). do	37,713	32,504	51,409	NA	NA.
Iron and steel:					
Iron ore—thousand tons	21,204	22,091	20,747	21,859	Belgium-Luxembourg 15,448; West Germany 6,410; United Kingdom 231.
Pyrite cinder do	344	291	243	245	West Germany 198; United Kingdom 47; Belgium-Luxembourg 46.
Slag, dust, scale etc. do	970	1,430	1,193	1,285	West Germany 1,047; Belgium-Luxembourg 208; Switzerland 126.
Scrap do	1,195	1,502	1,832	1,474	Italy 1,355; West Germany 67; Belgium-Luxembourg 49; Spain 26.
Pig iron,[5] including speigeleisen. do	166	129	130	121	West Germany 49; Belgium-Luxembourg 42; Italy 29.
Ferroalloys do	193	247	256	166	West Germany 78; Belgium-Luxembourg 53; United States 52.
Ingots and other primary forms. do	387	842	787	607	Italy 238; Belgium-Luxembourg 199; West Germany 164; Switzerland 62.
Semimanufactures:					
Bars, rods, sections[6]. do	1,894	2,017	2,372	801	West Germany 531; United States 296; Switzerland 151; Belgium-Luxembourg 133; Africa 228.
Universals, plate, sheet. do	1,915	2,325	2,426	1,174	West Germany 789; Italy 252; Switzerland 149; Belgium-Luxembourg 99; Spain 87; Sweden 73; United States 54.
Hoop and strip. do	238	220	223	112	West Germany 66; Italy 33; Switzerland 30.
Rails and accessories. do	131	101	140	25	Italy 16; Cameroon 14; Israel 12; Denmark 9.
Wire do	111	113	111	9	United States 26; Algeria 7; Morocco 5.

See footnotes at end of table.

Table 4.—France: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total export			1964 destinations	
	1963	1964	1965	EEC [1]	Principal destinations
Metals—Continued					
Iron and steel—Continued					
Semimanufactures—Continued.					
Tubes, thousand tons pipes, fittings.	544	526	601	72	United States 57; Netherlands 49; Algeria 44; Iran 39.
Castings do and forgings, rough.	3	4	4	2	West Germany 2.
Lead:					
Ore	125	5,057	3,178	4,933	Belgium-Luxembourg 3,807; West Germany 1,126.
Metallurgical residues	4,402	9,333	5,799	9,228	Belgium-Luxembourg 7,723; West Germany 1,372.
Oxides	4,925	6,376	5,628	2,409	Hungary 1,407; West Germany 1,111; Netherlands 1,081.
Metal including alloys:					
Scrap	8,369	9,723	12,132	9,629	Italy 6,478; West Germany 1,763; Belgium-Luxembourg 1,285.
Pig, including alloys	19,267	16,690	14,926	11,923	West Germany 11,368; Switzerland 3,842; Algeria 553.
Semimanufactures, including alloys.	r 723	1,408	1,160	145	Greece 383; Morocco 288; Italy 117.
Magnesium, all forms	107	201	21	56	Norway 70; Sweden 15; Common Market 56.
Manganese:					
Ore	1,840	1,758	1,591	1,345	Italy 832; Netherlands 321; Switzerland 232.
Oxide	280	282	221	157	West Germany 95; Poland 75.
Metal, all forms	202	1,043	1,590	838	West Germany 519; Italy 155; Belgium-Luxembourg 116.
Mercury 76-pound flasks	348	116	203	58	Belgium-Luxembourg 58; Upper Volta 58.
Molybdenum:					
Ore	20	42	15	28	Italy 26; Austria 14.
Oxide	24	18	60	2	Austria 16.
Metal, all forms	18	27	11	20	West Germany 8; Belgium-Luxembourg 7; Netherlands 4.
Nickel:					
Matte, speiss, etc	1,220	666	56	237	United States 289; West Germany 212.
Metallurgical residues	733	387	854	48	Japan 203; United Kingdom 71; United States 65.
Oxide and hydroxide	362	507	380	170	United States 171; Netherlands 85; Italy 50.
Metal including alloys:					
Scrap	3,099	840	1,378	434	United Kingdom 324; West Germany 175; Netherlands 154.
Ingots	5,582	3,332	4,808	996	Mainland China 999; West Germany 726; Austria 300; Italy 228; Canada 229; Spain 189.
Semimanufactures, including anodes.	1,073	1,139	1,773	527	West Germany 252; Spain 179; Belgium-Luxembourg 116; United States 103.
Platinum and platinum-group: [4]					
Metal, troy ounces including alloys.	61,086	61,086	73,947	22,505	Netherlands 16,075; United Kingdom 16,075; Switzerland 12,860.
Ashes and do sweepings.	8,295	55,460	96	55,460	Belgium-Luxembourg 25,078.

See footnotes at end of table.

Table 4.—France: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total export			1964 destinations	
	1963	1964	1965	EEC [1]	Principal destinations
Metals—Continued					
Selenium	2	2	1	2	NA.
Silver:[4]					
Metal, including alloys thousand troy ounces	2,884	4,057	6,186	2,890	West Germany 1,289; Netherlands 871; Belgium-Luxembourg 704.
Ashes and sweepings thousand troy ounces	667	608	122	3	Sweden 605.
Sodium metal	2,293	1,898	1,905	1,671	Italy 1,671.
Tantalum (powder)	NA	2	2	2	All to West Germany.
Tin:					
Ore—long tons	371	643	642	82	Spain 553; Netherlands 82.
Oxide—do	68	48	54	42	West Germany 42.
Metal including alloys:					
Scrap—do	11	33	26	21	Netherlands 21; United Kingdom 12.
Ingots—do	93	195	231	33	Switzerland 78; West Germany 27; Tunisia 18.
Semimanufactures—do	104	63	83	6	Tunisia 20; other Franc zone 26.
Titanium:					
Dioxide	7,868	10,676	10,725	1,025	United States 6,061; United Kingdom 1,488; Italy 710.
Metal, all forms	21	35	48	22	West Germany 12; Switzerland 4.
Tungsten:					
Ore	108	64	5	64	All to West Germany.
Trioxide	64	113	122	46	Austria 61; West Germany 46.
Metal, all forms	75	177	206	100	West Germany 82; Sweden 25; United Kingdom 16.
Uranium and other radioactive materials:					
Ore	NA	3,334	2,888	3,334	All to West Germany.
Metal, including thorium. kilograms	300	800	1,300	----------	All to United States.
Other radioactive material. metric tons	288	256	333	88	Italy 43; Japan 38; West Germany 28.
Zinc:					
Ore	499	718	505	718	All to Belgium-Luxembourg.
Matte, ashes, residues	11,582	33,707	14,230	31,211	Belgium-Luxembourg 29,911; Italy 1,025.
Dust (blue powder)	1,362	1,046	1,292	NA	Norway 900; Hungary 120.
Oxide	4,608	4,088	4,720	1,218	West Germany 1,032; Morocco 583; Israel 394.
Metal including alloys:					
Scrap	1,331	1,144	764	1,143	Italy 951; Belgium-Luxembourg 187.
Slab and ingot	14,573	11,921	18,022	6,733	West Germany 5,417; Italy 1,295; Switzerland 1,170.
Semimanufactures	3,270	1,709	3,041	1,172	West Germany 1,168.
Zirconium:					
Ore	314	243	177	231	West Germany 125; Netherlands 100.
Oxide	12	33	58	29	Netherlands 20; Italy 7.
Metal, including nuclear grade.	2	13	38	1	United Kingdom 9.
Other metals[7]	23	15	65	NA	NA.
Other metallic ores, ashes, residues.	25,332	30,186	28,605	18,824	Sweden 10,298; Belgium-Luxembourg 10,267; West Germany 7,031.
Other slag and ash	19,499	49,695	114,553	37,426	West Germany 33,315; Switzerland 12,252.
Nonmetals:					
Abrasives, natural, not elsewhere specified.	466	640	----------	621	West Germany 558.
Asbestos	6,175	8,926	5,013	3,702	Belgium-Luxembourg 3,041; Algeria 2,135; Argentina 1,359.

See footnotes at end of table.

Table 4.—France: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total export			1964 destinations	
	1963	1964	1965	EEC [1]	Principal destinations
Nonmetals—Continued					
Asbestos-cement products	39,188	38,719	34,277	24,412	West Germany 7,754; United Kingdom 5,273; Malaysia 3,536.
Barite, including witherite	10,876	16,162	14,046	8,308	Nigeria 5,725; Netherlands 2,748; Belgium-Luxembourg 2,747.
Borates, natural	354	698	1,212	335	Morocco 282; West Germany 247.
Bromine	763	977	1,101	23	United Kingdom 600; Switzerland 353.
Cement—thousand tons	1,081	836	717	321	West Germany 242; Ivory Coast 75; Spain 62; Malagasy Republic 55.
Chalk	232,278	247,603	269,803	215,632	West Germany 105,392; Belgium-Luxembourg 64,428; Netherlands 27,734.
Clays and clay products:					
Crude:					
Kaolin	51,958	55,939	56,109	408,506	West Germany 39,739.
Bentonite	2,272	3,045	2,429		Iran 1,259; Netherlands 310.
Refractory	334,600	346,209	343,201		Italy 178,432; West Germany 82,367; Belgium-Luxembourg 57,562.
Other	18,164	40,023	26,714		West Germany 27,678.
Clay and refractory construction materials (bricks, tile, etc.).	195,669	183,689	194,642	112,711	West Germany 62,604; Belgium-Luxembourg 36,469; Greece 9,476.
Corundum:					
Natural, including emery	59	105	50	74	Common Market 74.
Artificial	12,370	9,941	10,172	4,735	United Kingdom 1,643; Italy 1,572; Belgium-Luxembourg 1,473.
Cryolite and chiolite, natural	88	40	556	40	All to Common Market countries.
Diamond:					
Industrial excluding powder. value, thousands	$1,084	$1,379	$1,383	$735	West Germany ,514; India $229; Netherlands $198; United States $164.
Gem, unset—do	$3,453	$4,875	$3,843	$1,046	United States $1,533; Switzerland $1,046; Morocco $879.
Dust and powder—do	r$123	r$114	$112	$80	Belgium-Luxembourg $76; United Kingdom $29.
Diatomite	12,191	14,587	16,564	13,448	West Germany 9,420; Belgium-Luxembourg 1,448; Netherlands 1,385.
Dolomite, including calcined	25,465	26,486	24,674	15,911	West Germany 10,395; Belgium-Luxembourg 5,212; Switzerland 2,951.
Earth pigments, including iron oxide.	12,392	12,028	8,376	7,034	West Germany 2,716; Netherlands 2,014; United Kingdom 1,626.
Earths, other (pozzolan, santorin, etc.).	2,383	2,175	2,139	192	Switzerland 1,983.
Feldspar	19,480	26,901	25,338	24,005	Belgium-Luxembourg 15,478; West Germany 8,027.
Fertilizer materials:					
Crude:					
Nitrogenous (natural sodium nitrate).	446	130	487	100	Common Market 100.
Phosphate rock	r2,589	2,547	14,606	115	Austria 1,000; Switzerland 590; United Kingdom 559.
Potassic salts	73,199	91,483	92,151	87,846	Belgium-Luxembourg 48,675; Netherlands 39,171.

See footnotes at end of table.

Table 4.—France: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total export			1964 destinations	
	1963	1964	1965	EEC [1]	Principal destinations
Nonmetals—Continued					
Fertilizer materials—Continued					
Manufactured:					
Nitrogenous thousand tons	747	489	645	55	Greece 89; Spain 63; Algeria 53; Belgium-Luxembourg 47.
Phosphatic:					
Basic slag do	303	343	337	NA	Austria 189; Switzerland 127.
Other do	44	55	47	9	Denmark 13; Bulgaria 12; Netherlands 7.
Potassic do	1,239	1,403	1,187	458	Belgium-Luxembourg 260; United Kingdom 191.
Flint (pebbles)	59,877	75,699	80,792	31,765	United Kingdom 20,300; West Germany 15,453; United States 14,456.
Fluorspar	46,572	58,625	86,332	41,770	West Germany 32,101; Sweden 6,283; Belgium-Luxembourg 5,311.
Graphite	1,767	2,284	1,900	1,057	United Kingdom 824; Italy 439; West Germany 289.
Gypsum and anhydrite, including plaster.	648,147	766,524	786,572	480,689	Belgium-Luxembourg 399,734; Sweden 143,749; United Kingdom 57,543.
Lime	115,747	173,545	194,110	157,044	West Germany 93,262; Belgium-Luxembourg 63,752.
Limestone, for flux, cement, etc.	170,378	182,695	179,593	115,038	Belgium-Luxembourg 85,883; Switzerland 46,657.
Lithium and strontium minerals.	NA	238	NA	238	All to West Germany.
Magnesite, including calcine	442	219	534	197	Italy 174.
Mica	99	353	577	136	Libya 116.
Precious and semiprecious stones. [8] value, thousands	$4,810	$6,152	$8,660	$1,073	Switzerland $2,812; West Germany $590; United Kingdom $570.
Pumice	31	53	33	----	NA.
Pyrite	----	2,176	30	2,176	NA
Quartz and quartzite	2,242	1,430	1,874	1,016	NA.
Salt	r 137,266	137,257	94,071	130,133	Belgium-Luxembourg 84,508; West Germany 41,204.
Slate, rough and finished	14,648	18,885	17,089	16,000	Netherlands 7,590; Belgium-Luxembourg 6,008; United Kingdom 2,256.
Stone, sand and gravel: [9]					
Building stone:					
Unfinished	127,809	125,476	120,494	107,415	Belgium-Luxembourg 77,441; West Germany 21,855; Switzerland 10,281.
Finished	7,761	6,448	6,014	4,530	West Germany 2,857; Netherlands 925.
Gravel and other crushed stone. thousand tons	2,959	3,688	5,758	2,831	West Germany 2,490; Switzerland 842; Netherlands 181.
Sand do	1,034	1,360	1,451	1,006	West Germany 629; Switzerland 344; Belgium-Luxembourg 221.
Sulfur, elemental do	r 1,020	1,047	925	245	United Kingdom 379; West Germany 127; Netherlands 94.
Talc and steatite	49,624	51,278	51,182	19,699	West Germany 12,119; United Kingdom 9,060; Switzerland 17,281.
Other mineral substances	145,888	141,614	146,413	25,575	Switzerland 113,439; West Germany 16,644.

See footnotes at end of table.

Table 4.—France: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total export			1964 destinations	
	1963	1964	1965	EEC [1]	Principal destinations
Mineral fuels:					
Asphalt and bitumen, natural	20,506	20,429	19,230	---	United Kingdom 20,290.
Asphalt, worked	3,294	4,498	5,660	2,594	West Germany 1,782; United Kingdom 610.
Coal	1,003,077	915,016	842,581	767,845	West Germany 437,496; Belgium-Luxembourg 225,102; Switzerland 137,312.
Coal briquets	14,105	29,718	40,868	23,760	Italy 19,430; Switzerland 5,811.
Coke	51,145	36,386	57,152	6,964	Switzerland 15,775; Spain 5,395; Turkey 5,082.
Gas:					
Natural, including liquid petroleum gas (propane, butane, and other liquid petroleum gases).	221,804	287,824	392,147	87,009	Spain 72,739; Belgium-Luxembourg 61,366; Portugal 57,589; United Kingdom 36,220.
Manufactured	198,110	37,674	196	37,674	All to Belgium-Luxembourg.
Lignite, including briquets	628	21,570	61,174	---	Spain 21,302.
Peat, including briquets	316	343	488	342	NA.
Petroleum refinery products:					
Gasoline--thousand tons	1,396	1,491	1,889	404	Switzerland 538; United Kingdom 349; West Germany 307;
Kerosine---------do	860	921	490	188	Switzerland 136; international bunkers 237; West Germany 88; United Kingdom 66.
Distillate fuel oil--do	2,606	2,869	3,472	1,304	West Germany 852; Netherlands 310; United Kingdom 162.
Residual fuel oil---do	2,326	2,760	3,137	1,199	West Germany 847; international bunkers 512; Switzerland 416; United Kingdom 284.
Lubricants--------do	225	262	244	72	United Kingdom 41; Algeria 33; West Germany 24.
Other----------do	324	315	349	138	West Germany 85; Switzerland 66; Algeria 51.
Total refined products. do	7,737	8,618	9,581	3,305	Switzerland 2,206; West Germany 2,202; United Kingdom 903; international bunkers 847.
Chemical derivatives of coal, petroleum, or gas.	75,780	77,043	76,886	31,175	Belgium-Luxembourg 14,831; United States 12,399; United Kingdom 11,696.

NA Not available. r Revised.
[1] Belgium, West Germany, Italy, Luxembourg, and the Netherlands.
[2] Excludes artificial corundum.
[3] Including indium and thallium.
[4] Calculated from quantities reported in kilograms.
[5] Including cast iron and shot, grit, powder, and sponge of iron or steel.
[6] Including wire rod.
[7] Alkali, alkaline earth, and rare earth metals except sodium.
[8] Including synthetic and reconstituted stone but not including diamond.
[9] Not including slate, flint, or industrial limestone.

Table 5.—France: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	Total import			1964 sources	
	1963	1964	1965	EEC [1]	Principal sources
Metals:					
Aluminum:					
Bauxite	142,499	145,844	116,508	----------	Greece 68,191; British Guiana 37,198; Surinam 19,889; Ghana 19,235.
Oxide and hydroxide [2]	126,794	67,068	19,700	575	Guinea 56,100; United States 10,369.
Metallurgical residues	1,278	2,897	11,615	2,278	West Germany 1,713; Italy 565; Spain 415.
Metal including alloys:					
Scrap	2,295	2,685	2,165	1,995	Belgium Luxembourg 1,833; United States 386; Canada 118.
Ingots	55,870	72,438	71,694	382	Cameroon 40,713; United States 18,296; Norway 7,408.
Semimanufactures	12,417	16,259	19,425	12,384	West Germany 6,372; Belgium-Luxembourg 4,490; Switzerland 1,060.
Antimony:					
Ore and concentrates	867	2,691	1,678	----------	Republic of South Africa 1,176; Morocco 407; mainland China 301.
Metal, all forms	2,787	2,670	1,737	415	Mainland China 1,780; U.S.S.R. 422; Belgium-Luxembourg 305.
Arsenic, including anhydride	67	114	144	34	Arsenic only: Poland 17; Sweden 12.
Beryllium:					
Ore	122	381	NA	----------	All from Malagasy Republic.
Metal, all forms, value, thousands	$104	$69	$180	$4	United States $60.
Bismuth	665	785	700	90	United Kingdom 564; Peru 60; South Korea 42.
Cadmium	807	578	408	337	Belgium-Luxembourg 319; Republic of the Congo (Léopoldville) 77.
Cobalt:					
Ore	10,522	10,392	11,672	----------	All from Morocco.
Oxide and hydroxide	81	89	131	59	Belgium-Luxembourg 55; United Kingdom 28.
Metal, all forms	270	231	313	189	Belgium-Luxembourg 183; United States 15.
Chromium:					
Ore	153,662	193,395	224,287	----------	U.S.S.R. 78,305; Turkey 46,134; Iran 28,671.
Oxide and hydroxide	1,671	1,502	1,870	1,125	West Germany 1,122; United Kingdom 376.
Metal	11	1	14	1	NA.
Columbium:					
Ore (including tantalum ore)	72	150	138	----------	Canada 130; Nigeria 20.
Metal, all forms, value, thousands	$109	$106	$128	$21	United States $63.
Copper:					
Metallurgical residues	39	851	112	131	Morocco 250.
Matte	50	203	297	46	United States 60; Canada 51.
Metal including alloys:					
Scrap	8,507	7,145	11,855	2,935	Belgium-Luxembourg 2,084; United States 812; Algeria 789.
Blister and other unrefined	8,170	10,808	6,290	220	Republic of the Congo (Léopoldville) 9,334.
Refined	212,430	249,826	262,019	100,305	Belgium-Luxembourg 93,406; Rhodesia-Nyasaland 46,455; United States 33,413; Republic of the Congo (Léopoldville) 21,524; Chile 20,105.

See footnotes at end of table.

Table 5.—France: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total import			1964 sources	
	1963	1964	1965	EEC [1]	Principal sources
Metals—Continued					
Copper—Continued					
Metal including alloys: —Continued					
Semimanufactures	10,738	15,097	15,767	12,327	Belgium-Luxembourg 5,025; West Germany 3,302; Italy 2,588.
Germanium, gallium, etc.[3]	1	2	3	2	Netherlands 1; Belgium-Luxembourg 1.
Gold:[4]					
Ashes and sweepings. troy ounces	50,862	79,959	345,331	289	Switzerland 6,269; Algeria 1,029; other Franc zone 68,802.
Metal, including alloys. do	32,376	42,375	37,005	31,218	West Germany 19,708; Italy 9,774; Switzerland 5,144.
Metal, other (temporary imports and reexports). do	178,083	77,419	110,566	30,478	Switzerland 23,438; United Kingdom 23,218; Netherlands 19,966.
Iron and steel:					
Iron ore thousand tons	3,478	3,602	3,909	214	Mauritania 997; Liberia 815; Sweden 478; Brazil 394; Peru 239; Belgium-Luxembourg 197; Morocco 145.
Roasted iron pyrites do	27	40	77	20	Spain 19; Italy 13; West Germany 7.
Slag, dust, scale, etc do	680	705	708	705	West Germany 438; Belgium-Luxembourg 248; Italy 19.
Scrap do	577	584	494	361	Belgium-Luxembourg 261; United States 114; United Kingdom 103.
Pig iron, spiegeleisen, etc.[5] do	r 223	201	124	150	West Germany 91; Belgium-Luxembourg 41; Finland 23.
Ferroalloys do	r 34	38	46	10	New Caledonia 22; Belgium-Luxembourg 7; Norway 4.
Ingots and other primary forms. do	1,138	1,189	943	1,115	Belgium-Luxembourg 538; West Germany 520.
Semimanufactures:					
Bars, rods, sections [6]. do	1,018	1,249	1,174	1,217	West Germany 769; Belgium-Luxembourg 377; Italy 67.
Universals, plates, sheets. do	1,099	1,282	1,287	1,238	West Germany 611; Belgium-Luxembourg 544; Italy 46.
Hoop and strip do	223	278	247	272	Belgium-Luxembourg 173; West Germany 95.
Rails and accessories. do	16	31	38	10	United Kingdom 19; Belgium-Luxembourg 7.
Wire do	41	48	51	43	West Germany 35; Belgium-Luxembourg 8.
Tubes, pipes, fittings. do	104	129	137	105	West Germany 83; Belgium-Luxembourg 17; Sweden 8.
Rough castings and forgings.	1,033	828	1,709	690	West Germany 468.
Lead:					
Ore	132,271	144,090	130,387	----------	Morocco 68,947; Australia 28,054; Canada 13,793; Sweden 12,279.
Metallurgical residues	601	578	3,347	17	Morocco 490; Switzerland 71.
Oxides	2,706	2,099	2,327	867	Mexico 1,037; West Germany 666; Belgium-Luxembourg 196.
Metals including alloys:					
Scrap	4,002	1,448	2,950	701	Belgium-Luxembourg 542; United States 202; Switzerland 197.

See footnotes at end of table.

Table 5.—France: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total import			1964 sources	
	1963	1964	1965	EEC [1]	Principal sources
Metals—Continued					
Lead—Continued					
Metals including alloys: —Continued.					
Pig	67,789	58,160	28,170	17,812	Morocco 16,930; Belgium-Luxembourg 12,300; Peru 9,794.
Semimanufactures	239	348	484	313	Belgium-Luxembourg 184; West Germany 127.
Magnesium including alloys:					
Scrap	12	5	6	----	NA.
Ingots	1,848	2,659	1,196	865	Italy 855; Norway 738; United States 540; Canada 314.
Semimanufactures	103	121	207	12	Canada 70; United States 20.
Manganese:					
Ore	712,299	791,196	854,728	820	Morocco 223,006; Republic of South Africa 220,110; Gabon 183,016; U.S.S.R. 99,854; Brazil 24,960; India 17,512.
Oxide	375	684	1,339	139	Japan 350; United States 152; Belgium-Luxembourg 100.
Metal, all forms	968	613	725	1	Republic of South Africa 565; U.S.S.R. 35.
Mercury—76-pound flasks	15,319	9,921	12,938	5,192	Italy 5,134; Spain 3,394; mainland China 928.
Molybdenum:					
Ore	4,620	4,862	4,171	----	United States 3,583; Peru 690; Chile 363; mainland China 203.
Oxide	29	4	4	4	All from West Germany.
Metal, all forms	37	75	88	39	West Germany 25; Austria 22; Netherlands 13.
Nickel:					
Metallurgical residues	20	2	11	2	NA.
Matte	12,703	11,258	16,823	11	New Caledonia 10,000; Canada 723; Norway 507.
Oxide and hydroxide	66	106	80	1	United Kingdom 72; Canada 32.
Metal including alloys:					
Scrap	1,834	1,344	484	363	United States 443; United Kingdom 296; West Germany 283.
Ingots	4,887	8,426	8,259	36	United Kingdom 3,904; Canada 2,506; Norway 1,786.
Semimanufactures	1,757	2,532	2,120	744	United Kingdom 815; West Germany 710; United States 513.
Platinum and platinum-group:[4]					
Metal—troy ounces	170,399	157,538	176,989	32,150	U.S.S.R. 64,301; United Kingdom 45,011.
Ashes and sweepings—do	133,361	97,384	22,377	33,597	NA.
Selenium	32	32	28	10	Sweden 15; Belgium-Luxembourg 7; United States 5.
Silver:[4]					
Metal, all forms thousand troy ounces	26,544	30,170	24,515	5,321	United States 14,674; United Kingdom 4,186; Switzerland 2,392.
Ashes and sweepings—do	252	357	972	39	Netherlands 39; Switzerland 20; France zone 197.
Tantalum, all forms	4	6	9	1	United States 3; West Germany 1; Austria 1.
Tin:					
Oxide—long tons	25	44	8	44	West Germany 30; Belgium-Luxembourg 14.

See footnotes at end of table.

Table 5.—France: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total import				1964 sources
	1963	1964	1965	EEC [1]	Principal sources
Metals—Continued					
Tin—Continued					
Metal including alloys:					
Scrap—long tons	86	81	40	2	Switzerland 77.
Ingots—do	11,049	11,083	10,042	4,574	Malaysia 3,201; Netherlands 2,395; Belgium-Luxembourg 2,184.
Semimanufactures—do	27	52	115	18	United Kingdom 26; West Germany 10.
Titanium:					
Ore	96,618	140,973	94,919	----------	Malaysia 79,283; Australia 38,023; Spain 16,238.
Dioxide	9,750	12,935	14,721	7,252	West Germany 5,209; United Kingdom 4,021; Japan 1,100.
Metal, all forms	269	254	297	65	United States 80; Japan 77; West Germany 62.
Tungsten:					
Ore	2,191	1,563	2,188	----------	Brazil 588; South Korea 423; U.S.S.R. 220.
Trioxide	28	37	67	36	West Germany 27; Italy 9.
Metal, all forms	41	68	67	27	United States 21; Netherlands 14; West Germany 12.
Uranium and thorium:					
Uranium ore	1,943	1,910	2,239	----------	Gabon 1,325; Malagasy Republic 585.
Thorium ore	1,057	1,489	1,404	----------	Malagasy Republic 867; Australia 622.
Metal, including alloys—kilograms	[7] 1,000	2,500	500	----------	All from United States.
Other radioactive materials—do	84,600	77,300	157,000	13,200	United States 29,800; Norway 14,700; West Germany 10,300.
Vanadium pentoxide	222	405	611	165	West Germany 165; Finland 123; United States 66.
Zinc:					
Ore	281,073	368,137	332,225	14,801	Morocco 72,034; Algeria 57,353; Peru 51,278; Canada 49,087; Finland 20,058; Spain 14,925; Yugoslavia 12,346.
Matte, ashes, residues	5,428	9,752	6,957	5,568	West Germany 3,412; Spain 2,633; Belgium-Luxembourg 941.
Dust (blue powder)	4,078	3,931	4,038	3,844	Belgium-Luxembourg 3,818.
Oxide	1,362	2,256	1,754	1,497	West Germany 820; Yugoslavia 420; Netherlands 364.
Metal including alloys:					
Scrap	13,368	18,883	17,209	17,944	Netherlands 8,691; Belgium-Luxembourg 7,984.
Slab and ingot (including alloys)	20,625	22,141	14,546	11,324	Belgium-Luxembourg 9,827; U.S.S.R. 4,903; Rhodesia-Nyasaland 2,171; West Germany 1,355; Bulgaria 1,005.
Semimanufactures (including alloys)	2,557	3,099	2,928	2,532	Belgium-Luxembourg 1,985; Yugoslavia 444; West Germany 443.
Zirconium:					
Ore	19,685	23,059	29,820	----------	Australia 21,803; Senegal 1,248.
Oxide	114	211	293	7	United States 118; United Kingdom 86.
Metal	6	5	102	----------	All from United Kingdom.
Other metals [8]—value, thousands	$17	$64	$226	$9	United States $34.
Other metallic ores	3,597	2,843	2,897	90	Australia 2,081; New Caledonia 592.

See footnotes at end of table.

Table 5.—France: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total import			1964 sources	
	1963	1964	1965	EEC [1]	Principal sources
Metals—Continued					
Other metalliferous ash, slag, and residues.	74,629	81,362	73,417	78,789	West Germany 44,163; Belgium-Luxembourg 33,783.
Nonmetals:					
Abrasives, natural, not elsewhere specified.	3,591	3,705	2,169	3,508	Italy 3,487.
Asbestos	74,528	109,541	106,665	4,320	Canada 65,119; U.S.S.R. 22,711; Republic of South Africa 12,870.
Asbestos-cement products	18,388	39,314	31,602	34,197	West Germany 18,263; Italy 9,078; Belgium-Luxembourg 6,720.
Barite, including witherite	66,437	67,696	74,442	60,163	West Germany 60,107.
Borates (natural)	39,743	47,181	67,301	---------	Turkey 26,886; United States 20,295.
Bromine	NA	115	NA	73	Italy 73; Israel 42.
Cement	67,957	86,602	94,090	33,515	Algeria 40,238; Belgium-Luxembourg 23,842.
Chalk	8,961	14,985	12,775	14,950	Belgium-Luxembourg 14,907.
Clay and clay products:					
Crude:					
Kaolin, including calcined.	184,211	205,010	209,601	5,913	United Kingdom 176,976; United States 15,668.
Bentonite	91,857	96,383	114,127	7,350	Greece 49,926; Morocco 18,186; Spain 11,493.
Refractory clays	151,456	163,517	169,693	146,969	West Germany 120,207; Belgium-Luxembourg 15,641; United Kingdom 13,118.
Other clays and aluminum silicates.	r 19,846	24,278	26,074	12,272	United Kingdom 7,834; Belgium-Luxembourg 4,936; West Germany 4,143.
Clay and refractory construction materials (bricks, etc.).	164,026	340,150	367,117	285,801	West Germany 166,919; Belgium-Luxembourg 72,530.
Corundum:					
Natural, including emery	2,562	1,394	4,935	630	Greece 728; Netherlands 626.
Artificial	2,205	1,413	1,569	928	West Germany 928; United States 321.
Cryolite and chiolite, natural	1,261	1,730	1,380	---------	Denmark 1,710.
Diamond:					
Industrial, except dust. value, thousands	$4,026	$4,090	$4,004	$1,281	Ireland $1,556; Belgium-Luxembourg $834; United Kingdom $659.
Gem, Unset do	$13,741	$17,221	$15,593	$9,578	Belgium-Luxembourg $8,127; Israel $3,015; Netherlands $1,449; Republic of South Africa $1,443.
Dust and powder do	$2,524	$2,634	$3,014	$976	United Kingdom $921; United States $608; Belgium-Luxembourg $563.
Diatomite	8,964	14,013	7,987	2,077	Algeria 5,429; Spain 4,110; United States 2,151.
Dolomite, including calcined	185,111	184,092	178,233	173,679	Belgium-Luxembourg 166,521; Norway 9,697; West Germany 7,153.
Earth pigments, including iron oxide.	10,612	11,925	13,410	9,686	West Germany 9,524; Morocco 810; Spain 671.
Earths, other (pozzolanic, santorin, etc.).	70	295	103	265	NA.
Feldspar	9,385	11,144	15,940	7,317	West Germany 6,943; Norway 3,048.
Fertilizer materials:					
Crude:					
Nitrogenous (natural sodium nitrate).	49,841	64,916	40,760	---------	All from Chile.

See footnotes at end of table.

Table 5.—France: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total import			1964 sources	
	1963	1964	1965	EEC [1]	Principal sources
Nonmetals—Continued					
Fertilizer materials—Continued					
Crude—Continued					
Phosphate rock. thousand tons	2,235	2,523	2,870	---	Morocco 1,699; Tunisia 549; Togo 130; Senegal 96.
Potassic salts, crude	---	40	---	40	NA.
Manufactured:					
Nitrogenous	156,161	174,970	128,156	162,187	Belgium-Luxembourg 135,873; West Germany 17,516; Switzerland 12,641.
Potassic	54,209	64,209	72,788	64,186	Belgium-Luxembourg 44,441; Italy 10,183.
Phosphatic:					
Basic slag	887,214	787,969	736,856	787,970	Belgium-Luxembourg 569,237; West Germany 218,733.
Other	371,257	417,354	356,219	330,233	Belgium-Luxembourg 176,987; Netherlands 152,506.
Flint (pebbles)	889	7,580	23,127	7,580	Belgium-Luxembourg 7,576.
Fluorspar	77	NA	329	NA	NA.
Graphite	5,094	4,446	5,007	1,217	Malagasay Republic 2,568; Italy 892.
Gypsum and plaster	17,132	20,396	22,107	19,861	West Germany 17,914.
Iodine, crude	NA	NA	400	NA	NA.
Lime	77,224	94,581	77,833	93,021	Belgium-Luxembourg 78,317; West Germany 14,704.
Limestone for flux, cement, etc.	156,315	194,424	188,748	193,913	Belgium-Luxembourg 192,083.
Lithium and strontium minerals	1,324	1,651	NA	1,399	Netherlands 1,311; United Kingdom 224.
Magnesite, including calcined	26,292	35,360	42,962	1,224	Austria 18,916; United Kingdom 3,385; Greece 3,137.
Mica	3,627	5,561	4,808	39	India 2,696; Norway 913; Argentina 630.
Precious and semiprecious stones.[9] value, thousands	$6,042	$6,459	$6,869	$396	India $3,286; Brazil $664; Switzerland $470.
Pumice	28,839	37,489	36,679	37,482	Italy 28,240; West Germany 9,229.
Pyrite	395,622	368,985	350,977	150	Spain 178,179; Cyprus 95,464; Portugal 39,187.
Quartz and quartzite	9,993	15,104	17,447	14,025	Italy 5,900; Belgium-Luxembourg 5,884; West Germany 1,502.
Salt	62,710	133,774	117,733	14,272	Tunisia 85,126; Algeria 34,243.
Slate, rough and finished	2,352	3,436	13,553	2,114	Spain 927; Belgium-Luxembourg 825; Italy 710; Portugal 223.
Stone, sand and gravel:[10]					
Dimension stone:					
Unfinished	73,755	100,797	121,562	45,239	Italy 40,635; Republic of South Africa 18,985; Norway 14,486; Spain 7,421.
Finished	29,111	45,681	74,087	32,946	Italy 30,856; Portugal 11,169; Spain 1,203.
Gravel and other crushed stone. thousand tons	1,507	2,055	2,016	2,039	Belgium-Luxembourg 1,988; West Germany 26; Italy 23.
Sand do	1,225	1,231	1,333	1,226	Belgium-Luxembourg 661; Netherlands 527; West Germany 35.
Sulfur, elemental, all grades	115,077	214,836	264,236	517	Mexico 173,112; United States 40,884.
Talc and steatite	8,680	7,756	6,892	3,646	Italy 3,591; Austria 1,602; United States 1,283.
Other mineral substances	687,065	623,101	313,538	33,774	Switzerland 586,515; West Germany 27,097.

See footnotes at end of table.

Table 5.—France: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	Total import			1964 sources	
	1963	1964	1965	EEC [1]	Principal sources
Mineral fuels:					
Asphalt and bitumen, natural	2,188	1,655	2,169	31	United States 1,396.
Asphalt, worked	670	835	863	673	West Germany 552.
Coal—thousand tons	r 15,929	14,165	11,929	8,272	West Germany 6,358; United States 2,096; U.S.S.R. 1,812; United Kingdom 1,100.
Coal briquets—do	r 811	775	415	752	Belgium-Luxembourg 374; Netherlands 262; West Germany 116.
Coke—do	r 5,531	4,938	4,462	4,934	West Germany 3,692; Netherlands 1,047.
Gas:					
Natural, including liquid petroleum gases.	66,799	66,633	65,853	47,400	West Germany 27,258; Algeria 17,184.
Manufactured	147,712	115,596	123,004	113,723	West Germany 85,254; Belgium-Luxembourg 28,469.
Lignite and briquets. thousand tons	r 503	546	384	527	West Germany 514.
Peat, including briquets—do	13	17	19	16	Netherlands 8; West Germany 7.
Petroleum:					
Crude—do	43,258	49,275	58,556	———	Algeria 17,113; Kuwait 9,798; Iraq 8,078; Iran 3,441; Venezuela 2,594; Libya 2,290; Saudi Arabia 1,945.
Refined products:					
Gasoline—do	700	604	502	103	Venezuela 151; Rumania 118; Algeria 107; Italy 87.
Kerosine, including white spirit.—do	20	20	19	4	Kuwait 10; Algeria 4; Italy 3.
Distillate fuel oil.—do	1,735	2,063	1,720	379	U.S.S.R. 511; Algeria 461; Italy 298; Rumania 243; Saudi Arabia 129; Kuwait 76.
Residual fuel oil—do	1,269	1,302	1,100	372	U.S.S.R. 495; Rumania 196; Netherlands 184; Algeria 132.
Lubricants—do	23	29	33	10	United States 14; United Kingdom 4.
Other—do	861	936	531	224	United States 473; West Germany 174; U.S.S.R. 92.
Total refined products.—do	4,608	4,954	3,905	1,092	U.S.S.R. 1,126; Algeria 704; Rumania 558; Italy 518; United States 500; West Germany 270.
Mineral tar and crude chemicals derived from coal, petroleum, or gas.	226,260	211,441	209,384	63,705	United States 77,053; United Kingdom 54,670.

r Revised. NA Not available.
[1] Belgium, West Germany, Italy, Luxembourg, and the Netherlands.
[2] Excludes artificial corundum.
[3] Includes gallium, germanium, indium, thallium, rhenium.
[4] Calculated from quantities reported in kilograms.
[5] Includes cast iron and sponge, powder, etc., of iron and steel.
[6] Including wire rod.
[7] From quantity reported in metric tons.
[8] Alkali, alkaline earth, and rare-earth metals including cerium and hafnium.
[9] Including synthetic and reconstituted stone but not including diamond.
[10] Excludes slate, flint, or industrial limestone.

COMMODITY REVIEW

METALS

During the year the Commission of Nonferrous Mines and Metals presented its report for the Fifth Economic Development Plan (1965–70). In preparing its report the Commission was guided by three objectives: To assure the nonferrous metal industry of metropolitan France permanent and independent access to necessary raw materials, to improve as far as possible the unfavorable balance of payment position characterizing French trade in minerals, and to maintain the international competitive position of the industry.

While France has been a net exporter of bauxite, alumina, aluminum, and nickel (produced from nickel matte of New Caledonia), the Commission felt that France may become a net importer with regard to the aluminum industry. The Commission postulated production and consumption of principal nonferrous metals in 1970 as follows:

Commodity	Production (tons)	Consumption (tons)
Ores:		
Bauxite	2,745,000	3,060,000
Alumina (calcined)	941,000	[1]
Chromium		263,000–278,000
Cobalt		14,000
Lead	36,000–42,000	175,000
Manganese		840,000
Molybdenum		6,700–7,000
Tungsten		2,600
Tin	250	[1]
Zinc	31,500–35,500	336,000–358,000
Metals:		
Aluminum:		
Primary	365,000	458,000
Secondary	75,000	
Copper	42,000	360,000
Cobalt	1,000	900
Lead:		
Primary	140,000–145,000	238,500
Secondary	28,500	
Nickel	11,000–15,500	26,000
Tin		12,000
Zinc:		
Primary	230,000–245,000	278,000
Secondary	38,000	

[1] Not indicated.

Bauxite and Aluminum.—All bauxite mining companies were active in exploration and improvement of mining facilities. Bauxite exploration was carried out in the Herault, and important reserves were discovered. The Baume-Sud deposit in the Var was put in production by Compagnie des Produits Chimiques et Électrométallurgiques Péchiney (Péchiney); the company produced 1,394,000 tons of bauxite in 1965, a 9-percent increase from 1964 production. Société des Bauxites de France completed the layout of the Touvres and Derobade mines. Comptair d'Extractions et de Vente des Bauxites, which recorded an output of 112,541 tons in 1964, was concentrating production activities in its new Brignoles area, and Société des Bauxites et Alumines de Provence, which produced 391,000 tons of bauxite in 1964, made improvements in its opencast mine at Cabasse.

The expansion of the Gardanne plant from a daily alumina capacity of 1,100 tons to 1,400 tons was completed, raising the country's annual alumina capacity to an estimated 870,000 tons by yearend.

France remained the world's fourth largest aluminum producer, accounting for 5 percent of world output and 26.6 percent of West European production in 1965. Production in this year was 7.8 percent more than in 1964; Péchiney and Société d'Électro-Chimie, d'Électro-Métallurgie et des Acièries d'Électriques de Ugine (Ugine) produced 272,385 and 68,143 tons, respectively. In addition, 44,878 tons of aluminum ingot from the Edea plant in Cameroon was available to the French aluminum market. Shipment (production) of

semifinished products other than castings remained almost the same as in 1964, totaling 189,300 tons distributed as follows: plate, sheet, and foil 129,900; extrusion and tube products 33,500; wire 22,700; forgings 3,200. In addition 102,700 tons of castings, 9,900 tons of aluminum for the steel industry, and 8,400 tons of aluminum paste were shipped.

As a result of expansion at the Rioupéroux and Noguères plants of Péchiney and the Venthon plant of Ugine, total annual ingot capacity increased to 357,000 tons, with Péchiney having about 280,000 tons [10] and Ugine 77,000 tons. Continued installation of modern rectifiers and improved power consumption were reported by Péchiney.

Shipments by L'Aluminum Français reached 400,100 tons of aluminum content. The share of aluminum alloys in sales continued to increase and reached 27 percent.

Domestic demand did not grow in 1965, and aluminum consumption was 248,598 tons (249,275 tons in 1964), despite the fact that the Renault and Peugeot automobile producers for the first time started making cars with aluminum engine blocks. The domestic price of aluminum ingots was increased in April from $506 to $531 per ton, and the basis was changed from ex-works to delivery-point.

While domestic consumption did not rise significantly, exports increased 34 percent. The EEC and the United States were the two largest markets, receiving 60 and 20 percent, respectively. Of total aluminum exports, four-fifths were ingots.

The rolling mill of Société Rhénalus [11] at Neubreisach on the Rhine, with 100,000 tons' annual capacity was scheduled to start production at the end of 1966. It was hoped that this plan would secure part of the West German market.

Work was underway to increase the daily capacity of the Gardanne alumina plant from 1,100 to 1,420 tons (518,000 tons per year).

On November 15 an agreement was announced which increased integration among the producers of aluminum semifinished products. Péchiney and Ugine, together with their affiliate, L'Aluminium Français, agreed to the following measures:

1. L'Aluminium Français will conclude a long-term agreement with Tréfimétaux (a company formed by the merger of la Compagnie Française des Métaux and Tréfileries et Laminoirs du Havre), the largest French manufacturer of nonferrous sheets, shapes, and other semifinished products, to supply the aluminum need of the Tréfimétaux to the extent that they would not be satisfied from a plant on the island of Curaçao, in the Netherlands Antilles. (Subsequently it was decided not to build the Curaçao plant.)
2. Tréfimétaux and the Compagnie Générale du Duralumin et du Cuivre Cégédur) in which Péchiney and Ugine together are majority holders will reinforce their cooperation with the aim of rationalizing the production and development of aluminum and aluminum alloy semifinished products. Cégédur is the largest French producer of aluminum semifinished products.
3. Tréfimétaux and Coquillard, a subsidiary of Péchiney which specializes in aluminum foil, will develop their activities in aluminum foil together and may eventually create a new, jointly held company in this field.

Copper.—Consumption of primary refined copper was 287,000 tons, a 1.6-percent decline from 1964; it is estimated that 10,000 tons of secondary refined copper was also used. Direct use of scrap in 1964 amounted to 112,900 tons of copper content;[12] in view of large imports of copper in 1965, scrap use was probably greater.

Compared with 1964 figures, 1965 copper imports increased 5 percent for refined unwrought metal, over 4 percent for semimanufactures, and 66 percent for scrap, but declined 42 percent for blister and other unrefined ingots. Unrefined ingot trade of France, however, remained

---

[10] Péchiney capacity by plants was as follows, in metric tons: Noguères 103,000, St. Jean de Naurienne (Savoie) 72,500, Sabart (Ariège) 21,000, Rioupéroux (Isère) 21,000, Auzat (Ariège) 20,500, L'Argentière (Hautes Alpes) 19,000, La Saussaz (Savoie) 11,500, Chedde (Haute Savoie) 8,000, La Praz (Savoie) 3,800.

[11] Formed by Compagnie Général du Duralumin et de Cuivre, or Cégédur (75 percent), and Tréfimétaux du Havre.

[12] Metallgesellschaft A.G. (Metal Statistics 1955–64), Frankfurt, West Germany, 1965, p. 131.

relatively small, while overall copper and copper alloy imports were nearly 5 percent greater.

Production of semifinished copper and copper alloys, in terms of metal content, totaled 386,090 tons, 5 percent less than in 1964. The 1965 output consisted of 179,320 tons of copper wire, 15,000 tons of copper sheets, 39,080 tons of copper tubes, and 152,690 tons of brass products; the latter included 43,550 tons of sheets (including bronze), 102,170 tons of bars and sections, and 6,970 tons of tubes.

Iron Ore.[13]—Domestic iron ore production was 2.3 percent less than in 1964, and shipments to all destinations were 3 percent lower than in 1964, contributing to increases in stocks, which rose to 7.55 million tons at the Lorraine mines and to 8.24 million tons for all of France. Employees on the payroll as of December 31, 1965 totaled 19,955,[14] a decline of 7 percent in one year, but wages increased by 4.2 percent in Lorraine and 3 percent in Western and Pyrénées mines. Many mines had shorter working hours. Only 10 percent of the Lorraine mines were on the full 40-hour week basis during the whole year. Investment in iron mines was at almost the same level as in 1964—almost $18 million in the Lorraine and $2 million in the ore fields of l'Ouest (West) basin. In Lorraine, 17.51 tons was produced per man-shift for surface and underground workers, and in the West 8.60 tons; corresponding figures for 1964 were 16.34 and 7.94 tons, respectively.

Table 6.—France: Marketable iron ore production by basin, and total iron ore shipments, and stocks

(Thousand metric tons)

	1961	1962	1963	1964	1965
Production:					
Lorraine	62,400	62,422	54,377	57,455	56,125
West (Normandy and Anjou)	3,881	3,646	3,412	r3,400	3,326
Pyrenees	300	203	75	r65	80
Other basins	25	30	28	r18	
Total	66,606	66,301	57,892	r60,938	59,531
Iron content	19,708	19,706	17,399	18,440	NA
Shipments:					
Domestic	40,153	38,347	36,374	r38,689	38,145
Other ECSC countries [1]	25,568	25,699	21,341	r21,882	[2] 20,672
Other destinations	424	325	267	r227	88
Total	66,145	64,371	57,982	r60,798	58,905
Stocks	6,151	8,059	7,711	7,700	8,238

r Revised. NA Not available.
[1] Belgium, West Germany, Italy, Luxembourg, and the Netherlands.
[2] Belgium 6,956,304; Luxembourg 7,784,306; Germany (mainly Saar) 5,930,869; Netherlands 170.

In contrast to the situation in domestic output, France increased its imports of high-grade iron ores in 1965. Total receipts of foreign ores were 8.5 percent greater than in 1964, imports from Mauritania, Liberia, Brazil, and Sweden were all larger than in 1964, and as a result, the steel plant at Dunkirk, built to operate primarily on imported ore, showed a significant increase in output.

Total exports declined 6.1 percent and represented 35.2 percent of all shipments of French mines (36.3 percent in 1964). Shipments of French iron ore to Belgium and the Saar declined by 14 and 6.2 percent, respectively, but deliveries to Luxembourg increased by 4.5 percent, apparently because of temporary and exceptional circumstances. Total exports from the iron mines in the west diminished by 25.4 percent; those from the United Kingdom and the Ruhr declined 61 and 84 percent, respectively. According to industry spokesmen, the competitive position of these ores was adversely affected by high transportation charges. The French railroad increased its freight rate 5.1 percent, but negotiations were in progress in West Germany to lower freight rates.

[13] Chambre Syndicale des Mines de Fer de France. Rapport d'Activité pour l'Année 1965. Paris, France, Apr. 22, 1966, 32 pp.
[14] Including workers, engineers, and apprentices.

Construction of a secondary crushing and screening plant in Moyeuvre mine of DeWendel Cie. S.A. was underway. This project will increase production capacity of the mine from 1.8 million tons to about 2.5 million tons per year. Status of the project for equipping the Mairy mine of Union Sidérurgique Lorraine with shafts and surface facilities was not reported. This will increase annual production capacity of the mine from 1.2 million to 3.6 million tons of ore.

The Technical Services of Chambre Syndicale des Mines de Fer de France carried out research on improved mining methods, roof support, use of fuel oil-nitrate explosives, development and use of drilling equipment (jumbos), ore transport within and outside the mine, continuous miners, etc. Health and safety research by the same organization included the study of fuel oil-nitrate explosives and accidents due to fall of rock.

Roof bolting with resins, introduced in 1964, was applied on an industrial scale in 1965. A pilot plant for magnetic roasting was being built at Bazaille and should start operation in 1966. Several mines used this experimental station to carry out tests on crushing, classification, and higher intensity magnetic separation of iron ore.

Iron and Steel.—*Production.*—France did not maintain its record 1964 production levels for pig iron and crude steel in 1965; there were drops of 0.6 and 0.9 per cent in output of pig iron and crude steel, respectively. France's share of world steel output was about 4.3 percent, and the country ranked sixth among world producers and second to West Germany in the EEC.

Table 7.—France: Salient iron and steel industry statistics

(Thousand metric tons unless otherwise specified)

	1961	1962	1963	1964	1965
SINTER					
Production	7,412	10,048	14,478	17,442	18,531
Raw material consumption:					
Iron ore	7,912	11,279	17,135	20,780	22,454
Furnace dusts	1,351	1,447	1,446	1,476	1,241
Manganese	44	37	39	48	64
Pyrite cinder	43	49	58	58	34
Other iron-bearing materials	273	328	404	544	587
Limestone	200	288	415	404	552
PIG IRON					
Number of blast furnaces:					
Available	143	141	143	138	133
In operation at yearend	115	104	97	98	94
Maximum production capacity	15,500	16,100	17,300	18,100	18,770
Production:					
Thomas [1]	r 12,681	12,169	12,069	13,042	12,559
Hematite and semihematite (steelmaking)	358	270	782	1,300	1,680
Phosphorus (foundry)	464	448	447	452	416
Hematite and semihematite (foundry)	367	372	444	450	508
Special pig iron (foundry)	289	290	196	205	174
Spiegeleisen and high-carbon ferromanganese	407	410	368	412	432
Total	14,566	13,959	14,306	[2] 15,863	15,769
Raw material consumption for pig iron production:					
Iron ore directly in blast furnaces	33,303	28,295	21,860	21,246	19,398
Iron ore sinter	7,421	10,067	14,335	17,328	18,337
Manganese ore:					
In blast furnaces	598	582	569	630	677
In sintering plants	44	37	38	48	70
Metallurgical rejects	1,232	1,199	1,120	1,175	1,050
Scrap	1,219	883	833	690	478
Limestone	667	487	430	312	293
Phosphatic limestone	7	r 4	r 2	r 1	1
Coke in blast furnaces	13,905	r 12,789	r 12,116	r 12,785	12,305
Raw material consumption per ton of pig iron produced:					
Iron ore—kilograms	2,825	2,835	2,725	2,649	2,653
Coke—do	956	917	846	806	780
Sinter—do	516	722	1,003	1,092	1,163
Scrap—do	85	65	59	44	30

See footnotes at end of table.

Table 7.—France: Salient iron and steel industry statistics—Continued

(Thousand metric tons unless otherwise specified)

	1961	1962	1963	1964	1965
STEEL					
Number of steelworks:					
Thomas converters:					
Available	102	105	104	101	100
In operation	99	102	99	95	94
Open hearth furnaces:					
Available	99	94	94	r 92	88
In operation	67	66	60	r 62	54
Electric furnaces:					
Available	127	r 131	r 128	r 132	132
In operation	104	r 109	r 108	r 109	109
Oxygen:					
Available	6	8	10	10	11
In operation	5	5	8	8	9
Maximum production capacity (all furnaces)	18,800	19,500	20,900	21,900	22,500
Production of crude steel:					
Thomas	10,404	10,026	9,833	10,604	10,397
Open hearth	5,062	4,926	4,774	5,182	4,775
Electric	1,566	1,526	1,526	1,675	1,774
Bessemer	112	101	81	93	88
Kaldo, LD, and similar	423	658	1,341	2,224	2,568
Creuset	3	3	2	2	2
Total	17,570	17,240	17,557	19,780	19,604
Ingots	17,211	16,870	17,211	19,413	19,237
Liquid steel for casting	359	370	346	367	367
Material consumption for steel:					
Pig iron, spiegeleisen, and ferroalloy:					
By Thomas converters	11,375	10,996	10,767	11,420	11,100
By open hearth	1,211	1,112	1,070	1,220	1,147
By electric furnaces	101	90	96	109	117
By Kaldo, LD and similar converters	354	562	1,145	1,954	2,268
Total	13,041	r 12,760	r 13,078	14,703	14,632
Scrap	6,307	6,131	6,204	7,012	6,884
Liquid Thomas steel	261	288	265	193	173
Lime	1,797	1,727	1,746	1,933	1,892
Limestone	53	71	64	60	51
Iron ore	140	147	151	188	210
Fluorspar	34	30	33	37	32
Consumption per ton of crude steel:					
Pig iron kilograms	735	735	739	737	NA
Scrap do	363	361	359	359	NA
Rolled steel production:					
Rails and accessories	440	460	337	353	364
Heavy structural	877	897	848	1,030	1,122
Wire rods	1,931	1,753	1,870	2,010	2,085
Bars	3,253	3,210	3,067	3,327	3,480
Pipe skelp	605	554	529	602	609
Other	27	34	30	37	31
Flat products:					
Wide plates	76	78	81	79	94
Hot rolled sheets:					
Thickness, 4.76 millimeters or more	1,055	928	936	1,199	1,160
Thickness, 3 to 4.76 millimeters	478	511	516	501	500
Thickness, less than 3 millimeters	968	734	641	742	725
Cold rolled sheets: Thickness, less than 3 millimeters	2,770	2,929	3,282	3,647	3,579
Hot-rolled strips for tubes	982	998	1,061	1,092	1,043
Subtotal flat products	6,329	6,178	6,517	7,260	7,101
Total rolled steel production	[2] 13,465	13,086	13,198	14,619	[2] 14,793
Galvanized and other plated sheets	370	360	408	506	447
Condenser sheets	222	196	178	207	188
Tinplate	537	588	591	625	543
Total consumption of iron and steel industry:					
Iron ore	41,355	39,722	39,141	42,214	42,062
Scrap [3]	7,526	7,015	7,037	7,701	7,362
Coke	14,680	13,714	13,522	14,327	13,778

See footnotes at end of table.

Table 7.—France: Salient iron and steel industry statistics—Continued

(Thousand metric tons unless otherwise specified)

	1961	1962	1963	1964	1965
STEEL—Continued					
Coal other than coking coal	1,423	1,570	1,605	1,412	1,608
Coking coal	5,784	5,744	5,674	5,712	5,627
Fuel oil	r801	r889	r1,063	r1,233	1,234
Thomas slag production	2,415	2,375	2,351	2,573	2,546
Average total employment (workers and staff)	132,609	130,854	130,591	r130,806	127,593

r Revised. NA Not available.
[1] Includes special pig iron in metric tons as follows: 1961, 72,189; 1962, 31,006; 1963, 6,137; 1964, 42,994; 1965, 3,749.
[2] Detail does not add to total because of rounding.
[3] Excludes scrap used by rolling mills in tons as follows: 1961, 72,323; 1962, 73,075; 1963, 77,866; 1964, 85,858; 1965, 98,284.

The 94,000-ton drop in pig iron production was mainly in that used for steel production; foundry pig iron output fell by only 9,000 tons. The share of hematite-pig iron, obtained from high-grade imported ore, increased again to 10.7 percent (8.2 percent in 1964), although Thomas pig iron remained dominant in total output. Average output of slag per ton of pig iron showed a further decline because of the increased share of high-grade ore smelted. Fuel oil consumption of the industry as a whole, 1,234,440 tons, was practically the same as in 1964.

For the first time, production of pig iron in the North steel area showed a decline compared with that of previous years. Otherwise, there was no significant change in the geographical pattern of production. Of the 94 blast furnaces in operation at yearend, 71 were in the East, 15 in the North, 3 in the Southwest, 1 in the Southeast, and 4 in the West steel area of France.

Thomas steel and open hearth steel constituted 53.0 and 24.4 percent, respectively, of total 1965 crude steel output. Oxygen steel constituted 13.1 percent of the total, but the rate of increase (15 percent) was not as high as in 1964.

Production of special and alloy steel increased to 1,703,000 tons, or 8.7 percent of total crude steel output, distributed as follows, in percent: structural high-grade carbon steel 37, structural alloy steel 38, ball-bearing steel 6, tool steel 5, and stainless steel 14. There was a further increase in stainless steel production to 246,000 tons from 234,000 tons in 1964.

The share of flat products in rolled steel output remained practically unchanged. There were small increases in production of rails, heavy structurals, wire rods, bars, and pipe skelp, but the tonnages of hot- and cold-rolled sheets declined. Galvanized steel and tinplate production went down partly because of a drop in exports.

Consumption and Trade.—There was a slight reduction in French internal demand during the year as a result of stagnation in private investment and lower consumer expenditures. Activity was high in public works, the building industry, engineering, the tube industry, and the manufacture of motor vehicles and agricultural tractors. But steel requirements of shipyards, boiler makers, forging plants, and the equipment industry declined.

In terms of crude steel, apparent consumption fell from 17,808,000 tons to 16,691,000 tons and from 368 kilograms to 341 kilograms per capita. Steel shipments totaled 15.5 million tons of which 5.3 million was for the export market. Actual internal steel consumption may have been more than the 10.2-million-ton domestic shipment reported because steel stocks were depleted considerably during the year. Domestic shipments were distributed as follows, in thousand tons: for conversion 2,554; to steel merchants 2,681; to manufacturing industries 2,751; to railroads, extractive industries, and building industry 1,298; others 189; and special steels 744.

French steel exports (ingots and primary forms and semimanufactures) exceeded its 1964 record by about 500,000 tons and were valued at $908 million. Other EEC

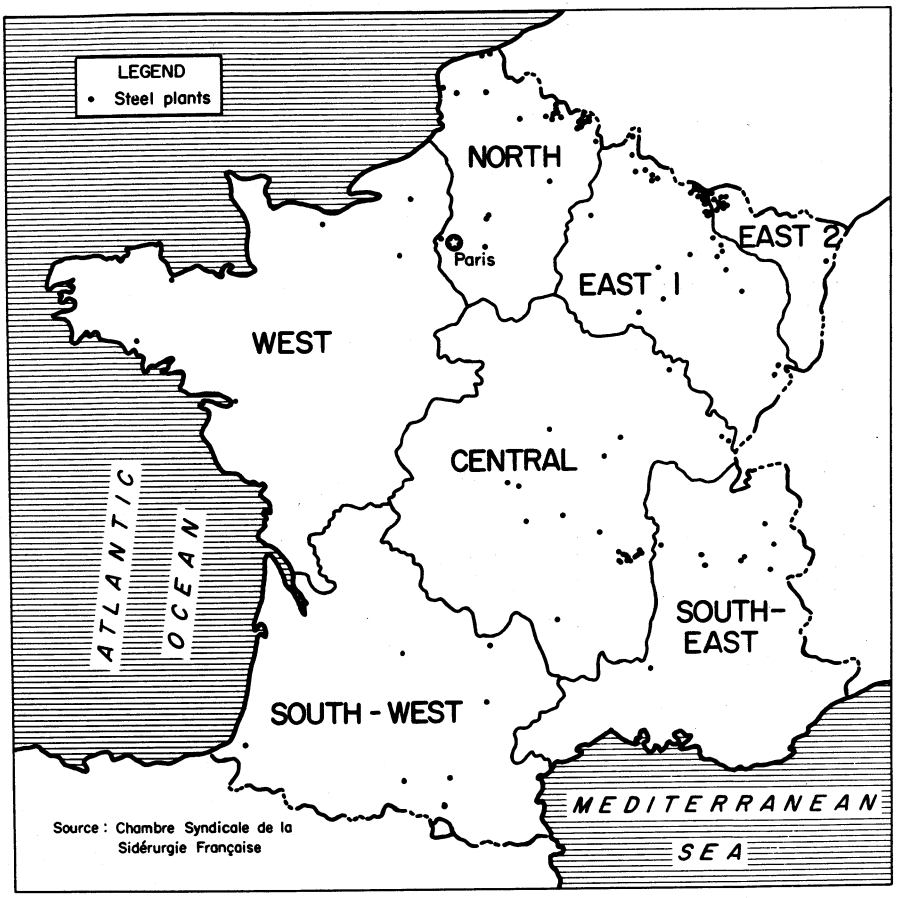

Figure 1.—France: Iron and steel districts and steel plant locations.

countries remained the largest market, receiving 2,774,000 tons. Although imports from EEC countries (3,717,300 tons) still exceeded exports to these destinations, the imbalance was reduced from that of the previous year when French net imports from other EEC countries totaled about 1.17 million tons. Exports outside the EEC increased largely as a result of higher sales in the U.S. market; these reached about 816,000 tons or almost double the 1964 level.

Total imports of primary forms and semimanufactured steel declined by 328,000 tons and $45 million in value. Net contribution of the industry to trade balance increased to $385 million. About one-fifth of French steel needs were met from imports, essentially from other EEC countries which were the source for 96 percent of all steel imports of France.

Facilities and Investments.—In 1965 there were 80 steel companies and 113 plants. Of these plants, 58 produced steel, 9 specialized in pig-iron production, 45 produced rolled steel while one plant produced pig iron and rolled products. In 1965 one-third of these plants had annual capacities of 300,000 to 2,300,000 tons, 17 percent had 100,000 to 300,000-ton annual capacities, and 50 had capacities of 100,000 tons or less

per year.[15] Ten companies produced 86 percent of the 1965 output; the largest, Dunkirk, produced more than 4 million tons. The smaller plants generally made fine and special steel.

The following tabulation gives a distribution by size of the majority of total blast furnaces and various types of steel furnaces available for use in France in 1964:[16]

Facility type and size	Number
Blast furnaces:[1]	
Under 3 meters in diameter	3
3 to 4 meters in diameter	17
4 to 5 meters in diameter	31
5 to 6 meters in diameter	40
6 to 7 meters in diameter	26
7 to 8 meters in diameter	6
Over 8 meters in diameter	5
Total	128
Open hearth furnaces:	
25- to 39-ton capacity	9
40- to 69-ton capacity	34
70- to 89-ton capacity	16
90- to 150-ton capacity	26
Total	85
Oxygen steelworks:	
27-ton OLP [2] converters	1
50-ton OLP [2] converters	3
0.67-ton Linz-Donawitz converters	1
60-ton Linz-Donawitz converters	2
120-ton Kaldo furnaces	1
Total	8
Electric furnaces:	
Under-25-ton capacity	60
25- to 55-ton capacity	15
60- to 80-ton capacity	6
Total	81
Bessemer converters:	
12- to 18-ton capacity	31
20- to 27-ton capacity	35
28- to 39-ton capacity	24
Over-40-ton capacity	10
Total	100

[1] Data as of January 1, 1965.
[2] Oxygen Lance Poudré; a process that employs powdered lime with a stream of oxygen.

The industry's investment totaled $170.56 million, distributed as follows, in millions of dollars: coking plants 0.76, charge preparation 19.93, blast furnaces 12.46, steel works 16.59, rolling mills 79.18, miscellaneous 41.64. The investment in steelworks was mainly in electric ($7.59 million) and oxygen furnaces ($5.06 million); basic bessemer investment was $2.64 million, and open hearth investment was $1.3 million.

The industry developed a rationalization and modernization plan to improve its competitive position and to increase production capacity to 24 million tons by 1970. The plan reportedly calls for an investment of about $2.3 billion. In 1965, the industry was already carrying a heavy debt load, reportedly about 70 percent of annual sale, with servicing charges running at about 8 percent of annual sales. In view of this the Government made a $60.9 million (300-million-franc) loan to the industry under favorable terms with no interest payment or payment on the capital in the first 5 years. It is believed this was to be the first of a series of loans for the long-term development program.

During the year programs for a number of regroupings and mergers were prepared to create larger units comparable to the large steel companies in West Germany and Italy.

Actual merger occurred in the regrouping of the activities of Forges et Acièries de Nord et Lorraine and Hauts Fourneaux et Forges de Saulnes et Gorcy in iron ore, sinter, and pig iron production, into a joint subsidiary, Hauts Fourneaux Reunis de Saulnes et Uckange. The new concern has annual capacities of 3.5 million tons of iron ore, 800,000 tons of pig iron, and 30,000 tons of calcium carbide. In addition a number of agreements on the joint use of facilities were reached: Usinor's rolling mill at Dunkirk will also be used by Lorraine-Escaut, the wire mill of Saulnes et Gorcy at Saulnes will be shared with Lorraine-Escaut and Acièries et Tréfileries de Neuves-Maisons-Chatillons, and the wire mill of Chiers at Anzin will be used by Usinor. An important company development was that Port-à-Mousson sold its share of the Hauts Forneaux et Acièries de Differdange-St. Ingbert-Rumelange S.A. (HADIR) steelworks in Luxembourg to Acièries Réunies de Burbach-Eich-Dudelange S.A. (ARBED). Port-à-Mousson company is diversifying in other fields but still disposes of 3.5 million tons of steel capacity.

[15] Economic Commission for Europe (Geneva, Switzerland). Steel Committee. Working Paper 317. Aug. 2, 1966, p. 18.
[16] Totals given here are less than those from official sources shown in table 7, but represent the majority of total furnaces.

The Sacilor plant at Gandranges [17] was under construction, as was the ore concentration and sintering plant of Société [18] SAEM at Longwy/St. Martin, due to be completed in 1968. Completion date of the steel plant was advanced to 1967–68.

Ferroalloys.—Of the 432,000 tons of spiegeleisen and high-carbon ferromanganese produced in blast furnaces, 108,000 tons were spiegeleisen and the remainder ferromanganese. Ferroalloys produced in electric furnaces and their monthly average output in 1965 were ferrosilicon (calculated on the basis of 50 percent silicon) 9,919 tons; silicospiegel and ferro-silicomanganese 1,058 tons; ferrochromium 5,957; ferrotitanium, ferrotungsten, ferrovanadium and ferromolybdenum 576 tons (metal content); and others 3,101 tons (metal content). Total monthly average was 20,611 tons.

Iron and Steel Scrap.—France consumed 7,362,000 tons of scrap exclusive of consumption by independent foundries and sintering plants in 1965, compared with 7,701,000 tons in 1964. The 1965 consumption was distributed as follows: 478,000 tons in blast furnaces, 6,884,000 tons in steel mills, and 98,284 tons in rolling mills. In addition, estimated consumption by independent foundries and sintering plants was 260,000 tons and 4,000 tons, respectively. It is estimated that the steel industry bought 2,915,000 tons of scrap for its use: 2,455,000 tons of French origin, 360,000 tons from other European Coal and Steel Community countries, and about 100,000 tons from third countries. The remainder was home scrap. France was a net scrap exporter in 1965 by 1,338,000 tons.

Lead and Zinc.—Results of exploration at Malines and Peyrebrune, carried out by Société Minière et Métallurgique de Peñarroya (Peñarroya), were reportedly encouraging, and the reserve condition in these two concessions has improved. Joint exploration by Bureau de Recherches Géologiques et Minières (BRGM) and the Société des Mines et Fonderies de Zinc de la Vieille Montagne has delineated 120,000 tons of ore with 3 percent lead and 8.4 percent zinc at Vézis with an additional 100,000 to 150,000 tons of probable reserves. Exploration by BRGM and Peñarroya in 1964 indicated a probable 3 million tons of ore at Caboire (Ariège) with 0.8 percent lead and 6 percent zinc. Two deposits in Corsica, Plélauff and Ghisoni-la-Finosa, have reserves of 300,000 tons of ore with 6 percent lead and 7 percent zinc and 600,000 tons with 2.8 percent lead and 2 percent zinc, respectively.

Output of both lead and zinc concentrates increased, resulting mainly from the operation of the Argentière mine in Ardèche. Peñarroya produced 22,850 tons of lead concentrates and 27,763 tons of zinc concentrate in France. Its smelter at Noyelles-Godault produced from domestic and imported concentrates 100,796 tons of lead and 45,089 tons of zinc, or 79 and 23 percent of total French domestic production of refined lead and smelter zinc, respectively. Smelter capacity of this plant was to be increased to 70,000 tons of zinc and 115,000 tons of lead by 1967. Orders were also placed for building a zinc distillation column. The company concluded a long-term contract for purchase of zinc concentrates from the Silvermines property in Ireland operated by Mogol of Ireland, Ltd. starting in 1968.

Compagnie Royale Asturienne des Mines added two new vertical retorts (Creuset) to its Auby smelter in May 1965. This plant has an annual capacity of 60,000 tons of zinc. The new retorts will compensate loss of productive capacity resulting from closure of the Montagne plant in 1963. At this plant construction of a fluidized-bed roaster and extension of sulfuric acid facilities was started. The capacity of the electrolytic zinc plant at Viviez of Vieille Montagne remains at 65,000 to 70,000 tons per year but is expected to increase to 80,000 tons when the hydropower plant on the Selve River starts operating. Secondary zinc was produced from distillation of scrap at Creil, Lunéville, and Honnecky plants, which have a combined capacity of 10,000 to 12,000 tons.

Consumption of both lead and zinc in 1965 diminished from the 1964 level by 16 and 19 percent, respectively. Lead consumption, including lead content of antimonial lead, totaled 144,600 tons; zinc consumption was 186,700 tons, excluding 7,300 tons of zinc dust.

Lead prices generally followed conditions of the international markets, but zinc

[17] A company created by Société de Wendel and Union Sidérurgique Lorraine (Sidélor).
[18] Formed by Société Anonyme de Lorraine-Escaut, Hauts Fourneaux et Forges de Saulnes et Gorcy, and Société des Laminoirs, Hauts Fourneaux, Forges, Fonderies et Usines de la Providence.

prices remained practically unchanged. Average lead price was $323 per ton ($284 in 1964); during the year the price ranged from $271 to $384; it was $307 at year-end.[19] The average zinc price in 1965, $316.70 per ton, was only 90 cents less than the 1964 figure.

Nickel.—The Havre nickel refinery, treating imported nickel matte, produced 6,400 tons of contained nickel—5,900 tons as refined metal and 500 tons as oxide. Nickel consumption of France is estimated as 26,500 tons per year.

Uranium.[20]—Aside from prospecting and exploration for uranium in the three mining divisions of La Crouzille, Forez, and Vendée, work was carried out in Auvergne and continued in l'Hérault where prospecting started in 1964. Private industry activities were limited, but a promising deposit was discovered in Haute-Vienne. Negotiations for long-term supply of uranium from Canada fell through in May because the French Government was not prepared to accept inspection by the International Atomic Energy Agency. In December there were unconfirmed press reports of the possibility of a contract between South Africa and France. Uranium reserves of France increased as follows:[21]

Area	Reserves (tons of contained uranium)		
	1963	1964	1965
Mines and deposits of Commissariat à l'Énergie Atomique (CEA):			
Forez-Morvan	5,470	5,190	4,960
La Crouzille	5,520	6,430	8,880
Vendée	3,670	3,870	3,870
Vosges	2,030	2,030	2,030
Hérault	4,310	5,880	5,680
Total	21,000	23,400	25,420
Private companies in Brittany	1,110	1,130	1,120
Private companies in Massif Central	5,580	5,230	7,290
Grant total	27,690	29,760	33,830

In addition to the 1,072 tons of contained metal from domestic production, France obtained 1,967 tons of preconcentrates from Gabon and Madagascar with 544 tons of uranium content. From these raw materials, concentrates with 1,516 tons of uranium were produced in French beneficiating plants. Three mills (Bessines, l'Écarpière, and Bois-Noirs) treated 746,150 tons of ore; the preconcentrates were treated in the Gueugnon plant and Le Bouchet, the latter handling the uranothorianite from the Malagasy Republic. Estimated annual French uranium requirements for 1980 have been estimated at 3,500 to 5,000 tons.

All the uranium needed by the reactors of CEA and Électricité de France were produced at Malvési and Le Bouchet. The magnesium-thermal reduction process of producing uranium metal, started in Le Bouchet in 1964, will also be utilized in Malvési. For refining uranium, tests on denitration in a fluidized bed, carried out with collaboration of Ugine, led to installation of a pilot plant. Recovery of uranium by ignescent electrolysis of uranium-dioxide (UO_2) is also indicated as a possibility.

The Pierrelatte gas-diffusion plant was inaugurated in January and produced enriched uranium during the year. Production of 8 percent enriched uranium started about midyear. Preparations were underway to start the units for producing higher grade enriched uranium. Enriched uranium was leased or purchased in the United States for CEA's research reactors. Pending completion of the Eurochemie plant at Mol, Beligum, CEA signed two contracts for processing of irradiated uranium with the United States Atomic Energy Commission and the United Kingdom Atomic Energy Authority. The Dounreay reactor will process spent nuclear fuel from the Pegase reactor at Cadarache.

Other Nonferrous Metals.—Ore produced by Société des Mines et Produits Chimques de Salsigne from its mines at Fontaine de Santé and des Ramèles contains gold, silver, copper, bismuth, and arsenic. The company produced 148,195 tons of ore, 26,131 tons of flotation concentrates, and 6,926 tons of matte which contained 1,603 kilograms of gold, 4,777 kilograms of silver, and 410 tons of copper; 52 tons of bismuth and 7,735 tons of arsenic anhydride also were recovered from furnace flue gases. During the year the

[19] Federation des Chambres Sydicales des Minerais et Métaux. Rapport Géneral pour l'Année 1965. Paris, France, 1966, p. 5.
[20] Commissariat à l'Énergie Atomique. Rapport Annuel 1965. Paris, France, 1966, 184 pp.
[21] Page 184 of work cited in footnote [20].

company added to its flotation circuit, installed jigs, and improved its grinding circuit with the expectation of obtaining better metal recovery.

Tin concentrates were produced by one firm, the Société Comiren à Saint-Renan. Annual consumption of the metal is estimated at 10,000 tons.

NONMETALS

In 1965 production of crude potash and potassium chloride increased, but domestic shipment, comprising 1,037,000 tons of K_2O equivalent was almost the same as in 1964, and exports decreased. As a result stocks at yearend increased to 215,600 tons of K_2O content, compared with 104,500 tons in 1964. Sufficient and comparable data are not available on the 1965 output of the important construction material and quarry industry for detailed analysis of its performance relative to that of 1964 but preliminary information indicates that production of alluvial sand and gravel and plaster increased while output of most other categories declined. In the case of sulfur materials a decline was noted in pyrite production and imports while elemental sulfur output remained substantially the same. These shifts, coupled with smaller sulfur exports, indicated that more sulfur was used domestically.

The value of 1964 nonmetals production exclusive of building raw materials and quarry products totaled about $156 million.[22] Potash, sulfur, and salt were the most important commodities, accounting for 62, 18, and 16 percent, respectively of the total value. Building raw material and quarry products were valued at $481 million, of which about $51 million was accounted for by material used in industry, (including minefill) about $4 million by material used in agriculture, and $426 million by material used in the building industry. The latter figure comprised sand and gravel ($164 million), other building materials such as stone, slate, clays, limestone, and gypsum, but excluding lime and cement ($141 million), and material for road building and similar uses ($121 million).

Value of nonmetal imports and exports including cement and lime in 1965 totaled $201 million and $173 million, respectively. Among imports, phosphate rock ($44 million), clay and other refractory materials ($18 million), stone, and sand and gravel ($18 million), asbestos ($16 million), Thomas slag ($8 million), sulfur ($8 million), and pyrite ($4 million) were the most important. Potash in chemically treated form, sulfur, and cement exports were valued at $40 million, $23 million, and $13 million, respectively.

Cement and Lime.—Cement production in France continued the pattern of uninterrupted increase that has prevailed for the last 20 years,[23] and France became the world's fifth largest producer. The 3.3-percent increase in 1965 was more than the rate for industrial production but considerably less than the 18.8-percent increase in cement production recorded in 1964. The decline in growth rate may be due to the consolidation of increased capacity achieved in 1964 and 1965. Industry spokesmen felt that in the immediate future market outlets for cement would be favorable because of the expected level of housing construction and increased allocation of funds for public works. Furthermore, the Fifth Plan envisages a 35-percent increase in construction and public works between 1966 and 1970 and an annual expenditure of about $600 million for roads compared with $240 million in the Fourth Plan. The Fifth Plan calls for a production of 30 million tons of cement by 1970.

Production of cement in recent years was as follows:

Type	Thousand metric tons				
	1960	1961	1962	1963	1964
Portland	9,281	9,607	11,757	12,647	16,227
Slag (blast furnace)	2,381	2,837	2,203	2,485	2,333
Special	1,130	1,860	1,475	749	983

[22] Bureau de Documentation Minière Statistique de l'Industrie Minérale 1964. Paris, France, 1966, p. 8.

[23] Syndicat National des Fabricants de Ciments et Chaux Hydrauliques. Assemblé Générale. Rapport sur l'Exercise 1965. Paris, May 3, 1965, 6 pp. (9 annexes).

Type	Thousand metric tons				
	1960	1961	1962	1963	1964
Other slag	865	404	626	1,448	1,144
Total	13,657	14,708	16,061	17,329	20,687
Natural	121	177	397	275	255
Mortar	381	496	424	530	595
Total	14,159	15,381	16,882	18,134	21,537

At the beginning of the year there were 61 plants in operation of which 15 had individual annual capacities exceeding 500,000 tons, 24 had capacities between 300,000 and 500,000 tons, 20 had capacities of 100,000 to 300,000 tons, and 2 had capacities of less than 100,000 tons.

In 1965 the industry used 2,135,000 tons of coal, 875,000 tons of fuel oil, 195 million cubic meters of gas, and 1,860 million kilowatt-hours of electricity. Additives consisted of 3,395,000 tons of blast furnace slag and 885,000 tons of fly ash. French cement consumption increased 5 percent to 21.6 million tons; on a per capita basis, this was 442 kilograms, compared with 551 kilograms in West Germany and 325 kilograms in the United States. The Paris region accounted for 19 percent of the consumption, followed by 16 percent for the Mediterranean area and 14 percent for the southwest. Of total shipments, 43.7 percent was in bulk and the remainder in bags.

During the year about $71 million was invested in the industry. By installing two new kilns in existing plants, and one kiln in a new blast furnace cement plant and improving existing plants, 1.7 million tons of capacity was added. At yearend the annual capacity was 20.3 million tons of clinker and 26.3 million tons of finished products. For 1966 and 1967 it was planned to add 3.11 million tons of capacity: 1,250,000 tons from 4 new plants and 1,860,000 tons from 10 kilns (8 dry, 1 wet, and 1 vertical) in existing plants.

French cement imports, though slightly greater than in 1964, were not important. Exports decreased by 14 percent; non-Communist Europe was the largest regional market, accounting for 53 percent of exports; West Germany was the largest single market, receiving 32 percent of exports.

Employment remained at much the same level for the fourth consecutive year in spite of increased production. Productivity improved 4.5 percent to an estimated 1,590 tons per year per worker, compared with 1,522 tons in 1964. Of the 14,000 employed, 10,400 were workers and the remainder were technical, clerical, and administrative employees. The cement price stayed stable.

In 1964 2,920,000 tons of high purity or fat lime was produced as follows: For use in iron and steel plants 2,042,000 tons, for use in calcium carbide and other chemicals 605,000 tons, for agricultural use including vine culture 273,000 tons. The 300,000 tons of increased output was mainly consumed by the steel industry and agriculture.

There were no significant changes in the number of hydraulic lime-producing plants, except that plants with annual capacities exceeding 50,000 tons increased from 9 to 12 and those with capacities between 30,000 and 50,000 tons dropped from 23 to 20. There were 75 plants in operation at yearend.

At the beginning of 1965, 108 plants producing fat lime were in operation (117 at the beginning of 1964). The drop was caused by a reduction of 16 in the number of small plants (5,000 to 25,000 tons' annual capacity), but this was partly compensated by an increase of 5 in plants with 25,000 to 50,000 tons' annual capacity.

Construction Material and Quarry Products.—In 1964, the latest year for which detailed information is available, there were substantial increases in the production of all categories of quarry products other than those for agricultural use. Output consisted of about 54 million tons of construction materials; 110 million tons of sand and gravel; 58 million tons of road and foundation building materials; 30 million tons of materials for industry such as kaolin and refractory clays, limestone, glass and foundry sands, chalk, and barite; and 1.1 million tons of materials for soil improvement and other agricultural uses, including limestone, gypsum, marl, phosphate, and phosphatic lime. Preliminary monthly average production data for some

items in 1965 indicate that there were declines in the majority of the items listed but a further substantial increase in sand and gravel:

Commodity	Quantity (thousand tons)	
	1964	1965
Calcareous building stone	130	129
Furnace limestone [1]	289	259
Slate	10	10
Plaster	207	217
Alluvial sand and gravel	7,964	9,230
Industrial sand	248	243
Road building material	4,268	4,195
Pozzolana	48	41

[1] For use in blast furnaces, foundries, and sugar mills.

In 1964 the industry employed 97,300 (91,900 in 1963) of whom 82,800 received hourly wages and the remainder salaries. These figures do not include workers in those limestone and clay quarries that were captive operations of the cement plants. The turnover of the industry in 1964 was $982 million.[24]

In 1964 there were 2,783 quarries and sand and gravel pits in operation, distributed as follows, by size of labor force:

Quarry type	Persons employed				
	Less than 20	21 to 50	51 to 100	101 to 200	201 and more
Sand and gravel for construction	1,316	98	23	3	3
Industrial sand	136	12	1	1	—
Road building materials	1,063	100	22	5	—
Total	2,515	210	46	9	3

Potash.—French potash consumption in the last 5 years has increased at an average annual rate of 7 percent. Consumption in 1964 was estimated at 1,050,000 tons of K_2O equivalent and in 1965 at about 1,100,000 tons. Consumption is expected to increase 4.3 percent annually in the next 5 years to 1,350,000 tons K_2O in 1970. Increase in production is limited by the size of existing deposits; another factor is limitation on the pollution of the Rhine River resulting from discharge of saline effluents.

In 1965, France's rank as a world potash producer fell to fifth as output in The Soviet Union increased noticeably. French output constituted about 14 percent of total world output in 1965. The increase in the share of long wall method in total production, noted in 1963, continued in 1964. Beneficiation plants treated 11,114,031 tons of crushed salt: 7,588,221 in hot leach plants, 3,189,425 in flotation plants, and 336,385 in levigation plants in 1964. Of the potassium chloride (KCl) produced in this year, 1,276,138 tons in terms of K_2O equivalent was recovered from hot leach, 594,005 from flotation, and 52,506 from levigation. Recovery percentages of the three methods were 90.12, 93.33, and 85.82 percent, respectively.

Investment in 1964 was directed primarily toward improving existing facilities rather than toward expansion. Investment totaled $7,600,000, of which 60 percent was for maintenance of production facilities. Shipments of crude and processed potash to the internal market in 1965 totaled 1,036,800 tons K_2O equivalent, and exports totaled 764,000 tons K_2O equivalent.[25]

France exported 92,151 tons of crude potash, mainly to other EEC countries. Major destinations for the 1,187,130 tons of chemically treated potassic fertilizer follow: EEC 406,245 tons (Belgium-Luxembourg 217,009, Netherlands 74,221, Italy 66,124, and West Germany 48,890), United Kingdom 223,315, United States 101,957, and Switzerland 69,194.

Salt.—Of the total salt produced in France in 1964, 3,241,577 tons was obtained from rock salt mines and salt springs in the following forms: 2,394,602 in solution, 679,777 as refined salt, and 167,198 as rock

[24] Employment and turnover figures include workers in plants making concrete products, plaster, asbestos cement, mineral wool, and bricks.

[25] Ministère de l'Industrie. Bulletin de Statistique Industrielle. Paris, France, August–September 1966, p. 4.

Table 8.—France: Salient statistics of the potash industry

(Thousand metric tons unless otherwise specified)

	1961	1962	1963	1964
Production:				
Mine run ore	10,860	11,024	11,058	11,046
K_2O equivalent	1,904	1,922	1,914	1,983
Marketable ore, K_2O equivalent [1]	1,710	1,722	NA	
Average daily output of mine-run ore—tons		40,329	41,807	41,762
Bromine production—do	NA	NA	1,903	2,568
Average grade—percent K_2O	17.53	17.44	17.32	17.38
Average output of mine-run ore per underground man-shift—kilograms	7,952	8,189	8,395	8,547
Production by mining methods:				
Room and pillar—percent	60.4	60.8	55.7	52.5
Longwall—do	39.6	39.2	44.3	47.5
Ore treated	NA	10,691	10,812	11,114
K_2O content	NA	1,854	1,862	1,923
KCl produced (50 percent K_2O equivalent basis)	3,317	3,311	3,342	3,497
K_2O equivalent	1,658	1,656	1,671	1,749
Recovery of treatment—percent	89.6	89.3	89.7	90.7
Sales of potash, K_2O:				
France [2]	888	995	983	1,099
Foreign	808	668	744	769
Total sales	1,696	1,663	1,727	1,868
Number of workers at end of year—persons	NA	10,503	10,369	10,004

NA Not available.
[1] Marketable ore is the total sale of potassium chloride and carbonate and crude salt as is.
[2] Includes Franc zone. Exports to these areas in 1961 and 1962 were 43,725 and 31,089 tons, respectively

salt.[26] In addition, 790,506 tons of salt was recovered from salt marshes along the Mediterranean and the Atlantic. The Lorraine area with an output of 2,313,141 tons was the largest producing area.

Disposition of the various types of salt by consumers in 1964 was as follows:

Commodity	Metric tons				
	Agriculture	Chemical industry	Domestic use	Industry	Export
Crude salt	37,329	64,178			64,181
Refined salt	(1)		187,886	[2] 201,365	28,419
Salt in solution		2,394,602			
Marine salt	762,010		175,518	[3] 10,739	13,105
Total	799,339	2,458,780	363,404	212,104	105,705

[1] Included in industry.
[2] Includes agriculture and fisheries.
[3] Includes fisheries.

As previously, the major share of the salt in solution was used for making sodium carbonate.

Sulfur and Pyrite.—Sulfur production from all domestic sources in 1964 was 1,609,400 tons; 1,519,600 tons recovered sulfur from the Lacq field and other sources, 78,300 tons in pyrite, 7,200 tons contained in lead and zinc sulfides, and 4,300 tons from spent oxides.[27] About 90,000 tons additional sulfur must have been obtained from metallurgical plants.

The 1965 sulfur production in all forms from all domestic sources was about 1.6 million tons. The decline in production of pyrite was compensated by the increased output of sulfur at Lacq and by the increased quantity of sulfur in lead-zinc ores. Total consumption was about 1,170,000 tons.

France produced 2,841,000 tons of sulfuric acid (exclusive of 75,600 tons of residual acid); sulfuric acid accounted for about 84 percent of the sulfur used in the

[26] Bureau de Documentation Minière. Statistique de l'Industrie Minérale 1964. Paris, France, 1966, p. 61.
[27] Organization for Economic Co-Operation and Development. The Chemical Industry 1964–65. Paris, France, 1966, p. 125.

country. In 1964 phosphatic fertilizer producers used about one third of the sulfuric acid and nitrogen fertilizer producers, one tenth.

Pyrite is now mined only in the Saint-Bel mines operated by St. Gobain. A sulfur recovery unit of 20 tons per day was put in operation by the Compagnie Française des Pétroles in 1964, and a unit of similar capacity is planned for the Union Générale des Pétroles-Union Industrielle des Pétroles UGP-UIP refinery at Ouzouoi-le-Repos which was scheduled to start in 1966.[28] The sulfur will be used in making sulfuric acid.

MINERAL FUELS

For the first time consumption of petroleum products in terms of standard coal equivalent (SCE) exceeded that of coal. The 12-percent increase in petroleum consumption was more than three times the 3.7-percent increase in total energy consumption. Favorable hydraulic conditions increased the contribution of hydroelectric power to total energy consumption.

Table 9.—France: Energy consumption by sources

Type of fuel	1961	1962	1963	1964	1965 p
Quantity:					
Solid fuel---million tons of standard coal equivalent	70.7	74.8	74.9	75.2	69.2
Petroleum products---do	42.0	48.8	57.3	66.3	74.1
Gas---do	6.0	7.3	7.8	8.3	8.4
Hydroelectric power---do	15.4	14.2	17.8	15.0	19.2
Total---do	134.1	145.1	157.8	164.8	170.9
Share of total:					
Solid fuel---percent	52.7	51.6	47.5	45.6	40.5
Petroleum produces---do	31.3	33.6	36.3	40.2	43.4
Gas---do	4.5	5.0	4.9	5.0	4.9
Hydroelectric power---do	11.5	9.8	11.3	9.2	11.2
Total---do	100.0	100.0	100.0	100.0	100.0

p Preliminary.

Source: Comité Professional du Pétrole. Éléments Statistiques, Activité de l'Industrie Pétroliére 1963. V. 1. Paris, France, 1965, p. A. 10.

Coal.—*Production.*—Production of coal (anthracite and bituminous) declined 3.2 percent below the level of the previous year, in keeping with the planned reduction of coal output to 48 million tons by 1970. Although all fields except Dauphiné showed a decline, loss of production in Nord/Pas-de-Calais, the largest producing area, accounted for 64 percent of total decline as follows:

	Thousand metric tons	
	1964	1965
Nord/Pas-de-Calais	26,567	25,489
Lorraine	15,628	15,547
Blanzy	2,468	2,295
Loire	2,223	2,201
Auvergne	941	909
Cévennes	2,307	2,216
Aquitaine	2,117	1,836
Dauphiné	730	752
Other mines or undistributed	49	100
Total	53,030	51,345

The Lorraine field increased its share of national output from 29.5 percent in 1964 to 30.3 percent; Nord/Pas-de-Calais accounted for 49.6 percent of production (50.1 percent in 1964). Lorraine fields remained France's most efficient fields with productivity exceeding that in all other areas. No ploughs or coal picks are used in these mines. Coal cutters and multiple attack faces account for 85 percent of the production.

In 1965, it is estimated that 53 percent of France's total coal output was obtained from seams 1 to 2 meters thick and an additional 17 percent was obtained from seams 2 to 3 meters thick. Weighted average of seam thickness in all faces in 1964 was 1.51 meters. Of all coal produced, about 53 percent was obtained from seams with dips of zero to 20 degrees. Coal production by extraction method in 1965 (corresponding 1960 figures in parentheses) follows, in percent: pickhammer only 23.6 (34.5), pickhammer and explosives 10.2 (12.5), coal cutter 15.3 (10.2), mechanical

[28] Mines et Métallurgie (Paris, France). May 1966, p. 213-214.

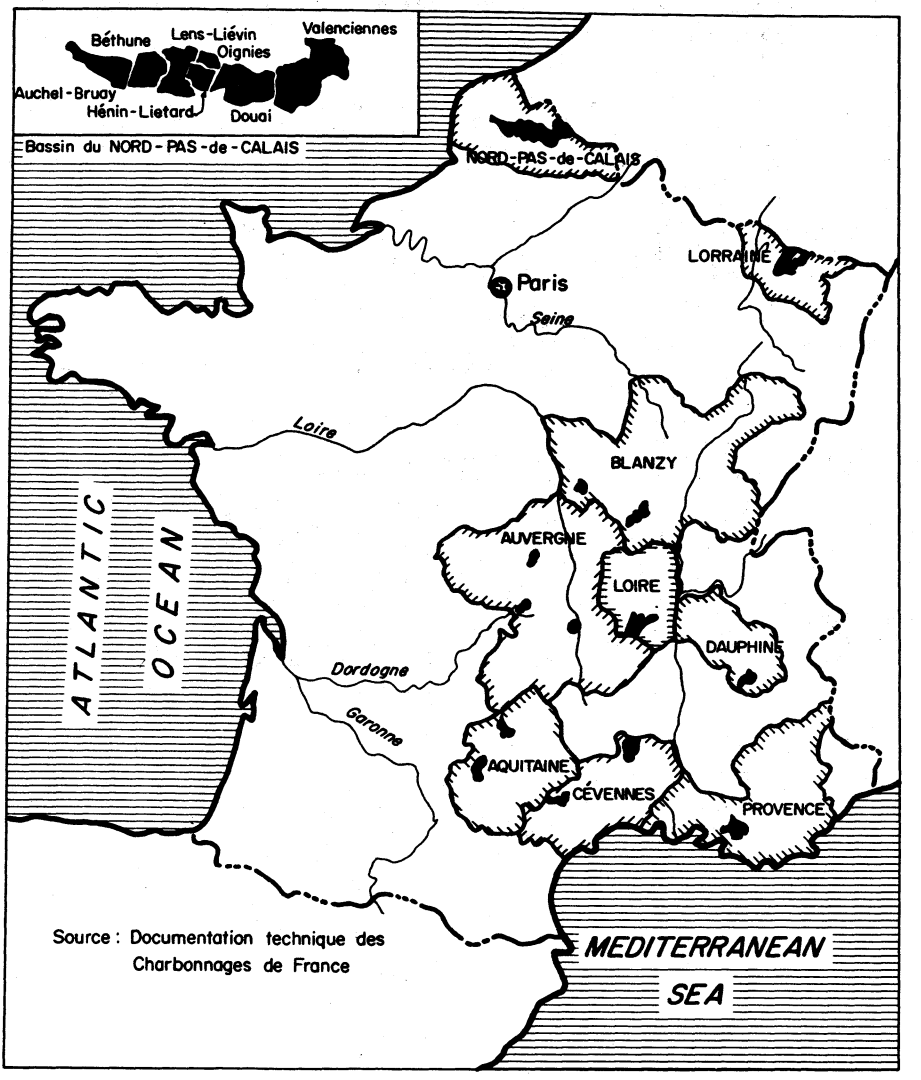

Figure 2.—France: Coal basins.

cutter and explosives 5.6 (7.7), explosives alone 24.1 (19.0), blasting by compressed air 3.4 (3.9), ploughs 17.7 (11.9), and other 0.1 (0.3). Particularly noteworthy during the 1960–65 period was the increase in the number of drum coal cutters (from 95 to 144) and the decline in coal cutters with arm (from 196 to 150). The number of coal ploughs increased from 118 to 178, allowing increased mechanization in thin seams. In 1964, longwall workings provided 68.3 percent of the coal.

Mechanized mines (those in which breaking and loading are mechanized) produced 61.4 percent of net coal mined underground in October 1965, while semimechanized mines (those in which either loading or breaking is mechanized) contributed

Table 10.—France: Salient statistics of the coal and lignite industry

(Thousand metric tons unless otherwise specified)

	1961	1962	1963	1964	1965
Coal:					
Production:					
Anthracite	2,995	3,163	3,053	3,373	NA
Semianthracite	8,696	8,648	7,869	8,913	8,798
Bituminous:					
Low volatile [1]	5,569	5,670	5,249	5,247	NA
Medium-volatile [2]	14,212	14,041	12,392	13,317	NA
High-volatile [3]	18,225	18,072	16,686	19,117	NA
High-volatile [4]	2,660	2,765	2,504	3,064	NA
Total [5]	52,363	52,369	47,762	53,030	51,345
Apparent consumption thousand tons of standard coal equivalent	70,665	72,900	77,100	74,400	NA
Stocks at yearend	11,974	8,692	6,123	5,703	7,317
Number of operating mines	86	83	NA	77	72
Average number of days worked	278	280	256	278	247
Average daily output, metric tons	188,500	197,045	186,500	190,400	187,100
Number of men working daily at yearend:					
Underground, persons	120,480	117,394	115,090	110,900	107,694
Surface, do.	51,720	49,125	46,795	44,951	43,352
In associated plants, do.	10,079	10,108	9,894	9,307	8,937
Production per man-shift:					
Nord/Pas-de-Calais:					
Underground, kilograms	1,610	1,633	1,663	1,709	1,662
Underground and surface, do.	1,099	1,129	1,149	1,191	1,168
Lorraine:					
Underground, do.	2,704	2,808	2,903	3,113	3,239
Underground and surface, do.	1,760	1,839	1,902	2,078	2,146
Blanzy:					
Underground, do.	2,112	2,202	2,182	2,214	2,286
Underground and surface, do.	1,422	1,487	1,455	1,475	1,498
Loire:					
Underground, do.	1,818	1,789	1,717	1,760	1,790
Underground and surface, do.	1,231	1,208	1,165	1,215	1,255
Cevennes:					
Underground, do.	1,683	1,743	1,663	1,666	1,697
Underground and surface, do.	1,064	1,119	1,145	1,284	1,289
Aquitaine:					
Underground, do.	2,077	2,172	2,338	2,536	2,463
Underground and surface, do.	1,381	1,445	1,536	1,635	1,594
All of France:					
Underground, do.	1,878	1,922	1,958	2,046	2,039
Underground and surface, do.	1,262	1,305	1,332	1,411	1,410
Power production by pithead steam plants:					
Quantity, million kilowatt-hours	10,428	12,152	10,931	14,762	NA
Share of thermal power produced in France, percent	27.2	25.7	24.4	25.0	NA
Share of total power produced in France, do.	13.6	14.6	12.4	15.7	NA
Lignite:					
Production	2,906	2,882	2,475	2,241	2,689
Stock at yearend	489	500	485	456	448
Average number of days worked	252	244	256	259	274
Average daily output, metric tons	11,500	11,800	9,700	8,600	9,800
Number of men working daily at yearend:					
Underground, persons	2,148	1,982	1,853	1,780	1,662
Surface, do.	1,202	1,118	1,066	1,030	1,046
Associated plants, do.	149	136	146	111	115
Production per man-shift:					
Underground man-shift only, kilograms	3,090	3,700	3,890	4,103	4,243
Total man-shifts, do.	3,824	4,120	3,579	3,334	3,983

NA Not available.
[1] Largely 14 to 18 percent volatile matter; a small tonnage has a higher volatile content.
[2] 16 to 28 percent volatile matter.
[3] 25 to 41 percent volatile matter.
[4] 40 to 42 percent volatile matter for the bulk of production in this category.
[5] Detail does not add to total (official data) because of differences in source.

21.6 percent. Average daily production per face in October 1965 was 226 tons (215 tons in October 1964). With increased mechanization, consumption of electricity per ton of coal, excluding that for ventilation, was 5.9 kilowatt-hours for work performed underground; 19.2 kilowatt-hours per ton was required for compressed air. Transformers installed underground had 356,591-kilovolt-ampere capacity. For underground transport, shaking conveyors are practically disappearing (only 13 kilometers in opera-

tion in 1965), and use of belt conveyors (307 kilometers), scraper conveyors (219 kilometers), and locomotive haulage (1,382 kilometers) has increased. At the face, nearly 75 percent of the output is transported by scraper conveyors and 10 percent by gravity conveyors.

In 1965 little progress was reported in the automation of mining operations,[29] but more advances occurred in the remote control of machines such as shearers. Interest in driving coal ploughs by hydrostatic means also increased.

Of the 77 mines operating in 1964, 2 had average daily production of 8,000 tons and over, 10 had average daily production of 4,000 to 8,000 tons, 49 each produced 1,000 to 4,000 tons daily, and the remainder provided less than 1,000 tons apiece per day.

Simultaneously, average length of faces has shown continued increase; in 1964, it averaged 116 meters for all faces, 139 meters for mechanized faces, and 93 meters for nonmechanized faces. Average daily rates of advance for the three classes of faces were 1.28, 1.42, and 1.10 meters, respectively. Three faces produced 1,000 tons and over per day, 5 faces 750 to 1,000 tons, and 34 faces 500 to 750 tons.

Coal production cost increased 5.4 percent to $17.33 per ton in 1965, compared with $16.44[30] in 1964. Higher labor cost resulting from increasing wages was the principal factor contributing to increased production costs. The 1965 cost per ton was composed of labor $11.14; supply $4.02; overhead, taxes, and financial charges $0.96; and amortization $1.21. Sale price of coal, $13.47, was 1.9 percent less than in 1964. Gross deficit on coal exploitation, including amortization, was $206 million, $56 million more than in 1964. The 1965 deficit was partially compensated by profit of $18 million in conversion of coal into electricity, coke, chemicals, and other products. Without amortization, the deficit for the industry as a whole was $73 million ($5.27 million in 1964). Budgetary aid to the coal industry amounted to $124 million. Final deficit, taking into account profit and loss and the Government's participation in the rationalization of the coal mines, was $65 million.[31]

To improve its financial situation, Charbonnage de France is pursuing a policy of diversification into other fields and seeking new applications of coal and byproducts. In cooperation with Électricité de France, cinder ash is recovered at coal-powered stations for use in the building industry. In 1965, 2.1 million tons of coal ash was sold in France: 956,000 tons to cement plants, 726,000 tons for road use, 103,000 tons for cinder blocks, and 339,000 tons for other uses. Of the total sale, the coal mines accounted for 1,146,000 tons. Utilization of shale for brick making is another area of work entrusted to Nord/Pas-de-Calais.

Consumption and Trade.—Apparent consumption of coal and lignite in 1965 declined by about 8 percent to 69 million tons of standard coal equivalent; this included about 66 million tons of coal and 3 million tons of lignite. Real consumption is estimated to have been 200,000 tons less. Domestic coal and lignite accounted for 78 percent of the apparent consumption.

Total sales of solid fuels from all sources declined further to 57.3 million tons (60.5 million tons in 1964). As in 1964, the decline in sales was borne mainly by imported coal (including coal from the Saar). Sales of these coals amounted to 15.9 million tons, 2.2 million tons less than in 1964. Sales to principal customers were as follows, in thousand metric tons: Iron and steel industry 16,746, domestic users and small industry 14,516, other industry 11,359, Électricité de France 9,597, railroads 1,888, Gas de France 891, briquetting plants 1,158, and exports 1,159. Sale to all principal consumers declined, with the sole exception of Électricité de France which bought 1,945,000 tons more.

Although production of thermal electricity by Électricité de France in 1965, 55,000 million kilowatt-hours, was less than in 1964 (59,064 million kilowatt-hours), solid fuel consumption by this organization increased 3.4 percent to compensate the smaller use of fuel oil, natural gas, and blast furnace gas. Total electricity production increased 6.5 percent to 102,200 mil-

[29] United Nations, Economic Commission for Europe, Coal Committee, Sub-Committee on Mining Problems. Report of the Sub-Committee on Mining Problems. Coal/178, Aug. 8, 1966.
[30] Revised to include coal used by coal mines and coal delivered to miners, which were not included previously in arriving at unit cost of production.
[31] Charbonnage de France. Rapport de Gestion 1965. Paris, France, pp. 94–107.

lion kilowatt-hours (96,007 million kilowatt-hours in 1964). Solid fuels accounted for 65 percent of all fuels used in thermal power production; the shares of other fuels in this market, in percent, were fuel oils 20, natural gas 5.5, blast furnace gas 8, and nuclear 1.5.

In the steel industry consumption of coke in blast furnaces, of coal for carbonization, and of coal for gas production declined by 4.1, 1.5, and 18.6 percent, respectively. The decline in blast furnace coke consumption was mainly because of lower consumption per ton of pig iron produced rather than reduced pig iron output. Owing to increased sintering of iron ore, coal consumption for miscellaneous purposes increased 5.7 percent to 2,928,000 tons, from 2,769,000 tons in 1964.

During 1965 another coke oven gas plant in the Paris area was closed so that only five such plants remained in operation. Relative share of primary fuels in the gas supply (output of Gas de France and purchase gas) were as follows, in percent: gas obtained from coal 25.8, natural gas 49.7, and gas from liquid fuels 24.5.

The share of total fuel needs of industry (other than iron and steel and small industry) supplied by solid fuels decreased further to 34.3 percent (39.7 percent in 1964), whereas that supplied by fuel oil increased from 50.3 percent in 1964 to 55.3 percent in 1965. The share of natural gas was 10.4 percent, slightly more than in 1964 (10.0 percent). Total delivery of all fuels to this sector increased to 33.8 million tons of coal equivalent, from 32 million tons in 1964.

Coal prices were substantially the same except for a 5-percent increase in transportation costs starting May 31.

Imports from all principal sources decreased. Purchases of U.S. coal fines for coking increased to 1.3 million tons.

Table 11.—France: Coal availability and distribution [1]

(Thousand metric tons)

	1961	1962	1963	1964	1965
Net production	52,358	52,359	47,754	53,030	51,348
Middlings, foreign coal, etc	64	113	561	921	859
Stock variations [2]	−1,195	−3,060	−2,408	−422	+1,482
Total availability	53,617	55,532	50,723	54,373	50,725
Consumption by mines and mine powerplants	7,767	8,791	7,954	10,209	8,085
Delivery to miners	1,254	1,234	1,201	1,079	1,005
Delivery for transformation:					
Mine coke ovens	9,483	9,584	8,862	10,091	9,795
Steel plant coke ovens	2,434	2,467	2,121	2,119	2,134
Gas coke ovens	1,333	1,099	661	539	301
Briqueting plants	4,838	5,241	4,983	4,723	4,331
Total	27,109	28,416	25,782	28,760	25,651
Exports	1,361	1,337	953	899	840
Total available from domestic production	25,147	25,779	23,988	24,714	24,234
Imports	10,334	10,807	15,584	13,447	11,959
Delivery from imports:					
Coal mine coke ovens	460	706	1,368	1,283	1,204
Steel plant coke ovens	3,372	3,230	3,587	3,551	3,427
Gas coke ovens	607	554	1,103	730	568
Briqueting plants	945	1,312	2,724	1,723	1,135
Mines, for use, blending, or stocks	21	4	378	(3)	
Stock variations [2]	+1,003	+497	−2,799	+291	+141
Available from imports	3,926	4,504	9,223	5,869	5,484
Available for domestic distribution	29,073	30,283	33,211	30,583	29,718
Railroads	2,517	2,306	2,363	2,081	1,569
Gasworks	543	321	181	69	23
Electricity	5,049	5,978	7,659	7,064	8,614
Iron and steel	1,387	1,624	1,649	1,557	1,607
Other industries	10,908	10,762	10,861	9,823	8,946
Domestic and small industries	8,669	9,292	10,598	9,989	8,959

[1] Data presented differ slightly from those given elsewhere in this chapter because of differences in sources.
[2] Plus (+) denotes addition to stocks; minus (−) denotes withdrawal from stocks.
[3] Accounted for in figure on available for domestic consumption.

Source: Bureau de Documentation Minière. Combustibles Minèraux Solides. Statistique Annuelle Définitive. Paris, France, pt. 2, 1961–65.

Table 12.—France: Import and export of coal, coke, and coal and lignite briquets in 1965 [1]

(Thousand metric tons)

Origin	Coal	Coke	Coal briquets	Lignite briquets	Total
Imports:					
EEC countries:					
West Germany	5,370	3,269	76	370	9,085
Saar	2,769	736			3,505
Netherlands	887	905	227	6	2,025
Belgium	643	170	105		918
Total EEC countries	6,900	[2] 4,351	408	376	12,035
Other countries:					
United Kingdom	803		4		807
Poland	474				474
U.S.S.R.	1,557				1,557
United States	1,898				1,898
Other countries	262				262
Grant total	11,894	4,351	412	376	17,033
Exports:					
West Germany	396	110			506
Belgium	162	2			164
Netherlands	130				130
Other	113	42	66	27	248
Total	801	154	66	27	1,048

[1] Data presented here differ somewhat from those presented elsewhere in this chapter because of differences in sources.
[2] Including 7 tons from Italy.

Source: Bureau de Documentation Minière. Combustibles Minéraux Solides, Statistique Annuelle Définitive. Paris, France, pt. 2, 1965, 6 pp.

Preparation.—There were 64 washing plants in operation in 1964 with an average hourly capacity of 400 tons of raw coal; newer plants have hourly capacities of 1,000 to 1,400 tons. Total capacity was about 24,700 tons, of which 21,500 tons was in new or modernized plants.[32]

In 1965, 87.2 percent of run of mine production was washed, including 43.7 percent delivered marketable coal, 34.5 percent rejects, 6.5 percent middling, and 2.5 percent slime. Of the total coal washed, 50.7 percent was treated in heavy media, 39.2 percent in piston jigs, 8.3 percent in flotation cells, 1.6 percent on pneumatic tables, and 0.2 percent by miscellaneous facilities. Flotation installations in operation totaled 31 in 1964 with hourly capacity of 1,300 tons. Practically all the fine coal (5 to 10 millimeters) is obtained from heavy-media cells. Dried slimes produced by flotation accounted for 9 percent of net annual output. Heavy media cyclone separation, introduced in 1964 at Messeix (Auvergne), was introduced during 1965 at Brassac (also Auvergne) and at Barrois and Bruay in Nord/Pas-de-Calais.

[32] Provisional figures.

Manpower.—The reduction of coal-mining workers, both underground and surface, continued. During the year 6,312 workers left the industry, including 4,277 underground and 2,035 surface workers. Employment on December 31, 1965, in the mines of Charbonnage de France (including lignite) was distributed as follows by area:

Area	Employment		
	Surface	Underground	Total
Nord/Pas-de-Calais	23,418	67,486	90,904
Lorraine	9,167	19,500	28,667
Centre-Midi	10,780	21,449	32,229
Total	43,365	108,435	151,800
Reduction from 1964 figures (percent)	4.5	3.8	4.0

In addition, 8,893 persons were employed in associated plants of the mines of Charbonnage de France.

Average salaries for an 8-hour, 15-minute day, including all premiums but excluding payments for vacation and rest days were as follows:

Year	Average daily salary (dollars)		
	Underground	Surface	Surface and underground
1963 r	7.19	5.61	6.69
1964 r	7.88	6.18	7.34
1965	8.34	6.57	7.79

r Revised.

Fringe benefits and social security payments were equivalent to 84.84 percent of wages. Because of increases in basic wage rates on April 1 and September 1, personnel costs increased by about $20 million for the year as a whole.

Investment.—There was a small increase in total investment in the coal industry because of the increase in investment in conversion facilities; investment in mining and housing continued to decline. Of total investment of $90,340,000 in 1965 (exclusive of recoverable taxes), $49,220,000 was for extraction, $33,620,000 for conversion industries, and $7,490,000 for housing (753 houses completed during the year).

Important projects started under the fourth phase of the modernization program during the year included a washery for coal fines at Barrois in the Nord/Pas-de-Calais area, opening of a new field (Falck) in the La Houve mine group, and deepening the Merlebach mine to 1,036 meters and the Simon mine to 580 meters, both in the Lorraine basin.

Of the sum invested in the conversion facilities, $14,580,000 was spent for powerplants (including $11,600,000 for the Gardanne powerplant); $2,430,000 was spent in coke oven plants to complete work previously undertaken, and for coal preparation, maintenance of gas networks and mechanization of coke pushers. The chemical section had the largest share of investment for conversion facilities, $16,640,000. A fourth nitric acid plant at Mazingarbe and a methanol plant at Harnes were being completed; a 600-ton-per-day ammonia plant was also under construction at Mazingarbe.

Research.—Research was concentrated in the chemical aspects of the industry (about $3.5 million) and in exploring new uses for coal. The work was carried out by Centre d'Études et Recherches de Charbonage (Cherchar) and by the coal mines of Nord/Pas-de-Calais and Lorraine. Research on coal, coke, chemial products, and high polymers was undertaken by Cherchar. Research on fertilizers and heavy water mainly concerned researchers in Nord/Pas-de-Calais, while those in Lorraine, utilizing their specialties, devoted attention to applying the results of Cherchar research to coal chemistry.

Coke and Coke Chemicals.—Coke ovens of the mines of Charbonnage de France accounted for 63 percent of total coke output. Their daily output averaged 23,675 tons, and production capacity remained practically the same as in 1964—25,600 tons per day. A new battery of coke ovens, number 4 in Nord/Pas-de-Calais, was put in operation in December, but this addition to capacity was balanced by closing two other batteries—one at Carbolux and one at Carmaux de Distirex. Of the coal used in coke production, Charbonnage de France carbonized 11,400,000 tons, 89.7 percent of total French-origin coal.

The iron and steel industry remained France's dominant coke consumer, accounting for 81 percent of the tonnage distributed. Of the 8,543,000 tons of coke, semicoke, and agglomerates produced at the coal mines, 5,222,000 tons was shipped to the iron and steel industry, 1.5 million tons was shipped to other industries, and the remainder went to household and export markets or was used for mine consumption.

There was a reduction in crude coal tar production—625,000 tons was produced, compared with 664,000 tons in 1964 and 625,000 tons in 1963. Of these totals, coal mines produced 377,000 tons in 1965, 395,000 tons in 1964, and 355,000 tons in 1963. The increase in production of benzoic hydrocarbons to 397,000 tons in 1965 (362,000 tons in 1964 and 327,000 tons in 1963) resulted mainly from treatment of petroleum; coal mines produced 137,000 tons of these products in 1965. Nitrogen products accounted for more than half of the turnover of coal chemicals produced by the coal mines and their subsidiaries. In 1965, with production of 572,900 tons of ammonia and 430,700 tons of ammonium fertilizers, the coal mines and their subsidiaries accounted for 46 and 39 percent of national output, respectively.

Table 13.—France: Production, availability, and distribution of coke

(Thousand metric tons)

	1961	1962	1963	1964	1965
Coal charged to coke ovens:					
Domestic	13,730	13,686	12,160	13,304	12,715
Imported	4,590	4,635	6,060	5,660	5,367
Total	18,320	18,321	18,220	18,964	18,082
Production:					
Coke oven coke:					
At mines:[1]					
Nord-Pas-de-Calais	4,777	4,660	4,473	5,260	4,851
Lorraine	1,879	2,308	2,419	2,753	2,618
Other	1,121	1,102	1,163	965	1,172
Total	7,777	8,070	8,055	8,978	8,641
In iron and steel plants	4,420	4,384	4,315	4,323	4,269
By gas companies and independents	1,555	1,332	1,365	1,002	740
Total	[2] 13,753	[2] 13,785	13,735	14,303	13,650
Of which:					
Semicoke	278	269	271	296	241
Carbonized briquets	NA	35	41	66	27
Gas coke	429	247	138	61	20
Availability and distribution:					
Coke produced [1]	13,753	13,785	13,735	14,303	13,650
Receipt of coke and fines	166	72	2	13	4
Consumption at coking plants and by labor	860	981	1,039	911	864
Available for distribution	13,059	12,876	12,698	13,405	12,790
Stock variation [3]	+200	−68	−370	+333	−85
Imports	5,530	4,694	5,916	4,958	4,399
Importers stock variation [3]	+21	+50	+439	+35	−15
Total available from domestic production and imports	18,368	17,588	18,545	17,995	17,289
Delivery to coking plants	160	66	5	11	13
Exports	105	160	154	144	158
Distribution:					
Railroads	78	78	116	91	83
Electricity	1	4	5	14	16
Iron and steel	14,829	13,791	13,675	14,515	13,796
Other industries	1,888	1,845	2,025	2,003	1,968
Domestic use and small industries	1,307	1,644	2,565	1,217	1,255
Total	18,103	17,362	18,386	17,840	17,118

[1] Includes semicoke and carbonized briquets.
[2] Detail does not add to total because of rounding.
[3] Plus (+) denotes addition to stocks, minus (−) denotes withdrawals from stocks.

Source: Bureau de Documentation Miniere. Combustibles Minéraux Solides. Statistique Annuelle Définitive. Paris, France, pt. 2, 1961–65.

Patent Fuels.—Coal mines of Charbonnage de France produced 4.48 million tons, and private mines and patent fuel producers other than mines provided 1.33 million tons. Of the total output, 4.4 million tons was classified as boulet (egg-shaped agglomerates used for domestic heating), 1.21 million tons was smokeless agglomerates, and 192,000 tons was briquets. Smokeless agglomerates maintained their popularity with consumers. Four furnaces for producing "anthracene" at Rousseau plant in Valencienne, Nord/Pas-de-Calais, were completed. A new plant was also being built at Blanzy.

Lignite.—Much of the increase in lignite production was obtained from mines in the Landes region, which produced 972,000 tons. Mines of Charbonnage de France in Provence produced 1,697,000 tons (1,606,000 tons in 1964); 19,000 tons was produced by other mines. Lignite shipment to users other than miners' own use and briquetting plants totaled 1,784,000 tons: 962,000 tons to powerplants, 735,000 tons to industry, and 87,000 tons to domestic users and small industry.

Petroleum and Natural Gas.[33]—Domestic production of crude petroleum in 1965, although 5 percent greater than in 1964,

[33] Comité Professionnel du Pétrole. Éléments Statistiques. Activité de l'Industrie Pétrolière, V. 1, Paris, France, 1963–1965.

was only 4.9 percent of total national refinery throughput (5.6 percent in 1964). Consumption of petroleum products increased about 5 million tons from the 1964 record, but the rate of increase was just about half that of 1963 to 1964. The net cost of imports of petroleum and petroleum products to the French economy increased again, from $803 million in 1964 to $926 million in 1965.

In 1965, $475 million was invested in the oil industry with refining, storage, and distribution as the largest areas of expenditure. Taxes on petroleum products contributed $2.1 billion to the general budgets. Tax represented between 74 and 77 percent of the retail price of motor gasoline and 70 percent of that of gas oil.[34]

Table 14.—France: Salient statistics of petroleum and natural gas industry

(Thousand metric tons unless otherwise specified)

	1961	1962	1963	1964	1965
Length of hole drilled—thousand meters	281	264	237	189	182
Production:					
Crude petroleum	2,163	2,370	2,522	2,846	2,988
Natural gas—million cubic meters	6,018	6,996	7,518	7,939	7,910
Marketed—do	4,010	4,740	4,861	5,090	5,048
Products obtained from refining natural gas:					
Liquefied products	414	424	438	490	569
Sulfur	1,105	1,345	1,409	1,511	1,521
Refining:					
Number of refineries—units	14	14	15	16	18
Capacity of refineries (atmospheric distillation)	43,590	44,540	51,830	61,930	70,280
Refinery throughput	37,074	39,863	46,702	53,284	61,359
Refinery production:					
Aviation gasoline	92	88	69	66	72
Motor gasoline	6,930	6,983	7,943	8,643	9,560
Special gasolines	224	249	423	825	1,126
Kerosine and white spirits	475	383	404	260	194
Jet fuels	1,179	1,371	1,542	1,662	1,850
Fuel oil:					
Distillate	4,415	4,352	4,756	5,091	5,997
Domestic	4,883	6,463	8,609	10,691	13,493
Residual	12,094	12,516	14,643	16,623	19,069
Bitumen	1,590	1,641	1,777	2,172	2,219
Lubricants	696	777	813	871	821
Paraffins and waxes	34	41	42	49	48
Petrochemical feedstock	363	433	503	582	691
Liquefied petroleum gas	1,023	1,117	1,352	1,487	1,644
Refinery gases	832	951	1,105	1,279	733
Other	118	244	113	75	79
Total	34,948	37,609	44,094	50,376	57,596
Foreign trade:					
Imports:					
Crude:					
Franc zone:					
Algeria	11,182	12,699	15,215	17,113	17,386
Other	830	820	784	884	1,114
Subtotal	12,012	[1] 13,520	15,999	[r] 17,997	18,500
Middle East:					
Iran	814	1,478	2,038	3,441	5,923
Iraq	6,893	7,226	9,260	8,079	9,814
Kuwait	8,752	8,203	8,083	9,799	8,814
Qatar	1,574	1,541	1,194	1,311	1,292
Saudi Arabia	2,335	2,083	1,793	1,945	2,546
Abu Dhabi	---	159	466	1,453	1,802
Total	20,368	20,690	22,834	26,028	[1] 30,190
United States	50	17	---	---	---
U.S.S.R.	113	86	114	92	836
Venezuela	2,449	2,598	2,649	2,595	2,668
Libya	25	250	1,661	2,290	5,863
Other	---	---	---	273	499
Grand total	[1] 35,018	37,161	43,257	49,275	58,556

See footnote at end of table.

[34] Petroleum Press Service. Obstacle Race in France. Vol. 33, No. 10, October 1966, p. 371.

Table 14.—France: Salient statistics of petroleum and natural gas industry—Continued

(Thousand metric tons unless otherwise specified)

	1961	1962	1963	1964	1965
Foreign trade—Continued					
Imports—Continued					
Products	2,462	r3,061	4,276	4,592	3,719
Exports of products including bunkering	8,178	7,520	8,006	8,963	11,200
Consumption:					
Internal market	25,868	30,297	r35,921	41,642	46,591
French bunkering	1,425	1,518	1,339	1,376	1,213
Other consumption including refinery and distribution losses (approximately)	4,350	4,620	5,000	5,000	5,500
Stock:					
In refinery	9,203	10,519	11,774	14,219	16,614
In distribution channels	3,871	3,914	4,540	5,161	5,763
Transportation:					
Tankers:					
Units	104	103	93	93	92
Deadweight tons	3,022	3,055	2,945	3,088	3,401
Tank cars:					
Units	13,142	14,191	16,150	18,719	19,461
Capacity—thousand cubic meters	355	511	620	782	835
Tank trucks:					
Units	7,363	8,019	8,248	10,220	11,677
Capacity—thousand cubic meters	90	99	100	126	141
Employment:					
Exploration and production—persons	11,650	10,923	11,043	10,503	10,847
Refinery—do	16,850	15,710	15,895	16,266	16,125
Distribution—do	84,750	84,550	84,600	89,590	89,990
Other—do	1,150	1,300	1,355	1,436	1,485
Investments:[2]					
Exploration and production—thousands	NA	NA	$67,044	NA	$65,828
Refining, storage, and chemical facilities in refineries—thousands	NA	NA	$142,798	NA	$198,702
Distribution and storage outside refineries—do	NA	NA	$119,707	NA	$227,059
Pipelines—do	NA	NA	$20,660	NA	$29,572
Maritime transport—do	NA	NA	$23,901	NA	$43,548
Other—do	NA	NA	$15,596	NA	$13,166
Total—do	NA	NA	$389,706	NA	$577,875

r Revised. NA Not available.
[1] Detail does not add to total because of rounding.
[2] Categories of expenditures have been changed so that the figures do not correspond to those given in previous editions of this chapter.

Sources: Comité Professionel du Pétrole. Éléments Statistiques. Activité dé l'Industrie Pétrolière. For the years 1961–1965. V. 1, Paris, France; and Statistical Office of the United Nations.

Government Actions.—A decree with regard to distribution of petroleum products was issued on February 26, 1965, fixing the maximum quantities of gasoline and lubricants that the marketing companies may sell in the French market each year. The decree, which will be valid September 1, 1965, to August 31, 1968, in effect renewed the distribution authorization of April 15, 1953, which was to expire in 1965.

The new quotas include gasoline produced from Algerian and Gabonese as well as other foreign crudes, while previously only gasoline from other foreign crude was considered. As a result, total authorized imports will be 10,250,000 tons, compared with 4,874,374 tons under the previous quota. The share of French marketing companies in the total was increased to 52.82 percent from the previous figure of 51.75 percent. The new quotas leave marketeers room for expansion, but the scope given to the mainly French groups is greater than that given to the international companies. The new decree removes the misgivings of the international oil companies as to their situation should Algerian crude become "foreign crude."

A decree of December 17 merged the Regie Autonome des Pétroles (RAP) and Bureau de Recherches de Pétrole (BRP) into a single entity, Enterprise de Recherches et d'Activités Pétrolières (ERAP) effective January 1, 1966. BRP, which was a holding company for participation in petroleum production and exploration, brings into the new company the following shares of other companies: 27.92 percent of Compagnie Algérienne de Recher-

che et d'Exploitation Pétrolières, 51.5 percent of Compagnie d'Exploration Pétrolière (CEP), 80.91 percent of Compagnie des Pétrolas France-Afrique, 4.5 percent of Compagnie Algérienne de Recherche et d'Exploitation du Pétrole au Sahara (CREPS), 86.66 percent of Société de Participations Pétrolières (PETROPAR), 67.5 percent of Société Anonyme Française de Recherches et d'Exploitation de Pétrole (SAFREP), 51.02 percent of Société Nationale des Pétroles d'Aquitaine (SNPA), 40.51 percent of Société Nationale de Recherche et d'Exploitation des Pétroles en Algérie, and 80.91 percent of Société de Recherches et d'Exploitation Pétrolières (SOREX). RAP, which is directly involved in oil production, will bring a majority interest in Société Auxiliare de la RAP (AUXIRAP) and Société de Gestion des Participations de la RAP, 25.5-percent interest in CREPS, and 33⅓ percent in Union Générale des Pétroles (UGP).[35] ERAP will have available to it annually about 20 million tons of crude (about 54 percent of Franc zone production), of which 17 million tons will be from the Sahara. UGP, controlled by ERAP, at year-end 1965 had 6.2 million tons of annual refinery capacity, including 4 million tons in the Feyzin refinery (Rhone-Alpes), 1.8 million tons in the Ambès refinery, and a 0.4-million-ton share in the Compagnie Rhenane de Raffinage refinery at Reichstett. UGP's plans envisage a 10-million-ton refining capacity, and its market share will be increased, through government measures, to 15 percent. ERAP, through a subsidiary, will also take over the 50-percent share in the Cooperative Association envisaged by the Franco-Algerian agreement detailed in the next paragraph.

The Franco-Algerian oil agreement was signed on July 29, 1965. So far as existing undertakings are concerned, it affects only French companies, as defined in the agreement, and the status of oil-producing companies operating in Algeria in 1965 will remain as specified in the Sahara Petroleum Code and the Evian Accords except for tax arrangements established by the new treaty. However, some of the terms designed originally to encourage exploration in the Sahara have been changed with the objective of increasing government revenue. Thus depletion allowance is canceled and amortization is made similar to the practice in the Near East. The agreement also includes the award of nine concessions (six for oil and three for gas) which will come under the same terms as above.[36]

With regard to taxes, Algeria obtained a guarantee against the effect of lower prices, because for tax purposes, profit will be calculated on a fixed price of $2.08 per barrel for crude f.o.b. Bougie (slightly different for other ports). The 50–50 split in profit is abandoned, and profits tax will be increased in steps to 55 percent in 1969 and will be at this rate after 1969.

The agreement increased the holdings of Société Nationale de Recherche et d'Exploitation des Pétroles en Algerie (S.N. REPAL Algeria) to its initial holdings of 50 percent. Algeria will pay for these shares at a price equivalent to that which it received when it sold its holdings in 1958.

Natural gas concessionnaires are required to deliver to Algeria the amount of gas it wishes to have for the domestic market and for any export contract it may negotiate, the price of the gas to be fixed so as to cover production cost, taxes, and a 12-percent return on capital. Future gas sales to France will be undertaken by a Franco-Algerian company which will share profits on a 50–50 basis.

An important feature of the agreement is the formation of a cooperative association between France and Algeria, which will undertake exploration and production, if oil is found, in an area of 180,000 square kilometers and in any additional areas from exploration permits that are turned over to it.

A declaration of intent was signed in December 1965 between the Électricité de France (EdF) and UGP, the Government's instrument for refining and marketing Saharan crude. Up to now, the EdF has been buying its fuel without long-term contracts from the Refiner's Group, an association of all French oil companies including foreign subsidiaries. The declaration of intent provides for a whole series of contracts to be concluded shortly between the two companies, providing for the supply of several EdF thermal powerplants with fuel from UGP refineries.

[35] Erdoel und Kohle. Vol. 19, No. 1, January 1966, p. 68.
[36] Petroleum Press Service. Vol. 32, No. 9, September 1965, p. 324.

Exploration.[37]—Exploration was centered in the Aquitaine and Paris basins in 1965. Of the 59 exploratory wells drilled, 34 were in the Aquitaine basin and 25 in the Paris basin, where the principal objectives were sandstones and carbonates of the Early Cretaceous and Middle and Lower Jurassic.

At yearend 99,740[38] square kilometers of France including offshore areas was covered by exclusive exploration permits. Geophysical and drilling activities continued to decline, geophysical by 11 and drilling by 4 percent. Compared with 117.1 geophysical team-months in 1964, 104.6 team-months were completed in 1965: 95.5 by seismic, 1.5 by gravimetric, and 7.6 by other methods, smaller footage of wells drilled by light rigs accounted for practically all of the decline in total drilling. Of the latter 47 percent were exploratory, 51 percent were reservoir extensions and development, and 2 percent were injection wells. Six wells struck oil (Grandville No. 102, Marolles-en-Hurepoix, and Saint Hilaire No. 1 in the Paris basin, and Cabeil, Bourrache, and La Jaougue No. 1 in the Aquitaine basin) and three wells struck gas (St. Martin de Bossenay in the Paris basin, Meillon No. 1 in Aquitaine, and Fouye West in the Polignac basin.) The producing horizon in the three oil wells of Aquitaine, all discovered by Société Esso de Recherches et de Exploitations Pétrolières (Esso Rep), is Neocomian (Early Cretaceous). Upper Jurassic dolomite is the producing horizon at the Meillon gas discovery.

Table 15.—France: Summary of drilling activities [1]

	Oil wells	Gas wells	Dry wells	Total	Length drilled, meters
Exploration:					
1961	4	1	102	107	166,325
1962	11	----------	88	99	163,788
1963	4	1	101	106	168,926
1964	1	2	76	79	139,476
1965	6	3	50	59	(2)
Development and injection:					
1961	58	----------	19	77	91,667
1962	54	----------	22	76	82,101
1963	24	----------	13	37	52,482
1964	16	1	11	28	46,318
1965	15	----------	14	29	(2)
Core drills:[3]					
1961			30	30	22,913
1962			31	31	17,915
1963			27	27	15,099
1964			6	6	3,290
1965			1	1	(2)

[1] In addition dry wildcat wells were driven as follows: 1961, 30; 1962, 31; 1963, 27; 1964, 6; 1965, 1.
[2] Total drilled 181,700 meters; distribution by type of activity not available.
[3] Excludes shallow depth core drills.

France expanded its interest in oil exploration abroad. Total Oil Marine, Ltd., an affiliate of the Compagnie Français des Pétroles, was operating in the United Kingdom section of the North Sea. Companies in which ERAP has a majority holding have search permits in many European countries. RAP and SNPA in association with private interests and the Spanish state enterprise, Instituto Nacional de Industria, participated in exploration carried out by Empresa Nacional de Petroles de Aragon and Empresa Nacional de Petroles de Navarra.

In Switzerland, SNPA owns 75 percent of the Vaud permit in the region of Lake Léman. In Italy, PETROPAR has formed a subsidiary, Petropar Italia, which in association with Montecatini was interested in petroleum exploration, particularly on the Adriatic offshore areas and in Sicily. Petropar Italia with Petrobelge-AMI- has been drilling at San Chirico on the Tolver permit where gas was discovered. Petroland, a Dutch affiliate of RAP, has made significant gas discoveries in the vicinity of Herbayum in the Frisian Islands. Coparex also formed a Netherlands subsidiary,

[37] King, Robert E. Petroleum Exploration and Production in Europe in 1965. Bull. Am. Assoc. Petrol. Geol., v. 50, No. 8, August 1966, pp. 1634–1642.
[38] This figure does not include 51,700 square kilometer area for which exploration permits had been sought.

Coparex Nederland, for participating in offshore drilling.

An agreement between Saudi Arabia and the Société Auxiliare de la Régie Autonome des Pétroles, wholly owned by the French Government, ratified on April 4, 1965, gave RAP a role in the exploration of the offshore areas of the Red Sea. The area of the exploration license remained to be determined. Under the agreement, upon the discovery of commercial oil, a joint company will be formed; the French share will be 60 percent.

SNPA, BRP, and RAP have a 20 percent share in a concession from Iran in the Persian Gulf. PETROPAR started working in Turkey in 1963 and now has several exploration permits in areas north of Syria and Iraq where in 1965 drilling was carried out to study the Cretaceous.

In Africa, outside the Franc zone, French interest has spread to Nigeria and Libya. SAFREP (Nigeria) Ltd. holds permits for four offshore blocks in the delta of the Niger River and six blocks in the Cretaceous basin and has struck oil in both areas. CEP is already involved in producing crude in Libya. This company and Deutsche Erdoel made bids for additional areas. An SNPA subsidiary has a 20-percent interest in a concession in Libya's Fezzan region. SNPA will participate with AUXIRAP (14 percent), Hispanoil (42 percent), and Murphy Oil (16 percent) to explore areas in Tripolitania and Cyrenaica. In Australia and Canada, French companies have entered into partnership with lease holders, have taken farmouts from other companies, and have taken permits directly.[39]

Australian Aquitaine Petroleum Ltd., the Australian subsidiary of SNPA, with ARCO Ltd., subsidiary of Atlantic Refining Company, have obtained an offshore permit in the Continental Shelf in the Timor Sea. With another group it will explore the regions of Mayneside in southeast Australia. SNPA is not the only French company in Australia. Compagnie Française des Pétroles (CFP) through its subsidiary, the French Petroleum Company (Australia) Ltd., is exploring for its own account in southwestern Queensland and has concluded agreements for exploration in the east-central region of the country. CFP and SNPA work together in the northwestern part of the Perth Basin, and CFP struck gas 230 kilometers north of Perth.

SNPA's oil activities in Canada are carried out under a general agreement with Banff which has numerous permits. In 1964 Aquitaine purchased about 41 percent of Banff's share capital. SNPA, acting as an operator for a group including itself, discovered oil at Rainbow Lake in Alberta on Mobil Oil permits.[40] In November SNPA was negotiating on a 50–50 farmout with Mobil.

Apart from SNPA, Petropar of Canada Ltd. is associated with various independents and is undertaking drilling in the Arctic Island of Canada.

Interest has also been shown in shale and tar sands of North America. Aquitaine of Canada has acquired acreage in Athabasca and Manitoba. Auxirap Corp. of America and Aquitaine Oil Corporation, subsidiaries of ERAP and SNPA, respectively, each have a 5-percent interest in the Oil Shale Corporation of Colorado.

In the North Sea, the French group consists of ERAP 30 percent, CFP 30 percent, and the REX group 10 percent.

In natural gas, Petroland, an RAP subsidiary, has discovered natural gas in the Netherlands. Petropar is a partner in natural gas discovery at Porto Canone, near Pescara in Italy. French participation in petroleum refining includes RAP's share in the Chittagong refinery in East Pakistan, a minority interest of BRP and UGP in a refinery to be built in Cambodia, and participation by French organizations in building a refinery in the Saar.

Crude Oil Production.—During 1965, 33 fields were in production in France including 11 in the Aquitaine basin that together produced 2,442,300 tons, or 82 percent of total national output. The Aquitaine basin increased output over that of 1964 by 8 percent, while output in the Paris basin declined by 6 percent to 521,300 tons and that of the Alsace basin by 20 percent to 24,200 tons. Parentis, Cazaux, and Lavergue were the three largest fields. Esso Rep continued as the largest producing company, accounting for 79 percent of national output (all from Aquitaine); CEP ranked second with 13 percent of the total,

[39] World Petroleum, April 1966, p. 48.
[40] Work cited in footnote [39].

and six other firms accounted for the remaining 8 percent.

Trade.—Almost the entire 9.28-million-ton increase in crude imports came from non-Franc-zone producers: 4.16 million tons from the Near East, 3.57 million tons from Libya and 740,000 tons from the U.S.S.R. Imports from Algeria (17.4 million tons) were at almost the same level as in 1964, but imports from Gabon increased by 238,000 tons. Near East suppliers did not quite maintain their share of the French market; it declined to 51.5 percent, compared with 53 percent in 1964. Libya had the largest increase; 1965 imports from this source were 2.5 times those of 1964. Although the trade agreement between France and the U.S.S.R. called for crude oil import starting at an annual rate of 1.55 million tons in 1965, actual crude import from this source was half the stipulated quantity. Product imports declined by 8 percent in 1965. Distillate and residual fuel oils contributed 72 percent of all product imports. U.S.S.R. and Rumania supplied 1,535,100 tons, and other non-Communist European (mainly EEC) countries supplied 1,067,000 tons. Imports of products from the U.S.S.R. (917,541 tons) declined from those of 1964 (1,126,811 tons).

Partly compensating for the increase in crude oil imports, France increased exports of petroleum products by about 1 million tons, with a value increase of $9 million. All the exports except 602,000 tons were shipped to Western Europe; 4.76 million tons went to other EEC countries, 2.58 million tons to Switzerland, and 1.08 million tons to the United Kingdom. The Netherlands, Switzerland, and West Germany were the principal markets for distillate fuels; these countries, Belgium-Luxembourg, and the United Kingdom were also the principal markets for residual fuel oils. Gasoline shipments were principally to Switzerland, the United Kingdom, and West Germany; together they accounted for 83 percent of gasoline exports.

French affiliates of Esso, Shell, British Petroleum, and Cie. des Produits Chimiques et Raffineries de Berre withdrew from their appeal to the Conseil d'État their objection on points relevant to the decrees issued in February 1963, leaving only those considered to be contrary to the Treaty of Rome.

Consumption.[41]—The internal market for petroleum products exceeded 46 million tons, a 12-percent increase compared with 1964, consumption. However, the rate of increase was lower than in 1964, when it was 17 percent. The decline resulted from general performance of the economy, unfavorable weather in the summer, which presumably reduced summer travel, and smaller sales to Électricité de France. Light and heavy fuel oil accounted for 60 percent; their share of the total market for a number of years follows:

Commodity	Percent of total			
	1962	1963	1964	1965
Gasoline	21.2	19.5	18.5	18.0
Motor gas oil	7.0	6.6	6.4	6.2
Fuel oils	55.5	58.1	59.6	60.0
Other products	16.3	15.8	15.5	15.8
Total	100.0	100.0	100.0	100.0

Domestic heating oil was the largest factor in domestic consumption, increasing by 25 percent. Of the 13.79 million tons shipped to the French market, heating of homes took 6.71 million tons, industrial space heating 5.11 million tons, and agriculture 1.3 million tons. Industry and space heating of dwellings also took almost the entire tonnage of light fuels, 1,843,000 and 942,100 tons, respectively. Principal consumers of heavy fuel oil and their consumption in thousand tons follow: industry 7,680, Électricité de France 2,450, French railroads 735, and domestic space heating 466.

[41] Equivalent to sales to civilian users. The figures do not take into account refineries' own consumption, refinery storage, and transportation losses, or change in the stocks of consumers and retailers.

For the first time sale of high-octane gasoline exceeded that of ordinary gasoline. With 50.7 percent of the total, premium gasoline increased its share of the market by 18.7 percent. The number of private cars and commercial vehicles increased to an estimated 8,775,000; the total number of motor vehicles was 10,843,300. The rate of increase of gasoline consumption was only 8.9 percent, compared with 10.7 percent in 1964. Direct sale of propane and butane to consumers increased 8.4 percent to 1,362,900 tons. Gasworks took 146,000 tons (127,000 tons in 1964), of which 129,500 tons was propane.

The Paris basin was the largest market for petroleum products with 21.7 percent of the market, followed by Nord/Pas-de-Calais with 7.69 percent and Haute Normandie with 5.47 percent. The Paris basin, although the largest market, had a smaller share of the total than in 1964, when it was 23 percent.

Table 16.—France: Petroleum supply position

(Million metric tons)

	1963	1964	1965
Crude oil supply:			
Production from Franc zone:			
France	2.52	2.85	2.99
Algeria and Sahara	23.89	26.49	26.48
Gabon and Congo (Brazzaville)	1.00	1.14	1.33
Total	27.41	30.48	30.80
Imports from outside Franc Zone:			
For French refineries [1]	24.40	26.60	34.16
For custom refining [1]	3.82	5.76	5.92
Total [1]	28.22	32.36	40.08
Changes in stocks [2]	+.02	+.05	−.18
Total crude available for refining or export	55.65	62.89	70.70
Crude oil disposal:			
Loss and other	.31	.27	.25
Additions to stocks	.50	.56	.19
Exports (from Franc zone production, largely Algerian crude)	8.14	8.77	8.89
Shipments to French refineries for processing	46.70	53.29	[1] 61.37
Total	55.65	62.89	70.70
Refinery operations:			
Refinery feed	46.70	53.29	61.37
Changes in stock of partly refined products	3.90	4.42	4.80
Refinery consumption and losses			
Refinery product output	42.80	48.87	56.57
Refinery product supply:			
Production [1]	42.80	48.87	56.57
Imports [1]	4.40	4.27	3.62
Hydrocarbon extracts produced from natural gas and other unspecified additions to product supply	.51	.62	.70
Total products available for consumption or exports	47.71	53.76	60.89
Refinery product disposal:			
Additions to refinery stocks	1.00	.60	1.01
Additions to distributors stocks	.40	.24	.40
Shipments for use:			
French market:			
Motor gasoline	6.93	7.69	8.37
Jet fuel	.68	.78	.84
Gas oil	2.36	2.66	2.89
Domestic heating oil	9.03	11.03	13.79
Light fuel oil	3.00	2.83	2.80
Heavy fuel oil	8.66	10.88	11.38
Liquefied petroleum gas	1.29	1.38	1.51
Petrochemical feedstock	r .85	r .99	1.25
Lubricants	.60	.64	.65
Bitumen	1.64	1.77	1.85
Other	r .88	r .99	1.26
Total	r 35.92	r 41.64	46.59

See footnotes at end of table.

Table 16.—France: Petroleum supply position—Continued

(Million metric tons)

	1963	1964	1965
Shipments for use—Continued			
French market—Continued			
Other markets and adjustments	1.10	1.05	1.13
Bunkering of French ships	1.34	1.34	1.21
Total French market	38.36	r 44.03	48.93
Bunkering of Franc zone ships	1.90	.92	.32
Bunkering of other foreign ships	.67	.53	.81
Exports	5.40	7.14	9.54
Total non-French market	7.97	8.59	10.67
Grand total refinery product disposal	46.33	r 52.62	59.60

p Preliminary. r Revised.
[1] Data presented differ slightly from those given elsewhere in the chapter because of differences in sources.
[2] Plus (+) denotes withdrawals from stocks; minus (−) denotes additions.

Table 17.—France: Estimated breakdown of petroleum consumption by end users

(Thousand metric tons and percent)

	1964		1965	
	Quantity	Percent	Quantity	Percent
Transport:				
Road	9,962	22.6	10,881	22.4
Coastal and river	545	1.2	573	1.2
Maritime	2,197	5.0	2,058	4.2
Railroad	1,191	2.7	1,131	2.3
Air	876	2.0	923	1.9
Agriculture	1,713	3.9	1,768	3.6
Domestic space heating and other domestic use	7,712	17.5	9,438	19.4
Industrial and other uses:				
Thermal electricity	2,949	6.7	2,661	5.5
Production of gas	665	1.5	765	1.6
Production of steam	6,477	14.7	7,380	15.2
Furnace use	4,954	11.2	5,809	11.9
Bakeries	487	1.1	485	1.0
Lubrication	165	0.4	177	0.4
Road pavement	1,713	3.9	1,776	3.6
Unspecified	1,882	4.2	2,080	4.3
Semi-fixed or installed engines	646	1.4	745	1.5
Total	44,134	100.0	48,650	100.0

Transportation and Distribution.— In 1965, 83 percent of crude oil delivered to metropolitan French ports for French consumption (excluding processing for exports) was carried by French vessels.[42] On December 31, 1965, the French tanker fleet included 93 vessels totaling 3,418,000 deadweight tons. During the year, four new tankers totaling 318,670 deadweight tons were added, one vessel was enlarged from 32,600 to 59,940 tons, and eight other ships totaling 158,542 tons were withdrawn from service. As a result, distribution of vessels by size categories in 1965 was 75,000 tons or more, 5; 50,000 to 74,499 tons, 17; 40,000 to 49,999 tons, 6; 30,000 to 39,999 tons, 32; 15,000 to 29,999 tons, 31; and 10,000 to 14,499 tons, 1. For internal transportation there were 786 barges in service with a total capacity of 465,410 tons; 17,903,469 tons of oil and products were carried by river transportation.

In 1965 the South European Pipeline transported 27.7 million tons of crude (supplying 10 refineries), the Trapil line (the pipeline from Le Havre to Paris) moved 4,753,000 tons of products, and the Parentis-Ambes line transported 2,341,601 tons of crude. At yearend, the South European Pipeline, with 15 pumping stations,

[42] République Française, Ministère de l'Industrie, Direction des Carburants. Activities of the French Oil Industry in the Year 1965. Paris, France, 1966, p. 3.

had 30 million tons' annual capacity; this capacity will be further increased to 35 million tons by mid-1966. Trapil can now transmit 6 million to 6.5 million tons of products annually. The gas pipeline from Le Havre to Paris started operation in March. A spur pipeline from the South European Pipeline (near Besançon) to Cressier in Switzerland was under construction. Proposed was a crude pipeline from the South European Pipeline at Strasbourg to the stite of the refinery in Lorraine that is slated for completion in 1970. A product pipeline from the Marseille area to Lyon with branches to St. Étienne, Dijon, and Geneva was also proposed. A new company, Société du Pipeline Mediterranée Rhon, has been set up to operate the pipeline.[43] UGP and UIP received permission to build and operate a 250-kilometer-crude pipeline, with a 2.5-million-ton initial and 7-million-ton ultimate annual capacity, from Le Havre to the UGP refinery to be built at Grandpuits near Paris.[44]

Refining.—At yearend 1965 France had an annual refining capacity of 70.3 million tons, including about 8 million tons added in 1965. Of this addition, 4.2 million tons was accounted for by the new refineries at Fos-sur-Mer and Vern-sur-Seiche, and the remainder by expansion of existing refineries at Gravenchon, Herrlisheim, Bordeaux, Gonfreville, and Donges. Of the total, 23.7 million tons was located in the Seine basin, 21.5 million tons on the Mediterranean, 10 million tons on the Atlantic, 7.6 million tons in Alsace, 5.5 million tons in the North, and another 2 million tons in the Lyon region.

Fos-sur-Mer, connected by three pipelines to Lavéra, was in full operation in October. This refinery has a middle distillate desulfurization unit with 700,000 tons' annual capacity. Storage capacity totaled 560,000 cubic meters of which 190,000 cubic meters was for crude.[45] The Vern-sur-Seiche refinery came on stream in June. Imported crude was supplied from Donges by a 93-kilometer pipeline. The refinery under construction at Grandpuits will be operated by Compagnie de la Raffinage de l'Isle de France, established jointly by UGP and UIP.

Plans for a new 2.8-million-ton-per-year refinery at Melun, to be built by UGP, have been announced. The refinery capacity of Feyzin is to be doubled to 4 million tons per year. A stream cracker, due to be operative by 1967, with an annual capacity of 150,000 tons of ethylene, 150,000 tons of propylene, and 40,000 of butadiene, will constitute the first stage of construction of a major petrochemical complex.[46] Three other stream crackers are also due to come into operation: a 200,000-ton unit at Esso's Port Jerôme refinery, a 125,000-ton unit at Berre refinery, and a 100,000-ton unit at Lavéra, the latter owned by Naphthachimie.[47]

Refinery output as a whole was 14 percent greater than in 1964. All fuel oils increased 19 percent, heavy fuel oil 15 percent, and domestic heating oil 26 percent. The increase in gasoline output (11 percent) was less than that for all refinery products. In 1965, residual fuel oils accounted for 33 percent, and domestic fuel oil for 23 percent, of gross production. Other products, in percent, were as follows: Gasoline 16; distillate fuel oil 10; bitumen 4; and liquefied petroleum gases 3.

Natural and Manufactured Gas.—Natural gas was discovered at Meillon and Gas de France, and Nederlandsche Aardolie Maatschappij (NAM) reached an agreement to import Dutch gas into France starting in 1967. Natural gas sales were at about the same level as in 1964—5 billion cubic meters.

The Meillon discovery was at a depth of about 4,950 meters in well Meillon I. A daily production of 1.7 million cubic meters from this well was reported in July. Meillon II was being drilled at yearend. The gas at Meillon has 6.5 percent H_2S (15.5 percent at Lacq) and a correspondingly higher methane content.

At yearend a preliminary agreement was made with NAM for delivery of up to 5,000 million cubic meters of gas per year for 20 years. Initial delivery at 1,000 million to 1,500 million cubic meters is scheduled for 1967. The gas will be delivered at

[43] Petroleum Press Service. Vol. 32, No. 7, July 1965, p. 272.
[44] Erdoel und Kohle. Vol. 19, No. 1, January 1966, p. 68.
[45] Erdoel und Kohle. Vol. 18, No. 2, February 1965, p. 155.
[46] Oil and Gas International. Vol. 5, No. 2, February 1966, p. 70.
[47] Owned jointly by Péchiney-Seichimie, Société Française des Pétroles BP, and Compagnie du Chemin de Fer du Nord

Table 18.—France: Capacities of petroleum refiners, 1965

(Thousand metric tons per year)

Company and location	Principal secondary processing facilities				
	Atmospheric distillation	Thermal reforming	Catalytic reforming	Thermal cracking	Catalytic cracking
Antar Pétroles de l'Atlantique:					
Donges	4,100	750	2,100	----	1,600
Vern-sur-Seiche	1,200	----	900	----	----
Société Française des Pétroles B.P.:					
Lavéra	4,400	635	1,000	----	----
Dunkirk	5,500	----	1,600	----	----
Compagnie Française de Raffinage:					
Gonfreville	10,600	1,060	3,750	----	2,665
La Mede	6,400	1,820	2,400	300	1,627
Esso Standard of Fance:					
Bordeaux	2,400	----	670	----	----
Port-Jérôme	4,000	----	1,660	----	3,040
Fos-sur-mer	3,000	----	1,190	----	1,720
Mobil Oil Française:					
Frontignan	1,730	----	600	----	1,500
Gravenchon	3,600	----	2,100	----	----
Union Industrielle des Pétroles: Ambes	1,800	520	480	----	900
Campagine Rhénane de Raffinage: Reichstett-Venheim	3,700	----	2,000	2,600	----
Compagnie de Raffinage Shell-Berre:					
Berre-l'Étang	6,000	1,400	2,000	1,000	2,800
Pauillac	500	----	----	----	----
Petit-Couronne	5,500	----	1,700	1,000	2,200
Société de Raffinage de Strasbourg: Herrlisheim-Drusenheim	3,850	----	2,500	----	----
Union pour le Raffinage et la Pétrochemie: Feyzin	2,000	----	820	2,000	----
Total	70,280	6,185	27,470	6,900	18,052
Under construction:					
Union Génerale des Pétroles: Grandpuits	2,800	----	----	----	----

a point to be determined on the Netherland-Belgium frontier. Gas de France will negotiate with Belgium's Distrigas on the price and terms of transit of gas through Belgium.

Under the terms of the oil agreement with Algeria, France is to receive 1,500 million cubic meters of gas per year from Algeria by 1968 in addition to gas now being shipped from this source in liquid form to Le Havre.

According to Gas de France, the last plant reproducing gas from coal will have gone out of production by 1970; at year-end 1965, seven such plants were still in operation. After 1970, all gas requirements are to be met by natural gas and gas produced by cracking light oils.[48] France also has the beginning of underground gas storage in sand at Beynes near Versailles; storage capacity here is 300 million cubic meters.

Production of natural gas declined slightly. Of the 7,910 million cubic meters of natural gas produced, 7,678 million cubic meters was obtained from the Lacq field.

In 1965, 5,016 million cubic meters of natural gas were delivered to consumers[49] distributed as follows in million cubic meters: public distribution and municipalities 1,787; chemical and petrochemical industries 1,572; thermal power plants 688; iron and steel industry 221; glass, lime, plaster, and cement industries 236; paper industry 158; ceramic and construction materials 146 and others 208. Sales to the chemical industry continued to increase as in 1964, but sales to thermal plants were only 70 percent of the 1964 level. Industrial use accounted for 63.53 percent of total sales, and city consumption for 35.56 percent, the remainder being condensate. Geographical distribution of sales varied a little from that of the previous year, with the following percentage distribution being recorded: Aquitaine 29.04; Paris region 17.33; Midi-Pyrénées 18.39; and Rhône-Alpes 13.08. The drop in sales in the Paris

[48] The Economist. Jan. 29, 1966, p. 435.
[49] To be distinguished from sales which would exclude increase or decrease in stock.

region from 22 percent of the total in 1964 was accompanied by increase in the share of Midi-Pyrénées and Rhone-Alpes.

The drop in sale in the Paris area may have resulted from availability of Algerian gas. The methane carrier *Jules Verne* delivered its first cargo of refrigerated gas from Algeria at Le Havre on March 28, 1965. This gas is transported by pipeline to St. Illiers in the Paris region where it is stored.

Table 19.—France: Production, availability, and distribution of natural and manufactured gas

(Billions of kilocalories [1])

	1961	1962	1963	1964	1965
Production:					
Gasworks gas	5.9	5.5	6.0	5.6	7.2
Coke oven gas	24.2	24.8	24.7	26.5	25.7
Drained methane	.6	.5	.5	.6	.8
Blast furnace gas	52.7	48.6	45.7	48.1	45.9
Refinery gas	14.1	17.9	23.2	25.2	28.2
Natural gas	37.4	43.5	45.7	48.2	47.0
Total	134.9	140.8	145.8	154.2	154.8
Imports and from stocks	3.0	3.8	4.1	3.8	6.1
Available gross	137.9	144.6	149.9	158.0	160.9
Consumption for heating coke ovens, other uses, loss, and stocks	52.8	49.7	55.0	57.9	59.9
Available, net	85.1	94.9	97.9	100.1	101.0
Industrial:					
Electricity	28.7	28.7	25.2	23.6	19.7
Iron and steel	17.9	18.5	18.3	19.2	18.9
Mechanical and electrical	1.8	2.1	2.4	2.5	2.4
Chemical	13.6	19.1	19.9	23.3	25.1
Other	5.9	6.9	7.0	7.9	8.4
Subtotal industrial distribution	[2] 68.0	75.3	72.8	76.5	74.5
Distribution:					
Domestic	11.6	13.1	15.2	16.3	18.3
Commercial	2.6	3.0	3.4	3.7	4.3
Gasoline	.6	.5	.5	.6	.4
Exports and loss	2.3	3.4	3.0	3.0	3.5
Total distribution	85.1	[2] 94.9	94.9	100.1	101.0

[1] 1,000 kilocalories is equivalent to 0.15 standard coal equivalent. Volume of gas in cubic meters is 4,200 kilocalories per cubic meter and it can be obtained by dividing number of kilocalories by 4,200.
[2] Detail does not add to total because of rounding.

Source: Annales des Mines. Paris. France, July-August 1966, pp. 118–119.

The Mineral Industry of East Germany

By Roman V. Sondermayer [1]

East Germany continued to produce a variety of mineral commodities in 1965 but output of most commodities was the result of processing imported raw materials, and its mineral industry was of limited significance to the world economy. The Government continued to devlop mineral production facilities, but these expansions had little effect on the level of raw material imports. Principal mineral products with output expressed in approximate percentages of 1965 world totals were fuel briquets 53, brown coal coke 23, potash 14, coal 8, and salt 2.

East German trade in minerals and mineral products was conducted mainly with other Communist countries and was of minor significance to the western world. The trade in mineral commodities with the United States was insignificant. The output value of mining industry was over 2 billion East German marks,[2] and the industry employed over 200,000 persons.

The major efforts in the mineral industry concerned production of mineral fuels and expansion of petrochemical and iron and steel facilities. The Schwartze Pumpe Combine near Cottbus was the center of activities in lignite production, but at yearend 1965, the plant remained incomplete. The expansion of the petroleum refinery at Schwedt was finished; annual capacity of the facility was raised to 4 million tons of crude oil. A steel rolling mill at Eisenhuettenstadt and a cadmium plant as Freiberg complete the list of important mineral industry facilities installed during 1965.

As in the case of many other Communist countries, East Germany introduced an economic reform. The new measures were introduced slowly, and production of some minerals may be cut back, but overall effect of the reform on mineral industry could not be evaluated due to the short time since their inception and conflicting reports on results.

PRODUCTION

The mineral industry production efforts were assisted by the Soviet Union, and in most cases assistance given was geared to cover the needs of the U.S.S.R. Information on nonferrous metal output was not published except for that on aluminum and copper ore. However, it is known that lead, zinc, cadmium, tin, nickel, and uranium were produced.

Open-pit mining prevailed in East Germany because of the nature of the lignite deposits, its largest mineral resource.

[1] Foreign minerals specialist, Division of International Activities.

[2] In ths chapter, values have not been converted from reported East German marks because of the wide variation in official and actual exchange rates.

Table 1.—East Germany: Production of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Alumina	58,200	59,820	61,072	e 62,000	e 62,000
Aluminum [e]	45,000	45,000	45,000	45,000	45,000
Copper ore—thousand tons	1,687	1,700	1,626	r 1,563	1,433
Iron and steel:					
Iron ore—do	1,643	1,642	1,661	r 1,634	1,630
Pig iron—do	2,031	2,075	2,150	2,260	2,338
Steel ingots—do	3,444	3,622	3,626	3,852	3,890
Rolled products—do	2,703	2,798	2,813	2,900	2,986
Nonmetals:					
Cement—do	r 5,275	r 5,432	r 5,460	r 5,767	6,087
Fertilizers:					
Nitrogenous (N content)—do	330	338	340	r 334	348
Phosphatic (P_2O_5 content)—do	172	181	196	r 198	232
Gypsum, calcined	214,529	228,132	214,329	r 223,194	217,298
Lime [2]—thousand tons	2,827	3,344	3,457	r 3,673	3,441
Potash, crude (K_2O content)—do	1,675	1,752	1,845	r 1,857	1,926
Sulfur (content of pyrite)	41,000	42,000	44,000	r 42,000	44,000
Mineral fuels:					
Coal:					
Bituminous and anthracite—thousand tons	2,671	2,575	2,483	r 2,340	2,212
Brown—do	236,926	246,992	254,219	r 256,926	251,301
Brown-coal briquets—do	57,996	59,727	60,256	r 61,504	60,380
Coke from:					
Bituminous coal [3]—do	3,084	3,122	3,262	r 3,398	3,209
Brown coal [4]—do	7,665	7,661	7,568	r 7,608	7,342
Manufactured gas—million cubic feet	116,760	r 122,255	r 125,475	r 122,290	e 130,000
Petroleum:					
Refinery products:					
Gasoline—thousand tons	1,167	1,268	1,316	r 1,461	1,604

e Estimate. r Revised.
[1] In addition to reported commodities, East Germany was a known producer of the following (figures represent approximate order of magnitude): Copper 35,000; lead 26,000; nickel 100; tin 600; zinc 4,000 fluorspar 75,000; salt 2,000,000; and peat 500,000.
[2] All types including industrial.
[3] Includes gas coke.
[4] Includes high-temperature coke.

Source: Statistisches Jahrbuch der Deutschen Demokratischen Republik 1966 (Statistical Yearbook of the German Democratic Republic for 1966), Berlin 1966, 580 pp.

TRADE

The basic geographic pattern of East German mineral commodity trade was not reported in official East German trade statistics, but reports from other countries showed that the largest share of trade in minerals, approximately 80 percent of the total, has been with other Communist countries. Imports of iron ore, high ranked coals, and crude oil were essential for the economy and accounted for a large segment of foreign exchange expenditures.

Table 2.—East Germany: Exports of selected metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity		1963	1964	Principal destinations 1964
Metals:				
Aluminum:				
Scrap		NA	124	All to United Kingdom.
Metal and alloys, unwrought		NA	4,662	United Kingdom 3,088.
Copper:				
Metal, refined		NA	813	All to United Kingdom.
Metal and alloys, worked		NA	571	All to Yugoslavia.
Iron and steel:				
Scrap		NA	15,195	Austria 13,114; Belgium-Luxembourg 1,981.
Pig iron and ferroalloys		NA	270,744	United Kingdom 58,921; Belgium-Luxembourg 45,631; Denmark 41,194; Italy 29,954.
Steel, primary forms		NA	2,353	All to Italy.
Semimanufactures [2]		NA	31,611	Yugoslavia 8,990; Turkey 8,093; Italy 4,082.
Lead and alloys, unwrought		NA	49	All to Netherlands.
Nickel:				
Matte and speiss		NA	1,543	All to United Kingdom.
Metal and alloys		NA	18	Do.
Zinc and alloys, unwrought		NA	300	Do.
Nonmetals:				
Cement	thousand tons	[2] 444	[2] 493	Spain 88; Netherlands 9.
Clay, kaolin		[2] 64,171	[2] 62,712	Yugoslavia 3,495; Finland 2,126.
Feldspar, fluorspar		NA	4,580	Yugoslavia 2,214; Austria 1,414; Belgium-Luxembourg 952.
Fertilizers:				
Potassic salts, raw, (K_2O content)	thousand tons	[2] 1,161	[2] 1,218	Austria 183.
Potassic, manufactured, bulk		NA	729,512	United Kingdom 217,000 Yugoslavia 129,000; Denmark 77,916; Belgium-Luxembourg 58,576; Finland 55,285.
Nitrogenous, manufactured, bulk		NA	100,198	Greece 37,572; Yugoslavia 28,816; Ireland 24,348.
Gypsum, burned		[2] 37,045	[2] 50,744	Finland 11,286.[2]
Salt		NA	107,971	Finland 51,269; Sweden 44,371.
Sulfur		NA	9,220	Austria 8,145; Finland 1,075.
Mineral fuels:				
Coal:				
Bituminous		[2] 580	2,749	All to Finland.
Lignite-briquet	thousand tons	[2] 6,981	[2] 6,799	Poland 631;[4] Austria 406; Denmark 150; Italy 86
Coke	do	[2] 43	121	Undisclosed.
Petroleum:				
Refinery products:				
Gasoline	do	[2] 418	[2] 424	U.S.S.R. 175.[3]
Kerosine		NA	200	All to Italy.
Diesel oil	thousand tons	[2] 418	[2] 442	U.S.S.R. 27.[3]
Heating oil	do	[2] 154	[2] 252	Austria 87.
Mineral waxes		NA	16,930	United Kingdom 3,571; France 3,366.
Carbon black		NA	1,610	United Kingdom 1,103.

NA Not available.

[1] Because East Germany publishes only limited data on foreign trade in minerals this table has been compiled from several sources. Information except as noted is from Supplement to the World Trade Annual: Trade of the Industrialized Nations with Eastern Europe and the Developing Nations—Statistical Office of the United Nations. New York 1965, 342 pp.

[2] Source: Statistisches Jahrbuch der Deutchen Demokratischen Republik—1965 (Statistical Yearbook of the German Democratic Republic 1965) Berlin, 1966 592 pp.

[3] Source: Vneshnaya Torgovlya za 1964 god (Foreign trade of the U.S.S.R. for 1964). Moscow 1965, 194 pp.

[4] Source: Statystyka Handlu Zagranicznego 1964 (Foreign Trade Statistics). Warsaw, 1965, 230 pp.

Table 3.—East Germany: Imports of selected metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Bauxite—thousand tons	[2] 327	[2] 327	Hungary 238; Yugoslavia 63.[3]
Alumina	[2] 18,312	[2] 42,188	Hungary 19,492.
Metal	53,800	[4] 66,492	U.S.S.R. 65,700.
Semimanufactures	3,100	[4] 8,571	U.S.S.R. 6,800.[5]
Cadmium	200	209	All from the U.S.S.R.
Chromite (Cr_2O_3 content)	[2] 16,511	[2] 30,269	Undisclosed.
Copper:			
Metal	33,000	40,331	All from the U.S.S.R.
Semimanufactures	800	[3] 31	All from Yugoslavia.[3]
Iron and steel:			
Iron ore—thousand tons	2,445	2,565	All from the U.S.S.R.
Scrap—do	159	155	Do.
Pig iron and ferroalloys—do	661	[4] 792	U.S.S.R. 789.
Semimanufactures—do	1,459	[4] 1,841	U.S.S.R. 1,747.
Lead	37,300	[4] 36,200	U.S.S.R. 35,200; United Kingdom 1,000.[3]
Magnesium	1,950	1,951	All from the U.S.S.R.
Manganese ore—thousand tons	210	175	Do.
Nickel	2,100	2,400	Do.
Tin[3]—long tons	NA	154	United Kingdom 139.
Vanadium-molybdenum ores	NA	3,000	All from Finland.
Zinc	25,900	[4] 32,000	U.S.S.R. 31,900.[5]
Nonmetallics:			
Asbestos	17,600	[4] 25,010	U.S.S.R. 24,700.
Borates, natural crude	5,600	[4] 7,400	U.S.S.R. 5,400; Turkey 2,000.[3]
Clay, refractory[3]	NA	2,863	All from Yugoslavia.
Feldspar, fluorspar[3]	NA	16,254	Yugoslavia 6,916; Norway 5,945; Finland 3,393.
Fertilizers:			
Raw:			
Apatite ore	16,500	19,900	All from the U.S.S.R.
Apatite concentrates	640,000	761,300	Do.
Manufactured:			
Nitrogenous fertilizers	NA	[3] 4,970	All from Sweden.
Phosphatic fertilizers	53,500	[4] 110,688	Yugoslavia 49,997;[3] United States 29,170;[3] Belgium-Luxembourg 25,566.[3]
Mineral fuels:			
Coal:			
Anthracite—thousand tons	292	190	All from the U.S.S.R.
Bituminous—do	[2] 8,849	[2] 10,411	U.S.S.R. 6,004; Poland 2,095.[5]
Brown coal—do	[2] 5,787	[7] 6,495	Poland 5,381;[5] Czechoslovakia 1,114.[6]
Coke—do	[2] 3,230	[2] 3,309	U.S.S.R. 1,530;[5] Poland 853;[6] Czechoslovakia 852.[7]
Gas, manufactured—million cubic feet	[2] 2,232	[2] 1,634	Undisclosed.
Petroleum:			
Crude—thousand tons	[2] 3,163	[2] 4,260	U.S.S.R. 3,936.
Refinery products:			
Gasoline—do	231	187	All from the U.S.S.R.
Diesel fuel—do	352	235	Do.
Residual fuel oil[3]—do	NA	29	All from Italy.
Lubricants—do	[5] 21	44	U.S.S.R. 22;[5] Austria 22.[3]
Petroleum coke—do	11	12	All from the U.S.S.R.

[1] Because East Germany publishes only limited data on foreign trade in minerals, this table has been compiled from several sources. Information except as noted is from Vneshnaya Torgovlya za 1964 god (Foreign Trade of the U.S.S.R. for 1964). Moscow 1965, 194 pp.

[2] Source: Statistisches Jahrbuch der Deutchen Demokratischen Republik-1965 (Statistical Yearbook of the German Democratic Republic 1965) Berlin, 592 pp.

[3] Source: United Nations, Statistical office.—Supplement to the World Trade. Annual: Trade of the Industrialized Nations with Eastern Europe, and the Developing Nations. Walker and Co., New York 1965, 342 pp.

[4] Figure derived from Soviet and United Nations sources.

[5] Source: Statystyka Handlu Zagranicnego 1964 (Statistics of Foreign Trade 1964) Warsaw 1965, 230 pp.

[6] Source: Statisticka Rocenka C.S.S.R.—1965 (Statistical Annual of the C.S.S.R. for 1965) Prague, 1965, 612 pp.

[7] Source: Statistikai Evkonyv 1964 (Statistical Yearbook 1964) Budapest 1965. 439 pp.

COMMODITY REVIEW

METALS

Aluminum. — East German aluminum production, which is completely based on bauxite from Yugoslavia and Hungary, remained at the same level as that of 1964.

With Soviet technical assistance, reconstruction of the Bitterfeld alumina and aluminum plants was completed at yearend 1965. The alumina section of the plant has been reconstructed and adapted to the Soviet method used in the Kirov aluminum plant in Zaporozhlye, U.S.S.R. Reportedly, the plant will produce 10 percent more alumina and aluminum in 1966 than in 1965, but output for that year was not disclosed. Construction of additional facilities for production of aluminum at Lauta in the Cottbus area was also announced, but capacity of these facilities was not reported.

Cadmium.—At a cost of 5 million East German marks, a plant of unreported capacity for cadmium production was completed at Freiberg Bergbau and Huettenkombinat, and the first electrolytic cadmium was produced in the spring of 1965. Reports state that the cadmium output is 99.95 percent pure. The Freiberg facility is one of 20 enterprises which employ a total of 20,000 persons comprising the East German nonferrous industry.

Copper.—East Germany moved to increase production of copper in the Halle region. In the near future the main output of this region will come from the vicinity of Sangerhausen. More than 1,000 workers will have to be moved from Mansfeld, heretofore the country's largest copper producing area.

Iron and Steel.—Iron and steel production continued to depend heavily on imported iron ore and coke; the U.S.S.R. was the principal source of the iron ore, and Poland provided the largest part of the coke. Despite the country's lack of adequate indigenous resources of iron ore and coking coal, the development of iron and steel production facilities continued. The U.S.S.R. provided both the principal technical advisors and most of the equipment for these expansions.

Assembly work was started on a new cold rolling mill in the East Metallurgical Combine in Eisenhuettenstadt, and production is expected to start at the end of 1968. The planned capacity of the new facility was reported to be 500,000 tons of cold rolled products.

At the beginning of 1965, the largest and most modern hot-dip galvanizing plant in East Germany was commissioned at the Hostaglas Enterprise in Dresden. Plant capacity was reportedly 10,000 tons of galvanized products per year.

The No. 3 plant in Riesa-Zeithain started production of pipes in 1965. In full operation, which is expected to begin in 1972, the plant will produce 80,000 tons of seamless pipes per year.

Other Metals.—Systematic, detailed, and complete reporting on metal mining, beneficiation, and smelting operations was not available during 1965. Partial information indicated a 25-percent decline in nickel ore production because of production costs.

It was announced that tin concentrate production will be increased, but no data were published on the existing level of production nor on the extent of this expansion.

The Dresden Academy Institute for Metallophysics and Very Pure Metals reportedly achieved appreciable results in the production of high-temperature metals such as tungsten, molybdenum, tantalum, and columbium and their alloys.

NONMETALS

Cement.—The construction of the Ruedersdorf No. 4 cement plant was underway during 1965. The project required the biggest investment to date in the building material industry of the country. When completed the plant will have a capacity of 900,000 tons of cement per year.

Fertilizer Materials.—In accordance with governmental efforts to eliminate the shortcomings in the agricultural sector of the economy, development of mines and other facilities for production of mineral fertilizers continued. Construction of a large fertilizer complex at the Schwedt petroleum refinery near the Polish border continued through 1965. The British firm Humphreys and Glasgow and the French group Schneider-Creuzot are involved in construction. East German authorities expect the plant to be operational at yearend 1966. The plant reportedly will have a

nitric acid and lime ammonium capacity adequate to permit production of 520,000 tons of fertilizers and 170,000 tons of ammonia per year. A new plant of unreported capacity for production of superphosphate was under construction in Salzwedel. Target completion date was not reported.

Lime. — A modern lime work started production near Pirna in the Dresden area in 1965. The plant was designed for an annual output of 125,000 tons of lime. Building enterprises in Dresden, Cottbus, and Potsdam will be the principal buyers of the lime.

MINERAL FUELS

Coal and Lignite.—The lignite industry remained the most important element of the East German mineral industry. During 1965 lignite accounted for approximately 80 percent of primary energy of the country. Because East German lignite was of low calorific value most of the output was turned into briquets for use in gasworks, powerplants, cokeries, and low-temperature carbonizing plants. During 1965 imports of high-rank coals remained a necessity for the domestic economy.

The Cottbus area, accounting for about 40 percent of the total lignite output, remained the center of the industry. Construction and development continued on the Schwarze Pumpe Combine which is in the same area. At yearend 1965, the Schwarze Pumpe Combine reportedly had 50 percent of its capacity developed. In addition to open pit mines two briquet factories, two power stations, and part of the plant for manufacturing gas were completed at Schwarze Pumpe.

In 1965 a new set of gas generators was added to existing facilities; when all installations for gas production become operational, Schwarze Pumpe will be able to produce 168 billion cubic feet of gas per year. Construction of coking plants continued. Annual coke output upon completion of facilities is expected to be 1.8 million tons. The completion date for the Combine was set for 1972, 2 years later than the previously scheduled completion date. In the Cottbus lignite basin, development of the opencast mine at Welzow-Zued was underway. The mine is supposed to be highly mechanized and without rails. All transportation of lignite and overburden will be done by conveyor belts. Plans call for a yearly output of 28 million tons of lignite when the mine is completed in 1966.

The underground lignite mine at Goezan in the Halle area was closed because production costs were higher than those of open pit mines. Authorities also closed the subsidiary plant for paraffin, wax, benzol, fuel oil, and coke from lignite. Workers from these facilities have been employed in other mines and chemical plants in the country.

Petroleum and Natural Gas.—No new information was available on results of drilling in Rostock near Stralsund. Deep drilling for oil, over 5,000 meters, was underway during 1965 on the Baltic coast. In this drilling operation Soviet personnel assisted in operating Soviet equipment.

Expansion of the Schwedt refinery at the western terminal of the Druzhba pipeline was completed at yearend 1965. Reports indicated that new annual throughput capacity of the plant will be 4 million tons of crude oil.

Most of the plants for oil production from coal were being converted in 1965 to use crude oil as a raw material; all such facilities are scheduled to be converted by 1970. Crude oil from the Soviet Union will replace coal. This work was underway in plants at Zeitz, Lutzkendorf, Leuna, and Schwarzheide.

The SEV countries [3] decided to develop a pipeline system 330 kilometers long connecting Schwedt refinery with the chemical industry in East Germany. A pipeline from the refinery at Schwedt to the Leuna chemical plant, a part of this overall project, was completed by Polish construction crews.

Manufactured Gas.—To alleviate winter gas shortages and to make possible uniform production levels throughout the year, construction of a unified gas pipeline and underground storage system continued during 1965. The regional gas supply system in the Eberswalde-Angermünde-Finow area in the northern part of Frankfurt/Oder Bezirk was connected with the overall East German pipeline grid. Development of underground gas storage in a 300 meter deep sandstone layer in the Magdeburg district continued.

[3] Soviet Ekonomicheskoy Vzayimopomoshchi, an organization of Communist countries including Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, and Rumania.

The Mineral Industry of the Federal Republic of Germany

By L. Nahai [1]

The value of crude mineral production in West Germany in 1965 totaled about $2,390 million.[2] In this year the gross national product (GNP) totaled $112,150 million in current prices, which was 8.4 percent higher than that of 1964. In real terms, however, the GNP increase between 1964 and 1965 was only 4.4 percent, compared with 6.6 percent between 1963 and 1964. Economic expansion slowed in the last half of 1965, primarily because of limitations imposed by resources, particularly labor. The shift in economic expansion from production to services continued to such an extent that the real rate of growth of the producing industries did not equal that of the economy as a whole. Real output for nonfuel mining, decreased 2.1 percent but that for energy increased 5.4 percent in comparison with 1964 levels.

In 1964, the latest year for which data are available, West Germany's mineral industry, excluding petroleum refining and processing, contributed about $9,213 million to the GNP, 8.9 percent of the total. This sum was distributed as follows: Mining $2,400 million; ferrous and nonferrous metal industries $4,270 million; and industries based on stone, earth, fine ceramics, and glass $2,543 million. This contribution includes output of some industrial sectors that are properly classified as manufacturing. Data on petroleum refining and processing are not included because, as reported, they are inseparable from data for the Nation's sizable chemical industry, which as a whole contributed $5,178 million to the GNP.

Total turnover of the mineral industry in 1965 for the various operations shown in table 1 was about 11 percent of the $93,700 million recorded turnover for all industry. Industrial employment in December 1964 averaged 8.4 million, of which the mineral industries accounted for 12 percent.

Government action in the mineral industry in 1965 stressed measures to assist the coal industry. The Federal Government agreed in December to finance the stockpiling of 4 million tons of coal in areas far removed from the coal mining districts. The Government also paid for four nonproducing shifts which reduced annual coal output 1.5 million tons. The Law for the Promotion of Use of Hard Coal in Powerplants of August 12, 1965, gives tax relief for powerplants using coal produced in West Germany or other European Economic Community (EEC) countries (Belgium, France, Italy, Luxembourg and the Netherlands). Measures in force at the start of 1965 to help the industry were continued. These included a $5 per ton import duty on coal from non-EEC countries (in force since February 1959) except for a duty-free quota of 6 million tons per year, a $2.50 per ton duty on light fuel oil and $6.25 on heavy fuel oil (in force since May 1960), favorable rates for transport of coal by rail and inland waterways, and Federal and State Government guarantees for investment in the industry to carry out a rationalization program. Besides the foregoing measures, the Bundestag passed an amendment to the industrial accident insurance law applicable to coal mining on July 1. Under the amendment, the Federal Government will pay two-thirds of the contributions to the industrial accident insurance fund, estimated

[1] Chief West Europe specialist, Division International Activities.

[2] Where necessary, values have been converted from West German marks (DM) to U.S. dollars at the rate of DM4 = US$1. The $2,390 million excludes petroleum and natural gas for which values are not reported.

Table 1.—Federal Republic of Germany: Employment and turnover in the mineral industry

	Employment (thousand persons) December 1965	Turnover (million dollars) 1964 Domestic	1964 Foreign	1965 Domestic	1965 Foreign
Mines:					
Iron	7	47	2	44	18
Nonferrous metals	4	22	1	22	2
Potash and salt	20	140	52	146	63
Other nonmetallic minerals	2	8	3	8	3
Coal	377	1,557	468	1,461	456
Lignite	38	282	19	265	16
Peat	3	20	3	21	3
Oil and gas	9	132	---	139	---
Total	460	2,208	548	2,106	561
Quarries:					
Stone	31	297	4	301	4
Sand and gravel	16	196	6	199	7
Slate, clays, other	9	52	7	53	8
Cement	22	497	13	496	16
Refractories	17	112	28	129	32
Lime, gypsum, chalk	18	189	9	198	10
Limestone, sandstone	6	97	---	98	---
Pumice	8	135	1	119	1
Total	127	1,575	68	1,593	78
Processing plants:					
Iron and steel [1]	353	4,097	1,026	4,105	1,201
Nonferrous plants [2]	88	1,170	209	1,298	280
Petroleum refineries	34	2,711	127	3,006	120
Coal chemicals	5	65	14	64	13
Total	480	8,043	1,376	8,473	1,614
Grand total	1,067	11,826	1,992	12,172	2,253

[1] Inclusive of forge and hammer works but exclusive of foundries and cold-rolling and cold-drawing mills. Foundries employed 137,000 and had $1,009 million domestic and $89 million foreign sales. Cold-drawing and cold-rolling mills employed 71,000 and had $952 million domestic and $154 million foreign sales.

[2] Exclusive of foundries which employed 28,000 and had $249 million domestic and $10 million foreign sales.

at $25 million. Prior to the amendment, the fund was financed by the employers only. Under the same amendment, the Government ceased making contributions, estimated at $10 million annually, to the miners' retirement funds.

Several measures pertaining to oil had the objective of assisting the coal industry. Voluntary restriction in sale of heavy fuel and heating oils was extended for another year, and for 1966 the industry and Government agreed to an increase of 8 percent over 1965 sales. Effective December 10, 1964, the import of crude oil, diesel oil, and fuel oil into West Germany became subject to licensing. The Government indicated, however, that licenses for import from non-Communist countries would be automatically granted. Nonetheless, the ordinance enables the Government to adjust future rates of increase of oil imports to an extent that will insure the development of a sound energy policy and give a measure of protection to the coal industry. Import licenses were valid for 9 months when the ordinance was issued, but this was subsequently reduced to 6 months.

Similarly, registration of refineries and pipelines became mandatory; petroleum refiners and pipeline operators were required to register the capacities of their facilities with the Bundesamt fuer gewerbliche Wirtschaft (Federal Office for Industrial Economy). This law, which came into effect on June 16, 1965, requires that enterprises that wish to build, substantially modify, or expand such facilities must submit their plans 12 months prior to starting the construction. The rapid expansion of refining capacity, considerably in excess of industry estimates compiled by the Ministry of Economics in 1962, was a factor in the Government's decision to ask for this law.

Regulations stating precisely which re-

fineries and pipelines would have to be registered and which would be exempt from registration were issued by the Federal Minister of Economics and published in the Federal Law Gazette of July 31.

Unrelated to coal industry problems, a law establishing minimum oil stocks was to become effective January 1, 1966.

Exploration of the West German Continental Shelf was being carried out under the provisions of a law which came into force on July 30, 1964. Pending final legislation concerning rights over the shelf, the law established a temporary competent authority for administering exploration and exploitation and provided for exemptions from the general prohibition to explore and exploit the seabed beyond the 3-mile zone. The Oberbergamt in Clausthal-Zellerfeld was appointed as the licensing authority.

The agreement signed December 1, 1964, between the Federal Republic of Germany and the Kingdom of the Netherlands on the Continental Shelf boundary went into effect on September 1, 1965.

On June 9, 1965, the Danish and West German Foreign Ministers signed a protocol establishing the Continental Shelf boundary between the two countries at a point approximately 48 kilometers from shore in the North Sea; boundary agreement beyond this point was not reached. The treaty was ratified by the Bundesrat on November 26. Agreement was also obtained regarding the Continental Shelf boundary on the Baltic Sea, which was to be determined by the median line of the two opposite coasts.

PRODUCTION

West Germany's rank as a world producer of minerals and metals remained about the same as in 1964: first in production of pumice; second in barite, feldspar, potash, and fuel briquets; third in cement, lime, and coke; and fourth in pig iron and crude steel.

While the production index for industry as a whole increased from 150.2 in 1964 to 158.9 in 1965 (1958=100), performance of the various sectors of the mineral industry was mixed as shown below:

Industry sector	Index of production (1958=100) 1964	1965
Coal mining	100.0	95.2
Metal ore mining:		
Iron ore	66.3	61.7
Other	94.7	93.9
Potash and salt	130.1	143.4
Crude oil and gas	186.2	202.3
Stone and earth	193.2	156.5
Nonferrous metals	148.5	152.1
Iron and steel	143.6	136.0

Only nonferrous metals, potash and salt, and oil and gas showed increases; the rate of increase for the latter was the highest.

Table 2.—Federal Republic of Germany: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Bauxite	4,232	4,657	4,331	4,156	3,893
Alumina and aluminum hydroxide, aluminum oxide content—thousand tons	513	517	547	r 612	657
Metal:					
Unalloyed:					
Primary—do	173	178	209	220	234
Remelted, including scrap—do	19	19	16	20	20
Alloyed, including some remelted scrap—do	117	123	141	169	183
Semimanufactures—do	234	246	255	316	319
Crude castings—do	120	120	130	159	179
Bismuth	108	131	126	175	e 125
Cadmium	432	254	223	320	323
Chromium	NA	NA	NA	e 300	e 400
Cobalt	1,617	1,646	1,508	1 1,445	1 1,356
Copper and copper alloys:					
Copper in ores [2]	2,171	1,998	r 2,282	1,566	965
Blister copper—thousand tons	64	69	67	68	NA
Refined, unalloyed:					
Electrolytic—do	232	238	235	r 232	247
Refined from scrap—do	72	70	68	r 104	110
Copper alloys	39	35	35	39	42
Semimanufactures—thousand tons	650	577	593	760	769
Crude castings, including alloys	92,986	81,800	78,186	91,160	93,210
Gold—thousand troy ounces	81	137	127	109	80

Table 2.—Federal Republic of Germany: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals—Continued					
Iron and steel:					
Iron ore—thousand tons	18,866	16,643	12,898	11,613	10,847
Spiegeleisen and blast furnace ferromanganese—thousand tons	271	275	290	287	280
Pig iron—do	25,160	23,976	22,619	26,895	26,710
Electric furnace ferroalloys—do	148	112	105	131	NA
Steel ingots and castings—do	33,458	32,563	31,597	37,339	36,821
Of which castings—do	730	670	575	637	650
Finished steel—do	21,862	21,589	20,991	24,953	24,837
Lead and lead alloys:					
Lead in ore—do	50	50	52	49	48
Smelter:					
Primary—do	141	148	140	107	104
Secondary—do	63	68	90	116	123
Alloys, unwrought—do	18	22	17	21	21
Semimanufactures and castings	56	52	48	57	55
Magnesium and magnesium alloys:					
Unwrought	2,912	3,288	3,187	3,141	2,187
Semimanufactures	279	257	373	538	522
Castings	26,284	30,387	31,614	38,499	37,994
Mercury—76-pound flasks	NA	725	1,595	1,740	e 2,176
Molybdenum	119	127	115	208	262
Nickel, including powder	3,001	3,223	1,935	761	305
Platinum—troy ounces	965	1,543	1,736	2,186	1,479
Silver:					
In ores—thousand troy ounces	1,789	1,958	2,067	r 2,063	1,992
Smelter—do	16,181	15,371	12,003	11,580	10,409
Silicon (pure)—kilograms	e 1,000	e 600	e 1,250	e 3,000	e 6,000
Tin and tin alloys:					
Refined unwrought—long tons	2,008	2,321	2,212	2,274	2,505
Alloys, unwrought and solder—do	17,010	16,944	18,242	19,453	20,975
Tungsten, minimum 90 per cent tungsten	611	550	532	649	825
Zinc and zinc alloys:					
Zinc in zinc ore	87	87	93	96	95
Zinc in pyrite	35	26	16	15	14
Metal:					
Primary—thousand tons	141	130	105	107	108
Secondary—do	62	60	68	69	81
Alloys—do	31	38	39	59	63
Semimanufactures—do	77	76	70	85	83
Castings	30	34	35	45	49
Nonmetals:					
Barite—thousand tons	471	465	423	443	451
Basalt lava and lava sand—do	3,378	4,112	4,968	NA	NA
Bromine and bromine compounds	2,532	2,145	2,139	2,236	2,945
Calcite—thousand tons	33	36	36	36	NA
Cement:					
Portland—do	19,500	20,739	21,519	24,789	25,435
Iron portland and blast furnace slag—do	6,620	6,809	6,831	7,881	7,865
Other cement and mortar—do	1,024	1,046	868	962	833
Chalk—do	88	74	72	94	100
Clays:					
Refractory (exclusive of Klebsand)—do	4,471	4,473	4,330	4,370	4,678
Kaolin (marketable)—do	373	389	388	409	400
Bleaching—do	374	345	365	399	414
Other (Schieferton)—do	70	NA	71	89	87
Corundum, artificial—thousand tons	74	64	58	64	75
Diatomaceous and similar earths—do	107	107	89	99	108
Feldspar—do	270	274	269	283	334
Fluorspar—do	121	106	87	92	86
Graphite—do	12	12	12	13	13
Gypsum:					
Crude—do	1,012	961	1,059	1,206	1,235
Calcined—do	955	988	942	1,010	1,029
Iodine and iodine compounds	120	132	118	119	NA
Lime:					
Burnt, hydraulic and burnt dolomite—thousand tons	9,924	9,698	9,775	10,814	10,627
Other, ground	1,867	2,033	2,371	2,918	3,153
Limestone, crude	48,888	48,858	49,298	54,585	52,754
Of which for sale	8,706	8,335	7,775	9,321	8,161
Mineral pigments—thousand tons	11	10	11	10	10
Phosphates:					
Superphosphates, phosphorus pentoxide content—do	53	52	53	68	81
Ground Thomas slag—do	380	399	431	436	433
Other—do	64	67	74	105	125
Total—do	497	518	558	609	639

Table 2.—Federal Republic of Germany: Production of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals—Continued					
Potash:					
Crude salts ---do---	19,509	18,413	18,537	20,588	22,209
Potassium monoxide content	2,400	2,264	2,283	2,553	2,740
Marketable potash salts, potassium monoxide content ---do---	2,044	1,938	1,948	2,201	2,384
Pumice, crude and washed ---do---	10,014	10,197	11,161	10,321	9,333
Marketable ---do---	5,351	5,707	6,390	5,821	5,096
Pyrite, marketable ---do---	508	386	385	424	439
Sulfur content ---do---	217	167	177	187	197
Quartzite ---do---	342	295	272	276	281
Salt:					
Rock ---do---	4,339	4,580	5,226	5,399	5,726
Other ---do---	341	346	302	397	514
Sand and gravel	110,273	124,643	132,358	[3] 156,370	[3] 161,304
Sand, industrial:					
Moulding sand ---do---	957	858	781	879	930
Quartz sand (ground) ---do---	222	603	906	904	851
Quartz sand (unground) and glass sand ---do---	3,911	4,065	3,858	4,870	5,127
Other (Klebsand) ---do---	201	196	193	177	159
Slate: [3]					
Roofing and for office and industry ---do---	55	51	50	43	38
Splittings and ground [4] ---do---	234	58	59	82	86
Stone:					
Crushed ---do---	63,234	72,389	79,411	85,847	87,862
Building ---thousand cubic meters---	194	[r] 201	217	[r] 249	257
Sulfur, elemental ---thousand tons---	84	91	86	78	77
Talc, including talc schist ---do---	30	28	26	30	31
Trassand tuff ---do---	75	78	5	4	4
Mineral fuels:					
Solid fuels:					
Bituminous coal and anthracite ---do---	142,740	141,135	142,116	142,201	135,077
Coal briquets [5] ---do---	5,137	5,939	6,614	5,505	4,570
Lignite ---do---	97,194	101,251	106,659	110,945	101,906
Lignite briquets ---do---	15,515	15,800	15,834	15,356	12,682
Pech coal ---do---	1,763	1,760	1,841	1,869	1,735
Coke:					
At mines ---do---	37,044	36,054	35,213	37,394	37,903
At steelworks ---do---	7,490	7,144	6,682	5,956	5,391
At gasworks ---do---	4,948	4,958	[r] 4,890	4,912	4,153
From lignite ---do---	601	600	600	596	578
Peat (for fuel use only) ---do---	610	704	759	701	439
Gas:					
Natural, [6] refinery gas, liquefied ---million cubic meters---	7,483	9,017	11,234	15,731	NA
Blast furnace gas ---do---	17,289	15,066	13,435	14,840	NA
Generator and water gas ---do---	5,772	5,247	4,878	4,309	NA
Coke oven gas ---do---	23,528	22,993	22,536	22,607	NA
Other ---do---	570	616	634	695	NA
Total ---do---	54,642	52,936	52,546	58,182	NA
Petroleum:					
Crude ---thousand tons---	6,204	6,776	7,383	7,673	7,884
Refinery products:					
Liquefied petroleum gas ---do---	846	853	1,102	1,380	1,476
Motor gasoline ---do---	6,539	7,262	8,176	9,000	9,785
Other gasolines ---do---	727	865	1,131	1,551	1,844
Jet fuel and kerosine ---do---	416	630	639	677	686
Diesel oil ---do---	5,573	6,155	7,246	6,788	6,910
Fuel oil ---do---	17,407	19,312	23,046	31,694	37,509
Lubricants ---do---	518	564	554	600	608
Greases ---do---	17	18	17	22	24
Bitumen ---do---	1,387	1,804	2,304	2,821	3,235
Petroleum coke ---do---	347	389	430	444	422
Refinery gas ---do---	1,001	1,200	1,470	1,880	2,542
Other ---do---	191	252	322	414	518
Total	34,969	39,304	46,437	57,271	65,558

[e] Estimate. [r] Revised. NA Not available.
[1] Including West Berlin
[2] Includes copper content of pyrites.
[3] Excludes West Berlin 1961–63; includes West Berlin 1964–65.
[4] Exclusive of slate recovered from mine dumps.
[5] Includes briquets produced by independent plants as follows in thousand tons: 1961, 268; 1962, 276; 1963, 261; 1964, 96; 1965, 26.
[6] Associated and unassociated.

TRADE

Imports and exports of mineral commodities in 1965 constituted 25.3 and 17.5 percent, respectively, of all imports and exports of West Germany by value as shown in the following tabulation:

	Value (million dollars)		Mineral commodities share of total trade (percent)
	Mineral commodities	All commodities	
Exports:			
1963	[1] 2,680	[1] 14,616	18.3
1964	[1] 2,818	[1] 16,215	17.4
1965	3,128	17,908	17.5
Imports:			
1963	[1] 3,190	[1] 13,019	24.5
1964	[1] 3,941	[1] 14,613	27.0
1965	4,447	17,591	25.3
Trade balance:			
1963	[1] −510	[1] +1,597	XX
1964	[1] −1,123	[1] +1,602	XX
1965	−1,319	+317	XX

XX Not applicable.
[1] Excludes value of gold.

Among major groups of mineral commodity exports, iron and steel products ranked first in value, accounting for 45 percent of the 1965 total for mineral commodities; solid fuels ranked second accounting for about 17 percent of total value. Among mineral commodity import groups, petroleum and its products ranked first, accounting for 28 percent of total mineral and metal imports and for about 7 percent of all commodity imports. Details on total tonnage and value of 1965 mineral trade by major groups appear in table 3.

In 1965, 35 percent of all exports from West Germany went to the other five countries of the EEC and 27 percent went to the countries of the European Free Trade Association (EFTA).[3] Imports were 38 percent from EEC and 17 percent from EFTA. Imports from EEC countries increased about $1,571 million in 1965, over those of 1964. For the minerals and metals tabulated, West Germany's exports to EEC in 1964 (approximately $1,368 million) were 52 percent of the $2,627 million exports to all countries; for the same commodities, imports were valued at approximately $3,866 million of which 30 percent was from EEC.

[3] Austria, Denmark, Norway, Portugal, Sweden, Switzerland, and United Kingdom.

Table 3.—Federal Republic of Germany: Mineral and metal trade by major commodity groups in 1965

	Exports		Imports	
	Quantity (thousand metric tons)	Value (million dollars)	Quantity (thousand metric tons)	Value (million dollars)
Metals:				
Ores and concentrates:				
Iron ore, including pyrite cinder	317	3	37,360	369
Other [1]	73	8	3,552	174
Scrap:				
Iron and steel	2,010	73	1,088	45
Other [1]	128	39	274	129
Primary forms and semimanufactures:				
Pig iron and ferroalloys	596	46	497	65
Steel	9,576	1,371	5,594	762
Nonferrous base metals [2]	305	342	1,190	901
Precious metals [3]	(4)	70	2	246
Metallic oxides including alumina	269	45	72	12
Nonmetals:				
Cement	1,397	19	460	7
Fertilizer materials, crude and manufactured	4,239	164	3,327	57
Other crude nonmetals [5]	15,107	63	18,268	186
Other nonmetallic mineral products	1,378	143	1,696	113
Mineral fuels:				
Solid	24,845	524	9,089	125
Liquid and gaseous, including asphalt	7,452	204	74,809	1,239
Coal—and petroleum—derived crude chemicals including carbon black	192	14	287	17
Total	67,884	3,128	157,565	4,447

[1] Excludes materials that are primarily precious metal ores and waste.
[2] Includes metalloids such as arsenic, tellurium, selenium, phosphorus, and silicon as well as mercury, alkali metals, and rare earth metals.
[3] Includes ores, concentrates, waste and scrap of precious metals, which account for most of the tonnage but for a relatively small part of the value.
[4] Less than ½ unit.
[5] Includes non-metal-bearing metallurgical wastes except Thomas slag.

Table 4.—Federal Republic of Germany: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1964	1965	1964 destinations	
			EEC[1]	Principal destinations
Metals:				
Aluminum:				
Bauxite	846	1,344	405	Austria 392; France 245.
Alumina	75,390	78,691	2,147	NA.
Aluminum hydroxide	35,429	38,178	14,270	Netherlands 7,990; Sweden 6,528; Belgium-Luxembourg 6,270; Austria 4,949; Finland 3,360.
Metal and alloys:				
Scrap	1,144	856	1,133	Italy 891; France 135.
Unwrought	9,837	10,166	6,970	Netherlands 3,641; Belgium-Luxembourg 1,822; Italy 1,238; Switzerland 1,009.
Semimanufactures	57,565	59,642	23,684	Netherlands 7,709; Belgium-Luxembourg 7,432; United States 7,027.
Antimony:				
Oxides	445	NA	45	United States 286.
Metal, all forms	230	174	166	France 100; Netherlands 53.
Arsenic oxides	38	71	3	Czechoslovakia 3.
Bismuth metal, all forms	59	72	39	Netherlands 21; United Kingdom 12.
Cadmium:				
Oxides and hydroxides	9	NA	3	India 3; Italy 2, Japan 1.
Metal, all forms	53	111	21	Netherlands 9; Belgium-Luxembourg 7; Spain 6.
Chromium:				
Chromite	1,521	1,746	799	Austria 377; Belgium-Luxembourg 333.
Oxides and hydroxides	5,908	6,320	NA	NA.
Metal, all forms	53	40	23	Austria 12; Italy 10; Belgium-Luxembourg 10.
Cobalt:				
Oxides and hydroxides	24	46	5	Yugoslavia 7; Bulgaria 5; France 4.
Metal, all forms	789	636	---	United States 640; Japan 96.
Copper:				
Ore, concentrate and matte	---	5,075	---	
Oxides and hydroxides	1,065	NA	432	Italy 189; United States 180; Denmark 141.
Metal and alloys:				
Scrap	18,608	31,926	13,115	Belgium-Luxembourg 4,768; Netherlands 4,080; Italy 3,766.
Unwrought:				
Blister	373	872	57	U.S.S.R. 254.
Refined, unalloyed	76,713	102,875	21,369	Austria 12,373; Argentina 11,486; Netherlands 11,352.
Master alloys	174	182	4	Switzerland 149.
Other alloys	992	1,524	628	Netherlands 343; Austria 191; Italy 158.
Semimanufactures	78,052	70,868	22,877	United States 21,218; Netherlands 15,258; Poland 5,339.
Gold and alloys:				
Bullion ---thousand troy ounces	241	317	75	Switzerland 89; Italy 54; Chile 33.
Wrought ---do	100	153	18	Austria 39; Denmark 17; Sweden 7.
Iron and steel:				
Ore and concentrate:				
Roasted pyrites ---thousand tons	14	38	3	United Kingdom 11.
Other ---do	290	279	17	Austria 270.
Scrap ---do	1,341	2,010	1,204	Italy 1,116.
Pig iron, including cast iron ---do	647	504	461	Italy 189; Belgium-Luxembourg 141.
Sponge iron, powder, and shot ---do	8	10	4	Netherlands 2; Switzerland 1.
Spiegeleisen ---do	10	9	6	Belgium-Luxembourg 4; United States 3.
Ferroalloys:				
Ferromanganese ---do	62	56	7	United States 33; Hungary 19.
Other ---do	13	17	4	Austria 2; Republic of South Africa 2.
Primary forms:				
Ingots ---do	150	111	148	France 109.
Blooms, billets and slabs ---do	842	996	421	France 276; United Kingdom 142; Switzerland 72.
Coils for rerolling ---do	468	516	341	Italy 208; France 111.
Semimanufactures:				
Wire rod ---thousand tons	516	546	211	United States 116; France 101; Netherlands 52.
Other bars and rods ---do	1,100	1,182	718	France 424; Netherlands 226; Denmark 56.
Sections ---do	1,074	1,241	507	France 236; Netherlands 195; United States 94.
Plates and sheets:				
Heavy ---do	1,184	1,586	685	France 376; Netherlands 138; Italy 96.
Medium ---do	133	149	72	France 34; Belgium-Luxembourg 15.
Thin uncoated ---do	841	1,037	356	France 168; United States 83; Italy 80.
Tinned ---do	142	141	49	France 31; Netherlands 12; Spain 11.
Other coated ---do	73	106	34	Italy 13; France 11; Switzerland 8.
Hoop and strip ---do	440	448	242	Netherlands 108; France 105; Switzerland 29.
Railway track and accessories ---do	134	162	65	Netherlands 34; Italy 26; Switzerland 14.
Wire ---do	189	191	65	France 37; United States 25.
Tubes, pipes, fittings ---do	1,040	1,140	343	Netherlands 218; France 81; Switzerland 79; Sweden 69.
Castings and forgings, rough do	23	21	9	Switzerland 5; Belgium-Luxembourg 4.

Table 4.—Federal Republic of Germany: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1964	1965	1964 destinations	
			EEC[1]	Principal destinations
Metals—Continued				
Lead:				
Ore and concentrate	956	7,029	956	France 780.
Oxides	7,694	6,786	3,010	Netherlands 1,716; France 664; Pakistan 529.
Metal and alloys:				
Scrap	9,363	14,874	9,271	Belgium-Luxembourg 4,332; Netherlands 3,320.
Unwrought	21,592	12,823	13,011	Belgium-Luxembourg 5,968; France 4,858; United States 4,006.
Semimanufactures	3,917	5,519	1,074	Belgium-Luxembourg 770; Sweden 575; Finland 423.
Magnesium:				
Oxides and hydroxides	1,904	2,278	546	U.S.S.R. 404; Poland 296; Italy 276.
Metal and alloys:				
Scrap	892	1,132	665	Italy 372; Belgium-Luxembourg 283; United States 111.
Unwrought and semimanufacture	135	133	96	Netherlands 56; Sweden 23; Belgium-Luxembourg 15.
Manganese:				
Ore and concentrate	7,325	9,146	2,175	Denmark 1,222; Sweden 1,175; Italy 685.
Oxides and peroxides	108	137	53	Italy 29; France 19.
Metal, all forms	2,152	2,631	248	United Kingdom 1,136; United States 507.
Mercury:				
Oxides	7	NA	4	Italy 2; Netherlands 2; Denmark 2.
Metal—76-pound flasks	1,349	1,769	693	Netherlands 650; United States 200; Bulgaria 119.
Molybdenum metal, all forms	81	84	28	Japan 27; France 24; Sweden 8.
Nickel:				
Matte and speiss	8	NA	---	All to Norway.
Metal and alloys:				
Scrap	819	1,021	478	France 271; United Kingdom 189; Netherlands 159.
Unwrought	276	192	181	Belgium-Luxembourg 125; Bulgaria 68.
Semimanufactures	4,376	5,128	2,080	Netherlands 1,016; France 630; United Kingdom 418; Italy 288.
Platinum-group metals, all forms thousand troy ounces	174	332	58	Switzerland 34; Italy 22; Hong Kong 21.
Silicon	41	33	---	India 31; Sweden 5; United States 3.
Silver:				
Ashes, residues, scrap	3	5	3	All to Belgium-Luxembourg.
Metal and alloys:				
Unwrought thousand troy ounces	18,066	15,750	10,849	Italy 8,528; Belgium-Luxembourg 2,318; Switzerland 1,501.
Semimanufactures do	6,702	8,734	2,312	Switzerland 1,325; Finland 1,084; Italy 899.
Tantalum metal, all forms	4	5	2	France 2; Austria 1.
Tin:				
Ore and concentrate long tons	84	66	84	All to Netherlands.
Oxides do	443	311	146	Italy 68; Czechoslovakia 57; Spain 56.
Metal and alloys:				
Scrap do	59	78	58	Netherlands 45; Belgium-Luxembourg 13.
Unwrought do	1,478	1,582	725	France 616; Denmark 149; United States 148.
Semimanufactures do	120	168	46	Italy 24; Netherlands 15; Switzerland 14.
Titanium oxides	55,687	32,749	16,463	United States 6,890; Italy 4,718; Norway 4,669; France 4,520.
Tungsten:				
Ore and concentrate	110	161	---	United Kingdom 74; Austria 36.
Metal, all forms	250	264	22	United States 85; Sweden 72; Austria 39.
Vanadium metal, all forms kilograms	500	500	---	United States 200.
Zinc:				
Ore and concentrate	44,201	46,286	35,418	Belgium-Luxembourg 20,047; Netherlands 15,372; United Kingdom 8,295.
Oxides and peroxides	7,279	7,509	1,266	Sweden 783; Switzerland 718; Denmark 597.
Metal and alloys:				
Scrap	2,725	4,236	2,724	Italy 1,431; France 905.
Zinc dust (blue powder)	2,086	1,846	758	Czechoslovakia 761; Belgium-Luxembourg 237; Netherlands 223.
Unwrought	21,501	13,429	9,070	Belgium-Luxembourg 3,527; Switzerland 2,734; France 2,521.
Semimanufactures	5,549	5,086	1,128	Denmark 869; Netherlands 735; Sweden 562.
Zirconium metal, all forms	9	7	---	Sweden 5; United States 3.
Other:				
Metallic ores and concentrates, n.e.s.	2,433	1,688	845	Switzerland 603; Austria 358; France 336.
Metalliferous nonferrous waste, n.e.s.	92,033	71,776	73,176	Belgium-Luxembourg 42,272; Netherlands 27,047; Sweden 5,018.
Oxides and hydroxides of barium and strontium	943	824	590	NA.

Table 4.—Federal Republic of Germany: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1964	1965	1964 destinations	
			EEC[1]	Principal destinations
Metals—Continued				
Metals:				
Alkali, alkaline earth, rare-earth metals	2,894	3,292	NA	NA.
Arsenic and tellurium	5	5	4	Italy 3.
Boron and nitrogen	1,466	1,963	10	Switzerland 1,439.
Columbium and tantalum	97	155	68	France 61; Japan 15; Switzerland 7.
Selenium and phosphorus	4,479	6,919	NA	NA.
Uranium and thorium—kilograms	100	700	100	NA.
Ferrocerium and other pyrophoric alloys	88	171	NA	NA.
Other—kilograms	2,500	2,600	100	Japan 900; Hungary 300.
Nonmetals:				
Abrasives:				
Natural:				
Industrial diamonds—thousand carats	75	45	40	France 15; Netherlands 15; United States 10.
Dust and powder of gem stones, including synthetic stones—do	51	80	35	Italy 18; Netherlands 12.
Diatomite and other siliceous earths—tons	4,573	5,963	2,843	Belgium-Luxembourg 1,430; Netherlands 1,031.
Pumice and other natural abrasives—thousand tons	639	593	635	Netherlands 432; Belgium-Luxembourg 194.
Manufactured (grinding stones)—tons	7,317	7,585	2,818	Italy 856; Switzerland 715.
Artificial:				
Corundum	19,327	21,368	4,540	Austria 2,844; Sweden 1,775; Italy 1,585.
Silicon carbide	6,180	7,038	NA	NA.
Boron materials:				
Crude, excluding brine products	7	112	NA	NA.
Boric oxide and acid	83	77	---	Yugoslavia 21.
Cement, portland, hydraulic, and other types—thousand tons	1,025	1,397	827	Netherlands 819.
Chalk, crude	809	1,066	209	Denmark 344; Netherlands 187.
Clays and clay products:				
Crude:				
Kaolin	56,762	55,383	33,689	Italy 19,640; Switzerland 10,095; France 5,585.
Fire clay—thousand tons	319	359	232	Netherlands 83; Italy 53; Switzerland 40.
Andalusite, dinas and other—do	547	602	508	Netherlands 296; Belgium-Luxembourg 104.
Products: Construction materials:				
Refractory—thousand tons	343	345	193	France 73; Belgium-Luxembourg 52.
Nonrefractory—do	270	304	181	France 94; Netherlands 53.
Diamonds and other gem stones:				
Diamond, except powder and dust, crude or rough cut—thousand carats	30	40	NA	NA.
Other worked—do	130	115	105	Belgium-Luxembourg 85; United States 20.
Other precious or semiprecious:				
Crude or rough cut—kilograms	34,658	47,894	13,987	Czechoslovakia 6,520; France 6,442; Netherlands 4,770.
Other—do	21,718	23,701	5,029	United States 7,607; France 2,330; Italy 1,660.
Dolomite, crude and calcined	73,896	90,596	66,446	Netherlands 50,690; Belgium-Luxembourg 8,252.
Feldspar	12,118	11,762	11,450	Italy 3,306; Belgium-Luxembourg 3,087.
Fertilizer materials:				
Crude, natural:				
Phosphatic	43,238	34,624	---	Austria 41,660.
Potassic	94,400	86,999	74,462	Netherlands 40,257; Belgium-Luxembourg 34,205; United Kingdom 19,613.
Organic, including guano	3,878	---	3,836	Netherlands 3,793.
Manufactured:				
Nitrogenous—thousand tons	1,577	1,359	104	Spain 221; United Kingdom 172; Yugoslavia 101.
Phosphatic:				
Basic slag—do	354	286	283	France 233; Netherlands 50; Austria 30.
Other—do	20	26	3	Denmark 6; Pakistan 3.
Potassic—do	1,473	1,916	338	United Kingdom 177; Denmark 165; Netherlands 151.
Mixed—do	429	453	122	France 110; Malaysia 36; Czechoslovakia 27.
Ammonia, anhydrous—do	80	76	12	Norway 53; Netherlands 9; Switzerland 5.
Fluorspar	12,314	10,598	2,608	Austria 6,640; Netherlands 2,182.
Graphite, natural, crude or ground	6,694	7,758	1,608	United States 1,780; Italy 1,178.
Gypsum and limestone:				
Gypsum and plasters—thousand tons	267	250	211	Netherlands 165; Belgium-Luxembourg 29.
Limestone, excluding dimension stone—do	47	42	46	Netherlands 43.
Lime, hydraulic or slaked—do	359	378	332	Netherlands 298; Switzerland 23.
Magnesite, crude and calcined	8,262	5,631	7,656	France 4,873; Netherlands 2,476.

Table 4.—Federal Republic of Germany: Exports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1964	1965	1964 destinations	
			EEC[1]	Principal destinations
Nonmetals—Continued				
Mica:				
Crude, powder and splittings	553	483	54	Switzerland 292; Austria 92.
Worked, including agglomerated splittings	126	NA	33	Denmark 24; Italy 13.
Pigments:				
Earth colors, natural	3,492	3,389	1,773	Belgium-Luxembourg 975; Denmark 738.
Iron oxides and hydroxides, thousand tons	85	98	38	France 22; United Kingdom 10.
Salt, do	871	961	442	Belgium-Luxembourg 415; Sweden 158.
Sodium and potassium compounds, n.e.s.:				
Caustic soda, thousand tons	138	120	60	Netherlands 50; Brazil 14; Yugoslavia 14.
Caustic potash and peroxides of sodium potassium	12,302	12,369	2,496	U.S.S.R. 3,780; Netherlands 1,720; Switzerland 1,715.
Stone, sand and gravel, n.e.s.:				
Dimension stone:				
Unworked and partly worked:				
Marble and other calcareous, thousand tons	4	7	3	Netherlands 1; Belgium-Luxembourg 1.
Slate, do	70	157	63	Netherlands 60; Sweden 6.
Granite, porphyry, other, do	229	398	219	Netherlands 207.
Worked, all types including paving blocks, do	42	32	35	Netherlands 25; Belgium-Luxembourg 10.
Gravel and crushed rock, including macadam, do	6,658	7,484	5,465	Netherlands 4,121; Belgium-Luxembourg 1,323; Switzerland 1,102.
Grinding stones and wheels	7,317	7,585	2,818	Italy 856; Netherlands 823; Switzerland 715.
Quartz and quartzite, crude and partly worked, thousand tons	45	54	23	Austria 12; Italy 9; Belgium-Luxembourg 7.
Sand, excluding metal-bearing, do	1,516	2,316	1,150	Netherlands 1,006; Switzerland 266.
Sulfur and pyrite:				
Pyrite	33	82	---	NA.
Elemental, excluding colloidal and precipitated	24,902	25,883	1,348	United Arab Republic (Egypt) 5,926; Austria 4,969; Pakistan 1,987.
Other elemental	1,210	1,219	291	Netherlands 130; Sweden 110.
Sulfur dioxide	2,762	2,198	358	Sweden 1,465; Austria 659.
Sulfuric acid	75,298	50,893	37,283	Netherlands 33,621; Austria 21,812; United Kingdom 6,293.
Talc, soapstone, steatite	1,215	1,220	359	Switzerland 274; Belgium-Luxembourg 172.
Vermiculite and mineral wool	12,542	14,202	4,129	Switzerland 2,251; Belgium-Luxembourg 1,604; Netherlands 1,144.
Other nonmetallic materials:				
Bromine, fluorine, iodine in pure form	117	427	52	Switzerland 37; Belgium-Luxembourg 26.
Meerschaum, amber, jet	3	1	---	Denmark 1.
Slag and other nonmetalliferous waste from metallurgical operations:				
Derived from iron and steel manufacture, thousand tons	1,108	1,171	1,102	Netherlands 755; France 298.
Other, do	286	362	278	Netherlands 233; France 45.
Mineral substances, n.e.s., do	340	323	181	Netherlands 138; United States 47; Austria 28.
Mineral fuels:				
Asphalt and bitumen, natural	2,088	1,653	1,098	Belgium-Luxembourg 1,098; Austria 891.
Coal, coke, briquets:				
Anthracite and bituminous coal, thousand tons	13,738	13,300	12,214	France 5,747; Netherlands 3,071; Belgium-Luxembourg 2,919.
Bituminous coal briquets, do	386	277	360	Italy 119; France 110; Netherlands 84.
Lignite and lignite briquets, do	1,681	1,342	1,294	France 529; Netherlands 341; Belgium-Luxembourg 222.
Peat and peat briquets, do	164	167	95	Netherlands 71; United States 30.
Coke and semicoke from coal, peat and lignite, do	10,929	9,759	7,745	France 3,732; Belgium-Luxembourg 3,513; Sweden 866.
Carbon black	31,822	29,329	16,136	France 6,829; Netherlands 4,177; Austria 3,546.
Gas, fuel, natural and manufactured, thousand tons	316	300	257	France 110; Belgium-Luxembourg 79; Netherlands 66.
Hydrogen and rate gases	83	112	13	Switzerland 22; United Arab Republic (Egypt) 14.
Petroleum:				
Crude and partly refined oil, thousand tons	---	22	---	
Refinery products:				
Gasoline, do	1,355	1,197	102	United Kingdom 430; Switzerland 334; Denmark 160.

Table 4.—Federal Republic of Germany: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1964	1965	1964 destinations	
			EEC[1]	Principal destinations
Mineral fuels—Continued				
Petroleum—Continued				
Kerosine ---do---	443	383	88	Netherlands 86; Denmark 19; Switzerland 15; bunkers 295.
Distillate fuel oil ---do---	1,454	1,003	202	Switzerland 698; Netherlands 123; United Kingdom 63.
Residual fuel oil ---do---	3,725	3,652	1,648	Netherlands 1,191; Switzerland 433; Belgium-Luxembourg 386.
Lubricants ---do---	122	124	54	Netherlands 29; United Kingdom 16; Belgium-Luxembourg 14.
Mineral jelly and wax ---do---	53	62	14	Sweden 7; Italy 4; Finland 4.
Nonlubricating oils, n.e.s. ---do---	66	77	26	United Kingdom 15; Belgium-Luxembourg 13; Netherlands 10.
Pitch and pitch coke ---do---	211	212	147	France 113; Belgium-Luxembourg 19; Austria 19.
Petroleum coke ---do---	151	164	79	France 71; Switzerland 35; Spain 13.
Bitumen and other residues thousand tons	193	231	42	Switzerland 67; Denmark 63; Netherlands 29.
Bituminous mixtures, n.e.s. do---	24	24	11	Netherlands 8; Denmark 7; United States 2.
Tar, mineral, and other crude chemicals from coal, petroleum, and natural gas distillation, n.e.s. thousand tons	145,590	162,655	88,922	France 44,040; United States 26,583; Netherlands 22,791.

NA Not available.

[1] Belgium, France, Italy, Luxembourg, and the Netherlands.

Table 5.—Federal Republic of Germany: Imports of minerals and metals

(Metric tons unless otherwise specified)

Commodity	1964	1965	1964 sources	
			EEC[1]	Principal sources
Metals:				
Aluminum:				
Bauxite thousand tons	1,622	1,636	134	Yugoslavia 682, Greece 372.
Alumina	53,563	57,728	4,281	Guinea 48,659; France 4,279.
Aluminum hydroxide	1,504	818	33	United States 1,469.
Metal, including alloys:				
Scrap	56,816	58,662	20,052	United States 22,737; France 8,591; Netherlands 7,831.
Ingots and equivalent forms	165,274	169,519	14,703	Norway 45,972; United States 36,507; Canada 31,640.
Semimanufactures	28,834	32,668	22,770	Belgium-Luxembourg 12,374; France 4,507.
Antimony:				
Ore and concentrate	2,661	2,793	---	Thailand 1,010; Turkey 999; Peru 337.
Oxides	828	NA	339	United Kingdom 277; Belgium-Luxembourg 264.
Metal, all forms	3,351	2,751	57	Mainland China 1,594; Czechoslovakia 671; U.S.S.R. 608.
Arsenic anhydrides	965	1,308	888	Belgium-Luxembourg 788; France 100.
Bismuth metal, all forms	259	233	99	Netherlands 57; Peru 55; mainland China 55.
Cadmium:				
Oxide and hydroxide kilograms	73,900	NA	73,900	Belgium-Luxembourg 73,800.
Metal, all forms	904,100	1,196	487,000	Belgium-Luxembourg 327,700; United States 155,900; Netherlands 127,800.
Chromium:				
Chromite	236,693	305,560	91	Republic of South Africa 94,224; U.S.S.R. 72,209; Turkey 37,890.
Oxides and hydroxide	89	265	11	Poland 75.
Metal, all forms kilograms	68,400	70,800	49,900	France 49,900; United Kingdom 9,200; Japan 8,000.
Cobalt:				
Oxides and hydroxides	261	263	258	Belgium-Luxembourg 255.
Metal, all forms	678	788	601	Belgium-Luxembourg 543; France 45.
Copper:				
Ores and concentrates	149,330	144,877	---	Cyprus 43,032; Chile 34,729; Nicaragua 28,475.
Matte	2,295	1,453	---	Czechoslovakia 936; Burma 457; Argentina 354.
Scrap	79,432	109,104	46,113	France 24,027; Netherlands 14,007; United States 9,370.

Table 5.—Federal Republic of Germany: Imports of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1964	1965	1964 sources	
			EEC[1]	Principal sources
Metals—Continued				
Copper—Continued				
Blister	135,862	142,076	2,061	Zambia 63,678; Chile 35,286; Peru 16,661.
Refined copper, unwrought	309,886	299,236	88,455	Belgium-Luxembourg 76,774; Chile 66,861; Zambia 46,770.
Copper alloys, unwrought	41,925	42,540	14,810	United Kingdom 17,347; Netherlands 6,460; France 5,080.
Master alloys	840	1,251	196	United Kingdom 278; Switzerland 257; Belgium-Luxembourg 187.
Semimanufactures, including alloys	42,905	72,673	32,851	Belgium-Luxembourg 19,815; Italy 5,553; Netherlands 4,827.
Gold and alloys:				
Unwrought—thousand troy ounces	2,694	3,930	50	U.S.S.R. 1,826; Switzerland 407; United Kingdom 207.
Semimanufactures—do	17	17	(2)	United States 12; Austria 4.
Iron and steel:				
Ore and concentrates:				
Iron ore—thousand tons	35,024	35,471	6,474	Sweden 9,563; France 6,453; Libya 4,294; Brazil 3,280; Venezuela 2,043; Peru 1,495.
Roasted pyrites—do	1,949	1,888	669	Spain 617; Finland 250; Netherlands 223.
Speigeleisen—thousand tons	16	10	12	France 10; Republic of South Africa 5.
Pig iron, including cast iron—do	258	188	90	Finland 38; France 35; Netherlands 32; Spain 32; Republic of South Africa 27.
Powder and shot—do	17	18	4	Sweden 9; United Kingdom 3; France 3.
Ferroalloys:				
Ferromanganese—do	90	88	64	France 56; Norway 18; Republic of South Africa 6.
Other—do	189	193	27	Norway 101; France 25; Switzerland 12.
Scrap—do	1,765	1,088	687	United States 500; United Kingdom 435; Belgium-Luxembourg 309.
Steel, primary forms:				
Ingots—do	46	4	3	Hungary 41.
Blooms, billets and slabs—do	476	368	436	Belgium-Luxembourg 311; France 117.
Coil for rerolling—do	583	503	71	Austria 313; United Kingdom 98; U.S.S.R. 63.
Semimanufactures:				
Wire rod—do	529	547	468	France 251; Belgium-Luxembourg 175.
Other bars and rods—do	732	733	623	Belgium-Luxembourg 360; France 129; Italy 114.
Sections:				
Large—do	344	339	322	Belgium-Luxembourg 211; France 97; Italy 13.
Small—do	174	206	140	Belgium-Luxembourg 45; Italy 30; Austria 9.
Plates and sheets:				
Heavy plates—do	376	548	231	Belgium-Luxembourg 136; France 76.
Medium plates—do	196	219	172	Belgium-Luxembourg 103; France 57; Austria 11.
Thin, uncoated—do	1,217	1,326	1,078	France 567; Belgium-Luxembourg 336.
Coated:				
Tinned—do	112	99	110	France 55; Belgium-Luxembourg 51.
Other—do	77	77	71	Belgium-Luxembourg 44; France 27.
Hoop and strip—do	345	333	312	Belgium-Luxembourg 194; France 73.
Railway track material—do	11	21	7	Belgium-Luxembourg 3; Norway 2.
Wire (excluding wire rod)—do	53	73	41	Belgium-Luxembourg 32; Sweden 6.
Tubes, pipes and fittings—do	168	188	118	Belgium-Luxembourg 49; Netherlands 45; Sweden 20.
Castings and forgings, rough—do	8	10	6	Belgium-Luxembourg 4; France 1.
Lead:				
Ores and concentrates	109,056	139,497	---	Sweden 31,928; Peru 26,047; Canada 18,356.
Oxides	3,595	3,727	970	Mexico 1,044; France 844; Poland 635.
Metal and alloys:				
Scrap	10,347	5,558	5,402	Belgium-Luxembourg 2,886; Switzerland 1,740; France 1,559.
Unwrought	100,048	116,677	36,376	United Kingdom 25,499; Austria 15,072; Belgium-Luxembourg 14,983.
Semimanufactures	2,149	2,057	1,588	Belgium-Luxembourg 897; France 596; Yugoslavia 529.
Magnesium:				
Oxide and hydroxide	2,399	2,115	759	United Kingdom 1,142; United States 485.
Scrap	387	552	101	Sweden 100; Netherlands 67; Switzerland 45.
Unwrought	34,120	40,494	3,835	Norway 17,481; United States 10,146.
Semimanufactures	137	256	4	United States 66; Austria 56.
Manganese:				
Ores and concentrates—thousand tons	764	732	---	Republic of South Africa 170; India 130; Gabon 102; Congo (Léopoldville) 89.
Oxides	1,579	2,377	93	Japan 1,339; Austria 140.
Metal, all forms	2,755	2,418	526	Japan 1,110; Republic of South Africa 733.

Table 5.—Federal Republic of Germany: Imports of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1964	1965	1964 sources	
			EEC [1]	Principal sources
Metals—Continued				
Mercury:				
Oxides—kilograms	74,700	NA	13,500	Spain 32,600; Yugoslavia 25,200; Netherlands 13,500.
Metal—76-pound flasks	24,329	22,974	12,247	Italy 12,201; Spain 6,773; mainland China 3,519.
Molybdenum metal, all forms	445	316	40	United States 322; Austria 34; Netherlands 28.
Nickel:				
Ores and concentrates	121	531	120	NA.
Matte and speiss	3,680	4,133	220	Canada 1,642; United Kingdom 1,551.
Metal and alloys:				
Scrap	3,208	1,895	1,318	United States 808; Netherlands 653; United Kingdom 509.
Unwrought	23,403	23,933	742	United Kingdom 8,178; Norway 5,462; Canada 5,220.
Semimanufactures	1,376	1,853	390	United Kingdom 375; France 246; United States 219.
Platinum-group metals:				
Ashes, residues, scrap—kilograms	31,900	49,300	4,600	Finland 11,000; Peru 5,600; Japan 3,400.
Metals, all forms—troy ounces	358,687	450,110	91,428	U.S.S.R. 152,471; United Kingdom 79,614; France 78,189.
Radioactive and associated materials:				
Radioactive elements and isotopes and other compounds—kilograms	36,343	10,424	---	United Kingdom 35,112.
Other isotopes	37,531	392	1	United States 37,506.
Compounds of thorium, uranium, and rare-earth metals	537	786	27	India 300; Austria 115; United Kingdom 54.
Silicon	16,878	19,051	10,053	France 6,070; Italy 3,983; Sweden 2,886.
Silver:				
Silver-platinum ores and concentrates	2,463	940	---	All from Peru.
Ashes, residues, scrap—kilograms	280,199	237,786	134,957	Italy 105,931; Switzerland 44,788; Sweden 41,929.
Unwrought including alloys—thousand troy ounces	45,180	55,463	5,768	Mexico 16,360; Peru 9,426; United States 8,060.
Semimanufactures including alloys—do	1,938	3,327	1,281	France 1,279; Switzerland 537.
Tantalum metal, all forms—kilograms	4,800	11,000	1,100	United States 2,800; France 700; United Kingdom 400.
Tin:				
Ores and concentrates—long tons	7,539	7,816	---	All from Bolivia.
Oxides—do	213	206	207	Belgium-Luxembourg 179; France 28.
Metal and alloys:				
Scrap—do	212	388	165	Netherlands 123; Belgium-Luxembourg 41; Switzerland 24.
Unwrought—do	13,608	13,492	8,636	Netherlands 7,785; Malaysia 1,965; United Kingdom 1,244.
Semimanufactures—do	19	34	7	United Kingdom 9; Belgium-Luxembourg 6.
Titanium, vanadium, molybdenum, tantalum, and zirconium ores and concentrates	394,703	447,426	111	Norway 189,991; Canada 146,442; Australia 40,884.
Titanium dioxide	1,609	1,812	1,502	Netherlands 645; Italy 334; Belgium-Luxembourg 303.
Tungsten:				
Ores and concentrates	4,908	6,120	79	U.S.S.R. 1,060; Bolivia 538; mainland China 503; South Korea 460.
Metal, all forms	352	449	91	United States 135; France 54; Switzerland 44.
Uranium and thorium:				
Ores and concentrates	28	1,676	---	Canada 23.
Metal and alloys—kilograms	---	12,100	---	
Zinc and alloys:				
Ores and concentrates	145,842	120,747	6,691	Sweden 49,449; Canada 27,640; Finland 16,572.
Oxides	4,502	3,605	3,141	Netherlands 1,767; France 957; Yugoslavia 600.
Metal and alloys:				
Scrap	543	549	285	Netherlands 139; Sweden 89; Belgium-Luxembourg 88; Denmark 81.
Zinc dust (blue powder)	3,554	5,468	3,129	Belgium-Luxembourg 3,115; United Kingdom 189.
Unwrought	167,276	184,305	78,016	Belgium-Luxembourg 56,200; Canada 18,992; U.S.S.R. 17,000.
Semimanufactures	11,413	15,847	6,031	Belgium-Luxembourg 4,448; Yugoslavia 4,448; France 1,219; United States 802.
Zirconium metal, all forms—kilograms	14,800	23,600	1,700	United States 7,400; United Kingdom 4,700; France 1,200.

Table 5.—Federal Republic of Germany: Imports of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1964	1965	1964 sources	
			EEC[1]	Principal sources
Metals—Continued				
Other:				
Nonferrous ores and concentrates	3,704	4,132	3,446	France 3,446.
Metalliferous nonferrous waste, n.e.s.	71,781	92,057	23,029	Netherlands 9,680; United States 8,076; Belgium-Luxembourg 7,381; Switzerland 5,223.
Oxides and hydroxides of barium and strontium	2,499	2,164	764	United Kingdom 1,193; United States 530.
Other inorganic bases, n.e.s.	2,557	3,127	580	United Kingdom 267; Belgium-Luxembourg 337; Republic of South Africa 210.
Metals:				
Alkali, alkaline earth, and rare-earth metals	322	32	1	United Kingdom 308; Canada 13.
Arsenic and tellurium	41	53	---	Sweden 30; Peru 9; United Kingdom 5.
Boron and nitrogen	28	3	28	All from Netherlands.
Columbium and tantalum metals, all forms	704	770	18	United States 510.
Phosphorus and selenium	616	2,333	3	United States 534; Sweden 36.
Pyrophoric alloys	33	62	6	Austria 26.
Other	5	6	3	Belgium-Luxembourg 3; United Kingdom 2.
Nonmetals:				
Abrasives:				
Natural:				
Industrial diamond thousand carats	495	565	290	Belgium-Luxembourg 220; Republic of South Africa 105; Netherlands 65.
Dust and powder of gem stones, including diamond do	962	1,250	586	Belgium-Luxembourg 389; Netherlands 190; United Kingdom 131.
Diatomite and other siliceous earths	62,722	87,254	9,009	Denmark 46,284; France 8,896; United States 4,522.
Pumice, emery, other natural abrasives	210,031	113,592	168,600	Italy 167,243; Greece 39,564.
Manufactured (grinding stone)	2,480	2,799	941	France 448; Sweden 423; Austria 470.
Artificial:				
Artificial corundum	3,767	4,619	1,147	Austria 1,171; France 1,067; United States 769.
Silicon carbide	5,227	6,504	985	Norway 3,783; Italy 935; United Kingdom 307.
Asbestos:				
Crude or partially worked	142,812	173,473	4,050	Canada 79,652; U.S.S.R. 23,252; Zambia 16,732; Repuglic of South Africa 14,843.
Asbestos cement products	94,468	110,793	53,018	Belgium-Luxembourg 39,183; Sweden 16,596; Austria 9,798.
Asbestos manufactures, excluding friction materials	7,804	8,356	3,782	France 2,297; United Kingdom 2,084; Netherlands 1,310.
Barite and witherite	45,964	54,044	6,134	United Kingdom 177; France 169.
Boron salts, natural	48,618	55,052	333	United States 44,369; Turkey 3,915; France 333.
Boric oxide and acid	11,081	11,521	7,454	France 4,988; United States 3,622; Italy 2,459.
Cement, hydraulic thousand tons	351	460	251	France 242; Switzerland 36; Poland 36.
Chalk do	133	126	104	France 92; Denmark 28; Belgium-Luxembourg 12.
Clays and clay products:				
Crude:				
China clay (kaolin) do	365	381	36	United Kingdom 259; France 36; Czechoslovakia 36.
Fire clay do	196	228	37	Czechoslovakia 65; Republic of South Africa 57; France 36.
Andalusite, dinas, other do	216	252	143	Netherlands 76; France 51; Czechoslovakia 23.
Products: Construction materials:				
Building bricks do	546	507	433	Netherlands 380; Denmark 89; France 28.
Other (roof tile, ceramic piping, etc.) do	199	235	121	Netherlands 57; Italy 27; France 19.
Refractory:				
Heat-insulating bricks of diatomite and similar earths	10,236	12,101	666	Denmark 8,059; Yugoslavia 979; France 488.
Bricks, n.e.s.	58,084	64,141	11,022	Austria 19,955; Norway 8,807; France 7,685.
Mortars	22,323	16,904	7,104	Spain 7,919; Belgium-Luxembourg 4,269; France 2,644.
Cryolite and chiolite	3,238	3,576	---	All from Denmark.
Diamond and other gem stones:				
Diamond, except powder and dust:				
Other:				
Crude or rough cut thousand carats	400	375	NA	NA.
Other worked do	165	215	110	Belgium-Luxembourg 80; Netherlands 30; Switzerland 10.

Table 5.—Federal Republic of Germany: Imports of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1964	1965	1964 sources	
			EEC[1]	Principal sources
Nonmetals—Continued				
Diamond—Continued				
Other precious or semiprecious:				
Crude or rough cut....kilograms	617,574	824,172	8,423	Brazil 385,329; Republic of South Africa 60,228; Uruguay 28,159; United States 26,109.
Other....do....	3,548	2,932	122	Mexico 1,840; mainland China 450; Switzerland 359.
Dolomite....thousand tons..	118	120	82	Belgium-Luxembourg 71; Austria 22; France 10.
Feldspar	43,748	51,206	23,474	Italy 14,196; Norway 13,473; France 9,207.
Fertilizer materials:				
Crude, natural:				
Phosphatic....thousand tons..	2,291	2,521	---	Morocco 781; U.S.S.R. 260; Senegal 202.
Potassic	20,266	---	20,266	All from France.
Nitrogenous (natural sodium nitrate)	---	8,120	---	
Organic, including guano	16,676	18,935	12,802	France 5,785; Netherlands 6,929; Peru 3,539.
Manufactured:				
Nitrogenous	120,271	158,079	119,448	Belgium-Luxembourg 111,431; France 7,399.
Phosphatic:				
Basic slag	423,621	529,082	418,257	Mainly from Belgium-Luxembourg.
Other	23,785	24,069	23,771	Belgium-Luxembourg 13,943; Netherlands 9,329.
Potassic	27,932	49,145	27,932	France 25,789.
Other	8,274	16,078	7,618	France 6,411; Netherlands 1,103.
Fluorspar	60,732	110,846	32,520	France 32,520; Spain 16,573; Morocco 7,379.
Graphite, natural crude or ground	16,211	17,729	70	Austria 9,620; Norway 1,356; Madagascar 1,846.
Gypsum and anhydrite	81,090	77,709	33,595	Austria 47,165; France 33,340.
Limestone and other calcareous stone, excluding dimension stone....thousand tons..	362	1,005	57	Denmark 291; France 27.
Lime, hydraulic or slaked	98,768	93,383	94,100	France 93,647; Poland 3,514.
Magnesite:				
Crude	8,885	3,066	673	Turkey 6,913.
Caustic calcined	115,426	123,386	7,498	Austria 77,728; Greece 18,643; India 7,535.
Other sintered or fired	177,712	223,938	915	Austria 102,623; Czechoslovakia 32,466; Greece 16,608.
Magnesite, dolomite, chrome-magnesite refractories	46,403	46,286	5,415	Austria 19,478; Norway 8,656; Yugoslavia 8,424.
Mica:				
Crude and scrap	6,373	6,856	58	India 3,171; Norway 1,028; Republic of South Africa 790.
Manufactures	145	204	105	France 85; Belgium-Luxembourg 20.
Pigments, mineral	3,222	3,575	1,312	Austria 1,247; France 1,170.
Salt:				
Table	8,643	6,407	8,156	France 4,309; Netherlands 3,575.
Other	87,467	87,444	84,124	Netherlands 54,446; France 29,678.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	36,726	76,097	34,347	Netherlands 26,167; France 3,455.
Caustic potash and peroxides of sodium and potassium	2,567	4,022	2,218	France 1,129; Belgium-Luxembourg 1,089.
Stone, sand and gravel:				
Quarts and quartzite, crude, ground, and/or roughly squared	41,462	51,091	10,621	Norway 13,217; Belgium-Luxembourg 9,307; Sweden 9,259.
Dimension stone:				
Crude or partly worked:				
Marble and other calcareous thousand tons..	178	192	78	Austria 61; Italy 54; France 14.
Slate....do....	6	7	4	France 2; Italy 2; Norway 1.
Granite, sandstone, and other, n.e.s.	459	558	14	Sweden 212; Denmark 84; Austria 51.
Worked:				
Building and monumental do....	76	116	58	Italy 53; Spain 6.
Paving blocks and flagstones do....	137	142	2	Portugal 104; Austria 13; Poland 13.
Slate....do....	15	15	11	Italy 10; Portugal 2.
Gravel and crushed stone, including macadam....do....	6,150	7,831	3,227	France 2,241; Denmark 2,002; Netherlands 608.
Sand, excluding metal-bearing....do....	1,206	1,513	1,158	France 609; Belgium-Luxembourg 287; Netherlands 262.
Sulfur, all forms:				
Pyrite....do....	1,602	1,548	---	Spain 734; Norway 474; Cyprus 83; U.S.S.R. 80.

Table 5.—Federal Republic of Germany: Imports of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1964	1965	1964 sources	
			EEC[1]	Principal sources
Nonmetals—Continued				
Sulfur, all forms—Continued				
Elemental, excluding colloidal and precipitated ---thousand tons	405	486	135	United States 142; France 134; Mexico 118.
Elemental, colloidal, precipitated	247	150	245	Italy 183; France 62.
Sulfur dioxide	200	573	---	All from Poland.
Sulfuric acid	156,338	219,532	109,772	France 44,977; Belgium-Luxembourg 43,210; Netherlands 21,585.
Mineral fuels:				
Asphalt and bitumen, natural	18,409	16,701	195	United States 11,001; Trinidad 7,017.
Carbon black	35,799	42,000	11,989	United States 19,020; Italy 5,025; United Kingdom 4,680; Netherlands 4,620.
Coal, lignite, peat:				
Anthracite and bituminous thousand tons	7,058	7,166	1,004	United States 4,863; United Kingdom 650; France 424.
Bituminous briquets ---do	373	305	330	Netherlands 295; United States 42.
Lignite and lignite briquets ---do	1,228	979	24	Czechoslovakia 1,134; Denmark 45.
Peat and peat briquets ---do	22	12	17	Netherlands 17.
Coke, except petroleum coke ---do	364	627	234	Netherlands 227; Czechoslovakia 103.
Gas:				
Natural	41,240	66,488	40,073	Netherlands 24,912; France 13,612.
Manufactured	809	245	809	All from Netherlands.
Hydrogen and rare gases	63	59	27	Hungary 23; Netherlands 17; France 10.
Petroleum:				
Crude, including shale oil thousand tons	51,276	59,068	14,447	Iran 7,384; Saudi Arabia 7,365; Iraq 5,409; Venezuela 4,011.
Refinery products:				
Gasoline ---do	1,391	1,551	908	France 399; Netherlands 294; Belgium-Luxembourg 190; Netherlands Antilles 129.
Kerosine ---do	262	272	154	Netherlands 84; Netherlands Antilles 55; France 39.
Distillate fuels ---do	8,586	9,312	3,908	Netherlands 1,789; Venezuela 1,182; Italy 1,008; France 908; United Kingdom 757.
Residual fuel oils ---do	2,881	3,383	1,602	France 756; Netherlands 700; Venezuela 428; United Kingdom 345.
Lubricants ---do	252	199	48	United States 77; Venezuela 56; United Kingdom 50.
Mineral jelly and wax ---do	46	51	8	United States 23; Indonesia 9.
Nonlubricating oils, n.e.s. ---do	18	75	10	Belgium-Luxembourg 9; United States 8.
Pitch and pitch coke ---do	56	35	5	Czechoslovakia 37; Poland 8; Turkey 5.
Petroleum coke ---do	198	283	1	United States 188; Switzerland 8.
Petroleum and shale oil residues do	682	497	607	Netherlands 297; Belgium-Luxembourg 138; Italy 87.
Bitumen and asphalt mixtures do	15	15	10	Netherlands 9; United Kingdom 2.
Tar, mineral, and other crude chemicals from coal, petroleum, and natural gas	211,158	245,119	69,332	Czechoslovakia 71,154; Netherlands 38,597; Belgium-Luxembourg 21,461; Poland 19,870.

NA Not available.
[1] Belgium, France, Italy, Luxembourg, and the Netherlands.
[2] Less than ½ unit.

COMMODITY REVIEW

METALS

Although the iron and steel industry generally maintained 1964 production levels during the first part of 1965, a decline in output was apparent toward the end of the year and profits reportedly declined because of the widening gap between costs and receipts.[4]

In contrast, the situation of the nonferrous metal industry improved during the year; the production index increased 10 percent compared with that of 1964. Production of all principal nonferrous metals (including secondary metal) increased: refined copper 6.3 percent, tin 10.2 percent, zinc 7.3 percent, and aluminum (primary only) 6.2 percent. Similarly, production of alloys of aluminum, copper, lead, zinc, and tin increased at rates ranging from 2 to 22 percent.

[4] The Economist. Jan. 29, 1966, pp. 432–433.

The price of copper increased significantly; the $1,580 per ton market price for copper wire bar at yearend was the highest price ever offered. At that time the difference between producers' and market price of copper wire bar was about $740 per ton. The average market price of copper wire bar for the year was $1,290 per ton, or $320 more than in 1964. Producers' price increased from about $720 per ton at the beginning of the year to about $840 per ton at yearend. It is estimated that only 30 to 40 percent of the requirement could be met at producers' price.[5]

Lead and zinc prices increased only in the beginning of the year. Lead prices increased from $365 per ton in January to $422 per ton in February before falling to the lowest level of $275 per ton in July; the yearend price was $322 per ton. Zinc prices did not show a wide range; the yearend price was $305 per ton, compared with $315 per ton in January. Aluminum prices remained stable.

Aluminum.—Aluminum output surpassed the previous record high achieved in 1942. Production of semimanufactures did not change much. Apparently competition in this sector of the industry was very intense, and due to reduced delivery time, there was little purchase for inventory. Castings showed substantial increase because of the favorable situation in the automobile industry, which generally absorbs almost 50 percent of the output.[6]

It is believed that the consumption increase (3 to 4 percent) did not match increases of the previous years. The supply position for primary and secondary aluminum was as follows:

	Thousand metric tons
Production	437
Imports	170
Exports	10
Total available	597
Custom smelting and use of primary metal for production of secondary metal	[1]—44
Direct use of scrap	[1]+22
Change in inventory	[e]—20
Consumption	555

[e] Estimate.
[1] NE-Metalle Düsseldorf, Germany. Feb. 2, 1966, p. 2.

Per capita consumption of aluminum in 1964 by important sectors in kilograms were transportation 2.2, electrical engineering 1.3, building and construction 0.7, and packaging 0.7. Transportation (predominantly road transportation) accounts for 25 percent of total domestic consumption.

Countervailing the large imports of aluminum, exports of semimanufactures (59,642 tons) exceeded imports by almost 27,000 tons. Non-EEC countries were the major sources of aluminum imports in 1965; EEC countries supplied only 27,850 tons of the 138,856 tons of aluminum imported and only 7,873 tons of the 30,663 tons of alloys imported. But these countries supplied nearly 80 percent of the semimanufactures.

In 1965 the Government allowed an 80,000-ton quota for imports at a preferential rate of 5 percent and a 3,000-ton duty-free quota from EEC countries.[7] The entire duty-free quota and an estimated 70,000 tons of the preferential quota were utilized. For 1966, the Government applied to the EEC Commission for a 100,000-ton quota to be imported at a preferential tariff from non-EEC countries.

Iron Ore.—Domestic ore accounted for only 11.5 percent of the iron content of iron ore smelted for production of pig iron. Production of iron ore in West Germany continued to decline in 1965 and four mines were closed. Employment in the industry was only 43 percent of the 1961 level. In 1965 Salzgitter accounted for 62 percent of total output. Ilseder for 30 percent, and Osnabrück for 8 percent. Mines in these areas are linked to iron and steel mills and presumably can maintain their production. Erzbergbau Salzgitter A.G. was developing an iron ore deposit at Salzgitter with a 1.2-million-ton annual capacity to be completed in 1967. Eisenwerkgesellschaft Maximilianhütte m.b.H. has also been developing sections of a deposit at Sulzbach-Rosenberg and building facilities to crush, screen, and stock ore at Auerbach. Ilseder Hütte Eisenerzbergbau had a modernization program of underground equipment which reportedly was scheduled to be completed in 1965. Apparently some work (shaft and drifts) was being carried out by Barbara Erzbergbau Mining Company at Staffhorst to determine

[5] NE-Metalle (Düsseldorf, Germany). Feb. 2, 1966, p. 2.
[6] Work cited in footnote 5.
[7] Meyer, P. The Aluminum Industry at the Turn of the Year. The Federal Republic of Germany. Aluminum, January 1966, pp. 6–10.

Table 6.—Federal Republic of Germany: Salient iron ore industry statistics

(Thousand metric tons unless otherwise specified)

	1963	1964	1965
Production, iron ore:			
Mine-run ore	12,898	11,613	10,847
Marketable:			
Direct shipping	4,076	4,148	3,755
Concentrate	5,429	r 4,549	4,198
Total	9,505	8,697	7,953
Iron content:			
Mine-run ore	3,477	3,145	2,929
Marketable:			
Direct shipping	1,128	1,142	1,051
Concentrates	1,946	1,654	1,502
Total (marketable)	3,074	2,796	2,553
Shipments of marketable ore	9,405	8,610	7,895
Iron content	3,030	2,786	2,547
Stocks at yearend (as reported)	2,254	2,218	2,217
Iron content	698	673	658
Employment:			
Workers:			
Underground mine—number of persons	5,630	2,927	3,990
Open pit—do	281	149	128
Surface plants—do	3,328	4,887	2,494
Salaried:			
Mines—do	544	445	359
Plants—do	981	913	819
Total—do	10,764	9,321	7,790

r Revised.

Source: Statistisches Bundesamt (Aussenstelle Düsseldorf). Eisen und Stahl (Iron and Steel): Reihe 1, 4th quarter 1965, pp. 18–20.

the economic feasibility of mining the deep Upper Jurassic ore.

Iron and Steel.—*Raw material consumption.*—The iron and steel industry as a whole consumed 25.97 million tons of iron (of which 20.50 million tons was contained in iron ore), 15.6 million tons of scrap, 22.35 million tons of solid fuel, 2.09 million tons of liquid fuels, and 890 million cubic meters of oxygen. While solid fuel consumption showed a 4.4-percent decline compared with that of 1964, liquid fuel use increased 9.4 percent. Coke consumption per ton of pig iron averaged 668 kilograms (691 kilograms in 1964) while in many blast furnaces actual consumption was lower than the average.

The small decline in pig iron production is reflected in raw material consumption which for all materials was 2.4 percent less than in 1964. But scrap consumption was nearly 14 percent and blast furnace dust 15 percent less than in the previous year. There was a further increase in use of sinter; iron ore sintered represented 65 percent of all iron ore consumed in pig iron production (60 percent in 1964).

Although scrap consumption per ton of steel averaged 405 kilograms, unit consumption for individual processes varied: 648 kilograms for open hearth, 167 kilograms for oxygen steel, and 69 kilograms for Thomas steel. A substantial share of the scrap requirements of both the steel mills and the foundries continued to be supplied by the plants themselves.

The steel industry (excluding foundries) at yearend employed about 399,000 persons, 3,000 less than at the beginning of the year.

Production.—In 1965 West Germany had an effective capacity to produce 33.1 million tons of pig iron, 44.6 million tons of crude steel, and 33 million tons of finished products. Crude steel production capacity was distributed between types of furnaces as follows, in percent: Open hearth 42.9, basic bessemer 29.5, Linz-Donawitz (LD) and similar oxygen furnaces 19.1, electric 8.5. About 33,000 tons of acid bessemer capacity also existed. Pig iron and steel output represented, respectively, 81.5 and 82.5 of maximum possible output.

In 1965 the country almost maintained the record 1964 output, registering declines

Table 7.—Federal Republic of Germany: Salient statistics of the iron and steel industry

(Thousand metric tons unless otherwise specified)

	1963	1964	1965
PIG IRON			
Producing plants—number	36	35	35
Blast furnaces available—do	147	147	145
Blast furnaces in operation at yearend—do	106	113	104
Maximum production capacity	30,540	30,620	33,100
Production:			
Thomas	14,080	15,527	14,917
Open hearth	6,705	9,372	9,768
Foundry	603	501	453
Spiegeleisen and blast furnace ferromanganese	290	287	280
Other	1,231	1,495	1,572
Total	22,909	27,182	26,990
Ratio of pig iron and crude steel	72.5	72.3	73.3
Blast furnace charge:			
Iron ore:			
Domestic	2,383	1,719	1,464
Iron content	834	633	552
Imported	11,908	14,902	13,020
Iron content	6,038	8,018	7,044
Sinter and briquets	24,969	28,658	29,908
Iron content	12,892	15,252	16,249
Manganese ore	509	556	603
Iron content	60	65	72
Other iron-bearing materials:			
Slag, scale, cinder, dust	3,479	3,710	3,534
Scrap	752	799	655
Limestone	1,704	1,882	1,678
Phosphate rock	544	542	401
Coke:			
Total	16,626	18,932	18,127
Kilograms per ton of pig iron produced	719	691	668
STEEL			
Converters:			
Basic Bessemer:			
Total—number	78	65	58
In operation at end of year—do	60	51	50
Oxygen:			
Total—do	14	18	20
In operation at end of year—do	12	13	14
Furnaces:			
Open hearth:			
Total—do	190	189	182
In operation at end of year—do	134	131	119
Electric:			
Total—do	182	185	185
In operation at end of year—do	150	163	164
Maximum production capacity (all furnaces)	39,735	40,950	44,635
Production of crude steel:			
Basic Bessemer	12,440	12,239	10,811
Oxygen	2,452	5,226	7,035
Open hearth	14,017	16,836	15,805
Electric	2,647	2,998	3,137
Other	41	40	33
Total	31,597	37,339	36,821
Ingots	31,022	36,702	36,171
Liquid steel for castings	575	637	650
Furnace feed for ingot steel:			
Pig iron:			
Total	21,012	24,933	24,759
Kilograms per ton crude steel	666	668	672
Scrap:			
Total	12,938	15,094	14,639
Kilograms per ton crude steel	407	411	405
Preblown Thomas and other presmelted steels	221	249	121
Ferroalloys, alloying metals, etc.	878	1,028	1,092
Iron and manganese ores	793	1,010	977
Limestone	2,618	2,970	2,840

Table 7.—Federal Republic of Germany: Salient statistics of the iron and steel industry—Continued

(Thousand metric tons unless otherwise specified)

	1963	1964	1965
CASTINGS			
Iron and steel foundries in operation—number	1,064	1,040	1,019
Production of iron and steel castings	3,859	4,412	4,464
Consumption of raw materials:			
Pig iron	1,693	1,857	1,867
Scrap	4,276	4,899	5,049
Ferroalloys and other metals	62	74	82
Total	6,031	6,830	6,998
EMPLOYMENT			
In coking plants of smelters—persons	2,539	2,101	1,976
Blast furnace, steel mills, hammer and forge shops—do	395,537	402,034	398,991
Foundries—do	173,206	182,327	176,158

Table 8.—Federal Republic of Germany: Production and consumption of sinter

(Thousand metric tons unless otherwise specified)

	1963	1964	1965
Production:			
Gross weight	24,925	28,705	29,912
Iron content	12,989	15,286	16,273
Consumption of sinter for pig iron and steel production	25,038	28,660	29,908
Consumption of raw materials:			
Iron ore	21,995	25,128	26,584
Cinder	3,700	3,595	3,461
Slags and scale	1,155	1,569	1,603
Blast furnace dust	2,150	2,545	2,168
Limestone	936	1,110	1,373
Iron content of materials consumed:			
Iron ore	9,840	11,768	12,908
Cinder	1,841	1,792	1,730
Slags and scale	606	845	832
Blast furnace dust	772	966	833
Total	13,059	15,371	16,303

Table 9.—Federal Republic of Germany: Raw material consumption for production of pig iron (including feed to sintering plants)

(Thousand metric tons unless otherwise specified)

	1963	1964	1965
Iron ore:			
Domestic	8,799	8,119	7,464
Imported	27,324	33,546	33,537
Total	36,123	41,665	41,001
Manganese ore	587	640	669
Pyrite cinder	3,785	3,677	3,542
Slags and plant scales	4,511	5,165	5,033
Blast furnace dust	2,189	2,577	2,191
Scrap: Total metallic raw materials	752	799	685
Gross weight	47,947	54,523	53,121
Iron content:			
Iron ore:			
Domestic	2,777	2,580	2,382
Imported	13,880	17,836	18,118
Manganese ore	62	68	75
Pyrite cinder	1,866	1,816	1,752
Slags and plant scales	1,972	2,272	2,231
Blast furnace dust	786	977	842
Scrap	638	670	571
Total iron content	21,981	26,219	25,971
Limestone	2,639	2,992	3,052
Per ton of product	115	110	113
Phosphate	563	585	419
Total gross weight of scrap, limestone, and phosphate	51,149	58,100	56,592
Coke	16,626	18,932	18,127
Per ton of product	719	691	668

Table 10.—Federal Republic of Germany: Scrap supply and consumption

(Thousand metric tons)

	1963	1964	1965
Source:			
Iron and steel plants	8,073	9,627	9,585
Foundries	2,219	2,492	2,589
Purchases:			
Domestic	6,175	6,545	6,332
Imported	596	1,685	1,066
Other, including variation in stock estimates	1,742	2,132	2,707
Total, new supply	18,805	22,481	22,279
Consumption:			
Iron and steel plants	13,713	15,921	15,337
Iron and steel foundries	4,275	4,899	5,049
Consigned for export	1,267	1,346	1,933
Stocks at yearend	2,019	2,334	2,294

of 0.7 percent in pig iron, 1.4 percent in crude steel, and 0.5 percent in finished steel production. In March monthly production attained a new record peak. However, toward yearend, because of declining domestic orders, the number of hours worked per week was reduced in a number of plants. Outstanding orders at the beginning of December stood at 3,262,700 tons compared with an average of 4,293,200 tons for the first 8 months of the year. Foreign orders, however, were about those of the previous year, the monthly average being 523,300 tons compared with 461,300 tons in 1964. Profitability of the industry has been adversely influenced by trends in labor costs and steel prices. During 1956 to 1965, share of wages and salaries in total costs increased from 13.6 to 19 percent.[8] Since 1960 average receipts per ton of steel had decreased from $135 to $120 per ton. Producers felt that they were handicapped by the German turnover tax and the duty on coal imports, which compelled them to use the more expensive Ruhr coal.

The decline in the share of total pig iron accounted for by Thomas pig iron that had prevailed for some years continued in 1965. Thomas pig iron accounted for 55.2 percent of total pig iron and blast furnace ferroalloys, compared with 57.1 percent in 1964. North Rhine-Westphalia, where the Rhur area is located, produced 68.7 percent of total West German pig iron output, followed by the Saar area with 13.5 percent.

Oxygen and electric furnace steels registered further increases in both tonnage and percentage of total. Flat products, including hoop and strip, maintained their dominant position, accounting for 48.3 percent of total output. Bars and rods other than wire rods were next in importance, with 22.3 percent.

[8] Work cited in footnote 4.

Table 11.—Federal Republic of Germany: Production of finished steel

(Thousand tons)

	1963	1964	1965
Wire rods	2,216	2,767	2,868
Other bars and rods	5,122	5,937	5,658
Angles, shapes, sections (excluding rails)	1,918	2,187	2,288
Universal plates	315	381	407
Other heavy plates and sheets (more than 4.75 millimeters thick)	3,035	3,720	3,688
Medium plates and sheets (3 to 4.75 millimeters)	476	562	531
Fine plates and sheets (less than 3 millimeters)	3,572	4,315	4,334
Hoop and strip	2,437	3,058	3,024
Rails and railway track material	567	516	443
Seamless steel tubes	1,333	1,510	1,596
Total finished steel	20,991	24,953	24,837
Selected semimanufactures:			
Tin plate	537	606	558
Galvanized and ternplate	241	318	447
Steel pipe welded	713	866	836
Wide strip coils for processing elsewhere in Germany or other countries of ECSC	1,436	1,819	
Extrusions and forgings	436	517	552
Steel castings	300	341	

Consumption and Trade.—Apparent consumption of steel in West Germany during the first half of the year was at an annual rate of about 34 million tons, on the basis of ingot steel, or an average of 587 kilograms per person. (In arriving at this figure only ECSC treaty items have been included in the trade.) Delivery of steel products in 1965 totaled 23.6 million tons, presumably including delivery for exports. Of this total, flat products accounted for 10.4 million tons (excluding 505,700 tons of tinplate and 333,300 tons of galvanized and other coated plates), and bars and rods accounted for 5.7 million tons; wire rods were the next most important item with 2.8 million tons.

Both imports and exports increased, but exports increased at a higher rate. Exports of ingots, blooms and billets, and rolled steel including pipes and tubes in 1965 (9.57 million tons) were 14.6 percent higher than in 1964 (8.35 million tons). Imports in 1965 (5.59 million tons) were 2.5 percent higher than in 1964 (4.45 million tons).

Lead and Zinc.—In 1965, West Germany produced 1.8 percent of the world's lead and 2.7 percent of zinc in ore. Seven mines were in operation as in 1964; each producing company had its own beneficiation and smelting facilities. Owing to improvement in prices of lead and zinc, the economic condition of the mines was satisfactory. Domestic smelters also showed an increased interest in purchasing West German ore because of widespread shortage.

During the year the Government announced a plan to bring financial stability to the industry. Under the plan a reserve fund may be accumulated by a producing company from the profits of a given fiscal year by multiplying the difference between the "average production cost" of lead and zinc plus a reasonable profit and the annual average price of the metals in the London Metal Exchange plus the import duty, by weight of the metal content of the concentrates. The mining company can put 50 percent of the computed difference into a reserve fund which remains temporarily tax-free. Sixty percent of this reserve fund must be deposited in a blocked account to be used as compensation for losses should any occur within 5 years. The remaining 40 percent may be used for current operations but must be included in the company's total accountability. The fund can be established only in a year when the company shows a profit.

In 1965, domestic ores constituted 47 percent of lead ore and 79 percent of zinc ore smelted in West Germany. In 1965, mines of the Harz area (Goslar) accounted for 60 percent of the lead ore and 39.5 percent of the zinc ore. The Eiffel area accounted for 23 percent of the lead ore and Sauerland, where the Meggen mine is located, accounted for 47.3 percent of zinc ore.[9]

While production of smelter lead remained practically the same as in 1964, smelter zinc output was 8 percent higher. Increasingly, the lead and zinc smelter requirements have been met by raw materials other than ore. While nearly 70 percent of lead produced in German smelters in 1961 was obtained from ores, the figure decreased to 45.8 percent (21.3 percent domestic and 24.5 percent foreign) in 1965; corresponding figures for zinc were 70 percent and 54.8 percent (44.9 percent domestic and 9.9 percent foreign), respectively. Productivity, measured in kilograms of lead and zinc brought to the surface per man-shift, increased from 50.15 kilograms in 1950 to 202.3 kilograms in 1965—an average annual increase of 9.4 percent for this period.

Consumption of both metals increased in 1965 to 275,000 tons of lead and 325,000 tons of zinc—an increase of 6 percent and 1.4 percent, respectively. The approximate percentage distribution of total lead consumption by use in 1963 was as follows: Cables 31, batteries 29, semi-manufactures 16, alloys 7, paint 12, and miscellaneous 5.[10] For the same year zinc consumption was distributed as follows, in percent: Brass 31, galvanizing 26, semimanufactures 20, die castings 16, and zinc oxide 7.

A significant development in plant construction was completion of an Imperial Smelting Process lead-zinc blast furnace in the works of "Berzelius" Metallhuetten-G.m.b.H. (a subsidiary of Metallgesellschaft A.G. of Frankfurt) in Duisburg. The furnace had been under construction since 1963. With the starting of the plant in October 1965, eight of the muffle furnaces (built in 1905 and in operation since 1907)

[9] Fachvereinigung Metallerzbergbau e.V. Jahresbericht und Statistik 1965, p. 6.

[10] Nachrichtendienst der NE-Metalle (Düsseldorf, Germany). June 1965, p. 1.

were abandoned.[11] The plant is highly automated and has many facilities to reduce air and water pollution.

Annual production capacity of the plant will be about 110,000 tons per year: 50,000 tons of zinc, 25,000 to 30,000 tons of lead bullion (Werkblei) from the new furnace, and 15,000 tons of zinc from the remaining muffle furnaces; the rest of the tonnage consists of tin alloys. The lead bullion will be shipped to the Metallgesellschaft's plant, Blei und Silberhuette Braubach, to be refined to soft lead.

The Meggen pyrite-zinc mine output comprised 670,046 metric tons of mine-run material, which included 561,635 tons of ore; 420,122 tons was treated by flotation, with a recovery of 141,513 tons of zinc-bearing pyrite and 257,235 tons of pyrite low in zinc content. The Bayerland mine was the only other pyrite mine in the country.

NONMETALS

The value of nonmetals produced in 1965, exclusive of building raw materials, totaled about $221 million. Building raw materials (stone, sand and gravel, lime, gypsum, slate, lava, and pumice that were used essentially as building material) were vauled at $694 million. Stone and sand and gravel accounted for 44 and 27 percent of this total, respectively. Cement and clinker added another $499 million to the value of building material. However, some of the cement was produced from slags rather than from quarry products.

In 1965, West Germany was a net exporter of barite, cement, refractory clays, gypsum, lime, pumice, quartz, quartzite, and slate. Among imports of nonmetals, the most important items and their values were phosphate rock $37.3 million, asbestos $24.5 million, pyrite $24.4 million, magnesite (including calcined and sintered) $17.2 million, marble and other stones $16.3 million, sulfur $15.1 million, and crushed rock and sand and gravel $13.1 million. Among minerals with exportable surplus, crude and chemically treated potash, cement, refractory clays, and salts were the most important in value with export values of $65.8 million, $18.9 million, $9.7 million, and $7.4 million, respectively.

Expansion of the building industry slowed down during the year. In current prices, value of all construction was 5.0 percent higher than in 1964, compared with an average yearly increase of 13.3 percent for the previous 4 years.[12] In real terms (1954 prices) the 1965 increase was 2.1 percent compared with 12.1 percent in 1964 and an average yearly increase of 7 percent from 1961 to 1964.

Cement.—In 1965 portland cement constituted 74.5 percent of total cement output (including that of West Berlin), about the same ratio as in 1964. The remainder was classified as iron portland cement (30 to 70 percent slag), blast furnace cement (70 to 85 percent slag), and miscellaneous cement and mortar. In 1964, the country had an annual installed capacity of 34.2 million tons. Despite a persistent labor shortage, capacity was to be increased by 4.5 million tons per year by mid-1966 by adding about 14 new furnaces in existing plants. Plant capacity at yearend 1965 was 37.2 million tons.

In 1965, West Germany exported 1.4 million tons of cement and clinker and imported 460,164 tons so that apparent consumption was 33.2 million tons (550 kilograms per person) of which 55 percent was delivered in bulk to internal and external markets. It was anticipated that bulk deliveries might increase to 58 percent of total deliveries by the end of 1966.

Price of portland bulk cement in 10-ton lots, f.o.b. receiving plant, averaged $16.40 per ton in 1964 and remained substantially the same in 1965. The price index was 99.9 (1958=100), compared with 99.7 in 1964. Sales of ready-mixed concrete accounted for about 12 percent of total sales.

Employment in the industry in 1965 totaled 23,000 and annual production per worker was 1,457 tons, a 3-percent increase from the previous year (1,417 tons).

Potash.—There were about 16 potash works in operation, 11 in Lower Saxony, 4 in Hesse, and 1 in Baden-Württemberg. Thirteen plants process crude potash, and three ship the crude potash to other plants for further processing. In addition four plants produced both salt and potash and one produced salt only. The majority of these plants are located near inland water-

[11] Erzmetall. V. 19, No. 2, February 1966, p. 101.

[12] Deutsches Institut für Wirtschaftsforschung (Berlin). Institut für Konjunkturforschung. Wochen Bericht, Apr. 12, 1966, pp. 71–74.

Table 12.—Federal Republic of Germany: Chemical fertilizer production [1]

(Thousand metric tons)

	1964	1965
Marketable potash, potassium monoxide (K_2O) equivalent	2,201	2,384
Crude salts	47	43
Potash salts, 38 to 42 percent K_2O	467	500
Potassium chloride over 42 percent K_2O	1,447	1,589
Potassium sulfate	176	193
Other potash salts	64	60
Phosphatic (simple) fertilizers, contained phosphorus pentoxide (P_2O_5)	609	639
Superphosphate	68	81
Ground Thomas slag	436	433
Other	105	125
Nitrogenous (simple) fertilizers contained nitrogen:		
From synthetic ammonia	774	841
From coke and gas works	108	109
Calcium cyanamide	97	100
Multiple fertilizers:		
Potassic part, K_2O equivalent	433	458
Phosphatic part, contained P_2O_5	300	324
Nitrogenous part, contained nitrogen	286	311
Other, including mechanically mixed:		
Potassic part, K_2O equivalent	5	4
Phosphatic part, contained P_2O_5	129	147
Nitrogenous part, contained nitrogen	188	219

[1] Includes West Berlin.
Source: Statistisches Bundesamt (Wiesbaden). Industrie und Handwerk (Industry and Trade), Industrielle Produktion (Industrial Production). Reihe 3, 1965, pp. 5, 16.

ways. The country also has two plants for producing potassium sulfate, two for mixed fertilizers, one for magnesium chloride, and four to make bromine.

Breakdown of production in 1965 by States is not available. In 1964, Lower Saxony produced 51 percent of the crude potash and 58 percent of the marketable potash; the bulk of the remainder was produced in Hesse. At the beginning of 1964 about 15,900 persons were employed in the potash industry of Lower Saxony. In 1964, 138 tons of potassium monoxide was produced per man-year (88 tons in 1956). The increase in productivity resulted from mechanization and rationalization in the industry.

Domestic shipment of potassium fertilizers from July 1, 1964, to June 30, 1965, totaled 1,184,020 tons compared with 1,125,277 tons during the previous 12-month period. This was equivalent to 83.8 kilograms per hectare of arable land, compared with 79.4 kilograms per hectare during the previous 12 months.

Sulfur.—Domestic production of contained sulfur in 1965 was estimated at 527,000 tons; 77,000 tons recovered elemental sulfur, 190,000 tons sulfur in pyrite, and 260,000 tons sulfur from other sources, mainly smelter gases from domestic and imported ores. Requirements were about 1.8 million tons; the difference between output and requirements was met by imports, including 1.5 million tons of pyrite and 485,700 tons of elemental sulfur. In spite of increased imports of crude oil, sulfur recovered from this source did not increase significantly because of growing imports of low-sulfur crude from North Africa. Also an increasing number of refineries manufactured small quantities of sulfuric acid directly from hydrogen sulfide for their own use. In 1965, 70 percent of sulfurous material was used for sulfuric acid, the output of which (including West Berlin) increased to 3.1 million tons, compared with 2.9 million tons in 1964.

West Germany remained the principal market for pyrite in West Europe because sulfuric acid production still was based largely on pyrite. Nonetheless, elemental sulfur imports in 1965 showed a 20-percent increase.

MINERAL FUELS

Energy consumption of West Germany (including West Berlin) in 1965 increased 3.0 percent compared with 1964 figures to a new high of 271 million tons of standard coal equivalent (SCE). Petroleum, hydroelectric power, and natural gas accounted for all of the increase. In addition, these sources of energy made further inroads into

markets heretofore occupied by solid fuels, as shown in the following tabulation:[13]

Energy source	Million tons SCE		Percent of total primary energy consumption	
	1964	1965	1964	1965
Coal:				
Anthracite and bituminous	122.1	114.7	46.4	42.4
Lignite and pitch coal	35.1	32.1	13.3	11.8
Gas, natural	2.5	3.5	1.0	1.3
Hydroelectric power	4.9	7.4	1.9	2.7
Petroleum	96.3	111.3	36.6	41.1
Other	2.1	1.9	.8	.7
Total	263.0	270.9	100.0	100.0

The state of the coal industry was a concern to the Federal Government as well as to the State government of North Rhine-Westphalia and to the industry and the unions. The industry in 1965 marketed an estimated 129 million tons of coal[14] (139 million tons in 1964), a figure which may decline to 105 million tons by 1970.

The coal producing companies agreed to reduce the annual production target from the 140-million-ton annual level that has long been maintained to a new level of 125 million tons, which corresponds to expected sales in 1966. An industry spokesman proposed that the Federal and the State Governments and industry establish a liquidation company that would acquire and subsequently close uneconomic mines. Also under consideration were closure premiums based on the tonnage of annual capacity closed, and a subsidy to assure that 50 percent of total output of electricity would be produced from domestic coal.

[13] Die Kohlenwirtschaft der Bundesrepublik im Jahre 1965. August 1966, p. 138.

[14] Total available minus exports and additions to stocks.

Table 13.—Federal Republic of Germany: Coal and lignite industry

(Production, productivity, and employment by district)

		1963	1964	1965
BITUMINOUS AND ANTHRACITE				
Production:[1]				
Ruhr	million tons	117.1	117.5	110.9
Saar	do	14.9	14.7	14.2
Aachen	do	7.8	7.7	7.8
Lower Saxony	do	2.3	2.3	2.2
Total[2]		142.1	142.2	135.1
Output per man-shift:				
Ruhr:				
Underground	kilograms	2,575	2,681	2,766
Total mining	do	2,011	2,097	2,166
Saar:				
Underground	do	2,531	2,616	2,740
Total mining	do	2,050	2,123	2,215
Aachen:				
Underground	do	1,998	1,990	2,139
Total mining	do	1,596	1,598	1,728
Lower Saxony:				
Underground	do	2,059	2,114	2,137
Total mining	do	1,598	1,644	1,676
Federal Republic, total:				
Underground	do	2,521	2,614	2,705
Total mining	do	1,978	2,055	2,130
Employment:				
Ruhr:				
Underground	thousand persons	200.7	192.0	181.0
Mine surface	do	57.2	54.9	51.6
Cleaning	do	24.2	23.1	22.4
Total including other workers and salaried employees	do	344.0	331.3	316.1
Saar:				
Underground	do	26.1	24.5	23.1
Mine surface	do	6.1	5.9	5.7
Cleaning	do	2.2	2.2	2.0
Total including other workers and salaried employees		43.9	41.7	39.6

Table 13.—Federal Republic of Germany: Coal and lignite industry—Continued

(Production, productivity, and employment by district)

	1963	1964	1965
BITUMINOUS AND ANTHRACITE—Continued			
Employment—Continued			
Aachen:			
Underground—thousand persons	16.5	16.1	16.0
Mine surface—do	4.2	4.0	3.8
Cleaning—do	1.0	1.0	1.0
Total including other workers and salaried employees—do	26.1	25.5	25 2
Lower Saxony:			
Underground—do	4.8	4.7	4.5
Mine surface—do	1.4	1.4	1.2
Cleaning—do	.3	.3	3
Total including other workers and salaried employees—do	7.3	7.2	6.9
Federal Republic, total:			
Underground—do	248.1	237.3	224.5
Mine surface—do	68.8	66.1	62.4
Cleaning—do	27.7	26.6	25.7
Total including other workers and salaried employees—do	421.3	405.7	387.7
LIGNITE AND SUBBITUMINOUS			
Production:			
Rhineland—million tons	90.1	94.6	86.5
Helmstedt, Hesse, and Bavaria—do	16.5	16.3	15.4
Total	106.6	110.9	101.9
Employment:			
Rhineland:			
Open pit—thousand persons	10.3	10.3	10.1
All other—do	13.0	12.8	12.3
Total—do	23.3	23.1	22.4
Helmstedt, Hesse, and Bavaria—do	11.5	11.2	11.0
Total—do	34.8	34.3	33.4
PITCH COAL			
Production—million tons	1.8	1.9	1.7
Employment—thousand persons	6.1	6.0	5.6

[1] Excludes small mines and leases.
[2] Details do not add because of rounding.

Coal.—For the first time since 1952, German coal production fell below 140 million tons; 1965 output was 5 percent less than that of 1964. Even with this decline (partly a result of 4 nonproduction days during the year), stocks of coal at mines at yearend 1965 stood at 14.6 million tons, compared with 8.6 million tons at the end of 1964. Of the total output 86.1 percent was medium- to high-volatile coking coals (Flammkohle and Fettkohle), 5.3 percent was bituminous to semianthracite (Esskohle and Magerkohle), and 8.6 percent was semianthracite to anthracite.

Despite a decline in production, the manpower cost of the industry (excluding premium and separation money for miners and allowances for miners to travel home) was $813.9 million ($784.6 million in 1964). Wages (including house allowance benefits) were increased 10 percent, effective January 1, 1965. Average daily wages for underground workers, surface workers, and all workers combined were $10.19, $7.82, and $9.49, respectively. Corresponding 1964 figures were $9.20, $6.94, and $8.53, respectively. In 1964, provisional production cost per ton of net output, exclusive of opencast working, was $14.85, distributed as follows: Manpower $8.37, materials $5.07, overhead $0.66, and depreciation $0.75. In 1965, manpower cost was 61.9 percent of the $2.13 billion total gross value of production from mines and auxiliary facilities.

Shipments, Consumption, and Trade.—During 1965, 145 million tons of coal was available, about 7 million tons less than in 1964, and this was almost entirely a result

Table 14.—West Germany: Solid fuel availability and disposal

(Thousand tons)

Commodity	1963	1964	1965
Coal:			
Production	142,116	142,201	135,077
From stocks	2,223	----	----
Imports	8,803	8,484	8,614
Other adjustments	1,206	1,436	1,452
Total availability	154,348	152,121	145,143
Disposal:			
Delivery to mine-owned coke ovens	47,009	49,749	50,385
Delivery to steel-industry-owned coke ovens	8,857	7,918	7,169
Delivery to briquetting plants	6,357	5,361	4,451
Consumption by mine:			
Powerplants	10,376	10,508	9,691
Other	4,557	4,194	4,291
Miscellaneous	4	3	3
Delivery to miners	2,046	1,781	1,674
To stocks	----	4,923	[1] 6,710
Exports except to East Germany	16,293	13,657	13,281
Exports to East Germany	726	830	306
Domestic sales:			
Railroads and other transport	6,991	5,852	4,471
Powerplants (public utility)	18,614	18,177	16,704
Gasworks	8,037	7,060	5,714
Iron and steel	1,768	1,534	1,283
Other industries	15,857	14,965	13,865
Household and small consumers	5,621	3,575	3,248
Military	1,498	1,891	1,901
Statistical adjustments	−263	+143	−4
Total reported domestic sales	58,123	53,197	47,182
Coke:			
Production	41,895	43,350	43,294
From stocks	3,417	768	----
Imports	580	370	535
Total availability	45,892	44,488	43,829
Disposal:			
Mine consumption [2]	2,301	1,643	1,446
To stocks	----	----	1,707
Exports [3]	12,173	10,824	9,769
Domestic sales:			
Iron and steel industry	18,245	20,930	20,037
Other industries	3,743	3,744	3,512
Household and small consumers	8,253	6,567	6,640
Military	929	656	524
Transportation, powerplants, and gasworks	248	196	196
Total reported domestic sales	31,418	32,093	30,909
Lignite:			
Production	106,659	110,945	101,906
Disposal:			
To briquet plants	33,004	31,831	26,379
To semicoke and other plants	3,625	3,466	2,829
Mine consumption	10,420	9,922	8,148
Consumption by mines for production of saleable electric power	1,512	1,648	1,654
To stocks	80	28	19
Exports	195	202	145
Domestic sales:			
Powerplants	49,899	56,291	55,515
Industry	7,530	7,241	6,860
Other	392	309	355
Total reported domestic sales	57,821	63,841	62,730

[1] Includes 938,000 tons to emergency stocks.
[2] Includes small quantities used in coke and briquet plants as follows, in thousand tons: 1963, 196; 1964, 73; 1965, 36.
[3] Includes exports to East Germany as follows, in thousand tons: 1963, 129; 1964, 113; 1965, 36.

of reduced domestic production. Shipments to a majority of the consuming sectors declined, particularly to powerplants, gasworks, and railroads. The public utility market remained subject to competition from fuel oil.

As a result of rationalization, the number of operating mines decreased to 107, compared with 115 in 1964 and 173 in 1957. Of the 1965 total, 90 mines were in the Ruhr, 9 in the Saar, 6 in Aachen and 2 in Lower Saxony.

The share of coal produced by fully mechanized mines was 79.5 percent compared with 74.4 percent in 1964 and 39.5 percent in 1960. Output per man-shift increased about 4 percent in 1965.

Production of coal by mine size in 1964 and 1965 was distributed as follows:

Mine size (tons per day)	Percent of total	
	1964	1965
10,000 and more	10.1	4.4
9,000–9,999	3.6	13.2
8,000–8,999	8.0	6.5
7,000–7,999	9.8	7.3
6,000–6,999	11.9	14.1
5,000–5,999	22.4	21.8
3,000–4,999	24.7	23.4
2,999 or less	9.5	9.3

Of the mines in operation 74 had a daily production capacity of 3,000 to 7,000 tons per day. At the end of the year there were 1,350 working faces, each producing about 500 tons of coal daily; average daily advance was 163 centimeters. Six mines were closed during the year with total normal annual production capacity of about 4 million tons.

Of the 1965 coal output, 88.4 million tons was shipped for conversion to secondary forms, including 57.6 million tons to coke, 4.4 million tons to coal briquets, and 26.4 million tons to electricity. Coal-producing companies themselves converted 68.87 million tons of the total (51 percent of total output) as follows, in million tons: Coke plants 50.38, briquets 4.45, and steam and electricity 14.04, of which 5.95 was delivered to other consumers.

Consumption declined in various degrees in all coal consumer groups because of structural changes connected with the continuing competition from fuel oil and because of the high output of hydroelectric power. Consumption by principal sectors was as follows, in thousand tons:

Sector	1963	1964	1965
Transportation	6,783	6,059	4,783
Public utility:			
Powerplants	17,473	18,038	17,422
Gasworks	7,438	6,649	5,641
Waterworks	140	126	108
Total	25,051	24,811	23,171
Coal industry:			
Mines' own consumption	4,576	4,209	4,303
Mine powerplants	10,376	10,508	9,691
Mine coking and briquetting plants	11,502	12,213	12,384
Other	6	4	1
Total	26,460	26,934	26,379
Iron and steel coke ovens [1]	2,176	1,952	1,778
Iron and steel industry	1,709	1,439	1,426
Other industry	16,616	15,549	14,721
Household and small industrial consumers [2]	12,113	8,812	7,574
Delivered to miners [3]	2,351	2,080	1,980
Military services	1,507	1,897	1,907
Total	94,766	89,535	83,719

[1] The difference between the weight of (1) coal input into coke ovens and briquetting plants and (2) coke and briquets produced.
[2] Shipments.
[3] As part of fringe benefits.

For water transportation, coal has become an insignificant source of energy, displaced by petroleum products. Gasworks consumption of coal has declined at an increasing rate both because natural gas has replaced manufactured gas in the energy marketplace and because of increasing use of natural gas, petroleum refinery gas, and liquefied petroleum gas in the gasworks. At yearend 1964, there were only 61 gasworks operating exclusively on coal compared with 132 at the end of 1961. In contrast, 92 gasworks were

using liquid or gaseous hydrocarbons exclusively at yearend 1964, compared with only 40 at the end of 1961. In the same period, 53 gasworks stopped producing gas and joined 337 others that were linked to gas networks at yearend 1961.

Coal consumption by the iron and steel industry was influenced by the reduction in that industry's output as well as by a decrease in blast furnace consumption of coke per ton of iron produced. Fuel oil not only covered increases in consumption of industries other than iron and steel but also displaced some coal from this market. Comparatively mild weather at the beginning of 1965 and competition of light fuel oils adversely influenced delivery to households and small industry. Coal consumption by colliery powerplants, which showed a continuous increase between 1958 and 1964 for a total of 53 percent, declined in 1965 because of an increase in hydropower output. Colliery powerplants produced 25.2 billion kilowatt-hours, or 14.6 percent of all electricity produced; corresponding 1964 figures were 26.4 billion kilowatt-hours, or 16.1 percent. Of the electricity produced, 16.8 billion kilowatt-hours were sold to other consumers (18 billion kilowatt hours in 1964). The central heating plants located at collieries were a new but small factor in consumption.

Exports of coal including coal briquets in 1965 totaled almost 13.6 million tons but were 3.9 percent below the 1964 level. Of the 1965 total, 88.7 percent went to other EEC countries. Principal recipients were France with 5,486,900 tons, Belgium-Luxembourg with 3,187,600 tons, Netherlands with 2,844,800 tons, and Italy with 519,000 tons. West Germany also exported 9,728,500 tons of coke, including 7,026,600 tons to EEC countries such as France (3,293,600 tons) and Belgium-Luxembourg (3,283,700). Other significant destinations were Sweden (682,700 tons), Denmark (410,900 tons), and Austria (403,700 tons). Imports of coal, including coal briquets (7,471,600 tons), were about the same as in 1964. The United States accounted for 5,032,600 tons of the imports, EEC countries for 1,288,200 tons, the United Kingdom for 534,800 tons, and Poland for 408,200 tons. Coke imports, 534,700 tons,[15] almost doubled from the previous year, with 481,000 tons from other EEC countries.

Marketing and Prices.—The High Authority of the European Coal and Steel Community (ECSC) by two decisions of December 15, 1965, prolonged the existence of the Ruhr coal sales agencies, Geitling and Präsident, until March 31, 1968.

Coal prices were increased 25 cents to $1.50 per ton depending on grade and quality (an average of 4 percent). For high-volatile bituminous coal, price per ton was $18.37 in 1965 ($17.62 to $17.87 in 1964).

Coke.—Coke production remained about the same as in 1964, the slight increase in output by coal-mining companies being compensated by a decline in coke produced in steel mills, in thousand tons:

Coke production	1961	1962	1963	1964	1965
Coal-mining companies	37,044	36,054	35,213	37,394	37,903
Steel mills	7,490	7,144	6,682	5,956	5,391
Total	44,534	43,198	41,895	43,350	43,294

Total coke shipments were 9.5 percent less than in 1964, the decline resulting mainly from decreases in both export sales (1,055,000 tons) and domestic iron and steel industry sales (893,000 tons).

Lignite (Braunkohle).—Reduction in lignite briquet production accounted for a large part of the nearly 9-million-ton decrease in lignite output. Powerplants remained the principal market for the lignite, which was not briquetted or otherwise converted, however, sales for this market decreased about 1.1 million tons.

Coal Byproducts and Coke Oven Gas.—There were no significant changes in the production of coke oven gas and other byproducts in the coke ovens of the coal mines.

Total manufactured gas production in 1965 is not available; the 1964 output totaled 42,451 million cubic meters distributed as follows, in million cubic meters: Coal gas 22,607, generator and water gas

[15] Excludes coke from nonbituminous coal.

Table 15.—Federal Republic of Germany: Production of coal byproducts in coke ovens of coal mines

(Thousand metric tons unless otherwise specified)

	1963	1964	1965
Crude tar	1,703	1,752	1,723
Crude benzol	512	526	518
Ammonia (nitrogen content)	100	104	103
Gas:[1]			
Total production—million cubic meters	21,052	21,222	21,041
Purchase—do	2,071	2,764	3,350
Total available—do	23,123	23,986	24,391
Gas use:			
Combustion	8,367	8,612	8,652
Plants' own consumption	968	1,218	1,350
Sales	13,528	13,907	14,134
Loss	260	249	255

[1] All gas converted to 4,300 kilocalories per cubic meter at 760 millimeters of mercury and 0° C.

Source: Verlag Glueckauf GmbH. (Essen), Zahlen zur Kohlenwirtschaft. February 1966, p. 43.

4,309, blast furnace gas 14,840, and other 695.[16] The total was equivalent to 63 percent of the 58,182 million cubic meters of all gas produced in the country in 1964; the remainder comprised natural gas, liquefied petroleum gas, and refinery gas.

Disposal of all gases totaled 58,495[17] million cubic meters, of which 75 percent went to end users, 20 percent went to the gas-producing installations themselves, and 5 percent was accounted for by losses. Corresponding figures for natural and refinery gases were 14,349, 1,129, and 566[18] million cubic meters, respectively. Of the 43,751 million cubic meters, iron and steel industry used 44.2 percent chemical industry 18.7, other industry 19.6, households 9.3, and other consumers 8.2.

Petroleum.—The turnover of the West German petroleum industry, including natural gas producers, totaled $3,265 million, 3.4 percent of the turnover of all industry. Preliminary figures show that the Government revenue from excise tax on petroleum products, amounting to $1.86 billion, was 22.4 percent more than in 1964. It represented 12.8 percent of the Government revenue. Included in this revenue is $153 million obtained from fuel oil tax. Taxes on motor vehicles supplied the States with $655 million revenue. The monthly average employment by the industry was 11,303, including exploration (geology and geophysics), drilling, production, administration, and transport, but not including refining.

Exploration and Drilling.—In 1965, 32 teams were engaged in geophysical work—30 seismic, 1 aeromagnetic, and 1 geoelectric—and 327 team-months were spent with a total expenditure of about $12 million. During the year, 125 wells were completed on land with a total depth of 309,325 meters, compared with 150 wells and 390,797 meters in 1964.[19] In 1965, exploration wells accounted for 117,384 meters, development wells for 93,926 meters, production wells for 96,840 meters, and auxiliary wells for 1,175 meters. Of the 125 wells, 31 were exploration wells of which 4 struck oil, 33 were development wells, and 61 were production wells. Twenty development and 57 production wells were successful, making a total of 81 successful wells. Two natural gas deposits, Dötlingen and Groothusen, were discovered between Weser and Ems, and gas was struck in a well (Fehndorf) west of Ems. A new oil deposit was discovered at Fronhofen in Bavaria, where the Lias has been determined to be oil bearing betwen 1,872 and 1,876 meters.

Drilling in the offshore area of West Germany in the North Sea was carried out

[16] Plesser, N., and R. Pohl. Die Entwicklung der Gaswirtschaft im der Bundesrepublik Deutschland im Jahre 1964 (The Development of the Gas Economy in the Federal Republic of Germany in the Year 1964). Das Gas und Wasserfach, 1965, 20 pp.

[17] The total of consumption, 58,495 million cubic meters, is 313 million cubic meters in excess of production of 58,182, this difference comprises refinery and liquefied petroleum gas input in gas-cracking installations.

[18] The total, 16,044 million cubic meters, is 313 million cubic meters above production. See footnote 17 above.

[19] Erdöl und Kohle. February 1966, pp. 88–90.

by a consortium of 11 firms.[20] Most wells were north and west of Borkum Island and did not result in significant discoveries. The principal wells in 1965 were the following:

Designation	Location	Results
A 1	21 kilometers north of Borkum.	Drilled to 4,000 meters without finding economic gas.
B 2	53 kilometers north of Juist and 60 kilometers west of Heligoland.	Some gas with 60 percent nitrogen. Drilling stopped at 4,600 meters.
C 1	83 kilometers northwest of Borkum.	Uneconomic gas at a depth of more than 4,000 meters.
D 1	35 kilometers northnorthwest of Borkum.	Undetermined quantity of combustible gas.
E 1	43 kilometers north of Borkum.	Completed December 1965.
M 1	15 kilometers northwest of Borkum.	Drilling at yearend 1965.
N 1	110 kilometers northwest of Borkum.	Drilling probably not started at yearend.

Deutsche Erdöl A.G., Deutsche Schachtbau- und Tiefbohrgesellschaft m.b.H., Saarbergwerke A.G., and Wintershall A.G. formed a consortium to drill a deep test well (6,000 meters) at Spieser Höhe near Neunkirchen in the Saar.

The first oil exploration concession for the Continental Shelf of the Baltic Sea was granted by the Federal Mine Inspectorate, Oberbergamt Clausthal-Zellerfeld, to three companies which already held concessions extending to the 3-mile limit off the coast of Schleswig-Holsten. The companies were Deutsche Erdöl A.G., Wintershall A.G., and Gewerkschaft Brigitta (a wholly owned subsidiary of Esso and Shell).

West German firms also participated in oil exploration in North Africa (Algeria, Libya, Morocco, and Ethiopia), the Near East (Iran and Dubai), West Europe (Italy, Spain, and Switzerland) and Canada and Peru; 51,337 meters were drilled abroad.

Reserves and Production.—At the end of 1965 reserve-production ratio stood at 13.5:1, with petroleum reserves totaling 106.4 million tons, compared with 111.1 million tons at the beginning of the year. The 106.4-million-ton total reserve consisted of 81.3 million tons proven and 25.1 million tons probable and was distributed by area as follows in thousand tons: North of Elbe 11,695; between Elbe and Weser 21,523; between Weser and Ems 26,329; west of Ems 41,405; Upper Rhine valley 2,441; and Alpine Foreland 3,000.[21]

Crude production at 7,883,893 tons was 211,275 tons more than in 1964. Rate of increase in production fell further to 3 percent. Nearly four-fifths of the production was from the Elbe to west of Ems.[22]

[20] Amoco Hanseatic Petroleum Co., Amphitrite Erdöl G.m.b.H., C. Deilmann Bergbau G.m.b.H., Deutsche Erdöl-A.G., Deutsche Schachtbau-und Tiefbohrgesellschaft m.b.H., Gelsenkirchener Bergwerks-A.G., Gewerkschaft Elwerath, Gewerkschaft Brigitta, Preussag A.G., Wintershall A.G., and Mobil Oil A.G.

[21] Jahresberichte der Geschäftsführung des Wirtschaftsverbandes Erdölgewinnung e.V. (Hannover, Germany). June 1966, p. 10.

[22] Erdöl und Kohler. January 1966, p. 65.

Table 16.—Federal Republic of Germany: Petroleum and natural gas production by areas, 1963–65

Area	1963	1964	1965
PETROLEUM (tons unless otherwise specified)			
North German basin:			
North of Elbe (Schleswig-Holstein)	800,024	835,575	853,217
Between Elbe and Weser (Hannover)	2,378,738	2,291,221	2,412,178
Between Weser and Ems	1,709,720	1,920,782	1,955,611
West of Ems (Emsland)	1,982,505	2,074,758	2,088,949
Upper Rhine Valley	250,246	243,307	233,992
Alpine Foreland (Bavaria)	261,467	306,975	339,946
Total	7,382,700	7,672,618	7,883,893
Rate of increase, percent	9	4	3
NATURAL GAS (thousand cubic meters unless otherwise specified)			
Between Elbe and Weser (Hannover)	33,622	49,062	49,548
Between Weser and Ems	338,558	690,860	1,172,056
West of Ems (Emsland)	262,132	411,820	664,057
Upper Rhine Valley	65,684	65,077	62,252
Alpine Foreland (Bavaria)	214,998	239,996	272,814
Total	914,994	1,456,815	2,220,727
Total million cubic feet [1]	32,482	51,717	78,836

[1] Converted at the rate of 1 cubic meter = 35.5 cubic feet.

The number of fields exploited declined to 76 (103 in 1963); Ruehlermoor in Emsland remained the largest producing field with a total of 802,776 tons. The distribution of crude oil production by principal producing companies from 1963 to 1965, in percent, was as follows:

Company	1963	1964	1965
Gewerkschaft Elwerath	23.0	23.3	23.9
Deutsche Erdöl A.G.	20.5	19.9	20.1
Wintershall A.G.	15.3	14.5	13.4
Mobil Oil A.G. in Deutschland	10.7	11.0	10.8
Preussag A.G.	10.8	10.5	10.3
Deutsche Schachtbau-und Tiefbohrgesellschaft	6.3	7.0	7.5
Gewerkschaft Brigitta	5.4	5.4	5.0

Crude production by West German firms outside of West Germany amounted to 1.33 million tons, mainly from Libya, where Gelsenberg Benzin A.G., shares a concession with Mobil Oil A.G.

Consumption and Trade.—Total petroleum product requirements, including refinery consumption, bunkers, other deliveries, and exports totaled 83.1 million tons, an increase of 13.0 percent over 1964 requirements. This figure is expected to increase to 90 million tons by 1966. While total requirements (including bunkers) increased by about the same percentage as in 1964, fuel oils increased by 18 percent.

Refining.—Refinery output was equivalent to about 79 percent of requirements, thus necessitating about 15 million tons of products imports. Total crude throughput was 14.3 percent more than the previous year; of this 11.3 percent was indigenous petroleum (13.1 percent in 1964). With the exceptions of kerosine and petroleum coke, output of all products increased. Heating oils (light, medium, and heavy) constituted 57 percent of total output in 1965 (55 percent in 1964).

At yearend 1964 annual refinery throughput capacity totaled 72 million tons, 16 million tons more than at yearend 1963. The corresponding figure for yearend 1965 was about 81 million tons and this was expected to increase to 85 million tons per year by the end of 1966.

Thirteen plants with annual throughput capacity of 3 million tons or more each accounted for 68.8 percent of 1964 capacity. Percentage distribution of total 1964 throughput capacity by company was Esso

Table 17.—Federal Republic of Germany: Shipments of petroleum products
(Metric tons)

Commodity	1963	1964	1965
Domestic sale:			
Gasoline, all kinds	9,272,770	10,840,051	12,103,432
Kerosine including turbofuel	363,070	536,928	653,187
Diesel oil	6,480,700	6,973,100	7,314,800
Fuel oils	30,218,900	34,956,900	41,435,200
Liquefied petroleum gas	1,031,125	1,322,886	1,406,890
Lube oil and greases	699,457	804,965	836,345
Petroleum coke	229,067	266,094	348,778
Bitumen	2,756,614	3,236,129	3,528,104
Other products	665,111	906,362	1,520,595
Total	51,716,814	59,843,415	69,147,331
Consumed by refineries:			
Fuel oil	1,757,267	2,362,649	2,892,429
Refinery gas, petroleum coke, residues	1,126,148	1,314,259	1,554,562
Petroleum coke	212,090	218,763	213,876
Total	3,095,505	3,895,671	4,660,867
Bunker deliveries:			
Gas and diesel oil	552,423	611,245	660,777
Fuel oil	2,120,498	2,599,884	2,839,865
Lubricants	32,818	35,230	36,700
Total	2,705,739	3,246,359	3,537,342
Exports	5,268,382	5,900,003	5,144,761
Other shipments	1,006,975	1,035,671	1,039,621
Changes in refinery stock [1]	+632,548	+288,703	−201,045
Balancing factor [1 2]	−11,923	−629,473	−186,232
Total products available	64,414,040	73,580,349	83,142,645

[1] Plus denotes add; minus denotes subtract.
[2] Apparently changes in nonrefinery stocks.

Source: Bundesamt für gewerbliche Wirtschaft (Aussenstelle Hamburg). Mineralölstatistik der Bundesrepublik Deutschland 1965, (Petroleum Statistics of the Federal Republic of Germany 1965). Feb. 22, 1966, 9 pp.

A.G. 20.2; Deutsche Shell A.G. 13.2, Gelsenberg 7.2, and BP Benzin-und Petroleum, A.G. (BP) 9.3. The Rhine-Ruhr area had 45 percent of the capacity, followed by Bavaria with 14 percent, Hamburg and Lower Saxony-Bremen each with roughly 12 percent, southwest Germany with 11.3 percent, and Schleswig-Holstein with about 5 percent.[23] Since yearend 1963 Bavaria's share of total capacity had increased by 5 percent and that of Rhine-Ruhr had increased by 0.4 percent; other areas mentioned above showed declines varying from about 0.5 percent to 1.5 percent.

During the year two new refineries came on stream, the Speyer refinery in the Saar and the refinery of Ente Nazionale Idrocarburi (ENI) in Ingolstadt. The Speyer refinery, completed in January 1965, and owned by Union Générale des Pétroles, was operated by its West German affiliate, Union Treibstoff G.m.b.H. A significant feature of this plant is that it produces 900

[23] Erdöl und Kohle. June 1965, p. 500.

Table 18.—Federal Republic of Germany: Nominal capacity of petroleum refineries on January 1, 1965

Company and refinery location	*Throughput capacity (thousand tons per year)*
BP Benzin-und Petroleum, A.G.:	
Hamburg	2,300
Dinslaken	4,400
Caltex Oil (Germany) G.m.b.H: Raunheim (near Frankfurt)	2,000
Deutsche Erdöl A.G. (DEA): Heide	3,000
DEA-Scholven G.m.b.H: Karlsruhe	2,200
Deutsche Shell A.G.:	
Hamburg-Harburg	3,000
Monheim	280
Godorf	4,000
Ingoldstadt	2,300
Erdoelwerk Frisia A.G.: Emden	1,500
Erdoel Raffinerie Ingolstadt A.G. (ENI)	2,400
Erdoel Raffinerie Mannheim G.m.b.H: Mannheim	2,500
Erdoel Raffinerie Neustadt G.m.b.H: Neustadt/Danube	2,500
Esso A.G.:	
Hamburg	3,300
Cologne	3,900
Karlsruhe	4,000
Ingolstadt	3,400
Gelsenberg-Benzin A.G.: Gelsenkirchen-Horst	7,000
Gewerkschaft Deutsche Erdoel Raffinerie:	
Deurag-Neurag, Misburg	2,300
Emsland, Lingen	3,350
Gwerkschaft-Julius Schindler: Schindler	220
Kleinholz and Company: Essen	550
Mineraloel und Asphaltwerke A.G.: Ostermoor	500
Mobil Oil A.G.: Bremen	1,500
Purfina Mineraloelraffinerien:	
Duisburg	2,000
Muelheim	500
Ruhrchemie A.G.: Oberhausen-Holten	550
Scholven-Chemie A.G.: Gelsenkirchen-Buer	4,000
Union Rheinische Braunkohle-Kraftstoff A.G. (Rhine Brown Coal): Wesseling	3,000
Wintershall A.G.: Salzbergen	220
Total	72,670

million cubic meters of town gas annually from the light distillates, black oils constituting the other principal product. Two processes are used—the Imperial Chemical Industries' catalytic cracking in stream of gasoline to produce lean gas and the British Gas Council's method for making rich gas by hydrogenation of a fraction of the distillates. The two gases are blended and enriched by the addition of liquefied petroleum gas to make a normal town gas of 4,650 kilocalories per cubic meter.

Crude oil is obtained from the South European Pipeline System. A 24-inch-diameter line is led off at Worms to storage tanks at Jockgrim. A 16-inch-diameter, 35-kilometer line from Jockgrim conveys the oil to the refinery.[24] The refinery will use principally Algerian crude.

The ENI refinery, although completed in late 1964, did not come on stream until March 1965 because of delay in the completion of the Central European Pipeline from Genoa. Under an agreement with Esso, the latter supplied ENI's refinery with Libyan crude, some of which is also conveyed to Esso's own refinery by the South European Pipeline. Until completion in December of a 20-inch-diameter and 5-kilometer-long pipeline connecting the ENI refinery to the Rhine-Danube pipeline, the crude was truck-transported to ENI's refinery. The refinery can process Middle East as well as Algerian crude. Capacities of the various units are as follows in tons per year: Unifining-platforming unit 450,000; hydrodesulfurizer for gas oils 300,000; Merox sweetening plant for straight-run gasoline and liquefied petroleum gas 170,000; liquefied petroleum gas fractionation 110,000; sulfur recovery 450,000.

Additional capacity was also created by expansion of the Deutsche Shell refineries at Hamburg and Ingolstadt, at the Esso refinery at Ingolstadt, and at the BP refineries at Hamburg and Dinslaken. At the end of December 1965, the BP Hamburg refinery started operation of a 2.2-million-ton-per-year combination atmospheric and vacuum distillation. Two older distillation units will be operated at lower throughput so that actual capacity increase of the refinery will be 1.4 million to 3.7 million tons per year.[25]

Two refineries were under construction, one at Berghausen in southeast Bavaria with a 2-million-ton annual capacity and one at Vohburg, east of Ingolstadt, with a 4.4-million-ton annual capacity. The first one is being built by Marathon Chemische Werke, a subsidiary of Deutsche Marathon Petroleum A.G. and the second by BP Benzin-und Petroleum, A.G. Three other refineries are planned.

In addition to new refineries under construction and planned, the DEA-Schloven refinery in Karlsruhe is slated for expansion to 5.5-million-ton capacity by 1966. New units will include a crude distillation column with an annual throughput capacity of 3.35 million tons.

Transportation and Distribution.—Crude oil from overseas destined for West German refineries was received at the following ports: Wilhelmshaven-Emden (31.92 percent), Marseilles (30.17 percent), Rotterdam (18.43 percent), Hamburg-Brunsbuettelkoog (17.94 percent), and Bremen (1.54 percent). About 77 percent of the crude oil imported in 1965 was delivered to refineries by pipelines (73 percent in 1964). The remainder was either off-loaded directly from ocean carrier to refinery or delivered by barge or tank cars.

Crude oil deliveries to West German refineries by long distance pipelines for 1963–65 were as follows:

Pipeline	Million metric tons		
	1963	1964	1965
Northwest (Wilhelmshaven-Cologne)	15.5	15.7	17.6
Rotterdam-Rhine	7.9	9.6	10.2
South European	4.8	[1] 12.8	18.2
Total	28.2	38.1	46.0

[1] Of this, 5.4 million tons was transported through the Rhine-Danube line to Ingolstadt.

Capacity of the Northwest line is to be increased to 22 million tons per year by additional pumping capacity. Work on the Trans-Alpine Pipeline (TAL) from Trieste to Ingolstadt continued during the year. This line, which was to be completed in 1967, will have an initial annual capacity of 25 million tons.

The Rhine-Main pipeline, the first West German long-distance pipeline for finished petroleum products, was being built by Shell between its refinery at Godorf, near Cologne, and Frankfurt and Ludwigshaven. BP acquired a 35-percent interest in this line. Under this arrangement a 110-kilo-

[24] Erdöl und Kohle, May 1965, p. 365.
World Petroleum, July 1965, p. 31–33.
[25] Erdöl und Kohle. January 1966, p. 65.

meter spur will be laid from the BP refinery at Dinslaken to Godorf to supply naphtha to the Bayer-BP petrochemical plant at Dormagen. When completed, the Rhine-Main pipeline will carry about 4 million tons of products—3 million tons for Shell and 1 million tons for BP.

At the end of 1965, West Germany's tanker fleet consisted of 43 units of more than 6,000 dead weight tons, with a total of 1,395,928 dead weight tons. It ranked 10th among the world's national fleets.[26] This fleet is capable of handling perhaps one-fourth of the country's petroleum transportation requirements.

Natural Gas.[27]—*Reserves.*—Official estimates put natural gas reserves as of January 1, 1965, at 192,700 million cubic meters of which 139,100 million cubic meters were proven.[28] Industry sources give the natural gas reserves as 250,000 million cubic meters. The area betwen Weser and Ems accounted for 93,900 million cubic meters, followed by the West German part of the river Ems area with 70,000 million cubic meters.

Official reserves increased by 42.1 percent from the 135.6-billion-cubic-meter figure reported as of January 1, 1964, as a result of discovery of new fields and finding new gas-bearing horizons in known fields. The gasfield north of the city of Wasserberg in Bavaria was discovered by Mobil Oil A.G. during the year; this has turned out to be a locally significant field with reserves of at least 5 billion cubic meters. A consortium of Wintershall (90 percent) and Mobil Oil A.G. (10 percent) found Upper Carboniferous natural gas in drill hole Emlichheim T_1 at a depth of 3,208 to 3,212 meters at Fehndorf west of Ems. At Dötlingen, between Weser and Ems, gas was found in middle Bundsandstein. Gewerkschaft Brigitta found gas in Rotliegender, the same gas-bearing formation as at Groningen, in well Groothusen Z3 about 13 kilometers northwest of Emden.[29]

Production.—Production of nonassociated gas from gas wells and associated gas from oil wells from 1961 to 1965 was as follows, in millions of cubic meters:

	1961	1962	1963	1964	1965
Nonassociated	481	616	915	1,457	2,221
Associated	225	310	380	510	557
Total	[1] 707	[1] 927	1,295	1,967	2,778

[1] Totals do not add because of rounding.

While associated gas output almost doubled during the 5-year period, nonassociated gas increased almost five times—an increase of 52.4 percent over 1964 output. The area between the Weser and the Ems Rivers, with a 52.7 percent of total output of nonassociated gas, was the largest producing area of nonassociated gas and showed the largest increase in production—52.8 percent above 1964 production. The Barrien field, now connected with the Rehden field by a 50-kilometer pipeline, began production. The area west of the Ems contributed 29.9 percent to total output. Increase in production of these fields resulted mainly from the construction of a second gas pipeline to Dorsten. The Dollart-Ems fields should be important producers, supplying gas through the 205-kilometer Brigitta pipeline to Hamburg. In Bavaria, a substantial increase in production was expected from the Bierwang field (east of Munich), which was to start supplying Munich late in 1966.

Principal producing companies and their share of output of nonassociated gas were:

Company	Percent		
	1963	1964	1965
Wintershall A.G.	35.8	38.1	38.5
Gewerkschaft Elwerath	20.1	19.2	17.8
Mobil Oil A.G. in Deutschland	5.1	8.4	10.2
Gewerkschaft Brigitta	8.5	5.6	7.9

Bayerische Mineral-Industrie (Mobil Oil), Gewerkschaft Elwerath, Mobile Oil A.G. in Deutschland, and Deutsche Erdöl A.G. were the largest associated gas producers with 1965 output of 115,742,000, 115,345,000, 71,199,000, and 57,946,000 cubic meters, respectively.

Production of natural gas from gasfields and associated gas, refinery gas, liquefied

[26] Data supplied by Esso Tankschiff Reederei G.m.b.H.
[27] For details on consumption, see section on Coal Byproducts and Coke Oven Gas.
[28] Petroleum Press Service. June 1965, p. 223.
[29] Erdöl und Kohle. June 1965, p. 499.

petroleum gas, and gas from oil and light benzene totaled 15,731 million cubic meters[30] in 1964 (including West Berlin). In addition 313 million cubic meters of refinery and liquid petroleum gas were added during cracking. These gases constituted 27 percent of total gas production, compared with 11.9 percent in 1960. Of the 16,044 million cubic meters in 1964, 4,200 million cubic meters was natural gas (including associated), 6,260 million cubic meters was refinery gas, 4,513 million cubic meters was liquefied petroleum gas, 632 million cubic meters was gas from liquid hydrocarbons, and 439 million cubic meters was refined cracked gas. Similar details are not yet available for 1965.

Trade.—In 1965, 37,012,980 cubic meters of natural gas was imported from the Netherlands[31] (4,153,396 cubic meters in 1964). Existing contracts between Nederlandse Aardolie Maatschappij Export (NAM-Export) and natural gas marketing organizations in West Germany should increase imports to about 12 billion cubic meters of Netherlands gas. Thyssensche Gas-und Wasserwerke G.m.b.H. (Thyssengas, now 50 percent owned by Esso) and Ruhrgas have an agreement with NAM-Export calling for Thyssengas A.G. to receive 4 billion and Ruhrgas A.G. 2 to 3 billion cubic meters annually. Another agreement betwen the Netherland organization and Gas-Union G.m.b.H. (GU) of Frankfurt and Gasversoergung Süd-Deutschland G.m.b.H. (GSV) of Stuttgart is planning gas deliveries for use in Hesse and Baden-Wuerttemberg within 3 years, the quantity delivered to 5 to 6 billion cubic meters annually by 1975.

Transmission.—Permission has been granted to build pipelines to transport the Netherland gas. The Government of North Rhine-Westphalia has given permission to Thyssengas to build a 36-inch pipeline from the Netherland border at Zevenaar with branches to Cologne, Düsseldorf, Wuppertal, and Düren. The pipeline will be utilized by Thyssengas and Ruhrgas on a 50-50 basis. The same authority approved application of the Deutsche Gesellschaft für Gas-Transport G.m.b.H. to build a trunkline from the Rehden and Bentheim fields to Limburg ander Lahn with a tie-in to Netherland gas. Another company, the Süddeutsche Gas-Transport G.m.b.H., will extend this pipeline from Limburg to Mannheim and Ulm to serve the markets of GU and GSV. These companies will have two-thirds participation in the pipeline company, and Esso and Shell will have each one-sixth. The pipeline, with annual capacity of 8 million cubic meters, will have branches going to Switzerland and Austria.

In October, GSV and Gasverband Mittelland A.G. of Basel reached agreement on delivery of gas from Germany to Switzerland, starting in 1967. Cost of the initial phase of this project was to be about $100 million and the entire line was to cost $250 million.[32] Investment for public gas supply in 1964 totaled $155 million of which $110 million was for gas transport.

A significant company development was that on January 1, 1966, Gewerkschaft Brigitta of Hanover was to acquire a 25-percent interest in Ruhrgas A.G., the largest gas-distributing company in West Germany, which is owned by 32 Ruhr coal companies. The share capital will be increased from $25 million to $37.5 million. Another 25 percent of the shares of Ruhrgas A.G. is offered to Erdgas-Verkauf-Gesellschaft of Munster. The latter is owned by six suppliers of natural gas, which together control about one-third of the West German gas deposits. The six suppliers are Mobil Oil A.G., Gewerkschaft Elwerath (which in turn is partly owned by Esso and Shell), C. Deilmann Bergbau G.m.b.H., Preussag, Wintershall A.G., and Deutsche Schachtbau-und Tiefbohrgesellschaft m.b.H.

[30] Adjusted to calorific content of 4,300 kilocalories per normal cubic meter.
[31] Bundesamt für gewerbliche Wirtschaft (Aussenstelle Hamburg). Mineralölstatistik der Bundesrepublik Deutschland 1965 (Petroleum Statistics of the Federal Republic of Germany 1965). Feb. 22, 1966, 9 pp.
[32] Erdöl und Kohle. February 1965, p. 157.

The Mineral Industry of Greece

By Stephen C. Brown [1] and L. Nahai [2]

The Greek economy made further gains in 1965, gross national product at constant prices rising by 7.3 percent, but at the cost of a sharp increase in the country's balance of payments deficit. Most of the major sectors of the mineral industry participated in the general economic growth, but declines were recorded in the output of several important commodities. The index of mine output, heavily weighted by coal, rose by 13 percent. Progress was made with the establishment of an aluminum industry, the construction of the steelworks in the Thessaloniki area, and the reactivation of the nickel project at Larymna. Plans were made for the expansion of fertilizer and cement output. Minerals and mineral products continued to play an important role in foreign trade. Mineral imports accounted for nearly one-fifth by value of total imports, and mineral exports accounted for slightly less than one-tenth by value of all exports.

The Hellenic Industrial Development Bank (ETVA), the Government's development institution, is one of the principal implementing agencies of the Government's 4-year mining development program; other chief implementing agencies are the Directorate General of Mines of the Ministry of Industry and the Institute of Geology and Subsurface Research (IGSR). Progress in fulfilling the Government's 4-year mineral development program was reported to be slow in 1965; both ETVA and the Directorate General engaged in research, in arranging feasibility studies, and the Directorate General also engaged in exploration for oil. IGSR conducted studies of peat deposits at Philippi.

ETVA established a wholly owned subsidiary under the name "General Mineral Prospecting and Mining Company" to engage in mineral research, the development of mining properties, and the sale of processed and unprocessed minerals. The company has a capital of Dr 5 million ($167,000).[3] The 1966 program of the new ETVA subsidiary includes mineral prospecting at 40 sites, reactivation of lead and zinc mines at Kirki, trial operation of an antimony mine at Lahana, development of kaolin and bentonite deposits on Milos Island, development of clay deposits at Laurium, and investigation of asbestos deposits at Kozani.

Other aspects of government policy affecting minerals include a decree raising by 10 percent (retroactively to January 1, 1965) minimum wages paid to miners, the introduction into Parliament of a draft law requiring mining companies to hire graduate mining and metallurgical engineers for their operations, and the conclusion of an agreement between the Government and the official French Bureau de Recherches Geologiques et Minierès for carrying out a hydrogeological survey of Crete over a period of 2 years. Meanwhile, the Center for Planning and Economic Research (KEPE), at the initiative of the Government, completed a draft Five Year Plan for Economic Development and submitted it to the Minister of Coordination. Not made public until early 1966, it calls for a total investment in mining of $167 million over the 5 years 1966–70 as compared with only $39 million in the preceding 5 years. Of this total, $87 million would be for lignite, $63 million for other minerals, and $17 million for research.

---

[1] International economist, Division of International Activities.

[2] Chief specialist, West Europe Area, Division of International Activities.

[3] Where necessary, values have been converted from drachmas (Dr) to U.S. dollars at the rate of Dr30 equals US$1.

PRODUCTION

Output of lignite, Greece's only type of coal, rose sharply by 26 percent. Bauxite output, limited by the export restrictions required by the Government's agreement with Aluminium de Grèce, declined slightly to about 1.1 million tons. Production of zinc concentrate declined, as did output of lead concentrate, but production of smelter lead nearly doubled. Output of manganese concentrate more than doubled.

Production of nonmetallic minerals as a group rose by 15 percent, with cement leading the way with a 20-percent rise. Magnesite output rose sharply, as did production of kaolin. Fertilizer and pyrites production showed more modest increases. Output of petroleum products from Greece's only refinery was practically unchanged. Production of pig iron and steel showed a significant rise.

Table 1.—Greece: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963 [p]	1964 [p]	1965 [p]
Metals:					
Bauxite—thousand tons	1,120	[r] 1,287	1,281	1,300	1,100
Chromite:					
Crude products [2]	77,854	56,247	57,000	60,000	51,000
Iron and steel:					
Iron ore (46–52 percent Fe) thousand tons	292	212	36	60	300
Pig iron—do	NA	NA	NA	164	225
Steel ingots and castings—do	[e] 140	[e] 155	209	[r] 210	210
Rolled products—do	NA	NA	150	215	250
Lead:					
Concentrate:					
Gross weight	17,791	19,691	19,700	20,000	13,000
Metal content [e]	11,600	12,800	13,200	14,400	9,000
Metal smelter:					
Primary	2,277	4,345	3,500	NA	5,200
Other	687	NA	1,000	NA	4,600
Total	2,964	NA	4,500	5,000	9,800
Manganese concentrate (40–45 percent MnO_2)	28,300	13,696	14,868	30,000	70,000
Silver—thousand troy ounces	113	138	158	[e] 157	145
Zinc concentrate:					
Gross weight	33,744	33,040	31,000	30,000	20,000
Metal content [e]	17,547	17,181	18,200	[r] 12,823	13,000
Nonmetals:					
Barite—thousand tons	75	71	85	68	120
Bentonite—do	25	21	40	40	50
Cement—do	1,837	1,923	2,294	2,672	3,230
Emery	7,200	7,600	7,500	7,600	7,800
Fertilizers, phosphatic (P_2O_5 content) thousand tons	49	48	58	65	67
Gypsum	89,686	94,284	95,000	[e r] 80,000	100,000
Kaolin	25,200	34,958	35,000	30,000	55,000
Magnesite, crude—thousand tons	148	273	250	200	350
Marble—thousand cubic meters	25	44	40	40	45
Perlite—thousand tons	17	30	30	28	30
Pumice—do	70	80	80	80	200
Pyrites—do	188	144	[r] 138	140	150
Salt—do	119	115	[r] 83	100	90
Santorin earth (pozzolan)—do	190	188	200	200	400
Talc	1,854	2,415	2,500	2,800	3,500
Mineral fuels:					
Coal (lignite)—thousand tons	2,504	2,695	[r] 3,516	[r] 3,402	4,800
Fuel briquets (from lignite)—do	66	81	141	[r] 160	175
Gas coke—do	23	22	21	[r] 16	[e] 15
Manufactured gas—million cubic meters	14	13	14	12	12
Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	1,976	1,953	2,178	2,254	2,160
Kerosine and jet fuel—do	1,416	1,423	1,294	1,377	1,289
Distillate fuel oil—do	3,783	4,048	4,503	4,364	4,440
Residual fuel oil—do	5,219	5,092	4,755	4,837	4,692
Other—do	227	468	601	698	813

[p] Preliminary. [e] Estimate. [r] Revised. NA Not available.

[1] In addition to commodities listed, Greece produced a variety of simple construction materials.

[2] Includes refractory and metallurgical ores.

TRADE

Both imports and exports of mineral commodities by Greece in 1965 increased appreciably over those of 1964, as shown in the following tabulation, which also shows the role of these commodities in total trade:

	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	20.6	290.1	7.1
1964	23.2	308.6	7.5
1965	32.2	327.8	9.8
Imports:			
1963	169.2	804.3	21.0
1964	168.0	885.1	19.0
1965	223.9	1,133.7	19.7
Trade balance:			
1963	−148.6	−514.2	XX
1964	−144.8	−576.5	XX
1965	−191.7	−805.9	XX

XX Not applicable.
[1] Value of commodities listed in tables 2 and 3.

Of total listed mineral exports in 1965, 47 percent by value were shipped to the European Economic Community (EEC) and 13 percent by value were destined for other countries of West Europe. Mineral exports to the United States were valued at $2.4 million and those to the U.S.S.R. were about the same. Bauxite valued at $6.7 million, and magnesite valued at $6.4 million were the principal mineral export commodities; other significant mineral exports were iron and steel, ores and concentrates of lead, zinc and manganese, cement and chromite. Iron and steel exports, valued at nearly $3 million were over 11 times those of 1964 on a value basis.

By value, 51 percent of Greece's mineral imports come from West Europe, including 44 percent from the EEC countries. Individual significant source countries of mineral imports, and the value of their contribution in millions of dollars were: West Germany—30; Italy—22; Belgium-Luxembourg—21; France—21; the U.S.S.R.—20; Saudi Arabia—19; and Iran—17. Imports from the United States were valued at $6.3 million.

Petroleum and petroleum products (valued at $84.4 million) and iron and steel (valued at $63.6 million) continued to be the chief mineral commodity imports, accounting for two-thirds of the 1965 total. Manufactured fertilizers (at $21.6 million) and nonferrous metals (at $17.4 million) were next in order of importance. Approximately $7 million of the value of nonferrous metal imports was for aluminum. Coal, coke, and briquets ($10.9 million) were also significant import items.

Imports of all these items, except manufactured fertilizers, showed significant increases in value as compared with 1964, imports of petroleum and petroleum products rose 56 percent, iron and steel rose 15.5 percent, nonferrous metals rose 21 percent, and coal, coke, and briquets rose 46 percent. Fertilizer imports were practically unchanged in value.

Table 2.—Greece: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum:				
Bauxite—thousand tons	1,118	1,063	1,150	U.S.S.R. 436; West Germany 357; France 107; United Kingdom 46; United States 29; Norway 22.
Semimanufactures	942	1,010	433	Italy 413; South Viet-Nam 253; Turkey 106.
Chromite	15,327	22,508	29,517	France 15,100; West Germany 6,808.
Copper:				
Matte	-------	77	64	All to Belgium-Luxembourg.
Scrap	-------	-------	49	
Semimanufactures, including alloys.	64	427	1,337	South Viet-Nam 234; Italy 96.
Iron and steel:				
Iron ore	50,893	-------	4,480	All to Rumania.
Roasted pyrite	43,171	-------	25,036	West Germany 24,536.
Slag, scale, etc. from manufacture of iron and steel.	2,200	2,530	-------	All to West Germany.
Ingots and other primary forms.	-------	-------	17,793	
Semimanufactures:				
Bars, rods, and sections	-------	-------	15,928	
Universal plates and sheets.	364	93	146	NA.
Tubes, pipes, and fittings.	1,985	950	1,394	Cyprus 779; Libya 71.
Lead:				
Ore and concentrate	9,581	6,909	10,438	West Germany 3,859; France 2,000; Italy 1,050.
Magnesium, unwrought	-------	-------	32	
Manganese ore	12,451	13,390	21,602	West Germany 4,640; Netherlands 3,025; United States 2,240; France 2,132.
Nickel:				
Unwrought, including alloys	605	-------	57	
Semimanufactures, including anodes.	-------	-------	5	
Tungsten:				
Ore and concentrate	19,067	22,407	23,982	West Germany 11,321; France 8,344; Poland 2,016.
Other nonferrous ores and concentrates.	-------	14	25	NA.
Other nonferrous waste and scrap	1,647	1,764	1,515	Belgium-Luxembourg 884; Spain 737.
Other slag and ash, including kelp	89	1,058	-------	All to Israel.
Nonmetals:				
Abrasives:				
Emery, corundum, and other natural abrasives.	49,345	127,761	206,748	United States 76,664; West Germany 45,240; Italy 1,044; France 700; Spain 562.
Grinding stones	154	99	159	NA.
Barite, including witherite	77,740	66,911	50,615	United States 22,147; Libya 20,039; Nigeria 3,760.
Cement	49,693	55,161	154,354	Libya 42,764; Cyprus 9,503; Aden 1,897.
Clay and refractory construction materials:				
Clay	63,636	108,318	125,974	France 56,242; Libya 25,290; Nigeria 6,700; United Kingdom 5,685.
Brick, tile, and refractory materials.	636	-------	1,601	
Fertilizer, phosphatic (manufactured).	-------	-------	1,030	
Magnesite	112,060	116,496	135,663	Netherlands 30,819; West Germany 29,224; Italy 18,314; United Kingdom 16,008; United States 14,444.
Pyrite	43,995	57,485	7,860	Italy 40,225; Austria 13,110; France 4,150.
Stone and gravel:				
Building stone:				
Unworked	21,047	28,693	22,558	West Germany 10,863; Italy 8,726.
Worked	168	437	208	NA.
Gravel and crushed stone	-------	-------	1,842	
Sulfur	4,461	6,149	14,607	Yugoslavia 2,975; Cyprus 1,288; Ceylon 799.
Sulfuric acid, including oleum	205	206	130	Sudan 120.
Other inorganic acids	361	486	597	Syria 378.
Other nonmetallics	21,233	35,570	47,748	United Kingdom 11,783; Italy 7,347; West Germany 6,385.

See footnote at end of table.

Table 2.—Greece: Exports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Mineral fuels:				
Petroleum refinery products:				
Distillate fuel oil	3,446	4,002	627	Sweden 800; United Kingdom 537; Yugoslavia 504; Netherlands 423.
Residual fuel oils	16,211	16,649	2,288	Tunisia 6,897; United States 3,183; Liberia 2,317; Lebanon 958; West Germany 821.
Lubricating oils, greases	628	1,529	1,163	Israel 1,152; Lebanon 310.
Liquefied petroleum gases	5,735	1,192	-------	Cyprus 845.
Petroleum coke	1,060	-------	-------	
Other	35	38	207	NA.

NA Not available.

Table 3.—Greece: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum:				
Oxide and hydroxide	1,152	1,306	1,349	France 1,000; West Germany 277.
Ingots, including alloys	5,730	8,557	8,582	Canada 2,484; Norway 940; Austria 437.
Semimanufactures	1,116	1,313	2,476	West Germany 489; Italy 261; France 187.
Chromium oxide	112	129	155	West Germany 118.
Copper:				
Scrap	414	33	---	NA.
Blister, unrefined	1,097	1,609	2,158	Congo (Léopoldville) 621; Federation of Rhodesia and Nyasaland 504.
Refined	5,653	4,546	4,213	Congo (Léopoldville) 1,782; Federation of Rhodesia and Nyasaland 2,458.
Master alloys	12	---	---	
Semimanufactures, including alloys.	661	597	731	West Germany 203; Belgium-Luxembourg 102; Italy 60.
Iron and steel:				
Iron ore	141,575	271,705	463,434	Tunisia 173,595; India 72,449; Liberia 25,659.
Scrap	544	1,118	1,174	United Kingdom 949.
Spiegeleisen	192	61	150	France 60.
Pig iron	29,132	15,371	26,668	West Germany 13,611; Bulgaria 1,427; United Kingdom 323.
Powder, shot, grit	315	514	478	United Kingdom 347; Italy 61.
Ferromanganese	228	335	280	Republic of South Africa 284.
Other ferroalloys	621	853	1,168	France 467; Republic of South Africa 292.
Ingots and other primary forms	70,452	42,812	71,844	West Germany 25,581; France 9,648; Belgium-Luxembourg 3,078.
Semimanufactures:				
Bars, rods, and sections	143,075	158,107	149,163	West Germany 50,512; Belgium-Luxembourg 44,891; France 30,261.
Universal plates and sheets	84,319	119,621	127,789	United Kingdom 29,965; West Germany 29,765; Belgium-Luxembourg 28,018.
Hoop and strip	51,151	57,011	57,778	West Germany 21,640; Belgium-Luxembourg 19,991; Italy 7,808.
Rails and accessories	5,516	3,313	6,562	Belgium-Luxembourg 1,471; Netherlands 874.
Wire	5,218	6,095	6,681	West Germany 1,654; Austria 1,369; Belgium-Luxembourg 708.
Tubes, pipes, and fittings	10,039	16,574	20,514	West Germany 4,270; Japan 3,416; U.S.S.R. 2,510.
Castings and forgings	637	1,214	1,062	West Germany 477; United Kingdom 245; Japan 136.
Iron oxide and hydroxide	546	660	700	West Germany 590.
Lead:				
Ore	4,271	3,949	6,932	Algeria 3,433; Morocco 516.
Oxide	480	506	482	France 287; Wset Germany 169.
Pig, including alloys	504	292	983	United Kingdom 113; Denmark 56.
Semimanufactures	188	92	350	European Economic Community [1] 67.
Magnesium	5	21	---	West Germany 21.
Manganese ore	1,643	7,758	68	India 7,706.
Mercury ---- 76-pound flasks	116	---	58	
Molybdenum ---- value, thousands	$13	$43	$55	Netherlands $30.
Nickel, semimanufactures	41	57	65	United Kingdom 34; West Germany 21.
Silver, all forms ---- troy ounces	66,005	188,596	185,285	West Germany 115,871; United Kingdom 56,425.

See footnotes at end of table.

Table 3.—Greece: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Tin:				
Ingot	246	270	244	Netherlands 128; Malaysia 92.
Semimanufactures	6	7	4	West Germany 7.
Titanium oxide	1,361	1,605	1,778	West Germany 606; United Kingdom 430.
Tungsten:				
Ore	---	183	---	Australia 172.
Metals, all forms	---	3	---	West Germany 3.
Zinc:				
Scrap	102	---	---	
Ingots including alloys	4,985	5,627	5,582	Belgium-Luxembourg 2,135; Federation of Rhodesia and Nyasaland 1,204; West Germany 1,025.
Semimanufactures	360	205	219	Poland 139; Belgium-Luxembourg 36.
Oxide	514	402	368	France 172; Sweden 90; West Germany 84.
Other:				
Nonferrous ores and concentrates, n.e.s.	218	145	327	Australia 130.
Pyrophoric alloys	---	2	13	NA.
Alkali and rare earth metals	5	5	5	France 3.
Metalloids	7	---	16	
Base metals, n.e.s	102	31	217	Japan 9; United Kingdom 5.
Nonmetals:				
Abrasives:				
Diatomite	152	901	460	Yugoslavia 689.
Other	15	27	19	NA.
Grinding stones, etc	213	181	287	Austria 37; Italy 35.
Asbestos	2,815	4,958	4,468	Republic of South Africa 1,724; U.S.S.R. 929.
Asbestos cement products	4,438	2,452	3,415	Czechoslovakia 695; Italy 683; Yugoslavia 536; France 512.
Borates	311	315	338	All from United States.
Cement	1,831	1,231	1,492	Denmark 829; France 324.
Clay	5,151	7,855	11,085	United Kingdom 3,778; Czechoslovakia 1,640; West Germany 1,264.
Clay and refractory construction material.	17,027	28,349	30,025	West Germany 6,680; United Kingdom 5,850; Italy 5,284; France 4,858.
Dolomite	---	---	253	
Earth pigments	174	---	171	
Feldspar, fluorspar, etc	---	---	446	
Fertilizer materials:				
Natural:				
Natural sodium nitrate	6,074	5,605	4,161	West Germany 3,304; Chile 1,998.
Phosphatic	204,066	25,817	157,650	Morocco 15,593; Tunisia 10,224.
Potassic salts	1,570	---	---	
Manufactured:				
Nitrogenous	370,306	276,961	194,838	Italy 103,202; West Germany 47,838; France 36,724; Belgium-Luxembourg 22,508.
Phosphatic, including basic slag.	81,617	83,686	60,435	Portugal 25,583; Belgium-Luxembourg 20,330; Italy 20,121; Tunisia 16,354.
Potassic	22,551	19,542	36,965	East Germany 7,974; France 3,872; West Germany 2,982.
Mixed	82,460	74,827	83,942	Belgium-Luxembourg 42,072; Italy 27,707.
Ammonia, anhydrous	11,779	1,960	5,862	Italy 1,384; West Germany 320.
Graphite	261	285	369	West Germany 114.
Gypsum and plasters	266	245	375	All from European Economic Community [1].
Magnesite	254	415	504	Austria 226.
Mica	23	28	22	NA.

See footnotes at end of table.

Table 3.—Greece: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Mica, worked	8	6	8	NA.
Quartz, quartzite	---	---	417	
Stone, sand and gravel, n.e.s.:				
Building stone	53	11	796	Italy 10.
Sand	17,588	24,170	26,523	Belgium-Luxembourg 20,104; Netherlands 3,845.
Gravel and crushed stone	---	121	317	NA.
Sodium and potassium compounds:				
Caustic soda	10,434	11,384	13,328	Italy 6,755; France 4,259.
Caustic potash	100	35	69	NA.
Sulfur and sulfuric acid:				
Sulfur, high purity	306	21,615	10,718	Canada 11,361; France 10,197.
Sulfur, elemental, other	20,483	24,835	37,343	France 24,746.
Sulfuric acid	23,953	4,459	61,487	Italy 4,400.
Talc	---	412	69	Italy 287.
Other:				
Crude nonmetals, n.e.s	260	---	175	
Inorganic bases and oxides	22	91	50	France 64.
Hydrogen and rare gases	41	57	148	France 28; Norway 17.
Mineral building products, n.e.s	4,796	2,892	3,808	Italy 707; Yugoslavia 536; France 533; Czechoslovakia 521.
Mineral fuels:				
Carbon black	747	603	885	Italy 369; United States 118; Rumania 30; Switzerland 28.
Coal and briquets	176,134	132,562	199,673	United States 38,318; Poland 35,667; U.S.S.R. 34,243.
Coke	110,626	169,747	230,161	West Germany 126,810; Spain 16,377; Italy 13,104.
Gas, natural	---	---	3,592	
Petroleum:				
Crude	2,163,166	1,705,709	2,589,745	Saudi Arabia 866,886; U.S.S.R. 545,469; Iran 293,354.
Refinery products:				
Gasoline	16,435	15,446	115,861	Netherlands Antilles 5,719; United Kingdom 3,958; United States 3,932.
White spirit and kerosine	1,974	3,276	6,556	Netherlands Antilles 1,650; Italy 667; France 327.
Distillate fuels	305,609	264,150	637,226	U.S.S.R. 128,083; Italy 38,243; Rumania 68,017.
Residual fuel oils	1,102,511	975,985	1,373,478	U.S.S.R. 388,351; Kuwait 161,031; Rumania 72,543.
Lubricating oils, greases	27,491	32,844	38,763	United States 13,495; Netherlands 7,557; Belgium-Luxembourg 4,398; United Kingdom 3,178; Italy 3,054.
Mineral jelly, wax	847	835	809	West Germany 502; Czechoslovakia 92.
Nonlubricating oils	662	594	787	Belgium-Luxembourg 172; Netherlands 106; West Germany 88.
Pitch from mineral tars	275	207	324	NA.
Pitch coke	---	---	344	
Petroleum coke	411	572	5,839	Rumania 454.
Other	7,804	16,927	7,257	Albania 6,889; United Arab Republic (Egypt) 4,040; Israel 3,156; Rumania 1,198; United Kingdom 362; Netherlands 138.
Total	1,464,019	1,310,836	2,187,244	U.S.S.R. 516,441; Kuwait 165,088; Italy 56,026; Turkey 30,145.
Tar, mineral, and other crude chemicals from coal, petroleum, and natural gas distillation.	2,068	1,567	1,335	U.S.S.R. 895; United Kingdom 283.

NA Not available.

[1] Belgium, Federal Republic of Germany, France, Italy, Luxembourg, and the Netherlands.

COMMODITY REVIEW

METALS

Aluminum.—Construction of the primary aluminum plant of Aluminion Ellados, otherwise known as Aluminium de Grèce, or Aluminum Company of Greece, was completed in September 1965, but lack of power supply and disagreement over the power rates to be charged prevented the plant from commencing operations during 1965. Negotiations with the Government on revision of the company agreement continued during the second half of the year, and it was expected that production would begin early in 1966. Meanwhile Reynolds Aluminum Co., the U.S. firm holding a 17-percent interest in the company, indicated its intention to withdraw. A new corporation under the name of Greek Aluminum Industry Viohalco-Aluminium S.A. was established by the Greek firm Viohalco, ETVA, and Belgian banking interests to produce drawn and extruded aluminum semimanufactures, steel-reinforced conductors, and aluminum foil. The controlling interest in the firm is held by Viohalco.

Copper.—The Canadian firm, Placer Development Corporation, completed drilling of copper deposits near Skounes, Chalkidiki, and undertook metallurgical tests to determine whether a flotation plant should be established at the mine site. The Skouries project had been abandoned by the Japanese firm, Nippon Mining Company, Ltd., because of difficulties over foreign exchange.

Iron and Steel.—Production of pig iron by Halyvourgiki, S.A., rose 37 percent, crude steel rose 25 percent, and semifinished steel rose 16 percent. The firm announced export orders for $4 million worth of billets and reinforcing bars. Construction of the Esso-Pappas steel mill at Thessaloniki began, and the cold-rolling mill for flat products was expected to go into operation in the second half of 1966. Republic Steel (United States) agreed to participate by furnishing capital and technical assistance, and by training workers. It was reported that the nickel plant at Larco Co., S.A., would include capacity for production of 80,000 tons of steel, per year. At yearend the Government introduced a bill into Parliament to raise import duties on a number of steel products, intended to give protection to the new Esso-Pappas steel plant. A report on the Greek steel industry, requested by the Government, was completed by the British firm, L. M. Manderstam and Partners.

Nickel.—The nickel plant of Larco Co., S.A., was completed in 1965 and was expected to commence operation in early 1966. In addition to an annual output of 4,000 tons of nickel, it is to produce 80,000 tons of steel per year.

NONMETALS

Cement.—Greece had an annual production capacity of 3.7 million tons of cement at the end of 1965. During the year about 500,000 tons of capacity was added. This was accomplished by the addition of one rotary kiln in an existing plant. Apparent consumption was estimated at 3 million tons, or about 360 kilograms per capita. Prices declined slightly during the year. The industry employed about 3,000 persons.

Production of cement rose to a new high in 1965, and plans were made for significant increases in capacity. Titan cement obtained a loan of $1.5 million from the European Investment Bank for expansion of its facilities at Eleusis and signed an agreement with American Cement (United States) to establish a $10 million plant at Patras. Chalkis Cement Company increased its annual capacity to 600,000 tons with startup of a new rotary kiln in May, while Halyps Cement Company obtained Government approval for expansion through the addition of a 500-ton-per-day rotary kiln. The Greek firm, General Cement Company, S.A., planned a $5.5 million expansion and modernization program, to raise its capacity to 2.2 million tons per year, and a group of Greek investors applied for permission to establish a 200,000-ton-per-year plant on Crete.

Fertilizers.—Production of chemical fertilizers also rose to a new high, and a number of new plants came into operation while others were planned. The Ptolemais nitrogenous fertilizer plant of ETVA resumed operations at the end of 1964, and the Nea Carvali sulfophosphate fertilizer plant of the Phosphate Fertilizer Industry, S.A. was inaugurated in May, with completion of the latter installation expected by

yearend. Construction of the $16 million ammonium sulfophosphate and mixed superphosphate plant of Chemical Industries of northern Greece proceeded satisfactorily, and trial runs began at the Thessaloniki plant about the end of the year. Construction of the 100,000-ton Esso-Pappas ammonia plant in Thessaloniki was on schedule, and the plant was expected to go into operation in the first half of 1966. Towards the end of the year the Pappas and Nevros interests agreed on a project for construction of a $35 million compound fertilizer plant at Lamia, supplementing the Esso-Pappas complex at Thessaloniki. With completion envisaged for 1969, it is to have an annual capacity of 500,000 tons of compound fertilizers and include a daily capacity of 900 tons of sulfuric acid, 500 tons of sulfonitrates, and 500 tons of nitric acid. Plans were also made to expand the Chemical Industries of northern Greece plant at Thessaloniki, and the Hellenic Chemical Products and Fertilizer Co. plant at Drapetsona.

The rise of the fertilizer industry in Greece has apparently resulted in a sharp decline of pyrite exports, which dropped from about 57,500 tons in 1964 to less than 8,000 tons in 1965, despite a rise in production. The phosphate rock for manufacture of phosphatic fertilizers is imported mainly from Africa. Imports in 1965 increased nearly sixfold over those of 1964, yet failed to reach the 1963 quantity.

MINERAL FUELS

Lignite and Peat.—Production of lignite rose sharply in 1965. A study prepared by the British firm, Manderstam and Partners indicated that by 1975 Greek thermal powerplants would probably consume about 16 million tons of lignite annually, more than three times the 1965 output; all of this would be expected to come from domestic mines.

However, the report of the IGSR on the large peat deposits near Philippi, said to contain some 2.5 billion tons reserve, suggested that peat might provide an alternative fuel for the thermal plants. Preliminary findings indicated that in spite of high moisture content, the peat has a higher calorific value than the lignite. The final report of the IGSR was turned over to the Public Power Corporation to evaluate the feasibility of using peat as a fuel.

Petroleum.—Output of the Government-owned Aspropyrgos refinery declined only marginally (by 1 percent) from 1964 levels. The 2.5-million-ton-per-year Esso-Pappas refinery was completed and began test runs in November; regular operation was to begin early in 1966. Mobil Oil Company, Inc., The Royal Dutch Shell Group, and The British Petroleum Company Limited submitted to the Government a joint proposal for modernization and expansion of the Aspropyrgos refinery at a cost of $5 million and for the establishment of a third refinery, to cost $45 million. The Aspropyrgos refinery has been operated under lease from the Government by Mobil Oil Company, Inc., and its Greek affiliate, Hydrocarbon. This lease terminates in August 1967.

Exploration for petroleum continued in 1965 without success, the French firm Société Anonyme de Forages (Safor), drilling on the island of Rhodes, and the Italian firm, Società Nazionale Metanodotti (Snam), in the Filiates district of western Epirus, both for the benefit of the Greek Government. Snam abandoned drilling at a depth of 3,827 meters because of damage to its drill rig and the lack of favorable indications; Safor drilled two dry holes on Rhodes.

Esso-Pappas was granted a concession covering a 490-square-kilometer area extending into the sea near Thessaloniki, and an exploration and development agreement was reported to be under negotiation with the Government.

The Mineral Industry of Hungary

By Roman V. Sondermayer [1]

Hungary was a modest producer of a limited number of mineral commodities during 1965, and only bauxite and alumina were of world significance. Hungarian bauxite production was about 4.5 percent of the world total. Output of other more important products—aluminum, cement, coal, pig iron, managanese ore, and steel ingots—ranged betwen 0.5 and 1.8 percent of world totals.

Overall mineral commodity consumption was much larger than the production, requiring substantial imports. Mineral imports, chiefly nonfuel raw materials, high-rank coals, and crude petroleum, remained vital to the country's industry. Exports of bauxite, alumina, and semimanufactured products were significant sources of foreign exchange. Most of the Hungarian trade was with Communist countries, and the U.S.S.R. was the largest trading partner.

The mineral industry provided about 6 percent of the Hungarian social product,[2] the same as in 1964. Roughly one-eighth of the total labor force, or approximately 160,000, persons were employed by the mineral industry in 1965.

During 1965 major devlopments in the metals branch of the Hungarian mineral industry included discovery of a bauxite deposit in the eastern part of Hungary, commissioning of a new bauxite mine with an annual capacity of 200,000 tons at Kosloed Oereghegy, completion of the first stage of Almafuzito Alumina plant expansion, and completion of the cold-rolling mill at Dunajvaros.

The field of mineral fuel production was also active during 1965. Expansion of coal beneficiation in Pecsuj and preparation for exploratory oil drilling to depths exceeding 5,000 meters were the most important events.

Completion of the new lime kiln at Helyoesaba was the only significant event in the nonmetallic mineral industry.

PRODUCTION

Although the technology of overall mineral production in Hungary still cannot be considered advanced, several new developments, mostly small ones, can be regarded as modern and up to date. Underground methods prevailed in production of minerals. Because of inadequate mechanization and lack of incentive in the ranks of workers, productivity remained low in comparison with that in Western Europe.

In oil production, pumping prevailed. Hungarians were using production stimulation methods, fracturing and acidizing, on a wide basis, but secondary recovery operations remained minimal. The Soviet-designed turbodrill was used on about 70 percent of operating oil and gas drilling rigs.

Many plants and facilities of the country's mining and metallurgical industry were designed by Soviet experts and equipped with Soviet equipment. Results were less than expected, and a tendency toward purchasing equipment in the West was noted.

---

[1] Foreign mineral specialist, Division of International Activities.

[2] As in other Communist countries of East Europe, Hungary does not report on its gross national product (value of all final goods and services produced) but rather publishes a figure for the social product, which generally excludes items such as banking fees, rent, education, defense, public administration, and health services.

Table 1.—Hungary: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965 [p]
Metals:					
Aluminum:					
Bauxite—thousand tons	1,366	1,473	1,362	r 1,477	1,478
Alumina	224,445	r 232,972	r 239,002	r 245,917	267,000
Metal:					
Ingots	51,062	52,732	55,496	56,874	58,099
Semimanufactures, unalloyed	r 15,349	r 15,474	r 16,663	r 17,615	e 18,000
Semimanufactures, alloyed	4,343	4,423	r 5,114	r 5,050	e 5,100
Iron and steel:					
Iron ore—thousand tons	605	682	733	775	762
Pig iron:					
For steel—do	1,165	1,266	1,285	1,404	NA
For foundry—do	140	112	101	89	NA
For spiegeleisen—do	1	4	2	1	NA
Total—do	1,306	1,382	1,388	1,494	1,582
Ferroalloys—do	13	19	12	6	e 7
Steel ingots—do	2,053	2,333	2,374	2,365	2,520
Rolled products:					
Bars, rods, shapes, sections—do	817	856	801	822	NA
Concrete reinforcement bars—do	87	84	94	109	NA
Plates and sheets:					
Thick—do	182	226	220	215	NA
Medium—do	176	220	254	250	NA
Black and thin—do	67	87	119	161	NA
Pickled—do	13	17	16	17	NA
Galvanized—do	8	7	6	7	NA
Tin plate—do	3	3	3	3	NA
Dynamo sheets—do	8	8	8	8	NA
Transformer sheets—do	3	3	3	3	NA
Cold-rolled bright sheets—do	5	4	5	4	NA
Total—do	465	575	634	668	NA
Rails and fish plates—do	80	95	97	52	NA
Total—do	1,449	1,610	r 1,626	r 1,651	1,718
Manganese ore	124,838	129,226	152,371	171,196	e 176,000
Nonmetals:					
Bentonite	74,783	84,108	112,697	98,384	e 99,000
Cement—thousand tons	1,601	1,733	r 1,798	2,257	2,383
Dolomite	455,076	430,769	431,801	482,114	e 500,000
Fertilizer materials:					
Nitrogenous:					
Gross weight	330,083	353,110	r 386,950	r 448,762	724,119
Nitrogen content	67,657	72,329	79,301	91,958	-----
Phosphatic:					
Gross weight	331,188	429,068	r 516,510	r 543,545	615,431
Phosphorous pentoxide (P_2O_5) content	55,871	73,845	88,368	99,931	-----
Kaolin	42,363	40,818	44,234	50,338	e 55,000
Lime, calcined	612,818	621,166	r 633,223	r 735,629	709,104
Quartzite	30,430	37,787	35,937	42,360	e 45,000
Refractories:					
Magnesite products	64,853	63,034	56,648	64,278	e 65,000
Shamotte products	168,660	178,941	185,680	181,470	e 183,000
Silica products	10,555	10,988	11,308	12,702	e 13,000
Sulfur, elemental	3,460	3,633	2,985	3,099	e 3,200
Mineral fuels:					
Coal:					
Bituminous—thousand tons	3,070	3,340	3,709	4,125	4,362
Brown—do	20,388	20,649	21,934	22,363	22,190
Lignite—do	4,717	4,662	r 4,836	5,060	4,885
Total—do	28,175	28,651	30,479	31,548	31,437
Briquets—do	1,123	r 1,125	r 1,120	1,144	NA
Coke:					
Oven and beehive—thousand tons	597	654	659	665	642
Other—do	535	551	554	544	NA
Total—do	1,132	1,205	1,213	1,209	NA
Gas:					
Natural—million cubic feet	11,419	12,005	21,598	27,455	38,754
Manufactured—do	12,704	14,232	15,646	16,873	-----

See footnotes at end of table.

Table 1.—Hungary: Production of selected metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity [1]		1961	1962	1963	1964	1965 [p]
Mineral fuels—Continued						
Petroleum:						
Crude	thousand tons	1,457	1,641	1,756	1,801	1,802
Natural gasoline		26,427	27,508	26,391	22,037	-----
Refinery products:						
Gasoline	thousand tons	338	343	333	370	[e] 445
Kerosine	do	65	68	72	38	-----
Diesel fuel	do	793	861	861	970	1,045
Heating oil	do	1,140	1,283	1,403	1,642	1,642
Lubricants:						
Oils	do	101	101	102	111	NA
Greases	do	19	19	19	19	NA
Paraffin, crude		5,873	5,404	4,963	5,520	NA
Bitumen, natural and refinery	thousand tons	345	393	416	455	450

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to reported commodities, Hungary is known to produce arsenic, copper, gold, uranium, zinc, china clay, diatomite, and peat.

Sources: Kozponti Statisztikai Hivatal (Office of Statistical Council). Statisztikai Evkonyv 1964 (Statistical Yearbook for 1964) Budapest 1965, 439 pp. for years 1961 through 1964. Figures for 1965 were taken from U.S. Foreign Service dispatches from the U.S. Legation Budapest and Bureau of Mines files.

TRADE

During 1965 the pattern of Hungarian mineral commodity foreign trade remained the same as in 1964. The country imported most of its raw materials as nonferrous base metals, iron ore, high-rank coals and crude petroleum. Exports consisted of bauxite, manganese ore, (not definitively reported in official statistics) and various semimanufactured products. Hungary's most important trading partner was the U.S.S.R., which provided most of the imported fuels and metallic ores and metals in exchange for semimanufactures and finished products. Foreign trade with Communist countries accounted for up to 80 percent of the total trade of Hungary.

Table 2.—Hungary: Export of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity		1963	1964	Principal destinations in 1964
Metals:				
Aluminum:				
Buaxite	thousand tons	667	761	Czechoslovakia 361; East Germany 238; West Germany 70.
Alumina	do	134	156	Poland 59; U.S.S.R. 37; Austria 25; Czechoslovakia 9; Finland 3.
Metal, ingot		9,315	12,191	United Kingdom 4,729; Czechoslovakia 2,000; Poland 2,000; Netherlands 1,031.
Iron and steel:				
Pig iron		28,901	67,333	Austria 25,463; East Germany, 14,969; Yugoslavia 14,845; United Kingdom 12,050.
Rolled products, excluding pipes	thousand tons	525	515	Czechoslovakia 194; Rumania 34; Poland 31; Italy 29; West Germany 26; Israel 15.
Pipes and fittings		51,375	66,225	Yugoslavia 7,312; Netherlands 7,121; Austria 5,492; West Germany 4,463; Iran 3,741; Bulgaria 3,661; Rumania 2,150; Poland 2,121.
Nonmetals: Cement		122,433	282,917	Yugoslavia 197,289; undisclosed 85,628.
Mineral fuels:				
Coke		126,758	107,320	Austria 88,071.
Petroleum refinery products:				
Gasoline		82,480	123,590	Poland 53,630; Austria 12,937; undisclosed 57,023.
Kerosine		240	211	All undisclosed.
Diesel fuel		162,025	166,833	Switzerland 45,302.
Heating oil		230,671	262,720	Austria 262,651.
Lubricants		13,533	13,763	Undisclosed.
Bitumen		197,354	168,483	Czechoslovakia 46,630; Austria 31,959; Poland 19,998.

Source: Kozponti Statisztikai Hivatal (Office of Statistical Council). Statisztikai Hivatal (Statistical Yearbook 1964). Budapest, 1965, 439 pp.

Table 3.—Hungary: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity[1]	1963	1964	Principal sources in 1964
Metals:			
Aluminum ingots	2,457	7,643	U.S.S.R. 6,501; Netherlands 250.
Cadmium	[2] 120	[2] 5	U.S.S.R. 5.[2]
Chromite	35,941	29,682	U.S.S.R. 11,000.[2]
Copper and copper products	17,558	22,722	U.S.S.R. 7,704; West Germany 438; United Kingdom 6,724; Czechoslovakia 2,210.
Iron and steel:			
Iron ore—thousand tons	2,351	2,662	U.S.S.R. 2,379; Yugoslavia 203; Sweden 10.
Pig iron—do	89	76	U.S.S.R. 70.[2]
Ferroalloys—do	20	19	U.S.S.R. 19.[2]
Rolled products, excluding pipes—do	574	647	Czechoslovakia 352; U.S.S.R. 108; Rumania 35; Poland 29; West Germany 23.
Pipes and fittings—do	33	32	United Kingdom 7; West Germany 7; Yugoslavia 3; Italy 3.
Lead, refined	11,127	12,427	U.S.S.R. 11,200;[2] Bulgaria 592.
Mercury—76 pound flasks	1,305	-----	
Tin	1,181	1,007	United Kingdom 205; Netherlands 224.
Zinc	10,950	11,817	Poland 6,613; U.S.S.R. 2,800; Bulgaria 1,025.
Nonmetals:			
Asbestos	14,550	14,981	U.S.S.R. 14,100.[2]
Cryolite	-----	[2] 1,100	All from U.S.S.R.[2]
Clay, calcined	62,847	60,437	Czechoslovakia 48,654.
Fertilizer materials:			
Nitrogenous, gross weight	471,205	482,719	U.S.S.R. 30,926; Norway 9,860;[3] Italy 6,014.[3]
Potassic, gross weight	217,825	203,314	U.S.S.R. 67,600;[2] West Germany 15,090.
Phosphatic, gross weight	94,615	178,177	U.S.S.R. 103,722; Yugoslavia 18,983; Belgium-Luxembourg 6,839.
Fire clay	[2] 1,600	[2] 7,900	All from U.S.S.R.[2]
Graphite	[2] 1,400	[2] 1,400	All from U.S.S.R.[2]
Magnesite, calcined	65,147	58,968	Czechoslovakia 37,080.
Pyrites, bulk	124,210	207,524	Yugoslavia 54,031; Rumania 51,052; Bulgaria 480.
Phosphate rock	306,474	482,330	U.S.S.R. 285,653; Israel 8,125.
Sulfur, elemental	126,694	165,608	U.S.S.R. 34,300;[2] France 9,873; Canada 4,572.[3]
Mineral fuels:			
Briquet	500	565	East Germany 491.
Coal, all kinds—thousand tons	2,690	3,280	U.S.S.R. 1,336; Poland 1,098; Czechoslovakia 803.
Coke—do	1,140	1,086	U.S.S.R. 638; Czechoslovakia 308.
Gas, natural—million cubic feet	7,185	7,799	All from Rumania.
Petroleum:			
Crude—thousand tons	1,827	2,026	U.S.S.R. 1,757;[2] United Arab Republic 198; Bulgaria 12.
Refined products:			
Gasoline—do	89	122	U.S.S.R. 107.[2]
Kerosine—do	180	225	U.S.S.R. 185; Rumania 27.
Heating oil—do	135	204	U.S.S.R. 97.

[1] In addition to listed commodity Hungary reported imports of following items without disclosing totals: cadmium, 20 tons from Bulgaria; cement, 20 tons from Switzerland.

[2] Vneshnyava Torgovlya SSR za 1964 god (Foreign Trade of the U.S.S.R. for 1964) Moscow 1965, 294 pp.

[3] Supplement to the World Trade Annual: Trade of the Industrialized Nations with Eastern Europe and the Developing Nations—1964. Part I, East Europe. Prepared by the Statistical Office of the United Nations. 342 pp.

Source, except as noted: Kozponti Statisztikai Hivatal (Office of Statistical Council). Statisztikai Evkonyv (Statistical Yearbook 1964). Budapest, 1965, 439 pp.

COMMODITY REVIEW

METALS

Bauxite and Aluminum.—Hungarian bauxite output remained among the largest in Europe during 1965, but aluminum production was only modest by world standards as a result of shortages of electric power and funds for building new power plants. Development plans call for larger output of bauxite by opening 12 new bauxite mines during the next 10 years and expanding existing mines in the Halimba, Nyirad, and Darvasto, and Iszkassento-Gyoergy areas. Plans also call for increased alumina output by completion of the second stage of modernization and expansion of the

Almafuzito plant. A large increase in aluminum production was not planned because of an aluminum agreement with the U.S.S.R. by which the Soviets will refine up to 300,000 tons of aluminum per year.

Exploration for bauxite continued during 1965. Hungarian authorities announced the discovery of a significant bauxite deposit in the eastern part of Hungary in the vicinity of Fenyofo and Bakonyszentlaszlo villages. Total reserves were not disclosed, but reports indicated seams 60 meters thick.

The Kisloed Oereghegy bauxite mine was opened in the fall of 1965. The mine capacity was reported to be about 200,000 tons of bauxite per year. The development of Halimba mine continued. When the mine is completed, capacity will be 600,000 tons per year. The first stage of expansion of the Alumafuzito alumina plant was completed in the fall of 1965. The new capacity of the plant was not reported, but when all stages of modernization are completed in 1970, the plant will produce 280,000 tons of alumina.

Germanium.—The first Hungarian germanium oxide plant began test production at the Doroz site of the Coal Chemical Industry Enterprise (Szenfelsolgozo Veguipari Vallalat). The plant will extract germanium oxide from brown coal tar. Equipment for the plant was purchased in East Germany and Czechoslovakia, and Soviet experts helped in the technologic aspects of design.

Iron and Steel.—To cover the annual domestic consumption of about 3 million tons of iron ore, Hungary imported roughly two-thirds of its requirements during 1965. To improve the iron ore supply position, Hungarian authorities continued to develop domestic iron ore resources.

According to reports, Hungarian geologists discovered a new iron ore deposit near the iron ore mine at Rudabanya. The deposit is on the outskirts of the village of Alsotelekes. Part of the deposit consists of limonite, reportedly of good quality.

Production started at the Vilmos mine in the Rudabanya area during the winter of 1965. Total reserves were reported to be around 4 million tons of iron ore. Development of this mine started in 1962 and since then 4.4 million cubic yards of overburden has been removed.

The final stage of the Danubian Iron Works (Dunai Vasnu), namely the highly automated cold-rolling mill, was nearing completion at yearend. The new mill will increase its production gradually and will not be producing at full capacity for another 3 or 4 years. Output for 1965 was planned to be about 20,000 tons of fine sheet, or about one-tenth of projected capacity. In the meantime, a plant with a nitrogen protective atmosphere was completed. The nitrogen will be generated in the iron works coking plant.

In the Diosgyoer Lenin Metallurgical plant a large gas pipe broke and gas ignited, resulting in a 1 day shutdown of the plant and injury of 12 people; the cause of the accident was not disclosed.

NONMETALS

The Hungarian nonmetals industry was small and insignificant by world standards. However, during 1965 output was adequate to cover domestic needs for cement, lime, clays, and other construction materials. Other industrially significant nonmetallic minerals had to be imported because of lack of natural resources.

Cement and Lime.—The planning authorities decided to build a new 1-million-ton-capacity cement plant in Berement near the old plant which has been in operation for nearly 50 years. The new plant is scheduled to begin production in 1970, and full capacity is expected to be reached by 1972.[3]

The new Danubian Cement Works plant at Lablatan has been rated as one of the most efficient cement factories in the country. Only 1,000 kilocalories was consumed per kilogram of clinker produced; energy consumption thus was 50 percent lower than the average of the country. Most of the success of this plant reportedly has been credited to efficient maintenance and adequate supply of spare parts. The Hungarian average of shutdown time for repairs and maintenance is 30 to 40 percent of the available plant time, whereas the Danubian Cement Works consumed only 10 percent.[4]

A gas-fired, almost fully automated lime kiln was completed at Helyocsaba. The annual capacity of the plant was reported to be 110,000 tons of calcinated lime.

Fertilizer Materials.—Consumption of chemical fertilizers reached about 1.7 mil-

[3] Magyar Nemzet, Dec. 12, 1965, p. 6.
[4] Muxzakielet, Sept. 23, 1965, p. 3.

lion tons in 1965. Production of phosphatic and potassic fertilizers was based on imported raw materials; nitrogenous fertilizer output was based on large domestic natural gas reserves and limestone.

The new nitrogenous fertilizer plant at Tiszepalkonya, which started test production and stocks at the mines were high at yearend 1965. Planned annual capacity of this plant was reported to be about 345,000 tons of nitrogenous fertilizer with an average nitrogen content of 34 percent.

MINERAL FUELS

According to Hungarian governmental sources, the mineral supply situation was not completely satisfactory during 1965. Production of coal, as well as production of crude oil, remained at the same level as in 1964. Coal contained 10 to 15 percent ash, and stocks at the mines were high at yearend. Because 90 percent of the coal was low grade, the country imported fairly large quantities of high-rank coals during 1965. Although other fuels were used on a broader base than in the past, coal remained Hungary's principal source of energy.

Coal.—Output of coal totaled 31.4 million tons, virtually the same as in 1964. Out of the total production, 70 percent was brown coal, 14 percent was bituminous, and 16 percent was lignite.

The development of coal mining was slowed by the flooding of Tatabanya, Balnika, and other mines, as well as by a fire in mine No. 3 at Komlo. Chronic shortage of miners persisted, and the overall result of these and other shortcomings was that coal output was only about equal to that of 1964.

Prospecting for coal was at the same level as in the past year, but the results announced indicated discoveries of substantial coal reserves by Hungarian standards. In the general area of Mecsek Mountain new reserves of about 500 million tons of low-grade coal were confirmed. First results of exploration in the Buekk Mountain indicated large reserves of lignite; some estimates set them at about 300 million tons. As the results were only preliminary, it was not possible to draw any conclusion concerning the impact of the discovery on the nation's energy resource picture.

The Governmental effort to improve the energy supply position of the country resulted in the commissioning of new mines. A new open pit mine was commissioned in the Tatabanya Coal Basin. The mine's capacity was reported to be about 500 tons of coal per day. Coal was used by the thermal power plant near Oroszlany. Total reserves of the new open pit mine were estimated to be about 2 million tons. Work was started on a new open pit mine north of Salgotarjan. The coal deposit was discovered by the geologists of the Nograd Coal Mining Trust. Planned mine capacity and extent of reserves of the deposit were not reported. Development of the Torez mine at Visonta continued through 1965. No date was fixed for the beginning of production, but the power generating plant, also named Torez, will be commissioned in 1968. This plant will be the principal consumer of coal mined in the Torez mine.

While developing new facilities for coal production, the Hungarians were also working on constructing facilities for upgrading the quality of the coal that reaches the consumer.

During 1965, the modernization and expansion of the coal benefication plant at the Pecsuj coal combine was completed. New installations will lower the ash content of the coal from 18 to 12 percent.

As Hungary's operating briquet factory has a capacity of only 1,230 tons of briquet per day, authorities decided to start construction of a new facility near the village of Mohra with a planned daily output of 2,000 tons. Balnika mines will provide the coal for this briquet works.

The modest success of the coal industry was overshadowed by explosion, fire, and flooding at several mines. At the mine No. 3 (Zobak pit) of the Komlo coal mine, work was suspended because of underground fire at the depth of 600 meters. At yearend, equipment was moved from the mine and steps had been taken to localize the fire. A gas explosion killed three men in a new section of the Tatabanya mine. Production has been abandoned in the southern (Altaro) section of the Tokado mine after fighting water for more than 1 year. Miners were reemployed in other mines in the area.

Petroleum and Natural Gas.—The petroleum industry, including natural gas production, was characterized by high levels of

activities in all its endeavors, but importation of 2.026 million tons of crude oil was needed to cover the domestic demand. Drilling for exploration and for development of known fields continued. Most of the production comes from Lovasy and Nagyenguel, and expansion of refineries was underway.

In exploration, drilling was concentrated on deeper structures of the Pannonian Basin; a depth of 4,000 meters was reached. Preparation were underway for deep drilling to depths of over 5,000 meters. A symposium held in Budapest with participation of drilling experts from Communist countries and France, as well as imports from the U.S.S.R. and Rumania of equipment capable of drilling over 6,000 meters, indicated deep drilling will be a reality in the near future. According to the Hungarian press, the Transdanubian Petroleum Drilling Enterprise (Dunantuli Koolajfuro Uzem) planned to drill about 100 exploratory wells in the Somogy, Kisalfold, and Nagykanizsa sectors of the country.[5]

During 1965 the most important event in the realm of exploration was the discovery of the Belezna oilfield in Zala County. Associated gas from the field will be supplied to the Nagykanisze gas pipeline network. A second well drilled on the structure at Alogyoe near Szeged was oil bearing. Reserves of these two fields were not disclosed.

A blowout of oil was reported from a formation 2,000 meters deep during drilling operations for thermal waters near Tape village near Szegal. Estimates set the rate of flow at about 27,000 barrels per day. No information was available to indicate when the well was brought under control. In addition to new discoveries, development of the area of Great Plains continued during 1965. A total of 38 producing wells were completed there. In the vicinity of Pusztafoldvar producers were drilled, and the rest were in the vicinity of Eger, Ulles, and Mezohegyes.[6]

Although the development activity was moved to the Great Plains during 1965, Lovasy and Nagyenguel remained Hungary's principal oilfields. Production stimulation methods were widely used and some recourse was made to secondary recovery in an effort to keep production on the 1964 level.

Natural gas development started to change Hungary's energy balance structure in 1965. New gas pipelines and liquefied petroleum gas facilities contributed to significantly larger use of gas by industry. Construction of the natural gas pipeline from Kardoskut to Dunajvaros started in the second half of 1965. The pipeline touches Oroshaza, Szentes, Kiskunfelegyhaza, Kecskemet, Kunszentmiklos, Doemsoed Andony, and Racalamas. The pipeline is expected to be completed in 1966 (a later date than predicted in 1964), and the main consumers will be the iron and steelworks at Dunajvaros and several power plants.

The construction of the Szazhalombatra oil refinery continued. The first crude oil arrived through the Druzba pipeline from the U.S.S.R. and was stored in four 10,000-cubic-meter (about 63,000 barrel) storage tanks. The Szony refinery started production of higher octane gasoline at yearend. Capacity of the refinery was reported to be 150,000 tons of oil per year.

[5] Figyelo. Apr. 9, 1965, p. 9.
[6] Nepszava. Sept. 12, 1965, p. 2.

The Mineral Industry of Ireland

By Edgar L. McGinnis [1]

Available statistical data indicate that the mineral industries of Ireland in 1965 maintained their relative position in the economy, due principally to the further expansion of the mineral processing sector. Chief contributors to the growth in this sector were the cement, fertilizer, and petroleum refining industries. In the extractive sector, barite production increased substantially and the revival of lead-zinc mining in 1965 held promise of future progress.

In 1965 the Irish economy grew at the rate of a little less than 3 percent, somewhat below the level of 4 to 4.5 percent registered in 1964. The average growth attained over the 5-year period 1961–65 amounted to 4 percent.

The mineral industry of Ireland remained small in relation to total national output as well as to world supply and demand. According to census data for 1963 (the latest available) the mining and quarrying industries accounted for about 1.9 percent of the total value of industrial production. The inclusion of mineral processing for which detailed figures are not available, would probably raise the proportion modestly. Both imports and exports of mineral commodities increased, the latter substantially since 1963.

Production of lead and zinc concentrates at Tynagh began near yearend and plans continued to bring another lead-zinc-silver deposit at Silvermines to the production stage. Development of a copper-silver mine near Tipperary continued. The expansion of Ireland's petroleum refining capacity by over 30 percent was expected to be completed early in 1966.

No significant change in government policies in regard to minerals was reported during 1965. Ireland, already a member of the Organization for Economic Cooperation and Development (OECD) and the Council of Europe, has predicated its economic development program to a certain extent on membership in the European Economic Community (EEC) which it hopes to achieve by 1970. Also pending was an Irish application for membership in the General Agreement on Tariffs and Trade (GATT).

The program for economic expansion covering 1965–70 was initiated. By 1970 this program hopes to achieve a 50-percent real growth over the 1960 level. The encouragement of direct foreign investment, which has brought new capital into the mining industry, is a part of this program. A free trade agreement was being negotiated with the United Kingdom.

PRODUCTION

Estimates for 1965 output showed declines for most nonmetals, though barite production more than doubled and gains were registered in cement as well as in mineral fuels including coke, milled peat, and petroleum refinery products. Output of the latter showed substantial overall gains as compared with 1964 production. For the first time since 1961 zinc concentrates were produced.

[1] International economist, Division of International Activities.

Table 1.—Ireland: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 e
Metals:					
Copper, metal content of ore	5,928	2,338	--	--	--
Lead, metal content of ore	253	--	--	1,200	1,422
Steel ingots and castings, thousand tons	28	19	20	20	20
Zinc, metal content of ore	167	--	--	--	2,641
Nonmetals:					
Barite	4,227	20	9,246	r 41,491	84,000
Cement, thousand tons	744	760	802	r 1,036	1,240
Clays, refractory	16,174	18,096	17,804	21,289	NA
Construction materials: [1]					
Sand and gravel, thousand tons	1,330	1,637	1,616	r 5,704	2,204
Limestone, do	913	1,363	2,356	r 3,737	3,597
Gypsum, do	167	176	190	r 232	218
Lime, do	29	166	35	43	42
Pyrites, including cupriferous, do	51	38	--	--	--
Superphosphate, do	593	655	320	NA	NA
Other, do	1,296	1,656	1,497	r 3,017	2,316
Mineral fuels:					
Coal:					
Anthracite, do	136	132	131	r 153	119
Semibituminous, do	72	76	78	r 77	66
Coke, gas plant, including coke breeze, do	123	122	128	102	105
Peat:					
Briquets, do	211	241	293	r 296	224
Milled [2], do	676	1,163	1,606	r 1,336	1,490
Sod, do	2,873	2,803	2,694	r 2,481	2,281
Moss, do	19	22	23	r 24	21
Petroleum refinery products:					
Gasoline, thousand 42-gallon barrels	2,630	2,784	2,895	3,278	3,644
Jet fuel, do	47	--	--	--	--
Kerosine, do	66	73	1	--	--
Distillate fuel oil, do	3,281	3,412	3,590	3,911	44,493
Residual fuel oil, do	4,022	4,364	4,462	5,076	5,930
Other, do	170	137	345	277	471
Refinery fuel (including losses), do	678	659	704	692	744

e Estimate. r Revised. NA Not available.

[1] Figures do not include large quantities of granite, stone, sand and gravel, and other materials used by government agencies except for 1964.

[2] Excludes milled peat used in briquets except for 1965.

TRADE

Irish mineral commodity exports continued to increase in 1965, exceeding those of 1964 by 42 percent and accounting for 5.4 percent of total exports. Mineral commodity imports, about 5.4 times larger than exports in 1965 also increased, rising by 5.9 percent from those of 1964, but these commodities again accounted for a slightly smaller share of total imports as shown in the following tabulation:

	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1963	$17.8	$535.7	3.3
1964	23.3	608.8	3.8
1965	33.1	610.5	5.4
Imports:			
1963	150.7	857.9	17.6
1964	169.8	973.9	17.4
1965	179.9	1,040.6	17.3
Trade balance:			
1963	−132.9	−322.2	XX
1964	−146.5	−365.1	XX
1965	−146.8	−430.1	XX

XX Not applicable.

On the export side the major items were refined petroleum products ($7 million), nonferrous metals and alloys ($4.9 million), metalliferrous ores and metal scrap ($4.5 million), iron and steel ($4.2 million), and clay and refractory construction materials ($2.4 million). Most of the increase in exports was contributed by refined petroleum products, clay and refractory construction materials, iron and steel, cement and metalliferrous ores, and scrap.

On the import side the chief items were crude and refined petroleum ($64 million), iron and steel ($34.8 million), crude and manufactured fertilizers ($28.8 million), coal ($22.8 million), and nonferrous metals and alloys ($18.9 million). Crude and refined petroleum and iron and steel accounted for the great bulk of the $10.1 million increase in imports.

The United Kingdom remained Ireland's principal trading partner in mineral commodities as well as in total trade, receiving almost 67 percent of total mineral exports and supplying over 38 percent of Irish mineral imports in terms of value. Spain ranked second as a recipient of Ireland's mineral exports, receiving almost 9 percent of the total, followed by West Germany with about 6 percent. Other notable sources of mineral imports and their shares of the total value were Iran—12 percent, West Germany—8 percent, Iraq—7 percent, and Belgium-Luxembourg—7 percent.

Table 2.—Ireland: Exports[1] of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum and alloys:				
Scrap	1,181	1,317	1,226	Netherlands 694; United Kingdom 484.
Unwrought and semimanufactures	1,386	4,402	4,096	United Kingdom 4,361.
Copper and alloys:				
Scrap	r 2,965	r 2,836	3,521	Netherlands 854; West Germany 814; United Kingdom 776.
Unwrought and semimanufactures	233	1,597	1,758	Netherlands 662; United Kingdom 497; West Germany 297.
Iron and steel:				
Ore and concentrate	1,665	6,164	------	Netherlands 4,244.
Scrap	26,450	45,595	35,113	West Germany 10,368; Spain 8,601; Netherlands 7,460; Belgium-Luxembourg 5,926.
Steel ingots and other primary forms	------	r 7,584	52,724	Spain 6,503.
Semimanufactures	10,827	r 19,450	8,732	United Kingdom 18,239.
Lead and alloys:				
Scrap	288	315	885	United Kingdom 241.
Unwrought and semimanufactures	612	825	525	All to United Kingdom.
Unspecified nonferrous ores and concentrates	------	------	589	
Nonmetals:				
Barite	NA	28,282	97,221	United States 27,921.
Cement----thousand tons	190	251	337	All to United Kingdom.
Fertilizer materials:				
Crude	r 7,377	r 9,088	13,198	Do.
Manufactured	175	442	8,845	United Kingdom 117.
Gypsum and plasters----thousand tons	NA	104	104	Mainly to United Kingdom.
Stone, sand and gravel:				
Dimension stone, crude and worked	220	269	144	NA
Gravel and crushed stone thousand tons	182	177	194	West Germany 70; Netherlands 61; United Kingdom 46.
Clay products:				
Refractory	3,756	10,361	23,903	United Kingdom 9,431.
Other	2,143	5,183	14,104	United Kingdom 2,504; Hong Kong 1,227.
Mineral fuels:				
Coal briquets and peat	67,752	57,430	52,090	United Kingdom 53,736.
Coke	38,571	35,728	48,044	Norway 35,169.
Petroleum refinery products:				
Gasoline---thousand 42-gallon barrels	238	200	86	All to United Kingdom.
Kerosine----do	588	721	763	NA.
Distillate fuel oil----do	1,055	998	1,558	All to United Kingdom.
Residual fuel oil----do	r 263	146	428	Do.
Liquefied petroleum gas (LPG)	5,749	7,064	1,688	Do.
Crude chemicals from coal and petroleum distillation.	3,751	5,476	11,199	United Kingdom 2,713; Netherlands 670.

r Revised. NA Not available.
[1] Including reexports.

Table 3.—Ireland: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum and alloys:				
Unwrought	5,459	8,955	7,831	Canada 7,476.
Semimanufactures	r 3,320	3,957	4,048	United Kingdom 2,363.
Copper and alloys:				
Unwrought	128	r 71	29	All from United Kingdom.
Semimanufactures	5,432	7,058	7,231	United Kingdom 6,176.
Iron and steel:				
Iron ore and concentrate	205	272	1,262	All from West Europe, not further identified.
Scrap	1,653	1,347	586	United Kingdom 1,287.
Pig iron, cast iron, powder, shot, and sponge iron.	9,461	28,903	22,810	East Germany 14,632; U.S.S.R. 10,555.
Ingots, blooms, billets, slabs, coils for rerolling, and pipe blanks.	2,148	21,661	52,298	United Kingdom 8,845; Belgium-Luxembourg 4,480; France 3,885.
Semimanufactures:				
Wire rod	16,392	17,894	15,931	West Germany 9,482; United Kingdom 5,177.
Bars and other rod	29,709	17,660	12,516	United Kingdom 8,438; Belgium-Luxembourg 5,513; West Germany 1,953.
Plate and sheet	56,051	67,693	68,226	United Kingdom 41,905; Belgium-Luxembourg 12,281.
Hoop and strip	2,299	4,129	4,132	United Kingdom 2,846; Belgium-Luxembourg 728.
Rails and railway track materials	1,879	4,971	8,166	Netherlands 2,069; Belgium-Luxembourg 1,443.
Wire	4,574	5,467	5,589	United Kingdom 4,280; West Germany 708.
Pipe, tube, and fittings	21,093	29,124	28,603	United Kingdom 20,413; Netherlands 3,561.
Castings	228	266	231	United Kingdom 108; West Germany 106.
Lead:				
Oxides	1,160	1,193	1,391	United Kingdom 1,172.
Metal and alloys, unwrought and semimanufactures.	712	427	469	United Kingdom 420.
Nickel and alloys, unwrought and semimanufactures.	153	140	94	United Kingdom 138.
Silver, all forms ——— value, thousands	$141	$269	$216	United Kingdom $175; Netherlands $93.
Silver and/or platinum ore	———	———	70	
Tin and alloys, unwrought and semimanufactures. long tons	51	65	47	United Kingdom 54; Netherlands 11.
Titanium oxide	1,620	2,130	2,173	United Kingdom 1,676; West Germany 293.
Zinc:				
Oxides	472	586	596	United Kingdom 504; Belgium-Luxembourg 82.
Metal and alloys:				
Unwrought	2,777	r 3,492	3,328	Belgium-Luxembourg 1,998; United Kingdom 702.
Semimanufactures	167	294	269	United Kingdom 180; Belgium-Luxembourg 52.
Other:				
Ores and concentrates	———	12,905	7,886	Mozambique 12,873.
Scrap, nonferrous	74	236	112	United Kingdom 229.
Unwrought and semimanufactures	164	———	———	
Nonmetals:				
Abrasives:				
Natural, n.e.s	497	2,807	1,132	United Kingdom 798; United States 255.
Grinding stones	181	222	237	United Kingdom 182.
Asbestos	r 2,798	3,270	5,089	Cyprus 1,433; South Africa 680; Rhodesia 463.
Cement ——— thousand tons	8	59	31	Belgium-Luxembourg 26; Poland 23; United Kingdom 7.
Clay:				
Crude refractory materials, not elsewhere specified.	9,290	16,423	22,804	United Kingdom 9,778; Yugoslavia 4,686.

See footnotes at end of table.

Table 3.—Ireland: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Clay—Continued				
Products including brick:				
Refractory	17,546	15,175	15,841	United Kingdom 11,668; West Germany 1,909.
Other	6,899	5,205	5,676	United Kingdom 3,745; West Germany 753.
Diamond, industrial—thousand carats	NA	65	-------	United Kingdom 60.
Fertilizer materials:				
Crude:				
Nitrogenous—thousand tons	3	2	1	Mainly from Chile.
Phosphatic—do	231	239	244	Mainly from Morocco.
Manufactured:				
Nitrogenous—do	170	161	116	Netherlands 48; United Kingdom 34; East Germany 24; Belgium-Luxembourg 23.
Phosphatic:				
Thomas slag—do	123	158	153	Belgium-Luxembourg 157.
Other—do	30	r 33	33	Belgium-Luxembourg 25; Netherlands 7.
Potassic—do	r 166	r 162	160	West Germany 50; East Germany 46; France 46.
Mixed—do	6	1	3	Mainly from United Kingdom.
Ammonia, anhydrous	135	435	14,963	United Kingdom 420.
Lime	2,731	3,849	5,364	All from United Kingdom.
Limestone and dolomite	905	1,635	3,327	United Kingdom 1,205.
Mica, worked	13	4	-------	All from United Kingdom.
Pigments, mineral (iron oxides and hydroxides).	1,785	1,522	1,315	United Kingdom 1,039; West Germany 350.
Salt—thousand tons	40	38	42	United Kingdom 32.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	2,568	3,241	3,221	United Kingdom 2,659; West Germany 426.
Caustic potash and peroxides of sodium and potassium.	238	195	248	United Kingdom 178.
Stone, sand and gravel, n.e.s.:				
Dimension stone:				
Crude or roughly cut	2,481	3,077	2,992	Italy 1,074; United Kingdom 1,548.
Worked	581	649	666	United Kingdom 612.
Sand, excluding metal bearing	37,485	38,568	39,411	Belgium-Luxembourg 30,818; United Kingdom 7,724.
Gravel and cushed stone	8,445	8,447	21,947	United Kingdom 8,297.
Sulfur and pyrite:				
Pyrite, unroasted	1,403	3,109	2,206	All from Spain.
Sulfur, elemental	47,598	54,662	53,375	France 35,690; United States 18,670.
Sulfuric acid	4,279	1,583	193	All from United Kingdom.
Other nonmetals: quartz, crude mica, feldspar, and fluorspar.	2,277	3,212	4,524	United Kingdom 3,133.
Mineral fuels:				
Asphalt and bitumen, natural	r 57,356	3,249	-------	United Kingdom 2,272; Trinidad and Tobago 973.
Carbon black	2,007	-------	-------	
Coal, coke, and briquets:				
Coal—thousand tons	1,458	1,307	1,289	United Kingdom 585; United States 403; West Germany 78.
Coke—do	12	13	12	United Kingdom 9; Belgium-Luxembourg 3.
Briquets—do	3	3	6	NA.
Gas, natural, including LPG	8,209	10,282	9,058	United Kingdom 10,041.
Petroleum:				
Crude and partly refined.—thousand 42-gallon barrels	r 12,200	r 13,042	15,186	Iran 6,043; Iraq 4,907; Saudi Arabia 2,091.
Refinery products:				
Gasoline—do	r 258	421	269	United Kingdom 393.
Kerosine and jet fuel—do	r 1,478	1,679	1,666	United Kingdom 1,563.
Distillate fuel oil—do	r 97	95	208	United Kingdom 92.
Residual fuel oil—do	1,727	1,888	2,687	United Kingdom 1,054.
Lubricating oils and greases—do	232	260	239	Mainly from United Kingdom.
Mineral jelly and waxes—do	22	15	15	Do.
Miscellaneous chemicals from the distillation of coal, gas, and petroleum.	17,026	17,161	10,626	United Kingdom 10,555.

r Revised. NA Not available.
Source: Statistical Office of the United Nations.

COMMODITY REVIEW

METALS

Copper.—Gortdrum Mines, Ltd., a Canadian company, was developing an open pit mine and planned to build a 1,500-ton- per-day copper-silver flotation mill a few kilometers north of the town of Tipperary. Target date for initial production was mid-1967, and the project will include a ship loading facility at the port of Limerick, about 55 kilometers from the mine site.

Diamond drilling has indicated about 4.2 million tons of ore assaying 1.19 percent copper and 0.75 ounce of silver per ton.

Lead, Zinc, and Silver.—Irish Base Metals Ltd., (a subsidiary of the Canadian firm, Northgate Exploration Ltd.), started operations in December at its 2,000-ton-per-day concentrator at the company's lead-zinc-silver mine at Tynagh. Full operation is expected in mid-1966.

The Tynagh mine, described by Irish Base Metals, Ltd., as the first major discovery in Ireland in the last 100 years, was officially opened in October. The project was constructed by the Bechtel Overseas Corporation and represented an investment of $10.8 million.

Financing arrangements were reportedly completed by Mogul of Ireland, Ltd., to bring into production a lead-zinc-silver mine at Silvermines containing ore reserves of over 11 million tons. The company will use the funds to complete mine development and construct a milling plant to treat 3,000 tons of ore per day. Production is scheduled to begin in January 1968.

NONMETALS

Fertilizers.—The nitrogen fertilizer plant of Irish Nitrogen Ltd., (Nitrigin Eireann Teoranta) started production in December. The plant is designed to produce annually 85,000 tons of ammonium sulfate and 65,000 tons of calcium ammonium nitrate.

MINERAL FUELS

Petroleum Refinery Products.—During 1965 the Irish Refining Company Ltd., proceeded with plans to increase the capacity of its Whitegate refinery at Cork Harbour from 1.9 million tons to 2.5 million tons annually, or by a little over 30 percent. The project, which is scheduled to be completed by early 1966, will cost about $8.4 million.

Gasoline taxes were raised by about 3 cents per imperial gallon to a little over 45 cents per imperial gallon.

The Mineral Industry of Italy

By F. L. Klinger [1]

The principal developments in the Italian mineral industry in 1965 were a 30-percent increase in steel production, mainly from new oxygen steelworks, and a continuing high growth rate in the petroleum refining industry. Steel output was brought up to the level of domestic consumption, and Italy became a net exporter of steel for the first time. The industry accounted for most of the increase in steel output of the European Economic Community (EEC) in 1965 and ranked eighth in world production. In the petroleum industry, refinery product output increased by more than 15 percent for the seventh straight year. In refining capacity as well as in output, Italy ranked first among West European countries.

The severe slump in building construction continued to have a depressing effect on metal and mineral consumption. In the cement industry, the slackened demand came at a time when the industry was in the last stages of a major expansion program, and output in 1965 ranged between 60 and 70 percent of rated capacity.

In the mining industry, gross output was slightly below the 1964 level. Four iron mines and the country's only anthracite mine (La Thuile) were closed in 1965. Output from new zinc mines in north Italy and Sardinia and increased production of potash and other nonmetallic minerals helped to compensate, in terms of value of overall output, for reductions in iron ore and crude oil production. The mineral industry continued to be plagued by rapidly rising production costs (particularly the cost of labor, which has doubled in the past 4 years), while overall production has been relatively static and only moderate increases in productivity have been achieved. In the face of added problems of increased foreign competition and impending removal of protective tariffs on lead, zinc, and sulfur, extensive rationalization programs in these industries were continued. Progress of the lead-zinc industry program in Sardinia was particularly impressive.

In related industrial developments, a merger of the Montecatini and Edison companies was almost completed in 1965. The new company, named "Montecatini-Edison," will control all present Italian production of potash and bauxite, 75 percent of the primary aluminum, 60 percent of lead and zinc, most of the chemical fertilizer, and a large proportion of the petrochemical industry, as well as substantial interests in other sectors of the mineral industry such as pyrite, sulfuric acid, and hydrocarbons. Combined sales of the two companies in 1965 amounted to $1,313 million. Montecatini Co. also entered into an agreement with the Soviet Union for construction of six chemical plants valued at about $112 million over the next 5 years.

In other international agreements, the Fiat Co., Italy's largest commercial firm, completed negotiations for construction of a large automotive plant in the Soviet Union valued at about $800 million and expected to involve large purchases of machinery from the United States. The World Bank approved a loan of $100 million for assistance in the industrial development of south Italy, including Sicily and Sardinia, and the Italian National Research Council signed an agreement with the Office of Saline Water of the U.S. Department of the Interior for cooperation in the field of water desalinization.

A draft law to govern offshore exploration and development of oil and gas de-

[1] Physical scientist, Division of International Activities.

posits in Italy's continental-shelf areas had been prepared by yearend, and it was hoped that final legislative action would be taken during 1966. The absence of legislation covering offshore deposits has prevented exploration of these areas except for a coastal strip 15 kilometers wide which is part of the Po Valley Concession reserved to the State hydrocarbons agency, Ente Nazionale Idrocarburi (ENI).

The gross output (value added) of the Italian mineral industry in 1965 was estimated at approximately $2,000 million, of which more than 80 percent was accounted for by manufacturing industries. This was equivalent to about 15 percent of gross industrial output and 3.6 percent of the gross national product, which was estimated at $56,700 million (current prices).

Some employment statistics of the mineral industry and related industries are shown in the tabulation below.

Industry group	Total employment [1]	Average hourly earnings [2]	
		Lire	U.S. dollars
Mining and quarrying	54,195	442	$0.707
Metallurgy	161,382	482	.771
Nonmetallic mineral products	213,590	359	.574
Petroleum and coal products	20,329	579	.926
Other:			
Chemicals and drugs	173,847	417	.667
Construction	468,612	414	.662
All industries	3,377,071	400	.640

[1] Includes salary and wage earners.
[2] Not including vacation and holiday pay, bonuses, or family allowances.

Source: U.S. Dept. of Labor. Labor Developments Abroad. January 1967, pp. 15–29. (Originally reported by the Ministry of Labor and Social Security (Rome) in Supplemento al Bollettino Statistiche del Lavoro, 1965 annual averages.)

PRODUCTION

The gross product of the mining industry in 1965 was valued at $362 million, approximately 4 percent less than in 1964. The decrease was mainly due to reduced output of crude oil, although continuing declines in production of solid fuels, iron ore, and sulfur, and reduced demand for construction materials were also contributing factors. Overall output of metallic and nonmetallic minerals increased over 1964 levels. Substantial gains were recorded for mercury ore, potash ore, barite, fluorspar, and other nonmetals while production of aluminum, lead, and zinc increased modestly. Increased output of natural gas and condensate did not compensate for the loss in crude oil. Production indices for various sectors of the extractive industry are shown in the following tabulation:

Sector	(Base: 1953 = 100)		
	1963	1964	1965
Metallic minerals	101.7	103.3	105.9
Iron ore	101.5	92.2	79.2
Nonferrous ore	101.8	106.2	112.8
Nonmetallic minerals	143.1	139.8	140.1
Sulfur	50.3	36.4	35.6
Block marble	212.9	206.2	198.5
Other	150.5	154.9	161.7
Solid fuels	91.1	77.5	65.1
Liquid and gaseous fuels	399.3	460.2	442.1
Total extractive industry	190.0	202.5	197.2
All industry	241.3	243.9	254.1

Source: Central Statistical Institute (ISTAT; Rome). Bollettino Mensile di Statistica, v. 41, No. 3, March 1966, pp. 27–30.

In contrast to the relatively static production of the domestic mining industry, there were large gains in production of the metallurgical, petroleum refining, and coke-manufacturing industries which are based largely on imported mineral commodities. There was also increased production of chemicals and electric power, which are partly based on domestic mineral resources, but output of cement and other non-

metallic mineral manufactures, which is not only based largely on domestic mineral resources but depends to a great extent on activity in the construction industry, decreased in 1965. Production indices for these industries are shown in the following tabulation:

Industry sector	(Base: 1953 = 100)		
	1963	1964	1965
Metallurgical	275.0	269.1	349.8
Primary iron and steel	303.0	292.1	387.2
Primary nonferrous metals	138.5	156.6	167.2
Nonmetallic mineral manufactures	283.5	300.9	277.5
Cement	282.0	291.6	258.4
Glass	248.8	309.3	294.9
Chemicals	364.4	413.4	434.6
Petroleum refining	379.0	452.8	543.0
Coking plants	196.4	199.2	243.1
Electric power	218.8	232.5	253.3
All manufacturing	246.3	248.0	258.2
All industry	241.3	243.9	254.1

Source: Central Statistical Institute (ISTAT; Rome). Bollettino Mensile di Statistica, v. 41, No. 3, March, 1966, pp. 27–30.

Table 1.—Italy: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Bauxite	r 327,129	r 309,434	r 269,659	236,071	244,431
Alumina, Al_2O_3 content	231,057	r 222,611	r 238,699	r 262,637	276,156
Metal:					
Primary	83,352	r 82,908	r 91,428	115,518	123,976
Secondary	45,000	56,000	65,000	58,000	61,000
Semimanufactures	90,000	97,000	107,000	105,000	112,000
Superpure	NA	NA	NA	338	352
Antimony:					
Ore, 13 to 57 percent antimony	1,817	2,056	r 570	775	854
Regulus	r 434	406	r 405	r 383	286
Oxide, metal content	141	43	113	r 74	57
Sulfide, metal content	60	60	20	44	45
Arsenic ore (including gold-bearing)	3,750	1,622	-----	-----	-----
Cadmium	348	r 243	r 282	271	296
Copper:					
Concentrate, 21 to 23 percent copper	2,688	3,902	4,531	3,531	3,302
Cement, copper content	4,700	r 4,200	3,300	3,200	2,800
Refined, secondary	14,000	12,000	13,000	11,700	12,700
Alloy ingots (from custom smelters):					
Brass	17,000	17,000	17,000	19,000	16,500
Bronze	14,000	12,500	10,500	12,000	10,500
Other	2,000	2,000	2,000	1,700	2,300
Semimanufactures:					
Copper	156,000	164,800	178,000	173,000	173,300
Brass	114,000	124,200	139,700	115,000	123,400
Other (including cupro-nickel)	5,000	5,000	5,300	5,000	5,800
Gold:					
Concentrates, 0.004 to 0.007 percent gold	r 246	-----	-----	-----	-----
Metal—troy ounces	r 1,093	-----	-----	-----	-----
Iron and steel:					
Iron ore—thousand tons	1,236	1,151	r 1,024	914	785
Roasted pyrite [1]—do	e 1,126	re 902	re 864	re 823	e 839
Sinter and other agglomerates—do	2,394	2,446	2,538	2,608	5,407
Pig iron—do	3,056	3,556	3,741	3,498	5,490
Ferroalloys—do	145	122	127	127	139
Steel—do	r 9,382	9,757	10,157	9,793	12,681
Semimanufactures:					
Hot rolled:					
Wire rod—do	653	603	563	553	674
Other bars and rods [2]—do	2,277	2,466	2,848	2,660	2,919
Sections—do	534	595	634	644	725
Plates and sheets—do	908	927	859	829	952

See footnotes at end of table.

Table 1.—Italy: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals—Continued					
Iron and steel—Continued					
Semimanufactures—Continued					
Hot rolled—Continued					
Coils—thousand tons	1,405	1,538	1,637	1,650	3,041
Strip—do	415	417	429	468	550
Seamless tube—do	781	793	817	724	784
Other—do	225	208	194	214	224
Total hot rolled—do	7,198	7,547	7,981	7,742	9,869
Castings and forgings—do	242	242	228	200	208
Cold rolled sheet—do	1,157	1,306	1,664	1,858	2,216
Lead:					
Concentrates (including silver-bearing)	75,986	67,695	50,671	52,319	54,821
Oxides	18,200	18,983	17,332	13,851	NA
Metal:					
Primary, unalloyed	43,011	41,986	41,937	37,912	39,429
Secondary, unalloyed	6,100	4,800	5,700	6,500	7,900
Alloys	14,000	12,000	14,000	17,000	e 16,000
Semimanufactures	38,000	38,000	38,500	39,500	39,000
Magnesium	5,774	5,704	5,810	6,028	6,313
Manganese ore	49,166	44,421	45,239	47,882	47,810
Mercury:					
Ore	291,073	267,943	r 257,770	276,230	322,248
Metal—76-pound flasks	r 55,376	r 54,506	54,448	57,001	57,291
Nickel:					
Secondary	450	250	-----	-----	-----
Semimanufactures, including anodes	350	300	300	350	220
Silicon	19,000	15,550	17,000	17,750	19,750
Silver—thousand troy ounces	r 974	r 919	r 997	r 1,074	1,103
Tin:					
Refined—long tons	68	-----	-----	-----	-----
Alloys:					
Solder—do	3,740	4,035	4,035	3,543	3,448
Babbitt—do	1,673	492	1,083	738	492
Semimanufactures—do	NA	NA	NA	e 118	e 103
Titanium dioxide	22,845	35,478	31,681	38,894	40,090
Tungsten concentrates (65 percent WO_3)	2	1	2	1	1
Uranium ore	60	-----	-----	NA	NA
Zinc:					
Concentrate (about 52 percent zinc)	240,054	234,515	r 199,670	218,040	224,485
Calamine ore (14 to 24 percent zinc)	33,772	32,652	r 8,615	3,983	-----
Oxide	12,082	12,106	13,373	12,273	NA
Metal:					
Primary	r 79,512	r 78,068	r 73,565	r 73,013	80,898
Secondary, from scrap and residues	5,200	4,400	4,900	600	-----
Alloys	NA	15,900	16,600	16,200	18,400
Semimanufactures	8,700	9,800	10,400	8,700	9,500
Nonmetals:					
Asbestos	56,984	55,553	r 57,532	r 68,557	71,862
Barite:					
Crude	r 130,231	r 121,541	r 103,627	r 84,738	141,895
Ground	76,217	81,185	47,249	56,173	NA
Boric acid, from steam	1,773	1,378	514	319	86
Bromine, elemental	977	1,001	1,162	1,605	2,059
Celestite	1,070	600	654	457	640
Cement—thousand tons	18,031	20,172	22,088	22,840	20,234
Cement rock—do	3,779	4,635	4,459	4,769	3,734
Clays:					
Bentonite—do	157	127	160	141	159
Bleaching—do	226	193	132	155	NA
Kaolin, crude—do	87	r 88	r 99	64	71
Kaolinitic earth—do	r 77	r 112	102	95	NA
Refractory—do	135	178	194	238	NA
Other:					
For bricks and terracotta—do	22,942	24,642	26,660	24,060	NA
For cement—do	2,493	2,838	3,219	3,195	NA
Diatomite	57,198	56,589	59,429	69,350	NA
Dolomite:					
For magnesium manufacture	61,566	71,078	77,070	NA	NA
For refractory and other uses	650,862	704,734	785,219	834,483	NA
Earths:					
For pigment	6,758	6,662	5,520	4,990	NA
For foundry use	350,127	410,417	230,051	216,338	NA
Feldspar:					
Crude	94,724	99,945	r 102,099	108,620	92,260
Ground	67,871	91,702	96,095	94,751	NA

See footnotes at end of table.

Table 1.—Italy: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals—Continued					
Fertilizer materials:					
Crude:					
Leucite	895	80	-----	-----	-----
Potassium salts--thousand tons	908	1,039	1,264	1,470	1,725
Manufactured:					
Nitrogenous--do	2,733	2,777	2,788	2,687	3,087
Phosphatic:					
Basic slag--do	117	125	112	r 88	1,422
Superphosphate (mineral)---	1,531	1,416	1,476	1,279	
Potassic--do	175	224	256	318	352
Other (compound)--do	1,119	1,386	1,554	1,778	1,638
Fluorspar	156,564	160,308	r 134,633	124,034	147,862
Graphite	4,069	3,018	1,862	1,309	1,227
Gypsum, for industrial use--thousand tons	2,001	2,073	r 2,305	2,441	NA
Iodine, crude--kilograms	12,547	10,865	3,270	-----	-----
Lime e--thousand tons	5,200	5,355	e 5,700	5,100	4,300
Limestone (excluding dimension stone) --do	42,388	46,310	64,415	NA	NA
Magnesite	6,784	8,414	6,815	6,309	3,536
Pozzolan--thousand tons	2,915	3,014	4,323	4,067	NA
Pumice--do	282	317	656	963	NA
Pumiceous lapilli--do	146	146	280		
Pyrite, including cupriferous pyrite --thousand tons	1,580	1,585	r 1,402	r 1,397	1,402
Quartz (ground)	25,431	37,991	57,454	NA	NA
Salt:					
Marine (crude)--thousand tons	1,626	1,134	903	NA	NA
Other (including Solvay brine)--do	1,192	1,731	1,892	2,031	2,129
Stone, sand and gravel, n.e.s.:					
Dimension stone:					
Calcareous, including travertine:					
Alabaster, including onyx	6,625	6,636	9,617	22,843	NA
Gypsum, other than alabaster	74,050	77,108	84,140	85,615	NA
Limestone	728,115	523,319	700,841	483,903	NA
Marble, in blocks:					
White	r 676,998	r 774,427	r 653,864	r 646,441	NA
Colored	r 317,822	r 634,067	r 840,217	r 764,753	NA
Schist	51,452	46,998	30,852	NA	NA
Travertine	291,288	324,073	403,651	393,166	NA
Tufa--thousand tons	846	1,403	1,388	NA	NA
Other:					
Gneiss	116,366	105,173	110,273	NA	NA
Granite	81,353	83,232	90,272	68,262	NA
Lava (basalt and trachyte)	456,640	420,857	922,060	610,271	NA
Porphyry	159,394	180,572	156,390	169,116	NA
Sandstone and quartzite	255,914	249,677	251,024	119,608	NA
Serpentine	47,488	72,130	83,870	NA	NA
Slate	60,635	59,915	60,870	56,755	NA
Volcanic tuff	116,828	436,326	128,056	NA	NA
Other	44,865	41,401	40,153	NA	NA
Total--thousand tons	4,332	5,439	5,954	NA	NA
Crushed and broken stone--do	21,389	18,611	27,472	NA	NA
Sand:					
Volcanic--do	43,142	40,000	115,000	NA	NA
Silica sand--thousand tons	2,097	2,474	2,776	3,105	NA
Sand and gravel--do	28,877	34,680	37,060	e 37,100	NA
Sulfur:					
Ore--do	1,220	1,066	984	678	645
Concentrate (90 percent sulfur)	76,000	90,000	95,000	67,041	59,252
Crude, in briquets	71,065	54,312	41,788	28,929	36,226
Talc and steatite	134,906	r 129,601	r 139,335	r 132,183	119,278
Mineral fuels:					
Asphaltic and bituminous rock:					
For distillation	233,065	r 201,856	r 271,743	r 237,911	269,592
For paving	106,779	r 116,860	r 114,823	r 101,462	
Coal:					
Anthracite	23,999	16,562	14,021	9,360	5,592
Subbituminous (Sulcis coal)	r 717,597	r 676,005	r 572,040	462,162	383,870
Coke:					
Metallurgical--thousand tons	3,897	4,326	4,595	r 4,683	5,738
Gasworks--do	782	776	725	r 542	386
Lignite--do	1,525	1,776	1,365	1,201	1,018
Natural gas--million normal cubic meters	6,863	7,150	7,268	7,684	7,802
Natural gasoline (condensate)	57,142	55,079	55,065	63,123	68,024
Petroleum:					
Crude--thousand tons	1,972	1,806	1,784	2,669	2,210

See footnotes at end of table.

Table 1.—Italy: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Mineral fuels—Continued					
Petroleum—Continued:					
Refinery products:					
Gasoline—thousand tons	4,782	5,886	6,519	7,407	8,543
Jet fuel—do	687	650	706	793	1,006
Kerosine—do	690	729	812	829	1,334
Distillate fuel oil [4]—do	24,165	10,454	12,616	r 15,536	18,910
Residual fuel oil [5]—do		18,777	21,561	25,384	30,078
Bitumen—do	843	900	1,055	1,226	1,228
Petrochemical feedstocks—do	736	710	797	1,106	1,702
LPG—do	690	794	963	1,087	1,272
Lubricants—do	155	167	169	259	347
Other—do	168	204	312	505	800
Total refinery products—do	32,916	39,271	45,510	54,132	65,220
Refinery fuel and loss—do	2,042	2,557	3,008	3,714	4,152
Crude oil processed—do	34,958	41,828	48,518	57,846	69,372

e Estimate. r Revised. NA Not available.

[1] Net exports plus consumption in agglomerating plants and blast furnaces in iron and steel industry.

[2] Includes rerolled scrap.

[3] Includes alloys except solder.

[4] Includes gas oil, and fuel oils less than 5° E ("fluidissimo" and "fluido").

[5] Includes fuel oils greater than 5° E ("semi-fluido" and "denso").

TRADE

Italy's overall trade balance was greatly improved in 1965. The net deficit for the year amounted to only $159 million, less than 13 percent of the 1964 figure and only 6 percent of the $2.5 billion deficit sustained in 1963. Mineral commodity trade increased, and accounted for approximately 8 percent of the $1.1 billion reduction in deficit that was realized in 1965 as shown in the following tabulation:

	Value, million dollars		Mineral commodities share of total trade (percent)
	Mineral commodities	All commodities	
Export:			
1963	665	5,047	13.1
1964	851	5,946	14.2
1965	1,150	7,188	15.9
Import:			
1963	2,123	7,539	28.1
1964	2,043	7,231	28.2
1965	2,256	7,347	30.7
Trade balance:			
1963	—1,458	—2,492	XX
1964	—1,192	—1,275	XX
1965	—1,106	—159	XX

XX Not applicable.

Source: Statistical Office of the United Nations (1966).

The gain in mineral commodity export value was principally due to iron and steel, with assistance from aluminum and building stone. Substantial increases in exports of petroleum products and copper were overshadowed by even larger increases in imports of crude oil and copper scrap. Along with coal, iron ore, and fertilizers, these items continued to dominate Italy's mineral commodity trade, as is shown in the accompanying table:

Commodity	Value, million dollars		Share of mineral commodity trade (percent)	
	1964	1965	1964	1965
Exports:				
Metals:				
Ores and concentrates	10.5	10.2	1.2	0.9
Iron and steel [1]	242.7	367.0	28.5	31.9
Nonferrous metals: [1]				
Copper	37.1	63.2	4.4	5.5
Aluminum	24.3	35.3	2.8	3.1
Mercury	18.9	19.0	2.2	1.6
Other	13.5	11.3	1.6	1.0
Nonmetals:				
Fertilizers [2]	75.5	82.3	8.9	7.2
Building stone	52.5	63.7	6.2	5.5
Other [3]	46.6	64.1	5.5	5.6
Mineral fuels:				
Petroleum products	298.1	388.8	35.0	33.8
Other [4]	2.8	3.6	.3	.3
Chemical elements, oxides and inorganic compounds [5]	28.8	41.2	3.4	3.6
Total	851.3	1,149.7	100.0	100.0
Imports:				
Metals:				
Ores and concentrates:				
Iron ore	52.5	76.0	2.6	3.4
Other	18.2	23.3	.9	1.0
Iron and steel [1]	517.4	499.3	25.3	22.1
Nonferrous metals: [1]				
Copper	144.7	191.2	7.1	8.5
Aluminum	43.2	42.2	2.1	1.9
Others	99.7	115.7	4.9	5.1
Nonmetals:				
Fertilizers [2]	30.7	34.5	1.5	1.5
Clay and clay construction materials [6]	35.8	30.1	1.7	1.3
Other	53.2	56.2	2.6	2.5
Mineral fuels:				
Coal, including briquets	157.0	151.5	7.7	6.7
Petroleum, crude [7]	787.0	930.5	38.5	41.3
Petroleum products	58.4	62.2	2.9	2.8
Other [4]	20.0	14.8	1.0	.7
Chemical elements, metallic oxides, and inorganic compounds [5]	25.5	28.1	1.2	1.2
Total	2,043.3	2,255.6	100.0	100.0

[1] Including scrap.
[2] Including manufactured fertilizer.
[3] Including other nonmetallic mineral manufactures listed under Groups 661, 662, and 663 (S.I.T.C., revised).
[4] Including crude chemicals derived from coal.
[5] Excluding mercury and including only those elements, metallic oxides and inorganic compounds under Item 513.1(3) and Subgroups 513.2, 513.3, 513.5, and 513.6 (S.I.T.C. revised).
[6] Includes refractory contruction materials.
[7] Including partly refined petroleum.

Source: Statistical Office of United Nations (1966).

Metals continued to account for most of the value of mineral commodity exports in 1965, with 44 percent of the total, followed by fuels (34.1 percent), nonmetals (18.3 percent), and chemical products (3.6 percent). West Germany remained the principal destination with consignments valued at $135 million, followed by France, ($89 million), the United States, ($65 million), and the United Kingdom ($61 million).

Imports of mineral fuels, valued at a record $1.16 billion in 1965, again accounted for slightly more than half (51.5 percent) of the total value of mineral commodity imports, followed by metals (42 percent), nonmetals (5.3 percent), and chemical products (1.2 percent). Because of the dominance of petroleum, Kuwait continued to lead all other countries among sources of Italy's mineral commodity imports. Imports from Kuwait in 1965 were valued at $361 million, followed by those from the United States ($270 million) and West Germany ($228 million).

Table 2.—Italy: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum:				
Bauxite	930	2,186	3,247	Switzerland 2,070.
Oxide and hydroxide	23,178	8,412	11,606	Austria 3,949; Switzerland 2,599.
Metal and alloys:				
Scrap	---	---	37	
Unwrought	252	19,171	32,042	West Germany 10,544; United Kingdom 5,067.
Semimanufactures	8,356	17,484	23,010	United States 6,530; West Germany 2,436.
Antimony	---	1	1	NA.
Beryllium oxide—kilograms	3,000	900	500	NA.
Bismuth, including manufactures	---	1	(1)	NA.
Cadmium	3	29	12	West Germany 15.
Chromium:				
Ore and concentrate	1,500	2,071	---	France 1,502; Switzerland 509.
Oxide and hydroxide	62	218	336	Finland 100; West Germany 40; Sweden 30.
Cobalt:				
Oxide and hydroxide	---	12	---	NA.
Metal	---	(1)	1	NA.
Copper:				
Ore and concentrate	r 2,192	2,502	1,015	Sweden 1,480; Spain 811.
Matte	---	r 190	80	All to West Germany.
Metal and alloys:				
Scrap	249	2,892	472	West Germany 1,658; Austria 471; Belgium 441.
Blister copper	---	180	527	Switzerland 89; France 50.
Refined	20	10,473	16,523	West Germany 5,050; France 1,431; Netherlands 1,429; Austria 1,148.
Master alloy	---	22	79	West Germany 20.
Semimanufactures	9,851	27,437	39,180	West Germany 5,237; Israel 3,000; France 2,324.
Germanium—value, thousands	NA	NA	$198	NA.
Gold, semimanufactures—troy ounces	NA	NA	e 1,350	NA.
Iron and steel:				
Iron ore—thousand tons	---	7	37	France 6.
Roasted pyrite—do	656	667	642	Austria 350; United Kingdom 165.
Scrap—do	2	5	2	France 3; Belgium-Luxembourg 1.
Pig iron [2]—do	1	3	3	France 2.
Ferroalloys—do	6	13	16	United States 4; West Germany 3.
Steel: ingots and other primary forms—do	r 103	r 114	113	Switzerland 67; West Germany 17; France 12.
Semimanufactures:				
Bars, rods, and sections—do	87	481	1,013	West Germany 167; France 71; Canada 26.
Universals, plates and sheets—do	289	440	652	Yugoslavia 64; Spain 57; France 48.
Hoop and strip—do	22	42	57	Yugoslavia 10; Greece 9; Turkey 4.
Rails and accessories—do	13	10	24	Switzerland 5; Turkey 2; United Arab Republic (Egypt) 2.
Wire, excluding wire rod—do	8	12	21	Yugoslavia 5; Libya 1; Ethiopia 1.
Tubular products—do	331	373	553	Libya 69; Argentina 64; Netherlands 37; Iran 22.
Castings, rough—do	2	2	5	Switzerland 1.
Total semimanufactures—do	752	1,360	2,325	
Lead:				
Ore and concentrate	4,440	5,467	4,662	Austria 5,000; Belgium-Luxembourg 203.
Oxides	958	1,393	1,570	Bulgaria 1,125; Yugoslavia 149.
Metal and alloys:				
Unwrought	114	193	159	Switzerland 95; West Germany 47.
Semimanufactures	406	54	79	NA.
Magnesium and alloys:				
Scrap	---	20	---	All to West Germany.
Unwrought	4,161	5,697	5,919	West Germany 3,955; France 875.
Semimanufactures	5	7	10	Yugoslavia 5.
Manganese:				
Ore	738	679	1,052	West Germany 620.
Metal	NA	NA	6	NA.
Mercury—76-pound flasks	r 75,740	83,514	51,112	United Kingdom 21,669; Japan 19,522; West Germany 12,676; France 4,786; United States 4,641; Yugoslavia 3,017; North Korea 1,508.
Molybdenum	---	2	3	NA.
Nickel and alloys:				
Unwrought, including scrap	2	207	178	West Germany 97; Netherlands 30.
Semimanufactures	988	r 793	1,090	Morocco 198; Iran 190; Bulgaria 96; Iraq 43.

See footnotes at end of table.

Table 2.—Italy: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals—Continued				
Selenium—kilograms	3,000	6,400	NA	NA.
Silicon	8,999	r 9,383	12,187	West Germany 4,154; United Kingdom 2,129; Yugoslavia 760.
Silver and platinum-group metals:				
Ores and residues—kilograms	---	---	19	
Platinum [3]—thousand troy ounces	26	r 96	50	West Germany 71; United Kingdom 21.
Silver—do	132	74	288	France 15; United Kingdom 12; Belgium-Luxembourg 6.
Tantalum—value, thousands	---	---	$41	
Tin and alloys, all forms—long tons	31	r 247	191	Sweden 142; United Kingdom 34; Switzerland 33.
Titanium:				
Dioxide	15,308	13,264	17,597	United States 1,698; United Kingdom 1,691; France 1,112.
Metal, including scrap	---	3	1	NA.
Tungsten	2	2	27	NA.
Zinc:				
Ore and concentrate	39,675	[4] 49,279	30,424	Belgium-Luxembourg 13,392; Austria 12,800; France 7,102.
Oxides	692	565	389	France 254; West Germany 110; Switzerland 65.
Metal and alloys:				
Unwrought	302	1,580	1,423	United States 581; Belgium-Luxembourg 499; mainland China 338; Switzerland 140.
Semimanufactures	304	443	150	Switzerland 221; France 121.
Miscellaneous, n.e.s.:				
Nonferrous ores, including ashes and residues	11,171	20,936	12,866	West Germany 9,024; Belgium-Luxembourg 4,265.
Base metals	1	3	10	NA.
Pyrophoric alloys	2	3	---	NA.
Metallic oxides and hydroxides, n.e.s.	284	24	75	NA.
Metalloids, n.e.s.	323	241	176	NA.
Oxides, hydroxides of barium, strontium, magnesium	306	381	9,341	Belgium-Luxembourg 115; Sweden 37.
Nonmetals:				
Abrasives, n.e.s.:				
Dust, powder of precious and semi-precious stones—kilograms	---	473	---	NA.
Grinding stones	1,257	1,615	2,239	France 355; West Germany 195; United Kingdom 93.
Pumice	343,825	321,734	148,695	Netherlands 131,316; West Germany 90,677; United States 37,443.
Corundum, garnet, tripoli and other	562	402	1,556	
Asbestos	6,412	9,017	25,699	West Germany 3,446; France 3,031.
Asbestos- and fiber-cement products	32,484	50,608	43,591	France 9,443; Tunisia 6,887; Aden 3,164.
Barite, including witherite	22,409	11,186	32,993	West Germany 5,659; Rumania 2,400.
Cement	r 149,796	174,639	567,224	Switzerland 69,184; Libya 25,927; Spain 22,383.
Chalk	225	509	455	Mostly to Switzerland.
Clays and clay construction materials:				
Bentonite	30,061	22,460	21,316	France 7,067; Libya 3,966; Switzerland 3,479; United Kingdom 3,459.
Kaolin	272	350	549	
Other, including andalusite, etc	1,441	1,519	3,023	
Construction materials:				
Refractory	12,629	12,311	17,724	Austria 2,051; West Germany 1,803; Switzerland 1,206.
Nonrefractory	206,938	255,412	337,762	Switzerland 88,231; Libya 49,637; France 44,953.
Cryolite	1	---	36	
Diamond:				
Gem—value, thousands	$234	$192	$50	United Kingdom $154.
Industrial—thousand carats	35	320	---	West Germany 65; Switzerland 45; United States 35.
Diatomite	1,332	801	634	France 604.
Dolomite, including calcined	11,526	10,541	13,992	Switzerland 6,372; Austria 1,892.
Feldspar	19,433	21,763	23,194	West Germany 13,669.
Fertilizer materials:				
Crude:				
Potassium salts	---	4,454	13,444	All to Yugoslavia.
Sodium nitrate	---	25	---	All to Common Market countries.
Manufactured:				
Nitrogenous—thousand tons	1,463	1,012	1,161	United Arab Republic (Egypt) 231; Yugoslavia 154; Greece 146; Spain 129.
Phosphatic—do	48	32	2	Greece 17; Albania 8; Bulgaria 6.
Potassic—do	77	114	135	Poland 17; United States 17; Yugoslavia 13.
Mixed—do	283	512	313	Yugoslavia 187; Czechoslovakia 57.
Ammonia, anhydrous	12,156	13,240	13,664	Greece 5,829; Switzerland 3,046.

See footnotes at end of table.

Table 2.—Italy: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Nonmetals—Continued				
Fluorspar	38,268	46,658	52,464	United States 34,651.
Graphite	1,516	1,292	1,680	France 889.
Gypsum and plasters	9,367	13,368	18,368	Switzerland 7,288; West Germany 2,852.
Lime	18,646	27,863	37,038	Libya 22,549.
Limestone (industrial)	702	646	869	NA.
Magnesite	109	78	92	NA.
Mica:				
Crude	48	135	166	France 25.
Worked	24	40	32	Yugoslavia 19; France 7.
Pigments, mineral, including iron oxide and hydroxide	1,103	1,811	1,142	United States 538; Sudan 165.
Precious and semiprecious stones (including synthetic), except diamond value, thousands	$142	$241	$326	Switzerland $122; United States $52.
Pyrite, unroasted	101,854	47,555	52,569	Switzerland 31,824; Netherlands 10,100; Austria 5,288.
Quartz and quartzite	5,226	16,678	20,743	Switzerland 9,069; France 6,055.
Salt	75,459	54,833	56,787	Norway 30,369; France 8,804.
Other sodium and potassium compounds:				
Caustic soda	101,995	119,616	218,127	U.S.S.R. 50,016; United Arab Republic (Egypt) 16,544.
Caustic potash	4,246	2,677	2,016	Hungary 670; Rumania 446; Switzerland 404.
Stone, sand and gravel:				
Dimension stone:				
Unworked:				
Granite, porphyry, etc	29,582	32,951	33,836	Switzerland 21,762; West Germany 4,272; Austria 3,719.
Marble and other calcareous	252,837	261,015	269,789	West Germany 67,767; France 33,608; United States 30,712.
Slate	3,429	4,102	5,117	West Germany 1,621; Switzerland 1,172; France 567.
Worked:				
Slate	13,964	17,580	21,869	West Germany 9,515; United States 5,218.
Other	84,414	130,879	195,421	France 38,233; West Germany 37,734; United States 32,294.
Gravel and crushed stone	339,860	443,417	390,177	Switzerland 117,839; West Germany 70,287; Belgium-Luxembourg 51,082.
Sand	178,623	229,029	157,768	Switzerland 227,605.
Strontium minerals	89	134	100	NA.
Sulfur, including purified sulfur	8,121	4,753	2,473	Yugoslavia 2,886; Thailand 592.
Talc and steatite	47,173	43,673	43,013	United States 13,451; United Kingdom 6,698; West Germany 5,763; France 4,646.
Miscellaneous:				
Mineral substances, n.e.s	47,364	67,996	80,372	United Kingdom 62,167.
Inorganic chemicals:				
Hydrogen and rare gases	217	73	93	NA.
Halogens, excluding chlorine	---	123	123	France 73; West Germany 45.
Inorganic acids, oxygen compounds of nonmetals or metalloids	83,697	118,841	111,690	Greece 45,130; Spain 29,355; Turkey 21,638.
Slag, scale and other nonmetal-bearing waste of iron and steel industry	4,948	19,590	26,084	France 16,939.
Other nonmetal-bearing ash and slag	---	359	1,436	All to Common Market countries.
Other, including artificial corundum	761	663	2,274	NA.
Mineral fuels:				
Asphalt and bitumen, natural	9,151	6,969	6,968	United Kingdom 6,324.
Coal, including briquets	23,931	4,218	1,412	Ships' bunkers 2,231; Zanzibar 313; India 192.
Coke	148,769	99,844	120,158	Austria 29,612; Switzerland 20,406; Greece 15,610.
Gas, natural and manufactured, including LPG thousand tons	47	56	145	Lebanon 15; France 10; Spain 8; Brazil 6.
Petroleum:				
Crude	179,311	337	---	NA.
Refinery products:				
Gasoline [5] thousand tons	1,814	1,865	2,503	United Kingdom 369; Switzerland 329; Austria 290.
Kerosine, white spirit, etc.[5] do	485	407	764	India 67; Switzerland 50; Greece 41; Nigeria 33.
Distillate fuel oil [5] do	4,139	5,022	6,383	France 1,002; Switzerland 989; Netherlands 733; United Kingdom 459; West Germany 307; Belgium-Luxembourg 297.
Residual fuel oil [5] do	2,618	2,725	6,376	United Kingdom 970; Austria 257; Greece 247; France 224; Switzerland 184.
Lubricants [5] do	40	88	272	Switzerland 19; United States 12; India 7; France 7.
Petroleum coke do	14	9	14	Switzerland 7; Austria 2.

See footnotes at end of table.

Table 2.—Italy: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Mineral fuels—Continued				
Petroleum—Continued				
Refinery products—Continued				
Bitumen and other [6] ---do---	203	181	153	Austria 67; Switzerland 37; Tunisia 16; Spain 13.
Total [5 6] ---do---	9,313	10,297	16,465	
Bunker deliveries:				
Gasoline ---do---	326	310	130	
Kerosine ---do---	323	383	382	
Distillate fuel oil ---do---	236	405	440	
Residual fuel oil ---do---	2,594	3,516	3,696	
Lubricants ---do---	17	15	41	
Total ---do---	3,496	4,629	4,689	
Grand total refinery products [6] ---do---	12,809	14,926	21,154	
Miscellaneous chemicals from the distillation of coal, petroleum and natural gas	3,916	867	3,645	France 659; Yugoslavia 122.

[e] Estimate. [r] Revised. NA Not available.
[1] Less than ½ unit.
[2] Includes spiegeleisen, cast iron, sponge, powder, etc.
[3] Including other metals of platinum group.
[4] Includes 16 tons of zinc dust (blue powder).
[5] Excludes bunkers.
[6] Excludes liquefied petroleum gases.

Table 3.—Italy: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963 [1]	1964 [1]	1965	Principal sources, 1964
Metals:				
Aluminum:				
Bauxite	349,605	378,788	476,606	Yugoslavia 249,105; British Guiana 28,992; Greece 20,832.
Oxide and hydroxide [2]	9,164	4,940	2,729	France 3,524; United States 638; West Germany 606.
Metal and alloys:				
Scrap	52,989	32,321	27,804	United States 10,599; Canada 8,940; France 2,630.
Unwrought	54,112	32,690	33,691	Norway 7,439; United States 7,411; Austria 4,561; Canada 4,558.
Semimanufactures	16,268	17,438	15,893	France 5,438; West Germany 2,574; Belgium-Luxembourg 2,298; United States 1,975.
Antimony	598	331	437	Belgium-Luxembourg 153.
Arsenic oxides and acids	1,626	1,606	1,866	France 942; West Germany 265; East Germany 190.
Beryllium:				
Oxide kilograms	5,000	300	4,720	NA.
Metal and alloys ---do---	---	400	950	NA.
Bismuth, unwrought	42	36	45	United Kingdom 11.
Cadmium	52	48	47	United States 14.
Chromium:				
Chromite	44,737	79,525	100,268	Turkey 35,796; U.S.S.R. 21,300; Philippines 9,680; Republic of South Africa 7,942.
Oxide and hydroxide	593	537	582	West Germany 506.
Metal, all forms	30	21	40	NA.
Cobalt:				
Oxide and hydroxide	281	247	219	Belgium-Luxembourg 184; United Kingdom 53.
Metal and alloys, all forms	367	299	276	Belgium-Luxembourg 257.
Copper:				
Ashes and residues	363	151	516	NA.
Matte	203	---	165	
Metal and alloys:				
Scrap	21,870	13,902	35,596	France 4,931; West Germany 3,726; United States 1,177.
Blister copper	9,792	5,506	1,895	Rhodesia-Nyasaland 2,408; Republic of South Africa 1,459.

See footnotes at end of table.

Table 3.—Italy: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963 [1]	1964 [1]	1965	Principal sources, 1964
Metals—Continued				
Copper—Continued				
Metal and alloys—Continued				
Refined	213,837	189,911	202,228	Rhodesia-Nyasaland 46,674; United States 44,509; Chile 27,923; Congo (Léopoldville) 26,248.
Master alloy	343	95	350	Belgium-Luxembourg 43; France 30.
Semimanufactures	12,404	9,093	8,617	Yugoslavia 3,140; West Germany 2,099; Switzerland 1,207.
Gallium, indium, thallium—kilograms	NA	NA	208	NA.
Germanium—do	NA	NA	479	NA.
Gold, including alloys—thousand troy ounces	2,472	1,010	e 1,610	United Kingdom 913.
Iron and steel:				
Iron ore—thousand tons	5,226	5,039	7,945	Brazil 919; Algeria 792; Venezuela 764; Mauritania 740; Liberia 644; India 300; Sweden 260.
Roasted pyrite—do	1	6	68	Yugoslavia 3; U.S.S.R. 3.
Scrap—do	3,846	3,149	4,593	France 1,244; West Germany 1,117; United States 539.
Pig iron, cast iron, and spiegeleisen—do	910	542	657	U.S.S.R. 206; West Germany 182.
Powder, shot, sponge, and grit—do	8	7	9	France 3; Sweden 3.
Ferroalloys:				
Ferromanganese—do	55	54	79	France 21; Republic of South Africa 14.
Other—do	30	30	35	France 9; Yugoslavia 4; Norway 3; Turkey 3.
Ingots and other crude forms—do	1,526	1,410	956	West Germany 286; France 219; United Kingdom 209; Japan 182; Netherlands 128 U.S.S.R. 102.
Semimanufactures:				
Bars, rods (including wire rod) and sections—thousand tons	660	297	270	West Germany 109; France 73; Belgium-Luxembourg 43.
Universals, plates and sheets—do	1,394	871	608	France 267; West Germany 218; Belgium-Luxembourg 121.
Hoop and strip—do	216	110	93	France 35; Belgium-Luxembourg 27; West Germany 18.
Rails and accessories—do	86	21	11	West Germany 10; France 5; United Kingdom 4.
Wire—do	29	19	15	Austria 6; West Germany 4; Belgium-Luxembourg 3.
Tubular products—do	100	65	48	West Germany 26; France 11; Yugoslavia 7.
Castings, unworked—do	2	2	1	West Germany 1.
Total semimanufactures—do	2,487	1,385	1,046	
Lead:				
Ore and concentrate	20,966	9,366	32,762	Morocco 6,025; Greece 3,003.
Ashes and residues	1,258	782	2,467	NA.
Oxides	3,556	4,055	3,495	Mexico 2,297; Australia 751.
Metal including alloys:				
Scrap	21,382	16,197	30,872	France 6,918; Switzerland 4,313; West Germany 1,512.
Unwrought	38,966	36,338	45,551	Mexico 6,924; Australia 5,589; Peru 5,175; Yugoslavia 4,604; Austria 3,451.
Semimanufactures	3,813	3,617	3,374	Yugoslavia 3,122.
Magnesium and alloys:				
Scrap	348	586	777	West Germany 398; Netherlands 53; Greece 41.
Unwrought	29	77	171	United States 55.
Semimanufactures	43	23	4	NA.
Manganese:				
Ore and concentrate	168,391	105,850	106,231	United Arab Republic (Egypt) 53,042; Republic of the Congo (Léopoldville) 17,201; U.S.S.R. 9,101.
Oxide	134	317	526	Japan 144; Netherlands 77.
Metal	130	536	511	NA.
Mercury—76-pound flasks	406	290	1,102	Spain 261.
Molybdenum:				
Ore and concentrate	1,133	1,241	1,525	United States 1,216.
Trioxide	NA	NA	35	NA.
Metal	21	40	123	U.S.S.R. 18; Austria 7.
Nickel:				
Matte	1,062	1,015	630	Canada 831; United Kingdom 140.

See footnotes at end of table.

Table 3.—Italy: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963[1]	1964[1]	1965	Principal sources, 1964
Metals—Continued				
Nickel—Continued				
Metal including alloys:				
Scrap	607	182	612	United States 109; Switzerland 48.
Unwrought	6,164	7,212	8,456	United Kingdom 2,924; Canada 2,620; Norway 1,035.
Semimanufactures	1,481	1,076	999	United Kingdom 361; West Germany 286; Switzerland 131.
Selenium	21	28	17	Sweden 8; Belgium-Luxembourg 4.
Silicon	80	26	15	NA.
Silver and platinum:				
Waste and sweepings—troy ounces	868	900	1,543	Yugoslavia 354.
Silver—thousand troy ounces	19,830	21,938	17,543	West Germany 9,685; United States 6,788; United Kingdom 2,672.
Platinum and platinum-group metals—do	89	89	115	United Kingdom 44; West Germany 22; United States 8.
Tantalum:				
Ore and concentrate	3	NA	51	NA.
Metal	8	2	3	United States 1.
Tin:				
Oxide—long tons	62	65	82	West Germany 63.
Metal including alloys:				
Unwrought and scrap—do	5,895	5,202	5,428	Malaysia 3,633; Netherlands 1,076; mainland China 320.
Semimanufactures—do	120	72	39	West Germany 49; United Kingdom 15.
Titanium:				
Ore and concentrate	98,913	112,228	85,909	U.S.S.R. 36,925; Finland 21,965; Australia 16,433; Norway 14,650.
Dioxide	13,694	14,532	15,979	West Germany 5,581; United Kingdom 3,514; Belgium-Luxembourg 2,349.
Metal	24	43	38	NA.
Tungsten:				
Ore and concentrate	79	60	13	Bolivia 30; Thailand 20.
Trioxide	NA	NA	5	NA.
Metal	41	29	35	France 8; West Germany 6; Austria 4; Sweden 4.
Uranium and thorium:				
Ore	42	---	1	
Metal and alloys—kilograms	1,106	---	988	
Vanadium pentoxide	115	232	206	West Germany 180.
Zinc:				
Ore and concentrate	9,065	1,040	23	Greece 790; Iran 250.
Ashes and residues	9,454	5,512	7,764	Switzerland 1,360; West Germany 1,329.
Oxide	2,338	3,583	2,591	Netherlands 1,371; West Germany 728; Poland 722.
Dust (blue powder)	3,127	2,655	2,720	Belgium-Luxembourg 2,370.
Metal including alloys:				
Scrap	7,117	4,571	4,933	West Germany 1,500; France 972; Switzerland 944.
Unwrought	31,326	43,486	40,519	Belgium-Luxembourg 7,530; Australia 5,442; Bulgaria 4,967; Canada 3,654; Austria 3,632.
Semimanufactures	615	354	329	Yugoslavia 125; West Germany 107; United Kingdom 92.
Zirconium:				
Ore and concentrate	11,156	13,238	11,790	Australia 13,032.
Oxide	NA	NA	304	NA.
Metal—kilograms	1,100	700	1,463	NA.
Metals, n.e.s.:				
Ores and concentrates	1,974	2,127	12,578	Australia 768; Bolivia 435; Thailand 362.
Ashes and residues	12,779	15,480	34,477	Austria 6,503; Yugoslavia 2,049; France 2,029; Hungary 1,794.
Nonferrous metals	84	77	---	NA.
Alkali, alkaline-earth and rare-earth metals	4,378	4,962	5,614	West Germany 2,192; France 1,497; United Kingdom 686; U.S.S.R. 565.
Metalloids	30	22	18	NA.
Pyrophoric alloys	1	---	17	
Oxides, hydroxides of strontium, barium, magnesium	585	475	526	West Germany 238; United States 116; France 91.
Nonmetals:				
Abrasives:				
Corundum, natural; including garnet	205	212	194	Mainly from West Germany and United States.
Corundum, artificial[3]	NA	NA	877	Mainly from France.

See footnotes at end of table.

Table 3.—Italy: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963 [1]	1964 [1]	1965	Principal sources, 1964
Nonmetals—Continued				
Abrasives—Continued				
Diamond, industrial—carats	5,000	20,000	10,000	All from Belgium-Luxembourg.
Dust and powder of natural and synthetic gems—carats	150,000	655,000	645,000	United Kingdom 490,000; Netherlands 80,000.
Emery	1,723	1,369	1,230	Mainly from Greece.
Grinding stones	3,045	2,559	2,530	West Germany 874; United Kingdom 376.
Tripoli	1,379	1,420	1,296	Mainly from West Germany.
Asbestos	38,757	43,890	38,639	Republic of South Africa 16,759; Canada 16,618; U.S.S.R. 5,586.
Asbestos-cement products	14,464	14,787	12,695	Yugoslavia 6,928; Belgium-Luxembourg 4,365.
Barite, including witherite	21,596	27,861	18,724	Spain 22,359; Morocco 3,550; Portugal 1,770.
Borates, natural	50,175	54,498	83,503	Turkey 51,016; United States 3,481.
Cement	120,639	163,918	41,571	Tunisia 55,216; Israel 52,446; France 49,915.
Chalk	5,887	6,461	8,593	France 5,712.
Clays and clay construction materials:				
Clay:				
Bentonite	4,018	4,716	4,891	United Kingdom 279,682; France 190,044; West Germany 137,388; Czechoslovakia 53,633; Poland 41,049; United States 27,410.
Kaolin	227,643	280,000	268,513	
Refractory and other	548,126	506,919	440,985	
Construction materials:				
Refractory	126,986	102,593	63,687	West Germany 43,440; United States 21,628.
Nonrefractory	34,813	30,610	8,949	Yugoslavia 16,292; West Germany 7,895.
Cryolite and chiolite, natural	1,080	910	611	Denmark 870.
Diamond, non-industrial, unset—thousand carats	150	455	NA	Republic of South Africa 255; United States 110; Belgium-Luxembourg 50.
Diatomite	1,663	7,087	8,087	Hungary 2,739; United States 1,237; Yugoslavia 1,062.
Dolomite	1,082	1,087	747	Norway 734; West Germany 122.
Earth pigments	509	587	435	Spain 172; West Germany 161.
Feldspar (excluding nepheline)	11,441	10,981	14,773	West Germany 5,805; Sweden 2,363.
Fertilizer materials:				
Crude:				
Phosphate rock—thousand tons	1,479	1,716	1,651	United States 784; Tunisia 476; Morocco 312; Togo 65.
Potassium salts—do	38	40	36	France 31; West Germany 9.
Manufactured:				
Nitrogenous	8,585	3,012	1,890	Austria 2,657.
Phosphatic, including basic slag	21,040	5,687	81,603	Belgium-Luxembourg 2,451; United States 2,005.
Potassic	140,952	180,619	165,848	Israel 54,600; France 47,300; Spain 45,955.
Other	14,825	9,300	11,828	France 4,869; Austria 3,313.
Fluorspar	9,935	14,793	5,676	Spain 13,583.
Graphite	10,367	9,328	11,456	Austria 6,733; West Germany 1,190; Malagasy Republic 1,085.
Gypsum and plasters	556	616	711	West Germany 310; United States 167.
Lime	2,720	2,494	1,212	Yugoslavia 2,360.
Limestone, for flux, cement, etc	920	659	30	NA.
Magnesite	39,084	45,362	49,558	Greece 18,436; Austria 13,955; Yugoslavia 8,749.
Meerschaum, amber, jet	440	---	---	
Mica:				
Crude	1,834	1,849	2,211	India 691; United Kingdom 440; United States 327.
Worked	129	100	75	France 42; West Germany 15; Czechoslovakia 15.
Nepheline	270	748	3,383	Mainly from Canada.
Precious and semiprecious stones, n.e.s.:				
Natural—kilograms	76,039	21,129	26,590	West Germany 1,696.
Synthetic, including reconstructed—kilograms	9,965	r 21,899	22,019	France 16,074; Switzerland 5,626.
Pyrite, unroasted	766,110	854,100	931,486	Cyprus 353,540; U.S.S.R. 337,505; Turkey 71,375; Yugoslavia 41,560; Greece 39,050.
Quartz and quartzite	45,657	52,758	49,291	Switzerland 14,377; West Germany 12,961; Spain 11,786.
Salt	55,851	37,542	2,198	Spain 35,290.
Mineral pigments including iron oxides and hydroxides	5,571	5,430	6,171	West Germany 3,396; Spain 954.
Stone, sand and gravel:				
Dimension stone:				
Marble and other calcareous	123,968	113,469	127,541	Portugal 61,765; Yugoslavia 16,385; Greece 7,964; Spain 6,112; France 5,092.
Granite, porphyry, sandstone, etc	22,393	23,465	29,560	Republic of South Africa 5,689; Norway 5,615; Sweden 4,266.

See footnotes at end of table.

Table 3.—Italy: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963 [1]	1964 [1]	1965	Principal sources, 1964
Nonmetals—Continued				
Stone, sand and gravel—Continued				
Dimension stone—Continued				
Worked, all types	1,463	975	652	Norway 302; France 204.
Gravel and crushed stone	4,934	5,340	4,873	France 4,116; Austria 700.
Sand	456,943	490,052	683,232	Belgium-Luxembourg 263,880; France 127,707; Netherlands 69,102.
Sulfur:				
Crude	---	61,672	73,334	Canada 35,340; United States 14,450.
Purified	---	114	95	France 93.
Sulfuric acid including oleum	2,005	263	68	West Germany 45.
Talc and steatite	13,180	12,310	11,276	Austria 7,043; India 2,469; France 893; mainland China 870.
Miscellaneous, n.e.s.:				
Other nonmetallic minerals	36,195	38,032	43,874	Republic of South Africa 16,299; West Germany 7,852; Greece 7,335.
Slag, scale and other nonmetallic waste from iron and steel manufacture—thousand tons	13	23	4	France 22.
Nonmetallic building materials, unfired	2,055	1,488	171	Austria 1,464.
Elements and inorganic chemicals:				
Hydrogen and rare gases	74	149	141	United Kingdom 99; West Germany 9.
Halogens, excluding chlorine	157	341	104	Argentina 149; Chile 75; Japan 47.
Acids and oxygen compounds	6,804	7,421	7,629	West Germany 5,701.
Bases	10,554	10,443	8,993	West Germany 3,532; France 2,200.
Mineral fuels:				
Asphalt, natural	2,536	2,710	2,582	United States 2,470.
Asphalt building products	254	1,103	576	West Germany 778; France 316.
Carbon black	27,918	21,725	24,507	United States 9,343; France 4,346; United Kingdom 4,437.
Coal:				
Anthracite and bituminous thousand tons	10,669	10,035	10,310	United States 7,277; U.S.S.R. 1,225; West Germany 501; Poland 448; Republic of South Africa 257; Yugoslavia 103.
Briquets—do	143	167	107	West Germany 117; France 24.
Chemicals—do	86	59	39	U.S.S.R. 16; West Germany 9; Czechoslovakia 8; United States 6.
Coke—do	675	365	270	West Germany 254; United Kingdom 50; Spain 29.
Lignite, including briquets—do	289	341	237	West Germany 206; East Germany 89; Yugoslavia 30.
Peat, including briquets—do	4	6	7	West Germany 4.
Petroleum gases (liquefied) [4]—do	19	10	10	France 9.
Petroleum:				
Crude—do	45,972	54,972	67,289	Kuwait 20,686; Saudi Arabia 10,189; Iraq 7,100; U.S.S.R. 6,453; Libya 4,901; Iran 1,790; United Arab Republic (Egypt) 1,776; Venezuela 766; Tunisia 606.
Partly refined—do	493	261	NA	Venezuela 104; U.S.S.R. 103.
Refinery products:				
Gasoline—do	121	159	109	United Arab Republic (Egypt) 50; Netherlands Antilles 34.
Kerosine, including white spirit—do	126	11	9	Kuwait 4; Iraq 2; Saudi Arabia 2.
Distillate fuel oil—do	36	18	207	Iraq 3; Iran 2; Saudi Arabia 2.
Residual fuel oil—do	2,659	1,546	1,901	United Arab Republic (Egypt) 318; U.S.S.R. 279; Rumania 258; Kuwait 256; Netherlands Antilles 122.
Lubricants, including grease—do	164	153	100	United States 78; Netherlands 33; France 17.
Petroleum coke—do	195	228	224	United States 205; Netherlands 13.
Bitumen and other [5]—do	124	164	176	United States 127.
Total refinery products—do	3,425	2,279	2,726	

r Revised. NA Not available.

[1] In a number of cases, figures given differ slightly from those appearing in Minerals Yearbook, Volume IV for 1964, in some cases because of revisions in published sources and in other cases because a different source was used.

[2] Excluding artificial corundum.

[3] Includes only material designated for abrasive use.

[4] Mostly produced in petroleum refineries.

[5] Excluding liquefied petroleum gases.

COMMODITY REVIEW

METALS

Aluminum.—Of the bauxite produced in 1965, the Montecatini Co. produced 166,000 tons from the San Giovanni Rotondo mine while the remainder was produced mostly by Società Alluminio Veneto Anonima (SAVA) from mines in Puglia. Montecatini was unable to locate additional bauxite reserves in the Rotondo mine area, but the results of exploration and ore dressing tests on deposits at Boca della Selva in Campania were encouraging and the company applied for mining concessions.

Consumption of bauxite in 1965 for production of alumina was 384,900 tons by the Montecatini Co. and 297,400 tons by SAVA. Other industries consumed 20,000 tons and 19,300 tons were added to stocks. Imports of bauxite increased by 26 percent. The principal source continued to be Yugoslavia, while imports from Guinea and Greece were substantially increased. The value of imports rose to $5.1 million in 1965.

Almost all of the increase in primary aluminum output came from Montecatini plants. The company's output in 1965 increased by 13 percent, to 72,437 tons; SAVA produced 47,978 tons; and 3,690 tons were produced by Alcan Alluminio Italiano. Superpure aluminum was produced almost exclusively by SAVA.

Aluminum consumption in 1965 included 128,000 tons of primary and 66,000 tons of secondary metal including that for export. Approximately 58 percent was used for semimanufactures, 38 percent for castings, and 4 percent for other products. Net domestic consumption was 171,500 tons, compared with 160,000 tons in 1964. Exports of unwrought aluminum and semimanufactures increased by a total of 19,000 tons and were valued at $35 million.

The new rolling mill of Lavorazione Leghe Leggere S.p.A. at Fusina was almost completed by yearend. Initial annual production capacity of the plant will be 47,000 tons. The company was the principal Italian producer of aluminum semimanufactures, with output of 28,400 tons in 1965. At Milan, Società Trafilerie e Laminatoi di Metalli (TLM) completed a new rolling mill with an annual capacity of 25,000 tons. Società Angeletti e Ciucani expected to finish construction of a plant for the production of aluminum sheet coated with synthetic resin. The plant, in which Alcan Aluminium Ltd. has a 26-percent interest, will be the largest of its type in West Europe. Also at Milan, Montecatini installed a four-high, reversible, 1,600-millimeter rolling mill at the Feltre plant. The latter, formerly owned by Metallurgica Feltrina S.p.A., produced 10,000 tons of semimanufactures in 1964.

Copper.—Production, imports, and total consumption of copper increased slightly in 1965 but remained below the levels of 1963. Exports of unwrought copper and semimanufactures continued to increase and were valued at $62 million.

Refined copper consumption in 1965 was 192,000 tons and total copper consumption was 300,000 tons. Of the latter, 140,000 tons were used for wire and cable; 123,300 tons for other semimanufactures; 28,400 tons for castings; and 8,300 tons for chemicals and other products. The principal semifabricators of copper were as follows:

Company	Plant location	Annual production capacity (metric tons)	Affiliated companies
Pirelli S.p.A	Turin, Milan, Naples	100,000	Trefimetaux.
Soc. Metallurgica Italiana S.p.A. (SMI)	Campo Tizzoro (Pistoia), Limestre Pistoiese, Fornaci di Borga (Lucca)	60,000	
Trafilerie e Laminatoi di Metalli S.p.A. (TLM)	Genoa, Milan, Brescia	40,000	Trefimetaux and Fiat.
Delta Metallurgica Ligure S.p.A	Genoa-Cornigliano, Serravalle Scrivia (Alessandria)	25,000	Istituto Recostruzione Italiano and Finmeccanica (Italian Government).
Fiat S.p.A	Turin	15,000	

Source: Metal Bulletin (London). Copper (Special Issue). May 1965, pp. 189–190.

Iron and Steel.—After years of heavy investments and new plant construction, the Italian iron and steel industry in 1965 completed facilities necessary to close the gap between steel production and domestic demand. Completion of the second blast furnace at Taranto, and of a blast furnace and three oxygen converters at Bagnoli, were largely responsible for the 57-percent increase in pig iron output and 30-percent increase in steel production. Italy accounted for 15 percent of EEC steel production.

The nation also became a net exporter of steel for the first time in 1965. While imports of steel were reduced by nearly 800,000 tons, increased domestic output coupled with lagging domestic consumption provided more than 1 million tons in excess of domestic needs. The industry was able to export most of the surplus in the form of rolled steel, although world market conditions were unfavorable and the exports were described as unprofitable. Nevertheless, the industry operated at 87 percent of rated capacity, and the trade surplus in steel was valued at more than $100 million in contrast to the deficits in previous years.

The low level of domestic steel demand in 1965 was attributed to a continuing slump in the construction industry and to a lag in new industrial investment. Steel consumption by various industrial sectors in Italy during the past 3 years, as estimated by the Italsider Co., is shown in the following tabulation:

Industry sector	(Thousand metric tons)		
	1963	1964	1965
Secondary manufactures [1]	3,130	2,660	2,820
Transport	1,960	1,750	1,750
Building	2,140	1,680	1,220
Metal construction [2]	1,915	1,420	1,530
Mechanical	1,190	1,022	930
Public works	780	700	860
Home appliances	420	450	470
Packaging	390	310	390
Casting and forging	570	530	557
Other	1,087	970	970
Total	13,582	11,492	11,547

[1] Reported as "Seconde lavorazioni".
[2] Reported as "Carpenteria metallica".
Source: Italsider S.p.A. (Genoa). Annual Report to Stockholders, 1965. April 1966, p. 62.

New capital investment in the iron and steel industry in 1965 was estimated at $373 million. Most of the total investment was concentrated in plants of the Government-controlled Finsider Group.

Expenditure item	Million dollars	
	1964	e 1965
Coke plants	40.5	17.6
Charge preparation	67.6	37.6
Blast furnaces	47.2	26.3
Steel plants	105.7	37.3
Rolling mills	309.6	158.1
General services	256.2	96.3
Total	[1] 826.8	373.2

e Estimate.
[1] Reported as $430 million in volume IV of the Minerals Yearbook 1964.

Source: Confindustria (Rome), through U.S. Embassy, Rome, Department of State Airgram A-1450, June 1, 1966.

Iron Ore.—Output of iron ore from Italian mines continued to decline in 1965. Società Mineraria Siderurgica S.p.A. (Ferromin), one of the principal producers, abandoned the Canaglia mine in Sardinia and the Manina mine in Bergamo; it also was preparing to close the Alfredo mine in Brescia. Competition from imports of high grade iron ore caused the company to withdraw from its operations on Elba and at the Gambatesa manganiferous iron ore mine on the mainland, and in April all assets of the company were taken over by the Italsider Co. Up to the time of its dissolution, Ferromin reported production of 102,000 tons of iron ore from Elba in 1965 and 20,000 tons of ore from the Gambatesa mine. The Fiat Co. closed the Antas mine at Cagliari in 1965.

Foreign companies owned by or associated with Ferromin included Sesa Goa Ltd. and Sociedade Mineira Goesa Ltd. (MINGOA) of India (Goa) and Minas del Hierro del Conjuro S.A. of Spain. Of 951,000 tons of ore produced by the Indian

properties in 1965, 304,000 tons were shipped to Italy; 545,000 tons to Japan; and 96,000 tons to destinations in north Europe. Of 258,000 tons produced by the company's Spanish affiliate, 62,500 tons were shipped to the Italsider Co.

In other developments, production of magnetite ore at the mine of Nazionale Cogne S.p.A. in Aosta increased to 312,000 tons (300,000 tons in 1964). The company reported installation of new beneficiation facilities and an 8-percent increase in output of pelletized concentrate. In Tuscany, output of pelletized iron oxide from pyrite by Montecatini's Follonica plant was probably about 300,000 tons in 1965. The plant was scheduled to produce 1,100 tons of pellets daily beginning early in 1965.

New ore preparation plants began operating at the Bagnoli and Cornigliano (Sinigaglia) steelworks of the Italsider Co. New facilities at Bagnoli included two sintering machines. Ore loading facilities were also completed at the company's Servola ironworks at Trieste.

Iron ore imports increased by 57 percent in 1965 and were valued at $76 million. Imports from Liberia increased by 1.2 million tons, and from Algeria by 400 thousand tons. Shipments of ore from Liberia, Mauretania, and Canada, where the Finsider Group has financial interests, increased by 1.75 million tons. The Fiat Co. also had a 3.5 percent share in Société des Mines de Fer du Mekambo, in Gabon.

Scrap.—Iron and steel scrap imports in 1965 increased by 46 percent and were valued at $185 million. Most of the increase was obtained from West Germany and France. Imports from West Germany increased by 745,000 tons as Italy took 90 percent of West German exports.

Scrap purchased by the Finsider Group totaled 1,370,000 tons in 1965, of which 44 percent was obtained from the home market, 32 percent from the United States, and 24 percent from EEC countries. The scrap of U.S. origin was mostly delivered to Bagnoli and Taranto.

The scrap resource in 1965 amounted to 8,893,000 tons, including 3,240,000 tons originating within the industry. Scrap consumption in oxygen steelworks increased from 69,000 tons in 1964 to 822,000 tons in 1965. In electric steelmaking, scrap consumption increased by 504,000 tons while 90,000 tons less was used for open-hearth steel.

Pig Iron.—Blast furnaces completed in 1965 increased the industry's productive capacity for pig iron by 6,100 tons per day. In January, 3,000 tons of daily capacity was added at Taranto; in May, 600 tons of daily capacity was added at Trieste; and in September daily capacity at Bagnoli was raised by 2,500 tons. The Cogne Co. also increased daily output at Aosta by 80 tons daily. These developments increased the industry's monthly output to 400,000 tons by March and 500,000 tons by October.

The Italsider Co. continued to account for approximately 94 percent of national output. An additional 179,000 tons was produced by A.F.L. Falck and 110,000 tons was produced by Nazionale Cogne. Output of the Servola works at Trieste was scheduled to increase to 380,000 tons annually in 1966, and at Bagnoli work was begun to increase the capacity of No. 4 furnace.

Imports of pig iron (including cast iron) increased in 1965 and were valued at $32 million. The principal increases were 95,000 tons from Finland and 30,000 tons from East Germany.

Ingot Steel.—The State-controlled Finsider Group of steel companies produced 7,450,000 tons of crude steel in 1965, approximately 59 percent of the national output. Of this total, Italsider plants produced 6,307,000 tons, including 1,500,000 tons from Taranto. Compared with 1964, Finsider output increased by 48 percent while production from privately owned companies rose by 11 percent. Among the private companies, the A. F. L. Falck Co. increased production to 913,000 tons in 1965, compared with 802,000 tons in 1964 and 712,000 tons in 1963; the increased output was due to operation of the company's new Concordia electric steelworks at Sesto San Giovanni. Production of steel was also increased by Nazionale Cogne to 195,000 tons (150,000 tons in 1964). Many other companies were reported to have increased production in 1965. The national monthly output reached the million-ton level in March and production during the last quarter was equivalent to 14 million tons annually.

The tenfold increase in production of steel by the Linz-Donawitz (L–D) process was due to the completion of three 125- to 150-ton converters at the Bagnoli works and to increased availability of hot metal

Table 4.—Italy: Salient statistics of iron and steel industry

(Thousand metric tons unless otherwise specified)

		1964	1965
Production:			
Pig iron:			
Blast furnace		3,249	5,253
Electric furnace		249	237
Steel:			
Open hearth		4,886	5,145
Electric		4,226	4,745
Thomas		449	—
LD		231	2,789
Oil furnace	tons	1,443	1,842
Bessemer converter	do	—	8
Total		9,793	12,681
Ingots:			
High carbon and alloy		1,060	1,302
Other		8,566	11,220
Castings		167	159
Production facilities:			
Number of blast furnaces:			
Existing	units	14	16
Operating	do	13	15
Number of open-hearth furnaces:			
Existing	units	53	51
Operating	do	39	36
Number of electric furnaces:			
Existing	do	193	183
Operating	do	142	142
Consumption:			
Crude steel (apparent)	kilograms per capita	229	229
Raw materials:			
Pig iron production:			
Iron ore, direct to furnaces		3,029	3,216
Iron ore, in agglomerating plants		2,575	5,316
Pyrite cinder, in agglomerating plants		162	265
Manganese ore		73	72
Coke:			
In agglomerating plants		158	394
In blast furnaces		2,250	3,488
Kilograms per ton of pig iron		640	638
Steel production:			
Iron ore		r 173	198
Scrap		7,346	8,439
Pig iron		3,465	5,447
Spiegeleisen and carbon ferromanganese		57	69
Energy:			
Petroleum products		885	NA
Electricity	million kilowatt hours	7,294	8,309
Gas	thousand tons SCE [1]	1,560	NA
Employment (December)	persons	56,271	58,167
Average direct hourly wage (October)	US dollars	$0.81	$0.89

r Revised.

[1] Standard coal equivalent at 7,000 kilocalories per kilogram. Calculated from units reported in billion kilocalories.

Sources: Associazione Industrie Siderurgiche Italiane (Milan). Rilevazioni Statistiche. Produzioni. Anno 1964 and Anno 1965. Statistical Office of the European Communities (Luxembourg). (a) Iron and Steel. No. 2 (1965) and No. 4 (1966); (b) Energy Statistics. No. 4 (1965) and No. 4 (1966).

at Taranto. Annual output capacities of the L–D plants were rated at 2 million tons for Bagnoli and 2.3 million tons for Taranto. Nazionale Cogne was reportedly planning to install two 35-ton L–D vessels at Aosta for production in 1968.

In electric steelmaking, Società Fabbrica Italiana Tubi completed a new plant for production of steel ingots at Riva Trigoso. The plant has a steelmaking capacity of 70,000 tons annually and will supply ingots to the company's tube mills at Sestri Levante. At Udine, the Bertoli Co. increased its electric furnace capacity to 52,000 tons annually. The Cogne Co. installed a tap-degassing plant at its works in Aosta.

Special Steels.—Production of all types of special steels increased in 1965, as shown in the following tabulation.

	Metric tons		
	1963	1964	1965
High carbon steel:			
Structural	562,829	478,438	588,879
Tool	1,686	781	1,222
Total	564,515	479,219	590,101
Alloy steel:			
Structural	506,116	434,697	529,261
Tool	18,462	16,851	20,174
Bearing [1]	46,265	64,539	70,708
Stainless	82,245	103,604	131,029
High speed	1,497	843	1,423
Other	2,378	3,303	2,994
Total	656,963	623,837	755,589
Grand total	1,221,478	1,103,056	1,345,690

[1] Production of ball bearings was 28,400 tons in 1963 and 29,000 tons in both 1964 and 1965.

Source: Associazione Industrie Siderurgiche Italiane (Milan). Rilevazioni Statistiche. Produzioni, Anno 1963, 1964, and 1965.

At the Terni steelworks, a contract was awarded to a French firm (Sidexport) for installation of plants for continuous casting and hot-rolling of stainless and silicon steel. The French firm is licensed under a Soviet patent in the field of continuous casting. At the Costa Volpino works of the Dalmine Co., an extrusion press and cold-drawing plant for producing tubular products from either stainless or ordinary steel were nearly completed in 1965. The plants have annual capacities of 36,000 tons of extrusions and 42,000 tons of cold-drawn tube.

Rolled Steel.—As in the output of crude steel, the Finsider Group accounted for 60 percent of Italian production of hot-rolled products. Italsider plants produced 4,765,000 tons of hot-rolled steel; 1,241,000 tons of cold-rolled steel (mostly at Novi Ligure); and 343,000 tons of tinplate, galvanized, and other coated products. The Dalmine Co. produced 578,000 tons of seamless and other tubular products (538,000 tons in 1964), of which 200,000 tons were exported.

In the private sector, the Falck Co. produced 774,000 tons of rolled steel, and the Fiat Co. processed 1.7 million tons of ingots. The Fiat Co. produced 1,014,000 motor vehicles and 44,000 tractors in 1965. In addition to the technical cooperation agreement signed with the Soviet Union, the company reportedly signed a trade agreement with mainland China involving the export of trucks and marine motors valued at $3.5 million.

In new plant developments, the welded-pipe mill at Piombino began full production in 1965, and a continuous rolling mill with annual capacity of 400,000 tons of light to medium sections was almost completed. A new continuous strip mill at the Sesto San Giovanni works accounted for the increased production of rolled steel by the Falck Co. Output capacity for sheet, strip, and skelp at Taranto was reported to be 1.5 million tons annually, plus 200,000 tons of welded pipe. At Rome, Società Feram was installing an automatic rolling mill for reinforcing bars with an annual capacity of 56,000 tons.

Steel Trade.—Net foreign trade earnings of $116 million were realized by Italy from crude steel and semimanufactures trade in 1965, compared with a loss of $115 million in 1964. Exports of rolled products were mainly responsible for this development, having increased by nearly 1 million tons and $123 million in value over 1964 levels. Increased exports of bars, rods, sections, and flat products were mainly destined for the United States, EEC countries, and the Republic of South Africa while exports of pipe to Libya and the Soviet Union increased by 65,000 tons and 33,000 tons, respectively. Imports of coils for rerolling were reduced by 150,000 tons each from Japan and the United Kingdom, while imports of sheets and plates from the EEC were reduced by 186,000 tons.

Lead and Zinc.—Improved mine and plant facilities of the Monteponi-Montevecchio and Pertusola companies were principally responsible for the increased lead and zinc production in 1965. In Sardinia, a full year's production from the Sos Enattos mine near Nuoro contributed

substantially to increased zinc and cadmium output by the Monteponi-Montevecchio Co. The company's big concentrator at Campo Pisano also began limited production in October, processing ore from mines of the Monteponi group. A 24-percent increase in output of mine zinc by the Pertusola Co. was mainly due to increased production at the Salafossa mine in north Italy where a new concentrator was completed in 1964. These mines helped to compensate for lower-grade ore encountered in 1965 at San Giovanni and Raibl.

Ore and metal produced by the principal mining companies in 1964–65, is shown in the following tabulation:

Metal	Metric tons unless otherwise specified					
	Società di Pertusola [1]		Monteponi-Montevecchio [1]		Azienda Minerali Metallici Italiana (AMMI) [1]	
	1964	1965	1964	1965	1964	1965
Lead:						
Concentrate	17,516	19,354	19,658	19,491	10,464	10,801
Metal (primary) [2]	21,279	24,195	21,413	21,224	6,022	6,758
Semimanufactures	15,672	[3] 11,843	[4] 6,072	[4] 6,772	840	976
Oxides	9,498	7,650	NA	NA	NA	NA
Zinc:						
Concentrate	51,974	63,786	51,246	61,650	80,944	76,800
Metal (primary) [2]	24,747	26,958	31,984	37,886	[5] 21,441	[5] 22,829
Semimanufactures	4,281	4,503	4,333	4,945	NA	NA
Other:						
Antimonial products	NA	NA	NA	NA	455	291
Bismuth	NA	NA	1	4	NA	NA
Cadmium	66	54	130	165	68	54
Silver [2] thousand troy ounces	555	553	514	547	95	117

NA Not available.
[1] As published in annual reports to stockholders.
[2] Sum of figures shown exceeds official total for national production for year indicated; reason for difference not identified.
[3] Including alloys.
[4] Shot.
[5] Production of Ponte Nossa plant.

Source (principal): L'Industria Mineraria (Rome). V. 17, Nos. 6, 7, and 11, 1966, pp. 268, 329, and 516, respectively.

Smelter production of lead and zinc was increased by the Pertusola Co. at La Spezia and Crotone as the company completed the initial phase of its program to expand capacity. Of the electrolytic zinc produced by the Monteponi-Montevecchio Co., 30,276 tons was produced at Porto Marghera and the remainder was produced at Monteponi. The company also produced germanium and oxides of lead and zinc. In other developments, the decreased recovery of secondary zinc in Italy was due to the closing of an electrolytic plant at Piedimulera in 1964, reportedly because of increased costs of labor and electric power.

Apparent consumption of lead and zinc increased in 1965. Net imports of lead in concentrates, scrap, and unwrought metal increased by approximately 35,000 tons, and exports of zinc decreased. Lead imports in 1965 were valued at $23 million, compared with $12.8 million in 1964. Most of the increase in imports came from Canada (ore) and West Germany (scrap). Consumption data for 1964 were reported as follows: lead, 89,000 tons of refined metal with total consumption of 117,000 tons and zinc, 114,000 tons of refined metal with total consumption of 161,000 tons.

The surge of mine and plant developments in the lead and zinc industry, stimulated by impending EEC tariff cuts and the necessity to rationalize production, continued strong in 1965. On the mainland, plans by the major companies to increase the capacity of reduction plants at Porto Marghera, Ponte Nossa, La Spezia, and Crotone apparently remained firm and at the Salafossa mine a heavy-media plant was built to increase the productive potential of the new 1,000-ton-per-day concentrator. In Sardinia, the large "Sartori" and "Faina" projects of the Monteponi-Montevecchio Co. were reported to be 70 percent completed. At least 13 kilometers of new underground workings had been excavated since the projects were started late in 1962, in addition to more than 20,000 feet of drilling. During the course of this work, the proved and probable ore reserves of the company in Sardinia were increased to 25 million tons, containing 1,350,000 tons of zinc and 400,000 tons of lead. This was a total in-

crease of 550,000 tons of contained metal as compared with 1962 figures.

At the "Sartori" project, designed to coordinate production from seven mines of the Monteponi group near Iglesias, the Monteponi and Campo Pisano mines were connected in April and ore began moving to the concentrator in September. The first section of the concentrator was started in October and a second section on December 2. The new concentrator, which will replace five smaller plants, is designed to handle 6,000 tons of ore daily upon completion and will be one of the largest in Europe. At Monteponi, the company began construction of a Waelz furnace to treat 400 tons per day of oxidized zinc ore and was expanding capacity of the electrolytic plant to 22,000 tons annually; both plants were scheduled for completion by early 1967. At the San Gavino lead smelter, capacity of the shot works was being expanded to 12,000 tons annually.

On the "Faina" project at Montevecchio, sinking of the Faina and Fais shafts was continued and the Estella-Rolandi level was extended almost to the Ingurtosu mine. In September the company acquired the Ingurtosu and four other mines from the Pertusola Co.

The tariff protection accorded to the industry by the EEC since 1960 was scheduled to end in March 1966, but in view of the investments committed and the importance of the industry to the EEC as well as to Italy it was likely that protection would be continued. Italian duties on lead and zinc imports from EEC countries were reduced by 15 to 20 percent in 1964.

Mercury.—Output of mercury was practically unchanged from the 1964 level although ore production increased by nearly 17 percent. Several companies reported a drop in average grade. Stabilimento Minerario del Siele, the country's second largest producer, processed 24 percent more ore than in 1964 but increased output of mercury by only 7 percent.

An experimental open-cast mine was opened in low-grade (0.1 percent mercury) deposits of the Siele Co. After 3 months, the operation was stopped because of strong protests from local labor unions although the company insisted that it had a right to test any method which promised to reduce the costs of production.

Exports of mercury decreased 40 percent, with shipments reduced mainly to Japan, the United Kingdom, and West Germany. Because of elevated prices, however, the total value increased to $19 million. In contrast to the previous 2 years, exports were less than production during 1965 and above-ground stocks of mercury increased from 9,595 flasks at midyear to 15,355 flasks at yearend.[2] Domestic consumption of mercury was reported to be between 10,000 and 15,000 flasks annually.

Four new furnaces were being installed in 1965, two by the Siele Co. and one each by Società Mercurifera Italiana and Società Mineraria Rimbotti. The latter two companies are subsidiaries of the Edison and Montecatini companies, respectively. In Siena, Società Mineraria Monte Amiata planned to open a new mine in 1966 at San Filippo d'Orcia.

Titanium.—The Montecatini Co. announced that plans for a new titanium dioxide plant at Scarlino were well advanced. Planned output capacity was 50,000 tons annually for the domestic market and export. Exports of titania in 1965 were valued at $6.7 million, with about one-third destined for East Europe. Imports were valued at $7 million.

NONMETALS

Asbestos.—Production continued to increase. The value of exports tripled to $1.75 million; most of the increase in volume went to West European countries but included 2,000 tons to Poland. Growing competition from Soviet asbestos was noted by Italian producers. The strong European demand for asbestos was attributed to increasing demand for asbestos cement products. Output of asbestos cement products in Italy decreased, mainly because of the slump in construction activity. Imports declined, and the value of exports dropped by $500,000. Slackened demand came at a time when Italian producers were about to begin programs of plant expansion and modernization. Output of asbestos cement products was 610,000 tons in 1963 and 550,000 tons in 1964.

Barite.—Output of barite increased 67 percent in 1965, ranking Italy second to West Germany among West European producers. The increase was partially due to opening of the Su Benatzu and Santa Lucia

[2] Official figures released by Ministry of Industry and Commerce (Rome).

mines in Sardinia. Exports nearly tripled in volume, as 24,000 tons were shipped to the Netherlands, but their value increased only 55 percent. Substantial quantities continued to be imported from Spain.

Cement and Other Construction Materials.—The slump in the construction industry continued throughout 1965 and was reflected in reduced output of cement, lime, bituminous rock, and many other quarry products and nonmetallic mineral manufactures. Employment in the industry decreased about 30 percent during the year and the industry's output, valued at $6.15 billion in 1964, was estimated to have declined by 20 percent. In residential construction, which accounts for about 50 percent of the industry's output, housing starts in the first quarter of 1965 were 51 percent less than in the comparable period of 1964.

Lime production was only two-thirds of total capacity; output of calcined gypsum fell to 500,000 tons, a 28-percent decrease from 1963–64 levels; brick and tile production decreased 20 percent; and cement production was more than 2 million tons less than in 1964.

The cement industry was hit by reduced demand at a time when expansion of productive capacity was reaching a peak. Total annual capacity increased by 3.2 million tons in 1965 and was 29.5 million tons at yearend. Average utilization of capacity in 1965 was about 70 percent although in north Italy, where most of the plants are located, it was only 60 percent. The low level of plant utilization was expected to continue in 1966 because additional increases in overall capacity would probably exceed or keep pace with the anticipated increase in production. Aggregate capacity was scheduled to reach more than 31 million tons annually by the end of 1966.

Cement consumption in 1965 was 20.5 million tons. Exports increased substantially (principally to Spain) but were inadequate to offset the decline in domestic demand, and yearend stocks were 9 percent more than a year earlier. Basic prices for ordinary portland cement were unchanged from the 1961 level of $11.25 per ton. Of cement delivered to the home market, 30 percent was in bulk and the rest was in bags.

In the past 2 years, eight new plants (with nine rotary kilns) have been built, and additions to existing plants included eight rotary kilns and five vertical kilns. Most of the increase in capacity in 1965 was due to completion of a large plant at Palermo by the Italcementi Co.

In highway construction, the 7.4-mile Mont Blanc tunnel was dedicated on July 16. The $64 million structure is reported to be the longest vehicular tunnel in the world. Elsewhere, the superhighway network was scheduled to increase by 400 kilometers in 1966 by opening of the Bologna-Rimini, Bologna-Ferrara, Napoli-Baiano, and Trieste-Palmanova highways.

Feldspar.—A feldspar grinding plant was completed at Livorno by the R. Ginori Co. Other Ginori plants include a tile factory at Gaeta and ceramic plants at Sesto Fiorentino, Milan Lambrate, Pisa, and Mondovi.

Fertilizer Materials.—Potash production in Sicily continued to increase. The Montecatini Co. accounted for 62 percent of the total output, producing 1,067,000 tons of crude salts. All production from the San Cataldo and Palo mines was processed at the Campofranco sulfate plant. The company was also engaged in development work at the Racalmuto mine. Minable ore reserves in the San Cataldo and Palo properties were reported to be 46 million tons (1961), but no figure was available for the Racalmuto deposits.

Subsidiaries of the Edison Co. of Milan presumably accounted for the remainder of potash production. The Santa Caterina mine, operated by Società Industriale Catanese (SINCAT), produced an estimated 150,000 tons of ore that was sent to the company's Priolo plant for processing. Elsewhere, Società Sali Potassici Trinacria produced ore from the Pasquasia mine and was preparing the Corvillo mine for production in 1966. Production facilities reportedly available at the Pasquasia mine include two shafts with a combined haulage capacity of 4,000 tons per day and a 2,000-ton-per-day beneficiation plant. A new section being added to the plant will increase the processing capacity to 3,000 tons daily.

In 1965 the Trinacria Co. entered into an agreement with the Sicilian Mining Agency (EMS) and E.N.I. to jointly exploit the potash reserves of the Pasquasia and Corvillo concessions, which contain a minimum

of 115 million tons of minable ore and 15 million tons of potash (1961 estimate). Participation in the new venture was to include the Edison Co. (49 percent), E.N.I. (40 percent), and EMS (11 percent). Investments planned by the group were reported to total more than $20 million and would include construction of a potassium chloride plant (100,000 tons annually) and a potassium sulfate plant (200,000 tons annually). A second company (EMS 48 percent and ENI and Edison 26 percent each) would invest $16 million in a phosphoric acid plant (120,000 tons annually) to be built at Gela.

Raw phosphate imports in 1965 were valued at $23.4 million. As in 1964, about 50 percent was supplied by the United States and the remainder came mostly from Morocco and Tunisia. A decline of 150,000 tons in shipments from Tunisia appeared to be largely compensated by increased deliveries from the United States and Jordan and by a 67,000-ton increase in imports of basic slag from Belgium-Luxembourg.

Both consumption and exports of fertilizers increased in 1965. Consumption of potash and phosphoric acid in the first 7 months of 1965 was reported to have increased by 56 percent and 26 percent, respectively, over the comparable period of 1964. The value of exports of nitrogenous fertilizers increased by $14 million.

Fluorspar.—Higher world prices for fluorspar appeared to be mainly responsible for the rise in Italian output in 1965. Exports increased and were principally destined for the United States, Netherlands, and West Germany, while imports of fluorspar were sharply reduced and none was purchased from Spain.

In Sardinia, concentration plants at the Santa Lucia mine began production in October. Combined output capacity (fluorspar plus barite) was reported to be 40,000 to 60,000 tons annually. The new facilities were built by Sarrabus Mineraria S.p.A. (SARRAMIN), a subsidiary of the Edison Co. Elsewhere, the Su Benatzu mine and plant, a joint project of Miniere Riunite Varesine (MIRIVA) and Baroid International, may have started production earlier in the year. The Pertusola Co., which operates the Su Zurfuru mine near Cagliari, produced 7,479 tons.

In north Italy, 1965 operations of Società Mineraria Prealpina were described as "normal" by the Edison Co. The Prealpina Co. operates the Torgola mine, Italy's largest fluorspar producer. The Montecatini Co. also reported that temporary difficulties reduced output from its Prestavel mine to 17,600 tons in 1965.

Graphite.—Plans for construction of an artificial graphite plant in Campania were announced by Elettrografite di Forno Allione (a subsidiary of the Union Carbide Co.) and an Italian financial group. The plant will be completed in 1967 and will have a production capacity of 10,500 tons annually.

Magnesium Compounds.—In Sardinia, production of magnesium oxide from seawater and limestone was begun in January by the Sardamag Co. Production capacity of the plant was 50,000 tons annually. Consumption of limestone from local quarries by the plant was expected to reach 200,000 tons per year.

Marble.—In spite of reduced domestic demand and reportedly lower total production, exports of unfinished marble increased in 1965 and were valued at $28 million. Shipments from Carrara rose to 390,000 tons and deliveries to both domestic and foreign markets were increased; producers admitted, however, that price reductions had been necessary to maintain the volume of sales.

Faced with rapidly rising labor costs, which have increased 55 percent since 1962, and increasing foreign competition, the industry continued to increase mechanization in quarries and efficiency of transportation systems. A new processing plant was under construction by the Montecatini Co. at Viareggio.

In November, representatives of the marble and building stone industries of Italy, France, West Germany, and Belgium met in Milan. The principal problems discussed were the need for harmonization of taxes imposed on building stone by individual EEC countries and the growing competition from prefabricated building materials.

Pumice.—Exports of pumice in 1965 decreased to less than half of the 1964 level. Shipments to the Netherlands were reduced by 130,000 tons and to West Germany by 50,000 tons.

Pyrite.—The Montecatini Co. continued to account for most pyrite production, with output of 1,372,000 tons, mainly from its three mines in Tuscany. The product was

used to produce sulfuric acid and pelletized iron concentrate at the company's Scarlino (Follonica) plant. The Monteponi and Montevecchio Co. reported production of 6,500 tons of pyrite in 1965 (9,500 tons in 1964).

Imports of pyrite continued to increase and were valued at $10.8 million. Shipments from Cyprus, Yugoslavia, and Greece were sharply reduced while imports from the Soviet Union were increased by more than 200,000 tons.

Salt.—Production of rock salt in Sicily continued to increase. Output during the first 6 months of 1965 was 362,000 tons, 16 percent more than during the same period in 1964 and 28 percent more than during the corresponding months of 1963. Expansion of coastal loading facilities, mainly to handle output from mines of the Cattolica Eraclea group, was continued. Rock salt was also produced from the Cammarata and Racalmuto districts, the latter in conjunction with potash deposits being developed by the Montecatini Co. Ex-mine prices of salt in 1964 ranged from US$0.72 per ton at Cattolica Eraclea to $1.00 per ton at Cammarata. About 10 percent of Sicilian production has been consumed in Sicily and most of the remainder has been consumed by the chemical industry on the mainland.

In Sardinia, a Government-owned evaporation facility was being built at San Antioco. Anticipated production capacity was 500,000 tons annually.

Sulfur.—Consumption of sulfur in 1965 was reported to be 1.3 million tons, of which 60 percent was supplied from domestic mines, mostly as pyrite. Production of elemental sulfur, now almost entirely confined to Sicily, continued to decline. Yearend stocks of crude fused sulfur held by the Italian Sulfur Agency (E.Z.I.) had dwindled from 4,200 to 600 tons during the first 10 months and foreign deliveries by the Agency ceased. In Sicily, crude ore produced for direct processing by sulfuric acid plants increased to 373,000 tons, as compared with approximately 173,000 tons in 1964. Many of the Sicilian mines came under the management of the Sicilian Mining Board (EMS) or were being developed under EMS programs in 1965.

There was increased production of sulfuric acid. Output of the Montecatini Co. increased to 1,570,000 tons (100-percent basis) in 1965 and the Edison Co. produced an estimated 600,000 tons. The third and fourth sections of Montecatini's acid plant at Scarlino were brought on stream by yearend and production from this plant (350,000 tons in 1965) was expected to double in 1966. Output of sulfuric acid by other mining companies in 1965 included Monteponi and Montevecchio (49,000 tons); Società di Pertusola (38,000 tons); and AMMI (17,000 tons).

Imports of sulfur increased in 1965 as the gap widened between domestic production and industrial demand. The United States replaced Canada as the principal supplier. All imports were strictly controlled to insure that all Italian production was utilized and that gradual rationalization of the sulfur industry could proceed without undue disruption. Authorized import quotas were 95,000 tons for 1965 and 65,000 tons for the first half of 1966. The price to final consumers for both Italian and foreign sulfur was to be approximately $76 per ton c.i.f. Genoa; the difference between this price and the world market price was to be deposited in a special account for aid to the domestic industry. Government protection of the Italian sulfur market was expected to continue until 1968.

Talc.—Higher operating costs and increasing foreign competition contributed to the decline in Italian production in 1965. Exports decreased, particularly to the United States, but the total value remained at about $2.8 million.

Società Talco e Grafite Val Chisone, operator of the Pinerolo mine and Italy's principal producer, had improved its plant facilities but was finding it increasingly difficult to remain competitive because of rising labor costs. The company stated that the cost of wages, salaries, and fringe benefits in 1965 amounted to 77 percent of the costs of production. Of the company's output in 1965, 35 percent was absorbed by the Italian market, 19 percent by the United States, and 46 percent by other countries.

MINERAL FUELS

Coal.—An expected increase in coal output from Sardinian (Sulcis) mines to fuel the new Porto Vesme thermal power station did not materialize in 1965 and production continued to decline at approxi-

mately the same rate as in 1964. Rationalization of the mines, which has been aided by a $15 million development loan from the EEC, was still underway at yearend: mechanization of the Seruci mine, where mining reached the 400-meter level, was nearly completed but the Nuraxi Figus mine was still being developed and had a daily productive capacity of about 600 tons. Although average daily coal output in Italy was 19 percent below the 1964 level and employment was reduced by 10 percent during the year, average underground productivity increased by 14.7 percent to 2.9 tons per man-shift, one of the highest rates in the EEC. By yearend, anthracite production ceased as the La Thuile mine was closed by Nazionale Cogne S.p.A.

A second 240-megawatt generating plant was completed at the Porto Vesme facility during 1965. The powerplants are equipped to use either coal or oil. Because of prevailing high cost of production and relatively low heating value of the coal (4,200 to 4,500 kilocalories per kilogram), it was expected that oil would continue to have a competitive advantage in 1966.

Coal continued to rank high on the list of Italian imports of mineral commodities. Receipts during 1965 were valued at $148 million. The United States remained the principal supplier, increasing its share to nearly 80 percent of the total, including 94 percent of the metallurgical coal, 82 percent of the gas coal, and 34 percent of the steam coal. The U.S.S.R. remained the major supplier of anthracite.

The principal change in inland deliveries of coal in 1965 was the sharp increase in consumption by coking plants as shown in the accompanying tabulation; this change resulted from increased requirements of the iron and steel industry.

Consumer of coal	Thousand tons	
	1964	1965
Coke works	5,962	7,632
Domestic and commercial heating, etc.	1,192	1,030
Thermoelectric plants	669	[1] 631
Gasworks	719	553
Railways	624	553
Glass, ceramic, and building materials	480	250
Chemical industry	209	287
Iron and steelworks	69	40
Briquetting plants	67	66
Mines' consumption [2]	9	10
Other industry	201	143
Total	10,201	11,195

[1] Includes 62,000 tons consumed in pithead power stations.
[2] Including miners' coal.

Source: Statistical Office of the European Communities (Luxembourg). Energy Statistics. No. 4, 1966, pp. 58–61.

Coke.—The 22-percent rise in metallurgical coke output in 1965 was due to increased requirements for pig iron production. The new coke ovens at the Taranto steelworks had their first full year of operation in 1965 and probably accounted for most of the increase. The Montecatini group of coke-producing companies (Cokapuania, Cokitalia, and Vetrocoke) produced 1,630,000 tons, about 8.5 percent less than in 1964. Nationwide investment in coking plants was estimated at $17.6 million in 1965, compared with $40.5 million during 1964. At Vado Ligure, Fornicoke S.p.A. completed enlargement of a coke plant capable of handling 2 million tons of coking fines annually. The project was completed with financial assistance from the EEC.

Most of the coke continued to be made from imported coal. Net imports of coke were further reduced in 1965; the net quantity and value was 150,000 tons and $3.5 million, respectively, compared with 526,000 tons and $12.3 million in 1963. West Germany remained the principal foreign coke supplier and imports from the United Kingdom were almost eliminated.

Inland deliveries of coke are shown in the following tabulation:

Consumer	Thousand tons	
	1964	1965
Iron and steel industry	2,587	4,140
Households, commerce, and handicrafts	1,259	1,352
Chemical industry	305	316
Independent foundries	192	192
Glass, ceramic, and building materials	184	141
Other	34	3
Total inland availability	4,561	6,144
Stocks at yearend	420	282

Electric Energy. — Electricity production continued to increase in 1965, with hydroelectric plants supplying slightly more than half of total output. Although output from all sources increased, the share of conventional thermal plants declined. Output from nuclear plants increased 46 percent as all three stations were operated throughout the year. Production by type of plant is shown in the following tabulation.

	Million kilowatt hours		Share of total output (percent)	
	1964	1965	1964	1965
Hydroelectric	39,328	43,181	51.2	52.3
Thermal (conventional)	32,482	33,333	42.4	40.4
Nuclear	2,401	3,510	3.1	4.2
Geothermal	2,527	2,576	3.3	3.1
Total	76,738	82,600	100.0	100.0

Source: Statistical Office of the European Community (Luxembourg). Energy Statistics, No. 4, 1966.

In thermal powerplants, consumption of liquid fuels continued to increase although not so sharply as in 1964. There was also a substantial increase in consumption of blast-furnace and coke-oven gas because of increased production in the iron and steel industry, while the share of natural gas decreased from 76 percent in 1964 to about 56 percent in 1965. Natural gas was increasingly diverted to the chemicals and synthetic fiber industries. The trends in fuel consumption by thermoelectric plants are shown by the following tabulation, in thousand metric tons:

Fuel	1962	1963	1964	1965
Fuel oil	3,728	4,057	6,097	6,254
Coal	1,167	661	737	710
Lignite	1,729	1,332	1,180	1,003
Gas—SCE [1]	1,227	1,258	1,366	1,538

[1] Standard coal equivalent, at 7,000 kilocalories per kilogram.

Source: Statistical Office of the European Communities (Luxembourg). Energy Statistics, No. 4, 1965 and 1966.

During 1964 and 1965, 11 new thermal power units, with a total nominal capacity of 2,253 megawatts, were scheduled to enter service. Five were new plants and the others were additions to existing stations. Of the total, six were designed to be fueled by oil, four by fuel oil or coal, and one by coal.

Consumption of electric energy by selected divisions of the mineral industry is tabulated below.

Consuming sector	Million kilowatt-hours	
	1964	1965
Chemicals and synthetic fibers	11,787	12,390
Iron and steel	7,294	8,309
Metal manufactures	5,228	5,385
Nonmetallic mineral manufactures	4,756	4,940
Nonferrous metals	2,877	2,960
Petroleum production and refining	720	791
Mining (including coal and lignite)	819	898
Total	33,481	35,673

Source: Statistical Office of the European Communities (Luxembourg). Energy Statistics, No. 4, 1966, p. 128.

Nuclear Energy.—The powerplant at Trino Vercellese, Italy's newest and most powerful nuclear station, completed its first full year of operation in 1965. The reactor went critical in June 1964. In February, the State power authority took over control of the Garigliano powerplant, near Naples, from Società Elettronucleare Nazionale (SENN). Later in the year, the second 5-year plan of the Italian Atomic Energy Commission (CNEN) was approved by the cabinet and sent to the Senate for consideration. The plan proposed expenditures totaling $240 million, including $36.8 million for 1965 and $33.6 million for 1966.

In other developments, the capacity of the SORIN (Società Ricerche Impianti Nucleari) research reactor at Saluggia, near Turin, was increased from 2 to 10 megawatts. In April, an agreement was reached between the United Kingdom Atomic Energy Authority and SNAM to form a company for production and sale of uranium and uranium oxide fuels. The proposal, which was subject to approval by the Italian and British Governments, included construction of a plant at Talmona, 120 kilometers from Milan.

By March 1965, three contracts for the supply of special fuel materials for the

power reactors had been concluded by the European Atomic Energy Community (EURATOM) Supply Agency with the United States Atomic Energy Commission. The contracts involved approximately 20,000 kilograms of U-235 and a value of $178 million.

Some details on Italy's three nuclear powerplants are shown in the following tabulation:

Plant	Capacity (megawatts of electricity)	Reactor type	Date commissioned	Installed cost [1] per kilowatt-hour	Cost [1] of electricity per kilowatt-hour [2]
Latina	200	Gas-graphite	1963	$518	$0.01246
Garigliano	157	Boiling water	1963	446	.01154
Trino Vercellese	257	Pressurized water	1964	279	.00863

[1] Source figures are in European Monetary Authority (EMA) units of account, equivalent to U.S. dollars.
[2] Figures not directly comparable because of differing bases for calculation.

Source: European Atomic Energy Community (EURATOM). Eighth Ann. Rept., 1965, pt. 2 (Documentation).

Petroleum.—*Exploration.*—There were no commercial discoveries of oil or gas in Italy in 1965. As compared with 1964, exploration drilling was reduced by 40 percent while development drilling (mostly in the Ravenna, Foggia, and Caltanissetta districts) was nearly doubled. Total footage drilled was 10 percent less. Italian hydrocarbon reserves were estimated at 40 million tons of petroleum and 4,620 billion cubic feet of natural gas.

In November, the draft of a law regulating offshore exploration and exploitation of oil and gas reserves was submitted to the Ministry of Industry and Commerce. The proposed law would reserve all prospecting rights and 25 percent of continental shelf areas to ENI; later, concessions may be granted to private firms, or to joint ventures of private firms and ENI. Exploration permits are presently issued under the basic hydrocarbons law of 1957 and under the special mining law of the semi-autonomous Government of Sicily. Under a 1953 law, ENI concessions already include an Adriatic Sea area between Rimini and Monfalcone extending 15 kilometers offshore. Provisions of the proposed law reportedly meet the requirements of the Geneva Convention regarding international boundaries in continental shelf areas although Italy was not yet a signatory to this convention.

In Sicily, an agreement was signed in July between ENI and the Sicilian Mining Agency (EMS), concerning exploration and development of hydrocarbon resources. The Azienda Generale Petroli Italiani (AGIP) division of ENI will undertake the entire cost or exploration, estimated at $17 million, on two permit areas; if hydrocarbons are found, shares in exploitation of the venture are to be 66.5 percent owned by AGIP and 33.5 percent by Società Azionaria Ricerche Coltivazione Idrocarburi Siciliani (SARCIS). The latter company is owned 90 percent by EMS and 10 percent by AGIP. Permits granted to SARCIS at year-end covered 517,000 hectares.

In exploration abroad, estimated reserves at ENI's oil discovery near El Borma in Tunisia were increased to 35 or 40 million tons, and the company obtained additional exploration permits. Encouraging oil shows were found in Libya (Concession 82), and explorations were continued in the Gulf of Suez area of the United Arab Republic (Egypt), Iran, Morocco, Nigeria, and in several areas of the North Sea where AGIP is associated with the Phillips and Petrofina companies. Exploration permits were relinquished in the Sudan and in the Mekran area of Iran.

Crude Oil Production.—The reduced output of crude oil in 1965 resulted from cutbacks by ENI in production schedules at both the Gela and Ragusa fields in Sicily. Output from the Gela and Ragusa fields was reduced by 20 percent and 16 percent, respectively, and the combined monthly output fell from approximately 250,000 tons in January to 150,000 tons in June. Reduced output was partly due to water infiltration in the Gela field. The Sicilian fields continued to account for 95 percent of domestic crude oil production, and 99.5 percent of all domestic output was produced by ENI. On the mainland, output from the small fields in central and southern Italy exceeded Po Valley production

Table 5.—Italy: Production of crude oil, natural gasoline, and natural gas, by area

Region and Province	Crude petroleum (thousand metric tons)			Natural gasoline (metric tons)			Natural gas (billion cubic feet) [1]		
	1963	1964	1965	1963	1964	1965	1963	1964	1965
Lombardia: Cremona, Milan	---	---	---	1,218	1,085	532	46.1	40.9	27.0
Emilia-Romagna:									
Ravenna	---	---	---	125	147	135	64.0	72.9	75.3
Bologna	---	---	---	643	543	411	60.7	72.5	65.6
Piacenza	59	44	36	41,204	35,172	26,456	28.3	25.0	17.9
Modena, Ferrara, Reggio-Emilia	(2)	---	---	5,966	8,281	9,847	44.7	42.0	48.4
Abruzzo: Chieti, Teramo	---	---	---	---	---	1,388	2.7	5.8	13.1
Basilicata: Matera	1	39	56	---	---	105	(2)	.6	12.7
Sicilia:									
Enna	---	---	---	5,594	17,587	28,924	1.7	5.3	9.5
Ragusa	1,123	937	787	---	---	---	---	---	---
Caltanissetta	592	1,641	1,310	---	---	---	(2)	.5	.5
All other provinces	9	8	21	315	308	226	8.5	5.9	5.6
Total	1,784	2,669	2,210	55,065	63,123	68,024	256.7	271.4	275.6

[1] Volume obtained after removal of condensable fractions. Figures converted from quantities reported in cubic meters, using 35.314 cubic feet = 1 cubic meter.
[2] Less than ½ unit.

Source: Ministry of Industry and Commerce (Rome). Bollettino Ufficiale degli Idrocarburi, v. 8, 9, 10, No. 7, July 1964, 1965, and 1966 (appendix).

for the first time. Total domestic crude oil reserves were estimated at 40 million tons.

Abroad, ENI produced 6 million tons of crude oil, of which 80 percent was from operations in the United Arab Republic (Egypt) and the remainder from Persian Gulf fields. Investments during the year by the ENI Group for petroleum exploration and development included $32 million in Italy and $37 million abroad.

Pipelines.—The Central European Pipeline carried 4.1 million tons of crude oil in 1965, mostly to the Sannazzaro de' Burgondi and Collombey refineries. The Ferrera-Spluga section of the pipeline was completed during the year, and necessary construction permits for extension of the line to Ingolstadt were granted by West German authorities but opposition from local authorities continued to delay its completion. In the meantime, the Ingolstadt refinery was using only part of its capacity and was being supplied with crude from the South Europe and Rhine-Danube pipelines.

Construction of the Trans-Alpine Pipeline began with work on the Monte Timau tunnel at the Austrian border. Construction of the Italian section of the line, handled by the Bechtel Corp. for Società Italiana per l'Oleodotto Transalpina (SIOT), will cost an estimated $96 million. ENI has a 10-percent interest in SIOT.

In Sicily, the 65-kilometer pipeline from Ragusa to Augusta carried 629,000 tons of crude.

Crude Oil Imports.—Imports of crude oil increased by 22 percent and more than made up for the reduction in domestic production as well as the increased demands of refineries. The principal sources continued to be Kuwait, Saudi Arabia, Iraq, the Soviet Union, Libya, and Iran, in that order. The largest increases (in million tons) came from Kuwait—5.4, Saudi Arabia—2.2, and Iran—1.9.

Refining.—Both processing capacity and output of Italian refineries continued to grow at rates of nearly 20 percent. The 69.37 million tons of crude oil processed in 1965 included 2.24 million tons of domestic crude and represented about 75 percent of total refinery capacity available at the beginning of the year and 62 percent of capacity available at yearend.[3] In refinery output as well as capacity, Italy led all other West European countries in 1965.

New refineries came on stream in 1965 near Milan, (Sannazzaro de' Burgondi; owned by ENI);[4] at Cagliari, Sardinia (Sarroch; owned by S.p.A. Raffinerie Sarde); and at Rome (Raffineria di Roma, S.p.A.). Major additions to existing plants were completed by Esso Standard Italiana and its affiliates at the Augusta (Sicily) and

[3] Actual capacity, including 30 percent legal reserve, was approximately 110 million tons annually as of December 31, 1965, and included 12.8 million tons assigned to petrochemical plants.

[4] Previously reported as having been completed in 1964.

Trecate (near Milan) refineries; other expansions were completed by ENI at Livorno and Gela and by the Mediterranea Co. at Ravenna. By yearend, Shell-Condor S.p.A. had nearly completed an $11 million, 80,000-ton-per-year lubricant plant at Rho (near Milan) and Shell Italiana S.p.A. began construction of a refinery at Taranto. The Taranto refinery, to be completed in 1967, will have a capacity of 4 million tons annually and was expected to cost $46 million. Abroad, ENI's new refinery at Ingolstadt (West Germany) came on stream in March; refineries being built by ENI in the Republic of the Congo (Léopoldville), Tanzania (Dar es Salaam), and Yugoslavia (Fiume) were nearing completion; and the company was scheduled to begin construction of plants in Norway and Ceylon. In 1965, refineries partly or wholly owned by ENI processed 17.5 million tons of crude oil, of which 81 percent was refined in Italy and 19 percent was refined in other countries.

In the transport of petroleum products, a 35-kilometer, 5-strand pipeline was completed in October between the San Quirico refinery (Genoa) of Edouardo Garrone S.p.A. and storage facilities at Arquata Scrivia. Another 80-kilometer pipeline was completed by ENI between Ferrera and Chivasso.

Fuel oils and motor gasoline continued to account for about 75 percent and 13 percent, respectively, of total refinery output. Domestic consumption of petroleum products (excluding international bunkers) is shown in the following tabulation:

Commodity	Thousand metric tons		
	1963	1964	1965
Gasoline	4,600	5,350	5,900
Jet fuel [1]	271	337	340
Kerosine [2]	280	376	486
Gas oil	3,765	3,957	4,107
Other fuel oils [3]	19,600	23,200	25,400
Lubricants	328	330	335
Liquefied petroleum gases	965	1,050	1,135
Petrochemical feedstocks	800	1,100	1,450
Bitumen	950	1,120	1,130
Petroleum coke	180	250	210
Other	646	683	578
Total	32,385	37,753	41,071

[1] Including aviation gasoline.
[2] Including white spirit and solvents.
[3] Neither Italian nor EEC statistics for consumption subdivide "fuel oil" by viscosity or other characteristics. The quantities given thus include "distillate" as well as "residual" fuel oil.

Source: Ministry of Industry and Commerce (Rome). Bollettino Petrolifero, No. 12, December 1963, 1964, 1965.

There were no tax increases on gasoline in 1965. Prices remained at $0.68 per U.S. gallon for regular gasoline and $0.73 for premium gasoline. AGIP reduced gasoline prices about 2.5 cents per gallon in 1965. In gasoline sales, AGIP accounts for about 25 percent of the market, Esso 20 percent, and Shell 18 percent. In 1965 the ENI subsidiary, AGIP U.K., sold its distribution network in the United Kingdom to Esso.

Net exports of petroleum products increased by 46 percent in volume and 36 percent in value. Fuel oils (nonbunker) accounted for 84 percent of the increase, while exports of lubricants nearly tripled. The increased volume went principally to Belgium and the Netherlands, followed by the United Kingdom, Pakistan, Switzerland, the United States, and Spain.

Natural Gas.—The increase in production of natural gas in 1965 was due mainly to a 6-fold increase in output from the Chieti and Matera provinces of southeastern Italy. Production from these areas accounted for about 10 percent of the national output compared with 2 percent in 1964, while fields in the Po Valley provided 86 percent of the total (95 percent in 1964) and the remainder was mostly produced from the Gagliano field in Sicily. ENI continued to account for 98 percent of the national output.

Offshore, in the ENI concession area of the Adriatic, regular production began from the Ravenna Mare gasfield. Eight kilometers east of Ravenna Mare, extension drilling in the Porto Corsini field indicated a gas reserve of about 350 billion cubic feet and the field had six gas wells by yearend. During the Porto Corsini operations, the drilling platform "Paguro" was

destroyed by a blowout from Hole No. 7.

In onshore explorations, small gas pools were found in San Marino and in the suburbs of Milan, and one hole found noncommercial gas (nitrogen) in the Arno river valley. In southeastern Italy, the Portocannone gasfield was further developed by Ausonia Mineraria. Gas reserves at Portocannone were reported to be 210 billion cubic feet.

In the Foggia area, gas reserves in the concession area of the Montecatini and Snia Viscosa companies were reported to be 700 billion cubic feet. At yearend, ENI gas reserves were 3,745 billion cubic feet, of which 1,995 billion were in the Po Valley, 1,050 billion in central and southen Italy, and 700 billion in Sicily. The Montecatini Co. reportedly discovered a new gasfield in Sicily but no details were available.

ENI invested $22 million in gas transport and distribution facilities in 1965. The company's pipeline-network was increased by 129 kilometers and included completion of the Bronte-Catania line (58 kilometers) in Sicily, the Fusignano-Bologna section (39 kilometers) of the Bologna-Ravenna pipeline, and a 22-kilometer branch of the Vasto-Rieti-Terni pipeline. Five other pipelines totaling 305 kilometers were under construction at yearend, including 180 kilometers in Sicily.

Consumption of natural gas for chemical conversion and nonindustrial uses continued to be encouraged by ENI. Deliveries of gas for these purposes increased 13 percent, while declines of 15 and 5 percent, respectively, were registered for thermoelectric plants and industrial fuel. Studies by ENI indicated increasing needs for imported natural gas, and the State agency was developing a program to assure domestic availability of up to 350 billion cubic feet of natural gas annually by 1975.

Consumption of natural gas in Italy in 1965 is shown by the following tabulation:

Consumer:	*Billion cubic feet*[1]
Extractive industry	497
Manufacturing industries:	
Metallurgical	32,215
Nonmetallic mineral manufactures	25,788
Chemical (thermal use)	31,275
Other manufacturing	39,917
For chemical synthesis	61,806
Thermoelectric plants	15,361
Domestic and other uses	61,486
Other	4,562
Total	272,907

[1] Converted from quantities reported in cubic meters, using 35.314 cubic feet = 1 cubic meter.

Source: Ministry of Industry and Commerce (Rome). Industria del Petrolio in Italia 1965. p. 118.

The Mineral Industry of Luxembourg

By Stephen C. Brown [1]

The growth of the Luxembourg economy, which had expanded at the rate of 6.5 percent in real terms in 1964, came almost to a halt in 1965; estimates indicate an output increase of approximately 1.5 percent in real terms during the year. Iron and steel industry production, accounting for approximately 70 percent of total output, was practically unchanged from that of 1964. A 365,000-ton decrease in iron ore output was offset by a smaller increase in output of crude steel and semimanufactures. Total output of the steel industry is estimated to have risen by approximately 0.7 percent, while the index of total industrial production rose by only 0.5 percent. Output of most nonmetals declined or was relatively unchanged, though there were increases in production of fertilizer, basic slag, and manufactured phosphatic fertilizer.

Trade in mineral commodities is believed to have increased slightly with imports of iron ore and petroleum products showing substantial increases. A substantial decrease in iron ore exports was offset by small increases in steel and basic slag exports.

No recent data exist to show the proportion of total gross national output (GNP) accounted for by the mineral extractive and processing industries, but there is some reason to believe this proportion may be declining slowly as Luxembourg iron ore output declines. Continuing efforts are being made to diversify the economy through the establishment of other manufacturing industries (for example, chemicals and rubber). Official national account figures show a steady decline of the share of total output attributed to the extractive sector alone (mining, stone and earth) from 3.1 percent in 1955 to 2.3 percent in 1963, the latest year for which these data are available.[2]

PRODUCTION AND FOREIGN TRADE

Production trends in Luxembourg's mineral industries during 1965 were as usual dominated by the fortunes of the iron and steel industry. The most significant change during 1965 was the sharp decline of domestic iron ore output, offset by the steel industry's increased imports of French ores. Output of pig iron declined slightly, while production of crude steel rose by 26,000 tons and production of semimanufactures rose by 13,000 tons. Cement output rose by approximately 10 percent, and basic slag production rose by 2.3 percent.

The official foreign trade statistics of Luxembourg are incorporated with those of Belgium in the trade returns of the Belgian-Luxembourg Economic Union. The data shown in the accompanying tables have been collected from various sources; including the official Annuaire Statistique 1965, L'Economie Luxembourgoise en 1964 and Bulletin du Statec, all published by Service Central de la Statistique et des Etudes Economiques. Other sources used (especially for iron, steel and energy products) were Iron and Steel, and Energy, both published by the Statistical Office of the European Communities. It should be noted that the figures for imports and exports of steel products were derived by analysis of data appearing in tables 60 to 62 of Iron and Steel, 1966, No. 2.

[1] International economist, Division of International activities.

[2] Statistical Office of the European Communities. General Statistical Bulletins 1965. No. 11, 1966, p. 48.

Table 1.—Luxembourg: Production of metals and minerals

(Thousand metric tons unless otherwise specified)

Commodity	1961	1962	1963	1954	1965
Metals:					
Iron ore	7,458	6,507	6,990	6,680	6,315
Pig iron [1]	3,834	3,597	3,587	4,191	4,145
Crude steel	4,113	4,010	4,032	4,559	4,585
Semimanufactures	3,290	3,193	3,213	3,589	3,602
Nonmentals:					
Cement	231	230	202	r 205	222
Dolomite	NA	NA	NA	254	225
Gypsum	7	8	5	5	5
Lime, hydraulic	12	3	2	2	1
Limestone	100	NA	NA	36	27
Molding sand	32	32	30	40	40
Quartzite—thousand cubic meters	NA	NA	NA	24	27
Sand and gravel—do	681	633	543	542	647
Slate and flagstone	6	5	5	5	NA
Stone:					
Cut stone:					
Crude—thousand cubic meters	2	2	2	(2)	NA
Flagstone—thousand square meters	6	2	2	3	NA
Building stone:					
Rough cut—thousand cubic meters	118	69	49	r 49	48
Facing—thousand square meters	8	12	7	5	9
Crushed rock—thousand cubic meters	380	330	367	468	NA
Paving blocks—thousand pieces	207	133	42	70	50
Fertilizers and raw materials:					
Basic slag	796	786	767	818	837
Manufactured phosphate fertilizers (P_2O_5 content) [3]	r 128	r 124	127	r 125	e 127
Mineral fuels:					
Coke, gas plant	33	32	32	27	NA
Manufactured gas—thousand cubic meters	23,065	23,613	24,168	24,031	26,272

r Revised. e Estimate. NA Not available.
[1] Official figures, includes some remelted pig iron.
[2] Less than 500 cubic meters.
[3] For fiscal years ending June 30 of year stated.

Table 2.—Luxembourg: Selected exports of metals and minerals

(Thousand metric tons)

Commodity	1963	1964	1965
Metals:			
Iron ore	918	936	659
Steel:			
Ingots and primary forms	177	223	235
Semimanufactures	2,810	3,145	3,137
Nonmetals:			
Basic slag	775	873	877
Manufactured phosphatic fertilizers (P_2O_5 content)	120	136	NA

NA Not available.

Table 3.—Luxembourg: Selected imports of metals and minerals
(Thousand metric tons)

Commodity	1963	1964	1965
Metals:			
Iron ore	6,490	7,881	8,100
Pig iron [1]	155	74	43
Steel semimanufactures [2]	11	10	16
Nonmetals:			
Manufactured fertilizer: [3]			
Nitrogenous	6	5	---
Potassic	6	7	---
Mineral fuels:			
Coal and briquets	216	156	239
Coke	3,677	3,963	3,795
Petroleum products:			
Gasoline	77	91	102
Kerosine	2	2	2
Diesel oil and gas oil	206	230	287
Residual fuel oils	269	357	416
Lubricants	8	9	10
Bitumens	5	7	6
Liquefied petroleum gas	14	16	22

[1] From European Coal and Steel Community (ECSC) countries only; excluding deliveries from Belgium and Netherlands.
[2] From ECSC countries only; including coils for direct utilization and export to third countries; excluding high carbon and alloy steels.
[3] In terms of N, P_2O_5, or K_2O content.
Source: Statistical Office of European Communities Iron and Steel. No. 2, 1965; No. 2, 1966, pp. 79–81. Service Central de la Statistique et de Étude Economiques (STATEC), Annuaire Statistique 1965 (Statistical Yearbook 1965).
Statistical Office of European Communities. Energy. No. 1, 1966. L'Economic Luxembourgoise en 1964 (The Luxembourg Economy in 1964). Service Central de la Statistique et de Etude Économiques. Bulletin du STATEC.

COMMODITY REVIEW

METALS

Iron Ore. — The declining output of Luxembourg iron ore is said to be due to the growing competition of richer ores from other sources and increasing domestic mine wage costs owing to inflationary pressures. The 365,000-ton decline in output in 1965 reflected a 276,000-ton drop in exports and a 100,000-ton decrease in consumption of domestic ores by the Luxembourg industry. Employment in the mines declined to 1,652 in 1965, compared with 1,872 persons employed in 1963. The declining trend of output is expected to continue, with some of the less efficient mines probably being closed.

The 1965 reduction in output was more than accounted for by a 424,000-ton decrease in production of siliceous ores, though output of the lower grade ferruginous limestone also declined. Output of calcareous ores rose slightly. Increased imports from France more than offset the reduction in domestic ore output.

Iron and Steel.—The Luxembourg plants of Aciéres Réunies de Burbach-Eich-Dudelange S.A. (ARBED) produced a total of 2,686,525 tons of steel (down 0.3 percent from 1964), while the Differdange plant of Hauts Fourneaux et Aciéres de Differdange-St. Ingbert-Rumelange S.A. (HADIR) produced 1,423,725 tons, slightly above its 1964 output. The third Luxembourg company, Rodange, produced the balance of approximately 475,000 tons. The operating rate of the Luxembourg industry, at 93.8 percent of capacity, continued to be the highest in the European Coal and Steel Community (ESCS).

At yearend ARBED announced the acquisition of a majority shareholding in HADIR (subject to approval by those with authority in the ECSC in a major move towards rationalization and integration of the Luxembourg industry. The two firms own plants in both Luxembourg and in the Saar, and as ARBED points out in its 1965 Annual Report, not only are the plants near each other but their production is largely complementary.[3]

The acquisition reportedly will result in creating one of the giants of the European

[3] Acieres Reunies de Burbach-Eich-Dudelange S.A. Rapport du Conseil d'Administration a l'assemblee generale ordinaire du 22 Avril 1966, pp. 6–7.

Table 4.—Luxembourg: Iron ore salient statistics

(Thousand metric tons unless otherwise specified)

	1963	1964	1965
Number of mines in operation (yearend)	22	20	NA
Ore production:			
Calcareous (27 to 28 percent Fe)	3,153	2,832	2,948
Siliceous (27 to 28 percent Fe)	3,397	3,474	3,050
Ferruginous limestone (22 to 23 percent Fe)	440	374	317
Total	6,990	6,680	6,315
Exports:			
Belgium	738	760	601
France	181	176	59
Total	919	936	[1] 659
Imports:			
France	6,374	7,449	7,780
Sweden	65	156	59
Brazil	26	271	235
Portugal	23	5	----
Africa	2	1	25
Total	6,490	[1] 7,881	[1] 8,100
Consumption:			
Domestic ores	6,078	5,767	5,667
Imported ores:			
From ECSC countries	6,328	7,783	7,995
From other countries	122		
Total	[1] 12,525	[1] 13,549	13,662
Employment in iron mining—persons	1,872	[r] 1,763	1,652
Production per man-year—metric tons	3,734	3,772	NA
Gross value per ton of ore produced—dollars	1.90	NA	NA

[r] Revised. NA Not available.
[1] Detail do not add to total because of rounding.

Sources: Service Central de la Statistique et des Etudes Economiques (STATEC), Annuaire Statistique 1965 (Statistical Yearbook 1965); Service Central de la Statistique et des Etudes Economiques (STATEC), Indicateurs Economiques, Recapitulation 1964–1965: Annexeau Bulletin des STATEC, V. XII, No. 1, 1966 (Supplement to STATEC Bulletin, V. XII, No. 1, 1966).

steel industry, giving ARBED (which also owns or has major interests in plants elsewhere) a capacity of over 5 million tons.

Steel industry fixed investments in 1965 were mainly concentrated on projects for rationalization and modernization. ARBED completed the new 8-meter-hearth-diameter blast furnace at Esch-Belval in June 1965. Construction of its new oxygen steel plant at the same location continued on schedule; it is expected to be completed before the end of 1966. It will be equipped with two 110-ton LD/AC converters (modified version of the Linz-Donawitz converter), a mixer of 1,800 tons capacity, and a new casting hall.

The capacity of the company's oxygen plant at Terre Rouge was also increased. Work on the plant is to be completed by January 1966. The company's casting capacity at its Dudelange works was expected to be increased during 1966, and modernization of its hot rolling mill at the same plant was scheduled for completion by the beginning of 1967.

Other company projects underway included the following: Expansion of oxygen plant capacity at Terre Rouge (to be completed by January 1966); expansion of casting capacity at the Dudelange plant (to be completed during 1966); and modernization of the hot rolling mill at Dudelange, scheduled for completion by the beginning of 1967.

During 1965 HADIR continued construction of a new wide-flange I-beam rolling mill at Differdange; completion was expected by the beginning of 1966.

Three LDAC converters were in use in Luxembourg during 1965. Two more will be added when the new plant of ARBED at Esch-Belval is completed sometime during 1966.

At its small plants in Dommeldange and Eich (near the city of Luxembourg), ARBED produces special forged and cast

Table 5.—Luxembourg: Iron and steel salient statistics

(Thousand metric tons unless otherwise specified)

	1963	1964	1965
Sinter:			
Production	4,472	4,776	4,749
Consumption of raw materials:			
Iron ore:			
Total	5,336	5,488	5,494
Per ton of sinter produced—kilograms	1,193	1,149	1,139
Coke:			
Total	183	216	208
Per ton of sinter produced—kilograms	41	45	44
Pig iron:			
Blast furnaces:			
In existence	33	33	31
In operation at yearend	26	28	26
Production [1]	3,563	4,178	4,145
Consumption of raw materials:			
Iron ore, direct use:			
Total	7,157	8,047	8,179
Per ton of pig iron produced—kilograms	2,009	1,926	1,973
Manganese ore:			
Total	34	42	37
Per ton of pig iron produced—kilograms	10	10	9
Sinter:			
Total	4,393	4,760	4,723
Per ton of pig iron produced—kilograms	1,233	1,139	1,139
Coke, direct use:			
Total	3,433	3,711	3,563
Per ton of pig iron produced—kilograms	964	888	860
Scrap:			
Total	89	157	91
Per ton of pig iron produced—kilograms	25	38	22
Steel:			
Furnaces in existence and operation:			
Basic Bessemer (Thomas) in existence	25	25	24
Basic Bessemer (Thomas) in operation	24	24	24
LD–AC oxygen converters in operation	2	3	3
Electric	5	5	5
Crude steel production by type:			
Basic Bessemer (Thomas)	3,846	4,219	4,040
Oxygen blown	120	271	488
Electric	66	69	57
Total	4,032	4,559	4,585
Of which:			
Ingots	4,028	4,553	4,579
Castings	4	6	6
Consumption of raw materials:			
Iron ore:			
Total	32	14	11
Per ton of crude steel—kilograms	8	3	2
Scrap:			
Total	732	811	961
Per ton of crude steel—kilograms	190	192	209
Semimanufactures, production:			
Semifinished, for sale as such	185	220	231
Finished:			
Wire rod	225	223	257
Other bars and rods	1,031	1,121	1,141
Sections	625	719	726
Plates and sheet coil	437	459	460
Hot and cold strip	653	801	722
Railway track material	57	46	65
Total	3,028	3,369	3,371
Total semimanufactures	3,213	3,589	3,602
Employment in the iron and steel industry: Laborers, average monthly [2]	21,748	r 22,233	22,386

r Revised.
[1] Excludes remelted pig iron.
[2] Includes ancillary Office works.

Sources: Statistical Office of the European Communities. Iron and Steel. No. 2, 1966. Service Centra de la Statisque et des Étude Économiques. Indicateurs Économique (Annexes au Bulletin du Statec) Economic Indicators (Supplement to STATEC Bulletin).]. V. 12, No 1, 1966.

Table 6.—Luxembourg: Deliveries of steel products by Luxembourg works

(Thousand metric tons)

Destination	1963	1964	1965
Crude steel:			
Germany, West	138	174	170
France	3	4	5
Italy	31	17	33
Netherlands	--	--	--
Belgium	5	24	4
To Luxembourg works	2	1	1
Total, ECSC	179	220	213
All other	--	4	23
Grand total	179	224	236
Semimanufactures:			
Germany, West	661	782	755
France	242	269	238
Italy	163	91	90
Netherlands	187	232	215
Belgium	503	570	532
To luxembourg works	208	213	218
Total, ECSC	1,964	2,157	2,048
Other Europe	498	557	500
United States	265	254	342
All other	291	390	463
Grand total	3,018	3,358	[1] 3,355

[1] Detail do not add to total because of rounding.

Source: Statistical Office of the European Communities. Iron and Steel. No. 2, 1964; No. 2, 1966.

steels, including stainless steels of the martensitic, ferritic and austenitic types. Total output of the special steels at Dommeldange is approximately 20,000 tons per year; output at the Eich plant is not known.[4]

MINERAL FUELS

Luxembourg continued to rely entirely on imports for mineral fuels. Imports of both coal and coke declined sharply, the former by 22 percent and the latter by 4 percent. Imports and consumption of petroleum products continued to rise steeply, consumption increased by 19 percent in 1965.

[4] Chemistry and Industry. Dec. 18, 1965, No. 51, pp. 2053–2058.

Table 7.—Luxembourg: Fuels and energy, salient statistics

(Thousand metric tons unless otherwise specified)

Commodity	1963	1964	1965
Solid fuels:			
Coal and briquets:			
Imports by types:			
Bituminous	104	147	114
Anthracite	113		
Lignite briquets	152	153	120
Other briquets	11	8	5
Total	380	308	239
Imports by orgin:			
Germany, West	310	277	197
Belgium	29	19	6
France	17	3	4
Netherlands	8	5	6
Deliveries to consuming industries:			
Iron and steel	22	15	13
Other industries	30	22	23
Domestic sector	267	233	185
Railroads	19	--	--
Gasworks	42	39	19
Total	380	309	240
Coke:			
Production: Gas coke from imported coal	32	31	NA
Imports by origin:			
Germany, West	3,255	3,450	3,184
Belgium	236	276	433
Netherlands	185	237	178
Total	3,676	3,963	3,795
Deliveries to consuming industries:			
Iron and steel	3,627	3,930	3,761
Other industries	8	6	6
Domestic sector	42	28	29
Total	3,677	3,964	3,796
Petroleum products, consumption.			
Gasoline	75	84	96
Kerosine and white spirit	2	2	2
Diesel oil and gas oil	r 205	224	281
Fuel oil	r 270	357	416
Liquefied petroleum gases	11	12	17
Lubricants	8	9	10
Bitumens	5	7	6
Refinery gases	3	3	3
Total	579	698	831
Electricity:			
Production:			
Thermal million kilowatt-hours	r 1,278	1,335	1,310
Hydro do	r 485	795	904
Total do	1,763	2,130	2,214
Imports: [1]			
Belgium million kilowatt-hours	r 279	r 342	298
France do	9	--	--
Germany, West do	r 682	r 1,147	1,327
Total do	970	1,489	1,625
Exports: [1]			
Belgium do	1	(2)	(2)
France do	r 36	r 27	26
Germany, West do	r 456	r 769	830
Total do	r 3 492	r 3 797	3 857
Gross domestic consumption do	r 2,287	2,909	3,069

r Revised.
[1] Delivered to consumers, exclusive of transmission losses.
[2] Less than 1 million kilowatt-hours.
[3] Detail do not add to total because of rounding.
Source: Service Central de la Statistique et des Etudes Economique. Annuaire Statistique 1965.

The Mineral Industry of the Netherlands

By Stephen C. Brown [1]

The minerals industry of the Netherlands continued to show a record of expansion in 1965, with the natural gas and steel industries leading the way, but there were indications that the rate of growth was somewhat slower than in 1964. The gross national product of the country increased by some 5 percent (in real terms) in 1965, as compared with an 8.2 percent growth rate in 1964; the mineral industry probably maintained its relative position in the economy as a whole.

The rapid expansion of natural gas as a factor in the Dutch energy market accentuated in 1965 the already existing difficulties of the coal industry, and at yearend the Government announced a drastic reorganization plan calling for immediate closure of one State-owned mine, the phasing out of another over a period from 1970 to 1972, the phasing out of two privately owned mines over a period ending in 1970, and provision for subsidies to remaining mines kept in operation.

Rapid progress was made in expanding the domestic natural gas pipeline network and by yearend seven agreements, tentative or firm, had been signed for export deliveries to Belgium, West Germany, and France. One million domestic gas connections were added during 1965.

Crude petroleum output rose and intensive explorations continued for oil and natural gas, with a number of significant gas strikes resulting. No exploration occurred in the Netherlands sector of the North Sea Continental shelf, pending the issuance of implementing regulations by the Government, although authorizing legislation for licensing was enacted during the year.

Plans were announced for a significant expansion of the steel industry, and the new primary aluminum plant at Delfzijl was nearing completion and expected to go into operation in the first half of 1966.

PRODUCTION

Natural gas output more than doubled, crude steel production rose again by 14 percent, and output of primary tin increased 14 percent in 1965. An 8 percent rise in output of primary zinc was offset by an 11 percent decline in lead output. Salt and cement production rose 7 percent and 3.5 percent respectively, while output of nitrogenous fertilizers increased 4.7 percent. Coal production was unchanged but increasing difficulties in marketing, accentuated by the rapid growth of natural gas in the domestic household and industrial markets, led to a 400,000 ton increase in pit-head stocks. Output of both crude petroleum and refinery products increased, the former by 5 percent and the latter by 11 percent.

TRADE

Exports of mineral commodities from the Netherlands were 11 percent higher than in 1964 on a value basis, compared with a 10 percent increase in the value of total commodity exports. In contrast, mineral commodity imports increased only 2 to 3 per-

[1] International economist, Division of International Activities.

Table 1.—Netherlands: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Aluminum, secondary [1] thousand tons	6	6	6	1	NA
Cadmium metal [e]	40	40	40	40	40
Iron and steel:					
Sinter thousand tons	1,805	1,995	2,355	2,787	2,960
Pig iron do	1,457	1,571	1,709	1,947	2,364
Ingots and other primary forms do	1,971	2,087	2,342	2,646	3,138
Castings:					
Iron do	230	230	216	238	247
Steel do	9	9	9	8	8
Rolled steel do	1,442	1,555	1,759	1,908	2,101
Lead:					
Pig lead	10,817	9,577	11,864	17,315	15,372
Semimanufactures [1] thousand tons	17	18	16	18	17
Tin long tons	2,729	4,282	5,762	15,858	18,114
Zinc (primary)	39,592	37,049	35,762	37,702	40,821
Nonmetals:					
Cement thousand tons	1,903	2,015	2,081	2,873	2,973
Fertilizers:					
Nitrogenous, N content do	410	417	421	451	472
Phosphate, P_2O_5 content do	200	182	174	201	199
Potassic, K_2O content	1,600	2,600	r 2,600	2,500	2,500
Salt thousand tons	1,114	1,262	1,479	1,596	1,707
Sulfur do	28	31	35	r 29	NA
Mineral fuels:					
Coal and coal products:					
Anthracite and bituminous thousand tons	12,621	11,573	11,509	11,480	11,446
Coal briquets do	1,282	1,369	1,561	1,355	1,349
Coke and semicoke, including gas coke [2] do	4,787	4,474	4,447	4,623	4,383
Lignite briquets do	74	71	63	66	46
Tar do	161	144	140	151	NA
Benzol do	54	52	r 45	48	NA
Gas, manufactured million cubic feet	155,326	154,281	154,000	157,328	142,353
Gas, natural [3] do	14,620	16,068	18,964	r 27,015	57,244
Petroleum:					
Crude thousand tons	2,046	2,157	2,215	2,270	2,395
Refinery products:					
Aviation jet fuels do	1,171	965	857	976	777
Motor gasoline do	2,944	3,501	3,827	2,769	2,746
Kerosine do	722	950	970	955	1,127
Solvents do	132	158	167	178	207
Residual fuel oil do	8,484	9,636	10,155	10,943	12,888
Distillate fuel oil do	4,743	5,465	5,164	6,025	6,567
Lubricants do	259	246	245	251	332
Bitumen do	469	469	584	681	678
Liquefied petroleum gas do	295	332	334	362	396
Refinery gas do	161	193	204	166	NA
Carbon black do	NA	NA	NA	52	62

r Revised. p Preliminary. NA Not available.

[1] Including alloys.
[2] Including breeze.
[3] Deliveries for sale. Converted from Nm^3 (cubic meters at 15° C and 760 mm mercury) at rate of 35.314 cubic feet per cubic meter.

cent, while total commodity imports were 6 percent greater than those of 1964 on a value basis. As a result, mineral exports played a slightly more important role in total trade in 1965 than in the previous year, while mineral imports accounted for a slightly smaller share of total imports as shown in the following table:

	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities [1]	Total commodities	
Exports:			
1963	908	4,961	18.3
1964	1,041	5,808	17.9
1965	1,155	6,393	18.1
Imports:			
1963	1,360	5,967	22.8
1964	1,661	7,057	23.5
1965	1,698	7,462	22.8
Trade balance:			
1963	−452	−1,006	XX
1964	−620	−1,249	XX
1965	−543	−1,069	XX

XX Not applicable.
[1] Includes value of all commodities listed in Tables 2 and 3 of this chapter except for gold and such diamonds and other precious stones as were classified in sources as being of gem quality.

Source: Statistical Office of the United Nations.

Exports of petroleum and products rose in value by 5 percent to $427 million, of iron and steel by 11 percent to $243 million, and of nonferrous metals (including silver and platinum group metals) by 24 percent to $129 million. Even exports of coal, coke and briquets rose slightly, by 1 percent, to $115 million, while exports of manufactured fertilizers rose by 36 percent to $74 million.

Principal destinations for exports of mineral commodities in 1965 were West Germany, the Belgium-Luxembourg Economic Union, the United Kingdom, and France, with 25.5, 13.8, 13.4 and 8.9 percent of total commidity export value, respectively.

Petroleum and refinery products, iron and steel, nonferrous metals, metal ores and scrap, and coal, coke and briquets (in that order) remained the most important categories of mineral imports by value. Imports of petroleum and products increased 2 percent to $620 million, of nonferrous metals (including silver and platinum metals) 23 percent to $196 million, and of metal ores and scrap 8 percent to $136 million. Imports of iron and steel declined 4 percent, from $392 million in 1964 to $376 million in 1965; imports of coal, coke and briquets fell sharply by 18 percent, from $165 million in 1964 to $136 million in 1965.

Principal sources of mineral imports were West Germany, the Belgium-Luxembourg Economic Union, Kuwait, Indonesia, the United Kingdom, the United States, and Iran, with 22.7, 17.9, 5.1, 4.7, 4.5, 4.5, and 4.3 percent, respectively, of total mineral commodity import values.

The entrepôt trade in crude petroleum and refined products continued at a high level, with entries in bond of 24.9 million tons of crude and withdrawals of 24.7 million tons. Entries of products totaled 16.9 million tons and withdrawals 16 million tons. The net increase of crude in bond was 516,203 tons, and of products, 855,400 tons.

The transit trade in mineral commodities rose by nearly 7 percent, with metal ores (21.3 million tons), coal, coke, and briquets (7.5 million tons), fertilizers and fertilizer materials (5.1 million tons), petroleum and products (5 million tons) and sand, gravel, and crushed stone (4.8 million tons) accounting for the bulk.

COMMODITY REVIEW

METALS

Aluminum.—Work continued on the primary aluminum plant in Delfzijl. The plant, jointly owned by Swiss Aluminium Ltd. (Alusuisse), Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V. (Hoogovens) and N.V. Billiton Mattaschappij (Billiton) and with an initial annual capacity of about 32,000 tons was expected to start production in the first half of 1966. Production at Alusuisse's anode plant at Botlet began in early 1965. N.V. Lips, of Drunen at yearend announced plans for erection of two new aluminum rolling mills to begin production in mid-1967; one, a hot rolling mill, will have an annual capacity of 30,000 tons, while the second, a cold mill, will have a capacity of 20,000 tons. The firm in 1965 put into operation

Table 2.—Netherlands: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Metals:				
Aluminum:				
Bauxite and alumina	887	198	42	NA.
Scrap	7,396	8,985	9,468	West Germany 8,655; Belgium-Luxembourg 788.
Ingot [1]	91	754	1,019	Belgium-Luxembourg 309; West Germany 245.
Semimanufactures	8,814	13,715	15,853	West Germany 5,079; Belgium-Luxembourg 3,306.
Bismuth, all forms	181	141	280	France 142; West Germany 70.
Cadmium, all forms	246	186	307	West Germany 182; France 51.
Chromite	1,476	1,272	1,002	United Kingdom 299; Italy 247.
Chrome oxides and hydroxide	20	13	66	West Germany 45.
Cobalt:				
Metal, all forms	63	59	88	United States 27; France 26.
Oxide and hydroxide	---	1	---	
Copper:				
Scrap	20,000	24,474	32,424	West Germany 15,856; Belgium-Luxembourg 14,734.
Unwrought [1]	5,572	7,586	5,742	West Germany 4,405; Belgium-Luxembourg 606.
Semimanufactures	9,006	13,699	16,173	West Germany 7,261; Belgium-Luxembourg 2,829.
Gold [2]—thousand troy ounces	49	46	102	Oman 34; Switzerland 24.
Iron and steel:				
Iron ore—thousand tons	7	3	7	NA.
Pyrite cinder—do	120	249	258	West Germany 236.
Blast furnace slag and waste—do	131	101	91	West Germany 50; Belgium-Luxembourg 41.
Scrap—do	282	423	451	West Germany 331; Belgium-Luxembourg 69.
Pig iron and ferroalloys [3]—do	146	95	85	Belgium-Luxembourg 29; West Germany 25.
Ingots and other primary forms—do	r 402	r 496	609	Spain 234; Belgium-Luxembourg 145.
Semimanufactures:				
Bars, rods, angles, shapes, sections—do	134	164	197	West Germany 80; Belgium-Luxembourg 36.
Universals, plate and sheet—do	802	777	870	West Germany 196; United Kingdom 142; Sweden 77.
Hoop and strip—do	60	63	65	West Germany 48.
Railway track material—do	6	7	9	West Germany 6; Indonesia 3.
Wire—do	23	25	26	West Germany 8; Republic of South Africa 5.
Tubes, pipes and fittings—do	117	123	134	West Germany 39; Belgium-Luxembourg 17.
Castings and forgings—do	1	2	3	Belgium-Luxembourg 2; West Germany 1.
Oxide and hydroxide	423	536	317	Belgium-Luxembourg 134; Australia 48.
Lead:				
Scrap	3,247	8,430	7,604	Belgium-Luxembourg 6,641; West Germany 820.
Ashes and residues	4,602	4,762	4,531	Belgium-Luxembourg 3,359; West Germany 1,135.
Pig [1]	r 5,467	7,639	8,040	West Germany 7,107; Switzerland 378.
Antimonial and other alloys	r 1,873	1,576	1,798	West Germany 1,593.
Semimanufactures	r 2,928	1,847	1,550	United States 352; Norway 312.
Oxides	969	796	709	Czechoslovakia 449; Belgium-Luxembourg 165.
Magnesium, all forms	373	243	291	Belgium-Luxembourg 131; West Germany 75.
Manganese:				
Ore	7,095	8,592	8,727	West Germany 1,967; Belgium-Luxembourg 1,642; Italy 1,525.
Oxide	326	583	917	Italy 172; Denmark 107.
Mercury—76-pound flasks	116	203	609	West Germany 174; United Kingdom 174.
Molybdenum metal	56	67	126	West Germany 70; United Kingdom 17.

See footnotes at end of table.

Table 2.—Netherlands: Exports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Metals—Continued				
Nickel:				
Matte, Scrap	1,548	1,559	1,186	West Germany 470; United Kingdom 384.
Ingots anodes and semimanufactures [1]	r 307	278	295	West Germany 110; Spain 46.
Oxide and hydroxide	8	---	7	Australia 3; Belgium-Luxembourg 2.
Platinum and platinum group metals, all forms---troy ounces	47,551	33,887	39,738	West Germany 12,346; Netherland Antillies 6,591; Switzerland 5,433.
Silver:				
Scrap and waste [4] thousand troy ounces	1,433	3,101	1,984	Belgium-Luxembourg 1,050; West Germany 758.
Unwrought [1] ---do---	1,724	588	1,235	West Germany 380.
Semimanufactures ---do---	353	362	359	Denmark 225; Belgium-Luxembourg 77.
Tantalum	---	2	2	France 1.
Tellurium and arsenic	---	1	2	All to West Germany.
Tin:				
Ore---long tons	44	548	---	
Ashes and residues ---do---	532	2,137	1,331	Spain 450; United Kingdom 427.
Ingots [1] ---do---	4,853	14,420	15,965	West Germany 7,880; France 2,235.
Scrap and semimanufactures do---	r 816	691	666	West Germany 226; United Kingdom 131.
Oxide---do---	1	---	1	All to India.
Titanium:				
Dioxide	2,616	6,188	8,628	West Germany 1,171; Italy 1,093.
Tungsten:				
Ore	66	57	87	West Germany 45; France 18.
Metal	190	220	229	United Kingdom 89; West Germany 84.
Vanadium, molybdenum, etc. ores	476	485	576	Belgium-Luxembourg 284; West Germany 110.
Zinc:				
Ore	3,870	8,161	5,821	Belgium-Luxembourg 3,977; Japan 1,844.
Ashes and residues	8,977	20,005	9,954	Belgium-Luxembourg 5,474; West Germany 2,748.
Scrap	7,955	9,287	10,129	France 9,460; West Germany 397.
Slab [1]	23,481	25,822	22,693	West Germany 15,812; Denmark 1,880.
Semimanufactures (include zinc dust)	r 1,295	1,337	1,386	Denmark 753; West Germany 316.
Oxide	10,295	10,771	9,510	West Germany 1,871; Belgium-Luxembourg 1,152.
Other nonferrous ores	53	160	---	
Other nonferrous metals [1]	598	538	779	West Germany 295; France 220.
Other nonferrous ashes and residues	10,917	10,321	9,516	West Germany 5,402; Belgium-Luxembourg 2,619.
Metalloids:				
Selenium	1	---	1	NA.
Silicon [3]	---	26	1	NA.
Other	398	498	672	Belgium-Luxembourg 666.
Alkali, alkaline-earth, and rare-earth metals	5	---	5	All to West Germany.
Oxides of strontium, barium and magnesium	49	185	99	NA.
Other slags and ashes thousand tons	32,522	22,571	26,820	Belgium-Luxembourg 22,338; West Germany 3,327.
Nonmetals:				
Abrasives, natural	4,274	9,470	4,747	NA.
Grinding stones	335	385	567	West Germany 246; Belgium-Luxembourg 64.
Asbestos	122	17	93	All to Belgium-Luxembourg.
Borates, natural	20	85,545	133,546	West Germany 50,445; United Kingdom 28,570.
Cement	7,893	9,059	12,705	West Germany 10,931.
Chalk	14,709	13,125	12,801	Belgium-Luxembourg 12,185
Clays:				
Kaolin	98	212	116	France 48.
Refractory	1,257	2,094	1,487	Sweden 660; West Germany 371.
Other---thousand tons	102	110	136	West Germany 103.
Construction materials:				
Refractory building production	5,378	8,469	6,754	West Germany 2,519; Belgium-Luxembourg 1,267.
Brick, etc. nonrefractory thousand tons	505	543	511	West Germany 421.

See footnotes at end of table.

Table 2.—Netherlands: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Nonmetals—Continued				
Diamond and other gem stones:				
Diamond, unworked and worked thousand carats	1,464	1,078	966	NA.
Diamond powder ——do——	671	695	880	West Germany 222; Italy 166; France 163.
Other gem stones, unworked and worked ——kilograms——	94	941	10,679	Switzerland 10,222; Hong Kong 155.
Diatomaceous earth	113	94	144	West Germany 96.
Feldspar, leucite and fluorspar	4,278	5,130	2,095	Belgium-Luxembourg 1,883.
Fertilizers:				
Nitrogenous:				
Manufactured thousand tons	565	455	584	Mainland China 147; United Kingdom 69.
Natural nitrate	r 248	---	---	
Phosphatic:				
Phosphate rock	3,505	1,324	976	Nigeria 510; Thailand 200.
Basic slag	40	190	7,794	West Germany 7,761.
Superphosphate and other thousand tons	376	465	378	France 133.
Potassic	r 1,362	1,038	1,568	Australia 466; Morocco 149.
Other ——thousand tons——	260	285	466	NA.
Ammonia, anhydrous	2,174	2,320	5,093	West Germany 1,461; Belgium-Luxembourg 1,118.
Kyanite and andalusite	1,426	1,920	---	
Lime	1,109	2,517	976	NA.
Magnesite	36,613	38,836	32,735	West Germany 8,870.
Mica	157	178	104	Belgium-Luxembourg 76.
Potash, caustic	33	24	50	NA.
Quartz and quartzite	2,036	2,408	6,194	Finland 2,877; Belgium-Luxembourg 2,071; West Germany 1,077.
Salt ——thousand tons——	863	959	979	Sweden 311; Belgium-Luxembourg 309.
Sand:				
Industrial ——thousand tons——	343	243	189	West Germany 68; Italy 58.
Construction ——do——	5,173	6,080	6,249	Belgium-Luxembourg 5,914.
Stone, building, unworked (including slate)	4,796	5,735	8,085	Belgium-Luxembourg 6,853; West Germany 1,021.
Stone, building, worked (including slate and natural paving stones)	33,657	19,972	11,264	Belgium-Luxembourg 10,543.
Stone, other, calcareous (including gypsum and plasters)	521	627	545	Belgium-Luxembourg 238; France 100.
Gravel and crushed stone thousand tons	1,796	2,247	2,027	Belgium-Luxembourg 1,702; West Germany 323.
Sulfur	6,949	4,493	3,052	All to Belgium-Luxembourg.
Sulfuric acid, oleum thousand tons	83	61	93	West Germany 56; Belgium-Luxembourg 34.
Sulfur dioxide	326	474	437	NA.
Talc and steatite	162	146	350	West Germany 95; Finland 71.
Other mineral substances thousand tons	86	111	164	Belgium-Luxembourg 107; West Germany 45.
Mineral fuels:				
Natural bitumen, asphalt, etc.	44	---	52	West Germany 33; Belgium-Luxembourg 18.
Carbon black	r 37,128	r 45,574	52,600	France 12,132; Sweden 8,762; West Germany 7,244.
Coal and coke:				
Anthracite and bituminous thousand tons	2,572	2,158	2,092	France 908; Belgium-Luxembourg 879.
Coal briquets ——do——	769	776	835	West Germany 296; Belgium-Luxembourg 280; France 228.
Lignite briquets ——do——	34	40	24	West Germany 12; France 7.
Peat ——do——	51	43	33	Belgium-Luxembourg 13; West Germany 11.
Coke and semicoke ——do——	2,118	2,327	2,404	France 946; Belgium-Luxembourg 745.
Gas:				
Hydrocarbon:				
Manufactured million cubic feet	r 25	r 79	18	All to West Germany.
Natural (including LPG) thousand tons	181	205	246	Belgium-Luxembourg 115; United Kingdom 48.
Hydrogen and rare gases	317	371	513	Belgium-Luxembourg 154; Denmark 131.

See footnotes at end of table.

Table 2.—Netherlands: Exports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Mineral fuels—Continued				
Petroleum: [6]				
Crude—thousand tons	---	7	11	Mainly to Denmark.
Refinery products:				
Gasoline—do	2,795	r 2,962	3,127	United Kingdom 1,677; West Germany 379.
Kerosine, include jet fuel—do	577	r 635	719	United Kingdom 329; Sweden 95.
Distillate fuel oils—do	2,636	2,477	3,451	West Germany 1,722; Sweden 348.
Residual fuel oils—do	5,582	6,390	6,413	Bunkers 2,797; United Kingdom 981; West Germany 914.
Lubricants—do	264	r 339	333	West Germany 35; Sweden 34; Belgium-Luxembourg 33.
Paraffin, jelly, etc.—do	18	22	22	West Germany 8; France 2.
Petroleum coke—do	56	58	58	United Kingdom 31; Italy 15.
Bitumen, bituminous mixtures and other derivatives—do	r 406	401	365	West Germany 284; Sweden 23.
Miscellaneous derivatives of coal, gas, and petroleum distillation—do	65	86	122	West Germany 51; Belgium-Luxembourg 38.

r Revised. NA not available.
[1] Including alloys.
[2] Excluding gold coin and gold and alloys shipped by post.
[3] Including sponge iron, shot, grit, pellets, powder, spiegeleisen and ferromanganese.
[4] In 1964, less than 99.7 percent pure; in 1965, less than 99.99 percent pure.
[5] Includes all precious metals.
[6] Includes bunkers for foreign ships and aircraft; excludes reexports from bonded storage.

Table 3.—Netherlands: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals:				
Aluminum:				
Bauxite	10,368	4,330	21,690	Greece 20,647; British Guiana 945.
Alumina	7,810	9,054	10,594	West Germany 10,208; France 264.
Scrap	2,180	2,972	3,136	Belgium-Luxembourg 1,503; France 393.
Ingots	14,129	15,099	11,675	Australia 2,650; Canada 2,344; France 2,082; United States 1,973.
Alloys	5,685	7,274	8,499	West Germany 3,678; France 2,469; Switzerland 1,153.
Semimanufactures [1]	r 21,753	29,734	29,370	NA.
Antimony, all forms	386	294	234	Belgium-Luxembourg 126; mainland China 42.
Arsenic, oxides and acids	984	871	901	Belgium-Luxembourg 784.
Bismuth, all forms	105	157	150	United Kingdom 44; Belgium-Luxembourg 30.
Cadmium, all forms	189	177	251	U.S.S.R. 90; Belgium-Luxembourg 60.
Chromium:				
Ore	2,700	2,772	4,563	Philippines 1,524; Mozambique 1,093; Turkey 1,051.
Unwrought and semimanufactures	16	17	29	France 13; United Kingdom 12.
Oxide and hydroxide	514	587	581	West Germany 337; France 117.
Cobalt, unwrought and semimanufactures	122	164	248	Belgium-Luxembourg 185; France 41.
Copper:				
Scrap	r 8,363	8,703	10,440	West Germany 5,302; Belgium-Luxembourg 2,465; France 728.
Unwrought [1]	27,899	36,790	35,297	Belgium-Luxembourg 12,501; United States 6,651; United Kingdom 4,715.
Semimanufactures [1]	r 40,701	58,617	68,601	NA.
Gold [2]—thousand troy ounces	147	193	243	United Kingdom 211.
Iron and steel:				
Ore—thousand tons	r 2,527	3,048	3,570	Liberia 943; Sierra Leone 764; Sweden 561.
Pyrite cinder	14,423	13,027	6,237	All from West Germany.
Scrap—thousand tons	90	44	99	Belgium-Luxembourg 63, West Germany 27; France 3.

See footnotes at end of table.

Table 3.—Netherlands: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals—Continued				
Iron and steel—Continued				
Pig iron and blast furnace ferro-alloys [3]	r 57	r 116	68	West Germany 19; Norway 12.
Other ferroalloys thousand tons	6	8	11	Norway 4; West Germany 3.
Ingots and other primary forms do	r 261	r 226	139	Belgium-Luxembourg 50; Norway 44.
Semimanufactures:				
Bars, rods, sections do	1,067	1,253	1,143	Belgium-Luxembourg 528; West Germany 454.
Universals, plates and sheets do	423	504	496	West Germany 244; Belgium-Luxembourg 154.
Hoop and strip do	155	220	196	Belgium-Luxembourg 97; West Germany 92.
Railway track material do	49	50	53	West Germany 36; Belgium-Luxembourg 12.
Wire do	49	59	59	Belgium-Luxembourg 36; West Germany 17.
Tubes, pipes and fittings do	219	431	398	West Germany 208; France 68.
Castings and forgings do	8	9	10	United Kingdom 4; Belgium-Luxembourg 3.
Oxide and hydroxide	7,005	10,219	9,782	West Germany 6,022; Spain 1,570; France 1,426.
Lead:				
Ore	---	---	290	All from West Germany.
Scrap	3,708	5,180	3,457	West Germany 1,390; Belgium-Luxembourg 954.
Ashes and residues	1,112	655	717	West Germany 631; Belgium-Luxembourg 64.
Pig [1]	r 32,357	37,930	45,607	Belgium-Luxembourg 19,850; Bulgaria 4,255; Republic of South Africa 3,885.
Antimonial and other alloys	r 8,216	11,117	10,099	Mexico 7,923; Belgium-Luxembourg 941.
Semimaufactures [1]	r 2,725	r 3,087	3,111	Belgium-Luxembourg 2,724; West Germany 133.
Oxides	7,200	7,982	8,155	Belgium-Luxembourg 2,773; Mexico 2,483; West Germany 1,680.
Magnesium:				
Scrap	94	53	64	Norway 40; West Germany 9.
Unwrought	393	208	187	Norway 140; United States 29.
Semimanufactures	76	122	76	West Germany 43; Austria 17.
Manganese:				
Ore	12,927	16,827	16,570	U.S.S.R. 5,318; Republic of South Africa 4,427.
Oxides	517	637	604	France 300; Japan 129.
Mercury 76-pound flasks	r 1,798	r 2,031	5,773	Spain 4,728; Belgium-Luxembourg 580.
Molybdenum (metal)	12	12	36	West Germany 23.
Nickel:				
Matte, speiss, etc.	---	---	120	France 61; United Kingdom 43.
Scrap	876	910	745	West Germany 184; United Kingdom 122.
Ingots and anodes [1]	774	976	994	United Kingdom 516; Norway 377.
Semimanufactures [1]	r 1,365	1,906	1,908	West Germany 1,252; United Kingdom 366.
Platinum and platinum-group metals thousand troy ounces	78	66	74	West Germany 24; France 16.
Silver:				
Scrap and waste [4] do	431	339	145	Denmark 130; West Germany 9.
Unwrought [1] do	3,895	3,039	4,646	United Kingdom 2,483; West Germany 1,009.
Semimanufactures do	2,242	2,648	3,149	West Germany 1,126; France 1,029.
Tantalum	2	2	4	United States 3.
Tellurium and arsenic	1	3	3	Canada 1; Japan 1.
Tin:				
Ore long tons	r 7,804	28,782	24,021	Indonesia 17,898; Thailand 4,020.
Ashes and residues do	716	594	671	West Germany 380; Southern Rhodesia 194.
Ingots [1] do	3,083	1,502	1,188	Mainland China 413; United States 134.
Scrap and semimanufactures do	r 209	241	394	Belgium-Luxembourg 162; West Germany 112.
Oxide do	103	88	70	West Germany 38; Belgium-Luxembourg 25.
Titanium dioxide	11,390	2,194	3,961	West Germany 2,239; Belgium-Luxembourg 1,407.

See footnotes at end of table.

Table 3.—Netherlands: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals—Continued				
Tungsten:				
Ore	20	61	244	Portugal 203.
Metal	11	37	23	United States 9; France 4.
Vanadium, molybdenum, etc. ores	4,550	6,384	7,618	Australia 2,966; United Kingdom 1,876.
Zinc:				
Ore	76,767	105,594	85,147	Finland 26,183; Canada 21,955; West Germany 13,356.
Ashes and residues	20,479	28,411	25,261	West Germany 17,110; United Kingdom 2,827.
Scrap	431	253	1,282	West Germany 1,075; East Germany 100.
Slab [1]	15,906	15,835	17,583	Belgium-Luxembourg 4,545; U.S.S.R. 3,530; North Korea 2,704.
Semimanufactures (including dust)	6,561	8,001	6,876	Belgium-Luxembourg 3,591; United Kingdom 1,644; West Germany 1,422.
Oxides	1,796	1,868	2,094	West Germany 1,213; Belgium-Luxembourg 431.
Other nonferrous ores	r 53	r 6,984	5,522	Republic of South Africa 3,803.
Other nonferrous metals and scrap [1]	r 87	r 182	173	NA.
Metalloids:				
Selenium	3	2	5	West Germany 2; United Kingdom 1.
Silicon [5]	NA	105	99	Sweden 40; Italy 30; Norway 21.
Alkali, alkaline-earth and rare metals	84	101	111	West Germany 108.
Oxides of strontium, barium, and magnesium	459	498	514	United Kingdom 186; United States 182.
Blast furnace dust, slag and waste thousand tons	1,254	1,470	1,553	West Germany 799; Belgium-Luxembourg 752.
Other slags and ashes do	243	248	298	West Germany 205; Belgium-Luxembourg 92.
Nonmetals:				
Abrasives, natural thousand tons	479	448	434	West Germany 402; Italy 26.
Grinding stones	1,236	1,441	1,669	West Germany 793; United Kingdom 221.
Asbestos	16,644	23,276	18,931	Canada 10,627; U.S.S.R. 2,545; Italy 1,485.
Barite	14,314	37,071	29,162	West Germany 24,165; France 1,583.
Borates, natural	3,500	92,182	164,972	United States 164,772.
Boric oxide, boric acid	2,006	2,370	2,464	France 1,452; Italy 462.
Cement thousand tons	1,410	1,846	2,018	Belgium-Luxembourg 1,196; West Germany 803.
Chalk	53,624	70,769	72,610	Belgium-Luxembourg 38,986; France 25,823; West Germany 7,210.
Clays:				
Kaolin thousand tons	112	130	128	United Kingdom 108.
Refractory do	75	75	83	West Germany 57; United Kingdom 11.
Other do	319	455	466	West Germany 428.
Construction materials:				
Refractory thousand tons	45	52	52	West Germany 21; United Kingdom 17.
Brick, etc., nonrefractory do	155	202	202	Belgium-Luxembourg 114; West Germany 71.
Cryolite and chiolite, natural	386	210	143	All from Denmark.
Diamond and other gem stones:				
Diamond, unworked and worked thousand carats	1,827	1,438	1,184	NA.
Diamond powder do	539	597	950	Ireland 663; United Kingdom 147.
Other gem stones, unworked and worked [6] thousand kilograms	52	161	148	Brazil 98; West Germany 46.
Diatomaceous earth	6,649	8,180	8,532	Hungary 3,690; West Germany 2,129.
Dolomite thousand tons	264	314	422	Belgium-Luxembourg 364.
Feldspar and leucite	28,913	28,946	26,966	Norway 7,755; West Germany 7,047; Canada 5,417.
Fertilizer materials:				
Natural:				
Phosphate rock thousand tons	675	810	783	Morocco 540: Togo 157.
Potassium salts do	187	80	88	France 46; West Germany 42.
Sodium nitrate do	32	17	30	All from Chile.
Manufactured:				
Nitrogenous	122	3	7	Belgium-Luxembourg 5; West Germany 1.

See footnotes at end of table.

Table 3.—Netherlands: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Nonmetals—Continued				
Fertilizer materials—Continued				
Phosphatic:				
Basic slag				
thousand tons	155	234	254	Belgium-Luxembourg 215.
Other	63	103	61	United States 38; Belgium-Luxembourg 14.
Potassic—thousand tons	218	402	411	West Germany 179; Belgium-Luxembourg 89.
Other	50	47	60	Belgium-Luxembourg 43; West Germany 8.
Ammonia, anhydrous	13,848	19,326	27,512	West Germany 21,278; Belgium-Luxembourg 6,221.
Fluorspar	8,842	14,472	18,972	Mainland China 8,959; Republic of South Africa 5,129; Mexico 2,519.
Graphite, natural	392	364	342	Austria 144; West Germany 126.
Gypsum—thousand tons	153	247	204	West Germany 137; France 49.
Kyanite and andalusite	3,011	4,700	---	
Lime—thousand tons	473	594	645	West Germany 324; Belgium-Luxembourg 302.
Limestone—do	709	769	811	Belgium-Luxembourg 808; West Germany 3.
Magnesite	40,368	52,120	43,620	Greece 22,039; India 6,154; Yugoslavia 3,967.
Mica:				
Unworked, including waste and scrap	630	793	957	United Kingdom 408; Norway 282.
Worked	57	55	60	Switzerland 29; United Kingdom 18.
Pigments, natural	2,393	1,043	1,028	France 395; Austria 260; West Germany 222.
Pyrite—thousand tons	226	244	211	Cyprus 116; Spain 77.
Quartz and quartzite	18,698	32,826	45,815	Belgium-Luxembourg 20,170; Norway 13,475.
Salt	62,830	34,979	35,593	West Germany 25,995; Italy 7,268.
Soda, caustic	31,306	66,542	73,254	West Germany 48,455; United States 14,044.
Potash, caustic	7,571	7,100	6,642	France 2,698; Belgium-Luxembourg 2,655.
Slate	22,157	32,939	31,306	West Germany 16,071; France 6,980.
Stone, sand and gravel:				
Stone, dimension				
thousand tons	1,128	1,526	1,529	Belgium-Luxembourg 1,177; West Germany 279.
Gravel and crushed stone				
do	5,821	7,998	8,753	West Germany 5,156; Belgium-Luxembourg 3,140.
Sand, industrial—do	264	298	333	Belgium-Luxembourg 269.
Sand, other—do	1,085	1,823	2,408	West Germany 1,932; Belgium-Luxembourg 474.
Sulfur, elemental—do	137	167	218	United States 148; France 56.
Sulfuric acid, oleum	51,849	100,694	75,243	Belgium-Luxembourg 40,660; West Germany 20,869.
Sulfur dioxide	---	262	---	
Mineral fuels:				
Asphalt and bitumen, natural	1,440	1,357	1,518	Trinidad 821; United States 450; Belgium-Luxembourg 185.
Carbon black (including other black of carbon)	r 9,668	r 11,241	8,918	West Germany 3,548; France 2,338; United States 1,171; United Kingdom 1,143.
Coal and coke:				
Anthracite and bituminous				
thousand tons	9,949	9,297	7,107	West Germany 2,811; United States 2,174; United Kingdom 816; Belgium-Luxembourg 808.
Coal briquets—do	200	93	55	West Germany 50; Belgium-Luxembourg 5.
Lignite—do	191	204	149	All from West Germany.
Lignite briquets—do	265	160	146	West Germany 134.
Peat—do	59	75	73	Mainly from West Germany.
Coke and semicoke—do	524	310	281	West Germany 203; United Kingdom 68.
Gas:				
Hydrocarbon:				
Manufactured				
million cubic feet	996	319	110	Belgium-Luxembourg 86; West Germany 24.

See footnotes at end of table.

Table 3.—Netherlands: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965 p	Principal sources, 1965
Mineral fuels—Continued				
Gas—Continued				
Natural (including LPG) thousand tons	82	102	106	West Germany 82; Belgium-Luxembourg 22.
Hydrogen and rare gases	64	64	56	Hungary 25; Belgium-Luxembourg 21.
Petroleum: [7]				
Crude thousand tons	20,890	23,438	26,379	Kuwait 5,143; Syria 4,225; Libya 3,854.
Refinery products: [7]				
Gasoline do	124	r 284	r 409	Netherlands Antilles 191; Belgium-Luxembourg 114.
Kerosine, include jet fuel do	341	r 364	r 367	Belgium-Luxembourg 192; Portugal 59.
Distillate fuel oils do	1,252	1,388	1,301	Belgium-Luxembourg 330; Italy 355; Venezuela 138.
Residual fuel oils do	r 2,984	3,747	4,082	Indonesia 1,646; West Germany 1,027; United Kingdom 504.
Lubricants do	167	r 188	337	Netherlands Antilles 169; Belgium-Luxembourg 45.
Paraffin, jelly, etc. do	20	29	19	West Germany 7; Indonesia 3.
Petroleum coke	40	52	54	West Germany 33; United States 19.
Bitumen, bituminous mixtures and other derivatives do	r 182	223	210	United States 87; Belgium-Luxembourg 81.
Miscellaneous derivatives of coal, gas, and petroleum distillation do	r 125	r 134	153	Belgium-Luxembourg 41; West Germany 32.

r Revised. p Preliminary. NA Not available.
[1] Including alloys.
[2] Excluding gold coin and gold and alloys shipped by post.
[3] Including sponge iron, shot, grit, pellets and powder; spiegeleisen and ferromanganese.
[4] Including other precious metals.
[5] In 1964, not more than 99.7 percent pure; in 1965 at least 99.99 percent pure.
[6] Including articles of piezo-electric quartz.
[7] Includes bunkers for Netherlands ships and aircraft; excludes deliveries to bonded storage.

a new extrusion press with a capacity of 2,500 tons per year. At yearend plans for a second aluminum smelter, to be located in the province of Limburg, were reported to be well advanced, but no details were reported.

Iron and Steel.—Output of crude steel increased 14 percent in 1965, while production of rolled steel rose 10 percent. Exports of pig iron, crude steel, and steel products rose 14 percent, imports declined 13 percent, and apparent consumption of steel declined 5 percent to 3,792,000 tons. The industry operated at 86.7 percent of its estimated capacity at the beginning of the year. Nearly 70 percent of the total output was produced by the oxygen process.

Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V. and its affiliate, Breedband N.V. (which it took over and liquidated as a separate enterprise in 1965) increased both pig iron and crude steel output 21 percent, while their production of semimanufactures rose only 5 percent. Output of crude steel by Koninklijke Demka Staalfabrieken N.V. (also a Hoogovens subsidiary) increased 6 percent to 126,000 tons, while its production of castings, forgings, rolled and other products rose from 93,820 tons to 117,830 tons.

Production data for N.V. Nederlandsche Kabelfabrieken (NKF), the other major producer, are not available but the company has had in hand an expansion program which includes a new rolling mill of 800,000 tons per year capacity, scheduled for completion in 1966. NKF's plans also include a blast furnace, a new steel plant, and a sintering plant, all scheduled for completion by 1969. When the expansion program is completed NKF is expected to have a crude steel capacity of about 600,000 tons per year.

Two important developments, both announced towards yearend, were Hoogovens' $268 million 5-year plan for expansion of crude steel output from 2.8 million tons to 4 million tons per year, and Hoogoven's participation in the merger of two West German steel firms, Dortmund Hoerder-Huetten Union (DHHU) and Hoesch A.G.,

in the former of which Hoogovens holds 42.8 percent of the shares.

Hoogovens' expansion program includes a second ore quay, a second coke plant, a second oxygen-steel plant equipped with two 225-ton converters (annual capacity 2.5 million tons), a third slabbing mill, of 1 million tons annual capacity, and a second hot-rolling mill with an initial capacity of 2 million tons per year. In 1966, the company reportedly planned to begin construction of a pipe-casting plant capable of producing pipe of 400 millimeters diameter. According to its annual report, plans for the second oxygen-steel plant take account of the eventual possibility of continuous casting of a part of the output.

The merger plans of DHHU and Hoesch include plans for cooperation with Hoogovens and reorganization and rationalization of the three firms' output. Briefly, it provides for the concentration of pig iron and crude steel production at Hoogovens' Ijmuiden plant on the coast, with DHHU's and Hoecsh's plants concentrating on production of semimanufactures for the West German inland market at their plants in the Dortmund region. In this way the operations of the three firms will benefit from the cost advantages of easy access to richer overseas ores for crude steel production, and of a central market location for semimanufactures. Hoogovens is to exchange its holdings in DHHU for an estimated 14 to 16 percent interest in Hoesch, which will acquire DHHU's share capital. Approval of the merger by the ECSC High Authority was requested at the end of the year.

Tin.—Production of primary tin rose 14 percent while ore imports declined 17 percent. Indonesia continued to supply the bulk of ores (17,898 long tons) with smaller quantities coming from Thailand, Republic of South Africa, and the Republic of the Congo (Léopoldville).

Table 4.—Netherlands: Iron and steel production of Koninklijke Hoogovens en Staalfabricken N.V.[1]

(Thousand metric tons)

Product	1964	1965
Pig iron	1,948	2,365
Steel ingots:		
Oxygen	1,840	2,173
Open hearth	483	651
Total	2,323	2,824
Plates	386	377
Bars	10	96
Cast iron pipes	25	26
Hot-rolled thin products:		
Coils	339	388
Sheet	95	108
Total	434	496
Cold-reduced thin products:		
Coils	217	359
Sheet	488	375
Total	705	734
Tinplate:		
Electrolytic	223	202
Hot dipped	47	43
Total	270	245
Rolled on commission	2	132

[1] Including production of Breedband N.V., which was taken over by Hoogovens at the end of 1964 and has been liquidated as a separate enterprise. The table has been revised accordingly.

Source: Annual Report of Koninklijke Nederlandsche Hoogovens en Stallfabricken N.V., Ijmuiden, 1965.

Table 5.—Netherlands: Salient iron and steel industry statistics
(Thousand metric tons unless otherwise specified)

Item	1963	1964	1965
SINTER			
Raw material consumption for sinter production:			
Iron ore	2,205	2,594	2,926
Coke	104	104	70
PIG IRON			
Number of blast furnaces:			
Available	5	5	5
In operation	4	5	5
Maximum production capacity	1,825	r 2,200	2,300
Production:			
Martin	r 1,501	1,743	2,119
Foundry	207	205	249
Total	r 1,708	1,948	2,368
Raw material consumption for pig iron production:			
Iron ore directly in blast furnaces	370	321	608
Iron ore in sintering plants	2,205	2,594	2,926
Coke in blast furnaces	1,123	1,214	1,321
Manganese ore in blast furnaces	23	11	6
Sinter in blast furnaces	2,341	2,773	3,171
STEEL			
Number of steelworks:			
Martin:			
Available	10	10	9
In operation	6	r 5	7
Electric:			
Available	r 10	r 10	9
In operation	r 10	r 10	9
Maximum production capacity	r 2,940	r 3,150	[1] 3,620
Production of crude steel:			
Martin	697	587	761
Electric	r 221	r 229	206
Oxygen	1,434	1,841	2,173
Total	r 2,354	r 2,659	3,140
Raw material consumption in steelworks:			
Pig iron, spiegeleisen and ferroalloys	1,509	1,815	2,140
Scrap	1,078	1,132	1,338
Iron ore	12	16	17
Consumption per ton of crude steel produced:			
Pig iron kilograms	644	686	679
Scrap do	470	431	426
Rolled steel production:			
Strip	76	84	81
Sheet and plate	1,387	1,456	1,448
Coil	111	149	272
Wirebar	132	152	162
Other	46	68	141
Total	1,752	1,909	[2] 2,103
Tinplate and other coated steel production	248	270	244
Tube production	145	175	193
Wire production	136	148	NA
Steel consumption: [3]			
Total	r 3,104	r 3,980	3,792
Per capita kilograms	r 259	r 328	308
Total employment, workers and staff, end of year	10,149	11,511	12,050

r Revised. NA Not available.
[1] Provisional figure established at beginning of year.
[2] Detail does not add to total due to rounding.
[3] Including products not covered by ECSC Treaty.

NONMETALS

Building Materials.—Cement output increased 100,000 tons (3.4 percent), no doubt reflecting the continuing high level of construction activity in the country. Imports rose 171,000 tons, while exports increased slightly by some 3,200 tons.

Fertilizer Materials.—Production of nitrogenous fertilizers increased 4.7 percent while output of phosphatic and potassic fertilizers was unchanged. Both imports and exports of fertilizers increased; in the case of exports, only nitrogenous fertilizers (export of which rose from 455,000 to 584,000 tons) were important.

Output of sulfuric acid on the other hand rose by 12 percent to over 1 million tons (100 percent H_2SO_4).

MINERAL FUELS

The rapid structural shift in the Dutch energy market accelerated during 1965. In that year coal supplied 29 percent of total energy requirements, compared with 35.3 percent in 1964, while the share of petroleum rose to 66 percent compared with 61.7 percent in 1964, and that of natural gas more than doubled from 2.1 percent in 1964 to 4.5 percent in 1965. In the market for domestic heating, coal supplied only 39.4 percent in 1965 compared with 49.4 percent in 1964, and even in the public utilities market, hitherto a mainstay, coal's energy consumption dropped to 56.9 percent from 60.8 percent in 1964. The expanding steel industry still provided a steady market for coal but the reduction in coke consumption per ton of output as technology improves tends to restrict the possibilities of growth. The rapid growth of natural gas foreshadows a continuing decline in the role of coal.

Coal.—Production of Netherlands mines in 1965 at 11.4 million tons was practically the same as in 1964, but consumption continued to decline and pit-head stocks rose by nearly 400,000 tons to 1,282,600 tons at the yearend, representing over 10 percent of annual production. Public utilities, under government pressure, increased their takings from 4.4 million to 5.1 million tons, but deliveries to the residential, gas plants, industrial (other than iron and steel), and coke oven markets declined sharply. Total employment declined slightly, while productivity (output per man-shift) rose about 2.5 percent.

A new government policy, announced to Parliament in December, officially recognized this situation. It was announced that Staatsmijnen's Maurits mine would be closed beginning in April 1966; that the closure of Staatsmijnen's Wilhelmina mine would begin in 1970 and be completed by 1972; that the privately-owned Willem-Sophia and Domaniale mines would be phased out over a period ending 1970; and that Staatsmijnen's Emma-Hendrick mine would continue in operation after the closure of the Maurits, while the privately-owned Oranje-Nassau and Laura Veresniging mines would be kept open as long as the employment situation in South Limburg required. Provision is to be made for subsidies to the mines, as permitted by the ECSC High Authority decision of 1964, and plans are to be made for alternative economic development in the Province; the first of these, a DAF auto plant, has already been granted State financial assistance for its establishment.

At the same time it was announced that an agreement had been reached with the power stations under which they will take 1.5-1.8 million tons of Netherlands coal annually for the next 10 years, and that Hoogovens (the steel firm) has agreed to take an additional 500,000 tons annually.

A major cause of the sharp decline in coal consumption was the rapid shift to natural gas for home and industrial use. The market for thermal power use was held chiefly because government policies of restricting imports of third country coal to 1964 levels and requiring that power stations bargain separately with Gas Unie, the natural gas distributor, for gas supplies rather than permitting them to benefit from the general industrial rates announced in 1964.

The Netherlands coal industry was clearly in a stage of rapid decline, highlighted at the end of the year by Staatsmijnen's announcement that beginning in 1966 it would shift to the use of natural gas for its chemical feedstock instead of the coal derivative formerly used. The chemical side of staatsmijnen's enterprises has been the expanding and, most profitable of its business for some years.

Petroleum and Natural Gas.—The major event of 1965 in the petroleum and natural

Table 6.—Netherlands: Salient coal and coal products statistics
(Thousand metric tons unless otherwise specified)

	1963	1964	1965
Coal:			
Production:			
Anthracite	5,572	r 6,312	6,837
Bituminous, medium to high volatile	5,935	r 5,082	4,487
Per work day—tons	45,900	46,700	46,500
Per man shift—do	2,137	2,208	2,253
Received from EEC	4,089	3,542	3,741
Delivered to EEC	2,276	1,961	1,904
Stocks at mines, yearend	378	898	1,204
Consumption, deliveries:			
Coking plants	5,173	r 5,611	5,616
Public utility plants	4,905	r 4,158	3,881
Domestic commercial	4,862	4,306	3,461
Briquet plants	1,484	1,289	1,349
Mines, electricity generation	1,039	1,113	1,117
Industry	889	681	504
Coal mines, own consumption	477	517	538
Gas plants	188	99	66
Transportation	r 9	7	5
Other	r 80	77	104
Total	r 19,106	r 17,858	16,641
Employment:			
Mines, underground	25,300	25,200	24,000
Mines, surface	14,800	14,400	13,700
Related installations	7,900	8,200	8,200
Technical personnel	5,100	5,200	5,300
Other	2,800	2,800	2,700
Total	55,900	55,800	55,300
Coal briquets:			
Production	1,561	1,355	1,349
Received from EEC	146	r 85	55
Imports from third countries	16	1	—
Delivered to EEC	728	749	811
Exports to third countries	37	25	26
Total internal deliveries	r 883	r 642	518
Lignite:			
Received from EEC	52	55	38
Delivered to briquet factories	43	45	32
Consumption of energy sector	9	10	6
Briquets:			
Production	63	66	45
Received from EEC	227	137	133
Imports from third countries	39	19	14
Delivered to EEC	25	37	23
Total internal deliveries	304	183	170
Coke, coke oven:			
Production	4,263	4,514	4,245
Received from EEC	449	r 249	200
Imports from third countries	59	70	51
Delivered to EEC	1,668	1,987	1,993
Exports to third countries	408	361	331
Internal deliveries:			
Iron and steel industry	1,174	1,400	1,437
Domestic, commercial	1,006	591	539
Other	r 492	r 348	232
Total	r 2,672	r 2,339	2,208
Coke, gas plant:			
Production	178	107	98
Stocks at gas plants	64	48	37
Exports, total	18	32	30
Total internal deliveries	144	95	79
Consumption at gas plants	126	88	67

r Revised.

Source: Statistical Office of the European Communities. Energy Statistics. 1965—No. 4, 1966—No. 3.

gas industries was the enactment in September of the Continental Shelf Mining Law. Changes were made in the original draft both by the new government which came into power in the spring, and by the Parliament in the process of enacting it. The law covers not only petroleum and natural gas, but also all other mineral deposits of the Continental Shelf and prohibits prospecting, drilling or mining without licenses issued by the Minister of Economic Affairs. Two classes of exploration permits are provided for, the first an exploration (Verkenningsonderzock) or reconnaissance search permit not authorizing drilling, and the second a prospecting (Opsporingsonderzock) permit authorizing exploration by drilling. The exploitation license authorizes development and extraction of the minerals. A key provision authorizes the state to participate up to 50 percent in the development of any oil and gas mineral discoveries. Detailed implementing regulations are to be drafted and promulgated by the Minister of Economics, subject to the right of Parliament to review and approve them within 30 days of presentation by the Minister, upon the demand of one-fifth of the members of either chamber. These implementing regulations had not yet been presented to Parliament by yearend, and consequently exploration in the Dutch sector of the Continental Shelf was deferred.

In November 1965, a bill amending the 1810 Mining Law, intended to provide for regulation of on-shore exploration, was introduced into the second Chamber. To be retroactive to December 15, 1965, if enacted, it would provide for a system of prospecting and exploitation permits similar to those for Continental Shelf mineral activities. Further prospecting after December 15, 1965, was reported to be effectively discouraged pending consideration of the bill.

During 1965, two agreements were signed with the British Government delineating the boundary between the Netherlands and British Continental Shelf areas. The text of a similar treaty with Denmark was agreed on, but was still to be approved. The agreement with the United Kingdom was said to provide for the exploitation of single geological structures extending over the line of demarcation. A less extensive agreement with West Germany, signed at the end of 1964, had extended the border between the two countries for these purposes some 25 nautical miles seward to the 54th parallel.

Petroleum.—NAM's crude petroleum output expanded by 5 percent in 1964 to 2.4 million metric tons, said to represent about 12 percent of the country's total requirements for petroleum products.

The refining industry continued to grow, with total reported throughput rising to 31.2 million tons. Expansion of the capacity of Shell's Pernis (Rotterdam) refinery to 16.5 million tons per year was completed; this is said now to be the biggest refinery in Europe and one of the six largest in the world. Similarly, expansion of Esso's Botlek (Rotterdam) refinery to 8 million metric tons per year was completed, as was the Gulf refinery at Rotterdam, with capacity doubled to 3 million tons per year. Caltex planned to increase capacity of its Pernis refinery from 4.4 million tons per year to 4.8 million tons per year by May 1966.

Meanwhile, Mobil's application for a refinery at Amsterdam was approved in February 1965 by the central and local authorities; it is to be supplied with crude by a 28-inch pipeline from Rotterdam's Europoort. The initial annual capacity is to be 4 million tons, to be raised to 8 million tons by 1973.

British Petroleum (BP) reorganized its interests in the Netherlands, establishing a new company at Amsterdam to act as a holding company (British Petroleum Maatschappij Nederland N.V.), with two subsidiaries, B.P. Raffinaderij Nederland N.V. (to operate BP's new refinery under construction at Rotterdam), and Benzine en Petroleum Handel Maatschappij N.V. (to market products in the Netherlands).

The growth of the petrochemical industry continued. The Dow Chemical Co. planned an 87 kilometer pipeline from Pernis to its chemical plant at Terneuzen, to be supplied with ethylene by Royal Dutch-Shell; and work was to start in late 1965 and a pipeline from Esso's Botlek refinery to Staatsmijnen in Limburg, for shipping light naphtha to Limburg for cracking, with the ethlyene to be retained by Staatsmijnen and the cracked fuel being returned to Botlek. This line, of 20 centimenter diameter and a capacity of 500,000 tons annually, was scheduled for completion by October 1966.

Natural Gas.—The 1.1 trillion cubic meter estimate of proven reserves in the Slochteren field of Groninger was confirmed by the Netherland Geological Survey, and proven reserves in the area of Friesland, Drente, and North Holland not under concession were estimated at 55 billion cubic meters, giving the Netherlands as a whole proven reserves of about 1,161 billion cubic meters. Additional probable reserves were estimated at about 470 billion cubic meters, raising total estimated reserves to 1,631 billion cubic meters. These estimates do not include the recent finds of Petroland and NAM in Friesland, nor the old concession areas of NAM in Drente, Overijssel, and South Holland.

The 1965 deliveries of NAM Gas Unie totaled 1,569 million cubic meters compared with 746 million cubic meters in 1964. Industrial consumers took 31.6 percent of all sales in 1965, compared with 25.7 percent in 1964. Meanwhile, an additional 1 million domestic gas connections (as compared with 500,000 in 1964) were scheduled for completion in 1965, and the total was expected to rise to about 2.5 million by 1968, sufficient to meet the country's expected demand. Deliveries of natural gas were expected to rise to about 3.5 billion cubic meters in 1966.

A total of 280 kilometers of pipeline was added to Gas Unie's network in 1965, the main sections being Hilvarebeek-Sluiskill (100 kilometers), Jutphaas-Voorschoten (55 kilometers), and Ommen-Enschede (50 kilometers). A secondary line was run from Leiden to Botlek (Rotterdam) to supply gas to chemical and petrochemical companies in that area. Gas Unie planned to lay an additional 800 kilometers of pipe in 1966, including feeder lines, regional extensions, and export lines.

Petroland, a consortium of French companies, made several gas strikes in Friesland, and Mobil's discovery in territorial waters off Ameland Island (made in 1964) was reported by the company to be of considerable size. Amoco and Dijas N.V. (a subsidiary of NAM) made new strikes in North Holland. Seven companies or groups have now filed for concessions in this Province: Dyas N.V., Mobil, BP, Gulf, Petroland, Philips Petroleum, and Superior Oil.

Natural gas exports from the Netherland to Belgium came appreciably nearer as the Belgian Government finally approved Gas Export's contract with the Belgian distributing company, Distrigaz, after substantial changes in the contract required by the Government to reduce holdings of Esso and Shell in Distrigaz and to assure that a one-third interest in the firm will be controlled by the Belgian Government. Agreement on the delivery price of gas was finally reached at the end of year. A contract was also signed with Savgaz of Liege for deliveries to eastern Belgium. Construction of a pipeline along the right bank of the Rhine from Zevenaar/Emmerich to Cologne/Bergisch-Gladbach, with branches to Duisberg, Düsseldorf/Werppertal and Dürer-Aacher, was to start in mid-1965, and deliveries to West Germany under the Thyssengas contract were to begin in 1966. Deliveries under the contract signed with Ruhrgas in 1965 were expected to begin in mid-1966. Meanwhile, negotiations began between Gas Export and two other German utilities, Gas Union GmbH (Frankfurt-am-Main) and Gasversorgung Süddentschland GmbH (Stuttgart) for supply of Dutch gas to areas as far south as Württemburg; a pipeline company would be formed to build the line, with which NAM would negotiate. Conclusion of the contract was expected by the end of the year.

Negotiations continued with the British and French utilities for exports of Dutch gas to those two countries. The (British) National Gas Council and NAM awarded a contract for tests of the soil structure, etc. of the North Sea bed and English Channel in order to determine possible routes for subsea pipelines to the United Kingdom, but as exploration intensified in the British sector of the Continental Shelf British interest appeared to lag and the National Gas Council sought to delay a decision until the results of British explorations were better known. Negotiations proceeded, however, with Gaz de France, and at the end of the year a preliminary agreement was announced, subject to approval at Cabinet levels, calling for deliveries beginning in 1967, eventually to reach a total of 5 billion cubic meters annually. By the end of the year therefore, Gas Export had a total of seven agreements, firm or tentative, for export deliveries of gas to Belgium, West Germany and France.

At one point in the protracted negotiations between NAM Gas Export and the Belgian firm Distrigaz, the Belgian Government lodged a complaint with the EEC Commission concerning Gas Export's sales policy, on grounds of violating Community regulations concerning the use of monopoly power. After some investigation, the complaint (which apparently centered mainly on price policies) was withdrawn by the Belgian Government after NAM Gas Export had accepted the contract modifications desired by the Government and an agreement on prices had been reached. The issue in the EEC Commission thus was not pressed to a conclusion.

One unsettled question related to the export marketing of gas discovered by companies other than NAM, especially any that may be discovered on the Continental Shelf. Gas Unie, according to official policy, is to distribute any Continental Shalf gas sold domestically, and Gas Unie's effective monopoly of the domestic market was strengthened when Hoogovens (the Dutch steel firm) abandoned plans to distribute its own gas and signed an agreement with Gas Unie. As for potential Continental Shelf gas, it is expected that it will be marketed primarily outside the Netherlands but no indication has yet been given as to how this will be effected.

Evidence continued to accumulate of a rapid and significant shift to natural gas by industrial consumers within the Netherlands itself. Aside from the rapidly growing petrochemical industry, there were reports that Staatsmijnen (the Government-controlled coal mining firm, itself a shareholder in NAM) is converting entirely to the use of natural gas as a chemical raw material, and that Philip of Eindhoven, the largest privately-owned manufacturing firm in the Netherland, is converting also to natural gas. According to reports, Staatsmijnen is expected to become the largest single consumer of natural gas in 1966, with an eventual annual consumption estimated at 500 million cubic meters.

The Mineral Industry of Norway

By F. L. Klinger [1]

The mining and processing sectors of the Norwegian mineral industry operated at near-capacity levels in 1965, and output of the industry contributed substantially to a growth of nearly 6 percent in gross national Product (GNP) to $6.7 billion [2] (at 1961 prices). Norway remained the leading West European producer of ferroalloys, refined nickel, magnesium, and ilmenite while ranking second in production of primary aluminum and nitrogen. Low cost hydroelectric power continued to stimulate growth of the electrometallurgical and electrochemical industries; rising ferroalloy production and aluminum industry expansion being especially evident. Investment in the mining and primary metals industries was slightly less than in 1964 but was still 30 to 50 percent higher than in 1963.

Details on the value of output and employment of the Norwegian mineral industry by sectors for 1963, the last year for which such details are available, were as follows:

	Million dollars		Number of persons employed (not including owners)
	Gross value of production	Value added, at f.o.b. establishment prices [1]	
Mining industry:			
Coal mines	3.86	3.51	670
Metal mines	32.74	26.86	4,578
Quarries and other	21.04	18.96	2,883
Total	57.64	49.33	8,131
Processing industry:			
Primary metals	352.80	127.31	22,430
Nonmetallic mineral manufacturing	102.12	63.30	11,958
Coal and petroleum refining	73.01	12.96	1,204
Fertilizer	80.81	42.42	6,338
Total	608.74	245.99	41,930
Grand total mining and processing	666.38	295.32	50,061
Total all industry	3,903.00	1,630.00	NA

NA Not available.
[1] Gross value of production less cost of raw materials.

Source: Statistisk Sentralbyra (Oslo). Industristatistikk 1963; Statistisk Arbok 1965; and Statistisk Manedshefte, No. 4, 1966. (Central Statistical Bureau (Oslo)). Industrial Statistics 1963; Statistical Yearbook 1965; and Monthly Statistics, No. 4, 1966.

In 1963, the GNP in current prices was $6,320 million.

Offshore boundary agreements negotiated with the United Kingdom and Denmark, and timely legislative action by the Government, led to increased activity in the search for oil and gas in Norwegian areas of the North Sea. The Government conducted geophysical surveys in middle and north Norway, and aeromagnetic maps covering parts of these regions were published. Three of the larger private com-

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from kroner (NKr) to U.S. dollars at the rate of NKr=US$0.14.

panies were coordinating prospecting activities and there appeared to be increasing public demand for exploration of the country's mineral resources. Meanwhile, new mines and plants were completed or under construction in several branches of the mineral industry, and the prospects for continued growth appeared to be good.

PRODUCTION

Output of the mining industry in 1965 was 7.4 percent greater than in 1964. Production of metal mines and stone, sand and gravel quarries rose more than 10 percent while mineral quarrying (quartz, feldspar, mica, etc.) increased approximately 2 percent, and output of coal showed a slight decline.

Led by 20-percent increases in production of pig iron, ferroalloys, magnesium, and copper, output of the primary metals industry was 11 percent greater than in 1964. Output of iron and steel, ferroalloys, aluminum, zinc, magnesium, and cobalt was at record levels, and production of nickel and copper was the highest in several years. The index of production for nonmetallic mineral manufacturing increased by 5 percent. In the chemical industry, output of nitrogen and sulfuric acid increased by 7 and 9 percent, respectively, and production of fertilizer and titanium pigment increased. In the energy sector, electric power production rose by 11 percent, but petroleum refining was slightly below the level of 1964.

Table 1.—Norway: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Alumina	13,200	e 13,000	e 13,000	14,000	16,000
Unwrought:					
Unalloyed	174,709	r 209,277	219,345	r 261,000	276,290
Alloyed	5,614	r 5,578	11,651		
Superpure	e 2,700	e 2,700	e 2,700	e 2,900	e 2,900
Semimanufactures	17,697	r 16,511	r 17,196	r 17,800	19,200
Cadmium	105	115	110	115	130
Cobalt	555	600	625	568	823
Columbium concentrate (35 to 42 percent columbium)	321	298	r 383	186	150
Copper:					
Ashes and residues	NA	NA	331	e 350	e 350
Concentrate (15 to 27 percent copper)	26,849	28,527	29,499	30,818	30,911
Metal content	5,769	6,764	7,354	7,758	7,730
Content of cupriferous pyrite	7,983	8,771	6,911	7,215	7,262
Unrefined	21,665	19,097	17,902	17,510	19,848
Refined	17,065	14,849	12,901	12,224	14,762
Semimanufactures [1]	13,697	13,257	13,657	e 13,750	e 13,750
Iron and steel:					
Iron ore (mostly 62 to 65 percent iron)—thousand tons	1,673	r 1,938	r 1,999	r 2,123	2,423
Pig iron	378,036	r 395,823	407,022	r 436,712	525,766
Ferroalloys:					
Ferrosilicon (45 percent silicon)	r 193,332	r 171,621	r 158,220	r 224,516	266,396
Other	r 185,286	r 156,321	r 183,613	r 232,347	288,172
Crude steel	498,883	r 487,779	541,665	r 614,176	685,952
Semimanufactures, including wire	r 422,131	450,477	495,558	e 550,000	601,600
Lead:					
Concentrates (51 to 63 percent lead)	3,870	5,241	5,778	6,968	6,997
Metal content	2,290	r 2,860	r 2,991	3,600	4,130
Secondary	1,883	2,040	1,434	e 1,200	NA
Magnesium, unwrought	r 14,531	r 14,582	r 18,081	22,000	26,430
Metalloids:					
Selenium	15	13	15	15	15
Silicon	NA	6,900	NA	NA	10,300
Molybdenum (content of concentrate)	241	261	r 210	231	226
Nickel metal	32,215	29,202	26,421	30,110	31,835
Precious metals (value, thousand dollars)	$3,923	$4,401	$3,788	NA	NA
Tin, secondary—long tons	652	579	455	e 540	e 540
Titanium:					
Ilmenite concentrate (43 to 45 percent titanium dioxide)	r 311,000	251,100	242,255	279,500	282,150
Dioxide	--------	--------	---------	13,000	14,000
Zinc:					
Ashes and residues	395	352	327	e 400	e 500
Concentrate (mostly 50 to 55 percent zinc)	18,601	22,958	25,219	23,865	24,502
Metal content	9,330	r 11,846	r 13,048	e 12,170	12,500
Smelter	r 46,300	r 44,200	r 46,600	48,400	52,400
Oxides	2,203	2,283	2,000	e 2,000	e 2,000
Other ashes and residues, not elsewhere specified (value, thousand dollars)	$967	$852	$836	NA	NA
Nonmetals:					
Cement—thousand tons	1,274	1,412	1,438	1,541	1,544
Dolomite—do	r 180	160	206	220	227
Feldspar	62,237	85,226	77,326	66,300	69,000
Fertilizer materials:					
Ammonia (nitrogen content)—thousand tons	292	302	307	355	382
Superphosphate—do	61	49	46	47	50
Calcium nitrate—do	1,164	1,172	1,180	r 1,250	r 1,238
Compound fertilizers—do	228	244	260	r 322	r 366
Graphite	5,715	6,552	r 7,628	7,242	7,700
Lime	149,152	92,379	122,391	110,000	127,000
Mica	3,500	3,200	3,600	4,000	3,000
Olivine	43,200	50,900	56,900	r 67,360	87,300
Pyrite:					
Cupriferous (1 to 2 percent copper)	733,391	809,868	397,165	709,660	709,108
Noncupriferous (42 to 50 percent sulfur)			324,281		
Sulfur content of total pyrite	323,981	361,163	328,237	e 319,000	e 319,000
Quartz	r 389,000	r 367,000	r 414,062	410,000	456,750

See footnotes at end of table.

Table 1.—Norway: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals—Continued					
Stone, sand and gravel:					
Dimension stone:					
Granite	11,648	10,599	6,422	6,644	NA
Marble	1,265	2,081	3,011	1,688	NA
Syenite ("labrador")	24,498	30,159	33,816	39,728	NA
Slate—thousand square meters	77	185	294	239	e 275
Worked, all types (value, thousand dollars)	$3,685	$3,837	$4,307	NA	NA
Limestone—thousand tons	r 3,074	r 3,514	r 3,760	4,000	4,100
Nepheline syenite	8,149	19,940	23,000	31,000	41,000
Sand and gravel:					
Screened—thousand cubic meters	2,123	1,794	1,590	1,603	e 1,700
Other, including crushed stone thousand cubic meters	2,392	2,913	3,734	NA	NA
Sulfur, elemental (recovered)	r 63,447	r 46,989	r 350	-------	-------
Sulfuric acid, 100 percent	90,258	89,929	103,628	109,627	119,390
Talc and soapstone	r 161,220	r 159,469	r 147,873	[3] 138,000	80,000
Mineral fuels:					
Coal (from Spitzbergen)	369,053	472,848	382,398	r 442,074	433,991
Coke:					
Coke oven	-------	-------	-------	108,000	240,000
Gasworks	38,000	45,000	36,300	44,900	49,000
Gas (from gasworks) thousand cubic meters	38,285	38,392	34,647	31,641	31,867
Peat:					
For fuel—cubic meters	545,000	490,000	349,000	350,000	NA
For agricultural use—do	150,000	121,000	120,000	140,000	150,000
Petroleum refinery products: [4]					
Motor gasoline—thousand tons	235	318	285	368	407
Kerosine and jet fuel—do	11	18	8	7	[5] 10
Distillate fuel oil—do	629	948	804	869	1,009
Residual fuel oil—do	760	980	1,280	1,517	1,251
Liquefied petroleum gas—do	12	17	15	18	NA
Other—do	84	90	94	107	120
Total refinery products	1,731	2,371	2,486	2,886	2,797
Total crude oil throughput	1,849	2,440	2,572	3,028	2,889

e Estimate. r Revised. NA Not available.

[1] Not including pipe fittings.

[2] Production of Norsk Hydro.

[3] May not include talc production.

[4] Source: Organization for Economic Cooperation and Development (OECD) (Paris).

[5] Aviation fuel.

TRADE

Norwegian trade in mineral commodities increased in 1965, with the overall pattern remaining the same as in 1964. The aggregate value rose to $1,015 million compared with $945 million in 1964. Relationships between mineral commodity trade and total Norwegian trade are shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of all trade (percent)
	Mineral commodities [1]	All trade [2]	
Exports:			
1963	374.9	1,073.1	34.9
1964	466.5	1,290.3	36.1
1965	488.6	1,442.6	33.8
Imports:			
1963	414.3	1,821.0	22.7
1964	478.3	1,982.3	24.1
1965	526.6	2,205.7	23.8
Net trade balance:			
1963	−39.4	−747.9	XX
1964	−11.8	−692.0	XX
1965	−38.0	−763.1	XX

XX Not applicable.
[1] Excluding gold and precious stones. In 1964, value of gold (unwrought and semimanufactures) was as follows: Exports, $36,000; imports, $1,292,000. Imports of precious stones in 1964 were valued at $389,000.
[2] Excluding gold.

The increased deficit in mineral commodities shown for 1965 was principally due to increased imports of nickel matte and zinc concentrate, coupled with reduced exports of nickel and aluminum. The effect of unusually large imports of chemical fertilizer in 1965 was countered by a $12 million increase in exports. The following table shows the relative importance of the principal mineral commodities in 1964 and 1965.

	Value (million dollars)		Mineral commodity share of trade (percent)	
	1964	1965	1964	1965
Export:				
Nonferrous metals:				
Aluminum [1]	123.8	119.7	26.5	24.4
Nickel [1]	58.6	53.3	12.5	10.9
Other [1]	47.2	56.1	10.1	11.4
Iron and steel:				
Ferroalloys	53.9	61.6	11.5	12.6
Other [1]	48.1	50.2	10.3	10.2
Fertilizers	53.0	65.2	11.3	13.3
Petroleum products	29.1	23.8	6.2	4.8
Import:				
Mineral fuels:				
Solid	22.4	21.8	4.6	4.1
Petroleum products	145.3	140.7	30.3	26.7
Iron and steel [1]	118.6	129.6	24.7	24.6
Alumina	34.7	36.9	7.2	7.0
Nickel-copper matte	47.7	58.7	9.9	11.1
Nonferrous metals [1]	49.5	54.7	10.3	10.3
Fertilizers (manufactured)	5.1	15.0	1.0	2.8
Zinc concentrates	7.1	10.8	1.4	2.0

[1] Including scrap.

The principal trading partners continued to be the United Kingdom, West Germany, Sweden, and the United States. The United Kingdom was the largest supplier and West Germany the largest buyer. Increased exchanges of metals and metallic ores led to a 20-percent increase in the volume of trade with Sweden. Trade with the United States increased in coal, petroleum products, and nickel but declined in aluminum. Canada continued to rank second in the total volume of imports because of large shipments of nickel matte.

Table 2.—Norway: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum:[1]				
Scrap	646	255	628	West Germany 202.
Unwrought	207,513	264,802	242,550	United States 91,382; United Kingdom 76,340 West Germany 51,598; Italy 8,985; Sweden 8,748; France 7,412.
Semimanufactures	4,237	4,669	5,074	Denmark 1,712; Sweden 1,356; Finland 848.
Beryllium, metal, all forms	--------	1	NA	NA.
Cadmium, metal excluding scrap	86	73	99	Sweden 67.[2]
Chromium, metal excluding scrap	--------	1	NA	NA.
Cobalt, metal excluding scrap	639	568	886	United States 554.[2]
Columbium ore	286	313	168	United States 157.[2]
Copper:				
Ore	10,047	14,317	11,548	West Germany 8,738; Sweden 5,579.
Cuprous oxide	1,044	1,308	1,589	United States 398; France 138; Netherlands 109.
Matte	1,125	--------	--------	
Scrap[1]	2,054	2,300	2,030	West Germany 1,254; Sweden 372; United Kingdom 236.
Unwrought[1]	17,165	16,152	20,000	West Germany 10,790; France 1,981; Sweden 845.
Semimanufactures	2,667	2,000	3,002	Sweden 737; Denmark 367; Greece 183.
Gold:				
Unwrought and semimanufactures—troy ounces.[3]	418	1,061	NA	NA.
Scrap,[1] residues, etc.—kilograms	577	1,046	NA	NA.
Iron and steel:				
Iron ore—thousand tons	1,223	1,553	1,374	West Germany 857; United Kingdom 542; Poland 113.
Roasted pyrite	71,731	81,246	73,284	West Germany 65,585; Sweden 6,448; Denmark 4,065.
Scrap	4,647	8,568	11,245	West Germany 5,427; Sweden 1,392; France 853.
Pig iron[4]	175,646	124,175	137,958	United Kingdom 56,309; West Germany 22,786.
Ferroalloys	333,041	444,493	498,456	United Kingdom 142,393; West Germany 138,669; Belgium-Luxembourg 35,997; Sweden 26,493; Netherlands 18,529.
Ingots and other primary forms	89,277	105,680	106,139	Netherlands 62,288; Denmark 18,749; Italy 16,282.
Semimanufactures:				
Bars, rods, sections	105,578	148,260	138,551	United Kingdom 48,732; West Germany 23,358; Sweden 20,608.
Sheets and plates	62,848	75,586	64,918	United Kingdom 34,806; Sweden 17,870; U.S.S.R. 4,837.
Hoop and strip	274	347	223	Sweden 87; Netherlands 62; Denmark 52; Portugal 51.
Rails and accessories	3,543	1,609	2,193	West Germany 1,594.
Wire	2,822	3,152	3,180	United States 855; Portugal 753; Greece 622.
Tubular products	19,846	25,813	25,558	Sweden 7,265; United States 4,754; Denmark 3,029.
Castings and forgings	3,227	7,648	8,799	Sweden 6,514; Liberia 563.
Total semimanufactures	198,138	262,415	243,422	

See footnotes at end of table.

Table 2.—Norway: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals—Continued				
Lead:				
Ore	3,432	7,456	5,903	United Kingdom 4,837; Belgium-Luxembourg 2,537.
Oxide	1	14	NA	All to U.S.S.R.
Scrap	2,735	3,350	2,945	Denmark 1,858; Netherlands 384; Sweden 382.
Unwrought [1]	186	386	360	Sweden 138; West Germany 107; France 52; Iceland 49.
Semimanufactures [1]	419	343	274	Sweden 327.
Magnesium:				
Scrap	104	131	95	West Germany 113; United Kingdom 10.
Unwrought	r 18,973	23,113	24,842	West Germany 17,842.
Semimanufactures	40	108	11	Sweden 44; United Kingdom 17; France 13.
Manganese ore	2,540	4,369	8,369	United States 4,064; United Kingdom 305.
Molybdenum:				
Ore	424	406	424	All to Sweden.[2]
Metal, all forms	(5)	1	NA	NA.
Nickel:				
Matte, speiss, etc	200	--------	--------	
Scrap	215	152	65	Sweden 60; Japan 50; West Germany 27.
Unwrought	23,937	33,865	31,238	United States 10,224; Sweden 5,702; West Germany 5,577; United Kingdom 5,478; France 2,436; Italy 1,523.
Semimanufactures	515	506	270	Yugoslavia 139; Italy 116; Sweden 111; Switzerland 34.
Selenium--value, thousand dollars	$87	$42	$79	Sweden $39.
Silicon	5,984	6,664	8,038	United Kingdom 2,816; Czechoslovakia 1,345; West Germany 1,020.
Silver and platinum-group metals:				
Silver, unwrought troy ounces [3] and partly worked.	15,915	8,231	NA	Denmark 7,716.
Platinum and platinum group metals, partly worked troy ounces.[3]	10,610	18,583	18,004	United States 13,760; Netherlands 4,598.
Sweepings, residues, kilograms--scrap, etc.	54,931	44,068	71,264	United Kingdom 29,118; West Germany 13,000.
Radioactive materials.[6] value, thousand dollars	$1,014	$1,131	$921	France $818; Sweden $249.
Tin:[1]				
Scrap--long tons	37	41	49	Denmark 34.
Unwrought--do	234	293	237	Sweden 195; Denmark 76; United Kingdom 10; Finland 9.
Semimanufactures--do	--------	4	3	West Germany 3; Denmark 1.
Titanium ore (ilmenite concentrate)	240,510	279,453	324,239	Mostly to West Germany.[2]
Zinc:				
Ore	14,505	14,628	22,055	West Germany 9,795; Poland 3,617; United Kingdom 1,216.
Oxide	778	304	198	West Germany 115; Sweden 79; Denmark 68.
Scrap	715	593	811	United Kingdom 315; Netherlands 98; West Germany 78.
Unwrought [1]	33,650	39,972	37,785	Sweden 15,485; West Germany 12,299; United Kingdom 5,125; Denmark 4,528.
Semimanufactures [1]	1,159	1,522	1,471	Netherlands 448; West Germany 350; Sweden 272; Denmark 252.
Other metals, not elsewhere specified:				
Ores and concentrates	5	3	3	NA.

See footnotes at end of table.

Table 2.—Norway: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals—Continued				
Nonferrous ashes and residues	9,316	12,812	21,414	Belgium-Luxembourg 6,040; United Kingdom 2,199; Sweden 1,493; Netherlands 1,483.
Metallic oxides.[7] value, thousand dollars	NA	$12	$19	NA.
Scrap	57	105	NA	United Kingdom 66; West Germany 26; Netherlands 12.
Other chemical elements, not elsewhere specified.[8] value, thousand dollars	$119	$181	$64	NA.
Nonmetals:				
Abrasives	1,153	1,112	1,153	Poland 274; Sweden 187; Finland 138.
Asbestos (manufactures, nonfriction)	49	196	NA	Sweden 128.
Cement	236,022	333,115	327,150	United States 167,220; United Kingdom 57,543; Nigeria 20,854; Denmark 16,888; Other Africa 56,000.
Clay and clay products:				
Crude, all types	89	121	89	Mainly to Sweden.
Construction materials (brick, tile, etc):				
Refractory	7,242	10,486	11,184	West Germany 9,038; Sweden 477.
Nonrefractory thousand units bricks.	1,056	801	460	Sweden 664; United Kingdom 109.
Nonrefractory ceramic piping	72	118	NA	All to Sweden.
Dolomite	66,140	77,530	77,774	Sweden 15,791; West Germany 14,812; United Kingdom 11,243
Fertilizer materials:				
Manufactured:				
Nitrogenous thousand tons	1,328	1,334	1,438	Denmark 582; Sweden 345; Finland 95; Spain 88.
Phosphatic do	24	18	24	Denmark 14.
Other do	9	46	186	Denmark 28; West Germany 10; Sweden 5.
Ammonia, anhydrous	8,038	14,402	33,644	Sweden 10,219; Denmark 4,169.
Sodium and potassium compounds, not elsewhere specified: Caustic soda.	15,252	13,255	6,910	Sweden 7.898; Denmark 5,357.
Feldspar	71,701	98,342	90,960	United Kingdom 56,849; West Germany 10,592; Netherlands 9,915; East Germany 5,945; Denmark 4,245; France 3,219.
Graphite	7,108	7,508	8,332	United States 2,352; West Germany 2,323; United Kingdom 1,475; Sweden 222; India 187.
Gypsum	30	27	---	Denmark 15.
Lime	70	85	NA	NA.
Limestone, for flux, cement, etc	r 19,818	20,864	23,073	Sweden 18,850; Denmark 963.
Mica:				
Crude, including splittings and waste.	3,583	4,009	4,151	West Germany 978; France 904; Sweden 596.
Manufactures	1	3	NA	All to Switzerland.
Pyrite	639,469	627,661	583,286	West Germany 477,341; Czechoslovakia 49,919; Denmark 50,097; Sweden 37,455; East Germany 10,249.
Quartz and quartzite	16,196	19,266	26,463	West Germany 8,772; United Kingdom 7,626; Sweden 869.
Salt	6,027	4,696	3,958	Sweden 1,987; Iceland 1,917; Denmark 729.

See footnotes at end of table.

Table 2.—Norway: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Nonmetals—Continued				
Stone, sand and gravel:				
Dimension stone:				
Granite, gneiss, syenite, etc	40,421	44,555	47,475	France 13,973; West Germany 11,091; Italy 5,622; Belgium-Luxembourg 3,295.
Marble and other calcareous	2,092	785	1,353	United States 274; Italy 154; West Germany 151.
Slate	30,276	42,913	40,671	Netherlands 19,479; West Germany 9,151; Sweden 5,684; Denmark 4,583.
Worked, all types	720	293	770	NA.
Sand	65	407	1,492	NA.
Gravel and other crushed stone	64,184	114,174	334,091	West Germany 74,160; Sweden 15,524; United Kingdom 12,495.
Sulfur:				
Elemental, crude	7,404	432	---	Sweden 387.
Dioxide	4,220	3,542	2,874	Sweden 3,463.
Sulfuric acid; oleum	3,772	12,864	19,329	West Germany 6,442; United Kingdom 5,785.
Talc and steatite	66,855	74,762	69,586	United Kingdom 21,577; Denmark 11,534; West Germany 10,421; Sweden 9,000.
Other inorganic acids, not elsewhere specified.	11,705	13,465	13,234	NA.
Other mineral materials	947	893	1,144	Netherlands 391; West Germany 117.
Mineral fuels:				
Asphalt and bitumen:				
Natural, crude	94	189	NA	Sweden 180.
Manufactures	105	1	NA	NA.
Coal	175,241	84,299	137,564	West Germany 83,948.
Coal derivatives	4,031	6,960	17,661	Netherlands 5,927.
Coke, including briquets	8,818	3,904	99,610	Netherlands 2,862; United Kingdom 613; Denmark 429.
Petroleum refinery products:				
Domestic consumption:				
Gasoline	125,861	230,647	146,503	Sweden 194,876; United Kingdom 34,659.
Kerosine, including jet fuel and white spirit.	8,129	5,897	6,029	Sweden 5,879.
Distillate fuel oil	472,535	493,287	556,497	Sweden 290,765; Denmark 84,329; United Kingdom 55,322.
Residual fuel oil	604,690	709,355	514,566	Sweden 485,668; Netherlands 114,424; Denmark 90,884.
Lubricants, including grease	19,229	21,337	21,286	Sweden 6,698; Denmark 5,703; Common Market 8,535.
Petroleum gases.	value, thousand dollars	$323	$324	$424	Denmark $241.
Bitumen and other	819	805	499	Denmark 710.
International bunkers:				
Distillate fuel oil	154,300	153,800	132,500	XX
Residual fuel oil	201,300	301,200	253,500	XX

r Revised. NA Not available. XX Not applicable.
[1] Including alloys.
[2] As reported by country of destination.
[3] Calculated from quantities reported in kilograms.
[4] Includes cast iron, spiegeleisen, and powder.
[5] Less than ½ unit.
[6] Including compounds, mixtures, and stable isotopes.
[7] Including mercury; metalloids; alkali, alkaline-earth and rare-earth metals; phosphorus, arsenic; nitrogen, etc.
[8] Including barium, strontium, and magnesium.

Table 3.—Norway: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum:				
Bauxite	24,873	30,034	29,254	Greece 29,516.
Oxide and hydroxide [1]	444,544	523,940	540,328	Jamaica 178,120; United States 173,711; Guinea 99,059; British Guiana 49,065; United Kingdom 22,762.
Scrap	161	57	NA	All from Sweden.
Unwrought [2]	1,481	11,838	9,868	U.S.S.R. 9,118; Canada 2,156; United Kingdom 347.
Semimanufactures [2]	r 8,866	9,907	7,038	Belgium-Luxembourg 2,639; United Kingdom 2,250; Sweden 2,129.
Antimony	91	95	102	Mainland China 44; United Kingdom 40; West Germany 11.
Arsenic trioxide	64	89	NA	Sweden 84.
Chromium:				
Ore	32,265	109,388	76,593	Southern Rhodesia 36,729; Turkey 33,638; U.S.S.R. 16,043; Greece 7,898.
Oxides	93	122	138	West Germany 87; United Kingdom 10; Italy 9.
Cobalt:				
Oxide and hydroxide	1	2	NA	All from United Kingdom.
Metal, except scrap	0	17	12	Belgium-Luxembourg 12; United Kingdom 4.
Copper: [2]				
Oxide	52	22	NA	All from West Germany.
Scrap	21	67	160	Sweden 60; West Germany 5.
Unwrought	r 5,084	5,283	4,939	United States 3,859; United Kingdom 645; Sweden 632.
Semimanufactures	18,581	20,327	21,713	Canada 7,846; Sweden 7,243; Finland 1,204.
Gold: [3]				
Unwrought troy ounces	15,561	24,499	NA	NA.
Semimanufactures do	10,127	11,703		NA.
Rolled gold (on silver) do	1,511	96		NA.
Scrap, residues etc. [2] do	64	---		
Iron and steel:				
Iron ore	11,043	19,099	15,770	Sweden 19,004.
Slag, dross, etc., from iron and steel manufacture.	27,250	33,331	35,802	Sweden 16,318; United Kingdom 7,808; France 7,570.
Scrap	33,934	27,316	61,441	United Kingdom 14,341; Denmark 8,667; Sweden 3,312.
Pig iron and ferroalloys	r 11,386	11,149	15,674	Sweden 6,454; West Germany 2,989; United Kindgom 594.
Ingots and other primary forms	r 77,479	79,135	82,372	Netherlands 58,726; U.S.S.R. 11,645; Denmark 3,457.
Semimanufactures:				
Bars, rods, sections	167,394	196,659	218,856	France 50,501; West Germany 42,325; Belgium-Luxembourg 39,813; Sweden 23,568.
Plates and sheets	287,255	388,008	410,653	United Kingdom 80,376; Sweden 59,675; West Germany 58,706.
Hoop and strip	55,401	66,489	65,696	Belgium-Luxembourg 45,137; West Germany 6,154; France 5,048.
Rails and accessories	18,302	22,299	19,972	Sweden 15,056; United Kingdom 4,920.
Wire	9,411	8,709	10,524	Belgium-Luxembourg 3,865; West Germany 1,394; Sweden 1,140.
Tubular products	45,321	51,732	54,929	West Germany 17,515; United Kingdom 11,143; Sweden 8,915.

See footnotes at end of table.

Table 3.—Norway: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Iron and steel—Continued				
Semimanufactures—Continued				
Castings and forgings	174	112	247	United Kingdom 41; Denmark 21; Sweden 21.
Total semimanufactures	r 583,258	734,008	780,877	
Iron oxide and hydroxide	973	1,305	1,564	West Germany 1,040; United Kingdom 197.
Lead:[2]				
Oxides	745	830	895	United Kingdom 361; West Germany 333; Mexico 81.
Scrap	208	187	154	Sweden 186.
Unwrought	r 11,267	10,060	9,487	Republic of South Africa 4,295; Denmark 1,566; Peru 1,346; Sweden 1,018.
Semimanufactures	1,058	1,114	1,292	Belgium-Luxembourg 355; Netherlands 249; Denmark 229.
Magnesium and beryllium	56	47	143	Italy 23; United Kingdom 4.
Manganese:				
Ore	233,446	360,003	510,111	Ghana 116,567; British Guiana 115,574; U.S.S.R. 30,933; Republic of South Africa 29,655; India 23,499; Brazil 22,397.
Oxides	68	195	229	Netherlands 83; Japan 37; West Germany 25.
Mercury 76-pound flasks	725	1,015	667	Italy 348; Spain 319; mainland China 145.
Molybdenum	2	1	1	NA.
Nickel:				
Matte	56,451	50,811	60,719	Canada 47,719.
Scrap	168	1,419	2,771	United States 1,147; United Kingdom 224.
Unwrought[2]	51	62	68	United Kingdom 60.
Semimanufactures, including anodes.[2]	r 286	267	247	United Kingdom 100; West Germany 73; Sweden 73.
Silver and platinum-group metals:[3]				
Silver, unwrought or partly worked. thousand troy ounces	2,163	2,835	3,616	United Kingdom 1,684; West Germany 1,023; Switzerland 116.
Platinum and platinum-group metals. thousand troy ounces	3,311	1,961	NA	United Kingdom 804; Common Market 675; Sweden 225.
Sweepings, scrap, residues.[2] kilograms	----	10	NA	NA.
Tin:[2]				
Oxides long tons	30	2	NA	Netherlands 1.
Scrap do	9	51	19	All from Sweden.
Unwrought do	512	536	597	Denmark 135; mainland China 131; United Kingdom 123; Netherlands 106.
Semimanufactures do	220	301	296	United Kingdom 270; West Germany 12.
Titanium:				
Ore	191	133	210	Australia 115.
Dioxide	1,096	5,764	9,137	West Germany 3,356; United States 2,216.
Tungsten, wire	1	1	3	NA.
Uranium[2] kilograms	----	1,695	71	All from United States.
Other radioactive material. value, thousand dollars	$60	$205	NA	United States $84; Sweden $48; Canada $32; United Kingdom $30.
Zinc:				
Ore	84,861	78,728	103,150	Sweden 38,373; Canada 19,387; Australia 14,899; Peru 3,925.
Scrap	956	786	1,085	Sweden 400; Denmark 328; Finland 43.

See footnotes at end of table.

Table 3.—Norway: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Zinc—Continued				
Unwrought [2]	1,823	2,274	5,404	U.S.S.R. 2,032.
Semimanufactures [2]	2,671	2,452	1,977	France 900; Belgium-Luxembourg 711; Netherlands 201.
Oxide	458	577	918	Poland 330; West Germany 118; Sweden 75.
Miscellaneous materials, not elsewhere specified:				
Ores of nonferrrous metals [4]	89	122	NA	Australia 101.
Metalliferous ashes and residues	112	270	230	Sweden 270.
Oxides of strontium, barium, magnesium.	945	874	175	Netherlands 824.
Metalloids, not elsewhere specified	22	6	18	NA.
Alkali, alkaline-earth and rare-earth metals.	4	5	NA	Austria 2; Belgium-Luxembourg 2.
Pyrophoric alloys	3	2	3	United Kingdom 1; Other West Europe 1.
Other metals, including semimanufactures.	220	711	236	U.S.S.R. 290; Denmark 252; United Kingdom 86.
Nonmetals:				
Abrasives:				
Natural (emery, corundum, pumice, etc.).	388	350	338	Italy 85; Netherlands 69; France 48; United States 40; West Germany 37.
Artificial corundum	520	709	619	West Germany 470; Austria 148; France 91.
Grinding stones	495	550	NA	United Kingdom 136; United States 134.
Asbestos:				
Crude and fabricated	4,639	7,434	5,099	U.S.S.R. 1,653; Southern Rhodesia 1,573; Canada 1,280; United Kingdom 1,028 Republic of South Africa 994.
Asbestos-cement manufactures	13,721	13,440	13,060	Denmark 4,658; Belgium-Luxembourg 3,495; United Kingdom 2,914.
Barite, including witherite	626	541	461	West Germany 310; Algeria 200.
Borates, natural	676	600	1,025	All from United States.
Boric oxide and boric acid	298	741	616	France 604; Italy 92; United States 41.
Cement	6,756	8,360	52,896	Denmark 3,263; United Kingdom 2,273; Sweden 1,887.
Chalk	5,428	5,709	6,036	France 3,293; Sweden 1,147; Denmark 522.
Clay and clay products:				
Fuller's earth	3,639	2,815	1,910	United Kingdom 1,979; United States 531.
Kaolin	67,810	70,702	63,721	United Kingdom 68,841.
Refractory and other clays	32,399	31,516	34,315	United Kingdom 19,901; Czechoslovakia 2,978; Sweden 2,575.
Construction materials (bricks, tiles, etc.):				
Refractory	19,813	17,971	22,679	Sweden 5,951; Austria 3,842; United Kingdom 3,227.
Ordinary thousand units bricks.	7,319	9,993	10,256	Denmark 8,786.
Other value, thousand dollars nonrefractory.	$2,123	$2,329	$2,453	Sweden $655; Netherlands $402.
Cryolite and chiolite, natural	3,291	2,655	4,294	Denmark 2,555; France 100.
Diamond and other precious and semiprecious stones:				
Industrial diamond [5]—carats [3]	10,000	10,000	NA	Sweden.
Nonindustrial diamond, carats [3] unset.	20,000	50,000	NA	Israel 15,000; West Germany 10,000; Belgium-Luxembourg 5,000.
Other, natural and synthetic stone. [6] kilograms	62	204	NA	West Germany 136; Switzerland 10; Denmark 2.

See footnotes at end of table.

Table 3.—Norway: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Diatomite and other siliceous earths	3,851	4,048	3,940	Denmark 2,466; United States 1,147.
Dolomite	6,764	12,525	15,829	United Kingdom 9,814; Sweden 1,503; West Germany 1,207.
Earth pigments	521	602	498	West Germany 305; Spain 110; Denmark 83.
Feldspar	22	622	483	Portugal 602.
Fertilizer:				
Raw materials:				
Phosphate rock	149,784	199,755	173,371	U.S.S.R. 115,955; Morocco 50,405; Togo 22,783; United States 10,612.
Sodium nitrate	4	---	11	
Manufactured:				
Nitrogenous	487	419	10,591	United Kingdom 245; Austria 118.
Phosphatic, including basic slag.	6,563	7,562	5,674	Belgium-Luxembourg 6,519; Sweden 656.
Potassic	102,540	120,794	121,670	Spain 65,397; France 16,970; West Germany 16,852.
Other	19	---	138,822	
Ammonia, anhydrous	946	37,395	20,654	West Germany 34,832.
Flint	1,462	1,709	1,313	Denmark 1,315; France 370.
Fluorspar	r 1,559	1,888	3,144	United Kingdom 1,393; West Germany 391.
Graphite	249	248	284	United Kingdom 111; West Germany 84; Malagasy Republic 28.
Gypsum, including calcined	57,369	47,282	60,758	Poland 43,734; Common Market 3,492.
Hydrogen value, thousand dollars and rare gases.	NA	$13	$30	NA.
Lime	17,965	18,573	15,851	Denmark 10,777; Sweden 7,575.
Limestone, for flux, cement, etc	113,635	115,518	174,416	United Kingdom 102,035; Sweden 7,865; Denmark 5,614.
Magnesite	7,337	7,766	3,957	Netherlands 4,216; United Kingdom 1,708; mainland China 796.
Mica, including worked mica	3,484	3,740	6,516	India 3,664.
Quartz and quartzite	1,211	98	NA	NA (1963: Sweden 1,126)
Salt	264,085	252,186	295,793	Netherlands 113,074; West Germany 45,486; United Kingdom 28,174; Italy 27,901; Spain 24,491.
Sodium and potassium compounds, not elsewhere specified:				
Caustic soda	7,622	10,387	13,200	France 6,652; Sweden 2,484.
Caustic potash	1,600	1,771	1,519	Sweden 904.
Stone, sand and gravel:				
Dimension stone:				
Crude and partly worked:				
Granite, gneiss, etc	385	745	514	Sweden 737.
Marble and other calcareous.	172	102	134	Italy 74.
Slate	305	508	536	Denmark 492.
Worked, all types	1,994	444	661	Denmark 150; Italy 88; Sweden 68.
Crushed stone and gravel	2,347	2,685	2,765	Italy 1,115; Sweden 939.
Sand	73,799	100,900	127,504	Belgium-Luxembourg 66,226; Sweden 12,036; Netherlands 8,786.
Sulfur:				
Crude	35,527	46,677	56,375	France 29,879; United States 16,457.
Purified	44	NA	1,638	United States 1,160.
Sulfuric acid, including oleum	821	1,537	3,650	Sweden 995; Denmark 510.

See footnotes at end of table.

Table 3.—Norway: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Talc and steatite	3,679	3,086	4,073	Mainland China 2,050; India 449; United States 418.
Other nonmetallic mineral materials	23,590	29,168	31,487	West Germany 19,746; East Germany 8,861.
Inorganic bases, not elsewhere specified	262	426	408	West Germany 271.
Mineral fuels:				
Asphalt and bitumen, natural [7]	812	2,357	2,093	West Germany 560; United Kingdom 447; Trinidad 350.
Carbon black	2,143	2,310	2,449	United Kingdom 1,083; United States 548; Netherlands 360.
Coal	224,503	276,607	366,328	United Kingdom 149,308; Poland 53,524; United States 44,895.
Coal derivatives	14,726	20,473	17,648	United Kingdom 12,916; Poland 3,259; Common Market 2,486.
Coke, from coal	826,970	766,961	680,752	United Kingdom 577,813; West Germany 80,607; Netherlands 39,183; Ireland 34,095.
Lignite and peat, including briquets	312	193	1,298	Sweden 116.
Petroleum:				
Crude—thousand tons	2,536	2,698	2,754	Saudi Arabia 1,006; Libya 711; Iraq 529; Venezuela 452.
Petroleum products:				
Gasoline—do	446	441	498	United Kingdom 139; Netherlands 116; West Germany 59; Bahrein 54.
Kerosine, including jet fuel—do	213	215	223	Netherlands 127; United Kingdom 60.
Distillate fuel oil—do	1,141	1,172	1,255	Netherlands 442; United Kingdom 317; U.S.S.R. 177; Belgium-Luxembourg 75.
Residual oil fuel—do	1,222	1,451	1,071	United Kingdom 516; Netherlands 371; Venezuela 156; East Europe 159.
Lubricants, including grease.—do	42	47	48	United Kingdom 17; United States 12; Netherlands 9.
Bitumen and other—do	204	247	294	United States 138; United Kingdom 42; Netherlands Antilles 28.
Petroleum gases.—value, thousand dollars	$75	$58	$77	Sweden $20; France $19; Denmark $12.

r Revised. NA Not available.
[1] Not including artificial corundum.
[2] Including alloys.
[3] Calculated from quantities reported in kilograms.
[4] Including ores of zirconium, molybdenum, vanadium, and tantalum.
[5] Includes artificial diamond (5,000 carats in 1964).
[6] Including dust and powder.
[7] Including manufactured articles (380 tons in 1963 and 438 tons in 1964).

COMMODITY REVIEW

METALS

Aluminum.—Norway's productive capacity and output of primary aluminum continued to increase in 1965. The rise in production was partly due to a 14,000-ton expansion in smelter capacity completed early in the year by A/S Norsk Aluminium Co. (NACO) at Høyanger. NACO's installation of a second potline increased total capacity to 28,000 tons annually. Through its subsidiary, A/S Nordisk Aluminiumindustri at Holmestrand, NACO also expanded production capacity for semimanufactures to the same level. The NACO expansion entailed an investment of approximately $14 million.

A/S Ardal og Sunndal Verk continued to account for the major share of Norwe-

gian production in 1965. The State-owned firm reportedly produced 160,700 tons of primary aluminum (152,200 tons in 1964) and 7,600 tons of alloys (12,400 tons in 1964), while deliveries dropped to 144,000 tons (165,900 tons in 1964).[3] Early in the year, the company announced plans to increase capacity of the Sunndalsøra smelter by 45,000 tons annually, by the fall of 1968. Plans include two new potlines and increased hydroelectric facilities, for an investment estimated at $41 million.

New production and sales records were reported in 1965 for primary aluminum made by Møsjoen Aluminum A/S. The Aluminum Company of America and Elektrokemisk A/S, joint owners of the Møsjoen company, announced plans to build an aluminum smelter at Lista, south of Stavanger. Initial production at Lista is expected to be 20,000 to 30,000 tons annually, starting in 1970 or 1971. Earlier in 1965, the firms announced plans to increase capacity of the Møsjoen smelter 23,000 tons by 1967–68.

Sør-Norge Aluminium A/S continued construction of a smelter at Husnes on Hardanger Fjord. Completion of the first of two potlines was expected before year-end, and completion of the second was expected by April 1966.

Another new smelter with a planned annual capacity of approximately 80,000 tons was under construction at Karmøy (northwest of Stavanger) by Alnor A/S, 51 percent of which is owned by Norsk Hydro-Elektrisk Kvaelstof A/S (Norsk Hydro) and the remaining 49 percent is owned by Harvey Aluminum, Inc. An integrated operation to produce aluminum semimanufactures as well as ingots is planned. Investment in the project reportedly totaled $84 million.

Developments in Norwegian primary aluminum capacity are summarized in the following table.

Production of high-purity (99.99 percent) aluminum was continued by A/S Vigeland Brug near Kristiansand.

The value of Norwegian exports of aluminum in 1965 was $4 million less than in 1964, despite increased domestic production. Reduced deliveries of ingot to West Germany, the United Kingdom, and the United States were partially offset by increased shipments to Sweden, Italy, and Switzerland. Imports of alumina from Jamaica increased to 223,000 tons, while shipments from the United States and Guinea were reduced. Total imports of alumina were valued at $36 million.

Columbium.—The Søve columbium mine in Telemark, operated by A/S Norsk Bergverk, was closed on September 1, 1965. In operation since 1953, the mine produced approximately 3,300 tons of pyrochlore concentrate containing 50-percent columbium oxide and a relatively low proportion of tantalum. Part of the concentrate was used in manufacturing ferrocolumbium, and the rest was exported. The mine was the only producer of columbium in West Europe.

Copper.—The 20-percent rise in output of refined copper in 1965 was apparently due to the increased volume of copper-nickel matte processed by Falconbridge Nikkelverk A/S at its Kristiansand refinery.

There was no appreciable change in output of copper from Norwegian mines in 1965, although two small producers had ceased operations during 1964. A/S Sulitjelma Gruber, the leading domestic producer, was increasing productive capacity by a $14 million expansion and modernization program. Norwegian exports of unrefined copper, probably representing Sulitjelma's smelter output, were slightly less than 5,000 tons in 1965 and were mostly sold to West Germany.

Folldal Verk A/S continued development of cupriferous pyrite deposits at Hjerkinn, 125 kilometers south of Trondheim in the Døvre mountains. Production at the Folldal mine, 20 kilometers east of Hjerkinn, was gradually being phased out. The Hjerkinn deposit, 2 kilometers from the Trondheim-Oslo railway, reportedly contains 0.7 to 2 percent copper.

Norwegian exports of copper in 1965 were valued at $7 million over that of 1964, because of an increase of nearly 4,000 tons of refined copper which went primarily to West Germany and Sweden. The value of imports also increased by $5 million, due primarily to a 1,500-ton increase in copper bars and wire.

Iron and Steel.—*Iron Ore.*—The 1965 increase in iron ore production was due mainly to the first full year of operations of the State-owned Rana mine and con-

[3] Metal Bulletin, No. 5104, June 10, 1966, p. 24.

Table 4.—Norway: Primary aluminum producers and plants

Company	Ownership or affiliation (percent)	Location	Production capacity, metric tons per year		
			Installed 1965	Under construction (UC) or planned (p) [1]	Approximate date of completion
A/S Ardal og Sunndal Verk	Norwegian Government	Ardal	110,000		
Mosjoen Aluminium A/S	Aluminum Co. of America (50)	Sunndalsøra	55,000	45,000 (p)	1968
	Elektrokemisk A/S (50)	Møsjoen	57,000	23,000 (p)	1967–68
A/S Norsk Aluminium	Alcan Aluminium Ltd. (50)	Lista	-------	20,000–30,000 (p)	1970
	A/S Høyanger (50)	Høyanger	28,000		
Det Norske Nitrid A/S	Alcan Aluminium Ltd. (50)	Tyssedal	19,000		
	British Aluminium Co. (50)	Eydehavn	9,000		
Sør-Norge Aluminium A/S	Swiss Aluminium Ltd. Compadec (including Pechiney)	Husnes	-------	60,000 (UC) [1]	1966
Alnor A/S	Norsk Hydro A/S (51)	Karmøy	-------	80,000 (UC) [1]	1967–68
	Harvey Aluminum, Inc. (49)	----do			
Total			278,000	228,000 to 238,000	

[1] Not including possible eventual expansions at Husnes (to 180,000 tons), Karmøy (to 120,000 tons), Møsjoen (to 105,000 tons), or Lista (to 100,000 tons).

centrator in northern Norway. An estimated 260,000 tons of concentrate was produced by Rana Gruber A/S in 1965. Production followed several years of research and testing of the complex magnetite-hematite ore, which contains 33 percent iron. The concentrate was delivered to the nearby steelworks of Norsk Jernverk A/S at Mo-i-Rana.

Because of the shipments from Rana, deliveries of concentrate by A/S Sydvaranger to Norsk Jernverk in 1965 were reduced from 400,000 tons to 145,000 tons. Production of concentrate at Sydvaranger, Norway's largest iron mining operation, was 1.51 million tons. The company was encountering strong competition in West European markets from African iron ores, and total sales in 1965 were 3 percent less than in 1964. In order to meet competition, Sydvaranger has decided to pelletize its entire output of concentrate. Production of pellets at the rate of 1.2 million tons annually is expected to begin in 1968. Under a $10 million expansion plan, the company expects to increase production of concentrate to 2.4 million tons annually by 1970. To achieve this level of production, overburden stripping at the rate of 7 million tons annually will be required. Open pit mining was expected to continue for another 25 years. In Finnmark, the company continued geophysical studies and diamond drilling.

Two other companies decided to build pelletizing plants in 1965—Fosdalens Bergverks A/S, a State-owned company that produces about 260,000 tons of concentrate annually, and Orkla-Grube A/B which recovers a small tonnage of iron concentrate from pyrite mining operations. The only pelletizing plant operating in Norway in 1965 had an annual capacity of 520,000 tons per year and was operated by Norsk Jernverk at Mo-i-Rana.

Development work was continued by Fosdalens Bergverks on new ore bodies at Malm. The company was sinking a circular, 6-meter-diameter shaft which was expected to reach a planned depth of 1,175 meters in 1966. Production from the East ore body was expected by 1970. Minimum cost of the development program was estimated at $7.5 million.

A/S Rødsand Gruber, a subsidiary of Christiania Spigerverk A/S, produced 136,000 tons of concentrate in 1965 from its underground operations at Sunndalsfjord in west Norway. A new shaft was being sunk to the 650-meter level.

Expansion of ore-handling and shipping facilities at the port of Narvik was continued, and the first 50,000-ton vessel was loaded in early 1965. Loading capacity at the port is being increased from 6,000 to 8,000 tons per hour and ships of 65,000-ton capacity were expected to be accommodated by yearend. Total shipping capacity of the port will be increased to 20 million tons annually. The Swedish company, Luossavaara-Kirunavaara A/B (LKAB), which accounts for practically all ore shipments from Narvik, has invested about $5.6 million in the development project.

Exports of Norwegian iron ore in 1965 were valued at $1.5 million less than in 1964. Shipments to West Germany and the United Kingdom were reduced by 230,000 tons and 75,000 tons, respectively, while deliveries to Finland totaled 125,000 tons.

Ferroalloys.—Production of ferroalloys sharply increased for the second consecutive year. Ferrosilicon and ferromanganese accounted for most of the increase. Imports of manganese ore increased in value by $5.8 million, with deliveries from Ghana increasing by nearly 100,000 tons, while the value of chromite imports dropped by $1 million, compared with 1964. The value of ferroalloy exports was more than $61 million, an increase of about $8 million over the 1964 level. Exports of ferromanganese increased by 28,000 tons, exports of ferrosilicon by 21,000 tons, and exports of ferrosilicochrome increased by 11,500 tons. Exports of ferrochrome were reduced by 7,500 tons.

Elektrokemisk A/S continued construction of the Salten Verk ferrosilicon plant at Fauske in northern Norway. The $5 million facility will employ about 100 persons when production begins in the spring of 1967. A 24,000-kilovolt-ampere ferrochrome furnace was also under construction at the Alvik works of A/S Bjølvefossen.

Pig Iron.—The 20-percent increase in pig iron production was almost entirely due to expanded operations at Mo-i-Rana by Norsk Jernverk A/S. The State-owned company reportedly produced 450,000 tons in 1965 (355,000 tons in 1964), and the remainder was produced mostly by Christiania Spigerverk A/S. Production capac-

ity at Mo-i-Rana was increased by 360,000 tons annually in 1964 by completion of two 60,000-kilovolt-ampere furnaces. Norwegian productive capacity in 1965 was about 710,000 tons annually and was expected to increase about 10 percent in 1966.

Steel.—Crude steel output continued to rise in 1965 and appeared to be close to capacity production. Two-thirds of total output was produced at Mo-i-Rana by Norsk Jernverk A/S. Most of the remainder was produced by Christiania Spigerverk. An estimated 25,000 tons of special steel was produced at Jorpeland by Stavanger Elektro-Staalverk A/S. Sixty percent of total output was again produced in electric furnaces, with the remainder produced in two 40-ton Linz-Donawitz converters at Mo-i-Rana. An estimated 385,000 tons of scrap was consumed in steel manufacture, compared with 356,000 tons in 1964. Rolled steel output by Norsk Jernverk in 1965 amounted to 366,000 tons.

Trade in steel was about the same as in 1964, although total semimanufacture imports increased by 40,000 tons and rose $4 million in value. The change was mainly due to increased imports of heavy plate. In crude forms, the principal import continued to be coils for re-rolling, and the main export items were slabs and sheet bars.

The report of the Backe Committee, which was formed in 1964 to determine the causes of financial losses resulting from State operations in the iron and steel industry (Norsk Jernverk A/S and Norsk Koksverk A/S), was completed in 1965. It recommended that Norsk Jernverk take over operations of Norsk Koksverk, that it be exempted from interest payments on its loan capital, and that its capitalization be reduced from $48 million to $35 million. Refinancing of the enterprise was to be provided by the Government, Elektrokemisk, and Christiania Spigerverk, with the latter firm requested to reorganize the company and to supervise its operations.

In other developments, technicians from Christiania Spigerverk were sent to Tunisia to assist in establishment of operations at a new rolling mill being built at Elfouadh, and Tunisian engineers and workers were being trained at the company's plant in Oslo.

Lead and Zinc.—Lead concentrate production in 1965 remained at the 1964 level, but metal content increased by 14 percent. A/S Bleikvassli Gruber operations at Korgen continued to account for almost all production. Concentrate exports to the United Kingdom were only half the quantity shipped in 1964, while deliveries to Belgium increased. Metal imports from South Africa and Peru were sharply reduced in 1965.

Zinc concentrate output was little changed from the levels of the previous 3 years, the Bleikvassli mine being the principal producer. Increased concentrate output by the Sulitjelma and Folldal companies was expected to result from expansion and development projects underway in 1965. The pyrite ore body being developed by Folldal Verk at Hjerkinn was reported to contain 1.2 percent zinc. At Eitrheim, electrolytic zinc production by Det Norske Zinkkompani was an alltime record, and the refinery's capacity was being increased.

Zinc concentrate exports to West Germany in 1965 increased by nearly 4,000 tons, while concentrate imports from Sweden were doubled as compared with those of 1964. However, metal exports decreased owing to reduced shipments to West Germany. Unwrought metal imports from the Soviet Union increased 150 percent to more than 5,000 tons in 1965. These developments brought the value of zinc imports close to the level of exports as compared with a trade surplus of almost $6 million in 1964.

Magnesium.—Production and exports of magnesium continued to increase in 1965. Exports were valued at $14.3 million and included nearly 20,000 tons shipped to West Germany.

Norway was concerned over a proposal by the European Economic Community (EEC) Executive Commission to levy a 1.5-percent duty on magnesium now imported under duty-free quotas from countries outside the EEC. Norwegian exports filled about half of the EEC duty-free quota of 37,000 tons for 1965. The principal buyer of Norwegian magnesium is the Volkswagenwerke A.G. in West Germany.

Norsk Hydro, sole magnesium producer, was converting a chemicals plant at Rjukan in Telemark for the production of magnesium extrusions and castings. The company's subsidiary, A/S Rjukanmaskiner,

was scheduled to start production in 1967. The project involves an investment of $1.5 million.

Molybdenum.—A major increase in production was reportedly planned at the molybdenum mine of A/S Knaben Molybdaengruber, at Fjotland in southwest Norway. At a cost of $1.4 million, annual production is to be increased to an estimated 450,000 tons of crude ore and 800 tons of concentrate.

Nickel.—Nickel production in 1965 at the Kristiansand refinery of Falconbridge Nikkelverk A/S was the second highest on record. As a result, Norwegian production of refined copper and cobalt sharply increased, and output of sulfur dioxide, selenium, and precious metals was probably increased as well. The raw material processed by the refinery is copper-nickel matte from Canada, with typical metal content as follows, in percent: Nickel—48, copper—27, sulfur—22, cobalt—0.8, iron—0.9, arsenic—0.13, lead—0.6, and selenium—0.04. Gold, silver, and metals of the platinum group are also recovered.

The refinery's nickel production capacity will be increased to 40,000 tons annually. More than $1.5 million was spent by the company in 1964–65 for process improvements and quality control.

Despite the high refinery output, exports of nickel were less than in 1964 and declined in value by $5 million. Exports to the Common Market decreased by 3,000 tons. At the same time, matte imports increased by 10,000 tons and increased by $12 million in value, compared with 1964.

Titanium.—Norway's production capacity for ilmenite and titanium pigment continued to increase in 1965. Approximately 280,000 tons of ilmenite concentrate and 85,000 tons of magnetite concentrate were produced by A/S Titania at Sokndal. Ore production was mostly from the company's open pit mine at Tellnes. The Størgangen underground mine was reported to have been closed. With development of the Tellnes mine, the ore-slurry pipeline, and the concentrator and shipping facilities at Sokndal, the company's productive capacity was increased to 400,000 tons of concentrate annually. The development program, started in 1957, has cost a minimum of $10 million. Ore reserves of the company were reported to be 350 million tons.

At Fredrikstad, Titan Company A/S was increasing capacity for production of titanium dioxide from 7,500 to 15,000 tons annually. Plant expansion will be completed in 1966. Both A/S Titania and Titan Co. A/S are subsidiaries of the National Lead Co.

Increased export demand for Norwegian ilmenite in 1965 was met by withdrawals from stocks. Shipments to West Germany and Italy were increased by 26,000 tons and 20,000 tons, respectively, compared with 1964. Total ilmenite exports were valued at $3.8 million, while titanium oxide imports were valued at $2.8 million in 1965.

NONMETALS

Abrasives. — Norton Norge A/S, subsidiary of the Norton Co. of Massachusetts, began production of silicon carbide in August at its new plant in Lillesand. Productive capacity of the plant is 8,000 tons annually, raising total Norwegian capacity to 38,000 tons. Other silicon carbide producers are Arendal Smeltverk A/S, at Eydehavn, with annual capacity of 24,000 tons, and the Løkken Verk plant of Orkla Exolon A/S and Company which has a capacity of 6,000 tons. The Arendal firm is a subsidiary of The Carborundum Co. of Niagara Falls, N.Y., and the other firm is a subsidiary of the Exolon Co. of Tonawanda, N.Y.

Cement.—Production and exports of cement remained very close to 1964 levels although annual productive capacity was increased by an estimated 180,000 tons in 1965. Total productive capacity by the end of the year was estimated at 1.66 million tons and was expected to increase to 2.1 million tons by the end of 1966.[4]

The expansion program of A/S Dalen Portland-Cementfabrik was nearing completion at yearend, and annual capacity of the Brevik works was expected to reach 1.2 million tons in 1966. This program, carried out over the past 6 years, has required an estimated investment of $31 million. Two horizontal kilns were installed in 1964 and the 23-foot-diameter Aerofall mill scheduled for delivery in 1965 was reportedly the first of its type to be used outside of the United Kingdom. The company was considering using the

[4] Organization for Economic Cooperation and Development (OECD) (Paris). The Cement Industry. Statistics 1964 and Trends in 1965. September 1965, 88 pp.

present crushing plant to produce crushed stone aggregate for export when the new mill is installed.

In Oslo a new rotary kiln was ordered by A/S Christiania Portland Cementfabrik. The kiln will increase productive capacity of the company by 500,000 tons annually in 1967.

Exports of cement in 1965 were slightly less than in 1964 but increased 14 percent in value to nearly $3.5 million. The United States continued to be the principal market, followed by West Africa. Under a 10-year agreement reached in 1960, production and sales of the three Norwegian producers (including Nordland Portland Cementfabrik) are coordinated through the Norwegian Cement Association in Oslo.

Fertilizers.—Fertilizers, mostly manufactured from nitrogen and nitrogenous products made in Norway, continue to rank with ferroalloys and nickel as one of the principal mineral export commodities. Exports in 1965 were valued at $65 million and accounted for 72 percent of the total value of nonmetal exports. The trade surplus increased to $46.8 million despite unusually large imports required to meet domestic commitments.

Accounting for almost the entire domestic output of nitrogenous products, Norsk Hydro increased production in 1965, and sales ($82.6 million) were 11 percent higher than in 1964. Output included 1,353,000 tons of calcium and ammonium nitrates; 366,000 tons of compound fertilizers ("nitrophoska"); 148,000 tons of urea; 19,700 tons of nitric acid; and 17,000 tons of liquid ammonia. The company also accounts for most of the limestone consumed by the basic chemicals industry (including fertilizers), estimated at approximately 1 million tons in 1965.

At Herøya, a fuel oil gasification plant for production of 100,000 tons of ammonia per year was completed by Norsk Hydro in October. Cost of the plant was estimated at $14 million. The company also decided to build another plant at Herøya in 1967. The plant will increase ammonia production by an additional 275,000 tons. Both plants will use the steam reforming process, with naphtha as raw material.

Domestic consumption of fertilizer materials in Norway in 1964–65 was estimated at 58,000 tons nitrogen, 55,000 tons of potash, and 45,000 tons of phosphorus pentoxide.

The Soviet Union and Spain, respectively, continued to supply most of Norway's import requirements for phosphate and potash in 1965. Extra import requirements were mainly supplied by the Netherlands.

Pyrite.—Pyrite production remained at the level of the previous 2 years. Cupriferous pyrite accounted for an estimated 60 percent of total output and was produced mostly by Orkla-Grube A/B at Meldal and by Elektrokemisk A/S at Namsskogan. Orkla produced 231,300 tons in 1965. The principal producers of noncupriferous pyrite continued to be A/S Sulitjelma and A/S Stordø Kisgruber, with the latter company producing 69,000 tons in 1965. At least seven other companies produced pyrite, along with byproduct concentrates of copper, zinc, lead, and other metals.

Elektrokemisk acquired control of the Sulitjelma company in 1965. The resulting combination of production capacity for pyrite was estimated at 260,000 tons annually. Explorations of prospective ore bodies in the Fauske region were continued. A joint organization was formed by Elektrokemisk, Orkla, and Sulitjelma in 1965 to coordinate prospecting activities.

Additional drilling of the pyrite deposits at Hjerkinn by Folldal Verk A/S in 1965 reportedly increased known ore reserves. Previous reports indicated proven reserves of 8 to 10 million tons containing approximately 30-percent sulfur. Mining at the rate of 300,000 tons annually was expected to begin in 1966 or 1967 with a yield of 160,000 tons of pyrite, and the company hopes to eventually double this output. Folldal Verk is a subsidiary of A/S Borregaard, a Norwegian pulp and paper company. A large sulfuric acid plant was being built for Borregaard at Sarpsborg (south of Oslo) by Dorr-Oliver, Inc. Scheduled for completion by the end of 1966, the plant will have an annual capacity of 200,000 tons of acid. Pyrite will be shipped by rail from Hjerkinn. Total investment in the mine and plant facilities was reported to be $15 million.

In other developments, Orkla-Grube A/B was using a new subshaft between the 380- and 930-meter levels at Løkken for exploration and development work in the

western part of the ore body. In Finnmark, cupriferous pyrite deposits near Kautokeino in the Bidjovagge region were estimated at 3.6 million tons by the Norwegian Geological Survey.

An 8-percent drop in pyrite exports in 1965 was attributed to a 48,000-ton reduction in shipments to Czechoslovakia. Shipments to Sweden increased by 30,000 tons and compensated for reduced deliveries to West Germany and Denmark.

Stone, Sand and Gravel.—The building stone industry continued to export approximately 40,000 tons each of syenite and slate, mostly to Common Market countries. Total exports were valued at $5.7 million, with syenite ("labrador" or "larvikite") accounting for the largest share. At Skjervøy in Finnmark, A/S Norsk Nefelin continued to increase production of nepheline syenite for the domestic glass and ceramics industries as well as for export. Olivine production was also increased at the State-owned mine and plant south of Ålesund, and exports of sand and gravel increased in value to $1.2 million in 1965.

Other Nonmetals. — Increased graphite output by the Skalands and Jennestad companies north of Narvik led to an increased value of exports (to $800,000), with the United States purchasing 3,700 tons. Quartz production included 9,600 tons of high-grade crystal. Exports of talc and feldspar declined slightly in 1965, to a combined value of $3.4 million, with total shipments to the United Kingdom reduced by 17,000 tons. A decrease in mica production was accompanied by imports of more than 6,000 tons from India.

MINERAL FUELS

Coal and Coke.—Although coal output from the Spitzbergen mines was only slightly less than in 1964, continued production on this scale appeared to depend largely on West German purchases as well as on successful operation of the State-owned cokeworks (Norsk Koksverk A/S) at Mo-i-Rana. Increasing mine costs and the relatively low quality of coal led the sole producing company, Store Norske Spitzbergen Kulkompani, to predict an operat- loss of NKr12 to 14 per ton for the 1966 season. Deliveries by the company in 1965 included 175,000 tons to Norsk Koksverk and 138,000 tons to West Germany, with the remainder of production mostly shipped to private customers in north Norway and to the Norwegian State Railways.

Increased coke requirements of the iron and steel industry and the poor coking qualities of Spitzbergen coal appeared to be responsible for appreciable changes in Norwegian coal and coke trade in 1965. Increased coal exports to West Germany were accompanied by an increase of 115,000 tons of imports (mostly coking coal) from the United States. Coke imports from the United Kingdom declined by 110,000 tons, while there were unusually large exports of low-priced coke, mainly to Rumania, Denmark, and Venezuela.

Norsk Koksverk's coke output appeared to be close to rated capacity in 1965, although much of the product was low grade. It was later reported that acceptable coke could be produced by mixing equal proportions of West Virginia coking coal with the Spitzbergen product. The plant was also unable to fulfill scheduled deliveries of ammonia to the Glomsfjord works of Norsk Hydro. These difficulties were partly responsible for a $5 million loss sustained by Norsk Koksverk in 1965.

Coal consumption in Norway in 1964 was reported to be 521,000 tons, of which cokeworks accounted for 26 percent; the iron and steel industry, 21 percent; other industry 20 percent; railroads and gasworks approximately 7 percent each; and the remainder by other consumers. Total coke consumption in the same year was 415,000 tons, of which the iron and steel industry accounted for 82 percent.

Petroleum.—*Exploration.*—Although not a signatory of the 1958 Geneva Convention on Law of the Sea, Norway negotiated offshore boundary agreements based on the median line principle with the United Kingdom and Denmark in 1965. By September, the Government had granted 21 petroleum-exploitation licenses to eight companies or groups of companies, covering a 40,000-square-kilometer area of the North Sea southwest of Stavanger. The concession holders include Esso Exploration Norway, Inc.; A/S Petronord, 20 percent of which is owned by Norsk Hydro and 80 percent is owned by a group of seven French companies; Caltex (California Asiatic Oil Co. and Texaco Overseas Petroleum Co.); A/S Norske Shell; Norwegian Gulf Oil Production Co.; the Phillips group (Phillips Petroleum Co.,

with subsidiaries of Petrofina S/A of Belgium and Ente Nazionale Idrocarburi of Italy); Syracuse Oils Norge A/S; and the Amoco-Noco group (Amoco-Norway Oil Co., Amerada Petroleum Corp. of Norway, and Norwegian Oil Consortium A/S). Esso and Amoco were expected to begin drilling in 1966. Shell, Petronord, and Phillips planned to begin drilling in 1967. Most of the companies have been conducting explorations in the area since 1963.

Under a royal decree issued by midyear, the Government's share of income from oil production is expected to be 56.25 percent, including a 10-percent royalty. One-fourth of the exploitation concessions must be relinquished after 6 years, and an additional one-fourth must be relinquished after the next 9 years.

Five exploration licenses, covering areas outside of the exploitation concessions, were also granted in 1965. The recipients included A/S Petronord, Esso, Phillips, Amoco, and Norske Murphy Oil Co.

Three companies were formed to provide servicing for offshore operations: International Offshore Services; Norwegian Oil Repairs & Supply Co. Ltd. (NORSCO A/S); and North Sea Exploration Service A/S. The companies were formed by Norwegian shipping interests, with the participation of British, French, Dutch, and Canadian firms.

On Spitzbergen, Caltex began drilling at Blåhuken, 70 kilometers south of the coal mines at Longyearbyen, after 5 years of prospecting and geophysical work. The 24-inch-exploration hole was expected to reach a depth of 3,000 meters by mid-December but was still being drilled at yearend. Caltex had a 2,010-square-kilometer exploration concession and was applying for 260 square kilometers of adjacent area. Investigations on Spitzbergen were also being conducted by the Soviet group, Arktikugol, and Norsk Polar Navigasjon A/S.

Refining.—In early 1965, A/S Norske Esso announced completion of a lubricant refinery at Valløy. The new plant, built by Lurgi A.G. of West Germany, has an annual capacity of 31,000 tons of lubricants and was reported to be one of the most advanced of its type in Europe. The company was also expanding capacity of the Slagen refinery to 19 million barrels of crude oil per year. By yearend, total investment of the company in its two plants, located 75 kilometers south of Oslo near Tønsberg, was estimated at $42 million.

At Risvika, near Stavanger, A/S Norske Shell was building a 2-million-ton refinery, scheduled to go on stream in 1967. Prime contractor for the $40 million project was a subsidiary of the Italian firm, Ente Nazionale Idrocarburi. Underground storage space for 220,000 tons of crude oil was being blasted from solid rock, and port facilities will accommodate tankers of up to 85,000 tons deadweight.

Petroleum Trade and Consumption.—While crude oil imports from Saudi Arabia, Iraq, and Libya were substantially reduced in 1965, those from Venezuela were increased by 900,000 tons. Total value of crude oil imports in 1965 was $47.5 million.

Trade in petroleum products was below the levels of 1964, with imports valued at $93 million and exports valued at $23 million. Imports from The Netherlands Antilles declined by 119,000 tons (principally fuel oils), while exports of petroleum products to Denmark and The Netherlands decreased by 164,000 tons and 130,000 tons, respectively, as compared with 1964. Trade in lubricants showed no appreciable change from 1964 and output of the Valløy refinery appeared to be absorbed by domestic consumption.

Petroleum product consumption (for fuel) in 1964 was estimated at approximately 3.9 million tons, of which fuel oils comprised 78 percent and motor gasoline comprised 15 percent. Increased petroleum coke consumption was reflected by imports, which rose to 177,000 tons in 1965, compared with 115,000 tons in 1963.

Electric Energy.—Electric power production increased to 48.8 billion kilowatt-hours in 1965. Principal consumers continued to be the primary metal, chemical, and paper industries. Total installed capacity of Norwegian powerplants at the end of 1965 was estimated at 9,640 megawatts, of which hydroelectric plants accounted for nearly 99 percent. An additional 680 megawatts of hydroelectric capacity was scheduled for service in 1966. In 1964, thermal powerplants accounted for only 0.2 percent of total electricity production and were fueled exclusively by petroleum products.

In the atomic energy field, the Institutt for Atomenergi (IFA) and Norsk Hydro A/S agreed to cooperate in plans for construction of a land-based nuclear powerplant. The proposed plant would be a 400,000-kilowatt heavy-water reactor located at Herøya. Project cost was estimated at $84 million, and construction was scheduled to begin in 1970. The only nuclear reactors now operating in Norway include a 20,000-kilowatt reactor at the Halden research center near Fredrikstad and several smaller experimental units. In other developments, the IFA director stated that joint Norwegian-Swedish research had reached a point where a decision was needed by 1966 on whether to build a prototype nuclear merchant vessel with a 67,000-ton capacity or to phase out the research program.

The Mineral Industry of Poland

By Bernadette Michalski [1]

High rank coal, sulfur, and zinc were Poland's principal mineral products in 1965. Although sizable aluminum, iron and steel, and petroleum refining industries have been recently developed, these industries are dependent upon raw materials imported principally from the Soviet Union and Hungary.

According to Polish sources, the value of total industrial output in 1965 increased 9 percent over that of 1964, approximately the same increase as was recorded in 1964 with respect to that of 1963. On the basis of a 1963 reported industrial product of Zl448,400 million,[2] a 1965 industrial production value of about Zl530,000 million is indicated.

The extractive industry lagged behind the overall industrial growth through 1964, with an increase of only 5 or 6 percent [3] with respect to output of 1963. The mineral industry's most significant contributions to the increased industrial output were the marked increase in the production of petroleum refinery products and elemental sulfur.

Leading developments in the mineral industry included the beginning of operation of an oxygen converter facility, and two coking coal batteries at the Lenin Iron and Steel Plant at Nowa Huta, the commissioning of a second processing plant at the Tarnobrzeg sulfur deposit, the opening of the Kazimierz brown coal mine, and the construction of additional facilities at the Plock refinery.

PRODUCTION

While aluminum production declined slightly from that in 1964, output of the petroleum and sulfur industries was greatly increased. The production of most other mineral industry products increased moderately, but in many cases failed to achieve planned goals. Commodities for which output fell short of planned goals were as follows: Natural gas 18 percent, brown coal 8 percent, electric power 2 percent, coke 2 percent, and lime 1 percent.

[1] Commodity research specialist, Division of International Activities.

[2] Throughout this chapter, the official currency unit of Poland, the zloty (Zl), has been used rather than the U.S. dollar because actual exchange rates differ considerably from the official Zl 1=US$0.25. In most cases, the zloty is overvalued.

[3] As indicated by United Nation's industrial production indices.

Table 1.—Poland: Production of minerals and metals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Aluminum, ingot—thousand tons	48	48	47	48	47
Cadmium e	400	400	420	420	425
Copper:					
Ore:					
Gross weight—thousand tons	1,944	2,162	2,162	2,247	NA
Metal content e	11,700	13,700	13,200	14,515	NA
Electrolytic	22,230	24,138	29,633	36,645	37,400
Iron and steel:					
Iron ore—thousand tons	2,386	2,436	2,609	2,680	e 2,700
Pig iron—do	4,770	5,311	5,395	5,643	5,760
Steel ingots and castings—do	7,234	7,684	8,004	8,572	9,088
Semimanufactures:					
Pipe—do	404	450	474	e 500	e 500
Other rolled—do	4,824	4,824	5,238	5,457	5,708
Total—do	5,228	5,274	5,712	e 5,957	e 6,208
Lead:					
Ore:					
Gross weight—do	2,365	2,497	2,556	2,597	NA
Metal (lead) content	38,200	37,900	37,700	38,400	NA
Refined	r 39,802	40,680	38,914	41,500	NA
Nickel	1,318	1,323	e 1,300	e 1,300	e 1,300
Silver e—thousand troy ounces	129	129	129	129	129
Zinc:					
Zinc content of lead-zinc ore	139,577	145,114	147,100	151,200	NA
Refined:					
Electrolytic	78,900	82,100	83,500	NA	NA
Other	103,100	98,800	97,700	NA	NA
Total	182,000	180,900	181,200	186,900	190,400
Nonmetals:					
Barite	37,341	45,215	45,700	e 45,700	e 45,700
Cement—thousand tons	7,364	7,544	7,670	8,761	9,573
Fertilizer materials:					
Nitrogenous, manufactured—do	1,191	1,269	1,330	NA	NA
Phosphatic:					
Phosphate rock	46,675	55,904	64,800	e 64,800	NA
Manufactured—thousand tons	1,191	1,368	1,389	NA	NA
Feldspar	NA	NA	26,700	e 26,700	e 26,700
Gypsum:					
Crude—thousand tons	468	548	585	e 585	NA
Calcined—do	96	116	117	NA	NA
Lime:					
Crude, construction and industrial—do	2,181	2,384	2,433	2,680	2,877
Quicklime, hydrated lime, and dead burned dolomite—thousand tons	1,879	1,983	2,004	2,110	NA
Magnesite	27,100	34,100	26,600	38,000	NA
Pyrite, gross weight—thousand tons	201	223	216	e 216	NA
Salt:					
Rock—do	608	609	645	660	NA
Other—do	1,443	1,466	1,486	1,581	NA
Sulfur:					
Ore, gross weight—do	1,150	1,740	1,791	NA	NA
Content of ore—do	133	210	235	295	431
Mineral fuels:					
Coal:					
Bituminous—do	106,606	109,604	113,150	117,354	118,800
Brown—do	10,338	11,091	15,344	20,250	22,600
Briquets—do	1,013	999	996	NA	NA
Coke:					
Oven and beehive—do	11,948	12,573	13,199	13,026	14,400
Gashouse—do	1,018	1,083	1,155	1,156	
Low temperature—do	e 200	e 250	254	e 255	NA
Gas, natural—million cubic feet	29,956	29,531	36,690	45,953	46,163
Peat, fuel—thousand tons	75	66	102	e 100	NA
Petroleum:					
Crude—do	203	202	213	282	339
Refinery products:					
Gasoline—do	139	248	305	385	654
Kerosine—do	81	28	21	NA	NA
Unspecified—do	710	1,016	1,116	NA	NA
Total—do	930	1,292	1,442	1,933	3,516

e Estimate. p Preliminary. r Revised. NA Not available.

TRADE

The value of Poland's mineral trade in 1964 (the latest year for which full detailed data are available) increased exports rising by 7.6 percent and imports by 24.7 percent. Reported value of mineral trade and total trade and the share of total trade accounted for by mineral commodities are given in the following tabulation:

	Value (thousand zloty)		Share of total mineral commodities (percent)
	Mineral commodities	Total	
Exports:			
1963	r 1,960	7,080	27.7
1964	2,110	8,386	25.1
Imports:			
1963	r 1,797	7,916	22.7
1964	2,241	8,289	27.0
Trade balance:			
1963	+ 163	− 836	XX
1964	− 131	+ 97	XX

r Revised. XX Not applicable.

The U.S.S.R. which accounted for a third of Poland's total trade, remained the country's foremost trading partner. Continued dependence on the U.S.S.R. was evident; Poland's three largest investment projects, the Plock refinery, the Pulawy nitrogen plant, and the Lenin Iron and steel Works are principally, if not totally, dependent upon crude petroleum, natural gas, and iron ore imported from the U.S.S.R.

Reports on trade agreements revealed that about 87 percent of Polish machinery and equipment exports and about 60 percent of the Polish fuel and raw material exports will be directed to the Soviet Ekonomicheskoy Vzayimopomshchi (SEV) countries.[4]

[4] Council of Mutual Aid set up under an intercountry agreement that includes Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Mongolia, Poland, Rumania, and the U.S.S.R.

Table 2.—Poland: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations 1964
Metals:			
Cadmium	290	297	U.S.S.R. 193; West Germany 69.
Iron and steel:			
Iron ore	2,900	19,700	United Kingdom 18,500.
Pig iron and cast iron	65,173	23,109	West Germany 14,025.
Ferroalloys	3,593	6,340	United Kingdom 1,633; Austria 1,140; West Germany 1.076.
Steel ingots	161,400	----------	
Ingots and semimanufacturers	939,500	928,400	Czechoslovakia 173,200; U.S.S.R. 110,800; Yugoslavia 85,700; Sweden 69,600; United States 62,100; Rumania 42,300.
Lead concentrate	5,908	6,139	West Germany 4,088; France 2,051.
Other nonferrous concentrates	--------	30	All to East Germany.
Zinc:			
Metal and dust	75,520	81,017	U.S.S.R. 50,221; Czechoslovakia 12,689; Hungary 7,342.
Alloys	8,082	8,472	U.S.S.R. 5,972; Brazil 1,408.
Rolled products	13,240	16,633	U.S.S.R. 3,964; East Germany 3,691; Czechoslovakia 2,808; Denmark 2,552.
Nonmetals:			
Cement----thousand tons	1,176	----------	
Lime, burned	48,230	64,840	Czechoslovakia 31,466; Netherlands 23,692.
Lime, hydraulic	4,221	----------	
Limestone	7,241	----------	
Pyrite	--------	31,500	All to East Germany.
Refractory clays	77,800	80,500	Italy 35,800; Hungary 19,600; Yugoslavia 15,200.
Salt, rock	106,600	125,000	Sweden 34,400; Finland 30,000; Hungary 20,800; Czechoslovakia 19,600.
Sulfur, elemental	124,300	150,500	Czechoslovakia 97,400; Sweden 17,200; Austria 15,500.
Mineral fuels:			
Coal:			
Bituminous----thousand tons	16,892	19,268	U.S.S.R. 4,814; Denmark 2,465; East Germany 2,095; Finland 1,754; Czechoslovakia 1,643; Austria 1,533; Hungary 1,171.
Brown, including briquets--do	5,736	5,381	All to East Germany.
Coke----do	2,352	2,249	East Germany 853; U.S.S.R. 662; Hungary 263; Egypt 139.
Petroleum:			
Refinery products:			
Gasoline	3,200	NA	
Kerosene	14,500	NA	
Fuel oil	554,600	NA	
Lubricants	3,500	NA	
Asphalt	10,100	NA	
Paraffin	3,000	NA	
Other	657	NA	
Total	589,557	586,000	West Germany 151,600; Austria 120,400; Sweden 86,100; Norway 83,700; Denmark 46,100.

NA Not available.

Table 3.—Poland: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Alumina	88,900	93,300	Hungary 59,300; United Kingdom 7,400.
Aluminum	6,400		
Bauxite	60,100	87,100	Hungary 81,100; Yugoslavia 6,000.
Bismuth	72	99	United Kingdom 66; West Germany 26.
Cadmium	15	9	Bulgaria 7; mainland China 2.
Chromite	85,300	117,400	Albania 56,100; U.S.S.R. 55,200.
Copper:			
Concentrate	12,332	19,100	Chile 10,521; Cuba 6,489.
Metal including wire	35,147	27,926	U.S.S.R. 9,000; West Germany 6,398; Southern Rhodesia 5,993; United Kingdom 2,693.
Iron and steel:			
Iron ore—thousand tons	8,806	9,087	U.S.S.R. 7,246; Sweden 666; Guinea 396; India 213; Brazil 192.
Pig iron—do	64	313	U.S.S.R. 231; Czechoslovakia 44.
Ferroalloys	1,914	2,545	U.S.S.R. 1,391; Norway 312; Austria 233.
Ingots and semimanufactures	474,000	443,800	Czechoslovakia 245,000; U.S.S.R. 55,000; Hungary 37,000.
Lead:			
Concentrate	50		
Metal	13,566	20,862	Bulgaria 8,463; U.S.S.R. 4,876; Yugoslavia 4,516.
Magnesium	430	280	All from Norway.
Manganese:			
Ore	304,300	380,200	U.S.S.R. 252,000; India 61,000.
Peroxide	3,900	3,700	Mainly from the U.S.S.R.
Mercury—76-pound flasks	4,496	4,796	Yugoslavia 1,734; United Kingdom 1,040; mainland China 1,011; Italy 1,011.
Molybdenum concentrate	243	239	Mainly from mainland China.
Tin—long tons	2,429	2,517	United Kingdom 1,454; Netherlands 462.
Titanium: Ilmenite	1,200		
Tungsten concentrate	2,402	2,673	Mainland China 1,350; United Kingdom 1,323.
Zinc:			
Concentrate	148,500	167,200	United States 62,700; Netherlands 27,500; Yugoslavia 17,700; United Kingdom 15,600; Canada 15,200.
Metal and dust	2,835	5,991	Bulgaria 4,571; North Korea 1,420.
Nonmetals:			
Asbestos	21,366	21,702	U.S.S.R. 17,633; mainland China 1,432. Bulgaria 1,236.
Barite	8,901	5,207	Mainly from mainland China.
Bentonite	8,478	8,807	Yugoslavia 7,812; Hungary 980.
Cement	177,600	147,100	Czechoslovakia 100,300; U.S.S.R. 45,900;
Cryolite	1,086	1,616	Mainly from the U.S.S.R.
Diatomaceous earth	304	484	Austria 364; Belgium 120.
Fertilizer materials:			
Nitrogenous	50,100	51,000	Czechoslovakia 19,700; East Germany 19,000.
Phosphatic:			
Apatite concentrate	317,200	432,500	U.S.S.R. 402,300; North Viet-Nam 30,200.
Other	483,400	561,900	Mainly from Morocco.
Potassic	888,600	986,100	East Germany 865,700; Israel 61,100.
Fluorspar	22,400	26,800	Mainland China 15,200; East Germany 11,600.
Graphite	9,938	10,518	Czechoslovakia 7,535; mainland China 1,258.
Kaolin	81,000	77,700	Czechoslovakia 48,800; East Germany 11,600.
Magnesite	125,700	122,500	North Korea 47,500; Czechoslovakia 39,200.
Mica	613	953	India 669; Rumania 216.
Pyrite concentrate	24,300		
Refractory clays	9,700	10,100	U.S.S.R. 8,000; West Germany 1,600.
Sulfur, elemental	27,100	19,500	Mainland China 19,000; Czechoslovakia 500.
Talc, powder	8,778	10,327	Mainland China 1,080; North Korea 7,462.
Mineral fuels:			
Coal:			
Anthracite—thousand tons	19	20	All from the U.S.S.R.
Anthracite briquets—do	32		
Bituminous—do	1,233	1,279	U.S.S.R. 908; East Germany 293.
Brown coal including briquets—do	520	631	All from East Germany.

Table 3.—Poland: Imports of selected metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Mineral fuels:—Continued			
Coke—thousand tons	175	9	All from Czechoslovakia.
Gas, natural—million cubic feet	11,417	11,128	All from U.S.S.R.
Petroleum:			
Crude—thousand tons	r 1,416	1,708	All from U.S.S.R.
Refinery products:			
Gasoline—do	1,108	NA	
Kerosine—do	53	NA	
Fuel oil—do	1,478	NA	
Lubricants—do	82	NA	
Asphalt—do	70	NA	
Paraffin—do	17	NA	
Others—do	26	NA	
Total—do	2,834	2,929	U.S.S.R. 2,080; Rumania 331; East Germany 216; Hungary 109; Czechoslovakia 109.

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—The construction industry reported serious shortages of aluminum sheet and profiles. These shortages warranted the establishment of a commission to restrict the use of aluminum in construction.[5] The shortage was in part attributed to repeated delays in opening of the Konin Aluminum Plant. The first stage of the plant was most recently scheduled to come on stream in late 1966 with an annual capacity of 50,000 tons of aluminum.

Copper.—The H. Walecki Copper Metallurgical Plant at Legnica was undergoing expansion. By 1968, plant capacity is anticipated to be 60,000 tons of electrolytic copper annually. The Legnica plant was undergoing expansion to accommodate ores from the Lubin and Polkowice I mines now under development.[6]

Iron and Steel.—Production of pig iron, crude steel, and rolled products other than pipe attained planned 1965 output levels. Expansion of pipe manufacturing facilities was slated for the coming 5-year plan (1966–70) by the installation of a Stiefel pipe rolling mill at the Zawiercie metallurgical plant and the installation of seamed pipe manufacturing facilities at the Lenin metallurgical plant in Nowa Huta. Near the close of 1965, an oxygen converter went into operation at Nowa Huta; however, the fifth blast furnace was rescheduled for completion in 1967. This furnace is to have a capacity of 2,000 cubic meters and an annual production capacity of 1 million tons of pig iron. When completed, the fifth blast furnace at Nowa Huta will exceed by 300 cubic meters all others in use in Poland. By yearend, 2 coking batteries, capacity 750,000 tons annually, were installed raising the total number of coking batteries at Nowa Huta to 10.

In January 1965, Poland, Hungary, and Czechoslovakia formed an organization known as Intermetal to coordinate actions in iron and steel manufacturing. In July, Bulgaria, the U.S.S.R., and East Germany joined the organization. Announced goals of the group included utilization of their unused production capacities, expansion of product variety range, and coordination of basic investment plans.[7]

NONMETALS

Cement.—By yearend, full production was finally achieved at the Rudnik cement plant. The plant, representing an investment of 1.1 billion zloty, will produce nearly 1.2 million tons of cement in 1966. Daily output of 4,000 tons clinker, 2,500 tons of fine cinder, and about 100 tons of gypsum for cement production is anticipated at Rudnik in 1966.

About half of all cement produced in

[5] Fundamenty (Warsaw, Poland). No. 38, Sept. 19, 1965, p. 2.
[6] Trybuna Ludu (Warsaw, Poland). Aug. 3, 1965, p. 4.
[7] Polish Economic Survey (Warsaw, Poland). No. 3, 1965, 28 pp.

1965 was 250 grade. The 450-grade light-construction cement contributed only 1 percent to the total cement output. By 1970 the Poles anticipate the 450-grade cement to account for 20 percent of the total cement production.

Fertilizer Materials.—Although production of mineral fertilizers increased by 5 percent over that of 1964, Poland was required to continue imports of these commodities. Construction of the Pulawy I nitrogen plant continued through 1965. Equipment imported from Czechoslovakia as well as that manufactured in Poland was reported late in delivery resulting in disruption of construction schedules. The plant will have an annual capacity of 500,000 tons of ammonia annually when completed. Initial production was to begin in 1966. The Pulawy II nitrogen plant equipped by Danish, British and Austrian firms was under construction in 1965 with completion scheduled for 1968 and with an expected daily production of 1,500 tons of ammonia, 2,700 tons of nitric acid, and 3, 600 tons of ammonium nitrate. Annual production of ammonium nitrate will be 1.1 billion tons or 380,000 tons of nitrogen content.

The Association for Chemical Plant Construction is considering the activation of a third nitrogen fertilizer factory at Pulawy by 1970.

Salt.—Rock salt mining operations were terminated at the Wieliczka deposit in 1965. Brine-pumping installations operating at Wieliczka yielded enough brine to produce 205,000 tons of table salt in 1965. Similar brine-pumping installations to replace rock salt mining at the Bochnia deposit are anticipated in 1966.[8]

Polish salt exports in 1965 increased to nearly 300,000 tons; Czechoslovakia and Hungary were the principal recipients.

Sulfur.—Poland's principal sulfur mine, the Piaseczno, yielded 3.2 million tons of sulfur ore in 1965. Production at this rate was slated to continue until 1970. Development of the Machow mine continued through 1965 with completion anticipated in 1970.

Marked increase in elemental sulfur production was attributed to the commissioning of a second processing plant at Tarnobrzeg.

MINERAL FUELS

Coal.—Poland's increased bituminous coal output was largely the result of greater mine mechanization. In 1965, 47 percent of bituminous coal production was mechanically mined as compared with 43 percent in 1964. The share of mechanically loaded bituminous coal was 51 percent compared with 46 percent in 1964.

Calculated on the basis of heat content per ton, open-pit brown coal is cheaper than hard coal because of (1) relatively higher productivity in open pit mines and, (2) the lower transportation cost for brown coal because deposits are centrally located. About 60 percent of the 1965 brown coal output was consumed by the electric power industry. Efforts in further expansion and modernization in the brown coal industry were underway at yearend. In November a new mine, Kazimierz came on stream in the Konin-Turek basin. In 1966 the mine should yield 500,000 tons of brown coal, and by 1969 it is slated to expand annual production to 4.5 million tons. Other brown coal mines—Jozwin and Wladyslaw—were also being developed and were to be in operation by 1968. Polish Government officials reportedly anticipate that brown coal production will reach 38 million tons in 1970.

Petroleum and Natural Gas.—Poland remained almost totally dependent upon imported crude oil to supply the six refineries. Extensive petroleum exploration activities continued with assistance from the U.S.S.R.; however, no significant increase in petroleum reserves has been reported. In July a well drilled near Puszcza Niepolomicka in Bochnia reportedly struck oil and was described as a gusher, but no further information has been released.

Marked increases in refinery output were credited to the distillation column and reforming unit which came on stream at the Plock refinery in late 1964. A cracking unit with a processing capacity of 750,000 tons of raw material annually which was planned to be operational in late 1965 also may have contributed to increased output. All crude oil processed at Plock (2 million tons in 1965) arrived from the U.S.S.R. via the Druzba pipeline.

While natural gas production failed to

[8] Kurier Polski (Polish Courier). Aug. 2, 1965. Warsaw, Poland, p. 1.

attain the 1965 goal by 18 percent, significant achievements were made in gas main and gas storage unit construction. The gas main from Blachownica to Kedzierzyn was completed in March. A subsurface storage facility was developed for natural gas being supplied to Warsaw, Lodz, and Slask.

The Mineral Industry of Portugal

By Justin B. Gowen [1]

Preliminary data for 1965 showed a continued but small decline in Portugal's mine and quarry production in the face of a strong rise in the country's general economy as a whole. The gross national product (GNP) at factor cost was estimated at $3,863 million compared with $3,384 [2] million in 1964, a rise of about 14 percent at current prices or 11 percent when adjusted to constant prices. Although the index number for mine production (1958=100) declined 5 points from 87 to 82 in 1965, there was a substantial increase in the value of mine and quarry products. However, available data do not permit an estimate of the mining industry's share in the GNP for 1965.

The Interim Development Plan for 1965–67 (Plano Intercalar de Fomento) was inaugurated early in 1965, based in part on an agreement in December 1964 for a $20 million loan in the United States, and supplemented by a domestic issue of 600 million escudos ($20.9 million) to help finance projects under this plan. The Interim Development Plan was designed to help industry bridge the gap between the 2d development plan, which terminated in 1964, and the 3d development plan, which was still in the planning stage.

The main objectives of the plan—speeding the rate of economic growth and bringing about a more equitable distribution of the national income—were subject to coordination with defense efforts, maintaining domestic financial stability and solvency of national currency abroad, and maintaining equilibrium in the labor market.

There will be quite extensive dependence on foreign capital to finance the private sectors under the plan. To clarify the official policy toward foreign investment, the Government promulgated Decree-Law 46–312 with its new regulations with regard to the importation of foreign capital. According to Portuguese sources Decree-Law 46–312 makes official what has long been considered a matter of general policy. However, it has the significant advantage of placing before foreign investors a statement of the Government's attitude toward foreign capital, which is one of encouragement toward investment in industrial sectors approved by the Government. The investment areas affected are not yet known; however, if an application to invest is approved the entrepreneur is now assured of his right to repatriate capital and remit profits.

An important factor in the decline of the mining industry was the continued and increasing shortage of labor. To alleviate this condition the Government, late in 1965 created the National Employment Service (Servico Nacional de Emperego (S.N.E.)) whose principal functions are to provide vocational guidance and free employment placement, coordinate emigration policy with the Overseas Ministry and Emigration Council, and conduct labor market research.

The creation of the S.N.E. was a result of the Government's increasing concern about the illegal movement of labor from Portugal. Studies reported in the press estimated that 84,000 Portuguese emigrated from Metropolitan Portugal in 1965, with 11,000 going to the Portuguese overseas provinces and 73,000 (including 19,000 in violation to legal restrictions) going to foreign countries. The net result was an estimated loss of 44,000 during the preceeding 2 years. It appears that a large

[1] West Europe specialist, Division of International Activities.

[2] Where necessary, values have been converted from escudos (Fsc) to U.S. dollars at the rate of Esc28.75=US$1.00.

percentage of these emigrants were leaving the most dynamic part of the Portuguese economy, the industrial sector, and there was a fear that the shortage of skilled labor beginning to develop there would grow and slow down the growth of this important sector.

In November a new industrial "conditioning" law was announced. The "conditioning" was designed to offer local infant industries initial protection from foreign competition. Although conditioning has been a factor in the Portuguese economy for many years, the new law was designed to provide for more efficient coordination of the views of conflicting interests prior to granting protection to an industry.

PRODUCTION

The decline in the index for crude mineral production in Portugal was reflected in lower output levels for almost all metalliferous ores and concentrates and for most of those crude nonmetallic mineral and fuel commodities for which 1965 output data were available. However, among crude mine products the output of zinc ore and concentrate, manganese ore, and pyrite increased. Despite the general decline in crude material production, iron and steel output and fertilizer production increased somewhat as did the country's modest output of aluminum, aluminum alloys, and refined copper.

Table 1.—Portugal: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Aluminum, alloys and secondary	399	303	354	260	366
Antimony concentrate	--	--	--	21	21
Arsenic, white	300	575	564	r 372	186
Beryl, 10 percent BeO	35	17	2	18	40
Columbite-tantalite concentrates (70 percent Ta_2O_5 and Cb_2O_5)	19	15	10	3	5
Copper:					
In cupriferous pyrites	2,865	3,167	3,025	4,119	4,176
In other ores and concentrates	91	148	180	167	114
In copper precipitates	84	80	85	79	64
Total mine production	3,040	3,395	3,290	4,365	4,354
Copper sulfate	15,272	13,212	11,326	9,381	8,323
Refined	5,846	4,766	4,584	r 3,392	3,744
Gold:					
In ores—thousand troy ounces	22	22	22	21	22
Refined—do	4	3	1	8	NA
Iron and steel:					
Iron ore:					
Hematite and magnetite—thousand tons	236	233	224	172	165
Manganiferous—do	13	29	39	43	46
Pig iron and cast iron—do	120	222	235	263	269
Ferroalloys:					
Ferromanganese	--	399	717	672	6,912
Ferrosilicon	--	2,832	4,944	4,707	
Ferrotungsten	--	--	--	--	218
Ingots and other primary forms:					
Linz-Donawitz—thousand tons	NA	163	185	207	232
Electric—do	NA	11	37	43	41
Total—do	92	174	222	250	273
Semimanufactures:					
Heavy sections—do	NA	7	9	7	22
Light sections—do	NA	49	107	120	139
Wire rod—do	NA	41	47	43	44
Other—do	NA	52	9	33	24
Total—do	15	149	172	203	229
Lead:					
Concentrates:					
Gross weight	42	74	374	329	224
Lead content	25	44	224	196	152
Refined:					
Primary	1,509	2,020	1,118	1,366	1,454
Secondary, and alloys	2,690	1,038	2,999	3,666	3,457
Manganese ore, 38 to 42 percent Mn	11,333	11,490	8,558	r 6,995	7,787
Silver:					
In ores—thousand troy ounces	48	53	48	49	63
Refined—do	303	178	116	178	NA
Tin:					
Concentrates:					
Gross weight—long tons	934	825	875	966	809
Metal content—do	729	679	718	r 676	570
Metal—do	784	766	663	589	r 603
Titanium ore (ilmenite) 50 percent TiO_2	99	68	41	r 57	75
Tungsten concentrates:					
Gross weight	2,500	2,031	1,330	r 1,451	1,350
Tungsten trioxide content	1,782	1,502	971	r 1,060	986
Zinc concentrates 42 percent Zn:					
Gross weight	--	27	429	2,267	7,570
Zinc content	--	11	171	952	2,952
Nonmetals:					
Asbestos	19	--	26	--	48
Barite	2,073	1,351	1,658	348	3,308
Cement, hydraulic:					
Cement—thousand tons	1,244	1,401	1,433	1,622	1,579
Clinker—do	--	118	115	212	NA
Total—do	1,244	1,519	1,548	1,834	NA
Clays—do	r 545	273	222	257	NA
Diatomite	768	1,450	1,875	r 2,002	2,627

See footnotes at end of table.

Table 1.—Portugal: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Nonmetals—Continued					
Dolomite	2,750	3,800	3,920	5,370	NA
Feldspar	2,938	3,733	402	r 11,070	NA
Fertilizer materials, manufactured:					
Nitrogenous:					
Ammonium sulfate—thousand tons	181	181	249	245	264
Calcium cyanamid—do	15	6	10	9	10
Calcium nitrate—do	6	17	16	21	22
Ammonium nitrate—do	64	84	169	193	192
Ammonium sulfate nitrate—do	--	10	6	5	4
Urea and other elementary fertilizers—thousand tons	--	--	1	18	29
Total—do	266	298	451	491	521
Phosphatic and superphosphates—do	455	420	442	431	431
Mixed and other—do	45	93	108	140	138
Total—do	766	811	1,001	1,062	1,090
Gypsum	71,949	72,259	60,090	64,979	NA
Kaolin	r 49,679	r 43,490	r 37,985	r 38,293	40,394
Lime, hydraulic	143,500	158,223	158,000	165,808	155,593
Pyrites:					
Cupriferous	257,448	315,614	298,375	412,182	NA
Other	395,473	325,679	303,693	195,219	NA
Total, 46 percent sulfur	652,921	641,293	602,068	607,401	616,392
Sulfur content	300,344	294,995	276,951	279,404	283,540
Quartz	18,844	11,292	10,397	24,328	NA
Quartzite	1,700	9,022	23,534	8,358	NA
Salt:					
Evaporated—thousand tons	267	315	268	232	NA
Rock salt—do	73	74	79	89	90
Sand and gravel—do	315	420	359	573	NA
Stone, not elsewhere specified:					
Marble—do	19	23	41	56	NA
Granite—do	426	540	447	211	NA
Slate—do	83	86	76	79	NA
Limestone and marl—do	2,655	2,944	1,917	1,988	NA
Porphyry and schist—do	173	164	161	174	NA
Other stone	58	49	49	40	NA
Sulfur, ground, precipitated or sublimed	r 14,143	r 10,763	r 9,119	r 6,130	NA
Talc	720	326	540	r 800	710
Mineral fuels:					
Coal:					
Anthracite—thousand tons	470	405	416	444	428
Lignite—do	158	153	142	r 102	90
Briquets—do	38	45	r 45	r 41	27
Coke, gas—do	40	31	25	10	4
Manufactured gas—thousand cubic feet	2,754	2,825	2,966	3,143	3,214
Petroleum refinery products:					
Gasoline—thousand tons	327	362	380	379	391
Kerosine—do	168	153	166	184	199
Jet fuel—do	9	12	32	29	39
Gas oil—do	259	256	290	r 322	331
Residual fuel oil—do	451	456	510	570	596
Butane and propane—do	43	50	56	r 46	45
Other petroleum gases—do	22	17	20	r 23	27
Other petroleum products—do	16	19	17	r 17	20
Total—do	1,295	1,325	1,471	1,570	1,648

p Preliminary. r Revised. NA Not available.

TRADE

Portugal's overall commodity foreign trade in 1965 followed the general trend of the economy and showed substantial increases in both exports and imports over those of 1964. However, while total commodity exports increased by nearly 12 percent to $576.4 million, mineral commodity exports declined 5 percent to $48.3 million. Total commodity imports rose by 19 percent to $938.5 million, and mineral commodity imports rose 16 percent to $182.4 million.

The deficit in balance of trade between the exports and imports of mineral commodities amounted to $134.1 million compared with $106.2 million in 1964.

Nonmetallic minerals and manufactures provided more than 56 percent of the mineral exports, while iron and steel, and petroleum products accounted for more than 65 percent of the mineral imports. For mineral commodities, the nations of the European Economic Community (EEC) were Portugal's most important group of customers, as well as Portugal's principal source of supply, accounting for about 36 percent of the exports and 40 percent of the imports. The European Free Trade Area (EFTA), of which Portugal is a member, accounted for 11 percent of the mineral exports and 15 percent of the mineral imports, followed by the United States with 7 percent of the exports and 5 percent of the imports.

Table 2.—Portugal: Foreign trade by commodity groups and selected areas

(Thousand dollars)

Commodity	1963	1964	1965	EEC	EFTA	Other West Europe	East Europe	United States	Angola and Mozambique	All other
Exports:										
Mineral commodities:										
Metals:										
Ores, concentrates and scrap	3,538	4,251	4,968	2,760	1,178	787	--------	193	12	38
Iron and steel	4,330	7,409	5,359	1,385	447	598	--------	183	2,340	406
Nonferrous metals	840	2,222	1,922	551	123	128	--------	588	476	56
Nonmetals:										
Crude fertilizers and crude minerals	6,571	7,375	9,130	8,114	301	142	--------	182	16	375
Fertilizers, manufactured	7,529	10,589	8,985	--------	1,083	4,510	--------	--------	1,147	2,245
Other mineral manufactures	5,912	9,522	9,136	2,192	378	2,398	--------	2,234	1,086	848
Chemical elements and compounds	375	394	360	--------	--------	25	--------	--------	255	80
Mineral fuels:										
Coal, coke, and briquets	25	7	6	--------	--------	--------	--------	--------	2	4
Petroleum	7,927	9,067	8,400	2,421	1,780	9	--------	--------	786	3,404
Gas, natural	30	36	64	--------	14	5	--------	--------	15	30
Mineral tar and crude chemicals from coal, petroleum and natural gas	3	4	3	--------	--------	--------	--------	--------	1	2
Total minerals	37,080	50,876	48,333	17,423	5,304	8,602	--------	3,380	6,136	7,488
All other commodities	381,081	464,828	528,071	102,063	149,506	18,546	6,198	57,653	122,521	71,584
Total exports	418,161	515,704	576,404	119,486	154,810	27,148	6,198	61,033	128,657	79,072
Imports:										
Mineral commodities:										
Metals:										
Ores, concentrates and scrap	503	1,033	1,578	139	181	473	--------	--------	27	758
Iron and steel	40,163	50,109	57,735	40,460	12,397	389	392	3,553	402	142
Nonferrous metals	16,630	20,137	26,814	12,256	7,729	763	168	1,076	--------	4,822
Nonmetals:										
Crude fertilizers and crude minerals	7,385	7,211	9,129	2,308	300	297	--------	477	16	5,731
Fertilizers, manufactured	3,422	2,572	4,109	2,648	5	1,454	--------	1	--------	1
Other mineral manufactures	1,442	1,177	1,691	844	594	33	--------	45	1	174
Chemical elements and compounds [1]	3,583	3,111	3,542	2,175	717	425	2	65	--------	158
Mineral fuels:										
Coal, coke, and briquets	11,430	11,338	11,738	3,817	2,631	214	3,174	1,730	--------	172
Petroleum	55,979	57,143	61,581	5,117	2,654	1,478	240	1,956	5,411	44,725
Gas, natural	1,307	2,711	4,009	3,948	49	12	--------	--------	--------	--------
Mineral tar and crude chemicals from coal, petroleum, and natural gas	463	543	488	161	280	--------	--------	47	--------	--------
Total minerals	142,307	157,085	182,414	73,873	27,537	5,538	3,976	8,950	5,857	56,683
All other commodities	513,874	619,210	741,108	248,191	170,682	44,271	8,011	65,879	111,977	92,097
Total imports	656,181	776,295	923,522	322,064	198,219	49,809	11,987	74,829	117,834	148,780

[1] Includes pyrophoric alloys.

Table 3.—Portugal: Exports of minerals and metals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum, all forms	124	68	134	United Kingdom 16; Belgium-Luxembourg 15; Netherlands 10.
Arsenic, white	713	499	354	Spain 350; Italy 65.
Beryl	-------	-------	55	
Copper:				
Ore and concentrate	2,188	182	19	West Germany 175.
Matte	-------	-------	1,937	
Metal, all forms	329	1,188	1,102	Italy 436; Netherlands 404; United Kingdom 165.
Gold bullion and troy ounces	-------	32	170	All to United States.
semimanufactures.				
Iron and steel:				
Iron ore and concentrate, including roasted pyrites.	89,865	23,190	6,825	All to West Germany.
Ashes and residues containing iron.	-------	104	-------	All to Spain.
Scrap	18,380	57,728	30,877	Sweden 21,000; Spain 18,099; Italy 13,500.
Pig iron and ferroalloys	19,920	23,709	4,438	West Germany 9,660; Italy 5,255; Belgium-Luxembourg 2,386.
Semimanufactures:				
Primary forms	11,136	39,805	13,799	Spain 15,636; France 7,855; Turkey 6,929.
Shapes	603	1,944	817	South Viet Nam 1,000; Angola 436.
Plates and sheets	506	727	1,558	Angola 395; Belgium-Luxembourg 121.
Hoop and strip	99	107	125	Angola 62.
Railway track material	60	75	33	Mozambique 28; Angola 22.
Wire	144	318	826	Angola 171; Mozambique 63; United States 63.
Tubes, pipes, and fittings.	7,186	7,791	7,545	Angola 2,531; Mozambique 1,947.
Rough castings and forgings.	260	165	140	Sweden 93; Angola 28.
Lead:				
Ore and concentrate	-------	-------	229	
Oxides	83	118	67	Spain 60; Angola 25.
Metal, all forms	49	66	135	Angola 27; Mozambique 21.
Manganese ore and concentrate	6,145	8,460	2,885	Spain 6,310; Norway 1,000.
Nickel, all forms	2	5	4	United Kingdom 4.
Platinum group troy ounces	542	1,132	1,788	France 857; United Kingdom 275.
metals and alloys.				
Silver and alloys ---do---	96	2,325	3,542	Mozambique 1,190; Angola 876.
Tantalum ore and concentrate	31	26	21	All to United States.
Tin:				
Ore and concentrate. long tons	116	122	35	United Kingdom 102.
Metal, all forms ---do---	246	375	238	United States 333.
Tungsten ore and concentrate	1,219	1,468	1,357	United Kingdom 378; United States 275; Poland 254; Netherlands 223.
Zinc:				
Ore and concentrate	391	729	8,433	France 365; Italy 363.
Metal, all forms	51	103	226	Belgium-Luxembourg 92.
Molybdenum, titanium, vanadium, and zirconium ores.	2,363	2,680	51	Spain 2,578.
Ashes and residues, n.e.s. containing nonferrous metals.	839	2,839	743	United Kingdom 2,068; Belgium-Luxembourg 377.
Nonferrous base metals, n.e.s.	2	4	3	Republic of South Africa 1; Mozambique 1; United Kingdom 1.
Nonmetals:				
Abrasives:				
Natural (diatomite, pumice, and other).	292	553	524	United Kingdom 420; Netherlands 60.
Manufactured, (grindstones, paper, cloth, and powder).	224	353	597	Angola 79; West Germany 77; South Viet Nam 55.
Asbestos:				
Crude	45	2	42	Angola 1.
Asbestos cement and cement products.	657	518	627	Cape Verde Islands 214; Guinea 209.
Barite and witherite, natural	4	109	20	Belgium-Luxembourg 64; United Kingdom 31.
Cement	176,572	391,732	234,353	Spain 368,509; Gibraltar 8,763.
Chalk	60	221	232	Angola 183; Mozambique 33.
Clays, clay products, and refractory products, n.e.s:				
Crude:				
Kaolin	13,005	10,965	10,587	Italy 10,750.
Other clays	164	345	2,941	Angola 112; Spain 100; Mozambique 62.

Table 3.—Portugal: Exports of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Nonmetals—Continued				
Clays, clay products, and refractory products, n.e.s.—Continued				
Construction materials:				
Brick and other nonrefactory.	14,932	26,068	23,530	Spain 21,137; Angola 2,024.
Refractory	929	1,220	1,459	Angola 515; United Kingdom 305; Spain 126.
Diamond, gem—thousand carats	-------	675	1,148	United Kingdom 674.
Feldspar	845	3,787	9,639	United Kingdom 3,176; Norway 610.
Fertilizer materials, manufactured:				
Nitrogenous	74,483	131,422	86,857	Spain 49,466; South Viet-Nam 27,906; Zambia 15,672; Czechoslovakia 13,932.
Phosphatic	96,139	80,430	44,224	Greece 35,897; Pakistan 12,334; Indonesia 9,900; Bulgaria 8,080.
Potassic	135	535	1,474	Angola 315; Mozambique 142.
Mixed	15,874	17,381	24,116	Cyprus 8,970; Mozambique 2,627; Angola 2,570.
Gypsum and anhydrite	305	264	202	Mozambique 71; Angola 61.
Lime, hydraulic	1,231	1,259	1,786	Mozambique 790; San Tomé and Principe 295.
Mica	-------	30	847	All to France.
Pigments, mineral	62	140	131	Angola 62; Mozambique 19.
Pyrites, unroasted	273,995	294,198	318,631	Belgium-Luxembourg 188,375; West Germany 52,424; France 41,029.
Quartz and quartzite	3,468	6,897	12,972	West Germany 4,187; Italy 2,710.
Stone, sand and gravel:				
Slate:				
Crude or rough split	8,651	9,664	9,224	Belgium-Luxembourg 3,659; United Kingdom 2,775; United States 1,056.
Slate products	2,836	3,465	3,325	West Germany 908; United Kingdom 902; Netherlands 700.
Other building and dimension stone:				
Crude or rough cut:				
Marble and other calcareous.	86,613	92,291	122,823	Italy 57,333; West Germany 13,919; Belgium-Luxembourg 9,996.
Granite, sandstone, and porphyry.	1,998	1,779	1,061	Italy 1,134; United Kingdom 495.
Sand, natural not mineral bearing.	12	21	16,666	NA
Gravel and crushed stone.	1,708	2,070	2,719	Mozambique 933; Canada 207; West Germany 200.
Dimension stone further worked:				
Paving, curb, and flagstones.	115,699	156,578	153,636	West Germany 95,922; Belgium-Luxembourg 15,377; Netherlands 15,079.
Building stone	18,155	16,790	19,050	United States 10,267; Netherlands 3,162.
Sulfur, elemental, all forms	29	155	647	Angola 80; Greece 69.
Nonmetallic minerals, n.e.s	412	903	711	West Germany 551; Netherlands 142; Angola 88.
Mineral fuels:				
Asphalt and bitumen, natural	278	494	337	Cape Verde Islands 200; St. Tomé and Principe 170.
Coal, coke, and briquets	968	252	224	Cape Verde Islands 140; Angola 60.
Coal distillation products	45	46	25	West Germany 17; Angola 10.
Petroleum refinery products:				
Gasoline	47,898	58,169	43,574	United Kingdom 21,515; Republic of South Africa 18,538; France 7,632.
Kerosine	45,317	86,243	107,889	Netherlands 47,023; Denmark 16,211; bunkers 11,838.
Distillate fuels	57,249	63,843	9,312	Belgium-Luxembourg 19,523; United Kingdom 17,666; bunkers 7,904; Republic of South Africa 7,593.
Residual fuel oil	61,078	47,309	69,614	Spain 19,023; Netherlands 15,176; bunkers 7,443.
Lubricants	2,401	3,129	4,608	Angola 1,995; Mozambique 662.
Nonchemical coal and petroleum waste.	194	1,070	972	Mozambique 360; Angola 62.
Liquid petroleum gases	237	235	803	Guinea 136; Angola 60.

NA Not available.

Table 4.—Portugal: Imports of minerals and metals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum and alloys:				
Bauxite	3,245	1,706	3,532	France 1,206; Guinea 500.
Alumina and aluminum hydroxide.	189	236	366	West Germany 185.
Metal, unwrought, and scrap.	1,108	816	1,220	France 366; United Kingdom 202; Canada 160.
Semimanufactures	4,958	6,394	7,311	Austria 1,343; West Germany 1,308; United Kingdom 906; Belgium-Luxembourg 813; France 497.
Chromium:				
Chromite	---	37	108	Federation of Rhodesia-Nyasaland 24; Republic of South Africa 13.
Oxides and hydroxide	61	58	72	West Germany 47.
Cobalt	4	3	2	Mainly from the United Kingdom.
Copper:				
Ore and concentrate	10	---	104	
Matte	22	---	1,938	
Scrap	238	358	136	United Kingdom 125; Angola 124.
Blister	803	1,274	119	Federation of Rhodesia-Nyasaland 1,020; Nigeria 254.
Refined, unwrought	4,576	4,105	635	Belgium-Luxembourg 1,856; United Kingdom 678; West Germany 531; France 434.
Master alloys	13	13	---	United Kingdom 6; Norway 2.
Semimanufactures	4,652	5,219	3,467	United Kingdom 1,786; Italy 1,335; West Germany 592.
Gold, bullion troy ounces and semimanufactures.	1,026	1,404	170	United Kingdom 797; Belgium-Luxembourg 607.
Iron and steel:				
Iron ore including roasted pyrites.	20,807	38,497	78,598	Spain 30,965; Morocco 7,532.
Scrap	1,362	1,393	4,671	United Kingdom 484; Cape Verde Islands 405.
Pig iron and ferro-alloys.[1]	925	938	1,816	United Kingdom 310; Norway 233; West Germany 140.
Steel ingots and other primary forms.[2]	869	1,739	5,874	United Kingdom 1,414.
Semimanufactures:				
Shapes	65,170	35,061	69,266	Belgium-Luxembourg 19,630; West Germany 11,474; France 5,309.
Plates and sheets:				
Uncoated	74,527	80,747	119,578	West Germany 28,142; Belgium-Luxembourg 18,309; France 14,160.
Tinplate	34,562	46,972	52,749	France 18,307; United Kingdom 12,128; West Germany 10,087.
Other coated	11,182	11,837	16,871	Belgium-Luxembourg 7,861; France 2,409.
Hoop and strip	41,584	51,484	38,495	France 22,709; Belgium-Luxembourg 15,268; West Germany 9,012.
Railway track material.	3,576	8,461	5,662	France 4,556; Belgium-Luxembourg 1,437; Austria 1,054.
Wire	10,070	16,022	16,124	United States 6,187; Belgium-Luxembourg 3,716; United Kingdom 3,176.
Tubes, pipes, and fittings.	6,959	7,590	10,328	West Germany 3,203; France 2,020; United Kingdom 537.
Rough castings and forgings.	596	334	396	United Kingdom 199.
Lead and alloys:				
Oxides	5	6	9	West Germany 4.
Scrap	45	96	74	Angola 53; Mozambique 32.
Unwrought and semimanufactures.	7,909	9,052	6,846	Mexico 4,064; Peru 1,625; Republic of South Africa 1,270.
Magnesium, all forms	6	6	9	United Kingdom 4.
Manganese:				
Ore and concentrate	207	262	239	United Kingdom 187.
Oxides	33	67	84	France 41; United Kingdom 23.
Mercury:				
Oxides kilograms	1,000	1,400	800	Spain 1,300.
Metal 76-pound flasks	305	679	249	All from Spain.
Nickel, all forms	120	214	254	United Kingdom 137; West Germany 48.
Platinum and platinum group metals troy ounces	1,127	1,501	7,663	France 1,040; United Kingdom 426.

See footnotes at end of table.

Table 4.—Portugal: Imports of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Silver, all forms troy ounces	1,065,635	1,021,497	709,727	United Kingdom 610,219; West Germany 399,040; Belgium-Luxembourg 11,785.
Tin:				
Oxides long tons	18	17	22	United Kingdom 9; Austria 7.
Metal, all forms do	r 23	36	25	United Kingdom 17; West Germany 8; Belgium-Luxembourg 7.
Titanium:				
Ore and concentrate, rutile.	400	203	346	All from Australia.
Oxides	1,696	2,031	2,192	West Germany 613; United Kingdom 563; Finland 422.
Tungsten, all forms kilograms	100	1,500	100	United Kingdom 1,000; France 500.
Zinc and alloys:				
Zinc oxides	443	304	296	Belgium-Luxembourg 102; West Germany 94; Netherlands 57.
Scrap	68	172	258	Belgium-Luxembourg 145.
Unwrought	5,020	4,887	5,849	Belgium-Luxembourg 2,415; Spain 2,197.
Semimanufactures	268	288	264	West Germany 187; Belgium-Luxembourg 77.
Metalliferous ores and concentrates, n.e.s.	163	151	165	United Kingdom 87; Australia 25.
Ashes and residues containing nonferrous metals.	---	4	8	Mainly from West Germany.
Nonferrous base metals, n.e.s.	2	71	120	Belgium-Luxembourg 21; West Germany 18; Netherlands 16.
Nonmetals:				
Abrasives:				
Natural:				
Dust and powder from gemstones thousand carats	---	---	316	
Diatomite	861	1,216	1,517	United States 557; France 293; Italy 177.
Pumice and other natural.	552	650	790	Italy 363; Netherlands 117; United Kingdom 84.
Manufactured:				
Corundum, artificial.	329	366	414	West Germany 261; France 63.
Grindstones and whetstones.	173	195	224	United Kingdom 79; West Germany 40.
Asbestos	1,846	2,511	3,878	Republic of South Africa 1,418; Canada 685; Federation of Rhodesia-Nyasaland 312.
Barite	66	184	201	West Germany 109; France 55.
Boron salts, natural	10	20	---	All from United States.
Cement, hydraulic	645	891	809	Angola 248; France 199; West Germany 185.
Chalk	1,295	1,267	1,500	France 798; Belgium-Luxembourg 372.
Clays, clay products and refractory products, n.e.s:				
Crude:				
China clay	281	257	273	United Kingdom 178; United States 75.
Bentonite	1,343	1,571	1,605	Morocco 578; United States 482; Algeria 177.
Other	3,182	3,187	2,682	United Kingdom 2,615; West Germany 200.
Construction materials:				
Bricks and other nonrefractory.	345	241	---	Italy 62; United Kingdom 53.
Refractory	4,091	3,397	---	Austria 1,294; United Kingdom 514; Belgium-Luxembourg 407.
Cryolite and chiolite	40	30	46	All from Denmark.
Dolomite	605	1,214	3,564	Norway 453; Spain 445; Italy 169.
Feldspar	570	861	641	France 400; United Kingdom 283; Spain 123.
Fertilizer materials:				
Natural:				
Animal or vegetable, crude.	666	257	389	West Germany 197; France 60.
Sodium nitrate	12,725	3,085	231	Chile 3,000.
Phosphate rock	273,298	256,390	274,978	Morocco 255,961.

See footnotes at end of table.

Table 4.—Portugal: Imports of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Fertilizer materials—Continued				
Manufactured:				
Nitrogenous	11,536	106	7,165	West Germany 45; United Kingdom 25.
Phosphatic:				
Basic slag	10,059	14,541	10,639	All from Belgium-Luxembourg.
Other	1,979	738	1,383	France 539; Belgium-Luxembourg 199.
Potassic	23,091	24,538	33,880	Spain 24,537.
Mixed	24,311	16,088	23,100	West Germany 8,491; Italy 7,594.
Graphite, natural	105	111	132	Norway 53; West Germany 33.
Gypsum and anhydrite	r 11,349	15,644	14,244	Morocco 15,600.
Magnesite	762	542	249	Netherlands 211; Austria 146; United States 120.
Mica, crude and scrap	93	131	147	Norway 91; United Kingdom 37.
Mica products	7	8	10	United Kingdom 3; Switzerland 2.
Mineral pigments	126	118	107	France 68; West Germany 22; Austria 20.
Pyrites, unroasted	1,712	---	---	
Quartz and quartzite	188	1,450	1,350	Belgium-Luxembourg 1,314.
Salt	11,680	9,688	28,063	Cape Verde Islands 9,570.
Sand	2,380	1,030	3,170	Belgium-Luxembourg 687; Spain 202; United Kingdom 103.
Stone:				
Slate, crude, or rough split.	5	---	1	
Marble	60	32	123	All from Italy.
Granite, porphyry, basalt.	189	140	33	Angola 59; Spain 45; Norway 36.
Flint and crushed stone	436	445	1,737	Belgium-Luxembourg 364; West Germany 30.
Total stone, all types	690	617	1,894	Belgium-Luxembourg 364; Angola 59.
Sulfur, elemental, all types	32,104	38,155	54,727	United States 17,122; France 16, 533; West Germany 4,152.
Talc and soapstone	1,380	1,943	1,950	France 999; Norway 506; Italy 304.
Crude nonmetallic minerals, n.e.s.	7,056	9,191	4,536	Cape Verde Islands 8,714.
Mineral fuels:				
Asphalt and bitumen, natural.	6,206	625	3,064	Spain 556.
Carbon black	3,193	3,790	4,236	United States 1,199; France 793; United Kingdom 697; West Germany 644.
Coal and coal briquets	r 458,472	406,489	427,895	Poland 148,021; United States 139,321; United Kingdom 85,177.
Coke from coal	208,994	245,686	216,564	United Kingdom 217,370.
Coal distillation products	5,758	7,763	6,835	Belgium-Luxembourg 2,840; United Kingdom 2,589; Italy 1,046.
Petroleum:				
Crude	r 1,497,696	1,519,269	1,716,815	Iraq 901,886; Angola 266,709; Bahrain 240,032.
Refinery products:				
Gasoline	21,975	52,191	91,297	Netherlands Antilles 21,805; Spain 11,531; Iran 9,443; Italy 8,862.
Kerosine, white spirit, jet fuel.	r 20,422	23,366	23,263	Netherlands Antilles 18,167; Iran 2,951.
Distillate fuels	425,943	416,302	334,096	Netherlands Antilles 166,327; Iran 55,500; Rumania 45,681.
Residual fuel oil	190,816	175,431	302,349	Mozambique 43,081; Angola 42,218; Netherlands Antilles 35,860; Netherlands 24,980.
Lubricants	r 36,782	41,163	56,635	United Kingdom 17,121; United States 12,067; Netherlands 7,486.
Mineral jelly and waxes.	3,082	3,929	3,394	United States 3,414; United Kingdom 282.
Nonlubricating oils, n.e.s.	5,260	5,738	7,936	Netherlands 2,801; France 1,570; United States 809.
Pitch and pitch coke.	2,030	2,369	6,323	United Kingdom 1,169; Italy 1,000; Spain 200.
Petroleum coke	20,183	13,360	294	United States 11,081; Spain 2,174.
Petroleum and shale oil wastes.	19,529	28,196	25,589	Netherlands Antilles 12,888; Spain 11,316.
Liquid petroleum gases.	28,055	59,425	88,680	France 54,130; Netherlands 3,034.
Other	1,362	1,574	2,306	United Kingdom 1,188; Spain 166.

r Revised. [1] Includes powder, shot, and sponge, and rough castings. [2] Includes coils for rerolling.

COMMODITY REVIEW

METALS AND NONMETALS

Copper and Pyrites.—After more than a century of more or less continuous mining, the ore extraction operations at the San Domingos cupriferous pyrites mine of Mason and Barry Ltd., in the Mertola District, Province of Beja was scheduled for closing at the end of 1965. In the meantime, however, the underground stope fillings, remaining ore pillars, and low-grade ore areas were being prepared for leaching of their copper content and its precipitation as cement copper, starting early in 1966. Introduction of the bacteria *Thiobaccillus Thiooxidans* and *Thiobacillus ferrooxidans* is expected to accelerate the leaching process. Revised estimates indicate that the operation will provide about 4,000 tons of metallic copper during the 6 years following its inauguration, and that about 75 percent of the total will be recovered during the first 3 years of the leaching operation.

MINERAL FUELS

Petroleum.—In mid–1965 it was announced that final approval to establish a new refinery at Oporto had been granted to Sociedade Anonima Concessionairi de Refinacao de Petroleos em Portúgal (SACOR), which is 33-percent government owned.

The proposed refinery will have an output capacity of 1.5 million tons, including 80,000 tons of lubricants. Storage capacity will total 3.1 million barrels (500,000 cubic meters).

The Mineral Industry of Rumania

By Roman V. Sondermayer [1]

Petroleum production continued to be Rumania's most important contribution to world mineral supplies; the country accounted for about 1 percent of total crude oil output in 1965. Output of other mineral commodities and related products was significant primarily to the domestic economy; although the country also accounted for about 1 percent of world production of manganese ore, cement, pyrite, and salt. In 1965 Rumanian crude oil output again ranked second in Europe to that of the U.S.S.R. Production of more than 12 million tons was equivalent to approximately 5 percent of the Soviet output. Large scale efforts to develop other mineral resources were in progress. The manufacturing base was expanded, and exploration was carried out on a large scale. In spite of exploration, the domestic raw material position was not significantly improved and many mineral commodity needs were covered wholly or in part by imports.

The estimated share of mineral industry in the 1965 social product was roughly 18 percent. Approximately one-seventh of the total labor force, or 230,000 persons, was employed in the mineral industry Overall foreign trade of Rumania in minerals was modest by world standards except for petroleum exports. Export of refined petroleum products was over 6 million tons; approximately 50 percent went to non-Communist countries of the world and as such they were a significant source of hard foreign currency. Imports covered most of the country's demand in metals semimanufactures.

During 1965 the most significant developments in the mineral industry were the completion of the Slatina aluminum plant (the country's first such facility), the commissioning of copper mine and beneficiation facilities at Moldavia Nouva and Bahan, and the continuation of construction of a steel plant at Galati and lead zinc complex at Copsa Mica. The emphasis on developing metal mines, smelters, and refineries in 1965 reflected the favored status of this sector of industry.

No announcements were made about new significant oil and gas discoveries; apparently, intensive exploratory drilling to over 4.000 meters in depth was without striking results. All activities in production were limited to extension of existing fields. Reports also indicated the first use of steam and underground combustion in production of crude oil in Rumania.

Two new plants for production of liquefied natural gas, one in Moreni and the other at Olteni went into production during 1965.

Development of industry in general and the mineral industry in particular were and are the primary targets of the Rumanian regime with a final aim to gain more independence within the Communist world.

PRODUCTION

Production of most minerals and metals increased in 1965. Petroleum output showed a relatively modest increase when compared with other minerals.

Although authorities continued to try to improve mechanization of mines in Rumania, results were inadequate. At yearend underground mines could not be considered well mechanized. Drilling and crude oil production were the most mod-

[1] Foreign mineral specialist, Division of International Activities.

ern operations of the mineral industry. For drilling operations Rumanians used domestic rigs and Soviet-made turbodrills.

Partial automation of production was introduced in certain oilfields, and the majority of wells were on pumps or were naturally flowing, although artificial lift methods were being used in some fields. Gas repressuring and water flooding were used for maintaining formation pressure.

Table 1.—Rumania: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965 [p]
Metals:					
Aluminum:					
Bauxite	69,000	30,000	10,000	[r] 7,000	[e] 30,000
Metal	-----	-----	-----	-----	[e] 10,000
Iron and steel:					
Iron ore—thousand tons	1,737	1,738	2,286	[r] 1,932	2,479
Pig iron—do	1,099	1,511	1,706	1,924	2,019
Steel ingot—do	2,126	2,451	2,704	3,039	3,425
Rolled products—do	1,518	1,665	1,918	2,200	2,347
Pipe—do	401	456	478	500	NA
Manganese	206,000	189,000	260,000	250,000	250,000
Mercury—76-pound flasks	350	222	194	190	191
Lead (smelter)	12,000	12,500	12,500	12,700	15,000
Silver—thousand troy ounces	643	643	643	643	700
Nonmetals:					
Cement—thousand tons	3,308	3,489	4,369	4,752	5,405
Fertilizers:					
Nitrogenous (nitrogen content)	29,934	43,950	84,850	[r] 107,981	166,307
Phosphatic (P_2O_5 content)	56,510	86,597	99,759	[r] 111,323	126,465
Lime—thousand tons	657	677	731	[r] 813	900
Pyrites (gross weight)—do	263	305	333	333	350
Salt—do	1,330	1,477	1,637	1,809	2,016
Sulfuric acid—do	248	326	343	350	360
Talc—do	NA	NA	NA	NA	115
Mineral fuels:					
Coal:					
Bituminous including anthracite—do	4,902	5,319	5,655	6,623	6,035
Brown—do	554	587	558	560	598
Lignite—do	3,247	3,683	4,054	4,100	5,461
Coke—do	940	1,119	1,141	1,145	1,134
Petroleum:					
Crude—do	11,582	11,864	12,233	12,395	12,571
Refinery products:					
Gasoline—do	2,667	2,400	2,434	2,500	2,458
Kerosine—do	1,234	1,234	1,084	1,100	965
Gas oil—do	2,653	2,910	3,110	3,200	3,600
Fuel oil—do	3,681	3,952	4,059	4,100	NA
Carbon black	28,390	29,521	33,177	34,000	36,704
Natural gas—million cubic feet	[2] 251,895	[2] 309,295	[2] 353,535	[2] 399,595	NA

[p] Preliminary. [r] Revised. [e] Estimate. NA Not available.

[1] In addition to listed commodities, Rumania produces antimony, chromite, copper, gold, molybdenum, zinc, asbestos, feldspar, gypsum, and mica, but quantitative data on production are not available.

[2] Converted from cubic meters; 35 cubic feet equals 1 cubic meter.

TRADE

Lack of published statistics on Rumanian foreign trade of minerals persisted in 1965. Only general information was available, but no breakdown on destination or origin was reported. Most of the available information on trade distribution was from trade books of other countries, particularly the U.S.S.R. Foreign trade in minerals continued to be a State monopoly, planned by the Government as a part of overall economic programing.

During 1965 most of the trade in minerals was with other European Communist countries and East Germany. But Rumania made efforts to increase trade with the non-Communist world.

Approximately two-thirds of the value of Rumanian mineral exports was provided by refined petroleum products. The rest of the mineral trade was modest by world standards. Mineral trade with the United States remained insignificant.

Table 2.—Rumania: Reported exports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964
Metals:		
Bauxite	8,000	-----
Manganese ore	72,000	73,900
Steel:		
Rolled products	521,300	272,700
Pipes	213,500	235,400
Nonmetals:		
Cement	1,264,400	1,298,300
Salt	309,200	387,200
Mineral fuels:		
Natural gas million cu. ft.	761	NA
Petroleum:		
Refinery products		
Gasoline	1,792,800	1,655,300
Kerosine	419,200	337,700
Diesel oil	1,608,800	1,899,400
Fuel oil	1,644,500	1,894,400
Paraffin	25,100	20,700
Petroleum coke	55,200	56,300
Bitumen (including natural)	100,900	104,900
Carbon black	17,900	18,600

NA Not available.
Source: Anuarul Statistic Al R.P.R.—1965 (Statistical Yearbook of R.P. Rumania for 1965). Bucaresti, Rumania, 669 pp.

Table 3.—Rumania: Export of selected metals and minerals to the Soviet Union
(Metric tons)

Commodity	1963	1964
Metals:		
Lead, metal	1,900	3,200
Iron and steel:		
Primary forms for re-rolling and rolled products	108,300	161,800
Pipes	204,400	215,000
Zinc	2,000	-----
Nonmetals:		
Cement	598,000	312,000
Minerals fuels:		
Petroleum:		
Refined products:		
Gasoline	1,263,500	1,164,500
Kerosine	202,400	150,000
Diesel fuel	216,400	202,900
Heating oil	51,000	52,500
Lubricants	132,100	139,800
Bitumen	68,100	72,300

Source: Vneshnaya Torogovlya SSSR za 1964 god (Foreign Trade of the U.S.S.R. for 1964)—Moscow, 294 pp.

Table 4.—Rumania: Reported import of selected metals and minerals
(Metric tons)

Commodity	1963	1964
Metals:		
Iron and steel:		
Iron ore	2,236,500	2,305,100
Ferroalloys	36,900	43,000
Rolled products	945,200	1,213,000
Pipes	108,500	142,900
Nonmetals:		
Fertilizers:		
Apatite concentrate (P_2O_5)	150,300	94,500
Potassic fertilizers (K_2O content)	5,800	8,800
Nitrogenous fertilizers (N content)	3,500	1,900
Mineral fuels:		
Coking coal	697,900	717,800
Coke	918,000	945,600

Source: Anuarul Statistic Al R.P.R. (1965) (Statistical Yearbook of P.R. Rumania for 1965) Bucaresti, Rumania, 669 pp.

Table 5.—Rumania: Import of selected metals and minerals from the Soviet Union
(Metric tons)

Commodity	1963	1964
Metals:		
Aluminum:		
Ingots	8,600	14,700
Semimanufacturers	609	621
Copper:		
Copper, metal	5,900	5,900
Semimanufactures	2,038	2,115
Iron and steel:		
Iron ore	1,633,000	1,667,000
Pig iron	90,400	209,100
Ferroalloys	34,500	41,800
Rolled products	679,400	805,200
Pipes for oil industry	28,800	32,200
Tin:		
Semimanufactures	295	NA
Nonmetals:		
Asbestos	r 4,600	3,300
Apatite concentrate	93,400	117,400
Cryolite	200	300
Refractories	20,200	NA
Sulfur	2,400	2,100
Mineral fuels:		
Bituminous coal	190,000	201,000
Coke metallurgical	618,000	599,000
Petroleum:		
Refined products:		
Lubricants	700	600

r Revised. NA Not available.
Source: Vneshnaya Torogovlya SSSR za 1964 god (Foreign Trade of the U.S.S.R. for 1964). Moscow, 294 pp.

COMMODITY REVIEW

METALS

Aluminum.—On July 30 the first stage of the aluminum plant at Slatina went on stream with an annual capacity of 25,000 tons of aluminum. Plans were made to expand production to 50,000 tons of aluminum in the near future. The highly automated plant was designed by the French firm, Péchiney, Compagnie de Produits Chimiques et Electrometalurgiques, S.A.

The plant used alumina from the Ordea plant. Electric power was supplied by the Craiova thermal powerplant. When the hydropower system is completed at the Iron Gates on the Danube River, Slatina plant's location will be favorable for further expansion of aluminum production.

Bauxite supply for the plant was assured through development of mines in the Crisana Region and the beneficiation complex at Dobresti. Because domestic bauxite contains clay, upgrading is necessary. Capacity of installation is 250,000 tons of bauxite per year.

Copper.—On July 1 the Moldava Nouva copper mining project was completed. The venture is based on cupriferous ore deposits in the southern part of Banat. The mine and the ore dressing facilities were commissioned. They reportedly have a capacity of 660,000 tons of ore per year, yielding a concentrate containing 16 to 20 percent copper as well as pyrite values. At Baia Mare the pyrite is recovered as a concentrate, and the copper concentrate is smelted. Although partially in production, the Baia Mare Chemical and Metallurgical complex was not completed in 1965.

In addition to facilities in Moldova Nouva and Baia Mare, the Rumanians commissioned another mining complex at Lesul Ursului with mine and concentrator. No information on capacity was available.

The well-established Balan Mining Enterprise at Balan was expanded. A third copper ore flotation plant with a daily capacity of 500 tons of ore was commissioned.

Iron and Steel.—During 1965 the known domestic raw material resources for ambitious steel plans remained inadequate, but the development of iron and steel facilities continued in an effort to achieve more independence from U.S.S.R. The iron and steel industry was the key sector in the entire development planning of Rumania.

In 1965 the construction of the Teliuc iron ore beneficiation plant was completed and the expansion of iron ore mines in this region was in full swing. Nevertheless, no information on the capacities of these new developments was available.

Development of a new iron ore mine also was underway in the Poiana Rusca Mountain, the major iron ore area in Rumania. It is expected that when this mine begins full operation, all demands of the plant at Hunedoara will be fulfilled.

The construction of the iron and steel plant at Galati, now called the Geogiu Dej Metallurgical Plant, continued, but plans were changed and the annual steel capacity of the plant proposed for 1970 was lowered from 4 million tons to 2 million tons. It is expected that partial production of the plant will start in 1966. At the Resitsa Iron and Steel Plant a new steel furnace, with a reported annual capacity of about 225,000 tons, started production. The Resitsa combine's ore concentration plant was commissioned. The new line is mechanized and partially automated. With this line in production the plant capacity will be doubled.

The Hunedoara iron and steel plant was modernized and expanded during 1965. Development of a new dolomite quarry, modernization of the rolling mill, and the beginning of production of high-quality steel were the most important developments and events at Hunedoara, the largest iron and steel plant in Rumania.

Lead and Zinc.—Construction of the Copsa Mica plant with the British Imperial Smelting process continued. Capacity of the plant was set at 50,000 tons of lead and 100,000 tons of sulfuric acid. It is reported that the first tests of equipment were underway at yearend.

Mercury.—Without disclosing any details on the quantity of reserves, Rumania announced discovery of new cinnabar deposits on the southern slopes of the Harghita Mountains.

NONMETALS

Cement.—The cement industry remained one of the most advanced sectors of the Rumanian nonmetals industry; rivaled only by the mineral fertilizer producing and processing sector. During 1965 production of cement was adequate for domestic needs and provided a surplus for export.

Construction of the cement plant and the complex for production of construction materials at Biresti near Tirgu-Jiu continued and certain elements of the cement factory were commissioned. When completed, the plant will have an annual capacity of 2 million tons of cement.

Diatomite.—A new line for diatomite beneficiation was reportedly installed in the Odhorei plant, but no information was

available on plant capacity before or after expansion.

Fertilizer Materials.—In the past several years, extensive development of the petrochemical and chemical industries have made possible increased output of fertilizers. These developments have made this industry one of the most modern sectors of the nation's nonmetal industry. The raw material base for production of mineral fertilizers remained Rumanian natural gas and Soviet apatite.

During 1965 the principal activity of nitrogenous fertilizer producers was the elimination of shortcomings in normal operation in plants commissioned since 1960, such as those at Pietra Neamt, Turnu Margurel, and Tirgu Mures.

Reportedly potash deposits were discovered in the country's salt producing areas. Experiments indicated ore unsuitable for beneficiation by standard methods, but Rumanian researchers developed a method for concentrating the crude potash. The resulting product's composition was such that it was rated as having a 50 percent K_2O equivalent content. Based on test results, the Rumanians reportedly planned to develop domestic production of potassic fertilizers in the near future.

Lime.—New lime kilns were put into production at the Bicaz cement plant. Annual output of the plant reportedly will be increased by 70,000 tons.

Other.—To improve the overall situation in production of nonmetals, plans were announced for modernization and expansion of production of certain facilities. Output in 1965 and production targets set for 1970 are as follows:

Commodity	Metric tons	
	1965 production	1970 target
Barite	45,000	105,000
Bentonite	90,000	143,000
Kaolin	35,000	75,000
Talc	115,000	140,000

MINERAL FUELS

With a production of over 12 million tons of crude oil during 1965 Rumania ranked second to the U.S.S.R. in Europe. Domestic production of low-grade solid mineral fuels (over 5 million tons) and large quantities of natural gas together with a small part of total Rumanian oil production satisfied much of the basic energy demand of the country, however, coking coals and coke had to be imported.

Coal.—Lignite was the backbone of the coal output in 1965; about 60 percent of the total coal production was lignite. The principal activities in coal production were concentrated in the Jiu Valley in Oltenia. In Livezem in the Jiu Valley preparations for development of a new mine were started. According to reports, the mine, with a planned annual capacity of about 1.2 million tons, will be the most modern in the area. A new mine started production at Ticani in the Rovinari coal basin in Jiu Valley. The annual capacity of the mine was planned to be about 1.3 million tons. The Rovinary region of the Jiu Valley will become more promising for future coal production when a new dam on the Jiu River is completed. The dam will prevent flooding of the lowlands of the Jiu River. New mines in this area will have a total annual capacity of 7.5 million tons of lignite.

At the Capeni Mining Enterprise a new briquet plant was commissioned. The plant's annual capacity is approximately 100,000 tons of lignite briquets. The plant is fully automated, and the equipment was produced by Rumanian factories. Coal industry progress was overshadowed by a serious coal mine accident. On February 23, 1965, a gas explosion killed 41 and injured 16 miners at the Uricani mine in the Jiu Valley.

Petroleum and Natural Gas.—During 1965 the activities in the Rumanian petroleum industry were characterized by intensive deep drilling without announcement of significant discoveries, introducing steam and underground combustion as production methods on experimental basis, completing gas plants and refineries, and designing modern equipment for drilling and refining.

During 1965 Rumanian drilling activities reached a new record depth of 13,715 feet (4,180 meters) in a well drilled for gas (with unreported results) in Transylvania. At yearend, five other deep wells were drilling with target depths of 15,000 to 16,400 feet (4,550 to 5,000 meters). While drilling to these depths, Rumanians were studying problems of drilling up to 23,000 feet (7,000 meters), apparently

because shallower formations in known oil areas were fully explored and exploitation had reached maximum practical levels. Without disclosing technical or geographical details, the Rumanians announced the beginning of steam injection into reservoirs for oil production. The staff of the Petroleum Research Institute at Cimpiha also developed a version of the underground combustion method to achieve crude oil production from tight formations containing viscous oil, and according to reports, the method was successfully applied in one field. During 1965 oil recovered by secondary production methods and various well production stimulation methods accounted for approximately 10 to 11 percent of the country's total output.

A new plant for thermo-absorption has started production in the Moreni oilfield in the Prahova Valley. The plant has a daily capacity of about 7 million cubic feet (200,000 cubic meters) of gas. Another plant with a daily capacity of about 31.5 million cubic feet (900,000 cubic meters) of gas began to produce liquefied natural gas products in the Oltenia oilfields. This plant was fully automated and is the most modern one in the country.

The catalytic cracking plant of unreported capacity was commissioned in the refinery at Gheorghiu-Dej.

Petroleum equipment production was stepped up and after several years of testing protoype rigs the Rumanians reported the start of production of a standard rig, capable of drilling to 16,400 feet (5,000 meters). A larger rig, designed to drill up to 23,000 feet (7,000 meters) passed tests successfully, and preparations were underway to start production of this rig.

The Mineral Industry of Spain

By Justin B. Gowen [1]

During 1965 Spain's mineral industries continued to expand along with the rest of its national economy under the country's Economic and Social Development Plan for 1964–67. The country maintained its position as the world's leading mercury producer, ranked third in the output of pyrites, fourth in fluorspar, sixth in gypsum, ninth in china clay, tenth in cement and eleventh in magnesite, and was an important producer of lead, salt, talc, tin, titanium, tungsten, and zinc.

The value of output of the extractive mineral industry rose 20 percent from $250 million [2] in 1964 to $301 million in 1965, representing 4.4 percent of the country's industrial product which is estimated at $6,900 million. The value of crude mineral output was equivalent to 1.4 percent of the gross national product (GNP), the same share as in 1964, although the GNP rose from $17,700 million in 1964 to $21,700 million in 1965.

Part of the increase in value was due to the increase in unit prices of mineral products, which rose an average 4.7 percent during the year, although prices of some commodities rose much higher.

Employment in the extractive industries (including quarrying) decreased about 4 percent from 146,200 in 1964 to 140,400 in 1965. This represented slightly more than 1.1 percent of Spain's active labor force of 12,204,500 as reported at yearend. Continued increase in productivity was largely responsible for the decrease in labor.

Major industrial developments that affected the mineral industries during 1965 included the proving of a commercially productive oilfield at Ayoluengo in the Provinces of Burgos and Santander, the proving of a second possible field at nearby Tozo, and the putting on stream of Empresa Nacional "Calvo Sotelo" de Combustibles Liquidos y Lubricantes, S.A.'s new petroleum refinery (Spain's fourth) at Puertollano, raising Spain's total refinery capacity to nearly 16 million tons annually. Other developments were the commissioning of the Empresa Nacional Siderurgica (ENSIDESA) 300,000-ton-per-year cold-rolling mill at Aviles; inauguration of oxygen injection in the ENSIDESA open hearth plant at Aviles; and the granting to the Government-controlled company, Instituto Nacional de Industria (INI), of the exclusive right to exploit the Spanish Sahara phosphate deposits.

On the negative side, one of the costs of expanding the mineral economy was a serious increase in the balance of payments deficit. The value of mineral commodity imports increased 36 percent, from $643.2 million in 1964 to $875.3 million in 1965, while the value of mineral commodity exports increased only 5 percent, from $143.7 million to $151.6 million, leaving a net deficit $723.6 million in mineral trade, a figure 45 percent greater than in 1964. One factor contributing to this deficit was the temporary closing of Spain's most important zinc-lead mine due to collapse and flooding of mine workings in January 1965, but a more significant factor was the increase in mineral imports required by the country's expanding economy, a need that could not be met by Spain's existing capacity to produce these commodities.

Evaluation of the Spanish Economic and Social Development Plan 1964–67 at its midpoint showed mixed results. In general the expansion of the national economy,

[1] West Europe specialist, Division of International Activities.

[2] Where necessary, values have been converted from pesetas (Pts) to US dollars at the rate of Pts 1=US$.0166667.

including most of the important mineral commodities except nonferrous ores, followed the trends foreseen in the plan. However, the possibility that imbalances accompanying the rapid surge in the economy might endanger the future progress of the plan caused concern to some of the country's economists.

The plan called for investment of about $2,484 million in the mineral sector during the 4-year period. Of this total, fuels and energy materials, including powerplants, would require about $1,367 million; iron, lead and zinc ores, pyrites, and potash $132 million; basic iron and steel $282 million; nonferrous metals $63 million; cement and construction materials $304 million; and fertilizers and basic chemicals $336 million.

Results of the third round of applications for investment in the seven growth centers set up under the development plan, announced during the third quarter of 1965, showed that of 342 applications received, 199 applications totaling $234 million were approved. Total investments approved to midyear 1965 were valued at $858.7 million and were expected to create 85,000 jobs. A breakdown of the approved applications on a value basis by industrial sectors showed steel metallurgy ranking first, with 34 percent of the approved investment, followed by chemicals with 21 percent. Most of the investment, by value, was destined for the Huelva area, where heavy chemical industries are located, but substantial interest was also shown in the Seville area.

To lend impetus to the Concerted Action Plan for the coal industry, the Fund for the Support of Coal Mines (Fondo de Fomento de la Mineria de Hulla) was created to provide subsidies during the development period. The subsidies amount to 50 pesetas ($0.83) per ton produced for the 1964–65 period; 37 pesetas ($0.62) per ton for the 1965–66 period; 35 pesetas ($0.58) for the 1966–67 period and 15 pesetas ($0.25) for the 1967–68 period. As a special incentive, the subsidy for the Asturias region, Spain's most important coal region, was increased to 95 pesetas ($1.58) per ton for the 1965–66 period. Only firms which have accepted and signed the Concerted Action Plan are eligible for these benefits.

PRODUCTION

In 1965 substantial gains over 1964 outputs were shown by iron ore (11 percent), fluorspar (42 percent), potash (23 percent), cement (18 percent), fertilizers (20 percent), crude steel (12 percent), steel products (40 percent), petroleum products (15 percent), and electric energy (13 percent). With a production increase of 5.8 percent during 1965, the coal industry recovered from the loss due to strikes during 1964, but this only slightly exceeded the 1963 output.

Table 1.—Spain: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Aluminum:					
Bauxite	5,594	6,047	r 11,819	6,772	NA
Aluminum	37,648	41,688	45,488	49,644	51,401
Aluminum alloys	10,698	7,155	13,860	21,915	NA
Antimony:					
Content of antimony concentrate	172	159	59	r 54	86
Smelter production	531	552	853	287	NA
Arsenic trioxide	311	212	146	r 143	119
Bismuth:					
Content of concentrate—kilograms	9,436	2,308	4,000	----	----
Smelter production—do	9,719	8,527	11,719	1,898	NA
Cadmium—do	34,318	60,228	54,100	60,219	NA
Copper:					
Content of ore mined [1]	9,585	7,894	6,835	r 9,872	NA
Concentrates	18,012	16,780	13,126	14,739	NA
Content of concentrate	2,974	2,349	1,825	2,650	NA
Content of precipitates	1,999	2,073	2,976	2,744	NA
Copper sulfate	10,671	8,735	6,863	4,565	2,564
Blister [2]	18,812	20,247	23,513	21,405	30,055

See footnotes at end of table.

Table 1.—Spain: Production of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals—Continued					
Copper—Continued					
Refined:					
Electrolytic	35,299	42,423	43,172	46,710	47,629
Fire refined	15,549	8,890	6,821	3,254	11,500
Total	50,848	r 51,313	49,993	r 49,964	59,129
Gold:					
Content of ore mined for gold troy ounces	8,231	6,687	15,625	r 23,534	8,809
Metal produced, including byproduct recovery do	r 28,968	r 52,513	27,991	27,601	NA
Iron and steel:					
Iron ore:					
Gross weight thousand tons	6,063	5,761	5,193	r 5,107	5,687
Iron content do	2,848	2,857	r 2,558	r 2,529	e 2,783
Pig iron do	2,077	2,100	1,911	r 1,903	2,364
Ferroalloys:					
Ferromanganese and ferrosilico manganese do	22	28	28	r 38	44
Ferrosilicon do	23	r 27	28	r 16	21
Other do	r 1	r 14	17	17	18
Total do	46	r 69	73	66	83
Steel:					
Ingots and castings do	2,340	2,311	2,492	r 3,150	3,515
Rolled products:					
Railway track material do	64	90	134	118	98
Heavy sections do	180	297	250	428	556
Light sections do	255	251	285	297	683
Wire rod do	129	145	149	149	431
Ingots and semimanufacture, for tubes thousand tons	23	----	----	----	63
Strip do	111	109	118	75	173
Plates and sheets:					
Heavy do	220	267	301	379	415
Medium do	53	37	36	41	52
Sheets, hot rolled do	193	259	233	283	271
Wheels centers and axles do	22	16	15	18	24
Other do	45	62	77	91	345
Semimanufactures for sale do	408	361	275	386	50
Total rolled products do	1,703	1,894	1,873	2,265	3,161
Rough castings do	40	35	36	26	106
Rough forgings do	49	48	51	56	136
Selected end products:					
Sheets, cold rolled do	----	2	82	100	118
Tin plate do	29	37	59	55	93
Wire do	60	71	84	56	113
Lead:					
Content of ore and concentrate	79,708	70,998	r 62,914	r 58,383	56,448
Refined:					
Primary	77,726	72,272	r 62,084	r 57,994	52,376
Secondary	NA	NA	NA	4,500	8,790
Total	NA	NA	NA	62,494	61,166
Manganese ore	15,506	12,792	15,293	16,113	17,157
Mercury:					
Content of ore mined 76-pound flasks	r 50,217	52,446	55,617	r 79,212	74,724
Metal do	51,202	r 52,798	56,954	r 78,322	74,667
Silver thousand troy ounces	4,527	5,684	4,955	2,315	e 2,320
Tin:					
Content of ore and concentrates long tons	230	231	158	90	110
Refined do	731	r 910	r 1,286	r 1,774	1,941
Solder do	639	577	610	430	NA
Titanium:					
TiO_2 content of ore and concentrate	14,255	20,593	24,829	r 21,478	16,100
TiO_2 produced	5,140	5,645	6,434	6,615	7,419
Tungsten:					
WO_3 content of ore and concentrate	648	423	88	r 22	42
Metal	95	68	72	38	NA
Uranium ore, U_3O_8 content kilograms	----	----	----	r 77,271	NA
Zinc:					
Content of ore and concentrate	87,982	78,521	91,733	r 88,459	38,445

See footnotes at end of table.

Table 1.—Spain: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals—Continued					
Zinc—Continued					
Metal:					
Primary	NA	r 61,232	64,730	r 64,431	54,498
Secondary	NA	NA	NA	1,500	1,830
Total	NA	NA	NA	65,931	56,328
Nonmetals:					
Barite	33,973	38,939	48,364	59,133	NA
Cement:					
Hydraulic:					
Natural—thousand tons	560	556	595	383	NA
Artificial—do	6,068	6,738	7,153	8,117	9,606
Chalk—cubic meters	54,307	35,401	r 52,305	91,147	NA
Clays:					
Bentonite	7,338	r 12,167	14,169	14,467	NA
Kaolin	126,893	167,793	207,609	140,927	NA
Other—thousand cubic meters	1,605	1,832	2,186	2,430	NA
Dolomite—cubic meters	94,104	91,278	118,791	176,731	NA
Feldspar	8,325	10,900	12,677	16,730	NA
Fertilizers:					
Crude:					
Potash:					
Crude natural salts, gross weight—thousand tons	1,722	1,579	1,848	2,151	2,643
K_2O content—do	294	265	300	345	425
Processed or manufactured:					
Nitrogenous:					
Ammonium sulfate, nitrogen content	86,867	83,548	105,506	130,442	157,192
Calcium-ammonium nitrate—do	40,625	53,737	66,730	75,883	85,423
Other—do	1,027	1,024	2,949	20,609	17,733
Total—do	128,519	138,309	175,185	226,934	260,348
Phosphatic:					
Superphosphates—P_2O_5 content	297,895	329,294	326,400	326,571	360,647
Potassic:					
Potassium chloride—K_2O content	262,210	235,103	260,520	292,501	390,750
Potassium sulfate	27,047	27,235	29,916	35,617	NA
Total	289,257	262,338	290,436	328,118	NA
Fluorspar:					
Acid grade	97,195	100,130	103,979	r 123,314	156,249
Metallurgical grade	49,727	49,878	49,421	r 26,367	55,840
Total	146,922	150,008	153,400	r 149,681	212,089
Garnet	188	167	71	----	NA
Gravel—cubic meters	283,853	237,979	278,737	690,744	NA
Gypsum, alabaster, and anhydrite:					
Alabaster—cubic meters	7,213	8,767	----	----	NA
Anhydrite—do	13,561	16,283	17,774	----	NA
Gypsum—thousand cubic meters	1,260	1,468	r 1,901	1,405	NA
Industrial earths, not elsewhere specified	7,368	6,709	6,793	8,569	NA
Lime:					
Hydraulic	223,642	229,961	248,781	72,228	NA
Quicklime	145,523	183,737	212,395	256,790	NA
Total	368,165	413,698	461,176	329,018	NA
Limestone—thousand cubic meters	11,099	r 11,446	11,191	12,666	NA
Magnesite	83,191	71,387	84,654	r 93,326	NA
Marble—cubic meters	40,921	35,392	51,523	59,709	NA
Marl—thousand cubic meters	1,958	1,996	r 2,283	1,786	NA
Ochre	19,125	18,664	15,208	20,170	NA
Pumice	1,438	1,740	1,529	2,293	NA
Quartz	68,087	99,617	73,115	97,006	NA
Quartzite—cubic meters	218,127	191,669	224,080	293,662	NA
Salt:					
Rock—thousand tons	614	626	699	r 733	680
Other—do	985	1,014	999	r 1,191	1,100
Total—do	1,599	1,640	1,698	r 1,924	1,780

See footnotes at end of table.

Table 1.—Spain: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals—Continued					
Sand, industrial—cubic meters	285,225	433,420	606,822	477,498	NA
Sandstone—do	371,928	405,492	452,372	370,972	NA
Sepiolite (meerschaum), saleable—do	10,576	9,122	10,940	16,000	NA
Serpentine—cubic meters	r 465	482	r 516	1,008	NA
Silica and silica sand—do	177,293	238,022	287,794	348,798	NA
Slate:					
Graphitic—do	1,530	1,500	1,600	----	NA
Other—do	66,066	60,519	100,276	43,123	NA
Sodium sulfates, natural:					
Glauberite, Na_2SO_4 content	1,254	1,928	2,517	4,085	NA
Thenardite, Na_2SO_4 content	18,079	20,700	33,465	42,486	NA
Stone, dimension and crushed, not elsewhere specified [3]—thousand cubic meters	724	r 861	r 964	898	NA
Sulfur and pyrites:					
Pyrites, all types:					
Gross weight—thousand tons	2,031	2,129	2,027	2,393	2,385
Sulfur content—do	1,017	1,013	966	1,135	1,129
Elemental sulfur all types	49,098	r 46,573	69,128	r 76,662	30,147
Talc (steatite)	27,667	27,725	27,503	r 26,807	e 27,000
Tripoli	17,550	12,113	10,187	11,346	NA
Mineral fuels:					
Asphalt, natural	9,058	8,500	7,800	9,700	NA
Carbon black	NA	1,300	1,300	1,500	1,700
Coal:					
Anthracite—thousand tons	2,597	2,643	2,773	r 2,680	2,775
Bituminous—do	11,199	10,052	r 10,135	r 9,515	10,106
Lignite—do	2,089	2,488	2,591	r 2,604	2,780
Bituminous shale—do	856	731	811	712	630
Distillation and refinery products:					
From coal:					
Coke:					
High temperature (coke oven) thousand tons	2,609	2,738	2,752	r 2,569	2,861
Low temperature (gas house) do	253	232	199	r 180	88
Liquid tar—do	138	139	139	129	127
Crude benzol—thousand barrels	190	195	182	170	138
Refinery products:					
Benzol, benzine, toluol and naphtha—do	159	62	254	229	139
Other—thousand tons	51	40	41	40	60
From bituminous shale:					
Gas oil—thousand tons	45	41	45	49	52
Solvents—do	21	41	38	30	----
Lubricants—do	50	52	50	64	84
Nonlubricating oils—do	4	6	5	5	----
Paraffin—do	5	2	3	5	4
Total	125	142	141	153	140
From petroleum:					
Dry gas—do	63	82	88	100	96
Liquid petroleum gases—do	102	172	240	326	384
Gasoline—do	880	1,039	1,045	1,217	1,448
Jet fuel—do	81	180	182	160	219
Kerosine—do	283	325	351	393	371
Gas oil—do	1,412	1,696	1,963	2,438	2,560
Diesel oil—do	301	342	254	284	230
Fuel oil—do	3,388	4,105	4,772	5,622	6,826
Lubricants—do	33	33	36	44	129
Nonlubricating oils—do	16	18	19	18	43
Asphalt—do	185	249	264	331	356
Other—do	51	57	104	238	216
Total	6,795	8,298	9,318	11,171	12,878
Gas, manufactured—billion cubic meters	385	402	400	401	422
Electric energy:					
Hydro—million kilowatt hours	15,981	16,073	21,139	20,646	19,845
Thermal	4,899	6,832	4,758	8,880	13,571
Total	20,880	22,905	25,897	29,526	33,416

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Includes copper ores, copper uranium ores, and cupriferous pyrites.

[2] Including production from imported ores and concentrates.

[3] Includes basalt, diabase, fonolite, granite, ophite, porphyry and trachyte.

TRADE

Spain's exports of all commodities during 1965 were valued at $966.5 million; mineral commodities exported totaled $151.6 million. Total imports were valued at $3,003.3 million, of which $875.3 million comprised mineral commodities. The European Economic Community (EEC) and the European Free Trade Area (EFTA) continued to be the major European destinations for Spanish exports. However, among individual destinations for Spain's exports, the United States followed West Germany and the United Kingdom, respectively. These three accounted for a total of $115.5 million, of which $16.5 million were in mineral commodities. As a source of imports by Spain, the United States led all other nations, accounting for imports valued at $527 million, of which nearly $76 million was in minerals.

Table 2.—Spain: Value of mineral trade by selected areas
(Thousand dollars)

Commodity	1963	1964	1965						
			EEC	EFTA	Other West Europe[1]	East Europe[1]	United States	Other	Total
Exports:									
Metals:									
Ore, concentrate and scrap	13,292	15,833	7,651	3,657	133	---	28	41	11,510
Iron and steel	18,404	17,764	3,034	765	773	---	2,413	3,314	10,299
Nonferrous	14,509	20,613	17,125	1,022	427	960	1,638	1,552	22,724
Nonmetals:									
Crude	13,884	17,244	12,703	2,095	353	28	2,999	1,181	19,359
Fertilizers, manufactured	9,232	13,512	3,372	6,166	1,901	637	1,506	1,854	15,436
Other manufactures	1,982	2,702	1,646	195	352	---	160	749	3,102
Chemical elements and compounds	9,895	19,198	10,722	7,392	309	699	7,713	9,391	36,226
Mineral fuels:									
Coal and briquets	368	928	28	212	28	---	---	4	272
Petroleum and products	42,191	35,677	6,525	12,103	344	11	71	13,359	32,413
Gas, natural	35	248	---	15	---	---	---	277	292
Crude chemicals from coal, petroleum and natural gas	75	12	---	---	---	---	---	15	15
Total mineral-based commodities	123,867	143,731	62,806	33,622	4,620	2,335	16,528	31,737	151,648
All other commodity exports	611,417	810,683	286,809	189,624	20,136	22,251	99,010	197,009	814,839
Total, all exports	735,284	954,414	349,615	223,246	24,756	24,586	115,538	228,746	966,487
Imports:									
Metals:									
Ore, concentrate and scrap	32,997	51,630	10,903	11,795	2,656	---	15,690	37,013	78,057
Iron and steel	110,395	131,788	165,935	44,345	2,134	1,863	21,611	23,645	259,533
Nonferrous[2]	43,260	53,453	30,026	15,249	3,121	522	5,029	29,833	83,780
Nonmetals:									
Crude	31,096	37,063	6,990	2,514	529	---	2,772	28,987	41,792
Fertilizers, manufactured	28,988	35,394	28,240	8,451	141	955	2,938	634	41,359
Other manufactures	21,886	29,216	13,081	5,576	34	21,277	693	5,121	45,782
Chemical elements and compounds	15,080	17,397	10,906	2,759	47	72	1,191	6,697	21,672
Mineral fuels:									
Coal, coke and briquets	31,054	32,365	3,761	296	55	2,704	20,282	1,767	28,865
Petroleum and products	214,572	250,044	7,399	4,917	---	6,166	5,562	241,211	265,255
Gas, natural and manufactured	1,392	3,091	6,924	266	---	---	---	---	7,190
Crude chemicals from coal, petroleum and natural gas	1,176	1,754	996	888	---	---	102	---	1,986
Total mineral based commodities	531,896	643,195	285,161	97,056	8,717	33,559	75,870	374,908	875,271
All other commodity imports	1,423,189	1,600,753	838,627	410,214	35,451	35,052	450,825	357,903	2,128,072
Total, all imports	1,955,085	2,243,948	1,123,788	507,270	44,168	68,611	526,695	732,811	3,003,343

[1] Yugoslavia included with West Europe.
[2] Includes pyrophoric alloys.

Table 3.—Spain: Exports of minerals and metals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum and alloys:				
Scrap	6	8	94	All to West Germany.
Unwrought	10,745	9,139	308	Poland 3,000; Argentina 2,580; France 1,000; Rumania 800.
Semimanufactures	3,679	2,644	2,021	United States 1,027; Bulgaria 750.
Antimony metal, all forms	---	9	50	All to the Netherlands.
Bismuth metal, all forms kilograms	---	---	1,814	
Cadmium metal, all forms	---	200	9,352	All to Venezuela.
Chromium oxides kilograms	---	---	2,495	
Copper and alloys:				
Matte	394	235	119	United Kingdom 215.
Scrap	---	87	195	United Kingdom 84.
Unwrought and semimanufactures	223	6,499	14,023	West Germany 4,030; Netherlands 2,386.
Iron and steel:				
Iron ore, excluding roasted pyrites thousand tons	1,295	1,650	1,234	Netherlands 517; West Germany 448; United Kingdom 436.
Roasted pyrites do	696	803	712	West Germany 543; United Kingdom 141.
Oxides	16,832	19,365	18,426	United Kingdom 4,839; United States 2,474; Australia 2,208.
Scrap thousand tons	4	4	---	United States 3.
Pig iron and cast iron do	151	148	110	Japan 74; Italy 24; West Germany 21.
Ferroalloys:				
Ferromanganese do	10	10	7	United States 7; United Kingdom 1.
Other do	10	8	3	West Germany 3; United Kingdom 3.
Steel:				
Primary forms do	51	51	---	Italy 21; Japan 9; Philippines 9.
Semimanufactures:				
Shapes do	2	6	5	West Germany 4.
Plates and sheets do	48	32	3	Italy 23; Colombia 7.
Other do	2	5	9	France 2; Switzerland 1.
Lead and alloys:				
Ashes and residues containing lead	---	1,211	---	All to the United Kingdom.
Lead oxide	20	8	---	Israel 5; Portugal 3.
Unwrought	11,628	1,908	317	United States 500; Portugal 450; Switzerland 400.
Semimanufactures	43	32	26	Andorra 24; Morocco 6.
Magnesium, scrap	5	9	15	All to United Kingdom.
Manganese ore	---	20	2	All to France.
Mercury:				
Metal 76-pound flasks	49,126	70,747	64,781	United States 24,085; Japan 18,750; United Kingdom 8,957; West Germany 6,670.
Oxides	144	135	112	Netherlands 82; Sweden 20.
Molybdenum scrap kilograms	2,645	---	---	
Nickel scrap	4	17	15	Netherlands 9; France 5.
Selenium kilograms	NA	543	295	West Germany 278; France 265.
Silicon	---	440	1,046	United Kingdom 240; West Germany 150.
Tin:				
Ore and concentrate long tons	---	15	1	All to United Kingdom.
Scrap do	8	5	113	All to West Germany.
Unwrought and semimanufactures do	1	494	260	Netherlands 225; United States 150; United Kingdom 89.
Titanium:				
Ore and concentrate (ilmenite)	20,760	26,722	19,108	Italy 13,561; Belgium-Luxembourg 6,700; France 6,450.
Oxide	1,222	1,675	1,795	Belgium-Luxembourg 637; Argentina 443.
Tungsten:				
Ore and concentrate	73	156	246	United Kingdom 115; West Germany 41.
Metal, all forms kilograms	350	---	---	
Uranium ores do	5,200	100	25	All to Austria.
Uranium and thorium salts do	10,500	529	---	All to Egypt.
Zinc and alloys:				
Ore and concentrate	32,694	24,308	6,583	France 9,590; Netherlands 8,338; West Germany 3,007.

See footnote at end of table.

Table 3.—Spain: Exports of minerals and metals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals—Continued				
Ashes and residues containing zinc	4,966	34,841	---	Belgium-Luxembourg 21,449; West Germany 7,129; Canada 6,244.
Oxides	192	115	56	Italy 80; Colombia 30.
Unwrought and semimanufactures	23,830	19,432	10,819	West Germany 6,430; United Kingdom 4,171; Portugal 2,270.
Other:				
Ores and concentrates, not elsewhere specified	---	4	6	NA.
Nonferrous waste	67	3,802	8,329	United Kingdom 3,344; France 416.
Inorganic bases, not elsewhere specified	1,284	7,131	900	United Arab Republic (Egypt), 5,000; United Kingdom 1,716.
Metals, not elsewhere specified:				
Scrap	15	71	15	Netherlands 38; Portugal 24.
Ingots and semimanufactures	---	31	61	United Kingdom 22.
Nonmetals:				
Abrasives:				
Natural, crude or ground:				
Siliceous earths and pumice	480	537	803	United Kingdom 220; West Germany 196.
Manufactures:				
Grindstones and whetstones	21	28	115	Portugal 7; Chile 6.
Paper, cloth and powder	7	10	8	Cuba 6.
Asbestos:				
Crude or fiber	---	29	9	All to Netherlands.
Asbestos cement products	292	2,282	1,923	France 1,664; Andorra 552.
Barite and witherite, crude or ground	28,922	56,877	49,935	Italy 25,112; United States 13,504.
Cement, hydraulic	10,135	9,369	11,392	Andorra 8,458.
Clays, clay products and refractory products, not elsewhere specified: Crude:				
China clay (kaolin), crude or calcined	10,715	18,732	25,106	West Germany 16,586.
Bentonite	2,221	5,625	3,247	France 5,574.
Other	15,187	11,407	6,562	France 6,180; Italy 3,274.
Construction materials:				
Building bricks	21,931	14,779	7,631	Gibraltar 6,921; Andorra 4,073; France 3,770.
Other nonrefractory	8,950	16,983	13,395	France 6,879; Algeria 4,912.
Refractory construction materials, not elsewhere specified	76	1,405	3,460	Cuba 1,355.
Dolomite, crude, calcined or tarred	4,457	624	2,083	Portugal 387; Peru 180.
Fertilizer materials:				
Natural, animal or vegetable	148	321	334	France 307.
Manufactured, except ammonia:				
Nitrogenous (ammonium sulfate)	1,500	1,500	1,497	All to Senegal.
Phosphatic:				
Basic slag	---	17,604	---	All to Cuba.
Phosphates and superphosphates	33,851	128,951	64,897	United Arab Republic (Egypt) 89,806; Finland 19,895.
Potassic:				
Potassium chloride	257,640	310,047	395,223	Norway 63,140; Italy 45,855; United Kingdom 44,205; United States 32,000.
Potassium sulfate	12,454	12,205	7,470	Algeria 3,500; Tunis 3,095; Morocco 3,000.
Ammonia	---	1,735	---	All to United Kingdom.
Fluorspar	86,605	137,317	154,569	United States 86,776; Japan 25,255; West Germany 15,184.
Gypsum	4,728	4,504	6,627	Andorra 2,825; France 784.
Lime, hydraulic	487	471	455	Andorra 466.
Magnesite, natural, crude or calcined	17,853	29,079	30,869	West Germany 28,139.
Mica products	---	11	7	Cuba 8; Belgium-Luxembourg 3.
Pigments, mineral	233	42	139	France 20; Argentina 20.

See footnote at end of table.

Table 3.—Spain: Exports of minerals and metals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Nonmetals—Continued				
Pyrites, unroasted:				
Cupriferous_thousand tons	23	15	---	All to West Germany.
Other_do	1,008	1,203	1,168	West Germany 733; France 159; Netherlands 98; Denmark 89.
Quartz and quartzite	9	13,454	22,831	All to Italy.
Salt	465,328	334,437	404,010	Japan 82,398; Denmark 48,235; Iceland 43,625; Canada 31,318.
Stone, sand, and gravel:				
Marble and other calcareous	12,927	12,594	13,073	Italy 5,000; West Germany 3,163.
Granite, porphyry basalt and sandstone	3,916	5,190	10,236	France 3,758; Italy 1,234.
Flint, gravel and crushed stone	13,044	7,998	4,311	Gibraltar 4,963; Andorra 2,961.
Sand, natural, not mineral-bearing	69,139	63,609	30,168	Gibraltar 34,830; Andorra 28,569.
Slate:				
Crude or rough cut	459	1,497	337	Andorra 717; France 578.
Slate products	314	394	2,945	France 341.
Sulfur, elemental all types	870	275	1,200	All to Morocco.
Talc and soapstone	3	233	1	Morocco 200.
Other:				
Meerschaum, amber, and jet	70	1,641	2,624	United Kingdom 1,583.
Crude nonmetals, not elsewhere specified	250	---	1,620	
Mineral fuels:				
Coal, coke and briquets thousand tons	24	56	13	Italy 29; Greece 25.
Gas, natural_million cubic feet	1	2	---	All to Gibraltar.
Petroleum:				
Partly refined thousand tons	50	34	---	All to the Netherlands.
Refinery products:				
Gasoline_do	256	250	297	United Kingdom 82; Nigeria 42; Netherlands 32; Sweden 24.
Kerosine_do	79	125	110	United Kingdom 49; Netherlands 27.
Distillate fuels_do	408	274	233	Ships' bunkers 115; Netherlands 49; United Kingdom 28; Nigeria 22.
Residual fuel oils_do	1,132	1,051	905	Belgium-Luxembourg 316; United Kingdom 145.
Other_do	1	1	1	NA.
Nonchemical coal and petroleum wastes:				
Nonlubricating oils thousand tons	---	82	106	United Kingdom 56; Netherlands 25.
Other_do	48	38	35	Portugal 14; Cyprus 9.

NA Not available.

Table 4.—Spain: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum:				
Bauxite	65,706	53,124	85,236	Greece 36,363; Netherlands Antilles 9,123; British Guiana 6,313.
Alumina and aluminum hydroxide	91,985	101,138	115,517	France 56,964; Republic of Guinea 32,481.
Metal and alloys:				
Scrap	322	166	170	United States 101.
Unwrought	10,329	9,984	16,897	Canada 8,305; United States 1,573.
Semimanufactures	5,970	6,527	9,032	Canada 1,671; France 1,195; West Germany 979; Belgium-Luxembourg 753.
Antimony:				
Ore and concentrate	516	532	708	Morocco 502; Thailand 30.
Oxides	193	257	225	United Kingdom 133; France 80.
Metal, all forms	135	155	273	United Kingdom 97; Belgium-Luxembourg 16.
Arsenic:				
Anhydrides	1,200	1,472	1,267	France 1,098; Portugal 370.
Metal	NA	1	5	All from Sweden.
Bismuth	8	21	12	United Kingdom 11; Netherlands 10.

See footnotes at end of table.

Table 4.—Spain: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:—Continued				
Cadmium:				
Oxides and hydroxide kilograms	11,200	4,376	NA	Belgium-Luxembourg 3,950; West Germany 400.
Metal, all forms do	10,813	17,331	12,867	West Germany 4,341; Belgium-Luxembourg 4,149.
Chromium:				
Chromite	15,128	18,290	29,576	Republic of South Africa 7,273; Iran 6,603.
Oxides and hydroxide	79	98	107	Poland 35; United Kingdom 35.
Metal, all forms kilograms	811	5,594	7,228	United Kingdom 5,505.
Cobalt, oxides and hydroxide	50	63	70	United Kingdom 46; Belgium-Luxembourg 14.
Copper:				
Ore and concentrate	17,885	19,883	22,865	Cyprus 10,665; Italy 5,114; Chile 2,580.
Matte	4,963	12,857	8,815	Cyrpus 4,816; Israel 4,187; Chile 3,627.
Oxides and hydroxide	92	135	142	Norway 73; West Germany 42.
Metal and alloys:				
Scrap	10,403	10,201	17,513	United States 3,864; West Germany 1,774; Canada 1,231.
Blister and other unrefined	r 12,346	r 20,386	11,652	Turkey 8,460; Uganda 8,098; Republic of South Africa 2,144.
Refined, unwrought	r 11,665	r 8,799	13,731	Belgium-Luxembourg 3,217; Zambia 2,892; United States 1,100.
Master alloys	30	27	70	Netherlands 9; Belgium-Luxembourg 7.
Semimanufactures	9,902	r 10,194	18,200	United Kingdom 4,769; Canada 1,655; West Germany 1,098.
Gold and gold alloys:				
Bullion troy ounces	4,212	421,175	432,717	Switzerland 289,327; United Kingdom 131,818.
Iron and steel:				
Iron ore and concentrate:				
Iron ore thousand tons	93	94	353	Morocco 90.
Roasted pyrites do	---	---	9	
Iron and steel scrap do	202	309	431	United States 146; United Kingdom 79.
Pig iron and ferroalloys do	9	10	25	Norway 3; France 3; West Germany 1.
Ingots and other primary forms:				
Coils for rerolling do	225	238	448	Japan 93; Netherlands 64; West Germany 49.
Other do	144	276	956	United States 104; West Germany 55; France 30.
Semimanufactures:				
Bars, rods and sections do	81	76	143	West Germany 27; United Kingdom 16; Belgium-Luxembourg 12.
Plates and sheets:				
Heavy and medium do	30	36	191	West Germany 14; Italy 7; France 5.
Thin:				
Uncoated do	159	215	338	United Kingdom 56; France 44; Italy 38; West Germany 36.
Tinned do	83	74	88	United Kingdom 27; France 19; West Germany 11.
Other coated do	10	11	26	France 5; Belgium-Luxembourg 3.
Hoop and strip do	5	9	18	France 3; West Germany 2.
Tubes, pipes, and fittings do	39	26	44	West Germany 10; France 5; Sweden 3.
Other do	19	11	16	West Germany 4; France 2; Belgium-Luxembourg 2.
Lead:				
Ore and concentrate	---	---	213	
Ashes and residues	20	115	204	United States 58; Italy 57.
Lead oxides	342	491	231	France 236; Mexico 129; Portugal 60.
Metal and alloys:				
Scrap	15	30	422	United States 25.
Unwrought	1	1,658	23,072	United Kingdom 1,541.
Semimanufactures	28	21	731	Belgium-Luxembourg 16.
Magnesium, all forms	172	221	313	Norway 98; United States 80.

See footnotes at end of table.

Table 4.—Spain: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Manganese:				
Ore and concentrate	102,370	149,668	86,625	Ghana 64,307; Ivory Coast 15,444; Congo (Léopoldville) 14,926; India 13,096.
Oxides	856	684	453	Netherlands 348; United Kingdom 153.
Metal	82	61	150	United States 27; Republic of South Africa 14.
Molybdenum and alloys, all forms	4	13	15	United States 6; Netherlands 5.
Nickel:				
Ore and concentrate	217	477	310	All from Australia.
Matte and speiss	296	331	441	United Kingdom 148; Norway 83; France 81.
Metal and alloys:				
Scrap	275	60	147	United Kingdom 30; West Germany 12.
Unwrought	831	902	1,210	United Kingdom 553; United States 140.
Semimanufactures	777	709	1,129	United Kingdom 218; France 178.
Phosphorus	40	65	51	France 42; West Germany 22.
Platinum group metals, all forms troy ounces	8,745	(1)	(2)	
Selenium	4	7	8	West Germany 3; Canada 3.
Silicon	878	342	81	All from France.
Sodium	17	84	344	France 76; West Germany 7.
Silver:				
Ore and concentrate	NA	35	---	NA.
Unwrought thousand troy ounces	3,652	3,261	4,868	Mexico 2,479; United Kingdom 232; West Germany 185.
Semimanufactures ---do---	125	133	---	France 128.
Tantalum metal, all forms kilograms	9	1	5	All from West Germany.
Tellurium ---do---	NA	260	1,436	France 250.
Tin:				
Ore and concentrate long tons	2,779	3,167	2,398	Thailand 1,145; Republic of Congo 1,016; France 512.
Oxides ---do---	93	127	116	United Kingdom 67; West Germany 57.
Metal and alloys, all forms do	120	53	38	United Kingdom 18; Netherlands 12.
Titanium:				
Ore and concentrate (ilmenite)	3,530	3,999	54	Portugal 2,515; Norway 1,482.
Oxides	1,700	2,573	3,788	United Kingdom 815; West Germany 776; Italy 526.
Tungsten:				
Ore and concentrate	r 329	147	191	South Korea 97; Australia 25; Republic of Congo (Léopoldville) 25.
Oxides kilograms	9,300	2,310	2,800	West Germany 1,310; Italy 1,000.
Metals and alloys, all forms	10	8	8	France 3; West Germany 3.
Vanadium pentoxide	NA	7	17	All from United Kingdom.
Zinc:				
Ore and concentrates	1,656	11,381	52,993	Italy 4,419; Greece 3,055; Algeria 2,485.
Ashes and residues containing zinc	68	15	341	West Germany 10.
Oxides	101	142	165	West Germany 132.
Metal and alloys, all forms	r 29	r 37	1,042	Belgium-Luxembourg 11; France 9.
Zirconium metal, all forms kilograms	304	151	126	West Germany 116; Australia 25.
Other:				
Nonferrous ores and concentrates, not elsewhere specified	7,912	9,644	4,982	Australia 4,641; Portugal 2,515; Norway 1,482; United Kingdom 997.
Metalliferous nonferrous waste, not elsewhere specified	6,686	8,361	14,142	United Kingdom 1,692; Chile 1,601; United States 1,300.
Oxides and hydroxides:				
Bismuth and cadmium	---	---	5,651	
Barium, strontium and magnesium	6,724	432	740	France 236.
Base metals and alloys, not elsewhere specified:				
Pyrophoric alloys kilograms	2,949	5,421	6,380	West Germany 3,978; France 967.

See footnotes at end of table.

Table 4.—Spain: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Other rare earth metals and alloys_____do____	150	260	3,331	Austria 150; France 60.
Other_____	216	118	126	United States 40; Belgium-Luxembourg 38; Republic of the Congo (Léopoldville) 33.
Nonmetals:				
Abrasives, natural, crude, not elsewhere specified_____	628	1,156	1,876	Greece 1,061.
Asbestos:				
Crude, washed or ground____	40,137	51,509	49,423	Canada 23,230; Republic of South Africa 15,672; Southern Rhodesia 9,299.
Asbestos cement products___	744	1,251	1,840	Belgium-Luxembourg 997.
Barite and witherite_____	906	98	415	West Germany 50; France 44.
Boron compounds:				
Natural salts_____	6,751	11,050	8,967	United States 7,050; Turkey 4,000.
Oxide and acid_____	31	321	768	France 166; United States 70; Italy 70.
Calcite_____	NA	379	23	Republic of South Africa 307; France 44.
Cement, hydraulic thousand tons__	1,334	1,534	2,548	Portugal 373; Poland 329; Bulgaria 176.
Chalk_____	1,697	852	2,649	France 522; Belgium-Luxembourg 255.
Clays and clay products:				
Crude or washed clays:				
Bentonite_____	6,961	9,001	12,507	Morocco 6,910; United Kingdom 1,169.
China clay (kaolin)_____	7,955	16,033	28,404	United Kingdom 15,359.
Other_____	11,252	14,234	23,271	United Kingdom 7,828; France 2,982.
Construction materials, not elsewhere specified:				
Refractory bricks and other materials_____	12,807	27,551	25,602	United States 10,999; France 5,197; Austria 3,470.
Nonrefractory bricks and other materials___	13,328	25,418	20,619	Portugal 21,218.
Cryolite and chiolite, natural____	250	425	655	All from Denmark.
Diamond:				
Gem, rough or cut, unmounted value, thousands__	$304	$937	$1,275	Belgium-Luxembourg $787; France $81.
Industrial_____do____	$188	$346	$666	United Kingdom $94; Belgium-Luxembourg $67; France $59; Netherlands $52; Ireland $41.
Diatomite and other siliceous earths_____	1,723	2,048	1,590	United States 1,220; West Germany 381.
Dolomite_____	2,194	2,003	937	France 971; Norway 970.
Feldspar_____	141	88	1,361	France 41; West Germany 25.
Fertilizer materials:				
Crude:				
Nitrogenous_____	112,182	125,142	122,225	Chile 124,354.
Phosphatic thousand tons__	1,018	1,101	1,141	Morocco 796; Tunisia 136; United States 133.
Potassic_____	---	---	150	
Organic, including guano	5,524	3,681	3,989	France 3,632.
Manufactured:				
Nitrogenous thousand tons__	715	721	728	West Germany 242; Italy 131; Norway 80.
Phosphatic:				
Basic slag (Thomas slag)_____	42,125	20,538	31,823	Belgium-Luxembourg 16,362; France 4,176.
Other_____	1,898	1,741	4,279	France 1,290.
Potassic_____	1,150	721	1,053	Netherlands 446; West Germany 275.
Mixed_____	26,586	68,522	79,936	West Germany 33,992; Italy 19,509.
Ammonia, anhydrous_____	2,893	1,653	5,518	France 1,652.
Gemstones, not elsewhere specified (except pearls):				
Precious__value, thousands__	$320	$105	$29	Belgium-Luxembourg $71; United Kingdom $26.
Semiprecious_____do____	$83	$71	$87	West Germany $41; France $19.
Industrial_____	$19	---	$45	
Powder and dust, abrasive do____	$67	$81	$117	United Kingdom $42; Netherlands $27.

See footnotes at end of table.

Table 4.—Spain: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Graphite, natural, crude or ground	687	809	801	West Germany 238; France 245; Malagasy Republic 210.
Gypsum	959	679	687	Morocco 557; West Germany 65.
Lime	557	450	1,227	Morocco 373; United Kingdom 65.
Magnesite, natural crude or calcined	1,160	3,921	11,734	United Kingdom 1,928; Greece 732; Czechoslovakia 496.
Mica:				
Crude, powder and splittings	587	437	901	India 131; Norway 129; United Kingdom 70.
Semimanufactures	80	33	24	France 13; United States 7.
Pigments, mineral, including iron oxides and hydroxides	1,235	1,555	1,714	West Germany 1,420.
Salt	206	395	501	United Kingdom 356.
Stone, sand and gravel:				
Quartz and quartzite, crude, ground and roughly squared	406	158	674	West Germany 63; Switzerland 61; United States 22.
Dimension stone:				
Crude, roughly split, and/or roughly squared:				
Granite, porphyry, sandstone	7,147	2,280	5,949	Morocco 1,478; Norway 686.
Marble and other calcareous	3,100	3,766	9,784	Italy 2,587.
Slate	70	433	233	France 310; Andorra 94.
Worked, all types	174	402	1,317	Italy 151; Portugal 112.
Gravel and crushed stone, including macadam	1,887	1,865	1,010	France 1,062; Denmark 500.
Sand, excluding metal-bearing sand	62,617	54,634	74,393	Belgium-Luxembourg 38,746; Morocco 8,965; Netherlands 5,450.
Grinding and polishing stones and wheels	459	532	701	West Germany 147; France 109; Sweden 66.
Sulfur and pyrite:				
Pyrite, unroasted	1,290	3,900	---	All from Morocco.
Sulfur, elemental, all types	26,047	39,680	44,858	France 29,210; United States 10,373.
Sulfur dioxide	133	243	299	United Kingdom 186.
Sulfuric acid	12,808	30,917	77,114	Italy 26,007; United Kingdom 3,513.
Talc and soapstone	1,317	871	2,185	Norway 497; France 330.
Vermiculite and mineral wool	252	361	836	West Germany 128; Denmark 121.
Other nonmetals:				
Crude, not elsewhere specified	4,984	2,281	5,445	Republic of South Africa 1,975.
Meerschaum, amber, jet	20	---	805	
Bromine, fluorine and iodine	31	24	190	All from Chile.
Mineral fuels:				
Coal and coke:				
Coal, bituminous and anthracite—thousand tons	1,791	1,850	1,661	United States 1,273; United Kingdom 329.
Lignite and briquets—do	---	16	55	All from France.
Peat and briquets—do	2	2	2	United Kingdom 1; Ireland 1.
Coke and semicoke—do	128	101	67	West Germany 76; United Kingdom 10.
Asphalt and bitumen, natural	614	582	1,029	United States 416.
Carbon black	15,491	17,017	19,516	France 8,808; Netherlands 2,479; United States 1,907.
Gas, natural—million cubic feet	1,716	3,111	8,628	France 2,671; United Kingdom 308.
Other gases (hydrogen and inert gases)	6	21	78	West Germany 9; Norway 7.
Petroleum:				
Crude and partly refined thousand tons	10,519	12,619	13,396	Saudi Arabia 3,506; Iraq 2,520; Venezuela 2,107; Libya 1,962.
Refinery products:				
Gasoline—do	52	58	73	Netherlands Antilles 24; Netherlands 18; United Kingdom 12.
Kerosine, white spirit do	60	86	93	Netherlands 37; United Kingdom 21; France 20.
Distillate fuels—do	170	74	42	Italy 23; Rumania 21; Venezuela 13; Belgium-Luxembourg 12.
Residual fuels—do	333	74	198	Venezuela 30; Iran 12; Netherlands Antilles 12; Netherlands 10.
Lubricants—do	16	47	26	United States 23; Bahrain 10.

See footnotes at end of table.

Table 4.—Spain: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Mineral fuels—Continued				
Refinery products—Continued				
Mineral jelly and wax do	3	7	6	United States 6; West Germany 1.
Nonlubricating oil, not elsewhere specified do	2	19	86	Iran 10; United States 2.
Pitch do	66	45	44	United Kingdom 30; Italy 13.
Pitch coke do	7	9	9	West Germany 7.
Petroleum coke do	15	27	76	United States 17; West Germany 10.
Other coal, gas and petroleum products:				
Mineral tar do	18	38	22	United Kingdom 19; Saudi Arabia 18.
Coal tar distillation products do	9	18	16	United Kingdom 5; Netherlands 2.

r Revised. NA Not available.
[1] Value $776,500, of which $574,000 was from the United Kingdom.
[2] Value $699,000.

COMMODITY REVIEW

METALS

Aluminum.—Revised figures for 1964 showed an increase of 9.1 percent in the output of primary aluminum over that of 1963, while preliminary figures for 1965 showed an increase of 3.5 percent over 1964 output. The 1965 level was somewhat short of the development plan target of 55,000 tons. In contrast, Spanish consumption of aluminum and alloys increased to 64,000 tons, far more than development plan estimates, thereby making necessary a revision of the time schedule for completion of modernization and expansion projects.

Increased imports and decreased exports to supply the additional domestic requirements resulted in trade deficits—which increased from $2.8 million in 1963 to $5.4 million in 1964 and to $15.0 million in 1965—a condition diametrically opposed to the goals of the development plan, to emphasize production for increased exports and eliminate imports as far as possible.

During 1965 the modernization and expansion of capacity continued at the Valladolid works of the Government-owned Empresa Nacional de Aluminio (ENDASA) from about 12,000 tons to a target of 24,000 tons. The development plan also calls for expansion of the Aviles works from 17,500 tons to 37,500 tons in 1967 and to 47,500 tons by the end of 1970, giving Spain a capacity of about 77,000 tons of primary aluminum in 1967 and 97,000 tons by the end of 1970.

Copper.—Prior to 1964 only about 9 percent of Spain's output of copper metal was derived from indigenous ores. A part of this primary copper of domestic origin was recovered as cement copper. This included a small amount from the leaching of oxide ores in the province of Zaragoza, but it mainly came from the leaching of pyrite and roasted pyrite stockpiles and old waste and slag dumps in the province of Huelva. The remainder of the domestic primary production was recovered in concentrates from the treatment of porphyry copper ores mined adjacent to the massive pyrite deposits at Rio Tinto and, starting in 1964, from copper uranium ores in the province of Jaen.

Although copper ores mined in the past from the enriched portions of cupriferous pyrite orebodies once placed Spain high among world copper producers, remaining large cupriferous pyrite reserves with their low copper content do not provide an alternate source to meet domestic requirements.

The four existing copper smelters and five electrolytic refineries in Spain at year-end 1964 had an annual capacity of about 33,000 tons of fire-refined copper and 48,000 tons of electrolytic copper, somewhat more than Spanish requirements. However, most of these plants were old and too small for efficient operation.

Likewise Spain's annual capacity of about 146,000 tons of copper semimanufactures was somewhat more than estimated

Table 5.—Spain: Mine production of copper
(Metric tons)

	1961	1962	1963	1964	1965
Copper-bearing ores:					
Cupriferous pyrites	514,019	453,262	375,640	480,667	367,735
Copper content	5,721	5,146	4,310	5,490	4,213
Porphyry ores	299,936	234,012	221,777	240,909	268,466
Copper content	3,366	2,595	2,440	2,770	3,087
Other ores:					
Copper	63,332	18,020	7,525	3,345	17,810
Copper content	498	153	85	49	194
Uranium-copper	---	---	---	33,259	NA
Copper content	---	---	---	1,563	NA
Total mine production	877,287	705,294	604,942	758,180	NA
Copper content	9,585	7,894	6,835	9,872	NA
Copper concentrates	18,012	16,780	13,126	14,739	NA
Copper content	2,794	2,349	1,825	2,650	NA
Copper precipitates	3,220	3,306	4,672	4,313	NA
Copper content	1,999	2,073	2,976	2,744	NA

NA Not available.

requirements for the near future. This capacity was shared among 115 companies, with the five major producers accounting for 90 percent of the total. Smelters and electrolytic refineries in operation at yearend were as follows:

Company	Location	Annual capacity (metric tons)	
		Fire refined	Electrolytic
Sociedad Espanola de Construccion Electro-Mecanicas (SECEM)	Cordoba	---	30,000
Compañia Española de Minas de Rio Tinto	Rio Tinto	13,000	---
Industrias Reunidas Minero-Metalurgicas (Indumetal)	Asua (Vizcaya)	10,000	7,000
Electrolisis del Cobre, S.A.	Palencia	7,000	5,000
Sociedad Industrial Asturiana Santa Barbara	Oviedo	---	4,500
Rafinerias e Industrias Metalurgicas (CARIM)	Barcelona	3,000	---
Cobre Electrolitico y Metales S.A. (CEYMSA)	Gijon	---	2,000
Total		33,000	48,500

Principal copper semimanufacture producers were SECEM (Cordoba), Sociedad Industrial Asturiana Santa Barbara, S.A. (Oviedo), Eduardo K.L. Earle (Vizcaya), Pradera Hermanos (Vizcaya), and Metales y Plateria Ribera (Barcelona).

An investment of about $24 million was foreseen in the Economic and Social Development Plan to modernize, centralize, and expand copper metal producing and processing facilities. This anticipates an annual consumption of 76,600 tons of refined copper and export of 2,500 to 3,000 tons of semi-manufactures by yearend 1967. The most important project under the plan was Rio Tinto's 40,000-ton-per-year smelter at Huelva.

Iron and Steel.—*Iron Ore.*—With iron ore reserves estimated at about 1,000 million tons, and a 1965 annual productive capacity of more than 7.5 million tons, the Spanish iron mining industry anticipated no particular difficulty in meeting expanded requirements for iron ore, originally set at 7.4 million tons, under the Economic and Social Development Plan for the iron and steel industry. However, an investment of $1.7 million was foreseen to centralize and rationalize some operations and to make the industry better able to compete with foreign ores. The 1965 output, 11 percent higher than that of 1964, was obtained from fewer producing units and with a smaller labor force than in 1964. Basic data compiled before the inauguration of the development plan showed 222 iron ore mining enterprises producing from deposits situated in 22 of the 47 Provinces of continental Spain. Of these enterprises, 4 had an annual production of more than 500,000 tons, 4 more each produced from 200,000 to 500,000 tons annually, and 14 produced

from 50,000 to 200,000 tons apiece annually. The remaining 200 each produced less than 50,000 tons annually. The number of producing mines or mine groups, employment, production and consumption of iron ore for 1963 through 1965 are shown as follows.[3]

	1962	1963	1964	1965
Number of producing mines or groups	279	261	202	NA
Total employment in iron ore mining at yearend	14,178	12,094	9,400	9,258
Production of iron ore—thousand tons	5,711	5,149	5,107	5,687
Iron content—do	2,830	2,533	2,529	e 2,783
Consumption of iron ore in ironmaking and steelmaking—do	4,485	4,287	4,139	NA

NA Not available. e Estimate.

Spanish domestic iron ore resources by metallogenic provinces at yearend 1963 were as follows:

Metallogenic province [1]	*Reserve (million tons)*
Asturias-Leon-Palencia-Galicia	592.1
Teruel-Guadalajara	115.1
Murcia-Valencia	107.0
Almeria-Granada	62.6
Vizcaya-Santander	60.0
Cordoba-Sevilla-Huelva	27.6
Soria-Zaragoza-Logroño-Burgos	25.4
Extremadura	10.0
Total	999.8

[1] In addition to those listed, Quipuzcoa-Navarra has a reserve of less than 50,000 tons.

Spain's principal domestic iron mining companies as of 1964 and most recent available details on their operations and facilities included the following:

Company	Mines and location	Remarks
Orconera Iron-Ore-Ltd.	Concha, Concha I, Eziquiela and Florencia in Vizcaya Province	Subsidiary of Altos Hornos de Vizcaya; supplies ore (mainly carbonate) to Altos Hornos' works at Sestao and Baracaldo.
Sociedad Franco-Belga de Minas de Somorrostro S.A.	Concha II and San Luis in Vizcaya Province	In 1965 had a capacity of 500,000 tons per year of carbonate ore.
Minero Siderurgica de Ponferrada S.A.	Coto Wagner (Wagnergroup)	In 1961 produced 582,000 tons of carbonate ore from about 30 individual mines of the group on a 14-kilometer-long ore zone; supplies ore to works at Aviles.
Coto Minero "Vivaldi" y Anexas, S.A.	Vivaldi group in Leon Province	In 1961 produced 339,000 tons of carbonate ore from the same zone that the Wagner group mines operate in.
Compañia Andaluza de Minas, S.A.	Marquesada in Granada Province	In 1961 produced 531,000 tons of hematite ore for works at Aviles and for export.
Minas de Hierro del Conjuro, S.A.	Conjuro in Granada Province	In 1961 produced 239,000 tons of ore.
Compañia Minera de Sierra Menera	Sierra Menera in Provinces of Guadalajara and Teruel	In 1965 produced approximately 650,000 tons of limonite ore.

Pig Iron and Steel.—The record output of 3.52 million tons of crude steel was very near the estimated requirement (3.58 million tons) for 1965 under the Economic and Social Development Plan. However, imports of crude steel increased by 178 percent over those of 1964 to 1.4 million tons, and finished steel imports rose by 88.6 percent to 864,000 tons to meet the surges in consumption and stock building. Exports dropped to 17,000 tons of crude steel and less than 500 tons of finished steel.

New estimates of future consumption based on more and better data indicated that minimum national requirements for 1972 would reach 12.31 million tons of crude steel, and that objectives under the development plan and its Concerted Action Plan for the iron and steel industry would be further revised upward.

The status of principal expansion projects of the major iron and steel producers at the end of 1965 is shown below by companies.

Empresa Nacional Siderurgica, S.A., (ENSIDESA): The Aviles works were projected for an annual production of 2.8 million tons of crude steel to be achieved

[3] This compilation does not include iron ore recovered from lead-zinc and tin ores.

in three stages. The first stage was essentially complete when the Economic and Social Development Plan was inaugurated in 1964, at which time the Aviles works consisted of the following plants (with theoretical annual capacities): two blast furnaces (1,140,000 tons pig iron), five acid open hearth furnaces including three of 300 tons each and two of 225 tons each (820,000 tons of crude steel), a blooming mill (1 million tons of blooms and billets), a structural mill (310,000 tons rails), a heavy plate mill (600,000 tons) and a hot strip mill (550,000 tons).

Phase two includes works completed during 1965; or scheduled for completion during 1966 or 1967 as follows: Development and diversion of a part of the Narcea River to insure an adequate water supply for expanded projects at Aviles and Gijon (1965); installation[4] of oxygen injection equipment on the two 225-ton open hearth furnaces, thereby increasing open hearth steel capacity by 80,000 to 100,000 tons annually (1965); installation and inauguration of the first unit of a tonnage oxygen plant with a capacity of 6,000 cubic meters of oxygen and 5,600 cubic meters of nitrogen per hour[5] (1965); installation and inauguration of a tandem 4-stand cold reduction mill with an initial capacity of 300,000 tons of cold rolled strip annually (completed 1965—to be expanded to its maximum capacity of 800,000 tons annually by the end of 1972); two 680,000 ton per year blast furnaces (Nos. 3 and 4), one for completion in 1966 and one in 1967; a new oxygen steelworks with two 65 ton L–D (Linz-Donawitz) converters and one 1,200 ton mixer (1966); and a new slabbing mill (1967).

Phase three includes projects authorized but not yet started in 1965, but scheduled for completion by the end of 1972 as follows: A second Linz-Donawitz type oxygen steelworks with an annual capacity of 1 million tons, including an integrated continuous casting plant; and a semicontinuous hot strip mill with 1.5 million tons annual capacity.

A reestimate of the capacity of the completed Ensidesa works as a unit indicates a possible output of 3.36 million to 4.00 million tons of crude steel and the equivalent in finished steel.

Altos Hornos de Vizcaya, S.A.: In March 1965, Altos Hornos de Vizcaya, S.A., with the participation of the United States Steel Corporation, joined the Concerted Action Plan for the iron and steel industry and officially became a participant in the Economic and Social Development Plan. With credits of $7.5 million from U.S. Steel, and $72 million from the Spanish Government effective during the period 1964–1967, Altos Hornos agreed to continue its expansion and modernization program, started in 1960. New basic objectives were set at 2.1 million tons of crude steel output by the end of 1967 and 2.7 million tons by the end of 1972.

Steel output expansion would be accomplished by increasing production of the 2 year old Sestao L–D steelworks, consisting of two 35-ton converters. To these would be added two 60-ton converters, and a third 60-ton converter would be added later to replace the two smaller ones. This would increase the L–D steel capacity to about 1 million tons annually. The first of the larger converters, reported by the manufacturer to be 70 tons in capacity, was under construction at yearend and scheduled for completion during the latter part of 1966. Additional installations will include two continuous casting lines.

Completed at yearend, and put into operation early in 1966 at Ansio, near Baracaldo, was a new 66-inch, 5-stand semicontinuous hot strip mill with an initial annual capacity of 1.25 million tons, and the possibility for an increase to 2.2 million tons.

UNINSA (Union Siderurgicas Asturianas, S.A.): During 1965 plans were announced, and in March 1966 an agreement was signed under the Concerted Action Plan for the iron and steel industry, whereby UNINSA would be recapitalized to form Spain's third major integrated iron- and steel-producing company. UNINSA was formed in 1961 by the three small Austurian iron and steel companies, Sociedad Metalurgica Duro-Felguera, Sociedad Industrial Asturiana Santa Barbara, and Fabrica Mieres, with small integrated works at Duro-Felguera, Gijon, and Mieres, respectively, to construct and operate at Veriña near Gijon in Asturias province a 200,000-ton-per-year merchant mill.

---

[4] Erroneously reported as a new Siemans plant put into operation during 1964. Bureau of Mines Minerals Yearbook 1964, v. 4, 1966.
[5] At 0°C and 760 mm Hg pressure.

The 1965 plans and 1966 agreement involved a more or less complete merger of the three companies into UNINSA with a capital of $83.3 million, of which the founding companies will contribute 60 percent, the Spanish Government through INI 10 percent, Friedrich Krupp of West Germany 10 percent, and the remainder is to be subscribed by employees. Capital projects will involve an investment of about $285 million and include a new integrated L–D steelworks at Veriña, which will have an initial annual capacity of about 1.6 million tons of steel. Those existing works of the three companies that can be integrated into the operations of the new complex or operated independently as economic units will be retained. The others will be abandoned. However, the announced plans include additional heavy plate, structural, and bar mills.

Sociedad Anonima Basconia: In 1965, Sociedad Anonima Basconia announced plans to invest about $17 million in a new plant for the production of stainless steel cold-rolled strip at Besauri in Vizcaya province. In addition to its own steelworks at Basauri, S.A. Basconia operates jointly with Altos Hornos de Vizcaya at Echevarri in Vizcaya Province a cold sheet mill and tin plate installations.

Echevarria, S.A.: Echevarria, S.A., with small integrated iron and steelworks at Recalde and Santa Agueda in Vizcaya Province, announced a new expansion project which will include a steelworks at Besauri to produce 270,000 tons of special steel ingots and 30,000 tons of special steel forgings annually. Still in the planning stage was a project for an integrated L–D steelworks and rolling mills.

J.M. Astrain, S.A.: In September 1965 J.M. Astrain, S.A., commissioned an 80-ton electric furnace (Spain's largest) with an annual capacity of 150,000 tons of crude steel in Guipuzcoa Province. Also, it was reported that the firm would build a new works to produce 130,000 tons (Spain's normal requirements) of grain-oriented and nonoriented electric sheets annually, under a license agreement with the Armco Steel Corporation.

Union Cerrajera S.A.: Union Cerrajera S.A. put into service at its works in Mondragon in Guipuzcoa province two new 25-ton electric furnaces integrated with a two strand continuous-casting installation that can be expanded to three strands.

Lead and Zinc.—While the 1965 mine lead output changed little compared with that of 1964, zinc concentrate output dropped nearly 60 percent as the result of the loss of production from the Reocin mine due to flooding. By yearend this property had regained only partial production. Exports of lead, an important source of foreign exchange prior to 1964, dropped in 1965 to 343 tons; lead imports, insignificant or nil prior to 1964 jumped to 24,255 tons in 1965.

Exports of zinc, in concentrates and as metal, dropped by 89 percent and 44 percent, respectively, while imports rose to 53,334 tons of concentrates and 1,014 tons of metal in response to expansion requirements and lower domestic output.

Spain's production of lead and zinc ores came from a large number of deposits situated in 21 Provinces, of which Badajoz, Ciudad-Real, Cordoba, Jaen, Murcia and Santander contain major deposits with substantial production records. When the Economic and Social Plan was inaugurated, there were some 200 individual enterprises, each with its own organization, mines, and installations producing lead and/or zinc ores. However, despite total positive reserves estimated to contain at least 700,000 tons of recoverable lead, 750,000 tons of recoverable zinc, and possible reserves of double these amounts, there were only a few enterprises so physically or economically situated that they could survive international competition without some form of assistance. Some assistance has been made available through the Lead Syndicate Service Fund (Fondo del Servicio Syndicale del Plomo), which was designed to stabilize internal prices and at the same time, preserve a balance between production, foreign trade, and consumption.

Although smelting capacity of the 10 existing lead smelters (163,000 tons) was substantially in excess of the annual requirement of 111,000 tons of primary lead estimated under the development plan for 1967, many of these plants and much of the equipment was obsolete. Zinc smelter capacity, rated at about 60,000 tons of electrolytic zinc and 14,000 tons of fire-refined zinc, also considerably exceeded the projected 1967 domestic requirements of 56,000 tons.

Objectives of the development plan with regard to lead and zinc included the following:

1. Formulation of a national program for a more thorough investigation and delineation of ore deposits so that they can be rationally mined to exhaustion of the deposits.

2. Centralization, rationalization, and modernization of mining operations.

3. Reduction of the number of primary lead smelters and refineries to four plants, with minimum capacities of 20,000 to 30,000 tons of lead each, preferably distributed geographically with one in the Cartagena district, one in the Linares district, one on the north coast and one in the south.

4. Development of adequate zinc capacity to treat all domestically produced concentrates, thereby providing for exportation of all zinc as metal or products rather than any in the form of concentrates.

Mercury.—Preliminary data for 1965 show a total mercury output of 74,667 flasks, 5 percent below the record high of 1964. Since the output of mercury-bearing ores increased substantially, the decrease in metal output was due to the processing of lower grade ores.

Development and modernization of the Almaden mine in the Province of Ciudad Real continued toward the goal of 90,000 flasks annual capacity by the end of 1967. Other sources of mercury in Spain included mines in the provinces of Leon and Oviedo.

In Leon the Empresa Minas de Tarna, S.A., continued exploration and development at the Carmina mine in the Maraña zone at 1,750 meters (about 5,750 feet) above sea level. Production was started in 1963 and in 1964 amounted to 7,338 tons with an average mercury content of about 1.4 percent in the form of cinnabar. The ore was treated in a plant near Riaño, comprising three muffel furnaces of 50-kilograms capacity each. Continuous-mining operations were not possible owing to climatic conditions at the high elevation.

In Oviedo the Minas de la Soterrana continued recovery of mercury from the arseno pyrite-mercury mines at Lena and Mieres.

NONMETALS

Cement.—Portland cement output during 1965 increased 1.5 million tons. This reflected production from new installations that were completed under an expansion program calling for addition of 4.2 million tons to the country's portland cement capacity during 1965, and an additional 3.9 million tons during 1966. This would give Spain a total cement capacity of 17.3 million tons by the beginning of 1967. These projects involve the installations of 29 companies and include 8 new plants and 27 additions or other expansion projects.

Other important developments in the cement industry include the organization in 1964 of Asland Asociada to take over the Cordoba plants of La Compania General de Asfaltos y Portland Asland and to build at Cordoba a new plant with an annual capacity of 315,000 tons scheduled for completion early in 1966. During 1965 La Compania General de Asfaltos y Portland Asland transferred to Asland Asociada its

Table 6.—Spain: Production of mercury ores and metal

	1961	1962	1963	1964	1965 p
Ores, metric tons:					
Cinnabar:					
Almaden [1]	43,098	58,497	53,167	63,790	NA
Other	1,050	---	4,040	7,338	NA
Total	44,147	58,497	57,207	71,128	76,256
Complex	90,101	74,407	73,688	75,553	91,702
Total ore	134,248	132,904	130,895	146,681	167,958
Metal, 76 pound flasks:					
From cinnabar ores:					
Almaden	40,991	42,897	46,817	66,467	64,434
Other	58	353	1,310	3,452	2,169
Total	41,049	43,250	48,127	69,919	66,603
From complex ores	10,153	9,548	8,827	8,403	8,064
Total metal	51,202	r 52,798	56,954	r 78,322	r 74,667

p Preliminary. r Revised. NA Not available.

[1] Ore production figures from Estadistica Minera y Metalurgica for the Province of Ciudad Real differ slightly from the figures shown in the official report of the Almaden Mine.

plants in Badajoz and Barcelona that are scheduled for modernization. Participating in the ownership of Asland Asociada are La Compania General de Asfaltos y Portland Asland (40 percent), The Associated Portland Cement Manufacturers, Ltd., (40 percent), and the Banco de Desarrollo Economico (20 percent). Upon completion of current projects the company will become Spain's largest cement producer, with a capacity of about 1,850,000 tons of cement annually.

Fertilizer Materials.—During 1965 Abonos Sevilla S.A., a subsidiary of Union Espanolas Explosivos, inaugurated regular production from its new ammonium nitrate and mixed fertilizer plant at Sevilla. Initial annual capacity was reported at 96,000 tons of ammonium nitrate and 78,000 tons of complex fertilizers.

It was announced early in 1966 that INI would have the sole authority for the issuance of mining concessions in the Spanish Sahara phosphate field.

Pyrites.—Production of pyrites in 1965 remained essentially unchanged from that of 1964, although an annual increase of about 7 percent over the 1958–63 average of about 2,150,000 tons was foreseen during the 4-year development period. Existing capacities are considered adequate to meet the requirements envisaged under the development plan.

Sources of production by area and type for 1964 are shown below:

Table 7.—Spain: Production of pyrites, 1964, by area and type

(Metric tons)

	Huelva	Murcia	Santander	Sevilla	Source not shown	Total	Sulfur content
Pyrites:							
Mine production	1,668,873	---	---	90,813	---	1,759,686	837,281
Washed from stockpiles	---	---	---	---	51,799	51,799	24,350
Total	1,668,873	---	---	90,813	51,799	1,811,485	861,631
Cupriferous pyrites [1]	480,667	---	---	---	---	480,667	226,590
Byproduct from lead-zinc ores [1]	---	42,651	58,418	---	---	101,069	47,064
Total	2,149,540	42,651	58,418	90,813	51,799	2,393,221	1,135,285
Sulfur content [1]	1,021,189	18,372	28,692	42,682	24,350	1,135,285	---

[1] Does not include 240,909 tons of cupriferous pyrites produced at Rio Tinto and classified as porphyry copper ore, which was treated by the Orkla process to produce copper matte, elemental sulfur, and sulfuric acid. (See section on copper in text.)

At the end of 1962 pyrite reserves were estimated at 241.85 million tons, distributed as follows:

	Thousand metric tons
Huelva:	
Tharsis group (Compañia de Azufrey Cobre de Tharsis, S.A.)	128.95
Rio Tinto group (Compañia Española de Minas de Rio Tinto, S.A.)	82.00
Others	18.80
Total	229.75
Sevilla	11.10
All others	.50
Total	241.35

These reserves include cupriferous pyrites, which contain an estimated 530,000 tons of recoverable copper.

MINERAL FUELS

Coal.—Coal production resumed its normal rate following loss of production due to strikes in 1964. It was far short, however, of the demand level forecast for 1967 in the Economic and Social Development Plan—22.3 million tons.

Early in 1965 the Government released the Concerted Action Plan for the coal industry, which was designed to make Spain more self-sufficient in coal production.

The Spanish coal industry, like other extractive industries in Spain, through 1965 continued to be characterized by a large number of small producers, many poorly equipped and short of labor. There were 194 anthracite-producing companies of which 3 accounted for 30 percent of the

national production; 109 lignite producing companies, of which 6 accounted for 55 percent of the national production; 167 bituminous coal companies of which 23 accounted for 86 percent of the national production; and 103 companies producing coke and briquets. Forty percent of the fixed equipment in the mines was over 20 years old, and another 30 percent was between 10 and 20 years old.

The Concerted Action Plan outlines means of meeting the production levels forecast in the Development Plan and provides certain benefits for the firms agreeing to meet stipulated conditions. For example, to obtain benefits, a firm, or preferably, a group of firms acting in concord must increase production of salable coal by 20 percent within an agreed upon time, must achieve a certain fixed production per mine, clean the produced coal to meet ash content specifications, concentrate mining operations, and achieve a minimum annual production of 400,000 tons from new mines.

In return for accepting the stipulated conditions the companies may receive modcrate tax rebates for a 4-year period, credit up to 70 percent of the value of new equipment and 5 years amortization for such equipment, tariff duty reductions for imported new equipment not produced in Spain, state subvention of up to 50 percent of the cost of outside technical advice and assistance, and a special subsidy for nonamortized small workings abandoned as a result of adherence to the plan.

Coal companies were given 3 months from the date of publication of the order in which to indicate their interest in adhering to the Concerted Action Plan.

Early in 1966 it was announced that four Spanish companies having extensive coal-mining concessions in northern Spain had agreed to merge their holdings and undertake an ambitious program to modernize their coal production operations. When completed, the merger will represent the largest bituminous coal-mining complex in Spain.

The new firm will be known as Hulla y Energia del Noroeste, S.A. (HUNOSA). Under an 8-year development plan the association expects to reach a production of 5.3 million tons of washed coal per year. The firm also plans to construct two thermal powerplants of 310,000 kilowatts each to use coal not suitable for coking. Estimated investment for the entire project is $66.4 million. If the HUNOSA proposal is approved under the Concerted Action Plan, about 70 percent of the proposed investment could be financed through official credits.

The firms involved in the merger are Sociedad Hullera Española, S.A.; Sociedad Metalurgica Duro-Felguera; Fabrica de Mieres; and Sociedad Industrial Asturiana Santa Barbara. The latter three companies recently merged their iron and steel operations to form UNINSA. (See section on iron and steel).

Petroleum.—During 1965 Spain's imports of crude petroleum and refinery products increased by 7 percent to about 14 million tons, while consumption rose to nearly 12 million tons. At yearend, annual crude throughput capacity stood at about 16 million tons.

In the country's energy balance, petroleum surpassed coal for the first time, supplying 39.4 percent of the energy consumed compared with 36.5 percent for coal and 26.6 percent for hydroelectric power.[6]

During 1965, 30 exploratory wells were drilled in continental Spain, of which 18 were drilled by the American Overseas Petroleum Company (AMOSEAS)—Compania Arrendetaria del Monopolio de Petroles, S.A. (CAMPSA) partnership in the recently discovered Ayoluengo field. Of the total, 12 were producers, all in the Ayoluengo field, giving that field a potential production of more than 3,500 barrels per day. By mid-1966 the potential was estimated at 10,000 barrels per day.

With inauguration of the Puertellano refinery, Spain had the following plants on stream or under construction at the end of 1965:

[6] Petroleum Press Service. April 1966, p. 138.

Plant	Ownership	Location	Annual crude capacity thousand metric tons
On stream:			
Compañia Española de Petroleos, S.A. (CEPSA)	CEPSA 100 percent	Tenerife (Canary Islands)	6,000
Compañia Iberica Rafinadora de Petroleos S.A. (PETROLIBER)	Ministry of Finance 52 percent; Marathon Oil Company 24 percent; Spanish private interests 24 percent.	La Coruna	2,000
Rafineria de Petroleos de Escombreros S.A. (REPESA)	Institut Nacional Industria (INI) 52 percent; CEPSA 24 percent; Caltex Oil Company 24 percent.	Cartagena	6,000
Empresa Nacional "Calvo Sotelo" de Combustibles Liquidos y Lubricantes, S.A.	"Calvo Sotelo" 100 percent	Puertollano	2,000
Total on stream			16,000
Under construction or authorized:			
CEPSA	CEPSA 100 percent	Algeciras	2,000
Inversions Esso, S.A	Esso, S.A. 50 percent; Banco Credito de Espanol 50 percent.	Castellon de la Plana	3,000
Compañia de Española de Minas de Rio Tinto S.A	Rio Tinto 60 percent; Gulf Oil Corporation 40 percent.	Huelva	2,000

Source: Petroleum Press Service. V. 32, No. 2, Feb. 1965, p. 54.

The Mineral Industry of Sweden

By F. L. Klinger [1]

The Swedish mineral industry maintained a high level of activity in 1965. Foreign and domestic demand for the industry's products remained strong. Swedish producers continued to invest in new plants and equipment, in improvement of existing facilities, and in exploration and development of mineral resources. Technologic developments during the year included automation of underground haulage facilities at the country's largest iron mine, installation of new oxygen steelmaking plants, and a new process for direct reduction of iron ore. Additional ore reserves of iron and nonferrous metals were announced.

The main developments in the Swedish nonferrous metals industry in 1965 were decisions to mine the low-grade Aitik copper deposit near Gällivare, to expand existing plant capacities for aluminum smelting at Kubikenborg, and to expand existing capacity for metal semimanufactures at Finspång. Total ore output of the country's nonferrous mines was about 3 percent more than in 1964, but the metal content apparently declined.

In the fuels sector, extraction of petroleum from oil shale was being discontinued at Kvarntorp, but uranium extraction from this type of shale was started at Ranstad. Swedish petroleum refinery capacity was being doubled, and construction of a third nuclear powerplant was begun. Legislation concerning offshore exploration for oil and gas was expected in early 1966.

The Swedish economy appeared to be operating at near capacity. Unemployment was down to 0.5 percent; there was a shortage of both semiskilled and skilled labor, and the mining industry was recruiting men from Finland and other countries. There was a substantial growth of the electrical, mechanical, automotive, shipbuilding, and other metal-consuming industries in 1965.

Other developments affecting the mineral industry included increased wages and higher interest rates. Industrial wages increased 8 percent in 1965, and a similar increase was expected in 1966. The discount rate of the Riksbank (Bank of Sweden) was raised to 5.5 percent, the highest in 33 years, and interest rates of commercial and savings banks rose to 7 percent and higher.

Despite inflationary trends in the economy, the outlook for the mineral industry appeared to be good, although the rates of growth in production and investment were expected to decline.

PRODUCTION

The principal gains in production of the Swedish mineral industry in 1965 were registered in iron ore, iron and steel, nonmetallic construction materials, and petroleum products. Gross output of nonferrous metals was not much different from 1964, although individual metals showed appreciable gains. The production indices indicate the gain in volume as shown in the accompanying table.

[1] Physical scientist, Division of International Activities.

Industry sector	Production indices [1] (1959 = 100)			1965 indices, percent change	
	1963	1964	1965	1964	1963
Iron ore mines	131	148	164	+10.8	+25.1
Basic metals	144	166	183	+10.2	+27.0
Quarrying, clay, glass	134	153	167	+9.1	+24.6
Total mining and manufacturing	133	145	156	+7.5	+17.2

[1] Source: Statistiska Centralbyrån (Stockholm). Allmän Månadsstatistikk. No. 7, 1966, pp. 464–465.

The value of crude mineral production from Swedish mines and quarries in 1963, the last year for which relatively complete data were available, was estimated at $226 million. Metallic ores and concentrates accounted for 85 percent of the total value, nonmetals accounted for 13 percent and the remainder was made up by mineral fuels.

The principal products are indicated as follows:

Commodity	Value of 1963 output (million dollars) [1]
Metals:	
Iron ore and concentrate	160.4
Copper concentrate	12.2
Lead concentrate	10.5
Zinc concentrate	7.3
Tungsten concentrate	.8
Other ores and concentrates	.4
Total	191.6
Nonmetals:	
Limestone and dolomite (industrial)	7.2
Other stone, sand, and gravel	15.5
Pyrite concentrate	3.5
Clays	1.0
Feldspar, chalk, talc, and other	e 1.6
Total	28.8
Mineral fuels:	
Oil shale	e 2.5
Peat, including briquets	2.4
Coal	.4
Total	5.3
Grand total	225.7

e Estimate.

[1] Where necessary, values have been converted from Swedish crowns (Skr) to US dollars at the rate of Skr 1.00=US$0.193304.

Source: Statistiska Centralbyrån (Stockholm). Bergshantering-Berättelse för År 1963. 1965, pp. 48–74; also Industri 1963. 1965, pp. 106–111 and 260–263.

Table 1.—Sweden: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Unwrought, unalloyed, electrolytic	r 16,350	r 17,298	r 17,066	r 32,286	30,600
Semimanufactures [1]	36,115	41,698	46,422	e 50,000	e 48,000
Scrap	3,739	4,680	4,336	e 5,000	e 4,500
Arsenic, white	11,025	5,753	r 14,850	17,970	r 16,500
Bismuth	e 36	e 70	e 70	e 68	e 68
Cobalt	(2)	(2)	2	NA	NA
Copper:					
Ore and concentrate (20 to 24 percent copper):					
Gross weight	75,304	85,254	73,906	79,289	69,600
Metal content	18,186	19,091	r 16,692	r 16,190	e 14,600
Unrefined (cement), for sale	1,925	1,878	1,788	970	NA
Refined	36,606	41,232	45,404	45,652	50,500
Semimanufactures [1]	136,137	137,428	148,853	NA	NA
Scrap	16,318	14,875	23,221	NA	NA
Gold:					
Ore and concentrate, gross weight	52,129	76,741	59,365	61,340	44,200
Metal:					
Domestic production, thousand troy ounces	124	128	r 126	r 104	109
Toll production, for reexport, do.	47	51	41	57	e 45
Iron and steel:					
Iron ore:					
For direct use (60 percent iron), thousand tons	20,517	19,164	19,922	r 22,685	29,485
Concentrates (63 to 64 percent iron), do.	3,076	3,362	3,715	r 3,934	

See footnotes at end of table.

Table 1.—Sweden: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals—Continued					
Iron and steel—Continued					
Iron ore—Continued					
Roasted pyrite_____do____	298	308	267	e 275	e 300
Agglomerates (sinter and pellets) do____	3,460	3,607	3,676	4,323	NA
Slag, scale, and other waste_____do____	46	60	329	389	NA
Iron oxide and hydroxide_____	2,816	2,311	NA	NA	NA
Scrap (from foundries and steelworks) thousand tons__	1,235	1,280	1,422	3 1,432	NA
Pig iron_____do____	1,761	1,827	1,888	r 2,173	r 2,287
Sponge iron_____do____	156	159	137	152	176
Ferroalloys_____do____	135	136	133	140	151
Steel:					
Ingot:					
Ordinary steel___thousand tons__	2,585	2,724	2,976	3,278	3,432
Alloy steel_____do____	741	671	692	907	1,004
High-carbon steel_____do____	168	157	176	198	224
Castings_____do____	66	62	55	60	64
Semimanufactures:					
Bars and rods [4]_____do____	1,012	1,006	1,087	1,210	1,293
Sections_____do____	144	135	155	173	192
Plates and sheets_____do____	560	646	704	804	873
Strip, including wide strip_do____	177	220	300	384	421
Rails and accessories_____do____	85	92	98	69	70
Seamless tube_____do____	184	185	189	206	235
Forgings_____do____	106	103	92	101	113
Other, for sale_____do____	139	115	98	127	79
Total semimanufactures_do____	2,407	2,502	2,723	3,074	3,276
Lead:					
Ore and concentrate (including silver-bearing):					
Gross weight_____	87,372	94,481	102,689	91,948	NA
Lead content_____	63,973	67,786	r 71,026	r 67,470	66,500
Dust, pelletized_____	1	---	1	NA	4,200
Refined_____	39,022	39,645	40,763	r 40,353	e 40,300
Semimanufactures [1]_____	944	1,118	966	NA	NA
Oxide_____	5,501	5,647	6,704	NA	NA
Scrap_____	911	1,190	736	NA	NA
Manganese ore (14 to 17 percent manganese)___	16,662	3,318	7,317	5,944	25,900
Selenium_____	97	70	r 71	e 82	e 64
Silicon_____	4,348	6,014	8,155	7,260	NA
Silver:					
Domestic production thousand troy ounces__	r 3,900	r 3,334	r 2,776	r 2,858	e 3,884
Toll production, for reexport_____do____	144	133	104	143	
Tungsten:					
Concentrate:					
Gross weight_____	372	339	339	---	NA
Metal content_____	188	161	164	---	NA
Unwrought_____	68	99	90	NA	NA
Uranium oxide_____	e 9	e 9	e 9	e 9	e 18
Zinc:					
Ore and concentrate:					
Gross weight_____	142,523	146,003	147,753	140,176	142,400
Metal content_____	79,431	81,853	r 84,987	r 77,174	e 73,320
Clinker (70 to 75 percent zinc)_____	---	---	---	14,800	22,800
Oxide_____	4,162	3,929	3,722	NA	NA
Other, n.e.s.:					
Ores and concentrates__value, thousands__	$1,004	$385	$186	NA	NA
Ashes and residues, metal bearing_____	19	31	45	NA	NA
Alkali, alkaline earth, and rare-earth metals_____	---	8	9	NA	NA
Nonferrous metals____value, thousands__	$571	$390	$400	NA	NA
Nonmetals:					
Cement_____thousand tons__	r 3,085	r 3,108	r 3,306	3,567	3,719
Chalk, saleable_____	16,061	16,294	20,552	17,200	NA
Clay and clay construction materials:					
Clays:					
Kaolin, including washed kaolin_____	r 27,048	26,228	r 31,723	r 44,038	41,700
Refractory_____	157,629	204,432	188,381	167,473	154,500
Other ("klinkerlera")_____	50,127	84,871	98,118	100,705	NA
Construction materials:					
Refractory_____thousand tons__	175	186	191	NA	NA
Nonrefractory:					
Bricks and tiles___million units__	410	442	456	NA	NA
Other_____thousand tons__	200	203	189	NA	NA
Corundum (artificial)_____	1,542	1,381	441	NA	NA
Diatomite, including calcined, for sale_____	664	229	r 363	r 217	400

See footnotes at end of table.

Table 1.—Sweden: Production of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals—Continued					
Dolomite, including calcined	107,862	131,467	146,911	165,178	NA
Feldspar	56,764	54,204	45,641	r 51,777	47,000
Fertilizer materials:					
Crude, apatite concentrate [5]	77	198	1,168	NA	NA
Manufactured:					
Nitrogenous:					
Ammonia, anhydrous thousand tons	60	64	80	NA	NA
Other do	214	194	193	NA	NA
Phosphatic:					
Thomas slag do	36	34	30	e 30	e 20
Other do	509	558	517	NA	NA
Potassic	5	4	1	NA	NA
Other	505	557	609	NA	NA
Flint	60	60	60	---	NA
Fluorspar	3,213	r 3,497	r 2,951	NA	NA
Lime thousand tons	893	725	777	848	NA
Limestone do	6,684	6,839	6,845	7,864	8,521
Mica, ground	50	57	r 20	r 21	NA
Pyrite:					
Gross weight thousand tons	r 438	r 378	r 403	r 452	441
Sulfur content do	r 224	r 192	r 206	r 231	e 225
Quartz do	201	212	188	[6] 184	NA
Quartzite do	622	670	613	[6] 823	NA
Stone and gravel:					
Building and ornamental stone:					
Unworked:					
Granite, gneiss, etc. thousand tons	245	270	242	[6] 119	NA
Marble and other calcareous do	105	112	114	[6] 55	NA
Slate and shale [7] do	25	25	24	[6] 2	NA
Worked, all types do	223	222	231	237	NA
Crushed stone, including gravel [8] do	6,215	6,292	6,861	8,228	NA
Sulfur:					
Elemental (recovered from oil shale)	r 30,980	30,400	26,300	r 27,442	e 22,000
Sulfuric acid (100 percent) and oleum	420,913	447,300	474,461	510,000	NA
Talc and steatite	15,667	17,419	r 18,775	r 16,659	r 18,600
Other, n.e.s.:					
Slag and ash, including kelp	181,686	222,685	NA	NA	NA
Other	19,536	3,082	2,571	NA	NA
Mineral fuels:					
Bituminous shale (alum shale):					
For distillation thousand tons	3,173	3,225	3,098	3,225	
For fuel do	268	261	175	279	2,551
For other use do	15	16	18	24	
Coal do	200	148	r 99	84	59
Coke:					
Coke oven do	266	344	343	375	NA
Gashouse do	600	582	570	r 550	NA
Peat:					
Briquets do	62	43	61	NA	NA
Baled do	e 65	55	47	NA	NA
Petroleum:					
Crude (from shale) do	107	101	79	81	58
Refinery products:					
Gasoline [9] do	377	372	389	512	503
Kerosine do	6	6	5	3	3
Distillate fuel oil do	543	588	640	811	823
Residual fuel oil [9] do	1,167	1,152	1,290	1,645	1,769
Liquefied hydrocarbon gases do	28	28	37	40	
Lubricants do	147	158	163	563	687
Bitumen and other do	362	383	409		
Total refinery products do	2,630	2,687	2,933	3,574	3,785

e Estimate. r Revised. NA Not available.
[1] Including alloys.
[2] Less than ½ unit.
[3] Not including scrap from cold working operations.
[4] Including wire rod.
[5] Byproduct of iron ore concentration at Vitåfors.
[6] For sale.
[7] Not including bituminous shale.
[8] Not including tarmacadam.
[9] Including production from shale oil.

TRADE

Sweden's total trade in mineral commodities was valued at $1,824 million in 1965, an increase of 12 percent as compared with that of 1964. In value, exports increased 10.7 percent while imports rose 13.5 percent. The trade deficit for mineral commodities increased by $66 million in 1965, mainly because of increased imports of copper in all forms and of semimanufactures of iron and steel. However there were also increased imports of other nonferrous metals and nonmetallic commodities including fertilizer materials, sulfur, and refractory clay products. Imports of fuels continued to be the largest item in Swedish mineral commodity trade although their share of the total decreased in 1965. The general role of minerals in overall trade and the relative importance of major commodity groups are shown in the following tabulations in terms of value:

	Value (million dollars)		Mineral commodities share of all commodity trade (percent)
	Mineral commodities [1]	All commodities [2]	
Exports:			
1963	523.2	3,202	16.3
1964	630.9	3,672	17.2
1965	698.9	3,971	17.6
Imports:			
1963	869.9	3,389	25.7
1964	991.7	3,853	25.7
1965	1,125.6	4,376	25.7
Net balance:			
1963	−346.7	−187	XX
1964	−360.8	−181	XX
1965	−426.7	−405	XX

XX Not applicable.
[1] Excluding gold (unwrought and semimanufactures) and precious stones. In 1964, exports of gold were valued at $2.34 million and imports at $6.89 million; exports of precious stones were valued at $526,000 (diamond only) and imports at $2.66 million.
[2] Excluding gold.

	Value (million dollars)		Share of total mineral commodity trade (percent)	
	1964	1965	1964	1965
Export:				
Iron ore	210.3	218.4	33.3	31.2
Iron and steel:				
High-carbon and alloy steel [1]	166.2	196.5	26.3	28.1
Other [2]	126.4	125.7	20.0	18.0
Nonferrous metals:				
Copper	41.1	65.8	6.5	9.4
Other [3]	20.7	23.3	3.3	3.3
Lead and zinc ores	19.3	19.3	3.1	2.8
Petroleum products	16.3	16.3	2.6	2.3
Other	30.6	33.6	4.9	4.8
Import:				
Fuels:				
Petroleum and products	412.5	414.6	41.6	36.8
Solid fuels	66.9	57.5	6.7	5.1
Iron and steel [2]	218.2	261.3	22.0	23.2
Nonferrous metals:				
Copper	65.9	113.3	6.6	10.1
Other metals [3]	84.2	104.0	8.5	9.3
Ores and concentrates [3]	32.8	43.8	3.3	3.9
Nonmetals [4]	79.2	93.6	7.9	8.3
Other	32.0	37.5	3.2	3.3

[1] Not including castings or forgings, tubes of bearing steel, or pipe blanks of stainless steel.
[2] Including scrap.
[3] Including alumina.
[4] Includes manufactured fertilizers, cement, brick, and other commodities under Sections 27 and 56, and Subgroups 661 and 662, Standard Industrial Trade Classification (S.I.T.C.) (Revised).

West Germany and the United Kingdom continued to be Sweden's principal trading partners for mineral commodities. Exports to West Germany were valued at $171 million and those to the United Kingdom were valued at $108 million. Iron ore accounted for about two thirds of each total, and iron and steel made up most of the remainder. Of the total value of exports, the European Economic Community (EEC) received 42.6 percent; the European Free Trade Association (EFTA), 33 percent; Belgium-Luxembourg 8.7 percent; United States 6.8 percent; and East Europe received 5 percent. Exports to Scandinavian countries amounted to 19.3 percent of the total.

Mineral commodity imports from the United Kingdom in 1965 were valued at $167 million and mainly consisted of petroleum products, iron and steel, nickel, copper, and clays. Imports from West Germany, valued at $131 million, mainly consisted of iron and steel, coke, copper, and other nonferrous metals. Imports from the EEC accounted for 31.7 percent of the total value, followed by the EFTA (27.5 percent), East Europe (9 percent); the Netherlands (8.1 percent), and the United States (5 percent). Imports from Scandinavian countries accounted for 12.8 percent.

Table 2.—Sweden: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum:				
Bauxite	313	265	400	All to West Germany.
Oxide and hydroxide [1]	14	12	NA	West Germany 5.
Scrap [2]	815	901	608	Denmark 451; West Germany 346.
Ingot [2]	509	2,148	1,792	West Germany 1,379; Denmark 406.
Semimanufactures	10,120	11,564	8,343	Denmark 3,678; Finland 3,569; Norway 2,154.
Antimony	40	35	NA	West Germany 32; Finland 3.
Arsenic:				
Elemental	303	350	NA	NA.
Trioxide	13,209	13,795	NA	NA. (1963: United Kingdom 7,519; United States 2,135).
Cadmium	1	2	NA	Finland 1; India 1.
Columbium	---	(3)	NA	All to United States.
Cobalt	4	9	NA	Belgium-Luxembourg 5; Cuba 2; Brazil 1.
Copper:				
Scrap	667	993	1,429	West Germany 675; United Kingdom 109; India 97.
Ingot [2]	18,980	12,030	20,099	France 4,124; Netherlands 3,790; West Germany 2,827.
Semimanufactures [2]	32,035	33,216	36,609	Denmark 9,098; United States 8,098; Norway 7,388.
Gold: [2 4]				
Unwrought and semimanufactures, troy ounces	64,300	64,300	NA	NA. (Denmark $324,000 value).
Sweepings, residues, etc., do	32,150	64,300	NA	Mainly to West Germany.
Iron and steel:				
Iron ore, thousand tons	20,255	24,357	24,461	West Germany 9,750; United Kingdom 5,899; Belgium-Luxembourg 5,618; Poland 666; France 490.
Roasted pyrite, do	231	346	424	United Kingdom 176; West Germany 166.
Slag, dross, scale, etc., do	46	81	113	United Kingdom 39; Finland 20; Norway 16.
Scrap, do	12	22	19	West Germany 15; Denmark 3.
Pig iron [5], including spiegeleisen, do	99	88	99	United States 14; West Germany 12; United Kingdom 11; Netherlands 9.
Ferroalloys, do	33	31	26	United Kingdom 13; West Germany 7; United States 5.
Ingots and other primary forms, do	105	121	101	United Kingdom 35; Israel 17; Denmark 15; West Germany 13; Finland 12.
Semimanufactures:				
Bars, rods, sections, do	226	305	287	West Germany 75; United Kingdom 54; United States 47; Denmark 25.
Plates and sheets, do	203	292	306	Denmark 69; Norway 66; West Germany 46; United Kingdom 30.
Hoop and strip, do	36	38	41	West Germany 7; Norway 5; United States 5.
Rails and accessories, do	44	26	30	Norway 15; Sudan 7; Denmark 2.
Wire, do	28	34	38	United States 6; West Germany 5; France 4; Finland 3.
Tubular products, do	152	159	160	U.S.S.R. 53; West Germany 21; United Kingdom 12.
Castings, do	1	1	2	Italy and Norway.
Total semimanufactures, do	690	855	864	

See footnotes at end of table.

Table 2.—Sweden: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals—Continued				
Iron and steel—Continued				
Iron oxide and hydroxide	113	125	NA	Switzerland 59.
Lead:				
Ore	42,049	49,057	41,469	West Germany 30,976; Belgium-Luxembourg 14,297; France 3,218.
Oxides	1,493	1,909	NA	NA. (1963: East Germany 710; Denmark 370; Finland 275).
Scrap [2]	173	242	161	Norway 197; Netherlands 43.
Unwrought [2]	14,165	8,293	9,159	Denmark 4,357; West Germany 1,806; Finland 1,090; Norway 1,031.
Semimanufactures [2]	27	19	26	Norway 6.
Magnesium (scrap)	173	240	266	West Germany 97; Norway 62; United States 53.
Manganese:				
Ore	1,311	590	24,888	Czechoslovakia 245; Yugoslavia 170.
Metal	70	131	NA	Norway 88; Italy 27; United Kingdom 10.
Mercury [4] 76-pound flasks	87	261	NA	Denmark 87; United Kingdom 58; Japan 58; Norway 29.
Molybdenum	8	10	NA	NA. (1963: U.S.S.R. 3; Hungary 2; United States 2; Italy 1).
Nickel:				
Ore	NA	2,153	NA	All to United Kingdom.
Scrap	56	75	334	United Kingdom 46; Netherlands 20; West Germany 9.
Unwrought [2]	9	---	72	
Semimanufactures	703	775	825	Denmark 110; United Kingdom 101; Norway 75; mainland China 71; United States 71.
Selenium	88	65	NA	NA.
Silicon	6,484	7,273	NA	West Germany 2,703; United Kingdom 2,009; East Germany 620.
Silver and platinum-group metals: [2]				
Sweepings, scrap, residues, etc	63	79	93	West Germany 60; United Kingdom 18.
Silver: [4]				
Unwrought thousand troy ounces		965		Denmark 739; Switzerland 450;
Semimanufactures do	1,511	675	965	West Germany 225; France 129.
Platinum-group metals value, thousands	$96	$171	$155	United Kingdom $71; Finland $60.
Tin: [2]				
Scrap long tons	37	22	25	Norway 15; United Kingdom 7.
Unwrought and semimanufactures do	126	135	159	Denmark 61; Finland 25; Netherlands 25; Norway 21.
Titanium:				
Ore	25	25	NA	All to Finland.
Dioxide	18	24	NA	Denmark 15; Finland 5.
Metal	4	8	NA	United Kingdom 5; West Germany 2.
Tungsten:				
Ore	18	226	34	India 91; United Kingdom 60; West Germany 45.
Oxides	---	23	NA	West Germany 22; Denmark 1.
Powder, wire, and other articles [2]	102	31	NA	West Germany 22.
Uranium and thorium [2]	5	4	1	All to Switzerland.
Other radioactive material value, thousands	$12	$72	NA	Denmark $47; Netherlands $20.
Vanadium pentoxide	4	30	NA	Denmark 15; United Kingdom 15.
Zinc:				
Ore	148,393	148,605	148,608	Belgium-Luxembourg 52,382; Norway 49,034; West Germany 42,937.
Oxides	960	474	NA	West Germany 216; Denmark 67; Norway 61.
Scrap	1,086	1,500	1,480	Norway 364; United Kingdom 356; Italy 238; Belgium-Luxembourg 147.
Unwrought and semimanufactures [2]	97	300	204	Japan 119; Norway 63; Pakistan 35.
Other materials, n.e.s.:				
Ores and concentrates	172	177	123	United States 57; Belgium-Luxembourg 25.
Nonferrous ashes and residues	6,426	14,001	68,917	Norway 6,236; Belgium-Luxembourg 3,956.
Oxides and hydroxides [6]	29	92	2,232	NA.
Base metals, including scrap	26	67	254	Canada 26; United States 23; Austria 10.

See footnotes at end of table.

Table 2.—Sweden: Exports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Nonmetals:				
Abrasives:				
Corundum (natural), pumice, and emery	44	53	60	Norway 33.
Corundum (synthetic)	688	715	NA	United States 189; France 155; Japan 134.
Diamonds, industrial value, thousands	$142	$189	$179	West Germany $165.
Dust and powder of gems, including synthetic, do.	$40	$6	NA	Finland $4.
Grinding stones	2,166	2,984	1,942	Cuba 1,365; West Germany 390; Denmark 353.
Asbestos:				
Crude fiber	54	136	NA	Netherlands 121.
Asbestos-cement manufactures	17,541	22,851	NA	West Germany 17,261; Denmark 4,814.
Cement	110,554	79,117	NA	NA (1963: United States 38,000; French Antilles 29,000; Liberia 19,400).
Chalk	3,179	4,700	3,068	Finland 2,600; Norway 1,056.
Clay and clay construction materials:				
Clay:				
Kaolin and bentonite	32	86	15,631	Finland 4,727; Norway 3,773; Denmark 2,773.
Refractory and other	6,412	13,712		
Clay construction materials:				
Refractory	22,309	21,194	24,215	Denmark 7,305; Norway 7,072.
Nonrefractory	26,663	31,691	31,836	Norway 10,915; Denmark 7,171.
Diamond, nonindustrial, unset value, thousands	$456	$526	NA	Finland $193; Denmark $99; Belgium-Luxembourg $86.
Diatomite and other siliceous earths	33	91	108	Italy 20; Denmark 19.
Dolomite, including calcine	3,836	4,443	3,721	Denmark 2,472; Norway 1,508.
Earth pigments	28	---	NA	
Feldspar	26,080	27,237	e 19,900	Netherlands 7,000; Belgium-Luxembourg 6,184; United Kingdom 4,288.
Fertilizer materials:				
Ammonia, anhydrous	102	105	NA	West Germany 104.
Phosphate rock	638	---	NA	
Manufactured fertilizers:				
Nitrogenous	10,751	18,599	24,859	Finland 7,465; United Kingdom 5,786; East Germany 4,970.
Thomas slag	6,820	22,522	20,352	Finland 11,381; East Germany 5,255; West Germany 5,218.
Other	78	126	121	Denmark 105.
Fluorspar	150	59	e 55	Finland 49.
Graphite	36	8	24	NA.
Gypsum and anhydrite, including calcine	235	8	13	NA.
Lime	5,722	6,340	NA	Norway 6,199.
Limestone, for flux, cement, etc	395,260	563,130	549,380	West Germany 292,494; Finland 221,927.
Magnesite, including calcine	193	159	205	Denmark 139.
Mica	6	9	26	NA.
Pyrite	14,055	21,242	13,218	All to United Kingdom.
Quartz and quartzite	73,031	85,745	80,968	Denmark 41,208; West Germany 28,142; United Kingdom 9,598.
Salt	1,245	33	1,378	NA.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	2,734	6,430	NA	NA.
Caustic potash	2,502	2,815	NA	Norway 975; Denmark 450.
Stone, sand and gravel:				
Dimension stone:				
Granite, gneiss	120,915	140,185	143,511	West Germany 90,529; Denmark 17,140; Netherlands 7,614.
Marble, bluestone, other calcareous stone	10,994	10,409	9,611	Denmark 8,925.
Slate	210	321	596	Denmark 108; United Kingdom 70.
Worked, all types	11,892	5,810	NA	West Germany 3,290; Denmark 859.
Gravel and other crushed stone	473,361	544,984	588,876	West Germany 429,770; Denmark 111,430.
Sand	31,549	28,392	39,342	Norway 11,875; Denmark 8,117; Finland 4,318.
Sulfur:				
Crude	139	152	201	Denmark 90.
Purified	51	40	NA	Netherlands 31.

See footnotes at end of table.

Table 2.—Sweden: Exports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Nonmetals—Continued				
Sulfur—Continued				
Sulfuric acid, including sulfur dioxide	7,963	11,134	NA	Finland 9,315; Norway 1,016.
Talc and steatite	1,458	4,197	5,080	United Kingdom 2,460; Denmark 778.
Miscellaneous materials, n.e.s.:				
Chemical elements	4,926	1,277	[7] 11,104	Norway 649; Switzerland 442.
Hydrogen and rare gases value, thousands	$24	$38	$39	Venezuela $21.
Inorganic acids and oxygen compounds of nonmetals or metalloids	10,986	11,999	[8] 57,523	NA.
Inorganic bases	---	---	[9] 7,161	
Other mineral materials	646	1,655	1,204	Denmark 1,088; West Germany 312; Finland 207.
Slag and ash, including kelp	1,822	3,544	2,375	Denmark 1,832; West Germany 1,712.
Mineral fuels:				
Asphalt and bitumen, natural	43	26	NA	NA.
Carbon black	21	79	NA	Norway 44; Netherlands 20.
Coal	22,919	6,959	2,810	Denmark 6,254.
Coal derivatives	17,461	11,994	17,015	Netherlands 10,483.
Coke, including briquets	7,262	12,175	9,436	West Germany 10,041; Norway 1,292.
Peat, including briquets	6,778	8,662	8,310	Denmark 7,193; United States 1,350.
Petroleum refinery products:				
Gasoline	65,123	129,585	131,071	Denmark 69,223; Norway 55,137.
Kerosine	7,570	6,556	7,901	Norway 4,217.
Distillate fuel oil	65,973	60,156	69,065	Norway 43,126; Denmark 17,030.
Residual fuel oil	38,567	74,051	70,462	Denmark 62,548; Norway 10,448.
Lubricants, including grease	42,059	45,249	45,208	Finland 18,529; Norway 10,651; Denmark 6,033.
Other, including gases	[r] 36,945	47,416	50,568	Denmark 29,881; Norway 8,020; Finland 5,856.
Total	256,237	363,013	374,275	Denmark 184,715; Norway 131,930; Finland 29,451.
International bunkers:				
Distillate fuel oil thousand tons	244	226	248	
Residual fuel oil ---do---	520	587	602	

[e] Estimate. [r] Revised. NA Not available.
[1] Not including synthetic corundum.
[2] Including alloys.
[3] Less than ½ unit.
[4] Estimated from quantities reported in metric tons.
[5] Includes cast iron, and shot, grit, sponge, etc. of iron steel.
[6] Includes oxides of lead, zinc, and other metallic oxides comprising Subgroup 513.5, S.I.T.C. (Revised).
[7] Includes silicon, arsenic, selenium, mercury, chlorine, and other elements comprising Subgroup 513.2, S.I.T.C. (Revised).
[8] Includes arsenic trioxide and sulfuric acid.
[9] Includes oxides and hydroxides of aluminum, copper, vanadium, tungsten, and other metals under Subgroup 513.6, S.I.T.C. (Revised).

Table 3.—Sweden: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum:				
Bauxite	13,790	31,351	22,988	Greece 25,086; British Guiana 3,107.
Oxide and hydroxide [1]	39,115	68,282	70,954	Jamaica 60,863; West Germany 6,988.
Scrap [2]	323	114	NA	U.S.S.R. 92; Denmark 20.
Ingot [2]	36,696	25,273	27,252	Norway 7,822; Canada 5,643; Switzerland 2,431.
Semimanufactures [2]	14,857	20,148	19,015	Belgium-Luxembourg 4,609; United Kingdom 2,812; West Germany 2,507.
Antimony	446	426	NA	Mainland China 225; U.S.S.R. 80; Czechoslovakia 51.

See footnotes at end of table.

Table 3.—Sweden: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Cadmium	188	142	NA	Norway 67; Belgium-Luxembourg 25; Peru 24.
Chromium:				
Ore	115,155	152,055	141,471	U.S.S.R. 70,284; Turkey 33,158; Yugoslavia 21,515.
Oxide	1,016	1,303	1,594	West Germany 1,023; United Kingdom 139.
Metal	107	165	NA	United Kingdom 143.
Cobalt:				
Oxide and hydroxide	8	4	6	Belgium-Luxembourg 3.
Metal	132	237	NA	Belgium-Luxembourg 216.
Copper:				
Ore	78,800	66,966	76,909	Chile 22,583; Canada 19,449; Finland 11,049.
Matte	7,347	10,824	8,431	France 9,443; Belgium-Luxembourg 1,381.
Cuprous oxide	91	105	NA	West Germany 71; Norway 27.
Scrap	3,225	4,691	10,400	United States 1,672; France 910; Norway 738; Denmark 643.
Unwrought [2]	r 68,798	62,342	69,577	Chile 21,883; N. Rhodesia 14,020; Belgium - Luxembourg 10,129; United States 5,231.
Semimanufactures [2]	12,554	18,050	35,294	Finland 4,781; West Germany 3,439; Belgium - Luxembourg 2,223; Austria 2,194.
Gold:				
Ore	2,167	646	NA	All from Bulgaria.
Scrap, residues, etc. value, thousand dollars	$64	$68	NA	All from Denmark.
Unwrought and partly worked [2] troy ounces [3]	225,000	418,000	NA	Mostly from United Kingdom.
Iron and steel:				
Iron ore	2,038	72,120	172,116	Liberia 57,515; Denmark 14,548.
Pyrite cinder	15,371	9,617	19,603	Norway 6,899; Morocco 2,218.
Slag, dross, scale from manufacture of iron or steel	13,028	25,157	17,551	France 13,985; United Kingdom 11,172.
Iron oxide and hydroxide	4,624	5,524	5,928	West Germany 4,634; Spain 520.
Scrap	123,001	239,461	248,268	United States 119,638; United Kingdom 73,722; Portugal 19,443.
Pig iron [4]	192,474	233,760	341,602	U.S.S.R. 89,663; Finland 89,591; West Germany 25,103.
Ferroalloys	r 36,065	39,651	69,432	Norway 23,195; U.S.S.R. 5,612; France 3,136.
Ingots and other primary forms [2]	6,972	5,864	24,001	Finland 2,075; Norway 1,943; West Germany 1,289.
Semimanufactures: [2]				
Bars, rods, sections	224,232	323,737	358,760	Belgium-Luxembourg 91,275; West Germany 79,718; France 58,052; Norway 20,826; Czechoslovakia 18,566.
Universals, plates, sheets	568,229	663,491	734,318	United Kingdom 149,462; West Germany 114,458; Belgium-Luxembourg 106,694; France 67,063; Netherlands 56,373; Denmark 49,221.
Hoop and strip	45,616	52,515	65,552	Belgium-Luxembourg 16,618; West Germany 10,174; United Kingdom 8,702.
Rails and accessories	r 5,179	4,102	5,025	West Germany 2,743; United Kingdom 674.
Wire	9,930	14,316	17,067	United Kingdom 6,779; Belgium-Luxembourg 3,028; West Germany 2,222.
Tube, pipe and fittings	142,546	175,973	204,408	West Germany 67,873; France 34,625; United Kingdom 23,869.
Castings and forgings, unworked	2,556	3,388	5,566	Poland 2,682.
Total semimanufactures	998,288	1,237,522	1,390,696	
Lead: [2]				
Oxide	1,296	1,503	2,232	United Kingdom 639; Poland 460; West Germany 196.
Scrap	593	416	666	All from Norway.
Unwrought	8,213	7,175	7,668	Peru 3,253; Mexico 1,905; Belgium-Luxembourg 814; Denmark 523.

See footnotes at end of table.

Table 3.—Sweden: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Lead—Continued				
Semimanufactures	2,071	2,195	2,005	Belgium-Luxembourg 969; West Germany 648; Norway 354.
Magnesium: [2]				
Unwrought, including scrap	498	591	478	Norway 470; United Kingdom 81; Canada 29.
Semimanufactures	76	40	63	West Germany 18; United States 12.
Manganese:				
Ore	77,373	56,985	95,975	U.S.S.R. 31,233; India 21,602.
Oxide	332	243	494	Japan 200; Netherlands 30.
Metal	1,133	1,138	NA	Republic of South Africa 787; U.S.S.R. 117; Norway 114.
Mercury—76-pound flasks	4,061	1,827	2,118	Italy 841; Spain 638; United Kingdom 174.
Molybdenum:				
Ore and concentrate	2,332	3,071	e 3,000	United States 1,732; Chile 892; Norway 427.
Oxide	---	22	NA	All from Canada.
Metal, wrought and unwrought	23	71	45	United States 33; mainland China 20; West Germany 9.
Nickel:				
Matte	345	381	584	All from Canada.
Scrap	270	630	838	United States 415; Canada 67; United Kingdom 42.
Unwrought [2]	8,587	11,784	13,184	Norway 5,669; Canada 2,937; United Kingdom 2,739.
Semimanufactures [2]	983	828	795	United Kingdom 504; West Germany 105; Norway 92.
Selenium	1	10	NA	Norway 5; Italy 4.
Silicon	18	8	NA	West Germany 7.
Silver and platinum-group metals:				
Ore and concentrate	---	---	2,242	
Residues and other waste	36	103	267	United States 65; France 24.
Silver:				
Unwrought and semimanufactures thousand troy ounces [2]	2,560	2,797	4,244	West Germany 1,286; United Kingdom 1,029; Switzerland 354.
Rolled, or other metal value, thousands	$210	$360	$583	West Germany $250; United Kingdom $110.
Platinum-group metals do	$892	$1,389	$1,533	United Kingdom $472; United States $428; West Germany $423.
Tin:				
Oxide—long tons	67	71	67	United Kingdom 55; West Germany 16.
Unwrought, including scrap [2] do	781	792	1,291	United Kingdom 295; mainland China 230; Malaysia 215.
Semimanufactures [2]—do	115	107	104	United Kingdom 73.
Titanium:				
Ore	3,670	3,474	e 3,500	Australia 3,147.
Dioxide	12,688	13,358	9,803	West Germany 4,773; United Kingdom 2,294; Finland 2,059; Japan 1,918.
Metal	61	90	NA	United Kingdom 67; United States 17.
Tungsten:				
Ore	1,297	1,306	1,881	Canada 828; South Korea 161; U.S.S.R. 120; mainland China 113.
Oxide	72	44	NA	West Germany 38; United Kingdom 5.
Metal	69	95	133	West Germany 65; France 18; South Korea 9.
Uranium and thorium [2] value, thousands	$345	$1,282	$47	All from United States.
Other radioactive materials	12	20	NA	United Kingdom 8; Norway 3.
Vanadium pentoxide	545	527	NA	Finland 425; Republic of South Africa 71; West Germany 30.
Zinc:				
Ore	---	---	496	
Oxide	3,598	3,409	3,509	West Germany 1,312; Netherlands 873; Poland 604.
Scrap [2]	56	62	73	Norway 42; Denmark 19.
Dust (blue powder)	168	120	135	United Kingdom 63; Norway 43.

See footnotes at end of table.

Table 3.—Sweden: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Zinc—Continued				
Unwrought [2]	28,017	29,097	35,783	Norway 15,070; Poland 5,207; U.S.S.R. 3,551.
Semimanufactures [2]	1,134	1,523	1,540	West Germany 675; Belgium-Luxembourg 437; Poland 341.
Zirconium ore [5]	1,273	1,191	e 1,554	Australia 1,096.
Other, n.e.s.:				
Nonferrous ores and concentrates	675	100	224	All from mainland China.
Metalliferous ash and waste	10,688	12,680	40,018	France 4,272; West Germany 3,106; Denmark 1,331; Norway 1,258.
Oxides, hydroxides, and peroxides:				
Of strontium, barium, and magnesium	2,328	4,507	5,201	Netherlands 3,911.
Other [6]	382	378	1,579	West Germany 161; United Kingdom 115.
Alkali, alkaline earth, and rare earth metals	14	35	12	West Germany 28; United Kingdom 7.
Nonferrous metals	34	59	2,025	Netherlands 14; United States 13; West Germany 9.
Pyrophoric alloys	4	3	6	United States 1; Austria 1.
Nonmetals:				
Abrasives:				
Corundum:				
Natural, including emery and pumice	1,325	1,209	1,164	Italy 408; Greece 335; Netherlands 223.
Synthetic	3,681	4,524	e 5,762	West Germany 1,727; United States 1,379.
Grinding stones	2,984	3,703	3,727	United Kingdom 1,760; Austria 645.
Silicon carbide	3,548	3,930	NA	Norway 2,921; West Germany 691.
Asbestos:				
Crude	15,624	19,758	21,162	Canada 8,011; Southern Rhodesia 4,096; U.S.S.R. 3,770.
Asbestos cement products	16,945	13,729	12,731	Belgium-Luxembourg 6,127; West Germany 3,212.
Other manufactures (non-friction)	2,861	2,762	NA	United Kingdom 1,435; Finland 517.
Barite, including witherite	1,294	1,670	1,878	West Germany 1,642.
Borates, natural	1,018	1,568	2,458	All from United States.
Boric oxide and boric acid	435	435	549	France 232; United States 144.
Cement	19,605	16,124	37,253	Denmark 14,050.
Chalk	10,868	9,871	10,863	Denmark 8,756; France 753.
Clay and clay products:				
Clay:				
Bentonite	2,161	5,900	229,371	United States 3,901; Hungary 885.
Kaolin	r 138,617	162,370		United Kingdom 146,854; United States 7,814.
Refractory and other	46,867	51,938		United Kingdom 22,391; Czechoslovakia 13,297.
Clay construction materials:				
Refractory	54,702	70,627	90,528	West Germany 24,090; Austria 17,122.
Nonrefractory	170,910	170,856	136,992	Poland 67,528; Denmark 59,935.
Cryolite and chiolite, natural	501	1,209	1,178	All from Denmark.
Diamond and other precious, semiprecious stones:				
Diamond:				
Industrial				
value, thousands	$854	$790	$1,260	United Kingdom $407; Netherlands $172; United States $101.
Nonindustrial, unset do	$1,744	$2,032	NA	Belgium-Luxembourg $1,095; Netherlands $447; Israel $286.
Dust and powder of gems do	$345	$280	$291	West Germany $298; United Kingdom $218; Switzerland $118.
Other do	$638	$631	NA	
Diatomite and other siliceous earths	7,407	8,503	8,773	Denmark 4,059; United States 2,146; Hungary 1,948.
Dolomite, including calcine	20,365	31,687	27,883	Belgium-Luxembourg 15,908; Norway 14,940.
Earth pigments	337	287	258	France 119; West Germany 99.
Feldspar	318	312	e 2,400	All from Norway.

See footnotes at end of table.

Table 3.—Sweden: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Fertilizer materials:				
Crude:				
Phosphate rock	385,051	426,759	488,457	Morocco 320,469; U.S.S.R. 49,936; United States 27,124.
Sodium nitrate	24,100	30,391	33,517	All from Chile.
Manufactured:				
Ammonia, anhydrous	12,154	16,952	17,614	Norway 9,342; West Germany 5,696.
Nitrogenous	372,382	400,460	425,833	Norway 346,703; Netherlands 43,737.
Phosphatic	704	2,776	669	United States 2,743.
Potassic	158,773	176,457	194,587	East Germany 61,434; West Germany 51,906; France 35,443.
Other	6,103	9,048	34,371	West Germany 4,369; Norway 4,108.
Flint	3,402	4,126	NA	Denmark 3,384; France 687.
Fluorspar	10,698	11,197	e 21,400	Republic of South Africa 4,660; France 2,788; mainland China 1,100.
Graphite	924	911	939	West Germany 337; Austria 225; Norway 202.
Gypsum and anhydrite, including plaster	r 231,727	335,903	398,251	Poland 169,552; France 146,066.
Lime	9,208	15,884	17,391	Denmark 10,587; Finland 3,757.
Limestone for flux, cement, etc	50,107	76,191	88,360	United Kingdom 29,717; Denmark 25,210; Norway 20,070.
Magnesite, including calcine	6,830	9,352	7,998	Netherlands 4,619; Austria 2,322; United States 1,235.
Mica, all forms	1,215	1,103	1,269	Norway 604; United Kingdom 182; West Germany 93.
Pyrite, unroasted	63,932	29,937	82,709	Norway 28,985.
Quartz and quartzite	1,684	1,475	22,954	Norway 741; West Germany 350; Finland 305.
Salt	638,377	672,208	752,498	Netherlands 303,383; West Germany 158,056; United Kingdom 104,941.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	19,278	32,597	33,852	Netherlands 10,433; Norway 8,394; East Germany 4,488.
Caustic potash	957	800	1,365	West Germany 636.
Stone, sand and gravel:				
Dimension stone:				
Granite, gneiss, etc	2,459	3,649	4,781	Norway 3,166; United Kingdom 429.
Marble and other calcareous stone	4,131	5,432	6,423	Italy 3,585; Belgium-Luxembourg 1,010; U.S.S.R. 707.
Slate	10,200	7,272	7,546	Norway 4,447; West Germany 2,534.
Worked, all types	1,726	4,092	9,418	Portugal 1,875; Italy 1,082; Norway 442.
Gravel and crushed stone	15,692	54,210	17,960	Finland 40,133; Denmark 8,534.
Sand	155,161	175,870	235,227	Belgium - Luxembourg 117,987; Denmark 45,068.
Sulfur:				
Crude	85,734	127,780	159,493	France 63,977; United States 40,484; Poland 19,207.
Purified	239	329	256	West Germany 83; United Kingdom 74.
Sulfuric acid, including oleum	1,043	3,467	22,216	West Germany 3,417.
Dioxide	7,128	4,972	3,265	Norway 3,461; West Germany 1,510.
Talc and steatite	13,074	14,591	16,752	Norway 9,162; United States 2,691.
Other mineral substances	23,113	20,277	32,280	Norway 9,727; West Germany 4,868; East Germany 2,163.
Other substances, n.e.s.:				
Chemical elements [7]	2,629	3,204	2,078	Norway 3,200.
Hydrogen and rare gases value, thousands	$265	$295	$261	Norway $193.
Inorganic acids [8]	9,002	10,494	10,775	Norway 6,583; West Germany 1,707.
Mineral fuels:				
Asphalt and bitumen:				
Crude	694	935	1,037	United States 569; Trinidad 348.
Manufactures	2,078	1,883	2,946	West Germany 1,587.
Carbon black	16,708	21,350	22,312	Netherlands 8,416; United Kingdom 7,762; United States 2,098.

See footnotes at end of table.

Table 3.—Sweden: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Mineral fuels—Continued				
Coal, including briquets thousand tons	1,777	1,994	1,704	United States 902; Poland 411; U.S.S.R. 298; United Kingdom 265.
Coal derivatives	36,726	45,566	36,365	Belgium - Luxembourg 12,646; United Kingdom 10,071.
Coke—thousand tons	1,611	1,647	1,404	West Germany 898; United Kingdom 245; Czechoslovakia 153.
Lignite and peat, including briquets	16,220	5,644	2,685	West Germany 5,604.
Petroleum:				
Crude [9]—thousand tons	2,748	3,557	3,824	Venezuela 1,903; Saudi Arabia 578; Iran 514; Iraq 501.
Refinery products:				
Gasoline—do	2,013	2,240	2,424	United Kingdom 568; Netherlands 378; Bahrain 297; Norway 191.
Kerosine, white spirit, etc.—thousand tons	416	420	413	Netherlands 160; United Kingdom 113; Netherlands Antilles 58.
Distillate fuel oil—do	5,535	5,787	6,082	Netherlands 1,103; United Kingdom 1,066; Venezuela 1,055; Bahrain 512.
Residual fuel oil—do	5,293	5,837	6,206	U.S.S.R. 2,691; United Kingdom 1,138; Norway 531; Venezuela 459.
Lubricants, including grease—do	127	142	141	United States 61; United Kingdom 32; Netherlands 27.
Other, including liquefied gases—do	56	64	87	West Germany 12; United Kingdom 12; Netherlands Antilles 11.
Total refinery products do	13,440	14,490	15,353	U.S.S.R. 3,015; United Kingdom 2,929; Netherlands 1,976; Venezuela 1,607; Norway 1,005; Bahrain 861; Netherlands Antilles 694; Trinidad 579; Denmark 526; Italy 417.

e Estimate. r Revised. NA Not available.
[1] Excluding artificial corundum.
[2] Including alloys.
[3] Calculated from quantities reported in metric tons.
[4] Includes cast iron, spiegeleisen, and sponge, powder, and shot of iron or steel.
[5] Includes ores of vanadium and tantalum.
[6] Mostly compounds of vanadium, copper, and hydrazine under Subgroup 513.6, S.I.T.C. (revised).
[7] Mostly chlorine under Subgroup 513.2, S.I.T.C. (revised).
[8] Mostly nitric acid under Subgroup 513.3, S.I.T.C. (revised).
[9] Includes partly refined crude as follows: 72,000 tons in 1963, 61,000 tons in 1964, and 99,000 tons in 1965.

COMMODITY REVIEW

METALS

Metal production in Sweden continued to be dominated by a few large firms. Luossavaara-Kiirunavaara AB (LKAB) and Trafik AB Grängesberg-Oxelösund (TGO) accounted for approximately 90 percent of the nation's production of iron ore, while Bolidens Gruvaktiebolag (BGAB) accounted for an equally large proportion of the mine and smelter output of metals other than iron and aluminum. More than half of the nation's output of iron and steel was produced by TGO, Stora Kopparbergs Bergslags AB, and Norrbottens Järnverk AB, although AB Svenska Kullagerfabriken (SKF) and the Uddeholm, Avesta, Fagersta, and Sandviken companies were major producers of special steels. AB Svenska Metallverken (SM) continued to be the largest fabricator of nonferrous metals and the only producer of primary aluminum. The Swedish Government participated in the industry mainly through its 95.7-percent ownership of LKAB and 100-percent ownership of Norrbottens Järnverk AB.

Available information indicated that the sales volume of LKAB, TGO, and SM was approximately $200 million each in 1965,

while that of BGAB was $110 million. Partly because of many foreign subsidiaries, sales of the SKF Group in 1965 were $653 million, more than that of any other Swedish company.

Consumption of some important raw materials in the metal industry is shown in the following tabulation. A more detailed breakdown for the iron and steel industry is given on a subsequent page.

Commodity	Thousand metric tons			
	Iron and steel		Other metals	
	1963	1964	1963	1964
Alumina, including bauxite	(1)	(1)	36	62
Arsenic concentrate [2]	---	---	61	40
Chromite	110	125	---	---
Copper concentrate	---	---	109	134
Copper scrap	---	---	24	34
Iron ore and concentrate [3]	3,462	3,957	(1)	(1)
Iron and steel scrap	2,422	2,766	6	1
Lead concentrate	---	---	57	54
Manganese ore	59	61	(1)	1
Roasted pyrite	(1)	(1)	72	38
Lime, limestone, and dolomite	500	495	14	10
Quartz and quartzite	104	114	48	43
Refractory materials, including brick	97	105	2	2

[1] Less than ½ unit.
[2] A source of gold as well as arsenic.
[3] Including sinter and pellets.
Source: Statistiska Centralbyrån (Stockholm). Bergshantering-Berättelse för År 1963 and År 1964. 1965 and 1966, pp. 37–43.

Swedish domestic consumption of individual metals, as reported by the Organization for Economic Cooperation and Development (OECD) for the past 3 years, is as follows:

Metal	Thousand metric tons (unless otherwise specified)		
	1963	1964	1965
Steel, crude [1]	4,040.0	4,640.0	5,150.0
Other metals:			
Aluminum, primary	50.7	51.2	44.2
Copper, refined	96.0	96.6	95.3
Lead, refined [2]	51.2	54.9	52.5
Zinc	27.8	28.4	34.0
Nickel, refined	8.4	11.6	13.1
Tin, refined long tons	.6	.7	.8

[1] Apparent home consumption.
[2] Including lead content of antimonial lead.
Source: OECD (Paris). The Iron and Steel Industry in 1965 and Trends in 1966. 1966, Table 27, Statistical Annex. Also: The NonFerrous Metals Industry. 1966, pp. 11–16.

Aluminum.—Aluminum production in Sweden continued to be based entirely on imported raw materials. AB Svenska Metallverken was planning to expand the capacity of the Kristineborg smelter and of the Finspång rolling mill in 1965. Capacity of the smelter will be increased to 53,000 tons annually by 1968 at a cost of $12 million. This is the second 20,000-ton expansion program initiated by the company since 1962. The plant's 1965 capacity of 33,000 tons annually was reached in 1964. The smelter is operated by AB Svenska Aluminum-Kompaniet (SAKO), a subsidiary of SM.

Capacity of the Finspång mill was being doubled, to 70,000 tons annually. The company also decided to install a continuous casting plant, with an annual capacity of 10,000 tons. Other facilities recently built or expanded by SM include a plant for remelting alloys near Avesta, and a foil plant at Skultuna that had an annual capacity of 1,500 tons when it began operation in 1963. Aluminum accounted for more than half of SM sales in 1965.

Swedish imports of aluminum oxide and metal were valued at $36 million, about the same as in 1964. Jamaica and Norway continued to supply most of the alumina

and unwrought metal, while the main sources of semimanufactures were EEC countries and the United Kingdom.

The value of aluminum semimanufacture exports was $7.8 million less than in 1964. The decrease was mostly due to the reduced deliveries of bars and wire to Denmark and Norway and of flat products to Finland.

Copper.[2]—Rising copper prices were an important factor in the sharp rise in value of imports of that metal, as well as in the sales of the nation's principal producers; they also drew attention to a decline in mine output and stimulated reopening of old mines.

The increased output of refined copper in 1965 was derived mostly from imported concentrates. Domestic mine output declined despite higher metal prices and Swedish ores accounted for less than 25 percent of the metal produced. Concentrates produced by BGAB amounted to 66,000 tons as compared with 68,600 tons in 1964. Output of copper ore at Adak, mined by BGAB under a Government lease, was unchanged from the 1964 level.

Reymersholms Gamla Industri AB, recently acquired by BGAB, continued to recover copper from cupriferous pyrite at Oskarshamn. In central Sweden, Stora Kopparbergs Bergslags AB began opencast mining of copper ore at the old Tomtebo mine. The ore was processed at the company's Falun concentrator near Domnarvet.

In Norrbotten province, BGAB was preparing to develop the Aitik copper deposit. 65 kilimeters south of Gällivare. Opencast mining was scheduled to begin in 1968 at the rate of 2 million tons annually. The ore will be processed at the mine to about 32,000 tons of concentrate containing 28 percent copper. The Aitik deposit is estimated to contain 150 million tons of 0.5 percent copper ore, of which 30 million tons can be mined by opencast methods. Cost of the development was estimated at $15 million.

AB Svenska Metallverken was doubling the tube-making capacity of its Västeras plant to 20,000 tons annually, at a cost of $4 million. The company has also invested about $10 million over the last 10 years for production of thin strip at Finspång.

Imports of copper ore and metal, and exports of refined copper were increased substantially in 1965. Imports from Canada and Chile accounted for most of the increase in concentrates and metal, respectively, while shipments of refined copper to the United Kingdom increased by 8,800 tons. Domestic copper consumption in 1965 was distributed as follows: Wire and wire products (65 percent); tubular products (20 percent); flat products (10 percent); and rods (5 percent).[3]

Complex Nonferrous Ores.[4]—Most Swedish metal mines (other than iron ore mines) produce complex ores—ores containing sulfides or other minerals of two or more metals, as shown in the accompanying table. The only mines reported to produce single metals are at Adak (copper) and Laisvall (lead), although the Vassbo deposit is primarily lead ore, and the Aitik deposit is scheduled to produce only copper. Because Swedish sources usually do not report output of individual metals by mine, concentrator, or district, or the metal contents of "complex ore" reserves, these ores are described here as a separate group.

In 1965 BGAB continued to develop the Näsliden copper-lead-zinc deposit and to expand the Långdal mine. Production at Långdal, which is scheduled to replace that from the nearly exhausted Boliden mine, was expected to begin in 1967. Under a contract with the Swedish Board of Trade, the company also continued investigation of the Stekenjokk copper-zinc prospect near Vilhelmina in Norrbotten province. Exploratory drifting was underway from the 275-meter shaft completed in 1964. The Stekenjokk deposit was reported to contain 1.6 percent copper, 3.5 percent zinc, as well as silver and pyrite. The company decided to open new mines (or reopen old ones) at Rävliden, Rakkejaur (near Kristineberg), and Kankberg (near Boliden), but these developments wil take place gradually over the next 2 or 3 years. Deep-level investigations, which recently proved new reserves at the Renström, Kristineberg, and Saxberget mines, were also underway at Garpenberg. Total complex-ore reserves announced by the company in 1965 were 34 million tons; this estimate includes reserves of the Boliden and Långdal mines, but not those of the Rudtjebäck or Rakkejaur mines which are partly Government owned.

[2] For further information on ores containing copper, see Complex Nonferrous Ores.
[3] E&MJ Metal and Mineral Markets. V. 37, No. 43, Oct. 24, 1966.
[4] Further information will be found in the section titled "Lead and Zinc".

Table 4.—Sweden: Ore production of nonferrous metal mines 1963–64
(Quantities in metric tons)

Company Province Mine or field	Ore for concentration 1963	Ore for concentration 1964	Principal metals recovered (including pyrite)
Bolaget Vieille Montagne:			
Örebro:			
Åmmeberg	220,640	167,770	Lead and zinc.
Storag Kopparbergs Bergslags AB:			
Kopparberg:			
Falu	165,399	135,256	Lead, zinc, copper, pyrite.
AB Yxsjö Gruvor:			
Örebro:			
Yxsjöberg	92,183	---	Copper and tungsten.
AB Statsgruvor:			
Kopparberg:			
Stollberg	96,629	93,662	Lead, zinc, iron.[1]
Bolidens Gruv AB:			
Norrbotten:			
Laisvall	1,009,898	1,060,304	Lead.
Örebro:			
Ljusnaberg	30,487	29,990	Lead, zinc, copper, silver, gold, iron.[1]
Västerbotten:			
Renström	172,947	142,791	Lead, zinc, copper, silver, gold, arsenic, pyrite.
Boliden	144,240	133,700	Zinc, copper, gold, arsenic, pyrite.
Kristineberg	187,529	187,482	Zinc, copper, pyrite.
Rävliden	229,124	208,732	Lead, zinc, copper, pyrite.
Adak	251,490	250,698	Copper.
Rudtjebäck	197,170	260,207	Zinc, copper, pyrite.
Långsele	218,271	278,712	Lead, zinc, copper, pyrite.
Näsliden	4,207	11,139	Lead, zinc, copper, pyrite.
Kopparberg:			
Saxberget	101,212	100,714	Lead, zinc, copper, silver, iron.[1]
Garpenberg	228,753	235,540	Lead, zinc, copper, silver, gold.
Vassbo	190,457	194,828	Lead and zinc.
Svärdsjö	70,866	62,177	Lead, zinc, copper, silver.
Kalvbäck	128	---	Lead, zinc, copper, silver.
Total ore	3,611,630	3,553,702	

[1] Other than pyrite. Concentrates contain small quantities of other metals recovered at the respective mines.

Sources: Statistiska Centralbyrån (Stockholm). Bergshantering-Berättelse för År 1963 and År 1964, 1965 and 1966, pp. 57–65. Bolidens Gruvaktiebolag (Stockholm). Annual Reports for 1961 through 1965.

Most of the complex ores continued to be processed by BGAB in concentrators at Boliden, Kristineberg, Garpenberg, and Saxberget. The company also operated concentrators at Adak, Laisvall, and Vassbo.

Iron and Steel.—The productive capacity of the Swedish iron and steel industry continued to increase in 1965. Output and capacity were substantially increased in iron ore mining, processing, and shipping, as well as in metal reduction and processing plants. Output of high-carbon and alloy steel, traditionally a Swedish specialty, continued to rise and accounted for 26 percent of all steel produced.

Exports of iron ore and steel lagged behind production increases not only because of rising domestic demand but because of trade restrictions and increasing competition in foreign markets. The value of exports, however, was substantially higher than in 1964, reflecting increasing production of high-quality or specialized items. The latter trend was also indicated by planned investments which show increasing concentration on cold-rolling plants. Total investments in steelworks for 1964–65 amounted to $95 million, a 21-percent increase compared with that of 1963–64. A further increase of 10 percent was expected in 1966.

Swedish steel prices were generally below foreign steel prices, and in some cases were reportedly less than the cost of production. The industry regarded prices for ordinary steel and for cold-rolled stainless steel as particularly unfavorable during 1965, and at least moderate increases were expected for most items in 1966.

Oxygen steelmaking continued to increase, and output from Kaldo and Linz-Donawitz (L–D) converters was 42 percent greater than that of 1964. There was a drop of 22 percent in production of Thomas steel as four converters were dismantled at Domnarvet.

Total effective production capacity for iron and steel increased about 7 percent in

1965. Domestic consumption of finished steel increased 9 percent, to slightly more than 3.5 million tons.

Total employment (including salaried personnel) in the industry in 1964 was approximately 69,700, including 10,200 in iron mining operations. Mine employment decreased slightly in 1965, but there was an increase of about 800 employees in metal processing plants.

Iron Ore.—Iron ore output continued to increase in 1965 at an annual rate of more than 10 percent. The 2.8-million-ton gain was due largely to expanded operations by LKAB. The company's new Svappavaara opencast mine, 40 kilometers southeast of Kiruna, produced more than 1 million tons of ore in 1965 while increases of 750,000 tons and 450,000 tons were registered at Malmberget and Kiruna, respectively. Total output by LKAB was 22 million tons, including 5.24 million tons from Malmberget and about 500,000 tons from Luossavaara.

Production by the Grängesberg Co. totaled 2.89 million tons, of which 560,000 tons came from the Stråssa mine and the remainder from Grängesberg. Stråssa production included 26,000 tons of manganese ore which was mostly exported to Finland.

The remaining 12 percent of ore output was distributed among more than a dozen other companies, most of which reported production gains in 1965. The following table shows the distribution of iron ore production in 1963, by company and by grade of ore.

Table 5.—Sweden: Principal producers of iron ore, 1963

(Quantities in thousand metric tons)

Company Province Mine or plant:	Ore for direct use[1]		Ore for concentration		Concentrate produced		Total ore and concentrate
	Quantity	Iron content (percent)	Quantity processed	Iron content (percent)	Quantity	Iron content (percent)	
Luossavaara-Kiirunavaara AB							
Norbotten							
Kiirunavaara	[2] 12,584	56.7–68.2					
Gällivare (Malmberget)[3]	2,667	60.7	1,411	43.6–46.0	522	70.8–71.2	
					292	67.1	
					26	56.4	
Koskullskulle (Freja)	697	60.7–64.0	(3)				17,343
Luossavaara	[4] 555	60.0–65.8	---	---	---	---	
Trafik AB Grängesberg-Oxelösund							
Kopparberg							
Grängesberg	2,061	59.6–70.9	---	---			
Örebro					32	68.8	
Stråssa	---	---	1,012	34.2	445	63.2	2,538
Stora Kopparbergs Bergslags AB							
Kopparberg							
Blötberget	17	58.1	379	38	202	62	
Risberg	---	---	551	41.9	309	63.6	
Tuna Hästberg	---	---	264	25	[5] 90	41	
Vintjärn	---	---	91	37.3	49	66.8	713
Örebro							
Bredsjö	---	---	34	32–49	18	66.5	
Uppsala							
Ramhäll	---	---	109	21.8	28	63.7	
Tuolluvaara Gruv AB							
Norbotten							
Tuolluvaara	317	65.7–68.7	263	54.9	189	70.7	506
AB Statsgruvor							
Kopparberg							
Häksberg	---	---	545	34.0	227	62.5	
Intrånget	15	56.6	81	37.5	44	67–69.5	364
Stollberg	---	---	NA	16.6	[6] 14	63.8	
Västmanland							
Mimer; Eskilsback	---	---	158	34.9	64	63.8–68.8	
Norrbergs Grufförvaltning							
Västmanland							
Morberg; Norrberg	88	47.7					
Balsjö	---	---	523	33–34.7	214	61.8–65.5	328
Getback; Röberg; others	[7] 26	45.1					
Stripa Gruv AB							
Örebro							
Stripa	105	51.6	200	44	123	63.1	228

[1] Includes sorted, washed, and magnetically cleaned ore, not classified as concentrates.
[2] Not including 4,000 tons containing 22 percent iron and 2 percent phosphorus.
[3] Processed at Vitåfors. Concentrates shown do not include 1,168 tons of apatite concentrates.
[4] Not including 9,000 tons containing 44 to 50 percent iron and 2.4 to 3.6 percent phosphorus.
[5] Containing 4.3 percent manganese and 10.2 percent calcium silicate.
[6] Containing 0.32 percent zinc and 0.23 percent lead.
[7] Containing 4.5 percent manganese.

Source: Statistiska Centralbyrån (Stockholm). Bergshantering-Berättelse för År 1963. 1965, pp. 48–61.

Of total 1965 output, 24.5 million tons was exported, 3.8 million tons was sold on the domestic market, and 1.1 million tons was stockpiled. Total stocks on December 31 were about 4.3 million tons.

The high phosphorus content of most Swedish ores continued to have a depressing effect on export prices. Swedish producers were attempting to overcome this disadvantage by improving product quality and by installing the most modern equipment and methods to reduce unit costs. These efforts were increasingly evident in 1965, as several new concentrating and pelletizing plants were completed or under construction, and improved methods of mining and transportation were being installed.

The Svappavaara mine concentrator, completed in 1965, will furnish 1.5 million tons of concentrate annually to the Kiruna pelletizing plant which was also completed during the year. This raised LKAB's pelletizing capacity to 2 million tons annually. Total annual pelletizing capacity will increase to 3 million tons in 1967 as the output from Svappavaara reaches the scheduled level and a fourth shaft furnace is added to the Malmberget plant. At Stråssa, a second pelletizing unit, scheduled for completion in early 1966, will increase annual capacity to 500,000 tons. These and other projects should increase Sweden's output of iron ore agglomerates by at least 2 million tons by 1966. Consumption of raw materials by agglomerating plants and their output in 1964 were as follows:

Plant name or location	Raw material consumption (thousand metric tons)				
	Iron concentrates	Crushed lump ore	Mill scale	Slag, lime, and other	Product [1]
Domnarvet	850	1	34	178	1,006
Oxelösund	785	[2] 97	27	162	963
Norrbottens Järnverk	---	643	---	93	720
Vitåfors (Malmberget)	458	---	---	---	468
Fagersta	214	16	---	45	240
Hofors	231	---	1	21	237
Stråssa	213	---	---	---	220
Others	[3] 446	3	---	39	469
Total	3,197	760	62	538	4,323

[1] Includes roasted pyrite and purple ore.
[2] Includes 3,474 tons of manganese ore.
[3] Includes 6,153 tons of pellets.

Source: Statistiska Centralbyrån (Stockholm). Bergshantering-Berättelse för År 1964. May 1966; p. 66.

Automation of underground transport at Kiruna was continued by LKAB. The centralized traffic control (CTC) system on the 420-meter level was integrated with an IBM–1710 computer. The annual haulage capacity on this level increased to 11 million tons in 1965 and was expected to reach 20 million tons by 1970. In 1965, CTC networks included 19 kilometers of underground track at Kiruna and 40 kilometers at Malmberget, as well as the surface railways between Gällivare and Narvik and Grängesberg-Oxelösund. LKAB also planned to spend $34 million by 1969 in modernizing mining and transportation at Malmberget. Sublevel caving will be used, and rail transport on the 600-meter level will be replaced by trucks.

At Luleå, the Baltic seaport for Kiruna ore, the 13-kilometer deepwater channel was completed. The $42 million port can now accommodate fully loaded ships of up to 37,000 tons.

Scrap.—Consumption of iron and steel scrap in 1965 totaled 2.73 million tons, including 65,000 tons consumed in blast furnaces. Of the scrap used in steelmaking, nearly 60 percent was charged in electric furnaces, 35 percent in open hearth furnaces, and the remainder in oxygen converters.

Pig Iron, Ferroalloys and Steel.—Raw materials consumption and the basic production facilities of the Swedish iron and steel industry are shown in tables 6 and 7.

Table 6.—Sweden: Consumption of raw materials by sectors of the steel industry in 1964

(Thousand metric tons unless otherwise specified)

Raw material	Pig iron production	Ferroalloy production	Sponge iron production	Iron and steel ingots and castings production [1]	Total
Metals:					
Iron ore and concentrate	91	3	119	114	327
Sinter, including pellets	3,491	(2)	100	39	3,630
Other ores and concentrates of:					
Chromium	---	125	---	---	125
Manganese	4	57	---	---	61
Molybdenum tons	---	2,766	---	15	2,781
Tungsten do	---	342	---	7	349
Iron and steel scrap	65	11	---	2,690	2,766
Pig iron, including sponge iron	10	---	---	2,252	2,262
Ferroalloys	1	2	---	118	121
Other metals and chemicals	2	[3] 1	---	[4] 34	37
Nonmetals:					
Limestone, dolomite, including calcined	36	75	16	368	495
Fluorspar	1	(2)	---	10	11
Quartz and quartzite	(2)	91	---	22	113
Refractory materials, including brick	9	2	3	90	104
Mineral fuels:					
Coal	(2)	13	1	6	20
Coke	1,192	72	8	12	1,284
Liquid fuels	23	3	6	585	617

[1] Including hot rolled products and forgings.
[2] Less than ½ unit.
[3] Includes 490 tons of vanadium pentoxide and 455 tons of aluminum.
[4] Includes 13,447 tons of nickel, 978 tons of aluminum, 680 tons of manganese, 133 tons of chromium, and 107 tons of cobalt.

Source: Statistiska Centralbyrån (Stockholm). Bergshantering-Berättelse för År 1964. May 1966; pp. 38–43.

Table 7.—Sweden: Production units, capacity, and output of iron and steel, 1963–65

(Thousand metric tons unless otherwise specified)

Type of furnace or converter	1963			1964			1965		
	Number of units [1]	Capacity [1]	Output [2]	Number of units [1]	Capacity [1]	Output [2]	Number of units [1]	Capacity [1]	Output
Pig iron:									
Blast furnaces	16	2,017	1,712	16	2,175	1,976	16	2,345	2,086
Electric	7	186	122	6	194	136	5	159	136
Hot blast cupola	1	45	[3] 54	1	55	[3] 61	1	60	[3] 65
Total	24	[4] 2,088	1,888	23	[4] 2,294	2,173	22	[4] 2,464	2,287
Sponge iron furnaces	10	226	137	10	222	152	9	213	176
Steel:									
Bessemer converters:									
Acid [3]	1	10	---	1	10	---	1	10	---
Basic (Thomas)	7	760	446	7	760	457	3	200	373
Open hearth furnaces:									
Acid	17	468	354	16	466	419	17	490	464
Basic	21	1,008	879	21	1,114	1,002	21	1,166	1,058
Electric furnaces:									
Arc	66	1,670	1,542	68	1,791	1,674	65	1,678	1,628
Induction	38	199	137	38	194	170	39	202	173
L-D and Kaldo converters	5	617	541	6	936	721	8	1,716	1,028
Total	155	[4] 4,385	3,899	157	[4] 4,840	4,443	154	[4] 5,189	4,724

[1] At yearend.
[2] Under "Steel", individual outputs do not include production for duplex process.
[3] Synthetic pig iron, not otherwise defined. Presumably made mostly from scrap.
[4] Total effective capacity.

Sources: Järnverksföreningen (Stockholm). Svensk Järnstatistik. No. 1, 1966. Statistiska Centralbyrån (Stockholm). Bergshantering-Berättelse för År 1963. 1965, p. 33.

TGO produced 677,000 tons of pig iron in 1965. The Oxelösund works accounted for 637,000 tons and the remainder was produced at Guldsmedshyttan. In addition, 34,000 tons of sponge iron was also produced at Oxelösund. At the Guldsmedshyttan works, the blast furnace was shut down for three months while alterations were made to increase productive capacity. The plant produced 56,000 tons of pig iron in 1964, mostly from Stråssa ore pellets. A new casting shop, with a capacity of 15,000 tons of ingot molds annually, was also completed.

At the Domnarvet works of Stora Kopparbergs Bergslags AB (SKB), a new pig iron plant was completed in 1965. The plant has an output capacity of 40,000 tons annually and is the first commercial-size unit to employ the recently developed Stora-Dored direct reduction process, which produces low-phosphorus pig iron from high-phosphorus iron ore. Although fairly large quantities of oxygen are required, the process permits ore fines (about 100 mesh) to be used without prior agglomeration, and coke consumption is approximately 20 percent less than in blast furnaces.

Production of ferroalloys and the main producing companies in Sweden are shown in tables 8 and 9.

Table 8.—Sweden: Production of ferroalloys

(Metric tons)

	1962	1963	1964
Ferrosilicon	25,971	23,519	27,293
Ferrochromium	44,367	45,790	50,839
Ferrosilico-chrome	25,658	24,198	21,566
Ferromanganese	23,271	25,889	26,671
Ferrosilico-manganese	14,248	11,146	10,905
Ferromolybdenum	1,261	1,483	2,087
Ferrotungsten	527	241	211
Ferrovanadium	287	317	324
Ferrotitanium	61	---	---
Other	334	271	228
Total	135,985	132,854	140,124

Source: Statistiska Centralbyrån (Stockholm). Bergshantering-Berättelse för År 1963; År 1964. 1965; 1966; p. 32.

Table 9.—Sweden: Principal companies producing ferroalloys

Company Plant or location	Principal products	Remarks
AB Ferrolegeringar Trollhätan	Full range of ferroalloys	Largest Swedish producer. Ferrochromium capacity about 30,000 tons annually. Also produces silicon, cobalt, silico-zircon, other metals and alloys.
Wargöns AB Vargön Trollhätan	High- and low-carbon ferrochromium (total capacity 15,000–20,000 tons annually); ferromanganese; ferrosilicon.	Annual capacities: Vargön works 50,000 tons; Trollhätan works 15,000 tons.
Avesta Jernverks AB Avesta	Low-carbon ferrochromium (annual capacity 11,000–14,000 tons); ferromolybdenum; ferrotitanium; others.	
Uddeholms AB Hagfors	Low-carbon ferrochromium (annual capacity 4,000 tons); ferromolybdenum; ferrotitanium.	Also produces titanium and other metals.
Gullspångs Elektrokemiska AB Gullspång	Ferrosilicon; ferrotungsten; ferromolybdenum.	Also produces silicon.
Stockholms Superfosfat Fabriks AB Stockholm	do	Do.
Söderfors Bruk Söderfors	Ferrovanadium	Division of Stora Kopparbergs Bergslags AB.
Wikmanshytte Bruks AB Vikmanshyttan	Ferrotungsten	Also produces tungsten carbide and drill steel.

Two 80-ton oxygen (Kaldo) converters were added to the Domnarvet works in 1965. The new vessels replaced four 28-ton Thomas converters. By yearend, SKB's productive capacity for crude steel was approximately 1 million tons annually. The company was also installing a continuous casting machine at Domnarvet, for production of slabs up to 63 inches wide. The single-strand machine was scheduled for completion in 1966.

The Oxelösund works produced 658,000 tons of steel ingots in 1965 (590,000 tons in 1964). Three fourths of the output was produced by two 100-ton Kaldo converters. A third oxygen converter (Linz-Donawitz, 120-ton) was scheduled for installation by 1968. A continuous casting machine (single-strand, output capacity 350,000 tons of slabs annually) was ordered in 1965 for installation by late 1967.

Norrbottens Järnverk AB, a Government-owned company and Sweden's third largest producer of steel, reportedly sustained a financial loss in 1965 despite increased sales. The loss was attributed to higher operating costs, in part due to mechanical difficulties in the hot-strip mill at Luleå. Output capacity for crude steel at the Luleå works in 1965 was approximately 700,000 tons annually. A 60-ton Kaldo converter was added to the plant during 1964.

Production of special steels continued to increase in 1965, as shown by table 10.

Table 10.—Sweden: Production of special steels
(Thousand metric tons)

Type of steel	1963	1964	1965
Unalloyed, high carbon	176.0	198.2	223.8
Stainless	188.0	251.0	275.3
Heat-treatable, case-hardening, including spring steel	161.0	211.1	252.5
Tool steel	55.2	77.6	88.4
High-speed	6.6	10.5	15.8
Free-machining	9.6	9.4	9.4
Other alloy steel, including bearing steel	271.1	347.5	363.0
Total	867.5	1,105.3	1,228.2

Source: Järnverksföreningen (Stockholm). Svensk Järnstatistik. No. 1, 1966.

Columbium-steel plate continued to be TGO's main specialty product at Oxelösund. Although production figures were not available, an increasing quantity of this steel was being processed by the company's plate mill. The total output of heavy plate in 1965 was 388,000 tons.

Avesta Jernverks AB was the leading producer of stainless steel, with output of 90,000 tons. Nyby Bruks AB, which became a division of TGO in 1964, produced 53,000 tons of stainless steel and 26,000 tons of other steel ingots. A new hot rolling mill and an automatic argon-arc welding machine for stainless steel pipe were installed at Nyby in 1965, and a new continuous casting machine (annual capacity 25,000 tons) will be installed in 1966.

At Hellefors, AB Svenska Kullagerfabriken (SKF) began operating a 30-ton ladle furnace for vacuum degassing of steel. The degassing process, which will be used mainly for case-hardening steel, is a new one developed by SKF and Allmänna Svenska Elektriska Aktiebolaget (ASEA), a large Swedish manufacturer of electrical equipment. SKF continued to operate plants at Hofors, Göteborg, Katrineholm, and Bängbro, and expanded its foreign operations by opening a new plant in India and acquiring control of an Italian bearing-steel firm. The SKF Group included at least 12 manufacturing subsidiaries and 30 factories abroad, and total sales in 1965 amounted to $653 million.

In Swedish exports of special steel semimanufactures, bars and wire rod continued to be the largest volume items, while hoop and strip accounted for the largest value ($33 million). In finished products, exports of ball and roller bearings were valued at $44 million in 1965.

Lead and Zinc.[5]—Mine output of both metals was little changed from 1964 levels, with BGAB continuing to account for about 90 percent of the lead and for 60 percent of the zinc. The remaining production was distributed between Bolaget Vieille Montagne, Stora Kopparbergs Bergslags AB, and AB Statsgruvor. The latter firm, owned by the Government, increased its ore-processing capacity at Stollberg by

[5] For further information on ores of these metals, see Complex Nonferrous Ores.

60 percent in 1965, to 170,000 tons annually. BGAB also increased its production of lead dust and zinc clinker.

Mine output of both metals exceeded domestic consumption of crude metal. Most of the output of mine zinc continued to be exported for smelting, so that Sweden remained dependent upon imports to meet zinc metal needs.

The Laisvall mine continued to be the country's principal source of lead. Development of the Kautsky ore body, west of the mine, was nearly completed, and production was scheduled to begin early in 1966. This ore body, developed at a cost of about $2 million, will produce most of the ore mined at Laisvall after 1966.

Lead ore reserves in 1965 were reported by BGAB to total about 33 million tons. Most of this ore is at Laisvall and contains about 4 percent lead. The reserves also include ore at Vassbo in western Sweden and about 1 million tons of ore at Bellviksberg in Västerbotten. The company expected to begin opencast mining at Bellviksberg in 1969.

Expansion of the Långdal mine was continued in 1965, and production was expected to begin in 1967. The Långdal ore contains lead, zinc, pyrite and some silver.

NONMETALS

Cement and Other Construction Materials.—Production and apparent consumption of cement increased in 1965 as the construction industry maintained a high level of activity. The number of residential housing completions was 11 percent more than in 1964, but new housing starts were 4 percent less as the Government took several steps to reduce the volume of building activity. A 10-percent cut in Government construction was ordered in April; applications for $51 million worth of building starts in the Stockholm area were turned down; and other public and private construction projects were ordered postponed. Late in the year, the Government also announced plans to purchase Svenska Durox AB, a company which produces concrete construction materials and indirectly controls about 15 percent of the country's output of porous concrete products and 45 percent of the mineral wool insulation. The plan was regarded as an attempt to control rising prices of construction materials.

Apparent consumption of cement was 3,787,000 tons in 1965, an increase of 3.7 percent over that of 1964. Bulk deliveries comprised an estimated 78 percent of the total (75 percent in 1964) while the remainder was delivered in bags. The total productive capacity for cement apparently remained at 4.15 million tons annually, as no further increases were reported during 1965.

Quarry production of rough cut and crushed stone, including quartz and feldspar for 1964 is shown in the following tabulation:

County	Thousand metric tons				
	Granite and gneiss [1]	Sandstone, quartzite, and flint	Feldspar	Quartz	Limestone, dolomite, and marble
Stockholm [2]	904	---	14	---	528
Uppsala	333	---	---	---	---
Östergötland	445	15	1	4	12
Jönköping	436	---	---	---	---
Gotland	---	[3]	---	---	2,315
Kristianstad	856	---	4	---	1
Malmöhus	1,151	757	---	37	1,649
Göteborg-Bohus	1,735	---	---	---	---
Älvsborg	144	66	1	107	---
Skaraborg	257	33	---	---	2,133
Örebro	249	30	2	[3]	216
Västmanland	259	---	---	---	62
Kopparberg	448	---	---	5	38
Norrbotten	657	---	[3]	---	29
Others	387	1	---	15	1,046
Total	8,261	902	22	168	8,029

[1] Includes 610,000 tons of black and green granites and unspecified quantities of waste rock from mining operations.
[2] Including Stockholm city.
[3] Less than ½ unit.

Source: Statistiska Centralbyrån (Stockholm). Bergshantering-Berättelse för År 1964. May 1966; p. 68.

Pyrite and Sulfur.—Pyrite production remained close to the level of 1964, with BGAB continuing to produce 90 percent of the total output from its Kristineborg and Boliden concentrators. Additional sources of pyrite to be mined in the near future, included the Kankberg and Rakkejaur deposits. Exploration of the Udden (Kedträsk) deposit was to be resumed in 1966.

Two new sulfuric acid plants, each having an annual capacity of 175,000 tons, were completed at Rönnskar and Halsingborg in 1965.

Production of elemental sulfur from oil shale operations at Kvarntorp was not expected to continue through 1966, and an increase in imports seemed likely. Sweden's sulfur consumption was estimated to exceed 400,000 tons annually.

MINERAL FUELS

Coal and Coke.—Coal production reached a new low in 1965. The decline was expected to continue, because the country's only producer (Höganäs-Billesholms AB) planned to close the Nyvång mine in 1966. Most of the coal produced was probably of B grade, since the proportion of A and C grades[6] had fallen off sharply since 1963. The company used part of the output for its own operations and sold the remainder to local consumers. The total output amounted to less than 3 percent of Sweden's apparent domestic consumption and was insignificant in the total energy supply.

Coke production capacity was increased in 1965 by the addition of 28 coke ovens to the Oxelösund steelworks. The new facilities raised the plant capacity to about 475,000 tons annually. Production of coke-oven coke at Oxelösund in 1964 was about 95 percent of the national output.

Imports of coal in 1965, valued at $23 million, were 15 percent less than those in 1964. Purchases from the United States, the principal supplier, were reduced by 17 percent, and deliveries from the United Kingdom and West Germany were down 30 percent. The total quantity received from East Europe declined only slightly; purchases from the Soviet Union were increased by 163,000 tons, largely at the expense of Poland.

Imports of coke, valued at $34 million, also dropped about 15 percent in 1965. Imports from West Germany declined by 203,000 tons and those from the United Kingdom by about 60,000 tons. The total quantity purchased from East European countries rose slightly, but the total value was less than that in 1964, owing to 62,000 tons of low-priced coke received from Poland.

Consumption statistics for coal and coke, through 1964, are as follows:

[6] These grades are based on the following properties: Calorific value, in kilocalories per kilogram: A 4,800–5,600; B 3,900–4,600; C 2,700. Ash content, in percent: A up to 13; B 14–35; C 36–55.

Commodity and consumer	Thousand metric tons			
	1961	1962	1963	1964
Coal:				
Coking plants [1]	383	485	491	529
Gasworks	752	732	713	692
Industry [2]	595	536	515	630
Households, etc	176	148	145	131
Coal mines	83	78	63	44
Transportation	97	71	33	21
Thermal powerplants	39	7	28	---
Total	2,125	2,057	1,988	2,047
Coke-oven coke:				
Iron and steel industry [3]	1,266	1,238	1,178	1,417
Other industry	e 250	e 250	e 250	e 280
Transportation	16	15	16	13
Other consumers	445	536	537	428
Total	1,977	2,039	1,981	2,138

e Estimate.
[1] Annual figures include an estimated 50,000 tons consumed by the iron and steel industry, exclusive of cokeworks.
[2] Other than iron and steel.
[3] Including quantities transformed into blast furnace gas.
Source: O.E.C.D. (Paris). Basic Statistics of Energy 1950–64. 1966, pp. 267–269.

The reductions in imports may have been matched by decreased total consumption in 1965, although increasing consumption in the iron and steel industry and lack of information on stocks made this somewhat uncertain.

Petroleum.—Oil shale continued to be Sweden's only natural hydrocarbon resource. Production at the Kvarntorp plant of Svenska Skifferolje AB declined by 30 percent in 1965 and was expected to cease by 1967. Most of the state-owned facilities were sold to private interests in October and will be converted for cement manufacture. While the Kvarntorp operations produced considerable quantities of elemental sulfur as well as fuel oil, gasoline, liquefiable gases, and ammonia, extraction was expensive and continual government subsidy was necessary to maintain operations. The works provided employment for about 600 persons.

Oil and Gas Exploration.—Geophysical work by the Swedish Geological Survey reportedly indicated that the province of Skåne (southwest Sweden) and adjacent sea areas offer the best prospects for oil and gas exploration in Sweden. Other possibly favorable areas were indicated in the Baltic Sea, south of Gotland and between Sweden's east coast and the Åland Islands. Previously, both the Oljekonsumenterna (OK) cooperative and Axel Johnson and Co. had reportedly drilled unsuccessfully for oil on Gotland and off the east coast of the mainland.

Although Sweden has agreed in principle to the Geneva convention on claims to offshore resources, the Government wished to study the matter further before signing the convention. In 1965, proposed legislation on offshore resources was being circulated and was expected to be acted upon by the Riksdag in the spring of 1966. Discussions were also in progress concerning the formation of an all-Swedish exploration consortium composed of the OK, LKAB, and Johnson companies.

Crude Oil Imports.—Imports of crude and partly refined petroleum in 1965 increased by 7.5 percent and were valued at $61 million. Venezuela remained the principal supplying country, followed by Saudi Arabia and Iraq. Shipments from Iraq increased by 148,000 tons, which was approximately equal to the decline in deliveries from Iran. Imports of Nigerian crude oil (57,000 tons) were reported for the first time.

Refining.—Sweden's refineries were operated at near-maximum levels in 1965 as total throughput increased 7.5 percent to 4.1 million tons. New plants under construction at Gothenburg were expected to double the country's capacity by 1967; AB Svenska Shell was expanding capacity of the Koppartrans refinery to 4 million tons annually (an increase of 1.7 million tons) at an estimated cost of $23 million. The British Petroleum Co. (Svenska BP) was building a large refinery at Syrhaala at an estimated cost of $60 million. The Svenska BP refinery will have an initial capacity of 4 million tons annually. The Gothenburg projects require enlargement of harbor facilities to accommodate 100,000-ton tankers, and the city has already appropriated more than $5 million for the necessary improvements.

AB Nynäs-Petroleum continued to operate refineries at Nynäshamn (south of Stockholm), Malmö, and Gothenburg. The refineries have annual capacities of 1.5, 0.15, and 0.25 million tons, respectively.

Petroleum products continued to be the most important commodity group in Sweden's mineral trade. Net imports increased by 850,000 tons in 1965 and were valued at $337 million. Fuel oils accounted for about 75 percent of the increase in volume and gasoline accounted for the remainder. The increased shipments mainly originated from Trinidad-Tobago and the United Kingdom. The principal supplying countries continued to be the United Kingdom, the Soviet Union, and the Netherlands.

Consumption of petroleum products rose by 11 percent in 1965, with fuel oils registering the largest gains. Inland consumption statistics are as follows:

Product	Thousand metric tons		
	1963	1964	1965
Gasoline	1,905	2,119	2,332
Kerosine	266	259	272
Distillate fuel oil	5,406	5,779	6,505
Residual fuel oil	6,311	6,730	7,625
Other products	1,017	1,093	1,032
Total	14,905	15,980	17,766

Source: O.E.C.D. (Paris). Provisional Oil Statistics by Quarters—1st Quarter 1966. August, 1966; pp. 16–21.

Other products, not specified in the preceding tabulation, included (in 1964) 550,000 tons of aviation fuels; 50,000 tons of liquefied petroleum gases; and 377,000 tons of non-energy products.

Gasoline consumption increased at the same rate as in 1964, although taxes were increased by 5 öre per liter on July 1. The tax increase was countered to some extent by the principal marketing firms which reduced gasoline prices by 2 to 3 öre per liter; all firms, however, announced that they would stop granting discounts and cash rebates. Prior to the tax increase, the retail markup on gasoline was reportedly the highest in Europe.

Uranium and Atomic Energy.—The uranium mine and concentrator at Ranstad (near Skövde) was completed by AB Atomenergi in August and began producing concentrate in November. The plant is designed to produce 170 tons of 70-percent uranium concentrate annually from about 850,000 tons of shale. The shale contains about 0.03 percent uranium and is similar to that mined at Kvarntorp, where the company operated a pilot concentrator until 1962. Final processing of the Ranstad concentrate will be done at Stockholm, where the company produces uranium oxide fuel elements and other radioactive materials.

The Ågesta powerplant supplied 5 million kilowatt-hours of electricity during 1965 and the equivalent of 100 million kilowatt-hours in the form of district heating to the Stockholm suburb of Farsta. The State Power Board assumed responsibility for the Ågesta operation on September 1.

Construction of the Marviken boiling-water reactor was continued. The Marviken plant, 48 kilometers east of Norrköping, is scheduled for completion in 1968; it will have an initial capacity of 140 megawatts of electricity, which will increase to 200 megawatts when a superheat system is installed.

A third atomic power project was announced in mid-1965. Oskarshamnverkets Kraftgrupp AB, a group of public and private utility companies, has contracted for construction of a large powerplant at Simpevarp based on a boiling light-water reactor. The plant will have an output capacity of 400 megawatts of electricity and is scheduled for completion in 1970.

Electric Energy.—Production of electricity increased about 9 percent in 1965, to 49 billion kilowatt-hours. Hydroelectric plants accounted for about 95 percent of the total output although thermoelectric capacity was increasing. The total installed capacity of new plants scheduled for service in 1965 and 1966 was 984 megawatts, of which 60 percent was assigned to thermal plants. Hydroelectric capacity was expected to reach nearly 50 percent of the country's estimated potential by 1968.

Consumption of electric energy in 1965 amounted to 42 billion kilowatt-hours, of which mining and manufacturing accounted for 58 percent. Some statistics on production and industrial consumption of electric power are as follows:

	1962	1963	1964
Number of power stations	1,371	1,380	1,370
Installed generator capacity (megawatts):			
Hydroelectric	9,432	10,007	10,212
Thermal	2,744	3,014	3,097
Total	12,176	13,021	13,309
Production (million kilowatt-hours):			
Hydroelectric	39,099	37,908	43,093
Thermal	1,525	2,747	2,300
Total	40,624	40,655	45,393
Consumption (million kilowatt-hours):			
Mining industry	954	987	NA
Other industries:			
Iron and steel	3,981	3,942	NA
Other metals	804	889	NA
Metal manufacturing	2,286	2,368	NA
Nonmetallic mineral manufacturing	789	844	NA
Coal and petroleum products	119	178	NA
Chemicals	2,526	2,612	NA
Pulp and paper	8,399	8,032	NA
Other	1,881	1,949	NA
Total industrial consumption	21,739	21,801	NA

NA Not available.

Sources: Statistiska Centralbyrån (Stockholm). Statistisk Årsbok för Sverige, 1965, 524 pp.; also, Industri 1963. 1965, 434 pp.

The Mineral Industry of Switzerland

By Stephen C. Brown [1]

Swiss efforts to combat inflationary pressures through a combination of a tight money policy, restrictions on new industrial construction, and limitations on the importation of foreign workers proved effective in 1965. The rate of economic growth (in real terms) was cut back from 5 percent in 1964 to 4.3 percent in 1965, and the mineral industries with few exceptions showed significant declines in output.

The aluminum industry increased primary production by 4.5 percent, but the small steel industry only maintained its 1964 rate of output and the construction material industries (cement, lime, and slate) showed sharp declines in production. The independent Swiss petroleum refinery at Aigle (Raffineries du Rhône) continued to be in difficulties and at the end of the year it was reported that a group of international oil companies had made an offer to take it over. Trade in minerals expanded; imports rose in value by about 5.5 percent, and exports rose in value by 27 percent. These increases were accounted for chiefly by sharp increases in the value of exports of the nonferrous and precious metals and of precious stones and gem stones. However, the great imbalance between values of mineral imports and mineral exports remained, and imports were valued at more than three times mineral exports.

PRODUCTION

The 4.5-percent increase in primary aluminum output and a 24-percent rise in salt production were the only significant increases in mineral output recorded in 1965. Iron ore production increased slightly from the low level of 1964, but steel output remained at the same level. Building materials showed sharp declines, output of cement falling by 7 percent, and output of lime decreased 12 percent. A sharp decline in production of gas plant coke probably reflects declining demand for manufactured gas, for which output data are not available. Unofficial data for 1964 output of petroleum products show a total of 766,017 tons; 1965 data are not available.

[1] International economist, Division of International Activities.

Table 1.—Switzerland: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965 [p]
Metals:					
Aluminum	42,210	49,570	[r] 60,110	64,235	67,140
Copper, smelter	1,800	800	--------	--------	---------
Iron and steel:					
Iron ore—thousand tons	86	104	96	90	113
Pig iron—do	50	50	42	30	25
Ferroalloys (ferrosilicon)—do	4	5	2	2	2
Ingots and other equivalent primary forms—thousand tons	270	290	295	320	320
Castings—do	16	16	15	25	25
Nonmetals:					
Cement—thousand tons	3,601	3,726	3,581	4,322	4,039
Lime, hydraulic	185,666	192,601	184,426	200,041	176,585
Salt	157,277	167,943	190,716	181,571	225,761
Slate	751	450	458	422	317
Mineral fuels:					
Asphalt (export)	2,056	2,007	1,731	[r] 3,571	2,638
Coke, gas plant	479,743	496,322	527,980	469,159	335,000
Tar and pitch, gas plant	27,729	27,505	29,367	26,482	NA
Gas, manufactured—million cubic feet	12,155	12,717	12,357	11,994	NA
Petroleum refinery products:[2]					
Gasoline	---------	--------	[e] 17,000	184,397	273,000
Distillate fuel oils:					
Diesel	---------	--------	[e] 80,000	20,621	444,000
Light	---------	--------		276,887	
Middle	---------	--------		52,045	
Residual fuel oils	---------	--------	[e] 52,000	232,067	393,000

[p] Preliminary. [e] Estimate. [r] Revised.

[1] In addition to commodities listed, unreported quantities of several metals, including copper, magnesium, nickel, and zinc were produced from scrap. Building stone, limestone for cement, crushed rock, gypsum, coal briquets, and peat were also produced but output is not reported.

[2] The refinery of Raffineries du Rhône at Aigle, Switzerland's first oil refinery, went on stream in September 1963, but its output has not been officially reported. 1963 and 1965 are from Organization for Economic Cooperation and Development (OECD); data for 1964 are as reported by Petroleum Times, July 9, 1965, from the company's annual report. OECD also list other products as follows: 1963—15,000 tons, 1964—42,000 tons, 1965—none.

TRADE

In terms of value, both imports and exports of mineral commodities rose, the former by 5.5 percent and the latter by 27 percent. They also increased slightly their proportion of total trade, mineral imports rising to 19.8 percent of total imports in 1965 as compared with 19 percent in 1964, while mineral exports rose to 7.1 percent of total exports in 1965 as compared with 6.2 percent in 1964. Mineral imports valued at $726 million and mineral exports at $208.7 million left a deficit on mineral trade of $517.3 million as compared with a deficit on mineral account of $523.8 million in 1964, but as a proportion of the total trade deficit the mineral deficit rose to about 75 percent as compared with about 55 percent in 1964.

On the import side iron and steel ($224 million), petroleum and petroleum products ($193 million), and the nonferrous metals ($109.7 million) remained the chief items, with coal, coke, and briquets following ($37.9 million). Imports of precious metals and precious stones, including industrial diamonds and dust, rose by more than 10 percent to $81.4 million.

On the export side the chief items were aluminum and alloys ($34.9 million), metalliferous ores and scrap ($21.5 million), iron and steel ($20.7 million), and copper and alloys ($13.5 million). Exports of precious metals and precious gem stones, including industrial diamonds and dust, rose sharply from $68.2 million in 1964 to $92.5 million in 1965.

Table 2.—Switzerland: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum:				
Bauxite	50	5	--------	All to West Germany.
Alumina and aluminium hydroxide.	62	120	112	West Germany 41.
Metals and alloys:				
Scrap	2,710	4,475	3,232	West Germany 3,492; Italy 983.
Unwrought	15,468	14,692	16,186	West Germany 3,944; United Kingdom 3,050; Sweden 2,592.
Semimanufactures	17,112	20,229	22,889	Netherlands 2,943; Sweden 1,709; Austria 1,643; Denmark 1,325; West Germany 1,244.
Antimony metals, all forms	--------	2	--------	NA.
Cobalt oxides and hydroxides	2	2	3	All to France.
Copper:				
Matte	339	107	318	Italy 96.
Metal and alloys:				
Scrap	7,012	10,056	12,240	West Germany 7,533; Austria 1,250; Italy 450.
Unwrought	1,877	2,882	3,717	West Germany 1,516; Italy 1 127.
Semimanufactures	8,486	10,362	8,240	United States 5,004; Italy 1,222; Israel 622; West Germany 576.
Gold and alloys:				
Bullion and other unwrought.	344	497	839	West Germany 345; France 71; Philippines 43; Denmark 36.
Semimanufactures.[1]	37	63	60	Denmark 27; Philippines 16; Israel 6.
Iron and steel:				
Iron ore, including roasted pyrite.	89,929	63,639	96,833	West Germany 62,736.
Metal:				
Scrap	14,857	31,053	32,690	Italy 22,811; West Germany 5,718.
Pig iron[2]	1,060	505	496	West Germany 218; Denmark 76; Italy 63.
Ferroalloys	14,135	15,327	13,005	West Germany 12,103; Italy 1,765; Austria 1,236.
Ingots and equivalent forms.	142	r 138	1,469	NA.
Semimanufactures:				
Bars, rods, angles, shapes and sections.	r 13,826	r 11,071	28,028	West Germany 4,379; Italy 3,004; Austria 2,126.
Universals, plates and sheets.	869	981	1,647	West Germany 651; Austria 132.
Hoop and strip	1,131	1,129	1,234	Denmark 315; Austria 218; Italy 217.
Rails and railway track materials.	--------	101	492	West Germany 93.
Wire	3,232	3,676	4,257	Italy 1,012; France 603; Belgium-Luxembourg 531.
Pipes, tubes, and fittings.	21,701	30,643	34,158	United States 7,354; Denmark 2,889; Netherlands 2,783; France 2,223.
Rough castings and forgings.	105	104	113	Italy 49; West Germany 26.
Total	r 40,864	47,705	69,929	
Lead and alloys:				
Scrap	3,460	7,041	10,620	Italy 4,778; West Germany 1,712.
Unwrought	--------	868	350	West Germany 598; Austria 270.
Semimanufactures	108	85	135	Belgium-Luxembourg 26; Austria 20.
Magnesium and alloys, all forms	29	66	86	West Germany 43; Netherlands 18.
Manganese ore	--------	--------	4,801	
Mercury----76-pound flasks	--------	435	29	United States 400; Denmark 11; Austria 10.
Molybdenum, unwrought and semimanufactures.	1	4	1	Netherlands 3.
Nickel:				
Matte and speiss	--------	--------	13	
Metal and alloys:				
Scrap	478	589	802	France 167; West Germany 166; United Kingdom 90; Italy 88.
Semimanufactures:				
Anodes	321	265	193	France 158; West Germany 51.
Other	468	529	885	France 126; Netherlands 118; Italy 101.

See footnotes at end of table.

Table 2.—Switzerland: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals—Continued				
Platinum group metals, all forms. thousand troy ounces	42	69	66	Italy 18; France 10; Netherlands 9; Belgium-Luxembourg 7.
Silver and alloys:				
Ingots, bars, and equivalent forms. do	470	211	1,107	West Germany 157; France 27; Austria 21.
Semimanufactures [1] do	3,604	3,621	3,908	Italy 1,017; Germany 540; Denmark 536; France 392.
Silicon metal	2,263	3,083	3,630	West Germany 2,698; Belgium-Luxembourg 105; Yugoslavia 100; U.S.S.R. 100.
Tantalum and alloys, all forms. kilograms	1,688	1,939	4,414	United States 600; Poland 432; United Kingdom 261; West Germany 196.
Tin:				
Scrap long tons	165	132	134	West Germany 55; Netherlands 39; France 37.
Unwrought and semimanufactures do	54	59	69	West Germany 21; Netherlands 20; Austria 12.
Tungsten and alloys, all forms	14	23	32	West Germany 21.
Zinc and alloys:				
Scrap and dust	1,017	1,033	937	Italy 933.
Unwrought	112	301	161	Italy 300.
Semimanufactures	17	12	5	France 2; Rumania 2.
Other metals:				
Ores and concentrates	400	--------	--------	
Residues, sweepings and waste:				
Of silver and platinum group metals.	76	54	71	West Germany 33; France 12; United Kingdom 9.
Other	14,522	14,942	14,227	West Germany 5,790; Belgium-Luxembourg 5,422; Italy 2,516.
Oxides and hydroxides of barium, magnesium and strontium.	75	--------	--------	
Metals and alloys:				
Alkali, alkaline earth, and rare-earth elements.	NA	261	501	NA.
Nonferrous base metals not elsewhere specified	5	7	9	NA.
Nonmetals:				
Asbestos	101	58	92	West Germany 26; France 11; Italy 11.
Cement	64,675	45,845	142,014	West Germany 36,873; France 8,527.
Chalk	27	5	2	NA.
Clays and clay products:				
Clay	4,718	6,927	3,399	West Germany 6,476.
Refractory brick and other materials.	535	632	524	United Kingdom 176; West Germany 103; Rumania 101.
Nonrefractory products	47,129	54,027	52,916	West Germany 37,404; Austria 8,410.
Diamond: Industrial, including bort. thousand carats	355	215	115	West Germany 110; United States 30; United Kingdom 25.
Diatomite and other infusorial earth.	--------	75	93	West Germany 51; Austria 24.
Dolomite	180	165	117	Netherlands 100; Belgium-Luxembourg 20.
Feldspar, fluorspar and nepheline syenite.	6	34	37	Austria 21.
Fertilizer materials, manufactured:				
Nitrogenous	r 20,371	r 26,996	29,153	France 12,283; United Kingdom 12,271; Belgium-Luxembourg 2,391.
Phosphatic	--------	20	13	NA.
Potassic	--------	29	38	West Germany 13; France 13.
Mixed	--------	31	45	NA.
Gem stones, thousand carats dust and powder, including diamond dust.	5,700	22,370	28,290	Netherlands 17,550; West Germany 4,215.
Gypsum and limestone:				
Gypsum and plasters	76	150	69	West Germany 68; Italy 33; France 12.
Limestone, industrial	--------	5	83	All to Austria.
Lime	1,987	2,604	2,672	France 1,539; West Germany 1,064.
Magnesite	9	13	39	France 5; United States 4.

See footnotes at end of table.

Table 2.—Switzerland: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Nonmetals—Continued				
Mica:				
Crude and partly worked	20	12	5	West Germany 4; Italy 1; East Germany 1; France 1.
Worked	167	197	152	Czechoslovakia 32; Austria 27; Netherlands 23.
Salt	2,610	3,335	3,187	West Germany 3,305.
Sodium compound: Caustic soda	755	3,726	1,779	Hungary 2,701; West Germany 774.
Stone, sand and gravel:				
Quartz and quartzite, crude, ground and roughly squared.	14,964	21,924	21,456	Italy 18,258; West Germany 1,086.
Dimension stone, crude, roughly split and roughly squared.	22,595	25,398	27,957	West Germany 19,394; Austria 1,672.
Gravel and crushed rock, not elsewhere specified.	43,213	46,708	66,547	West Germany 33,076; Austria 9,002.
Sand, excluding metal-bearing	28,818	29,751	25,603	Austria 1,930; France 10,130.
Grinding and polishing stones and wheels.	413	478	571	West Germany 192; United Kingdom 84; France 48.
Dimension stone, worked including slate, flagstone, and paving blocks.	2,772	4,079	4,620	West Germany 3,204; Netherlands 548.
Sulfur: Sulfuric acid	9,567	21,077	26,550	West Germany 20,603.
Talc, soapstone, and steatite	1,531	1,276	1,276	Italy 1,245.
Other nonmetallic materials:				
Bromine, fluorine, and iodine	7,834	12,955	12,376	West Germany 12,484.
Mineral substances, not elsewhere specified.	1,353	4,450	342	NA.
Mineral fuels:				
Asphalt and bitumen, natural, crude	1,732	3,571	2,638	United Kingdom 3,550.
Coal, peat, coke and briquets thereof	1,062	1,038	288	France 889.
Carbon black	411	400	315	Italy 254.
Hydrogen and inert rare gases	--------	--------	15	
Petroleum refinery products:				
Gasoline—thousand tons	1	12	22	Mainly to Austria.
Kerosine—do	--------	r 3	4	Mainly to West Germany.
Fuel oils:				
Distillate—do	1	5	20	Mainly to Austria.
Residual—do	6	58	87	All to Austria.
Lubricants—do	(3)	1	2	Mainly to Italy.
Petroleum coke—do	16	18	10	West Germany 8; France 7.
Other—do	1	1	1	Mainly to Italy.
Coal, petroleum, and natural gas chemical, not further described.	3,056	2,286	2,750	West Germany 2,031.

r Revised. NA Not available.
1 Including rolled gold or silver.
2 Including sponge iron, shot, grit, and pellets.
3 Less than ½ of unit.

Table 3.—Switzerland: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum:				
Bauxite	1,463	2,594	2,917	Italy 2,190.
Alumina	124,776	120,673	136,379	France 73,444; British Guiana 22,265; Guinea 21,605.
Metal and alloys:				
Unwrought	4,562	5,965	12,248	Italy 2,158; Norway 952; Canada 727; Austria 715.
Semimanufactures	8,848	8,158	6,878	West Germany 6,005.
Antimony metal, all forms	317	355	208	U.S.S.R. 170; mainland China 150.
Arsenic, white	91	99	79	Sweden 45; West Germany 20.
Beryllium metal, all forms	1	1	(1)	Mainly from United States.
Chromium:				
Ore and concentrate	1,518	4,131	3,559	U.S.S.R. 2,486; Mozambique 938.
Oxide and hydroxide	386	472	469	West Germany 310; Australia 63; United Kingdom 60.
Cobalt oxides and hydroxides	8	9	7	Mainly from Belgium-Luxembourg.
Copper and alloys:				
Matte	41	22	116	NA.
Metal and alloys:				
Scrap	226	301	428	Israel 165; United Kingdom 94.
Unwrought	39,016	r 38,681	42,393	Zambia 12,232; Belgium-Luxembourg 11,838; West Germany 4,592; United States 3,304.
Semimanufactures	16,515	20,772	24,513	Canada 5,630; West Germany 4,811; United Kingdom 3,792.
Gold and alloys:				
Bullion and other unwrought. thousand troy ounces	62	163	245	West Germany 90; France 65.
Semimanufactures [2] do	126	130	154	West Germany 74; United Kingdom 28; United States 27.
Iron and steel:				
Iron ore, including roasted pyrite	3,728	1,990	2,603	West Germany 890; Brazil 601.
Metal:				
Scrap	11,174	5,392	5,002	West Germany 2,997; Austria 2,202.
Pig iron [3]	68,609	57,420	66,586	West Germany 39,541; Netherlands 5,959.
Ferroalloys	13,228	13,003	13,179	France 3,549; West Germany 2,699; U.S.S.R. 1,634; Czechoslovakia 1,552.
Ingots and equivalent forms	304,836	220,492	188,562	West Germany 76,488; Italy 69,919; France 62,326.
Coils for rerolling	2,059	2,618	3,011	West Germany 1,343; France 772.
Semimanufactures:				
Wire rod thousand tons	60	68	65	France 43; West Germany 15; Austria 6.
Bars and other rods do	143	139	160	West Germany 50; France 49; Belgium-Luxembourg 14.
Angles, shapes, and sections. do	r 192	211	204	West Germany 82; Belgium-Luxembourg 65; France 58.
Universals, plates, and sheets. do	425	r 486	450	France 150; West Germany 145; Austria 53.
Hoop and strip do	93	121	123	Austria 35; France 30; West Germany 27.
Rails and railway track materials. do	73	52	50	Austria 19; West Germany 12; France 8.
Wire do	20	21	22	West Germany 9; Austria 5; Belgium-Luxembourg 2.

See footnotes at end of table.

Table 3.—Switzerland: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Iron and Steel—Continued				
Semimanufactures—Continued				
Tubes, pipes, and fittings, thousand tons	129	145	129	West Germany 80; France 38; Italy 14.
Rough castings and forgings, do	4	3	3	West Germany 2; Belgium-Luxembourg 1.
Total, do	1,139	1,246	1,206	
Lead:				
Oxides	320	323	476	France 161; West Germany 111.
Metal and alloys:				
Unwrought, including scrap	19,847	21,413	23,929	Mexico 4,091; France 3,666; Peru 3,602; Belgium-Luxembourg 2,984.
Semimanufactures	571	446	537	West Germany 316; United Kingdom 55.
Magnesium, all forms	586	764	524	Norway 692.
Manganese and alloys:				
Ore	1,083	1,197	1,196	West Germany 493; France 186; Morocco 182.
Oxide	1,386	1,424	1,651	Japan 205; France 145.
Mercury, 76-pound flasks	1,254	1,566	957	Italy 812; mainland China 319; Yugoslavia 203.
Molybdenum metal, all forms	8	20	21	West Germany 10; United States 3.
Nickel:				
Ore and concentrate	16	35	--	Norway 25.
Metal and alloys:				
Scrap	67	--	12	
Unwrought, including matte and speiss.	1,035	1,338	971	United Kingdom 641; Norway 406; Canada 160.
Semimanufactures:				
Anodes	158	133	135	United Kingdom 58; Norway 29; France 20.
Other	489	620	1,285	United Kingdom 230; West Germany 227; United States 54.
Platinum group metals, all forms, thousand troy ounces	42	r 62	47	U.S.S.R. 25; West Germany 21.
Silver and alloys:				
Ingots, bars, and equivalent forms, do	10,266	11,175	4,190	United States 8,132; West Germany 1,217.
Semimanufactures [2], do	1,720	1,920	2,179	West Germany 1,719.
Silicon metal	1,032	675	544	Sweden 564; Italy 110.
Tantalum and alloys, all forms, kilograms	2,883	3,495	3,239	Sweden 1,449; West Germany 1,095; United States 879.
Tin:				
Oxide, long tons	30	40	34	West Germany 30.
Metal and alloys:				
Unwrought, do	1,002	727	966	Malaysia 285; Netherlands 241.
Semimanufactures, do	87	90	88	Netherlands 25; Belgium-Luxembourg 22; West Germany 20.
Titanium oxides	5,591	6,829	7,065	West Germany 2,879; United Kingdom 1,908; Japan 1,049.
Tungsten:				
Ore and concentrate	37	--	25	
Metal, all forms	35	24	33	West Germany 17; France 3.
Uranium, thorium and alloys, kilograms	1,371	--	35	
Zinc:				
Oxide and peroxide	1,585	1,850	1,677	West Germany 627; Netherlands 383; East Germany 337.
Metal:				
Unwrought; including scrap and dust.	r 22,390	22,145	27,287	Belgium-Luxembourg 9,006; West Germany 2,023; Mexico 1,553.

See footnotes at end of table.

Table 3.—Switzerland: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals—Continued				
Zinc—Continued				
Semimanufactures	r 1,622	1,597	1,982	Belgium-Luxembourg 662; West Germany 582.
Other metals:				
Ore and concentrates:				
Of silver and platinum group metals.	6	11	6	Denmark 6; Saudi Arabia 3; Iran 2.
Other	r 2,729	r 4,671	3,245	Australia 4,124.
Residues, sweepings, waste, and ashes:				
Of silver and platinum group metals. kilograms	6,244	10,945	5,535	Denmark 5,642; Saudi Arabia 2,807; Iran 2,024.
Of nonferrous metals, not elsewhere specified.	473	544	866	West Germany 324; Netherlands 215.
Oxides and hydroxide of barium, magnesium, and strontium.	145	209	153	United Kingdom 47; United States 40; West Germany 28.
Metalloids, not elsewhere specified	1,903	1,703	1,652	Sweden 571; West Germany 545; France 461.
Metals and alloys:				
Alkali, alkaline earth, and rare-earth elements.	164	146	182	West Germany 89; France 50.
Nonferrous, not elsewhere specified.	200	621	461	United States 221; Norway 120; Belgium-Luxembourg 46.
Ferrocerium and other pyrophoricalloys.	11	12	10	Austria 5; West Germany 4.
Nonmetals:				
Asbestos	11,370	12,528	14,668	Canada 6,800; Republic of South Africa 1,807; Southern Rhodesia 1,472; U.S.S.R. 995.
Barite and witherite	1,951	2,021	4,758	West Germany 1,508; France 282.
Boron materials:				
Crude, excluding brine products	157	210	443	United States 190.
Oxides and acids	463	593	487	France 311; Italy 160.
Cement	59,742	132,087	62,005	Italy 69,244; Austria 36,476; France 15,471.
Chalk	12,958	12,565	11,589	France 11,311.
Clay and clay products:				
Crude	161,343	161,989	178,990	West Germany 73,436; United Kingdom 41,703; France 24,180.
Refractory brick and other materials	23,099	26,711	26,448	West Germany 19,105; France 2,844; Austria 2,131.
Nonrefractory products	132,148	141,084	133,870	Italy 112,294; West Germany 20,452.
Cryolite and chiolite	838	229	157	All from Denmark.
Diamond: Industrial, thousand carats unmounted.	1,640	595	1,860	West Germany 330; Belgium-Luxembourg 110; United States 65.
Diatomite and other infusorial earths	2,378	1,933	1,593	West Germany 405; France 384; United States 732.
Dolomite	7,902	9,012	11,857	Italy 4,603; France 2,484; West Germany 1,124.
Feldspar, fluorspar, and nepheline syenite.	12,384	12,734	12,842	West Germany 3,484; France 3,850; Italy 3,029.
Fertilizer materials:				
Crude:				
Nitrogenous	96	46	205	NA.
Organic, including guano and dung.	18,303	20,396	17,282	France 16,781; Peru 404.
Phosphatic	34,567	36,571	37,306	Morocco 22,034; Senegal 3,868; Tunisia 3,121.
Potassic	104,331	108,598	105,382	France 77,275; West Germany 29,090.
Manufactured:				
Nitrogenous	5,920	963	1,029	West Germany 511; Italy 274.
Phosphatic:				
Basic (Thomas) slag	183,700	192,632	194,328	France 127,733; Belgium-Luxembourg 64,899.

See footnotes at end of table.

Table 3.—Switzerland: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Fertilizer materials—Continued				
Phosphatic—Continued				
Superphosphate and others	12,501	14,704	12,703	France 6,303; Netherlands 5,613.
Potassic	1,450	1,715	12,587	France 1,420.
Mixed	13,768	17,083	15,195	France 9,672; Italy 3,304; West Germany 3,196.
Ammonia, anhydrous	17,285	23,781	21,812	Austria 12,741; West Germany 5,274; Italy 3,187.
Gem stones, dust and powder including diamond dust. thousand carats	1,115	1,170	1,670	United Kingdom 560; Belgium-Luxembourg 225; Ireland, 65.
Graphite	669	561	556	Austria 305; West Germany 180.
Gypsum and limestone:				
Gypsum and plasters	26,280	32,230	39,566	West Germany 12,124; Austria 9,041; Italy 7,449.
Limestone, industrial	44,846	52,838	70,706	France 43,569; Italy 8,818.
Lime	4,102	5,265	9,933	Italy 5,238.
Magnesite	3,616	4,310	3,931	Austria 4,111.
Mica:				
Crude and partly worked	920	689	837	West Germany 291; India 182; United Kingdom 162.
Worked	59	121	162	France 103.
Pigments, mineral, including iron oxide and hydroxide.	r 1,754	r 1,905	r 2,083	West Germany 1,479.
Pumice, emery, corundum, and other natural abrasives.	15,305	7,868	2,852	Italy 6,137; West Germany 1,560.
Salt	2,835	r 842	1,121	France 758; West Germany 43.
Sodium and potassium compounds, not elsewhere specified:				
Caustic soda	4,716	5,843	6,071	West Germany 2,686; France 1,344; East Germany 1,358.
Caustic potash and sodium and potassium peroxides.	3,174	3,865	3,709	West Germany 1,757; France 1,365.
Stone, sand and gravel:				
Quartz and quartzite, crude, ground, and roughly squared.	6,595	10,285	13,865	Italy 4,626; West Germany 4,050; France 1,081.
Dimension stone, unworked, including slate.	68,305	82,832	87,096	Italy 44,545; West Germany 17,327; France 16,537.
Gravel and crushed rock. thousand tons	2,689	3,114	3,110	West Germany 1,395; France 1,233; Italy 459.
Sand, excluding metal bearing. do	782	1,031	941	Italy 639; France 146; Belgium-Luxembourg 122.
Grinding and polishing stones and wheels.	1,325	1,375	1,358	West Germany 725; Austria 184; United Kingdom 155.
Dimension stone, worked, including slate, flagstone, and paving blocks.	23,045	21,748	19,982	Italy 12,696; Austria 6,088; West Germany 1,749.
Sulfur and pyrite:				
Sulfur, elemental, crude	r 64,621	r 52,947	81,194	United States 29,637; France 21,439.
Pyrite, unroasted	37,324	31,918	48,114	Italy 31,746.
Sulfur, purified	179	219	255	West Germany 167.
Sulfur dioxide	-------	-------	612	
Sulfuric acid	468	342	390	West Germany 305.
Talc, soapstone, and steatite	15,430	13,308	13,871	France 7,314; Austria 3,950; Italy 1,340.
Other nonmetallic materials:				
Bromine, fluorine, and iodine, pure	812	847	1,542	France 363; United Kingdom 212; East Germany 133.
Slags, dross, scalings, ash, and similar non-metal-bearing metallurgical residues.	75,767	156,903	92,959	France 138,240; West Germany 17,912.
Mineral substances, not elsewhere specified.	17,103	23,675	24,355	West Germany 11,628; France 6,223; Italy 4,795.

See footnotes at end of table.

Table 3.—Switzerland: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Mineral fuels:				
Asphalt and bitumen, natural, crude	764	911	1,106	Trinidad and Tobago 647; United States 249.
Coal, peat, coke, and briquets:				
Coal and coal briquets. thousand tons	2,055	1,409	1,144	West Germany 462; United States 270; Belgium-Luxembourg 252; Poland 204.
Lignite and lignite briquets do	217	190	151	West Germany 185.
Peat and peat briquets do	24	26	29	Mainly from West Germany.
Coke do	692	491	476	West Germany 359; Netherlands 86; Italy 21.
Carbon black	5,775	6,549	7,671	France 2,181; West Germany 1,528; Netherlands 1,010.
Hydrogen and inert rare gases	35	54	58	West Germany 22; Norway 14; United States 4.
Petroleum:				
Crude and partly refined. thousand tons	359	838	1,209	Libya 573; Algeria 138; Saudi Arabia 93; Kuwait 33.
Refinery products:				
Gasoline do	1,273	1,295	1,335	France 570; Italy 346; West Germany 312.
Kerosine do	78	87	79	Italy 36; France 18; Netherlands 17.
Fuel oil:				
Distillate do	3,601	3,401	4,050	Italy 1,021; France 970; West Germany 681.
Residual do	1,111	1,058	1,181	France 429; West Germany 428; Italy 183.
Lubricants do	75	71	71	United States 20; United Kingdom 13; Italy 11.
Liquefied petroleum gases do	9	11	13	France 6; Netherlands 4.
Mineral jelly and wax do	7	8	8	United States 3; West Germany 2.
Petroleum coke and pitch coke. do	67	52	55	West Germany 35; United States 16.
Bitumen and other residues. do	194	218	233	West Germany 69; France 66; Italy 36.
Other do	21	19	20	West Germany 11; France 2.
Coal, petroleum, and natural gas: Chemicals, not further described. do	23	27	26	France 11; West Germany 10; Czechoslovakia 2.

r Revised. NA Not available
1 Less than ½ of unit.
2 Including rolled gold or silver.
3 Including cast iron, sponge iron, spiegeleisen, powder, shot, grit, and pellets.

COMMODITY REVIEW

METALS

Aluminum.[2]—Despite the 4.5-percent increase in output of primary aluminum in 1965, trade reports indicated a decline of 3 to 4 percent in domestic sales of metal and semimanufactures. Domestic consumption of secondary aluminum was estimated at 6,500 tons as compared with 7,400 tons in 1964. Imports of aluminum and semimanufactures rose by some 5,000 tons but this was more than offset by an increase of 5,154 tons in exports; the import increase was said to consist chiefly of intrafirm transactions in the first half of the year.

Final consumption of aluminum in Switzerland was broken down as follows in 1965, according to a recent estimate (1964 percentages in parentheses): Transport 8.1 percent (7.8 percent); mechanical construction 20.4 percent (19.6 percent); electrical uses 10.8 percent (10.8 percent); construction 24.5 percent (25.1 percent); chemical, food and agricultural equipment 1.3 percent (1.3 percent); packaging 18.3 percent (18.3 percent); household and

[2] Aluminium. V. 42, No. 1, January 1966.

office installations 5.3 percent (5.7 percent); iron and steel industry 1.3 percent (0.8 percent); other metal working industries 2.8 percent (2.8 percent); and various other industries 7.2 percent (7.8 percent).

Prices of ingot aluminum were unchanged during the year.

NONMETALS

Cement.—Production of cement declined by nearly 300,000 tons in 1965, reflecting the cutback in industrial building; imports fell by 70,000 tons and exports rose by nearly 100,000 tons. The Government's antiinflationary policy thus was felt keenly by the industry, but its trade association (Verein Schweiz., Zement-, Kalk-, und Gips-Fabrikanten), writing in its 1964 Annual Report (published in 1965) expressed greater concern at the effects of coming shifts in Switzerland's energy policies. It pointed out that in the past hydropower dams have provided a large market for cement and that this market will disappear as Switzerland shifts to thermal and nuclear power for required additional energy supplies. The national roadbuilding program will not provide a sufficient demand for cement to offset loss of this market according to the association and it predicted a rate of market growth in the future nearer to the rate of population growth than in the past.[3]

MINERAL FUELS

Petroleum.—Data are unavailable for 1965 output of the refinery at Aigle owned by Raffineries du Rhône but trade returns show imports of 1,209,000 tons of crude oil, indicating a throughput in the vicinity of that figure, which represents only about 60 percent of its 2-million-ton capacity. This unsatisfactory situation, said to be due basically to the refinery's lack of marketing and distribution facilities, led to an offer by the Standard Oil Co. of New Jersey and an associated group of international oil companies to take over the refiinery from Raffineries du Rhône. The bid was still pending at yearend. A complicated problem involved in the takeover was reported to be a Raffineries du Rhône contract for the importation of Soviet crude oil, signed in 1965.

Meanwhile construction continued on Shell's new refinery of Cie. de Raffinage Shell (Suisse) at Cressier, near Lake Neuchatel, and it was nearly completed by November. The proposed Mittelland refinery at Ettiswil near Lucerne, was still stymied at yearend by failure to obtain a license for the building of a spur line from the South European pipeline to supply crude oil. (Shell had obtained a permit for a similar line to feed its Cressier refinery.) Similarly, no progress was made in obtaining the necessary permission for another refinery at Sennwald in eastern Switzerland, sponsored by Swiss, Italian and U.S. interests.

Reports indicated that negotiations were going on between Swiss interests and Gasversorgung Suddeutschland (GVS) for purchase of Netherlands natural gas when the proposed pipeline from the Groningen fields to Munich reaches southern West Germany. The gas would be supplied by a spur line to Switzerland from that pipeline.

Swiss consumption of petroleum products has been rising rapidly, showing rates of growth ranging from 15 to 26 percent during 1960–63, followed by increases of 6.6 percent in 1964 and an estimated 14 percent in 1965. Total consumption in 1965 is estimated at 7,984,000 tons. The two refineries at Aigle and Cressier will have, according to estimates, a combined capacity of 4.5 million tons, a little over half the current demand.[4]

Swiss policy towards refinery construction is said to be influenced by the following considerations: (1) A desire to keep a variety of oil transport routes for imports open (including rail and Rhine barges) in order to avoid complete dependence on one or two pipelines; (2) a desire to maintain minimum stocks of certain products in the country; and (3) concern for possible effects of air and water pollution.[5]

of petroleum in Switzerland depend primarily on the authority to license pipelines.[6]

[3] Verein, Schweizerischer Zement-, Kalk-, und Gips- Fabrikanten. (54th Annual Report.) 1964, pp. 17–18.

[4] Petroleum Press Service. June 1966, pp. 217–218.

[5] Petroleum Press Service. Safety First in Switzerland. July 1965, pp. 251–253.

[6] Work cited in footnote 4, p. 218.

The Mineral Industry of the U.S.S.R.[1]

By V. V. Strishkov[2]

The Soviet Union's share of world industrial production continued to rise and in 1965, constituted for nearly one-fifth of the total world industrial output. The mineral industry contributed 38 billion rubles or about 9 percent of the gross national product (GNP) of the U.S.S.R. and was an important earner of foreign currency.

The apparent self-sufficiency position of the Soviet Union for selected mineral commodities, together with its approximate share of world output of these commodities and rank among world producers are shown in table 1.

In 1965, the output of electric power increased by 48 billion kilowatt-hours over that of 1964, production of petroleum increased 19 million tons, output of gas increased 17 billion cubic meters, and that of coal 24 million tons. There were 2 million workers in ferrous and nonferrous industries and 1.7 million workers in the coal industry of the U.S.S.R. in 1965.

Shipments of practically all of the Soviet mineral commodities that are exported were at increased levels in 1965. The export of fuel from the U.S.S.R. increased and was the largest and fastest growing single commodity group in the Soviet export trade to the West. The Soviets probably will be able to maintain and even increase the rate of growth of their oil exports, in spite of rising home demand and technical difficulties of production and transport.

During 1965, the last year of the 7-year plan (1959–65), many new mineral industry facilities became operational. In the ferrous metals sector, additional mining and concentrating facilities as well as new blast furnaces, smelters, and rolling mills resulted in some significant increases in total capacity.

Although not all of the planned 1959–65 goals were attained, growth of ferrous industry during the period was as follows: Pig iron, 67 percent; steel, 66; rolled metal, 65; pipe, 95; and iron ore, 72 percent. Its share in the fixed assets of all industry amounted to 10.7 percent in 1965. Production of ferrous metals accounted for nearly one-seventh of all fuel and almost a ninth of all electric power consumed in the U.S.S.R.

In the nonferrous industry, output of many base and precious metals particularly nickel, aluminum, cobalt, and platinum increased in comparison with that of 1964. The discovery of rich deposits in the Norilsk area, and the completion of nickel facilities on the Kola Peninsula advanced the U.S.S.R. to one of the leading world producers of nickel and platinum.

Total refining capacity of aluminum plants almost doubled during the years 1962–65, and the country is expected to become a significant exporter of this metal in the future. In 1964, the U.S.S.R. for the first time became a net exporter of copper.

Several new nonferrous enterprises came into operation during 1959–65, and a number of diamond mines were opened in Yakutia.

Capacity of Soviet power stations exceeded 110 million kilowatts in 1965. Several new facilities were put into operation during the year including: The Kiev hydroelectric plant, and the Burshtynskaya (Ivan-Franko Oblast') and Krivoy Rog No. 2 thermal powerplants. Some 800,000–1,200,000 kilowatts were added to existing thermal power plants in the Ukraine, and a fourth turbine to the Lithuanian hydroelectric powerplant.

The production of electric power, coal, and gas were below both industry requirements and 7-year plan targets. New goals were planned for 1965.

[1] Based almost entirely on published Soviet material.

[2] East European specialist, Division of International Activities.

Table 1.—U.S.S.R.: Estimated [1] world significance and self-sufficiency of Soviet metals and minerals

Commodity	Self-sufficiency in 1964, percent	Share of estimated world output in 1965, percent	Approximate rank in world output
Metals:			
Aluminum:			
Bauxite	90	13	2
Metal	100+	19	2
Antimony	100+	10	4
Arsenic	100	NA	NA
Beryl	100	20	3
Bismuth	100−	3	7
Cadium	100+	15	2
Chromite	100+	29	1
Cobalt	100+	8	5
Copper, mine	100	15	2
Gold	100+	13	2
Iron and steel:			
Iron ore [2]	100+	25	1
Pig iron and ferroalloys	100+	20	2
Steel:			
Steel ingots and castings	100+	20	2
Steel pipes	90	NA	NA
Lead, mine	100	14	1
Magnesium	100+	21	2
Manganese ore [2]	100+	44	1
Mercury	100	15	3
Molybdenum	100	12	2
Nickel, smelter	100	20	2
Platinum	100+	57	1
Silver	100	11	5
Tin, mine	75	11	4
Titanium	100	NA	NA
Tungsten, concentrate	80	21	2
Zinc, mine	100	10	3
Nonmetals:			
Asbestos	100+	36	2
Barite	65	6	4
Boron minerals and compounds	100	NA	NA
Cement	100+	17	1
China clay (kaolin)	100	NA	NA
Diamond	100	11	3
Diatomite	100	20	2
Feldspar	95	10	3
Fertilizer materials:			
Crude:			
Nitrogen compounds	100	NA	NA
Phosphate rock	100+	24	2
Potash	100	17	3
Manufactured [2]	100	NA	NA
Fluorspar	65	12	2
Graphite	100	9	4
Gypsum [2]	100	9	5
Lime, dead burned [2]	100	NA	NA
Magnesite	100	30	1
Mica	95	15	3
Pyrite, gross weight	100+	15	2
Salt	100+	9	3
Sulfur, all types	100	9	2
Talc	85	10	3
Mineral fuels:			
Coal, all grades [2]	100+	21	1
Coke, all types [2]	100+	20	1
Crude oil	100+	16	2
Oil shale [2]	100	NA	NA
Peat [2]	100	96	1
Natural gas [2]	100+	NA	NA
Electric power [2]	100	NA	NA

NA Not available.

[1] Self-sufficiency is expressed as a ratio of mine production to consumption of primary material. Except as noted, production has been estimated.

[2] Production as reported in Soviet sources.

Chemical production (including fertilizers) increased over the 7 years, 1959–65, with an annual growth rate averaging 13.6 percent compared with 9 percent for industry as a whole. Among the enterprises started up during the period were: Nevinnomyssk, Grodno, Novo-Lipetsk, Navoy, Kuybyshev, and Fergana nitrogen plants; Shchekino chemical combine; Chardzhou, Sumgait, Volkhov, and Kedayaynay superphosphate plants; Rozdol sulfur combine; "Fosforit" combine in Kingisep; and Seligorsk potash combine.

The goals of the 7-year plan were not fulfilled in many areas of chemical production. Mineral fertilizer output totaled 31.3 million tons in 1965, while the planned goal was 35 million tons.

For many years Soviet industrialization was directed toward expansion of heavy industry, with emphasis largely on increases in gross production rather than on efficiency and product quality.

The U.S.S.R. experienced considerable difficulty in the construction of mineral industry projects. Efforts were dispersed over a large number of projects, with the work taking one and one-half to two times as long as specified by the U.S.S.R. State Construction Committee. This resulted in a disparity between capacities of mines, concentration plants, and metallurgical plants.

Many mines and plants were put into operation in spite of numerous inperfections and insufficient equipment. As a result, labor productivity was below planned levels, and a large number of personnel was occupied in repair and auxiliary operations.

At polymetal mines in Kazakhstan the proportion of mechanized labor did not exceed 35 percent, with the majority of auxiliary operations performed manually. In underground coal mining over 50 percent of the workers were nonmechanized.

Decisions of the September Plenum of the Central Committee of the Communist Party of the Soviet Union (C.P.S.U.), with regard to the 5-year plan for 1966–70 will have important significance to the development of Soviet industry, including the mineral producing and processing sector. The draft plan, as approved by the 23d Congress of the C.P.S.U., foresees annual average increases in gross industrial production of about 8.2 percent, or slightly less than that of the 1959–65 7-year plan. The annual rises for capital goods are fixed at around 8.5 percent, and for industrial consumer goods at 7.9 percent. Labor productivity in industry is to be raised by 33 to 35 percent, with the average yearly rates per worker amounting to 6 percent as compared with 4.6 percent for 1961-65.

The plan envisages a 20- to 25-percent reduction in consumption of rolled ferrous metals by machine building and metal processing and not less than 8 to 10 percent in the fuel consumption by industry.

Basic tasks of the new 5-year plan include the more intensive use of equipment, raw material, and supplies; improvement of product quality, reliability, and service life; increase of machine productivity and increase of profitability.

In order to carry out this plan, enormous resources will be required. Capital investment in the U.S.S.R. for the next 5 years has been set at a level of 310 billion rubles as compared with 210 billion rubles for 1961–65. Heavy industry will continue to be transferred to the Eastern Region of the country. The generation of power and production of iron and steel, especially in the Eastern Region, are to be developed to high degree.

The level of Soviet industrial production in 1965 and as planned for 1970 is as follows:

(Million metric tons unless otherwise specified)

Commodity	Production		Planned production		
	1955	1960	1965	1966	1970
Iron ore	71.9	107	153	NA	NA
Pig iron	33.3	46.8	66.2	70.5	94–97
Steel	45.3	65.3	91.0	96.7	124–129
Rolled metal	35.3	50.9	70.9	75.6	95–99
Steel pipes	3.5	5.8	9.0	9.8	14–15
Cement	22.5	45.5	72.4	78	100–105
Mineral fertilizers	9.7	13.9	31.3	35.3	62–65
Coal (bituminous, anthracite, and lignite)	391.3	513	578	598	665–675
Natural gas—billion cubic meters	10.4	47	129	148	225–240
Peat	50.8	53.6	50	NA	92
Petroleum, crude	70.8	148	243	264	345–355
Oil shale	10.8	14.1	21.3	NA	28
Power electric—billion kilowatt-hours	170.2	292.3	507	NA	830–850

NA Not available.

To achieve the planned goals, capacity for usable iron ore is to be increased by 100 million tons, pig iron by 17.8 million tons, ingot steel by 23.2 million tons, and steel pipe by 4.7 million tons.

Technologic changes to be emphasized include increasing use of open-pit iron mining, erection of additional large size (2,700 cubic meters) blast furnaces, and increased smelting of pig iron using oxygen and natural gas. Also, additional and larger (up to 500-ton capacity) oxygen converters are to be installed, electric steel output is to be increased approximately 1.5 times, and continuous casting of steel will be practiced on a large scale. In pipe production, it is planned to increase the share of electrically welded and seamless cold formed pipes, to produce 1.5 times more large-diameter pipe, and to attain an even larger increase in deliveries of high-capacity gas and oil pipes.

In nonferrous metals, directives call for a significant increase in production by completing projects now underway, increasing capacities of existing facilities and developing new installations. Production of aluminum is slated to be raised by 1.9 to 2.1 times, and of copper and zinc by 1.6 to 1.7 times. There will be increases in the production of lead, magnesium, tin, nickel, titanium, tungsten, molybdenum, and precious metals.

The amount of ore mined by openpit methods is to be increased 1.5 times and that from underground mines fivefold. By 1970, 75 percent of the copper output and 80 percent of the nickel output will come from open pit mines. New investments in nonferrous metallurgy is set at over 6 billion rubles, one and a half times more than in the previous 5 years.

Accelerated development is also planned for mineral fuel commodities. From 1950 through 1965 gross output of the fuel industry increased 3.3 times, while the volume of industrial production on the whole increased 4.6 times.

In the forthcoming 5-year period the share of the fuel industry in gross output of all industrial production is to be stabilized. That is, it will be developed at approximately the same rate as for industry as a whole in an effort to better provide the economy with fuel raw materials. Significant shifts will occur in the relative proportion of total energy output accounted for by each major fuel. It is planned to increase natural gas output more than 1.7 times, and oil production almost 1.5 times, while increasing coal by less than 1.2 times. As a result, the share of oil and gas in the fuel production balance of the country will increase from 51.7 percent in 1965 to 60 percent in 1970.

In the coal industry, it is planned to accomplish the production increase with the same number of workers. By 1970, openpit mining should account for up to 28 percent of the total coal output (compared with 24 percent in 1965). An additional 80 mines and pits with 65 million tons of output capacity are scheduled to be brought into production, and 80 existing enterprises are to be renovated. Special attention will be paid to the development of coal preparation, with a number of new plants scheduled for construction.

In mining thin and medium coal seams, overall mechanization, including hydraulic mobile supporting, narrow excavation by means of narrow-web continuous miners, and with integral mobile conveyers is to be stressed.

The growth rate of Soviet oil industry is to be slowed; the new 5-year plan calls for an average annual rate of between 7.3 and 7.9 percent, compared with the 11.5 percent annual average achieved during the past 7-year plan.

Recent production increases have been primarily due to the development of the rich Ural-Volga region ("Second Baku") oilfields. This area will continue to account for about three quarters of the Soviet total production over the next 5 years. The new plan specified that production by 1970 will reach 23.5 million tons in Azerbaydzhan, about 16 million tons in the Ukraine, and 15 million tons in Turkmenistan.

The output of the newly discovered Tyumen' Oblast' ("Third Baku") fields will reach 20 to 25 million tons by 1970 and the plan for the Mangyshlak Peninsula in Kazakhstan ("Fourth Baku") is 15 million tons. East Siberia ("Fifth Baku") is not mentioned in the plan as a prospective oil production area.

Exploration drilling is to total 25.6 million meters during 1966–70, and most of this effort is to be concentrated on the promising new areas. Secondary recovery methods are to be used to an increasing extent; the daily volume of water injection in 1970 is to be 1.6 million cubic meters. The new 5-year plan provides for the laying of 12,000 kilometers of additional oil pipelines.

Oil refinery production by 1970 is expected to be 40 to 50 percent higher than in 1965, but there were no indications of impending changes in overall refinery yield patterns.

Usable natural gas production is slated to increase more rapidly under the 1966–70 plan than it did during 1961–65, and in order to deliver this gas to consumers, 25,000 kilometers of gas pipelines will be built. The Soviet Union has also concluded agreements with governments of Iran and Afghanistan to import gas from these countries, and is undertaking to provide the resources for construction of pipelines from these areas to be completed before 1970.

The growth of the electric power supply industry will be achieved by putting into service new capacities amounting to 64 to 66 million kilowatts, mainly through the construction of large condenser thermal power stations with a capacity of over 2.4 million kilowatts, using 300,000-kilowatt generating units.

PRODUCTION

Mineral production statistics were not officially reported for a number of commodities. Therefore, many of the data in production tables were estimated, and represent, at best, an order of magnitude. The increase in Soviet mineral production in 1965 was not the result of productivity gains, but rather the addition of new capacity.

Some of the sectors did not achieve planned goals for 1965. There was a deficit (as compared to reported established capacity) of 11 million tons of coal, 13 million tons of iron ore, 3 million tons of pig iron, and 2.5 million tons of rolled steel.

Kazakhstan was the nation's leading producer of chromite, copper, lead, zinc, and rare metals, however, the metallurgical enterprises in the Altay region of Kazakhstan experienced raw material shortages in 1965 because of lags in mine expansions.

Table 2.—U.S.S.R.: Estimated [1] production of metals and minerals

(Thousand metric tons unless otherwise specified)

Commodity [2]	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Ores and concentrates:					
Bauxite, 26 to 52 percent alumina	4,000	4,200	4,300	4,300	4,700
Nepheline concentrates 25 to 30 percent alumina	350	375	400	500	900
Alunites ores, 16 to 18 percent alumina			30	40	50
Metal [3]	r 890	r 900	960	1,000	1,280
Antimony, content of ore metric tons	5,700	6,000	6,100	6,100	6,200
Arsenic, white (As_2O_3) do	6,000	6,500	6,500	6,500	6,800
Beryl, cobbed, only 10 to 12 percent BeO do	800	900	1,000	1,000	1,000
Bismuth do	30	30	30	30	35
Cadmium do	r 1,500	r 1,600	r 1,700	1,800	1,900
Chromite ore, 30 to 55 percent Cr_2O_3	920	1,150	1,230	1,300	1,420
Cobalt metric tons	1,000	1,100	1,200	1,200	1,300
Copper:					
Ores, gross weight, 0.5 to 2 percent Cu	46,000	54,000	59,000	60,000	64,000
Smelter [4]	550	650	700	r 750	800
Iron and steel:					
Iron ore, 55 to 63 percent Fe [5]	117,633	128,111	r 137,502	r 145,856	153,432
Iron ore sinter [5]	74,190	83,360	93,531	103,613	NA
Pig iron and ferroalloys:					
Pig iron for steelmaking [6]	42,018	45,579	48,366	51,594	NA
Foundry pig iron [6]	7,430	8,071	8,617	8,977	NA
Spiegeleisen [6]	97	90	91	81	NA
Ferromanganese [6]	699	812	821	916	NA
Other blast furnace ferroalloys [6]	649	713	796	809	NA
Total [6]	50,893	55,265	r 58,691	r 62,377	66,184
Steel: [6]					
Ingots	65,532	70,880	74,411	78,921	NA
Steel for casting	5,223	5,426	5,820	6,113	NA
Total	70,755	76,306	r 80,231	r 85,034	91,021
Semimanufactures:					
Heavy sections	14,443	15,155	15,549	16,747	NA
Light sections	4,662	5,305	5,464	5,730	NA
Wire rods	3,902	4,072	4,369	4,635	NA
Pipe stock	2,925	3,176	3,458	3,777	NA
Tubes from ingots	1,139	1,105	1,083	1,121	NA
Plates and sheets:					
More than 4.75 millimeters thick	7,695	8,224	8,850	9,464	NA
Other	5,925	6,721	7,460	7,944	NA
Total plates and sheets	13,620	14,945	16,310	17,408	NA
Strip	3,166	3,633	4,128	4,507	NA
Railway track material	3,194	3,404	3,278	3,228	NA
Wheels, tires and axles	748	833	825	808	NA
Unspecified, for sale	471	639	535	407	NA
Other	192	120	122	123	NA
Total semimanufactures	48,462	52,387	55,121	58,491	61,600
Selected end products: [7]					
Welded pipes and tubes	2,963	3,341	3,770	4,022	NA
Seamless pipes and tubes	3,394	3,537	3,751	4,102	NA
Total	6,357	6,878	7,521	8,124	9,014
Cold-rolled sheets	1,703	1,815	2,155	3,031	NA
Tinplate	330	351	368	406	NA
Galvanized sheets	244	260	267	303	NA
Electrical sheets	601	661	742	790	NA
Wire, plain	1,381	1,584	1,759	1,936	NA
Lead, smelter	r 350	350	350	360	370
Magnesium	30	32	32	32	33
Manganese ore [5]	5,972	6,402	r 6,663	r 7,096	7,576
Mercury 76-pound flasks	25,000	35,000	35,000	35,000	40,000
Molybdenum metric tons	5,400	5,700	5,700	6,000	6,200
Nickel, smelter [4]	75	85	85	85	90
Platinum thousand troy ounces	500	800	800	r 1,500	1,700
Silver do	25,000	27,000	27,000	27,000	27,000
Tin, smelter [4] long tons	17,000	17,000	20,000	20,000	21,000
Titanium	3	4	5	5	6
Tungsten concentrates, 60 percent WO_3 basis metric tons	10,000	10,500	11,000	11,000	11,500
Zinc:					
Recoverable metal content of domestic ores	400	410	410	410	412
Smelter [4]	425	465	465	460	465

See footnotes at end of table.

Table 2.—U.S.S.R.: Estimated [1] production of metals and minerals—Continued

(Thousand metric tons unless otherwise specified)

Commodity [2]	1961	1962	1963	1964	1965
Nonmetals:					
Asbestos	r 600	r 640	r 685	r e 735	r 785
Barite	150	180	180	200	220
Boron minerals and compounds, B_2O_3 content	62	63	63	63	63
Cement [5]	50,864	57,328	61,018	r 64,934	72,388
China clay (kaolin)	1,300	1,400	1,500	1,500	1,500
Diamond—thousand carats	1,500	2,500	3,000	3,000	3,500
Diatomite	300	300	r 310	310	315
Feldspar	r 200	r 200	r 200	r 200	200
Fertilizer materials:					
Crude:					
Nitrogen compounds, N content equivalent	1,600	1,700	2,000	2,100	2,500
Phosphate:					
Apatite (ore) r	11,200	12,700	14,300	15,800	17,100
Sedimentary rock (ore) r	7,500	8,000	8,500	8,900	9,100
Total r	18,700	20,700	22,800	e 24,700	26,200
Potash, K_2O equivalent	1,760	1,900	r 2,050	e 2,200	2,350
Manufactured:					
Nitrogenous, bulk [5]	5,664	6,905	8,575	10,222	13,217
Phosphatic, bulk [5]	5,047	5,161	r 7,857	10,677	12,240
Potassic, bulk [5]	2,753	3,198	3,365	4,353	5,691
Others [5]	1,858	1,994	r 138	110	105
Total [5]	15,322	17,258	19,935	r 25,562	31,253
Fluorspar	210	240	270	300	350
Graphite	50	55	55	55	55
Gypsum [5]	4,456	4,376	r 4,239	r 4,203	4,344
Lime, dead burned [5]	17,259	r 16,559	16,013	r 16,198	17,686
Magnesite	2,500	2,500	2,700	2,800	2,900
Mica	25	30	30	30	30
Pyrite, gross weight	2,800	3,000	3,200	3,200	3,300
Refractories:					
Shamotte [5]	5,174	5,427	r 5,543	r 5,695	5,790
Dinas (quartzite-lime) [5]	689	685	r 616	r 629	637
Magnesite and chrome magnesite [5]	1,115	1,195	r 1,250	r 1,313	1,372
Magnesite powder [5]	1,102	1,172	r 1,218	r 1,220	1,265
Total	8,080	8,479	r 8,627	r 8,857	9,064
Salt [5]	7,500	r 8,500	r 9,600	r 10,100	9,500
Sulfur (excluding sulfur content of pyrite)	1,175	1,320	1,350	1,350	1,400
Talc	300	310	350	350	360
Mineral fuels:					
Coal:					
Brown [5]	133,516	130,976	136,590	145,127	149,850
Hard:					
Coking [5]	112,247	117,462	127,063	r 133,617	138,959
Anthracite [5]	77,480	76,364	r 76,683	78,840	80,467
Undifferentiated	187,292	192,606	r 191,383	196,413	208,455
Subtotal [5]	377,019	386,432	395,129	408,870	427,881
Total [5]	510,535	517,408	531,719	r 553,997	e 577,731
Coke [5]	58,604	60,929	63,876	66,300	67,500
Crude oil [5]	166,068	186,244	206,070	r 223,600	242,900
Oil shale [5]	15,174	16,370	18,308	20,233	21,259
Peat [5]	51,249	34,720	58,550	59,500	46,000
Natural gas [5]—billion cubic feet	2,270	2,800	3,400	3,850	4,466
Electric power [5]—billion kilowatt hours	328	369	412	459	507

r Revised.
NA Not available.
[1] Estimated except where noted.
[2] In addition to commodities listed, the U.S.S.R. is known to produce gold, but no estimate of output is included.
[3] Excludes production from scrap.
[4] Includes production from scrap.
[5] Reported in Soviet sources.
[6] Data for 1961–64, United Nations Quarterly Bulletin of Steel Statistics for Europe. V. XVI, No. 1, 1965, p. A–23.
[7] Items listed under this heading are produced from semimanufactures listed above and possibly also from imported material. Therefore, these data are not additive to the total of semimanufactures listed.
[8] The average ash content of the coal shipped from the mines was 19.4 percent and average calorific value—a little more than 5,000 kilocalories per kilogram.

Table 3.—U.S.S.R.: Production of selected commodities by Union Republics

(Million metric tons unless otherwise specified)

Republic	Iron ore	Pig iron	Steel ingots	Rolled steel [1]	Steel pipes	Cement
Russian Soviet Federated Socialist Republics (R.S.F.S.R.)	53.8	31.2	50.0	37.7	5.2	43.9
Ukrainian S.S.R.	84.1	32.6	37.0	30.5	2.9	12.3
Belorussian S.S.R.	----	----	----	----	----	1.7
Uzbek S.S.R.	----	----	.4	.3	NA	2.5
Kazakh S.S.R.	14.1	1.6	1.1	.6	NA	4.0
Georgian S.S.R.	----	----	1.4	1.0	.4	1.4
Azerbaydzhan S.S.R.	1.5	.8	.8	.6	.5	1.3
Lithuanian S.S.R.	----	----	----	----	----	.8
Moldavian S.S.R.	----	----	----	----	----	.6
Latvian S.S.R.	----	----	.1	.3	----	.8
Kirgiz S.S.R.	----	----	----	----	----	.5
Tadzhik S.S.R.	----	----	----	----	----	.9
Armenian S.S.R.	----	----	----	----	----	.6
Turkmen S.S.R.	----	----	----	----	----	.3
Estonian S.S.R.	----	----	----	----	----	.7
Total U.S.S.R.	[3] 153.4	66.2	[3] 91.0	[3] 70.9	9.0	[3] 72.4

Republic	Mineral fertilizers	Sulfuric acid	Coal	Coke	Crude oil	Natural gas (billion cubic feet)	Electric power (billion kilowatt hours)
Russian Soviet Federated Socialist Republics (R.S.F.S.R.)	3.9	4.5	326.0	29.8	200.0	2,247.8	332.9
Ukrainian S.S.R.	1.6	1.9	194.0	35.0	7.6	1,377.0	94.6
Belorussian S.S.R.	.7	NA	----	----	[2]	----	8.4
Uzbek S.S.R.	NA	NA	4.5	NA	1.8	576.3	11.5
Kazakh S.S.R.	NA	.9	45.7	NA	2.0	1.0	19.2
Georgian S.S.R.	NA	NA	2.6	.7	----	----	6.0
Azerbaydzhan S.S.R.	.8	.1	----	----	21.5	216.2	10.4
Lithuanian S.S.R.	NA	.3	----	----	----	----	3.6
Moldavian S.S.R.	----	NA	----	----	----	----	3.1
Latvian S.S.R.	----	NA	----	----	----	----	1.5
Kirgiz S.S.R.	----	NA	3.7	NA	.3	5.4	2.3
Tadzhik S.S.R.	----	NA	.9	NA	----	----	1.6
Armenian S.S.R.	[2]	NA	----	----	----	----	2.9
Turkmen S.S.R.	.1	NA	----	----	9.6	40.5	1.4
Estonian S.S.R.	NA	.1	----	----	----	----	7.1
Total U.S.S.R.	[4] 7.4	[4] 8.5	[3] 577.7	[4] 67.5	[3] 242.9	4,466.0	[3] 506.7

NA Not available.

[1] Includes finished rolled products, tubes and forgings made of castings, and ingots and billets supplied to other plants for rerolling.

[2] Less than ½ unit.

[3] Detail does not add to total because of rounding.

[4] Reported total; detail does not add to this figure because of omission of data for some republics.

Ferrous metal production volume in the U.S.S.R. during the years 1959–65 increased 1.5 times, with crude steel output reaching about 91 million tons in 1965. Nonetheless, the economy continued to experience shortages of ferrous metals. Soviet statistical data established that millions of tons of iron and steel were not reaching end users in the form of new products because of: (1) excessively high crude metal consumption per unit of finished useable product; (2) low levels of product durability, requiring extensive replacement and repair; and (3) inefficient repair practices. According to Soviet sources, the utilization factor of metal in the metal-working and machine building industries in 1965 was, on the average, 0.6; and that there was a potential for improving metal utilization in these industries by 20 to 25 percent. Some improvement reportedly could be achieved if manufacturers produced smaller forged billets to meet consumer requirements rather than simply striving to meet planned quotas on a tonnage and unit basis.

Approximately half of the new profiles produced reportedly do not meet consumer specifications, but nevertheless were used. Similarly, use of incorrect types and sizes of pipe in the gas industry resulted in the use of 16 percent more metal than was necessary.

TRADE

Tables 4 and 5 are derived from official statistics of the Ministry of Foreign Trade for 1964. Official figures for 1965 are not yet available, but much the same general pattern can be expected.

The value of total Soviet trade expanded from 12.9 billion rubles in 1963 to 13.9 billion rubles in 1964. Exports increased about 5.5 percent and imports were almost 9.5 percent higher in 1964, than in 1963.

Mineral industry products accounted for 40.9 percent of the value of all exports in 1964 compared with 38.4 percent in 1963, an increase of 6.5 percent. The Soviet Union remained a significant exporter of mineral fuels, manganese, iron, and chromite ores, steel ingots, aluminum, precious metals and apatite concentrate.

In 1964, the U.S.S.R. exported 56.6 million tons of petroleum and petroleum products valued at 849 million rubles, a 10.1 percent increase in volume and 3.6 percent in value compared with that of 1963. The big increase was in crude petroleum, which rose 21 percent; more than offsetting a 6 percent drop in refined product exports.

Compared with performance in previous years, Soviet iron and steel was sold to a larger number of countries in 1964. Sales of steel products to African nations have been steadily increasing. Efforts to increase ferroally exports were concentrated on improving quality.

In 1964, the U.S.S.R. became a net exporter of copper. Imports were cut to 10,000 tons, but exports mostly to East Europe totaled about 90,000 tons.

Exports of apatite concentrate rose by about one-third in 1964 to about 3 million tons; much of this increase can be attributed to the heavier requirements of European Communist countries.

In the U.S.S.R., reported production costs, are not the major factor in determining the selling price of a commodity in the country, or to the free world. The Soviet system permits the establishment of selling prices at any level believed desirable to meet political and economic requirements. The workings of this pricing mechanism can be seen by comparing the prices paid for Soviet coal by Communist and non-Communist countries. The Communist countries paid the highest prices for Soviet coal—15.10 rubles per ton f.o.b. border in 1964, compared with 6.70 to 10.00 rubles per ton f.o.b. for sales to the West. The average cost of standard coal including transportation for Soviet consumers in the European U.S.S.R. was 16.30 rubles in 1964. The average f.o.b. border price for crude oil paid by the Communist countries was 16.54 rubles per ton compared with an average of 9.41 by the rest of the world.

Among Soviet imports of minerals and metals; ferrous and nonferrous semimanufactures, steel pipes, bauxite, tin, tungsten concentrate, barite, fluorspar, talc, and mica were the most important items in 1964.

Soviet sources do not record trade in precious metals. Gold sales in world markets in 1965 were estimated at $310 million compared with about $500 million in 1964.

In the case of platinum-group metals, the following 1964 receipts were recorded in United Nations import statistics:

Country	Quantity (thousand troy ounces)	Value (thousand dollars)
France	64	$3,807
West Germany	NA	7,673
Italy	7	736
Japan	NA	978
Netherlands	28	3,384
Switzerland	25	1,140
United Kingdom	6	270
Yugoslavia	167	9,537

NA Not available.

U.S. platinum group imports from the Soviet Union in 1965 comprised 40,345 troy ounces of platinum and 443,555 ounces of palladium; while 1964 U.S. imports included 3,744 troy ounces of unrefined primary and scrap undifferentiated platinum-group metals, 6,351 ounces of platinum, and 126,719 ounces of palladium.

United Nations trade data do not indicate any appreciable exports of silver from the U.S.S.R. to major non-Communist countries.

Table 4.—U.S.S.R.: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964	Value (thousand rubles)	
				1963	1964
Metals:					
Aluminum:					
Ingots and equivalent primary forms	122,100	175,200	East Germany 65,700; United Kingdom 18,000; Czechoslovakia 14,800; Rumania 14,700.	54,432	78,798
Semimanufactures, including those of duraluminum.	r 25,700	34,100	East Germany 6,800; Czechoslovakia 3,901; Cuba 3,300; United Arab Republic (Egypt) 3,300; Bulgaria 3,072.	17,082	23,255
Antimony, primary forms	r 3,300	4,300	Bulgaria 1,179; Netherlands 600; Japan 600; West Germany 400	1,510	3,483
Cadmium, primary forms	1,000	700	Czechoslovakia 210; East Germany 209; United Kingdom 110; Netherlands 100	4,064	3,191
Chromite, (48 to 56 percent Cr_2O_3)	567,000	663,000	United States 236,000; Japan 95,000; Sweden 72,000; West Germany 70,000; France 70,000; Poland 55,000.	12,000	13,314
Cobalt, primary forms	200	200	NA	846	844
Copper:					
Ingots and equivalent primary forms:					
Unalloyed	72,000	89,500	East Germany 40,300; Czechoslovakia 19,100; Poland 8,200	40,868	51,223
Alloyed (bronze)	2,200	2,400	East Germany 2,000	1,032	1,063
Semimanufactures:					
Unalloyed	5,500	5,000	Cuba 2,112; Czechoslovakia 771; Rumania 764	5,214	4,613
Alloyed (copper-zinc)	6,000	4,700	Rumania 1,351; Bulgaria 1,103; Cuba 600	5,147	4,226
Ilmenite	25,800	27,500	All to Italy	234	263
Iron and steel:					
Iron ore thousand tons	20,789	22,600	Czechoslovakia 7,638; Poland 7,154; East Germany 2,565; Bulgaria 2,339	212,275	229,961
Pig iron do	2,538	3,198	Japan 854; East Germany 787; Poland 235; Rumania 209	108,988	146,786
Ferrous scrap do	271	472	Japan 191; East Germany 155; Finland 114	9,075	15,739
Ferroalloys:					
Ferrosilicon	56,900	66,700	Rumania 41,800; Czechoslovakia 25,500; United Kingdom 25,000; Hungary 19,000; Belgium 12,700; Bulgaria 5,600; North Korea 5,400.	4,928	5,517
Ferromanganese	58,900	59,600		10,035	10,603
Ferrochromium	14,100	15,400		4,636	4,254
Ferromolybdenum	3,100	5,400		6,234	13,932
Not specified	20,000	24,900		9,455	11,778
Total	153,000	172,000		35,288	46,084
Semimanufactures:					
Rolled products, excluding pipes. thousand tons	3,536	4,181	East Germany 1,633; Rumania 805; Bulgaria 317; Czechoslovakia 293	475,090	568,646
Steel pipes do	221	239	East Germany 101; Bulgaria 35; Rumania 32; mainland China 13	48,999	50,329
Lead, ingots and equivalent primary forms	110,200	96,100	East Germany 35,200; Czechoslovakia 15,900; Hungary 11,200; Finland 8,000; Poland 6,300.	21,239	23,255
Magnesium, primary forms	2,100	2,800	East Germany 1,951	1,470	1,966

Manganese:					
Metallurgical grade ore	986,000	979,000	West Germany 252,000; Poland 174,000; East Germany 138,000; Czechoslovakia 130,000; France 103,000.	28,407	28,351
Battery and chemical ore	8,900	13,100	Poland 2,900; East Germany 2,700; Netherlands 2,300 Czechoslovakia 1,000	606	918
Mercury 76-pound flasks	14,500	2,900	NA	3,090	462
Nickel	5,900	5,100	East Germany 2,400; Czechoslovakia 1,700; mainland China 1,000	8,807	7,987
Tin, primary forms long tons	700	18	NA	1,552	24
Tungsten, concentrate	r 4,220	3,800	West Germany 1,200; United Kingdom 1,200; Austria 1,000	2,175	3,050
Zinc:					
Ingots and equivalent primary forms	82,400	149,800	East Germany 31,900; United Kingdom 31,100; Netherlands 26,400; Czechoslovakia 11,900; India 7,900.	17,062	40,711
Nonmetals:					
Abrasives:					
Hard alloys	185	156	Rumania 79; Poland 39	3,488	2,928
Asbestos	180,100	212,200	East Germany 24,700; West Germany 23,500; France 23,100; Poland 18,600; Czechoslovakia 17,300; Bulgaria 15,800; Hungary 14,100.	23,954	28,608
Cement thousand tons	1,081	1,382	Ghana 276; Pakistan 231; Spain 161; Libya 80; Turkey 70; Yemen 51	8,101	10,470
Cryolite	3,000	3,500	Poland 1,500; Hungary 1,100	520	676
Fertilizers and fertilizer raw material minerals:					
Apatite ore	81,400	64,900	Czechoslovakia 45,000; East Germany 19,900	564	511
Apatite concentrates, 38.5 to 39.4 percent P_2O_5 thousand tons	2,222	2,989	East Germany 761; Poland 381; Czechoslovakia 370; Hungary 307; West Germany 279.	35,201	47,773
Superphosphate, not less than 18.7 percent P_2O_5	295,100	226,900	Hungary 99,600; Cuba 77,100; Bulgaria 29,800	6,217	4,851
Ammonium nitrate	159,300	42,500	Cuba 22,500; Hungary 14,200	8,676	2,342
Ammonium sulfate	410,200	223,800	Cuba 171,800; North Viet-Nam 25,000	10,697	5,547
Potassium salts, KCl, 58 to 62 percent K_2O equivalent.	992,200	754,200	Japan 238,900; Czechoslovakia 164,000; Finland 85,300; Hungary 67,600; Cuba 54,300; Netherlands 37,500; Belgium 34,000; United Kingdom 31,000.	19,658	15,437
Fluorspar	3,300			54	
Graphite	6,400	7,500	East Germany 3,400; Hungary 1,400; Bulgaria 1,000	625	666
Gypsum	18,000	18,000	All to Finland	85	85
Kaolin	3,200	100	NA	86	2
Pyrite thousand tons	1,016	942	Italy 457; East Germany 257	6,043	6,146
Refractories:					
Clay, fire resistant	8,600	16,200	Hungary 7,900; Undisclosed 8,300	105	201
Magnesite powder	13,000	10,900	Rumania 7,000; Japan 3,900	560	499
Other	57,400	72,600	Bulgaria 29,700; Rumania 13,600; India 8,700; Cuba 3,400	5,210	6,049
Salt	138,200	108,900	Hungary 50,700; Czechoslovakia 40,900; Finland 16,200	743	595
Sulfur	103,700	147,100	Cuba 70,000; Hungary 34,300; Czechoslovakia 32,500	2,732	4,055
Sulfuric acid	77,400	96,500	Hungary 33,900; Czechoslovakia 24,800; Yugoslavia 16,300	2,282	2,772
Talc	14,600	16,100	All to Japan	256	294

See footnote at end of table.

Table 4.—U.S.S.R.: Exports of selected metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964	Value (thousand rubles) 1963	1964
Mineral fuels:					
Coal:					
Anthracite—thousand tons	4,235	4,086	France 1,713; Italy 470; Belgium 450; Czechoslovakia 333; Finland 277	58,818	62,913
Bituminous—do	16,785	19,230	East Germany 6,004; Czechoslovakia 2,776; Bulgaria 1,994; Hungary 1,291; Japan 994; Yugoslavia 964; Austria 887.	195,319	224,508
Other—do	342	312	Czechoslovakia 233	4,346	3,990
Total—do	21,362	23,628		258,483	291,411
Coke—do	3,796	3,999	East Germany 1,530; Hungary 638; Rumania 599; Finland 504; Denmark 246	80,425	85,194
Petroleum:					
Crude—do	30,243	36,691	Italy 7,013; Czechoslovakia 4,760; East Germany 3,936; Cuba 3,427; West Germany 2,959; Japan 2,483; Brazil 1,877; Finland 1,872; Bulgaria 1,799; Hungary 1,758; Poland 1,703; United Arab Republic (Egypt) 706.	389,246	475,636
Refinery products:					
Gasoline—thousand tons	3,342	2,747	Poland 818; mainland China 270; Bulgaria 215; North Korea 209; East Germany 187.	107,210	87,506
Kerosine—do	1,269	889	India 242; Czechoslovakia 236; mainland China 139	36,039	24,351
Gas/diesel oil—do	7,488	6,851	Finland 1,483; West Germany 634; Poland 617; Japan 510; France 491	165,210	142,775
Residual fuel oil—do	8,576	9,056	Sweden 2,424; Finland 817; Bulgaria 808; Cuba 752; Italy 669; Japan 590; Poland 564.	82,539	86,700
Lubricants—do	387	295	Cuba 51; North Korea 49; Bulgaria 40	33,075	25,098
Bitumen—do	19	23	Bulgaria 20	519	693
Paraffin—do	29	33	Poland 17, Bulgaria 2	3,949	4,592
Unidentified—do	29	36	All to Communist countries	1,542	1,471
Total—do	21,139	19,930	Sweden 2,741; Finland 2,327; Poland 2,113; Bulgaria 1,327; Cuba 1,133; Japan 1,107.	430,083	373,186
Carbon black	9,506	12,728	East Germany 4,900; Czechoslovakia 2,300; Hungary 2,000	1,551	2,040
Natural gas—million cubic meters	301	295	Poland 295	2,070	2,032
Electric power—million kilowatt hours	804	1,329	Hungary 647; Czechoslovakia 429; Poland 166	8,243	14,216

r Revised.
NA Not available.

Table 5.—U.S.S.R.: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964	Value (thousand rubles) 1963	Value (thousand rubles) 1964
Metals:					
Aluminum:					
Bauxite	441,300	449,300	All from Greece	1,953	2,016
Alumina	----------	15,100	All from Jamaica	----------	1,467
Semimanufactures, including those of duraluminum.	6,400	5,600	NA	3,771	3,454
Antimony	2,000	----------	----------	759	----------
Cadmium, primary forms	259	155	Poland 95	849	509
Copper:					
Ingots and equivalent primary forms:					
Unalloyed	88,000	9,500	West Germany 4,900; Rhodesia 3,700	51,052	6,668
Semimanufactures	r 7,200	8,600	All from Yugoslavia	6,475	7,384
Iron and steel:					
Pig iron, thousand tons	230	195	Mainland China 150; North Korea 45	14,582	12,409
Ferroalloys, do	12	3	Belgium 0.5; Japan 0.2	5,262	1,467
Rolled products, excluding pipes, do	926	732	Czechoslovakia 192: Rumania 162; Austria 107; Poland 84; Japan 71	150,713	122,246
Steel pipes, do	657	514	Rumania 215; Czechoslovakai 130; West Germany 54; Sweden 53	123,377	103,075
Lead:					
Ore	23,700	22,000	All from Iran	1,799	1,764
Concentrate	3,800	----------	----------	355	----------
Ingots and equivalent primary forms	38,800	49,900	Bulgaria 19,000; North Korea 17,600; Yugoslavia 10,100	9,092	13,130
Magnesium	500	500	All from Norway	255	255
Mercury, 76-pound flasks	2,900	2,900	All from Yugoslavia	427	560
Nickel	3,000	----------	----------	4,881	----------
Tin, primary forms, long tons	r 7,800	5,500	Malaysia 2,100; United Kingdom 1,400; mainland China 1,100; Indonesia 800	15,454	16,082
Tungsten, concentrate	12,000	6,000	All from mainland China	20,972	10,530
Zinc:					
Ore	8,500	10,200	All from Iran	283	658
Concentrate	36,200	32,200	All from North Korea	2,025	1,763
Dust	1,000	1,400	All from Poland	213	305
Ingots and equivalent primary forms	50,000	71,700	Poland 46,900; North Korea 24,700	10,928	15,297
Rolled products	4,000	3,900	All from Poland	1,203	1,129
Nonmetals:					
Barite	106,200	97,600	Yugoslavia 42,700; Bulgaria 27,500; North Korea 23,400	2,604	2,205
Cement, thousand tons	1,353	333	Rumania 312; North Korea 21	15,303	3,277
Fluospar	90,900	132,500	Mongolia 66,500; mainland China 30,700	2,664	3,823
Mica	200	240	All from India	1,063	1,348
Refractories, magnesite powder	97,600	80,100	All from North Korea	4,936	4,055
Sulfur	r 85,100	145,800	Canada 96,200; mainland China 25,100; Mexico 18,800	1,896	3,847
Talc	59,900	72,600	Mainland China 40,600; North Korea 18,800	1,360	1,657

See footnote at end of table.

Table 5.—U.S.S.R.: Imports of selected metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964	Value (thousand rubles)	
				1963	1964
Mineral fuels:					
Coal, bituminous thousand tons	5,100	5,100	Poland 4,805; mainland China 202	72,182	71,445
Coke do	654	661	All from Poland	15,387	15,777
Petroleum:					
Crude do	543	----------	----------	9,167	----------
Refinery products:					
Gasoline do	1,535	1,386	Rumania 1,164	50,540	46,554
Kerosine do	204	151	Rumania 150	6,264	4,655
Gas/diesel oil do	241	230	Rumania 203	6,894	6,560
Residual fuel oil do	51	52	All from Rumania	771	792
Lubricants do	147	154	Rumania 140; Hungary 13	9,949	10,438
Bitumen do	68	73	Rumania 72	1,575	1,696
Paraffin do	27	18	Rumania 12; East Germany 6	3,791	2,577
Unidentified do	67	18	----------	5,210	4,382
Total do	2,340	2,082	Rumania 1,796; East Germany 210	84,994	77,654
Carbon black	26,700	12,800	Rumania 3,900; United Kingdom 2,000; Netherlands 1,500; East Germany 700; Poland 500.	4,157	2,088

r Revised.
NA Not available.

COMMODITY REVIEW

METALS

With regard to metal production the U.S.S.R. was conducting a quantitative drive, and product quality seemed to be of secondary importance; nevertheless metal output fell short of demand. To meet requirements it will be necessary to increase efficiency of processes at existing mines and plants as well as to provide new capacity.

Nonferrous ore beneficiation facilities continued to experience poor recoveries of metal, particularly from oxide and mixed ores. Lead concentrates produced from mixed ores at the Zyryanovsk and Leninogorsk polymetallic deposits contained only about 60 percent of the lead present in the ore, and zinc concentrates carried only 30 to 50 percent of the zinc present in these ore.

Considerable effort has been put into the development and application of mining machinery. For many years in the nonferrous industry, efforts were directed primarily to the development of machines only for basic operations, and the potential for overall mechanization was underestimated. Methods of ore loading and conveying, which used old equipment and conveyance by scrapers, greatly impeded increases in labor productivity. The quality of drilling rigs and self-propelled equipment lagged.

Presently produced self-propelled equipment does not satisfy the miners. Idle time due to breakdown of individual units and component parts (taking into account repair) is 1.2 to 1.5 times greater than operating time. Existing drilling equipment does not achieve the aims of improvement of ore-mining technology.[3]

Aluminum.—During 1965, there were 12 aluminum plants in operation and this sector was one of the most successful in the nonferrous industry. At the Irkutsk aluminum plant the output of four potlines (each with 84 cells) was about two-thirds of design capacity. In 1966 output of marketable products reportedly will be increased about 25 percent over that of 1965. An experimental aluminum rolling mill was installed at Irkutsk during the year.

The second stage of the Krasnoyarsk aluminum plant, largest in the country, went into production in April. The plant's two units operated at about 80 percent of capacity.

Construction continued on the 800,000 ton per year aluminum plant near Bratsk. It will contain 24 potlines, each over 500 meters long, the first of which is planned to be operational in 1966.

A large aluminum plant (capacity unreported) also was under construction in the Gissar valley in Tadzhikistan, with a target completion date for the first stage set for 1968. It will be supplied with electricity from the Nurek G.E.S. (Nurek hydroelectric power station) and with natural gas from Afghanistan. Work on laying the pipeline from Afghanistan to Dushanbe was begun in 1965.

An experimental potline was commissioned at the Volgograd aluminum plant in October. The large capacity cells, the experimental plant for pumping alumina, and a plant for cleansing waste gases were assembled.

The Turgay bauxite open pits, the main supplier of raw material for the Pavlodar alumina plant, doubled ore production over that of 1964. Mine No. 15/15a in the north Urals bauxite field became operational in January, and will account for 25 percent of all ore extracted in that field. Four more mines being developed are expected to produce almost as much bauxite as was produced by the existing mines prior to completion of No. 15/15a.

A few deposits of bauxite were found on the eastern slopes of the Timanskiy Kryazh Range, and outcrops were found in the center of the Kzylkum desert in Uzbekistan.

Output of the Pavlodar alumina plant in 1965 reached only 80 percent of planned first stage capacity. Nevertheless, this facility, the main supplier of alumina for the Krasnoyarsk aluminum plant, became one of the leading plants of its kind in the U.S.S.R. For 1966, a production increase of 1.8 times over that of 1965 is programed on the basis of putting the second stage into operation.

The development of the technology for producing alumina from the nepheline mines of Kiya-Schal-Tyrsk was given priority in

[3] Narodnoe Khozyaystvo Kazakhstana (The National Economy of Kazakhstan), No. 1, 1966, pp. 1–3.

the Soviet aluminum industry. The process was first put into operation at the Volkhov aluminum combine. The Kirovabad alumina plant began producing alumina for the Sumgait aluminum refinery from raw alunite at the end of December 1965.

The country continued to import substantial quantities of bauxite from Greece.

Antimony.—Production of antimony trioxide increased considerably after the commissioning of a plant at the South Kirgiz mining and metallurgical combine.

Arsenic.—Arsenic production began at the Arachinskiy metallurgical combine in Georgia.

Bismuth.—As in prior years, bismuth was produced in 1965 from tungsten-molybdenum-bismuth and other complex ores. The Lenin Ust' Kamenogorsk lead and zinc combine succeeded in extracting metallic bismuth for the first time. This was the 18th chemical element extracted from Altay polymetallic concentrates.

Cadmium.—As in 1964, cadmium was produced in 1965 almost entirely from the zinc sulfide mineral, sphalerite. The Leninogorsk zinc plant organized the production of electrolytic cadmium for the first time in the Soviet Union.

Chromite.—The U.S.S.R. remained the largest world chromite ore producer. Kazakhstan took first place in production, and output was increasing as the result of the recent discovery of large deposits. The Millionnyy open pit in Aktyubinsk Oblast' operated at full capacity in 1965 and another pit was being prepared. The second crushing and grinding mill was completed at Khrom-Tau at the end of this year. As a result of these projects, shipments of chromite ore from Kazakhstan to ferroalloy plants in the U.S.S.R. and to foreign countries are slated to be doubled. The Donskie chromite open pits in Aktyubinsk Oblast' almost tripled ore extraction between 1959 and 1965. The new 5-year plan envisaged an increase of 1.3 times in chromite extraction by 1970 compared with 1965.

Copper.—The planned 90 percent increase in total Soviet refined copper production during the last 7-year period was almost achieved by yearend 1965. As a result of progress toward the planned goal, the nation reportedly achieved self-sufficiency for the first time in 1964. Of the total 1965 production, copper from the Urals and Kazakhstan accounted for about 80 percent. The Ural mountain area was one of the leading regions for copper deposits.

Copper content of concentrates ranged from 13 to 35 percent.

At the Dzhezkazgan combine mines, productivity in 1965 was at 1958 levels and at the largest and best mechanized copper open pit in the country, the Kounradskiy operation, productivity dropped 8 percent in comparison with 1958 levels. Reports indicated that the idle time of excavators at the Tishinskiy open pit was 34 percent of total calendar time, at the Kounradskiy pit, 21 percent, and at the Dzhezkazgan mine, 20 percent.

In 1965 copper metallurgical enterprises in Kazakhstan experienced raw material shortages because of the lag in development of mines as they had in 1963 and 1964.

Development of the Nikolaevskiy open pit in eastern Kazakhstan was progressing rapidly, and the Orlovskiy mining and concentrating combine was being built in northern Kazakhstan. Construction of Mine No. 55 at the Dzhezkazgan combine was completed. This copper mine, one of the biggest in the U.S.S.R., introduced in the country the extraction of ore with self-propelled equipment.

Copper deposits were discovered some 200 kilometers from Lake Balkhash in the Ayaksk area. The first 50 kilometers of a railway to link the town of Balkhash with the Ayaksk deposits were under construction. A copper deposit amenable to openpit mining was found in the Kuramir mountains, in the vicinity of Almalyk.

A Soviet State commission confirmed the existence of a large copper deposit in the Udokan mountains northeast of Lake Baykal and some 700 kilometers from Chita. The Government has proposed to Japanese copper mining and smelting companies a joint venture to develop the deposits.

A copper ore dressing mill was put into operation at the Uryupin mining combine in Stavropol' Kray. The Kofan copper combine was being renovated and enlarged; plans were made to double the capacity of the Kadzharan copper-molybdenum operation in Armenia, and a plant for producing granulated copper concentrate was installed at the Balkhash mine.

Smelting of copper concentrate by fluidized bed was carried out for the first time in the U.S.S.R. at the Alaverdy copper and

chemical combine. Production of refined copper was started in the Uzbek S.S.R.

Iron and Steel.—*Iron Ore.*—The Soviet iron ore industry in 1965, operated 65 underground mines and 68 open pits with a total capacity of 160 million tons of usable ore (direct smelting ore plus concentrates). In 1965, 73 percent of the usable iron ore production was from open pits. Sixty-two percent of the open pits and 53 percent of all underground mines had annual productive capacities of less than 1 million tons of crude ore. About 17 percent of the open pits had capacities exceeding 5 million tons and only 4 percent of the underground mines exceeded 4 million tons of crude ore a year. The Gigant mine in Krivoy Rog with an annual crude ore capacity of 6 million tons was the largest underground iron mine in the U.S.S.R.

Compared with 1964, production of usable ore in 1965 increased 7.6 million tons or 5 percent. The average grade of all crude ore mined was about 41 percent. Direct shipping ore averaged 54 to 55 percent iron while ore for beneficiation averaged 35 percent. Concentrates produced from the latter averaged 58 percent iron. Production of agglomerate reached 113 million tons in 1965 with an iron content of 57 percent.

Capacities put into operation for production of usable iron ore during the 1959–65 period totaled 112.6 million tons. The increase was obtained chiefly by construction of new plants rather than by expansion at existing plants.

A delay in developing additional mining and concentrating capacities with respect to the goal of 124.6 million tons set under the 7-year plan resulted in difficulties in obtaining needed raw materials at metallurgical operations. Thus, a 4-year delay in the development of pellet production at the Sokolovsko-Sarbaiskiy ore concentration combine had a marked influence on the output of blast furnaces at the Magnitogorsk metallurgical combine. Similarly, a 5-year delay in development of the Teyskiy open pit and in expansion of the Abagur concentration plant required the use of 3 million tons of low quality ore from the Urals and Kazakhstan by the West Siberian metallurgical combine.

The current and fixed assets of the Soviet iron ore industry totaled 2.75 billion rubles at the end of 1965; however the return on capital continued to fall; between 1960 and 1964 the output of usable ore per ruble of assets declined 32 percent.

Many of the machines in the iron ore industry were unreliable or lacked durability. As a result, about half of all the mine workers were engaged in equipment repair in 1965.[4]

The Krivoy Rog Basin in the Ukraine produced about 50 percent of the nation's total 1965 output. Both underground mines and open pits as well as five concentrating plants with a total production of 32 million tons of concentrate were operating in the region. The average iron content of Krivoy Rog usable ore was 54 to 55 percent and that of concentrate was 62 percent. It is planned to increase content of concentrate to 63.8 percent in 1966, and to 65 percent in 1967. By 1970 concentrate production of 50 to 55 million tons is planned.

Five underground mines were being developed in Krivoy Rog in 1965. Two, the Zorya mine and the second stage of the Gvardeyskaya mine, were put into operation. The latter, with an annual capacity of 3.5 million tons of crude ore, is one of the largest in the basin. The third stage of the Southern mining and concentration combine open pit became operational in September, increasing its capacity to 24 million tons of taconite annually. Construction also started on the third stage of this combine's concentrator. The unit scheduled for completion in 1967 will have four sections, and a total annual concentrate capacity of 4.4 million tons containing 65 percent iron.

The first stage of the Severnyy ore-dressing combine in Krivoy Rog, with a yearly concentrate output of 6.5 million tons, was completed in December. Construction was started on a second stage, scheduled for completion by 1970, that will double the capacity of the installation. The first stage of the Ingulets combine, to be the largest in the U.S.S.R. when completed, was commissioned in June, and additional sections became operational in December. At yearend the combine's annual capacity was 4.5 million tons of concentrate.

Concentration facilities of the Novokrivorozhskiy combine in Krivoy Rog were completely reconditioned.

Ore dressing installations were being constructed also in Poltava and Zaporozhye

[4] Ekonomicheskaya Gazeta (Economic Newspaper). Moscow, 1965, No. 39, p. 16.

oblasts in the Ukraine, and five mines were being developed in the Beloozerskiy iron ore deposit in Zaporozhye.

The second center of Soviet iron-ore activity was the Urals, where direct-shipping ore output reached 28 million tons in 1965. In addition, agglomerate production was increased from 18.3 million tons in 1959 to 29 million tons in 1965. A new ore dressing plant was being built for the Magnitogorsk iron and steel combine, to concentrate low-grade, high sulfur ore.

Kazakhstan, with an output of 14.1 million tons in 1965 compared with 13.9 million tons in 1964 ranked third among iron ore producing areas in the country. Iron ore was produced in two oblasts of the republic: In Karaganda at the Atasu mine group and in Kustanay at the Sokolovsko-Sorbay combine. Production costs in Kazakhstan were the lowest in the U.S.S.R.

The Sokolovsko-Sorbay mining and concentrating combine began full scale operation in December. It has an annual throughput of 26.5 million tons of ore, making it one of the largest mining and beneficiation enterprises in the U.S.S.R. The magnetic separation and pelletizing facilities have an annual capacity of 8.4 million tons of concentrate containing 65 percent iron. The combine is the main supplier of iron ore to metallurgical plants in the Urals and Kazakhstan.

Several iron ore projects were developed in Siberia. The first stage of the Korshunovo iron mining and concentrating combine in Irkutsk Oblast' was commissioned in March and deliveries to the West Siberian Steelworks began in April. Initial annual capacity was 6 million tons of crude ore, and 2.5 million tons of dry concentrate containing 60 percent iron. When the second stage is completed, capacity will be doubled.

In November the first stage of the Teyskoe iron ore pit in Khakas Autonomus Oblast', Siberia, with an annual capacity of 2 million tons of ore, was put into operation. A concentrator with an annual output of 1.75 million tons was built at Tashtagol in Kemerovo Oblast'.

In Kursk Oblast', central European U.S.S.R., the second stage of the Mikhaylovka iron combine was commissioned in April. This addition increased annual capacity to 4.5 million tons of ore. Expansion at the Olenogorsk ore dressing combine in Murmansk Oblast' on the Kola Peninsula increased annual capacity to 5.8 million tons of concentrate.

The Chernomorsk No. 2 open pit of the Kamysh-Burun iron ore combine in Crimea was commissioned in January. Reportedly yearly capacity was to be 3 million tons of ore.

Iron ore deposits amenable to open pit mining were discovered near Zhdanov on the coast of the Azov Sea during 1965. The magnetic anomaly contains an estimated 500 million tons of taconite with an iron content of 35 percent. In the Bakal area of the south Urals an iron deposit containing up to 50 percent iron was explored.

An iron deposit found in Aktubinsk Oblast' in Kazakhstan, containing an estimated 100 million to 120 million tons of ore, may provide a possible solution to the raw material supply problem at the Orsk-Khalilovo metallurgical combine.

About 150 million tons of magnetite ore was prospected in the Karamazar mountains in north Tadzhikistan. It was planned to develop a steel industry on the basis of this deposit.

Reportedly the first large iron ore deposit in the Soviet Far East the Galamsk was discovered in the Uda River region about 130 kilometers from the Sea of Okhotsk. Reserves were estimated at up to 250 million tons, half of which are of direct shipping grade.

The U.S.S.R's total mineable iron ore reserves were 46 billion tons, averaging 39.8 percent iron. The estimated measured reserves of iron ore were about 10 billion tons in 1965.

Pig Iron and Steel.—During 1959–65 significant new iron and steel capacities were commissioned: 18 blast furnaces with annual capacity of 18.8 million tons, 51 open-hearth furnaces with a design output totaling 19.1 million tons (most were of 500 to 600-ton nominal capacity, but 6 were of 900-ton capacity), six 100-ton oxygen converters, seven 100-ton electric steel smelting furnaces, and 33 rolling mills with overall capacity of 19.7 million tons.

The number of "industrial production personnel" at enterprises of the Ministry of Ferrous Metallurgy totaled about 1.2 million, 2.4 percent more than in 1964.

Thirty-six enterprises produced 66.2 million tons of pig iron in 1965, 6 percent more than in 1964. Of the total, about 52.5 million tons was produced in furnaces using natural gas for at least a part of the fuel; this was 7.8 million tons more than in 1964. At yearend, 86 furnaces used natural gas. In 1965, 12 furnaces were converted to oxygen enriched blasting. Coke consumption per ton of pig iron produced was reduced from 613 to 589 kilograms.

At plants which do not have natural gas, residual fuel oil was used. Last year its introduction was continued at a number of Ural enterprises and at the Karaganda plant. In all, liquid fuel was used in 25 blast furnaces.

While in 1959 only 53 blast furnaces had a volume of over 1,000 cubic meters, in 1965 there were 77. The volume of the average Soviet blast furnace in 1965 was 22 percent greater than in 1959, around 1,030 cubic meters; however, 25 blast furnaces with individual volumes of less than 300 cubic meters, were still in operation.

In 1965, steel production increased by 7 percent reaching 91 million tons. Of this amount, 80.5 million tons were produced in plants of the Ministry of Ferrous Metallurgy. Distribution of production by process was as follows:

Process	Percentage distribution	
	1964	1965
Open hearth	88.5	88.1
Oxygen converter	4.3	4.8
Electric furnaces	5.0	5.0
Unspecified	2.2	2.1

Furnaces which used natural gas for at least part of its fuel requirements produced 62 percent of the total output in 1965.

Oxygen converter steel was produced mainly by three plants: The Krivoy Rog, the Il'ich and the Petrovskiy. Electric steel production came principally from the Dneprospetsstal' and Chelyabinsk metallurgical plants.

The daily output of steel per square meter of furnace floor at Ministry plants, averaged 8.95 tons in comparison with 8.65 tons in 1964. On the average, the consumption of standard fuel per ton of steel was 165 kilograms in 1965.

Soviet 1965 rolled steel output totaled 70.9 million tons (including finished rolled metal, pipes, forged ingots and rerolling blanks). Of this, 66.3 million tons was from Ministry plants, 6 percent more than in 1964. The greatest production growth took place at: Krivoy Rog, Il'ich, Cherepovets, and Chelyabinsk. Despite increased total output, the production of structural shapes remained inadequate. As a result, according to a Soviet source, steel consumption was 20 percent greater than necessary because of the substitution of less efficient although heavier shapes.

Of the total rolled steel produced, 30 to 35 percent came from some 25 rolling mills installed in the last century.

Reportedly the Soviet Union was first among world producers of steel pipe. In 1965, a total of 9 million tons was manufactured, 11 percent more than in 1964. However, the industry did not satisfy the demands of all sectors of the Soviet economy, and there were a number of serious shortcomings in the industry. For example, despite the substantial growth, planned goals for pipe casing and drill pipe for the petroleum industry remained unfulfilled. Moreover not all pipes were equal to world standards of quality and preciseness of dimensions (for example, boiler pipe and petroleum pipe). More than half of the defects detected involved low quality of pipe metal. Plans for renovating pipe shops and modernizing equipment were being implemented slowly. Finishing equipment in many of the existing shops was not capable of manufacturing high-quality pipes; automation and mechanization were insufficient in finishing and quality control sections, as well as in warehouses of ready products.[5]

In the Soviet ferrous industry production was increasing at a slower rate than the growth of capital investment. In 1965, return on capital decreased 3 percent in comparison with 1964. Incomplete utilization of existing capacities, prolongation of construction projects, and unsatisfactory work of many units and shops were the principal reasons. Unsatisfactory introduction of planned capacities of new units also had pronounced negative effects on the level of returned capital. New units were slow in attaining capacities mainly because actual conditions of their operation did not

[5] Stal' (Steel), Moscow, No. 9, September 1965, pp. 777–780.

correspond with their designed and planned utilization.[6]

Among the main causes leading to failure of the ferrous industry to meet planned production costs were overly large consumption of raw materials, supplies, and energy. These excessive uses stemmed to a considerable degree from high losses due to defective quality of production.[7]

The Ukraine with Krivoy Rog, Zaporozhye, and the Donbas as the main centers, produced 49.2 percent of total Soviet pig iron, 40.7 percent of total ingot steel, and 53.2 percent of total rolled steel. The second center was the vast area of the R.S.F.S.R. including the Urals, Center, and Siberia regions. Kazakhstan ranked third in Soviet ferrous metal production.

In 1965, additional production capacity for 2.0 million tons of pig iron, 1.8 million tons of steel and 1.4 million tons of rolled metal was installed. 1.6 billion rubles of capital investment were available for the Soviet ferrous industry (including mining and concentration). However, at a number of plants installation of equipment had fallen behind schedule. As a result, blast furnace No. 10 at the Magnitogorsk metallurgical combine, rolling mills at the Kommunar and Krivoy Rog plants, the converter shop at the Novo-Lipetsk plant, and the sinter shop at the Il'ich plant in Zhdanov were not commissioned in 1965.

The largest blast furnace in the world, with useful volume of 2,300 cubic meters, was under construction at Il'ich but was not completed by yearend.

A second oxygen converter at the Krivorozhstal' steel plant, the U.S.S.R.'s 13th and largest converter, was slated for completion in October but was not ready for operation at yearend.

Open hearth furnaces at the Orsk-Khalilovo combine and at the Amurstal' plant were put into operation. A new thermic furnace was commissioned at the Zhdanov Il'ich plant in June. A complex for radial method of steel casting was completed at the Rustavi metallurgical plant.

The second 1,300 millimeter automated blooming mill in the Soviet Union was installed at the Chelyabinsk plant. The first mill of this type began operating in 1964 at the Krivoy Rog plant. A new rolling mill at the West Siberian metallurgical plant in Novokuznetsk, with a capacity of 800,000 tons of rolled metal a year, began production in September.

The world's largest electric pipe-welding shop for the production of 159—529 millimeter diameter pipe was completed at the Novomoskovsk steelworks in Dnepropetrovsk Oblast'. A 150 ton capacity pipe drawing mill was commissioned at the Dnepropetrovsk Karl Libknecht in March. The country's first experimental spiral pipe welding mill at the Novomoskovsk metallurgical plant reached its planned capacity in December.

Ferroalloys.—Part of the Soviet effort to improve steel quality was devoted to ferroalloy plants. The first stage of a new smelting shop was commissioned at Zaporozhye. This fully mechanized and automated shop was the largest in the U.S.S.R. An enclosed furnace for melting ferroalloys was commissioned at the Chelyabinsk electrometallurgical works, and the construction of the first electric melting section began at the Yermak plant in Kazakhstan. A ferroalloys plant was under construction in Nikopol', and the Zestafoni ferroalloy plant in the Georgian S.S.R. installed five closed-type electric furnaces.

Lead and Zinc.—In the Altay region of Kazakhstan, construction continued on the Tishinsk mine complex near Leninogorsk. A new ore-dressing installation was commissioned in December, and a zinc works was under construction. Ores from this mine, regarded as one of the richest in the Altay region, contain lead, zinc, gold silver, and other metals. Also in Kazakhstan, work began on a new mine at the Tekely lead and zinc combine, and the Kentau concentration mill for the production of lead and barite was commissioned. The Zyryanovsk concentrating mill, for the first time in the U.S.S.R., obtained zinc concentrate from oxidized lead-zinc ores.

In the Georgian S.S.R., the Morneuli mining and concentrating combine was under development to exploit extensive copper-lead resources found in the area around Bolnisi. This will be the Georgian S.S.R.'s first nonferrous industry enterprise.

Soviet lead-zinc concentration mills used on the average 4 kilograms of flotation reagent and 35 kilowatt hours of energy per ton of ore processed in 1965.

[6] Ekonomicheskaya Gazeta (Economic Newspaper), Moscow, April 1966, No. 14, pp. 24–25.
[7] Work cited in footnote 6.

Magnesium.—In 1965, the Soviet Union produced about 21 percent and consumed over 18 percent of the world production of primary magnesium.

Experimental production of metallic magnesium began at the Ust'-Kamenogorsk titanium-magnesium combine in Kazakhstan, which was under construction in 1965. The new plant is believed to be a major producer of magnesium metal in the country.

Manganese.—The Soviet manganese industry remained the largest in the world. In 1965, 992,000 tons of manganese ore, about 13 percent of total production, was exported.

The Chiatura manganese basin in Georgia, the richest in the U.S.S.R., produced a total of 1.5 million to 2 million tons of concentrates of various grades. There were 15 mines in Chiatura at the beginning of 1965, and two more (with an annual capacity of some 100,000 tons each) were commissioned at yearend. Approximately 80 percent of the ore was extracted by underground methods.

Reportedly the Darkvety carbonate ore concentrating mill in Chiatura, built in 1961 at a cost of 5 million rubles, has been idle since 1962 because metallurgical plants are not using carbonate concentrate.

The nation's second principal manganese basin, the Nikopol' in the Ukraine, has several times greater reserves than Chiatura, but the ore bed is only a little more than 2 meters thick and lies under as much as 80 meters of overburden. More than 70 percent of ore mined was obtained by open pit methods.

Two mines, the No. 1–BIS, with an annual capacity of 200,000 tons of manganese ore and the first stage of the Grushovskaya Mine No. 7, were commissioned in December. The latter, the largest in the Nikopol' basin, will supply annually 500,000 tons of ore, more than twice as much as any other single mine.

The first and second stages at the Chkalov combine, having an annual capacity of almost 1.1 million tons of concentrate, also were commissioned.

The Dzhezdy manganese ore-dressing plant in Karaganda Oblast' was put into operation in May to process low-grade ore for the Yermak ferroalloys plant. In January construction of a manganese reagents plant was started in Rustavi, Georgian S.S.R.

Manganese ore deposits were discovered in the Idzhevan mountains of northern Armenia and in the Zangezur mountains of southern Armenia. A near surface deposit was discovered in Irkutsk Oblast', 40 kilometers from Nizhneudinsk.

Mercury.—The Soviet Union was estimated to have produced about 14 percent of the world total, and was apparently self-sufficient in mercury in 1965.

The Ulugtau mercury mine with metal recovery works was completed in the Kirgiz S.S.R. Extraction of metal was begun on the Chukotsk Peninsula near the Bering Strait. Two mercury deposits close to surface were found in Magadan Oblast'.

Molybdenum.—Output of molybdenum concentrate was estimated at 6,200 tons or 12 percent of the world total in 1965. About 50 percent of the production was from copper-molybdenum ores, about 30 percent from molybdenite ore, and the remainder from tungsten-molybdenum ores.

Armenia occupied first place in the production of molybdenum concentrate from Kadzharan copper-molybdenum ores, but the concentrate was shipped out of the Republic for further processing.

The Chorukh-Dayron mining enterprise started extracting molybdenum ore from a deposit in the Kuraminskiy mountain range in Tadzhikistan. The molybdenum plant of the Balkhash mining and concentrating combine and the Dzhidinskiy tungsten and molybdenum combine in Buryat A.S.S.R. increased output of molybdenum concentrate in 1965.

Nickel.—The U.S.S.R. apparently contributed about 20 percent and consumed less than 19 percent of the nickel produced in the world in 1965.

The Monchegorsk area of the Kola Peninsula and Norilsk area in northern part of western Siberia were the country's foremost nickel producers. The first stage of the ore concentration mill of the Severonickel combine in Monchegorsk with an annual capacity of 2 million tons of copper-nickel ore was commissioned. A new ore-dressing installation was completed at the Norilsk ore-dressing combine and was expected to be operating at full capacity in 1966. In the Talnakh River Valley on the Taymyr Peninsula a mining complex was being established for the openpit mining of polymetallic ores. The complex will include

two open pits, the Mayak and the Komsomol'skiy.

In the southern Urals, the Oktyabr'skiy mine was commissioned and the Novo-Buranovskiy mine was being prepared for exploitation. These open pits will ship ore to the Yuzhno-Ural'skiy nickel combine. An electric furnace was put into operation at the Buruktal nickel combine in Orenburg Oblast'.

Gold.—Since the early 1930's few data on Soviet activities in precious metals exploration, production, trade and stockpiles have been published officially. Available information however indicates that in 1965, the U.S.S.R. was probably second among world producers. Reportedly, about 75 percent of Soviet gold production came from the sub-Arctic Asian area, and most of the remainder from polymetallic ores mined in Kazakhstan and the Urals.

The major areas of gold production reportedly fulfilled or overfulfilled their prescribed 1965 goals. Soviet sources claim gold reserves are sufficient for 16 to 17 years of operation at present rates of extraction, and an intensive exploration effort has been mounted. This effort has resulted in the discovery of a number of rich deposits. In 1965, more than 30 gold placer deposits were surveyed in the Yano-Kolymskiy gold-bearing belt in Magadan Oblast'. This belt is 1,000 kilometers in length and up to 200 kilometers wide. Many gold deposits within its limits have been mined for more than 30 years, but new discoveries have virtually paced the extraction rate, thus known reserves are practically as great as they were at the outset of mining.

Eleven placer deposits, were discovered in the Khabarovsk region, and reserves of placer gold were increased at existing mines in the Udokhan, Vacha, and Yandara River basins. New placer deposits were discovered in the valleys of the Bodaybo, Udokhan and Vinyam Rivers.

Prospecting, completed in the Serebryannaya River Valley in the middle Urals, reportedly revealed one of the largest gold deposits to be discovered in the U.S.S.R.

Discovery of a gold deposit near the upper reaches of the Irtysh River in Kazakhstan resulted in the start of construction on a large mining and processing complex.

Two new mining administrations—Nizhne-Yanskoe and East Chukotskoe—were formed in Magadan Oblast' in 1965. Under the new 5-year plan, output of gold in this area is to be 32 percent higher than under the past 7-year plan.

Enterprises of the Transbaykal gold trust were reconstructing small dredges to exploit gold deposits in Chita Oblast' that can be processed only by such dredges.

A new mine became operational in the Aldan area of Yakut A.S.S.R., and a new ore-dressing combine was being built in this area. The Kamenistyy placer mine in Kamchatka Oblast' was commissioned in 1965.

Platinum.—The U.S.S.R. remained the largest world platinum-group metal producer. Production was believed to be obtained mainly from copper-nickel mines of Severonickel (Kola Peninsula) and Norilsk combines and from placer deposits of the Urals.

Rare Metals.—A new rare metal recovery unit was put into operation at the Ust'-Kamenogorsk combine. Rhenium was recovered from molybdenum and copper concentrates in Armenia.

An installation to extract selenium from sulfur residues was completed at the Chardzhou chemical plant in Turkmen S.S.R. The Leninogorsk zinc plant introduced a new filtration method of extracting selenium.

Tin.—Production of tin continued to be inadequate to meet internal demand, and more than 25 percent of requirements had to be imported in 1965.

New tin concentrate capacity was put into operation at the Solnechnyy ore-dressing combine in Khabarovsk Kray, and development of the open pit continued.

New sources of tin were discovered during the year as the result of an intensive geological exploration program carried out by Ministry of Geology. In the Sikhote-Alin mountains of Maritime Kray, work was started on designing the Ternistoe mine, to exploit one of the recently discovered deposits.

Titanium.—Development of the titanium industry continued in the U.S.S.R., the world's second largest producer. Additional capacities commissioned in 1965 included the electrolysis plant at the Ust'-Kamenogorsk titano-mangnesium combine, under construction since the late 1950's, and new facilities at the Berezniki titanium and magnesium combine, in Perm Oblast'.

Ilmenite was discovered in placer deposits along two right-bank tributaries of the

Dnieper River in the Ukraine. One ilmenite concentrating mill was completed, and construction of another started at the Irshansk mining and concentrating combine in Zhitomir Oblast'. With completion of the latter, this combine will become the country's largest supplier of ilmenite concentrate.

Tungsten.—Production of tungsten was insufficient to satisfy growing domestic needs, and about 20 percent of concentrate requirements had to be imported.

In 1965, the Dzhidinskiy combine in Buryat A.S.S.R. increased output of tungsten concentrate by 2.5 percent as compared with 1964.

Vanadium.—Indigenous requirements for vanadium were satisfied from certain vanadifferous iron ores and small vanadate deposits. The principal sources of vanadium in 1965 continued to be the titaniferrous magnetites of the Kachkanar open pits in the Urals, and the iron ore of Lisakovska deposit in Kazakhstan.

NONMETALS

The Soviet Union produced a wide variety of nonmetals. However, the resource position varies from adequacy or abundance for many nonmetals to apparent shortages of other such as barite, feldspar, fluorspar, mica, and talc.

Amber.—The Kaliningrad amber combine increased its yearly output to 420 tons and in 1965 exported 1.2 million rubles worth of amber and amber jewelry to 30 countries.

Asbestos.—Asbestos industry development was concentrated in the Urals, Kazakhstan, and the Buryat A.S.S.R. The first 200,000 ton-per-year stage of the Dzhetygara asbestos combine in Kazakhstan was commissioned in October, and produced 40,000 tons of asbestos by year end. Construction of the second stage was started and reportedly it will be commissioned in 1967. By that time the combine's capacity is slated to reach 600,000 tons, and it will be one of the largest asbestos producers.

Deposits of two types of asbestos were discovered in Kazakhstan: Anthophyllite in the Mugodzhary hills, and chrysotile in Dzhambul Oblast'. In Buryat A.S.S.R. detailed prospecting of the Molqdezhnoe asbestos deposit was nearly completed and a road to the site was under construction.

Barite.—Barite was mined by both open-pit and underground methods and at some operations crude output was concentrated by flotation. About two-thirds of the country's barite consumption in 1965 was produced domestically, the balance being filled by imports of high-grade barite.

The increase in output in 1965 was attributed largely to the commissioning of new capacities. The second and third stages of the Kentau concentrator were put into operation. Equipped with machinery built in Czechoslovakia from Soviet Union plans, the mill became the largest barite concentrator in the country.

Bentonite.—Armenia, Tadzhikistan, and Kazakhstan remained the three principal centers of bentonite production. The Isfara plant in Tadzhikistan, which supplies ground clay for oil well drilling, was reconstructed and output is expected to increase more than twofold.

New bentonite deposits were found in the Idzhevan mountains in Armenia and construction of a clay works was started at Barsa-Gelmez in Turkmenistan.

Cement.—Cement output was 72.4 million tons, or 11 percent higher than in 1964. Plans called for the construction of 6.6 million tons of new capacity in 1965 but only 4.6 million tons of the total was completed. Small cement plants were put into operation in Magadan and Odessa, and the first stages of plants were completed in Ust'-Kamenogorsk (annual capacity 200,000 tons) and in Achinsk (annual capacity 1 million tons). New capacities were added at the following cement plants: Amvrosievsk, Balakliysk, Bukhtarma, Dneprodzerzhinsk, Kant, Lipetsk, Nikolaev, Volzhsk, Rybnitsa, Punane-Kunda, Semipalatinsk, Alekseevsk, and Ul'yanovsk.

Annual capacity of the Balakliysk cement plant in Khar'kov Oblast', according to official sources the largest in Europe, was almost 3.5 million tons. In 1965 four 185-meter rotary kilns were in operation, and output totaled nearly 2.5 million tons. A fifth kiln will be installed in 1966.

The national average fuel consumption in 1965 was 250 kilograms of standard fuel equivalent per ton of clinker.

Diamond.—The Soviet Union continued to make rapid progress in the expansion or diamond mining. A substantial but unknown quantity of synthetic diamond was also produced in 1965 by plants, in Kiev, Moscow, and Yerevan.

The use of diamond by Soviet industry in past years was severely limited by inadequate supply; however this situation changed radically after discovery of the large Yakut diamond deposits, and the advent of synthetic diamond production. All Soviet demand for diamond tools can now be met by home industry. Reportedly, the demand for diamonds in the Russian union republics totaled 2.6 million carats of stones and 0.6 million carats of powder in 1964.

In 1965, the Mirnyy mine, the largest of the Yakut diamond trust, increased extraction and processing of kimberlite by over 50 percent compared to 1964 levels. Aykhal, the location of the new diamond mining center in Yakutsk A.S.S.R., will be the first town in the country with an artificial climate.

Diamonds were found in the upper reaches of the Anabar River in the arctic area of Yakut A.S.S.R. Important concentrations of diamond were also discovered near the 70th parallel, where Olenek River flows into the Arctic Ocean. Preparations started for commercial exploitation of these deposits.

Several diamond deposits were discovered on the Vishera River north of Perm'Oblast', and two were being exploited commercially, using dredging. The Urals diamond mining administration transferred its base to this locality.

A large diamond-processing works was opened in Smolensk. Operators were trained by experts from other Soviet and foreign jewelry enterprises.

The production of synthetic diamonds and instruments utilizing them was started in Yerevan. In 1964 only one type of synthetic diamond was in production. In 1965, the experimental shop of the Kiev super hard materials institute manufactured three new kinds for industry.

Fertilizer Materials.—Fertilizer production totaled 7.4 million tons in 100 percent nutrient content or 31.3 million in bulk fertilizer content[8] in 1965, but was well behind the target of 35 million tons bulk content set by C.P.S.U. in December 1963. Nevertheless, compared with 1964 output, mineral fertilizer production in 1965 increased over 22 percent. This increase was attained largely through the commissioning of new capacities.

The following enterprises and facilities were completed in 1965: The Novo-Lipetsk, Dorogobuzh, and Kuybyshev nitrogenous fertilizer plants, and Gomel' superphosphate plant in Belorussia; the Angarsk mineral fertilizer plant, the Dzhambul superphosphate plant and mineral fertilizer production facilities at the Lisichansk and Dneprodzerzhinsk chemical combines. The first stage of the Navoi fertilizer combine was commissioned, and the second ammonium producing line at the Novokemerovsk chemical combine started production in December. The Novomoskovsk chemical plant was reequipped to produce a nitrogenous-phosphatic-potassic fertilizer.

A mineral fertilizer plant was under construction in Rustavi, Georgia, and superphosphate facilities were built at the central Urals copper smelting works. Construction of a new phosphoric acid production complex started at the Kedainiai chemical combine in Lithuania and superphosphate plants were being built in southern Kazakhstan.

An increase of about 12 percent in mineral fertilizer output was expected in 1966. Under the plan the following projects were to be put into operation in 1966: The Gorlovka and Dneprodzerzhinsk nitrogenous fertilizer plants, the Odessa superphosphate plant, and Novostebnikovsk potassium combine. Construction will be accelerated at the the Rovno nitrogenous fertilizers plant, and the Yavorov mining and chemical combine.

Phosphate.—The bulk of the increased output of phosphate fertilizers in 1965 may be credited to the greater capacity of the "Apatit" combine on the Kola Peninsula and the commencement of production at Karatau in Kazakhstan.

Geological reserves of phosphate were estimated in 1965 at 2.7 billion tons of phosphorite (overall average grade, 13.8 percent P_2O_5) and 1.6 billion tons of apatite (average grade, 18.5 percent P_2O_5).

The 40 commercial deposits in the Karatau mountains contain over 1.5 billion tons phosphorite. More than half of the reserves

[8] The active ingredients (nitrogen, phosphorous and potash) are expressed in terms of Soviet standard units which are not the same as those used in the United States. Nitrogen is expressed as ammonium sulfate, phosphate is expressed as 18.7 percent P_2O_5, potash is expressed as 41.6 percent K_2O, and ground rock phosphate (phosphatic flour) is expressed as 19 percent P_2O_5.

of the basin will be extracted by underground mining. The second and final stage of the Aksay open pit was commissioned in August, increasing annual capacity to 2 million tons of phosphorite ore. There were 19 rotary drill rigs and 130 25-ton dump trucks at the pit in 1965. Production was started at Molodezhnaya underground mine in the same region.

In 1965, phosphate fertilizer production at the Karatau mining and chemical combine was raised to 1.5 million tons, 300,000 tons more than in 1964. It was planned to increase ore deliveries to the plant five times by 1970.

The second stage of the Kingisepp "Phosphorit" combine in Leningrad Oblast' was put into operation in July. Extraction of phosphorite ore began at the Dzhantas open pit in Dzhambul Oblast'.

Additional phosphorite deposits were found in the Dzhezkazgan area of Kazakhstan, and phosphate rock deposits were discovered near the confluence of the Kama and Vyatka Rvers, in Krasnoyarsk Kray, and in south Uzbekistan.

A deposit of apatite was found 40 kilometers from Kokchetav in Kazakhstan.

There were three underground mines (Kirov, Yukspor, and Rasvumchor) and the Tsentral'nyy open pit (2.5 million ton capacity) in operation at the "Apatit" combine in 1965. At the Kirov mine construction of necessary facilities was started to increase apatite ore output by 1 million tons to 5 million tons.

Reportedly, the "Apatit" combine failed regularly to supply needed raw material to the Konstantinovka chemical plant and other enterprises.

The fourth section of the ore-dressing plant at the Kirovsk apatite combine was commissioned in December, and its annual capacity reached 5 million tons of apatite concentrate (38.5 to 39.4 percent P_2O_5).

Construction started on a second section of the ore and concentrate shipping facilities in Murmansk port, aimed at doubling the loading rate.

Potassium.—Increased potassium fertilizer output in 1965 was attained entirely through the commissioning of new capacities. The more important enterprises and facilities put into operation in 1965 include the first stage of the second Soligorsk potassium combine in Belorussia, the Novostebnikovsk potassium combine in L'vov Oblast', and a new potassium fertilizer production installation at the Ust'-Kamenogorsk magnesium-titanium combine.

Three chemical combines for processing local potassium into fertilizer were under construction in Soligorsk, south Belorussia. According to the plan, the yearly potassium output of these facilities will amount to 3 million tons. It was decided to erect a fourth combine at the Starobin deposit. Construction of another potassium combine started in the north of Perm' Oblast', in the Berezniki area. This is the fourth enterprise in that vast potassium salt basin.

A new potash deposit was discovered at Karlyuk in southern Turkmenistan.

Fluorspar.—Domestic fluorspar output remained significantly inadequate to meet the demand of the industry, and high-grade fluorspar imports continued; these totaled 132,500 tons in 1964.

Fluorspar was mined in Buryat A.S.S.R., in the Soviet Far East and in Central Asia. Reports indicate construction of the Yaroslavsk ore-mining and concentrating combine in the Far East, and of a fluorite concentrating plant, with an annual capacity of 200,000 tons of ore, in Buryat, A.S.S.R. The Yaroslavsk combine will be a major supplier of fluorspar concentrates for the aluminum, electrode manufacturing, and cement industries.

Graphite.—Increased domestic output of natural graphite in 1965 was supplemented by material recovered from metallurgical wastes of the iron and steel enterprises.

Additional capacity planned for 1965 included the Soviet Union's first installation for the production of fettled graphite (a raw material for artificial diamond) at the Zavalovskiy graphite combine in Kirovgrad Oblast', the Ukraine.

Gypsum.—The overall goal of the 7-year plan for gypsum output was not fulfilled as output in 1965 remained at about the 1964 level. At the Rustavi construction materials combine in Georgia a gypsum plant was commissioned in January.

Iodine.—New iodine production capacities were placed in operation in Turkmen S.S.R. A State commission accepted the 16 industrial and auxiliary units of the first stage of the Baku iodine plant in January; construction of the second stage continued. An experimental iodine plant was put into operation near Slavyansk in the Kuban' re-

gion. The iodine was extracted from water discovered during drilling for oil wells.

Kaolin.—Kaolin was mined from open pits in the Ukraine and the Urals. Construction of a kaolin mining combine was started at a large deposit in the vicinity of the Chalgan railway station in Amur Oblast'.

A large kaolin deposit was discovered in the Kokchetav steppes, east of the Urals.

Lime.—The original Soviet 1965 production target for lime, 17 million tons, was fulfilled. The Dzhivil-Aryksk lime plant in Kirgizia, and the Ussuriysk lime combine, the largest in the Far East became operational in 1965. Annual capacity of the latter was 500,000 tons.

Magnesite and Magnesium Compounds.—In the Kara-Bogaz area of Turkmenistan a new chemical plant began manufacturing magnesium dichloride for farms in the central Asian republics. At Satka in Chelyabinsk Oblast', a new rotary furnace, for producing magnesite powder for the metallurgical industry, was put into operation.

The Savina magnesite deposit, in the eastern Sayan Mountains, Irkutsk Oblast' was explored. The reserves, the largest in the country, were of high grade and it was decided to plan a magnesite-calcining and ore-concentrating combine to process ore from this deposit.

Mica.—Irkutsk Oblast' was the main Soviet supplier of muscovite mica; 75 percent of all muscovite deposits in the country were in Mamsko-Chuyskiy Rayon of Irkutsk Oblast'. The Bol'shoy Severnyy mine was the largest mine of the Mama mica trust, and the Irkutsk mica factory was one of the largest enterprises in the country engaged in mica processing.

In 1965, the State allocated 11 million rubles for muscovite mica prospecting. More than 150 teams of geologists, geophysicists, and topographers were assigned to the Mama area in Irkutsk Oblast'.

Strategic-grade mica continued to be imported from India to meet special industrial demands.

Perlite.—Perlite was mined in Armenia and Buryat A.S.S.R. A new unit with annual capacity of 25,000 cubic meters of perlite was under construction at the Arakadzh plant in Armenia. The second stage of a perlite quarry, with an annual capacity of 50,000 cubic meters, was commissioned in Mukhor-Tala, Buryat A.S.S.R., in November.

Refractories.—As in prior years, production of refractories paced rising industrial output, but consumers were not satisfied with product quality. The refractory industry however, continued to direct its major efforts toward quantity in 1965 rather than quality of refractories.

A large refractory materials deposit was discovered near Shorza, northeast of Sevan in Armenia and it was planned to construct a combine at these new pits in 1966.

Refractory clays were mined from the Turgay bauxite open pit operations for shipment to the Chelyabinsk metallurgical plant.

A new deposit of fire clay was surveyed at Barzas in the Kuznetsk coal basin that will be able to meet all requirements of the Kuznetsk metallurgical combine and the West Siberian metallurgical works.

Salt.—The Volodarsk salt mine in Artemovsk, Donetsk Oblast', was renovated. This property has a planned capacity of 5,000 tons of table salt daily, an increase of nearly 50 percent over the capacity before renovation.

The largest salt mine of the U.S.S.R., with a capacity of 2 million tons a year, was being developed in Salarinsk Rayon, Irkutsk Oblast'. In order to operate the mine at full capacity, some 4,000 workers will be needed.

Sulfur.—The Soviet Union is one of the leading countries in sulfur ore reserves but sulfur content is low and production costs high. In 1965, the commercial deposits of sulfur ore were: Rozdol (West Ukraine), Gaurdak and Shorsu (Central Asia), and Vodinsk and Alekseevsk (Volga group).

The Rozdol chemical and ore combine was the largest producer of sulfur and the largest operating sulfur combine in Europe. The Gaurdak deposit in Turkmenia was one of four exploited deposits in Central Asia which, together with the Rozdol deposit near L'vov, provided the bulk of the country's sulfur requirements.

An important factor undoubtedly contributing to the recent increase in elemental sulfur output was initiation of production from mirabilite obtained from the Caspian Sea and treated at the recently opened Kara-Bogas combine.

Other sources of sulfur were receiving attention, including recovery in the form

of sulfuric acid from nonferrous smelter gases and from oil processing.

Construction of the largest facility in Europe for the production of sulfur started at the Yavorov mining and chemical combine in the vicinity of large sulfur deposits in L'vov Oblast'.

The most important new facilities for sulfuric acid production commissioned in 1965 were at the following plants: Krivoy Rog Lenin works, Sumy chemical combine, Balkhash mining and metallurgical combine (first stage), and at the Leninogorsk zinc plant (second stage). New productive capacities were put into operation for the production of natural sulfur in Turkmen S.S.R.

Vermiculite.—The vermiculite deposits of Kola Peninsula were the largest in the U.S.S.R The extensive Urals deposits were the second producing center. A large deposit of vermiculite was found in Kokchetav Oblast', Kazakhstan.

MINERAL FUELS

Among the many goals set for the various branches of the economy, the planned structural change in the Soviet Union's fuels balance was of considerable significance to the mineral industry, as a producer, consumer, and exporter. In 1965, crude oil and natural gas provided 51.6 percent of total fuel production, whereas in 1966 the share of the total to be accounted for by these fuels was slated to increase to 53.5 percent. If planned goals are met, oil production will reach 264 million tons (about 1,924 million barrels); gas, 148,000 million cubic meters (about 5,180,000 million cubic feet); coal (including anthracite and lignite) 598 million tons; and fuel peat 75 million tons.

Production of coal in the U.S.S.R. in 1965 was equivalent to about 420 million tons of standard fuel,[9] while crude oil production was equivalent to less than 347 million tons. It is evident that in development of power sources in the Soviet economy, coal is likely to play a larger role than petroleum.

In spite of the development of the Soviet coal industry, output during recent years has not kept up with the demands of the Soviet economy. Moreover coal exports have intensified this problem.

[9] A metric ton of standard fuel equivalent has a calorific value of 7,000,000 kilocalories (7,000 kilocalories per kilogram) or the equivalent of 27,780,000 British thermal units (or 13,100 B.t.u. per pound).

Although coal's share in the country's fuel production balance has gradually declined, there has been no relaxation in coal industry development plans, as is evidenced by the output target of 665 to 675 million tons of useable coal planned for 1970.

Development of electric power facilities has had one of the highest priorities in the Soviet economy since 1920. During the 1959–65 7-year-plan alone, the annual production of electric power in the U.S.S.R. was increased by more than 270 billion kilowatt-hours, with an average annual rate of growth of 11.6 percent.

Installed capacity of electric stations of the U.S.S.R. at yearend totaled 114 million kilowatts including 22.2 million kilowatts capacity of hydroelectric power. Production is expected to reach 840 to 850 billion kilowatt-hours in 1970.

Coal.—Daily coal output increased from 1.5 million tons in 1958 to 1.7 million tons in 1965. The total tonnage included about 410 million tons for heating and power purposes, 40 percent supplied to electric power stations, 27 percent for communal-domestic requirements, about 11 percent for transport purposes, and 22 percent for other uses.

The requirements for coking coal by the the metallurgical industry were met almost in full.

In 1966, plans call for the coal mining industry to increase its capacity by 20 million tons. The production goal was set at 598 million tons, or nearly a 3.5 percent increase over the 1965 output.

In 1965 there were 877 underground coal mines and 62 open pits which employed 1.7 million workers. The average annual capacity of underground mines was 0.5 million tons and mine timber consumption amounted to 1,380 cubic feet per thousand tons of coal produced. Underground production of coal in 1958–65 increased by 11 percent. Recovery of coal at eight main underground coal combines in the Soviet Union has decreased from 82.6 percent in 1954 to about 70 percent in 1965.

The average ash content of all useable coal was 19.4 percent in 1965, however, home heating fuel ranged up to 45 percent. The calorific value of coal shipped averaged a little more than 5,000 kilocalories. The throughput of coal preparation plants was 172.5 million tons, only 30 percent of the total coal output.

In 1965, 139 million tons or 24 percent of the total coal production came from open pits. The average yearly output per pit was 2.2 million tons. It was planned to mine by 1970 about 195 million tons of coal from 69 open pits each with an average annual capacity of 2.8 million tons. Openpit mining was used in 12 regions of the Soviet Union, with the Urals basin the largest single producer of coal by this method. Next in importance were the deposits of East Siberia, followed in order by those of the Ukrainian brown coal basin, the Far East, Kazakhstan, the Kuznetsk basin, and Central Asia. The lack of large capacity dump cars was the reason for the comparatively low figure of 10.6 percent for this kind of transport in Soviet open pits in 1965.

The average working thickness of the coal seams, according to 1965 data, was 1.32 meters. Figures by basin were: 0.95 meters in the Donets, 2.23 meters in the Kuznetsk, 2.27 meters in Moscow, 1.99 meters in Karaganda and 1.70 meters in the Pechora. The relative share of coal production from gently sloping seams was about 70 percent, that from inclined seams was 14 percent, and that from steep seams was 16 percent. The maximum depth at which underground coal production was carried out reached 1,000 meters in 1965, while the average depth was about 320 meters. Average depths by basin were: 385 meters in the Donets, 205 meters in the Kuznetsk, 300 meters in the Karaganda, 57 meters in the Moscow, and about 400 meters in the Pechora.

Distribution of coal production by mining method was as follows: Longall, 84 percent; slicing, 8 percent; shield, 3.2 percent; room and pillar 2.8 percent; and others, 2 percent.

Coal Preparation.—Preparation of coal for the market did not play a great role in the industry and was normally restricted to coking coals. The shortage of coal and beneficiation facilities forced Soviet planners to direct all efforts to the improvements in quantity rather than quality. Multistage manual preparation in the longwall, and hand sorting on the conveyor from underground mine cars and elsewhere was widespread. Altogether, about 40,000 men and women were employed in hand sorting rock from coal.

In 1965, 142 preparation plants were working in the Soviet Union. The wet method was the principal method used in the mechanical preparation of coal (65 percent), and pneumatic preparation was used to clean about one-third. The use of heavy media was only being introduced in the Soviet Union with the help of the French firm, Préparation Industrielle des Combustibles (P.I.C.), which provided coal treatment plants for the U.S.S.R.

The ash content of washed noncoking coal in 1965, was over 15 percent, and that of coking coal was 8 percent. The large proportions of fines shipped to preparation plants, 50 to 70 percent, complicated operations at preparation plants.

New Capacities.—According to the 1965 plan, the annual capacity of coal mines was to be increased by 24.7 million tons, but this plan was not fulfilled. The Nazarovsk and Irsha-Borodin pits and others were not completed. The more important enterprises put into operation in 1965 included the No. 15 coal mine at the Intaugol' combine, the Biryulinsk No. 1 mine, Safronovsk and Chermgov open pits and Sholokhovsk and Safronovsk preparation plants in the Russian union republic, the Kara-Su open pit in Kirgizia and the Irtyshsk open pit No. 3 in Kazakhstan.

Mechanization.—In the coal industry, mechanization was introduced in mines and to a small degree at preparation plants and open pits, however there were serious shortcomings. A great number of mines which had been accepted as fully mechanized and automated do not conform with the technical level of existing Soviet "Basic Codes and Requirements for Overall Mechanization and Automation", mainly in stopes and development faces. There were no high efficiency continuous miners for hard and viscous coal, while the utilization of cutter-leaders on steep seams did not increase labor productivity significantly. The available machinery did not exclude manual labor at the longwall.[10]

New Soviet machines, together with mechanized hydraulic props, were tested for the first time in the Donets and Karaganda coal basins in 1965. The introduction of a prop-free-front system in longwall coal min-

[10] Mekhanizatsiya i Avtomatizatsiya Proizvodstva (Mechanization and Automation of Production). Moscow, No. 3, 1966, pp. 33–37.

ing followed 12 years after its initiation in Great Britain and West Germany. Until now, the Soviet coal mines have been unable to change over to this system because they have not had a dependable narrow-web extracting machine. It is planned to replace wide-web continuous coal miners by more efficient narrow-web continuous miners.

Coal ploughs were tested for the first time in the Kazakhstan Basin during the year and some 14 ploughs were introduced at the anthracite mines at the Rostov combine (Donets Basin). Introduction of coal ploughs in the Donets Basin, which took place in 1963 to 1965, followed by 12 to 14 years their use in West Germany.

Hydraulic Mining.—Hydraulic mining yielded in 1965 about 3.5 million tons of coal, but completion of additional hydromines has been at much slower rate than was planned. In actual practice hydraulic mining in the U.S.S.R. involves primarily hydraulic transport from the face to the mine surface. Actual cutting of coal is by a combination of conventional and hydraulic methods. Labor productivity was 50 percent below that planned, costs proved to be double, and operational losses of coal were 2.3 times those planned. Consumption of electric power at hydraulic mines in Kuzbas was over 50 kilowatt hours per ton of coal, and consumption of water was 7.7 to 27 cubic meters per ton.

Production Centers. The 10 major and many minor coalfields in the U.S.S.R. produced 428 million tons of hard coal (bituminous and anthracite) and about 150 million tons of lignite in 1965.

The Ukraine, with the Donets and L'vov-Volyn coal basins as the main centers, produced 194 million tons in 1965 and was the foremost coal producing region of the Soviet Union.

The Donets took the first place in the coal industry of the U.S.S.R. Thirteen mines with a total output of 15.5 million tons a year were under development in 1965. A preparation plant went into service at the Gorlovsk-Glubokaya coal mine in December. Its designed capacity was 5,000 tons of coal concentrated in 24 hours. After reconditioning, the Krivorozhsk and Bryansk coal preparation factories in Lugansk Oblast', were commissioned in January.

There were three mines with the total output of 2.7 million tons of coal a year in Dnepropetrovsk Oblast' of the western Donets Basin. Nine new mines were under construction. One of them was to have an annual capacity of 2.4 million tons of coal. The western Donets Basin produced over 7 million tons of coal in 1965.

There were 18 coal mines in the L'vov-Volyn Basin. Development of the Velikomostrovsk Mine, which with a capacity of 1.5 million tons of coal per year will be the largest mine in the basin, started in April. In addition, development of two more coal mining enterprises was in progress.

The Kuznetsk Basin in Siberia was the second major producer of coal and one of the largest centers of fuel supply for Siberia, the Urals, Central Asia, and partially the Center and Volya regions of the European U.S.S.R. This basin produced over 90 million tons of coal in 1965. The first section of the Chernigorsk coal mine in Kuzbas was completed in December. Initial output will be 600,000 tons a year.

Kazakhstan was third in coal production, producing 45.7 million tons. Some 100,000 tons were mined daily at the 37 mines of the Karaganda Coal Basin in 1965. The basin's washeries handle 7 million tons a year and the commissioning of three more washeries in the near future will increase this figure by 14 million tons.

Continuously, since 1961, the production cost of coal in Kazakhstan increased, and planned output was not achieved. Thus, the Churubay-Nurinsk mine No. 1, put into operation in 1959, attained only 42.3 percent of planned capacity in 1965. The Churubay-Nurinsk mine No. 2, which was completed in 1960, produced 71.8 percent of its planned capacity.

The delayed attainment of capacities, low indexes of mining equipment utilization and large coal losses reduced the return on capital at Karaganda coal enterprises from 81 kopecks in 1959 to 58 kopecks in 1965.

Mine No. 35–B in the Karaganda basin was nearing completion. The new 500-meter mine will be the deepest in Kazakhstan. The Churubay-Nurinsk mine No. 14 in the basin was commissioned in 1965, and a coal preparation plant was under construction.

The coal deposits at Ekibastuz in Kazakhstan were estimated at 10 billion tons, all of which can be mined by openpit methods. The three operating pits at the coalfield produced about 14 million tons in 1965. It was planned to renovate these pits and equip them with rotary excavators.

The Moscow Basin, which produced lignite with an ash content of about 45 percent, was the fourth major coal producer in the U.S.S.R. Plans provided for the opening of about 50 mechanized mines with yearly outputs ranging from 0.9 million tons to 1.5 million tons of raw lignite. Four preparation plants are also projected.

The Donets, Kuznetsk, Karaganda, and Pechora coal basins produced over four-fifths of the total coal output in calorific value and 97 percent of the coking coal in the U.S.S.R.

The Chelyabinsk Basin held first place in the total coal production in the Urals area. Construction began on the Vostochnaya-Batyrinsk mine with a yearly capacity of 0.4 million tons. The Raychikhinsk Basin shipped over 12 million tons in 1965. In the Kansk-Achinsk (lignite) and Minusinsk (anthracite) coal basins in Krasnoyarsk Kray it was decided to build 9 open pits and renovate existing ones. In 1965, these basins produced about 8 million tons.

Primorsk Kray produced about 7 million tons of coal in 1965, and construction of a large lignite pit started in the region of Pavlovka village. Openpit mining began at a new coal deposit near Lipovtsy station in the Far East. At the Rettikhovka open pit construction was started on a coal preparation plant which will use the pneumatic process for lignite cleaning.

The Safronovsk open pit in Cheremkhovo Basin, with annual capacity of 6.5 million tons of coal, was put into production in December. The second stage of the Tom'-Usinsk-78 pit with daily output of 16,000 tons was commissioned in January; 70 percent of coal was of coking quality. Eleven mines at the Sakhalin coal combine produced about 4.5 million tons of coal in 1965. The largest coal-preparation plant on Sakhalin Island and the Lermontov open pit No. 2 were being developed at Vakhrushevo, near Yuzhno-Sakhalinsk. Chita Oblast' produced 4.1 million tons of coal.

There were 11 coal mines in operation in Georgia. The first mine on the Shaori deposits, the Komsomol'sk, was under development. Extraction of anthracite started at a mine in Karachaevo-Cherkessk Autonomous Oblast'. The erection of the Soviet Far East's first large washing plant to handle 1.5 million tons of coking coal a year started at the Verkhne-Vilyuysk coalfield.

In 1965, a new coal combine, Kirgizugol' Combine, was created. Two open pits were working in the republic, and one more, the Abshir open pit, with a yearly output of 200,000 tons, was opened in November. In 1965, Kirgizia supplied 1.6 million tons of coal.

Labor Productivity.—Coal cutting and hauling operations were nearly 100 percent mechanized in underground mines, but manual labor was used almost exclusively in conveyer transfer, roof support, and surface operations. Consequently, overall productivity was low and utilization of machines and equipment was unsatisfactory. At the Primorskiy coal basin in 1965 continuous coal miners produced at a monthly average of 4,000 to 4,500 tons, however this amounted to only 32 tons of coal a month per worker. The average output of coal at Donets Basin longwalls was 155 to 210 tons of run-of-mine coal per day, and productivity of a longwall worker was 2.9 to 3.7 tons per shift. In the Budennovugal' Trust of the Donets Basin, with a daily average output of about 12,600 tons of run-of-mine coal, the labor force comprised 19,970 workers and junior servicing personnel, and 2,450 engineers, technicians and white collar workers.

Natural Gas.—Usable Soviet gas extraction in 1965 was 129.2 billion cubic meters, an increase of 17 percent compared with that of 1964, but below the original 7-year plan target of 150 billion cubic meters. Of this quantity 98.6 percent consisted of natural gas and oil associated gasses, and 1.4 percent was gas from gasification of coal and oil shale. In 1965, gas accounted for 15.6 percent of the U.S.S.R. fuel production.

There were over 200 proven fields of natural gas in the Soviet Union; 2,400 wells were operational however 15 to 20 percent of them were idle. Total measured and indicated gas reserves were estimated at 2.5 trillion cubic meters. Trunk gas pipelines totaled about 40,000 kilometers at yearend. Of all the gas produced in the Soviet Union for consumption, about 85 percent was used by industry and most of the remainder for domestic heating. In 1965, natural gas was supplied to about 7 million apartments, serving 40 million people. During the 7-year plan period, Soviet gas production increased over 300 percent.

According to Japanese trading circles, the Soviet Government presented to Japanese industrial and trading interests two projects to develop natural gas resources in northern Sakhalin and Primorskiy Kray with Japanese cooperation.

Gasfields.—The largest fields of natural gas in 1965 were the following: Shebelinka, North Caucasus, and Gazli. Major new gas-producing centers are to be established in Turkmenia, Uzbekistan, Kazakhstan, West and East Siberia.

In 1965 the Ukraine extracted 39.4 billion cubic meters of gas or nearly one-third of the national total. The republic supplied its gas to the Russian union republic, Belorussia, the Baltic S.S.R's, and Poland and will in 1966 supply it also to Moldavia and Czechoslovakia. New deposits will begin to yield in L'vov and Poltava Oblast's, the Crimea, and elsewhere.

Two-thirds of gas extracted in the Ukraine in 1965, 26 billion cubic meters, was supplied by Shebelinka. Another string of the Shebelinka-Belgorod-Kursk-Bryansk gas pipeline, with a throughput of nearly 3 million cubic meters a day, was put into operation. Work began in Moldavia on a 200-kilometer-long main gas pipeline from Shebelinka to Kishinev.

The second largest center of gas production was Krasnodarsk Kray, which produced 23 billion cubic meters of gas or 18 percent of total national output. A new 83-kilometer section of the gas pipeline linking Krasnodarsk Kray with Moscow was put into operation in Lugansk Oblast' on August 11.

The third center of gas production was Uzbek, S.S.R., which produced 16.5 billion cubic meters of gas. The system of gas pipelines linking Bukhara and the Urals stretches more than 4,500 kilometers. Gas from Bukhara fields was already being extensively used by industrial plants in the Urals. The gas industry ministry counted on delivery of 20 billion cubic meters to the Urals in 1966. Construction of the second string of the Bukhara-Urals gas pipeline, 1,500 kilometers long and extending from Gazli in Uzbekistan to the border of Orenburg Oblast', was completed. The first string was extended northward to Nizhniy Tagil. Throughput of the Bukhara-Urals gas pipeline in 1965 was over 11 billion cubic meters. The third string of this gas pipeline will be completed in 1966. Eighty-two kilometers were commissioned in 1965.

Stavropol' Kray produced over 15 million cubic meters of gas in 1965. Production costs for natural gas of this region were the country's lowest. A second gas pipeline was being built from Stavropol' to Tbilisi. The total consumption of gas in the Donets Basin was over 10 billion cubic meters in 1965; all this gas came from Russian union republic gasfields.

The other significant gas producers in 1965 with output in billion cubic meters were: Volgograd Oblast' 7.1, Saratov Oblast' 6.3, Azerbaydzhan 6.2, Bashkir A.S.S.R. 3.0, Tatar A.S.S.R. 2.8, and Kuybyshev Oblast' 2.

The Khabarovsk refinery put into operation an installation for production of liquefied gas with a capacity of 12,000 to 15,000 tons of gas per year. It was estimated that the Sakhalin Oblast' had four deposits of natural gas.

At Markovo on the Lena River, 300 kilometers from Irkutsk, a large natural gas deposit was found. Preparations for laying a 500-kilometer gas pipeline to supply Norilsk were underway. Gas was discovered in the Ararat Valley in 1965, and it was estimated that the deposits were sufficient to supply Armenia from its own gasfields. Construction started on a 62-kilometer gas pipeline from Yerevan to Oktemberyan.

Transportation.—The distant location of the principal consuming centers from the gasfields has made it inevitable that the bulk of natural gas must be transmitted by large pipelines. Over 80 percent of the natural gas produced in 1965 was carried by pipelines and only about 20 percent was consumed at the place of production. In 1965, large-diameter pipelines comprised over half the total length of trunk gas pipelines in the country.

Underground gas reservoirs existed at Moscow, Leningrad, and Kiev. Last year Moscow was supplied with over 4 million cubic meters a day from this source. It was planned to establish others in Uzbekistan and near Yerevan. Later, more will be added near Sverdlovsk, Magnitogorsk, and elsewhere. Construction of the underground storage for natural gas near Tashkent, with a capacity of 1 billion cubic meters, was completed in August. An under-

ground gas storage reservoir was completed at a depth of 800 to 1,000 meters in Georgia. It held a 2-week supply of natural gas for Tbilisi and Rustavi.

Construction of the gas pipeline from the Dashava (Rechka) gasfield in L'vov Oblast' to the Pulawy chemical combine. Lublin Province in Poland, was completed. It was planned to extend this pipeline to Warsaw and to Wroclawek in Bydgoszch Province. The length of the pipeline will be more than 500 kilometers.

The following gas pipelines were commissioned in 1965: The Mali-Su-Iv-Dzhalal-Abad-Osh (Kirgisia), Kotur-Tepe (Turkmenistan) to the Cheleken Peninsula (43 kilometers), Poltava-Kremenchug (120 kilometers), Pereshchepino-Dnepropetrovsk (60 kilometers), and the first stage of the Zyrya-Karagag in Azerbaydzhan (50 kilometers). Construction of the 230-kilometer Minnibaevo-Nizhnekamsk gas pipeline was completed in December.

The construction of the 200 kilometer Afghanistan-U.S.S.R. gas pipeline started in 1965. The pipeline will start at Shibargham in Afghanistan and will join the Central Asian gas pipeline system. Work on laying a gas pipeline from the Volga to the Mari A.S.S.R. started in the Tatar A.S.S.R.

A plan for the construction of a new U.S.S.R.-Czechoslovakia gas pipeline was approved. It will start at Dolina (Dashava) in the Ukraine and run to Bratislava. This 534 kilometer line scheduled for operation in 1967 will supply Ukrainian gas to a chemical combine now under construction in Czechoslovakia. The design of the 7,000-kilometer Central Asia-Moscow gas pipeline was completed and work began.

For the first time in the Soviet Union gas and oil were transported a distance of 100 kilometers through a single pipeline from Prova to Karatau in Kazakhstan.

Exploration.—Deep drilling plans were not fulfilled in 1965 in several regions including Orenburg and Kuybyshev Oblast's. Among the fields that were prospected in 1965 and which have a particularly favorable outlook were those of Novyy Port area of the Yamal Peninsula, Yefremovka in the Ukraine (15 billion cubic meters of reserves), in the neighborhood of Uchkyz in the Kyzyl-Kum (22 billion cubic meters), and the third gas region in the Bashkir, A.S.S.R. Eight new gas deposits were put into operation in Ukraine in 1965. Three gas deposits were discovered in Crimean Oblast'.

New deposits, Yuzhnoe and Tsentral'noe, were discovered on the Ust'-Yurt Plateau in Aktubinsk Oblast'. The advantage of these new Kazakh deposits is their proximity to the route of the Bukhara-Urals gas pipeline, to which they will be connected. A new gas deposit was discovered in the Kara-Kum in eastern Turkmenistan. The deposit is in the area of the Gazli-Urals gas pipeline.

New deposits of natural gas were also discovered in the foothills of the Caucasus, Kalmyk and Chechen-Ingush A.S.S.R.'s, near Dushanbe in Kirgiziya, Saratov and Sverdlovsk Oblast's and other areas of the U.S.S.R.

Petroleum.—Crude oil output increased 9 percent over that of 1964 and totaled 243 million tons (about 1,771 million barrels).

Turbodrilling was rapidly developed and has replaced rotary drilling almost completely. In 1965, about 80 percent of the total footage drilled was by turbodrilling. The maximum depth of drilling obtained in the U.S.S.R. was 16,531 feet, while the average depth of exploration wells was about 7,200 feet and that of producing wells was over 5,200 feet. Planned 1965 drilling targets were about 19.7 million feet of development and about 16.4 million feet of exploratory drilling, but less than 90 percent of the 1965 exploration target was met.

For the first time in the U.S.S.R the Gronzy Oil Research Institute suggested pumping gas into the well instead of water for reservoir pressure control.

The rate of increase in drilling speeds and depth of wells was impeded by obsolescence of drilling rigs, and shortages of specialized transport facilities, durable casing and drill pipes, and good-quality drilling bits. The machine building industry was not able to supply enough special equipment for reservoir surveying, high-pressure pumps for water injection, or submersible electric pumps and devices for deep testing.[11]

In 1965, over 60 oil and gas deposits were discovered in the U.S.S.R., including 9 deposits in the middle reaches of the Ob' River.

The main Soviet oil province, between the Volga and the Urals, was expanded by

[11] Pravda, Dec. 2, 1965.

1 thousand square kilometers. The U.S.S.R. Ministry of Oil Extraction Industry approved a project for the development of new deposits between Kama and Belaya Rivers. Commercial oil production was already underway on a small scale at the Arlansk deposit.

Exploration and Crude Oil Production.—The largest increase in crude oil production occurred in the Tatar and Bashkir autonomous republics and Kuybyshev Oblast'. The Volga-Ural region, which includes these areas, accounted for approximately 80 percent of the total Soviet oil output in 1965. The oilfields of this region, were producing 468,000 tons of oil daily by yearend. Commercial output of oil started at 14 new deposits last year.

In 1965, output of the Tatar A.S.S.R. exceeded that of any other individual area in the country, totaling 76.4 million tons compared with 28.6 million tons in 1958. There were 130 oil deposits being exploited in the republic and new fields were put into operation at the Romashkino deposit. In 1965, 60 new wells were commissioned at fields managed by the Alkeyev oil administration; data on drilling performance by other oil administrations in this republic were not available.

The second producer of crude oil in 1965 was the Bashkir A.S.S.R. Exploitation of five new oil deposits began in the central part of Bashkiria.

The oil industry of Kuybyshev Oblast' was third, and produced about 36 million tons of oil in 1965. Fourteen new deposits were tapped and four deposits were discovered, bringing the total number of known deposits in the region to 350 with reserves sufficient for 20 years' production.

Outside of the Volga-Urals region, Azerbaydzhan produced 21.5 million tons of oil, while about 10 million tons of oil were extracted in Turkmenistan in 1965. Over 50 wells were in operation in Kyzyl-Kum in the latter area. Oil extraction began at the new Komsomolsk deposit in west Turkmenistan, next to the Kotur-Tepe oilfield.

In 1965, the Ukraine supplied about 8 million tons of oil. New deposits, the Novogrigor'evsk in Poltava Oblast' and the Rybalsk in Sumy Oblast' were put into operation. More than 80 new wells were commissioned at the Ukrainian fields last year.

In 1965, a number of new oil regions, in particular the West Siberian fields in Tyumen Oblast' and those of Mangyshlak on the eastern shore of the Caspian Sea in Kazakhstan, started production. In total Kazakhstan produced about 2 million tons of oil in 1965.

In the Mangyshlak Peninsula of Kazakhstan, the first field, Uzen, produced 0.5 million tons of oil in 1965. It was delivered to the refinery at Guryev on the northern shore of the Caspian Sea in western Kazakhstan. The Uzen deposit occupied third place in the U.S.S.R. in the size of reserves, which were more than 1.5 times larger than the total reserves of oil of all the Central Asia republics. Mangyshlak Peninsula oil experts plan to extract 1.8 million tons of crude oil in 1966. Zhetybay oilfield, 70 kilometer from Uzen with a yearly capacity of several million tons, was opened.

In 1965, 74 wells were commissioned on the Mangyshlak Peninsula, which is expected to become a major oil producer in the next few years. According to the latest geological data, the exploitation of all deposits in southern Mangyshlak will make it possible to produce up to 100 million tons of oil annually. The Mangyshlak oil, highly viscous and paraffinic, presents difficult refining problems.

The oil fields on Sakhalin Island produced 2.4 million tons of oil in 1965. Fourteen new oil and gas deposits have been found on the island during the past 4 years and in 1965, prospectors were engaged in large-scale operations to locate oil in the southern part of the island.

Production from offshore fields, particularly in the Caspian, has been rising. In 1965 more than 11.2 million tons, over 50 percent of Azerbaydzhan's total output, was obtained from offshore. More than 1 million tons was extracted on the eastern shore of the Caspian Sea in Turkmenia and a further 0.5 to 0.6 million tons in Dagestan. By 1970 it was proposed to raise oil output in Turkmenia to 15 million tons, of which a large proportion will come from beneath the Caspian waters. In Azerbaydzhan, where production has fallen sharply, measures are now being taken to find new offshore oil deposits.

More than 70 percent of total offshore oil was recovered by artificial stimulation methods. The 1965 footage of offshore drilling was more than 328,000 feet.

Oil was being obtained from offshore platforms in waters about 90 feet deep and drilling was being conducted from platforms in about 130 feet of water. Plans called for erection of platforms in waters nearly 200 feet deep in 1966. In addition, it has been reported that floating drill rigs have been used successfully to drill wells 4,250 feet deep in waters 50 feet deep and that equipment to drill to 9,800 feet in 70 feet of water was nearing completion.

West Siberia contained 25 percent of the oil resources and 10 percent of the natural gas resources of the U.S.S.R. in 1965. The most promising areas were at Surgut and in the north of west Siberia.

In east Siberia the pace of prospecting the Markovo deposit has been accelerated, and about 164,000 feet were drilled in the area. The oil is of a very light type, almost like gasoline. At a new oilfield, 600 kilometers north of Tomsk, the first well began to yield from a depth of about 5,600 feet in November.

In the Urals the 40th oil deposit was discovered in Perm' Oblast', and in Orenburg Oblast', over 20 deposits have so far been discovered. New oil deposits also were found in Krasnodar Kray, near Abinskaya, and in north Dagestan.

Refineries.—In 1965, annual primary oil-refining capacity in the Soviet Union was increased by 15 million tons, and refinery output reportedly increased by 11 percent over that of 1964.

Exports of crude oil increased 21 percent in 1964 over those of 1963, and product exports decreased 6 percent. This in part reflects the shortage of refinery capacity in the Soviet Union itself and the slowness with which new refineries have been brought into operation. Each new refinery needs from 9 to 12 years to pass from the planning stage to full operation.

Oil refining operations in the Ural-Volga and eastern regions have been complicated by increased corrosion of equipment resulting from processing highly sulfurous oil over the past few years.

The new oil industry facilities commissioned in 1965 include an oil refinery near the Karabash reservoir in the Tatar A.S.S.R., the first section of a refinery in Kremechug on the Dnieper River in the Ukraine, a new catalytic reforming plant at the Novyy Yaroslav' refinery, a gasoline-separating unit at the Sumgait oil and chemical combine, and a new production unit for liquefied gas at the Krasnovodsk oil refinery.

One of the largest oil refineries in the U.S.S.R. was being built in Angarsk, and other oil processing enterprises at Fergana, Kherson, Omsk, and Ryazan.

A large oil refinery is to be built in Jurbakas, Lithuania, which will process more oil than all the Baku refineries combined. It will receive oil through a branch of the "Friendship" pipeline. It was decided to modernize and double the capacity of the Guryev oil refinery in Western Kazakhstan on the Caspian Sea.

The Polotsk refinery began to receive oil from the Belorussian fields, thereby reducing its dependence on supplies from the eastern regions of the country. The oil refinery at Kirish, Leningrad Oblast', received the first trainloads of crude oil in December. A pipeline eventually will connect the refinery with the Tatar oilfields.

In 1965, capital investment in the petroleum refining industry of the Azerbaydzhan S.S.R. increased by 8 percent over that of 1964. The 22d C.P.S.U. Congress oil refinery in Azerbaydzhan employed in 1965 over 3,000 workers, half of which were women.

Transportation.—About 70 percent of the total tonnage of crude oil and refinery products moved in the Soviet Union in 1965 was shipped by rail. The mileage of trunk pipelines has been increased considerably in recent years and totaled more than 27,500 kilometers in 1965, including 22,500 kilometers of crude oil lines and 5,000 kilometers of oil products lines. The average distance of oil delivery by pipeline in 1965 was about 450 kilometers.

The Druzba or "Friendship" pipeline, which links the oil fields of Kuybyshev Oblast' with other East European nations, extends more than 4,200 kilometers, including 3,015 kilometers over the territory of the Soviet Union. Oil deliveries through this line to Czechoslovakia, Hungary, Poland, and East Germany were doubled over those of 1964; this was made possible in part by six pumping stations put into operation. An oil refinery near L'vov and another near Syzran' as well as the new Belorussian oilfields were connected to the "Friendship" pipeline.

Construction was underway on a 284-kilometer-long pipeline through Chernigov, Sumy, and Poltava Oblast' to connect several oilfields to a new refinery; on a 780-kilometer line from Markovo on the Lena River to Angarsk and Irkutsk; and on the 1,026 kilometer Ust'-Balyk to Omsk crude oil pipeline.

A second 620-kilometer pipeline from Okha-on-Sakhalin to Komsomol'sk-on-Amur was under construction in 1965. It will carry Sakhalin oil to the Komsomol'sk-on-Amur refinery which supplies products to the Soviet Far East, and Siberia as well as providing exports to Japan, Mongolia and other countries. This refinery has been receiving Sakhalin oil through a World War II-pipeline which is no longer able to meet the demand. The first 145-kilometer section was accepted by a State commission in 1965, and it was planned to put the entire line into operation by 1967.

In Western Siberia, the 410-kilometer Shaim-Tyumen' pipeline was under consrtuction. By 1967 the 1,000-kilometer Ust'-Balyk-Omsk pipeline will make it possible to reduce the Omsk refinery's throughput of oil from the fields in Bashkiria and the Tatar A.S.S.R.

It was reported that the Moscow State Institute of Planning and Designing of Pipelines prepared plans for a new 824 kilometers pipeline from Baku on the Caspian Sea to Batumi on the Black Sea.

Oil Shale.—The Soviet Union produced 21.3 million tons of oil shale in 1965. The main center of production, as in prior years, was the Estonian S.S.R., where output totaled 15.8 million tons.

All the shale mines in Estonia were being switched to the new mechanized room-and-pillar system. For the first time all underground processes were completely mechanized at mine No. 10. The largest existing shale mine produced 1.5 million tons a year.

The new concentration plant at mine No. 7 of the Estonslanets trust was commissioned in August. The shale will be concentrated using the heavy media method. The projected capacity of the plant was 1.8 million tons of marketable shale a year.

In 1965, the shale processing combine in Estonia produced about 500 million cubic meters of butane gas from shale.

New deposits of oil shale were discovered in the Stolen area of Belorussia and in the south of the Ukraine.

The Mineral Industry of the United Kingdom

By Justin B. Gowen [1]

The output of mineral raw materials in the United Kingdom during 1965 was valued at $2,033 million [2] at factor cost at current prices, compared with $2,050 million in 1964, and represented a contribution of about 2.4 percent to the gross national product (GNP) which rose to an estimated value of $86,531 million at factor cost. Compared with the 1964 GNP the increase was 6.3 percent, or 2.7 percent when adjusted to constant prices.

In world production the United Kingdom ranked first in the output of strontium minerals, second in china clay, third in salt, fourth in coal and gypsum, fifth in tin metal and crude steel, and seventh in fluorspar and cement.

Although total industrial employment in the United Kingdom increased by about 215,000, to 23,920,000, and employment in the manufacturing industries increased by 101,000, employment in mining and quarrying decreased by 33,000. Nearly all of the reduction was in coal mining. Revised employment figures for mining, manufacturing, and construction industries during the month of June are shown, in thousands:

	1963	1964	1965
Mining:			
Coal	625	597	565
Other	71	71	70
Total	696	668	635
Manufacturing:			
Chemicals	521	517	523
Metal manufacture	603	629	637
Metal goods not elsewhere specified	560	577	596
Nonmetal manufacture	348	360	362
Other	6,881	6,926	6,991
Total	8,913	9,009	9,109
Construction	1,658	1,711	1,746

Probably the year's most important development affecting the mineral industries was the Government's White Paper, published in May 1965, containing proposals to be embodied in a bill to renationalize the steel industry. It listed 13 major steel companies that would be subject to nationalization in addition to the one (Richard Thomas & Baldwins) that was still under Government ownership from the previous nationalization. On the basis of this White Paper with some revisions, the Iron and Steel Bill was prepared and presented to the House of Commons in July 1966. The purpose of the bill is outlined in the first four paragraphs of the Explanatory and Financial Memorandum prefacing the bill as follows:

> The main purpose of this bill is to bring into public ownership the principal companies concerned with the production of steel in Great Britain. The Bill also provides for the continued control of the development by other companies of substantial production facilities in the basic fields of iron and steelmaking and for the dissolution of the Iron and Steel Board.
>
> A National Steel Corporation is to be established consisting of a chairman and from ten to sixteen other members appointed by the Minister of Power.
>
> The Corporation will hold the securities of the Nationalized companies. They will themselves have power to carry on iron and steel activities, the

[1] West Europe specialist, Division of International Activities.

[2] Where necessary, values have been converted from pounds (£) to U.S. dollars at the rate of £1=US$2.80.

sale of iron and steel products and, with the Minister's consent, any other activities which any publicly-owned company is, or has been, authorized to carry on under its memorandum of association. The Corporation may acquire interests in, or form companies which are wholly or mainly engaged in iron and steel activities or the sale of iron and steel products, and, with Minister's consent, any other companies.

The general duties of the Corporation are to promote the efficient and economical supply of iron and steel products; to avoid undue preference or unfair discrimination between consumers; to promote exports of iron and steel products and other products of the nationalized steel industry; and to promote research and development.

The bill proposes to pay compensation up to about £ 580 million in Government stock according to a formula based on average stock exchange quotations over specified periods of time. It is expected that the changeover will be completed during 1967.

In September 1965 the Government published its National Plan which laid down the guidelines for the national economy during the period 1964–70. It is a detailed statement of expected growth in all sectors of the economy and the Government's policy intentions. The objective of the plan is to achieve an increase of 25 percent (£ 8,000 million) in the GNP by 1970 (which is the equivalent of 3.8 percent annually) mainly by means of increased productivity. The effect of the plan on the mineral industries was not yet apparent at yearend.

PRODUCTION

Moderate gains in the output of nonmetals, especially fluorspar and salt, and the construction materials were more than offset by decreases in output of coal which was 3.2 percent less than in 1964, and iron ore production, which was 5.6 percent less than in 1964. Moderate increases were shown in the output of crude steel which rose by 4.6 percent over the 1964 output,[3] and of nonferrous metals which increased by about 1 percent over the 1964 output.

[3] Revised from 53 weeks' output as reported in 1964 Minerals Yearbook, volume IV, to basis of 52 weeks for comparability.

Table 1.—United Kingdom: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Aluminum:					
Primary	32,812	34,576	31,065	32,220	36,207
Secondary	119,050	131,780	148,970	171,614	178,800
Cadmium kilograms	r 98,550	107,610	r 111,826	197,439	220,097
Copper:					
Electrolytic	21,965	25,290	29,804	30,510	34,838
Fire refined	216,119	206,456	184,228	214,565	221,210
Total	238,084	231,746	214,032	245,075	256,048
Primary—all from imported blister included in total	131,080	118,862	91,429	112,502	102,802
Brass and bronze ingots	133,262	131,727	124,849	r 132,877	135,102
Iron and steel:					
Iron ore, 27 percent Fe thousand tons	16,783	15,522	15,151	r 16,588	15,662
Pig iron and blast furnace ferroalloys do	14,984	13,912	14,825	17,551	17,740
Other ferroalloys do	186	175	120	r 169	191
Steel ingots and castings do	22,441	20,820	22,881	r 26,234	27,439
Net finished steel deliveries, new material do	16,975	15,867	17,521	20,611	20,466
Of which from imported finished steel do	352	627	948	1,104	537
Lead:					
Ore and concentrate, lead content	1,502	405	250	180	92
Refined lead [1]	87,663	90,026	96,584	122,690	127,453
Magnesium	5,280	r 5,080	r 4,670	r 4,770	5,380
Nickel, refined and ferronickel	38,000	38,300	38,100	38,000	40,500
Pyrites (gross weight)	167	27,421	26,422	e 26,400	e 26,400

See footnotes at end of table.

Table 1.—United Kingdom: Production of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:—Continued					
Silver—troy ounces	4,744	514	---	---	---
Tin:					
Ore and concentrate, tin content—long tons	1,210	1,181	1,226	1,226	1,313
Refined:					
Primary—do	24,449	18,749	17,411	16,849	16,494
Secondary—do	1,903	r 1,198	1,278	2,466	1,869
Zinc, slab	94,375	98,837	100,617	r 111,036	106,314
Nonmetals:					
Barite and witherite	83,168	76,888	r 55,398	r 62,000	61,000
Calcite	27,400	28,400	24,400	25,400	24,400
Cement—thousand tons	14,376	r 14,256	r 14,060	r 16,968	16,972
Chalk—do	17,779	17,967	r 17,568	r 18,556	18,955
Chert and flint—do	175	r 140	99	r 142	138
China stone—do	50	53	51	r 58	44
Clays:					
China clay—do	1,746	1,724	1,928	r 2,066	2,244
Fire clay—do	r 2,217	r 1,918	1,712	r 1,923	1,816
Potters and ball clays—do	544	r 578	602	r 626	640
Other clays and shale—do	r 10,059	r 12,352	r 17,319	r 20,485	e 21,000
Diatomite	22,607	20,332	14,466	r 13,937	e 15,000
Fluorspar	2 r 86,800	2 r 72,900	2 r 88,500	r 156,500	173,700
Gypsum and anhydrite—thousand tons	3,791	4,063	4,143	r 4,587	4,455
Igneous rock—do	17,672	18,574	r 19,267	r 23,314	24,315
Limestone—do	r 42,585	44,760	47,878	r 57,996	59,786
Salt:					
Rock—do	290	485	764	704	735
Evaporated—do	1,208	1,280	r 1,411	1,369	1,451
Other—do	4,262	4,312	4,320	4,672	4,814
Sand:					
For glassmaking—do	1,153	1,161	1,245	r 1,396	1,390
Other silica sand—do	703	572	r 506	r 736	1,079
Molding and pig bed sand—do	725	806	846	r 908	908
Other industrial sand and gravel—do	r 81,163	81,446	r 85,190	r 102,472	102,094
Sandstone—do	r 4,982	5,322	r 5,395	r 6,927	7,550
Slate—do	99	94	125	r 123	123
Strontium minerals	8,818	6,637	9,164	r 17,306	4,429
Sulfur, recovered elemental includes sulfur recovered from petroleum refineries	59,343	52,762	47,275	54,563	e 55,000
Talc, includes steatite and pyrophyllite	7,041	7,475	8,104	10,318	e 10,000
Mineral fuels:					
Coal:					
Anthracite—thousand tons	3,604	3,965	4,226	r 4,672	4,268
Bituminous—do	189,918	196,641	194,712	192,063	186,238
Coke and coke breeze:					
Coke oven coke—do	18,115	15,812	15,792	17,220	17,381
Gashouse coke—do	9,956	9,876	9,923	8,981	7,884
Coke breeze, total—do	3,710	3,650	3,680	3,620	3,430
Fuel briquets—do	1,492	1,573	1,679	1,351	e 1,200
Gas, natural—million cubic feet	106	115	153	172	NA
Oil shale—thousand tons	r 476	159	---	---	---
Shale oil—do	r 44	16	---	---	---
Crude petroleum 3—do	r 108	r 113	r 125	r 129	83
Carbon black—do	137	128	140	r 153	161
Refinery products:					
Liquid petroleum gases—do	467	r 643	942	1,228	1,419
Light distillate feedstock for gasworks—do	546	819	1,037	1,401	1,550
Aviation gasoline—thousand tons	216	198	145	165	165
Wide cut gasoline—do	1,118	1,294	699	847	593
Motor and industrial spirit—do	7,162	7,147	6,927	r 7,805	8,852
White spirit—do	150	142	143	144	126
Kerosine, including jet fuel—do	2,726	2,652	3,132	3,220	3,429
Gas/diesel oil—do	8,756	10,126	10,961	12,185	13,638
Fuel oil—do	21,490	r 22,314	21,481	23,176	26,288
Lubricating oils—do	973	913	983	1,053	1,017
Bitumen—do	1,151	1,240	1,326	r 1,482	1,445
Paraffin—do	40	39	56	60	54
Feedstocks for petroleum chemical plants—do	488	1,130	1,502	1,566	2,138
Miscellaneous products—do	346	247	258	245	192
Total—do	45,629	r 48,904	49,592	r 54,578	60,906

e Estimate. p Preliminary. r Revised. NA Not available.
1 Does not include lead refined from imported bullion.
2 Includes fluorspar recovered from old lead and zinc mine dumps.
3 Includes petroleum gases.

Table 2.—United Kingdom: Foreign trade by major commodity groups and areas

(Million dollars)

Commodity	1963	1964	1965							
			Total	Areas of consignment						
				EEC [1]	Other EFTA [2]	Other West Europe	East Europe	United States	Canada	All other
Exports:										
Produce of the United Kingdom:										
Mineral commodities:										
Metals:										
Ores, concentrates and scrap	45.7	40.3	41.2	25.3	4.0	8.4	0.7	0.5	1.2	1.1
Iron and steel	572.8	609.7	655.4	71.9	93.5	70.1	20.3	88.4	37.1	274.1
Nonferrous metals (except gold)	348.5	387.5	470.4	172.2	61.0	31.4	26.5	48.9	18.6	111.8
Nonmetals:										
Crude	49.7	53.0	57.1	23.2	11.3	6.6	.6	2.9	1.2	11.3
Manufactures:										
Fertilizers	13.7	16.5	22.8	.1	.4	4.3	---	---	---	18.0
Other	48.1	50.9	52.7	9.0	7.0	5.5	.5	2.7	3.0	25.0
Chemical elements and compounds [3]	41.2	43.2	45.4	7.4	4.9	4.8	7.0	2.0	1.2	18.1
Mineral fuels:										
Coal, coke and briquets	133.7	103.4	71.2	37.1	24.1	8.7	.4	---	.1	.8
Petroleum and petroleum products	325.8	282.8	301.6	73.8	143.0	31.7	1.9	.5	7.1	43.6
Gas, natural and manufactured	.6	.4	.3	---	---	.2	---	---	---	.1
Mineral tars and crude chemicals from coal and coke	8.4	10.6	10.0	1.7	1.1	1.1	---	3.3	.1	2.7
Total minerals	1,588.2	1,598.3	1,728.1	421.7	350.3	172.8	57.9	149.2	69.6	506.6
All other commodities	9,835.7	10,313.2	11,498.7	2,109.6	1,316.5	999.6	255.1	1,246.5	491.9	5,079.5
Total exports, domestic produce	11,423.9	11,911.5	13,226.8	2,531.3	1,666.8	1,172.4	313.0	1,395.7	561.5	5,586.1
Reexports of imported merchandise:										
Mineral commodities	43.6	46.9	72.3	45.3	7.4	2.7	5.2	2.4	2.0	7.3
All other commodities	386.9	382.8	411.2	165.7	44.9	37.7	4.6	56.4	18.8	83.1
Total reexports	430.5	429.7	483.5	211.0	52.3	40.4	9.8	58.8	20.8	90.4
Gross exports:										
Mineral commodities	1,631.8	1,645.2	1,800.4	467.0	357.7	175.5	63.1	151.6	71.6	513.9
All other commodities	10,222.6	10,696.0	11,909.9	2,275.3	1,361.4	1,037.3	259.7	1,302.9	510.7	5,162.6
Grand total	11,854.4	12,341.2	13,710.3	2,742.3	1,719.1	1,212.8	322.8	1,454.5	582.3	5,676.5

Imports:										
Mineral commodities:										
Metals:										
Ores, concentrates and scrap	401.9	518.3	565.6	13.8	89.3	9.9	19.4	21.6	143.1	268.5
Iron and steel	210.2	297.2	218.2	63.6	73.8	9.5	18.4	21.5	13.0	18.4
Nonferrous metals	656.4	919.9	1,029.1	86.1	74.8	4.7	74.2	117.9	255.8	415.6
Nonmetals:										
Crude	110.2	126.2	139.9	23.4	8.2	5.5	3.0	22.2	13.7	63.9
Manufactures:										
Fertilizers	56.3	52.7	54.3	38.7	.7	2.9	10.3	.1	---	1.6
Other	18.5	25.7	39.3	17.6	8.5	8.2	1.2	1.5	.4	1.9
Chemical elements and compounds [3]	30.9	43.6	51.2	17.8	4.0	6.8	.5	8.4	7.7	6.0
Mineral fuels:										
Coal, coke and briquets	1.6	1.5	1.6	.1	---	1.4	---	---	---	.1
Petroleum and petroleum products	1,571.1	1,632.6	1,697.3	259.4	4.3	23.3	2.6	27.4	.7	1,379.6
Gas, natural and manufactured	.9	2.8	26.8	3.9	1.0	.6	---	1.6	---	19.7
Mineral tars and crude chemicals from coal and coke	4.8	4.8	5.9	2.5	.1	.1	---	2.4	.2	.6
Total minerals	3,062.8	3,625.3	3,829.2	526.9	264.7	72.9	129.6	224.6	434.6	2,175.9
All other commodity groups	10,433.3	11,812.4	12,308.6	2,260.7	1,603.2	1,086.6	487.1	1,661.3	850.3	4,359.4
Total imports	13,496.1	15,437.7	16,137.8	2,787.6	1,867.9	1,159.5	616.7	1,885.9	1,284.9	6,535.3
Of which imports for consumption:										
Minerals	3,019.2	3,578.4	3,756.9	481.6	257.3	70.2	124.4	222.2	432.6	2,168.6
All other	10,046.4	11,429.6	11,897.4	2,095.0	1,558.3	1,048.9	482.5	1,604.9	831.5	4,276.3
Total imports for consumption	13,065.6	15,008.0	15,654.3	2,576.6	1,815.6	1,119.1	606.9	1,827.1	1,264.1	6,444.9
Trade balance:										
Mineral commodities	−1,431.0	−1,980.1	−2,028.8	−59.9	+93.0	+102.6	−66.5	−73.0	−363.0	−1,662.0
All other commodities	−210.7	−1,116.4	−398.7	+14.6	−241.8	−49.3	−227.4	−358.4	−339.6	+803.2
Total	−1,641.7	−3,096.5	−2,427.5	−45.3	−148.8	+53.3	−293.9	−431.4	−702.6	−858.8

[1] European Economic Community: Belgium, France, West Germany, Italy, Luxembourg, Netherlands.
[2] European Free Trade Association: Austria, Denmark, Norway, Sweden, Switzerland, Portugal.
[3] Data are as reported in source for Divisions 51 and 59 of the Standard International Trade Classification—Revised (SITC–R) and as such includes commodities listed in detailed trade tables of this chapter under metals, nonmetals and mineral fuels as well as a few nonmineral items. Total listed here is not readily divisable into these categories.

Source: Statistical Office of the United Nations.

TRADE

In October 1964 a temporary import surcharge of 15 percent was imposed on imports of certain classes of manufactured and semimanufactured goods to alleviate the rapidly growing negative trade balance and the consequent unfavorable effect on the balance of payments. In April 1965 the import surcharge was reduced to 10 percent, and it remained at that level through yearend.

Although mineral commodities accounted for only 13 percent in value of exports of United Kingdom produce, and 24 percent in value of all of the United Kingdom's imports for consumption, this trade in minerals accounted for nearly 84 percent of the unfavorable balance in the United Kingdom's foreign trade in commodities during 1965.

Exports of United Kingdom produce increased by 11 percent in 1965 to $13,226.8 million of which $1,728.1 million was in mineral products. Predominating among the latter were exports of iron and steel, nonferrous metals, and petroleum products. The European Economic Community (EEC) continued to be the most important area of consignment both in total and in mineral products. The United States continued to be the United Kingdom's foremost individual trading partner with regard to both exports and imports.

The United Kingdom's imports for consumption were valued at $15,654.3 million of which $3,756.9 million was in mineral products. The leading mineral supplying areas were the Near East, West Europe, Africa, and North America. The leading individual suppliers of mineral products were Canada, $434.6 million; Kuwait, $252.6 million; and the United States, $224.6 million.

Table 3.—United Kingdom: Exports[1] of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum:				
Aluminum oxide and hydroxide	r 19,688	17,413	21,251	Norway 7,653; Poland 6,410.
Metal and alloys:				
Metal, unwrought	7,575	6,849	24,536	Sweden 1,785; Denmark 608; Netherlands 541; West Germany 524.
Semimanufactures	r 56,722	47,826	46,439	Ghana 4,966; Canada 3,370; Finland 3,207; Sweden 2,985; Ireland 2,575; Norway 2,331; Republic of South Africa 2,326; Malaysia 2,107.
Antimony, regulus and refined	1,477	1,096	NA	NA.
Bismuth	613	728	535	NA.
Chromium	449	625	606	NA.
Cobalt oxides and hydroxides	366	471	374	Japan 54; Netherlands 49; Italy 48; Spain 46.
Copper and alloys:				
Unwrought	r 86,909	71,543	78,069	West Germany 20,550; Netherlands 15,131; Italy 10,536.
Semimanufactures	56,716	64,006	78,205	United States 7,139; Ireland 5,406; Spain 4,813; New Zealand 4,534; Netherlands 4,201; Australia 3,619; Switzerland 3,488; France 3,070.
Gold:				
Bullion, refined thousand troy ounces	r 18,985	17,593	76,518	NA.
Leaf gold do	NA	37	46	NA.
Gold coin do	949	2,630	2,296	NA.
Iron and steel:				
Scrap thousand tons	1,081	716	430	Netherlands 207; West Germany 150; France 75; Spain 74; Sweden 73.
Pig iron and ferroalloys do	113	74	129	Belgium-Luxembourg 25; West Germany 10; Netherlands 6; Italy 5.
Ingots and other primary steel forms do	r 44	204	296	Italy 63; Spain 35; India 24; West Germany 16.
Semimanufactures:				
Wire rod do	103	98	76	United States 54; India 10.

See footnotes at end of table.

Table 3.—United Kingdom: Exports [1] of metals and Minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:—Continued				
Other bars and rods--do----	255	262	314	India 35; Netherlands 19; Sweden 15; Norway 13; Australia 12; Denmark 11; United States 10; New Zealand 10; Ireland 10.
Angles, shapes and sections:				
Heavy----------do----	279	290	319	United States 46; Australia 46; Canada 27; New Zealand 25.
Light----------do----	49	57	66	United States 8; Australia 6; Ireland 5; Nigeria 5.
Plates and sheets:				
Universals and heavy plate----------do----	223	297	269	Canada 68; India 44; Yugoslavia 20; Norway 18; France 16; Republic of South Africa 15.
Medium plate----do----	57	131	76	Italy 47; Sweden 21; West Germany 10.
Thin plates and sheets:				
Uncoated----do----	929	916	855	West Germany 125; Italy 83; Sweden 81; Spain 56; U.S.S.R. 53; Israel 30; Finland 30.
Coated:				
Tin plate and tinned sheets do----	465	395	397	Republic of South Africa 81; Argentina 47; Sweden 29; Spain 26.
Other---do----	156	183	217	Finland 24; China (mainland) 16; New Zealand 15; Norway 13.
Hoop and strip-------do----	r 161	105	96	India 15; Turkey 13; United States 11; Finland 9; Sweden 6.
Railway track material do----	96	182	306	Republic of South Africa 34; Nigeria 24; France 21; West Germany 18; Peru 14.
Wire----------do----	117	123	126	United States 22; Canada 15; New Zealand 13; India 9.
Tubes, pipes and fittings do----	r 513	550	550	United States 46; Netherlands 42; Algeria 33; Canada 30; Trinidad 26.
Rough castings and forgings do----	15	23	42	Belgium-Luxembourg 7; Netherlands 4; Sweden 4.
Lead:				
Lead oxides----------	r 4,136	4,344	4,774	Ireland 992; West Germany 344; Australia 229; Pakistan 203.
Metal and alloys:				
Unwrought----------	r 42,927	40,119	42,822	West Germany 2,279.
Semimanufactures----------	r 1,983	1,986	1,902	Norway 153; Hong Kong 114; India 101; Malaysia 96; Pakistan 78.
Magnesium and alloys, unwrought and semimanufactures----------	r 1,894	1,659	1,769	West Germany 905; France 213.
Nickel:				
Matte and speiss----------	NA	278	NA	Sweden 96.
Oxides----------	488	151	39	NA.
Metal and alloys:				
Unwrought----------	r 23,971	27,319	28,228	West Germany 8,116; Sweden 3,789; France 4,150; Italy 3,250.
Semimanufactures----------	6,447	7,617	6,829	United States 786; Australia 768; France 754; Sweden 643.
Platinum group metals thousand troy ounces--	866	781	906	Canada 248; United States 185; Japan 107.
Silver and alloys, unwrought and semimanufactured----------do----	r 21,362	21,139	28,676	Italy 5,412; Belgium-Luxembourg 3,549; France 1,599; West Germany 1,569.
Tin:				
Ores and concentrates, long tons--	---	73	---	All to United States.
Oxides----------do----	r 460	405	411	Spain 69; Sweden 56; Mexico 38; Brazil 36.
Metal and alloys:				
Unwrought----------do----	r 11,161	9,409	9,275	United States 1,788; U.S.S.R. 1,091; France 987; West Germany 715; Netherlands 650.
Semimanufactures----do----	335	520	975	Norway 209; West Germany 99.

See footnotes at end of table.

Table 3.—United Kingdom: Exports[1] of metals and Minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:—Continued				
Tungsten ores and concentrates	---	1,326	---	West Germany 519; United States 398; Poland 171; France 91.
Zinc:				
Zinc oxides	r 7,140	5,698	3,688	Australia 945; West Germany 617; Ireland 472; Nigeria 372; Malaysia 335.
Metal and alloys:				
Unwrought	8,941	6,023	1,254	Belgium-Luxembourg 2,096; Japan 755; Thailand 711.
Semimanufactures	r 4,402	5,622	6,289	Netherlands 1,008; France 421; Australia 347; Chile 342; Ireland 306.
Nonferrous base metals, not elsewhere specified:				
Ores and concentrates	13,677	15,864	16,612	West Germany 3,655; Belgium-Luxembourg 3,157; Spain 1,947; Republic of South Africa 1,319; France 1,129.
Scrap	34,399	33,162	50,162	Belgium-Luxembourg 8,749; West Germany 5,250; Netherlands 3,284; Spain 1,880; Sweden 1,524.
Nonmetals:				
Abrasives, natural, n.e.s.	4,066	4,701	3,175	Ireland 1,556; Australia 406; India 260.
Asbestos:				
Crude or simply processed	r 8,248	5,773	6,040	West Germany 1,131; United States 1,047; Italy 732.
Asbestos cement products	r 45,848	58,868	38,353	Sudan 13,905; Nigeria 11,846; Ghana 2,810; Ireland 2,652.
Fabricated asbestos products, excluding friction materials	26,478	29,193	---	NA.
Cement, hydraulic---thousand tons	r 313	293	281	Ghana 63; Australia 25; Mauritius 21; Sierra Leone 14.
Clays and refractories:				
Crude:				
China clay---thousand tons	1,271	1,383	1,506	NA.
All other---do	320	368	382	NA.
Total---do	1,591	1,751	1,888	West Germany 285; Italy 260; France 194; Sweden 169; Finland 159.
Clay construction materials:				
Brick and other nonrefractory---do	63	68	71	Australia 14; United States 8; Canada 6; Malaysia 3.
Refractory---do	142	141	157	Netherlands 16; Sweden 13; Australia 12; Ireland 10; Belgium-Luxembourg 10; Canada 9; India 6.
Construction materials	12,248	8,769	7,750	Ireland 3,467; Norway 1,604; France 1,076.
Corundum artificial	NA	1,304	809	NA.
Fertilizer materials, manufactured:				
Nitrogenous---thousand tons	394	384	439	Ceylon 106; Malaysia 86; Spain 46.
Other---do	r 16	20	55	Spain 4; Netherlands 3; Cuba 3.
Gypsum	6,831	7,724	NA	NA.
Iodine---kilograms	16,353	24,591	NA	NA.
Lime	25,195	30,338	38,165	Norway 6,056; Nigeria 4,835; Ghana 2,355.
Pigments, mineral	5,464	6,504	3,661	NA.
Quartz, mica and feldspar	r 9,532	17,585	24,463	Australia 2,372; Norway 1,152; Finland 876.
Salt---thousand tons	368	363	405	Sweden 101; Nigeria 66; New Zealand 33.
Stone, sand and gravel---do	r 163	189	212	West Germany 78; Ireland 49; Sweden 20.
Cut stone	r 2,005	2,099	3,829	Ireland 850; Canada 477; West Germany 98.
Strontium minerals (celestite)	9,588	15,479	NA	NA.
Crude minerals, n.e.s.---thousand tons	170	173	252	Norway 95; Sweden 25; United States 8; West Germany 6.
Slag, scalings, dross, etc---do	361	386	327	West Germany 346; Denmark 15; Sweden 11.

See footnotes at end of table.

Table 3.—United Kingdom: Exports [1] of metals and Minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Mineral fuels:				
Carbon black	38,278	38,416	38,466	NA.
Coal, anthracite and bituminous thousand tons	8,002	5,965	3,856	Netherlands 1,521; France 980; Denmark 675; West Germany 642; Belgium-Luxembourg 630; Ireland 523.
Coal briquets do	138	51	33	France 23; Ireland 15; Norway 7.
Coke from coal and lignite do	r 2,052	1,489	1,009	Norway 535; Sweden 234; Portugal 205.
Petroleum:				
Crude and partly refined thousand barrels	r 10,522	2,507	1,997	Netherlands 2,486.
Refinery products:				
Gasoline do	r 12,138	11,017	13,513	Sweden 3,999; Denmark 2,322; France 1,367.
Kerosine do	r 7,028	5,921	6,249	Ireland 1,452; Sweden 1,265; Denmark 1,096.
Distillate fuels do	r 26,104	24,757	29,112	Denmark 5,318; West Germany 5,043; Norway 1,792; Netherlands 1,698.
Residual fuel oil do	r 20,843	21,378	25,792	Sweden 6,859; Denmark 4,666; Norway 3,951; West Germany 2,590.
Lubricants:				
Oils do	r 3,653	3,696	3,643	Belgium 284; Netherlands 277; India 276; West Germany 268; Australia 196; Norway 185; Republic of South Africa 180; Ireland 175.
Greases and impregnating compounds thousand tons	34	35	76	NA.
Mineral jelly and waxes do	r 8	6	5	West Germany 2; Ireland 1; Republic of South Africa 1.
Nonchemical coal and petroleum wastes	---	261	246	Norway 42; Spain 30; Netherlands 15; Sweden 8.
Electric energy megawatt-hours	120,658	305,963	103,069	All to France.

r Revised. NA Not available.
[1] Excluding reexports.

Table 4.—United Kingdom: Reexports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum and alloys, unwrought	66	480	183	United States 205; West Germany 153; Ireland 57.
Copper and alloys, unwrought	12,064	638	3,321	United States 331; Italy 254.
Lead and lead alloys, unwrought	803	2,617	5,429	Japan 1,726; Poland 560; West Germany 152.
Mercury 76-pound flasks	3,829	11,400	13,025	Japan 2,176; Rumania 986; West Germany 986; India 841; Poland 754.
Nickel and alloys:				
Unwrought	4,757	10,482	9,895	Italy 2,466; West Germany 2,422; Sweden 2,392; France 1,893.
Semimanufactures	---	741	799	Sweden 135; Spain 123; Republic of South Africa 123; West Germany 109.
Tin and alloys, unwrought long tons	219	252	180	U.S.S.R. 140; United States 75; Uruguay 19.
Zinc and alloys, unwrought	728	3,375	8,270	United States 848; Netherlands 640; Denmark 341.
Nonmetals:				
Asbestos, crude or simply processed	120	227	152	France 36.
Fertilizer materials, manufactured	3,409	2,297	2,030	NA.
Graphite natural	98	61	67	NA.
Mica, including splittings and waste	240	246	2,493	NA.
Quartz, mica, and feldspar	1,405	236	2,533	West Germany 55; Spain 37; Italy 30; France 26.
Salt	---	915	---	Poland 913.
Stone, sand and gravel	---	59,512	---	Netherlands 59,337.
Talc, natural steatite	7,038	7,369	323	Republic of South Africa 3,494; Ireland 2,540.

Table 4.—United Kingdom: Reexports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Mineral fuels:				
Coal, coke and briquets	93	9	29	NA.
Petroleum:				
Crude—thousand barrels	---	422	---	Ireland 422.
Refinery products:				
Gasoline—do	18	87	55	Ireland 86.
Kerosine—do	53	107	30	Spain 50; Ireland 47; Netherlands 5.
Distillate fuels—do	761	275	31	Netherlands 269; West Germany 4.
Residual fuel oil—do	1,179	---	8	
Lubricating oils, greases	---	---	11	
Lubricants (high petroleum contents)	---	---	11	
Mineral jelly, wax—thousand tons	10	---	---	

NA Not available.

Table 5.—United Kingdom: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum:				
Bauxite—thousand tons	337	381	474	Ghana 213; Greece 63; France 58.
Metal and alloys:				
Scrap	r 9,368	12,255	23,772	United States 6,512; U.S.S.R. 2,810.
Unwrought	270,631	331,618	324,074	Canada 177,017; Norway 77,698; United States 36,944.
Semimanufactures	25,649	26,733	24,312	Belgium-Luxembourg 9,086; Ireland 3,883; Austria 2,541.
Antimony ore and concentrates	r 11,995	(1)	(1)	NA.
Arsenic trioxide	8,951	9,773	11,089	NA.
Bismuth:				
Metal	428	619	394	NA.
Alloys	282	385	297	NA.
Cadmium	r 1,424	1,596	1,454	Canada 534; United States 431; U.S.S.R. 116.
Chromite	r 162,595	225,558	205,004	Philippines 106,557; Republic of South Africa 89,848.
Cobalt:				
Oxides	NA	1,006	873	NA.
Metal	387	1,553	1,833	NA.
Columbium-tantalum ores	821	1,555	1,780	NA.
Copper and alloys:				
Ores and concentrates	117	1,373	811	Peru 1,311.
Metal and alloys:				
Scrap	r 2,204	3,630	5,758	Ireland 706; United States 344; Netherlands 323; France 308.
Unwrought:				
Blister	r 101,113	100,656	74,210	Federation of Rhodesia and Nyasaland 50,303; Chile 42,014.
Electrolytic	r 358,692	383,067	445,994	Zambia 188,116; Canada 99,464; United States 44,775.
Fire refined	r 41,110	42,068	42,289	Chile 31,805; Republic of South Africa 7,823.
Alloys, including master alloys	618	313	127	NA.
Semimanufactures	r 4,330	9,956	7,350	Canada 3,622; Federation of Rhodesia and Nyasaland 1,832; West Germany 1,002.
Gold:				
Ores, concentrates, jewelers sweeping, etc. estimated gold content—thousand troy ounces	r 1	65	NA	NA.
Bullion:				
Unrefined—do	1,676	1,550	1,527	NA.
Refined—do	32,623	39,299	37,885	NA.
Other—do	3	5	9	NA.
Gold coin—do	419	359	605	NA.

See footnotes at end of table.

Table 5.—United Kingdom: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:—Continued				
Iron and steel:				
Iron ore and concentrates:				
Iron ore excluding pyrites thousand tons	14,551	18,309	18,609	Sweden 5,507; Canada 3,324; Venezuela 1,714; Liberia 1,623; Mauritania 1,410.
Roasted pyrites do	---	609	567	Sweden 173; Spain 168; Italy 140.
Scrap do	5	14	74	Canada 9; United States 1.
Pig iron, including shot and sponge iron do	201	353	333	Canada 79; Finland 79; Norway 59; East Germany 56.
Ferroalloys:				
Ferromanganese do	55	63	82	Republic of South Africa 39; Norway 10.
Ferrochromium do	35	48	62	Sweden 10; Norway 8; Republic of South Africa 6.
Ferrosilicochromium do	4	5	124	Federation of Rhodesia and Nyasaland 2; Norway 2.
Ferrosilicon do	89	110		Norway 57; Canada 29; U.S.S.R. 11.
Silicomanganese do	28	36	33	Norway 31; U.S.S.R. 2.
Other do	3	5	7	Norway 2; U.S.S.R. 1.
Steel ingots and other primary forms do	r 262	465	30	West Germany 153; Canada 88; United States 67.
Coils for rerolling do	246	176	---	United States 100; U.S.S.R. 48.
Semimanufactures:				
Wire rod do	80	86	34	Belgium-Luxembourg 35; Sweden 20; Norway 14.
Other bars and rods do	174	187	104	Belgium-Luxembourg 72; France 36; Sweden 35.
Angles, shapes, and sections do	28	39	9	Belgium-Luxembourg 13; West Germany 8; Norway 7.
Plates and sheets:				
Heavy and medium plate do	70	60	31	Sweden 21; Austria 10; Australia 8.
Thin plates and sheets:				
Uncoated do	295	426	236	Netherlands 194; Austria 65; West Germany 47.
Coated:				
Tinplate and tinned sheets thousand tons	2	19	---	United States 6; Canada 5; Belgium-Luxembourg 4.
Other do	17	43	NA	Canada 20; Belgium-Luxembourg 8; United States 5.
Hoop and strip do	13	42	37	Belgium-Luxembourg 23; United States 6; West Germany 3; Sweden 3.
Tubes, pipes, and fittings do	16	26	68	Sweden 12; United States 4; West Germany 4.
Wire, single strand do	6	5	5	Sweden 2; Belgium-Luxembourg 1.
Rough castings and forgings do	r 2	1	2	Mainly from Norway.
Lead:				
Ores and concentrates	r 34,893	r 31,508	22,027	Australia 12,910; Canada 12,466; Norway 5,208.
Metal and alloys:				
Scrap	r 1,681	4,235	2,713	Canada 980; Australia 575; New Zealand 498.
Bullion	58,936	61,558	219,039	All from Australia.
Refined lead	124,378	133,725		Australia 76,215; Canada 39,942; Zambia 3,913.
Magnesium and alloys:				
Scrap	502	683	350	Belgium-Luxembourg 229; West Germany 151; Netherlands 90.
Unwrought and semimanufactures	4,133	3,209	4,584	NA.
Manganese ore and concentrates thousand tons	r 314	534	503	U.S.S.R. 155; Republic of South Africa 126; Brazil 92.
Mercury 76-pound flasks	r 24,570	33,620	30,487	Italy 21,872; Spain 9,341.
Molybdenum ore and concentrates	r 5,873	6,541	8,177	NA.
Nickel:				
Ores and concentrates	5	---	---	
Matte and speiss	62,620	57,363	65,076	Canada 55,820.

See footnotes at end of table.

Table 5.—United Kingdom: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:—Continued				
Nickel:—Continued				
Metal and alloys:				
Scrap	2,533	3,798	3,263	United States 1,363; Netherlands 1,062; France 523.
Unwrought	r 13,337	29,794	26,861	Canada 22,605; Norway 5,484.
Semimanufactures	r 3,145	5,105	2,847	United States 3,120; Canada 1,412.
Platinum group metals, all forms thousand troy ounces	86	108	148	U.S.S.R. 28; Italy 21; United States 18; Switzerland 10.
Selenium	130	150	178	NA.
Silicon	8,990	10,584	12,000	NA.
Silver:				
Ores and concentrates	135	---	240	NA.
Unwrought and semimanufactures—thousand troy ounces	21,517	62,487	46,825	United States 49,199; Australia 5,081; Mexico 2,152.
Tin:				
Ores and concentrates long tons	r 45,610	44,821	45,370	Bolivia 38,919; Indonesia 1,626; Republic of South Africa 954.
Metal and alloys:				
Scrap—do	698	1,138	1,131	France 220; Netherlands 178; United States 159; Australia 104.
Unwrought—do	r 7,926	8,936	9,265	Nigeria 5,529; Malaysia 1,893.
Semimanufactures—do	r 46	33	NA	NA.
Titanium ores and concentrates:				
Ilmenite	230,490	181,841	270,695	NA.
Other	18,563	35,495	17,508	NA.
Tungsten ore and concentrates	r 5,426	6,381	8,063	U.S.S.R. 1,021; Republic of Korea 1,020; Bolivia 921; Australia 548; China (mainland) 504.
Zinc:				
Ores and concentrates	r 215,101	308,958	233,779	Australia 213,483; Iran 28,455; South Africa 25,640.
Scrap	2,980	3,380	1,966	Netherlands 1,023; West Germany 571; Sweden 488.
Metal and alloys:				
Unwrought:				
High purity	r 79,948	89,029	86,291	Canada 43,349; Australia 12,504; Peru 8,976.
Electrolytic	r 61,329	77,652	87,525	U.S.S.R. 27,180; Canada 25,399; Australia 11,581.
Other	r 21,177	26,888	23,134	Canada 22,177; United States 3,329.
Semimanufactures	r 864	596	NA	NA.
Zirconium ore and concentrates	32,897	50,160	42,920	NA.
Other:				
Nonferrous ores and concentrates, not elsewhere specified	979	1 29,433	1 15,370	NA.
Metalliferous nonferrous waste, not elsewhere specified	36,579	33,677	64,604	NA.
Nonferrous base metals, n.e.s.:				
Tungsten, molybdenum, tantalum	r 94	150	187	Austria 97; United States 13; Canada 11.
Other	6,866	9,507	8,994	United States 2,978; Federation of Rhodesia and Nyasaland 1,447; Japan 1,203.
Nonmetals:				
Asbestos:				
Crude	160,082	186,555	178,958	Canada 91,601; Malawi 45,852; Republic of South Africa 32,608.
Asbestos cement products	24,357	29,783	34,456	Belgium - Luxembourg 18,977; France 5,387; South Africa 3,089.
Barite and witherite	r 28,448	47,328	68,205	Morocco 28,650; Spain 8,765.
Boron:				
Crude natural borates	r 26,300	30,374	42,787	Netherlands 14,806; Turkey 8,174; United States 7,393.
Borax	r 21,732	27,717	22,201	NA.
Cement hydraulic—thousand tons	247	420	1,126	Ireland 253; Denmark 51.
Chalk	3,215	1,694	1,099	France 1,509.
Clays and clay products:				
Crude:				
Andalusite, kyanite, sillimanite, mullite, dinas, and chamotte	19,848	27,798	26,587	NA.
Other	r 43,029	61,701	85,251	NA.

See footnotes at end of table.

Table 5.—United Kingdom: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals:—Continued				
Clays and clay products:—Continued				
Clay construction materials (non-refractory)	r 19,922	31,724	21,303	Belgium - Luxembourg 10,197; Netherlands 4,500; West Germany 3,316; France 3,284.
Cryolite, chiolite natural	3,160	3,454	2,534	Denmark 3,358.
Diatomite and other siliceous earths	54,569	58,325	46,664	Denmark 38,240; United States 11,224.
Dolomite	10,212	12,255	13,976	Norway 10,375.
Feldspar	r 36,881	59,034	98,468	Norway 62,415; Canada 15,813.
Fluorspar	17,590	33,066		
Fertilizer materials:				
Nitrogenous:				
Sodium nitrate, natural thousand tons	14	15	18	All from Chile.
Manufactured do	r 320	298	269	West Germany 138; Netherlands 105.
Phosphatic:				
Phosphate rock do	1,436	1,510	1,694	Morocco 797; United States 247; Nauru 213.
Basic slag do	98	78	47	Belgium-Luxembourg 54; France 24.
Other phosphates do	26	17	13	Netherlands 12; Belgium-Luxembourg 3.
Potassic:				
Potash salts, crude natural do	29	38	38	West Germany 20; East Germany 17.
Potassium chloride do	691	673	691	East Germany 202; France 192; West Germany 184.
Potassium sulfate do	28	34	34	France 19; East Germany 14; West Germany 9.
Other do	18	9	3	
Crude fertilizers not elsewhere specified do	8	9	13	Ireland 9.
Manufactured fertilizers, n.e.s. do	155	119	143	Netherlands 96; Chile 10; United States 7.
Graphite, natural	r 8,325	9,406	10,516	Madagascar 3,090; Ceylon 2,747; Norway 1,481; mainland China 1,052.
Gypsum, crude and calcined thousand tons	r 141	157	159	Ireland 100; France 56.
Lithium minerals	r 3,251	10,465	NA	NA.
Magnesite	r 38,061	87,592	109,674	Austria 35,402; Greece 16,026; India 7,666; United States 7,453.
Mica:				
Film, splittings, and waste	11,561	1,272	1,649	India 5,780; South Africa 589; Tanganyika 179.
Manufactures	37	5,504	12,267	
Pigments, earth colors, etc.	6,392	6,562	8,093	South Africa 2,684; Spain 1,521; Cyprus 623.
Pumice and other natural abrasives	12,231	14,553	14,046	Italy 4,769; Turkey 3,781; United States 3,726.
Pyrites, unroasted thousand tons	204	289	228	Cyprus 167; U.S.S.R. 53; Canada 27.
Quartz, natural, quartzite	13,102	18,276	16,835	Sweden 9,064; Norway 7,763.
Refractory construction materials, n.e.s.	34,034	51,712	63,172	Austria 20,175; Denmark 8,317; France 4,920.
Salt thousand tons	r 180	38	60	West Germany 22; Poland 9.
Stone, sand and gravel:				
Building and dimension stone (rough cut) thousand tons	42	41	43	Italy 25; Sweden 4.
Dimension stone worked do	26	27	21	Portugal 14; Italy 3; India 3.
Natural sands, not mineral bearing do	r 199	211	207	Belgium-Luxembourg 171; Netherlands 31.
Gravel and crushed stone	133	115	138	Ireland 48; Italy 33; France 21.
Talc and soapstone	r 45,196	49,511	46,656	Norway 20,698; France 9,661; Italy 6,784.
Crude minerals, n.e.s.	119,476	198,797	246,004	NA.
Slag, scalings, dross, not metal-bearing	22,766	42,229	64,813	Sweden 39,953; Argentina 1,286.
Mineral fuels:				
Asphalt and bitumen, natural	83,468	99,755	83,295	Trinidad 60,790; France 20,435.
Coal, coke and briquets thousand tons	66	57	56	Ireland 55.
Gas, natural and manufactured do	---	64	703	NA.

See footnotes at end of table.

Table 5.—United Kingdom: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Mineral fuels—Continued				
Petroleum:				
Crude and partly refined for further refining thousand 42-gallon barrels	405,919	444,653	492,989	Kuwait 133,247; Iraq 85,141; Libya 68,826; Venezuela 46,408; Nigeria 24,535; Saudi Arabia 13,501.
Refinery products:				
Gasoline, including blending components ...do	27,269	29,312	28,961	Netherlands 5,453; Trinidad 5,041; Bahrain 4,009; Italy 2,083.
Kerosine ...do	16,719	22,132	25,103	Aden 3,794; Netherlands 3,301; Netherlands Antilles 2,233; Bahrain 2,118; Trinidad 1,107.
Distillate fuel oil ...do	25,636	22,605	22,582	Trinidad 3,008; Italy 2,994; Kuwait 2,788; Bahrain 2,731; Venezuela 2,469; Netherlands 1,573.
Residual fuel oil ...do	55,724	60,053	65,548	Venezuela 13,999; Netherlands 11,046; Trinidad 9,640; Italy 5,762; Netherlands Antilles 5,657.
Lubricating oils ...do	3,792	3,796	3,902	United States 1,239; Netherlands Antilles 1,029; Venezuela 473.
Other lubricants thousand tons	---	3	2	Netherlands 2.
Mineral jelly and waxes do	r 814	177	123	Netherlands 67; Indonesia 40; Netherlands Antilles 36.
Petroleum coke ...do	69	96	94	Netherlands 46; Belgium-Luxembourg 14.
Other ...do	NA	11	103	NA.

r Revised. NA Not available.
[1] Not separately recorded; included under other nonferrous ores.

COMMODITY REVIEW

METALS

Home consumption of crude steel estimated at 23.47 million tons in 1965 showed little change from that of 1964, while the consumption of nonferrous metals showed a general increase.

Aluminum.—In January 1965 the R.T.Z. Metals Limited, a wholly owned subsidiary of the Rio Tinto Zinc Corp., put into operation an aluminum extrusion plant at Widnes, Lancashire, that has an annual capacity of 5,000 tons of extrusions. The announced purpose of the plant is to process virgin aluminum from the Bell Bay, Tasmania, Australia, primary reduction works which is jointly owned by the Rio Tinto Zinc Corp. and the Kaiser Aluminum Co. It was planned to add a small zinc extrusion section in the aluminum plant for the production of special zinc products.

Iron and Steel.—For the second successive year production of crude steel exceeded that of any previous year. Capacity at year-end was estimated at 31.36 million tons, an increase of nearly 6 percent over that of 1964. Average utilization of capacity was about 88 percent compared with 89 percent in 1964. Consumption of finished steel increased nearly 5 percent over the 1964 level on a 52-week basis.

In response to measures designed to ease the balance of payments deficit, exports of iron and steel increased from 3.89 million tons in 1964 to 4.13 million tons in 1965, while imports decreased from 2.16 million tons in 1964 to 1.22 million tons in 1965. Stocks increased by only 90,000 tons.

Total requirements for crude steel in 1970 under the national plan were estimated at 32.26 million tons, of which 31.24 million tons would be supplied from domestic production and 0.76 million tons from imports. Export requirements were estimated at 4.32 million tons.

Nationalization.—In addition to the Government-owned Richard Thomas &

Baldwins, Ltd., the following major British steel companies were declared subject to nationalization in the White Paper on Iron and Steel:

Colvilles, Ltd.
Consett Iron Co., Ltd.
Dorman Long (Steel), Ltd.
English Steel Corporation, Ltd.
Lancashire Steel Manufacturing Co., Ltd.
South Durham Steel and Iron Co., Ltd.
The Steel Company of Wales, Ltd.
Stewarts and Lloyds, Ltd.
John Summers & Sons, Ltd.
The United Steel Companies, Ltd.
G.K.N. Steel Co., Ltd.
Tube Investments, Ltd.
The Park Gate Iron and Steel Co., Ltd.
Round Oak Steel Works, Ltd.

Development.—An important result of research by the British Iron and Steel Research Association was the development of the Spray steelmaking process on a pilot plant scale at its Sheffield laboratories. By this process, hot blast furnace metal was directly refined in a receiving ladle to provide "a product suitable as the starting point for a wide range of steels." Plans include a commercial scale plant for one of the steel companies scheduled for nationalization.

Table 6.—United Kingdom: Consumption of principal nonferrous metals and scrap

(Metal content in metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Aluminum:					
Primary, dispatches to consumers	284,114	286,658	318,553	358,934	363,616
Secondary, dispatches to consumers	131,071	142,777	163,047	r 186,769	188,709
Aluminum in scrap, direct use	11,720	9,187	10,028	10,486	11,513
Total	426,905	438,622	491,628	r 556,189	563,838
Scrap consumed in secondary smelters	146,725	160,118	182,341	204,278	206,779
Antimony:					
In metal	2,637	2,814	2,815	2,785	2,430
In oxides	2,321	2,110	1,948	2,370	2,278
In sulfides and crude	63	72	59	59	55
In antimony in scrap, direct use	6,215	6,979	r 7,534	8,316	8,633
Total	11,236	11,975	r 12,356	13,530	13,396
Cadmium kilograms	1,250,351	1,276,108	1,288,707	r 1,270,367	1,290,891
Copper:					
Primary	433,565	429,997	441,160	503,360	499,373
Secondary	95,235	96,067	116,808	129,493	146,022
Copper in scrap, direct use	163,623	138,267	r 137,494	r 156,718	157,517
Total	692,423	664,331	r 695,462	r 789,571	802,912
Lead:					
Refined lead	275,718	276,339	283,493	307,766	312,130
Scrap and remelted lead	97,690	108,956	109,808	119,650	122,990
Total	373,408	385,295	393,301	427,416	435,120
Magnesium and magnesium alloys, dispatches to consumers	NA	10,100	9,600	9,100	9,600
Nickel, including ferronickel	26,500	25,100	27,500	38,100	36,900
Tin:					
Primary long tons	20,242	21,439	20,636	19,252	19,256
Secondary do	1,381	995	1,134	1,817	1,461
Total do	21,623	22,434	21,770	21,069	20,717
Zinc:					
Primary:					
Slab zinc	258,675	246,344	261,626	288,117	278,077
Other	2,623	2,325	1,755	941	15
Remelted	5,930	5,290	7,070	7,670	6,732
Scrap, zinc content	77,316	r 68,340	r 74,990	81,609	78,153
Total	344,544	r 322,299	r 345,441	378,337	362,977

r Revised.

Table 7.—United Kingdom: Salient iron and steel statistics
(Thousand metric tons unless otherwise specified)

	1963	1964 [1]	1965
IRON ORE			
Production by field and type:			
Lancashire, Cumberland and Glamorgan hematite, 49 percent Fe	400.2	434.0	414.7
Frodingham ironstone (including Claxby), 21 percent Fe	5,353.4	5,528.2	5,146.6
Cleveland oolite, 28 percent Fe	143.3	.8	---
South Lincolnshire and Leicester marlstone, 25 percent Fe	353.9	711.8	626.9
Oxford and S.W. Northamptonshire marlstone, 22 percent Fe	917.2	r 902.9	853.0
Northampton sand ironstone, 31 percent Fe	7,983.3	9,010.0	8,620.9
Total,[2] 27 percent Fe	15,151.3	r 16,587.7	15,662.1
Consumption:			
In blast furnaces:			
Domestic iron ore	3,463.0	3,843.8	2,933.9
Imported iron ore, 58 percent Fe [3]	4,987.2	5,626.6	5,741.9
Imported manganese ore	294.4	415.2	440.3
Total	8,744.6	9,885.6	9,116.1
In sinter plants:			
Domestic iron ore	11,765.8	12,672.2	12,803.4
Imported iron ore, 58 percent Fe [3]	8,614.7	11,107.7	11,473.4
Imported manganese ore	13.2	14.1	23.5
Total	20,393.7	23,794.0	24,300.3
In steelworks:			
Domestic iron ore	8.4	7.9	7.4
Imported iron ore, 64 percent Fe [3]	906.9	r 1,158.3	1,008.6
Imported manganese ore	1.0	---	---
Total	916.3	r 1,166.2	1,016.0
Total:			
Domestic iron ore, 27 percent Fe [2]	15,237.3	16,523.9	15,744.7
Imported iron ore, 58 percent Fe [3]	14,508.8	17,892.5	18,223.9
Imported manganese ore; 9 percent Fe, 44 percent Mn [3]	308.7	429.3	463.8
Grand total	30,054.8	34,845.7	34,432.4
SCRAP			
Arisings from own works	8,585.2	9,998.0	9,940.6
Purchased (Home and Imported)	9,057.1	10,611.8	10,795.1
Consumption	17,469.2	19,895.5	20,373.6
Stocks at end of year	1,084.4	1,342.1	1,308.8
SINTER			
Production of sinter	18,053.9	21,363.2	21,690.7
Average materials consumed per ton of sinter produced:			
Domestic iron ore—kilograms	649.7	592.0	589.0
Imported iron ore—do	477.9	520.5	530.0
Pyrites residue and purple ore—do	33.4	36.5	33.5
Other iron-bearing materials [4]—do	81.9	77.5	80.0
Limestone and sandstone—do	52.1	55.0	47.5
Coke breeze and anthracite—do	101.6	98.5	98.0
Total—do	1,396.6	1,380.0	1,378.0
PIG IRON			
Production of pig iron by type:			
Hematite	829.9	972.1	891.4
Basic	12,847.3	15,311.2	15,623.9
Forge and foundry	1,022.0	1,096.4	1,028.5
Blast furnace ferroalloys	126.4	171.1	196.3
Total [5]	14,825.6	17,550.8	17,740.1
Average number of furnaces in blast—number of units	64	67	66
Average annual output per furnace	232.3	261.1	267.1
Average materials consumed per ton of pig iron produced:			
Domestic iron ore, as charged—kilograms	232.0	217.5	164.0
Average Fe content—percent	27	27	27
Imported iron ore, as charged—kilograms	336.5	320.5	323.5
Average Fe content—percent	59	59	59

See footnotes at end of table.

Table 7.—United Kingdom: Salient iron and steel statistics—Continued
(Thousand metric tons unless otherwise specified)

	1963	1964 [1]	1965
PIG IRON (continued)			
Average materials consumed per ton of pig iron produced:—Continued			
Imported manganese ore—kilograms	20.0	23.5	25.0
Average Fe content—percent	8	9	8
Sinter—kilograms	1,208.0	1,216.5	1,220.0
Scrap—do	104.5	96.5	93.5
Other Fe bearing materials [6]—do	89.0	78.0	78.5
Limestone and dolomite—do	96.5	89.5	92.5
Total—do	2,086.5	2,042.0	1,997.0
Coke—do	719.0	697.5	680.0
Consumption of pig iron:			
In ironworks and iron foundries	1,596.9	1,797.6	1,726.6
In steelworks and steel foundries	13,502.1	15,892.9	16,307.2
Total	15,099.0	17,690.5	18,033.8
CRUDE STEEL			
Production by type:			
Open hearth:			
Acid	389.7	426.0	398.3
Basic	16,994.0	18,359.6	17,092.2
Converters:			
Acid	217.1	295.0	262.5
Kaldo	---	266.2	525.4
Linz-Donawitz	[7]	2,545.1	4,012.6
Tropenas and Stock converters	79.9	81.0	71.0
Other	3,090.7	1,692.1	1,585.1
Electric:			
Arc	1,986.8	2,835.6	3,340.9
Induction	123.4	150.3	151.6
Total	22,881.6	26,650.9	27,439.5
Including:			
Ingots	22,385.4	26,068.3	26,843.7
Steel for castings	496.2	582.6	595.8
Average materials consumed per ton of crude ingots and castings produced:			
Pig iron:			
Molten—kilograms	512.0	521.5	520.5
Cold—do	78.0	74.5	74.0
Scrap:			
Cast iron—do	21.0	19.5	22.0
Steel—do	496.5	490.0	493.5
Oxides—do	57.5	59.5	50.0
Finishings—do	16.5	17.0	17.0
Fluxes—do	91.5	88.0	87.0
Fettling materials—do	23.5	22.0	20.0
Total	1,296.5	1,292.0	1,284.0
FINISHED STEEL			
Production, all qualities: [8]			
Heavy rails and accessories	292.7	375.2	401.0
Plates 3mm thick and over	2,594.4	3,405.5	3,222.3
Heavy bars and sections, excluding alloy	2,409.7	2,857.3	2,989.7
Wire rod and other bars and rods in coil	1,946.7	1,712.8	1,774.3
Arches, light rails and accessories	360.1	366.1	359.6
Other light rolled sections and hot rolled bars	2,610.4	3,241.6	3,386.2
Bright steel bars	506.9	633.5	640.5
Hot rolled strip, excluding alloy	1,689.6	1,878.3	1,829.9
Cold rolled strip	505.8	r 599.1	558.5
Sheets, coated and uncoated	3,632.9	4,096.3	4,238.4
Tinplate, (including black plate for sale as such)	1,225.6	1,204.6	1,231.0
Tubes, pipes and fittings	1,254.6	1,452.4	1,551.1
Tires, wheels, axles and rings	77.0	92.8	112.5
Forgings, (excluding drop forgings)	170.5	205.9	198.7
Castings	257.1	307.4	317.3
Consumption:			
Plates	2,210.7	2,657.9	2,746.5
Sheets	2,777.9	3,029.1	2,970.5
Tinplate, terneplate, and blackplate	775.5	791.6	836.0
Other steel	8,788.6	9,971.1	10,364.5
Total	14,552.7	16,449.7	16,917.5

See footnotes at end of table.

Table 7.—United Kingdom: Salient iron and steel statistics—Continued
(Thousand metric tons unless otherwise specified)

	1963	1964 [1]	1965
FINISHED STEEL (continued)			
Consumption:—Continued			
Stocks of mill products at end of year:			
Held by producers:			
Ingots and semis	1,645.2	1,748.2	1,805.0
Finished steel	1,285.2	1,307.2	1,218.1
Held by consuming industries and stockholding merchants:			
Plates	631.3	761.0	765.1
Sheets	631.5	712.9	629.6
Tinplate, terneplate, and blackplate	165.8	168.7	144.7
Other steel	2,387.9	2,596.1	2,789.4
Total consumer and merchant stocks	3,816.5	4,238.7	4,328.8
Consumption of finished steel by consuming industries:			
Coal mining	497.3	517.6	486.6
Food, drink, and tobacco	95.6	100.0	103.0
Chemical and allied industries	125.3	131.6	163.0
Iron and steel, including iron foundries	630.0	828.7	998.2
Machinery, machine tools, and equipment	1,343.0	1,546.8	1,582.7
Ordnance, small arms and mechanical engineering, not elsewhere specified	486.7	549.6	599.4
Industrial plant and steelwork	1,637.7	1,935.5	2,029.5
Tools, instruments, and implements	87.8	113.6	117.5
Electrical industries	750.9	791.4	779.2
Shipbuilding	589.7	787.3	681.5
Motor vehicle manufacturing and servicing	2,225.4	2,406.2	2,416.1
Other vehicles, aircraft, manufacture, and repair	131.8	130.0	129.9
Railway equipment and other transportation services	481.5	451.3	503.1
Bolts, nuts, wire and wire manufactures	1,433.8	1,586.7	1,583.8
Other metal manufactures	2,608.7	2,929.2	3,070.3
Construction	938.5	1,080.8	1,108.6
Utilities	140.9	122.8	113.0
Other consumers	348.1	440.6	452.1
Total	14,522.7	16,449.7	16,917.5

[r] Revised.
[1] 53 weeks.
[2] Weighted average, based on quantity of each grade consumed.
[3] Weighted average, based on quantities of each grade received.
[4] Includes burnt spent and black oxides, flue dust, scale, slag, and other materials.
[5] Includes direct castings not shown in table.
[6] Includes cinder, purple ore, scale, and slag.
[7] Included with "Other."
[8] Includes some material for conversion into products also listed in this table.

New development projects costing $280,000 or more each, completed or in progress during 1965, involved a capital expenditure of nearly $100 million during the year. Although several major steelmaking expansion or replacement projects were completed, the general stress was on improvement of product quality and operating efficiency. Major projects completed during 1965 and those in progress or authorized during 1965 are as follows:

Company	Type of project
COMPLETED DURING 1965	
Alloy Steel Rods Ltd.	A new wire-rod mill.
Appleby-Frodingham Steel., branch of The United Steel Companies, Ltd.	Conversion of the fourth open hearth steel furnace to the "Ajax" oxygen injection process (an Appleby-Frodingham research development); installation of two further strands on the rod and bar mill; and two additional sinter strands.
Dorman Long (Steel) Ltd., Lackenby Works	Completion of the installation of a four-high universal plate mill and continued installation of a new rod mill scheduled for completion early in 1966.
Cleveland Works	Installation of an 80-ton electric arc furnace at the North Steel Plant and scrap charging equipment at the South Steel Plant.
G.K.N. Steel Company Ltd., Brymbo Steel Works	Improvements to existing blast furnace.

Company	Type of project
COMPLETED DURING 1965—Continued	
Lancashire Steel Manufacturing Co. Ltd., Warrington Works	Installation of a 22-inch medium section mill.
Park Gate Iron and Steel Co. Ltd	Installation of a heat treatment plant and ancillary equipment.
Round Oak Steel Works Ltd	Installation of a vacuum degassing plant and a fume cleaning plant.
Steel Company of Wales Ltd., Margam, Abbey Works	Increase of blowing capacity for three blast furnaces; installation of fume cleaning equipment for four open hearth furnaces.
Steel Peech & Tozer, branch of The United Steel Companies Ltd	Installation of sixth electric arc furnace, thereby completing the replacement of open hearth steelmaking facilities at Templeborough and Rotherham by six 100-ton electric arc furnaces.
Stewarts & Lloyds Ltd.:	
Billston Works	A vacuum degassing plant and two additional soaking pits.
Corby Works	Two 100-ton basic oxygen LDAC [1] steelmaking vessels, and improvements to the ore preparation, sintering, and strip finishing plants.
Wolsingham Steel Co. Ltd	Installation of a 30-ton electric arc furnace.
IN PROGRESS OR AUTHORIZED IN 1965	
Firth Brown Ltd	Replacement of open hearth furnaces by electric arc furnaces.
Consett Iron Co. Ltd	Conversion of a 100-ton Kaldo steelmaking vessel to a 150-ton LD vessel at the Consett Works.
Richard Thomas & Baldwins Ltd., Panteg Works	Replacement of the open hearth steelmaking plant by a 60-ton electric arc furnace.

[1] A modification of the Linz-Donawitz (LD) process.

Lead and Zinc.—Early in 1966 the Rio Tinto Zinc Corp. announced plans for the installation of a new Imperial Smelting Furnace at Avonmouth. The facility, with a capacity of 90,000 tons of zinc annually, is to replace the existing experimental prototype furnace in which the Imperial smelting process was largely developed. The new works, scheduled for completion in 1972 would give the Avonmouth works together with the Swansea works (comprising the United Kingdom's first standard size Imperial Smelting Furnace) a combined capacity of 180,000 tons of slab zinc and 44,000 tons of lead annually. The new facility is expected to also increase annual cadmium output to 500 tons, raise the annual national sulfuric acid capacity to 440,000 tons, and produce 75,000 tons of phosphoric acid per year. Capital cost was estimated at about $35.6 million.

Tin.—The South Crofty mine at Redruth, the Geevor mine at Pendeen, and the dredging operation of Hydraulic Tin Inc. near Truro, all in Cornwall, again accounted for nearly all of the United Kingdom's output of tin concentrates. At yearend, however, there were some 15 additional domestic or international companies either actively engaged in prospecting and exploration, or preparing to prospect for new tin deposits, and unknown extensions to known deposits, and/or to reexamine known mineralized areas remaining from former mining operations in Cornwall. A thorough investigation of all old dumps or slime and sand accumulations from former mining operations and of possible placer deposits is also being carried out.

A very promising area was being made available for mining and exploration under the sea through the unwatering of the Levant mine of Geevor Tin Mines Ltd., made possible by that company's successful plugging of a breach in the sea floor which led directly into the old mine workings.

NONMETALS

Fluorspar.—Fluorspar output in 1965 was 11 percent above that of 1964 and nearly double that of 1963, placing the United Kingdom among the world's leading producers of fluorspar. This was made possible by the completion by Glebe Mines Ltd. at Eyam, Derbyshire, of the new Cavendish gravity-flotation plant for the treatment of ores from the Ladywash mine and the newly developed Sallet Hole mine, as well as for treatment of customs ores from old dumps and other sources in the district. Glebe Mines Ltd. is a subsidiary of Laporte Industries Ltd., a diversified chemical manufacturing company that has acquired

extensive mineral reserves in the Southern Pennine orefield.

The annual rated capacity of the Cavendish plant, built on the site of the Cupola Mining and Milling Co., is 70,000 tons of acid-grade fluorspar, 30,000 tons of metallurgical-grade fluorspar, 18,000 tons of barite, and 3,850 tons of lead filter cake.

MINERAL FUELS

A further decrease in coal output (3.2 percent in 1965 compared with that of 1964) against an increase in total energy consumption (4 percent in 1965 compared with that of 1964) reflected, among other causes, the continued trend toward the supply of energy growth requirements from petroleum and natural gas, as well as the replacement of coal as a source of energy for certain industries in which the economic advantages of petroleum outweigh the disadvantages, including its effect on the balance of payments. Out of a total increase in energy consumption amounting to the equivalent of 11.7 million tons of average bituminous coal (SCE),[4] all primary forms of energy contributed to the gain except coal which lost 2 million tons. The share of coal in total energy consumption dropped from 65.4 percent in 1964 to 62.2 percent in 1965 while petroleum's share rose from 32.7 percent in 1964 to 34.6 percent in 1965.

[4] One ton of Standard Coal Equivalent (SCE) is the equivalent of 1 ton of average British coal as consumed.

Table 8.—United Kingdom: Energy balance
(Million tons coal or coal equivalent[1])

Energy source	1961	1962	1963	1964	1965
Coal, direct use	85.7	82.6	78.8	71.2	68.6
Coke and coke breeze	30.1	28.7	29.1	30.0	30.2
Other solid fuel	1.5	1.5	1.6	1.3	1.0
Coke oven gas	2.5	2.1	2.1	2.5	2.5
Oil, direct use	r 60.6	r 67.1	74.2	79.9	86.8
Electricity:					
Coal and coke	57.2	62.9	69.2	69.8	71.6
Oil	r 9.7	r 10.1	8.8	9.9	10.9
Nuclear electricity	1.1	1.5	2.6	3.3	6.1
Hydroelectricity[2]	2.1	2.1	1.8	1.9	2.3
Total	r 70.1	r 76.6	82.4	84.9	90.9
Town gas:					
Coal	11.7	11.9	11.9	10.9	9.9
Oil and petroleum gases	1.9	r 2.8	3.7	5.1	6.8
Coke oven gas and colliery methane	2.7	2.4	2.3	2.4	3.2
Total	16.3	r 17.1	17.9	18.4	19.9
Liquid fuels derived from coal and methane at collieries	1.7	1.9	2.0	1.7	1.7
Grand total	268.5	277.6	288.1	289.9	301.6
Summary primary sources:					
Coal	193.1	194.0	196.9	189.6	187.6
Natural gas	.1	.1	.2	.3	1.2
Petroleum	72.1	79.9	86.7	94.8	104.4
Nuclear electricity	1.1	1.5	2.5	3.3	6.1
Hydroelectricity	2.1	2.1	1.8	1.9	2.3
Total	268.5	277.6	288.1	289.9	301.6

r Revised.

[1] Conversion factors:
1 ton average salable coal=1 ton coal equivalent.
1 ton oil=1.7 tons coal.
300 therms colliery methane=1 long ton coal or 295 therms=1 metric ton coal.
40,000 cubic feet coke oven gas=1 long ton coal or 1,115 cubic meters=1 metric ton coal.
1 ton coke breeze=0.9 ton coal.
Coal equivalent of hard coke and gas coke is the coal used at coke ovens less coke, coke breeze, and coke oven gas supplied to consumers, to stocks or for export. Other solid fuels show coal used for production of briquets, etc.

[2] Adjusted for imports or exports.

Source: Ministry of Power Statistical Digest 1965.

In October 1965 the Government issued a White Paper on Fuel Policy outlining the main problems involved in protecting and maintaining a domestic energy supply in competition with imported fuels. The estimates of supply and demand were based on the National Plan which foresaw a total increase of 13.5 percent in energy requirements by 1970 to 329 million metric tons of SCE representing an average annual increase of about 2.1 percent annually. The White Paper also foresaw a decrease in coal production to a level of 170 to 180 million tons annually by 1970; the use of petroleum and/or natural gas for additional supplies of primary fuels to the manufactured gas industry with an estimated annual growth rate of 7.5 percent, doubling the capacity by 1970; an increase in atomic energy capacity to 8,000 megawatts by 1975 including a gas-cooled reactor of 1,200-megawatt capacity for the Dungeness "B" plant in 1970, and one new reactor each year during the following years to 1975; and an increase in petroleum refinery output to 98.5 million metric tons by 1970, compared with a demand of 94.5 million tons.

Specific measures designed to improve the position of coal included the provision of funds to deal with human problems arising from concentration of production and the closing of uneconomic coal mines, provision for the retraining of displaced miners, provision of housing, and encouragement of new industries in the affected areas. Probably the most important measure from a cost of production standpoint was the writing off of $1,200 million from a total capital debt of $2,688 million carried on the books of the National Coal Board, thereby reducing interest charges by $80 million annually.

Subsquent to the publication of the White Paper extensive natural gas reserves were discovered in the British sector of the North Sea, making necessary the development of a new fuel policy and a revision of certain guidelines in the national plan for energy. Such a revision is expected to be published during 1967.

Coal.—An important factor contributing to the difficulties of the coal mining industry was the shortage of labor, both as to numbers available for employment as well as voluntary absenteeism of those employed, which averaged about 17 percent for 1965. Substantial gains were made in productivity, obtained through closing of additional uneconomic mines, further concentration of operations, and continued mechanization of mining.

Probably the most important technological advance in coal mining in the United Kingdom was the development of the remotely operated longwall face (ROLF) of which 20 were in the planning stage by the end of the fiscal year 1965–66 (March 1966.) A prototype mine—the Bevercotes—was being prepared to start operations early in 1966. The equipment involves both remotely controlled and automatic mining and loading equipment which can operate on a longwall face. The Bevercotes is expected to produce 6,000 tons daily by 1968–69.

Table 9.—United Kingdom: Salient statistics of coal, coke, gas and petroleum

	1963	1964	1965
COAL			
Deep mined coal:			
National Coal Board (NCB) mines:			
Number in operation at yearend	r 580	545	507
Salable output—million tons	191.2	188.4	181.8
Net sales value—million U.S. dollar equivalent	1,855.4	1 1,759.5	NA
Employment at end of September:			
At mines:			
Wage earners on colliery books:			
Underground—thousand persons	409.8	389.9	361.0
Other—do	106.9	101.6	94.8
Other operative—do	2.0	2.0	NA
All other—do	62.9	62.7	NA
Total, NCB deep mines—do	581.6	556.2	NA
Output per man-shift:			
At face—metric tons	4.95	5.20	5.50
Underground total—do	2.14	2.23	2.34

See footnotes at end of table.

Table 9.—United Kingdom: Salient statistics of coal, coke, gas and petroleum—Continued

		1963	1964	1965
COAL (continued)				
Deep mined coal:—Continued				
National Coal Board (NCB) mines:—Continued				
Cost per ton at mines	U.S. dollars	[2] 12.24	[2] 12.38	[2] 12.95
Average proceeds per ton	do	[2] 12.83	[2] 12.85	[2] 12.81
Average cash earnings per man-shift worked:				
Underground	do	[2] 10.81	[2] 11.39	[2] 12.06
Surface	do	[2] 7.51	[2] 7.94	[2] 8.50
Average allowances in kind, per man-shift	do	[2] .65	[2] .69	[2] .71
Licensed mines:				
Number in operation		363	396	302
Salable output	million tons	1.5	1.4	1.3
Total number of operating deep mines		943	943	809
Average total wage earners employed	thousand persons	528	503	469
Salable output	million metric tons	192.4	189.8	183.1
Opencast coal:				
Number of producing sites, NCB and licensed		33	46	52
Total employment, labor	thousand persons	4.2	4.2	4.2
Salable output	million tons	6.2	6.9	7.5
Total coal production:				
Bituminous	do	194.7	192.0	186.3
Anthracite	do	4.2	4.7	4.3
Total	do	198.9	196.7	190.6
Consumption, shipments and stocks of coal:				
Domestic shipments to—				
Electrical supply industry	million tons	67.9	68.5	70.4
Gas supply industry	do	22.5	20.5	18.3
Coke ovens	do	23.9	25.9	26.1
Manufactured fuel plants	do	1.7	1.4	.9
Railways	do	5.0	3.9	2.9
Collieries	do	4.0	3.8	3.5
Iron and steel industry	do	2.4	2.1	1.8
Engineering and metal trades	do	2.7	2.5	2.5
Other industry	do	21.1	20.4	20.1
Domestic	do	32.5	28.4	27.7
Miscellaneous	do	10.6	10.3	10.6
Subtotal	do	194.3	187.7	184.8
Shipments to Northern Ireland and the Channel Islands	do	2.8	2.5	2.7
Total	do	197.1	190.2	187.5
Exports and foreign bunkers	do	7.6	6.1	3.8
Grand total	do	204.7	196.3	191.3
Stocks at end of year, total	do	36.7	38.3	38.7
COKE				
Production of coke:				
By coke ovens:				
National Coal Board	million tons	4.1	4.3	4.3
Iron and steel industry	do	10.6	11.7	11.9
Independent cokeries	do	1.1	1.2	1.2
Subtotal	do	15.8	17.2	17.4
From gasworks	do	9.9	8.9	7.9
Total	do	25.7	26.1	25.3
Domestic shipments to—				
Gasworks	do	1.7	1.3	1.2
Blast furnaces	do	10.7	12.0	12.1
Domestic	do	4.4	4.4	4.5
Other inland	do	8.8	7.4	7.0
Total	do	25.6	25.1	24.8
Exports	do	1.7	1.0	.6
Stocks at end of year	do	5.5	4.8	3.7
COKE BREEZE				
Production and arisings of coke breeze:				
Production from coke ovens and gasworks	million tons	3.7	3.6	3.4
Arisings from rescreening of coke, and other sources	do	.9	1.0	1.1
Total	do	4.6	4.6	4.5

See footnotes at end of table.

Table 9.—United Kingdom: Salient statistics of coal, coke, gas and petroleum—Continued

		1963	1964	1965
COKE BREEZE (continued)				
Consumption and shipments of coke breeze:				
Domestic shipments to—				
Iron and steelworks	do	2.0	2.3	2.2
Power stations	do	.7	.7	.4
Gasworks	do	.7	.6	.6
Other	do	.8	.8	.8
Total	do	4.2	4.4	4.0
Exports	do	.3	.4	.4
Stocks at yearend	do	1.6	1.3	1.5
GAS [3]				
Gas production:				
Gas supply industry	million therms [4]	2,425	2,324	2,367
Coke oven plants	do [4]	1,346	1,496	1,503
Blast furnaces	do [4]	1,339	r 1,474	1,478
Petroleum refineries:				
Liquefied petroleum gas	do [4]	r 281	r 418	508
Other	do [4]	r 1,137	r 1,351	1,411
Natural gas	do [4]	56	63	66
Total	do [4]	r 6,584	r 7,126	7,333
Imports	do [4]	7	65	341
Exports	do [4]	11	8	9
Losses and stock increases	do [4]	r 401	r 441	518
Consumption:				
Gas producers own use	do [4]	r 1,819	r 1,992	2,010
Domestic use	do [4]	1,566	1,642	1,898
Iron and steel industry	do [4]	r 1,243	r 1,387	1,407
Other industries	do [4]	r 1,027	r 1,205	1,282
Other uses (public administration lighting, etc)	do [4]	524	516	550
Total	do [4]	r 6,179	r 6,742	7,147
PETROLEUM [3]				
Deliveries of products for inland consumption:				
Petroleum gases	thousand tons	911	1,350	2,060
Feedstock:				
For chemical plants	do	2,749	3,177	3,382
For gasworks	do	915	1,369	2,098
Gasoline:				
Aviation	do	244	196	170
Wide cut	do	523	458	326
Motor	do	9,189	10,173	10,911
Kerosine:				
Industrial and white spirit	do	346	379	388
Jet turbine fuel	do	1,508	1,686	1,930
Other	do	1,887	1,642	1,732
Gas-diesel oil	do	8,899	9,792	10,872
Fuel oil	do	23,068	25,203	27,734
Lubricating oils	do	1,019	1,098	1,124
Bitumen	do	1,336	1,515	1,483
Paraffin wax	do	54	60	57
Total products	do	52,648	58,098	64,267
Of which fuels	thousand tons	(47,144)	(51,869)	(54,064)
Refinery fuel	do	3,938	4,083	4,234
Grand total	do	56,586	62,181	68,501

r Revised. NA Not available.
[1] For 52 weeks ending March 26, 1965.
[2] For fiscal year ending in March of following year.
[3] Liquefied petroleum gases reported under the heading Gas are also included among petroleum product deliveries under the heading Petroleum. Other gas production listed under the heading Gas is in part obtained from coal, coke and petroleum products listed under consumption and/or deliveries of these materials in appropriate sections of the table.
[4] One therm equals 100,000 British thermal units (Btu).

Natural Gas.—In September 1965 the British Petroleum Co.'s rig Sea Gem discovered natural gas in the British sector of the North Sea continental shelf. Subsequent discoveries were reported at nine other places indicating at least five commercial gasfields in the British sector. In addition the Home Oil Co. drilled a discovery well on the mainland at Lockton, near Scarborough, Yorkshire, which was eventually measured at 510 million cubic feet per day.

While estimates of production potential of the onshore and offshore deposits varied greatly at mid-year 1966, it was evident that the British gas industry was already considering a program for conversion of their system to supply natural gas within their long term planning.

Petroleum.—Although the Fuel Policy of October 1965 forsees an annual refinery output of 98.5 million metric tons, equivalent to a crude distillation capacity of about 104 million tons, by the end of 1970, projects in progress and/or scheduled for completion by the end of 1968 are expected to exceed that capacity. Refinery capacities of 1965 was as follows:

Company and refinery	Location	Crude oil distillation capacity at yearend (Thousand metric tons per year)	
		1964 [1]	1965
British Petroleum Co.:			
Kent	Isle of Grain	10,161	10,161
Llandarcy	South Wales	5,588	8,128
Grangemouth	Stirlingshire, Scotland	4,572	4,572
Pumpherston [2]	West Lothian, Scotland	183	---
Belfast	Belfast, Northern Ireland	1,321	1,321
Total		21,825	24,182
Esso Petroleum Co., Ltd.:			
Fawley	Hampshire	11,481	11,481
Milford Haven	South Wales	6,401	6,401
Total		17,882	17,882
The Shell Co. of the United Kingdom:			
Shellhaven	Essex	9,500	9,906
Stanlow	Cheshire	6,604	9,906
Heysham	Lancashire	1,981	1,981
Androssan	Ayrshire, Scotland	183	183
Total		18,268	21,976
Regent Refining Co., Ltd.: Pembroke	South Wales	4,674	4,725
Mobil Oil Co., Ltd.: Coryton	Essex	2,401	2,769
Imperial Chemical Industries, Ltd.: North Tees	Durham	1,016	1,016
Berry Wiggins and Co., Ltd.:			
Kingsnorth	Kent	290	290
Weaste	Manchester, Lancashire	170	170
Total		460	460
Lobitos Oilfields Ltd.: Ellesmere Port	Cheshire	274	300
Manchester Oil Refinery, Ltd.: Barton	Manchester, Lancashire	163	163
Wm. Briggs and Sons Ltd.: Dundee	Angus, Scotland	61	61
Grand total		67,024	73,534

[1] Revised.
[2] Plant closed down at end of 1964.

Additional facilities in progress or definitely scheduled include expansion of facilities at the Fawley refinery (a 5-million-ton) increase underway) and at the Coryton refinery (a 700,000-ton increase underway), and the following new refineries: Gulf Oil Co. at Milford Haven (3 million tons); Continental Oil Co. at Immingham (3 million tons); Phillips-Imperial Petroleum, Ltd. at Billingham (11 million tons); Lindsay Oil Refinery, Ltd. at Killingholme, owned by Total Oil Products (GB), Ltd., and Petrofina (GB), Ltd. (7 million tons); and Isle of Man Petroleums Lt. (500,000 tons).

The Mineral Industry of Yugoslavia

By Roman V. Sondermayer [1]

Yugoslavia maintained its position as one of the leading producers of nonferrous metals in Europe during 1965. The more prominent minerals, with production expressed in approximate percentages of the 1965 world totals, were as follows: Mercury, 6.8 percent; antimony, barite, bauxite, lead, and magnesite, 4 to 5 percent; and chromite, copper, feldspar, pyrite, silver, and zinc, 1 to 2 percent. Economic difficulties of the country as well as shortages of electric power and fuel, low productivity, deficiencies in management, and shortage of foreign exchange slowed down mineral industry growth.

The 1965 mineral and metal output value for the country was about $640 million,[2] roughly 7 percent above that of 1964. The mineral industry contributed about 10 percent of the gross national product in 1965 and employed about one-fourth of the total labor force, or 280,000 people.

In July 1965, the country enacted an economic reform. Essentials of the reform could be summarized as a movement toward a market-oriented economy with more freedom given to enterprises and gradual withdrawal of the political factor in economic decision making but without changing fundamental principles of the Communist economy.

This reform gave more control over production and distribution to the various enterprises and began gradual withdrawal of State and party interference in economic decision making. Changes also were made in the distribution of net profit between the State and the enterprises, permitting the enterprises to retain 71 percent of net profits as compared with 51 percent before the reform. However, substantial reduction in State subsidies to producers was included in the measure, which should make the enterprises both cost and market conscious and which should lead to gradual elimination of less efficient operations. In addition, price controls were eliminated on some materials and were retained only for basic necessities.

The dinar (Din) was devaluated from $1.00 equals Din. 750 to $1.00 equals Din. 1,250. Beginning January 1, 1966, a new dinar will be introduced. One hundred old dinars will have the value of 1 new dinar. To lessen the costs of the monetary change, conversion to new currency will be made over a 4-year period. An appraisal of the ultimate influences of the reform on the country's mineral industry was not possible because of the short period of time that this reform has been in effect, but the short-term effects of the reform on the country's economy were adverse. Prices began to soar, unemployment continued to increase and as a solution to the unemployment problem, labor migration to the west was officially blessed by the Communist party and the Government. The salaries of all workers and employees rose but the standard of living declined because improvements in salaries did not cover price increases.

The most important mineral developments during 1965 were in the nonferrous and petroleum industries. Highlights included decisions to build a new lead-zinc smelter in Titov Veles in Macedonia, discovery of a significant uranium deposit near Zletovo in Macedonia, and completion of a new oil refinery in Urje near Rijeka.

The principal activities in the ferrous branch were limited on construction of the Skopje integrated works and modernization of iron and steel plants at Zenica, Smederevo, and Sisak.

---

[1] Foreign mineral specialist, Division of International Activities.

[2] Where necessary and possible, values have been converted from dinars (Din) to U.S. dollars at the rate of Din 1,200=$1.00.

PRODUCTION

Economic difficulties of the country stressed once more the need for improved utilization of existing facilities rather than development of new ones. Switching to opencast mining whenever possible was common. Mass methods in production of ore in both underground and opencast mining were used on a larger scale than in 1964.

Petroleum production and refining, although modest by world standards, was performed by modern and efficient methods. All three methods for production of crude oil (flowing, pumping, and gaslifting) were widely used. Equipment and plants in the petroleum industry were modern and operations were automated. In other branches of mineral industry, the stage of automation was not considered satisfactory.

Table 1.—Yugoslavia: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 e
Metals:					
Aluminum:					
Bauxite thousand tons	1,232	1,331	1,285	1,293	1,574
Alumina	71,159	77,064	82,055	87,912	95,424
Ingots	27,407	27,980	35,895	34,763	40,318
Semimanufactures [1]	r 33,759	r 39,796	r 43,020	r 46,716	52,999
Antimony:					
Ore	108,013	116,654	123,327	124,965	127,044
Concentrate	7,735	7,064	7,671	7,511	7,602
Regulus	2,463	2,691	2,661	2,729	2,768
Arsenic concentrate	796	913	920	2,025	1,541
Bismuth, metal	98	91	88	84	88
Copper:					
Ore thousand to s	3,236	5,070	5,629	5,928	6,003
Metal content of ore	37,909	51,717	62,093	63,184	62,551
Concentrate	148,622	221,471	261,208	287,305	270,785
Smelter	30,869	45,741	r 50,779	51,716	57,000
Electrolytic	30,108	45,520	49,032	51,941	56,354
Semimanufactures [2]	r 35,009	r 38,206	44,915	r 52,145	48,962
Chromium:					
Chromite	108,126	97,045	93,770	88,358	79,851
Chromite concentrate	43,481	44,088	56,176	52,591	46,990
Gold troy ounces	67,195	70,506	74,041	93,688	103,922
Iron and steel:					
Iron ore thousand tons	2,184	2,190	2,297	2,307	2,504
Pig iron do	997	1,050	996	1,026	1,115
Ferroalloys	55,651	53,469	63,784	50,433	59,849
Steel ingots thousand tons	1,532	1,595	1,588	1,677	1,769
Rolled products [3] do	1,009	1,057	1,146	1,204	1,188
Lead:					
Lead-zinc ore thousand tons	2,063	2,239	2,287	2,364	2,358
Metal content of ore	96,681	101,995	r 113,884	r 106,251	r 113,105
Concentrate	123,502	132,804	135,804	134,398	126,444
Smelter	101,698	113,018	117,481	117,224	116,166
Refined	90,401	97,926	104,174	101,085	101,504
Rolled products	12,817	16,295	18,256	19,445	16,258
Manganese ore	14,148	14,839	8,132	7,784	8,097
Mercury:					
Ore	180,210	192,083	198,089	242,699	264,086
Metal 76-pound flasks	15,954	16,273	r 14,406	17,313	16,416
Selenium kilograms	849	1,808	1,869	3,828	7,911
Silver thousand troy ounces	3,454	3,750	3,792	4,036	4,149
Tungsten, concentrate	7	48	16	121	----------
Zinc:					
Metal content of ore	59,882	61,114	r 88,285	r 91,801	91,819
Concentrate	113,899	118,889	126,960	132,711	132,977
Smelter	20,401	20,232	22,009	25,290	24,729
Electrolytic	16,467	19,072	20,222	19,222	21,336
Rolled products	5,957	6,948	10,063	12,233	14,015

See footnotes at end of table.

Table 1.—Yugoslavia: Production of selected metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 e
Nonmetals:					
Asbestos:					
Ore	270,291	253,774	253,407	264,780	230,724
Fiber	6,086	6,714	8,232	8,419	9,603
Barite, crude	104,210	103,763	104,486	101,670	97,110
Cement:					
Portland thousand tons	2,307	2,445	r 2,825	3,018	3,078
Other do	29	74	r 22	21	25
Gypsum:					
Raw	97,005	118,046	138,046	r 154,739	167,204
Calcined	32,113	30,553	39,330	44,314	40,260
Lime:					
Burned thousand tons	725	768	860	906	946
Hydrated	25,051	48,110	90,044	129,229	165,988
Feldspar, raw	20,539	r 32,085	r 29,885	r 33,794	55,935
Mica kilograms	r 1,686	r 2,433	r 35,300	11,660	53,890
Mineral fertilizers:					
Phosphatic	413,000	520,000	731,000	967,588	801,000
Others	250,000	400,000	347,000	421,300	461,000
Pyrites (concentrates, bulk)	364,313	414,202	356,000	428,000	406,773
Refractories:					
Fire clay:					
Raw	152,264	144,707	210,346	232,354	245,080
Burned	34,282	33,937	39,393	43,520	46,590
Magnesite:					
Raw	273,065	373,362	411,959	497,420	525,941
Calcined	25,591	24,019	26,466	32,068	28,163
Sintered	97,885	131,626	155,016	177,933	195,880
Other [4]	171,538	193,509	215,645	254,129	281,161
Salt:					
Sea	45,193	86,522	r 32,618	52,748	40,338
Brine	115,754	128,331	r 133,934	131,230	133,241
Other nonmetals	301,668	355,032	512,725	677,592	736,115
Mineral fuels:					
Coal:					
Bituminous thousand tons	1,313	1,188	1,286	r 1,262	1,169
Brown do	9,494	9,319	9,945	10,715	10,509
Lignite do	13,266	14,186	16,191	17,534	18,279
Briquets	4,732	3,244	r 15,899	3,963	22,667
Coke:					
Metallurgical thousand tons	1,028	1,030	1,108	r 1,089	1,153
Breeze do	71	77	81	70	100
Gaswork do	17	18	16	17	14
Manufactured gas million cubic feet	r 1,339	r 1,600	r 1,964	2,144	2,263
Natural gas do	2,566	3,557	r 7,131	10,224	10,500
Petroleum:					
Crude thousand tons	1,341	1,526	1,611	1,799	2,063
Refinery products:					
Gasoline do	293	321	344	385	546
Kerosine do	58	80	89	98	82
Diesel fuel do	404	532	618	701	890
Lubricants do	72	99	112	126	134
Heating oil do	409	492	480	683	1,148
Carbon black	4,398	3,735	r 4,281	4,907	5,099
Bitumen	80,030	113,834	119,816	150,850	112,000

r Revised. e Estimate.
[1] Including aluminum alloys.
[2] Including copper alloys.
[3] Including pipes.
[4] Includes shamotte, magnesite, chrome-magnesite, other refractory materials, and silica bricks.
Source: Statisticki Bilten 412—Industrija 1965 (Statistical Bulletin 412—Industry 1965) Belgrade, 1966, 75 pp.

TRADE

Minerals continued to occupy an important position in overall trade, in both exports and imports. During 1964 mineral exports valued at about $43.6 million accounted for 16.4 percent of total export value and mineral imports valued at $77.1 million constituted 17.4 percent of total import values.

Nonferrous metals contributed most significantly to Yugoslavia's mineral export, accounting for $24.8 million or roughly 50 percent of the value of all mineral exports in 1964, a 5-percent decrease from 1963 figures.

The imports of the iron and steel industry products totaled $38.7 million, about 50 percent of the total value of mineral imports.

Table 2.—Yugoslavia: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum:			
Bauxite	997,261	1,079,691	West Germany 677,366; Italy 263,063; East Germany 63,155.
Alumina	13,268	13,919	U.S.S.R. 8,185; Austria 4,133.
Metal:			
Unwrought	14	30	West Germany 20; Sweden 10.
Semimanufactures	14,187	18,490	U.S.S.R. 5,348; India 4,062; United States 2,565; Czechoslovakia 1,154.
Antimony:			
Ore	----------	284	All to Czechoslovakia.
Regulus	2,360	1,951	United States 1,583.
Bismuth, unwrought	----------	39	West Germany 18; United States 12; Netherlands 8.
Chrome concentrates	23,513	23,885	Sweden 17,805; Czechoslovakia 5,980.
Copper and alloys:			
Scrap and filings	11	341	Italy 325.
Unwrought	863	91	Italy 59; Germany 32.
Semimanufactures	17,804	22,193	U.S.S.R. 7,761; West Germany 3,908; Italy 3,350; United States 2,214.
Iron and steel:			
Iron ore	153,978	201,148	All to Hungary.
Scrap	692	7,779	West Germany 4,506; Italy 3,224.
Ferroalloys	36,808	20,973	Austria 6,892; West Germany 3,829; Sweden 3,355.
Steel ingots and billets	27,836	46	All to Italy.
Rolled products	119,351	127,996	Brazil 51,638; U.S.S.R. 27,652; Italy 13,117.
Other semimanufactured products.	69,250	63,432	East Germany 24,966; Italy 6,980; West Germany 4,211; Austria 3,546.
Lead:			
Refined, unalloyed	52,596	53,419	United States 28,309; U.S.S.R. 6,780; Poland 4,022; Italy 3,526; Czechoslovakia 2,710; Austria 2,680; Hungary 2,038.
Alloys	841	867	Austria 754.
Cable lead	3,812	3,640	Austria 2,940.
Semimanufactures	7,774	5,049	Italy 3,665; West Germany 554; Indonesia 258.
Mercury, metal 76-pound flasks	10,556	10,846	United States 5,162; U.S.S.R. 2,581; Poland 1,160.
Zinc:			
Concentrate	25,057	32,181	Poland 13,250; France 11,992; Japan 4,718.
Metal:			
Electrolytic	5,741	3,113	Czechoslovakia 800; West Germany 750; Italy 630; United States 330.
Powder	----------	1,572	Czechoslovakia 976; Austria 270.
Semimanufactures	8,812	9,150	West Germany 3,747; Denmark 1,322; France 1,280; United States 1,057.
Nonmetals:			
Asbestos, fiber and flour	5,362	4,352	United States 4,255.
Barite, raw and ground	76,146	72,875	U.S.S.R. 37,746; United States 13,082; Hungary 12,615.
Bentonite	13,052	17,636	Poland 7,520; Italy 4,005 ;East Germany 2,863.
Cement:			
Portland	183,306	151,079	Ghana 38,600; Libya 28,480; Malta 24,498.
Other	81,774	81,292	Italy 35,277; Sudan 31,870; United States 4,009.
Feldspar	16,598	21,236	West Germany 9,367; East Germany 6,915; Austria 2,346.
Fire clay:			
Raw	4,913	5,035	Hungary 4,999.
Calcined	2,475	376	Italy 314.
Lime:			
Calcined	2,676	4,348	Italy 2,296; Libya 2,001.
Hydrated	147	20	All to West Germany.
Magnesite:			
Raw	3,839	6,152	East Germany 5,986.
Calcined	21,858	25,172	Netherlands 11,492; Poland 5,897; West Germany 4,033.
Sintered	63,779	96,363	United States 34,892; Poland 27,123; Italy 7,877; Hungary 5,660; United Kingdom 4,922; Ireland 4,719; West Germany 4,331; Sweden 3,249.
Pyrite concentrates	281,085	309,451	Czechoslovakia 120,850; West Germany 65,683; Hungary 57,705; Switzerland 38,230.

Table 2.—Yugoslavia: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Mineral fuels:			
Coal:			
Anthracite	----------	80	All to Austria.
Bituminous except dust	9,714	8,711	Italy 3,515; Greece 3,220; Austria 1,976.
Bituminous dust	74,845	103,014	Italy 100,630.
Brown, including dust	40,008	19,953	Austria 18,873.
Lignite	25,502	----------	
Petroleum:			
Crude	455,090	315,831	Austria 254,412; Hungary 37,033; Israel 23,382.
Refinery products:			
Gasoline	10,591	41,686	Austria 14,063; Netherlands 13,638; Czechoslovakia 9,600.
Diesel fuel	3,967	1,762	West Germany 737; Hungary 464; United Kingdom 214.
Jet fuel	1,560	----------	
Heating oil	66,323	74,842	Austria 48,310; West Germany 18,933.
Lubricants	46,752	45,974	India 45,969.
Other products	250	348	Austria 348.

Table 3.—Yugoslavia: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Bauxite	3,077	5,529	British Guiana 5,529.
Alumina	----------	1,500	All from France.
Unwrought [1]	6,734	15,862	United States 10,005; U.S.S.R. 5,277.
Semimanufactures	1,052	1,117	Italy 301; West Germany 276; Austria 168 United Kingdom 108.
Chrome ore	58,969	59,977	Turkey 31,418; Albania 28,428.
Cobalt unwrought	43	50	Belgium-Luxembourg 50.
Copper:			
Scrap	4,504	3,140	United States 2,237; Indonesia 437; Netherland 422.
Blister	----------	2,528	All from United Kingdom.
Electrolytic	6,005	6,969	Belgium-Luxembourg 2,249; West Germany 2,150; United Kingdom 1,292.
Semimanufactures [1]	603	2,669	Italy 896; West Germany 754; East Germany 571.
Iron and steel:			
Iron ore	431,567	381,269	India 361,685; Morocco 9,863; Brazil 9,601.
Scrap	48,797	120,474	United States 47,894; Algeria 30,619; Morocco 15,262; West Germany 8,972.
Pig iron [2]	80,315	191,135	U.S.S.R. 135,152; East Germany 19,730 Hungary 14,862.
Ferroalloys	1,484	1,471	U.S.S.R. 561; France 283; Italy 272.
Ingots and equivalent forms	r 22,858	16,236	Poland 7,431; Rumania 2,869; Hungary 2,389; U.S.S.R. 1,500; West Germany 1,190; Austria 824.
Rolled products—thousand tons	379	538	U.S.S.R. 113; Czechoslovakia 93; Italy 74; Poland 69; United Kingdom 45.
Other semimanufactures thousand tons	69	88	Italy 18; West Germany 17; Czechoslovakia 11 U.S.S.R. 1; Hungary 9; Poland 7.
Lead:			
Scrap	759	2,229	United States 1,812.
Refined [1]	3,048	1,570	West Germany 576; Italy 354; Netherlands 337 United Kingdom 302.
Magnesium, all forms	273	495	United States 225; Switzerland 148; Italy 113
Manganese:			
Ore	36,034	40,680	India 19,295; Morocco 11,000; Turkey 10,295.
Unwrought metal	18	99	United Kingdom 35; U.S.S.R. 28; Belgium Luxembourg 21; Italy 15.
Mercury ----------76-pound flasks	2,988	3,104	Netherlands 1,624; United Kingdom 957.
Nickel:			
Unwrought [1]	575	584	United Kingdom 463; Canada 112.
Semimanufactures	83	98	West Germany 69; Austria 7; Belgium-Luxembourg 6.

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals—Continued			
Tin:			
Unwrought [1] long tons	r 2,150	1,324	Malaya 1,153; Indonesia 170.
Semimanufactures do	25	18	West Germany 11.
Zinc:			
Smelter	1,404	1,318	Netherlands 779; United States 336.
Electrolytic	717	1,629	Netherlands 1,332; United Kingdom 227.
Semimanufactures	76	180	United Kingdom 71; West Germany 71.
Other ores and concentrates (largely titanium concentrates).	1,751	1,426	Australia 1,226.
Nonmetals:			
Asbestos	8,103	15,573	U.S.S.R. 9,390; United States 2,640; Rhodesia 1,881.
Cement:			
Portland	19,459	481,002	Hungary 168,602; Rumania 130,858; Bulgaria 111,766; Czechoslovakia 60,356.
Other	2,477	55	West Germany 50.
Chalk	135	155	East Germany 90; United Kingdom 49; France 10.
Cryolite, natural	30	363	U.S.S.R. 345; East Germany 18.
Fertilizer materials:			
Crude:			
Nitrogenous	----------	28,375	All from Chile.
Phosphatic	540,593	644,934	Jordan 183,817; Tunisia 152,232; Egypt 124,475; Morocco 120,224; Togo 22,288.
Potassic	403	----------	
Manufactured:			
Nitrogenous	536,703	518,187	Italy 223,254; Netherlands 107,710; France 61,350; Austria 50,650.
Phosphatic:			
Thomas slag	77,503	117,906	West Germany 97,846; Egypt 18,200; United States 1,860.
Other	218,693	16,601	U.S.S.R. 8,589; Hungary 4,350; Poland 3,662.
Potassic	313,158	395,784	Italy 209,270; East Germany 126,609.
Mixed	19,016	85,700	Netherlands 52,500; Italy 33,200.
Ammonia, anhydrous	----------	142	Italy 141.
Fire clay:			
Raw	6,895	9,571	Czechoslovakia 6,703; Poland 2,737.
Burned	27,372	30,244	Czechoslovakia 16,608; Poland 13,176; Austria 414.
Fluorspar	3,074	4,035	East Germany 2,214; Bulgaria 965; Italy 800.
Graphite:			
Raw	1,120	1,060	Austria 687; West Germany 212.
Retort	41	19	All from East Germany.
Kaolin	20,814	25,869	Czechoslovakia 15,427; East Germany 3,399; Greece 3,230; United Kingdom 1,893; Bulgaria 1,309.
Magnesite, calcined	30	25	All from Austria.
Mica:			
Crude	23	----------	
Worked	34	46	India 25; Switzerland 11.
Refractory bricks:			
Shamotte	4,602	3,186	Poland 2,196; West Germany 755; Italy 110.
Dinas	2,559	563	Poland 471; U.S.S.R. 91.
Silica	208	407	West Germany 268; Poland 120; Italy 10.
Magnesite	2,047	----------	
Chrome-magnesite	41	438	Poland 435.
Salt	89,601	105,927	Rumania 62,097; Egypt 43,175.
Sulfur	12,672	7,859	France 3,676; Italy 2,500; Greece 1,000; U.S.S.R. 425.
Talc, natural	680	6,707	Bulgaria 3,895; Czechoslovakia 1,058; Austria 530; India 498; Hungary 492.
Mineral fuels:			
Carbon black and gas carbon	5,222	6,309	Italy 2,555; East Germany 1,685.
Coal:			
Anthracite	120,461	138,968	U.S.S.R. 138,968.
Bituminous:			
Coking	1,318,326	1,858,679	U.S.S.R. 957,607; Poland 455,315; United States 445,536.
Gas	22,000	30,115	Czechoslovakia 16,259; Poland 13,855.
Forge	20	40	NA.
Coke:			
Metallurgical	229,068	191,609	Czechoslovakia 79,539; Poland 42,636; West Germany 28,851; United Kingdom 17,057; Italy 12,239; U.S.S.R. 10,774.
Dust	810	----------	
Petroleum coke	15,500	18,850	United States 17,861; West Germany 989.

See footnotes at end of table.

Table 3.—Yugoslavia: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Mineral fuels—Continued			
Petroleum:			
Crude	778,060	760,250	Iraq 345,857; U.S.S.R. 250,767; Egypt 85,085; Venezuela 55,175; Algeria 22,769.
Refinery products:			
Gasoline	10,635	23,576	U.S.S.R. 21,045.
Diesel oil	97,142	156,311	Rumania 79,704; U.S.S.R. 70,855; Czechoslovakia 5,751.
Heating oil	42,441	106,150	U.S.S.R. 67,906; Rumania 35,320; Bulgaria 2,922.
Lubricants	11,142	26,043	Rumania 9,190; Poland 4,179; U.S.S.R. 3,521; United Kingdom 2,631; Italy 1,550; United States 1,315.
Other products	16,625	30,807	Venezuela 14,079; Netherlands 7,091; Rumania 5,638; Italy 2,263; United States 1,226.

r Revised.
NA Not available.
1 Includes alloys.
2 Includes sponge iron, shot powder, grit and similar forms.

COMMODITY REVIEW

METALS

Aluminum.—Exploration for bauxite was intensive and concentrated in Hercegovina although new discoveries were announced in Kosovo and Metohija. Extensive exploratory work was performed in the general area of Posušje and Jablanica in Hercegovina. According to reports, new reserves totaled 800,000 tons of bauxite. Exploration was financed by the bauxite mining enterprise in Mostar, Hercegovina, and by the enterprise which had been established to construct an alumina and aluminum plant in Mostar.

The exploration of a bauxite deposit in Grabovica, Kosovo-Metohija, discovered in 1959, was completed. Confirmed reserves totaled 1.5 million tons. Preparations were underway for production. The U.S.S.R. was reported to be the prospective buyer of this bauxite.

The Yugoslav Investment Bank granted the necessary credit for the construction of the alumina and aluminum plant at Mostar, and a new enterprise was organized with the primary task of constructing the plant. The Yugoslavs reported planned capacity of the plant's first phase to be 200,000 tons of alumina and 20,000 tons of aluminum. However, at yearend, there was evidence that this project might be canceled early in 1966 in favor of a generally similar plant in Montenegro.

Antimony.—Discoveries of antimony mineralization were reported near the Yugoslav antimony center at Zajača in west Serbia. Reserves of the new deposits were not disclosed. Management of the antimony mine and smelter at Zajača was studying the possibility of a complete change of the technological process at the antimony smelter.

Copper.—Management of the Bor smelter accepted a program for the expansion of its facilities. Plans called for a total production of 95,000 tons of electrolytic copper in 1972. Production of ore at Majdanpek will be increased from the present 3.6 million tons per year to 11 million tons per year. A new factory for production of 240,000 tons of sulfuric acid was also included in the development plan.

Meanwhile in the Bor smelter, a new chimney with special filters was put into operation. Expected recovery of copper dust will be around 500 tons annually. The first time in its history the Bor enterprise started to leach copper from waters that were coming from mine and tailing dumps, and construction of a modern, full scale plant began after trial production showed good results.

Germanium.—The Copper Institute at Bor performed successful experiments in obtaining germanium from Bor copper concentrates. It is estimated that at the present rate of copper concentrate output, annual production of 4 tons of germanium would be possible. No report was made regarding the beginning of industrial production of germanium.

Iron and Steel.—The principal event in the iron and steel industry was the continu-

ing construction of the iron and steel plant at Skopje, Macedonia. The first steel was expected to be produced in July 1966. Production of the first phase of the plant will be 300,000 tons of steel annually. In 1963, plans were set to expand output to 600,000 tons of steel in a second stage, and by 1970 the facility is scheduled to be producing 940,000 tons of steel per year. Iron ore will be supplied from mines in Macedonia. Gas and coking coal are supposed to be delivered by the Kosovo combine near Obilić in Kosovo and Metohija.

Efforts to alleviate shortages of ferrous products on the domestic market dominated activities of the entire steel industry in 1965.

Lead and Zinc.—A new smelter will be built in Titov Veles, Macedonia. The Economic Bank of Macedonia granted the necessary funds totaling 28.8 billion dinars. The construction is expected to last 3 years. Annual capacity of the smelter will be 32,000 tons of zinc, 30,500 tons of refined lead, 17.5 tons of bismuth, and about 645,000 troy ounces of silver. In connection with the construction of the smelter at Titov Veles, Zletovo and Sasi mines were being modernized. Capacities of beneficiation plants will be increased to 80,000 tons of lead concentrates and 45,000 tons of zinc concentrates per year.

The largest lead and zinc producer in the country, the Trepča Mining and Metallurgical combine at Zvečan, Serbia, was planning modernization and expansion of its mines and other facilities. According to reports Trepča should double production of lead, zinc, and their byproducts in 1968. Smelter gases will be used for production of 65,000 tons of sulfuric acid.

The lead and zinc mine at Mojkovac, Montenegro, was developed in 1965. Reserves of 7.5 million tons of ore were reported. Ultimate production goals call for an annual output of 29,000 tons of zinc concentrate, 16,000 tons of lead and copper concentrate, and 118,000 tons of pyrite.

Selenium.—A facility for production of pure selenium will be added to the Bor copper electrolysis plant. Equipment was purchased abroad and was already in Yugoslavia at yearend. No information on the capacity of the plant was disclosed.

Uranium.—After 3 years of prospecting, Yugoslav geologists confirmed the presence of uranium mineralization in the Kratovo-Zletovska River area in Macedonia. The reserves of ore were not disclosed but reports indicated that deposits are the largest in the country. At yearend, exploration continued in the regions of Nežilovo and Pogled.

NONMETALS

Feldspar.—The enterprise for production of feldspar located in Toplica, Serbia, expanded its activities in 1965. A new feldspar beneficiation plant was put into operation at yearend. Capacity of the plant will be 20,000 tons per year of feldspar with 10,000 crystals per cubic millimeter. Approximately 290 million dinars has been invested in the new separator. All production for 1966 was sold to the exporting firms.

Fertilizers.—After several years of delay, construction of the nitrogenous fertilizer plant at Kutina in Croatia began in the summer of 1965. Annual production of the new plant will be 800,000 tons of fertilizers. Large reserves of natural gas and limestone in the area will provide adequate supply of raw material for the plant. Some of the plant equipment will be produced in the country and some will be imported from France, Belgium, and Italy. Out of the total of 950 employees, only 16 percent will be employed in production; 40 percent will be engaged in maintenance and the rest will work on research and in administration.

Sand.—The Zajača smelting enterprise opened its foundry sand quarries after purchasing machinery for sand production and building a new sand washery near the village of Gornja Koviljača in Serbia. Reserves of sand were estimated to be of an order of magnitude of 10 million tons. It is expected that production of quartz sand for production of glass will start in the near future.

MINERAL FUELS

During 1965, coal remained the principal source of energy in Yugoslavia; petroleum and natural gas were emerging as significant competitors, but their use was limited by lack of means for distribution and adequate industrial and home appliances. Because of large reserves of low-grade coals, upgrading and conversion of this material to higher forms of energy such as gas and power remained the primary task of the coal industry. Several facilities for drying, gasification, and production of thermal power were under construction or completed. A basic plan for a gas and oil pipeline system was approved and the expansion of oil refining capacity continued.

Coal.—On June 8, 1965, an explosion of methane gas occurred in the Orasi shaft in the brown coal mine at Kakanj, Bosnia. After rescue operations were completed 128 bodies were recovered. The majority of deaths reportedly resulted from gas developed after explosion. The disaster triggered a series of investigations including one by the Federal Parliament. The official report prepared by the Mining Inspectorate did not positively determine the immediate cause of the accident nor did it fix responsibility, but apparently the catastrophy resulted from several factors which in summary reflected inadequate mine safety practice by all concerned, including miners, technical staff, and all authorities of political and administrative levels. As a result, the Secretary of Industry of Bosna i Hercegovina resigned, the party committee of the Kakanj mine was fired, and 10 members of the mine technical staff were arrested and brought to trial. Of the accused, seven were cleared and three were convicted.

Completion of the gasification plant at Valenje scheduled for the end of 1965 was postponed and may have been canceled; no reasons were reported. The plant, when and if completed, will handle 96 million cubic feet of gas per day. The British company Humphreys and Glasgow Ltd., supplied gas purifiers and extended a long term credit totaling $15.4 million. Enterprises from Czechoslovakia supplied compressors for the project.

In the Kosovo Metohija lignite basin in Obilić, a new open pit mine was commissioned with an annual capacity of 2.2 million tons of lignite. The mine was equipped with power shovels and overburden stripping machines imported from East Germany. The new thermal powerplant at Obilić with the annual capacity of 65 megawatts started production late in the spring of 1965. At the same time, construction was under way on a gas plant at Obilić and on a gas pipeline from Obilić to Skopje. All these new facilities are part of the large Kosovo chemical combine production of which is based on 6.5 billion tons of lignite reserves.

The lignite mine in Kreka, Bosnia, started production from its first open pit. The beginning of operation was a turning point in mining in this area. In pursuit of more profitable operation, the mine management was shifting production from underground to open pit operations.

The Soko brown-coal mine near Sokobanja opened new shafts; coal reserves here were set at 70 million tons. The new mine was completely mechanized. A coal beneficiation plant of adequate size for annual coal production of 180,000 tons was constructed. Beneficiated coal was moved to the railroad terminal at Rgosta by an aerial tramway 19.5 kilometers long. In addition to facilities for coal production, the mine administration was building living quarters and other facilities for miners and staff at Sokobanja.

The Kolubara open pit mine, part of the large Kolubara mining enterprise, was closed in the summer of 1965. The mine produced 200,000 tons of lignite annually and employed 300 workers. Production was becoming less profitable as reserves were exhausted.

The overall situation in the coal industry did not change during 1965; despite larger output of coal, traditional difficulties in supply continued. Prices of coal were increased twice during the year and the financial situation of mines improved. Although the salaries of miners were higher than ever, the turnover of workers in coal mines remained high and the shortage of miners persisted.

Petroleum and Natural Gas.—The principal events in the petroleum industry were the continued exploration of the Pannonian basin and the Dinaric Alps; the development of known oilfields and gasfields; expansion of refining capacities; and approval of a basic plan for a countrywide pipeline system.

Main activities in oil and gas exploration were scattered all through the Pannonian basin. No new discoveries were reported during 1965. The exploration of the Dinaric Alps, along the Adriatic coast and inland was restricted by shortage of capital. At yearend, geological institutes and enterprises concerned were evaluating exploration results from the standpoint of regional geology related to possible accumulations of oil and gas.

Development of known fields near Ivanić Grad, Žutica, Ježevo, Pepelana, and Jagnedovac in Croatia and the Serbian fields near Kikinda in Banat and Mokrin in Bačka were given priority status. In the Kikinda oilfield, a faulty wellhead valve assembly permitted unrestricted flow of oil and gas for several days before it was controlled.

Gojlo, the oldest oilfield in Croatia and one of the oldest in the country, was closed during the beginning of 1965. Because of low yield, production had become unprofitable.

The new refinery at Rijeka, the 1.3-million-ton-per year Urinj plant on the bay of Bakar, started production during the fall of 1965. The plant is fully automated and requires only 230 workers to operate it. Equipment was obtained from the Italian company, Sociata Nacionale Metandoti, a subsidiary of Ente Nazionale Idrocarburi (ENI). The same concern extended a credit which the Yugoslavs will repay with the refinery's products over the next 5 years. Total investments in the plant were approximately 17 billion dinars. The expansion of the refinery at Bosanski Brod continued. According to reports, the capacity of the refinery will be 2.5 million tons per year when modernization is completed. While the modernization was underway at the main plant, a new facility for regeneration of motor oils was under construction at Modrica near the refinery. The new development will have a capacity of 10,000 tons of motor oil annually. Construction of the refinery at Pancevo entered its second year. This refinery, which was being built according to United States' designs, will be supplied with equipment produced by British firms. During 1965 most of the refinery buildings as well as roads were completed.

A general plan was approved for a network of pipelines that would cover the country. According to reports, construction of the trunk line from Rijeka refinery on the Adriatic coast to the refinery at Sisak in the Sava river valley in Croatia was ready to start in 1966. Apparently, the new Yugoslav pipeline system can be extended toward the northern oilfields, and from there it can be connected with the existing Hungarian pipelines and the Soviet Druzhba pipeline. Sometime in the future, when the Yugoslav pipelines are connected with the Hungarian pipelines, Soviet oil can be brought to the Adriatic.

Not far from the existing carbon black plant at Kutina, a new facility was under construction during 1965. The annual capacity of the new plant will be 6,000 tons, or more than the country's 1965 production. The engineering design for the new plant is of United States' origin, but most of the equipment will be produced in France. The plant is being built for Metan Kutina, which is part of the INA (Industrija Nafte i plina) combinat at Zagreb.

Regional Mineral Industry Review of Africa

By Thomas C. Denton [1] and Henry E. Stipp [2]

In 1965 Africa maintained its position as a region of the world essential to advanced non-Communist nations for supply of vital metals and minerals. The position stemmed from the fact that Africa produced in large quantity a number of key minerals of which either or both resources and production capacity elsewhere did not approach the needs of the free world. The Republic of South Africa alone contributed more than three quarters of the gold mined in the entire non-Communist world besides an estimated 60 percent of metals of the platinum group and the entire new supply of amosite asbestos, and Africa as a whole was nearly the non-Communist world's only source of gem and industrial diamond. Africa also accounted for 83 percent of non-Communist world cobalt production.

Besides these massive contributions, Africa in 1965 provided 50 percent or more of the new supply from non-Communist countries of the following mineral commodities: Lithium minerals, corundum, manganese ore, and chromite, and over 20 percent of new supply from non-Communist countries of columbium-tantalum concentrates, antimony, beryl, vanadium, phosphate rock, and copper. Africa also accounted for 18 percent of the non-Communist world's output of uranium, 14 percent of its tin, 11 percent of its lead, 9 percent of its zinc, and 8.9 percent of its crude oil output. With respect to chromite, at yearend Africa's reserves of the mineral were far larger than those of all other non-Communist regions combined. This probably also held true for manganese ore. In the case of crude oil, the fact that Africa's share of non-Communist world output was 1.6 percentage points greater than in 1964 was significant, particularly inasmuch as the output rate was continuing to increase at yearend.

The great bulk of these and other commodities continued to be produced for export to countries outside Africa, but continuing industrialization in South Africa had resulted in substantial consumption increases there, particularly of such items as asbestos, iron ore and steel melt additive metals, copper, lead and zinc, and phosphates. South Africa also consumed some 45 million tons of coal, produced in the country itself. It was also significant that capacity for petroleum refining and cement manufacture in Africa as a whole increased substantially.

At yearend it was evident that Africa soon would also be a large source of rutile (titanium) and potash, the former from a deposit in Sierra Leone and the latter from either or both Ethiopia and Republic of the Congo (Brazzaville). With this new output virtually the only mineral commodities vital to industry that Africa does not produce in significant quantity will be primary aluminum, mercury, and molybdenum.

Toward yearend a political development occurred that could adversely affect the availability of mineral supplies from Africa in the immediate future. On November 11 the self-governing British colony of Southern Rhodesia unilaterally declared Rhodesia independent. The British Government promptly declared the action illegal and treasonable and imposed selective economic sanctions against Rhodesia. By yearend Zambia, Rhodesia's neighbor to the north, had become involved in the

[1] Africa specialist, Division of International Activities.
[2] Physical scientist, Division of International Activities.

Table 1.—Major multilateral and unilateral assistance given African countries in mineral and related areas, in 1965

Country	Contributor	Contribution
Algeria	United Nations	Natural resources and economic development survey. Involves steel production, metal fabrication, and natural gas markets.
Burundi	----do	Geological and mineral studies. Minerals included: Bauxite, diamond, and iron ore.
Cameroon	----do	Partially financed study of granites by Association of African Geological Services.
Do	France: Bureau de Recherches et Géologiques Minières (BRGM).	Was granted right to explore for copper, lead, silver, cadmium, germanium, and gallium. A 4-year project, renewable for two 4-year periods.
Central African Republic	BRGM	Uranium search.
Chad	----do	Hydrologic study and geologic mapping in Fort Lamy area. Also, clays, talc, and diatomite investigated elsewhere.
Congo, Republic of (Brazzaville)	----do	Partner in lead-zinc mining at M'Passa.
Do	International Bank for Reconstruction and Development (IBRD).	Loan agreement providing 60 percent of financing of a potash project.
Do	West Germany	Credit for a cement plant.
Do	U.S.S.R	Credit, including funds for mineral exploration, potash development and hydroelectric power development.
Dahomey	BRGM	Mineral exploration.
Ethiopia	U.S.S.R	Financial and technical assistance in building an oil refinery.
Do	Yugoslavia	Financed and built a cement plant.
Gabon	United Nations	Investigated iron ore developments.
Do	IBRD	Provided a loan toward railroad and harbor construction.
Ghana	----do	Provided credit toward construction of an aluminum smelter.
Do	Rumania	Oil exploration.
Do	U.S.S.R	Furnished technical personnel to Ghana Geological Survey.
Ivory Coast	United Nations	Three-year mineral survey program.
Do	BRGM	Geologic study; aeromagnetic survey; exploratory drilling and mining; investigation of cinnabar deposits; study of a diamond area.
Do	France: Fonds d'Aide et de Cooperation (FAC)	Grant for general geologic and mineral studies.
Kenya	United Nations	Mineral resources survey.

Liberia	United States: Agency for International Development (AID).	Mineral resources survey and regional geological survey.
Do	IBRD	Loan to a company to increase iron ore production.
Malagasy Republic	United Nations	Contributed toward mineral, ground-water, and energy resources studies.
Do	BRGM	Geologic investigations of chromite deposits; prospecting and exploration for various minerals.
Do	FAC	Exploration for diamond, phosphate, lead, platinum, and other minerals.
Do	European Economic Community: European Development Fund (EDF).	Financed chromite development.
Mali	BRGM	Petroleum exploration; diamond investigations; geologic mapping.
Do	U.S.S.R	Provided credit toward cement plant construction.
Mauritania	BRGM	Geologic, hydraulic, and mineral surveys; regional geologic mapping and airborne geologic surveys.
Morocco	IBRD	Provided loan toward expansion of the phosphate industry.
Niger	BRGM	BRGM was granted a 3-year permit to prospect. Investigated gold occurrences.
Do	France: Commissariat d'Energie Atomique (CEA)	Uranium prospecting.
Senegal	United Nations	Geologic, geochemical, and geophysical surveys. Investigations for chromite, gold, and diamond.
Do	BRGM	Geologic mapping and phosphate rock study.
Somali Republic	United Nations	Minerals survey and iron ore investigation.
Sudan	IBRD	Granted a loan to improve and expand railroads and river and harbor facilities.
Tanzania	United Nations	Three-year mineral survey.
Togo	----do	Minerals survey.
Tunisia	----do	Exploratory drilling and geophysical surveys.
Uganda	----do	Ground-water surveys.
Do	Canada	Investigation of anomalies indicated in an earlier airborne geophysical survey.
Do	United Kingdom	Mineral surveys.
United Arab Republic (Egypt)	United Nations	Mineral surveys.
Upper Volta	----do	Provided part of funds for ground-water and mineral surveys.

dispute and it appeared that both Rhodesia's production of chromite and asbestos and Zambia's copper production might be drastically curtailed.

During the year agencies of the United Nations, particularly its Special Fund, were engaged in or became committed to projects in several African countries that directly or indirectly related to the mineral industry. Also involved in such projects, via loans, grants, studies, etc., were governmental agencies of various countries operating unilaterally, agencies of the European Economic Community (EEC), and the International Bank for Reconstruction and Development (IBRD) and its affiliates. In addition, the French Government-owned, incorporated company, Bureau de Récherches Geologique et Miniére, explored on its own behalf and undertook mineral exploration projects for various Francophone countries of Africa.

UNITED STATES CAPITAL INVOLVEMENT IN AFRICAN MINERAL INDUSTRY

United States private capital investment in African mineral and petroleum industry continued to expand. At yearend U.S. companies were interested in varying degree in most mining, metallurgical, and petroleum activities in Africa. The involvement in countries with existing diversified important mineral industry perhaps was smallest in the Democratic Republic of the Congo (Léopoldville), and largest in the Republic of South Africa, including South-West Africa. In Libya U.S. companies dominated the petroleum situation, both with respect to crude production and concession acreage held. In South Africa and Southern Rhodesia U.S. capital controlled the major part of chromite reserves and production. Iron mining in Liberia was largely in the hands of companies with large U.S. equity. In Gabon a U.S. corporation held nearly a half interest in a company that in 1965 was the world's largest producer of manganese ore. U.S. capital was largely involved in companies accounting for over 40 percent of Zambia's large copper production.

PRODUCTION

Strong markets existed in 1965 for most of the minerals and metals that Africa produces in important quantity. Largely as a result of these markets, Africa's output generally improved compared with that of 1964. The major exception was uranium (U_3O_8) production in South Africa which fell by 29 percent, reflecting a decline in contractural commitments to the atomic energy agencies of the Governments of the United States and the United Kingdom. In addition declines occurred in production of beryl, lithium minerals, tin and industrial diamond, ranging from 6 percent for tin and diamond to 22 percent for beryl. The decrease for beryl reflected substantial declines in the output of Mozambique (down 23 percent from that of 1964), and of the Republic of Uganda (down 51 percent). On the other hand, the Republic of Rwanda exported 756 tons in 1965, which compares with 328 tons produced in 1964. The export probably was the alltime record for Rwanda.

METALS

Chromite. — In 1965 the Republic of South Africa was the largest producer of chromite in the non-Communist world, a position the country generally has held for some years. Southern Rhodesia ranked with Turkey for second place. Together, South Africa and Rhodesia produced 1.5 million tons in 1965. South Africa consumed about 20 percent of its output. The Malagasy Republic and Republic of Sudan were the other African producers in 1965. Malagasy's reserves were reported as 6 million tons of proved and probable ore.

Cobalt.—The Democratic Republic of Congo (Léopoldville) and Zambia contributed in the form of metal, respectively, 71 percent and 13 percent of the 11,764 tons of cobalt produced in Africa in 1965. In addition Morocco contributed 1,832 tons contained in complex sulfide concentrates averaging 11 percent cobalt, most of which was exported to France for processing.

Table 2.—Major African contributions to world mineral production [1]

(Metric tons unless otherwise specified)

Commodity	1964			1965 [p]		
	Production	Africa's percent of		Production	Africa's percent of	
		Non-Communist world production [2]	World production		Non-Communist world production [2]	World production
Metals:						
Aluminum:						
Bauxite	[r] 2,090,567	7.6	6.2	2,404,465	7.9	6.5
Alumina	484,350	NA	NA	522,142	NA	NA
Antimony concentrate, antimony content	14,486	37.4	23.4	15,107	38.2	24.1
Beryl	[r] 1,746	46.1	37.1	1,368	33.0	26.8
Chromite	1,325,891	59.9	31.1	[e] 1,540,989	50.4	31.4
Cobalt, metal content	[r] 11,439	88.7	NA	11,764	82.8	NA
Columbium and tantalum concentrate thousand kilograms	[r] 2,707	50.8	NA	2,903	43.0	NA
Copper:						
Ore and concentrate metal content	[r] 1,041,271	26.1	21.5	1,122,230	27.1	22.1
Smelter production	[r] 1,036,495	24.1	19.9	1,092,100	23.9	19.9
Germanium kilograms	[e] 10,271	NA	NA	[e] 17,826	NA	NA
Gold thousand troy ounces	[r] 30,960	77.5	67.1	32,130	78.6	67.6
Iron and steel:						
Iron ore thousand tons	[r] 29,931	7.8	5.1	39,418	9.8	6.4
Pig iron [3]	[r] 3,397	1.5	1.0	4,028	1.9	1.3
Lead:						
Concentrate, metal content	[r] 202,976	10.8	7.8	216,143	11.3	8.3
Metal	91,256	4.8	3.5	118,787	6.2	4.5
Lithium minerals	[r] 62,512	97.7	NA	60,183	98.4	NA
Manganese ore thousand tons	[r] 3,632	50.1	22.9	4,459	53.0	25.3
Platinum group metals [4] troy ounces	[e] 606,185	46.4	23.8	[e] 756,353	60.1	25.6
Silver thousand troy ounces	[r] 6,800	3.2	2.7	6,990	3.0	2.7
Tin:						
Concentrate, content of metal long tons	[r] 21,393	14.4	10.9	20,603	13.5	10.3
Metal do	[r] 11,770	8.2	6.2	12,607	8.6	6.5
Titanium:						
Ilmenite	[r] 6,141	.3	.3	6,300	.3	.3
Rutile	54	.03	.03	----------	------	-------
Tungsten concentrate (60 percent tungsten trioxide basis)	[r] 584	2.5	1.0	630	2.8	1.1
Uranium oxide	[r] 4,717	19.5	NA	3,358	17.8	NA
Vanadium, concentrate and pentoxide, content of metal	[r] 2,171	30.5	NA	2,535	30.6	NA
Zinc:						
Concentrate, zinc content	[r] 270,638	8.6	6.7	309,739	9.2	7.2
Metal	102,265	3.6	2.7	104,544	3.5	2.7
Nonmetals:						
Asbestos	[r] 374,674	19.4	11.6	415,000	21.5	12.7
Barite	[r] 128,031	4.8	4.1	165,231	5.7	4.8
Cement, hydraulic thousand tons	10,694	3.5	2.6	11,336	3.6	2.6
Corundum	2,658	80.0	33.2	4,513	89.3	45.1
Diamond:						
Gem thousand carats	[r] 6,442	95.8	92.3	6,601	96.1	92.1
Industrial do	[r] 26,796	98.3	89.8	24,854	98.9	87.7
Mica	4,524	3.1	2.4	3,400	2.3	1.8
Phosphate rock thousand tons	[r] 15,680	35.7	26.5	16,157	33.6	24.6
Mineral fuels:						
Coal	[r] 49,460	3.7	1.8	53,895	3.8	1.8
Petroleum: Crude thousand 42-gallon barrels	[r] 623,586	7.3	6.0	811,692	8.9	7.3
Gas, natural (marketed) million cubic feet	67,416	.4	.3	145,588	.7	.6

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Details may differ from figures in commodity chapters because of later revisions.

[2] Excludes Albania, Bulgaria, China (mainland), Cuba, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Rumania, U.S.S.R., North Viet-Nam, and Yugoslavia.

[3] Includes ferroalloys.

[4] Content of primary platinum raw materials.

Columbium and Tantalum Concentrates.—Nigeria was by a wide margin the free world's largest producer of columbite in 1965. Its output of 2.6 million kilograms accounted for about 84 percent of non-Communist production of the mineral. Much of the Nigerian columbite is relatively rich in tantalum. For this reason certain Nigerian columbites have been important raw materials for tantalum metal producers during periods of high demand for the metal and inadequate availability of tantalite and other tantalum-rich minerals more desirable as a tantalum raw material. Nigeria also produced tantalite (128,000 kilograms) in 1965 and there were six other African producers of tantalum raw materials, particularly Mozambique, from which United States imports were 125,368 kilograms, and the Democratic Republic of the Congo (Léopoldville) which produced 72,405 kilograms.

Copper.—Since 1962 six political divisions of Africa have contributed to its smelter production of copper (either or both blister copper and refined copper). At 1.122 million tons (27.1 percent of free world output) smelter production in 1965 was 5 percent higher than in 1964. The contributors, and the share of each of total African output in percent, were Republic of Zambia 63, Democratic Republic of the Congo (Léopoldville) 26, Republic of South Africa 5, South-West Africa 3, and Southern Rhodesia and Republic of Uganda each 1.5. In addition to blister and refined copper, approximately 18,000 tons of copper were produced in concentrates for export overseas. Producers of these materials included Algeria, Morocco, and South-West Africa.

The output achieved in 1965 was the alltime record for Africa. That such production could be maintained in the immediate future seemed doubtful at yearend.

Gold.—Gold production in Africa in 1965 continued to increase, but at a slower rate than in previous years. The failure to maintain the pace of recent years primarily resulted from a decline in the rate of expansion of output of South Africa, which accounted for 95 percent of African output, with Ghana and Southern Rhodesia, the next largest African producers, contributing respectively 2.4 percent and 1.7 percent of the African total. At yearend it appeared that African gold production had reached a level from which important further increase could not be expected in the forseeable future, barring discovery of a new large goldfield.

Iron Ore.—A feature of the year was continued improvement in iron ore production. At 39.4 million tons, output was 32 percent higher than that in 1964 and three times that of the period 1955–59. There were 12 significant producers, 7 of which contributed 1 million tons or more as follows in million tons: Liberia 15.9, Mauritania 6, South Africa 5.8, Algeria 3.1, Sierra Leone 2.1, Tunisia 1.1, and Swaziland 1. The ore was produced exclusively for export, mostly to West Europe and Japan, except in the case of South Africa where local sales of iron ore totaled 4.7 million tons in 1965.

At yearend further expansion of the industry was indicated, particularly in Liberia where a washing and pelletizing plant with annual capacity of 2 million tons of pellets was under construction at the port of Buchanan.

Manganese Ore.—The 4.4 million tons of manganese ore produced in Africa in 1965 was a new record high for the continent. Five countries accounted for 93 percent of the output as follows: South Africa 35 percent; Republic of Gabon 29 percent; Republic of Ghana 13 percent; and Democratic Republic of the Congo (Léopoldville) and Morocco, each 8 percent. South Africa itself consumed about a third of its production of 1.6 million tons. With that exception the ore was mined for export. Gabon's production of 1.3 million tons was realized by one company, Compagnie Miniére de l'Ogooúe (COMILOG), which with that tonnage became the largest producer of manganese ore in the non-Communist world.

Platinum.—By yearend the Republic of South Africa had firmly established itself as the largest producer of platinum and other metals of that group in the non-Communist world. The U.S. Bureau of Mines estimated the 1965 output of Rustenburg Platinum Mines Ltd., the only significant producer in South Africa, at 750,000 ounces (platinum-group metals as a whole). Although this estimate may have been high, Rustenburg later announced plans to increase output of plati-

num alone to 750,000 ounces by 1970. This increase would mean an output of about 1.2 million ounces of platinum-group metals.

NONMETALS

Diamond, phosphate rock, and asbestos accounted for the great bulk of value of nonmetallic minerals produced in Africa in 1965. At $415.3 million, raw diamond sales by De Beers Consolidated Mines Ltd. were a record for the fifth successive year and exceeded 1964 sales by $41.4 million. Ten political divisions of Africa were significant producers.

The value of phosphate and asbestos output amounted to about $147 million and $44 million respectively. While Morocco accounted for the major part of phosphate output (about 61 percent), seven other countries each produced from 86,000 tons (Algeria) to 3 million tons (Tunisia), and at 16 million tons, total African output was 3 percent higher than in 1964. A significant feature with respect to phosphates was that at yearend South Africa was approaching self-sufficiency.

With respect to asbestos, although there was recorded production in 6 countries or areas, the great bulk of African output continued to be contributed by South Africa (52 percent), Southern Rhodesia (37 percent), and Swaziland (9 percent). Besides being the world's only producer of amosite asbestos, South Africa continued to contribute the great bulk of crocidolite asbestos. For the whole continent asbestos output was 11 percent larger than that of 1964.

MINERALS FUELS

The outstanding development of the year occurred in the petroleum area. Crude oil output at 811.7 million barrels was 30.2 percent larger than that of 1964 and at yearend production capacity was increasing. Major contributors to 1965 African crude oil production were: Libya (55 percent), Algeria (25 percent), Nigeria (12 percent), and Egypt (6 percent). Republic of Gabon, Angola, Morocco, and Republic of the Congo (Brazzaville), in that order, were also producing crude, and besides in the countries named above, exploration was being conducted in Ethiopia, Somalia, Mozambique, Cameroon, Ghana, Senegal, and Spanish Sahara.

Crude oil refining capacity also was increasing. At yearend 21 refineries were operating and 6 refineries were under construction.

The natural gas industry expanded production 116 percent compared with that of 1964, and from Algeria liquefied natural gas was being exported in large quantity to the United Kingdom and France.

CONTRIBUTION TO MINERAL SUPPLIES OF SELECTED COUNTRIES [3]

Several mineral commodities that are exported from Africa in important quantities reach the consuming country in part via third countries outside the continent. For this reason and because trade reports of some countries fail to provide mineral commodity detail, it is difficult to determine the true African contribution to the mineral imports of a given country. This applies particularly to raw diamond and to a lesser extent to cobalt, primary platinum raw materials, and primary germanium raw materials.

UNITED STATES

United States industry continued to rely heavily on Africa for mineral and metal supplies. In 1964 imports direct from Africa included more than 25 items, with a total value of about $230 million. The imports included $59 million of raw and uncut diamond. Total U.S. imports of diamond, some 92 percent of which was mined in Africa, were valued at $259 million, comprising $150 million of gem diamond and $60 million of industrial diamond. While there were no direct imports of platinum-group metals, the value of total platinum imports in 1964 was $50 million, of which perhaps half or even more represented platinum-group metals mined in South Africa.

Imports from Africa of other metals and minerals for which for lack of significant domestic resources the United States is dependent on imports or essentially so, and in percent the share of total imports represented, included the following: amo-

[3] Information presented here on Africa's contribution is for 1964 if not stated otherwise.

site and crocidollte asbestos each 100, chromium ore 55, columbium and tantalum concentrates 53, manganese ore and beryllium ore each 51, cobalt 46, antimony 37, germanium 21, and tin 6.

Significant also was the fact that U.S. imports direct from Africa of crude petroleum became substantial in 1964, amounting to 4 percent of total crude oil imports and valued at $3.2 million.

COUNTRIES OF THE EUROPEAN ECONOMIC COMMUNITY

The European Economic Community (EEC)[4] relies more heavily on imports of mineral, metal, and energy supplies than does the United States, its resources being less abundant and less diversified. Moreover the EEC obtains a much larger share of its mineral imports from Africa because of the close commercial ties that developed during the period of colonial rule, and because the EEC countries are closer to the African ports than the United States.

The value of EEC mineral imports (including petroleum) direct from Africa in 1964 was roughly $1,780 million, eight times the value of these imports into the United States in 1964, and about 21 percent of total EEC mineral imports. Indirect imports, particularly of raw diamond from the United Kingdom, made Africa's true contribution substantially larger than 21 percent.

The imports from Africa included more than 25 commodities. By value crude petroleum was the largest item, amounting to $908 million, or 28 percent of the EEC's total crude oil imports of $3,254 million.

UNITED KINGDOM

In 1965 the United Kingdom maintained the preferred position among importers of African gold, platinum raw materials, and diamond that it has held for many years. During the first 11 months of 1965 imports of unrefined gold bullion from African countries other than South Africa amounted to 1,265,230 ounces. Imports of refined gold bullion from South Africa amounted to 32,471,550 ounces (about $1.14 billion). The 1965 imports from Africa of platinum raw materials were valued at $38 million; this figure includes some silver however. Raw gem diamond from Africa was valued at $301 million, compared with total raw gem diamond imports of $496 million.

In 1964 (most recent year for which complete foreign trade statistics were available) the United Kingdom's mineral imports from Africa included the following eight additional items in quantities ranging from 64 percent to 29 percent of the total imports: Crude phosphates 64 percent, ferromanganese 62, refined and blister copper, chromium ore and concentrates and asbestos each 48, cobalt 47, iron ore 29.

JAPAN

Japan imported in 1964 roughly $2,500 million of raw minerals, crude and refined metals, and crude petroleum. Represented by some 17 commodities, the direct contribution of Africa to the total value was about $142 million or about 6 percent. Items imported from Africa and valued at $2 million or more comprised $62.2 million of copper of which $58.8 million was blister and refined copper, $25.9 million of iron ore, $19.4 million of pig iron, $9.3 million of phosphate rock, $6.1 million of asbestos, and $2.4 million of ferroalloys. Value of imports direct from Africa of raw diamond, manganese ore, chromium ore and concentrate, and crude petroleum in millions of dollars was 1.3, 1.6, 1.2, and 1.2, respectively.

At yearend long-term contracts existed for delivery to Japan of pig iron and iron ore from the Republic of South Africa and of iron ore from Swaziland.

[4] Belgium, France, Federal Republic of Germany, Italy, Luxembourg, and Netherlands.

Table 3.—Selected African contributions to mineral imports of major industrial areas in 1964

(Metric tons unless otherwise specified)

Commodity	United States [1]			European Economic Community [2]			United Kingdom [2]			Japan [2]		
	Total imports	From Africa		Total imports	From Africa		Total imports	From Africa		Total imports	From Africa	
	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total
Metals:												
Aluminum:												
Bauxite	9,235,000	-------	-----	2,156,342	176,100	8.2	380,589	213,809	56.2	1,621,932	------	-----
Alumina	NA	58,422	NA	148,355	104,795	70.6	9,009	----------	-----	---------	------	-----
Metal, semimanufactures and scrap	411,188	3,623	0.8	613,496	45,124	7.4	370,606	118	.03	36,207	254	0.7
Antimony concentrate	9,685	3,584	37.0	NA	NA	NA	NA	NA	-----	6,501	1,238	19.0
Beryllium ore	4,921	2,534	51.5	NA	NA	NA	NA	NA	-----	---------	------	-----
Chromium ore and concentrate	1,295,252	715,383	55.2	513,820	132,244	25.7	225,558	107,715	47.7	396,427	53,589	13.5
Cobalt:												
Oxide	687	NA	NA	829	-------	-----	1,006	61	6.1	319,075	------	-----
Metal	5,141	2,380	46.3	----------	-------	-----	3,120	[6] 1,466	47.0	---------	------	-----
Columbium and tantalum concentrate	2,087	1,097	52.6	[3] 698,363	[3] 9,617	1.4	[3] 290,329	[3] 1,070	.4	305	67	22.0
Copper:												
Ore and concentrate	46,661	3,282	7.0	154,014	4,852	3.2	1,373	----------	-----	620,381	16,651	2.7
Blister and refined	478,611	59,008	12.3	1,159,849	551,945	47.6	529,374	253,237	47.8	121,202	89,727	74.0
Scrap	4,058	-------	-----	----------	-------	-----	3,630	447	12.3	29,806	1,058	3.5
Germanium: Concentrate and semi-refined—kilograms	425	88	20.7	NA	[4] 46,000	-----	NA	NA	-----	NA	NA	NA
Gold, bullion—troy ounces	1,168,885	929	.08	NA	NA	-----	[5] 40,849,000	30,013,920	73.5	NA	NA	NA
Iron and steel:												
Iron ore—thousand tons	43,089	3,167	7.3	71,766	15,170	21.1	18,918	5,409	28.6	31,236	1,644	5.3
Pig iron—do	668,115	62,251	9.3	1,401	47	3.4	341	5	1.5	3,359	395	11.8
Ferroalloys:												
Ferromanganese (manganese content)	147,031	12,832	8.7	247,192	23,825	9.6	63,069	39,301	62.3	3	------	-----
Other	NA	NA	NA	286,903	16,066	5.6	205,597	18,687	9.1	25,707	15,020	58.4
Lead (for consumption)												
Concentrate	111,817	30,917	27.6	364,125	105,546	29.0	31,508	----------	-----	51,704	------	-----
Metal	309,344	-------	-----	321,779	50,263	15.6	195,612	NA	NA	68,985	152	.2
Lithium minerals	12,254	12,254	100.0	NA	NA	-----	NA	NA	-----	NA	NA	NA
Manganese ore	2,743,542	1,389,531	50.6	1,914,195	1,403,761	73.3	534,472	213,315	39.9	558,951	51,812	9.2

Table 3.—Selected African contributions to mineral imports of major industrial areas in 1964—Continued

(Metric tons unless otherwise specified)

Commodity	United States [1]			European Economic Community [2]			United Kingdom [2]			Japan [2]		
	Total imports	From Africa		Total imports	From Africa		Total imports	From Africa		Total imports	From Africa	
	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total	Quantity	Quantity	Percent of total
Platinum-group metals:												
Matte—troy ounces	35,916	--------	-----	--------	--------	-----	[6] 108,412,160	[6] 107,994,201	[7] 99.6	NA	------	-----
Semirefined—do	1,137,699	183,446	16.1	[6] 79,859,174	--------	-----	107,770	290	.3	344,141	------	-----
Silver, bullion thousand troy ounces	51,674	759	1.5	113,098	611	.5	62,486	1,596	2.6	9,937	------	-----
Tin:												
Concentrate—long tons	5,190	--------	-----	42,882	7,624	17.8	44,113	2,038	4.6	2,811	------	-----
Metal—do	31,582	1,817	5.8	35,388	2,319	6.6	8,968	5,547	61.9	16,030	10	.06
Zinc:												
Concentrate	282,529	6,806	2.4	1,070,133	250,774	23.4	308,958	38,042	12.3	288,447	6,793	2.4
Metal	129,669	10,500	8.1	334,133	20,701	6.2	198,498	7,572	3.8	69,058	4,704	6.8
Nonmetals:												
Asbestos	670,737	58,953	8.8	375,429	81,203	21.6	186,872	89,349	47.8	143,969	37,087	25.8
Barite	545,227	30,099	5.5	202,161	--------	-----	47,328	29,090	61.5	11,343	------	-----
Diamond:												
Gem—value, thousands	$258,534	$28,614	11.1	$306,425	$21,625	7.1	$427,048	[e] $414,000	96.9	$17,024	$204	1.2
Industrial—do	$60,051	[8] $30,771	51.2	$56,693	$10,709	18.9	----------	----------	-----	$9,619	$1,145	11.9
Phosphate:												
Crude	158,320	25,331	16.0	8,519,133	6,344,279	74.5	1,509,929	973,025	64.4	2,315,775	490,729	21.2
Superphosphate	175,521	NA	-----	--------	--------	-----	----------	----------	-----	10	------	-----
Other	3,512	NA	-----	1,998,231	75,818	3.8	95,044	----------	-----	59	------	-----
Mineral fuels:												
Coal	265,859	--------	-----	49,217,900	587,390	1.2	1,014	----------	-----	13,232,807	157,659	1.2
Petroleum:												
Crude thousand 42-gallon barrels	438,643	17,743	4.0	1,345,717	356,486	26.5	444,653	94,727	21.3	454,004	370	.08
Refinery products—do	388,200	1,016	.3	237,949	13,666	5.7	145,235	2,483	1.7	93,506	14	-----

[e] Estimate. NA Not available.

[1] Quantity figures for concentrates represent content of metal except for columbium-tantalum and germanium which are gross weight.

[2] Quantity figures for concentrates represent gross weight.

[3] Includes ores and concentrates of titanium, vanadium, molybdenum, tantalum, and zirconium.

[4] Exports to Belgium reported by Republic of the Congo (Leopoldville).

[5] Unrefined and refined, gold content. 1st 11 months only.

[6] Includes ores and concentrates of platinum and silver.

[7] Africa supplies the major part of primary platinum raw materials imported.

[8] Includes diamond dust and powder.

Source: For United States: Minerals Yearbook, 1964, v. 1; for European Economic Community: Statistical Office of the European Communities, Foreign Trade Analytical tables, Imports, 1964; for United Kingdom, Statistical Office of the United Nations; for Japan: Ministry of Finance, Trade of Japan, 1964.

IMPORTS INTO AFRICA

Africa's major energy, metal, and mineral imports continued to be petroleum products, crude petroleum, iron and steel semimanufactures, cement including clinker, and fertilizers. The approximate volume of these imports in 1963 and 1964, the most recent years for which the figures were available, are as follows

	Million metric tons	
	1963	*1964*
Petroleum products	24.9	16.6
Crude petroleum	7.8	12.9
Iron and steel semimanufactures	1.6	2.5
Cement [1]	2.2	2.5
Fertilizers	2.2	2.0

[1] Includes lime and other raw construction materials.

The 33-percent decline in petroleum product imports from 1963 to 1964 was largely accounted for by South Africa and Algeria, where such imports fell from 12.8 to 7.8 million tons and from 1.7 to 0.4 million tons respectively. South Africa increased refinery output from existing facilities during 1964 and in Algeria a new refinery went on stream early in the year. The large increase in imports of crude petroleum from outside Africa was primarily attributed to South Africa, which thus far has failed to find petroleum and obtains crude oil mostly from Near East fields. South Africa more than doubled its imports, from about 2.2 million tons in 1963 to 4.5 million tons in 1964.

The increase of more than 50 percent in imports of iron and steel semimanufactures largely reflected increases in such imports by South Africa (185,000 tons), Ghana (161,000 tons), and Nigeria (121,000 tons). At yearend there were still no important integrated iron and steel facilities in Africa outside South Africa and it appeared that the continent as a whole would continue to depend largely on imports of semimanufactures for some time to come.

That no significant change in cement imports occurred from 1963 to 1964 in part reflects establishment of increased capacity for cement manufacture in several African countries. At yearend this trend was expected to continue.

The largest consumers of manufactured fertilizers and fertilizer raw materials are South Africa, Egypt, and Southern Rhodesia, in that order. Their combined imports in 1963 and 1964 totaled about 1.8 and 1.5 million tons respectively. At yearend South Africa was working toward self-sufficiency in phosphate rock, which in 1963 and 1964 comprised, respectively, 70 percent and 44 percent of total fertilizer imports of 1.2 million and 685,000 tons. In the United Arab Republic (Egypt) superphosphate manufacturing capacity was being expanded, and expansion of phosphate rock production was being considered. In Southern Rhodesia, where nitrogenous fertilizers are mostly required, production capacity for phosphate rock and superphosphate by yearend had become sufficient to meet the country's superphosphate requirements.

The Mineral Industry of Algeria[1]

By Walter C. Woodmansee [2]

As in 1964, the Algerian mineral industry was dominated by the petroleum sector, which continued as the principal source of revenue and the main subject of mineral news from the country. The prolonged French-Algerian oil negotiations were concluded in July, effective at yearend, and inaugurated a new policy influencing French, United States, and other petroleum operations in the country. Because this conference extended through most of the year, little initiative was shown in petroleum exploration, although successful development drilling continued and several oil discoveries were announced.

The trend toward greater Algerian Government control of the country's resources was advanced by the oil agreements with the French. In January, government authorities warned holders of about 75 inactive mining concessions that they might lose property control if mining activity was not commenced within 2 months. These mines were mostly copper-lead-zinc deposits, abandoned by French owners in 1962 when Algeria became independent. In June the Government announced the nationalization of all diatomite mines and quarries and about 60 other, largely inactive mines. Control was turned over to the Bureau Algérien de Recherches et d'Exploitations Minières (BAREM), the State mining agency. Petroleum acreage was relinquished to the Government; requests for petroleum permits were denied as it became increasingly difficult to obtain or renew permits or concessions. As the year ended, further announcements regarding petroleum policy and mine nationalization were expected.

In mid-1965, 39 petroleum companies were operating 112 concessions in the Algerian Sahara, including 15 French, 12 United States, 5 West German, 4 Italian, and 3 British companies. Oil and gas were produced from 550 to 600 wells. Algeria was surpassed during the year by Libya as the continent's largest oil producer. Large oil and gas production capacity remained shut-in because of limited pipeline capacity.

In December, agreement was reached between the United Nations and the Algerian Government on a $1.2 million, 2-year survey of natural resources and economic development possibilities, including steel production, metal fabrication, and foreign markets for natural gas.

PRODUCTION

Except for marketed natural gas, there were no pronounced changes in mineral production during the year. Output of petroleum, by far the most important mineral commodity, was essentially the same as the 1964 output; expansion was not possible without additional pipeline capacity. Marketed dry natural gas increased 117 percent with expansion of foreign markets for liquid methane in France and the United Kingdom. Natural gas output, however, remained small relative to resource potential. Iron mining continued to move forward, following recovery from the low period of 1962–63. Progress was made toward completion of the iron and steel plant at Annaba. Copper, lead, and zinc ore output showed a slight decline, attributed to the labor situation. In the industrial mineral sector, output data on

[1] Considerable mining information in this chapter was derived from mineral reports prepared by R. B. Duncan, Dept. of State, U.S. Embassy, Algiers.

[2] Physical scientist, Division of International Activities.

Table 1.—Algeria: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Unwrought	113	67	157	e 150	NA
Semimanufacturers, including alloys	1,826	350	261	e 200	NA
Antimony:					
Concentrate	2,224	500	------	------	e 200
Metal content	653	153	------	------	e 70
Copper:					
Concentrate	2,184	2,900	3,745	3,900	3,660
Metal content	664	779	1,036	1,092	1,020
Refined, including alloys	3,622	2,025	1,370	473	e 400
Iron and steel:					
Iron ore—thousand tons	2,867	2,062	1,976	r 2,746	3,132
Pig iron	6,395	4,000	3,462	3,629	NA
Ingots and equivalent forms	30,535	5,507	9,480	19,792	NA
Semimanufactures, except castings and forgings	40,376	15,583	16,788	25,784	NA
Castings and forgings	786	402	406	365	NA
Lead:					
Concentrate	13,072	12,922	11,763	13,602	14,922
Metal content	9,378	9,039	8,020	9,548	e 8,900
Refined, including alloys	552	699	1,280	1,393	e 1,200
Silver [2]—thousand troy ounces	300	275	275	295	e 295
Zinc:					
Concentrate—thousand tons	71	70	58	64	63
Metal content—do	42	42	36	35	e 34
Other [3]	118	84	60	81	NA
Nonmetals:					
Barite	r 30,738	r 27,582	r 29,412	r 29,633	42,767
Cement—thousand tons	1,072	650	884	730	e 700
Clay, bentonitic	25,680	13,443	16,256	e 15,000	NA
Diatomite	r 31,945	r 27,428	17,648	r 20,106	16,413
Fertilizer materials:					
Phosphate rock—thousand tons	426	390	r 248	73	86
Superphosphate—do	55	46	52	88	NA
Other	4,416	744	2,171	e 2,000	NA
Fuller's earth	r 50,337	38,442	81,608	r 52,923	59,895
Gypsum—thousand tons	e 175	e 175	e 175	e 175	e 175
Lime—do	60	r 23	r 19	r 28	NA
Pigments, mineral—do	11	5	6	e 6	NA
Pyrite—do	r 32	43	38	61	57
Salt—do	r 129	r 118	r 124	116	e 120
Stone, dimension—thousand square meters	356	814	e 800	e 800	e 800
Mineral fuels:					
Coal—thousand tons	78	53	38	46	45
Coke (low temperature)—do	e 62	e 70	e 60	e 40	NA
Fuel briquets—do	40	e 27	e 25	e 25	NA
Natural gas, marketed—million cubic feet	8,615	13,189	r 14,902	r 29,994	65,038
Natural gas liquids—thousand tons	136	202	241	258	e 430
Petroleum:					
Crude—do	15,664	20,498	23,655	26,226	26,026
Refinery products: [4]					
Gasoline—do	-------	-------	-------	326	418
Kerosine—do	-------	-------	-------	141	193
Distillate fuel oil—do	-------	-------	-------	448	534
Residual fuel oil—do	-------	-------	-------	279	345
Liquefied petroleum gas—do	-------	-------	-------	38	65
Total—do				1,232	1,555

e Estimate. r Revised. NA Not available.

[1] In addition to commodities listed, Algeria produces other types of construction materials, but data on output are not available.

[2] Estimated recoverable silver content of lead and zinc concentrates.

[3] Undifferentiated metals produced in foundries.

[4] Production of Algiers refinery (Société Raffinerie Algérienne), which commenced operations in February 1964; totals do not include relatively small output of a field topping plant at Hassi Messaoud.

several commodities were not available. Cleanup mining continued at the nearly exhausted Kouif phosphate mine, while development was underway on the new phosphate rock deposit at Djebel Onk.

The overall value of metal and mineral output is not known, but crude oil, condensate, and natural gas sales were probably valued in excess of $500 million.[3] Iron

[3] Where necessary, values have been converted from Algerian dinars (DA) to U.S. dollars at the rate of DA 1=$0.2046.

ore output was valued at $23 million, and the base metal concentrates were valued at about $8.7 million. Algeria's operating and capital budget was $843 million during 1965.

TRADE

For the years of review, complete official trade statistics of Algeria were not available; most data were derived from European Economic Community (EEC) statistics on foreign trade with Algeria, supplemented by Algerian sources. According to International Monetary Fund estimates, total Algerian trade in 1964 was as follows: Exports—$710 million, imports—$739 million. EEC data indicate that Algerian metal and mineral exports to the Community were valued at $440.6 million, including $418.7 million for oil and gas; corresponding Algerian imports of metals and minerals from the Community were valued at $52.3 million, including $28.3 million for iron and steel. A large share of this trade continued with France.

Table 2.—Algeria: Selected exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum, unwrought and scrap	2,550	[1] 971	Italy 838.
Copper:			
Ore and concentrate	3,344	4,082	All to West Germany.
Metal, all forms	5,730	[1] 1,577	France 842; Belgium-Luxembourg 572.
Iron and steel:			
Ore and concentrate—thousand tons	1,961	2,828	United Kingdom 1,081; Italy 854; West Germany 287; U.S.S.R. 241.
Scrap	101	[1] 8	Mainly to Italy.
Semimanufactures	[1] 2,402	[1] 446	All to France.
Lead:			
Concentrate	12,057	11,042	Greece 4,194; Morocco 2,581; France 2,026.
Unwrought and scrap	[1] 3,577	[1] 1,036	Italy 871; France 165.
Zinc:			
Concentrate	58,272	62,584	France 51,256; Belgium-Luxembourg 3,101.
Scrap	687	[1] 241	Italy 132; France 81.
Residues, metalliferous, nonferrous	124	[1] 108	France 73; Belgium-Luxembourg 32.
Nonmetals:			
Barite	1,120	8,400	West Germany 4,000; Nigeria 3,780.
Cement	[1] 4,791	[1] 40,239	All to France.
Diatomite	13,159	14,314	France 9,193; United Kingdom 1,532.
Fuller's earth	43,321	14,705	France 7,000; Morocco 5,285.
Phosphate rock—thousand tons	326	8	France 7.
Pyrite	32,901	32,150	France 28,050; Italy 4,100.
Salt	[1] 35,721	[1] 34,243	All to France.
Mineral fuels:			
Petroleum:			
Crude—thousand tons	23,655	24,895	France 17,113; West Germany 2,973.
Refinery products:[1]			
Gasoline—do	80	107	All to France.
Distillate fuel oil—do	345	461	Do.
Residual fuel oil—do	52	144	France 132; Italy 12.
Liquefied petroleum gas do	18	17	All to France.
Other—do	3	4	Do.
Total—do	498	733	

[1] Data are based on European Economic Community foreign trade statistics and include only Algerian trade with the Community. Information not available from Algerian sources.

Source, except as specified in footnote 1: Annuaire Statistique de l'Algérie. Nouvelle Serie, Premier Volume, 1963–64; and Chambre Syndicale des Mines d'Algérie. Compte-Rendu de l'Assemblée Générale Annuelle, June 1965.

Table 3.—Algeria: Imports of metals and minerals from the European Economic Community

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:[1]			
Alumina		206	All from France.
Aluminum	877	800	France 799.
Copper	670	779	France 774.
Iron and steel:			
Pig iron and ferroalloys	269	691	France 661.
Blooms, billets, and slabs		36	All from France.
Semimanufactures:			
Tubes, pipes, and fittings	67,119	71,021	France 44,224; West Germany 20,800.
Rails and accessories	1,912	213	All from France.
Castings and forgings	213	111	France 76; Belgium-Luxembourg 35.
Other unspecified	71,603	72,093	France 67,149.
Total	140,847	143,438	
Lead:			
Oxide	91	105	France 97.
Metal	491	645	All from France.
Silver—thousand troy ounces	e 62	e 67	All from France.
Tin—long tons	34	18	All from France.
Titanium oxide	147	223	France 213.
Zinc:			
Oxide	196	344	France 294.
Metal	575	493	France 353; Belgium-Luxembourg 140.
Other	182	19	All from France.
Nonmetals:			
Abrasives		7,490	Italy 7,466.
Asbestos	819	2,136	All from France.
Barite	2,653		
Cement	24,580	10,930	France 10,122.
Chalk	3,695	3,989	All from France.
Clays	380	708	All from France.
Construction materials and their products[2]	16,179	6,760	France 6,029.
Dolomite	1,042	1,374	Belgium-Luxembourg 740; France 634.
Fertilizers:			
Nitrogenous	43,346	57,856	France 52,600; Italy 5,256.
Phosphatic	317	3,340	France 2,994; Italy 346.
Potassic	11,892	11,570	France 5,136; Belgium-Luxembourg 4,299.
Other	2,891	870	France 770; Italy 100.
Gypsum	2,155		
Lime	5,503	3,188	All from France.
Pigments, mineral	516	451	France 405.
Quartz and quartzite		400	All from Belgium-Luxembourg.
Salt	83	74	All from France.
Sand	5,952	1,935	Belgium-Luxembourg 1,725.
Sulfur, crude and refined	28,571	31,694	All from France.
Talc	2,578	3,831	All from France.
Mineral fuels:			
Carbon black	306	1,189	France 839; Netherlands 250.
Coal	11,960	10,676	West Germany 6,330; France 4,346.
Coal byproducts	1,954	650	France 644.
Coke and semicoke	2,946	10,544	West Germany 6,657; France 2,235.
Petroleum refinery products:			
Gasoline—thousand tons	310	69	Mainly from France.
Kerosine—do	126	32	All from France.
Distillate fuel oil—do	456	99	France 67; Netherlands 19.
Residual fuel oil—do	503	59	France 39; Italy 20.
Lubricants—do	197	33	Mainly from France.
Liquefied petroleum gas—do	44	12	France 11.
Bitumens—do	54	52	France 51.
Other—do	6	1	Mainly from France.
Total—do	1,696	357	

e Estimate.

[1] Includes unwrought metal, semimanufactures, and scrap, unless otherwise specified.

[2] Includes dimension stone, bricks, tiles, and other ceramic ware.

COMMODITY REVIEW

METALS

Antimony.—Early in the year, the Société de la Vieille Montagne reopened the Hamman N'Bails antimony mine in eastern Algeria. This mine produced a small ore tonnage.

Copper.—Despite favorable world market prices, output of copper decreased slightly at the Aïn Barbar mine, Algeria's only producing copper mine, located near Annaba in the northeast coastal area. Difficulties were experienced in recruiting experienced mining personnel for expanded operations.

Starting in March, a Bulgarian mission conducted a drilling program at Kef Oum Teboul, near the Tunisian border.

Iron Ore.—Production increased 14 percent over that of 1964, partly because of a larger market in Italy, which became the leading foreign purchaser during 1965. Preliminary information indicates that in 1965 principal Algerian exports of iron ore, in thousands of metric tons, were as follows: Italy 1,222, United Kingdom 1,010, Bulgaria 170, West Germany 163, and Belgium-Luxembourg 103. The United States imported 53,000 tons from Algeria during the year.

Seven mines were productive at the beginning of the year. Output in recent years, including the latest year for which data are available, was as follows:

Mine	Metric tons		
	1962	1963	1964
Ouenza-Bou Khadra	1,505,544	1,458,313	2,171,934
Khanguet	142,837	157,318	182,938
Beni-Saf	159,119	181,551	174,585
Zaccar	153,960	90,483	138,924
Timezrit	91,046	67,870	46,608
Rouina		7,038	15,776
El Maden	9,377	13,421	15,380
Total	2,061,883	1,975,994	2,746,145

The resurgence of iron mining in Algeria during 1964–65 has been attributed to a greater demand for iron ore in Western Europe; new markets in the U.S.S.R., Czechoslovakia, Poland, and the United States; low ore prices accepted by Algerian producers; and good industrial relations at Algerian mines.[4]

The Ouenza-Bou Khadra ore deposits in eastern Algeria, operated by Société de l'Ouenza, a private firm in which the Algerian Government holds 30 percent of the stock, continued to account for about 80 percent of the ore output in 1965. The other producing mines, which are worker-managed (autogéré) or are operated by BAREM, were hampered by low-grade ore and a lack of qualified mine personnel. Operators of the Zaccar mine, near Algiers, were unable to fulfill an ore contract concluded with the United Kingdom in April 1965. Exports from this mine were suspended in September, when settling of the dock at the Algiers port precluded ore loading.

Although Ouenza-Bou Khadra ore sales were about 200,000 tons higher than in 1964, profits were changed relatively little, because of low prices and increased operating costs. The mines operated by BAREM were more adversely affected by these factors.

Iron ore exploration during 1965 was limited to drilling programs by the U.S.S.R. at the Zaccar mine and by Bulgarian technicians at the Beni Saf mine in western Algeria.

Domestic consumption of iron ore, largely in cement plants, was 12,797 tons in 1965 compared with 14,743 tons in 1964.

Iron and Steel.—The Algerian Government through the Caisse Française d'Equipment pour le Developpement de l'Algérie acquired majority share holdings in the Société Nationale de Sidérurgie (formerly Société Bônoise de Sidérurgie), the Government's new iron and steel plant at Annaba. A total of about $6.1 million, originally planned for construction of furnaces, was used in purchasing installations

[4] Mines et Métallurgie. No. 3599, October 1965, pp. 439–440.

for the first construction stage from French private interests. Plant construction, started in 1959, originally was planned for completion in 1963, but several delays necessitated rescheduling. The French built the pig iron division. Late in 1964, it was reported that the U.S.S.R. had agreed to build the steelmaking plant,[5] but a year later,[6] the French firm, Société Française d'Equipment Sidérurgique (SOFRESID), agreed to engineer the steel plant in cooperation with Soviet technicians. Work on the foundry section was started during 1965. Specifications for iron and steelmaking facilities have been changed during the construction period; in 1965 plans called for a blast furnace (capacity not reported) fitted for fuel injection, two 50-ton oxygen converters (annual capacity 500,000 tons), and a continuous casting machine.

Lead and Zinc.—Favorable market conditions led to a rise of nearly 10 percent in lead-concentrate output. Although data on foreign markets are incomplete for 1965, the major purchasers of Algerian mine lead were Italy, Greece, and Morocco.

Although ore output in 1965 was higher at the El Abed and Oued Zounder mines, near the Moroccan border, zinc content was reduced. This decline was somewhat offset by a marked increase in oxide ore (calamine) at the Ouarsenis mine, which was rehabilitated during 1964–65. Exports of concentrate exceeded production in 1965, resulting in lower stocks at the mines. France and Spain were the main buyers of Algerian zinc concentrate during the year; the United States purchased 4,842 tons.

Exploration for lead-zinc ores and capital improvements at mines and mills continued at a moderate pace during the year. A new ore body discovered at the El Abed mine was developed further, and mining is expected to begin in 1966. New lead ore bodies also were discovered at the Ouarsenis mine. A Yugoslav firm continued drilling and underground work at Kherset Youcef and Djebel Gustat. A Bulgarian mission drilled at Kef Oum Teboul, near the Tunisian border, and at Guerrouma in central Algeria. Results of exploration are not known.

Silver.—In 1964 lead concentrate at the El Abed and Oued Zounder mines reportedly contained 839 grams of silver per ton, and zinc concentrate contained 244 grams of silver.[7]

NONMETALS

Barite.—Output increased sharply during the year, because of greater demand for barite in oil drilling in the Algerian Sahara. Consumption of barite was 28,504 tons, 33 percent greater than in 1964. Exports were only about 1,500 tons, nearly all to Nigeria. In May, BAREM, which exercises a monopoly over the processing and marketing of barite, reopened the Keddara mine, near Algiers, and began exploration in the Grande Kabylie. Early in the year, the Government appointed a commissioner to oversee barite mining operations of two producing companies.

[5] Metal Bulletin. No. 4945, Nov. 6, 1964, p. 17.
[6] Metal Bulletin. No. 5049, Nov. 19, 1965, p. 17.
[7] Chambre Syndicale des Mines d'Algerie, Compte-Rendu de l'Assemblee Generale Annuelle, June 1965, p. 42.

Table 4.—Algeria: Production of lead and zinc concentrates
(Metric tons)

Mine	Lead			Zinc		
	1962	1963	1964	1962	1963	1964
Société Nouvelles des Mines d'Ain Arko (Oued Zounder concession)	4,848	5,409	6,878	32,015	32,219	36,929
Société Algérienne du Zinc (El Abed concession)	3,824	1,853	1,935	31,971	15,892	13,333
Société de la Vieille Montagne (Ouarsenis concession):						
Sulfide	634	944	1,085	2,961	4,508	4,618
Oxide				353	1,660	5,387
Société des Mines de Sidi Kamber	3,258	3,189	3,300	1,975	2,407	2,632
Société des Mines d'Ain Barbar	358	368	404	682	837	1,375
Total	12,922	11,763	13,602	69,957	57,523	64,274

Source. Chambre Syndicale des Mines d'Algérie-Compte, Rendu-de L'Assemblée Générale Annuelle, June 1965.

Fertilizer Materials.—Limited production of phosphate rock continued at the nearly exhausted Kouif deposit. Exports were resumed, 57,000 tons from Kouif stockpiles and mine cleanup work reportedly having been sold, largely to West Germany and France. Development continued on the new deposit at Djebel Onk, where reserves in excess of 500 million tons have been established. Railroad and electric power connections and a new town site have been developed. One hundred 48-ton rail cars for phosphate haulage were fabricated at Annaba, where port loading facilities used for Kouif phosphate will also be used for Djebel Onk phosphate. Société du Djebel Onk, in which the Algerian Government holds a one-third interest, was formed as mine operator. A treatment plant for crushing, cleaning, calcining, washing, and drying was under construction during the year. Crude phosphate rock of 53 to 60-percent bone phosphate of lime (BPL) is to be upgraded to 75-percent BPL. Production at an annual rate of 800,000 tons has been anticipated for 1966.

Algeria continued to import large quantities of nitrogenous and potassic fertilizers from the European Common Market countries, principally France. Superphosphate was produced at plants in Oran, Algiers, and Annaba.

Pyrite. — Labor-management difficulties at the Aïn Ben Merouane mine, Algeria's only operating pyrite mine, resulted in a production decline and led to reorganization of the mine by BAREM. During the year BAREM installed new flotation equipment and began exploratory drilling. Pyrite consumption at fertilizer plants was 23,256 tons, and 35,880 tons were exported to Italy and France.

MINERAL FUELS

Coal.—Reported plans to close the BAREM-managed coal mine of Houilleres du Sud Oranais, following conversion of the thermal-electric powerplant at Colomb-Béchar to diesel fuel, have apparently been postponed. BAREM has introduced measures to reduce costs.

Petroleum.—Crude oil production dropped slightly below the 1964 rate but remained near the maximum for available pipeline capacity during 1964–65 (daily rate of about 550,000 barrels). Construction work continued on the new Haoud el Hamra-Arzew pipeline, which is expected to add about 200,000 barrels per day to pipeline capacity and a further 240,000 barrels daily when additional pumping stations, planned for a later date, are completed. The pipeline construction contract between Société Nationale de Transport et de Commercialization des Hydrocarbures (SONATRACH), an Algerian Government agency, and John Brown Ltd., a British firm, called for completion of the initial project in October 1965. However, construction problems developed, chiefly in transportation of equipment inland from the Oran docks and a shortage of experienced labor. Thus commercial use of the line was delayed until early 1966. During the year, the line was welded out and tested, and the crude-oil tank farm was installed at the Arzew terminal. In October, the first of three vessels for pilotage, customs, and mooring duties was completed in the United Kingdom for John Brown Ltd., which will operate the port under contract with the Algerian Government. In November, 17 companies signed contracts for the delivery of crude oil through the new line.

A second major expansion in the Compagnie de Transport par Pipe-lines au Sahara (TRAPSA) pipeline, connecting the Polignac Basin oilfields to the port at La Skhirra in Tunisia, was completed in April. Capacity was increased from 200,000 to 270,000 barrels daily with the addition of two new pumping stations, very-high frequency control, and new communications equipment.

Potential production at several large oilfields in the Triassic and Polignac basins remained partially or wholly shut-in. The new SONATRACH pipeline will permit increased production at the Rhourde el Baguel, Gassi Touil, and El Gassi-El Agreb fields. A new 16-inch feeder line was under construction from the latter to the Haoud el Hamra gathering center. A new line between the Zarzaitine Northeast and main Zarzaitine fields permitted the flow of natural gas liquids from the large Alrar gasfield. Other feeder lines were under construction or planned.

The pilot gas-injection project in the Hassi Messaoud field, involving seven wells, was completed. Details on success of the project were not available at yearend, but

preliminary reports indicated favorable results.

Compagnie de Recherches et d'Exploitation du Pétrole au Sahara (CREPS), the country's largest crude oil producer, commenced water injection [8] of 9 to 10 million gallons per day in 20 to 30 wells in the large Zarzaitine field, where production fell 19 percent in 1965. Difficulties were encountered in maintaining an adequate water supply and in injecting water to the oil-bearing zones.

Exploration and Development.—Exploratory drilling declined sharply during 1965; most petroleum drilling activity was developmental, testing for extensions of structures and oil deposits in and near producing fields. The following data indicate the change in these activities during 1964–65:

	1964	1965
Exploration:		
Geophysical team-months	119.3	40.7
Footage drilled thousand feet	302	161
Number of wells completed	52	24
Development:		
Footage drilled thousand feet	472	512
Number of wells completed	82	88

The decline in drilling activity was attributed to the lack of sufficient pipeline capacity to deliver additional oil and to uncertainty regarding the future of the industry during the French-Algerian oil negotiations, which terminated in July 1965. The only seismic programs operating late in the year were sponsored by the Algerian Government. Step out drilling by Compagnie des Pétroles France-Afrique (COPEFA) at Gassi Touil and by Sinclair Sahara Petroleum Co. at Rhourde el Baguel increased reserves at these fields. New oil reserves were proved at Rhourde Hamra. Extension drilling also resulted in increased oil reserves at the Tin Fouyé North and East fields and increased gas reserves at Tin Fouyé West, Oued Zenani, and Zarzaitine. Drilling continued at Askarène and Guelta late in the year.

Of the 24 exploratory wells completed, 2 led to commercial discoveries. Compagnie Française des Pétroles (Algérie) (CFPA) discovered commercial oil at Haoud Berkaoui, west of Hassi Messaoud, and Société Nationale de Recherche et d'Exploration des Pétroles en Algérie (SNREPAL) discovered oil at Nezla Nard on its Oued Mya permit, south of Hassi Messaoud. Of the 134 exploratory and development wells drilled in 1964 (the latest year for which details are available), 72 were successful oil wells, 11 were gas wells, and 51 were dry holes.

Oilfields at In Aksmil, Hassi Mazoula, and Temedratine became new producers during the year. The large Alrar gasfield was productive during a lengthy trial run.

Table 5.—Algeria: Crude oil production by field

(Thousand metric tons)

Oilfield	1963	1964
Hassi Messaoud South	6,563	7,319
Zarzaitine	6,687	6,592
Hassi Messaoud North	4,382	4,938
Edjeleh	1,826	1,846
Tin Fouyé North	785	1,203
Rhourde el Baguel	183	1,011
Ohanet North	711	799
El Gassi-El Agreb	1,117	715
Tiguentourine	482	544
El Adeb Larache	494	486
Other	425	773
Total	23,655	26,226

Natural Gas.—Marketing of dry natural gas more than doubled during 1965, largely because of expansion of export markets for liquefied methane. Production of natural gas liquids (condensate) increased correspondingly. The Hassi R'Mel gasfield remained the predominant source. Reported recoverable reserves of 35.3 million million cubic feet [9] ranked this field as one of the world's largest.

Production remained small relative to potential gas output, but the Algerian Government made plans for moving more natural gas to Mediterranean ports. Another gas pipeline connecting the Rhourde Nouss, Gassi Touil, and Alrar fields to the coast was considered.[10] Existing pipelines were also to be expanded. The Société de Transport du Gaz Naturel d'Hassi R-Mel à Arzew (SOTHRA) line from the Hassi R'Mel gasfield to Arzew has a new dis-

[8] United Nations, Economic Commission for Asia and the Far East, Symposium on the Development of Petroleum Resources of Asia and the Far East. The Zarzaitine Field, Exploration Progress, Pressure Maintenance Schedule. Tokyo, Nov. 10–20, 1965, 19 pp.

[9] Oil and Gas International. French Firm Exports First Hassi R'Mel Natural Gas, v. 5, No. 3, March 1965, pp. 42–45.

[10] Institute of Petroleum Review. V. 19, No. 219, March 1965, p. 83.

patcher at St. Leu, near Oran, which is provided with telemetry and telecommand equipment for future use with pumping stations. This equipment will carry out routine and alarm inspections of the line and will regulate the pumps.

Delivery of liquefied methane to the United Kingdom, commenced in late 1964, continued at an annual rate of 1-billion cubic-meters gas equivalent (700,000 tons liquid methane). The French tanker vessel, *Jules Verne,* arrived at Arzew in March to load the first shipment of liquefied methane for delivery to Le Havre.

Minor operational difficulties with refrigerator compressors and refrigerant leakage were experienced at the Arzew liquefaction plant of Compagnie Algérienne du Methane Liquids (CAMEL), but the first year of operation was considered successful. The plant and process were described in several sources.[11]

Early in the year, Spain and Algeria signed a trade pact for future Spanish purchases of Algerian gas and oil in exchange for Algerian purchases of industrial goods from Spain. Algerian authorities also negotiated for future markets for Sahara gas in Austria, Yugoslavia, and Czechoslovakia, either by tanker shipment of liquid methane or possibly by sub-Mediterranean pipeline delivery of gas.

Electricité et Gaz Algérienne (EGA), the Algerian public utility company, announced a policy of uniform gas prices and a 30-percent lowering of rates, effective January 1, 1966.

Refinery Products.—The new Algiers refinery of Société de la Raffinerie d'Alger (SRA), on stream in early 1964, completed its first full calendar year of production. Operations were not continual during 1965 because of occasional shortages of crude oil and because of a limited domestic demand for petroleum products. Crude oil throughput was 1,603,000 tons during the year. Imports of refined products were curtailed during 1964 (and apparently also in 1965, although data are not available), because the refinery was able to provide most domestic supplies.

The small Hassi Messaoud refinery continued to provide gasoline, distillate fuel oil, kerosine, and liquefied petroleum gas for the local market; estimated crude oil throughput was 1.5 million barrels, and refined product output was 1.4 million barrels, during the year.

In March, the Algerian Government announced plans for two new 3- to 5-million-ton refineries, possibly at Arzew and Algiers. but there were no further developments on this by yearend. Société Nationale Distribution was announced as a new government agency concerned with distribution and sales of petroleum products to government organizations and the armed forces.

French-Algerian Petroleum Agreements.—Yearend 1965 marked the beginning of a new petroleum policy in Algeria. After 20 months the French-Algerian oil negotiations were terminated in July; the agreements were ratified by the French National Assembly in October; instruments of ratification were exchanged in Paris on November 30; and the new policy became effective 30 days later. The accords were for 15 years' duration, renegotiable at 5-year intervals with agreement of both parties.

The negotiations and accords reached were the subject of considerable interest to the petroleum world during the year.[12] The accords reportedly comprised 53 articles and 12 annexes. France retained a privileged position in oil and gas exploration and development; Algeria was to receive greater financial returns (higher tax rates including new tax-reference prices, stricter tax allowances and regulations on capital remittance, larger share in profits), a more active role in all sectors of the petroleum industry, and long-term French financial and technical aid.

Of particular interest was the "Cooperative Association," created for joint French-Algerian exploration and development of 70,000 square miles of prime oil land. Late in the year it was announced that the Algerian partner would be a subdivision of SONATRACH, and the French partner

[11] Europe and Oil, January 1965, pp. 26–30. The Institute of Petroleum Review. Part II, The Liquefaction Plant at Arzew, v. 19, No. 217, January 1965, pp. 1–4. Pipe Line Industry, October 1965, pp. 33–35.

[12] World Petroleum Report 1965. V. XI, Mar. 15, 1965, pp. 108–116; Petroleum Times. V. 69, No. 1775, Aug. 20, 1965, pp. 443–444; Oil and Gas Journal. V. 63, No. 31, Aug. 2, 1965, pp. 84–86; Petroleum Press Service. V. 32, No. 9, September 1965, pp. 324–327; Arab Oil. August–September 1965, pp. 38–40.

was established under the name Société Pétrolière Française en Algérie.[13]

Following announcement of the French-Algerian oil accords, Algerian authorities spelled out the effect of these accords on non-French, foreign oil companies in the country.[14] Compliance with the higher tax rates and the new amortization-depletion provisions was expected, but the effects of the tax-reference price system and the role of non-French companies in future exploration and development remained unsettled at yearend.

[13] U.S. Embassy, Algiers, Algeria. Airgram A-341, Feb. 11, 1966, p. 3.
[14] Oil and Gas Journal. V. 64, No. 3, Jan. 17, 1966, p. 48.

The Mineral Industry of Angola, Mozambique, and Portuguese Guinea

By Henry E. Stipp [1]

The mineral industries of the Portuguese Provinces of Angola and Mozambique had a combined production (excluding petroleum refinery products) valued at approximately $64.0 million [2] in 1965 compared with $63.1 million in 1964. There was no mineral production recorded in Portuguese Guinea.

Exports of diamond and iron ore remained an important source of foreign exchange for Angola. In 1965 this province ranked seventh on a quantity basis among world diamond producers with output valued at $32.5 million. Iron ore production was valued at $6.5 million. Mozambique ranked fourth among world producers of columbite-tantalite and ranked fifth as a world producer of beryl.

The most significant event relating to minerals in Angola was the agreement between Companhia Mineira do Lobito and a European syndicate to develop the Cassinga iron ore deposits. In Mozambique the most important minerals development in 1965 was the drilling of the fourth productive gas well near Inhassoro.

ANGOLA

Mineral production in Angola decreased in quantity from that of 1964, but the value remained relatively the same. Although output of two of the principal minerals of Angola, iron ore and crude petroleum, decreased, the production and unit value of diamond, one of Angola's chief sources of foreign exchange, increased. Angola's mining industries were characterized as offering the brightest prospects for the economy of the Province in the immediate future.[3] Foreign investor interest in this field has been significant. The Government recently has shown considerable interest in attracting foreign investment. A decree was issued authorizing the establishment of firms in nonstrategic fields with 100 percent foreign capital throughout Portuguese territory. The decree also guaranteed full remittance of profits and repatriation of capital for such investments. A law was also issued providing greater protection of local industry from foreign competition.

In 1965, Angola's mining industry employed 30,249 salaried workers compared with total employment by private industry of 357,851 salaried workers.

PRODUCTION

The principal mineral commodities produced in Angola were diamond, crude oil, refinery products, and iron ore. Diamond production increased slightly in 1965 compared with the diamond output in 1964. Crude oil output was reduced sharply because of a revision downward in the estimated reserves of the Tobias field. Total output of refinery products in 1965 increased about 4.6 percent over that of 1964. Iron ore output was reduced reportedly because of rail transportation difficulties to the ports of Mocamedes, Lobito, and Luanda. Production of metals, minerals,

[1] Physical scientist, Division of International Activities.

[2] Unless otherwise noted, values for 1965 have been converted from escudos (Esc.) to U.S. dollars at the rate of Esc. 28.57=US$1.00.

[3] U.S. Consulate, Luanda. Economic Summary-Angola. State Department Airgram 100, Jan. 20, 1966, p. 25.

and mineral fuels (excluding petroleum products) was valued at about $56.4 million compared with output valued at about $56 million in 1964. Refined petroleum products were valued at $10.1 million, down from $14.9 million in 1964. Diamond was valued at $32.5 million, an increase over the $28.7 million in 1964.

Table 1.—Angola: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Copper:					
Mine	927	1,134	130	---	---
Smelter	850	783	101	---	---
Gold, troy ounces	48	77	37	7	2
Iron ore, thousand tons	812	752	638	r 899	815
Manganese ore	20,589	12,781	---	---	---
Nonmetals:					
Cement, thousand tons	157	169	194	214	245
Diamonds:					
Gem, thousand carats	751	762	759	873	890
Industrial, do	397	319	325	276	266
Gypsum	r 11,498	16,305	14,208	e r 14,000	e 14,000
Mica:					
Sheet	2	---	---	---	---
Scrap and splittings	23	49	---	---	---
Salt, thousand tons	67	60	69	81	59
Mineral fuels:					
Asphalt, natural	22,783	36,237	54,741	44,167	22,874
Petroleum:					
Crude	104,429	471,236	799,657	904,757	655,365
Refinery products:					
Gasoline	34,083	55,235	59,775	53,337	---
Kerosine and jet fuel	2,553	3,625	12,594	35,735	43,939
Distillate fuel oil	90,748	183,755	253,536	258,695	291,179
Residual fuel oil	68,725	89,447	117,773	142,480	173,635
Asphalt	---	2,130	6,071	7,264	10,478
Liquefied petroleum gas	1,596	3,035	4,149	6,118	7,460
Total	197,705	337,227	453,898	503,629	526,691

e Estimate. r Revised. NA Not available.

TRADE

Detailed trade data for Angola were not available for 1964 and 1965, but on the basis of preliminary official returns, it was apparent that mineral exports in 1965 again accounted for about one-fifth of total Angolan exports, while mineral imports accounted for an increasing share of total imports as shown below:

	Value (million dollars)		Minerals commodities share of total (percent)
	Mineral commodities [1]	Total commodities [2]	
Exports:			
1964 [3]	41.2	r 205.3	20.0
1965	42.4	201.6	21.0
Imports:			
1964 [3]	10.1	165.0	6.1
1965	17.7	196.5	9.0
Trade balance:			
1964	+31.1	r +40.3	XX
1965	+24.7	+5.1	XX

r Revised. XX Not applicable.

[1] Values given are for those mineral commodities listed in table 3.

[2] Source: Boletim do Instituto Nacional de Estatistica. XI–Ultramar. No. 3, March 1965, p. 7; No. 4, April 1966, p. 5.

[3] Where necessary, monetary conversions for 1964 have been made at the rate of 28.58 escudo=US$1.00.

Among reported mineral export commodities, diamond, valued at $31.7 million, accounted for about 75 percent of the total value in 1965. Iron ore, valued at approximately $5.1 million, accounted for about 12 percent of the total value. Crude oil and petroleum product exports together were valued at approximately $4.2 million and ranked third among Angolan mineral exports accounting for about 10 perecent of the total value.

The principal metal and mineral import groups of Angola in 1965 were iron and steel products, valued at $13.0 million, and petroleum refinery products, valued at about $3.1 million.

In 1965, metropolitan Portugal remained Angola's principal trading partner on the basis of trade in all commodities, as shown in the following tabulation:

Trading partner	Percent of total Angolan exports received	Percent of total Angolan imports supplied
Portugal	35.2	47.5
United States	23.1	7.9
United Kingdom	1.3	11.2
Netherlands	11.8	1.6
Germany, Federal Republic of	5.5	8.2
Other African countries	4.1	2.6

The delivery of diamond exports to Portugal rather than to the United Kingdom that began in 1964 was intensified in 1965 when the total exports of this commodity were delivered to Portugal. As a result, the United Kingdom, the chief recipient of Angolan mineral exports in 1963, declined as a prominent recipient of total exports.

Table 2.—Angola: Foreign trade of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations and sources, 1965
Exports:				
Metals:				
Copper, unrefined and matte	178	111	---	
Iron ore	665,536	r 1,120,337	683,079	West Germany 505,381; Japan 154,762; Spain 22,931.
Manganese ore	2,915	9,636	862	United States 608; United Kingdom 254.
Nonmetals:				
Cement	24,432	56,107	81,681	NA.
Diamond—thousand carats	1,293	1,095	1,157	All to Portugal.
Salt	24,341	r 33,901	24,711	NA.
Mineral fuels:				
Petroleum:				
Crude	317,715	361,050	114,182	All to Portugal.
Refinery products:				
Gasoline	23,771	r 9,295	1,824	NA.
Residual fuel oil	170,963	200,140	200,296	All to Portugal.
Imports:				
Metals:				
Iron and steel:				
Crude and rolled products	22,036	29,922	48,999	Belgium-Luxembourg 13,556; France 4,852; West Germany 3,472.
Pipe and fittings	451	r 3,853	5,176	NA.
Nonmetals:				
Fertilizers	5,531	r 14,930	1,886	NA.
Tile and similar products	1,213	1,207	NA	
Mineral fuels:				
Coal	4,186	30,118	20,231	NA.
Coke and semicoke	5,413	9,737	---	
Petroleum refinery products:				
Gasoline	10,541	10,303	6,554	NA.
Kerosine	6,944	6,116	---	
Fuel oil, not further described	15,774	12,080	22,466	NA.
Lubricants	9,619	9,531	10,146	United States 4,598; United Kingdom 1,771; Netherlands 1,309.

r Revised. NA Not available.

COMMODITY REVIEW

Metals.—*Beryl.*—Deposits containing about 10 percent beryllium oxide (BeO) were reportedly discovered in the Huila district of southern Angola.[4]

Copper.—There was no production of copper in 1965. Three concessions for prospecting and producing copper were in effect.[5] The Angolan Copper Company, which had operated the exhausted Mavoio deposits, was reportedly negotiating with another firm for joint exploitation of the Tetelo deposits. These deposits in the high Zambeze area were estimated to comprise 10 million tons of minerals containing 3 to 4 percent copper.[6] The Angolan Mining Company, an affiliate of Anglo-American Corporation of South Africa Ltd., claimed to have located possibly exploitable deposits in its concession in the east-central panhandle of Angola. The Lobito Mining Company, which discovered indications of rich copper in the Mocamedes district, was assessing reserves. These deposits are near a major railroad and an excellent port.

Gold.—Although production has been declining since 1962, government officials indicated that potential production could be much larger than that reflected by production statistics, especially in the central plateau of the Province.[7]

[4] Mining Journal (London). Angola-Beryl. V. 264, No. 6763, Apr. 2, 1965, p. 251.
[5] Pages 29, 30 of work cited in footnote 3.
[6] Annales Des Mines. Metaux Courants-Cuivre. May 1966, p. 408.
[7] Page 31 of work cited in footnote 3.

Iron Ore.—Production of ore was reduced in the later months of 1965, owing to transportation difficulties.[8] About 250,000 tons of high-grade ore were stockpiled at the Cuima and Cassinga mines of Companhia Mineira do Lobito awaiting transport to the coast.

The Cassinga mining operation of Companhia Mineira do Lobito and its subsidiary, the Lombig Mining Company, continued to be a major economic hope of the Province.[9] The conclusion of a series of agreements was reached with a consortium headed by Krupp interests of West Germany, for development of the Cassinga iron ore deposits.[10] Cia. Mineira do Lobito placed contracts with the Krupp Consortium valued at $52 million for mining and transportation equipment, telecommunications and port-loading facilities. Total iron ore reserves in the Cassinga area were estimated at 30 million tons of high-grade (68 percent iron) ore, 75 millon tons of pebble ore (62 to 64 percent iron) and several hundred million tons of low-grade (42 to 45 percent iron) ore. At yearend Companhia Mineira do Lobito reportedly signed contracts with six Japanese steel companies for delivery of 1 million tons of iron ore annually for the next 6 years.[11] The price of the ore, which will come from the Cassinga deposits, was said to be $8.14 per ton for ore of 64-percent iron content. Companhia Mineira do Lobito reportedly has formulated plans for marketing up to 5 million tons of Cassinga ore annually by 1967.

Manganese Ore.—There has been no production since 1962, but exports from existing stocks continued in 1965. The Angolan Manganese Company made shipments from the production of established mines at Saia. The Bermanite-Quissama Company shipped ore recovered from prospecting operations. However, both companies have had difficulty locating markets because of high silicate and sulfur content of the ore.[12] There has been a large cutback in prospecting, and the Angolan Manganese Co. was concentrating on iron ore production.

Tin.—A tin deposit was reportedly discovered in the Lau region.[13]

Nonmetals. — *Diamond.* — Companhia de Diamantes de Angola (DIAMANG) continued to produce diamonds in northeastern Angola at a rate of more than 1 million carats per year. The company employed 29,000 workers, making it the largest private employer in Angola.[14] In 1964, 76 percent of total output mined was gem quality and 24 percent was industrial quality. Diamond exports since 1963 have been made through a new subsidiary of DIAMANG, the Sociedade Portuguesa de Lapidacao de Diamantes in Lisbon. The Angola Exploration Co. (Pty.), Ltd., which was given a concession in 1964, lost it for failure to put down the necessary funds required by the contract. In November 1964, the Government awarded a concession to Joao Antonio Veiga, a local businessman. The concession area covers most of the Angolan coast from Ambriz south to the Southwest African border. Veiga reportedly began exploration activity in the south, but sales of diamond were not shown by Veiga in 1965. An application for exploration rights was pending for Wynand Johannes du Toit.

Mica.—Production ceased with the beginning of the rebellion because the most important mines were in areas where access was precarious.[15] There was some production of scrap mica in southern Angola, but foreign marketing of this material has been difficult.

Phosphates.—Studies by the Angolan Government reportedly have confirmed 27 million tons of exploitable reserves, about 15 million tons in the Cabinda area and 12 million tons on the northwestern coast, north of Ambrizete.[16] Four companies applied for concessions in these areas. They were as follows: Fosfangol, an affiliate of Cia. Uniao do Fabril; COFRAMET, a

[8] Mining Journal (London). Angolan Iron Ore Held Up. V. 265, No. 6799, Dec. 10, 1965, p. 429.
[9] Page 28 of work cited in footnote 3.
[10] Engineering and Mining Journal. V. 166, No. 8, August 1965, p. 122.
[11] Mining Journal (London). Angola. V. 266, No. 6809, Feb. 18, 1966, p. 116.
[12] Page 30 of work cited in footnote 3.
[13] Mining Journal (London). V. 265, No. 6789, Oct. 1, 1965, p. 237.
[14] Page 24 of work cited in footnote 3.
[15] Page 31 of work cited in footnote 3.
[16] Page 30 of work cited in footnote 3.

French company; and the Lobito Mining Company.

Salt.—Production of salt remained an important local small industry, particularly in towns such as Lobito and Mocamedes, where salt was used chiefly for drying fish.

Mineral Fuels.—*Asphalt, Natural.*—Two major companies produced 22,874 tons in 1965. All output was consumed locally.

Petroleum.—This industry, which includes crude production, refining, and distribution, again ranked as the third most important economic activity in Angola next to the coffee and diamond industries. Total investment at the beginning of 1965 in crude production and refining was calculated at about $75 million. The gross product of the industry in 1965 was valued at about $11 million. An agreement was reached between the Portuguese Government and Companhia de Petroleos de Angola (Petrangol), under which Petrangol's exploration permits in Angola were extended to yearend 1970.[17] The company was to spend $26 million in the Cuanza area of central Angola and in the northern area of Angola. The agreement was renewable for an additional 5 years. The estimate of reserves in Compagnie Financiere de Petroles (Petrofina), the parent concern of Petrangol, Tobias deposit was revised downward to 60 million barrels from the previous estimate of 200 million barrels.[18] This resulted in a sharp reduction in crude production and exports in 1965. Total Angolan reserves of crude oil were estimated at 100 million barrels.

About 83 percent of the 1965 crude production was refined locally in the 650,000-ton capacity Petrofina refinery, the only one in Angola. All the refinery's production was consumed locally except for 1,824 tons of gasoline and 200,296 tons of fuel oil.

Affiliates of two United States firms, Mobil Oil Portuguesa and Texaco Africa, Ltd. were engaged in petroleum distribution in Angola, operating in competition with two foreign companies (Shell Company of West Africa, Ltd. and Petrofina) and one Portuguese company, Sociedade Anonima Concessionaria Da Refinacao De Petroleos Em Portugal.

MOZAMBIQUE

The mineral industry of Mozambique, producing metals and minerals valued at about $7.5 million in 1965, was small compared with world standards. The refining of imported crude oil by the Matola refinery also produced products valued at about $8.4 million. The two principal mining activities in Mozambique were the production of coal near Tete and the recovery of columbite-tantalite and associated minerals from pegmatites of the Alto Ligonha district, southwest of Nampula.[19] The most significant development has been the recent discovery of natural gas in the Pande area near Inhassaro and in the Buzi area near Beira.

Much of Mozambique's income was derived from the shipment of minerals, fuels, and other materials from and to landlocked neighboring countries.

PRODUCTION

Production of metals, minerals, and mineral fuels decreased generally in 1965 compared with that of 1964. Output of columbium and tantalum minerals and concentrates, one of Mozambique's principal earners of foreign exchange, decreased 31 percent from 1964, and bituminous coal, another important export item, dropped slightly in output. Petroleum refinery output decreased 30 percent from that of 1964. The only mineral commodities to show a significant increase in production were montmorillonite, tourmaline, and cement.

[17] Petroleum Press Service. Angola-Exploration Agreement Extended. V. 33, No. 1, January 1966, p. 30.

[18] Page 26 of work cited in footnote 3.

[19] U.S. Consulate, Johannesburg. Notes on the Mozambique Mining Industry. State Department Airgram 263, Jan. 13, 1966, p. 1.

Table 3.—Mozambique: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 [1]
Metals:					
Bauxite	4,671	6,216	6,593	6,278	5,683
Beryl	973	569	556	383	219
Bismuth	22	8	14	8	6
Cesium (pollucite)	4	---	NA	4	7
Columbium and tantalum concentrate [3]	169	r 157	153	200	137
Copper ore (chalcopyrite)	---	---	---	r 122	340
Gold, troy ounces	105	91	29	40	32
Tin ore (cassiterite), kilograms	---	---	---	---	101
Nonmetals:					
Asbestos	147	336	---	---	80
Cement, thousand tons	212	179	167	182	220
Clays:					
Common	129,449	90,573	NA	NA	NA
Kaolin	120	180	5	10	150
Montmorillonite	40	37	800	825	2,723
Diatomite	360	350	---	959	NA
Granite	730,394	387,267	NA	NA	NA
Lime	7,454	6,543	NA	NA	NA
Limestone	433,817	318,129	NA	NA	NA
Lithium (lepidolite)	154	274	104	---	75
Mica, including scrap	2	1	---	---	10
Perlite	---	---	---	---	24
Salt	22,345	r 27,506	e 27,000	NA	[4] 30
Sand and gravel	130,489	205,218	NA	NA	NA
Tourmaline, kilograms	289	522	316	p 2,455	317
Quarry products, not elsewhere specified	62,574	87,550	(2)	(2)	(2)
Mineral fuels:					
Coal, bituminous, thousand tons	321	298	283	245	238
Petroleum refinery products:					
Gasoline	84,310	91,787	94,303	101,627	104,438
Distillate fuel oil	125,213	116,645	116,734	133,820	148,244
Residual fuel oil	218,143	214,411	230,659	246,261	241,687
Butane	---	---	1,337	2,239	2,567
Total	427,666	422,843	443,033	483,947	496,936

e Estimate. p Preliminary. r Revised. NA Not available.

[1] In addition to items listed, 1965 recorded output also included monazite-tantalite 12,675 kilograms, microlite-gahnite 628 kilograms, euxenite 200 kilograms, feldspar 50,000 kilograms, quartz 405,400 kilograms, and samarskite 1,250 kilograms.

[2] In addition to commodities listed, production included quarry products for which detailed statistics were not available.

[3] Includes microlite, 53 tons in 1962; 73 tons in 1963; 154 tons in 1964; 85 tons in 1965.

[4] Rock salt, sea salt figures not available.

TRADE

Detailed data on trade for Mozambique were not available for 1964 and 1965. However, based upon official reports of the value of selected mineral commodities traded, reports of the value of total trade for the entire year of 1964, and reports of the value of the first 11 months of 1965, it could be estimated that trade in mineral and in total commodities for 1965 was approximately the same as that of 1964.

In 1965, exports of petroleum products valued at about $6.6 million accounted for the largest part of mineral exports and constituted about 6.7 percent of total exports. Metalliferous ores and metal scrap shipments from Mozambique were second in value amounting to about $1.5 million, followed by exports of coal, coke, and briquets valued at $0.7 million.

Mineral imports for 1965 were about three times as large as exports, contributing to the adverse balance of trade in mineral commodities as well as in total merchandise trade. Imports of iron and steel products valued at $11.3 million accounted for the

	Value (million dollars) [1]		Mineral commodities share of total (percent)
	Mineral commodities	Total commodities	
Exports:			
1964	9.1	106.5	8.5
1965 [2]	8.7	98.0	8.9
Imports:			
1964	26.4	156.8	16.8
1965 [2]	24.6	154.5	15.9
Trade balance:			
1965	−17.3	−50.3	XX
1965	−15.9	−56.5	XX

XX Not applicable.

[1] Values given were obtained from Boletim do Instituto Nacional de Estatistica. XI-ULTRAMAR (overseas areas). No. 4 and No. 6, April 1965 and June 1966, pp. 7, 17–19 and pp. 6, 18–20.

[2] Values for mineral commodities and total trade in 1965 are for the first 11 months of the year only.

largest part of mineral imports and were about 7.3 percent of total commodity imports. Crude oil imports valued at $7.7 million were second in importance, followed by petroleum products valued at $3.0 million, coal and coke valued at $1.5 million, and fertilizers valued at $1.1 million.

Portugal continued its role as Mozambique's principal trading partner in 1965,[20] based upon trade in all commodities, as shown in the following tabulation:

Country	Percent of total Mozambique exports received	Percent of total imports supplied
Portugal	37.2	35.0
South Africa, Republic of	10.7	10.5
United Kingdom	4.7	10.6
Germany, Federal Republic of	3.7	7.7
India	14.4	.1
United States	4.9	3.8
Other African countries	5.5	1.7

The ports of Beira and Lourenco Marques in Mozambique continued to serve as the principal points of entry and exit for commodities transshipped through Mozambique by the countries of Zambia, Democratic Republic of the Congo (Kinshasa), Malawi, Southern Rhodesia, and Swaziland, and in addition received and shipped some goods for the Republic of South Africa. For calendar year 1965, minerals loaded at Beira totaled 1,023,469 tons compared with 935,633 tons in 1964.[21] Cargo off-loaded in 1965 included 851 tons of cement and 954,863 tons of petroleum products compared with 536 tons of cement and 582,814 tons of petroleum products in 1964. At the port of Lourenco Marques 3,556,697 tons of minerals were loaded in 1965 compared with 2,497,393 tons loaded in 1964. The quantity of fuel loaded in 1965 totaled 391,281 tons compared with 406,766 tons loaded in 1964. Coal exports from the port were 598,158 tons in 1965 compared with 579,236 tons exported in 1964. Cargo off-loaded in the 1965 period contained 1,897,488 tons of fuel compared with 1,824,012 tons in 1964.

COMMODITY REVIEW

Metals.—*Columbite and Tantalite.*—Production of 53 tons of concentrates in 1965 (exclusive of microlite) compared with 47 tons mined in 1964, but output generally has been declining since 1960 because of decreased market prices.[22] The principal producers, Sociedade Mineira de Marropino and Empresa Mineira do Alto Ligonha, located southwest of Nampula, were troubled by technical and transportation difficulties. Several firms reportedly were trying to obtain control of the operating concerns. They would like to re-equip and modernize mines and plants to put their operation on a more profitable basis.

Copper.—A mine near Umtali, Rhodesia, was opened in 1963 by Edmundian Investments (Pty.) Ltd.[23] In 1964, production was 122 tons of chalcopyrite containing 20 percent copper, in 1965, 340 tons of ore. Ore reserves were estimated at 12,000 tons with a 10-percent copper content. The mine was flooded in the lower levels, which as a result could not be worked in 1965. A ball mill and small flotation plant with a capacity of 100 tons per month were located near the mine. Rand Mines, Ltd. of Johannesburg signed an agreement with the operating company to explore the mineralized area near the mine.

Gold.—Deposits were reportedly found in the Lourenco Marques district, near Matola.[24] A group said to be connected with outside interests applied for a concession to explore for gold, silver, and asbestos.

Ilmenite.—Large deposits were located near Port Pebane on the Mozambique channel.[25] Potential exports could approach 30,000 tons per year; however, the deposits were not being worked because of transportation problems.

Iron Ore.—Large reserves of iron ore with a high content of titanium were found in the Tete district.[26] The deposits were not being developed because the long distance to the coast would make ore shipments too expensive for profitable operation. Deposits at Namapa, district of Moçambique were being considered for investigation in order to estimate the area's mineral potential.[27]

[20] Trade for 1965 based upon statistics for the first 11 months of year.
[21] Boletim, Portos, Caminhos De Ferro E Transportes De Moçambique. No. 3, March 1966, pp. 30–33.
[22] U.S. Consul General Johannesburg, Republic of South Africa. State Department Airgram 263, Jan. 13, 1966, p. 2.
[23] Work cited in footnote 22.
[24] U.S. Consulate, Lourenco Marques, Mozambique. State Department Airgram 178, Jan. 12, 1965, p. 5.
[25] Mining Annual Review (London). Mozambique. Mining Journal, May 1966, p. 221.
[26] Work cited in footnote 28.
[27] Overseas Review (London). Moçambique. Barclays Bank D.C.O., January 1966, p. 23.

Table 4.—Mozambique: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965 [1]	Principal destinations, 1965
Metals:				
Aluminum:				
Bauxite	NA	7,363	5,661	All to Southern Rhodesia.
Semimanufactures	71	254	NA	
Scrap	NA	(2)	NA	
Beryllium: Beryl	NA	424	221	United States 145; Japan 75; United Kingdom 1.
Bismuth: Bismuthite—kilograms	NA	11,000	5,360	United Kingdom 3,360; Netherlands 2,000.
Cesium: Pollucite—do	NA	5,000	7,000	All to Netherlands.
Chromium: Ore and concentrate	NA	[3] 10,789	NA	
Columbium and tantalum:				
Columbite-tantalite kilograms	NA	76,950	65,040	United States 51,000; United Kingdom 14,040.
Microlite—do	NA	126,500	95,300	United States 57,000; Netherlands 20,000; United Kingdom 18,300.
Copper:				
Chalcopyrites	---	20	330	Belgium 260; Japan 70.
Matte	NA	[3] 117	NA	
Scrap	280	[3] 759	NA	
Iron and steel:				
Ore and concentrate	NA	[3] 139,000	NA	
Rolled products	15	NA	NA	
Pig and cast iron	NA	[3] 43,082	NA	
Ferroalloys	NA	[3] 4,193	NA	
Scrap	4,742	[3] 2,522	NA	
Lead	157	NA	NA	
Lithium: Lepidolite	---	---	75	All to Netherlands.
Manganese: Ore and concentrate	NA	[3] 17,687	NA	
Metallic ores, unspecified	5,935	NA	NA	
Nonferrous metal scrap and waste	NA	[3] 1,096	NA	
Nonmetals:				
Amazonite—kilograms	NA	25	2,800	West Germany 2,700; Southern Rhodesia 100.
Asbestos	[e] 45	[3] 2,325	149	United Kingdom 105; United States 38; Rhodesia 6.
Clays:				
Montmorillonite	NA	872	2,588	Netherlands 693; Belgium 582; Australia 340.
Other	NA	[3] 1,460	NA	
Total clay	NA	[3] 2,332	NA	
Euxenite—kilograms	NA	NA	6,600	All to United States.
Fertilizer materials, crude	(4)	NA	NA	
Mica, scrap—kilograms	---	---	10,000	All to Portugal.
Perlite—do	---	---	23,600	All to Republic of South Africa.
Quartz, rose—do	NA	452	172	All to Southern Rhodesia.
Salt	3,432	NA	NA	
Mineral fuels:				
Coal, bituminous and coke	63,340	[r] 52,676	98,666	Kenya 53,381; Angola 18,746; Malawi 15,784; Portugal 10,755.
Petroleum refinery products:				
Gasoline	84,208	84,332	[5] 63,752	Republic of South Africa 56,228; Zambia 4,981; Southern Rhodesia 2,542.
Kerosine and diesel oil	[6] 2,342	90,881	[5] 75,508	Republic of South Africa 53,304; Zambia 4,135; Southern Rhodesia 2,350.
Fuel oil, unspecified	329,570	184,912	[5] 183,864	Portugal 112,372; Republic of South Africa 418; Malawi 212; bunkers 70,862.
Lubricants	4	NA	NA	

[e] Estimate. [r] Revised. NA Not available.

[1] Source: U.S. Consulate, Lourenco Marques, Mozambique. Department of State Airgram 5, July 12, 1966, p. 1, encl. 1.

[2] Valued at US$31,000.

[3] Source: Supplement to the World Trade Annual. Africa. Statistical Office of the United Nations, 1964. V. III, pp. 111–596 to 111–612.

[4] Valued at US$704,000.

[5] Petroleum refinery products for 1965 cover period of January through November.

[6] Kerosine only in 1963.

Table 5.—Mozambique: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964 [1]	Principal sources, 1964
Metals: [2]			
Aluminum	394	304	United States 151; West Germany 90; Belgium-Luxembourg 46.
Copper, crude and semimanufactures	667	[3] 369	United Kingdom 70; Italy 64; West Germany 30.
Iron and steel:			
Scrap	114	NA	
Ingots and primary forms	3,604	20,660	Portugal 4,057; others NA.
Semimanufactures	38,246	[3] 36,738	Japan 7,730; Belgium-Luxembourg 4,421; West Germany 4,409.
Lead	116	33,000	NA.
Tin	NA	24	All from United Kingdom.
Nonmetals:			
Asbestos	1,395	11	All from Portugal.
Brick and tile	841	847	Do.
Cement	381	1,038	Do.
Fertilizer materials	17,311	16,683	West Germany 8,345; Portugal 7,171; Belgium-Luxembourg 1,167.
Sand and gravel	738	1,041	All from Portugal.
Stone, building	386	670	Do.
Sulfur	499	4,569	All from Canada.
Other nonmetals	---	120	Portugal 81; United Kingdom 39.
Mineral fuels:			
Coal and coke	293,031	323,105	NA.
Petroleum:			
Crude	436,820	483,967	All from Iraq.
Refinery products:			
Gasoline	10,588	17,805	Spain 10,583; Italy 5,092; Portugal 2,130.
Kerosine	16,133	1,097	All from Italy.
Fuel oil	18,669	9,313	Do.
Lubricants	6,591	1,391	Portugal 662; France 486; Netherlands 243.
Other	---	4,324	Netherlands 1,460; Spain 1,406; United States 743.

NA Not available.

[1] Source: Except where otherwise noted Supplement to the World Trade Annual. Africa; Trade of the Industrialized Nations With Eastern Europe and the Developing Nations, Statistical Office of the United Nations, v. III, 1964, pp. 600–612.

[2] Includes unwrought, scrap, and semimanufactures.

[3] Source: Boletim do Instituto Nacional de Estatistica XI–Ultramar. No. 4, April 1965, p. 18.

Nonmetals. — *Diamond.* — Two residents were granted a concession to prospect for diamonds in the Chicualacuala, Pafurs, and Malvernia regions.[28] A company to exploit any discovery was being formed with a capitalization of about $418,000.

Fertilizers.—A plant for the manufacture of fertilizers and sulfuric acid was to be constructed by Sociedade de Estudos e Investimentos at Lourenco Marques and Société d'Expansion Commerciale et Industrielle of Paris, France.[29] The plant, which will cost over $3.5 million was to start producing in 1967. Annual plant capacity reportedly will be 30,000 tons of superphosphate, 500,000 tons of sulfuric acid, 20,000 tons of ammonia, and 60,000 tons of ammonium sulfate.[30]

Montmorillonite.—Mozambique's only producer of this commodity, Luzinada Umbeluzi Mina, Ltd., located near Lourenco Marques, started mining in 1962.[31] A major share of the company was held by G. & W. Base & Industrial Minerals (Pty.) Ltd. of Johannesburg, Republic of South Africa. The larger part of production was exported in 1965; however, some was consumed locally in oil-well drilling. Markets for the material were said to be uncertain.

Mineral Fuels.—*Petroleum.*—In October a well drilled by the Mozambique Gulf Oil Company in the Pande area, 40 miles from Inhassoro, encountered gas at a depth of 5,316 feet.[32] This was the fourth productive well out of seventeen drilled by the company. All wells have been drilled to depths of from 10,000 to 12,000 feet. The

[28] Mining Journal (London). The Industry in Action. V. 265, No. 6789, Oct. 1, 1965, p. 237.

[29] FDC Israel Newsletter. Mozambique: French-Built Fertilizer Plant. V. 5, No. 9, September 1965, p. 11.

[30] Nitrogen (London). Mozambique. No. 37, September 1966, p. 9.

[31] Work cited in footnote 22.

[32] Work cited in footnote 22.

productive wells, one near Beira and three in the Pande area, have struck gas at depths between 3,000 and 5,000 feet. The Pande area was closer to a potential market, the Johannesburg area; therefore, it has been selected for intensive study. The Beira field will be investigated more thoroughly in the future.

PORTUGUESE GUINEA

Official statistics recorded no exports of metals, minerals and mineral fuels from Portuguese Guinea in 1964 and the first 5 months of 1965. It is unlikely that there was any production of minerals, except minor production of construction materials for local consumption. Total exports in 1964 were 50,110 tons of commodities valued at $5.6 million.[33] During the first 5 months of 1965 total exports were 14,171 tons valued at $1.8 million. In 1964 mineral imports consisted of 6,678 tons of cement valued at $137,785, 10,419 tons of gasoline valued at $930,357; and 10,676 tons of fuel and diesel oil valued at $653,929.[34] During the first 5 months of 1965 mineral imports were cement 4,726 tons valued at $96,964, gasoline 2,965 tons valued at $281,321, kerosine 816 tons valued at $61,893, and fuel and diesel oil 1,835 tons valued at $113,929.[35] In 1964 total imports were 62,249 tons of materials valued at $15.4 million; in the first 5 months of 1965 total imports were 26,084 tons valued at $5.8 million.

Long-term economic development of oil and bauxite deposits was reportedly possible.[36] ESSO Exploration Guiné, a subsidiary of Standard Oil Corp. of New Jersey, was preparing to start oil prospecting in the interior again after 3 years of inactivity. Bauxite deposits of 110,000 tons were reported to occur near the border with Guinea; however, they have not been developed because of transportation and financial difficulties.

---

[33] Where necessary, values have been converted from escudos (Esc) to U.S. dollars at the rate of Esc 28=US$1.00.

[34] Source: Boletim do Instituto Nacional de Estatistica. XI-Ultramar. No. 10, October 1965, p. 21.

[35] Source: Boletim do Instituto Nacional de Estatistica. XI.-Ultramar. No. 4, April 1966, p. 15.

[36] U.S. Embassy, Dakar. State Department Airgram 331, Mar. 21, 1966, p. 1.

The Mineral Industry of Basutoland, Bechuanaland, and Swaziland

By Henry E. Stipp [1]

Metals and mineral production in the British High Commission Territories of Basutoland, Bechuanaland, and Swaziland in 1965 consisted principally of asbestos and iron ore. A number of other commodities were mined in minor quantities. The attainment of full production at Swaziland's Ngwenya iron mine and the increase in coal production at the Mpaka colliery were the most significant events in the mineral industry. Of potential importance to the economy of Bechuanaland was the possibility of exploiting recently discovered copper deposits. The recovery of two large alluvial diamonds in Basutoland was also noteworthy.

The Territories moved closer to a self-governing status in 1965, although Britain retained some responsibility for their economic viability, defense, and foreign relations. Basutoland was scheduled to become independent on October 4, 1966 and will be named the Kingdom of Lesotho. Bechuanaland will become the independent Republic of Botswana on October 1, 1966. Swaziland was to receive internal self-rule in 1966 and was to receive independence at the end of 1969.

BASUTOLAND

The recovery of small quantities of alluvial diamonds by individual Basuto diggers was the only significant productive mineral operation in Basutoland in 1965. A diamond of 103.5 carats was found on September 17 in the Letšeng la Draai diggings, and on October 7 a 527-carat diamond was recovered from these diggings.[2] The number of laborers working at Letšeng la Draai fluctuated between 400 and 600 in 1964. Production of gem diamonds from various diggings in 1965 totaled 2,489 carats valued at $664,785,[3] and industrial stones totaled 3,003 carats valued at $85,160.[4]

The Overseas Geological Survey carried out tests on some kimberlite occurrences and prospected for diamonds in the Orange and Caledon Rivers.[5]

In May the Swaziland Geological Survey, at the request of the Basutoland Government, prospected in the vicinity of Maseru for clay deposits.[6] Preliminary kiln tests indicated that the clay in four fields of the area was suitable for making bricks.

As in previous years Basutoland furnished laborers for work in mines outside the colony, chiefly in the Republic of South Africa. In 1965 the number of Basuto diggers recruited for this work totaled 81,675 compared with 62,985 in 1964.

[1] Physical scientist, Division of International Activities.

[2] The Standard Bank Ltd. Basutoland. The Standard Bank Review (London), November 1965, p. 16.

[3] Where necessary, values have been converted from South African Rands (R) at the rate of R1=US$1.40.

[4] Barclays Bank. Basutoland, Overseas Survey (London), 1966, p. 33.

[5] Mining Journal (London). 1966 Mining Annual Review, May 1966, p. 221.

[6] Swaziland Geological Survey and Mines Department. Clays-Maseru Basutoland, Ch. in Swaziland, Annual Report of the Geological Survey and Mines Department (Mbabane), Dec. 31, 1965, p. 10.

BECHUANALAND

The mineral industry of Bechuanaland continued to decline in importance to the total economy of the country in 1965. The closing of the only producing asbestos mine and the curtailment of manganese ore mining were blows to the mineral economy. However, a number of other deposits were being explored and their development could be of significance in diversifying the economy of the protectorate, which was chiefly agricultural. Reportedly the system of having mineral rights owned by the tribes in their territories has inhibited mineral development. It was theorized that the control of mineral rights by the Government of Bechuanaland would encourage prospecting by the public and by small companies, thus speeding the discovery of mineral deposits. The number of persons recruited for mining work outside the protectorate averaged about 1,600 persons per month during 1965.

PRODUCTION AND TRADE

Total production of metals and minerals in Bechuanaland decreased again to $251,395 compared with $552,000 in 1964. Asbestos output dropped sharply in 1965, owing to the closing of the Moshaneng mine in November. Production of manganese ore also decreased significantly from that of 1964, because of a reduction in the scale of mining at the Ootse mine. A minor quantity of talc was produced during prospecting in the Moshaneng area. Talc could be of future importance if large scale markets could be developed.

Total exports of metals and minerals were valued at $306,803 in 1965 compared with $399,790 in 1964. This was the lowest value recorded for mineral exports since 1957.[7]

Bechuanaland's import of metals and minerals remained negligible. Chief imports consist of general merchandise, textiles, vehicles and spare parts, maize, and other foodstuffs. In 1964 imports (as measured by domestic sales) of gasoline totaled 1,305,960 U.S. gallons and diesel fuel oil totaled 1,992,240 U.S. gallons.

COMMODITY REVIEW

Metals.—*Copper.*—Roan Selection Trust Ltd. continued to make progress in prospecting by diamond drilling at two occurrences.[8] The company reportedly found limited but encouraging quantities of copper minerals in the Matsitamma area, about 95 kilometers west of Francistown. Geophysical surveying and drilling on a copper-nickel deposit at Sedibe, 95 kilometers southeast of Francistown was started in December 1965.[9]

Iron.—The Overseas Geological Survey prospected a deposit of low-grade iron ore (30 to 35 percent iron) in the Bamangwato Tribal Territory.[10] Reserves were estimated at 85 million tons.

Manganese.—Low-grade ore reserves, believed to be large in size, were found in the Bamangwato Tribal Territory by the Overseas Geological Survey.[11] Plans to mine reserves of battery-grade manganese ore in the Lobatsi Block, reported at yearend 1964, were not carried out, and no other new properties were opened.

Nonmetals.—*Asbestos.*—The Moshaneng mine of Marlime Chrysotile Asbestos Corp. Ltd., was placed on a reduced production basis in June and was closed in November. This relatively small mining company was reportedly susceptible to any increase in production costs and marketing problems.[12]

[7] Work cited in footnote 5.
[8] Roan Selection Trust Ltd. (Ndola). Exploration, Annual Report Nov. 20, 1965, p. 29.
[9] Barclays Bank. Bechuanaland, Overseas Review (London), February 1966, p. 21.
[10] Source cited in footnote 5.
[11] Source cited in footnote 5.
[12] Source cited in footnote 5.

Table 1.—Bechuanaland: Production of metals and minerals

Commodity		1961	1962	1963	1964	1965
Metals:						
Gold	troy ounces	261	288	142	9	------
Manganese ore	metric tons	28,791	24,002	10,776	24,599	8,815
Silver	troy ounces	39	33	21	1	------
Nonmetals:						
Asbestos, chrysotile	metric tons	1,745	2,155	2,148	1,960	806
Talc	do	------	------	------	------	48

Diamond.—Kimberlite Searches, Ltd., a subsidiary of De Beers Consolidated Mines Ltd., found encouraging indications of diamonds in the northern Bamangwato Tribal Territory, west of Francistown.[13]

Gypsum.—Fairly large deposits of gypsum reportedly have been discovered in the Foley area; however, they are a long distance from the railroad.[14] Because of the low unit cost for gypsum and the lack of a large nearby market, the deposits probably will not be exploited for a long time.

Salt and Soda Ash.—Technical studies were completed on the brines located in the Sua Pan in the Makarikari Pans area, and a detailed technical report was prepared.[15] A market study of the requirement for soda ash and salt in southern Africa was also made; however, no conclusions were reached on the feasibility of the development of these deposits.

Mineral Fuels.—*Coal.*—Although there are extensive deposits of coal (313 million tons) in the Bamangwato Tribal Territory near the railroad line, it was doubtful that they would be exploited in the near future,[16] because of the low quality and high-moisture content of the coal. A market for coal for some industrial purposes might be developed in the Republic of South Africa, but competition from collieries in the Transvaal would make this difficult.

SWAZILAND

The mineral industry of Swaziland continued to increase in importance to the territory's economy, setting new records in production and export of mineral commodities. Employment in the industry totaled 24,199 laborers including 2,438 skilled workers, compared with a total of 20,034 laborers in 1964. Employment of workers for mines outside of Swaziland totaled about 5,800 persons in 1965.

An aerial geophysical survey of Swaziland was scheduled to start in early 1966.[17] The survey will be conducted under a $800,000 grant from a United Nations Special Fund.

PRODUCTION AND TRADE

Total production of metals and minerals were valued at $14.5 million compared with $7.9 million in 1964. Production of asbestos and iron ore accounted for 98.8 percent of total value in 1965. The most significant mineral event of the year in Swaziland was the increased output of iron ore from the Ngwenya mine, which practically reached the planned annual production rate. The increase in the output of coal at the Mpaka colliery was also of interest.

In 1965 Swaziland's exports of crude mineral commodities were valued at $14.4 million compared with $7.9 million in

[13] Bechuanaland Protectorate, The Standard Bank Review (London), The Standard Bank Ltd. May 1965, p. 15.
[14] U.S. Consulate, Mbabane, Swaziland. Mineral Development Possibilities in Bechuanaland. State Department Airgram 38, Dec. 11, 1964, p. 4.
[15] Source cited in footnote 8.
[16] Source cited in footnote 14, p. 11.
[17] E&MJ Metal & Mineral Markets. Swaziland. V. 36, No. 32, Aug. 9, 1965, p. 3.

Table 2.—Swaziland: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Beryl	6	--	2	--	--
Gold, troy ounces	1,325	2,214	2,092	2,078	1,619
Iron ore	--	--	--	r 60,193	1,019,957
Tin in concentrates, long tons	5	5	3	r 2	2
Silver, troy ounces	103	132	120	130	130
Nonmetals:					
Asbestos, chrysotile	27,934	29,783	30,255	36,162	37,089
Barite	412	62	84	15	491
Diaspore	446	203	58	374	--
Kaolin	53	2,488	2,007	312	753
Pyrophyllite	2,681	3,540	2,769	1,996	920
Mineral fuels:					
Coal:					
Anthracite	938	--	--	--	--
Bituminous	42	--	--	4,073	29,966

r Revised.

Table 3.—Swaziland: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1964 [1]	1965 [2]	Principal destinations, 1965
Metals:			
Gold—troy ounces	2,078	1,619	All to Republic of South Africa.
Iron ore—thousand tons	60	1,020	All to Japan.
Silver—troy ounces	130	130	All to Republic of South Africa.
Tin concentrates—long tons	4	2	Do.
Nonmetals:			
Asbestos, chrysotile	36,160	37,088	United Kingdom 14,725; Republic of South Africa 10,256; Spain 4,708.
Barite	15	491	All to Republic of South Africa.
Diaspore	374	--	
Kaolin	312	753	All to Republic of South Africa.
Pyrophyllite	1,996	920	Do.
Mineral fuels:			
Coal	1,757	7,589	All to Mozambique.

[1] Source: Annual Report of the Geological Survey and Mines Department, December 1964, p. 30.
[2] Source: Annual Report of the Geological Survey and Mines Department, December 1965, p. 38.

1964. This was an increase of 82 percent, owing chiefly to larger shipments of iron ore to Japan. Total exports increased 33 percent from 1964 to 1965.[18]

Swaziland's imports come chiefly from or through the Republic of South Africa. Only about 10 percent are imported directly from Mozambique or overseas countries. The principal metals and minerals imported in 1965 were as follows: Gasoline, diesel oil, and lubricating oils and greases valued at $2,633,388; fertilizers valued at $1,663,800; piping for buildings, irrigations, etc. valued at $1,188,630; cement, bricks, and asbestos products valued at $1,292,970; steel reinforcement and corrugated iron valued at $399,000; and plumbing and sanitary fittings valued at $22,780.

COMMODITY REVIEW

Metals.—*Gold.*—The decrease in total output of gold in 1965 was largely the result of the closing of the Waterfall mine, which had been Swaziland's richest producer.[19] Some gold was produced at the mine by reworking the slime dumps. Drilling operations were carried out at the dormant Daisy mine. Two mines in the Forbes Reef area, the She and the Waterfall, were the site of new gold reef discoveries. The reefs were being studied for quantity and grade of ore. The Piggs Peak mine, dormant since 1950, was surveyed thoroughly. The survey indicated a possibility that the mine could be productive again.

Iron Ore.—The Ngwenya open pit mine of Swaziland Iron Ore Development Co. Ltd., reached full production during 1965.[20] A series of holes were drilled to test the attitude and grade of the deposit at depth. A deposit in the Forbes Reef area near the Ngwenya mine was also investigated. Preliminary studies indicated the existence of substantial quantities of siderite ($FeCO_3$) in the area. A deposit of haematite and specularite (Fe_2O_3) at the Iron Hill mine was said to contain 15 million tons of 48.66 percent iron and 22.28 percent silica.[21]

Nonmetals.—*Asbestos.*—The Havelock mine continued to produce on an increasing scale in response to a rise in the price of asbestos fiber. An occurrence of short fiber chrysotile was scheduled to be drilled in early 1966. A quarter of a mile west-southwest of the Havelock mine an asbestos deposit was examined extensively by the Swaziland Mines Department and Mineral Holdings, Ltd.[22] A serpentine structure about 1 mile long and 450 feet in average width, which contained pseudo-asbestos fibers, was discovered in the Umkomazaan Valley near Nottingham Hill. Numerous other small bodies of serpentinites occur in this area.

Barite.—Production recovered after a sharp drop in 1964. New techniques in

[18] U.S. Consulate, Mbabane, Swaziland. Swaziland 1965 Imports and Exports. State Department Airgram 7, Aug. 9, 1966, p. 2.
[19] Swaziland Geological Survey and Mines Department. Mineral Statistics and Exports. Ch. in Swaziland, Annual Report of Geological Survey and Mines Department (Mbabane), Dec. 31, 1965, p. 28.
[20] Source cited in footnote 19, pp. 26, 27.
[21] Source cited in footnote 19, p. 14.
[22] Source cited in footnote 19, p. 14.

shipping the ore to market were said to be responsible for increased sales.

Mica.—Large quantities of mica schist were found in the Mahlangatsha Mountains.[23] It was planned to grind the mica to minus 400-mesh size for use as a filler in paint.

Pyrophyllite.—Production decreased owing to a reduction in mining operations in Swaziland by a producer which also mined pyrophyllite from a deposit in the Transvaal. This latter source had a competitive advantage over the Swaziland deposit, because of lower rail costs to markets.

Mineral Fuels.—*Coal.*—Production increased sharply at the Mpaka colliery of Swaziland Collieries, Ltd. The low-volatile bituminous coal containing 12 to 14 percent ash was extracted from a 7- to 8-foot thick seam dipping 5 degrees east. Reserves were estimated at about 160 million tons. The mine is 95 to 115 kilometers from the port of Lourenço Marques, Mozambique. A 75-ton-per-hour washing plant was constructed and began operating in September. The plant using magnetite as a heavy media eliminates shale and produces a sized, washed product suitable for the export market. In 1965 inadequate rail transportation facilities resulted in decreased sales of coal to consumers in Lourenço Marques and also to the railways. A coal deposit at Maloma owned by the Johannesburg Consolidated Investment Co. Ltd. was being investigated by drilling.

[23] Source cited in footnote 19, p. 27.

The Mineral Industry of the Democratic Republic of the Congo (Leopoldville) [1]

By Henry E. Stipp [2]

In general the mineral industry of the Democratic Republic of the Congo (Léopoldville) continued to make significant contributions to the economy of the country in 1965; however, some sectors of the industry suffered decreases in production and large financial losses as a result of the disruption of mining, transportation, and communication activities by civil disorder. These disturbances reached their peak in 1964 and early 1965; but by late 1965 they had been brought under control in most areas. Mining companies that had been affected by the disturbances were in the process of replacing lost equipment and personnel, and mining had resumed on a limited scale at the close of 1965.

Total production of metals and minerals increased somewhat over that of 1964, but output of some commodities including gold, tungsten, and diamond, decreased sharply.

Although production of metals and minerals was affected by civil disturbances in 1964 and 1965, mineral exports decreased only moderately, chiefly because of large stocks which had accumulated within the country in previous years.

In 1965, the Governments of the Congo (Léopoldville) and Belgium negotiated an agreement that gave the Congolese Government shareholdings in several mining firms and confirmed the Congo's right to collect taxes from mining companies. Its action of 1964 in dissolving the Comité Special du Katanga, the Compagnie des Chemins de Fer du Congo Supérieur aux Grands Lacs Africains, and the Comité National du Kivu [3] led to the agreement. As a result of the 1965 settlement, the Government of the Congo (Léopoldville) became an important shareholder in Union Minière du Haut-Katanga (UMHK), the largest mining firm in the Congo, with 222,950 of the 1,242,000 shares outstanding.[4]

During 1965 the Government required that all earnings from sales abroad be transferred to the Congo. Later in the year, financial regulations on UMHK were eased in an effort to expand production of copper and cobalt, and thereby improve foreign exchange income. In 1965, UMHK contributed $87.3 million[5] to the state for taxes, export duties, and money derived from the dual rate of exchange.[6] In addition to this direct income, the economy of the country benefited from the numerous UMHK activities in other fields. As the largest non-Government employer in the nation, the company employed 22,366 laborers and 2,247 supervisors in 1965. Of the supervisors, 229 were Africans. Employees and dependents totaled 107,718

[1] Effective July 1, 1966, the name of the capital of the Congo (Léopoldville) was formally changed from Léopoldville to Kinshasa. However, because this change occurred during 1966, too late for inclusion in all yearbook chapters, the old name (Léopoldville) has been used throughout Volume IV of the Minerals Yearbook.

[2] Physical scientist, Division of International Activities.

[3] Mining Annual Review (London). Congo Republic. Mining Journal, May 1966, p. 225.

[4] Mining Journal (London). Congo (Léopoldville). V. 266, No. 6813, Mar. 18, 1966, p. 197.

[5] Union Minière du Haut-Katanga. Rapport Annuel, 1965. May 26, 1966, p. 6.

[6] Where necessary, Congolese francs (CF) have been converted to U.S. dollars at the rate of CF150 equals US$1.00 unless otherwise specified.

at the end of the year. The company continued to provide vocational and educational training for its employees and their dependents. Attendance at company primary schools totaled 25,972 pupils.

In May four Congolese were named to the UMHK Board of Directors.[7] This was the first time in the company's history that Congolese were given a place on the board. The company also appointed a Congolese as auditor in the Brussels Office.

On August 30, 1965, the President of the Congo (Léopoldville) signed a councilor decrée, which described guarantees accorded private investments in the Congo.[8] Rules applicable to firms engaged in economic activity in the Congo were also defined.

PRODUCTION

Production of most metals and mineral commodities increased somewhat over output in 1964. Commodities produced by firms located in the northern and eastern sections of the Congo, for the most part, decreased in output owing to disturbances caused by the rebellion. The value of metal and mineral production in 1965 was estimated at $278.3 million compared with about $234.3 million in 1964. The rise in output and unit price of copper was chiefly responsible for the 1965 increase.

[7] U.S. Embassy, Léopoldville. State Department Airgram A-417, June 10, 1965, p. 3.
[8] Federation des association d'entreprises du Congo (Brussels). Legislation Et Jurisprudence. No. 75, October 1965, p. 134.

Table 1.—Democratic Republic of the Congo (Léopoldville): Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Beryl	167	276	213	r 123	19
Cadmium	532	307	393	469	399
Cobalt (recoverable)	8,326	9,683	7,376	7,676	8,388
Columbium (concentrate) [2] ___kilograms	51,294	25,331	74,133	r ____	20,460
Tantalum (concentrate) [2] _____do____	74,514	103,502	66,794	45,885	72,405
Copper [3]	r 295,237	r 296,986	r 271,337	r 276,640	288,605
Germanium (recoverable) ____kilograms	13,549	8,006	7,283	8,271	14,697
Gold _____troy ounces	233,672	203,707	214,574	r 188,693	r 69,542
Lead, metal	----------	283	1,185	1,045	1,551
Manganese ore	r 318,700	r 311,338	270,033	309,700	[4] 377,575
Monazite	----------	----------	----------	----------	20
Silver _____troy ounces	3,457,877	1,595,513	1,097,176	1,480,250	1,538,411
Tin:					
Mine (metal content) ____long tons	6,314	6,875	6,883	r 5,108	6,324
Metal _____do____	275	945	1,441	r 1,485	1,844
Tungsten ore and concentrate (60 percent WO_3 basis)	r 582	r 370	202	r 234	170
Zinc:					
Mine	99,634	95,735	103,545	105,540	119,154
Refined (electrolytic)	56,960	56,027	52,724	55,553	57,019
Nonmetals:					
Cement _____thousand tons	140	197	246	r 225	248
Diamonds:					
Gem _____thousand carats	405	256	296	295	14
Industrial _____do____	17,738	14,400	14,468	[5] 14,457	12,490
Salt	r 560	r 550	r 343	r 525	[6] 725
Mineral fuels:					
Coal, bituminous _____thousand tons	73	76	92	100	113

e Estimated. r Revised.
[1] Does not include data on simple construction materials for which reports are incomplete.
[2] U.S. imports.
[3] Includes production by Union Miniere du Haut-Katanga and Société Metallurgique du Katanga.
[4] Average grade 48 percent.
[5] This represents recorded diamond production; it is estimated that an additional 12 to 14 million carats valued at about $35 million were illegally produced and exported.
[6] For local use only.

TRADE

The Congo (Léopoldville) has had a favorable trade balance for many years, and this continued in 1964, as shown in the following table of trade statistics for 1963 and 1964:

	Value (million dollars) [1]		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1963	213.3	307.9	69.3
1964	r 182.3	r 349.7	52.1
Imports:			
1963	48.3	207.7	23.3
1964	39.7	r 288.3	13.8
Trade balance:			
1963	+165.0	+100.2	XX
1964	+142.6	r +61.4	XX

r Revised. XX Not applicable.
[1] Where necessary, monetary conversions have been made at the following rates: Prior to November 1963, CF65 equals US$1.00; since that time, CF150 equals US$1.00 (the official rate). However, the unofficial rate used in actual practice has exceeded the official rate by as much as CF30 per dollar, reaching CF180 equals US$1.00.

Exports of some metals and minerals in 1964 were not as large as those of 1963 owing to disruption of facilities and services, chiefly in the northern and eastern sections of the country; nevertheless export values did not decline as much as did export tonnages because of generally increased world commodity prices. Copper, the most important metal exported, was valued at $85.7 million, followed by cobalt and its alloys valued at $19.0 million, zinc, zinc ore, and concentrate valued at $18.0 million, and tin and tin concentrate with a value of $15.4 million. Diamond was the most valuable nonmetallic mineral export accounting for $28.7 million.

Mineral fuels, chiefly petroleum products, were the highest valued import commodity group, at $19.9 million, followed by iron and steel valued at $14.1 million.

In 1964 Belgium was the principal destination for exports of most commodities from the Congo (Léopoldville), with 50.6 percent of the total value, followed by Italy with 9.6 percent, United Kingdom 9.5 percent, France 6.7 percent, West Germany 5.5 percent, and the United States 5.2 percent. African countries received commodities valued at 3.7 percent of the total value of the country's exports.

Belgium supplied 35.7 percent of the nation's total imports by value while the United States provided 23.8 percent on the same basis. Much of the U.S. exports to the Congo were supplied under United States Agency for International Development and Public Law 480 programs. Other non-Communist European countries shipped 22.9 percent by value of the Congo's total imports, while African countries supplied 10.9 percent.

Table 2.—Democratic Republic of the Congo (Léopoldville): Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum, scrap	4	41	Belgium 15; France 14.
Beryl	129	185	All to Belgium.
Bismuth—kilograms	426	NA	
Cadmium—do	390,000	479,000	Belgium 294,000; United States 181,000; Republic of South Africa 4,000.
Cobalt:			
Granules	4,388	5,014	All to Belgium.
Cathode	2,036	2,817	Do.
Cobalt-copper alloy	965	555	Do.
Columbium-tantalum:			
Ore—kilograms	103,591	49,077	Belgium 38,966; United States 10,111.
Slag—do	310,615	313,778	All to Belgium.
Copper:			
Scrap	36	10	Belgium 8; Italy 2.
Wire bars	107,072	136,392	Belgium 64,867; Italy 33,663; France 18,481; Republic of South Africa 4,068; United Kingdom 3,088.
Cathode	61,779	75,054	Belgium 74,487.
Blister	68,407	64,432	Belgium 56,274; France 8,158.
Rolled products	34	17	Southern Rhodesia 10; Zambia 7.
Alloys	NA	624	Belgium 574.
Germanium	9	46	All to Belgium.
Gold:			
Crude and alloys—kilograms	[1] 22,000	1,134	Do.
Metal—troy ounces	249,332	208,759	Do.
Iron and steel:			
Scrap	NA	449	Republic of South Africa 358; France 76.
Rolled products	NA	223	All to Angola.
Lead, scrap	NA	7	All to Italy.
Manganese ore	221,872	232,612	All to Lobito Depot.
Tin:			
Concentrate—long tons	9,714	5,973	All to Belgium.
Metal—do	1,031	1,164	Do.
Tungsten:			
Concentrate	94	126	Do.
Other	NA	330	Belgium 216; Japan 63; Netherlands 50.
Zinc:			
Ore and concentrate	66,664	93,892	Belgium 79,673; France 14,219.
Metal	51,641	56,755	India 12,281; West Germany 11,208; United States 9,976; Republic of South Africa 8,376; United Kingdom 4,757.
Scrap	NA	44	Republic of South Africa 40.
Other	NA	39	All to Belgium.
Nonmetals:			
Cement	34,021	27,966	Central African Republic 11,250; Republic of Congo (Brazzaville) 6,795; Burundi 4,454; Ruanda 3,251; Chad 2,000.
Diamond—thousand carats	14,414	14,985	United Kingdom 14,951; United States 28.
Precious and semiprecious stones, other than diamond—do	1,820	4,085	NA.
Salt	20	1	All to Central African Republic.
Sand—kilograms	NA	6	United States 6.
Sulfur, crude—do	NA	1	All to Netherlands.
Sulfuric acid	NA	2,952	All to Zambia.
Mineral fuels:			
Coal	65	NA	
Petroleum refinery products:			
Kerosine	NA	2	Mainly to Kenya
Fuel oil	NA	3	Mainly to Ruanda
Total	87	5	
Petroleum jelly	NA	17	All to Central African Republic.

NA Not available. [1] Concentrate.

Table 3.—Democratic Republic of the Congo (Léopoldville): Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals: [1]			
Aluminum	1,167	964	Belgium 478; Italy 142; United States 113.
Copper	151	166	Belgium 137.
Gold—troy ounces	1,929	[2] 327,519	All from Belgium.
Iron and steel:			
Pig iron	1,668	2,307	Republic of South Africa 1,404; Southern Rhodesia 760; Belgium 143.
Ferroalloys	578	623	Republic of South Africa 358; Southern Rhodesia 145; France 55; West Germany 53.
Scrap	261	140	NA.
Oxide, shot and powder	110	29	Belgium 20; Zambia 6; France 3.
Ingots, blooms, billets, and semimanufactures.	r 40	94	Belgium 93.
Rolled products:			
Bars, rods, profiles, and sections.	r 16,889	23,381	Belgium 14,204; United States 3,874 Republic of South Africa 1,505.
Pipes and fittings	4,903	5,794	Belgium 3,070; Zambia 734; United States 516.
Plate and sheet, hoops, and strips.	r 24,098	29,096	Belgium 18,179; United States 5,434; Republic of South Africa 1,444.
Rails and track material	6,575	1,854	Belgium 1,726.
Other	r 715	2,019	Belgium 1,036; United States 522.
Lead	136	156	Belgium 117.
Manganese oxide	29	2	All from Belgium.
Magnesium—kilograms	NA	200	All from United Kingdom.
Mercury—76-pound flasks	44	16	All from Belgium.
Molybdenum—kilograms	NA	16	Do.
Nickel and alloys, all forms	45	31	United Kingdom 18; United States 10; Belgium 3.
Platinum—troy ounces	r 15,303	32	All from Belgium.
Silver—do	48,998	48,355	Belgium 48,194.
Tin and alloys, all forms. long tons	22	38	Belgium 19; United States 10; United Kingdom 7.
Titanium oxide	234	381	United States 240; Belgium 103.
Tungsten—kilograms	NA	20	All from Belgium.
Zinc	122	88	Belgium 66.
Other	195	40	Belgium 39.
Nonmetals:			
Abrasives	3	22	Belgium 21.
Asbestos:			
Crude	1,581	3,724	Southern Rhodesia 1,562; Belgium 1,222; Canada 457.
Barite and witherite	111	213	Belgium 156; West Germany 37.
Brick and tile	6,062	3,596	Republic of South Africa 1,317; Belgium 543.
Cement:			
Portland	NA	152	Kenya 68; Belgium 54; Tanganyika 30.
Aluminous	NA	88	France 45; United Kingdom 41.
White	NA	366	Belgium 363.
Other	NA	19	Belgium 11.
Total	392	625	
Chalk	1,388	1,185	Belgium 570; France 507.
Clays	859	508	United Kingdom 281; United States 84.
Dolomite	77	116	Belgium 109.
Feldspar and fluorspar	162	211	Republic of South Africa 206.
Fertilizer materials:			
Nitrates	NA	1,686	Belgium 824; United States 369.
Phosphate rock	NA	91	Zambia 78.
Phosphates, other	NA	1,002	West Germany 564; Belgium 293.
Potash	NA	1,307	Belgium 800; West Germany 432.
Other	r 33	3,646	Belgium 3,450.
Graphite—kilograms	[3]	1,507	Belgium 954; Republic of South Africa 553.
Gypsum	5,745	4,020	France 4,000.
Lime	1,536	136	Belgium 86; Zambia 48.
Magnesium sulfate (kieserite)	30	196	All from West Germany.
Magnesite	1,427	63	Republic of South Africa 60.
Magnesium compounds, other	NA	574	Kenya 361; United Kingdom 197.
Mica—kilograms	[3]	50	All from Belgium.
Pyrite, iron (unroasted)	r 26	53	United States 50.
Quartz and quartzite	86	127	Belgium 89; Luxembourg 38.
Salt	28,580	55,148	Angola 21,002; Cape Verde Islands 16,674.
Sand (nonconstruction)	11	10	All from Belgium.
Siliceous earths	487	279	United States 113; Belgium 81.
Slag and ash	NA	177	All from United States.
Sodium carbonate (natural)	2,399	NA	

See footnotes at end of table.

Table 3.—Democratic Republic of the Congo (Léopoldville): Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—Continued			
Stone:			
Dimension——kilograms	--------	2,350	Italy 1,700; Belgium 650.
Fluxing	--------	58	All from Belgium.
Paving	2	13	Belgium 12.
Sulfur	97	150	Belgium 82; United States 60.
Sulfuric acid	NA	155	Belgium 90; Netherlands 56.
Talc and steatite	268	336	Italy 115; United States 78; Belgium 58.
Other	[4] 61	[5] 270	Belgium 269.
Mineral fuels:			
Coal and briquets	175,874	218,432	Southern Rhodesia 188,034; Republic of South Africa 18,319.
Peat	NA	50	All from United States.
Coke and semicoke	43,599	40,433	Southern Rhodesia 37,841; Belgium 2,086; Zambia 466.
Asphalt, mineral	94	92	Belgium 57; United Kingdom 31.
Coal tar byproducts	260	1,326	Belgium 377; United States 171.
Petroleum:			
Crude——kilograms	--------	10	All from Angola.
Refinery products:			
Gasoline	197,721	84,093	Netherlands Antilles 60,501; Italy 13,770. Venezuela 10,487; Iran 9,838.
Kerosine	65,964	48,250	Netherlands Antilles 15,989; Venezuela 11,286; Italy 8,380; Iran 5,096.
Distillate fuel oil	145,252	114,870	Netherlands Antilles 48,093; Venezuela 22,074; Italy 20,224.
Residual fuel oil	34,230	36,017	Angola 9,838; Canary Islands 5,307; Italy 4,933; Venezuela 4,569; Netherlands Antilles 4,105.
Liquid petroleum gas	1,182	1,075	Belgium 907; Angola 113.
Lubricants	28,910	23,677	United States 18,594; Belgium 2,929.
Asphalt and bitumen	4,033	5,422	Belgium 1,458; Canary Islands 1,960; United States 1,239.
Petroleum jelly and waxes.	242	497	United States 199; Netherlands 108; Zambia 74.
Other	--------	6,714	Venezuela 4,734; Canary Islands 1,420.

r Revised. NA Not available.
[1] Includes unwrought, scrap, and semimanufactures.
[2] Crude gold and gold partially worked.
[3] Include with "Other" in 1963.
[4] Includes the following (in tons): Graphite 5, mica 13, carbon black 7, and meerschaum 0.8.
[5] Consists of mineral cinders.

COMMODITY REVIEW

METALS

Cadmium.—The entirety of the country's metallic cadmium output was produced by Société Métallurgique du Katanga (Métalkat), a subsidiary of UMHK. Production included 126 tons of electrolytic cadmium rods,[9] which were produced from cadmium-containing cements prepared by treating 5,493 tons of flue dusts from the Lubumbashi smelter at Elisabethville and by treating 253 tons of dusts from the sulfuric acid plants of Société Générale Industrielle et Chimique du Katanga (Sogechim) at Jadotville.

Cobalt.—Output by UMHK in the year ending January 31, 1965 totaled 8,388 tons compared with 7,676 tons in 1964.[10] Production consisted of 3,474 tons of electrolytic granules, 3,574 tons of commercial-grade cobalt cathodes, 1,315 tons of other types of cobalt cathodes, and 25 tons of other cobalt products. The cobalt electrolysis section of the Shituru plant produced cobalt cathodes, of which some were refined at the plant and some exported. The Shituru refinery also produced cobalt granules, which were sent to the Luilu plant for processing. Principally commercial-grade cathodes were produced by the electrolysis section of the Luilu plant and were refined by the vacuum-degassing section.

Columbium - Tantalum. — Compagnie Géologique et Minière des Ingénieurs et Industriels Belges (GEOMINES) produced 32 tons of columbite-tantalite concentrate

[9] Union Minière Du Haut-Katanga. Rapport Annuel, 1965. May 26, 1966, pp. 5–47.
[10] Page 17 of work cited in footnote 9.

in the fiscal year ended June 30, 1965, compared with 100 tons in fiscal year 1964.[11]

Mining companies in the provinces of North Kivu, Central Kivu, and Maniema reportedly operated at about 70 percent of the 1963 production level, owing to insecurity from rebel activity.[12]

The Société Minière de Lulshe, a company formed by Union Carbide Corp., Compagnie Minière des Grands Lacs Africains (MGL), and Société Kivumines for the development of the columbium (niobium) deposits at Bingo and Lulshe, was constructing a pilot plant at Bingo.[13] The plant was to have a capacity to concentrate from 10 to 20 tons of ore per day and was expected to begin operating in early 1966. The deposits have been surveyed and the Bingo occurrence proved commercially feasible; however, the Lulshe deposit would require a larger investment to exploit and will not be developed until the political situation stabilizes.

Copper.—UMHK, the Republic's only copper mining firm and largest copper metal producer reported output of 287,568 tons in 1965, compared with 275,547 tons in 1964.[14] Electrolytic copper ingots constituted 151,514 tons, cathodes 71,447 tons, blister and other types 64,600 tons, and copper in products amounted to 7 tons of total copper output.

The UMHK subsidiary, Métalkat, produced 1,037 tons of copper in 1965 compared with 1,093 tons in 1964.

The quantity of ore mined by UMHK totaled 8,661,651 tons, which was divided among the various mines as follows:

Mine	Ore production (metric tons)
West group:	
Musonoi	2,458,390
Kamoto	1,496,141
Ruwe	1,523,650
South group:	
Kipushi	1,145,105
Central group:	
Kambove-West	1,103,352
Sesa	271,886
Kakanda	663,127

In addition to the ore extracted, about 17.3 million cubic meters of waste material was removed with the ore. Extraction of ore from the West and Central group mines increased owing to the use of new equipment and improved maintenance of machines. Output from the Kipushi underground mine reached a new high because of increased use of mechanization and better working techniques. Production from the Ruwe open pit mine, which decreased in 1964, rose to its previous rate of output. A river was diverted from the Sesa mine by a tunnel to permit removal of overburden in preparation for open pit operation.

Ore processed by concentrating plants in fiscal 1965 totaled 8,399,419 tons as shown in the following table:

[11] Compagnie Géologique et Minière des Ingénieurs et Industriels Belges (GEOMINES). (Rapports présentés a l'assemblée générale des actionnaires du 14 Décembre 1965) November 1965, p. 2.

[12] U.S. Consulate, Bukavu. State Department Airgram A-42, Mar. 21, 1966, p. 8.

[13] U.S. Embassy, Léopoldville. State Department Airgram A-27, Jan. 20, 1966, p. 5.

[14] Page 17 of work cited in footnote 9.

Concentrating plant	Ore treated (metric tons)	Concentrates produced			
		Type	Quantity (metric tons)	Metal content (percent)	
				Copper	Cobalt	Zinc
Kolwezi	4,136,860	siliceous oxide	618,424	25.51	1.60	----
		sulfide	54,119	43.33	2.42	----
		dolomitic oxide	54,056	18.90	2.94	----
Kipushi	1,144,754	sulfide	187,789	25.97	----	----
		----do	204,136	----	----	58.37
Kambove	883,356	----do	50,383	51.17	1.61	----
		dolomitic oxide	[2] 84,561	18.65	1.24	----
Kambove (washer)	[1] 184,163	NA	114,816	6.24	----	----
		oxide	28,361	19.78	.18	----
Kakanda	640,413	siliceous oxide	94,728	23.73	.91	----
Ruwe (washer)	1,409,873	breccia	83,569	24.88	----	----
		----do	31,819	9.37	----	----

NA Not available.
[1] Stocked ores.
[2] Oxide concentrates from retreated materials.

The Lubumbashi smelter of UMHK produced 65,484 tons of blister copper chiefly from Kipushi sulfide concentrates and produced 11,004 tons of crude copper from Kambove and Ruwe oxide ore concentrates. Crude copper was used for preparing soluble anodes at the Shituru electrolytic plant. Flue dusts containing cadmium and germanium recovered for processing at Métalkat's Kolwezi plant totaled 4,103 tons.

The copper electrolysis section of UMHK's Shituru plant at Jadotville produced 114,517 tons of copper cathodes, and the starting-sheet section produced 10,952 tons. Refinery output from two furnaces was 153,374 tons of ingots. Soluble anodes output totaled 28,892 tons. The cobalt-electrolysis section produced 5,379 tons of cathodes, while the refinery prepared 3,546 tons of cobalt granules.

Output of UMHK's Luilu electrolytic plant was 107,481 tons of copper cathodes and 7,982 tons of soluble anodes produced from Kolwezi concentrates.

Gold.—Société Métallurgie Hoboken of Belgium recovered about 835 troy ounces of gold from refining crude copper originating in the Congo (Léopoldville). The gold was returned to UMHK, the producer of the crude copper.[15]

Despite the insurrection that disrupted mining operations, Société Des Mines D'or de Kilo-Moto produced 161,947 troy ounces of gold in 1964 compared with 162,486 troy ounces in 1963.[16] It was reported that an estimated 45,032 troy ounces of the 1964 output was confiscated by the authorities.

Iron and Steel.—The steelworks at Inga, about 50 kilometers north of Matadi, was expected to begin producing in 1972.[17] Annual output was scheduled at 200,000 tons. Iron ore was to be supplied from mines near Kimpako about 125 kilometers northeast of Inga.

Lead. — UMHK's sintering plant and electric furnace at Jadotville produced 1,551 tons of lead in 1965.[18]

Manganese.—In 1965 Société Minière de Kisenge produced 320,000 tons of manganese ore from its Kisenge mine compared with 290,000 tons in 1964.[19] The company's Kasekelesa mine near Lufupa remained inactive. Société Afripile, a subsidiary of Société Minière de Kisenge, was scheduled to begin manufacturing dry cell batteries in a plant at Kisenge, using Congolese material in 1965. Nothing further was reported on this operation at yearend.

Silver. — Société Métallurgie Hoboken returned 1,538,411 troy ounces of silver to UMHK in 1965 which had been recovered from refining crude copper in Belgium.[20]

Tin.—After the liberation of Kalima and Punia from rebel occupation, Syndicat Minière d'Etain (Symétain) moved quickly to resume mining in these areas.[21] Production of cassiterite concentrates containing 75 percent tin totaled 2,762 long tons in 1964 and 3,110 long tons in 1965.

GEOMINES produced 2,372 long tons of cassiterite in fiscal 1965 compared with 2,063 long tons in fiscal 1964.[22]

Production was interrupted for 2 months during the year in the company's Lualaba region holdings. The smelter at Manono produced 1,793 long tons of metallic tin in fiscal 1965.

Zinc.—In 1965, copper-zinc ores from the mine at Kipushi yielded 204,136 tons of concentrates containing 58.37 percent zinc.[23]

Sogechim processed 135,807 tons of concentrates from Kipushi that produced 116,483 tons of sulfuric acid and 112,597 tons of roasted concentrates for UMHK. The latter firm sold 95,155 tons of roasted concentrates to Métalkat and exported 80,898 tons of concentrates. Métalkat remained the Republic's sole metallic zinc producer.

NONMETALS

Cement. — Ciments du Congo (Cico) produced 147,000 tons of cement during the first 11 months of 1965.[24] Monthly production averaged 12,000 tons for the first 6 months but rose to 15,000 tons in July, and this level was maintained through November.

[15] Page 17 of work cited in footnote 9.
[16] Société Des Mines D'or de Kilo-Moto. Annual Report 1964. Brussels, June 9, 1966, p. 10.
[17] Mining Journal (London), Congo (Léopoldville). V. 266, No. 6816, Apr. 8, 1966, p. 252.
[18] Page 17 of work cited in footnote 9.
[19] Mining Annual Review (London). Congo Republic, Mining Journal, May 1966, p. 227.
[20] Page 17 of work cited in footnote 9.
[21] U.S. Consulate, Bukavu. State Department Airgram 48, May 19, 1966, p. 1.
[22] Page 2 of work cited in footnote 11.
[23] Page 17 of work cited in footnote 9.
[24] Belgo-American Development Corporation. Belgo-American Letter. Ciments du Congo (Cico). January 1966, p. 6.

The company Ciments du Katanga an affiliate of Société d'Etudes et de Gestion de Cimenteries produced 47,756 tons of cement in the fiscal year ending June 1965.[25]

Sales of Société des Ciments Metallurgiques de Jadotville, a subsidiary of UMHK, totaled 18,600 tons in 1965 compared with 12,885 tons in 1964. The plant of Société des Ciments du Kivu was not operative in 1965.[26]

The only cement plant in the Kivu and Maniema area remained closed.[27] This plant near Katana reportedly will resume operations when local consumption increases.

Diamond.—Strengthening of the central Government's mining police was advocated by Société Minière de Bakwanga (MIBA) in order to control illicit diamond production in South Kasai province, especially in reserve zones not being exploited by the company.[28] MIBA recommended that additional personnel and equipment be obtained for the mining police force from donations by other countries.

The United States Government was negotiating to purchase approximately US$20 million of Congolese industrial diamond.[29] Sale of the diamond slated for the U.S. strategic stockpile will aid the Republic's marketing problems and help to stabilize the economy.

A report was published describing the geology of diamond-bearing rocks in the Kundelungu mountain area of Katanga.[30] According to the Congolese Ministry of Mines 28 kimberlite pipes have been located and diamonds of industrial grade were reported to be present in the area. It has not been determined if the deposits are commercially exploitable.

Stone, Sand, and Gravel.—Output of Union Minière's Katonto quarry totaled 128,434 tons after crushing, for ballast and cement manufacture. The company's Kakontwe quarry produced 224,648 tons of limestone in fiscal year 1965 compared with 179,630 tons in fiscal 1964.[31] The Katonto quarry also yielded 29,086 tons of sand.

MINERAL FUELS

Coal. — Charbonnages de la Luena, a subsidiary of UMHK, produced 113,660 tons from the Kaluku coal measures in 1965 compared with 100,190 tons in 1964.[32]

Petroleum.—Machinery and equipment for the refinery to be built by Société Congo Italienne de Reffrinage (SOCIR) at Kinloa near the mouth of the Congo river, was ready for shipment from Italy, however work on the project was at a standstill.[33] A lack of hard currency for procurement of machinery and equipment was the major obstacle in completing the project. Despite the lack of progress on the refinery, SOCIR continued to train Congolese technicians. Most petroleum representatives appeared optimistic about the refinery and future economic prospects of the Congo.

All drilling operations conducted by Société Congolaise de Recherches et d'Exploitation Petrolières (SOCOREP) in the Bas Congo area north of Moanda were stopped.[34] Six persons were employed to maintain disassembled equipment, which was to be shipped to Angola. SOCOREP was preparing to hire a seismological group to carry out further investigations in the area.

---

[25] Compagnie Due Congo Pour Le Commerce Et L'Industrie (Brussels). Rapports Du Conseil D'Administration, Du College Des Commissaires Et Du Commissaire-Reviseur. No. 104, 1965, p. 17.

[26] Page 30 of work cited in footnote 9.

[27] U.S. Consulate, Bukavu. State Department Airgram A-42, Mar. 21, 1966, p. 9.

[28] U.S. Embassy, Léopoldville. State Department Airgram A-290, Mar. 4, 1965, p. 4.

[29] International Monetary Fund. International Financial News Survey. V. 18, No. 1, Jan. 7, 1966, p. 3.

[30] N. Koretzky. Resume Des Notes Sur La Region Des Kundelungu. Nov. 19, 1965, 33 pp.

[31] Page 14 of work cited in footnote 9.

[32] Page 30 of work cited in footnote 9.

[33] U.S. Embassy, Léopoldville. State Department Airgram 417, June 10, 1965, p. 4.

[34] U.S. Embassy, Léopoldville. State Department Airgram 373, Dec. 16, 1965, p. 1.

The Mineral Industry of Ethiopia [1]

By Walter C. Woodmansee [2]

Total value of Ethiopia's mineral output in 1965 has not been reported but was probably about $6 million. The principal commodities and estimated values were cement, $3.9 million; gold, $855,000; salt, $356,000; and lime, $161,000.[3]

The mineral industry continued to play a minor role in the nation's economy, accounting for less than 1 percent of the gross national product, which was not accurately known but probably was nearly $1 billion during 1965. However, certain events during the year indicated possible new mineral activities. The Ministry of Mines planned increased efforts in mineral exploration, and further efforts were made to attract new industry.

In March Major Assefa Lema was appointed Minister of State for Mines and State Domains, a new post. Late in the year, the Ministry of Mines was under reorganization. The Ministry reportedly had 40 government prospectors and 8 engineers on its staff, and 65 students in training. In December, the Ministry, by letter to the U.S. ambassador, requested the services of five U.S. specialists in mineral development. A draft of a new mining law, which has been in planning for some time, was sent to a U.S. legal firm for review and suggestions. Yugoslav, West German, and U.S.S.R. technicans also were involved in mineral industry development or production.

Ministry of Mines exploration parties were investigating resources of asbestos, iron, nickel, platinum, and tungsten, the latter at Yubdo in Wollega Province. Potash mine development continued at Dallol and could represent the largest private investment in the country's mineral industry if plans are carried out in 1966. Progress was made on a new galvanizing and corrugated sheet plant at Asmara, Eritrea. The new Addis Ababa cement plant was in full production and another plant was completed late in the year.

Petroleum exploration was underway by three companies, of which one drilled unsuccessfully in the Ogaden desert, the second started drilling in the Red Sea off the coast of Eritrea, and the third made plans for drilling in a nearby offshore area.

PRODUCTION

There were few marked changes in mineral production activities. For the first time in several years, data were made available on gold mining in the Kebre Mengist (formerly Adola) goldfields. Manganese mining apparently continued at the Tigre concession at Enkafala, about 20 kilometers southwest of Dallol, although production was not reported. Cement output more than doubled as production at the new Addis Ababa plant reached capacity. Clays, limestone, and brick were produced in the vicinities of major cities for local construction use. Gypsum was used primarily in the cement industry.

---

[1] T. J. Burke, U.S. Embassy, Addis Ababa, provided information helpful in the preparation of this chapter.

[2] Physical scientist, Division of International Activities.

[3] Where necessary, values have been converted from Ethiopian dollars to U.S. dollars at the rate of Eth$1=US$0.4032.

Table 1.—Ethiopia: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity [2]	1961	1962	1963	1964	1965
Metals:					
Gold—troy ounces	47,029	28,015	e 27,300	e 27,300	24,236
Manganese ore, shipments	7,000	6,000	[3] 3,496	[3] 3,248	NA
Platinum, placer—troy ounces	e 180	e 180	e 180	e 180	352
Nonmetals:					
Cement—thousand tons	30	41	34	e 44	96
Feldspar	3,000	432	e 500	e r 1,000	-----
Gypsum	NA	NA	NA	e r 1,000	e 2,500
Kaolin	4,000	1,000	e 500	e 500	e 200
Lime [4]	4,538	5,488	4,408	e 6,000	e 4,000
Salt [4]—thousand tons	151	198	255	263	188

e Estimate. r Revised. NA Not available.

[1] Includes Eritrea.

[2] In addition to commodities listed, Ethiopia has produced small quantities of asbestos, barite, copper ore, lead ore, iron ore, mica, pumice, sulfur and various construction materials, but quantitative data are not available.

[3] U.S. imports.

[4] Data are for years ending September 10.

TRADE

Available trade data for 1964 and 1965 are incomplete, particularly with regard to sources and destinations. The major mineral export during these years was salt, valued at $301,000 in 1964 and $270,000 in 1965 (about 80 percent of total mineral export value), and shipped mainly to Japan.

Available information on imports indicates the following sources of metals and minerals during 1964:

Commodity	Principal sources, 1964 (metric tons)
Iron and steel semimanufactures:	
Bars	Italy 2,335; Belgium-Luxembourg 1,339.
Plate and sheet	Japan 13,712; Belgium-Luxembourg 1,753.
Tubes, pipes, and fittings	Belgium-Luxembourg 974; Italy 499; Japan 284.
Wire	U.S.S.R. 1,130; Italy 755.
Lime, cement, and other construction materials	Israel 8,171; Yugoslavia 4,810.
Petroleum refinery products	Iran 97,031; Saudi Arabia 24,370.

Principal mineral imports during 1965 were petroleum refinery products, $9.4 million ($9.5 million in 1964); iron and steel, $5.5 million ($6.3 million in 1964); and various nonmetals, $1.97 million ($1.9 million in 1964). The relationships between mineral and total trade during these years were as follows:

	Million dollars		Mineral commodities' share of total trade, (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1964	0.4	105.8	0.4
1965	0.4	117.0	0.3
Imports:			
1964	18.0	124.0	14.5
1965	17.5	133.4	13.1
Trade balance:			
1964	−17.6	−18.2	XX
1965	−17.1	−16.4	XX

XX Not applicable.

[1] Values given are for only those commodities listed in table 2 of this chapter.

Table 2.—Ethiopia: Foreign trade in metals and minerals
(Metric tons)

Commodity	1964	1965
Exports:		
Metals:		
Iron and steel scrap	195	108
Nonferrous scrap	75	e 1,000
Manganese ore	[1] 3,248	-----
Nonmetals:		
Clay construction materials	60	32
Gypsum and limestone	44	554
Salt	79,675	79,503
Imports:		
Metals:		
Aluminum	280	352
Copper	14	42
Iron and steel:		
Pig iron and ferroalloys	275	8
Semimanufactures:		
Bars	5,479	3,405
Plate and sheet	18,053	17,355
Hoop and strip	39	274
Tubes, pipes, and fittings	3,064	3,322
Wire	3,126	2,454
Rails and accessories	1,324	630
Castings and forgings	24	394
Total	31,109	27,834
Nonferrous metals, not elsewhere specified	264	e 1,000
Nonmetals:		
Abrasives, natural	522	580
Chemical, inorganic	1,074	1,680
Clay construction materials	812	1,280
Lime, cement, and other construction materials	25,011	28,120
Stone, dimension	228	85
Sulfur	640	-----
Nonmetals, not elsewhere specified	10,369	13,965
Mineral fuels:		
Coal	1,827	7,776
Petroleum refinery products, unspecified	158,155	102,913
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation	256	161

e Estimate.
[1] U.S. imports.

COMMODITY REVIEW

METALS

Copper.—The Ministry of Mines conducted a drilling project at the Adi Rassi prospect. Four holes, totaling about 2,000 feet, were drilled. Results are not known, but Ministry officials reported that a U.S. firm was interested in development of the property.

Drilling of another prospect, on Mount Saccar, near the Asmara-Massawa road about 50 kilometers from Asmara, Eritrea, was planned, but information on the project was lacking. A Yugoslav firm, Rudis, had been awarded a drilling contract for 2,000 meters in 1964.

Gold.—The Kebre Mengist goldfields accounted for more than 95 percent of reported gold output. The remainder came from a small mine southeast of Lake Margareita in southern Ethiopia. Ministry of Mines officials believe that substantial quantities, produced by prospectors in various parts of the country, remain unreported.

In April a new $1.4-million, 1,500-kilowatt, hydroelectric plant on the Mormora River began providing electric power to the Bore and Shanka placer projects in the Kebre Mengist goldfield. According to the Ministry of Mines, gold reserves there are considered sufficient for 10 years of operation.

Iron and Steel.—Steel Co. of Ethiopia was incorporated to operate a proposed sheet plant at Asmara. The company is privately owned, comprising Ethiopian, United Kingdom, Indian, and Italian shareholders. In July further private subscription and public sale of shares was announced. The plant will produce plain and galvanized sheet, including corrugated sheet, and related steel products.

Nickel.—Discovery of two deposits was reported by the Ministry of Mines, but details on tonnage and grade are incomplete. A garnierite deposit totaling 60,000 to 70,000 tons was found near the Kebre Mengist goldfield. A nickel-bearing serpentine deposit, containing 1 to 4 percent nickel, also was reported but the location was not disclosed.

NONMETALS

Asbestos.—A deposit discovered in large quantities, near Kebre Mengist, in 1964 was under further investigation. Another discovery was reported at Harrar from which asbestos samples were sent to the United States for analysis.

Cement.—The plant at Addis Ababa, which was financed and built by a Yugoslavian firm, went into production in August 1964. Technical difficulties with clay raw materials and the heat-exchange system were overcome and the plant was operating at the planned 70,000–ton–per–year rate. In September construction started on an asbestos cement sheet and pipe plant integrated with the cement plant. The Ethiopian Government will hold the major interest in this new plant.

Operating tests were conducted at the new cement plant at Massawa in late 1965. Full production was expected in 1966. The $4.7-million plant was built by Freidrich Krupp Maschinen und Stahlbau for Eritrea Cement Share Co., in which the Ethiopian Government is the major shareholder. In May, a rail spur was under construction from the plant to the Massawa-Asmara-Agordot rail line. A loading pier at Massawa and road construction were planned. Products are super-, high-, and common-quality cement. The rated annual capacity of 70,000 tons can be doubled when sufficient demand has developed.

Total cement capacity of the Addis Ababa, Massawa, and the older Dire Dawa installations is 180,000 tons per year. Domestic consumption is increasing and was estimated to be 140,000 tons at yearend.

Potash.—Development at the Dallol deposit, Tigre Province, included a 300-foot shaft and about 1,000 feet of drift. Sampling indicated a grade of 30 percent K_2O. A pilot plant for treating 2 to 3 tons of crude potash per day was built late in the year.

The future of the project was uncertain at yearend. The concession contract between the Ethiopian Government and Ralph M. Parsons Co., Los Angeles, Calif., was renegotiated in late 1964, permitting the Parsons Co. to defer exploitation until November 1965. If exploitation ensues, a total investment of $40 to $50 million was planned. Planned mine capacity was 600,000 tons per year. A processing plant for a product of 60 percent K_2O also was scheduled.

MINERAL FUELS

Petroleum.—Exploration was concentrated in the Ogaden desert (Elwerath Oil Co.) and the Red Sea coast of Eritrea (Gulf Oil Co. of Ethiopia and Mobil Petroleum Ethiopia, Inc.). Elwerath, holding a 185,000-square-kilometer concession, completed a 10,044-foot wildcat well (dry), the fourth unsuccessful well on the mainland. Geophysical work continued, but preliminary indications were unfavorable, according to company sources.

Exploration by Gulf included 1 month of airborne magnetometer survey, 3 months of seismic work, 2 months of marine seismic work, and 3 months of geological study on its 28,250-square-kilometer concession along the coast and offshore, opposite and south of Massawa. In December a wildcat well was spudded in offshore, near Massawa, on the Nola III drilling platform.

Mobil concluded 8 months of shallow water seismic, 1 month of land seismic, 6 months of gravity survey, and 1 full year of geologic work on its 10,400-square-kilometer tract, north of Massawa. Study and interpretation of field data were underway. The company planned offshore drilling in 1966 from the same platform employed by Gulf.[4]

Ethiopia's first oil refinery, at Assab, was scheduled for completion in late 1966, several months behind the original planned date. Rated capacity is 10,000 barrels per day, and 2,000 barrels per day for catalytic reforming. The U.S.S.R. provided financial and technical aid during construction of the $13-million plant. The Ethiopian Government expects to save substantial foreign exchange with domestic production of refinery products; imports of these products cost about $9.4 million annually during 1964–65.

[4] Bulletin of the American Association of Petroleum Geologists. V. 50, No. 8, August 1966, p. 1711.
World Petroleum Report 1966. V. 12, Mar. 15, 1965, p. 94.

The Mineral Industry of Gabon

By Henry E. Stipp [1]

The mineral industry of Gabon made significant contributions to the economy of the country as advances in production of the principal mineral commodities continued. The 1965 value of mineral production at $52.9 million [2] was equal to almost 15 percent of the gross domestic product estimated at $354 million in 1965.

Gabon had a positive trade balance in mineral commodities as well as in total trade in 1965. Exports of mineral commodities valued at $51.3 million were 23 percent larger than those of 1964. Imports of mineral commodities also increased, totaling $8.4 million or about 11 percent greater than imports in 1964.

The Government of Gabon's 5-year development plan for 1966 to 1970 provided for total investments of $385.7 million. The mineral industry was scheduled to receive $109.6 million or 28 percent of total investments. The sum of $102 million will be spent on road maintenance and completion of major road networks. A deep-water port at Owendo will be created under the plan. However, the Owendo-Belinga railroad will only be started under this 5-year plan. Foreign private investment was to provide for 61 percent of total expenditure during the period. Foreign aid and domestic fiscal revenue was to contribute 26 percent and 13 percent, respectively, of financial requirements.

PRODUCTION

Substantial increases in production of Gabon's principal mineral products were recorded in 1965. Output of manganese ore increased 35 percent compared with that of 1964, uranium concentrate increased 24 percent, and crude petroleum increased 19 percent. Gold production decreased 13 percent compared with 1964 production.

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from the African Financial Community francs (CFAF) to U.S. dollars at the rate of CFAF245=U.S. $1.00.

Table 1.—Gabon: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Gold—troy ounces	15,304	16,300	35,719	42,760	37,134
Manganese ore (over 35 percent manganese)	------	NA	NA	948,303	[2] 1,274,607
Manganese pellets (82 to 84 percent manganese dioxide)	------	NA	NA	NA	5,789
Total	------	203,244	636,587	948,303	1,280,396
Uranium concentrate	969	1,161	1,317	1,287	1,591
Mineral fuels:					
Natural gas, marketed—million cubic feet	249	328	321	353	376
Petroleum, crude—thousand 42-gallon barrels	5,446	5,992	6,446	7,668	9,161

NA Not available.

[1] In addition to commodities listed, construction materials such as clays and sand and gravel were also produced, but no quantitative data are available.

[2] Manganese content 50–53 percent.

TRADE

Gabon's minerals trade in 1965 consisted principally of exports of gold, manganese ore, uranium concentrate, and crude petroleum. Shipment of manganese ore increased 30 percent over that of 1964, and crude oil export increased 20 percent; however, uranium concentrate shipments were less than 1 percent greater than those of 1964, and gold export decreased 1 percent. Imports of mineral commodities, far exceeded on a value basis by mineral exports, consisted chiefly of iron and steel products, cement, and petroleum refinery products. Iron and steel imports increased almost 16 percent over those of 1964 while cement imports decreased 1 percent and imports of refinery products increased 0.4 percent over those of 1964. The relationship of trade in mineral commodities to total trade has been summarized in the adjacent table:

	Million dollars		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1964	41.7	90.1	46.3
1965	51.3	97.0	52.8
Imports:			
1964	7.6	55.7	1.4
1965	8.4	62.5	1.3
Trade balance:			
1964	+34.1	+34.4	XX
1965	+42.9	+34.5	XX

XX Not applicable.

[1] Values given are only for those commodities listed in tables 2 and 3 of this chapter.

France continued to be Gabon's principal trading partner in 1965 receiving 49 percent (by value) of total exports, while supplying 58 percent of Gabon's total imports. The United States was also an important trading partner of Gabon receiving 18 percent (by value) of the latter's total exports and shipping 12 percent of Gabon's imports. Other countries that conducted significant trade with Gabon were West Germany, United Kingdom, and Netherlands.

Table 2.—Gabon: Exports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Metals:				
Gold, troy ounces	34,551	[1] 39,738	[1] 35,205	Mainly to France.
Iron and steel:				
Scrap	NA	1,854	1,823	All to Italy.
Semimanufactures	NA	240	138	Nonspecified 43; France 39; Spanish Guinea 26.
Manganese ore	603,673	881,749	1,149,462	United States 689,967; France 191,020; West Germany 153,877.
Nonferrous scrap	NA	37	36	Senegal 20; France 10; Dahomey 5.
Uranium concentrate	1,248	1,392	1,521	All to France.
Nonmetals:				
Clays, construction and refractory materials	NA	1	----	
Other crude minerals	NA	10	----	
Mineral fuels:				
Petroleum, crude thousand 42-gallon barrels	6,341	7,690	9,225	France 7,585; Senegal 968; Ivory Coast 449.
Petroleum, refinery products thousand 42-gallon barrels	NA	79	86	All to Cameroon.

NA Not available.

[1] Data from the Republic of Gabon. Bulletin Mensuel de Statistique. No. 84, March 1966, p. 67.

Source: Except where otherwise noted, Office Statistique Des Communautés Européennes. Gabon. No. 20, 1965, 25 pp.; No. 7, 1966, pp. 123–145.

Table 3.—Gabon: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals:				
Aluminum	NA	96	107	Cameroon 70; France 22.
Copper	NA	32	41	France 40.
Iron and steel:				
Scrap and ferroalloys	NA	NA	13	All from France.
Semimanufactures	8,542	13,652	15,822	France 14,753.
Lead	NA	10	8	France 7.
Tin, long tons	NA	2	2	All from France.
Zinc	NA	10	7	Do.
Nonmetals:				
Cement, lime and other building material	32,056	38,548	33,431	France 21,149; Belgium-Luxembourg 10,700.
Clays, construction and refractory material	NA	184	213	France 108; West Germany 72.
Fertilizers:				
Natural	39	6	---	
Manufactured		27	47	France 38.
Minerals, other crude	NA	3,833	6,570	France 1,919; Netherlands 1,097; Senegal 1,030.
Mineral manufactures [1]	NA	433	47	France 31; West Germany 9.
Mineral fuels:				
Coal, coke and briquets	NA	22	36	All from France.
Gas, natural and manufactured	NA	587	623	France 420; Belgium-Luxembourg 192.
Petroleum refinery products thousand 42-gallon barrels [2]	420	459	479	Venezuela 214; Netherland Antilles 151; France 25; Italy 23; West Indies 22.

NA Not available.

[1] Category reported in source and not further subdivided; includes some materials not included among mineral commodity trade in other chapters.

[2] Converted at rate of 7.2 barrels per metric ton.

COMMODITY REVIEW

METALS

Chromite.—Mineral resource studies conducted by the Bureau De Recherches Géologiques Et Minières (BRGM), for the Government of Gabon, indicated the occurrence of chromite in the vicinity of Boone and Makokou, along the route of the proposed railway from the Port of Okanda to Belinga.[3]

Copper.—Detailed investigation of copper indications previously discovered in the Boone-Makokou area showed that the mineralization was not extensive. A general geologic and prospecting survey, conducted by BRGM in an area to the west of the valley of the Ofooué River southeast of Etéké indicated that geologic conditions were favorable for the occurrence of deposits of copper in rocks similar to those of the Republic of the Congo (Léopoldville).

Gold.—Société Gabonaise de Recherches et d'Exploitation, a government-controlled company produced 37,134 troy ounces (1,155 kilograms) of gold from alluvial deposits in the districts of Etéké, Lastourville, Makokou-Belinga, N'Djole, and M'Bigou. A large part of the output came from the deposit N'Dangui near Lastourville, in east-central Gabon. Most of the gold was exported to France. However, a small quantity was used by local artisans for producing jewelry. The BRGM conducted a detailed study of gold deposits in the Etéké region for the Government of Gabon.[4] Results of the study were said to warrant further investigation.

Iron Ore.—Geologic surveys and studies conducted in 1964 by BRGM for Syndicat de Recherches de Fer et de Manganèse dans Nord-Gabon established the existence of a large deposit of high-grade iron ore near Minkebe, 72 kilometers northwest of Belinga.[5] Ore reserves have been estimated to be at least 1 billion tons containing 60 to 65 percent iron. The deposit will be exploited by Société des Mines de Fer de

[3] Bureau De Recherches Géologiques Et Minières (Paris). Rapport Annuel 1965. Dec. 31, 1965 pp. 52–53.

[4] Work cited in footnote 3.

[5] Work cited in footnote 3.

Mekambo (SOMIFER), a consortium of United States and European firms. By 1972 the mines are expected to be producing at a rate of 5 million metric tons annually.[6] Later, extraction will be increased to 10 million tons of ore annually. The ore will be transported by rail about 560 kilometers to the port of Owendo, near Libreville. Sedes, a French engineering bureau, made a study on the economic effects of exploiting the Minkebe iron ore deposits and constructing a railway from Belinga to the port of Owendo.[7] Installation of the mining complex at Belinga and port facilities at Owendo reportedly will cost the SOMIFER consortium about $137 million. The railway will cost about $133 million. It will be integrated with the existing system and operated by the National Railways Administration. The work will be financed by a group consisting of the International Bank for Reconstruction and Development, the United States Agency for International Development, the European Investment Fund, France, and West Germany.

Lead and Zinc.—Research was conducted by BRGM on possible lead-zinc occurences in the Cretaceous marine series in the vicinity of Lake Azinga.[8] Results of the survey were negative; however, an investigation of formations along the coast north of Libreville and Mayanmba indicated areas favorable for concentrations of heavy minerals.

Manganese.—Production of manganese ore in 1965 was valued at about $29 million, almost 56 percent of the total value of Gabonese mineral production. Compagnie Miniere de l'Ogooue (COMILOG) mined all the ore produced in Gabon from its Moana mine in the upper section of the Ogooue River. The deposit, consisting of a 10- to 25-foot-thick bed of ore under a barren capping of about the same thickness, occurs in several plateaus near the village of Moana.[9] Proved ore reserves were estimated at 200 million tons containing 48 to 50 percent manganese. As of 1965, trucks with a capacity of 30 tons hauled ore from the opencast mine to the washing plant where it was crushed at the rate of 450 tons per hour and washed in two countercurrent rotating drums. The product of this operation was a lumpy ore carrying 50 to 53 percent manganese, 5 to 10 percent water, 2 to 4 percent iron, 1 to 3 percent silica, 5 to 7 percent alumina, and 0.09 to 0.13 percent phosphorus. A small quantity of ore was concentrated on vibrating tables yielding a product containing 83 to 85 percent manganese dioxide for use as a depolarizing agent in dry cell batteries.

Uranium.—Compagnie des Mines d'Uranium de Franceville produced uranium ore valued at about $8.7 million from its Maunana mine, about half way between Libreville and Lastourville. Here an entire industrial center and a community for 1,000 workers and their families have been established.[10] The industrial complex, completed in March 1961, includes two separate extracting and processing sections. The open-pit mine has been worked to a depth of 230 feet and also some mining was done in underground shafts sunk in 1964. Ore, hauled to the crusher station and processing plants by a system of trucks and conveyor belts, was pulped, treated with sulfuric acid, and reacted with magnesium to precipitate magnesium uranate, containing about 15 percent uranium metal. The magnesium uranate was filtered, dryed, and stored for shipment to France. Another local facility produced sulfuric acid and energy for plants furnishing electric power to the complex.

NONMETALS

Cement.—The plan to erect a cement plant near the port of Owendo was delayed[11] when a new study indicated that it would be economically more advisable to establish the plant near the calcareous deposit on the island of Coniguet, near Libreville. Moreover, capacity of the plant has not been determined. The originally proposed 100,000-ton annual capacity would far exceed 1965 national consumption, estimated at about 35,000 tons, and markets for the remaining 65,000 tons per year would be difficult to develop because neighboring countries such as Cameroon have plans to erect similar plants. The administrative council of Société des Ciments Portland Gabonais was studying plans to install

[6] Mining Journal (London). Gabon, Gabonese Iron Ore Expansion. V. 266, No. 6817, Apr. 15, 1966, p. 266.
[7] Metal Bulletin (London). Gabon. No. 5068, Jan. 28, 1966, p. 14.
[8] Work cited in footnote 3.
[9] Mining Magazine. Mineral Production in Gabon. V. 114, No. 2, February 1966, pp. 96–101.
[10] Work cited in footnote 9.
[11] Industries Et Travaux D'Outremer. Informations D'Outre-Mer (Overseas Information). No. 151, June 1966, p. 488.

a plant with a capacity of 50,000 tons sufficient to cover anticipated national requirements.

Diamond.—BRGM made a study of diamond mineralization in areas near Franceville, Etéké, and Mitzic.[12] Two groups of stones were distinguished, one of dendritic origin and the other group which reportedly originated in kimberlite rock.

Fertilizer Materials.—*Phosphates.*—Studies were conducted by BRGM on indications of phosphate deposits, discovered by Société Pétrolieres in a sedimentary basin north of the Iquela Lagoon, near the coast about 160 kilometers south of Port Gentil.[13]

MINERAL FUELS

Petroleum.—Production of crude oil, the second largest mineral industry activity in Gabon, increased over 19 percent compared with that of 1964. Exports in 1965 were valued at $14.7 million, 15 percent of total export value. Proved petroleum reserves were estimated at 170 million barrels in 1965. Société des Pétroles d'Afrique Equatoriale (SPAFE) held concessionary exploration rights in the area extending from somewhat north of Libreville to somewhat south of Pointe Noire in the Republic of Congo (Brazzaville).[14] Shell Gabon (formerly Compagnie Shell pour Recherches et Exploration au Gabon), the only other producer in Gabon, held exploration rights on a 50-percent basis with SPAFE in three areas, Sette Cama, Sette Cama South, and Sette Cama West. Fields at Cap Lopez, Pointe Clairette, Techengue, M'Bega, and Ozouri, all owned by SPAFE, reportedly were nearing exhaustion. The recently discovered Anguille field, owned by SPAFE and located west of Sette Cama, and the Gamba field, jointly owned by Shell Gabon and SPAFE and located south of Sette Cama were considered to be bright spots for the future. Reserves in the Anguille field were unknown as only four wells have been drilled to a depth of 2,000 meters. Reserves in the Gamba field were estimated at 75 million barrels of 33.5° gravity crude oil.[15] Sixteen of 22 wells drilled here have struck oil in a sandstone of Cretaceous age at 3,000 to 4,000-foot depths.

SPAFE and Shell Gabon collaborated in an extensive survey program. A seismic survey was being completed on the Lambarene area, and seismic survey teams were based at Koumaga and near Diema.

An oil line, 7 kilometers long, was being constructed from the Gamba field to take crude oil out to tankers waiting at sea.

The oil-producing industry employed about 1,600 Africans and 155 Europeans in 1965, and there were 104 Africans and 2 Europeans employed in oil products distribution.

Shell de l'Afrique Equatorial et du Cameroon, a separate company from Shell Gabon operated depots for gasoline distribution at Libreville, Alembe, Lambarene, N'joli, and Mayonomi. It was estimated that Shell had about 30 percent of the market for petroleum products, Mobil Oil de L'Afrique Equatoriale about 25 percent, Société des Pétroles BP d'Afrique Occidentale 24 percent, a subsidiary of Texaco Inc. 9 percent, a subsidiary of Compagnie Francaise des Pétroles 8 percent, and a subsidiary of Petrofina, S.A. had about 4 percent of the market for petroleum products.

The work of constructing the refinery at Port Gentil was awarded to the Société parisienne pour l'Industrie Electrique.[16] Société Foster Wheeler Francaise will be responsible for the engineering on the refinery, which was expected to be completed by the close of 1967.

---

[12] Work cited in footnote 3.
[13] Work cited in footnote 3.
[14] U.S. Embassy, Libreville, Gambia. State Department Airgram 109, Apr. 22, 1966, pp. 1–5.
[15] Oil and Gas International. Spectacular Growth Seen for Petroleum Industry In Africa. V. 6, No. 3, Mar. 1966, p. 47–48.
[16] Industries Et Travaux D'Outremer. Informations D'Outre-Mer (Overseas Information). No. 146, January 1966, p. 51.

The Mineral Industry of Ghana

By Roderick G. Murchison [1] and Walter C. Woodmansee [2]

Although Ghana produced only a limited number of mineral commodities in 1965, the country maintained a significant world position as a source of several commodities, including diamond, manganese ore, gold, and bauxite. Gold followed cocoa as Ghana's second largest source of foreign exchange. Preliminary data indicate that the value of mineral output (except refined petroleum) was about $60 million, an estimated 3 percent of a gross national product of $2,035 million (current prices).[3]

In January, a Soviet geological survey group of 40 exploration technicians became an integral part of the Ghana Geological Survey. The Soviet group totaled 84 in 1963 and 65 in 1964.

Throughout the year the minerals industry was hurt by the continuing inflationary trend, increased taxation, shortages of mining supplies and equipment, and stricter regulations on import licenses, including licenses for items essential to mine production. In spite of these problems, Ashanti Goldfields Corp. Ltd., the large, private gold producer, and Consolidated African Selection Trust Ltd. (CAST), continued substantial expansion programs. During the year the Government passed a Minerals and Metals Act, Sales Tax Act, Social Security Act, and Foreign Travel Tax Act, all affecting mineral operators. The Minerals and Metals Act, passed by Parliament in March, created a Ministry of Mines and Mineral Resources, charged with regulating the mineral industry. This marked the first time in Ghana's history that a ministry was created solely for the administration of the country's mines and mineral resources. The new legislation granted the Ministry authority to inspect mines and mineral properties, to require operating companies to provide production data, to set fees for mineral licenses and permits, and to establish mineral policies, including policies regarding conservation.[4] In May a new section, concerned with diamond and gold sales and defining offenses for illegal activities, was added to the Act.

Under the Social Security Act, effective July 1, 1965, companies were required to contribute to the fund a sum equal to 15 percent of total wages paid. The Sales Tax Act placed an 11.5 percent tax on all petroleum products and a gasoline tax of 7 cents per gallon.

The Government assumed control over several sectors of the mineral industry; by yearend the following State-owned agencies had been incorporated: State Brick and Tile Corp., State Diamond Marketing Corp., State Diamond Mining Corp., State Gold Mining Corp., State Marble Works Corp., State Metal Industries Corp., Kwame Nkrumah Steelworks Corp., and Sheet and Metal Works Corp.

Ashanti Goldfields was supplied with hydroelectric power from the new Volta River Dam at Akosombo in 1965, improving the company's financial position. Volta Aluminium Co. Ltd. (VALCO), the new aluminum producer, was connected to this power source in September. Other gold-mining operations also were expected to receive Volta hydroelectric power.

The mineral industry ranked third, after cocoa and timber, as an employer among industries earning foreign exchange. Di-

[1] Regional minerals attache, U.S. Embassy, Accra.

[2] Physical scientist, Division of International Activities.

[3] Department of State, Agency for International Development, AID Economic Data Book. Where necessary, values have been converted from Ghanaian pounds (£G) to U.S. dollars at the rate of £G1 = $2.80. On July 19, 1965, a new decimal currency, the cedi, was introduced; the conversion rate is 1 cedi = $1.17.

[4] U.S. Embassy, Accra, Ghana. State Department Airgram A-368, Mar. 21, 1965, p. 3.

rect employment in the mineral industry was 25,000 to 26,000 Africans and about 500 non-Africans, according to the Ghana Chamber of Mines and the Central Bureau of Statistics. Distribution by operation at yearend was as follows:

Operation:	*Africans*	*Non-Africans*
Gold	18,396	344
Diamond	3,263	75
Manganese	2,300	27
Bauxite	465	15
Salt	420	—
Iron and steel	400	7
Refined petroleum	320	50

In addition, an estimated 8,000 African contract diggers worked government-allotted mining leases for diamonds early in the year, but at yearend the number had substantially decreased. In addition, 258 Africans and 18 non-Africans were engaged in mineral prospecting. The number of expatriates in the mining industry decreased by 102, due to continued Africanization and to difficulty in hiring suitable staff from overseas.

PRODUCTION

As in recent years, gold, diamond, refined petroleum products, manganese ore, and bauxite were the essential mineral commodities produced. Bauxite and manganese mining showed increases in 1965, whereas gold and diamond mining and output of petroleum products were lower. Gold mining was adversely affected by depleted reserves at Government-operated mines. Heavy illegal traffic in diamond continued, and a drop in individual digger production on government leases caused a lower recorded output in the diamond industry. Delays in receipt of foreign crude oil caused occasional refinery output losses.

Ghana's first steel production was reported from the new steelworks, which operated intermittently and produced only 8,000 tons of mill products. The first cement plant went into production in January, and a second was under construction at yearend.

Table 1.—Ghana: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Bauxite—thousand tons	204	243	315	250	319
Gold—thousand troy ounces	853	888	921	865	755
Iron and steel: Steel semimanufactures	------	------	------	--------	e 8,000
Manganese ore—thousand tons	438	379	407	462	604
Silver (exports)—troy ounces	7,027	4,443	4,827	--------	--------
Nonmetals:					
Diamond—thousand carats	r 3,214	3,208	2,678	2,668	2,248
Salt—thousand tons	18	19	20	31	27
Mineral fuels: Petroleum refinery products:					
Gasoline	------	------	35,303	154,465	141,766
Kerosine	------	------	24,121	50,333	49,032
Distillate fuel oil	------	------	65,833	268,032	262,306
Residual fuel oil	------	------	62,023	263,444	245,542
Other	------	------	28,685	1,437	1,805
Total	------	------	215,965	737,711	700,451

e Estimate. r Revised.

[1] In addition to commodities listed, cement production started in 1965, but output data are not available. Stone was quarried; output was 1.5 million cubic yards in 1964.

TRADE

Metal and mineral trade showed a favorable balance in 1964, the latest year for which complete data are available, but the total trade balance remained in deficit as follows:

	Million dollars		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1963	54	299	18.1
1964	63	317	19.9
Imports:			
1963	53	365	14.5
1964	59	340	17.4
Trade balance:			
1963	+1	−66	XX
1964	+4	−23	XX

XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.
Source: Statistical Office of the United Nations. Values for gold exports, not listed in UN statistics, have been included.

Values for the three leading mineral exports, which comprised 92 percent of total mineral exports, were as follows in 1964: Gold $28.9 million, diamond $17.1 million, and manganese ore $12.1 million. The principal recipients of Ghana mineral commodities were United Kingdom, $36.0 million, including all gold shipments; Japan, $11.3 million; Belgium-Luxembourg, $7.1 million; Netherlands, $6.4 million; and United States, $4.4 million. In addition, mineral commodities valued at $146,000 were reexported in 1964.

Principal metal and mineral imports in 1964 were as follows: Iron and steel, $18.5 million, largely from the European Economic Community; crude petroleum, $14.4 million; cement, $11.6 million; nonferrous metals, $4.9 million; and refined petroleum products, $4.7 million. The United Kingdom continued as the main source of these materials, providing goods valued at $11.8 million, followed by West Germany, $11.6 million; Nigeria, $9.4 million; U.S.S.R., $5.6 million; and Libya, $5.2 million.

Data available for most of 1965 indicate a continued overall trade deficit and favorable balance in mineral commodities. Mineral exports for January through November were valued at $60.9 million; corresponding imports were $51.8 million. Gold, diamond, manganese ore, and bauxite continued as chief mineral exports, although gold exports apparently declined by about 7 percent. The United States received 204,000 tons of manganese ore, valued at $5.5 million, during this period.

Table 2.—Ghana: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965 [2]	Principal destinations, 1964
Metals:				
Aluminum: Bauxite—thousand tons	211	269	287	United Kingdom 230; France 19; Netherlands 19.
Gold, bullion—thousand troy ounces	910	831	783	All to United Kingdom.
Manganese ore—thousand tons	394	506	574	Spain 134; United States 126; Norway 111.
Silver—troy ounces	4,827	------	------	
Scrap, nonferrous	998	1,774	744	United Kingdom 929; Belgium-Luxembourg 460.
Residues (slag, dross, scale, etc.)	-------	30	------	All to United Kingdom.
Nonmetals:				
Clays	38	------	------	
Diamond—thousand carats	1,514	2,569	3,084	Belgium-Luxembourg 975; Netherlands 550; United Kingdom 530.
Mineral fuels: Petroleum refinery products:				
Gasoline—thousand 42-gallon barrels	-------	120	49	Nigeria 68; Cameroon 52.
Kerosine—do	-------	16	26	All to Nigeria.
Distillate fuel oil—do	-------	86	169	Nigeria 85.
Residual fuel oil—do	123	1,348	1,381	Netherlands 660; United Kingdom 321.
Total—do	123	1,570	1,625	

[1] In addition to commodities listed, a few tons of salt were exported in most years.
[2] Partial figure; data through October or November for metals and nonmetals.

Table 3.—Ghana: Imports of metals and minerals

(Metric tons unless otheawise specified)

Commodity	1963	1964	1965 [1]	Principal sources, 1964
Metals:				
Aluminum and alloys:				
Ingots	194	80	288	United Kingdom 17.
Semimanufactures	7,323	5,699	5,949	United Kingdom 4,946; U.S.S.R. 367.
Copper and alloys, semimanufactures	r 779	399	1,007	United Kingdom 166; Australia 92.
Gold:				
Bullion—troy ounces	7,034	4,942	-------	All from United Kingdom.
Partly worked—do	1,094	808	1,904	Do.
Iron and steel:				
Ore and concentrate	-------	112	-------	United Kingdom 102.
Pig iron and ferroalloys	r 301	419	361	United Kingdom 253; West Germany 142.
Ingots and similar forms	r 104	2,064	3,148	United Kingdom 1,513; Belgium-Luxembourg 515.
Bars and rods	24,939	169,217	133,011	United Kingdom 128,863; West Germany 17,955.
Angles, shapes, and sections	3,216	2,564	2,641	United Kingdom 740; Italy 668; West Germany 581.
Plate, sheet, hoop, and strip	14,815	10,336	10,650	United Kingdom 5,680; West Germany 1,247; Japan 1,198.
Rails and accessories	3,782	7,932	1,241	United Kingdom 7,586.
Wire	4,035	2,831	2,234	West Germany 1,582; Czechoslovakia 323.
Tubes, pipes, and fittings	11,414	30,616	19,564	West Germany 21,434; Netherlands 3,513; United Kingdom 3,362.
Castings and forgings	4,073	1,784	1,834	Zambia 999; Italy 385; United Kingdom 372.
Total	66,679	227,763	e 174,684	
Lead:				
Ore and concentrate	9	-------	21	
Ingots and semimanufactures, including alloys.	407	186	472	Belgium-Luxembourg 135.
Silver, unworked and semiworked. troy ounces	6,368	400	176	All from United Kingdom.
Tin and alloys, ingots and semimanufactures. long tons	145	171	43	Belgium-Luxembourg 110; United Kingdom 30.
Zinc and alloys, ingots and semimanufactures.	99	60	1,044	United Kingdom 30.
Metals, not elsewhere specified:				
Ore and concentrate [2]	-------	30	65	West Germany 20; United Kingdom 10.
Oxides, mainly for paint, and other metallic compounds.	322	3,088	577	NA.
Scrap, nonferrous	12	6	18	All from United Kingdom.
Ingots and semimanufactures	r 295	4	4	Do.
Nonmetals:				
Abrasives, natural	66	61	110	United Kingdom 60.
Cement—thousand tons	r 509	645	525	U.S.S.R. 277; Poland 144; United Kingdom 66; Yugoslavia 52.
Clays	2,019	1,303	2,977	United Kingdom 870; Italy 109.
Clay construction materials	3,659	3,322	18,518	West Germany 1,696; United Kingdom 656.
Fertilizer materials:				
Crude, all types	840	598	631	Nigeria 269; Netherlands 52.
Manufactured:				
Nitrogenous	80,718	776	873	Netherlands 497.
Phosphatic	r 1,196	246	4,183	NA.
Potassic	r 464	969	18	West Germany 897.
Mixed	355	1,565	511	NA.
Ammonia	76	22	31	NA.
Lime	7,198	3,005	5,837	United Kingdom 2,009.
Salt	2,695	2,135	8,553	West Germany 1,498; United Kingdom 238.
Sodium and potassium compounds:				
Potash, caustic	-------	124	12	Netherlands 122.
Soda, caustic	2,449	2,465	1,515	United Kingdom 1,492; Netherlands 477.

See footnotes at end of table.

Table 3.—Ghana: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965[1]	Principal sources, 1964
Nonmetals—Continued				
Stone, sand and gravel:				
Dimension stone, worked	796	615	996	Italy 550.
Grinding stone and wheels	61	58	NA	United Kingdom 25.
Undifferentiated	1,868	1,505	[3] 61,238	Italy 1,343.
Sulfur in all forms:				
Crude	51	13	17	United Kingdom 10.
Sulfuric acid and other inorganic acids.	397	338	274	United Kingdom 158; Italy 127.
Nonmetals, not elsewhere specified:				
Chemicals, inorganic	112	48	165	United Kingdom 26.
Gases, hydrogen and other	87	108	60	Nigeria 80.
Minerals, crude	1,705	646	1,375	Italy 389; mainland China 203.
Mineral fuels:				
Coal, coke, and briquets	42,289	45,623	27,752	Nigeria 35,154; Poland 10,077.
Petroleum: [4]				
Crude thousand 42-gallon barrels	1,440	3,847	4,233	Nigeria 1,915; Libya 1,682.
Refinery products:				
Gasoline do	847	57	20	Netherlands Antilles 23; Venezuela 17; Netherlands 17.
Jet fuel and kerosine do	105	101	138	Venezuela 76; Ecuador 25.
Distillate fuel oil do	216	7	23	United States 6.
Residual fuel oil do	1,279	47	51	United States 42; Italy 5.
Lubricating oil do	367	108	148	United Kingdom 40; United States 35; Netherlands 18.
Other liquid products do	103	----------	6	
Total do	2,917	320	386	
Grease	1,411	969	1,001	West Germany 481; United Kingdom 269; United States 131.
Other solid products	2,251	1,527	4,548	Indonesia 1,160; Belgium-Luxembourg 102.
Asphalt and bitumen	7,606	9,646	12,228	Netherlands 4,055; Venezuela 2,834; Netherlands Antilles 2,526.
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation	1,235	154	112	All from United Kingdom.

e Estimate. r Revised. NA Not available.
[1] Partial figure; data through October or November for metals and nonmetals.
[2] Principally manganese.
[3] Includes 54,903 tons of limestone.
[4] Does not include small quantities of manufactured gas (liquefied petroleum gas), given only in terms of value.

Sources: Central Bureau of Statistics, External Trade Statistics of Ghana.
Statistical Office of the United Nations.

COMMODITY REVIEW

METALS

Aluminum.—Construction on the Volta Aluminum Co. Ltd. (VALCO), $128 million reduction plant at Tema was about 30 percent completed at yearend. Target date for plant completion was April 1967. The project was partially financed by an Export-Import Bank credit of $98 million. With a total work force of 4,000, VALCO was a major employer during the year. Initial plant capacity was reported in various sources as 100,000 to 130,000 tons of ingot annually. Plans called for the use of imported alumina, at least during the early years of operation, and export of ingot.

Electric power from the Akosombo Dam was delivered to Tema in September. VALCO contracted with the Volta River Authority for up to 300,000 kilowatts annually for 30 years.[5] Dedication ceremonies for the official opening of the dam were announced for January 1966.

Ghana Aluminium Products Ltd., a fabricating company jointly owned by the Gha-

[5] The Financial Times (London). Jan. 24, 1966.

naian Government and Aluminium Ltd. of Canada, continued to operate at only partial capacity because of continuing shortages of raw materials and equipment.

Bauxite.—Mine production at Owaso by British Aluminium Co. Ltd (BAL), of which Reynolds Metals Co. owns 47.7 percent, was stepped up to a record high level, largely due to improved ore haulage from mine to washing plant. Late in the year, BAL was engaged in the development of a second deposit in the area.

The Ghana Geological Survey, in cooperation with Kaiser Engineers, Inc., carried out a series of small drilling projects on bauxite deposits in the Volta region. Results of those investigations were not made public.

Gold.—Mine output of gold declined appreciably in 1965, due mainly to smaller output at State Gold Mining Corp. properties. The only privately owned gold company, Ashanti Goldfields Corp. Ltd., reported mining activities and earnings for the fiscal year ending September 30, 1965, at a level similar to 1964. Ashanti produced 461,336 troy ounces from 528,000 tons of ore at its Ashanti, Ayeinm, and Justice mines during calendar year 1965, 61 percent of the total Ghanaian gold output, 3 percent more than in 1964. During the company's fiscal year, sales were 466,953 ounces from ore with an average grade of slightly over 1 ounce per ton and with a 88.99 percent recovery. Gross value of output was $16,487,000; working profit was $5,887,000 ($5,938,000 in 1964) of which $3,718,000 was paid in taxes to the Ghanaian Government. The company reported ore reserves totaling 3,344,760 tons at 1 ounce per ton, as of September 1965. Total operational cost was $16.14 per ton, $0.35 less than in 1964, a cost reduction attributed to savings in electric power costs and the use of ammonium nitrate for blasting. In September, Ashanti became the first large industrial consumer to obtain power from the Volta River Authority's new Akosombo Dam. The company estimated that this new power supply would save $600,000 to $700,000 annually, although new taxes would absorb more than half of this savings.[6]

The State Gold Mining Corp., a new State-owned holding company which owned and operated six mines at yearend, produced 293,855 troy ounces, a decrease of 21 percent from 1964 production. Shortage of foreign exchange for supplies and equipment and continued attrition of expatriate technicians contributed to the decline in output, but the major factor was the failure to develop new ore as reserves were depleted. The State Gold Mining Corp. replaced the State Mining Corp. in February. Operating gold-mining companies under its control at yearend were Amalgamated Banket Areas (ABA), Ariston-Ghana Main Reef, Bibiani, Bremang Gold Dredging, and Konongo. Two of these Government mines experienced shutdowns varying from 2 weeks to 1 month on several occasions due to shortages of cyanide and other mill reagents.

The Konongo mine and its installations and equipment were purchased by the State Gold Mining Corp. from Konongo Gold Mines Ltd. of Consolidated Goldfields Group, effective April 1, 1965, after lengthy negotiations. The former private operator had worked out the minable ore and had scheduled mine shutdown for March. The new Government management planned new mine exploration by the Geological Survey of Ghana and temporary mill shutdown in July. Employment was reduced at the mine, and attempts were made to transfer workers to other State-operated mines. At yearend the former owner was unable to liquidate its assets in Ghana and distribute funds in London because of a lack of sterling coverage in Ghana.

In late 1964, construction began on the $800,000 Tarkwa gold refinery with proposed U.S.S.R. financial and technical assistance. Planned annual capacity was 1 million ounces of standard 98 percent gold bullion and byproduct silver. At yearend 1965, the building was completed except for connection to electric power and water supply, but U.S.S.R. technical personnel and equipment had not arrived.

Iron and Steel.—The 30,000-ton-per-year Kwame Nkrumah Steelworks at Tema completed its first full year of operation. The plant operated at less than one-third of capacity; output was only 8,000 tons of steel reinforcing bars and angles. Production was handicapped by shortages of domestic scrap, foreign exchange for pur-

[6] Ashanti Goldfields Corp. Ltd. Sixty-ninth Annual Report and Statement of Accounts for the Year Ended 30 September 1965. London, 20 pp.

chase of foreign scrap, equipment, and experienced staff.

Manganese. — Production and foreign sales of manganese ore by African Manganese Co. Ltd., subsidiary of Union Carbide Corp. and the only manganese producer in the country, increased from its Nsuta mine. Demand was greater for low-grade carbonate ores. The operating company conducted research on beneficiation of the carbonate ores and built a vertical kiln for a pilot plant operation.

Exports during January-November 1965 included 43,345 tons of battery-grade ore and 530,517 tons of ore containing 30 percent or more manganese. Total value was about $13.4 million. The United States received 25,269 tons of battery-grade ore, valued at nearly $1 million, and 179,162 tons of plus 30 percent manganese ore, valued at $4.4 million. A total of 196,564 tons of plus 30 percent ore was shipped to Norway.

NONMETALS

Cement.—In January, the country's first domestic cement was made at the $1 million Tema Cement Works, which has capacity of 200,000 tons per year and was part of the Tema Harbor expansion program. The plant was built by Parkinson Howard (Ghana), Ltd.[7]

Clinker grinding started at Tema in May. The plant used imported raw materials, but development of nearby limestone deposits was planned. Construction was by Parkinson Howard and Associated Portland Cement Manufacturers Ltd., both United Kingdom-based firms.

Another cement plant was under construction at Takoradi Harbor late in the year. A Polish state enterprise had an estimated $3.9 million construction contract.

Diamond.—Continuing a decline started in 1961, recorded output was nearly 16 percent below the 1964 total and 30 percent below that of 1962, the last year of a free diamond market in Ghana. Exports in 1964 were valued at $17,137,000.

Production by Consolidated African Selection Trust Ltd. (CAST) has been expanded gradually, but reported output by direct employees at Government mines and by contract diggers (individual African miners) on Government leases has fallen off substantially, at least in part because of false declarations by diggers and Government restrictions on licensing. Output in thousands of carats during 1961–64 was as follows:

Year	Consolidated African Selection Trust Ltd.	Diggers	Total
1961	1,966	1,248	3,214
1962	2,264	944	3,208
1963	2,119	559	2,678
1964	2,289	379	2,668

CAST was in the midst of an $8 million expansion program during which the company expected to raise output to 2.5 million carats in 1966. In June 1965 company production was at an annual rate of 2.1 million carats.[8] A new $3-million No. 12 washing plant with annual capacity of 655,000 cubic yards and theoretical maximum recovery of 1 million carats per year went on stream at Akwatia on the Birim River in June. CAST planned to finance a large part of its expansion program by reinvesting company profits for about 3 years.

In February the Ministry of Trade announced in Parliament that the Diamond Marketing Board was reconstituted as the State Diamond Marketing Corp., which would control diamond processing as well as sales and distribution. The Ministry of Mines and Mineral Resources voided all digging licenses, and the State Diamond Marketing Corp. assumed control of all diamond properties except those of CAST and Akim Concessions Ltd., in an attempt to eliminate illicit traffic in diamonds. In May a new section was added to the Minerals Act to control smuggling. Since 1962 a steadily increasing number of licensed diggers had smuggled their diamonds out of Ghana to the hard currency markets in Nigeria and the Ivory Coast, where higher prices commonly were paid.

Plans for the Government-sponsored project for dredging the Birim River from its confluence with the Pra River easterly to the town of Kade, at an estimated cost of $23.8 million, were completed, and financing was sought in Western Europe.

Limestone.—The Geological Survey con-

[7] U.S. Embassy, Accra, Ghana. State Department Airgram A–272. Jan. 24, 1965, p. 5.

[8] Mining Journal. Review of Consolidated African Selection Trust Ltd. Annual Report. V. 265, No. 6796, Nov. 19, 1965, p. 372.

tinued exploration work on limestone deposits at Nauli on the coast in western Ghana and at Buipe in the northern region. The Nauli deposit, reported at depth of 500 feet, was investigated as a source of raw material for a cement plant under construction at Takoradi.

At Asuboni in the east, 10,000 tons were mined early in the year for use at the Kwame Nkrumah Steelworks. Mining continued but was temporary; the deposit lies within the area to be flooded by the new Volta River Dam at Akosombo.

MINERAL FUELS

Petroleum.—In accord with a $15 million agreement with the U.S.S.R. for 1 million tons of crude oil, Ghana imported 3,473,000 barrels of crude oil from that country during January-November 1965. Early in the year the U.S.S.R. reportedly failed to meet delivery dates, necessitating a brief shutdown of the Tema refinery. Residual fuel oil output, far in excess of domestic needs, was exported from large stocks as follows, in thousand barrels: Italy, 911; United Kingdom, 244; mainland China, 115; other, 111.

Until midyear, the refinery was supplied with crude oil by several marketers in the country in proportion to their shares of the market. When Soviet crude oil started to arrive, the 3-year contract between the Government and domestic marketers was suspended on June 20, and the marketing companies reluctantly agreed to distribute products refined from the Soviet crude oil, taken from the Ghana Purchasing Commission.[9]

The joint Ghana-Rumania oil exploration project continued through the year. Favorable structures were reported located at Atiari and Anloga in the Keta basin on the coast in eastern Ghana. A Rumanian advance drilling team arrived in September. At yearend, two Rumanian drill rigs, each capable of drilling 6,000 feet, were in the littoral area at Keta and planned drilling in early 1966.

In June the Minister of Fuel and Power announced a $670,000 contract with A. Lang Ltd., a Swiss firm, for construction of oil workers' camps for 200 people at Keta.

[9] World Petroleum Report 1966. V. 12, Mar. 15, 1966, p. 99.

The Mineral Industry of Guinea

By Henry E. Stipp [1]

Guinea's production of minerals in 1965 generally increased compared with that of 1964. The minerals industry contributed significantly to the country's economy with total output valued at about $41.8 million,[2] a sum equal to 17 percent of the total gross national product estimated at $245 million. Although Guinea was primarily an exporter of agricultural products up to 1960, the export of mineral commodities has grown to such an extent that in 1964 they accounted for 83 percent by value of total exports from Guinea. Mineral imports by Guinea constituted about 11 percent of total imports in the same year.

The potential for future exploitation of minerals in Guinea is great. Large quantities of bauxite occur in deposits near Boké, and these are to be developed in the near future by Compagnie des Bauxites de Guinée, a firm jointly owned by Harvey Aluminum, Inc., and the Government of Guinea. Vast quantities of iron ore are waiting to be developed in the Nimba and Simandou Mountains of Eastern Guinea. New deposits of diamonds have been discovered recently, and these are to be developed by the Guinean Government with the help of Soviet technicians. Under the Government's 7-year plan for economic development (1964–71) $7.4 million was reportedly allotted to the minerals industry for planning and general research. A number of mineral plants also were scheduled for construction under a $60.3 million development fund. These included an aluminum fabricating plant, a petroleum refinery, a cement plant, a granite quarry, a salt plant, a fertilizer plant, and three brick factories.

PRODUCTION

Crude mineral production of Guinea in 1965 was valued at an estimated $41.8 million, compared with $40 million in 1964. Increases in output of bauxite and alumina, the nation's most valuable mineral products, presumably more than made up for the 51,000-ton decline in iron ore production. Diamond and gold production, al-

[1] Physical scientist, Division of International Activities.

[2] Where necessary, monetary conversions have been made from Guinean francs (GFr) to U.S. dollars at the rate of GFr246.5=US$1.00.

Table 1.—Guinea: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Bauxite—thousand tons	1,767	1,468	1,664	r 1,612	1,870
Alumina	390,336	458,432	480,035	484,350	522,142
Iron ore—thousand tons	542	700	662	767	[2] 716
Nonmetals:					
Diamond:					
Gem—carats	[3] 490,000	[3] 140,000	[3] 22,000	[4] 20,568	e 21,000
Industrial—do	[3] 730,000	[3] 210,000	[3] 32,000	[4] 51,166	e 51,000

r Revised. e Estimate.

[1] In addition to commodities listed, gold, simple construction materials, and clay products were also produced, but quantitative data on output were not available.

[2] Export figures reported by producers.

[3] Sales on tender; not necessarily true indigenous output.

[4] Exports.

263-927 O-67—52

though not officially reported, were estimated to be about on a par with output levels of 1964. Of the total estimated value of mineral production in 1965, alumina accounted for about $33.7 million.

TRADE

Detailed customs information on Guinea's foreign trade for 1964 and 1965 was not available; statistics on exports were obtained from company reports, while import data was compiled from the data on exports of major developed nations to Guinea as reported by the statistical office of the United Nations.[3] Although these statistics represent the greater part of Guinea's trade, they fail to include some trade with smaller nations, which in some instances could represent significant quantities of material.

Exports of mineral commodities in 1965 were valued at approximately $42.7 million compared with about $35.4 million in 1964. Details on total trade for 1965 were not available; however, in 1964, total exports from Guinea were valued at about $42.6 million. Of this sum mineral exports accounted for over 83 percent of total exports, and agricultural commodities supplied the remaining 17 percent. Mineral exports consisted chiefly of alumina, bauxite, iron ore, and diamonds as shown in table 2.

Norway received the largest quantity of total exports from Guinea in 1964, valued at $7.7 million, followed by the United States, which received $7.1 million and France which received $5.4 million. U.S.S.R. imports were valued at about $2.2 million.

Mineral commodities imported by Guinea in 1964 were valued at about $4.6 million compared with total commodity imports of approximately $41.8 million. The principal mineral imports consisted of petroleum products, cement, and iron and steel products.

The U.S.S.R. supplied large quantities of mineral commodities, chiefly petroleum products, and cement valued at an estimated $9.2 million in total, but exports from this country were not listed in United Nations data. Among exporters listed by the United Nations, France was foremost with total commodity exports valued at $11.5 million, followed by the United States with $10.4 million, and the United Kingdom $4.9 million. The United States exported chiefly agricultural products, machinery, transport equipment, and mineral fuels.

Table 2.—Guinea: Major exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal destinations, 1965
Metals:			
Aluminum:			
Bauxite	166,649	244,042	Mainly to Eastern European countries, Canada, and Italy.
Alumina	477,126	511,198	Mainly to Cameroon, Norway, and United States.
Iron ore	701,053	715,528	Mainly to Poland, United Kingdom, and Austria.
Nonmetals:			
Diamond:			
Gem—carats	20,568	NA	Mainly to Belgium-Luxembourg and the United States.
Industrial—do	51,166	NA	Do.
Total—do	71,734	NA	

NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—Bauxite was mined in 1965 by Bauxites de Kassa, the country's only producer, from its deposit on Kassa Island in the Los group, near Conakry. Reserves at Kassa have been variously estimated from around a quarter of a million tons to over half a million tons.

A loan of $1.7 million was made by the World Bank to the Republic of Guinea for financing field and engineering studies on the construction of a railroad, seaport, and

[3] United Nations. Supplement to the World Trade Annual: Trade of the Industrialized Nations With Eastern Europe and the Developing Nations. Africa. V. 3, 1964, pp. 460–467.

Table 3.—Guinea: Imports of metals and minerals
(Metric tons)

Commodity	1964 [1]	Principal sources, 1964
Metals:		
Iron and steel:		
Semimanufactures	3,695	Japan 2,381; France 1,048; United Kingdom 215.
Unknown forms	2,000	All from U.S.S.R.
Nonferrous metals	(2)	NA.
Nonmetals:		
Cement	62,692	U.S.S.R. 50,000; Poland 9,000; United Kingdom 3,692.
Clay and clay products	581	All from France.
Fertilizers, crude and manufactured	(3)	United States 158; France 37.
Sand and gravel	6,000	All from France.
Stone calcareous	21,000	Do.
Mineral fuels:		
Petroleum refinery products:		
Gasoline	32,500	All from U.S.S.R.
Kerosine and jet fuel	3,509	Italy 1,985; Spain 1,524.
Diesel fuel	23,300	All from U.S.S.R.
Lubricating oils and greases	[4] 1,536	France 1,536.
Pitch, coke, bitumen	(5)	All from United States.

NA Not available.
[1] Statistics on imports for 1963 or 1965 were not available.
[2] Valued at $28,000.
[3] Valued at $271,000.
[4] In addition an unlisted quantity valued at $488,000, was received from the United States.
[5] Quantity not available; valued at $57,000.

town.[4] The railroad would extend 137 kilometers from the port and town near Dougofissa to Sangaredi, the site of a bauxite mine being developed by Compagnie des Bauxites de Guinée, a subsidiary of Harvey Aluminum, Inc., and the Government of Guinea. This subsidiary was established in 1963 to develop the Boké bauxite deposits of northwestern Guinea, which are reportedly among the world's largest. The railroad would transport bauxite to the port where it could be loaded at the rate of 2,000 tons per hour. An organization known as l'Office de Aménagement de Boké (OFAB) was created by the Government of Guinea to manage construction activities, administration of installations, and preparation of contracts with Compagnie des Bauxites de Guinée.[5] A trade agreement betwen Guinea and Hungary provided for export of bauxite, alumina, and agricultural commodities by Guinea in exchange for manufactured products including aluminum semimanufactures.[6]

The substantial increase in the output of alumina by Compagnie International pour la Production de l'Alumine (FRIA), a subsidiary of United States and West European firms, was apparently the result of more efficient operation of plant and equipment. The company was reportedly adding a furnace at its Kimbo plant, about 145 kilometers north of Conakry; however, the furnace did not begin production in 1965.

An aluminum fabricating plant was erected near Conakry by Harvey Aluminum, Inc., with the aid of a $200,000 U.S. Government investment guarantee.[7] The plant was constructed under Guinea's 7-year plan 1964–71. The Government of Guinea will become half owner of the plant when Harvey's investment is amortized. Société Guinéenne de Fabrique d'Articles de Ménage et de tôles Ondulees (SOGUIFAB), a Harvey subsidiary, produced utensils, corrugated sheet, and roof gutters from aluminum sheet imported from Cameroon. Output was estimated at several thousand tons of aluminum products per year. Harvey Aluminum, Inc., also planned to construct an alumina plant and an aluminum smelter,[8] which would eventually supply aluminum to the fabricating plant.

Iron Ore.—Production by Société Miniére de Conakry, from its open pit mine near Kaloum about 10 kilometers northeast of Conakry, reportedly decreased because of deteriorating condition of equipment. It was estimated that production could be increased to over 800,000 tons per year with new and repaired equipment. Ore was hauled from the mine to the port at Con-

[4] International Financial News Survey. Guinea. V. 18, No. 14, Apr. 8, 1966, p. 113.
[5] U.S. Embassy, Conakry, Guinea. Establishment of Boké Development Office (OFAB). State Department Airgram 136, Feb. 8, 1966, 4 pp.
[6] Metal Bulletin (London). Guinea. No. 5058, Dec. 21, 1965, p. 23.
[7] International Financial News Survey. Guinea. V. 18, No. 2, Jan. 14, 1966, p. 13.
[8] Mining Annual Review (London). Guinea. Mining Journal, May 1966, p. 239.

akry on a 9-kilometer-wide gage track, where it was stockpiled. Boats of up to 9.4-meter draft were loaded by belt conveyors at the rate of 1,000 tons per hour.

The iron ore deposits near Conakry reportedly consist chiefly of a laterite-covered ridge extending 40 kilometers in a northeast direction from the city.[9] From the surface to a depth of 7 to 10 meters, a bed of ore occurs containing 53 percent iron, 9 percent aluminum oxide, 1.5 percent silicon dioxide, 1.9 percent chromium oxide, 0.15 percent nickel oxide, 0.1 percent sulfur, and 0.085 percent phosphorous. Below this is a soft ore bed varying from a few meters to over 100 meters in thickness and containing about 57 percent iron. An igneous rock, dunite, considered the source rock of the iron ore lies below the lower ore bed. Total reserves were given as 3,000 million tons of iron, 58 million tons of chromium, 12.8 million tons of nickel, and 254 million tons of alumina. Research was being conducted on methods of separating chromium, aluminum, and nickel from the iron ore. Technical studies were said to be successful; however, the economic feasibility of the separation process has not been determined.

No progress was reported in negotiations between various consortiums and the Government of Guinea with regard to development of iron ore deposits in the Nimba and Simandou Mountains of eastern Guinea.

NONMETALS

Clay Products.—A brick and tile factory was completed in 1963 with Yugoslav assistance.[10] Initial production totaled 16 million units; 9 million bricks of all sizes and 7 million tiles. However, construction requirements caused production to be increased to 12 million bricks per year. The use of bricks for construction in place of cement saved much foreign exchange for Guinea. The brick factory employed 136 persons including 6 Yugoslav technicians.

Diamond.—Although diamond output in 1965 was unreported the output was believed to be 21,000 carats of gem diamonds and 51,000 carats of industrial stones. In April, diamonds were discovered in the Farecaria region southeast of Conakry by Soviet geologists.[11]

Stone.—At Maneah on the south side of the Conakry peninsula, granite was being quarried for railway and road ballast.[12]

[9] The Institution of Mining and Metallurgy. The Lateritic Iron Deposits of Conakry. Bull. 702, May 1965, pp. 429–462.
[10] Revue Du Economique Developpment (Conakry). La Briqueterie de Kobaya. No. 4, July 1965, p. 28.
[11] Mining Annual Review (London). Guinea. Mining Journal, May 1966, p. 239.
[12] Page 431 of work cited in footnote 9.

The Mineral Industry of the Ivory Coast

By Henry E. Stipp [1]

In 1965 the mineral industry of the Ivory Coast produced commodities valued at $7.4 million,[2] a sum equal to less than 1 percent of the estimated gross national product of about $830 million. Principal mineral commodities produced and exported in 1965 were manganese ore and diamonds. Imports of metals and minerals consisted chiefly of iron and steel products, cement and other building materials, fertilizers and petroleum, crude and refined products. The Ivory Coast enjoyed a favorable overall balance of trade, but the mineral trade balance was unfavorable.

In December 1964, the French Government granted $1.3 million for a number of projects in the Ivory Coast[3] including $518,367 for geological and mineral studies. Later in 1964, a second phase of the assistance program was approved, which included an additional $338,776 for other projects in the mineral field.

The Bureau de Recherches Géologiques et Minières (BRGM) conducted a general geologic study of the southwest section of the Ivory Coast for the State-owned company, Société pour le Développment Minièr de la Côte d'Ivoire (SODEMI).[4] BRGM also experimented on the use of an aeromagnetic survey to locate sulfide mineralization in the volcanic-sedimentary basin east of Bouake, and conducted drilling and exploratory mining in a mineralized area north of Toulepleu. In addition, two occurrences of cinnabar northeast of Bouake were being prospected thoroughly by BRGM, and the company conducted geologic, photogeologic, and geochemical studies in the diamondiferous area northeast of Korhogo.

SODEMI initiated its second triennial plan for mineral development.[5]

The Ivory Coast Government and the United Nations started a 3-year mineral-prospecting program that was expected to cost about $1.9 million. The purpose of the program was to evaluate the economic potential of mineral resources discovered in the southwestern part of the country.

PRODUCTION

Diamond mining operations with an output valued at about $3.6 million and manganese ore output valued at $3.8 million accounted for the largest part of the Ivory Coast's total recorded mineral production of $7.4 million. Diamond production continued at about the same level as in 1964, while output of manganese ore increased by nearly one-third. Columbium-tantalum output decreased almost 27 percent.

[1] Physical scientist, Division of International Activities.

[2] Where necessary values have been converted from francs (CFAF) to U.S. dollars at the rate of CFAF245=US$1.00.

[3] U.S. Embassy, Abidjan, Ivory Coast. State Department Airgram 157, Jan. 20, 1965, pp. 1–2.

[4] Bureau de Recherches Géologiques et Minières (Paris). Rapport Annual 1965. Jan. 31, 1965, p. 49.

[5] Mining Annual Review (London). Ivory Coast, Mining J. May 1966, p. 237.

Table 1.—Ivory Coast: Production of metals and minerals

Commodity		1961	1962	1963	1964	1965
Metals:						
Columbium-tantalum concentrate	kilograms	3,800	2,618	1,000	1,500	1,100
Manganese ore	metric tons	124,740	106,983	139,063	136,425	179,785
Nonmetals:						
Diamond:						
Gem	carats	219,330	102,208	62,659	120,163	118,976
Industrial	do	330,000	181,703	117,000	80,108	79,317
Total	do	549,330	283,911	179,659	200,271	198,293

TRADE

The Ivory Coast had a positive total trade balance in 1965; however, a negative trade balance was recorded for mineral commodities. The comparison of mineral trade to total trade for 1964 and 1965 is shown in the following table.

In 1965, France remained the principal trading partner of the Ivory Coast, supplying 62.4 percent by value of the total Ivory Coast imports and receiving 37.7 percent by value of total exports. France also ranked high in mineral commodity trade, receiving most of the diamonds exported by the African nation and supplying a large part of the iron and steel imports of the Ivory Coast, along with a number of other less valuable commodities. Belgium-Luxembourg, Venezuela, West Germany, United States, and Italy ranked high in total trade and also in trade in mineral commodities as shown in tables 2 and 3.

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1964	6.5	302.1	2.2
1965	8.8	277.2	3.2
Imports:			
1964	30.7	245.0	12.5
1965	31.1	236.1	13.2
Trade balance:			
1964	−24.2	+57.1	XX
1965	−22.3	+41.1	XX

XX Not applicable.
[1] Value for mineral commodities are for those shown in tables 2 and 3.

COMMODITY REVIEW

METALS

Aluminum.—A bauxite deposit was reported near the site of the proposed Bandama Dam.[6] SODEMI, a government-owned company was said to be investigating the deposit.

Iron and Steel.—During the year, erection of a small plant in the Ivory Coast was considered.[7] The rolling mill would turn out reinforcing rods and small sections from scrap metal obtained locally and from Mauritania and Guinea as well. A study for the plant was completed by Compagnie d'Etudes et de Gestion Industrielle of France.

A general study of iron formations in the western part of the country indicated the existence of iron resources of at least 400 million to 500 million tons.[8] However these deposits were regarded as uneconomic on the basis of their distance from the coast and their grade, which would necessitate beneficiation.

Manganese.—Total production of 179,785 tons consisted of 99,792 tons containing 46 percent manganese, 53,649 tons containing 40 percent manganese, and 26,344 tons fines. Exports in 1965 were reported as 170,524 tons, 63 percent higher than in 1964. Increased sale of low-grade ore to the United States reportedly was the chief reason for the increase in exports.[9] At the 1964 rate of depletion, reserves of the Grand Lahon deposits reportedly would last only 6 to 8 years. However, if world demand increased sufficiently, deposits near Odienne could be developed. These deposits were said to contain 1.2 million tons of proven reserves and 2 million tons of probable reserves.[10]

[6] U. S. Embassy, Abidjan, Ivory Coast. State Department Airgram 15, July 19, 1966, p. 1.
[7] Metal Bulletin (London). Ivory Coast. Jan. 4, 1966, p. 11.
[8] Work cited in footnote 6.
[9] U.S. Embassy, Abidjan, Ivory Coast. State Department Airgram 11, July 12, 1966, p. 17.
[10] Industries et Travaux D'Outremer. L'Activite De La Sodemi Manganese. 13° Annee, No. 137, April 1965, pp. 284–285.

Table 2.—Ivory Coast: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1964 [1]	1965 [1]	Principal destinations, 1965
Metals:			
Aluminum	106	221	France 70; Niger 64; Dahomey 40.
Copper	189	3	Overseas Associates of European Economic Community 2; Upper Volta 1.
Iron and steel:			
Scrap	3,546	7,091	Spain 6,348; Italy 556.
Semimanufactures	350	554	Mali 311; Upper Volta 128; Niger 54.
Lead	43	157	Italy 95; France 59.
Manganese, ore and concentrate:			
45 to 47 percent manganese	84,313	102,722	
40 to 42 percent manganese	---	18,759	
40 percent manganese	20,236	6,914	
Mixed percentage	---	42,129	
Total	104,549	170,524	United States 107,570; United Kingdom 28,326; Belgium-Luxembourg 13,207; Sweden 10,689; Spain 10,008.
Nonmetals:			
Abrasives, natural (includes industrial diamond)	---	2	France 2.
Diamond carats	209,565	204,084	Mainly to France.
Cement, lime, and dimension stone	236	241	Mali 164; Upper Volta 76.
Clay products	30	36	Upper Volta 16; Mali 10; Togo 8.
Fertilizer material, manufactured	534	279	Upper Volta 267.
Other, crude	3,645	3,750	Upper Volta 2,838; Senegal 903.
Mineral fuels:			
Coal, coke, and briquets	---	13	All to Upper Volta.
Natural and manufactured gas	62	---	
Petroleum refinery products:			
Lubricants	37	---	
Other (undifferentiated)	7	104	Upper Volta 49; Congo (Brazzaville) 22.
Total	44	104	

[1] Source: Office Statistique Des Communautes Europiennes. Côte d'Ivoire. No. 42, 1965, 35 pp. and No. 7, 1966, pp. 50–79.

Tantalite.—Good prospects of tantalite associated with beryl, gold, and lithium were discovered in the Issia region.[11]

NONMETALS

Cement.—There are no known limestone deposits in the Ivory Coast; therefore, plans were formulated to import cement clinker and gypsum. Two clinker grinding plants were slated to be operating by late 1965 to supply Ivory Coast requirements for cement.

Clays.—A deposit of clay suitable for making bricks was discovered near Grand-Bassam. Known reserves were reported as 1.7 million cubic meters, and probable reserves were described as enormous.[12] On the Gounioube plateau in the vicinity of Abidjan, a deposit of white clay was reported containing proved reserves of 3 million cubic meters. This material was said to be suitable for manufacturing crockery, porcelain, and refractories. Reserves of over 2 million cubic meters of clay occur on the plateaus of Banco and Adonkoua.

Diamond.—Of total 1965 diamond output Société Anonyme de Recherches et d'Exploitation Minières de Côte d'Ivoire (SAREMCI) produced 171,940 carats; Société Diamantifère de Côte d'Ivoire (SODIAMCI) produced 25,207 carats and Société Minière des Bandamas (SMB), an affiliate of SAREMCI, produced 1,146 carats. Reserves at the SAREMCI operation were estimated to be sufficient for 5 more years.[13] Expansion of the SODIAMCI plant and equipment was expected to increase production in 1966 despite a decrease in the grade of material processed. The Watson Company, prospecting in an area to the north of Seguela was said to have had excellent results. Proved reserves reportedly exceeded 100,000 carats. The possibility of erecting a treatment plant with a capacity of 30,000 carats per year was being studied. A treatment plant was built by SMB near Tortiya, and monthly production was reported as 1,000 to 1,500 carats. A prospecting program in the Dabakola area was

[11] Work cited in footnote 5.
[12] Work cited in footnote 10.
[13] Work cited in footnote 5.

Table 3.—Ivory Coast: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1964 [1]	1965 [1]	Principal sources, 1965
Metals:			
Aluminum	1,175	578	France 380; Belgium-Luxembourg 142.
Copper	112	160	France 152.
Iron and steel:			
Scrap	41	27	France 11; Liberia 7.
Pig iron and ferroalloys	4	17	France 14.
Steel ingots and equivalent forms	---	(2)	All from France.
Semimanufactures	54,444	46,365	France 35,431; Belgium-Luxembourg 7,475; West Germany 2,773.
Lead, all forms	112	97	France 77; Belgium-Luxembourg 13.
Nickel	---	1	All from France.
Silver, platinum troy ounces	32,151	32,151	Do.
Tin long tons	8	12	Do.
Zinc	41	27	Do.
Other nonferrous metals:			
Ore	139	2	France 1; West Germany 1.
Metal, all forms	(3)	2	Do.
Nonmetals:			
Abrasives, natural, (includes industrial diamond)	32	123	Yugoslavia 92; France 31.
Cement, lime, and dimension stone	249,238	260,827	Yugoslavia 60,263; Poland 54,412; U.S.S.R. 33,740; Belgium-Luxembourg 33,263; France 26,384.
Clay products	1,907	2,606	France 1,779; West Germany 717.
Fertilizer:			
Natural	79	516	All from France.
Manufactured	21,881	19,420	France 9,258; West Germany 4,811; Italy 1,885; Belgium-Luxembourg 1,545.
Total	21,960	19,936	
Iron pyrites, unroasted	---	10	All from France.
Sand, gravel, and crushed rock	1,581	2,375	France 2,278.
Other nonmetals (unspecified):			
Crude minerals	26,328	23,346	Senegal 14,377; France 5,139; Algeria 2,771.
Manufactures [4]	290	449	France 213; Italy 161.
Mineral fuels:			
Coal, coke, and briquets	317	275	France 186; Netherlands 60.
Gas, natural or manufactured	1,808	1,896	France 1,409; Spain 478.
Petroleum, crude	---	198,558	Algeria 136,031; Gabon 62,527.
Petroleum refinery products	286,785	264,075	Venezuela 109,835; Italy 79,989; France 15,203.

[1] Source: Office Statistique Des Communautes Europiennes. Côte d'Ivoire. No. 42, 1965, 35 pp. and No. 7, 1966, pp. 50–79.
[2] Valued at $1,000.
[3] Valued at $2,000.
[4] Includes material other than grinding and polishing stones and worked mica that should not be included.

started by Diamond Corporation Côte d'Ivoire in cooperation with SODEMI.

Fertilizer Materials.—Requirements for fertilizers were expected to reach 47,000 tons in 1965. Imports in 1964 were 21,960 tons. It has been reported that a fertilizer plant with 60,000-ton initial capacity was scheduled to be built by 1966. The plant was designed to use naphtha from the petroleum refinery at Abidjan and to use phosphate rock imported from Togo or Senegal. The cost of the plant was estimated at $8.5 million.

MINERAL FUELS

Petroleum.—The new oil refinery at Abidjan started producing at the close of 1965.[14] The plant was designed to operate annually on 700,000 tons of crude oil from Gabon, Nigeria, or Algeria. The plant is owned by Société Ivoirienne de Raffinage, a joint venture company, among its members are Standard Oil Co. of New Jersey, Mobil Oil Co., Standard Oil Co. of New York, and Texaco Inc.

[14] United States Department of Commerce, Bureau of International Commerce. International Commerce. V. 71, No. 50, Dec. 13, 1965, p. 1.

The Mineral Industry of Kenya, Tanzania, and Uganda

By Thomas C. Denton [1]

The three countries of this chapter continued to comprise the East African Common Market (EACM), which they established shortly after achieving independence, and continued to belong to the East African Common Services Organization (EACS), which administers railways and harbors, collection of customs and excise revenue, postal and telecommunications services, and civil aviation. The countries also continued to use a common currency, the standard unit of which is the East African shilling, controlled by the East African Currency Board which maintains a stable rate of sterling exchange. At yearend 20 East Africa shillings (EAsh) were equivalent to 1 pound sterling.[2]

The common market scheme tended to favor Kenya, in part because Kenya was the only member with a petroleum refinery. In 1964 Kenya's interterritorial transfers totaled $72 million, Tanzania's $14 million, and Uganda's $27 million. The Kenya transfers included $7 million worth of petroleum refinery products, whereas such transfers by Tanzania and Uganda were respectively about $40,000 and $1 million.

Toward yearend the common market was tending to disintegrate, despite the fact that during the past 5 years interregional trade had nearly doubled. In October Tanzania placed restrictions on certain Kenya products. Official Kenya policy was that retaliatory action would not be taken against Tanzanian and Ugandan imports. But in order to protect local industries, the Kenya Government put import controls on certain items from countries outside East Africa, and manufacturers were forced to seek markets elsewhere.

A further movement away from the goal of ultimate achievement of political unity was the decision taken by each of the countries to break away from the East African Currency Board and to establish a central bank which would issue its own currency.

East African railways and harbors continued to be the part of EACS most important to the mineral industry in the three countries. Freight hauled by the railways totaled about 4.4 million tons, about 168,000 tons more than in 1964. Import and export cargo tonnages handled at the ports of Mombasa in Kenya and Dar es Salaam, Tanga, and Mtwara in Tanzania reached 6.9 million tons, 590,000 tons higher than in 1964. Imports through Mombasa included nearly 2 million tons of petroleum.

In April 1965 meetings were held between representatives of Tanzania and adjacent Zambia on behalf of the Governments of the East African countries and the EACS. A purpose of the meetings was to investigate possibilities for improving trade and existing transport links between the EACS countries and Indian Ocean ports in Tanzania. In addition a feasibility study was proposed for an all-rail link between Zambia and the EACS countries and an Indian Ocean port in Tanzania. At yearend a survey of the physical and economic aspects of the proposal was to be undertaken by Canadian and British experts whose Governments would share the cost.

[1] Africa specialist, Division of International Activities.

[2] Where necessary, values have been converted from East Africa shillings (EAsh) and pounds sterling (£) to U.S. dollars at the rates: EAsh 1 equals US$0.14 and £1 equals US$2.80.

KENYA

In 1965 the mineral industry exclusive of petroleum refining produced about 2 percent of Kenya's Gross Domestic Product (GDP), which has increased somewhat each year since 1961. About 13 million barrels of crude oil were processed during the year, and the contribution to GDP of petroleum refining probably exceeded that of other mineral processing and of mining combined.

Salient statistics for the mining industry in 1963 and in 1964 (most recent year for which information was available) were as follows:

	1963	1964
Expenditures:		
Prospecting—thousands	$3,856	$1,420
Mine development—do	6	8
Mining and milling—do	1,540	1,505
Number of persons employed:		
Africans	1,360	1,074
Asians	109	109
Europeans (whites)	94	60
Total basic cash wages paid:		
Africans—thousands	552	355
Asians—do	240	207
Europeans (whites)—do	663	443

In the second half of 1964 United Nations technical personnel reached Kenya, and the U.N.-Kenya Government mineral resources survey in western Kenya, agreed upon early in 1964, was begun. The survey was continued throughout 1965. It required the closing of most of western Kenya to prospecting and mining, excepting areas already covered by valid prospecting and mining titles. The closure will continue in effect until completion of the survey.

PRODUCTION

At $18.2 million the value of Kenya's mineral production, exclusive of petroleum products, in 1965 was $2.6 million higher than in 1964.

Cement and soda ash again were the major items. The breakdown of total value in 1964 and 1965 was as follows:

	Thousand dollars	
	1964	1965
Cement	9,081	10,621
Soda ash	2,486	2,572
Copper concentrate	1,812	2,431
Salt	849	1,478
Gold	471	400
Silver	70	27
Other	799	671
Total	15,569	18,200

Table 1.—Kenya: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Beryl	1	-----	-----	r 1	1
Columbite—kilograms	-----	[1] 375	-----	-----	-----
Copper, concentrate	2,564	2,225	2,244	2,077	1,969
Gold—troy ounces	12,299	9,327	10,193	r 12,480	11,420
Silver—do	40,731	50,160	52,422	47,702	21,247
Nonmetals:					
Asbestos	137	192	70	185	123
Carbon dioxide, natural	648	465	517	746	762
Cement—thousand tons	330	346	r 343	r 422	505
Coral	6,108	2,154	-----	-----	-----
Diatomite	3,209	2,909	3,336	3,055	2,218
Feldspar	r 1	-----	-----	-----	-----
Gem stones, sapphire, and other—carats	1,000	-----	800	2,204	4,212
Gypsum	20,085	26,844	r 20,728	r 27,994	34,474
Kaolin	741	1,174	r 6,663	r 1,288	1,714
Limestone, other than for cement	20,038	18,284	16,448	12,095	NA
Magnesite	1,751	-----	261	170	67
Meerschaum—kilograms	1,000	-----	6,000	204	2,000
Mica—do	100	1,000	800	[2] 170,000	-----
Pumice	708	1,128	1,129	1,438	1,039
Quartz	10	-----	259	-----	-----
Salt—thousand tons	23	19	16	r 27	51
Sandstone	4,355	49,177	-----	-----	-----
Soda, raw crushed	2,295	2,924	2,342	2,220	2,548
Soda ash	144,717	124,081	103,506	81,670	83,194
Vermiculite	-----	20	92	r 34	22
Mineral fuels: Petroleum refinery products:					
Gasoline	-----	-----	20,229	214,895	e 221,000
Kerosine	-----	-----	9,793	113,086	e 175,000
Liquefied petroleum gas	-----	-----	86	4,877	NA
Distillate fuel oil	-----	-----	20,856	223,937	e 243,000
Residual fuel oil	-----	-----	77,363	902,760	e 588,000
Bitumen and other products	-----	-----	-----	10,668	e 10,000

e Estimate. r Revised. NA Not available.

[1] Includes oxides of rare-earth metals.

[2] Scrap.

TRADE

As shown in the following table, Kenya had an unfavorable balance of foreign trade in 1964, both with respect to mineral commodities and total trade. A deficit also occurred in 1965.

	1964 value (million dollars)		Mineral commodities share of total trade (percent)
	Mineral commodities	Total commodities	
Exports	13	132	9.8
Imports	41	214	19.2
Trade balance	−28	−82	XX

XX Not applicable.

Kenya continued virtually to preclude trade with the Republic of South Africa. The embargo made difficult procurement of coal for Kenya's relatively important cement industry at satisfactory prices. While a small tonnage was imported from South Africa in 1964, the most recent year for which complete information is available, the great bulk of 1964 imports came from "other countries" and from Mozambique. There was also difficulty in disposing of Kenya's important output of soda ash, about half of which the Republic of South Africa had been taking.

Exports.—According to the U.S. Embassy, Nairobi, 1965 exports totaled a record $21.4 million, 4.1 percent more than in 1964. Exports of petroleum products doubled during the year, and at $12.6 million took third place among Kenya's exports.[3]

Imports.—Total 1965 imports from all countries were valued at $282 million, 23.4 percent more than in 1964. Major increases included crude petroleum ($4.8 million) and iron and steel ($3.1 million). The largest supplier was the United Kingdom ($70.6 million). The United States for the first time was the second most important exporter to Kenya.

[3] U.S. Embassy, Nairobi, Kenya. State Department Airgram 656. June 3, 1966, p. 9.

Table 2.—Kenya: Exports of metals and minerals, to countries outside the East African Common Market

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum, semimanufactures	620	177	Ethiopia 122; Republic of the Congo (Léopoldville) 38; Rwanda 10.
Copper:			
Concentrate	3,090	---	
Metal, unwrought	NA	3,412	All to Italy.
Gold, troy ounces	8,868	12,162	West Germany 10,039; United Kingdom 2,123.
Iron and steel:			
Semimanufactures	2	52	Seychelles 28; Somalia 12; Republic of the Congo (Léopoldville) 12.
Iron and steel scrap	2,955	22,924	Japan 20,573; Netherlands 1,172; Pakistan 1,082.
Nonferrous metal scrap	2,129	2,715	Japan 1,201; Denmark 682; Mozambique 117; Spain 95.
Platinum, troy ounces	---	8	All to United Kingdom.
Silver, do	44,114	46,834	All to West Germany 46,834.
Nonmetals:			
Cement	110,607	174,124	Mauritius 47,666; Réunion 45,619; Somalia 35,095; Aden 22,710.
Diatomite	1,960	1,672	United Kingdom 1,418.
Lime	21	1	All to ship's stores.
Mica, kilograms	1,000	---	
Salt	86	12	Somalia 7.
Soda ash, sodium carbonate	108,588	65,023	India 11,602; Thailand 8,190; New Zealand 7,824; Japan 6,250; Malaysia 6,096.
Crude minerals, not further described, value	$2,895	$1,114	United Kingdom 890.
Mineral fuels:			
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	---	40	Zanzibar 24; Burundi 6; Somalia 4; Seychelles 2.
Kerosine, do	---	17	Zanzibar 14; Seychelles 1.
Distillate fuel oil, do	122	177	Ship's stores 104; Somalia 30; Zanzibar 24; Seychelles 8.
Residual fuel oil, do	---	2,558	Malaysia 765; Ship's stores 536; United Kingdom 248; Netherlands 241; Mauritius 221; Aden 173; Japan 108.
Liquid petroleum gas	---	1,954	Malagasy Republic 1,062; Réunion 521; Mauritius 268.
Asphalt and bitumen	---	2,625	Mauritius 1,435; Somalia 1,181.

NA Not available.

Table 3.—Kenya: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Unwrought	1,762	891	Norway 885.
Semimanufactures	890	642	Belgium 305; United Kingdom 136; Austria 79; West Germany 44.
Copper:			
Unwrought	62	32	United Kingdom 29.
Semimanufactures	205	150	United Kingdom 72; Southern Rhodesia 24; Austria 13.
Gold bullion troy ounces	634	5,285	All from United Kingdom.
Iron and steel:			
Iron ore	1,376	2,551	All from Spain.
Iron and steel scrap	NA	7	Zanzibar 6.
Pig iron and ferroalloys	539	646	United Kingdom 645.
Ingots and other primary forms	2,626	33	United Kingdom 32.
Semimanufactures	79,822	63,656	Japan 30,251; United Kingdom 13,140; Belgium 5,831; West Germany 3,210; France 2,400; mainland China 2,230.
Lead:			
Unwrought	109	97	United Kingdom 55; Zambia 20; Denmark 13.
Semimanufactures	7	10	United Kingdom 3; Australia 3; West Germany 3.
Nickel, unwrought	4	3	All from United Kingdom.
Silver troy ounces	16	NA	
Tin, unwrought long tons	203	48	All from United Kingdom.
Zinc:			
Unwrought	1,401	1,443	Zambia 1,349.
Semimanufactures	17	13	All from United Kingdom.
Nonferrous metal scrap	NA	8	All from Somalia.
Nonmetals:			
Abrasives, grinding and polishing wheels, and stones	43	52	United Kingdom 44.
Cement	771	1,318	West Germany 599; United Kingdom 525.
Feldspar, fluorspar, cryolite, and chiolite	4,407	2,301	NA.
Fertilizers:			
Nitrogenous	17,851	32,178	West Germany 23,275; United Kingdom 7,088; Italy 1,660.
Phosphatic	14,196	12,453	Netherlands 8,496; Belgium 3,607; United Kingdom 289.
Potassic	382	369	Netherlands 262; United Kingdom 56; Israel 49.
Other, manufactured, including mixed	6,192	10,610	Netherlands 6,298; Belgium 1,648; Italy 1,427; United States 1,002.
Gypsum	186		
Graphite	(1)	3	All from United Kingdom.
Lime	128	28	All from United Kingdom.
Mica, crude	13	9	All from United Kingdom.
Salt	9,817	12,096	Aden 6,898; Ethiopia 1,532; Netherlands 1,220; United Kingdom 935.
Stone, sand and gravel	NA	528	Italy 406; United Kingdom 108.
Sulfur	371	1,410	United States 1,016; Belgium 181; West Germany 178.
Mineral fuels:			
Solid:			
Coal	40,723	33,171	Mozambique 13,065; Republic of South Africa 5,233.
Coke	1,598	1,592	United Kingdom 1,378; Southern Rhodesia 146.
Petroleum:			
Crude thousand tons	221	1,500	Kuwait 1,044; Iran 263; Iraq 193.
Refinery products: [2]			
Gasoline thousand 42-gallon barrels	1,121	178	Iran 116; Bahrain 15.
Kerosine do	737	348	Iran 193; Aden 48; Bahrain 44; United States 16.
Distillate fuel oil do	1,068	418	Iran 299; Bahrain 68.
Residual fuel oil do	3,060	60	Iran 60.
Liquid petroleum gas do	13	4	All from Iran.
Lubricating and other oils do	79	103	United Kingdom 47; United States 26; Italy 26.
Grease, jelly, and wax	1,397	775	West Germany 406; Indonesia 154; United States 101; United Kingdom 70.
Asphalt and bitumen	10,113	4,553	Trinidad 1,667; Iran 1,619; Bahrain 1,141.
Other refinery products, not further described	---	22,292	United States 21,918; United Kingdom 370.

r Revised. NA Not available.

[1] Less than ½ unit.

[2] The 1964 statistics for refinery products recorded here exclude quantities officially reported as "negative quantities," caused by transfer from one territory to another of products imported in a previous year.

COMMODITY REVIEW

Metals.—*Copper and Gold.*—The Macalder copper mine, owned by Macalder-Nyanza Mines Ltd., was expected to be exhausted by May 1966. For many years Macalder has been the major source of Kenya's small output of copper concentrate.

During the year, exploration of the Migori gold vein about 3 kilometers from Macalder was completed. Ore reserves were estimated at about 1,400 short tons, with average gold content of 0.9 ounces per ton.

Platinum.—Johnson Matthey and Company of London were granted an exclusive prospecting license for platinum in the West Pokot District.

Nonmetals.—*Cement.*—Enlargement of the plant at Mombasa of British Portland Cement Company was completed during 1965. The project cost $700,000 and increased the annual cement capacity of the plant to 635,000 tons.

Other Nonmetals.—Toward yearend it appeared that Kenya's exports of soda ash and diatomite would improve. A trade agreement was concluded under which India would increase imports of those commodities.

Nonmetallic minerals being investigated during the year included kyanite at Murka and Coast Province, asbestos in West Province and Teita Hills, and sapphires from Kinziki in the West Province.

Mineral Fuels.—*Petroleum.*—In 1965, the East African Refineries Ltd. plant at Mombasa reportedly produced a total of 1,237,000 metric tons of products compared with 1,471,000 tons in 1964. Crude throughput in 1964 totaled 1,544,000 tons; comparable data for 1965 were not available.

In supplying the figures the management observed that neither aviation gasolines nor lubricating oils were manufactured by this refinery.

In 1965 the refinery increased output by 18.8 percent compared with 1964 results, which was perhaps the most significant development in Kenya mineral industry during the year.

BP-Shell Company was granted an oil-prospecting license for the North Eastern Province of Kenya. BP-Shell Company has been conducting a survey of 310,000 square kilometers and proposed to survey an additional 12,300 square kilometers.

TANZANIA

The mineral industry was a significant contributor to the Gross National Product (GNP) of Tanzania in 1965. Excluding Zanzibar, GNP at current prices was about $750 million, to which mineral industry contributed about 3.5 percent. Diamond accounted for nearly 77 percent of mineral industry contribution and gold for 12 percent. The volume of diamond produced was about 2 percent of non-Communist world output in 1965; by value the contribution was much higher. The share of the gold-mining industry in non-Communist-world gold production was about 0.2 percent, and for Africa as a whole was about 0.3 percent.

For some years Tanzania's mineral industry has been a major contributor to foreign exchange earnings, mostly from diamond exports. In 1965 mineral exports comprised 13 percent of the value of all domestic exports; the contribution in 1963 and 1964 was 11 percent and 12 percent, respectively.

With respect to the labor situation, significant statistics for employment in June 1965 were reported as follows: [4]

Employees by industrial division:	
Mining and quarrying	7,192
Agriculture	139,162
Other	187,401
Total	333,755
Mining and quarrying wage bill:	
Citizens, thousands	$2,251
Noncitizens, do	$2,425
Total, do	$4,676

[4] Central Statistical Bureau. The United Republic of Tanzania. Employment and earnings in Tanzania in 1965. Dar es Salaam, Tanzania, April 1965.

Regarding the whole year, the Mineral Resources Division of the Ministry of Industries, Mineral Resources and Power reported that labor relations within the mining industry were good. Africanization continued at a satisfactory level, and a number of Tanzanians attended courses of instruction. Difficulties were encountered in recruiting suitable professional and technical personnel from overseas, and the prob-

lem was expected to continue.[5]

An agreement was signed during the year by the Minister of Finance and a representative of the United Nations Special Fund (UNSF) for exploration of the Lake Victoria goldfields over the next 3 years. The cost of the project will be $616,000 from the UNSF and an estimated contribution of $47,600 to be made by the Tanzanian Government. Ground investigations will be undertaken of anomalies indicated by aerial geophysical surveys made in 1959-60. Airborne and ground operations also will be undertaken in other promising areas. The UNSF will provide experts and pay for 3,500-line kilometers of aerial geophysical survey and 6,100 meters of diamond drilling. The Tanzanian Government will make available senior professional staff, transportation and laboratory services, field officers' operating costs and labor. Besides the possibility of finding new ore bodies, the project will train Tanzanians in modern exploration techniques and will provide training of geology and mineral industry students returning from abroad.[6]

At yearend the Mines and the Geological Survey Divisions of the Tanzania Ministry of Industries, Mineral Resources and Power were to be reorganized under one division, called the Mineral Resources Division, with headquarters in Dodoma. The headquarters of the Mines Division would be moved from Dar es Salaam to Dodoma, but a mining warden's office will remain open in Dar es Salaam under the new division.

No new mines were opened in 1965. As to the immediate future outlook for the mining industry, it was anticipated that diamond production would be maintained at around the 1965 level. On the other hand, the outlook for gold was discouraging. Production would fall considerably because two important mines would close down in 1966. Rejuvenation of gold mining in Tanzania was heavily dependent on the outcome of the UNSF project mentioned earlier, and associated work by Tanzania's Mineral Resources Division. As to tin, the outlook remained good, although uncertainty existed regarding the size of minable reserves in the principal mine (Kyerwa).

PRODUCTION

As measured by the value of exports and local sales, Tanzania produced about $26.4 million worth of minerals and metals in 1965, about 7.3 percent more than in 1964. The increase largely resulted from improvement in diamond exports, which were $1.3 million higher than in 1964.

[5] Ministry of Industries, Mineral Resources and Power. The United Republic of Tanzania, Mineral Resources Division. Review of the Mining Industry in Tanzania for the year 1965. Dodoma, July 1966. Five pages. Prepared for Acting Commissioner for Mineral Resources. This report is the source of most of the Tanzania part of this chapter.

[6] Ministy of Industries, Mineral Resources and Power. Tanzania Trade Journal. No. 12, April-June 1965, p. 34.

Table 4.—Tanzania: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Copper, content of lead concentrate	101	-----	-----	-----	-----
Gold, troy ounces	102,502	101,972	102,917	93,040	90,819
Lead, content of ore (exports)	351	-----	-----	-----	-----
Silver, exports, troy ounces	64,144	23,959	22,669	25,329	22,865
Tin, content of ore, long tons	r 181	r 218	r 234	r 287	255
Tungsten, ore and concentrate, 60 percent WO_3, exports	3	-----	-----	-----	-----
Nonmetals:					
Artstone	8	5	502	457	27
Bentonite	249	-----	-----	5	-----
Diamond:					
Gem, carats	339,982	323,177	275,958	337,711	e 828,356
Industrial, do	344,873	324,000	312,753	326,059	
Gem stones, semiprecious and precious, exclusive of diamonds [2], kilograms	1,132	521	386	956	1,318
Gypsum	640	2,007	1,894	2,957	4,560
Kaolin	r 157	159	182	111	-----
Lime	3,524	2,296	1,260	2,169	1,428
Magnesite, export	43	-----	85	495	1,143
Meerschaum	18	1	16	16	[3] 100
Mica, sheet	89	99	107	95	103
Salt, thousand tons	33	30	34	33	e 35
Vermiculite	142	65	27	131	97
Mineral fuels: Coal bituminous, thousand tons	2	3	2	1	2

e Estimate. r Revised.

[1] Besides commodities listed, unrecorded quantities of construction materials are produced.

[2] Generally includes ruby, sapphire, chrysoprase, corundum, garnet, tourmaline, and zircon.

[3] Scrap.

TRADE

Unlike Kenya, Tanzania enjoyed a favorable foreign trade balance in 1964 both in mineral commodities and total trade, as seen in the following table:

	1964 value (million dollars)		Mineral commodities share of total trade (percent)
	Mineral commodities	Total commodities	
Exports	21	196	10.7
Imports	16	123	13.0
Trade balance	+5	+73	XX

XX Not applicable.

The virtual ban on trade with Portugal and its territories declared in November 1964 was continued in 1965.

Tanzania's 1964 exports to commonwealth countries were 52 percent of total exports and included diamond valued at $19 million to the United Kingdom. For imports the share of the commonwealth was 44 percent and included imports valued at $14 million from the United Kingdom.

COMMODITY REVIEW

Metals.—*Gold.*—Tanzania's three principal gold mines at Geita, Kiabakari, and Buhemba accounted for about 96 percent of 1965 gold output. Their operations were submarginal. Small operators including cooperatives continued to work in the Geita, North Mara, Nzega, and Mpanda areas and in the old Lupa goldfields near Chunya.

The Geita gold mine production was valued at $1,503,000. Work was confined to stoping developed ore including pillars prior to planned closure of the mine early in 1966. Tangold Mining Company Ltd. at Kiabakari produced $1,280,000 of gold. Stoping continued down to the 470-meter level, where ore grade was better, but deeper development was not considered feasible because the ore body was pinching out. The mine was expected to close down in the second half of 1966. Production from the Buhemba mine, a subsidiary of Williamson Diamonds Ltd., amounted to $328,000. The output was realized at a loss; however, projected more efficient ore treatment may reduce costs.

The possibility of establishing a gold subsidy was again considered, but no suitable formula was found.

Tin.—World tin prices were strong and tin miners in Karagwe had a relatively prosperous year, realizing about $2,926 per long ton of concentrates sold. Keyerwa Syndicate Ltd. from its open pit Kaborishoke mine produced 61 percent of the total value of concentrate output. The remainder came from small operators, whose methods for the most part were primitive.

Nonmetals.—*Construction Materials.*—Increased building activity resulted in a high level of output and sales of construction

Table 5.—Tanzania: Exports of metals and minerals to countries outside the East African Common Market

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Gold—troy ounces	102,519	93,040	All to United Kingdom.
Iron and steel scrap	1,624	8,279	Japan 7,828; Netherlands 447.
Silver—troy ounces	22,521	25,329	All to United Kingdom.
Tin, concentrate—long tons	341	361	United Kingdom 214; Malaya 147.
Tungsten, concentrate	(1)	---	
Nonferrous metal scrap	387	547	West Germany 130; Japan 122; Denmark 100; India 68.
Nonmetals:			
Cement	1,224	---	
Diamond:			
Gem—carats	275,958	828,355	United Kingdom 664,031.
Industrial—do	312,753		
Gem stones, exclusive of diamond—value	$97,602	$270,029	United Kingdom $227,578; West Germany $27,720.
Lime	48	15	Malawi $15.
Mica	109	243	United Kingdom 220; United States 11.
Salt	12,755	10,309	Republic of the Congo (Léopoldville) 7,981; Rwanda 1,360.
Crude minerals, not further described—value	$7,714	$11,872	Australia $10,920.

[1] Less than ½ unit.

Table 6.—Tanzania: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Unwrought	235	2,252	Netherlands 1,634; Norway 241; France 163.
Semifabricated	110	945	Belgium 384; United Kingdom 182; West Germany 125; United States 81.
Copper:			
Unwrought	2	1	All from United Kingdom.
Semifabricated	140	62	United Kingdom 36; West Germany 20.
Gold bullion, troy ounces	1,269	1,434	All from United Kingdom.
Iron and steel:			
Iron ore	328	769	Norway 768.
Pig iron and ferroalloys	969	244	United Kingdom 166; West Germany 75.
Ingots and equivalent primary forms	289		
Semimanufactures	26,738	39,405	Japan 16,246; United Kingdom 6,879; Belgium 5,134; United States 3,125; West Germany 2,599.
Lead, all forms	71	29	U.S.S.R. 10; Denmark 8; West Germany 6; United Kingdom 3.
Nickel, all forms	(1)	1	All from United Kingdom.
Tin, unwrought, long tons	58	20	United Kingdom 19.
Zinc:			
Unwrought	305	1,429	Zambia 566; Belgium 557; U.S.S.R. 306.
Semimanufactures	24	26	United Kingdom 20; Belgium 6.
Nonmetals:			
Abrasives, grinding and polishing wheels and stone	13	13	United Kingdom 9.
Cement	10,436	3,474	Japan 1,559; West Germany 603; United Kingdom 432.
Fertilizers:			
Nitrogenous	6,752	13,409	West Germany 5,550; United Kingdom 3,894; Belgium 2,053; Netherlands 1,486.
Phosphatic	655	891	Netherlands 718; Belgium 112; United Kingdom 44.
Potassic	1,686	912	Israel 534; West Germany 212; France 165.
Other, manufactured, including mixed	1,516	3,716	Belgium 1,547; Netherlands 1,211; Italy 676; West Germany 162.
Gypsum	15		
Lime	3,559	2,106	United Kingdom 916; Zanzibar 782; West Germany 403.
Mica	7	4	All from United Kingdom.
Salt	4,197	3,777	Aden 1,861; Ethiopia 959; United Kingdom 543.
Sulfur	276	243	Belgium 128; West Germany 110.
Mineral fuels:			
Solid:			
Coal	37	145	Mozambique 71; Republic of South Africa 51.
Coke	508	426	West Germany 202; United Kingdom 136; Netherlands 52.
Petroleum, refinery products:			
Gasoline, thousand 42-gallon barrels	715	511	Iran 358; Saudi Arabia 60; Bahrain 57; Italy 60.
Kerosine, do	361	280	Iran 204; Aden 33; Saudi Arabia 24; Bahrain 11.
Distillate fuel oil, do	824	472	Iran 293; Bahrain 93; Saudi Arabia 41; Aden 20; Italy 17.
Residual fuel oil, do	696	89	Iran 88; Bahrain 1.
Liquefied petroleum gas	6	5	All from Aden.
Lubricating and other oils thousand 42-gallon barrels	49	49	United Kingdom 24; United States 22; Italy 2.
Greases, jellies, and waxes	615	578	United Kingdom 237; United States 174; West Germany 122.
Asphalt and bitumen	4,929	926	Iran 623; Bahrain 216; United States 61.

[1] Less than ½ unit.

materials throughout the year. The cement plant of Tanganyika Portland Cement Company at Wazo Hill near Dar es Salaam was expected to go into production early in 1966. The company was investigating the possibility of obtaining its gypsum requirements from deposits near Mkomazi, Lushoto area, and Itigi, Manejoni area.

Diamond.—Both production and exports of diamond, virtually all by Williamson Diamonds Ltd. and its adjoining subsidiary, New Alamasi Ltd., reached record lev-

els. Contributing to the record were increased throughput at the main Mwadui plant, involving a higher percentage of surface gravel treated, and the occurrence of some rich patches in the gravel. The increased recovery was offset however by a higher proportion of small stone sizes, with a resultant reduction in the average price obtained per carat. Williamson continued to prospect for diamonds. A low-grade discovery at Kahama was being developed for mining in 1966.

A revised diamond sales agreement with the De Beers sales organization was finalized during the year.

Other Gem Stones.—The year saw considerable activity in prospecting for and mining other gem material, mostly by small operators. Several discoveries were made. Export sales were mainly of ruby, sapphire, chrysophase, garnet, tourmaline, and amethyst. Overseas firms were much interested in rose garnet as a semiprecious stone, and zircon also attracted attention. During the year the stones could be exported only under export permits issued to claim holders by the Mineral Resources Division. The Government expected to introduce legislation to establish a central gem-grading and gem-buying office, and to promote local gem-cutting and polishing enterprises.

Mica.—Output improved mainly because of dry weather prevailing in the Uluguru area, which provides about 90 percent of Tanzania's mica output. Small operators belonging to two cooperatives accounted for roughly 40 percent of Uluguru production. Two licensed dealers in Morogoro processed the crude mica. A license was granted a dealer in the Mpanda area.

Salt.—Most of the salt produced in 1965 came from Nyanza Salt Mines (T) Ltd., from a brine spring at Uvinza. Coastal solar evaporation works also produced salt. Powell Duffryn Technical Services Ltd. of the United Kingdom surveyed methods for reducing costs and increasing salt production at Uvinza.

Mineral Fuels.—*Petroleum.*—The $14 million oil refinery under construction at Kigomboni near Dar es Salaam was expected to go on stream by August 1966. Annual capacity for crude oil was expected to be about 600,000 tons. When in full production, the facility will require around 300 workers.

UGANDA

The gross domestic product of Uganda in 1965 at current prices was about $625 million, to which mineral industry contributed about $30 million, or nearly 5 percent. The value of exports including reexports was about $179 million, to which mineral industry contributed nearly 14 percent, mostly represented by exports of blister copper. The industry, excluding quarrying, employed 7,305 persons.

Exploration activity was expanded during the year. The Drilling Division was to have 20 new drilling machines. A British mineral exploration team was formed, mainly to investigate tin deposits in western Uganda. Partly financed by the UNSF, the Karamoja ground water survey was begun. The Canadian Aid Team was mainly active in ground followup work in the areas surveyed earlier during the UNSF airborne survey. By yearend, work in area A (Karamoja) had been largely completed and work had begun in area B (Aswa zone). Except in two small parts where exploratory drilling was proposed, area A was thrown open for general prospecting. Certain carbonatite centers in eastern Uganda were reinvestigated, and geochemical surveys were conducted in Kigezi in western Uganda.

By the end of 1965, 14 industries involving capital investments totaling $14.4 million had been started in Uganda since the country became independent on October 9, 1962. Four of the industries are government enterprises, the remainder being in private hands. Completed projects include a steel rolling mill and a galvanized iron sheeting plant.

Toward yearend the chairman of Government-owned Uganda Development Corporation disclosed that the Corporation planned to spend $51.1 million in new development over the next 5 years.

PRODUCTION

The value of Uganda's mineral production in 1965 was an alltime record $30 mil-

Table 7.—Uganda: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Beryl	1,031	1,012	380	r 394	192
Bismuth, metal content—kilograms	650	50	30	r ---	1 280
Columbium-tantalum concentrates—do	7,366	13,087	9,000	r 5,832	8,130
Copper, blister	13,374	15,579	16,216	r 18,260	17,141
Gold—troy ounces	419	291	48	24	36
Lithium minerals (amblygonite)	23	20	48	20	20
Silver (exports)—troy ounces	70	38	9	---	---
Tin, content of concentrate—long tons	33	r 74	163	213	176
Tungsten concentrate, 60 percent WO_3 basis (exports)	r 135	r 12	2	r ---	49
Nonmetals:					
Cement—thousand tons	63	56	55	r 73	131
Lime—do	14	16	11	r 12	20
Mica, splittings—kilograms	386	83	---	---	---
Phosphate (apatite)	401	1,123	7,072	r 9,544	16,382
Salt—thousand tons	7	3	3	3	3

e Estimate. r Revised.
1 Exports.

lion, largely because of higher prices obtained for copper. Production of cement, lime, and apatite increased compared with 1964 output.

TRADE

In 1965 minerals again were Uganda's third most valuable export after cotton and coffee. The provisional value for minerals was $25 million, 12 percent higher than in 1964 and double the 1963 figure. Copper accounted for about 96 percent of total value.

In 1964 Uganda realized a favorable foreign trade balance in mineral commodities and with respect to total trade, as shown in the following table:

	1964 value (million dollars)		Mineral commodities share of total trade (percent)
	Mineral commodities	Total commodities	
Exports	18	180	10
Imports	7	92	8
Trade balance	+11	+88	XX

XX Not applicable.

Table 8.—Uganda: Exports of metals and minerals to countries outside the East Africa Common Market

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Beryl	346	473	All to United States.
Copper, blister	15,565	18,506	Spain 8,213; United States 2,437; West Germany 2,426; Belgium 2,235; Italy 1,016.
Gold—troy ounces	16	---	
Iron and steel, semimanufactures	---	83	Somalia 47; Rwanda 15; Republic of the Congo (Léopoldville) 11.
Tin, concentrate—long tons	230	325	United Kingdom 313; Malaya 12.
Tungsten, concentrate	6	---	
Other ores and concentrates of base metals, unspecified	400	6	All to United States.
Nonmetals:			
Asbestos	81	121	Rwanda 119.
Cement	r 1,224	3,087	Rwanda 2,241; Sudan 827.
Lime	574	2	All to Sudan.
Phosphate, fertilizer	---	3	All to Rwanda.
Salt	574	554	Rwanda 443; Republic of the Congo (Léopoldville) 111.

r Revised.

Table 9.—Uganda: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Sources	
			United Kingdom	Other principal sources, 1964
Metals:				
Aluminum, semimanufactures	90	166	22	West Germany 69; Austria 35.
Copper	67	101	48	Southern Rhodesia 20; West Germany 10.
Gold bullion—troy ounces	1,152	2,599	2,599	
Iron and steel:				
Iron ore	---	---		
Pig iron and ferroalloys	216	88	16	West Germany 47; Belgium 20.
Steel ingot and equivalent forms	186	---		
Semimanufactures	14,981	15,647	4,394	Japan 4,451; West Germany 2,249; Belgium 2,065.
Lead, all forms	13	57	11	Netherlands 41.
Nickel	1	2	---	Canada 2.
Silver	---	---		
Tin	39	35	32	
Zinc	3	12	8	
Nonmetals:				
Asbestos, crude	382	748	---	Southern Rhodesia 391; Canada 357.
Cement	418	745	444	West Germany 262.
Feldspar, fluorspar, cryolite, and chiolite	800	469	437	
Fertilizers:				
Nitrogenous	3,475	5,102	665	West Germany 3,181; Italy 900.
Phosphatic	656	1,517	8	Belgium 1,509.
Potassic	2,012	1,718	(1)	West Germany 1,403; Netherlands 262.
Other, not further described	846	3,192	64	Italy 1,435; West Germany 1,319; Netherlands 270.
Gypsum	171	---		
Lime	34	3	3	
Salt	30,040	34,019	97	Aden 17,655; Ethiopia 8,160; Pakistan 5,881.
Sulfur	1,726	1,563	(1)	West Germany 1,382; Belgium 181.
Mineral fuels:				
Solid:				
Coal	73	115	20	United States 36; Republic of South Africa 25; West Germany 25.
Coke	463	437	374	West Germany 50.
Petroleum refinery products:				
Gasoline—thousand 42-gallon barrels	698	343	---	Iran 314; Italy 16; Bahrain 11.
Kerosine—do	312	173	---	Iran 136; Italy 5.
Distillate fuel oil—do	NA	161	---	Iran 145; Bahrain 11.
Residual fuel oil—do	50	44	---	Iran 43.
Liquid petroleum gas—do	3	1	---	Aden 1.
Lubricating and other oils—do	29	32	14	Italy 10.
Grease, jelly, and wax	470	666	145	United States 127; Netherlands 71; West Germany 69.
Asphalt, pitch, resins	865	647	(1)	Iran 555; Bahrain 68.

NA Not available.
[1] Less than ½ unit.

COMMODITY REVIEW

Metals.—*Beryl.*—Low prices for beryl prevailed during the year and production declined sharply. The mineral was mined in the Mengo, Kigezi, and Ankole Districts.

Copper.—Kilembe Mines Ltd., in western Uganda in the foothills of the Mountains of the Moon, continued to be Uganda's only copper producer and most important mining company. The volume of blister copper produced was somewhat less than in 1964, but at $24.2 million the estimated value of output was nearly 30 percent higher. Ore mined totaled 941,000 tons, about 40,000 tons more than in 1964. Reserves of proved and possible ore at year-end were reported at 5.9 million tons averaging 2.0 percent copper. At the smelter at Jinja, equipment was being installed to recover copper being lost in flue dust. Training facilities for local employees were improved and expanded. The company's program for gradual Ugandanization of the operation was continued.

Iron and Steel.—The Steel Corporation of East Africa Ltd. reportedly produced about 17,000 tons of ingots and 13,000 tons of finished products during the year.

Tantalite-Columbite.—Small quantities of these minerals (8 tons) reportedly were mined during the year in Buganda Kingdom and in western Uganda.

Tungsten.—An appreciable output of wolframite was reported from the Kigezi District. The largest producer was Bjordal Mines Ltd., which has an open pit mine and a gravity mill.

Nonmetals. — *Fertilizer Materials.* — The 1964 Kampala Agreement, which apportioned industrial development between Kenya, Tanzania, and Uganda, allotted the fertilizer industry to Uganda. Toward the end of 1965, a consortium of West German companies signed an agreement with the Ugandan Government under which an additional fertilizer plant would be established, using local raw materials to produce annually 100,000 tons of calcium ammonium nitrate. Tororo Industrial Chemicals and Fertilizers Ltd. (T.I.C.A.F.) already was operating a fertilizer plant in Uganda, producing from Sukulu apatite about 25,000 tons of single superphosphate annually. T.I.C.A.F. is a subsidiary of Government-owned Uganda Development Co. Ltd. Imperial Chemical Industries Ltd., through its Kenya subsidiary, Twiga Chemicals Ltd., are managing agents for T.I.C.A.F.

The Mineral Industry of Liberia

By Walter C. Woodmansee [1]

Iron ore was essentially Liberia's only indigenous mineral product. Most diamond bought and sold in Monrovia originated outside the country. Iron ore provided $112.4 million in export earnings and was the principal factor in Liberia's large trade surplus. A fourth mine, Bong Mining Company, joined the iron ore producers and contributed to the output of nearly 16 million tons in 1965. Liberian American-Swedish Minerals Co., Join Venture Operating Co. (LAMCO JV), the principal producer, planned Africa's first iron ore pelletizing plant. Liberia passed the United Kingdom to rank eighth in the free world in iron ore output. The country also was the largest producer in Africa, contributing 40 percent of total output of iron ore on the continent.

The United States Agency for International Development (AID) continued its geological assistance program. A geological map of Liberia at 1:250,000 was in preparation, mineral resources were under investigation, and Liberians were trained in geological work.

PRODUCTION

The iron-mining sector, which dominated the mineral industry, moved forward in production and sales. A fourth major mine was brought into production, and two other deposits were under investigation. Output of gold and construction materials was small and showed no appreciable change from that of 1964. Diamond shipments, largely originating in other West African countries but not recorded as a part of these countries' output, were reduced slightly.

Table 1.—Liberia: Production of metals and minerals

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Gold—troy ounces	e 2,088	e 2,184	e 1,960	e 1,824	e 2,305
Iron ore—thousand metric tons	3,251	r 3,719	r 7,540	r 12,999	15,959
Nonmetals:					
Diamond:					
Gem (exports)—thousand carats	596	225	[2] 240	298	277
Industrial (exports)—do	500	680	[2] 508	273	263
Total (exports)—do	1,096	905	[2] 748	571	540

e Estimate. r Revised.
[1] In addition to commodities listed, construction materials also were produced, but output data are not available.
[2] Year ended Aug. 31, 1963.

TRADE

Adequate data on imports of metals and minerals are lacking for 1964 and 1965. Export earnings from iron ore totaled $112,412,000 in 1965 ($86,765,000 in 1964); foreign exchange earnings from diamond were $3,552,000 in 1965 ($3,894,000 in 1964). Because of continued expansion of iron ore sales, the total trade balance, which was

[1] Physical scientist, Division of International Activities.

favorable in 1964 for the first time in many years, apparently improved further in 1965. The relationships between mineral trade and total trade for 1963 and 1964 were estimated as follows:

	Million dollars		Mineral commodities' share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	49.1	[2] 81.1	60.5
1964	[e] 92.0	[2] 131.8	[e] 69.8
Imports:			
1963	13.6	108.0	12.6
1964	[e] 17.0	111.2	[e] 15.3
Net trade balance:			
1963	+35.5	−26.9	XX
1964	[e] +75.0	+20.6	XX

[e] Estimate. XX Not applicable.
[1] Values given are for only those commodities listed in table 2 of this chapter.
[2] Includes reexports ($5.2 million in 1963, not reported in 1964).

Table 2.—Liberia: Exports of selected metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Iron and steel:			
Iron ore and concentrate thousand tons	[r] 6,285	12,232	Netherlands 3,647[2]; United States 3,093; United Kingdom 1,683; West Germany 1,455; France 866; Belgium-Luxembourg 775; Italy 668.
Semimanufactures	[r] 298	NA	
Manganese ore	---	1,000	All to Italy.
Scrap, nonferrous, mainly copper	---	225	All to West Germany.
Nonmetals:			
Cement	33	---	
Diamond [3] thousand carats	746	572	NA.
Mineral fuels:			
Petroleum refinery products:			
Gasoline 42-gallon barrels	38	NA	
Lubricants do	860		
Liquefied petroleum gas do	6		

[r] Revised. NA Not available.
[1] Except for iron ore and concentrate, all commodities listed are re-exports. In addition, small quantities of clay construction materials, certain inorganic chemicals, mineral pigments, and salt are reexported.
[2] Received at Netherlands ports but probably largely in transit to West Germany.
[3] Shipments of trading companies in Liberia.

COMMODITY REVIEW

METALS

Gold.—Recorded output of gold valued at $78,382 was sold to the Bank of Monrovia. However, a large share of actual gold output from hand placer operations remained unrecorded and went to goldsmiths, jewelers, and others.

Iron Ore.—Mining operations and shipments to foreign destinations showed marked expansion during 1965. Total mine output and exports increased 22.8 percent and 28.1 percent, respectively. The 1965 output, by ore type and company, was distributed as follows:

	Metric tons
Liberian American-Swedish Minerals Co., Joint Venture Operating Co. (LAMCO JV)	
Direct shipping ore	8,709,262
National Iron Ore Co. Ltd.	
Direct shipping ore	2,906,237
Liberia Mining Co. Ltd.	
Direct shipping ore	1,399,868
Concentrate	1,206,561
Bong Mining Co.	
Concentrate	1,737,000
Total	15,958,928

Shipments, nearly equal to production, were valued at $112,412,000, making iron ore Liberia's most important export item.

LAMCO Joint Venture Operating Co. (LAMCO JV).—This company, owned by Liberian American-Swedish Minerals Co. (LAMCO) (75 percent) and Bethlehem Steel Corp. (25 percent), continued expansion of all phases of its operation and in November attained a monthly mining rate of 839,495 tons.

In June LAMCO JV announced plans for construction of new washing and pelletizing plants at Buchanan. The latter will be the first in Africa and one of the largest outside North America. Planned annual capacity of the washing plant was 10 million tons of ore. Pelletizing capacity was rated at 2 million tons annually, raising total ore and concentrate output to about 10 million tons per year. Construction work started during the dry season in late 1965; completion was scheduled for late 1967. Grängesberg Co., the Swedish firm which is manager for LAMCO JV, established a project organization in which the International Construction Co. Ltd., London, was engaged as consulting engineers and field supervisors. Bethlehem Steel Corp. was to supervise contractors and procurement of supplies in the United States. Dravo Corp. in Pittsburgh was granted a contract for design and construction of the pelletizing plant. Svenska Entreprenad A.B. Sentab received the contract for site preparation and foundation work. Other contract negotiations continued at yearend.

Estimated cost of this expansion program was $51.4 million, making LAMCO JV's total investment $282 million in Liberia. Expansion was financed by issuing of new shares ($11 million), an Export-Import

Table 3.—Liberia: Iron ore shipments by company and principal destinations

(Thousands metric tons)

Company, mine, and country of destination	1963	1964	1965
Liberian American-Swedish Minerals Co.			
Joint Venture Operating Co. (LAMCO JV), Nimba mine:			
Belgium-Luxembourg	143	775	990
France	175	388	403
Germany, West	212	834	2,771
Italy	18	274	964
Netherlands	564	1,856	31
United Kingdom	---	14	352
United States	665	2,656	2,398
Other	---	30	407
Total	1,777	6,827	8,316
National Iron Ore Co. Ltd. (NIOC), Mano River mine:			
France	363	478	454
Germany, West	89	350	549
Greece	---	15	154
Italy	191	180	237
Netherlands	704	1,037	1,019
United Kingdom	419	903	807
United States	231	253	379
Total	1,997	3,216	[1] 3,599
Liberia Mining Co. Ltd. (LMC), Bomi Hills mine:			
Germany, West	259	271	531
Italy	342	214	203
Netherlands	678	754	448
United Kingdom	659	766	495
United States	494	184	394
Other	79	---	115
Total	2,511	2,189	2,186
Bong Mining Co., Bong mine:			
Germany, West	---	---	1,129
Italy	---	---	438
Total	---	---	1,567
Grand total	6,285	12,232	15,668

[1] Substantially larger than production; NIOC buys fine ore from LMC. LMC shipments therefore are correspondingly lower than production at that mine.

Bank loan ($23 million), Bethlehem Steel Corp. ($13 million), and the remainder from retained earnings.

LAMCO JV's net earnings were $12,344,000 compared with $4,914,000 in 1964. Distributable profit was $7,408,000 in 1965. Total sales were $42,595,000 ($33,642,000 in 1964). The company employed 3,754 workers and staff, including 3,200 Liberians.[2]

The Attorney General of Liberia granted LAMCO JV rights to a 70-square-kilometer area in the Kitoma mountains, where reserves were estimated at 750 million tons of ore containing 40 to 60 percent iron. These reserves were claimed by both LAMCO JV and Kitoma Mining and Trading Company. Kitoma was to receive compensation for exploration costs.

National Iron Ore Co. Ltd. (NIOC).—A mining rate of about 3 million tons per year was maintained. Improvement of facilities continued during the year.

Liberia Mining Co. Ltd. (LMC).—Production at the Bomi Hills mine continued at the 1964 rate. No new reserves were found, and dwindling reserves of shipping-grade ore were estimated sufficient for only 9 years at the 1965 mining rate.

Joint exploration by LMC and NIOC in the Gbee Mountains, Lofa County, proved large low-grade resources (38 to 40 percent iron), which LMC planned to develop. Ore will be transported by rail 32 kilometers to Bomi for concentration.

Bong Mining Co.—The Bong Range mine, 112 kilometers northeast of Monrovia, became Liberia's fourth major iron producer. The mine went into partial production in March and full production, 3-million-ton-per-year rate, began in April. An increase to a 5-million-ton rate was planned. First ore delivery was made in June. The mine was officially opened on November 12.

The operation represents an investment of $80 to $90 million. Run-of-mine ore averaging 40 percent iron is upgraded by separators to 62 to 65 percent iron. Company officials reported reserves of 300 million tons in one ore body, and 150 million tons in another deposit. One ton of crude ore produced one-half ton of concentrate.

Bong Mining Co. was incorporated in 1961 as operating company for Deutsche-Liberian Mining Co., a consortium of West German Ruhr steel interests (75 percent) and Societa Finanziaria Ria Siderurgica per Azioni (Finsider) (25 percent). According to the Bureau of Natural Resources and Surveys, the mine employed 1,536 unskilled workers, 275 foreign technical personnel and staff, and 47 Liberian technical personnel as of the fiscal year ended August 31, 1965.

Proposed Iron and Steel Plant.—Liberian authorities continued efforts to establish an integrated iron and steel plant in Buchanan to serve West African markets. In 1964 Buchanan was selected as most favorable location after a United Nations Economic Commission for Africa (UNECA) feasibility study of four proposed sites in West Africa, based on estimated costs of production and distribution of steel. From August 2 to 6, a consultative meeting was held in Monrovia, at the invitation of the Liberian Government. The meeting was attended by representatives of UNECA, the Organization for African Unity, and eight other nations. Liberia sought regional agreement and cooperation in establishing a 700,000-ton-per-year plant for crude and finished steel at Buchanan, but no decision was reached. An interim committee was formed to pursue the matter further and report within 6 months to an appropriate intergovernmental body.[3]

In September, A. Romeo Horton, Secretary of the Department of Commerce and Industry and Head of the Liberian Steel Mill Committee, visited the United States and met with World Bank officials concerning the proposed steel mill. Late in the year, Liberian delegates planned a trip to Vienna and London to discuss plant technology.

NONMETALS

Diamond.—Two mining companies, one (name unknown) working near the Mano River and the other (Diamond Mining Co.) not reporting its activities or production, probably produced a few thousand carats of diamond. The bulk of output given in table 1, however, represents stones originating in Sierra Leone, Ghana, Democratic Republic of the Congo, and probably other countries of West Africa, and sold to licensed buyers in Monrovia. These shipments, according to the Bureau of Natural Resources and Surveys, were as follows:

[2] Liberian Iron Ore Ltd. Annual Report 1965, April 1966, 24 pp.

[3] U.S. Embassy, Monrovia, Liberia. State Department Dispatch A–68, Sept. 23, 1965, 14 pp.

Type	Carats	Value (U.S. dollars)
1964:		
Bort and industrial	273,498	307,835
Gem	298,370	3,585,761
Total	571,868	3,893,596
1965:		
Bort and industrial	262,850	403,695
Gem	276,574	3,148,779
Total	539,424	3,552,474

Royalty paid to the Liberian Government was $532,871 in 1965, compared with $584,023 in 1964.

MINERAL FUELS

No further progress was made toward construction of a petroleum refinery, which has been under consideration since 1961. Toward the end of 1965, Liberia Refining Co., a subsidiary of Dynalectric Corp. which held a concession agreement to build the refinery, claimed that location of the plant site was selected near Monrovia.

The Mineral Industry of Libya[1]

By Walter C. Woodmansee[2]

Principal mineral developments in Libya during 1965 concerned the petroleum industry, which continued as the nation's predominant source of revenue and foreign exchange. Revenues from the petroleum industry were estimated at over $300 million in 1965, substantially more than in 1964 (including increases derived from 1965 amendments to the Petroleum Law of 1955).[3] This revision was expected to add $100 to $140 million to annual revenues. The state budget for 1965–66 was established at $464 million, including approximately $230 million for 1965.[4]

At midyear, cumulative oil company investment and expenditures in Libya totaled about $1,500 million.[5] The petroleum industry employed 12,600 people, including 9,500 Libyans. In November, Esso Standard Libya, Inc., opened an industrial training center at Marsa el-Brega to train Libyan nationals in petroleum operations.

PRODUCTION

The petroleum industry was developed further during 1965; daily output of crude oil was 1.2 to 1.3 million barrels through most of the year and attained a rate of 1.4 million barrels by yearend, ranking Libya sixth among petroleum-producing countries.

Five consortia—Esso Standard Libya, Inc., Oasis Oil Co. Libya, Inc., Mobil Libya Petroleum Co./Gelsenberg Benzin A.G., American Overseas Petroleum Co. Ltd. (Amoseas), and Phillips Petroleum Co.—were active oil producers, while two others — British Petroleum Exploration Ltd./Nelson Bunker Hunt and Pan American Petroleum Co. — neared the production stage. At yearend there were 47 oilfields, including 7 discovered in 1965, and more than 800 producing wells. Total daily pipeline capacity, including that connected to the new Sarir line not yet in commercial production, was 1.6 million barrels, and estimates envisioned a future daily capacity of 3 million barrels.

Progress also was made toward marketing associated natural gas, which through 1965 was flared in large quantities. Esso Standard Libya, Inc., a major oil producer, negotiated long-term contracts with Italian and Spanish firms for future delivery of liquefied gas by large-capacity tankers and made plans for natural gas pipelines and a liquefaction plant.

In the metals and nonmetals sectors, significant developments were few. The Geological Society, Ministry of Industry, commenced collecting data on more than 300 active quarry operations, largely in building stone and crushed rock. Projects were planned or were underway on building materials, glass, fertilizers, and asphalt. Libyan Metal Industry Co. reportedly began production of steel bars in May, but further information on the operation was lacking at yearend.

---

[1] Much information in this chapter was derived from petroleum reports by B. W. Brown, Jr., Dept. of State, U.S. Embassy, Tripoli.

[2] Physical scientist, Division of International Activities.

[3] Where necessary, values have been converted from Libyan pounds (£L) to U.S. dollars at the rate of £L1 = $2.80.

[4] Petroleum Press Service. V. 32, No. 8, August 1965, p. 314.

[5] Europe and Oil. V. 4, June 1965, pp. 68–70.

Table 1.—Libya: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity [1]		1961	1962	1963	1964	1965
Nonmetals:						
Brick	million bricks	e 11	e 11	e 10	e 10	e 10
Gypsum		------	------	-------	400	1,865
Lime	thousand tons	18	20	e 20	e 20	e 20
Natron		1,000	1,000	-------	5	-------
Salt	thousand tons	11	16	19	13	-------
Stone, crushed	do	250	250	e 250	e 250	e 250
Mineral fuels:						
Natural gas, associated [2]	million cubic feet	------	------	-------	e 231,200	303,433
Petroleum, crude	thousand 42-gallon barrels	6,642	67,052	167,786	315,660	445,374

e Estimate.
[1] Statistics are available only on mining operations conducted by the Ministry of Industry, which include gypsum and salt. Various quarry products, including building stone, clay, marble, mica, sand, and sulfur, have been mined sporadically for local use.
[2] Flared or used as fuel in oilfield operations.

TRADE

Preliminary information indicated that exports of crude oil reached nearly 443 million barrels, valued at nearly $785 million on posted prices, in 1965. The following tabulation illustrates the relationship of mineral industry trade to total trade during 1963–64, the latest years for which these data are available:

	Value (million dollars)		Minerals' share of total (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	369	374	98.7
1964	695	701	99.1
Imports:			
1963	45	239	18.8
1964	54	292	18.5
Trade balance:			
1963	+324	+135	XX
1964	+641	+409	XX

XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

Crude oil accounted for nearly all mineral exports. Import values, divided by commodity group, during 1964 were as follows: Metals $32.1 million, largely iron and steel pipes and tubes but also including $2.2 million in nonmonetary gold; nonmetals $9.0 million, largely cement, ceramic ware, and fertilizers; and mineral fuels $13.3 million, largely petroleum products.

Crude oil exports continued to be shipped from three terminal ports—Marsa el-Brega 206 million barrels, Ras es-Sidr 184 million barrels, and Ras Lanuf 53 million barrels. A fourth port was under development at Marsa el-Hariga, near Tobruk in eastern Libya, for oil from the new Sarir field, where reserves were estimated at 10 billion barrels.[6]

Petroleum companies operating in Libya imported supplies and equipment valued at $61 million in 1965, compared with $78.8 million in 1964. The 1965 value was the lowest since 1961, indicating the industry has progressed toward production as exploration and oilfield development declined.

Libya also reexported goods valued at $8.2 million in 1964, including $0.9 million involving the mineral industry, largely iron and steel tubes, pipes, and fittings.

[6] Oil and Gas Journal. V. 63, No. 20, May 17, 1965, p. 82.

Table 2.—Libya: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals: Scrap, ferrous and nonferrous	7,757	4,944	Italy 4,332.
Nonmetals: Sulfur	22	-------	
Mineral fuels: thousand 42-gallon barrels	167,015	314,309	West Germany 106,412; United Kingdom 70,572; Italy 37,965; Netherlands 27,267; France 17,872; Spain 14,744; United States 13,788.
Petroleum, crude.			

Table 3.—Libya: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals: [1]			
Aluminum	307	677	Italy 370; United States 125.
Copper	104	113	Italy 63; United States 18.
Iron and steel:			
Pipes, tubes, and fittings	86,973	108,774	West Germany 31,274; Italy 30,201; United States 15,669.
Other forms	32,502	37,225	Italy 13,111; West Germany 7,384; Belgium 5,836.
Lead	152	92	Netherlands 74.
Nickel	6	1	Belgium 1.
Silver, platinum, and other platium group metals. troy ounces	89,345	71,889	West Germany 48,644; France 13,310; United Kingdom 9,935.
Tin long tons	33	10	United Kingdom 5.
Zinc	364	378	Belgium 336.
Undifferentiated, including scrap and waste.	409	51	United Kingdom 50.
Nonmetals:			
Abrasives, natural	4	2,423	All from Italy.
Asbestos, crude and friction materials	223	21	Yugoslavia 8; Italy 7.
Bricks, tiles, other ceramic ware for construction uses.	NA	49,590	Italy 46,520.
Cement thousand tons	288	329	Rumania 99; U.S.S.R. 72; Greece 46; West Germany 30.
Clays do	27	41	Greece 32.
Fertilizers:			
Crude	10	400	West Germany 200; Belgium 100; Italy 100.
Finished	15,308	14,018	West Germany 5,740; Italy 4,116.
Gravel and crushed rock	[2]	5,711	Italy 4,537.
Gypsum and plaster	[2]	820	Greece 664; Italy 133.
Lime	15,603	23,021	Italy 20,768; Yugoslavia 1,502.
Limestone for fluxing	[2]	658	All from Italy.
Pigments, mineral	[2]	622	Italy 521.
Refractory materials, including brick	NA	202	United States 127; Czechoslovakia 44.
Salt	61	37	United Kingdom 36.
Stone, building and dimension:			
Unworked	[2]	7,929	Italy 6,299; Greece 951.
Worked	NA	723	Italy 589.
Sulfur	7	19	United Kingdom 12; Italy 7.
Talc and steatite	[2]	34	Italy 32.
Other	3,539	[3] 20	United States 13; United Kingdom 5.
Mineral fuels:			
Asphalt, natural	3,553	5,810	Rumania 2,922; Italy 2,118.
Coal and coal products	8,561	2,307	United States 2,265.
Petroleum refinery products:			
Gasoline. thousand 42-gallon barrels	644	1,132	France 427; United States 349; Italy 227.
Kerosine and jet fuel do	229	364	France 178; Italy 74; United States 67.
Distillate fuel oil do	765	1,289	United States 549; France 319; Italy 271.
Residual fuel oil do	118	164	Italy 118; France 32.
Lubricants do	59	87	France 31; United States 22.
Asphalts, wax, and bitumen do	63	104	Italy 72; Hungary 11.
Liquefied petroleum gas do	67	40	Italy 37.
Total	1,945	3,180	

NA Not available.
[1] Base metals include alloys.
[2] Not listed separately in 1963.
[3] Includes mainly barite and chalk.

COMMODITY REVIEW

NONMETALS

Cement.—During 1965 the Libyan Government took further steps to encourage development of a domestic cement industry. National Cement Co., 70 percent of the shares in which were purchased by the Government, started construction on its 120,000-ton-per-year cement plant near Homs, Tripolitania. A Board of Directors was appointed to consider bids for plant equipment and, late in the year, granted a contract to a West German firm for machinery. Port facilities were under construction at Homs. National Cement Co. was granted a 20-year concession for limestone development in the area. Drilling of limestone and clay deposits was underway near Tripoli.

Another cement plant, also financially backed by the Government, was planned by Libyan Cement Co., near Benghazi. Foreign consultants were engaged to recommend an appropriate plant site.

Salt.—According to the Ministry of Industry, salt was not produced in 1965, because a 1964 surplus provided for domestic demand. A new installation for marine salt recovery, with an annual capacity of 5,000 to 6,000 tons, was under construction near Benghazi.

MINERAL FUELS

Petroleum.—Production and export of crude oil continued upward as new oilfields and pipeline facilities were developed. Production rose 40 percent over that of 1964, and exports totaled 443 million barrels, valued at nearly $785 million. The daily output rate reached 1.4 million barrels late in the year.

The year started with oil flow limited to a rate of 1 million barrels per day because a series of storms in the Gulf of Sirte delayed tanker loadings. The daily rate was 1.2 million barrels in March and continued at 1.2 to 1.3 million barrels through most of the year.

Over 200 productive wells were brought in, including 10 discovery wells. Seven fields became producers: Jebel, Raleh, Maghil, and Ain Jarbi of Esso Standard; Ora of Mobil/Gelsenberg; Kotla of Amoseas; and Umm Farud of Phillips. The Jebel field, 19 kilometers southeast of Esso's Zelten field, was reported capable of 40,000 barrels per day. Phillips' Umm Farud field produced at a rate of 10,000 to 15,000 barrels daily and was considered capable of 25,000 barrels daily. Pan American made an important discovery at Khuff, where production at about 15,000 barrels per day was anticipated. The Mobil/Gelsenberg Amal field also neared the production stage. Phillips discovered its third productive well in western Libya; the well tested at 1,800 barrels per day, but the region was not considered commercial, because productive wells are widely separated.

Operations were affected briefly by two incidents of apparent sabotage. On May 14, four oil wells in the British Petroleum/Nelson Bunker Hunt Sarir field caught fire after explosions and a fifth

Table 4.—Production of crude oil and natural gas, 1965

Company	Field	Crude oil, thousand 42-gallon barrels	Natural gas, million cubic feet
Oasis Oil Co., Libya, Inc	Gialo	70,894	2,028
Do	Dahra	46,966	68,959
Do	Waha	45,313	19,318
Do	Samah	18,794	2,785
Do	Zaggut	2,640	912
Esso Standard Libya Petroleum Co., Inc	Zelten	158,083	109,701
Do	Jebel	13,939	12,086
Do	Raleh, Maghil, Ain Jarbi	146	141
Mobil Libya Petroleum Co./Gelsenberg Benzin A.G	Hofra	25,816	49,691
Do	Ora	10,924	2,370
Esso Sirte Petroleum Co., Inc	Raguba	34,838	35,422
American Overseas Petroleum Co	Beda	13,064	1,118
Do	Kotla	2,892	560
Phillips Petroleum Co	Umm Farud	1,065	180
Total		445,374	305,271

well ran wild.[7] In July, explosions and fire at Esso's Marsa el-Brega port terminal caused the loss of three 268,000-barrel crude oil storage tanks and damage to a 36-inch water pipeline. Orders for construction of replacement tanks were placed with a Libyan firm. The incidents were investigated by Government authorities. Installations were guarded by the Libyan Army and Police, and more effective security measures were planned. The last fire at the Sarir field was brought under control on June 11. Production was not handicapped because the field had not been connected to pipeline.

A pipeline explosion at Oasis's Samah field on November 3 killed 10 men. This was considered the worst accident involving petroleum operations in the country. Production from four fields was interrupted for about 10 days.

On May 27, the Libyan Government requested bids on new oil concession areas involving 185,000 square miles, including relinquished acreage. This was the first such announcement in several years. The bid deadline was July 29, and bids were publicly opened in Baida on July 31. Representatives of 48 companies, which individually or grouped had bid on 104 land parcels, assembled in the Council of Ministers conference room to witness the opening. The Libyan Government had indicated several factors considered preferential in consideration of granting concessions.[8] Announcement of concession awards was delayed while authorities considered revisions of basic petroleum laws.

On November 20, King Idris signed a Royal Decree, amending certain provisions of Petroleum Law No. 25 of 1955. The OPEC (Organization of Petroleum Exporting Countries) formula for calculating taxes was thereby applied to petroleum companies operating in Libya. The amendments revised the calculation of crude oil discounts and price reductions, which allegedly had caused substantial revenue losses to the Government. Royalties were to be considered as production expenses only and not as advance payment on the 50–50 profit split, as formerly permitted. It was estimated that this would increase revenue by $0.14 per barrel. Also, income was to be based on officially posted prices (about $2.20 per barrel for 40° gravity oil), less a maximum permissible discount of 7.5 percent for 1965 sales, and 6.5 percent for 1966 sales, rather than on realized price (about $1.60 per barrel). Another stipulation limited expenses deductible in connection with marketing, prior to computation of taxable income, to $0.005 per barrel. These adjustments were expected to add $100 million to $140 million to revenues during 1965. The new oil laws were discussed in several sources.[9]

Amendments to the petroleum law were passed unanimously by the Chamber of Deputies and the Senate on December 8 and 9, respectively. The decree included a number of inducements for the 24 concession holders to amend their agreements in accordance with the OPEC formula by December 15. Inducements involved quittance on disputes over prices, rebates, discounts, allowances, and royalties that existed during 1964. At yearend, most operating companies had amended their agreements to conform with the new regulations.

The Royal Decree also set a January 6, 1966, deadline for the 48 companies applying for new concessions to indicate their acceptance of the OPEC formula and to amend their applications. Several companies withdrew; others amended their bids. At yearend, negotiations were in progress, and no new announcements had been made on awarding of new concessions.

Late in 1965, Amerada Petroleum Corp. sold half of its one-third interest in Oasis Oil Co., Inc., to Libya Shell N.V., giving Shell a one-sixth interest in Oasis, effective January 1, 1966, subject to approval of the Libyan Government.[10] Shell agreed to pay about $64 million to Amerada for pre-1966 Amerada expenditures and to purchase a specified quantity of crude oil from Amerada's remaining share. Shell formed a new subsidiary company for this operation.

Exploration and Development. — The downward trend in exploration, started in

[7] World Petroleum. V. 36, No. 7, July 1, 1965, p. 53.

[8] Oil and Gas International. V. 5, No. 7, July 1965, p. 110.

[9] Arab Oil Review. October–November 1965, pp. 35–42. Petroleum Times. V. 69, No. 1782, Dec. 24, 1965, p. 687. Petroleum Press Service. V. 33, No. 1, January 1966, pp. 7–9.

[10] The Economist. V. 218, No. 6387, Jan. 22, 1966, p. 344.

1964, continued in 1965, as indicated below:

	1964	1965
Geological parties active at yearend	2	1
Seismic parties do.	15	10
Drill rigs do.	45	38
Rig months	542	536
Footage drilled thousand feet	2,632	2,381
Number of wells completed:		
Producing, development	214	194
Producing, discovery	17	10
Dry	178	155
Total	409	359
Total tested production rate of new wells barrels per day	21,862	7,237

Esso Standard continued stepout drilling at its Jebel field. In the west, Phillips drilled in Concession 90, and Libya Shell N.V. completed 7 wells for a total of 40 unsuccessful wells and terminated exploratory drilling. Compagnie des Pétroles Total carried out a seismic survey in Concession 49. Campagnie Ricerche Idrocarburi (CORI), subsidiary of the Italian firm Ente Nazionale Idrocarburi (ENI), made a significant oil discovery in eastern Libya (Concession 82). It bottomed at 13,600 feet and is believed to be the deepest oil well in the country and a possible extension of the large Sarir field.

As an incentive to petroleum activity, the Government announced in August that foreign-owned companies engaged in exploration, installation of electronic and telecommunication equipment, and pipelime construction are exempt from Libyanization requirements of the Commercial Code.

Pipelines.—In February Mobil/Gelsenberg/Amoseas announced plans for a new 283-kilometer, 30-inch pipeline from the Amal field to the port terminal at Ras Lanuf. Contracts were awarded in June to Arabian Bechtel Corp.; Brown and Root Overseas Ltd.; Libyan Engineering and Contracting Co.; National Development Co./Toyo Kanetsu Ltd.; and Chicago Bridge Ltd. for various construction phases. The first shipments of pipe arrived at Ras Lanuf in July, and the line was completely welded out late in the year. Production was expected in early 1966. A $28-million total cost was reported by the press.

Oasis Oil Co. began a $12.6-million expansion program on its major line to Ras es-Sidr and feeder lines, raising daily throughput capacity from 530,000 to 680,000 barrels. Additions consisted of a 139-kilometer, 30-inch line; a 48-kilometer, 24-inch line; a pump station at Gattar; generating equipment for increased power; and improved power distribution systems. The project was virtually complete at yearend.

Esso Standard completed new gathering and feeder lines from its new fields to the main pipeline and a 4,000-horsepower booster pump station on the main line, which raised capacity from 550,000 to 605,000 barrels daily. The Kotla, Umm Farud, Khuff, and Ora fields were connected by feeder lines to the main pipelines.

At yearend, four operating pipeline systems had total throughput capacity of about 1.5 million barrels per day. Work continued on a fifth major line—the British Petroleum/Hunt 515-kilometer, 34-inch line from the Sarir field to the new oil port of Marsa el-Harega, near Tobruk, in eastern Libya. Jetty construction was underway at the port.

Natural Gas.—Oilfields continued to produce large quantities of associated natural gas, most of which was flared. In March the Libyan Council of Ministers appointed an Energy Committee, headed by the Minister of Petroleum Affairs, to study proposals for gas commercialization and attempt to develop markets. Late in the year, two contracts for the sale of liquefied gas were announced—one with the Italian Societa Nazionale Metanodotti (SNAM), a subsidiary of ENI, involving 235 million cubic feet per day for 20 years; and the other with Catalana de Gaz, Barcelona, Spain, for 110 million cubic feet per day for 15 years.[11] Liquefied natural gas (LNG) output for this contract was considered equivalent to 80,000 barrels per day. Large LNG tankers with capacity of 250,000 barrels were planned. Esso Standard awarded an $8.4-million contract to Air Products and Chemicals Co. (U.S.) for design and engineering of the refrigeration plant at Marsa el-Brega. A new gas pipeline parallel to the Zelten-Marsa el-Brega line was planned.

In August, Libyan Atlantic Refining Co./Phillips, drilling offshore on the ship, *Glomar V,* struck a pocket of high-pressure gas which ran out of control for 11 days

[11] Petroleum Press Service. V. 32, No. 12, December 1965, p. 466.

Table 5.—Libya: Data on main crude oil pipelines

Operating company and year of initial operation	From—	To—	Length (kilometers)	Diameter (inches)
Oasis:				
1962	Dahra	Ras es-Sidr	140	30
1963	Samah	Dahra	201	32
Esso Standard (1961)	Zelten	Marsa el-Brega	171	30
Mobil/Gelsenberg/Amoseas:				
1964	Asida	Ras Lanuf	89	30
1964	Ora/Beda	Asida	135	24
1966	Amal	Ras Lanuf	283	30
British Petroleum/Nelson Bunker Hunt (1966)	Sarir	Marsa el-Harega	515	34

	Capacity (thousand barrels per day)	Ultimate capacity (thousand barrels per day)	Port terminal and installations
Oasis:			
1962	680	750	Ras es-Sidr: 4 tanker berths; storage capacity 4.7 million barrels in 15 tanks.
1963	-------	--------	
Esso Standard (1961)	605	650	Marsa el-Brega: 4 tanker berths; storage capacity 4.3 million barrels in 16 tanks.
Mobil/Gelsenberg/Amoseas:			
1964	185	500	Ras Lanuf: 2 tanker berths; storage capacity 1.5 million barrels in 3 tanks.
1964	-------	--------	
1966	100	500	Ras Lanuf: 1 tanker berth; storage capacity 1.5 million barrels in 3 tanks.
British Petroleum/Nelson Bunker Hunt (1966)	100	600	Marsa el-Harega, near Tobruk; line under construction at end of 1965.
Total	1,670	3,000	

before it was sealed off. The discovery was not considered commercial. The exploration group had a 7-million-acre offshore concession and drilled several wells in water as deep as 525 feet.[12]

Refineries.—The Esso Sirte, Inc., 8,500-barrel-per-day refinery at Marsa el-Brega remained inoperative during the year, owing to a continuing lack of agreement between Esso and the Government on refinery product prices. However, in October King Idris signed a Royal Decree establishing excise taxes on domestic refinery products, thereby removing a major barrier to their production.[13]

Marketing continued to be restricted to three companies: Esso, Shell, and Societá Lidica per il Petrolio S.p.A. (Asseil); 49 percent of Asseil was owned by ENI of Italy and 51 percent by Libyan interests. Effective May 1, the Esso marketing organization, formerly operating independently, became a department of Esso Standard, a major operator in the country. Shell maintained marketing separate from its oilfield subsidiary.

[12] Oil and Gas Journal. V. 63, No. 10, Mar. 8, 1965, pp. 130–132.

[13] Arab Oil Review. October–November 1965, p. 27. Oil and Gas Journal. V. 63, No. 49, Dec. 6, 1965, pp. 103–104.

The Mineral Industry of the Malagasy Republic

By Walter C. Woodmansee [1]

As in previous years, the Malagasy Republic's mineral industry was dominated by the mining sector. A large chromite deposit was under development, backed largely by Société d'Électro-Chimie, d'Électro Metallurgie, et des Aciéries Électriques d'Ugine (Ugine) and the Malagasy Government. The Malagasy Republic was the world's chief source of phlogopite mica and ranked fourth in the free world as a graphite producer. The United States received important quantities of both of these commodities. Uranothorianite production provided a significant share of uranium requirements in France.

Several domestic and foreign agencies were actively engaged in projects directly related to mineral development. The Service Géologique continued a geologic mapping program at a scale of 1:100,000 and planned to complete five sheets during the year. This office also conducted field studies on graphite, gold, mica, quartz, clays, and limestone (the latter in conjunction with a new cement plant planned in the Hauts-Plateaux) and geochemical studies on several metals.

The French Bureau de Recherches Géologiques et Minières conducted a diversified program in several regions. Its activities included geologic mapping of 7,000 square kilometers in the Andriamena chromite area, prospecting and geochemical exploration for numerous metallic and nonmetallic minerals, engineering studies on soils, and hydrogeology in 20 localities. Drilling was planned in several areas. Another French organization, Fonds d'Aide et de Coopération (FAC), had exploration programs for diamond, phosphate, copper, lead, zinc, molybdenum, and platinum. Fonds Européen de Developpement (FED), a European Economic Community agency, provided financial assistance for chromite development.

In October several United Nations Special Fund projects were underway or planned. These included assistance in the study of mineral and ground water resources in southern Malagasy, the development of energy resources, and the improvement of the railroad system. United Nations funds made available for all projects totaled $3.5 million,[2] and the Malagasy Government was to contribute $9.8 million.[3]

The 1964–68 development plan called for increases in output of most minerals. Total programed investment in the mineral industry during this period was $23.7 million, of which $20.2 million would be private and the remainder would be public funds.[4]

Aluminum products and cement were included among materials granted preferential treatment under terms of the investment code. Benefits to investors include reduced taxes on imported materials for processing and on profits for stated periods of time; protective tariffs and quotas on imported competing goods were also established.

---

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from Malagasy francs (FMG) to U.S. dollars at the rate of FMG 245=US$1.00.

[3] International Monetary Fund. International Financial News Survey. V. 17, No. 45, Nov. 12, 1965, p. 419.

[4] Industries et Travaux d'Outremer. No. 136, March 1965, p. 194.

PRODUCTION

Mine-head value of total reported mine output in 1965 was $3.3 million. Graphite with a value of $1,169,000, replaced uranothorianite as the most valued product, while the latter dropped to $996,000 (actual export value). Graphite production showed a marked improvement, owing to better marketing conditions, whereas the mining of uranothorianite was handicapped by shortages of shipping-grade ore. Production of phlogopite mica, another important mineral product, was valued at $555,000, almost the same as that of 1964. Semiprecious gem stones were valued at $191,000. Other notable mineral products were quartz crystal, particularly the peizoelectric variety, and monazite, both of which showed higher output during 1965.

Data on cement production, which began in 1964, became available for the first time. Output has been small relative to demand and went to areas near the plant. A second plant was planned in the Hauts-Plateaux region of the interior.

A small plant for galvanized and corrugated sheet, which apparently was used largely for roofing, was completed at Tamatave late in the year.

TRADE

Foreign trade in metals and minerals in 1964, the latest year for which complete data are available, was characterized by exports of graphite and phlogopite mica, which together accounted for two-thirds of total mineral export value, and imports of steel semimanufactures and petroleum refinery products. Steel import value was $6.6 million, and that for petroleum refinery products was $7.1 million. The unfavorable trade balance in mineral and total trade is indicated in the following tabulation:

	Million dollars		Mineral commodities' share of total (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	r3.8	82.7	4.6
1964	3.7	92.5	4.0
Imports:			
1963	r18.7	128.5	14.6
1964	17.2	136.5	12.6
Trade balance:			
1963	−14.9	−45.8	XX
1964	−13.5	−44.0	XX

r Revised. XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

COMMODITY REVIEW

METALS

Bauxite.—Compagnie de Produits Chimiques et Électrométallurgiques Péchiney, through continued exploration, determined that bauxite resources totaling about 70 million tons in the Manantenina region, north of Fort Dauphin, may be economically exploitable. Government authorities studied possible methods of sea transport.

Chromite.—Ugine discontinued operations at the Ranomena mine, 37 kilometers north of the port of Tamatave, on August 31 after producing 6,500 tons of concentrate during the year. Geologic study and exploration continued in the Andriamena area, 180 kilometers north of Tananarive in the Hauts-Plateaux. Ugine reported reserves of 3 million tons of chromite proved and a similar tonnage probable. The largest deposit, Bemanevika, contains 2 million tons with an average of 42 percent chromic oxide (Cr_2O_3) and average chromium-iron ratio of 2.6:1 at the surface and 3.0:1 at depth. Remaining ore is in numerous relatively small ore bodies ranging from several thousand to 200,000 tons.

Compagnie Minière d'Andriamena was formed to develop and exploit the deposit. Initial capacity would be about 100,000 tons of concentrate per year. The possibility of an electrometallurgical plant for silicochrome also was under consideration. A $7-million, all-weather road from mine to railhead was planned for construction in 1966, financed by Ugine, the Malagasy Government, FED, and FAC.

Participation in the company was reported as follows: Ugine 55 percent, Malagasy Government 20 percent, Pechiney, 10 percent, Compagnie Financière pour l'Out-

Table 1.—Malagasy Republic: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Beryl, industrial	758	674	411	212	20
Chromite	10,500	18,454	11,200	11,770	r 6,500
Columbite and tantalite—kilograms	21,200	9,400	17,200	3,600	4,000
Gold—troy ounces	347	325	900	440	598
Manganese ore	300	------	------	------	5
Monazite	456	637	615	964	1,085
Nickel ore [2]	2	100	14,388	NA	NA
Titanium concentrate (ilmenite)	3,302	3,184	3,653	r 4,800	6,300
Uranium ore and concentrate [2]	410	544	482	690	421
Zircon concentrate, industrial	320	354	388	512	644
Nonmetals:					
Cement	------	------	------	40,996	30,294
Feldspar	13	------	------	r 1	------
Garnet, industrial	50	100	2	65	69
Graphite	14,944	17,485	19,245	13,173	17,015
Mica, phlogopite:					
Block	101	82	97	93	91
Splittings	908	1,261	868	589	538
Quartz, crystal—kilograms	17,850	13,300	28,700	28,300	88,100
Salt	e r 140	e r 140	r 200	r 290	145
Stones, semiprecious—kilograms	12,201	762	4,159	3,831	5,822
Mineral fuels:					
Coal, bituminous	2,000	------	2,000	r 4,000	2,000

e Estimate. r Revised.
NA Not available.
[1] In addition to commodities listed, a variety of minerals, mainly nonmetallic, are produced in very small quantities.
[2] Exports.

Table 2.—Malagasy Republic: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Beryllium:			
Concentrate	227	239	United States 194; France 44.
Unwrought	------	418	France 338; United States 80.
Chromite	13,000	7,003	All to France.
Columbite-tantalite	27	17	United States 13.
Copper, mainly scrap	136	228	West Germany 178; Italy 40.
Gold—troy ounces	32	------	
Iron and steel:			
Scrap	2,736	74	Italy 70.
Semimanufactures	93	174	Comores 128; Réunion 41.
Lead, mainly scrap	4	43	All to Netherlands.
Thorium and uranium minerals, mainly monazite	1,127	1,434	All to France.
Zinc	14	------	
Ore and concentrate, not elsewhere specified	7	------	
Residues, precious metal—kilograms	1	------	
Nonmetals:			
Fertilizer materials, all types	6	3	Mainly to Comoro Islands.
Gem stones, precious and semiprecious—kilograms	62,209	104,690	United Kingdom 50,000; France 47,529.
Graphite	15,797	14,055	United States 4,500; United Kingdom 3,196; France 2,694.
Mica, crude and worked	854	966	United States 314; West Germany 184.
Salt	2,407	1,633	Réunion 1,186; Comoro Islands 445.
Stone for construction use	------	12	All to Réunion.
Nonmetals, not elsewhere specified	18	6	Comoro Islands 5.
Mineral fuels:			
Coal and briquets	------	3	Bunkers 2.
Petroleum refinery products	46	[1] 7	Réunion 6.
Tar, pitch, and other crude chemicals from coal, oil and gas distillation	------	1	Mainly to Réunion.

[1] May not be complete; data lacking.

Table 3.—Malagasy Republic: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals: [1]			
Aluminum	252	438	France 374.
Copper	179	232	France 207; United Kingdom 22.
Gold, troy ounces	14,886	2,122	All from France.
Iron and steel:			
Pig iron and ferroalloys	25	27	Do.
Ingots, blooms, billets, slabs, etc.	455	25	Do.
Semimanufactures:			
Bars and rods	11,678	7,904	France 7,257; Belgium-Luxembourg 466.
Structural shapes	8,491	7,377	France 7,131.
Hoop and strip	524	513	All from France.
Plates and sheets	13,109	13,906	France 13,163; Belgium-Luxembourg 532.
Tubes, pipes, and fittings	5,113	3,308	France 3,016; Belgium-Luxembourg 217.
Rails and accessories	911	681	France 635; Belgium-Luxembourg 39.
Wire	401	382	France 322; Belgium-Luxembourg 59.
Total	40,227	34,071	
Special steels, all forms	165	158	All from France.
Lead	195	154	Do.
Platinum, troy ounces	32	96	Do.
Silver, do.	8,841	11,446	France 10,642.
Tin, long tons	32	14	France 7; Malaya 7.
Zinc	89	77	Belgium-Luxembourg 56; France 21.
Metals not elsewhere specified:			
Unwrought and semimanufactures	5	3	All from France.
Oxides and bases, metallic, mainly for paint	45	121	France 98.
Residues, precious metals, kilograms	2	------	
Nonmetals:			
Abrasive materials:			
Natural	18	15	All from France.
Grinding stones, millstones	18	19	France 18.
Cement	84,232	70,803	France 29,522; Belgium-Luxembourg 348.
Chalk	116	106	All from France.
Clays	110	46	Do.
Clay construction materials	1,480	1,258	France 691; West Germany 476.
Diamond, other precious and semiprecious stones, kilograms	7	55	France 54.
Fertilizer materials:			
Crude, phosphatic	------	140	Mainly from Tunisia.
Manufactured:			
Nitrogenous	1,970	2,521	France 1,549; Italy 495.
Phosphatic	266	623	Tunisia 443; France 104.
Potassic	705	745	France 534; West Germany 57; Tunisia 55.
Mixed	2,220	1,184	France 735; Tunisia 319.
Ammonia	12	21	France 19.
Gypsum and anhydrite	2,194	1,247	All from France.
Lime	2,761	2,729	Do.
Magnesite	5	5	Do.
Mica, crude and worked, kilograms	1,032	2,001	Do.
Pigments, mineral	178	149	Do.
Salt	535	636	West Germany 373; France 262.
Sodium and potassium compounds, mainly caustic soda	226	299	France 274.
Stone for construction use	35	61	Italy 40; France 19.
Sulfur in all forms:			
Crude	19	25	All from France.
Precipitated	4	4	Do.
Sulfuric acid	70	59	France 37; West Germany 15.
Talc, kilograms	2,659	7,893	All from France.
Nonmetals, not elsewhere specified	1,135	1,699	Mainly from Comoro Islands.
Mineral fuels:			
Coal and briquets	14,524	13,323	Republic of South Africa 9,737; Mozambique 2,489.
Coke and semicoke	43	90	All from France.
Petroleum refinery products:			
Gasoline	61,830	67,814	Iran 41,816; Bahrain 12,093; Pakistan 13,367.
Kerosine	18,459	20,561	Iran 17,930; Bahrain 2,620.
Distillate fuel oil	51,199	51,360	Iran 44,801; Bahrain 4,899.
Residual fuel oil	1,544	1,559	Arabian Peninsula 966; Kenya, Uganda, and Tanzania 141.
Lubricants	6,450	6,474	Kenya, Uganda, and Tanzania 1,277; United States 1,201.

Table 3.—Malagasy Republic: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Mineral fuels—Continued			
Petroleum refinery products—Continued			
Liquefied petroleum gas	1,331	1,734	Arabian Peninsula 982; Kenya, Uganda, and Tanzania 632.
Asphalt, bitumen, and petroleum coke.	5,628	6,630	Republic of South Africa 3,913; Iran 1,438; France 1,107.
Wax and jelly	792	1,483	United States 1,316; Indonesia 123.
Total	147,233	157,615	
Tar, pitch, and other crude chemicals from coal, oil and gas distillation	86	70	All from France.

[1] Scrap, unwrought, and semimanufactures, including alloys, unless otherwise specified.

remer 10 percent, and Compagnie de Mokta 5 percent.[5]

Iron and Steel.—A plant for galvanized and corrugated sheet was completed at Tamatave in December. Production was expected in early 1966 at an annual rate of 12,000 tons. Sheet will be provided for domestic use and also for the Comoro Islands and Réunion.

Monazite.—Société de Traitement des Sables du Sud de Madagascar produced 810 tons of monazite (696 tons in 1964) from beach sands along the coast near Fort Dauphin.[6] The remainder of total monazite output, 275 tons, presumably was produced by Établissements Tricot at Isandravisany, north of Manantenina, although data on this operation were not available.

Uranothorianite.—Concentrate production declined in 1965 because of mining and milling difficulties. Société des Minerais de la Grande Isle (SMGI) had trouble maintaining adequate ore grade at Ikatefa and at Amboasary-Kelly, where work was suspended temporarily. Also, water for the washing plant was in short supply.

NONMETALS

Cement.—The only cement plant in the country, that of Société des Ciments Vicat at Amboania, provided for about one-third of domestic requirements, the remainder being imported. The Amboania plant supplied the northwest region.

A 150,000-ton-per-year plant was planned near Antsirabe in the Hauts-Plateaux of the central part of the country, where the market is about 70,000 tons annually. The new plant was expected to operate initially at partial capacity to supply cement to the interior of the country; it was believed that cement could not be economically shipped to the coast for export.

The proposal for the Antsirabe plant resulted from a Westinghouse Electric Corp. study made in 1963. Foreign participation was expected to furnish 30 to 70 percent of the capital and also provide technical assistance.

Graphite.—Output included 8,874 tons of fine graphite and 8,141 tons of flake graphite. The total represented a recovery from the 1964 slump, which was attributed to decreased deliveries to U.S. stockpiles. Exports in 1965 were 17,900 tons, chiefly to the United Kingdom and the United States.

Mica.—SMGI and Société des Mines d'Ampandrandava, important phlogopite mica producers, merged in 1965.[7] The former produced 250 tons and the latter 159 tons during the year. The main producing areas were Benato, Ampandrandava, and Sakamasy. All producers cooperated, where possible, to reduce costs. Exploration was fairly widespread in mica areas throughout the southern part of the country.

MINERAL FUELS

Petroleum.—In June a government decree announced exploration agreement between Société des Pétroles de Madagascar (SPM) and Société Française des Pétroles Elwerath

[5] Mines et Métallurgie. No. 3607, June 1966, p. 241.

[6] Groupement des Industries Minières et Métallurgiques d'Outremer. Rapport du Bureau. General Assembly June 7, 1966, p. 20.

[7] Metal Bulletin. No. 5133, Sept. 24, 1966, p. 26.

(SOFRAPEL), the French subsidiary of Gewerkschaft Elwerath. SOFRAPEL has a one-half interest in SPM permits totaling nearly 100,000 square kilometers.[8] Permit areas and programs were announced.[9]

A wildcat test hole of a seismic high in the Tuilerie structure, Majunga basin, was terminated at 8,723 feet in July. Gas emulsion and salt water were encountered in Jurassic strata. Seismic work was conducted in the Betsiboka River delta, where drilling was planned in 1966.[10] SPM also investigated bituminous sandstone at Pemolanga.

Construction continued on the country's first petroleum refinery, at Tamatave, where capacity will be 12,000 barrels daily.

[8] World Oil. V. 163, No. 3, Aug. 15, 1966, p. 160.

[9] Industries et Travaux d'Outremer. No. 140, July 1965, p. 626.

[10] World Petroleum Report 1966. V. 12, Mar. 15, 1966, p. 101.

The Mineral Industry of Morocco[1]

By Walter C. Woodmansee [2]

The Moroccan minerals industry had a record year in 1965. According to estimates of the Association des Industries Minières, total value of mineral production (including crude oil) was $180 million,[3] compared with $174 million in 1964. Phosphate rock accounted for about 67 percent of the total. Mineral industry output value was equal to 7.8 percent of the gross national product of $2,300 million (1962 prices) and followed agriculture as second most important contributor to the national product.

Morocco maintained free world ranking as an ore producer of cobalt (second), lead (sixth), manganese (sixth), and phosphate rock (second). The country also was the leading world exporter of phosphate rock.

The new government budget, made public in February, included research and development projects on lead-zinc deposits near Midelt and Moulouya, potash deposits near Khemisset, and fluorspar deposits near Meknes. An economic survey mission, organized by the World Bank and started in 1964, formulated a development program for the 1965–70 period. The mission report was not available at yearend, but was concerned mainly with expansion of phosphate mining and the Safi chemical complex.

In June, following the declaration whereby the King assumed full authority for government operations under the constitutional "state of exception," Mohamed Laghzaoui, then the Director-General of the Office Chérifienne des Phosphates (OCP), was named also Minister of Industry, Mines, and Tourism. In July, however, Mr. Laghzaoui resigned, and his positions were divided among a Minister of Industry and Mines, a Minister of Tourism, and a new Director-General of the OCP. The Bureau de Recherches et de Participations Minières (BRPM) and the Bureau d'Etudes et de Participations Industrielles (BEPI), both government agencies concerned with mineral activities, retained their semi-independent status.

At yearend, 30,929 workers were employed in the minerals industry, differing only slightly from the 1964 total. Distribution of this total by main sectors of the industry was as follows: Phosphate 12,864 lead-zinc 4,820, coal 4,229, manganese 2,839, iron 2,727, crude petroleum 680, copper 525, cobalt 474, antimony 423, barite 396, and pyrite-pyrrhotite 302. The lead smelter at Oued-el-Haimer employed 305 workers.

PRODUCTION

The overall improvement in the minerals industry, as reflected in increased value of total output, took place in spite of a decrease in output of phosphate rock, the most important mineral commodity, comprising more than 60 percent of total value. The main Khouribga phosphate mines showed a higher output, which, however, was more than offset by a loss at the Youssoufia mine, where reserves were further depleted. A major development program, involving two new phosphate mines and a washing-drying center in the Khouribga area, was advanced during the year.

[1] Much information for this chapter was provided by Walter A. Hayden, U.S. Embassy, Rabat, Morocco.

[2] Physical scientist, Division of International Activities.

[3] Where necessary, values have been converted from dirhams (DH) at the rate of DH5.06= US$1.

Table 1.—Morocco: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Antimony concentrate:					
Gross weight	819	866	1,742	3,282	4,516
Metal content	368	407	675	1,559	2,247
Cobalt concentrate:					
Gross weight	12,899	14,364	13,707	15,253	16,654
Metal content	1,290	1,436	1,371	1,678	1,832
Copper concentrate:					
Gross weight	5,623	7,696	6,119	6,504	6,278
Metal content	1,737	2,497	1,806	r 1,748	1,883
Gold—troy ounces	136	------	------	------	------
Iron ore—thousand tons	1,462	1,149	1,035	888	951
Lead:					
Concentrate:					
Gross weight	128,004	131,284	106,073	103,944	113,259
Metal content	88,268	90,104	73,972	r 71,290	77,111
Smelter	24,488	24,143	18,760	18,839	17,232
Manganese ore:					
Metallurgical	456,634	368,758	266,051	266,400	321,429
Chemical	114,450	100,599	68,897	74,678	54,452
Nickel, content of cobalt ore	258	287	274	305	e 300
Silver—thousand troy ounces	908	826	773	604	599
Tin:					
Metal content of ore—long tons	11	r 11	r 9	r 14	15
Smelter—do	10	10	10	10	12
Zinc concentrate:					
Gross weight	67,655	58,354	58,618	80,974	95,015
Metal content	40,779	34,420	33,038	r 42,346	51,218
Metallic oxides, mainly for pigment	1,541	1,237	869	864	910
Nonmetals:					
Barite	82,183	89,793	94,554	89,844	103,880
Cement—thousand tons	630	698	759	927	750
Clays:					
Smectite and bentonite	38,603	32,639	37,367	32,289	51,760
Other, including Fuller's earth	2,298	2,898	2,959	4,305	6,789
Fertilizer materials:					
Phosphate rock (dry)—thousand tons	7,950	8,162	8,548	10,098	9,824
Fluorspar	788	495	6,350	6,570	3,000
Gypsum—thousand tons	e 25	e 25	e 30	e 30	e 30
Pyrite, including cupriferous	14,077	20,745	23,142	21,220	18,318
Pyrrhotite	------	------	------	------	128,014
Salt [2]—thousand tons	21	28	37	61	e 60
Mineral fuels:					
Coal, anthracite—do	r 410	370	404	400	419
Fuel briquets—do	24	23	18	18	18
Natural gas, marketed—million cubic feet	r 339	r 369	r 436	r 443	402
Petroleum:					
Crude—thousand 42-gallon barrels	603	968	1,140	910	782
Refinery products:					
Gasoline—do	592	1,821	2,189	1,442	2,072
Kerosine—do	122	541	602	490	504
Distillate fuel oil—do	435	2,246	2,457	2,187	2,532
Residual fuel oil—do	347	1,511	1,933	2,345	2,438
Other, mainly liquefied petroleum gas thousand 42-gallon barrels	333	233	457	e 712	352
Total—do	[3] 1,907	[3] 6,557	7,638	e 7,176	7,898

e Estimate r Revised.

[1] In addition to commodities listed, Morocco also produced small quantities of copper matte from lead smelting, phosphatic fertilizer, and various quarry products, but production data are not available.

[2] Partial figure.

[3] Includes refinery fuel and losses, which are not listed separately in detail.

The Safi industrial complex, where phosphatic fertilizers and chemicals will be produced on a large scale, went into partial production. A new pyrrhotite mine was opened near the pyrite deposits at Kettara, providing sulfur for use at Safi and substantial byproduct copper in cinder for the export market.

The nonferrous metal mining sector showed improved output; several mines were reopened and renewed exploration was stimulated by favorable world markets for antimony, copper, lead, and zinc. United States companies expressed interest in copper, lead-zinc, barite, and fluorspar mine development. A new iron mine development program was initiated, including a pelletizing plant. Output of metal-

lurgical manganese was increased markedly.

The search for oil continued, both by government agencies and by foreign private participants, but no successes were announced. The limited oil reserves were further depleted, necessitating imports of large quantities of crude oil. A natural gasfield was discovered and was considered a source of industrial fuel.

TRADE

Morocco's trade balance in metals and minerals was favorable during 1964, the latest year for which complete trade data were available, whereas the total trade balance improved but remained in deficit. A marked increase in imports of iron and steel products was the principal reason for the reduced trade balance in mineral commodities. The relationship between mineral commodities and total trade is indicated below:

	Million dollars		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1963	137	384	35.7
1964	166	432	38.4
Imports:			
1963	29	443	6.5
1964	70	460	15.2
Trade balance:			
1963	+108	−59	XX
1964	+96	−28	XX

XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

Phosphate rock remained Morocco's predominant mineral export, as indicated in the following tabulation of principal mineral trade commodities:

Commodity	Value of 1964 export (million dollars)
Exports:	
Phosphate rock	$114
Lead concentrate	13
Manganese ore	10
Iron ore	8
Zinc concentrate	4
Cobalt concentrate	3
All other mineral commodities	14
Imports:	
Iron and steel	28
Petroleum:	
Crude	17
Refinery products	8
All other mineral commodities	17

France continued as Morocco's leading trading partner in mineral commodities as well as in total trade. According to data from the Statistical Office of the United Nations, mineral exports to France totaled $60.5 million in 1964, largely phosphate rock and nonferrous metal ores and concentrates. Other recipients of major shares of Moroccan minerals were West Germany $20.9 million, United Kingdom $16.4 million, and Belgium-Luxembourg $14.4 million. The United States received mineral commodities valued at $4.7 million.

Moroccan imports from France totaled $37.8 million in 1964, largely iron and steel.

Preliminary information for 1965 indicated a slight increase in mineral export value to about $170 million. Table 4 gives exports of the principal mineral commodities during 1965. Corresponding estimated mineral imports were about $65 million during 1965, a slight decrease, due mainly to lower receipts of coal and iron and steel.

Table 2.—Morocco: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum:			
Bauxite	--------	50	All to France.
Metal and alloys, all forms [1]	r 541	275	Italy 200; West Germany 60.
Antimony concentrate	1,349	1,868	Spain 600; Belgium-Luxembourg 405; France 334.
Cobalt concentrate	16,712	14,601	Mainly to France.
Copper:			
Ore and concentrate	6,620	4,579	West Germany 2,950; Poland 1,547.
Matte	--------	328	Mainly to Belgium-Luxembourg.
Metal and alloys, all forms [1]	r 974	1,018	West Germany 676; France 229.
Iron and steel:			
Ore thousand tons	1,079	994	West Germany 425; United Kingdom 209; France 131; Czechoslovakia 107.
Pyrite cinder	19,860	26,151	Portugal 10,076; West Germany 5,258; France 5,183.
Scrap	27,588	31,396	Italy 16,784; Yugoslavia 8,184.
Ferroalloys	52	45	Japan 30; Netherlands 15.
Semimanufactures	r 215	122	Algeria 43; Senegal 30.
Lead:			
Concentrate	137,583	95,785	France 74,368; Italy 8,735.
Unwrought and scrap	14,015	17,096	France 16,742.
Magnesium and alloys, ingot and scrap	r 1,569	5	All to France.
Manganese ore thousand tons	350	334	France 235; United States 40; Norway 10.
Silver and alloys, unworked troy ounces	71,246	NA	All to France.
Zinc:			
Concentrate	66,233	64,369	France 53,932; Poland 4,200; Belgium-Luxembourg 4,056.
Semimanufactures	20	--------	
Ore and concentrate, not elsewhere specified	1,845	15,765	France 10,110; West Germany 3,000.
Metallic slags and residues, not elsewhere specified	4,306	1,171	France 622; Italy 400.
Metallic oxides, mainly for paint	843	869	France 801.
Nonmetals:			
Barite	r 82,110	72,903	United Kingdom 26,654; United States 21,496; West Germany 6,363.
Cement	r 18,562	26,102	Spain 26,003.
Clays and clay products:			
Bentonite	6,353	8,536	France 3,624; Nigeria 986; Netherlands 900; United Kingdom 855.
Fuller's earth	73	37	All to Algeria.
Kaolin and refractory	2,890	3,545	Spain 3,090; France 276.
Smectic	29,329	23,200	France 14,577; Spain 8,623.
Other	2,752	3,183	Tunisia 2,053; Algeria 1,106.
Construction materials	3,494	5,004	Cuba 1,184; Lebanon 770; Tunisia 653; Spain 596.
Fertilizer materials:			
Crude:			
Guano	150	56	All to France.
Phosphate rock thousand tons	8,527	10,086	France 1,686; Belgium-Luxembourg 990; United Kingdom 837; Spain 803; mainland China 797; West Germany 739.
Manufactured, phosphatic	6,200	32,878	West Germany 20,210; Bulgaria 9,668.
Fluorspar	1,523	9,048	West Germany 5,741; Belgium-Luxembourg 3,081.
Gypsum and anhydrite	r 18,747	24,576	Portugal 13,450; Japan 9,000.
Lime	r 572	346	Spain 326; Senegal 20.
Pyrite, crude	6,044	3,703	Belgium-Luxembourg 2,065; Sweden 1,464.
Salt and saline solutions	10	312	Cuba 300.
Stone, sand and gravel:			
Sand, mainly industrial	12,961	10,322	Spain 8,179: Algeria 2,143.
Stone, crushed and broken	326	454	Spain 216; Senegal 151.
Stone, dimension and other	r 16,348	14,232	Spain 8,016; Italy 3,748.
Minerals and chemicals, not elsewhere specified	15	1	All to Italy.
Mineral fuels:			
Coal, anthracite and briquets thousand tons	r 176	138	France 66; Italy 19; Netherlands 14.
Petroleum refinery products: [2]			
Gasoline thousand 42-gallon barrels	1	7	France 3; United States 2.
Kerosine do	17	112	France 61; United States 19; U.S.S.R. 16.
Total do	18	119	

r Revised. NA Not available.

[1] Includes scrap, ingots, and semimanufactures.

[2] Excludes exports and reexports of fuel oils from Ceuta and Melila (Spanish enclaves), mainly from bunkers.

Table 3.—Morocco: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Bauxite	2,553	921	All from France.
Metal and alloys, all forms [1]	r 1,798	1,931	France 1,703.
Antimony, unwrought	20	10	France 6; United Kingdom 4.
Copper and alloys, all forms [1]	r 3,085	2,615	France 1,841.
Gold, all forms, including plate [1]	244 thousand troy ounces	NA	
Iron and steel:			
Scrap	r 355	89	France 45; United States 42.
Pig iron and ferroalloys [2]	1,721	1,343	West Germany 822; France 480.
Blooms and slabs	1,047	966	France 952.
Bars and rods	59,389	74,928	France 37,013; West Germany 18,651.
Angles, shapes, and sections	17,299	22,723	France 17,007; West Germany 4,742.
Sheet and strip	48,331	59,948	France 52,860.
Tubes, pipes, and fittings	10,998	11,049	France 9,753.
Wire	8,604	8,143	France 5,249; Czechoslovakia 2,227.
Rails and accessories	3,215	6,752	France 6,539.
Other	133	75	France 43; West Germany 22.
Total	r 151,092	186,016	
Lead and alloys, all forms [1]	r 97	79	France 60.
Manganese ore	161	110	Ghana 75; West Germany 35.
Mercury 76-pound flasks	105	8	France 4; Spain 4.
Molybdenum, unwrought	50	------	
Nickel and alloys, all forms [1]	r 391	295	Italy 169; Canada 43.
Silver and alloys, all forms [1] troy ounces	1,511	2,411	All from France.
Tin long tons	r 299	253	Malaya 234.
Zinc	854	703	Belgium-Luxembourg 308; France 191.
Nonferrous ores, not elswhere specified thousand tons	310	245	All from Algeria.[3]
Metallic slags and residues, pyrite cinder.	819	25,000	Do.
Metallic oxides, mainly for paint	2,019	1,353	France 772; West Germany 277.
Nonmetals:			
Abrasives, natural	r 22	30	France 23.
Asbestos	2,353	1,995	Canada 653; France 259.
Barite	12	15	West Germany 14.
Borate, natural	354	287	All from France.
Cement	4,354	5,157	France 4, 859.
Chalk	3,461	3,157	France 2,897.
Clays and clay products:			
Bentonite	12	20	All from France.
Fuller's earth	8	12	France 11.
Kaolin and refractory	9,632	9,688	Guiana 4,895; France 2,017; United Kingdom 1,515.
Smectic	3,075	4,838	Mainly from Algeria.
Other	r 609	501	All from France.
Construction materials	3,920	e 5,100	NA.
Diatomite	742	763	Algeria 256; Belgium-Luxembourg 249; United Kingdom 140.
Dolomite and magnesite	706	410	France 350; Austria 54.
Fertilizer materials:			
Crude, all types	1,923	1,371	France 1,360.
Manufactured:			
Nitrogenous	42,271	48,259	France 27,291; West Germany 14,049; Italy 4,587.
Phosphatic, including Thomas slag.	1,741	419	Portugal 168; France 150.
Potassic	r 13,477	11,628	Spain 4,876; France 1,864; East Germany 1,299.
Mixed	21,607	16,988	France 12,282; West Germany 3,386.
Ammonia	160	162	France 82; West Germany 80.
Graphite	21	15	All from France.
Lime	1,031	549	Do.
Salt	r 1,952	5,475	Algeria 3,572; Spain 1,554.
Stone, sand and gravel:			
Sand, industrial	9,804	7,989	Belgium-Luxembourg 6,666; Netherlands 1,000.
Stone, crushed and broken	53	140	Italy 128.
Stone, dimension	504	e 1,500	Mainly from Italy.
Sulfur in all forms:			
Crude and refined	r 7,041	9,331	France 7,858; Spain 905.
Sulfuric acid	1,042	360	Spain 350.
Talc	1,895	1,473	France 1,046; Spain 198.
Minerals, not elsewhere specified	1,010	239	France 127; West Germany 40.

See footnotes at end of table.

Table 3.—Morocco: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principle sources, 1964
Nonmetals—Continued			
Chemical, inorganic:			
Potash, caustic	49	37	Mainly from France.
Soda, caustic	5,376	4,654	France 4,653.
Other	52	220	France 167; Spain 36.
Mineral fuels:			
Coal, coke, and briquets. thousand tons	103	121	Poland 105; West Germany 9.
Petroleum:			
Crude			
thousand 42-gallon barrels	3,346	8,385	Algeria 3,419; U.S.S.R. 2,631; Libya 1,302.
Refinery products: [4]			
Gasoline ---do---	92	46	Netherlands Antilles 34; Netherlands 11.
Kerosine ---do---	136	176	Netherlands Antilles 67; France 60; Italy 30.
Distillate fuel oil ---do---	52	70	United Kingdom 18; Venezuela 17; Aden 11; Kuwait 10.
Residual fuel oil ---do---	66	33	Venezuela 23; Aden 4.
Lubricants ---do---	125	95	France 82.
Liquefied petroleum gas. ---do---	2	36	France 28.
Asphalt and bitumen ---do---	236	260	France 132; Netherlands Antilles 78.
Paraffin, waxes and unspecified. ---do---	44	73	France 53; Netherlands Antilles 8; United States 8.
Total ---do---	753	789	
Tar, pitch, and other crude chemicals from coal, oil and gas distillation.	1,495	4,207	Guiana 2,235; Italy 1,033.
Carbon black	795	1,235	France 1,028.

e Estimate. r Revised. NA Not available.
[1] Includes scrap, ingots, and semimanufactures.
[2] Includes iron powder and grains.
[3] Mined near Moroccan border and processed in Morocco.
[4] Excludes receipts of fuel oils at Ceuta and Melila (Spanish enclaves), mainly for bunkers.

Table 4.—Morocco: Exports and domestic sales of principal metals and minerals, 1965
(Metric tons unless otherwise specified)

Commodity	Exports	Domestic Sales	Principal foreign destinations
Metals: [1]			
Antimony	3,558	--------	Belgium-Luxembourg 1,528; Spain 700.
Cobalt	14,067	--------	France 11,035.
Copper	5,586	--------	Poland 1,827; West Germany 1,328.
Iron and steel:			
Ore----thousand tons	977	5	West Germany 354; United Kingdom 212; Spain 180.
Pyrite cinder	13,807	--------	Spain 4,953; Portugal 4,215.
Lead:			
Concentrate	89,204	21,524	France 68,515; Italy 5,200.
Smelter	16,662	1,001	France 15,378.
Manganese, ore:			
Chemical----thousand tons	68	--------	United States 30; France 18; West Germany 11.
Metallurgical----do	173	--------	France 152.
Sinter----do	106	--------	France 91; Poland 9.
Silver, smelter-thousand troy ounces	529	70	All to Spain.
Zinc	95,090	--------	France 60,215; United States 18,540.
Nonmetals:			
Barite----thousand tons	104	3	United States 44; United Kingdom 19.
Clays:			
Bentonite	8,105	461	Nigeria 5,250.
Smectic	25,628	15,603	France 15,162; Spain 7,499.
Fertilizer materials: Phosphate rock:			
From Khouribga-thousand tons	7,171	70	France 1,398; United Kingdom 878; mainland China 599; West Germany 577; Spain 551; Netherlands 530.
From Youssoufia----do	2,310	165	Belgium-Luxembourg 595; France 422; Spain 357; Poland 293.
Pyrite	2,369	17,297	All to Belgium-Luxembourg.
Salt	--------	31,180	
Mineral fuels:			
Anthracite----thousand tons	101	233	France 30; Algeria 26; Italy 19.

[1] Concentrate unless otherwise specified.

Source: Ministère du Commerce et de l'Artisanat. Note de Decumentation. Nos. 328–329, April–May 1966.

COMMODITY REVIEW

METALS

Antimony. — Mine output showed a marked increase as several mines were reopened. Omnium de Gerance Industrielle et Minière (OGIM) was the largest producer from several small mines near Djemaa deM'Rirt, northeast of Oued Zem. Although operations expanded during the year, employment in 1964 decreased from 462 to 423 at yearend.

Cobalt.—Compagnie de Tifnout Tiranimine absorbed Société Minière de Bou Azzer et du Graara (SMAG) and assumed control of the new mine at Aghbar, 10 kilometers east of the exhausted Bou Azzer mine. Exploration continued at Aghbar; reserves in the area assured only 3 years' production at an extraction rate of 400,000 tons of ore at 1.5 percent cobalt.[4]

Copper.—Société des Mines de Bou Skour produced 55,000 tons of sulfide and oxide ores, averaging about 3 percent copper, and 3,500 tons of concentrate containing 36 to 37 percent copper, at its Bou Skour mine. Ore reserves at Bou Skour totaled 300,000 tons in early 1965. The balance of Moroccan mine copper output was largely from Djebel Klakh, Azegour, and other small properties in the High-Atlas, south of Marrakech. In addition, substantial quantities of copper were contained in pyrite and pyrrhotite mined at Kettara, where the ore contains 0.6 to 0.8 percent byproduct copper. Because of prevailing high market prices for copper, prospects for new mine development and reopening of old mines were good.

The Moroccan Government has expressed the hope that mine production of copper will increase to a point at which it would be economically feasible to construct a smelter. According to the press, a Yugoslav group agreed to exploit copper deposits in the Anti-Atlas in cooperation with the BRPM and also to assist in con-

[4] Mines et Métallurgie No. 7, July–August 1965, p. 337.

struction of a smelter if such a project should become feasible.

On May 26, 1965, a small washing plant to produce copper concentrate was formally dedicated at Irhem, 150 kilometers southeast of Agadir, where two small copper deposits were under development and where copper prospects were considered good. Copper ore at 2 to 2.5 percent copper was concentrated to 30 to 35 percent copper at a rate of 5 tons of concentrate per day, according to officials of the Direction des Mines. This project was a joint effort of the BRPM and a Czech firm, resulting from a 1961 agreement. The Czechs provided mining equipment and the washing plant at a cost of $4 million, which is to be repaid by supply of the mineral product. The Moroccan Government furnished capital for exploration and development.[5]

Iron and Steel.—The Uixan and Sétolazar iron mines of Société des Mines du Rif (formerly Compagnie Espagnole des Mines du Rif), near Nador on the Mediterranean coast, accounted for the bulk of 1965 iron ore output. The company initiated a new development program, with European assistance, to lower costs and produce a better quality product. Plans called for a new 350-meter central shaft, an annual mining rate of 1.2 million tons, and a 800,000-ton pelletizing plant. Although production was greater in 1965 than that of 1964, ore sales dropped off.

Renewed interest was shown in the long-considered Nador integrated steel mill, using Rif iron raw materials, but at yearend no specific program had been announced.

Lead and Zinc.—There were no major changes in this sector during 1965. Exploration for new deposits and investigations of old lead-zinc workings continued, although no new mines were developed during the year. The BRPM conducted surveys in the High Moulouya, where a development company was planned, and in Bou Madine and the Jebilet.

In 1964, the latest year for which data are available, the principal lead concentrate producers were Bou Beker 19,495 tons, Mibladen 17,624 tons, Aouli 16,980 tons, Touissit 14,500 tons, and Djebel Aouam 12,380 tons. These mines accounted for 78 percent of total output of lead concentrate. About 80 percent of zinc concentrate output originated at two mines—Bou Beker, 37,900 tons, and Touissit, 27,450 tons. Lead output at Djebel Aouam, operated by Compagnie Royale Asturienne des Mines, S.A., reportedly increased 30 percent in 1965. Exploration by Société Minière et Métallurgique de Penarroya at Aouli discovered new ore in certain veins.

The Oued el Haimer lead smelter of Fonderies Penarroya-Zellidja produced 18,839 tons of pig lead from 24,960 tons of concentrate, largely from Bou Beker but including about 2,600 tons from Algeria. The Moroccan Government announced plans for a second lead smelter, at Kenitra, for treating Tafilalet ores.

Manganese.—The Imini mine of Société Anonyme Chérifienne d'Etudes Minières (SACEM), an affiliate of the French Compagnie de Mokta, maintained its position as leading mine manganese producer. Although complete data are not available, Imini apparently produced about 140,000 tons of metallurgical-grade manganese in 1965, well below the mine capacity of 250,000 tons. Output at Imini and at other manganese mines was curtailed by marketing difficulties. Two Birtley tables, ordered in 1964, were installed at Imini for treating fines from stockpile and rejects from the main treatment plant at a rate of 32,000 tons per year.

Output of metallurgical-grade ore, by mine, was as follows during 1964: Imini 134,700 tons, Bou Arfa 81,200 tons, and Tiharatine 11,300 tons; remaining output was derived from retreatment of dumps at Tiouine (about 26,000 tons) and several small mines of the miners' cooperative at Ouarzazate (about 13,000 tons).

In 1965, 106,750 tons of Imini metallurgical manganese ore was agglomerated to 84,800 tons sinter at Sidi Maarouf, compared with 81,000 tons ore sintered to 64,700 tons in 1964.

As of January 1965, stocks were as follows: Metallurgical 48,048 tons and chemical 38,671 tons.[6]

NONMETALS

Phosphate. — Production of phosphate rock at Khouribga, the principal mining area, was greater in 1965, but the mining rate declined at Youssoufia, the other pro-

[5] U.S. Embassy, Rabat, Morocco. State Department Airgram A–433, June 8, 1965, 2 pp.
[6] U.S. Embassy, Rabat, Morocco. State Department Airgram A–372, May 7, 1965, 1 p.

ducing center which is gradually being phased out, resulting in an overall lower output, as shown in the following tabulation:

Year	Thousand tons					
	Khouribga [1]		Youssoufia		Total	
	Wet	Dry	Wet	Dry	Wet	Dry
1964	6,763	7,203	3,050	2,895	9,813	10,098
1965	7,405	7,351	2,767	2,473	10,172	9,824

[1] The 1964 output of dry phosphate rock was reported higher than that in the wet state; this is attributed to a drawing from wet mine stockpiles for the drying plant.

Development continued on three projects in the Khouribga area—the open pit and underground mines at Meraa el Arech, 20 kilometers east of Khouribga; the open pit at Sidi Daoui Sud, 25 kilometers east of Khouribga; and the washing and drying plants at Beni Idir. Construction was underway on a conveyor belt system connecting the mines to processing plants. Meraa el Arech was expected to enter production in early 1966 at an annual rate of 2 million tons. Construction of service buildings and storage facilities were completed at this mine. The first section of the drying plant at Beni Idir, with four ovens, each having capacity of 1 million tons per year, was readied for operation at yearend, and six additional ovens were planned. Completion of the washing plant was planned for 1967. Production from the Sidi Daoui Sud open pit also was expected in 1967. Reserves, as reported by OCP, were 100 million tons at 72–75 percent bone phosphate of lime (BPL) at Meraa el Arech and 245 million tons at 58–75 percent BPL at Sidi Daoui Sud.[7]

In November the Export-Import Bank authorized a credit of $24 million to OCP for the purchase of U.S. mining equipment to be used in the $56.6 million phosphate mining expansion. OCP planned a production of 17 million tons of phosphate rock by 1970–71. The order included a 60-cubic-yard dragline, a 9-cubic-yard dragline, earthmoving equipment, drill rigs and equipment, conveyor belts, and heavy-duty trucks for use at Meraa el Arech and Sidi Daoui Sud.[8]

The chemical complex at Safi, on the Atlantic coast 60 kilometers west of the Youssoufia phosphate mining area, was officially inaugurated by King Hassan II in June. Technical difficulties were encountered during early operations. Annual production capacity was 200,000 tons triple superphosphate, 150,000 tons diammonium phosphate, and 14,000 tons phosphoric acid. In addition to local phosphate rock, raw materials included pyrite and pyrrhotite form Kettara. An agreement was made between OCP and the Algerian Ministry of Economics for temporary supply of ammonia from Arzew, Algeria, until an ammonia plant is built at Safi.

Early in the year, OCP, the Government agency controlling the mining and marketing of phosphate, sought United States and other foreign participation in financing and management of Société Maroc-Chemie, a subsidiary of OCP responsible for the Safi chemical plant. OCP had planned an initial investment of $40 million at Safi. West Germany provided $9.8 million for roads, services, and water canalization.[9]

The long-planned project for participation of Occidental Petroleum Corp. in the Safi project remained in the discussion stage. An accord in principle was signed by OCP and Occidental whereby a joint company was considered with capitalization of $100 million, part of which was for Safi construction.[10] At yearend, negotiations continued for a $37.5 million superphosphoric acid plant, rated at 1,000 tons per day and expandable to 5,000 tons daily by 1970, and an ammonium phosphate plant (capacity unreported).

With demand for crude phosphate increasing, domestic consumption reached 240,000 tons in 1965. The Safi works ab-

[7] Mining Journal. V. 265, No. 6794, Nov. 5, 1965, p. 319.
[8] U.S. Embassy, Rabat, Morocco. State Department Airgram A–215, Nov. 29, 1965, pp. 1–2.
[9] The Economist. V. 215, No. 6356, June 19-25, 1965, p. 1433.
[10] Mining Journal. V. 264, No. 6766, Apr. 23, 1965, p. 317.

sorbed about 50,000 tons. Consumption of phosphate rock was expected to attain a yearly rate of 500,000 tons with expanded production.

In conjunction with Tunisia and Jordan, OCP authorities formed Office des Producteurs de Phosphates to coordinate phosphate sales, following conferences at Amman, Jordan, and Rabat, Morocco. OCP attempted to conclude long-term agreements for phosphate sales. In June a contract was made with Compagnie Royale Asturienne des Mines for 500,000 tons of phosphate rock over a 5-year period. Marketing of superphosphate from Safi was difficult. In July the first sale, 10,000 tons, was made to South Korea, which in October ordered 50,000 tons valued at $3 million.

Potash.—BRPM and Mines Domaniales de Potasse d'Alsace, the French potash firm, jointly conducted geophysical exploration and deep drilling in the Khemisset basin, 70 kilometers southeast of Rabat. Results of exploration were not announced. Discoveries of potash also were reported in the Doukkola and Zemmour basins.

Pyrite and Pyrrhotite.—Production of pyrite, containing 30 percent sulfur and up to 6 percent copper, continued at a slightly reduced scale at Kettara, 30 kilometers northwest of Marrakech. Société d'Exploitation des Pyrrhotines de Kettara was formed in January to mine extensive pyrrhotite deposits nearby. The first years' production, 128,014 tons, largely went to Safi for use in sulfuric acid.

MINERAL FUELS

Coal.—Anthracite production at Djerada continued at a planned rate of about 400,000 tons per year, which, however, exceeded domestic demand and exports. The mining rate was maintained for mine efficiency and employment purposes. Stocks of anthracite totaled 325,000 tons at the start of the year.

Solid fuel requirements continued to decline. Consumption was 339,600 tons in 1964 and 314,000 tons in 1965, mainly for electric power (97,900 tons in 1965) and cement (53,600 tons in 1965).[11] Difficulty was encountered in marketing anthracite.

Bituminous coal was received from Poland in 1965 pursuant to a new trade agreement signed on February 15, 1965, providing for a quota of 70,000 tons during the year.

Natural Gas. — Early in the year, the Moroccan Government authorized increased imports of butane as an emergency measure because of a growing shortage; the consumption rate for butane had increased 16 percent, whereas output was falling.[12]

Discovery of an important natural gas deposit at Kechoula, near Essaouira, was announced late in the year. Proved reserves were reported at 16 to 18 billion cubic feet. SCP and Office Chérifienne des Phosphates (OCP) considered the feasibility of a 200-kilometer pipeline to deliver this gas as fuel for the Youssoufia phosphate works.[13]

In 1965, the Haricha gasfield produced about 350 million cubic feet, of which about 35 million cubic feet was used by the Sidi Kacem refinery as fuel.

Petroleum. — Production of crude oil from the two active fields—Rharb and Sidi Rhalem—remained at a rate of about 2,000 barrels per day, only about 10 percent of requirements. Imports of crude oil more than doubled in 1964 to supply the two refineries. Production from the Rharb field declined in both 1964 and 1965 as reserves were being depleted. Recoverable reserves of both fields were reported at 1,687,000 tons.[14]

Only 23,772 feet were drilled by two active drill rigs, compared with 45,600 feet in 1964 and 94,800 feet in 1962. A review of exploration activity for the year follows:

[11] Bulletin Economique et Social du Maroc. V. 28, No. 100, Jan.–March 1966.
[12] Petroleum Times. V. 69, No. 1765, Apr. 2, 1965, p. 171.
[13] Petroleum Times. V. 69, No. 1783, Dec. 10, 1965, p. 667.
[14] Mines et Métallurgie. No. 3601, December 1965, p. 542.

Company	Party months			
	Surface geology	Land seismic	Marine seismic	Geochemistry
Société Chérifienne des Pétroles (SCP)	6	1	1	
Azienda Generale Italiana Petroli (AGIP)		7		
Canadian Delhi Oil, Ltd. (CANDEL)	5	2		
Preussische Bergwerks und Hütten A. G. (PREUSSAG)	3	8		2
Petrofina, S. A				4
Total	14	18	1	6

Source: Bulletin of the American Association of Petroleum Geologists. V. 50, No. 8, August 1966, p. 1700.

Three wells were completed and one minor oil showing was reported—that of Deutsche Schactbau—und Tiefbor G.m.b.H. in the region of Berguent.[15] A number of companies abandoned exploratory work, at least on certain permits. The Doukkala and Essaouira D permits were reduced in size in accordance with the Petroleum Law. A new exploration agreement between Bureau de Recherches et Participations Minières (BRPM) and Petrofina, S.A., the Belgian firm, was for the Sebou (2,800 square kilometers) and Sebou B (5,000 square kilometers) areas on the Rharb plain. At yearend, SCP, a petroleum company shared between BRPM and the French State company Bureau de Recherches des Pétroles (BRP), held eight permit areas totaling 15,565 kilometers.

Geologic investigations were conducted by SCP in two permit areas (Essaouira and Moulouya). Seismic work (weight-dropping method) was conducted on the Moulouya permit. SCP also had seismic crews on another permit area for 1 month and the Essaouira offshore permit (gas exploder method) for 1 month.

Other foreign interests continued exploration in conjunction with BRPM. PREUSSAG worked the Paleozoic sediments of the Doukkala permit, including geologic studies and seismic work, and also made a 2-month geochemical study in the Safi area. Société Anonyme Marocaine-Italienne des Pétroles (SOMIP), subsidiary of AGIP Mineraria, relinquished its permit near Colomb-Béchar after unsuccessful drilling and moved into the Haut Plateaux, south of Oujda, where 7 months of seismic work (weight-dropping method) was completed on the Tendrara anticline. Drilling was planned for 1966. Petrofina conducted geologic, geophysical, and geochemical work on the Sebou permits. Two wells were drilled—one was dry and abandoned, and the other, at Souk-el-Arba, was suspended at 3,750 feet awaiting arrival of another drill rig. CANDEL, operator on the Ksar-es-Souk permits, carried out geologic and seismic work, and planned drilling in 1966.[16]

Crude oil throughput at the Société Marocaine Italienne de Raffinage (SAMIR) refinery at Mohammedia was 699,000 tons in 1964; throughput at SCP's Sidi Kacem refinery was 375,000 tons. The total country crude oil throughput rate was 20,000 to 28,000 barrels per day.

[15] World Petroleum Report. V. 11, Mar. 15, 1965, p. 122.

[16] Bulletin of the American Association of Petroleum Geologists. V. 50, No. 8, August 1966, pp. 1700–1701.

The Mineral Industry of Nigeria

By Walter C. Woodmansee [1]

Nigeria became more prominent as a world producer and exporter of petroleum in 1965. Oil exploration continued at a high level, particularly offshore, where a record success ratio of about 85 percent was attained. Crude oil became the country's leading export, surpassing agricultural products which traditionally has been the chief source of foreign exchange. Fourteen petroleum companies, including 9 U.S. firms, were engaged in petroleum exploration and development, and more than 40 U.S. companies were engaged in all phases of the industry.

Basic conditions for foreign investment remained good. No difficulties were encountered in repatriation of profits. Tax relief was planned for new mining ventures. Capital allowances on machinery and buildings continued to be generous. There were no problems in labor supply.[2]

The Geological Survey Division, Ministry of Mines and Power, announced plans for increased mineral exploration including aeromagnetic surveys, geologic mapping, and mineral investigations under the National Development Plan for 1962–68. Technical assistance was provided by Canada, United Kingdom, and Italy, with efforts concentrated in the Western Region and in tin-mining areas of the Plateau Province, Northern Region.

According to the Federal Office of Statistics, 50,717 laborers were employed in the metallic minerals sector in early 1965, nearly all in connection with tin mining and smelting. The petroleum industry employed 3,135 persons in exploration, including 2,668 Nigerians, and more than 10,000 persons were probably engaged throughout the industry, including service and supply.[3] The Nigerian Coal Corp. employed 3,157 persons, including 2,412 underground miners, at the Enugu Colliery.

PRODUCTION

Nigeria's output of crude oil showed the world's fastest rate of expansion in 1965 and reached 300,000 barrels per day late in the year. New oil wells became productive at a steady rate throughout the year. Increased crude oil production resulted in a corresponding growth in associated and nonassociated natural gas output, which was largely flared. Sales of natural gas increased moderately as new industrial demand for natural gas fuel was developed. Late in the year, Nigeria's first domestic refined petroleum products were delivered to local consumers from the new petroleum refinery near Port Harcourt.

In the metals sector, mine production of cassiterite was the highest for several years, and output of tin ingot also showed a gain. The cement industry showed continued growth.

---

[1] Physical scientist, Division of International Activities.

[2] The Economist. V. 118, No. 6385, Jan. 8–14, 1966, p. 126.

[3] U.S. Embassy, Lagos, Nigeria. State Department Airgram A–10, July 7, 1966, 2 pp.

Table 1.—Nigeria: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Columbite, concentrate	2,385	2,298	2,044	r 2,377	2,589
Gold ---troy ounces	676	384	316	244	80
Monazite, concentrate	8	9	11	r 12	8
Tantalite, concentrate ---kilograms	11,898	17,242	15,240	r 10,160	13,168
Tin:					
Cassiterite, concentrate:					
Gross weight ---long tons	10,511	11,096	11,788	11,787	12,885
Tin content ---do	7,779	8,210	8,723	8,721	9,547
Metal, unwrought ---do	623	8,024	9,051	8,748	9,339
Zircon, concentrate	756	[2] 494	804	[2] 564	NA
Nonmetals:					
Cement ---thousand tons	364	483	527	660	983
Clays:					
Kaolin ---do	---	5	15	e 20	25
Other (for drilling muds) ---do	5	e 4	e 2	NA	NA
Limestone ---do	599	725	770	996	1,312
Marble	---	---	---	---	1,137
Mineral fuels:					
Coal ---thousand tons	607	634	596	699	740
Gas, natural:					
Gross ---million cubic feet	r 10,943	r 17,179	22,106	36,333	79,438
Marketed ---do	---	---	NA	2,800	3,395
Petroleum:					
Crude ---thousand 42-gallon barrels	16,802	24,624	27,644	43,997	99,354
Refinery products:					
Gasoline ---do	---	---	---	---	284
Kerosine ---do	---	---	---	---	187
Distillate fuel oil ---do	---	---	---	---	341
Residual fuel oil ---do	---	---	---	---	467
Total ---do	---	---	---	---	1,279

e Estimate. r Revised. NA Not available.

[1] In addition to commodities listed, lead and zinc concentrates and a few tons of tungsten and molybdenum ores are produced, but exact output data are not available.

[2] U.S. imports.

TRADE

The trade balance in mineral commodities was favorable in 1965, primarily because of increased crude oil exports, whereas the total trade balance improved but remained in deficit, as shown in the following table:

	Million dollars		Mineral commodities share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1963	87	518	16.8
1964	118	576	20.5
1965	230	728	31.6
Imports:			
1963	100	574	17.4
1964	136	711	19.1
1965	134	772	17.4
Net trade balance:			
1963	—13	—56	XX
1964	—18	—135	XX
1965	+96	—44	XX

XX Not applicable.

[1] Values given are for only those commodities listed in table 2 and 3 of this chapter.

Source: Statistical Office of the United Nations.

Crude oil became Nigeria's leading export for the first time. Exports of crude oil were valued at $181.6 million, compared with $76.8 million in 1964.[4] Exports of tin, which followed crude oil in mineral export value, were $41.7 million compared with $35.0 million in 1964. The United Kingdom received mineral commodities valued at $131.8 million from Nigeria in 1965, or 57.3 percent of Nigeria's mineral exports. Minerals sent to the United States were valued at $21.7 million.

Principal mineral imports were iron and steel $53.6 million ($53.0 million in 1964) and petroleum products $48.4 million ($54.1 million in 1964).[5]

Shell-BP Petroleum Development Co. of Nigeria Ltd. exported 87.7 million barrels of crude oil and sold 1.5 million barrels to local markets, according to company re-

[4] Where necessary, values have been converted from Nigerian pounds to U.S. dollars at the rate of £1 = $2.80.

[5] Statistical Office of the United Nations.

Table 2.—Nigeria: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Aluminum:				
Bauxite	---	---	49	
Metal, all forms	---	11	---	All to Netherlands.
Copper, concentrate and matte	83	61	49	All to Belgium-Luxembourg.
Iron and steel:				
Scrap	5,316	10,928	6,208	Japan 5,253; Netherlands 2,764.
Semimanufactures	4,572	41	NA	All to Ghana.
Lead, concentrate	198	953	1,600	Argentina 340; Belgium-Luxembourg 321.
Tin:				
Ore and concentrate--long tons	160	25	9	All to United Kingdom.
Unwrought ----------do----	9,673	10,557	10,575	United Kingdom 3,674; United States 1,026.
Zinc, concentrate	---	---	1,905	
Other nonferrous ores and concentrates [1]	r 3,522	3,487	3,675	United States 1,162; United Kingdom 1,065.
Scrap, nonferrous	2,346	3,078	2,858	West Germany 729; Italy 720; Netherlands 405.
Nonmetals:				
Cement	416	1,872	---	Niger 1,439.
Construction materials:				
Stone, dimension	---	201	NA	Italy 198.
Other	---	77	NA	All to Liberia.
Fertilizer materials:				
Natural	782	383	263	Ghana 221; United Kingdom 37.
Processed	152	264	---	All to Cameroon.
Salt	85	---	NA	
Other crude minerals	47	4	286	NA.
Mineral fuels:				
Coal	8,160	8,021	---	Ghana 7,711.
Briquets	26,544	38,125	NA	All to Ghana.
Coke and semicoke	8,255	14,529	15,277	Do.
Petroleum,[2] crude -----thousand 42-gallon barrels	27,998	43,432	97,008	United Kingdom e 23,900; West Germany e 11,300; Ghanna e 3,900.

e Estimate. r Revised. NA Not available.
[1] Includes columbium-tantalum and zirconium ores.
[2] In addition, estimated reexports and bunker loadings of refined products were 1.5 million barrels annnually during 1963–64 and 1.1 million barrels in 1965.

Principal source: Statistical Office of the United Nations.

ports. Nigerian Gulf Oil Co. Ltd. joined Shell-BP as an oil exporter and sent 9.3 million barrels to foreign markets. Petrobrás, Brazilian state oil agency, concluded a contract with Nigerian Gulf for 460,000 barrels of crude oil in 1965, valued at $830,000, shipped in Brazilian tankers. Nigerian Gulf began oil exports to the United States in May.

An export tariff of $8.40 per ton of metal scrap was introduced to conserve the domestic supply. In April, import tariffs were reduced on cement, wire rods, galvanized wire, and anthracite. Duty on cement imported by approved manufacturers, formerly $14 per ton or 75 percent ad valorem, became 33⅓ percent ad valorem. Import duty on clinker was reduced from $2.80 per ton to $1.40 per ton. Wire rods and galvanized wire import duties were lowered from 33⅓ percent to 20 percent ad valorem for certain manufacturers. A former 33⅓ percent ad valorem tax on anthracite for tin smelting was rescinded.[6]

COMMODITY REVIEW

METALS

Aluminum.—Nigeria's first aluminum rolling mill was planned at Port Harcourt, and the third plant for aluminum corrugated roofing sheet was planned at Lagos.

Iron and Steel.—In August, an agreement was signed between the Nigerian Government and a western consortium for the development of an $84-million iron and steel industry, the first fully integrated facility

[6] U.S. Embassy, Lagos, Nigeria. State Department Airgram A-807, June 24, 1965. 3 pp.

Table 3.—Nigeria: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum and alloys:				
Unwrought	2,710	2,734	821	Canada 2,332.
Semimanufactures	3,281	3,692	1,620	United Kingdom 1,253; Japan 717; Austria 384.
Copper and alloys, ingots and semimanufactures	2,250	1,893	NA	United Kingdom 1,033; Japan 440.
Iron and steel:				
Ore and concentrate	44	81	9	Niger 52.
Pig iron and ferroalloys	180	771	1,139	United Kingdom 537; France 127.
Ingots and other primary forms	1,179	1,716	1,077	United Kingdom 994; Japan 318.
Semimanufactures:				
Bars and rods	41,897	75,830	60,056	West Germany 21,437; Belgium-Luxembourg 18,176; United Kingdom 16,447.
Angles, shapes, and sections	8,707	20,376	27,439	United Kingdom 11,598; Belgium-Luxembourg 4,511.
Plates, sheets, hoop, and strip	57,999	75,540	60,971	Japan 41,355; United Kingdom 19,643.
Rails and accessories	10,486	24,331	4,807	United Kingdom 23,482.
Tubes, pipes, and fittings	44,666	89,599	107,702	United States 27,944; United Kingdom 20,675; West Germany 9,973.
Other	r 5,680	4,438	2,224	United Kingdom 2,581; France 1,611.
Total	169,435	290,114	263,199	
Lead and alloys, ingots and semimanufactures	420	1,141	527	Poland 748; United Kingdom 202.
Nickel and alloys, semimanufactures	---	---	417	
Platinum-group metals, unworked troy ounces	7,073	2,379	9,967	United Kingdom 1,543; Italy 836.
Silver, unworked ---------do----	19,355	22,280	20,705	United Kingdom 14,789; West Germany 7,620.
Tin and alloys, ingots and semimanufactures ------long tons--	r 69	237	142	West Germany 116; United Kingdom 70.
Zinc and alloys; ingots and semimanufactures	38	965	1,979	Belgium-Luxembourg 558; Netherlands 203.
Metals not elsewhere specified:				
Ores and concentrates:				
Platinum and/or silver ores	---	3,048	---	All from United Kingdom.
Other	140	37	120	All from Niger.
Oxides, mainly for paint	119	170	169	West Germany 81; United Kingdom 81.
Scrap, nonferrous	10	3	1,283	All from United Kingdom.
Ingots and semimanufactures	49	---	29	
Nonmetals:				
Abrasives, natural	1	186	121	France 183.
Asbestos, crude and partly worked	r 908	1,669	3,804	Southern Rhodesia 846; Canada 371; Switzerland 232.
Cement ---------thousand tons--	305	181	174	Poland 59; Norway 23; Yugoslavia 16.
Clay construction materials_do---	7	7	7	United Kingdom 4.
Fertilizer materials:				
Crude, all types	819	796	1,216	Netherlands 271; West Germany 241.
Manufactured:				
Nitrogenous	3,089	8,963	14,835	United Kingdom 3,428; West Germany 3,806.
Phosphatic	8,402	13,231	10,660	Netherlands 9,462; East Germany 1,905.
Potassic	666	848	3,274	West Germany 504; France 249.
Mixed	r 3,481	5,366	6,699	United Kingdom 2,716; West Germany 1,150.
Ammonia	118	198	365	United Kingdom 66; Netherlands 43; Belgium-Luxembourg 41.
Lime	7,067	5,537	5,427	United Kingdom 5,528.
Mica, crude and partly worked	50	15	253	All from United Kingdom.
Salt ----------thousand tons--	r 126	134	130	United Kingdom 90; East Germany 16; West Germany 16.

Table 3.—Nigeria: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Nonmetals—Continued				
Sodium and potassium compounds, not elsewhere specified, caustic soda	7,079	9,186	8,996	United Kingdom 6,147; West Germany 1,786.
Stone, sand, and gravel:				
Dimension stone, worked thousand tons	5	41	5	Belgium-Luxembourg 38.
Crushed rock, sand, and gravel ——do	33	26	NA	France 19; Italy 4.
Grinding stones and wheels	137	238	295	West Germany 103; Italy 82; United Kingdom 39.
Sulfur in all forms:				
Pyrite, unroasted	1	17	---	All from United Kingdom.
Sulfur	---	---	193	
Nonmetals, not elsewhere specified ——thousand tons	30	49	NA	Algeria 10; Greece 10; Italy 8.
Mineral fuels: [1]				
Coal, coke, and briquets	1,421	4,354	2,660	United Kingdom 3,883.
Petroleum refinery products:				
Gasoline ——thousand 42-gallon barrels	2,617	2,706	2,702	Netherlands Antilles 573; United States 561; Italy 514.
Kerosine ——do	1,201	1,385	1,075	United States 458; Netherlands Antilles 284.
Jet fuel ——do	352	532	460	Italy 180; Netherlands Antilles 179.
Distillate fuel oil——do	2,786	2,415	2,573	United States 653; Italy 551; Venezuela 411.
Residual fuel oil ——do	640	1,370	1,824	Spain 460; Aden 224; Venezuela 186.
Lubricants ——do	164	183	99	United Kingdom 70; United States 39.
Asphalt and bitumen——do	73	84	61	United Kingdom 18;
Other ——do	18		87	United States 8.
Total ——do	7,851	8,675	8,881	
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation	1,302	859	1,344	United Kingdom 836.

r Revised. NA Not available.
[1] Imports of manufactured gas and minor quantities of petroleum coke and natural gas are reported in terms of value: $409,000 in 1963, $338,000 in 1964, and $491,000 in 1965.

Principal source: Statistical Office of the United Nations.

on the west coast of Africa. Plans called for facilities at two locations; pig iron and crude steel facilities were planned for construction at Lokoja in the Northern Region, near iron ore and limestone deposits, and a steel casting and rolling mill were to be constructed at Onitsha on the Niger River in the Eastern Region. Rolling mill capacity will be in the range of 125,000 to 250,000 tons per year.

The operating company, United Nigerian Iron and Steel Co. (UNISCO), is a consortium of Wellman-Smith-Owens Engineering Corp. (United Kingdom); Demag A.G., Didier-Werke A.G., and Ferrostaal A.G. (West Germany); and Nigerian Steel Associates, Inc. (Westinghouse Electric International, Inc. and Koppers International, Inc., United States).[7]

Lead and Zinc.—Exports of lead and zinc concentrates commenced from the Abakaliki mine, Eastern Nigeria, which was reopened in 1964. Exploratory drilling revealed two tabular ore bodies, which were under development. A new crushing plant was completely installed, and surface plant construction continued.

Molybdenum.—Charter Consolidated Ltd., London, planned an aerial survey, geochemical prospecting, and drilling of an area in Plateau Province.

Tin and Columbite.—The 1965 output of cassiterite, the highest since 1957, was valued at $41.4 million, compared with $35 million in 1964. Columbite output was 65 percent of the free world total in 1965 and was valued at $3.25 million.

Company profits and tin prices were favorable during the year. The tin price was increased to $4,796 per long ton in late 1964, dropped slightly in March 1965, and

[7] Mining Journal. V. 265, No. 6784, Aug. 27, 1965, p. 149.

remained at an average of $3,828 through most of the year.[8] Contract prices for columbium-tantalum concentrate in ratio of 10:1 were about $18 per long ton while $22.40 per ton was often realized in the open market.

Amalgamated Tin Mines of Nigeria Ltd., the principal producer, reported increased profits for 1965, although the company's tin output was lower than that of 1964. The company paid royalty and taxes of nearly $4.2 million to the Nigerian Government during the year. The main deposit at Odegi of United Tin Areas of Nigeria Ltd., a relatively small producer, was under geologic investigation.

Bisichi Tin Co. (Nigeria) Ltd., second in tin output in Nigeria and leading world producer of columbite, announced plans for increased mine production at Bukuru, Plateau Province, Northern Region. Two new pumps have been acquired for providing high water pressure for breaking mineralized ground and also for jig operation.

The Ministry of Mines and Power reported renewed prospecting near Kano and at Riruwai, 210 kilometers southeast of Kano, after a 9-year lapse. The Ministry also signed the Third International Tin Agreement in London on behalf of the Nigerian Government. Cassiterite and columbite reserves, as reported by the Ministry and depleted by 1965 output, were 116,800 long tons and 32,200 metric tons, respectively.

A ground geophysical survey on the Jos Plateau, sponsored by the United Kingdom Ministry of Overseas Development, was completed early in the year. A report, "Geophysical Prospecting for Basalt-Covered Alluvial Cassiterite on the Jos Plateau, Northern Nigeria" was prepared by D. J. M. Smith, Overseas Geological Surveys, Geophysical Division.

NONMETALS

Cement.—Total capacity, according to the Northern Nigeria Ministry of Trade and Industry, was increased to 1.5 million tons annually from four clinker grinding plants and four cement plants, including three under construction in 1965. Domestic demand was on the order of 900,000 tons per year. Producing companies were Nigerian Cement Co. Ltd. (Eastern Region), West African Portland Cement Co. Ltd. (Western Region), and Cement Co. of Northern Nigeria Ltd. (Northern Region).

Cement prices were higher, and a cement shortage prevailed at times. The Government lowered import duty on cement and clinker, but competition to hold prices down was lacking. Distribution and marketing were handicapped by limited railroad transportation facilities.

In March, Northern Nigerian Development Corp. announced plans for a new plant making a wide range of asbestos cement products at Kaduna. A French firm, Société Fives lil Caille, conducted a feasibility survey for a third cement plant in the Northern Region.

Lime.—Cideco Ltd., Lagos, an Israeli-owned firm, announced plans to establish a lime industry. The company estimated an investment of $1.4 million and anticipated purchasing plant machinery in the United States. Annual plant capacity will be 20,000 tons of quicklime and 10,000 tons of hydrated lime. Location of the plant site depends on a survey of limestone deposits near Ewokeri in the Western Region and Gboko in the southeast part of the Northern Region.[9]

MINERAL FUELS

Coal.—Coal production continued to expand in 1965, and exports of briquets to Ghana increased markedly in 1964. According to the Nigerian Coal Corp., the contract for sales to Ghana was increased to 48,000 tons for the fiscal year ending March 31, 1965, and output per man-shift was reported as 34.7 tons for miners and 16.7 tons overall. The Corporation also sought coal markets in West African countries other than Ghana.

The Federal Office of Statistics, Lagos, reported average monthly domestic sales of 55,802 tons in 1964 (the last year for which these data are available), distributed as follows: Nigerian Railway Corp., 20,198 tons; public utilities, 13,604 tons; direct sales from mines, 8,909 tons; and other, including bunkers, 13,091 tons.

Petroleum.—Nigeria showed the world's largest rate of expansion as an oil producer in 1965, moved into 13th place in world ranking, and ranked third in Africa follow-

[8] Tin International. March 1966, p. 65.
[9] U.S. Embassy, Lagos, Nigeria. State Department Airgram A-736, May 29, 1965, 2 pp.

ing Libya and Algeria. Oil also became Nigeria's leading export.

Output of crude oil increased 126 percent over that of 1964. A spectacular drilling success ratio continued, as increased emphasis was placed on offshore operations. Several new fields were under development at yearend; continuing discoveries and further expansion of the industry were indicated for 1966.

Table 4.—Nigeria: Oil and gas production, by field, 1965

Field	Oil (thousand barrels)	Gas (million cubic feet)
Bomu	24,512	18,886
Imo River	18,590	10,737
Umuechem	14,245	17,275
Okan	9,666	6,520
Korokoro	9,362	10,452
Olomoro	5,530	1,257
Obigbo North	5,063	3,275
Uzere West	4,476	2,056
Agbada	1,840	2,068
Ebubu	1,725	1,549
Oloibiri	1,667	605
Uzere East	1,141	704
Afam	890	2,458
Apara	647	1,596
Total	99,354	79,438

The 1965 average daily production rate for crude oil was 272,000 barrels, compared with 120,000 barrels in 1964. In August, the rate passed 300,000 barrels daily and for December was 359,724 barrels, according to Nigerian Ministry of Mines and Power statistics. Shell-BP Petroleum Development Co. of Nigeria, Ltd., continued to dominate the industry, accounting for 90 percent of the 1965 output. In April Nigerian Gulf Oil Co. Ltd. became the country's second largest oil producer, when production began from the offshore Okan field, yielding 9.7 million barrels in 1965.

At yearend 14 petroleum companies were engaged in Nigerian oil operations, including 9 U.S.-based companies. In addition to Shell-BP and Gulf, participants active in exploration and development were American Overseas Petroleum Co. (Amoseas); AGIP Mineraria, an Italian Government oil affiliate; Mobil Exploration Nigeria Inc.; Phillips Petroleum Co.; Société Anonyme Française de Recherches et d'Exploitations Petrolières (Nigeria) Ltd. (SAFRAP), a French firm; and Tennessee Nigeria, Inc. (Tennessee Gas Transmission Co. with its partners Sinclair Nigerian Oil Corp. and Sunray Nigeria, Inc.). Early in the year, Shell-BP had 65 fields or separated discoveries, largely shut-in or "suspended" wells not tied to pipeline.[10] Few fields were fully developed or completely defined. Shell-BP producing fields totaled 13 in the Eastern Region and 5 in the Western Region. Gulf's Okan field had 21 producing wells. All output was from flowing wells. By yearend the other concession holders had made oil strikes, most on their first wells, and were engaged in stepout drilling and field development. Crude oil reserves were increasing as offshore development continued; early in the year they were estimated at 3 billion barrels, largely onshore,[11] and yearend estimates were as high as 10 billion barrels.

Shell-BP had invested $420 million in exploration and development through 1964.[12] Estimated revenues paid to the Nigerian Government by oil companies, based on a 50/50 profit split, were $25 million in 1965.[13]

The Ministry of Mines and Power was in the process of reviewing petroleum laws and preparing new legislation consolidating the various laws under the Division of Petroleum. Oil producing companies contributed to a training fund under which Nigerians study oil technology and other fields abroad or receive on-the-job training.[14]

Other significant developments were the inauguration of Nigeria's first oil refinery, which went on stream in October, and advanced progress in negotiations between United Kingdom and Nigerian authorities on the natural gas liquefaction plant proposed in 1964.

Exploration and Development.—Exploration and development continued at a fast pace as more companies joined in the search for oil. Work onshore in the Eastern and Midwestern Regions of the Niger delta stressed field development; the discovery rate slumped slightly compared with that of 1964. Exploration became more intense offshore. Shell-BP, Gulf, Amoseas, and Mobil were actively engaged in drilling operations offshore. All companies reported discoveries and development programs. The

[10] Oil and Gas Journal. V. 63, No. 3, Jan. 18, 1965, pp. 37–40.
[11] Oil and Gas Journal. V. 5, No. 2, February 1965, p. 42.
[12] Source cited in footnote 10.
[13] U.S. Embassy, Lagos, Nigeria. State Department Airgram A–07, July 2, 1965, p. 2.
[14] Petroleum Press Service. V. 32, No. 2, February 1966, pp. 50–52.

offshore success ratio was about 85 percent, a record, and the onshore ratio was about 60 percent.[15] Offshore rigs consisted of two jackups, a submersible Delta platform, and two inland barges for use near shore.

Shell-BP drilled more than 900,000 feet and 87 holes in the Eastern and Midwestern Regions and offshore.[16] About 35 holes were land wildcats with a 50-percent success ratio. Offshore, Shell-BP was successful in five of seven wells drilled to midyear.

Shell-BP's Trans-Niger pipeline was officially opened in June, adding 50,000 barrels per day from the Eriemu, Kokori, Ughelli, Uzere, and Olomoro fields in the Western Region to the 200,000 barrels per day flowing from the Eastern Region to the Bonny terminal. Pipeline construction and terminal expansion continued at yearend.

Sixteen seismic parties were in the field at yearend, distributed by company as follows: Shell-BP 6, SAFRAP 6, Tennessee 2, Phillips 1, and AGIP 1. Esso West Africa, Inc., a newcomer to Nigeria, investigated two exploration concessions in the Abakaliki-Ogoja area, Eastern Region. Canadian Aero Services, Ltd., completed an aerial photo survey of an area of 1,000 square miles on the delta. Decca Navigation Co. made a hydrographic study of the Nigerian coast for the Nigerian Government and operating companies.

Refining.—The new $28 million, 45,000-barrel-per-day refinery of Nigerian Petroleum Refining Co. (owned 50 percent by the Nigerian Government, 25 percent by Shell, 25 percent by British Petroleum) at Alesa-Eleme, near Port Harcourt, underwent operational tests during August and September and was on stream commercially in October. According to Ministry of Mines and Power monthly bulletins, refinery throughput from October to December was 1,518,885 barrels, including 110,486 barrels of imported material classified as kerosine. Crude oil was from the Imo River and Umuechen fields. The refinery will supply the domestic market, where demand was estimated at 25,000 barrels per day, and will provide fuel oils for exports. Indigenous refinery production reportedly will save $30 million per year in foreign exchange.[17]

Two ancillary projects were announced—a small liquefied petroleum gas (LPG) plant for 100,000 barrels annually and an experimental plant for byproduct recovery. A new marine loading jetty, accommodating tankers up to 18,000 deadweight-tons, was finished in July. The Nigerian Railway Corp. built a 26-kilometer spur line to the refinery.

Natural Gas.—Domestic gas sales increased during 1965 but remained small relative to gross output of associated and nonassociated gas, most of which was flared. Sales totaled 3,163 million cubic feet according to the Ministry of Mines and Power. Gross output exceeded 200 million cubic feet per day. Crude oil contained an estimated 800 to 900 cubic feet of gas per barrel.

The new petroleum refinery will use about 4 million cubic feet per day as fuel.[18] A powerplant near Port Harcourt used natural gas at a daily rate of 6 million cubic feet, and nearby industry used 1.3 million cubic feet daily. Main sources in the Eastern Region were the Afam, Korokoro, Apara, and Imo River fields. The Imo River field served the nearby Aba textile mill by Shell-BP's 30-kilometer, largely aluminum pipeline, which represents the first industrial use of natural gas in the country.[19] In the Midwestern Region the Ughelli field supplied a local power station. Natural gas markets were reviewed in an article, "Nigeria, the Federal Government's Control of the Oil Industry and the Development of Crude Oil Production in the Niger Delta", by R. K. Dickie.[20]

Further progress was made in negotiations between Conch International Methane, Ltd., and the Nigerian Government for a proposed gas liquefaction plant. Specifications called for a processing capacity of 100 million cubic feet per day, or 700,000 tons liquefied natural gas (LNG) annually. Feasibility and cost studies continued at yearend. Estimated costs included $50 million for the main plant on Bonny Island, $34 million for two LNG tankers,

[15] Oil and Gas Journal. V. 63, No. 49, Dec. 12, 1965, pp. 122–126.
[16] Shell-BP Bulletin No. 19, December 1965, p. 1.
[17] Oil and Gas Journal. V. 63, No. 5, Feb. 1, 1965, p. 50.
[18] Institute of Petroleum Review. V. 19, No. 225, September 1965, pp. 309–314.
[19] World Oil. Aug. 15, 1965, p. 151.
[20] Journal of the Institute of Petroleum. V. 52, No. 506, February 1966, pp. 38–45.

Table 5.—Nigeria: Salient petroleum exploration and development activities, 1965

Company	Location	Activity
American Overseas Petroleum Ltd. (Amoseas)	Block F, Pennington field, Block G.	Five discoveries in six wells drilled. Discovery well in Pennington field flowed at 1,730 barrels per day of 33.7 API oil, at 5,100 feet. Survey team arrived at Port Harcourt in April for preliminary study of production facilities.
Mobil Exploration Nigeria Ltd.	Blocks L and M	11 wildcat wells, 5 producers. Stepout drilling late in year.
Nigeria AGIP Oil Co. Ltd.	Block 34, Eboka field	First successful well completed in June; two dry holes. Joined with Phillips (see below) near yearend, but remained operating partner.
Nigerian Gulf Oil Co. Ltd.	Offshore: Block D, Okan field.	Construction included well-head equipment, gathering and flow lines, storage tanks. Production rate reached 49,000 barrels daily from 19 wells. Work on loading facilities completed; production and auxiliary equipment for 75,000 barrels per day; 10-kilometer, 26-inch underwater pipeline from field gathering platform to temporary offshore mooring terminal. Storage capacity at terminal increased to 386,000 barrels. Preliminary field and laboratory soil tests made for proposed new onshore tank farm in Midwestern Region.
	Block C	Discovery made in October. Gulf brought "Glomar V" drilling ship and another drill rig into area. Several wildcats productive.
	Onshore: Block 29 e, Robertkin field.	Discovery early in year; 2,300 barrel-per-day flow rate, 38.5° API, perforations at 11,802 feet. Located in delta marshes, 48-kilometers southwest of Port Harcourt.
Phillips Petroleum Co	Blocks 43–47	Formerly Block 30, relinquished by Tennessee and subdivided. Acquired 50 percent of AGIP Block 34.
Société Anonyme Francaise de Recherches et d'Exploitations Petrolières (Nigeria) Ltd. (SAFRAP).	Blocks 35 Band C, Obagi-Uberte fields.	Seven productive wells completed. Contract given for 40-kilometer, 12-inch pipeline connecting field to Trans-Niger pipeline. French seismic party worked delta perimeter and Niger River borders. Obagi production planned in 1966. Reserves 500 million barrels oil equivalent.
Shell–BP Petroleum Development Co. of Nigeria Ltd.	Onshore, Eastern Region	Pumping and flow stations completed or in construction at Imo River, Obigdo North, Bomu, and Agbada; second station started at Imo River. Contract made with Willbros (Overseas), Ltd., for Rumuekpe-Bomu, 78-kilometer, 28-inch pipeline. Booster station under construction at Rumuekpe field. Imo River-Ebubu, 12-inch line, Nkpoku-Ebubu, 8-inch line, Obigdo North-Ebubu, 6-inch line, Korokoro-Afam, 8-inch gas line, Bomu-Ebubu, 8-inch gas line, under construction or completed. Storage tank construction continued at Bonny terminal; tanks 9-10 completed; Phase III, including tanks 11-14, underway; increase throughout capacity to 400,000 barrels per day; dredging for 50,000-ton tankers; storage capacity 1.7 million barrels.
	Onshore, Midwestern Region.	Pumping and metering stations completed or in construction at Olomoro, Kokori, Ughelli, Uzere. Trans-Niger line, 224-kilometers, completed in June, connecting to Eastern Region. Branch lines Uzere-Rumuekpe, 18-inch, Ughelli-Eriemu, 16-inch, Kokori-Eriemu, 10-inch, completed in April. Field development at Meja, Meta, Meren, Delta fields.

Table 5.—Nigeria: Salient petroleum exploration and development activities, 1965—Continued

Company	Location	Activity
Shell-BP Petroleum Development Co. of Nigeria Ltd.	Offshore, Blocks, E, H, J, and K.	Well in Block E, 13 kilometers off mouth of Dodo River, blew out in July after hitting gas pocket. "Triton" platform, owned by Offshore Venezuela, C.A., disabled and drilling suspended until new platform arrived from Netherlands. Drilling successful in Blocks H, J, and K at depths of 2,500-8,500 feet.
Tennessee Nigeria, Inc--	Block 33 c, Brass River field.	Located 96 kilometers southwest of Port Harcourt; two discoveries, 1,736 barrels per day of 41° API oil, and 2,000 barrels of 32° API oil. Plan production 50,000 barrels per day from 27 wells in 1966.
	Block 33 b, Owopele field.	Midwestern Region; more than 1,000 barrels per day of 22° API oil.

Principal sources: Ministry of Mines and Power. Monthly Petroleum Information, Lagos.
Oil and Gas Journal. V. 63, No. 49, Dec. 12, 1965, pp. 122–126.
Petroleum Press Service. V. 32, No. 5, May 1965, p. 190.
Petroleum Times. Apr. 16, 1965, p. 189.
World Oil. Aug. 15, 1965, pp. 76–78.
World Petroleum. V. 37, No. 4, Apr. 1966, pp. 22–24.
World Petroleum Report. Mar. 15, 1966, pp. 102–104.

and $14 million for pipeline construction. The United Kingdom Gas Council, which received liquefied methane from Algeria, wanted cheaper gas from a Commonwealth source to reduce the need for foreign exchange payment. Although unit price had not been determined, it was estimated that Algerian gas would cost approximately one-third more per therm than Nigerian gas.[21]

"Utilization of Natural Gas in the Nigerian Economy", a report on natural gas market conditions in Nigeria prepared by Canadian Industrial Gas Ltd., Calgary, became available to the public and was reviewed in the press.[22] The survey was made for the Ministry of Mines and Power in 1964 and was financed by the Special Commonwealth Africa Aid Program.

Proved natural gas reserves were reported at 1,700,000 million cubic feet.[23] Fields in the Port Harcourt area produced 50 million cubic feet of associated gas per day in 1965, and gross nonassociated gas output in the area was estimated at more than 100 million cubic feet per day, most of which was flared.[24]

Considerable interest was shown in development of gas-based byproducts for the export market. Signal Oil & Gas Co., California, associated with Canadian Industrial Gas Ltd., negotiated with Ministry of Mines and Power officials for a liquefied petroleum gas (LPG) plant where liquefied natural gas will be processed. Petrochemical and fertilizer industries also were under consideration.

[21] International Financial News Survey. V. 17, No. 40, Oct. 8, 1965, p. 376.
[22] Petroleum Press Service. V. 32, No. 4, April 1965, pp. 139, 142-144.
[23] World Oil. V. 161, No. 3. Aug. 15, 1965, p. 91.
[24] Source cited in footnote 22.

The Mineral Industry of Rhodesia (Southern Rhodesia), Zambia, and Malawi

By Thomas C. Denton [1] and William F. Keyes [2]

On November 11, 1965, Southern Rhodesia, then a self-governing British colony, declared itself independent and sovereign within the British Commonwealth of Nations. The British Government refused to recognize this unilaterial declaration of independence (UDI) and promptly took economic action against Southern Rhodesia. The United States and other members of the United Nations collaborated in this economic action in varying degrees. At yearend the dispute had not been resolved. The status of the other political divisions discussed in this chapter remained unchanged from that at the end of 1964. Both Zambia and Malawi were independent countries within the British Commonwealth of Nations, Zambia (formerly Northern Rhodesia) having achieved that status on October 24, 1964, and Malawi (formerly Nyasaland) on July 6, 1964.

SOUTHERN RHODESIA

With the end of the third quarter of 1965, Southern Rhodesia suspended publishing mineral production statistics and deferred further releases of such figures until the political and economic situation resulting from the UDI had been clarified. Statistics of foreign trade, however, were published for all of 1965.

European employment in mining was 2,692 in June 1965, compared with an average of 2,531 in 1964. African employment rose similarly, to 40,066 compared with 39,026. Gold mining was the only sector of the industry to show a decline in employment, which was consonant with a decline that occurred in production of gold. The origins of the 40,066 Africans employed on June 30 were, in percent, as follows: Rhodesia 39; Zambia 15; Malawi 25; Mozambique 17; other countries 4.

The Ministry of Mines rejected the Development Plan for the Mining Industry that the Mining Promotion Council drew up early in the year. The plan proposed that the Government set up a Minerals Development Corporation to finance new mining ventures, and recommended formation of a Government-Industry Mining Affairs Board to coordinate both Government and private minerals activities. The Ministry of Mines' rejection of the plan was on the grounds that the existing Industrial Development Corporation was fully capable of making loans to mining companies and that the Ministry could not accept placing a private manager of the board in authority over Government minerals agencies. The purpose of the council's recommendations on this latter point was to circumvent limitations on Government salaries, which cannot be greater than $11,200 per year, so as to employ a high-caliber business executive to promote the mining industry.

[1] Africa specialist, Division of International Activities.
[2] Regional minerals officer, U.S. Consulate General, Johannesburg, Republic of South Africa.

PRODUCTION

Mineral production rose almost month by month during the three quarters of 1965 for which statistics were available. Gold was virtually the only mineral to register a decline. Total value for the first three quarters was $66 million, nearly $11 million higher than in the corresponding period of 1964, as shown in the following tabulation:

Commodity	Value—January–September (million dollars)	
	1964	1965
Asbestos	14.3	17.5
Gold	15.0	14.3
Copper	8.7	13.1
Coal (sold)	6.9	8.2
Chromite	4.7	5.3
Other minerals	5.5	7.6
Total	55.1	66.0

Early in 1965 the Minister of Mines expected mineral production for the year to reach $84 million or more, and reports at the end of the third quarter indicated that this goal would be attained; the unilateral declaration of independence, coming as it did on November 11, probably did not alter the trend of rising production. The production recorded for the first three quarters was at the annual rate of $87.9 million.

TRADE

The Central Statistical Office, Salisbury, issued an Annual Statement of External Trade for 1965 in commodity and country detail, similar to the one issued in 1964. Prior to 1964 (beginning in 1953), Southern Rhodesia's external trade accounts were included as a part of trade accounts of Federation of Rhodesia and Nyasaland. These latter accounts did not document interterritorial trade in detail, therefore data for 1963 comparable to that given for 1964 and 1965 could not be compiled.

In 1964 and 1965 Rhodesia had a large favorable balance of external trade with respect to both total trade and trade in mineral commodities. In each case the balance was distinctly more favorable in 1965 than in 1964. The favorable balance in total trade increased from $90.5 million to $125.7 million and for minerals from $54.7 million to $84.1 million, as shown in the following tabulation:

	Thousand dollars		Mineral commodities share of total (percent)
	Mineral commodities [1]	Total commodities	
Exports: [2]			
1964	100,795	351,140	28.7
1965	131,063	417,897	31.4
Reexports:			
1964	4,975	42,412	11.7
1965	6,213	43,235	14.4
Imports:			
1964	51,090	303,064	16.9
1965	53,161	335,409	15.8
Trade balance:			
1964	+54,680	+90,488	XX
1965	+84,115	+125,723	XX

XX Not applicable.
[1] Values include only those mineral commodities listed in tables 2 and 3 of this chapter.
[2] Includes net gold sales of $19,841,000 in 1964 and of $19,023,000 in 1965.

Exports.—Mineral exports in 1965 ($131 million in all) included 13 categories valued at $1 million or more, as follows (figures represent millions of dollars): Asbestos 30; gold 19 (net sales); copper 18; chromite 11; coal and coke 8; pig iron 7; petroleum refinery products 6; iron and steel semimanufactures 5; ferrochrome 5; iron and steel billets, etc. 2; tin ingot 2; iron ore 1; miscellaneous ores and concentrates 3.

Imports.—Principal mineral imports in 1965 in order of value were petroleum products, iron and steel semimanufactures, and fertilizer materials. The values of these imports in 1965 in thousands of dollars were respectively 15,479, 14,365, and 13,178. Reexports, in thousands of dollars, amounted to 719, 2,111, and 3,027, respectively. The official Statement of External Trade of Rhodesia for 1965 did not record imports of crude petroleum, which were probably about 4 million barrels.

Direction of Trade.—In recent years the bulk of Rhodesia's general imports have come from the United Kingdom, the Republic of South Africa, the United States, Japan, West Germany, and Zambia. In 1965 imports totaled $335.4 million; in percent the contributions of these countries to the total figure were, respectively, 30.3, 22.9, 6.8, 5.5, 4.1, and 3.6, or 73.2 percent in all. With respect to domestic exports the pattern in 1965 was somewhat different. The exports totaled $398.9 million and principal recipients were, in percent of the total: Zambia 25.3; the United Kingdom 22.1; West Germany 9.0; the

Table 1.—Southern Rhodesia: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 January–September
Metals:					
Antimony, content of concentrate	62	55	60	44	230
Arsenic, white	--------	1,095	549	187	46
Bauxite	--------	508	1,842	2,478	1,360
Beryl	359	507	226	165	62
Cesium mineral: Pollucite	9	19	--------	24	31
Chromite	536,045	460,565	374,116	447,576	424,860
Copper:					
Mine, content of concentrates	13,828	13,740	16,773	16,639	e 13,471
Smelter, fire-refined copper	11,716	12,337	14,685	15,239	13,452
Gold, troy ounces	570,095	554,647	566,277	575,386	406,061
Iron and steel:					
Iron ore, thousand tons	388	619	655	824	1,021
Pig iron, do	220	241	r 236	r 318	e 200
Ferroalloys, ferrochrome (exports), do	9	8	14	23	NA
Steel ingots and castings, do	92	r 88	r 84	r 128	e 100
Manganese ore	186	7,237	--------	145	154
Nickel, content of concentrate	58	78	119	173	e 402
Silver, troy ounces	106,801	83,540	83,742	88,463	71,602
Tantalum concentrate, kilograms	62,768	72,493	68,492	64,101	31,000
Tin:					
Mine, content of concentrate, long tons	715	706	498	512	e 382
Smelter, do	673	679	499	r 511	360
Tungsten ore and concentrate, 60 percent WO_3	50	22	2	--------	10
Nonmetals:					
Asbestos	146,609	128,997	129,051	139,208	117,372
Barite	--------	--------	1,772	1,416	1,084
Cement, thousand tons	279	e 250	e 250	e 250	e 187
Corundum	2,533	3,037	5,389	2,604	3,125
Diatomite	371	384	273	315	355
Fire clay	14,640	13,910	13,180	12,455	13,274
Fluorspar	--------	18	311	70	111
Kaolin	18,494	--------	11,104	19,051	NA
Kyanite	--------	--------	54	233	414
Limestone	717,111	615,420	533,173	540,251	439,141
Lithium minerals:					
Amblygonite	78	32	47	--------	--------
Eucryptite	1,705	786	1,056	731	483
Lepidolite	21,806	19,272	14,657	20,813	12,057
Petalite	25,127	19,690	27,167	33,066	20,355
Spodumene	1,476	1,357	2,028	6,318	10,443
Magnesite	12,592	10,541	10,947	38,474	25,988
Mica:					
Block	29	15	26	34	22
Crude and scrap	46	79	103	71	62
Phosphate rock	454	--------	--------	1,995	5,624
Pyrite	59,379	51,265	66,099	82,431	61,538
Quartz	8,930	10,575	19,054	28,311	22,638
Quartzite	344	236	200	181	190
Semiprecious stones:					
Agate, kilograms	1,664	340	--------	--------	5,153
Amazonite, do	--------	--------	--------	66	2,532
Amethyst, do	--------	--------	901	288	162
Aquamarine, do	--------	--------	109	107	--------
Chrysoberyl, do	(1)	10	16	15	(1)
Cordierite, do	--------	--------	1	4	(1)
Garnet, do	--------	--------	15	98	1,700
Jade, do	1,814	2,721	1,814	3,629	--------
Topaz, do	--------	--------	76	7	33
Tourmaline, do	--------	--------	57	3	9
Silica sand	--------	--------	2,021	3,268	6,570
Talc	--------	21	19	14	62
Mineral fuels:					
Coal, bituminous, thousand tons	3,073	2,826	2,740	3,044	2,603
Coke, do	192	102	r 92	130	e 100

e Estimate. r Revised. NA Not available.
1 Less than ½ unit.

Table 2.—Southern Rhodesia: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal destinations, 1965
Metals:			
Antimony concentrate	164	211	United States 152; Belgium 59.
Beryllium ore and concentrate	144	86	All to United States.
Chromium ore and concentrate	455,673	635,089	United States 309,666; Republic of South Africa 186,186; Japan 38,546; United Kingdom 25,240.
Copper:			
Concentrate	7,135	6,978	Republic of South Africa 5,686; Japan 1,138.
Refined, unwrought	15,403	16,731	West Germany 10,241; Poland 1,731; Italy 1,587; United Kingdom 1,472.
Bar and rod and copper alloys	3,792	1,640	Malaya 1,291.
Gold—value, thousands	[1] $19,832	[1] $19,023	NA.
Iron and steel:			
Iron ore	286,571	321,344	Japan 318,865.
Pig iron	218,396	214,432	Japan 207,513.
Ferrochrome	22,700	21,326	United Kingdom 7,720; Australia 2,551; Sweden 2,550.
Iron and steel scrap	3	31	NA.
Iron and steel billets, ingots, equivalent forms.	33,958	23,213	Republic of South Africa 22,498.
Semimanufactures:			
Bars, rods, angles, shapes	11,235	26,088	Zambia 19,071; Democratic Republic of the Congo (Léopoldville) 2,556.
Other	9,300	7,230	Zambia 4,544; Malawi 1,024.
Total	20,535	33,318	
Nickel, ore and concentrate	NA	NA	
Silver, bullion—troy ounces	96,280	83,285	United Kingdom 81,568.
Tantalum, ore and concentrate	75	34	United Kingdom 17; United States 10.
Tin:			
Ore and concentrate—long tons	54	71	All to Netherlands.
Ingot—do	473	399	Republic of South Africa 393.
Tungsten, ore and concentrate	-------	26	United Kingdom 24.
Metallic ores, value, thousands—concentrate, etc. not further described.	$127	$902	Japan $833.
Nonferrous metal scrap	3,960	2,529	Republic of South Africa 1,195; West Germany 256.
Nonferrous metals value, thousands—not further described.	$314	$422	Malawi $158; Zambia $157; Republic of South Africa $67.
Nonmetals:			
Asbestos	161,316	167,406	United Kingdom 38,818; West Germany 15,619; Republic of South Africa 15,183.
Barite	1,539	1,875	All to Republic of South Africa.
Cement	5,843	14,576	Zambia 11,468; Bechuanaland 2,008.
Corundum	3,020	3,260	Republic of South Africa 1,601; United States 1,291.
Fertilizer materials, manufactured	22,958	33,356	Zambia 29,289; Malawi 3,406.
Lithium ores	67,389	50,733	United States 15,326; Belgium 14,972; United Kingdom 6,510.
Magnesite	23,770	34,102	Republic of South Africa 34,086.
Quartz, mica, feldspar, fluorspar	352	2,854	Libya 1,154; Norway 363; West Germany 254.
Crude minerals not further described. value, thousands	$74,698	$530,128	Republic of South Africa $207,970; Zambia $207,385.
Mineral fuels:			
Coal, bituminous—thousand tons	1,342	1,634	Zambia 1,157; Democratic Republic of the Congo (Léopoldville) 52.
Coke—do	105	146	Zambia 60; Democratic Republic of the Congo (Léopoldville) 52.
Petroleum refinery products:			
Asphalt and bitumen	1,937	4,412	Zambia 4,384.
Mineral fuels and value, thousands—related materials not further described.	$123	$5,807	Zambia $5,600.
Electric energy—value, thousands	$11,836	$12,410	All to Zambia.

NA Not available.
[1] Net sales.

Table 3.—Southern Rhodesia: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1964	1965		
		Total	Sources: Republic of South Africa	Sources: Principal sources except Republic of South Africa
Metals:				
Aluminum:				
Semimanufactures	711	962	684	United Kingdom 176.
Aluminum and alloys not further described	219	237	110	United Kingdom 84; Israel 35.
Copper and copper alloys, all forms	6,519	4,283	625	Zambia 3,262; United Kingdom 62.
Iron and steel:				
Pig iron	377	199	198	
Ferroalloys	1,186	1,395	1,352	
Iron and steel ingots	74	67	29	United Kingdom 36.
Semimanufactures	99,991	95,564	48,590	United Kingdom 13,230; Japan 11,537.
Lead and lead alloys, all forms	753	851	17	Zambia 784; Malawi 45.
Nickel and nickel alloys, all forms	17	49	46	
Tin and tin alloys, all forms—long tons	79	77	32	United Kingdom 42.
Zinc and zinc alloys, all forms	111	774	40	Zambia 609; Democratic Republic of the Congo (Léopoldville) 122.
Nonferrous metals not further described	81	136	61	Belgium 34; United Kingdom 23.
Metalliferous ores and metal scrap. value, thousands	$646	$510	$44	Zambia $294; Mozambique $118.
Nonmetals:				
Abrasives, wheels, disks, etc	182	181	129	United Kingdom 32.
Bricks, refractory—number, thousands	1,283	1,034	844	Austria 143.
Cement:				
Hydraulic	3,587	1,464	286	Zambia 812; United Kingdom 330.
Fire and furnace	904	619	441	United Kingdom 170.
Fertilizer materials:				
Crude, not further described	84,009	69,208	403	Senegal 65,267; Chile 3,538.
Manufactured:				
Nitrogenous:				
Ammonium sulfate	56,999	66,142	44	Netherlands 34,797; West Germany 26,041.
Urea	23,953	37,918	------	Netherlands 19,944; Norway 5,280; Italy 4,028.
Other nitrogenous	65,937	80,863	5	United States 29,056; Belgium 18,585; West Germany 10,835; Netherlands 10,692.
Phosphatic:				
Superphosphate	5,827	2,417	2,414	
Other, not further described	6,189	10,982	1,023	United States 8,466.
Potassic	38,246	29,811	2	France 14,153; West Germany 11,437.
Other, not further described	1,068	243	21	United States 73; United Kingdom 25.
Gypsum and plaster of paris	9,426	7,878	7,708	United Kingdom 94.
Potash compounds other than fertilizers	239	193	36	Sweden 56; West Germany 43; United Kingdom 19.
Salt	29,772	40,026	25,033	Angola 8,484.
Mineral fuels:				
Solid fuels, coal and coke	12,650	10,035	10,035	
Petroleum:				
Crude—thousand 42-gallon barrels	------	[1] NA	------	
Refinery products:				
Gasoline—do	1,358	521	2	Iran 382; Bahrain 127.
Kerosine—do	510	348	(2)	Iran 259; Bahrain 57; Aden 29.
Distillate fuel oil—do	1,121	351	(2)	Iran 217; Saudi Arabia 89; Bahrain 44.
Residual fuel oil—do	7	1	------	All from Iran.
Lubricating oils—do	92	103	85	United States 7; West Germany 4.

See footnotes at end of table.

Table 3.—Southern Rhodesia: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1964	1965		
		Total	Sources	
			Republic of South Africa	Principal sources except Republic of South Africa
Mineral fuels—Continued				
Petroleum—Continued				
Refinery products—Continued				
Lubricating greases	1,139	1,246	793	United States 441.
Jellies and waxes	2,391	2,233	61	Indonesia 1,330; United States 442; West Germany 292.
Asphalt and bitumen	15,289	5,418	3,958	Iran 937.
Petroleum oils not further described—thousand 42-gallon barrels	7,721	8,828	513	United States 2,638; United Kingdom 2,089; West Germany 1,816.
Petroleum products not further described—value, thousands	$91	$6,690	$14	Iran $6,529.
Electric energy—do	$1,073	$984	------	Mozambique $713; Zambia $271.
Explosives, industrial:				
Prepared explosives	5,483	5,767	5,767	
Fuses	286	301	301	
Detonators—number, millions	7,423	9,289	9,289	
Primers, caps, ignitors—value, thousands	$121	$120	$117	

NA Not available.
[1] According to Diario de Mozambique, Beira, Mozambique, May 3, 1966, the equivalent of 4,186,000 barrels of crude petroleum was pumped from Beira to Umtali, Southern Rhodesia, from January 1965 to November 1965, when pumping ceased.
[2] Less than ½ unit.

Table 4.—Southern Rhodesia's trade with selected countries

(Thousand dollars)

Countries	1964		1965	
	Total	Mineral commodities	Total	Mineral commodities
Exports to—				
United Kingdom	85,232	15,204	88,228	13,216
Zambia	84,655	7,781	101,052	15,632
Republic of South Africa	23,890	6,532	35,826	10,447
West Germany	22,148	6,423	35,862	13,838
Japan	15,568	11,186	20,720	10,690
Malawi	15,456	818	21,666	1,170
United States	11,108	8,176	9,783	8,316
Imports from—				
United Kingdom	91,854	3,360	101,794	2,764
Zambia	14,524	4,584	12,096	3,108
Republic of South Africa	73,808	15,053	76,891	13,317
West Germany	11,631	2,881	13,622	2,562
Japan	12,284	652	18,497	1,288
Malawi	4,561	53	3,912	42
United States	20,597	902	22,952	1,996

Republic of South Africa 9.0; Malawi 5.4; and Japan 5.2; these countries thus received 76.0 percent of total domestic exports. The United States ranked eighth at $9.8 million. The total export figure does not include $19 million (£6,794) of gold bullion Rhodesia sold in 1965, most of which presumably went to the United Kingdom.

COMMODITY REVIEW

Metals.—*Antimony*—Production of antimony, long a byproduct from the Sebakwe gold mine near Que Que, rose from 44

tons in 1964 to 230 tons in 1965 (9 months), largely on the strength of a few months' operation of the new pilot flotation plant of Rhodesian Antimony (Pvt.), Ltd., also near Que Que.

Chromium.—Output of chromite during the first 9 months of 1965 was equivalent to an annual rate of 567,000 tons, 27 percent higher than the tonnage produced in 1964. Rhodesia Chrome Mines Ltd. (RCM), a subsidiary of Union Carbide Corp., the largest producer in Rhodesia, increased production to about 340,000 tons from under 272,000 tons in 1964. RCM's exports in 1965 were 313,000 tons, of which about 60 percent reportedly went to the United States and about 5 percent went to the United Kingdom.

Development continued on two ore bodies at the mine in the Belingwe district, southwest of Fort Victoria, of Inyala Chrome Co. (Pvt.) Ltd., a subsidiary of Associated Ore and Metals Co. Mining started on the No. 1 ore body, the product being high-grade, hard, lumpy chromite. Fines were being accumulated until the gravity-concentrating plant was in operation in 1966.

Rhodesian Alloys (Pvt.) Ltd. at Gwelo in August announced a $5.6 million expansion that should nearly treble production of low-carbon ferrochrome, from the present rate of 15,400 tons per year to 45,400 tons per year. Three additional 15,000 kilovolt-ampere furnaces will be installed. In addition, an experimental char plant was being erected on a site adjacent to the ferrochrome plant at a cost of $84,000. It will use low-temperature carbonization to produce 650 tons per month of char, which has a higher volatile content than the metallurgical coke from Wankie colliery now used. If this method of production proves as satisfactory as expected, the plant was to be expanded to produce 91,000 tons to supply both Rhodesian Alloys and the domestic market for smokeless fuels.

Windsor Ferroalloys (Pvt.) Ltd., at Que Que, the other ferrochrome producer in Rhodesia, was acquired by Rhodesia Chrome Mines Ltd. in May. Windsor was operating at a loss and owed the Rhodesian Government $3.6 million. At yearend the plant was producing ferrochrome silicon from Selukwe ores, for which the principal market was Japan. Capacity was to be tripled from the existing 11,000 tons per year of product.

Copper.—Average quarterly production of new copper during the first 9 months of 1965 was at the rate of 16,484 tons annually, about 1,200 tons more than was produced in 1964. The output was largely fire-refined copper produced at the Alaska smelter near Sinoia, controlled by a South African company, Messina (Transvaal) Development Co. Ltd. In addition, at Messina's Umkondo mine near the South African border, copper-in-concentrates was produced at the rate of about 1,450 tons annually and then shipped by train to the Messina smelter in South Africa.

Messina's new leach plant at Mangula was officially opened by the Prime Minister on August 30, 1965. In September the stockpile of oxidized ore to be leached totaled 2.85 million tons averaging 1.13 percent copper. At yearend about 900 tons of ore per day was being leached, equivalent to over 2,200 tons of cement copper production per year. This figure was expected to be doubled later.

As of September 30, 1965, Messina reported the following ore reserves for its three mines in Rhodesia:

Mine	Thousand tons	Grade (percent copper)
Mangula	15,164	1.39
Alaska	1,789	1.87
Umkondo	176	3.06

The tonnage reported for Umkondo was more than double that reported for 1964, and copper content was significantly higher, as a result of new discoveries.

Gold.—Production for all of 1965 was indicated to have been 4 or 5 percent under the 575,386 ounces produced in 1964, when by value gold was Rhodesia's leading mineral product. The decline in production came in the face of Government efforts during the past 2 years to stimulate small-scale operations. Many mines had been hit by rising costs and were in danger of closing; others were near closing because of the exhaustion of ore. The Turk mine near Inyati, one of the oldest mines in Rhodesia, announced that it would close in February 1966, primarily because ore reserves would then be exhausted. It has been producing about 1,000 ounces of gold per month.

Larger companies continued to explore abandoned gold districts. At yearend Anglo American Corporation was still examining three old mines, the Renco mine south of Fort Victoria, the Sabi mine near Shabani, and the Felixburg mines at Felixburg north of Fort Victoria. Rio Tinto (Rhodesia) Ltd. was examining its concession areas, stimulated by the prospective closing of its Cam and Motor mine, the largest Rhodesian gold producer. Coronation Syndicate Ltd. was examining several mines. The Syndicate faces exhaustion of its Kanyemba and Arcturus mines.

In a report submitted in February 1966, the Select Committee on the Mining Industry declared that a decline in Rhodesian gold production was inevitable unless increased government subsidies, in the form of development allowances for low-grade ores, were granted to the industry.

Iron and Steel.—Iron ore production in all of 1965 is indicated to have been about 70 percent larger than in 1964, or about 1.4 million tons. Export railings, all to Lourenço Marques, Mozambique, were at the annual rate of about 522,000 tons, compared with 380,307 tons in 1964. Exports in 1964, presumably tallied at the Southern Rhodesia-Mozambique border, were 286,570 tons, all to Japan.

Sales by the Rhodesian Iron and Steel Co. Ltd., (RISCO) in the first half of 1965 were 140,114 tons of pig and foundry iron and 50,933 tons of semifinished steel and steel sections. According to the chairman of RISCO, production of about 317,000 of pig iron in all of 1965 was entirely sold by midyear.

During the year RISCO announced plans for expansion of capacity, which presumably were held in abeyance as a result of retaliatory action taken against Rhodesia after the UDI on November 11. The plans were to spend between $784,000 and $840,000 on new equipment to increase steelmaking capacity, and $19.6 million over 2½ years to increase pig iron capacity. In addition, the United Nations Economic Commission for East and Central Africa in October had recommended establishment of 1 million-ton-per-year iron and steel plant at Que Que, to serve the entire central African market.

Nickel.—At yearend it appeared that Rhodesia would soon become a significant nickel producer. Output of concentrates averaging about 15 percent nickel was 2,679 tons in January-September 1965. This output compares with 783 tons produced in 1964, mostly in the fourth quarter. Trojan Nickel Mining Company (Pvt.) Ltd. was the producer, from claims near Bindura north of Sudbury. The nickel minerals are mostly the arsenides, chloanite and niccolite. In June 1965 Anglo American Corp. of South Africa Ltd., took an option to examine an area of 272 square kilometers that included the claims. The investigation was expected to take about 1 year.

Besides this development, Rio Tinto (Rhodesia) Ltd. decided to put into production by 1967, at a cost of about $11.2 million, the Empress nickel mine situated 48 kilometers west of Gatooma. Over the years Rio Tinto had spent $2.8 million on the Empress mine and had developed a substantial ore tonnage. The nickel mineral here is the iron-nickel sulfide, pentlandite.

Tantalum and Cesium—Tantalum ore production declined. In the January-September period 31 tons was produced, indicating production for the year of about 41 tons, which compares with 64 tons produced in 1964. The Benson mine north of Salisbury appeared to have produced no microlite after June. Other tantalum ore (columbite-tantalite) production was by Kamativi Tin Mines Ltd., as a byproduct of tin mining.

A pollucite (cesium) ore body discovered in the Benson mine in 1964 continued to be mined on a small scale in 1965. Bikita Minerals (Pty.) Ltd., whose reserves of pollucite are substantial, also shipped some of the mineral in 1965.

Tin.—At yearend the outlook was for increased production of tin. The only significant producer of the metal, Kamativi Tin Mines Ltd., east of Wankie and near the Zambia border, had nearly completed its new shaft. Mill capacity was 45,000 tons per month, and most of the ore going to the mill was to be underground ore, which is richer than the open pit ore supplied the mill in recent years. The former contains up to 0.4 percent tin, compared with 0.1 to 0.2 percent for surface ore.

Nonmetals.—*Asbestos.* — Production of chrysotile asbestos in the first 9 months of 1965 was 14,830 tons larger than that in the same period of 1964, and for the whole year probably about 33 percent higher than in all of 1964.

Rhodesian and General Asbestos Corporation (Pvt.), Ltd., awarded a contract to deepen a shaft at the Birthday section of the company's mines at Shaboni. The shaft will be converted from a rectangular to a circular shaft of 7-meter diameter, and will be bottomed at a depth of 666 meters. In 1964 a haulageway was completed that connects the Birthday section with the Nil Desperandum section, allowing all ore mined to be treated at the former. At the latter section dump ore was being treated. At the company's Gaths and King mines a shaft 6 meters in diameter and 445 meters deep was scheduled for completion by mid-1966.

Mineral Fuels.—*Coal.* — Production of coal during the first 9 months was at the annual rate of 3.4 million tons compared with 3 million tons produced in 1964. Peak annual output to the present was 3.8 million tons, realized in 1954.

At yearend Wankie Colliery Co. Ltd., Rhodesia's only coal producer, was considering the possibility of establishing strip workings east of the existing No. 3 colliery workings. The project would represent the first strip mining to be undertaken in Rhodesia. In addition, the company was building the experimental char plant at Gwelo mentioned in the discussion of chormium and was considering building in the near future a new coal preparation plant and new retort coke ovens.

Petroleum.—The Beira-Feruka (Umtali) pipeline operated from January to November 1965 only, pumping 4,186,000 barrels of crude oil to Feruka over this period. Gross earnings of the pipeline company in 1965 amounted to $5.9 million, of which $4.5 million were paid in charges to the Mozambique Administration of Railways. The owner of the pipeline is Companhia do Pipeline Moçambique-Rhodesia, S.A.R.L.[3]

ZAMBIA

Zambian mineral industry prospered in 1965, largely as a result of high copper prices and despite labor unrest that resulted in strikes both by Zambian and European labor. The value of total mineral output increased by 22 percent compared with that of 1964, reaching $508.2 million, copper accounted for $480.1 million. Gross national product (market price) rose to $779.5 million from $586.3 million in 1964.[4] At yearend, however, the immediate outlook was obscure. While the Rhodesia UDI in November had little effect on the economic situation in 1965, it introduced many uncertain factors into future prospects.

On May 7, 1965, the Government announced that, effective October 24, 1964, it intended to retain the formula for assessing copper royalties that the British South Africa Company had applied previously. This means that the amount of royalty is determined not by producers' selling prices but by reference to the average prices for copper on the London Metal Exchange. At the same time the Government announced that it would give special consideration to the position of mines operating at a loss.

Late in the year the Zambian Government decided to establish a specialized Metals and Minerals Development Unit within the Ministry of Mines, to provide the Government with experts who can deal on a professional level with the copper companies and with other countries that produce copper, in matters pertaining to production levels, taxation, and Government mining policy in general. The unit was to be staffed by economists, lawyers, and statisticians.

African employment in mining and quarrying rose in Zambia's first year of independence from 42,700 at the end of September 1964 to 45,540 12 months later. In the same period employment of Europeans fell from 8,150 to 7,490. There was an acute shortage of skilled manpower which was accentuated by substantial net emigration.[5]

PRODUCTION

The value of mineral production was $91.6 million higher than in 1964, and

[3] U.S. Consulate General, Lourenco Marques, Department of State Airgram 188, May 11, 1966.

[4] Republic of Zambia, Ministry of Finance (Lusaka). Economic Report, 1966. P. 30.

[5] Page 14 of work cited in footnote 4.

copper accounted for 94.5 percent of the total value, as indicated in the following tabulation:

Commodity	Value of mineral production (millions)	
	1964	1965
Copper, blister and electrolytic	$392.2	$480.1
Zinc	14.4	13.6
Lead	3.2	6.1
Cobalt	4.4	4.8
Other minerals	2.4	3.6
Total	416.6	508.2

TRADE

At $238 million Zambia's favorable balance of visible trade in 1965 was nearly as large as the $250.6 million favorable balance achieved in 1964, and the total value of merchandise trade increased by 21 percent. Exports and imports were respectively 15 percent and 35 percent higher than in 1964.

During the year the Zambia Government issued the first of a new series of Annual Trade Reports, covering the year 1964.[6]

The 15-percent increase in exports in 1965, to $526.4 million, was almost entirely the result of sharply improved copper price. The volume of copper exports did not increase. Copper accounted for 92 percent of export earnings (91 percent in 1964); zinc, lead, manganese ore, and cobalt contributed 4 percent. Thus the mineral industry provided 96 percent of export earnings in 1965.

COMMODITY REVIEW

Metals.—*Cobalt.*—Rhokana Corp. Ltd., one of the Zambia mining companies administered by Anglo American Corp. of South Africa Ltd. (Anglo), was the only producer of cobalt metal in 1965, inasmuch as Chibuluma Mines Ltd. (administered by Roan Selection Trust Ltd.) stockpiled its cobalt-bearing concentrates following

[6] Republic of Zambia. Annual Statement of External Trade, 1964. Central Statistical Office (Lusaka), 1965.

Table 5.—Zambia: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Beryl	----	----	----	(1)	----
Cadmium—kilograms	18,912	16,859	14,993	14,631	18,158
Cobalt:					
Metal	689	727	682	1,345	1,544
Other forms, cobalt content	854	136	24	63	----
Total	1,543	863	706	1,408	1,544
Copper:					
Concentrate, copper content	97	64	68	68	e 280
Blister	151,208	113,743	137,121	145,431	163,526
Electrolytic	416,280	433,292	438,893	496,884	521,175
Other	1,449	718	836	531	193
Total	569,034	547,817	576,918	642,914	685,174
Gold [2]—troy ounces	4,192	r 5,362	4,960	5,033	5,196
Lead, refined	r 15,382	14,826	19,610	13,161	21,345
Manganese ore	53,086	r 57,545	35,250	38,010	30,813
Selenium [3]—kilograms	17,369	r 32,410	28,527	26,141	e 27,000
Silver [4]—troy ounces	738,558	r 943,932	883,681	1,001,267	848,819
Tin concentrate, tin content—long tons	1	r 5	1	8	e 15
Vanadium, contained in V_2O_5	236	----	----	----	----
Zinc, electrolytic	r 31,065	40,439	49,451	46,712	47,525
Nonmetals, except fuels:					
Amethyst—kilograms	4,508	12,664	15,443	6,714	21,254
Cement—thousand tons	122	120	116	170	168
Limestone	423,335	460,055	538,679	567,146	579,400
Mica, sheet	----	----	----	2	4
Phyllite	21,129	16,376	13,026	11,268	19,281

e Estimate. r Revised.
[1] Less than ½ unit.
[2] Chiefly contained in electrolytic copper refinery muds and blister copper.
[3] Contained in electrolytic copper refinery muds and blister copper.
[4] Refined silver and silver contained in electrolytic copper refinery muds and blister copper.

Table 6.—Zambia: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destination, 1964
Metals:			
Cadmium metal	189	13	Republic of South Africa.
Cobalt:			
Anode slimes	NA	119	All to Japan.
Copper-cobalt matte	819	1,460	All to Belgium.
Alloys	NA	32	All to Republic of South Africa.
Metal	537	1,466	United Kingdom 1,398.
Copper:			
Slimes	NA	1,590	Japan 1,352; Sweden 138.
Metal, unwrought:			
Blister	NA	153,600	West Germany 58,322; United Kingdom 48,067; Belgium 12,895.
Electrolytic:			
Wirebar	378,608	464,925	United Kingdom 167,243; Japan 62,546; Italy 50,375; West Germany 50,375.
Cathode form	37,674	38,113	Japan 14,456; United Kingdom 8,280; West Germany 6,397; Mainland China 3,045.
Ingot and bar	23,594	25,077	United Kingdom 12,305; France 3,601; India 2,888; Republic of South Africa 2,845.
Brass and bronze	NA	23	Republic of the Congo (Léopoldville) 18.
Iron and steel:			
Scrap	NA	477	All to Southern Rhodesia.
Semimanufactures:			
Castings	NA	295	Ghana 223; Tanzania 52.
Pipes and tubes	NA	124	Southern Rhodesia 97; Malawi 22.
Lead, bar and ingot	14,089	13,389	Republic of South Africa 7,907; United Kingdom 3,201; Belgium 762; Southern Rhodesia 703.
Manganese, ore and concentrate	43,562	26,971	France 10,004; West Germany 7,315; United States 4,227.
Silver, unworked—troy ounces	NA	40,000	All to Republic of South Africa.
Tin, ore and concentrate—long tons	NA	155	All to Southern Rhodesia.
Zinc, ingots and bars	47,293	45,875	Republic of South Africa 30,566; United Kingdom 2,569; France 2,182.
Old and scrap metal not further identified.	NA	1,940	Southern Rhodesia 1,458; United Kingdom 300.
Nonmetals:			
Cement, for building, including hydraulic lime.	NA	3,077	Southern Rhodesia 2,834.
Lime	NA	424	Southern Rhodesia 371.
Marble, granite, other stone	NA	700	All to Southern Rhodesia.
Mica, block and sheet	NA	3	Do.
Salt	NA	14	Southern Rhodesia 10.
Sand, stone, gravel	NA	16	All to Southern Rhodesia.

NA Not available.

closure of its cobalt smelter at Ndola in 1964. Rhokana increased its production during 1964 in response to much improved demand, and from late 1964 to June 1965 was producing at an annual rate of 1,500 to 1,600 tons. Sales in the year ending June 30, 1965 were 1,552 tons, the highest ever achieved. Rhokana has introduced a cyanide-regrind circuit in the cobalt plant, which has considerably improved recovery by increasing the selectivity of the cobalt-copper separation in the flotation step.

Copper.—Zambia's 1965 production of blister and electrolytic copper totaled 684,701 tons valued at $480 million, of which 163,526 tons was blister and 521,175 tons was electrolytic copper. These figures represent increases of about 42,000 tons and $88 million over the 1964 results. The volume was about 15 percent of free world copper production in 1965.

The price at which the producers sold copper rose during the year but remained well under the London Metal Exchange price. Early in 1966 the producers' price stood at 42 cents per pound.

The largest companies in Zambia that Anglo controlled and administered during the year continued to be Rhokana Copper Refineries Ltd. and the following producing mining companies: Nchanga Consolidated Copper Mines Ltd. (financial year ends March 31), Rhokana Corp. Ltd. (year ends June 30), and Bancroft Mines Ltd., an Nchanga subsidiary (year ends March 31). The total 1965 copper output of the mining companies was 402,000 tons, about 13 percent higher than in 1964 and about 10 percent of free world mine pro-

Table 7.—Zambia: Imports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964		
		Total	Sources	
			Republic of South Africa	Principal sources except Republic of South Africa
Metals:				
Aluminum semimanufactures	1,170	230	162	United Kingdom 38.
Chromium ore and concentrate	-------	401	381	Southern Rhodesia 20.
Copper and copper alloys, all forms	709	390	191	Southern Rhodesia 163.
Iron and steel:				
Iron ore and concentrate	-------	19	NA	NA.
Pig iron, sponge iron, ferroalloys	18	2,908	395	Southern Rhodesia 2,512.
Ingots and other primary forms	25	33	21	Southern Rhodesia 7; United Kingdom 5.
Semimanufactures	83,896	49,402	25,417	Southern Rhodesia 16,490; United Kingdom 3,164.
Lead and lead alloys	85	156	76	Southern Rhodesia 67.
Tin and tin alloys—long tons	134	41	9	Southern Rhodesia 32.
Nonferrous ores and concentrates not further described.	NA	211	211	
Nonferrous metal scrap	NA	36	36	
Other old and scrap metal	NA	308	-------	Southern Rhodesia 268.
Nonmetals:				
Abrasives:				
Grinding and polishing wheels	NA	64	58	United Kingdom 2.
Industrial diamond—carats	NA	144,323	127,697	United Kingdom 6,939.
Asbestos, crude, washed or ground	NA	1,194	-------	All from Southern Rhodesia.
Cement:				
Building, including hydraulic lime	45,802	5,260	5,088	All from Southern Rhodesia.
Clinker		1,519	-------	
Fire and furnace		1,359	1,155	
Fertilizers	247,067	31,873	388	Southern Rhodesia 17,744; West Germany 9,587.
Gypsum and plaster of paris	15,373	7,739	7,413	Southern Rhodesia 269.
Lime, building	8,297	2,654	2,549	Southern Rhodesia 56.
Fire clay	NA	2,255	1,920	Southern Rhodesia 224.
Marble, granite, other monumental stone	NA	76	9	Southern Rhodesia 67.
Mica, blocks or sheets	NA	19	18	
Cornish stone, kaolin, china clay	NA	84	64	United Kingdom 11.
Salt	39,279	10,294	6,580	Angola and Cabinda 1,679; United Kingdom 765.
Explosives, industrial:				
Prepared explosives	20,945	10,329	10,324	
Fuses	840	528	528	
Detonators—number, millions	10	4	3	
Mineral fuels:				
Solid fuels:				
Coal	60,116	977,840	3,593	Southern Rhodesia 974,247.
Coke		65,749	-------	All from Southern Rhodesia.
Liquid fuels:				
Gasoline—thousand 42-gallon barrels	1,253	658	(2)	Iran 407; Bahrain 234.
Kerosine—do	375	88	(2)	Aden 44; Bahrain 28; Iran 13.
Jet fuel—do	280	17	-------	Aden 15.
Distillate fuel oil—do	1,508	382	(2)	Iran 227; Saudi Arabia 135.
Residual fuel oil—do	42	6	(2)	Iran 5.
Lubricating oils—do	132	45	39	United States 3.
Greases, jelly, waxes	3,455	1,148	434	Indonesia 377; United States 202.
Asphalt and bitumen	17,685	50	38	Southern Rhodesia 11.
Other—barrels	7,550	3,239	96	United Kingdom 2,530.

NA Not available.

[1] The statistics for 1964 are for Zambia alone, whereas those for 1963 are for the former Federation of Rhodesia and Nyasaland (dissolved Dec. 31, 1963), which comprised Southern Rhodesia (Rhodesia), Northern Rhodesia (Zambia), and Nyasaland (Malawi).

[2] Less than ½ unit.

duction of copper in 1965. Ore reserves at financial yearend were reported as follows:

	Thousand tons	Grade (percent copper)
Nchanga	217,841	4.28
Rhokana	108,330	2.95[1]
Bancroft	84,992	3.56
Total	411,163	3.78

[1] Plus about 0.13 percent cobalt.

Nchanga reached its scheduled delivery of 100,000 tons of ore per month to Bancroft's concentrator, and Nchanga's production of electrolytic and blister copper in the year ending March 31, 1966, was expected to be 254,000 tons. Instead of the $14 million to $22.4 million expansion program that would have been needed if the Bancroft concentrator had not been used, a smaller $7 million program was being carried out to enable this production rate to be maintained in the face of a decreasing ore grade. The program included installation of a crushing and washing plant with a monthly capacity of 272,000 tons. This plant was to be fed with ore brought in trucks from the Nchanga open pit mine. The coarser fraction of the product was to go to Bancroft, and the finer to Nchanga's concentrator. The washed ore would be more suitable metallurgically than Chingola high-grade ore, and handling difficulties in the rainy season would be eliminated. This rationalization should improve Bancroft's financial situation, although Bancroft continued to operate at a loss in 1965.

Rhokana's production of finished copper in the year ended June 30, 1965, was 101,600 tons, about 7,000 tons less than in the previous year. The decrease was largely due to rock pressure problems in Rhokana's Mindola mine, which reduced ore deliveries from the mine by 354,000 tons; only part of this decrease was made up by increased deliveries from the Rhokana's Nkona mine.

Prospecting and exploration by companies of the Anglo group continued. Such expenditures were at the annual rate of about $1.7 million.

Late in 1965 the commercial scale (500 tons per day) TORCO (treatment of refractory ores) plant was completed and put in operation by three companies of the Anglo group. Successful operation of the plant could greatly enhance the prospects of several idle properties that have large reserves of oxide-silicate ores, such as Bwana Mikubwa and Kansanshi.

Roan Selection Trust Ltd. (RST) continued to operate its Luanshya Division (formerly Roan Antelope Mine) and to control and administer Ndola Copper refineries and the following producing mining companies: Mufulira Copper Mines Ltd., Chibuluma Mines Ltd., and Chambishi Mines Ltd. The financial years of these companies end June 30. In the year ended June 30, 1965, the mining companies produced 281,441 tons of finished copper, a record for companies of the RST group for the second successive year. Ore reserves of the companies and of the undeveloped property of Boluda Mines Ltd. of the RST group as of June 30, 1965, were reported as follows:

	Thousand tons	Grade (percent copper)
Mufulira	160,368	4.28
Luanshya Division	86,150	2.87
Chibuluma	7,667	4.83[1]
Chambisi	32,000	3.37
Baluba	102,000	2.41[2]
Total	388,185	3.41

[1] Plus 0.18 percent cobalt.
[2] Plus 0.16 percent cobalt.

Mufulira completed extensions to its refinery and at yearend could handle all of its rated output of 165,000 tons of copper annually, plus 18,000 tons contained in Chambishi sulfide concentrates. The cost of the extensions was $4.6 million.

Luanskya Division produced 93,468 tons of copper in the 1964–65 financial year, somewhat less than in the previous year. There were no plans to increase production at this high-cost mine.

Chibuluma copper production fell slightly to 22,981 tons, which is about the capacity of the operation. There were no immediate plans to increase output.

Chambishi produced its first copper in April 1965, from oxide ore. Late in 1965 the surface plant was completed by bringing the sulfide concentrator into production. The concentrator was to produce annually about 18,000 tons of copper contained in high-grade concentrates which

Mufulira will smelt. Additional production by the roast leach plant will bring total copper capacity to 26,400 tons per year, but in the year ending June 30, 1966, only about 15,000 tons will be produced.

RST continued to explore its extensive exclusive prospecting areas, which were extended in 1965 to include additional ground south of RST's concession in the Mwinilunga area. All four of RST's exploration companies—Baluba, Chisangwa, Kadola, and Mwinilunga—were active.

Lead and Zinc.—The only producer of lead and zinc in Zambia, The Zambia Broken Hill Development Co. Ltd. (Anglo group), increased lead production by 62 percent. Zinc production, at about the 1964 level, included 98.5-percent grade zinc and 99.95-percent grade zinc in about equal proportions.

The company had experienced difficulty in 1964 in operating its Imperial Smelting Furnace with a high lead content in the sinter which is fed to it, and lead content had to be lowered. This difficulty was overcome in 1965, but the goal of producing 70,000 tons of combined metals was not achieved; this goal should be reached in 1966.

Three factors make it unlikely that dividends will be maintained in the near future at the 1965 level, according to the chairman: Lower prices for lead and zinc, increasing costs of production, and a substantial expansion program. It is estimated that some $7 million will be spent in the next 5 years on prospecting, mining plant, housing, and the concentrator and smelter; of this sum, $2.8 million will be spent in 1966.

Nonmetals.—*Cement.*—The cement industry continued to expand. The Zambian Government increased its share in the only producer, Chilanga Cement Ltd., to 40 percent by purchase of 1.98 million shares at 8 shillings ($1.12) each, payable over 5 years. The existing factory, south of Lusaka, was to add a third kiln to increase capacity 50 percent over the present 180,000 tons per year by mid-1966, and a second plant was planned for Ndola, with a capacity of 180,000 tons per year. The cost of the total expansion is estimated at $8.4 million. Zambia in 1965 imported cement at an increasing rate to cope with growing construction activity. Cement sales in 1965 totaled 236,000 tons.

Gypsum.—At Lochinvar near Monze, 120 miles southwest of Lusaka, Anglo American Corp. of South Africa Ltd. was opening the country's first gypsum mine, to supply the cement industry. Gypsum previously was imported from Republic of South Africa. A processing plant was being built at a cost of $112,000, with a capacity of 90,000 tons of product per year. Reserves at Lochinvar were roughly estimated 900,000 tons.

Mica.—Small-scale production of mica continued in the Lundazi district on the Malawi border. The activity had been encouraged by the British South Africa Company to provide local employment, and the Zambian Government was continuing to promote it.

Mineral Fuels.—*Coal.* — There was no production of coal in Zambia in 1965, but development of the largest known deposit was commenced late in the year to provide an indigenous source to offset possible loss of imports from Southern Rhodesia.

Two areas have been mapped and investigated for coal deposits: The Zambezi Valley north of Lake Kariba, and the Luano Valley, a downfaulted area 50 miles southeast of Broken Hill. The most promising occurrences are in the mid-Zambezi Valley and of these the largest is at Nkandabwe, 45 miles southeast of Choma. The coal seams occur in the Gwembe coal formation, in a downfaulted block of Lower Karroo sediments, over an 8- by 1½-mile area. The main seam ranges in minable thickness from 6 to 9 feet in the workable area, and dips about 20° southeast; approximately 17 million recoverable tons were estimated here by the Northern Rhodesian Geological Survey (Bulletins No. 1, 1959; No. 3, 1963; No. 4, 1960). The quality of the coal is mediocre; average ash is 24 percent, calorific value is about 10,500 B.t.u. per pound, and volatile matter is about 22 percent.

In October 1965 plans were announced to form a company to develop the Nkandabwe deposit. The Zambian Government has a 50-percent interest in the company, to be called the Nkandabwe Coal Company (Pvt.) Ltd. The remaining interests will be divided between Anglo and RST.

Late in 1965 a contract for site preparation was awarded to the Amalgamated Construction Company, of Kitwe, an Anglo subsidiary, and a contract for transport of the coal to the railroad siding at Batoka, 20 miles northeast of Choma, was given to Zalbro United Transport, of Choma. The announced production goal was an annual output of 720,000 tons, starting by mid-1966. The mine was to be opencast, and a total of 3 million tons of overburden was to be removed. Anglo and RST agreed to buy the first 3 million tons of coal.

MALAWI

Mineral production in Malawi during the year was limited to construction materials. Nyasaland Portland Cement Company at Changalumi west of Zambia produced 31,493 tons of cement clinker, using about 45,000 tons of limestone, 2,700 tons of shale, and 900 tons of laterite. Stone quarried amounted to about 3,770 cubic meters. An unrecorded quantity of clay was mined in rural areas.

With respect to the future, plans still existed ultimately to utilize the bauxite on the Lichenya Plateau, where 54 million tons have been proven.

The strontianite-rich rare-earth occurrence at Kangankunde Hill was optioned to mid-1966 to a local businessman, who reportedly was advised that a fair price for the ore would be $280 (£100) per ton.

The Geological Survey of Malawi was completing a geological survey of the country to a scale of 1:100,000. The work was expected to be completed by the end of 1969, when the functions of the Geological Survey would be oriented toward engineering geology. Some decrease in personnel, all expatriate, was expected.

The first annual publication on Malawi's external trade was issued during the year by the Director of Census and Statistics, National Statistical Office, Zomba. It was for 1964. The compilation of the statistics and the preparation of the volume was undertaken by the Central Statistical Office of Southern Rhodesia at Salisbury. The volume reports total domestic exports of $32.2 million and imports less reexports of $37.3 million, or an unfavorable balance of visible trade of $5.1 million in 1964. Imports in the minerals area comprised iron and steel and nonferrous metal semimanufactures and petroleum products. Scrap metal was the largest mineral export.

Table 8.—Malawi: Imports of metals and minerals in 1964

(Metric tons unless otherwise specified)

Commodity	1964	Principal sources	
		Republic of South Africa	Other
Metals:			
Aluminum, semimanufactures	183	40	United Kingdom 64; Belgium 45.
Antimony, bar, block and ingot	2	-------	Netherlands 2.
Copper:			
Copper and copper alloys, unwrought.	12	(1)	Southern Rhodesia 11.
Semimanufactures	22	6	United Kingdom 13.
Iron and steel:			
Pig iron	18	-------	All from Southern Rhodesia.
Semimanufactures	5,983	698	Southern Rhodesia 2,410; United Kingdom 1,280.
Lead, all forms	9	(1)	Southern Rhodesia 7.
Tin, all forms—long tons	15	6	Southern Rhodesia 8.
Zinc, all forms	1	(1)	NA.
Nonmetals:			
Abrasives, grinding stones and wheels	3	2	
Bricks, fire—number	12,728	8,228	Southern Rhodesia 4,400.
Calcite, limestone and dolomite	16	16	
Cement:			
Clinker	829	-------	All from Southern Rhodesia.
Other	663	2	Southern Rhodesia 623.
Clay:			
Fire	10	3	NA.
Fullers earth	48	-------	All from United Kingdom.
Fertilizer materials:			
Nitrogenous	6,271	2	United Kingdom 2,758; West Germany 1,822; Italy 1,375.
Phosphatic	116	-------	Belgium 55; West Germany 54.
Potassic	115	-------	East Germany 40; West Germany 37.
Mixed or compound fertilizers	5,650	1	Southern Rhodesia 3,324; Netherlands 1,091.
Fertilizers, not further described	106	-------	Portugal 82; West Germany 23.
Graphite and carbon products	24	NA	NA.
Gypsum and plaster of paris	686	686	
Lime	201	164	
Magnesium sulfate, natural	19	NA	United States 10.
Marble, granite and other building stone	4	-------	All from Southern Rhodesia.
Ochre and earth pigments	1	NA	NA.
Salt	6,164	57	Mozambique 5,632; Angola 430.
Mineral fuels:			
Solid fuels:			
Coal	62,459	235	Southern Rhodesia 41,775; Mozambique 20,449.
Coke	116	-------	All from Southern Rhodesia.
Petroleum refinery products:			
Gasoline—42-gallon barrels	191,437	NA	Iran 153,807; Saudi Arabia 24,905; Bahrain 12,467.
Kerosine—do	57,188	9,064	Iran 36,600; Saudi Arabia 5,862; Bahrain 5,633.
Distillate fuel oil—do	179,399	200	Iran 86,354; Saudi Arabia 79,463.
Residual fuel oil—do	9,550	200	Iran 4,432; Saudi Arabia 4,889.
Lubricating and other oils—do	11,037	9,367	France 657; United States 286.
Greases, jellies and waxes	141	54	Southern Rhodesia 42; United States 9; Indonesia 4.
Asphalt and bitumen	771	690	Southern Rhodesia 72.
Tar and pitch preparation	5	NA	United Kingdom 4.

NA Not available.
[1] Less than ½ unit.

The Mineral Industry of Senegal

By Walter C. Woodmansee [1]

The main features of Senegal's mineral industry in 1965 were continued expansion in the mining and marketing of phosphate rock; termination of beach sand mining of ilmenite, rutile, and zircon, output of which had decreased markedly in 1964; and a large increase in imports of crude petroleum as feedstock at the new M'Bao refinery.

Crude phosphate rock and small quantities of processed phosphatic fertilizers accounted for about $11 million of the total mineral production valued at $15 million.[2]

Mineral investigations were conducted by the Bureau de Recherches Géologiques et Minières (BRGM), the French Government mineral exploration company, and by the United Nations. The BRGM completed arrangements for nonferrous mineral prospecting in southeast Senegal for 2 years beginning January 15, 1966. The BRGM also completed the last two of seven geologic maps of eastern Senegal at a scale of 1:200,000 and was preparing a report on the geology of this region. The hydrogeology of the Haut Delta area was under investigation, and a hydrogeologic map of Senegal at a scale of 1:500,000 was in preparation. The BRGM also studied phosphate rock deposits of the Eocene period in the Lac de Guiers region and construction stone on Cape Verde Peninsula.

A United Nations Special Fund project, involving geologic, geophysical, and geochemical work in eastern Senegal, was extended through 1966. Discoveries were made of chromite in the Gabou area, near the eastern border, gold along the Dialé and Makabingui Rivers, and diamond in the drainages of the Faleme River and tributaries. The United Nations also sponsored the training of Senegalese for government geologic and mining work.

PRODUCTION

Mineral industry output in 1965 included crude phosphate rock, petroleum refinery products, processed phosphatic fertilizers, and salt. The phosphate rock mining rate reached 1 million tons annually, and further increases were planned. Data on petroleum refinery output, which exceeded 300,000 tons in 1964, the first full year of operation, were not available for 1965. However, the supply of imported crude oil available for refinery feedstock indicated an increase in output of refinery products. Phosphatic fertilizer output was largely for the export market; refined petroleum production was for both the domestic and export (Mali and Mauritania) markets; salt output provided for domestic demand and small exports.

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from the African Financial Community franc (CFAF) to U.S. dollars at the rate of CFAF245 = $1.00.

Table 1.—Senegal: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Titanium concentrate:					
Ilmenite	17,496	22,432	12,189	1,320	---
Rutile	177	736	708	54	---
Zirconium concentrate	5,388	2,336	3,069	554	---
Nonmetals:					
Cement---thousand tons	182	183	190	205	181
Fertilizer materials:					
Phosphate rock:					
Aluminum phosphate	139,380	141,426	125,814	120,939	134,940
Calcium phosphate	406,969	497,090	470,080	677,081	867,239
Processed: [1]					
Aluminum phosphate, dehydrated	31,197	41,681	e 32,300	32,254	28,639
Other phosphatic [2]	7,314	7,425	e 10,900	10,018	7,694
Salt [3]---thousand tons	44	48	e 60	56	47
Mineral fuels:					
Petroleum:					
Crude	2,242	463	---	---	---
Refinery products:					
Gasoline	---	---	3,481	73,390	NA
Kerosine and jet fuel	---	---	665	26,580	
Distillate fuel oil	---	---	3,430	68,860	
Residual fuel oil	---	---	3,263	105,690	
Other	---	---	---	26,025	
Total	---	---	10,839	300,545	

e Estimate.
[1] Derived from crude aluminum phosphate output.
[2] Includes products marketed under trade names of Baylifos and Phosphal.
[3] Includes production of Mauritania, estimated at 500 to 800 tons per year.

TRADE

As in previous years, Senegal during 1965 was a notable world source of phosphate rock and an importer of iron and steel and energy products. Exports of phosphate rock were valued at $6.8 million in 1963, $9.6 million in 1964, and $10.8 million in 1965, accounting for the bulk of the country's mineral export values. Iron and steel imports totaled $5.4 million in 1964 and $5.6 million in 1965. Imports of petroleum refinery products have been adjusted in relation to production from the new refinery, which went on stream in late 1963 supplied wholly by imported crude oil. Imports of energy products totaled nearly $8.0 million in 1964 and $10.3 million in 1965.[3]

The following tabulation illustrates the relationship between mineral trade and total trade in recent years:

[3] Statistical Office of the European Communities, Overseas Associates: Foreign Trade Statistics; January-December 1963, pp. 35–44 and 97–105; No. 40, 1965, 31 pp.; and No. 7, 1966, pp. 19–45.

	Million dollars		Mineral commodities share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1963	6.9	110.5	6.2
1964	10.9	122.5	8.9
1965	11.2	128.4	8.7
Imports:			
1963	16.4	156.0	10.5
1964	16.8	171.6	9.8
1965	19.2	164.3	11.7
Net trade balance:			
1963	−9.5	−45.5	XX
1964	−5.9	−49.1	XX
1965	−8.0	−35.9	XX

XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

Source: Cited in footnote 3.

Table 2.—Senegal: Exports of metals and minerals

(Metric tons)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Copper, scrap	616	545	65	France 288; West Germany 174.
Iron and steel:				
Scrap	11,269	6,036	3,013	Japan 3,438; India 1,252; Spain 1,186.
Unwrought and semimanufactures.	256	463	4	Italy 444.
Lead	175	221	29	Belgium-Luxembourg 154; France 67.
Titanium concentrate	13,877	2,148	-------	All to France.
Zinc	11	8	5	All to France.
Ore and concentrate, not elsewhere specified	10	141	94	All to United States.
Nonmetals:				
Cement and lime	80	1,500	51	All to Guinea.
Fertilizer materials:				
Phosphate rock:				
Aluminum phosphate	49,385	88,239	108,350	West Germany 193,412; United Kingdom 119,313; Japan 111,062; France 88,241.
Calcium phosphate	346,257	633,200	818,620	
Manufactured [1]	21,343	19,273	33,336	Mainly to France.
Salt	43,302	5,460	NA	NA.
Stone, construction, sand and gravel.	53	32	-------	NA
Nonmetals, not elsewhere specified.	45,522	11,917	6,162	Cameroon 5,543; Togo 3,309.
Mineral fuels:				
Petroleum:				
Refinery products, unspecified.	80	156	58	To bunker stores 114 (lubricants); Guinea 40.

NA Not available.

[1] Includes dehydrated aluminum phosphate and products marketed under trade names of Baylifos and Phosphal.

Sources: Statistical Office of the European Communities, Overseas Associates. Partial data on the fertilizer materials are from company sources.

Table 3.—Senegal: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:				
Aluminum [1]	212	352	287	France 345.
Copper [1]	171	123	110	France 117.
Iron and steel:				
Scrap	14	39	21	Gabon 21; Guinea 10.
Pig iron and ferroalloys	2	12	22	All from France.
Semimanufactures:				
Bars, rods, shapes	18,364	16,259	15,988	France 15,341.
Plate and sheet	8,326	13,082	6,840	France 10,542; Belgium-Luxembourg 2,412.
Tubes, pipes, and fittings.	5,297	6,669	7,273	France 6,285.
Other	1,412	2,297	1,799	France 2,143.
Total	33,399	38,307	31,900	
Lead [1]	68	100	111	France 83; Netherlands 11.
Tin [1] long tons	15	14	8	All from France.
Zinc [1]	44	64	49	France 45; Republic of South Africa 10.
Nonferrous metals, not elsewhere specified.[1]	5	12	2	France 11.
Nonmetals:				
Abrasive materials, not further described.	40	75	53	Algeria 59; France 16.
Cement and lime	9,572	7,587	7,476	Morocco 3.403; France 3,197.
Clay construction materials	3,061	3,325	2,715	West Germany 1,831; France 1,295.
Fertilizers, crude and manufactured.	15,554	26,897	21,772	France 13,608; Belgium-Luxembourg 8,401.
Gem stones, precious and semiprecious. kilograms	2,000	NA	NA	
Pyrite	6	--------	--------	
Stone, construction, sand and gravel.	6,823	6,038	5,085	Morocco 3,342; France 2,332.
Nonmetals, not elsewhere specified.	1,801	1,587	1,501	France 1,455.
Mineral fuels:				
Coal, coke, and briquets	320	833	899	All from France.
Petroleum:				
Crude	--------	199,462	282,453	Algeria 122,294; Gabon 77,168.
Refinery products:				
Gasoline	72,103	43,244	NA	NA.
Kerosine	18,569	6,140		
Distillate fuel oil	17,036	9,932		
Residual fuel oil	148,901	52,172		
Asphalt and bitumen	6,172	7,791		
Other	6,648	6,165		
Total	269,429	125,444	154,617	Venezuela 42,607; Netherlands 19,882; West Indies 19,044; France 12,708.
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation.	299	224	213	France 110; Iraq 75.

NA Not available.
[1] Unwrought and semimanufactures, including alloys.

Sources: Statistical Office of the European Communities, Overseas Associates. Data on petroleum refinery products are from Bulletin Statistique et Economique Mensuel, Dakar, Senegal.

COMMODITY REVIEW

METALS

Ilmenite, Rutile, and Zircon.—Société Minière Gaziello, which is part of the Compagnie de Produits Chimiques et Électrométallurgiques Pechiney organization, terminated beach sand operations at Djifere in February and moved its equipment to a new site in the M'Bao-Joal region, about 70 kilometers south of Dakar.[4] In April, however, the company decided to abandon the new property because of excessive chomium content of the concentrate. No production was reported during 1965 for the first time in many years.

NONMETALS

Diamond. — The BRGM joined with Anglo American Corporation of South Africa Ltd. in a diamond prospecting venture in eastern Senegal. Washing tests, geochemical investigations, and sampling of alluvial concentrations were conducted. Results were not encouraging, and work was discontinued.[5]

Fertilizer Materials.—*Phosphate Rock.*— Mine expansion continued at the Taiba property, 18 kilometers north of Tivaouane, where output of calcium phosphate by Compagnie Sénégalaise des Phosphates de Taiba was expected to reach 1.5 million tons in 1966. In May, new installations raising annual capacity to 1 million tons were dedicated by President Senghor. International Minerals & Chemical Corp. (IMC), of Skokie, Ill., which held a 12-percent interest in the operating company, had an option to purchase additional interests to a total of 51 percent. In December, however, IMC announced that this option would not be exercised.

Proved reserves at Taiba, early in the year, were reported at 38 million tons of crude phosphate rock amenable to upgrading to 82 percent bone phosphate of lime and 60 million tons of probable ore.[6]

The Thiès deposit of aluminum phosphate, 85 kilometers east of Dakar, was worked during the November to April dry season because of limited demand. Société Sénégalaise des Phosphates de Thiès, mine operator and subsidiary of Pechiney, the large French mining and metallurgical company, was granted a prospecting permit of 2,000 square kilometers in an area east of Tivaouane.

Reserves of crude aluminum phosphate at Thiès were 37 million tons at 29.5 percent P_2O_5 and 65 million tons at 28 percent P_2O_5.[7]

Syndicat de Recherches de Phosphates du Lac de Guiers, comprising the Government of Senegal (10 percent), BRGM (35 percent), and Pechiney (55 percent), was granted an exploration permit to a 5,800-square kilometer area in the Lac de Guiers region. Shaft sinking and exploratory drilling were conducted, but results were unfavorable, and the project was abandoned later in the year.

Manufactured fertilizers.—Société Industrielle des Engrais du Sénégal, a French consortium largely held by Société des Potasses d'Alsace, the French potash monopoly, was formed to establish a new fertilizer plant. The company applied to the International Bank for Reconstruction and Development for financing, and representatives of the International Finance Corp. visited Senegal to investigate loan possibilities.[8] No action had been taken by yearend.

Stone.—The BRGM conducted exploration for construction stone on Cape Verde Peninsula and selected five sandstone and basalt deposits for further investigation.

MINERAL FUELS

Petroleum.—The entire offshore coastal area of Senegal was taken up in oil concessions granted to three operators: Esso Exploration Senegal, Inc., 10,448 square kilometers from latitude 14°N northward to the border with Mauritania; Société des Pétroles du Senegal (SPS), 3,320 square kilometers from latitude 14°N south to and including the offshore of Gambia; and Compagnie Pétroles Total (Afrique Ouest) (COPETAO), 10,670 square kilometers south of Gambia to the Portuguese Guinea border.

Esso agreed to spend $2.4 million over a 5-year period on its offshore concession.[9]

[4] Mines at Métallurgie. No. 3599, October 1965, p. 453.
[5] Bureau de Recherches Géologiques et Minières. Annual Report 1965, pp. 70–72.
[6] "Activité de l'Industrie Minière de la Republique du Senegal," Mines et Métallurgie. No. 3595, May 1965, p. 240.
[7] Source cited in footnote 6.
[8] U.S. Embassy, Dakar, Senegal. State Department Dispatch A–78, Aug. 20, 1965, 2 pp.
[9] U.S. Embassy, Dakar, Senegal. State Department Dispatch A–479, June 22, 1965, 1 pp.

From September to December, an airborne magnetic survey was conducted, and seismic work was planned.

SPS, comprising BP Exploration Co. Ltd. and Société Francaise des Pétroles BP (50 percent), and other French state and private interest (50 percent), completed a 1-month marine seismic survey.

COPETAO, an affiliate of Compagnie Française des Pétroles, completed a seismic survey, started in 1964, and a 4-month gravity survey of a domal structure. Drilling of the structure was planned for 1966 upon arrival of a mobile drilling platform, *Ile de France,* from the Netherlands. The first well site is 25 kilometers off the Casamance coast.[10]

A 42-percent increase in crude oil imports indicated that the refinery of Société Africaine de Raffinage (SAR) at M'Bao probably expanded production; official output data were not available. SAR ownership was described as follows: [11] Société Africaine des Pétroles, 30 percent; British Petroleum Co. Ltd., Compagnie Française des Pétroles Aquitaines, Mobil Oil Co., Shell Oil Co., and Texas Oil Co., each 11.8 percent; Banque Sénégalaise de Developpement, 10 percent; and Esso Oil Co., 1 percent.

The refinery produced two grades of gasoline, kerosine, jet fuel, distillate and residual fuel oil, and liquefied petroleum gas for Senegal, Mali, and Mauritania.

[10] Bulletin of the American Association of Petroleum Geologists. V. 50, No. 8, August 1966, pp. 1733–1734.

[11] Europe and Oil "Senegalese Refinery Provides for Various Needs of Three African States." V. 4, March 1965, pp. 44–46.

The Mineral Industry of Sierra Leone

By Henry E. Stipp [1]

The minerals industry continued to be one of the principal sectors of the Sierra Leone economy in 1965. Production of diamond continued at about the same rate; however output of iron ore and bauxite increased substantially.

Mineral commodity exports in 1965 presumably accounted for about three-fourths of total exports as they did in 1964, but despite increases apparently failed to produce a favorable overall trade balance. Diamond, the nation's most important single source of foreign exchange, accounted for about 60 percent by value of all mineral exports.

Although the country ranked seventh among world diamond producers in terms of quantity of output in 1965, its high ratio of gem quality stones to industrial stones ranked it fourth in terms of value in 1964 and probably in 1965 as well, behind South-West Africa, Republic of South Africa, and Republic of the Congo (Leopoldville).

An estimated 7,800 persons were employed by mining companies in 1965, and an additional 40,000 individuals were reported [2] to be privately mining alluvial diamonds. Thus employment in the minerals industry constituted a large percentage of the 105,000 reported wage earners [3] in the nation.

The Government of Sierra Leone continued its policy of encouraging prospecting for new deposits of minerals and announced its intention to revive alluvial gold mining in the Northern Province.

A loan of $3.8 million [4] was granted to Sierra Leone by the World Bank for expansion of electric power generating and distribution facilities.

The Sierra Leone Chamber of Mines was formed in 1965 to assume the function of the former Sierra Leone Mining Association, which was dissolved recently. The new organization consisted of the Sierra Leone Development Co. Ltd. (DELCO); Sierra Leone Selection Trust Ltd.; Sierra Leone Ore & Metal Co. Ltd.; and Sherbro Minerals Ltd.

PRODUCTION

Total production of diamonds dropped slightly from that of 1964. While output of Sierra Leone Selection Trust increased slightly, production of individual diggers from alluvial deposits fell sharply. Annual production was expected to remain at current levels for the next few years, but in the long run production is uncertain. A small decrease in the price of diamonds contributed to their decrease in value from $55.8 million in 1964 to $51.7 million in 1965.

Iron ore production increased slightly and is expected to reach 2.7 million tons annually in the near future. Output of bauxite also increased from that of 1964. An expansion project underway at yearend was expected to increase production to 500,000 tons annually. Production of rutile, to begin in late 1966, was scheduled at the rate of 100,000 tons per year.

The total value of minerals produced in 1965 was approximately $68.2 million, a decrease of 3.8 percent from the $70.9 million value of 1964.

---

[1] Physical scientist, Division of International Activities.

[2] Sierra Leone Trade Journal. Economic Minerals and the Mining Industry in Sierra Leone. V. 5, No. 4, October–December 1965, p. 127.

[3] U.S. Embassy, Freetown, Sierra Leone. State Department Airgram A-263, Apr. 28, 1966, p. 5.

[4] Where necessary, values have been converted from Leone (Le) at the rate of Le1=US$1.40.

Table 1.—Sierra Leone: Production of metals and minerals

Commodity	1961	1962	1963	1964	1965
Metals:					
Bauxite—thousand metric tons	-----	-----	r 20	r 153	207
Chromite—metric tons	-----	11,450	2,782	-----	-----
Gold—troy ounces	22	30	44	r 49	NA
Iron ore—thousand metric tons	1,695	1,873	1,912	1,993	2,144
Nonmetals:					
Diamond—thousand carats	r 2,295	r 1,637	r 1,388	r 1,463	1,462

r Revised. NA Not available.

TRADE

The role of mineral commodities in the total foreign trade of Sierra Leone is shown in the following tabulation:

	Value (million dollars)		Minerals' share of total (percent)
	Mineral commodities [1]	Total	
Exports:			
1963	37	81	46
1964	71	95	75
Imports:			
1963	13	84	15
1964	15	99	15
Trade balance:			
1963	+24	—3	XX
1964	+56	—4	XX

XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

Sierra Leone's export of metals and minerals in 1964 increased substantially over those of 1963. Diamonds valued at $55.8 million, were the most important mineral export commodity; however, iron ore, valued at $14.6 million, and bauxite at $570,000, also contributed to the nation's favorable balance of trade in minerals.

Imports of metals and minerals, which increased slightly over those of 1963, consisted largely of mineral fuels valued at $10.2 million and iron and steel products valued at $2.7 million.

In 1964 Sierra Leone increased its import of commodities from the United States 14 percent over those of 1963. Among these items, valued at $4.9 million, was $400,000 of mining and construction machinery.

Table 2.—Sierra Leone: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Bauxite—thousand tons	20	129	West Germany 57; Italy 51, East Germany 11.
Chromite	8,840	----	
Gold—troy ounces	44	49	All to United Kingdom.
Iron ore:			
Concentrate—thousand tons	1,844	1,856	West Germany 678; United Kingdom 625; Netherlands 517.
Fines—do	140	156	All to Netherlands.
Total—do	1,984	2,012	
Ferromax [1]	787	223	West Germany 154; Italy 25; Philippines 10; Turkey 10; United Kingdom 10.
Nonmetals:			
Diamond, uncut and unworked:			
Government Diamond Office—thousand carats	649	824	All to United Kingdom.
Sierra Leone Selection Trust—thousand carats	1,089	826	Do.
Total—do	1,738	1,650	
Mineral fuels:			
Petroleum refinery products (reexports):			
Gasoline—thousand 42-gallon barrels	r 3	NA	
Jet fuel—do	16	NA	
Kerosine—do	r 94	NA	
Distillate fuel oil—do	505	[2] 524	All to Bunkers.
Residual fuel oil—do	1,246	1,244	Do.

r Revised. NA Not available.
[1] Trade name for specularite largely for use as pigments.
[2] Includes other such as aviation gasoline, commercial jet fuel, and lubricants.

Source: Sierra Leone Trade Report, Government Printing Department.

Table 3.—Sierra Leone: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum, all forms	125	72	United Kingdom 33; West Germany 14; Switzerland 11.
Copper semimanufactures	50	108	United Kingdom 84; France 1.
Iron and steel semimanufactures	23,424	17,067	Japan 9,076; United Kingdom 3,354; Belgium 2,289.
Lead, ingots and semimanufactures	36	30	United Kingdom 15; Belgium 13; Netherlands 2.
Silver, unwrought and semimanufactures—troy ounces	6,936	1,344	All from United Kingdom.
Tin, all forms—long tons	1	1	Do.
Zinc, all forms	2	641	Japan 639; United Kingdom 2.
Nonmetals:			
Cement, asbestos	885	292	Ireland 132; United Kingdom 130; Czechoslovakia 16.
Cement	r 68,344	61,916	West Germany 32,518; United Kingdom 12,485; East Germany 10,998.
Clay manufactures	627	504	United Kingdom 304; Italy 66; West Germany 62.
Fertilizers, mineral	2,248	1,167	Belgium 733; United Kingdom 214; Netherlands 210.
Lime	673	270	United Kingdom 260; Israel 10.
Salt	r 8,862	9,001	United Kingdom 8,744; Senegal 221; West Germany 29.
Stone, sand and gravel	--------	250	United Kingdom 216; United States 22; Canary Islands 10.
Other, n.e.s	--------	248	Italy 194; West Germany 28; United Kingdom 16.
Mineral fuels:			
Coal, coke, and briquets	4,523	81	All from United Kingdom.
Gas, natural and manufactured	87	65	Netherlands 46; United Kingdom 11; Canary Islands 4.
Petroleum:			
Crude and partly refined—42-gallon barrels	--------	34	All from United Kingdom.
Petroleum refinery products: [1]			
Gasoline—thousand 42-gallon barrels	205	206	Netherlands West Indies 64; Italy 40; Venezuela 33.
Jet fuel—do	16	NA	
Kerosine—do	r 98	125	Netherlands West Indies 37; Venezuela 25; Italy 23.
Distillate fuel oil—do	r 976	1,673	Netherlands 503; Trinidad 476; Venezuela 473.
Residual fuel oil—do	r 1,187	800	NA.
Lubricating oil—do	18	24	Nigeria 6; United States 5; Netherlands 4.
Total—do	r 2,500	2,828	
Asphalt	5,780	2,994	United Kingdom 2,518; Netherlands 404; Malagasy Republic 71.
Other	133	398	United Kingdom 310; United States 21; West Germany 11.

r Revised. NA Not available.

[1] Total imports, include reexports shown in table 2.

Source: Sierra Leone Trade Report, Government Printing Department.

COMMODITY REVIEW

METALS

Bauxite.—The Geological Survey of Sierra Leone reported occurrences of bauxite in 1928; however, prospecting for deposits on a large scale was not undertaken until 1953.[5] In 1960 extensive bauxite deposits were discovered in the Mokanji Hills in the Moyamba District. An exclusive prospecting license was granted to Suisse Aluminum Co. of Zurich, Switzerland, for the Mokanji Hills deposit and for an earlier discovery in the Gbonge Hills. Sierra Leone Ore & Metal Co., a subsidiary of Suisse, mined and shipped a small quantity of ore in 1963, and in 1964 exports rose to 129,000 tons.

Chromium.—Sierra Leone's only chromite mine, an underground operation in the Eastern Province, remained closed in 1965, because the deposit was too low in grade to be mined economically. Between

[5] Work cited in footnote 2, p. 128.

1937 and the announced closure date in 1963, over 330,000 tons of chromite was produced and exported. Exports in 1964 were possible as a result of draw down of accumulated production at the mine and as a result of mine cleanup.

Gold.—The mining of gold in Sierra Leone probably began in the 15th century, but production was first recorded in 1929 when 937 ounces were mined.[6] Between 1929 and 1963 about 350,000 ounces were produced, with peak output of 40,000 ounces occurring in 1936. In 1965 small quantities of gold were produced locally and sold to Freetown jewelry makers for domestic consumption; however, no production was recorded by mining firms. In 1964 Sierra Leone Selection Trust recovered 49 ounces of gold as a byproduct of diamond concentration.

DELCO and four other mining companies (one British and three from the United States) were granted exclusive prospecting rights over 880 square miles in the Sula mountains and Kangari Hills area in Koinadugu and Tonkolili Districts.[7] The search was reported to be primarily for gold, lead, and zinc. Large scale exploration was scheduled to start in May 1966 and to extend for 4 years.

Iron Ore.—DELCO, the British owned operator of Sierra Leone's only iron ore mine, has operated the mine, about 88 kilometers northeast of Freetown since 1932. DELCO will be eligible for tax relief of $1.75 million for the 1965–66 fiscal year, owing to capital improvements on its mine. The company loaned the Government of Sierra Leone $2.8 million. Reserves at the company's property, the Marampa mine, were estimated at 90 million tons with an average iron content of 49 percent. Cumulative output through year-end 1965 totaled over 34 million tons.

The Tonkolili deposits, 50 miles east of Marampa, were discovered in 1927. They have not been exploited, owing to the presence of considerable alumina, which complicates ore dressing. Reserves were estimated at more than 100 million tons, with a minimum iron content of 53 percent. Other occurrences of iron ore are known, but their economic value has not been determined.

Titanium.—Reserves of rutile (TiO_2), estimated at more than 30 million tons, have been proved in the Bonthe and Moyamba districts of southwestern Sierra Leone.[8] Sherbro Minerals Ltd., jointly owned by British Titan Products Co. Ltd. and Pittsburgh Plate Glass Co., signed a $2.8 million contract with Taylor Woodrow of Sierra Leone for construction of a rutile mine and port facilities near Gbangbama, south of Freetown.[9]

Sherbro Minerals Ltd., contracted for the purchase of marine equipment to be used in recovering and transporting rutile from the firm's deposits in the Bonthe District.[10] The firm planned to operate a diesel-electric suction dredge on a strip of coastal plain, in an area 40 kilometers inland from the coast. Rutile will be piped from the dredge to floating and lakeshore processing plants through a floating pipeline. Concentrated ore will be trucked 16 miles to the Gbangbaia Creek, loaded into 2,000-ton-capacity cargo barges and pushed by a 600-horsepower towboat to the Sherbro estuary. Here the rutile will be transferred to ocean freighters by derrick, bucket-ladder, and belt-conveyor loader. Production, which is expected to be about 100,000 tons annually, is to begin in late 1966.

NONMETALS

Cement.—A bill was introduced in the Sierra Leone Legislature which would forbid foreigners to manufacture cement blocks for sale or to supply granite and sand. The Government placed a ban on this activity effective April 1, 1965.[11]

Diamond—Sierra Leone Selection Trust produced 677,000 carats in the fiscal year ended June 30, 1965 compared with 663,000 carats in the year ended June 30, 1964.[12] Production in fiscal 1965 reportedly was valued at about $9.3 million. Increased production in fiscal 1965 was the result of a higher grade of gravel milled, while the quantity treated remained the same. Examination of kimberlite deposits in the Koidu and Tonga areas indicated a

[6] Work cited in footnote 2, p. 128.
[7] Overseas Review (London). Sierra Leone. December 1965, p. 58.
[8] Work cited in footnote 2, p. 128.
[9] Africa Report. Sierra Leone. V. 10, No. 10, November 1965, p. 44.
[10] Mining Magazine. Rutile From Sierra Leone. V. 112, No. 1, January 1965, p. 37, 39.
[11] U.S. Embassy, Freetown, State Department Airgram A–226. Mar. 26,, 1965, p. 1, Enclosure 1.
[12] Consolidated African Selection Trust, Ltd. Annual Report for the Year Ended 30th June 1965. 1965, p. 22.

small potential reserve in a 0.6-acre pipe at Koidu. Operations on the scale of 100,000 carats per year could result, if economic considerations prove favorable. A report was published that described the Sierra Leone Alluvial Diamond Mining Act and the progress made since its adoption.[13]

The mining of diamonds by Sierra Leoneans has been going on legally since 1956. It was estimated that an average of 40,000 persons were now engaged in alluvial diamond mining.[14]

The Government Diamond Office purchased 809,570 carats of diamonds valued at $31.6 million in 1965, compared with 777,844 carats valued at $32.3 million in 1964.[15] Overall diamond production in 1965, which consisted of 45-percent gem quality and 55-percent industrial, was valued at $51.7 million.

Parliament passed the Diamond Cutting Factory Act of August 7, 1965, ratifying the agreement between the Sierra Leone Government and Leon Tempelsman & Son of New York for establishment of a diamond cutting and polishing factory. Construction of the plant was completed toward the end of 1965, and production began.

Water.—A new water treatment plant was opened near Freetown on December 13.[16] The plant, jointly financed by Sierra Leone and the United Kingdom, is part of the Guma Valley water project, which is to cost about $14 million and be completed in 4 to 6 months.

MINERAL FUELS

Petroleum.—The Minister of Mines was authorized to issue oil exploration or prospecting licenses and oil mining leases by chapter 197 of the laws enacted by the House of Representatives in August 1958.[17] The Governor-General can implement the law detailing operating requirements.

The Haifa Refineries Ltd. of Israel was awarded a contract on March 29 for construction and management of an 8,000 to 10,000 barrel-per-day[18] oil refinery to be located near Freetown.[19] Management of the plant will be for an 8-year term. Products such as gasoline, kerosine, gas oil, diesel oil, and fuel oil will be consumed domestically. Some diesel and fuel oil will be for international marine bunkers.

The operation by foreigners of any petrol or fuel station, with the exception of service stations attached to garages, was banned by the Government of Sierra Leone effective April 1, 1965.[20]

---

[13] Mining Magazine. Licensed Diamond Mining in Sierra Leone. V. 112, No. 3, March 1965, pp. 166–177.

[14] Work cited in footnote 2, p. 127.

[15] The Standard Bank Review (London). Sierra Leone. Standard Bank Limited, March 1966, p. 18.

[16] Africa Report. Sierra Leone. V. 11, No. 2, February 1966, p. 36.

[17] Work cited in footnote 2, p. 126.

[18] Sierra Leone Trade Journal. Oil Refinery. V. 5, No. 2, April–June 1965, p. 51.

[19] Africa Report. Sierra Leone. V. 10, No. 5, May 1965, p. 38.

[20] U.S. Embassy, Freetown. State Department Airgram A-226. Mar. 26, 1965, p. 1, Enclosure 1.

The Mineral Industry of the Republic of South Africa

By Thomas C. Denton [1] and William F. Keyes [2]

In 1965 mineral and mineral-based industry continued to be the backbone of the Republic's economy. This status mostly resulted from high gold production, high employment, large purchases from other home industries including agriculture, and important export earnings.

On the basis of figures published by the South African Reserve Bank, the real gross domestic product (GDP) of the Republic (at 1958 prices) was 5 percent larger in 1965 than in 1964. The increase was realized at least in part as a result of an increase in the value of the output of mineral and mineral-based industry, and occurred against a background of drought-reduced agricultural output, rising prices, import restrictions, and other hindrances.

A further indication of the importance of mining in the economy was that in October 1965, its estimated total number of employees was 618,742, which compares with an estimated total of 1,150,000 employed in all other industries of the Republic.[3] Mine labor statistics for all of 1965 were not available.

Unskilled labor was in sufficient supply during the year, but the shortage of skilled labor continued to be acute, particularly in the gold mining industry. Campaigns to recruit skilled labor in Europe met with some success. Statistics for labor and other facets of South African mining industry in recent years appear in the table that follows:

[1] Africa specialist, Division of International Activities.

[2] Consul and Regional Minerals Officer, American Consulate General, Johannesburg, Republic of South Africa.

[3] South Africa Scope, Pretoria. June 6, 1966, p. 9.

	1962	1963	1964
Average number of persons at work:			
Whites	87,410	87,518	88,276
Nonwhites	594,522	580,438	590,483
Total	681,932	667,956	678,759
Sources of nonwhite labor:			
Republic of South Africa---percent of total	39	40	38
British Protectorates [1]---do	20	20	21
Other---do	41	40	41
Salaries, wages and allowances:			
Salaries and wages, including allowances, earned, white employees---million dollars	290.4	304.7	314.9
Wages earned, nonwhite employees---do	134.1	137.3	145.7
Total---do	424.5	442.0	460.6
Value of supplies and electric power consumed---do	481.3	493.6	513.2

[1] Basutoland, Bechuanaland, and Swaziland.

Source: Republic of South Africa, Department of Mines. Annual Reports, including Reports of the Government Mining Engineer and the Geological Survey for years ended 31st December 1962, 1963, and 1964.

The contribution of the Republic to world mineral supplies improved significantly with respect to platinum and for gold continued the upward trend of recent years, reaching 74 percent of non-Communist world production compared with 72.5 percent in 1964. For eight other minerals the contribution to non-Communist world supply ranged from 34 percent for antimony to 11.4 percent for asbestos, as shown in the table that follows.

Commodity	South Africa's share of world putput (percent)			
	Total world		Non-Communist world	
	1964	1965	1964	1965
Gold	63.1	64.0	r 72.5	74.0
Platinum	r 23.5	25.3	r 57.1	59.5
Antimony	20.8	20.1	35.7	34.2
Chromium ore	19.8	19.2	33.6	30.8
Vermiculite	NA	NA	32.7	33.2
Manganese ore	8.7	8.9	19.1	17.2
Vanadium	NA	NA	16.7	16.6
Uranium	NA	NA	17.4	14.2
Diamond	12.3	14.2	13.4	15.7
Asbestos	6.1	6.7	10.0	11.4

r Revised. NA Not available.

In December the Department of Planning released its Economic Development Programme (EDP) for the period 1965–70,[4] the second such publication, the earlier one being for 1964–69. The targets aimed at in the program are those to be attained if an average real growth of 5.5 percent in the gross domestic product (GDP) is to be realized during the 7-year period from 1963 to 1970 as a whole. In addition the program incorporates the effects of some technical improvements in quantitative estimates of the EDP in 1965.

In the new program there were the following projections of production with respect to nine major sectors of mineral and mineral-based industry.

Sector	Million dollars	
	1964	1970
Gold mining, including uranium	1,126.0	1,201.0
Coal mining	97.9	133.4
Other mining and quarrying	388.9	522.6
Basic iron and steel products	391.9	624.1
Basic nonferrous metals	116.1	180.5
Petroleum and coal products	211.8	418.0
Basic industrial chemicals	270.6	437.6
Metal products	592.3	865.3
Nonmetallic mineral products	277.2	388.8
Total	3,472.7	4,771.3

It is notable that during the entire 7-year period the value of gold and uranium production increases by only $75 million, or 6.7 percent.

A mining rights bill was introduced into Parliament. It is essentially a consolidating measure, but includes changes aimed at removing defects in previous legislation. The bill amended laws relating to prospecting for and mining precious metals, base minerals, and petroleum, and dealing in unwrought precious metals. Similar legislation for precious stones was passed in 1964.

The Government was studying the possibility of permitting base mineral prospectors to operate in diamond prospecting areas of the northwest Cape Province. Such action was opposed by holders of diamond prospecting rights on the grounds that it would interfere with their operations. The exclusion of other mineral prospectors from diamond areas was a provision of the Cape Government's Mineral Law Amendment Act of 1907.

During the year the annual report for 1963 of the Director, Government Metallurgical Laboratory, was issued.[5] The report is the second to be circulated to the public. It states that during 1963 an effort was made to increase to an appropriate level the amount of fundamental research undertaken by the laboratory. Such research was begun by the ore-dressing section, particularly in the field of flotation, on conversion of manganese in low-grade manganese ores to manganese sulfate, on extracting asbestos by wet methods, and on fundamental aspects of leaching reactions.

[4] Republic of South Africa, Department of Planning, Pretoria. Economic Development Programme for the Republic of South Africa, 1965–70, December 1965, 92 pp.

[5] Government Metallurgical Laboratory, Johannesburg. Annual Report, 1963. 1965, pp. 14.

The Analytical Section undertook fundamental projects in atomic absorption, flame photometry, and spectroscopy.

Much applied research was undertaken, some of it on a long-term basis. Such projects included investigation of the recovery of alumina from nonbauxitic material, examination of refractory gold ores that occur in the Republic, and assistance in the design of a sampling unit and in developing a process for recovering baddeleyite (a zirconium oxide) from apatite flotation tailings. An efficient flotation process was developed for concentrating sulfide nickel ore from the Matooster mine in the Pilanesberg area.

The report lists some 400 nonconfidential project reports that the laboratory issued through 1963.

In 1960 the Geological Survey prepared a report on the exploitation of mineral resources situated in the Bantu homelands. At yearend the report had not yet been released, pending a government decision on the type and extent of development to be permitted in these areas.

PRODUCTION

Although in recent years the percentage contribution of mining to the Republic's gross national product has tended to decline, mine output itself nevertheless has steadily increased. Equally important, the output of mineral-based industry has grown steadily and has tended to include increasingly sophisticated items. Production of ferroalloys more than doubled in the period 1961–65.

Increased local consumption of domestic mineral production reflects the growth of this vital sector of the economy. The volume of local sales of manganese ore and chromium ore in 1965 was respectively 34 percent and 52 percent higher than in 1964.

The index of the physical volume of mining production averaged 162.4 in 1965 compared with 156.9 in 1964 (1957=100). For gold alone the index rose by 5 percent, the smallest annual increase in many years. Increases of 16.2 percent and 20.6 percent were recorded for iron ore and manganese ore, respectively. The indexes for building materials and asbestos rose by 5.8 and 12.6 percent respectively.[6]

The Department of Mines of South Africa issues a quarterly minerals information circular which includes the value of local sales and exports. The report takes into account separately raw minerals, refined gold and silver, blister and refined copper, refined tin, and vanadium oxide. It also includes uranium (U_3O_8), refined nickel, and semiprocessed platinum products. For some years the nickel and platinum have not been reported separately but have been included in the item "other". In 1965 uranium was also put there.

The value of South Africa's mineral pro-

[6] Department of Commerce and Industries of the Republic of South Africa. Commerce and Industry. V. 24, No. 7, March 1966, p. 310.

Table 1.—Republic of South Africa: Approximate value of mineral production

(Million U.S. dollars)

Commodity	1961	1962	1963	1964	1965
Gold (production)	804.9	891.2	960.8	1,022.7	1,073.2
Silver (production)	2.2	2.7	3.5	3.8	4.1
Diamond (sales of domestic production)	53.7	51.1	51.3	61.9	p 69.4
Local sales:					
Coal	76.8	80.9	85.1	91.2	105.2
Other minerals	71.0	69.2	83.6	97.0	117.6
Subtotal	147.8	150.1	168.7	188.2	222.8
Exports:					
Coal	6.7	10.2	9.7	9.9	8.7
Fissionable materials [1]	111.0	103.2	93.5	81.4	(2)
Other minerals	125.9	122.7	129.4	150.8	235.9
Total	1,252.2	1,331.2	1,416.9	1,518.7	1,614.1

p Preliminary.
[1] Comprises uranium (U_3O_8) and in 1961 relatively small quantities of monazite.
[2] Included in other minerals. Estimated at $46.5 million.

Source: Republic of South Africa, Department of Mines. Minerals Quarterly Information Circular, October to December issues for 1961 through 1965.

duction in 1965 as represented by the value of gold and silver production, diamond sales, and the value of local sales and exports of other minerals, as reported in the circular, was $1,614.1 million. The comparable figure for 1964 was $1,518.7 million, and for 1961, $1,252.2 million. Each year since 1961 or earlier gold has accounted for 60 percent or somewhat more of total value and in 1965 the contribution of gold was 66 percent. The next largest contributor in 1965 probably was platinum, with diamond ranking third. At yearend the outlook was for some further increase in gold production and substantial increases for platinum and diamonds.

Table 2.—Republic of South Africa: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Antimony, content of cobbed ore and concentrate	10,708	10,611	11,258	12,882	12,611
Beryl, about 11.7 percent BeO	174	327	386	137	48
Bismuth, content of concentrate kilograms	76	59	1,188	1,420	100
Chromite:					
44 percent or less Cr_2O_3	243,076	257,868	132,773	180,971	242,650
More than 44 percent to 48 percent Cr_2O_3	649,988	632,348	639,692	641,823	668,483
More than 48 percent Cr_2O_3	4,795	22,564	19,695	26,752	30,977
Total	897,859	912,780	792,160	849,546	942,110
Copper:					
Concentrate, metal content	2,054	190	642	4,979	5,997
Blister	35,517	35,415	39,470	42,461	40,284
Fire refined	16,702	10,765	15,038	12,052	14,125
Electrolytic e	1,800	1,800	1,800	2,200	3,000
Gold thousand troy ounces	22,941	25,492	27,432	29,112	30,554
Iron and steel:					
Iron ore, 60 percent or more Fe thousand tons	3,961	4,331	4,460	4,830	5,816
Pig iron do	2,169	2,220	2,217	2,657	3,271
Ferroalloys and spiegel iron do	159	196	224	230	332
Steel:					
Ingots and castings do	2,484	2,633	2,834	3,097	3,396
Semimanufactures do	1,444	1,722	2,115	2,316	NA
Manganese ore:					
Metallurgical:					
Over 30 to 40 percent Mn do	NA	NA	494	406	483
Over 40 to 45 percent Mn do	NA	NA	469	478	581
Over 45 to 48 percent Mn do	NA	NA	231	334	433
Over 48 percent Mn do	NA	NA	52	61	24
Subtotal do	NA	NA	1,246	1,279	1,521
Chemical:					
Over 35 to 65 percent MnO_2 do	NA	NA	52	34	40
Over 65 to 75 percent MnO_2 do	NA	NA	7	3	6
Over 75 to 85 percent MnO_2 do	NA	NA	3	5	1
Subtotal	NA	NA	62	42	47
Manganiferous iron ore, 15 to 30 percent Mn thousand tons	NA	NA	50	147	208
Total do	[1] 1,418	[1] 1,465	1,358	1,468	1,776
Monazite	---	4,832	2,087	---	---
Nickel, electrolytic e	2,600	2,400	2,400	2,400	3,000
Platinum-group metals:					
Osmiridium (sales) [2] thousand troy ounces	6	6	5	4	e 4
Platinum and other, contained in concentrates, matte, and refinery products e thousand troy ounces	350	300	300	600	750
Silver do	2,288	2,549	2,737	2,917	3,132
Tantalum concentrate	9	4	29	6	3
Tin:					
Concentrates, metal content long tons	1,430	1,408	1,530	1,586	1,671
Metal, smelter production do	870	821	r 962	1,016	962
Titanium concentrates:					
Ilmenite	89,820	79,012	28,158	---	---
Rutile	3,160	3,243	1,256	---	---
Tungsten ore and concentrate, 60 percent WO_3	27	23	8	4	4
Uranium U_3O_8	4,960	4,558	r 4,111	4,032	2,669
Vanadium, fused oxide, 99.9 percent V_2O_5	2,311	2,260	2,255	2,077	2,461
Zircon, concentrate	6,901	6,877	2,402	---	---

Table 2.—Republic of South Africa: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals:					
Andalusite	7,045	18,338	10,008	13,972	---
Asbestos:					
Amosite	62,808	67,933	70,414	70,103	73,241
Chrysotile	28,781	27,209	26,243	32,587	35,285
Crocidolite	85,094	105,532	89,965	92,891	109,879
Tremolite	67	87	25	---	---
Total	176,750	200,761	186,647	195,581	218,405
Barite	1,780	1,699	2,453	2,572	1,340
Cement, thousand tons	2,598	2,659	2,884	r 3,481	3,881
Clays:					
Bentonite	[3] 4,107	[3] 5,745	[3] 7,814	r 9,313	11,737
Fire clay	[3] 243,841	[3] 183,042	[3] 223,561	r 266,704	280,288
Flint clay	[3] 217,513	[3] 155,782	136,208	r 191,965	248,357
Fuller's earth	[3] 671	[3] 668	[3] 452	[3] 163	532
Kaolin	[3] 24,495	[3] 26,920	[3] 34,355	[3] 39,458	44,344
Corundum	144	317	72	54	313
Diamond:					
Natural, gem and industrial, thousand carats	3,788	3,912	4,376	r 4,450	5,026
Manufactured, industrial, do	---	999	1,475	2,639	NA
Diatomite	124	587	200	495	976
Emerald crystals, kilograms	860	212	239	208	532
Feldspar	23,664	28,662	42,086	36,095	42,304
Fluorspar:					
Acid grade	1,706	4,132	7,539	6,066	4,835
Ceramic grade	9,862	31,439	16,632	2,129	4,829
Metallurgical grade	75,396	65,746	28,229	52,070	56,122
Total	86,964	101,317	52,400	60,265	65,786
Graphite	874	1,187	609	945	406
Gypsum	173,361	192,001	187,464	240,082	303,940
Limestone [3], thousand tons	5,244	5,300	5,802	6,971	7,550
Lithium minerals	236	1,146	378	162	869
Magnesite	61,444	92,852	98,256	84,770	86,898
Mica	2,469	2,224	r 2,141	3,115	2,269
Mineral pigments	5,104	4,559	3,966	4,975	4,741
Pyrite	446,805	440,993	418,551	432,475	428,294
Salt, thousand tons	208	255	198	300	331
Shale	176,394	163,200	176,180	233,611	246,849
Silcrete [4]	8,463	11,500	14,878	19,695	11,349
Silica and silica sand	194,678	199,491	275,107	324,304	375,202
Sillimanite	85,760	53,662	56,241	54,649	42,148
Sulfur, elemental, refinery byproduct	2,198	1,944	2,013	5,792	7,216
Talc	2,975	12,629	6,864	6,617	9,241
Tiger's eye [5]	15	93	117	73	73
Vermiculite	64,517	77,595	89,591	101,488	115,131
Wonderstone (pyrophyllite)	928	1,676	1,855	1,704	3,626
Mineral fuels:					
Coal, marketable:					
Anthracite, thousand tons	1,297	1,110	1,152	NA	1,247
Bituminous, do	38,268	40,165	41,302	NA	47,213
Total, do	39,565	41,275	42,454	44,917	48,460
Carbon black	1,870	7,638	9,708	11,945	13,163
Petroleum refinery products:					
Gasoline, thousand 42-gallon barrels	4,790	5,235	5,107	12,038	11,260
Kerosine, including aviation turbine fuel, do	1,253	1,367	1,449	1,829	1,753
Distillate fuel oil, do	2,843	3,069	3,918	8,880	8,869
Residual fuel oil, do	2,057	2,237	4,662	10,715	8,226
Miscellaneous products, do	1,339	1,337	835	1,406	1,093

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Classes of ore making up total not reported on same basis as in 1963–65.

[2] Natural alloy of osmium, iridium, small quantities of other platinum group metals, and gold; recovered by certain gold mines.

[3] Local sales.

[4] A rock containing up to 98.4 percent SiO_2.

[5] Decorative material resulting from oxidation and silicification of crocidolite.

TRADE

The statistical territory for the external trade statistics of the Republic of South Africa includes the Territories of Basutoland, Bechuanaland, and Swaziland, besides the Territory of South-West Africa, and no separate official trade statistics are recorded for the trade between these territories and the Republic. Hence items of external trade involving only the Republic are not always identifiable. For this chapter, however, the problem applies mostly to imports (which for the territories are small) because most export data have been taken from a supplementary source that lists the Republic's mineral exports separately.

The Republic's chronic deficit in merchandise trade declined somewhat toward the end of 1965, mainly owing to a sharp reduction in imports accomplished by government-imposed restrictions.[7] The deficit for the entire year approached $1,000 million[8] and was the highest ever recorded. The comparable figure for the deficit in 1964 was about $700 million. The statistics from which the deficits were computed did not include gold and uranium and probably not platinum. Against these deficits, the value of the Republic's gold production in 1964 and 1965 was respectively $1,018.9 million and $1,069.4 million, and uranium exports were valued at respectively $81.3 million and about $46.5 million.

With respect to the direction of trade, total imports in 1964 were $2,136 million, and the principal suppliers were, in percent: United Kingdom 29; United States 19; West Germany 11; Japan 5. Total exports, with the exclusions noted earlier, amounted to $1,454 million. Major markets were, in percent: United Kingdom 31; United States 9; and Japan 9. Major mineral commodity exports besides gold and uranium were diamond, metals, ferroalloys, metallic ores, and asbestos.[9]

With respect to mineral commodities exclusively, including mineral fuels but excluding gold, South Africa continued to have a favorable trade balance. In 1964 exports exceeded imports by $222 million, as shown in the table that follows. These exports were nearly 39 percent of total merchandise exports. Reexports amounted to $95 million, to which diamond contributed about $85 million.

During the year, a new international marketing organization, Imex (Pty.) Ltd., was formed in South Africa with the object of securing and developing export markets for South African goods. The sponsors and shareholders of the company include the Anglo American Corporation of South Africa Ltd., General Mining and Finance Corporation Ltd., Industrial Development Corporation of South Africa Ltd., The Netherlands Bank of South Africa Ltd., Union Acceptance Ltd., and Walker Brothers (London) Ltd. The company intends to handle the direct exporting and marketing of primary products, semiprocessed commodities, consumer goods, durables, and capital equipment.

	Million dollars		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:[1]			
1963	452	1,282	35.3
1964	564	1,454	38.8
Imports:			
1963	267	1,683	15.9
1964	342	2,136	16.0
Trade balance:			
1963	+185	−401	XX
1964	+222	−682	XX

XX Not applicable.
[1] Excludes gold and uranium and, probably, platinum. Uranium (U_3O_8) exports in 1963 and 1964 were respectively $93.5 million and $81.3 million.

U.S. Mineral Imports From South Africa.—U.S. imports for consumption from South Africa in 1965 included $114.4 million of mineral commodities, excluding iron and steel semimanufactures. Principal items by value of the 1965 imports follow:

Commodity	Value, thousand dollars
Uranium (U_3O_8)	[1] 46,496
Diamond, gem and industrial	31,121
Ferroalloys	10,154
Asbestos	7,218
Manganese ore	3,947
Chromium ore	1,887
Antimony ore	1,864
Total	102,687

[1] Estimated in part.

[7] U.S. Embassy, Pretoria, Republic of South Africa. State Department Airgram A-262, Jan. 21, 1966, p. 3.
[8] United States Department of Commerce, Bureau of International Commerce. Overseas Business Reports. Market Profiles for Africa OBR 66-36, June 1966, p. 32.
[9] Page 32 of work cited in footnote 8.

Table 3.—Republic of South Africa: Exports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Antimony concentrate	19,474	21,741	United Kingdom 13,323; United States 5,927; France 1,108; Japan 864.
Beryllium ore	270	84	All to United States.
Bismuth concentrate	---	1	NA.
Chromite	587,444	629,384	United States 383,108; West Germany 94,564; United Kingdom 90,602; Japan 31,027.
Copper:			
Contained in concentrate	592	3,340	Japan 3,323.
Blister and fire refined	52,399	53,302	United States 20,455; Belgium 8,484; United Kingdom 7,935; West Germany 6,096; Austria 3,455.
Iron and steel:			
Iron ore—thousand tons	604	1,085	Japan 1,070.
Iron and steel scrap	NA	848	Japan 537.
Pig iron, spiegeleisen, powder, and shot:			
Pig iron	218,821	353,612	Japan 227,241; United States 73,923.
Other	---	8,354	Netherlands 5,296.
Ferroalloys:			
Ferrochromium	NA	28,559	United Kingdom 7,645; United States 5,244; West Germany 3,334; Sweden 3,062; Japan 3,044.
Ferromanganese	106,544	122,240	United Kingdom 41,100; United States 22,003; Australia 18,015; Italy 16,531; West Germany 6,512.
Ferrosilicon	NA	20,740	Australia 6,481; Japan 3,970; United Kingdom 3,436; Netherlands 2,138; Italy 1,280.
Other	38,936	4,575	United States 2,032; Venezuela 1,244.
Total	145,480	176,114	
Steel ingots and other primary forms	2,935	3,549	Mozambique 2,849; Rhodesia 610.
Semimanufactures:			
Bars, rods, angles, shapes, and sections	80,157	29,579	United States 9,068; Rhodesia 8,784; Zambia 4,866; Mozambique 1,165; United Kingdom 698.
Universals, plates, and sheets	145,275	65,545	Rhodesia 31,823; Zambia 10,858; United Kingdom 6,759; United States 5,243; Mozambique 4,751; Italy 3,969.
Hoop and strip	---	1,536	Rhodesia 810; Zambia 378.
Rails and accessories	21,117	18,647	Rhodesia 15,616; Mozambique 1,695; Zambia 1,199.
Iron and steel wire	NA	2,230	Rhodesia 1,404; Mozambique 329; Zambia 180.
Tubes, pipes, and fittings	20,634	20,498	Rhodesia 7,800; Zambia 6,356; Mozambique 5,010.
Castings and forgings, rough	---	364	United Kingdom 197; Rhodesia 144.
Total	267,183	138,399	
Manganese:			
Ore:			
Metallurgical grade	852,540	819,851	France 197,530; United States 179,877; United Kingdom 139,725; West Germany 63,287.
Chemical grade	8,532	9,618	United Kingdom 7,346; Japan 1,360.
Manganiferous iron ore	41,374	128,607	West Germany 116,743; Netherlands 11,864.
Total	902,446	958,076	
Electrolytic metal	4,532	4,826	United Kingdom 859; Sweden 809; United States 772; France 616; Canada 535.
Monazite	3,102	---	
Platinum-group metals	NA	NA	
Silver—thousand troy ounces	1,679	1,700	All to United Kingdom.
Tantalite—kilograms	r 2,086	381	Do.
Tin concentrate—long tons	1,155	878	Do.
Titanium, illmenite	14,691	---	
Tungsten concentrate	5	20	West Germany 14; United Kingdom 5.
Uranium (U_3O_8)	3,756	3,388	NA.
Vanadium:			
Fused oxide	1,731	3,243	NA.
Ammonium vanadate	24	61	NA.
Zirconium concentrate	2,544	73	NA.
Nonferrous metal scrap	941	3,962	Belgium 3,032.

See footnotes at end of table.

Table 3.—Republic of South Africa: Exports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Nonmetals:			
Andalusite and sillimanite	43,296	53,959	Japan 26,219; United Kingdom 1,596.
Asbestos:			
Amosite	66,133	74,174	United Kingdom 21,539; United States 19,216; Japan 6,585; Australia 6,399; Italy 4,730.
Chrysotile	14,614	25,921	Japan 9,534; West Germany 3,776; Rhodesia 3,758; United Kingdom 2,503; Italy 2,028.
Crocidolite:			
Cape blue	77,596	88,119	United States 18,326; Japan 11,342; Italy 10,342; France 6,973; United Kingdom 6,458.
Transvaal blue	8,445	9,714	United States 4,164; Japan 2,611; Italy 1,391.
Tremolite	8	---	
Total	166,796	197,928	
Barite	---	14	All to Rhodesia.
Cement, including refractory cements	34,932	51,786	Mauritius 20,827; Reunion 17,586; Malagasy Republic 9,479.
Corundum, crystal	72	53	NA.
Diamond, exports and reexports:			
Exports:			
Gem:			
Rough, uncut thousand carats	2,043	1,809	United Kingdom 1,616.
Cut, unmounted	124	111	Belgium 47; Hong Kong 27; United States 21; Netherlands 8.
Subtotal	2,167	1,920	
Industrial:			
Natural do	NA	52	United Kingdom 29; Belgium 15; Zambia 5.
Manufactured do	1,475	2,639	Ireland 2,639; United States 44.
Subtotal	3,642	4,611	
Reexports: [2]			
Gem: Rough, mixed origin do	NA	403	All to United Kingdom.
Industrial:			
Mixed origin do	NA	5,670	United Kingdom 3,653; United States 1,752.
Other do	15,732	12,317	Ireland 9,505; United Kingdom 1,888; United States 897.
Total	19,374	23,001	
Emerald crystals kilograms	239	200	Switzerland 168; United Kingdom 32.
Feldspar	10,463	6,558	Italy 2,755; West Germany 2,539.
Fertilizers, manufactured:			
Nitrogenous	---	4,676	Zambia 2,710; Rhodesia 1,929.
Phosphatic	---	5,358	Mauritius 4,048; Rhodesia 1,159.
Potassic	---	9	NA.
Not elsewhere specified	---	1,494	United Kingdom 791; Mozambique 237.
Total	---	11,537	
Flint clay	100,023	87,948	West Germany 35,109; Japan 22,421; Netherlands 17,396.
Fluorspar:			
Acid grade	4,668	5,054	Japan 4,227; Australia 743.
Ceramic grade	7,853	5,461	Japan 2,891; Netherlands 1,666; Australia 277.
Metallurgical grade	44,955	40,799	Japan 20,882; United States 5,739; Sweden 4,714.
Total	57,476	51,314	
Granite	44,472	60,486	NA.
Graphite	---	42	Rhodesia 33.
Gypsum	13,512	17,287	Rhodesia 16,716.
Lime and limestone	26,557	20,551	Rhodesia 18,988.
Lithium minerals	386	340	United Kingdom 182; West Germany 158.
Magnesite	---	322	United Kingdom 285.
Marble, blocks cubic meters	---	5	NA.
Mica	1,455	2,302	NA.
Mineral pigments	2,188	2,881	United Kingdom 2,605.
Pyrite, sulfur content	1,949	2,440	All to South-West Africa.
Salt	25,714	30,184	Rhodesia 27,751; Swaziland 1,446.

Table 3.—Republic of South Africa: Exports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Nonmetals—Continued			
Silica	---	773	All to Rhodesia.
Silcrete	---	256	All to Italy.
Talc	13	664	Australia 417; Japan 200.
Tiger's eye	136	89	Japan 39; United States 23; West Germany 9.
Vermiculite	82,360	97,843	United Kingdom 31,300; United States 16,708; Italy 16,592; France 9,383; West Germany 9,001.
Wonderstone	1,395	1,377	United States 1,342.
Explosives:			
Dynamite and gelignite	12,674	17,952	Zambia 13,041; Rhodesia 4,371.
Other prepared explosives	NA	3,381	Zambia 2,083; Rhodesia 1,145.
Fuses	873	808	Zambia 550; Rhodesia 243.
Detonators—thousands of	12,132	10,522	Rhodesia 5,698; Zambia 3,063.
Mineral fuels:			
Coal:			
Anthracite—thousand tons	675	656	Italy 194; Japan 147; France 113; Netherlands 59; Belgium 59.
Other—do	723	728	Mozambique 454; Ceylon 149; Italy 50.
Total	1,398	1,384	
Coke	r 3,422	722	NA.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	81	35	Mozambique 32.
Kerosine:			
Aviation turbine fuel do	222	158	Mozambique 127.
Other kerosine—do		21	Mozambique 20.
Liquid petroleum and manufactured gas—do	NA	27,469	Rhodesia 14,164; Zambia 8,422.
Distillate fuel oil—do	592	860	Ship stores 387; Mozambique 324.
Residual fuel oil—do	3,598	8,996	Ships stores 4,965; Canary Islands 1,151; United Kingdom 816.
Lubricating oils—do	216	4	Mozambique 2; Rhodesia 1.
Nonlubricating oils—do	NA	38	West Germany 32.
Lubricating greases	54	1,664	Rhodesia 724; Mozambique 459; Zambia 373.
Jellies and waxes	59	7,191	United States 2,275; Netherlands 1,840; United Kingdom 909; West Germany 835.
Bitumen and oil residues and bituminous mixtures	27,066	27,602	Mozambique 10,486; Rhodesia 7,120; Zambia 2,773.
Pitch and pitch coke	NA	2,363	South Korea 2,285.

r Revised. NA Not available.

[1] The sources for the table were (1) the Minerals Quarterly Information Circular of the Department of Mines of the Republic and (2) Volume I of the official Foreign Trade Statistics of the Republic for the years 1963 and 1964. The statistical territory of the latter includes the British High Commission Territories of Basutoland, Swaziland, and Bechuanaland Protectorate as well as the Territory of South-West Africa.

[2] Include some South African diamond, both for gem and industrial demand.

Table 4.—Republic of South Africa: Imports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Bauxite	NA	8,641	Mozambique 5,426.
Scrap	NA	320	Rhodesia 158; Zambia 65.
Ingots and other primary forms	16,752	17,246	Canada 15,861; United States 894.
Semimanufactures	4,641	7,966	United Kingdom 2,559; United States 2,706; Belgium 457.
Antimony, primary forms	321	NA	
Chromite, ore and concentrate	NA	48,562	All from Rhodesia.
Copper and its alloys:			
Ore and concentrate	NA	5,554	Do.
Scrap	NA	307	Rhodesia 171.
Ingots and other primary forms:			
Blister and other unrefined	NA	3,605	All from Zambia.
Refined	NA	27,689	Zambia 23,736.
Total	26,092	31,294	

See footnotes at end of table.

Table 4.—Republic of South Africa: Imports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals—Continued			
Semimanufactures	1,369	4,407	United Kingdom 1,476; Rhodesia 950; Italy 838; Belgium 382; Canada 246.
Iron and steel:			
Iron ore and concentrate	NA	63	NA.
Scrap	NA	32,174	United States 20,141; Mozambique 4,422; Angola 2,327; Rhodesia 1,891.
Pig iron, spiegeleisen, etc.	365	1,642	Sweden 798; United Kingdom 574; United States 109; Belgium 81.
Ferroalloys:			
Ferrochromium	NA	36	NA.
Ferromanganese	4	7	NA.
Ferrosilicon	856	1,863	West Germany 1,802.
Other ferroalloys	140	195	United Kingdom 60; United States 46; U.S.S.R. 34; West Germany 27.
Total	1,000	2,101	
Steel ingots and other primary forms	NA	17,206	Rhodesia 14,443; United Kingdom 2,393.
Semimanufactures:			
Bars, rods, angles, shapes, and sections	9,515	38,979	United Kingdom 15,923; Belgium 11,536; Italy 2,451; West Germany 1,746.
Universals, plates, and sheets	104,459	189,026	United Kingdom 107,591; Japan 31,624; France 16,774; Italy 9,483.
Hoop and strip		5,397	United Kingdom 1,192; Italy 1,171; Belgium 423; Sweden 382; West Germany 344.
Rails and accessories	4,025	33,758	United Kingdom 32,919.
Wire	NA	28,648	Belgium 8,548; Netherlands 8,361; United Kingdom 2,461; Japan 1,979.
Tubes and pipes	7,709	15,173	United Kingdom 6,356; West Germany 2,796; Japan 2,637; Belgium 525.
Castings, rough	390	603	United Kingdom 301; West Germany 270.
Total	126,098	311,584	
Lead:			
Scrap	NA	3,055	Australia 1,073; New Zealand 448; Rhodesia 417; Angola 252.
Ingots, other primary forms	15,485	9,778	Zambia 7,513; Australia 1,775.
Semimanufactures	50	100	NA.
Manganese ore	NA	626	Zambia 550.
Mercury, 76-pound flasks	805	639	Spain 273; Italy 228; United Kingdom 112.
Nickel:			
Scrap	NA	70	NA.
Ingots and other primary forms	NA	14	United Kingdom 9.
Semimanufactures	NA	451	United Kingdom 227; Canada 127; West Germany 24; Sweden 19.
Platinum, troy ounces	1,687	2,211	United Kingdom 1,761.
Tin:			
Ore and concentrate, long tons	NA	1	NA.
Scrap, do.	NA	155	Rhodesia 30.
Ingots, do.	794	564	Rhodesia 448.
Semimanufactures, do.	396	48	United Kingdom 14.
Titanium, concentrates	NA	18,707	Australia 18,667.
Tungsten, ore and concentrate	NA	114	Portugal 73; South Korea 41.
Zinc:			
Scrap	16	333	United Kingdom 143; Rhodesia 97.
Ingots and equivalent forms	34,309	42,049	Zambia 28,036; U.S.S.R. 3,555; Australia 2,004.
Semimanufactures	140	960	United Kingdom 244; Zambia 233; West Germany 94; United States 90.
Metals not further specified	1,200	589	United Kingdom 198; Zambia 164.
Nonmetals:			
Abrasives: Emery, pumice, etc.	298	3,591	Rhodesia 1,396; United Kingdom 1,070; Italy 415; United States 335.
Asbestos	NA	7,136	Rhodesia 6,756; Canada 269.
Barite	2,065	2,418	Rhodesia 1,278; West Germany 269.
Borax	1,367	103	NA.
Cement	12,837	13,972	United Kingdom 9,187; Denmark 1,691; West Germany 954; Japan 878.

Table 4.—Republic of South Africa: Imports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—Continued			
Clays:			
Bentonite	NA	1,546	United States 1,458.
Kaolin	NA	1,195	United Kingdom 831; West Germany 193.
Other clays, and refractory minerals	NA	6,035	United Kingdom 2,824; United States 2,297; West Germany 520.
Total	9,234	8,776	
Diamond:			
Gem:			
Rough, mixed origin thousand carats	(2)	5	United Kingdom 5.
Other rough diamonds do	(2)	4	United Kingdom 1; United States 1.
Unmounted, cut, etc. do	(2)	1	Mainly to Israel.
Industrial:			
Mixed origin do	(2)	1,974	United Kingdom 1,781; Ireland 168.
Other do	(2)	[3] 13,754	NA.
Total do	17,042	15,738	
Diatomaceous earth	2,661	4,186	United States 2,815; West Germany 865; United Kingdom 206.
Fertilizers and fertilizer raw materials:			
Nitrogenous:			
Ammonium nitrate	50,145	750	West Germany 372; Netherlands 272.
Ammonium sulfate	118,443	133,353	Netherlands 42,822; West Germany 38,965; Belgium 29,681; Italy 11,491.
Urea fertilizers	NA	29,170	Netherlands 8,009; West Germany 4,273; Italy 3,232; Japan 1,361.
Phosphatic:			
Phosphate rock	818,962	302,756	NA.
Thomas slag	40,078	26,913	Belgium 26,459.
Other phosphatic fertilizers, etc	NA	52,056	Netherlands 20,144; United States 12,495; Belgium 6,967.
Potassic: Potash	118,443	123,340	United States 48,843; West Germany 40,458; France 29,985.
Manufactured fertilizers not elsewhere specified	23,702	16,752	West Germany 9,529; Mozambique 2,999; Netherlands 2,743.
Graphite	784	550	United Kingdom 448.
Gypsum, including plaster of paris	2,611	3,229	West Germany 2,469; United Kingdom 703.
Magnesite	NA	26,157	Rhodesia 23,248; United Kingdom 2,547.
Mica	41	585	NA.
Mineral pigments	NA	58	NA.
Quartz and quartzite	41	12	NA.
Salt	2,458	700	United Kingdom 677.
Sulfur:			
Elemental	124,110	144,546	Mexico 75,889; France 35,248; Canada 32,306.
Pyrite	NA	7,509	Spain 7,488.
Mineral fuels:			
Coal	49,509	98,037	Rhodesia 88,927; Zambia 9,110.
Coke	5	13	NA.
Petroleum:			
Crude thousand 42-gallon barrels	15,882	34,731	NA.
Partly refined do	---	1,031	NA.
Total do	15,882	35,762	
Refinery products:			
Gasoline do	9,225	5,745	NA.
Kerosine:			
Aviation turbine fuel do	NA	38	NA.
Other do	r 3,604	3,498	
Total do	r 3,604	3,536	

See footnotes at end of table.

Table 4.—Republic of South Africa: Imports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Mineral fuels—Continued			
Petroleum—Continued			
Refinery products—Continued			
Distillate fuel oil			
thousand 42-gallon barrels	4,499	2,615	NA.
Residual fuel oil——do——	880	26	
Lubricating oils——do——	939	1,274	United States 608; Netherlands Antilles 232; Australia 175; United Kingdom 116.
Nonlubricating oils			
thousand 42-gallon barrels	42,811	928	United States 204.
Lubricating greases	3,529	2,979	United States 2,248; United Kingdom 549.
Jellies and waxes	3,547	22,622	United States 17,943; United Kingdom 1,340.
Bitumen and oil residues and bituminous mixtures	32,750	21,827	United States 9,604.
Pitch and pitch coke	856	549	United Kingdom 401.

r Revised. NA Not available.

[1] The statistical territory for the external trade statistics of the Republic of South Africa includes the British High Commission Territories of Basutoland, Swaziland, and Bechuanaland Protectorate besides the Territory of South-West Africa. (No separate statistics for the trade between these territories and the Republic are recorded).

[2] Included in the total.

[3] Probably includes appreciable gem diamond.

COMMODITY REVIEW

METALS

Aluminum.—The Government-owned Industrial Development Corporation (I.D.C.) of South Africa toward yearend decided to underwrite construction of a primary aluminum smelter, which will be the first such facility in the country. The smelter will have an initial annual capacity of 38,000 tons of aluminum and will cost about $49 million. It will be situated in a border area (adjacent to a Bantustan), several of which have been found suitable. Alumina for the plant will be imported at the outset because bauxite has not been found in South Africa; the search for an aluminum raw material was continuing.

Alcan Aluminium Ltd., the country's major aluminum fabricator, opened at Pietermaritzburg (Natal) a $2.8 million 72-inch cold rolling mill. The annual aluminum consumption of the country was expected to rise to 45,000 tons by 1970, which compares with estimated consumption in 1965 of 27,000 tons.[10]

Antimony.—Consolidated Murchison (Transvaal) Goldfields & Development Co., Ltd. (Murchison), the sole antimony producer in South Africa, supplied 26 percent of U.S. general imports of antimony in 1965, compared with 24 percent in 1964 and 23 percent in 1963.

The mine was worked to capacity during the year. Combined production of concentrates and cobbed ore averaging 60.91 percent antimony was 20,548 tons, compared with 21,381 tons at 60.46 percent antimony in 1964. In addition, 3,922 ounces of gold was recovered (5,602 ounces in 1964). Ore milled totaled 188,059 tons, 7,620 tons more than in 1964. At yearend ore reserves taking into account combined antimony and gold content amounted to 435,000 tons, up 30,000 tons from 1964 and the largest reserves reported since 1955 or earlier. Stocks of cobbed ore and concentrate on hand totaled 5,050 tons.

By the end of January the Alpha shaft had been sunk to its final depth of 1,102 meters, and except for minor items, installation of permanent equipment had been completed. By means of an auxilliary winze the extension of the Gravelotte shaft was completed to 20 level where exploratory development was in progress at yearend.

Murchison's operating profit and dividend declarations for 1965 were respectively $4.1 million and $2.47 million, compared with $3.7 million and $2.07 million in 1964. At yearend demand for the ore and concentrate Murchison produces reportedly remained steady, although the London price for antimony metal declined during the year.

Chromium.—Production and exports of chromite increased over 10 percent in 1965

[10] South African Mining and Engineering Journal (Johannesburg). V. 76, pt. 1, No. 3764, Mar. 26, 1965, p. 885.

compared with the 1964 figures, and local sales by 52 percent. The value of 1965 sales and exports was respectively $1.3 million and $8.4 million. In view of the establishment in 1964 of two ferrochromium plants and of the present construction of a stainless steel plant, local sales of chromite were expected to continue to grow.

In 1965 some 12 large or medium sized companies were producing chromite from two areas in the Bushveld Igneous Complex in Transvaal Province. Export railings from the areas in 1965 to Lourenco Marques in Mozambique totaled 691,196 tons. Most of the ore was loaded at seven sidings: Steelpoort (201,488 tons), Northam (131,423), Burgersfort (115,603), Bleskop (100,891); Rustenburg (71,369), Boshoek (46,270), and Marikana (23,604).

Copper.—O'okiep Copper Co. Ltd. in the Nababeep area of Cape Province established several financial records in its financial year ended June 30, 1965. The records were achieved as a result of high copper prices and despite only nominally increased blister copper production, a decrease in average copper content of ore milled, and rising wage and materials costs. Sales of blister copper totaled 43,915 tons compared with 38,025 tons in the previous financial year. Salient financial results in million dollars for these years follow:

	Year ended June 30	
	1964	1965
Metal sales	24.98	41.71
Net operating income	10.87	23.95
Provision for income taxes	2.74	6.99
Net profit	7.37	17.18
Dividends declared	7.86	15.01

O'okiep blister copper averages about 99.4 percent copper, and about 0.14 ounce of gold and 3.4 ounces of silver per short ton. The average price obtained for the 43,915 tons of blister copper that O'okiep sold in the 1965 financial year was 43.08 cents per pound, or 94.97 cents per kilogram. This compares with 29.79 cents per pound, or 65.68 cents per kilogram, obtained for blister copper sold in the previous financial year computed on the same basis as for 1965.[11]

During the year 2.6 million tons of ore, averaging 1.79 percent copper and obtained from seven mines, was treated in three separate mills. The tonnage compares with 2.4 million tons averaging 1.93 percent copper milled in the previous financial year.

The smelter treated 1.33 million tons of concentrates and other new metal-bearing material averaging 31.64 percent copper, producing 41,800 tons of blister copper averaging 99.37 percent copper and per short ton (2,000 pounds) 0.14 ounce of gold and 3.44 ounces of silver. In the previous year 41,688 tons of blister copper was produced.

Ore reserves at yearend totaled 25.14 million tons of sulfide ore averaging 1.81 percent copper and 414,000 tons of oxide ore averaging 1.01 percent copper. No major new ore discoveries were made.

At yearend O'okiep reportedly was employing 919 "Europeans" (whites), 1,535 "Coloureds" (mixed racial origin), and 2,079 "Bantu" (Negroes).

Palabora Mining Co. Ltd. at yearend was approaching production from its open-pit copper mine in North Eastern Transvaal, where over 270 million tons of ore averaging 0.69 percent copper had been developed. Stripping had started in 1964 and by the end of 1965 about 13 million tons of material had been mined, of which 1.5 million tons was sulfide ore. Milling and smelting facilities can process 30,000 tons of ore per day, yielding 73,000 tons of blister copper annually.

The 270-ton-per-day sulfuric acid plant was under construction. It will supply a local phosphate fertilizer plant under a long-term contract. Also under construction was a $5 million plant to produce annually 80,000 tons of magnetite concentrate for Japanese steel companies.

Gold.—In 1965 for the 14th successive year, the Republic's gold production again increased, reaching 30.55 million ounces valued at $1,073 million. The comparable figures for 1964 were 29.11 million ounces and $1,023 million. The 1965 volume of production was about 74 percent of non-Communist-world gold production, which compares with the 72.5 percent contribution by South Africa in 1964.

Of the total 1965 volume, all but 438,000 ounces was produced from mines in the Witwatersrand sedimentary basin and its extension (Rand), which are members of the 76-year-old Transvaal and Orange Free State Chamber of Mines. While production

[11] Republic of South Africa chapter of Bureau of Mines Minerals Yearbook 1964, Volume IV, reported 25.54 cents, but on an "ex-mine" basis.

from the Rand has increased each year since 1955, and further increase is forecast for some years, the annual rate of increase has been declining and probably will continue to do so until the peak of output is reached. Annual rates of increase in recent years have been as follows, in percent: 1960–61, 7.29; 1961–62, 11.12; 1962–63, 7.61; 1963–64, 6.12; 1964–65, 4.95. The Government's second Economic Development Program for the Republic estimates that in the 6-year period from 1964 to 1970, gold production will have expanded 12 percent, or at an average annual rate of 2 percent.

With respect to 1965 results of the operations of Chamber members as a whole, while gold output increased, operating profit declined somewhat. Seven mines sustained losses. Costs continued to rise, largely because of wage increases granted both to white and nonwhite employees, and to higher prices for supplies and services. There was an adequate supply of nonwhite labor, but the shortage of skilled white labor continued to be severe.

At the 75th annual meeting of the Chamber held in Johannesburg in June 1965, C. B. Anderson, retring president, said in part with reference to rising costs:

> . . . . I would again stress that every cent increase in working costs per ton milled transfers a quantity of ore in every mine—be the mine old or new, a low-grade or a high-grade producer—from the payable to the unpayable category. In aggregate, over the industry as a whole, the quantity of ore transferred is considerable. This ore will be left unmined, possibly forever, and so lost to South Africa and to the world. Furthermore, the lives of individual mines are progressively shortened and the day of the decline of the gold mining industry as a whole is brought appreciably nearer. This elimination of payable ore is constantly progressing and should not be overlooked in the popular acclaim of spectacular figures of output revenue and profits.

In March the South African Government stopped the experiment of certain gold mines whereby promising nonwhites were being given jobs requiring increased responsibility and skill. The experiment was undertaken as part of an effort both to combat the developing shortage of white labor and as part of a campaign to improve efficiency, which in fact did improve in 1965. Compared with that of 1960, the tonnage of ore handled by the whole industry increased by 11.4 percent, while the

Table 5.—Salient statistics of gold and uranium production by members of the Transvaal and Orange Free State Chamber of Mines

	1963	1964	1965
Number of operating mines	56	56	53
Ore milled thousand short tons	78,427	79,569	80,027
Gold produced:			
Gross weight thousand troy ounces	26,911	28,604	30,102
Per ton of ore milled troy ounces	0.3430	0.3595	0.3760
Number of mines producing uranium ore	13	12	7
Ore treated for uranium recovery thousand short tons	12,582	11,556	8,160
Uranium oxide (U_3O_8) produced:			
Gross weight thousand pounds	9,065	8,890	5,885
Per ton of ore milled pounds	0.72	0.77	0.72
Working revenue excluding uranium thousand dollars	$978,521	$1,010,755	NA
Average realized gold price per ounce [1] dollars	$35.03	$35.13	$35.13
Working profit, gold and uranium thousand dollars	$438,193	$465,598	$465,030
Taxation and mineral lease consideration payable to the government thousand dollars	$163,520	r $173,023	p $180,460
Net dividends do	$161,799	$173,547	$177,904
Average number of employees in service:			
Whites	47,352	45,774	44,098
Nonwhites	381,440	r 380,949	375,329
Development footage including shaft sinking thousand feet	3,252	3,299	3,177
Payable ore reserves thousand short tons	174,025	180,420	176,018
Average grade of reserves troy ounces per ton	0.418	0.419	0.444

r Revised. p Preliminary.

[1] Figures reported for 1963, 1964, and 1965 were respectively 25.02 rands, 25.09 rands, and 25.09 rands.

Source: Union Corporation Ltd. report and accounts for the year ended Dec. 31, 1965. Statistics published by the Transvaal and Orange Free State Chamber of Mines.

white labor decreased by 11.3 percent and the nonwhite force by 3.2 percent.[12]

Mines controlled by Anglo American Corporation of South Africa Ltd. (Anglo) accounted for 37.7 percent of the total 1965 output of the gold mining industry, compared with 36 percent in 1964, and their aggregate operating profit rose by $16.8 million to $203 million. Union Corporation Ltd. companies accounted for 13.2 percent of total production and realized an aggregate working profit of $63.9 million, $1.9 million less than in 1964.

In the year ended June 30, 1965, 12 producing gold and uranium mines administered by Gold Fields of South Africa Ltd. (wholly owned by Consolidated Gold Fields Ltd.) for the first time produced over 5 million ounces of gold. Aggregate operating profit rose by 10 percent to $88.2 million,[13] a new record.

During the year ended June 30, 1965, West Driefontein Gold Mining Co. Ltd. (administered by Goldfields) produced 2,146,451 ounces of gold ($75 million). This was the first time in the history of mining that a mine had produced more than 2 million ounces of gold in a period of 12 months.

Kloof Gold Mining Co. Ltd. expected to reach production by January 1968, at an estimated total cost of $60.2 million of which $21 million was raised in August 1964 to meet expenditures during the first 2 years. The company's base area is underlain by conglomerate ore estimated at 90.7 million tons containing 40 million ounces of gold ($1,400 million).

An important development of the year was the formation by Johannesburg Consolidated Investment Co. Ltd. of the new Elsburg Gold Mining Co. Ltd. Elsburg will exploit a new mining lease lying to the southwest of Western Area's mine. The project is expected to begin production in the middle of 1969, milling 45,000 tons of ore per month.

Kinross Mines Ltd. in the Evander area made excellent progress during the year in the sinking of its two vertical shafts and the construction of surface facilities.

Cementation Co. (Africa) (Pty.) Ltd. of Johannesburg won the contract to sink the new No. 5 shaft of Hartebeestfontein Gold Mining Co. Ltd. The shaft will reach a final depth of 2,007 meters (6,580 feet) and inside its concrete lining will be 9 meters (29½ feet) in diameter. With this inside diameter the shaft will be one of the largest of its kind in the world. The contract also specifies installation of a concrete partition from collar to bottom, dividing the shaft into upcast and downcast ventilation channels. The downcast channel will have four hoisting compartments. The shaft was started late in 1965 and is expected to be operational by the end of 1968. A total of 29 Europeans (whites) including the administrative staff and 320 Bantu (Negroes) will be employed in sinking it.[14]

Iron and Steel and Ferroalloys.—The iron and steel industry continued to grow in 1965 despite some slowing down of the economy as a whole. The industry, aided by foreign capital and technical assistance, was beginning to include products not previously manufactured locally; for example, stainless steel. The 1965 production of the industry as a whole was 10 percent higher than in 1964. The largest increase (20 percent) occurred in pig iron production; steel production rose 3 percent. Government controlled and operated South African Iron & Steel Industrial Corp. Ltd. (ISCOR) supplied 85 percent of 1965 output. Total employment in the iron and steel industry in 1964 was estimated at 41,000 (18,000 whites, 23,000 nonwhites).

The import levies introduced in 1964 to pay for supplementary steel imports were permanently incorporated into basic domestic steel prices. Effective January 3, 1966, prices for products of ISCOR's Pretoria plant were raised $5.6 per short ton; and effective March 28, 1966, the price of Vanderbijlpart steel plate was raised $6.65 per short tons. These price increases are the first since 1952. Reportedly their effect was to raise producers' selling prices by between 6.7 and 7.4 percent.

ISCOR estimated that from October 1964 to March 31, 1966, about 816,000 tons of steel products will have been imported under the general levy import scheme, mostly from Japan and Italy. During the period from October 1964 to June 30, 1965, about 397,000 tons were imported under the scheme.

Pig iron exports, very largely to Japan, rose nearly 80 percent compared with those

[13] Converted from £ sterling at 1£=$2.80.
[12] South African Mining and Engineering Journal (Johannesburg). V. 77, pt. 1, Apr. 1, 1966, p. 705.
[14] Coal, Gold, and Base Minerals (Johannesburg). V. 13, No. 11, January 1966, p. 14.

in 1964. With this principal exception exports of iron and steel were moderate. This situation was expected to continue until the home industry could more nearly satisfy domestic demand. According to Dr. F. P. Jacobsz, chairman of Union Steel Corp. South Africa, annual steel consumption in the country was estimated at 186 kilograms per capita (one-third of U.S. per capita consumption) and to be increasing at the rate of 8 percent per year (versus 2.9 percent in the United States). At this growth rate South Africa's steel consumption would exceed 4.5 million tons by 1970.

Despite the growing domestic iron and steel demand, the Government's revised Economic Development Programme provides for a substantial increase in exports of basic iron and steel products between 1964 and 1970. The program put the value of such exports in 1964 at about $50.8 million and stated that the figure would increase to $81.5 million by 1970.

ISCOR's $784 million expansion program at its steel plants at Pretoria and Vanderbijlpart was on schedule. For the financial year that began July 1, 1965, additions and improvements were expected to cost $140 million. This scheduled work included at Pretoria modernization of No. 1 sinter plant and the stoves of No. 1 blast furnace and completion of a second oxygen plant with daily capacity of 95 tons. At Vanderbijlpark the work included construction of a sixth open hearth furnace with 360 ton capacity and an electrolytic tinning line. In addition, $9.8 million was being spent on improvements at ISCOR's Sishen and Thabazimbi iron mines.

ISCOR's ultimate production target for its existing plants is 4.1 million tons of steel ingots annually. Earlier the target was expected to be reached by 1973, but ISCOR chairman F. Meyer in his annual report for the 1965 financial year predicted that the target would be reached by 1969. In addition, ISCOR was planning to build a third major steel works, probably on the east coast.

The Southern Cross Steel Co., jointly owned by Rand Mines Ltd. and the U.S. Eastern Stainless Steel Corp., expected to commission South Africa's first stainless steel plant, at Middleburg, Transvaal Province, in October or November 1966. Annual production of the $14.7 million plant by 1970 was estimated at 23,000 tons.

The iron, steel, and vanadium plant to be built at Witbank in Transvaal Province by Highveld Steel & Vanadium Corp. Ltd. was scheduled to begin operating in 1969, not in 1968 as previously reported. The vanadium product of the plant will be vanadium-rich slag, not vanadium pentoxide as previously reported.

In a speech in Johannesburg in September 1965 the Minister of Planning, J. F. W. Haak, cited the country's distinct export potential for ferroalloys. He mentioned the Republic's large reserves of chromite, manganese ore, and silica, and that it has one of the world's largest vanadium plants.

That the potential cited exists is apparent from the performance of the Republic's ferroalloy industry in recent years. Including spiegeleisen, in presumably relatively small quantity, production rose uninterruptedly from 159,000 tons in 1961 to 230,000 tons in 1964 to 332,000 tons in 1965. Exports in 1964 (most recent year for which data are available) totaled 176,076 tons valued at $21.6 million, compared with 145,275 tons valued at $18.1 million in 1963. The exports comprise mostly ferromanganese, ferrochromium, and ferrosilicon, for which export values in 1964 in million of dollars were respectively 13.7, 4.8, and 2.6.

Manganese.—Local sales and exports of manganese ore were valued at $6.3 million and $18.6 million, respectively, 39 percent and 20 percent higher than in 1964. Exports of chemical grade ore declined slightly, while local sales improved.

The Associated Manganese Mines of South Africa, Ltd. (AMM), earned $4.7 million, 43 percent more than in 1964, owing to higher prices and record shipments of iron and manganese ores. Shipments of the ores totaled 840,000 and 616,000 tons respectively. At the plant of AMM's wholly owned Feralloys, Ltd. capital expenditures totaled $283,000 in 1965, and Feralloy's $4.2 million, 3-year expansion plan was completed.

South African Manganese Ltd., the other large South African manganese producer, produced 800,000 tons of manganese ore in the year ending June 30, 1965, at its Hotazel, Lohathla, and Mamatwan mines, 85,000 tons more than in the previous financial year.

Electrolytic Metal Corp. (Pty.) Ltd. produced 5,035 tons of electrolytic manganese in 1965, and plans to expand capacity to 7,600 tons annually. The project was delayed by shortages of labor and contractor facilities.

A paper was prepared for publication which describes two sources of battery-grade manganese in the western Transvaal, the Gopani and Orient mines.[15]

Platinum.—Rustenburg Platinum Mines Ltd. (RPM), continued to be the only significant producer of platinum group metals in the Republic. RPM does not publish production, and there was much speculation in Johannesburg and elsewhere as to that figure for 1965. The Bureau of Mines has estimated RPM's 1965 production at 750,000 ounces, for combined platinum and other metals of the group. The estimate is 150,000 ounces larger than that made for 1964 and again ranks South Africa as by far the largest platinum producer in the free world.

RPM's financial year ends August 31. During the 1965 financial year the mines (Rustenburg and Union) operated at capacity and mine output substantially increased. The flow of refined marketable metal also increased. The expansion program in progress during the year was on schedule and the designed rate of mine output would be reached during March 1966. Toward the end of 1966 all of the refined platinum resulting from the program would be available to the market.

A long-term agreement made in 1964 with a consortium headed by the Central Mining/Rand Mines group became operative. On a royalty basis RPM was mining in the consortium's Brakspruit property adjacent to RPM's Rustenburg mine, and in April 1965 regular deliveries to the consortium of platinum group metals were begun. The deliveries were in the form of converter matte and metallics (blanket table concentrates of platinum minerals).

On January 18, 1965, RPM raised its published price for platinum from the equivalent of $89.60[16] per ounce to the equivalent of $100.10 per ounce, where it remained during 1965. The company also increased its prices for palladium, rhodium, and osmium. With respect to platinum, RPM reported that as at November 17, 1965, the "free market price" of platinum (mostly Soviet platinum) was the equivalent of about $168 per ounce.

	Value, million U.S. dollars	
	1964	1965
Net revenue from sales of metals	23.7	19.1
Taxation and State's share of profits	8.9	5.2
Dividends declared	11.6	11.6

The following financial items appeared in the report of RPM for the year ending August 31, 1964.

According to the report, the decline that occurred in revenue from metal sales resulted from a reduction in the volume of sales of platinum.

The principal ultimate markets for Rustenburg platinum continued to be the United States and the United Kingdom, along with Japan and certain European countries.

Uranium.—On August 5 the Prime Minister inaugurated the Republic's first nuclear reactor, Safari I, at Pelindaba, which cost $330 million to build,[17] and during the year the Atomic Energy Board was asked to thoroughly study nuclear energy as a source of energy for the Republic.

Seven mines produced uranium as a byproduct of gold mining during the year; namely, Buffelsfontein, Harmony, Hartebeestfontein, Vaal Reefs-Western Reefs (a joint production scheme), Virginia, and West Rand Consolidated gold mines. An eighth mine, Zandpan, was preparing for production, using the Hartebeestfontein plant.

Early in the year the South African Government invited uranium producers to stockpile production in excess of current contracts, and it was estimated that the value of domestic stocks of uranium (U_3O_8) would be about $28 million in 1966, and about $70 million by 1970. Stockpiles took some of the 2,673 tons produced in 1965, which was 1,363 tons less than 1964 output and reflected a decline in contractural commitments to the United States Atomic Energy Commission and the United Kingdom Atomic Energy Authority. Total exports during the first 6 months of 1965 (no later data available) were valued at $32.7 million. Final deliveries to the United

[15] "Nsutite (battery-grade manganese dioxide) From the Western Transvaal," by R. J. Ortlepp. For publication in Volume 67 of the Transactions of the Geological Society of South Africa, 1966.

[16] Converted from £ sterling at £=$2.80.

[17] Mining Journal (London). V. 265, No. 6784, Aug. 27, 1965, p. 149.

States will be made in 1966 and deliveries to the United Kingdom will begin in 1967.

In August the Minister of Mines announced that the Republic's uranium reserves at the present price of gold were 172,000 tons of recoverable uranium oxide at a price for uranium oxide of $17.64 per kilogram ($8.00 per pound); this was 30,000 tons above the previous estimate. Early in 1966 the Minister added that reserves were 172,000 tons at $22.05 per kilogram ($10.00 per pound), 204,000 tons at $33.07 per kilogram ($15.00 per pound), and 240,000 tons at $44.10 per kilogram ($20.00 per pound).

A pilot plant was operated as a cooperative research program by the Atomic Energy Board and Buffelsfontein Gold Mining Co., Ltd., to investigate the production of nuclear-grade uranium by a combination of sulfuric acid election and solvent extraction. The procedure, known as the Bufflex process, reportedly satisfies economically the most stringent specifications for nuclear-grade uranium, except as regards cobalt, molybdenum, and hafnium contamination.[18]

Vanadium.—Vanadium oxide (V_2O_5) exports in the form of fused oxide fell sharply, from 3,243 tons worth $5.8 million in 1964 to 2,148 tons valued at $4.3 million. Exports in 1964 had included a large quantity of material from stocks.

The sole producer in 1965 was Transvaal Vanadium Co. (Pty.) Ltd., which in November 1965 became a wholly owned subsidiary of Highveld Steel & Vanadium Corp., Ltd. But during the year control of the assets of the Federale Vanadium Company was acquired by Ruighoek Chrome Mines (Pty.) Ltd., a subsidiary of Union Carbide Corp. of the United States, and Federale's plant near Pretoria (operated experimentally in 1963) will be put into commercial production. Vanadiferous magnetite which Federale had used, will be the vanadium raw material. Mining and milling, beginning in mid-1966, will be undertaken by Ucar Minerals Corp., another Carbide subsidiary.

The steel and vanadium complex of Highveld Steel & Vanadium Corp. Ltd. (formerly Highveld Development Co. Ltd.) was expected to be commissioned at Witbank at a cost of about $164 million, including working capital. Vanadiferous magnetite will be mined at the new Mapoch's mine at Roossenekal, eastern Transvaal, at a cost of $9.8 million. Reserves there stood at 18 million tons containing 13 percent titanium, 1.6 percent vanadium (V_2O_5) and 56 percent iron. Ore will be provided initially at a rate of 900,000 tons a year. At the Witbank plant 435,000 tons annually of pig iron containing most of the vanadium will be produced initially. Oxygen will be blown into the molten pig to slag off vanadium at the initial rate of 10.4 million kilograms per year.

NONMETALS

Asbestos.—Total output of the three varieties of asbestos mined in the Republic rose by 11.6 percent compared with the 1964 output. Crocidolite registered the largest increase, 18 percent. The value of local sales more than doubled, but total export value in thousand dollars showed little change, as follows:

	Local sales [1]		Exports [1]	
	1964	1965	1964	1965
Amosite	176	273	10,867	10,557
Chrysotile	584	1,149	2,945	2,571
Crocidolite	351	1,083	19,607	20,544
Total	1,111	2,505	33,419	33,672

[1] Local sales values are free on rail; export values are f.o.b. port of shipment.

The United States generally has ranked second after the United Kingdom in consumption of South African asbestos. United States imports of the material in 1965 were valued at $7.2 million, with amosite and crocidolite accounting for $2.6 million and $4.1 million, respectively.

A new system of fiber extraction was introduced at the crocidolite property of Mercncor Asbestos Mines in the Kuruman district of Cape Province. In this method, known as the impact system, the fiber-bearing rock is thrown against an impact plate; experience has shown that the rock is shattered and the fiber freed more efficiently than through the use of hammer mills. The new plant has a capacity of about 635 tons of fiber per month.

The Barberton chrysotile asbestos property, near Malelane in the Eastern Trans-

[18] Faure, A., and coauthors. The Production of High Purity Uranium at a South African Gold Mine. J. South African Institute of Min. and Met., v. 66, No. 8, March 1966, pp. 339-341.

vaal, was reopened after having been closed for 2 years. About 180 tons per month of fiber will be produced.

South Africa's needs for asbestos more than doubled in the period 1960–65 and this pattern appeared likely to continue. Further increases in mine capacity were foreseen as a result and to meet export demand.[19]

Diamond.—Production of natural diamond increased by 12.9 percent compared with 1964 production. About 92 percent of 1965 output came from underground mines; 383,632 carats were obtained from alluvial workings. The figure for alluvials compares with 585,390 carats recovered from alluvial deposits in 1964.

Sales at 4.8 million carats valued at $69.4 million (R49,601,476) were 8.8 percent in volume and 12.2 percent in value greater than in 1964. The value per carat of 372,417 carats of alluvial stones included in the total was $52.08 (R37.20), whereas the value per carat of 4,472,632 carats of mine stones making up the remainder was $11.17 (R7.98).

At yearend the outlook was for a continuation of the firm market for diamond that existed in 1965.

De Beers Consolidated Mines Ltd.—De Beers accounts for the order of 80 percent of world sales of raw diamond. The following are some salient features of the statement of the chairman supplementing De Beers report for 1965. For the fifth successive year diamond sales by De Beers Central Selling Organization were a record. At $415.3 million, sales exceeded the total for 1964 by $42.4 million. At yearend the market for gem diamond was firm. Sales of industrial diamond were good and increasing. A growing demand existed for the synthetic grit produced in Shannon, Ireland, by Ultra High Pressure Units (Ireland) Ltd., an associated company, and in South Africa new types of grit were being developed by the De Beers company, Ultra High Pressure Units, Ltd.

The Diamond Producers' Association agreement and the related agreements with the selling companies were modified and renewed for another 5 years. Satisfactory new purchase agreements were concluded with Companhia de Diamantes de Angola and the Diamond Corp. Tanzania Ltd.

The increase in diamond sales was largely made possible by increased output from mines of the De Beers group. The output of mines in the Republic operated by the De Beers company increased by 212,113 carats to 1,900,216 carats, which included the first contribution from the new Finsch mine of 95,217 carats. Further increases were expected in 1966 in Namaqualand, where prospecting had established substantial reserves, and at Finsch. Premier mine in Transvaal Province (owned half by De Beers and half by the Government) completed its expansion program and production increased to 2,439,000 carats, from 2,224,012 carats in 1964.

During 1965 Marine Diamond Corp. in South-West Africa Ltd. became a subsidiary of Consolidated Diamond Mines of South West Africa Ltd., and hence of De Beers. Diamond reserves of Marine were stated to be "probably large," making Marine "a potentially important producer." Anglo American Corporation of South Africa Ltd. assumed technical direction of Marine's activities, and the chairman reported that "we are confident that we will eventually succeed in putting the Corporation (Marine) on a profitable basis, although quick results cannot be expected."

De Beers profit before taxes was $161 million, up $9.1 million from that of 1964. After providing for taxation and deducting minority interests, the profit attributable to De Beers increased by $4.5 million to $102 million. Taxation absorbed $45 million, $4.9 million more than in 1964.

Fluorspar.—Production of fluorspar again increased by 9 percent compared with 1964 output.

Buffalo Fluorspar (Pty.) Ltd. expanded rated capacity to 1,600 tons per month and it was expected that output would reach that figure by mid-1966. Proven reserves of ore for open pit mining were about 4.8 million tons, and a further 350,000 tons exist on a nearby farm over which the company obtained mining rights. Besides supplying the major portion of the domestic market for ceramic grade fluorspar, the company exports acid grade spar to Japan and Australia.[20]

Nitrogen.—African Explosives & Chemical Industries (AE & CI) called for tenders for its $22.4 million ammonia plant at Umbogintwini, Natal and Fisons (Pty.) Ltd.

[19] General Mining and Finance Corp., Ltd. Annual Report, 1965.
[20] Rand Daily Mail (Johannesburg). June 3, 1965.

placed a contract for the first stage of a $23.8 million ammonia plant at Milnerton, Cape Province. Fisons' output will be solely for the fertilizer field in the form of nitric acid, ammonium nitrate, and limestone ammonium nitrate, while much of AE & CI's output will go to industry in general, and the explosives industry. Total capacity of AE & CI should reach 254,000 tons per year of ammonia, Fisons about 90,000 tons, and a third plant, completed by the South African Coal, Oil & Gas Corp., Ltd. (SASOL) in 1964, will reach 60,000 tons per year, all by 1967. This total capacity will be larger than that needed locally, and a surplus for export is expected.

Phosphates.—The Phosphate Development Corporation Ltd. (FOSKOR) produced 3.6 million tons of foskorite ore during the fiscal year to June 30, 1965, and produced 446,000 tons of apatite concentrate. Mining of foskorite ore will be discontinued in 1966, and lower grade pyroxenite ore will be mined. Reserves of pyroxenite ore are potentially adequate to provide for the country's requirements for hundreds of years to come. Plant extensions at FOSKOR were completed and officially commissioned in August. Production capacity of the plant is now 540,000 tons of salable concentrates per annum, sufficient to supply the major portion of the Republic's requirements. During the fiscal year FOSKOR's price for phosphates (about 37 percent P_2O_5) was reduced to $12.89 per ton, compared with $14.95 in the previous financial period. With the disappearance of revenue from copper concentrates, which are a byproduct of foskorite mining, it is not expected that any further reductions will be possible. Other byproducts are titaniferous magnetite, for which no market has been found, and baddeleyite (zirconium oxide), for which markets are being sought.

Windmill Fertilizers S.A. (Pty.) Ltd. completed its new factory at Sasolburg, Orange Free State, in July at a cost of $8.4 million, and started manufacture of superphosphate; the factory will produce a wide range of fertilizers with a total output of up to 454,000 tons per year.

Silica.—Delmas Silica (Edms.) Bpk. with quarries about 6 miles from Delmas, began to produce silica in about 1959, but only recently has a modern plant been commissioned to produce pure silica for the glass, ceramic, iron and steel, and ferroalloy industries. The deposits have been drilled to a depth of 183 meters (600 feet) and reserves of very high grade material have been estimated at about 27 million tons. The average analysis of material being quarried from one of the deposits was, in percent: SiO_2, 99.5; Al_2O_3, 0.35; Fe_2O_3, 0.02. At yearend the capacity of the plant was governed by the size of two washers and was 27 tons per hour. Provision for a third washer was made and when installed plant capacity will be 41 tons per hour.[21]

Allied Quartzite (Pty.) Ltd. was developing extensive deposits of slab quartzite at the Lekkersing quarry near Port Nolloth, Namaqualand, Cape Province. The quartzite reportedly is among the hardest known, and the deposits are said to be the largest in the world. Contracts have been obtained for shipments to Europe and the United States.

In December De Beers Consolidated Mines, Ltd., called for tenders for the right to mine quartzite from deposits on the company's Oograbies West and Kwakanab farms in Namaqualand 20 miles from Port Nolloth. De Beers conservatively estimated the deposits to contain over 1 million tons of quartzite.

Soda Ash.—The plans of Salt & Soda Corp. Ltd. to manufacture soda ash were abandoned during the year. Goldfields of South Africa Ltd., was considering the possibility of mining soda ash in South-West Africa and refining it in the converted uranium plant of the Vogelstruisbult mine, which was closed in 1964.

Vermiculite.—The value of local sales of vermiculite increased over 20 percent to $155,506 but export sales declined slightly to $2 million. The only producer, Palabora Mining Co. Ltd., planned a drive to increase exports to the United States. Use of chartered ships and establishment of a stockpile near New York were proposed.

MINERAL FUELS

Coal.—The coal industry continued to expand owing to steady increase in internal demand. While coal exports were somewhat lower than in 1964, production and local sales were, respectively, 7.9 percent and 8.4 percent, greater than in 1964; and compared with 1962 sales those of 1965 were

[21] Coal, Gold and Base Minerals (Johannesburg). V. 13, No. 11, January 1966, p. 32.

16 percent higher. The value of sales per short ton free on rail increased to $2.05 from $1.93 in 1964. These figures probably represent the cheapest coal sales price at mine in the free world today.

In December the Electricity Supply Commission (ESCOM) awarded the coal contract for its new 2-million-kilowatt power station to Anglo-American Corporation of South Africa Ltd., acting on behalf of a consortium of companies. The station, to be called Arnot station, will be one of the world's largest coal-fired power stations. It will begin to operate in 1971 and at full capacity will burn annually about 6.3 million tons of coal. The coal will be supplied by four new collieries to be established in an area between Middleburg and Belfast in eastern Transvaal Province.

The new station is part of ESCOM's expansion program which by 1975 will have doubled the Republic's present capacity of about 6 million kilowatts. Leading authorities estimate that by the year 2000 South Africa's power requirements could have increased to about 10 times the present level. Although nuclear power stations may well be operating in the Republic by the late 1970's, the estimated increase in power needs is such as virtually to preclude abandonment of coal-fired stations in favor of nuclear stations. It appears that both power sources will be needed for many years.[22]

Petroleum.—The search for oil in South Africa was further intensified during the year. Southern Oil Exploration Corp., wholly owned by the Government, in October contracted for the drilling of three holes, in the Richmond, Sutherland, and Fraserburg districts of Cape Province. The holes will be drilled to depths of between 3,000 and 3,700 meters and are expected to require a year to complete.

Anglo Transvaal Consolidated Investment Co. Ltd., jointly with other companies, formed Zululand Oil Exploration Co. (Pty.) Ltd. in August. The new company was assigned rights to prospecting leases over about 14,000 square kilometers in northern Zululand (Natal Province) and the bed of the sea to the limits of South African territorial waters and the continental shelf.

Toward yearend at least seven syndicates were reported active in drilling in areas that had been surveyed geologically or geophysically. Several United States companies sent representatives to South Africa during the year to investigate oil possibilities.[23]

According to the South African Mining and Engineering Journal[24] the 27th oil refinery owned by the Standard Oil Co. of California (Caltex) will be officially opened and go on stream at Killarney, Cape Province, in April 1966.

The $27.4 million project has been described as the most integrated refinery that Caltex has yet undertaken. Capacity for crude will be about 30,000 barrels daily. Storage capacity for crude is 1.2 million barrels. The crude oil will come from the Middle East, with 20 tankers docking at Cape Town each year. The largest tanker will be 65,000 tons deadweight, and capable of discharging 60,000 tons of crude oil over a 3-day period. Effluent from the refinery will be discharged into Table Bay by pipeline about 460 meters long.

A significant event of the year was the completion of the pipeline for petroleum products from Durban to the Witwatersrand. The line will lessen the load on the railroad connecting those areas, which carries the heaviest tonnage in the country and whose capacity cannot be readily increased because it traverses rugged country.

---

[22] Anglo American Corporation of South Africa Ltd. Chairman's statement in Annual Report for 1965. P. 2.

[23] U.S. Embassy, Republic of South Africa. State Department Airgram A–161, No. 4, 1965, pp. 4.

[24] South African Mining and Engineering Journal (Johannesburg). V. 76, pt. 2, No. 3801, Dec. 10, 1965, p. 2901.

The Mineral Industry of South-West Africa

By William F. Keyes [1] and Charles L. Kimbell [2]

As in previous years, the mineral industry in 1965 was the most important economic activity in the Territory of South-West Africa. The value of minerals exports, including some very minor local sales, was $161.2 million[3], an increase of $30.5 million over the 1964 total. This was more than half the gross domestic product of the Territory, although exact figures on the latter are not available. Output value of diamond, blister copper, and refined lead made up nearly 90 percent of the total value of mineral commodity output, and was significantly greater in 1965 than in 1964. The only major commodity recording a significant decline was zinc-lead ore.

Sales of diamonds, which were slightly less than production, were valued at $98.4 million in 1965, or almost 24 percent of total world gem sales by the Central Selling Organization. Vanadium output, about 15 percent higher than in 1964, contributed a significant part of total free-world output, and the Territory ranked second only to the United States as a mine source of this metal among free-world producers. Zinc concentrate and metallic cadmium also were produced in quantity, but production of germanium on a major scale was not realized because of lack of markets. Small quantities of lithium ores, tin concentrates, tin-tungsten concentrates and salt were also produced for export and iron ore (for use as flux) salt, phosphates and simple construction materials were produced for domestic markets. Reserves of most of these materials, both for export and indigenous use, were sufficient to permit output to continue at the 1965 levels or possibly at an expanded level for some time to come.

Thirteen companies reportedly[4] conducted exploration for diamond, base metals, nonmetallic minerals, and petroleum in South-West Africa in 1965. The two largest mining companies, Consolidated Diamond Mines and Tsumeb Corp. Ltd., were among these. Prospecting for oil was carried on by the subsidiary of a U.S. petroleum company.

The minerals industry of South-West Africa employed about 13,600 persons in 1965, a slight increase over the number of persons employed in 1964. The greatest increases in employment were at the Tsumeb copper-lead mine, which employed about 5,000 persons, at Consolidated Diamond Mines, which employed about 4,800 persons and at the tin-tungsten and lead-zinc-vanadium mines of the South-West Africa Co. Ltd., which employed about 1,100 persons. A shortage of skilled workers was noted.

New developments in mining included the takeover of the marine diamond-dredging operation by De Beers' subsidiary, the Consolidated Diamond Mines of South-West Africa Co. Ltd.; initial production of silver metal at the Tsumeb smelter; the reopening of the only manganese mine; and the start of operations at a new tin mine.

---

[1] Consul, U.S. Consulate General, Johannesburg, Republic of South Africa.

[2] Physical scientist, Division of International Activities.

[3] Where necessary, values have been converted from Rands (R) to U.S. dollars at the rate of R1=US$1.40.

[4] South-West Africa Administration, Mines Division. Annual Report, 1965. Windhoek, South-West Africa, 1966, pp. 7-8.

263-927 O-67—59

PRODUCTION

Although the total value of mineral production is not reported for the Territory of South-West Africa, the value of total sales may be taken as an approximation of the value of production. These sales consist almost entirely of exports but include modest local sales, chiefly of nonmetallic minerals. Total sales amounted to $161.2 million in 1965, $30.5 million greater than the value of total sales in 1964. The increase was due largely to a higher rate of diamond mining on the major concession along the coast and to increased production by Tsumeb Corp. Ltd.

Table 1.—South-West Africa: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity [2]	1961	1962	1963	1964	1965
Metals:					
Beryl, 10 to 12 percent BeO	229	144	r 55	r 7	52
Bismuth concentrate—kilograms	743	220	35	4,726	587
Cadmium:					
Contained in Tsumeb concentrates [3]	r 793	r 553	r 480	r 320	r 543
Smelter output	---	---	---	---	33
Cesium ore, pollucite—kilograms	1,769	508	---	---	---
Copper:					
Ore [4 5]	4,904	1,452	---	490	1,696
Metal:					
Content of ore and concentrate [6]	25,200	22,653	32,454	r 35,106	39,423
Blister	---	1,214	r 20,813	28,511	29,706
Germanium: [7]					
In concentrate—kilograms	10,523	25,125	---	---	---
In blister copper—do	---	96	---	---	---
Dioxide—do	5,162	14,375	20,348	---	---
Gold—troy ounces	---	183	3	32	14
Iron ore	---	---	15,029	9,481	32,835
Lead:					
Ore and concentrates: [5]					
Straight lead ore [4]	100	---	---	---	---
Lead-vanadium concentrate	10,337	9,168	10,206	9,916	11,476
Metal:					
Content of ore and concentrate [6]	r 70,472	r 75,369	r 75,496	r 94,368	87,806
Refined	---	---	1,812	47,795	66,035
Manganese ore, about 48 percent Mn	45,627	---	---	---	3,797
Molybdenite—kilograms	---	---	486	---	---
Silver, recoverable, in concentrate—thousand troy ounces	r 1,118	r 1,301	r 1,143	r 1,436	r 1,541
Tantalite-columbite concentrates—kilograms	2,930	5,244	2,069	r 669	1,005
Tin:					
Tin concentrate—long tons	146	247	265	359	490
Tin-tungsten concentrate, about 37 percent Sn and 16 percent WO_3—long tons	580	575	753	659	588
Tungsten, scheelite concentrate	6	2	---	(8)	1
Vanadium, in lead vanadate concentrate	1,039	924	1,029	r 1,008	r 1,157
Zinc:					
Ore and concentrate: [5]					
Straight zinc concentrate	2,136	2,950	8,334	2,447	13,091
Zinc-lead ore [4] and concentrate	---	14,072	13,858	26,671	13,717
Metal content of concentrate [6]	13,522	22,862	33,307	32,034	29,981
Polymetal concentrate [9]	164,954	216,023	153,694	76,729	62,910
Nonmetals:					
Aragonite—kilograms	181	6,350	---	---	---
Diamonds:					
Gem—thousand carats	816	800	1,076	1,387	r 1,490
Industrial—do	90	227	119	154	r 166
Total—do	906	1,027	1,195	1,541	r 1,656
Feldspar	90	472	2,232	1,923	2,318
Fertilizer materials, phosphate:					
Apatite	---	---	---	1	---
Guano	937	583	1,375	418	1,406
Fluorspar	---	218	435	---	---
Graphite	---	---	---	250	359
Lime	3,403	2,928	2,923	3,719	3,570
Lithium minerals:					
Amblygonite, 6 to 8 percent LiO_2	123	128	r 116	12	35
Lepidolite, 3 to 3.6 percent LiO_2	1,286	1,616	78	369	270
Petalite, 3 to 4 percent LiO_2	2,304	914	785	724	1,208
Marble	331	1,891	925	1,490	1,113
Mica	---	68	543	377	118
Salt	55,599	75,573	64,686	98,832	96,968

Table 1.—South-West Africa: Production of metals and minerals [1]—Continued
(Metric tons unless otherwise specified)

Commodity [2]	1961	1962	1963	1964	1965
Nonmetals—Continued					
Semiprecious stones:					
Agate kilograms	---	---	---	2,268	5,058
Amazonite do.	---	862	16,375	9,562	680
Amethyst quartz do.	3,020	141,937	61,253	52,367	2,595
Jasper do.	---	272	181	3,084	360
Opal quartz do.	---	91	---	---	---
Rose quartz do.	---	227	227	13,608	---
Sodalite do.	---	---	---	6,350	180
Tourmaline do.	33	5	62	16	2
Chalcedony do.	13,698	3,647	1,016	3,225	7,398
Sillimanite and kyanite	2,722	1,512	---	572	---
Slate	---	---	1,189	642	1,053
Wollastonite	---	---	---	118	209

e Estimate. r Revised.

[1] Compiled from Minerals, the Quarterly Information Circular of the Department of Mines of the Republic of South Africa, from company annual reports, and from Beerman's All Mining Yearbook, 1965. Data on metal content of concentrates containing copper, lead, and zinc have been revised from that reported in the 1964 edition of the Minerals Yearbook, Volume IV, in order to show metal content of total Territorial output on a calendar year basis rather than only the output of Tsumeb Corp. on a fiscal (July 1–June 30) year basis. Data for silver output are from Tsumeb Corp. on a fiscal year basis and considerably exceed officially reported quantities.

[2] In addition, construction materials such as common clay, sand and gravel are presumably produced, but quantitative data are not available.

[3] Data given here as reported in Minerals considerably exceed figures published by the Territory's sole producer, Tsumeb Corp., for years ended June 30. Tsumeb data, reported as recoverable cadmium content of concentrates produced for years ended June 30 of that stated, were as follows in metric tons: 1961–123; 1962–109; 1963–114; 1964–99; 1965–108.

[4] Figures represent only those ores and concentrates produced for export sale in that form; they exclude ores produced and processed within the Territory to concentrates, and concentrates produced and processed within the Territory to metals.

[5] In addition to ores and concentrates listed under this heading, see Polymetal concentrates at the end of the list of metals.

[6] Includes content of all ores and concentrates produced, including those Tsumeb Corp. concentrates smelted in the Territory as well as those exported as ores and concentrates.

[7] The accuracy of the germanium figures is questionable.

[8] Less than ½ unit.

[9] Includes copper-lead-silver, lead-copper-silver, copper-lead, and zinc-cadmium concentrates produced by Tsumeb Corp. for export; does not include concentrates of these types smelted in the Territory.

TRADE

The value of mineral commodity exports from South-West Africa, reported separately from the value of local sales for the first time,[5] reached $160 million, almost $29.7 million more than the revised export value of $130.3 million recorded for 1964. This new high chiefly resulted from increased diamond sales and both larger shipments and higher unit prices for nonferrous metal commodity exports. Increased diamond exports alone accounted for about half of the increase in total exports.

Major categories of mineral exports and the value of exports in these categories were as follows:

Commodity	Value, million dollars		
	1963	1964	1965
Diamond	57.4	84.4	98.4
Blister copper	11.3	19.5	21.0
Refined lead	.1	10.0	20.7
Complex concentrates [1]	14.5	11.0	14.3

[1] Copper-lead-silver and zinc-cadmium concentrates.

Together, these four commodities accounted for 96.5 percent of total export sales; most of the remainder resulted from exports of tin concentrates from the Uis mine, lead-vanadium concentrates from the Berg Aukas mine and tin-tungsten concentrates from the Brandberg West mine.

Mineral commodities continued to be the chief export product group of the Territory although exact comparison to total exports is impossible because data on gen-

[5] Department of Mines, Republic of South Africa. Quarterly Information Circular, Minerals, October to December 1965. Pretoria, South Africa, pp. 46–49.

eral exports have not been published separately from those of the Republic of South Africa. Likewise, total and mineral commodity imports are not reported separately. Fuels, including coal delivered by rail from the Republic of South Africa, and petroleum products, made up most of the tonnage and presumably also accounted for a large share of total value of imports.

In addition to total reliance upon imports to meet fuel requirements, much of the Territory's need for other mineral commodities also was met by imports. Indigenous resources in 1965 supplied about 32,800 tons of iron ore for use as a metallurgical flux, about 480 tons of guano fertilizer, about 26,600 tons of various grades of salt, and 56 tons of slate for domestic use. Local quarries presumably met virtually the entire need of the Territory for stone and sand and gravel. Requirements for cement, iron and steel, nonferrous metals, and other mineral manufactures were filled entirely by imports.

Table 2.—South-West Africa: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Beryllium ore (beryl, 10 to 12 percent BeO)	36	10	24	Mainly to United States.
Bismuth concentrate_kilograms	204	4,632	10,076	All to United Kingdom.
Cadmium metal:				
Contained in complex concentrate [1]	480	320	276	United States 175; Japan 113; Belgium 32.
Smelter product	---	---	24	
Cesium ore (pollucite) kilograms	---	---	(2)	
Copper:				
Ore and straight concentrate [3]	---	317	679	West Germany 169; Japan 148.
Metal:				
Contained in complex concentrate [1]	11,676	r 5,926	8,021	United States 5,256; Belgium 554; Japan 116.
Blister	19,118	28,573	30,150	United States 17,102; Belgium 7,523; West Germany 3,947.
Germanium dioxide_kilograms	306	7,473	4,591	Japan 5,924; United Kingdom 1,549.
Gold_troy ounces	---	1	31	NA.
Lead:				
Lead-vanadium concentrate	10,678	r 10,686	9,918	Mainly to West Germany.
Lead-zinc ore and concentrate [3]	2,419	r 23,935	15,245	United Kingdom 21,488.
Metal:				
Contained in complex concentrate [1]	68,083	r 35,538	36,723	United States e 28,687; Japan e 3,434; Belgium e 3,416.
Refined	434	41,789	70,982	Netherlands 7,861; Italy 5,652; Republic of South Africa 4,883; West Germany 4,502; Norway 4,064; Japan 3,703.
Manganese ore	426	---	---	
Molybdenite_kilograms	486	---	---	
Silver metal:				
Contained in complex concentrate [1] thousand troy ounces	634	329	462	United States 287; Belgium 33; Japan 9.
Refined_do	---	---	198	
Tantalite-columbite_kilograms	907	272	755	United Kingdom 154; United States 118.
Tin metal contained in straight concentrates_long tons	293	r 297	462	Republic of South Africa 295; United Kingdom 1.
Tin-tungsten concentrate	773	691	519	All to Netherlands.
Zinc:				
Ore [3]	8,334	2,447	---	All to United Kingdom.
Concentrate [3]	18,749	r 17,295	15,310	West Germany 13,614; Republic of South Africa 804.
Metal in complex concentrate [1]	20,289	14,414	16,891	United States 8,297; Japan 4,840; Belgium 1,277.

Table 2.—South-West Africa: Exports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1964
Nonmetals:				
Diamonds:				
Gem—thousand carats	1,181	1,373	1,432	NA.
Industrial—do	149	165	158	NA.
Total—do	1,330	1,538	1,590	NA.
Feldspar	888	2,516	1,432	Belgium 989; United Kingdom 874; West Germany 548.
Gemstones, semiprecious:				
Agate—kilograms	---	2,268	907	NA.
Amazonite—do	---	r 10,047	---	Republic of South Africa [4] 4,808.
Amethyst quartz—do	25,580	r 15,717	5,173	Republic of South Africa [4] 5,738.
Blue quartz—do	---	---	2,721	
Chalcedony—do	---	r 2,253	317	United States [4] 1,814.
Green quartz—do	2,749	1,814	---	NA.
Jasper—do	---	2,087	294	NA.
Sodalite—do	---	3,175	180	All to Republic of South Africa.
Tiger's eye [5]—do	2,658	3,629	---	All to West Germany.
Tourmaline—do	15	2	---	Mainly to West Germany.
Graphite	NA.	214	134	NA.
Lithium minerals:				
Amblygonite	179	---	607	
Lepidolite	286	491	154	Netherlands 299; United Kingdom 192.
Petalite	692	1,044	1,007	United Kingdom 395; Japan 356; Netherlands 293.
Marble	NA.	152	---	NA.
Mica	577	r 269	77	West Germany 137; United Kingdom 75.
Salt	47,084	56,107	49,312	Republic of South Africa 50,091.
Sillimanite/kyanite	---	555	210	All to Republic of South Africa.

e Estimate. r Revised. NA Not available.
[1] Polymetal concentrates produced by Tsumeb Corp. Gross weight of concentrates of this type reported in source was as follows: 1963—152,003 tons; 1964—82,284 tons; 1965—123,734 tons. Source does not classify Tsumeb concentrates on a basis comparable to company production figures.
[2] Less than ½ of unit.
[3] Concentrates other than those produced by Tsumeb Corp.
[4] May be only partial total to country indicated.
[5] Imported from Republic of South Africa and reexported.

Sources: Department of Mines, Republic of South Africa. Quarterly Information Circular Minerals. October–December issues for 1964 and 1965, Pretoria, South Africa.
South-West Africa Administration Mines Division. Annual Report 1965. Windhoek, South-West Africa 1966, p. 11.

COMMODITY REVIEW

METALS

As in previous years, 3 large companies were producing metalliferous ores in South-West Africa in 1965, and 15 smaller producers were reported.[6] The only smelting operations were carried on by the Tsumeb Corp. Ltd., which produced blister copper, refined lead, commercial silver, cadmium, germanium dioxide, and black arsenic derived from ores from two mines; in addition Tsumeb produced complex copper-lead-silver concentrates and zinc-cadmium concentrates, both for export in that form. The South-West Africa Co. Ltd. was the only other producer of lead and zinc, milling ore from its Berg Aukas mine to produce lead and zinc concentrates as well as all the Territory's vanadium concentrates. In addition, this company produced tin-tungsten concentrates from its Brandberg West mine. The third large metal producer was the Industrial Minerals Exploration (Pty.) Ltd., whose Uis tin mine accounted for more than half the tin output. The remaining producers contributed to the output of ores of beryllium, bismuth, columbium, copper, gold, lithium, tantalum, tin, and tungsten.

Copper, Lead, Vanadium, Zinc, and Associated Metals.—*The Tsumeb Corp. Ltd.*—During the fiscal year ended June 30, 1965, the value of Tsumeb's metal sales increased by 60 percent over that of 1964, to a total of $72.0 million, and net profits more than doubled, to $26.4 million. The increases were due to larger sales and higher metal

[6] Pages 43–53 of work cited in footnote 5.

prices. The figures for metal sales and net profits were the highest in the company's history, materially exceeding the previous record year of 1956. The company's income tax payments also increased two and a half times over those of 1964, to $12.3 million.

Capital expenditure on the expansion program, including the copper smelter, the lead smelter, the cadmium plant, the germanium plant, the townsite, and the Kombat mine, totaled $30.4 million in the 5-year period ending June 30, 1965. Further authorized capital expenditure on new construction subsequent to this period was $5.7 million. This included $1.6 million on the two smelters, $1.4 million for increasing capacity at the Kombat mine to 36,000 metric tons of ore per month, and additional sums on European and African housing and other surface plants. Expenditure on the smelters will improve technical operations and hygienic conditions, and provide facilities necessary to smelt all of the company's concentrate products.

Operations at Tsumeb for the year ended June 30, 1965, are summarized in table 3.

Table 3.—South-West Africa: Operations of Tsumeb Corp. Ltd.

	Year ending June 30				
	1961	1962	1963	1964	1965
Tsumeb mine and mill:					
Sulfide ore mined—metric tons	283,004	294,773	297,870	333,911	333,029
Sulfide ore grade:					
Copper—percent	3.08	2.86	3.10	2.69	2.58
Lead—do	11.85	12.21	14.26	10.98	12.61
Zinc—do	4.91	4.30	5.14	3.80	4.29
Oxide ore mined—metric tons	308,432	353,745	299,686	344,873	403,692
Oxide ore grade:					
Copper—percent	5.72	6.20	4.90	5.31	5.13
Lead—do	13.88	13.36	14.24	14.31	13.46
Zinc—do	3.83	3.23	3.34	3.71	3.58
Total ore produced and milled—metric tons	591,436	648,518	597,556	678,784	736,721
Milled ore grade:					
Copper—percent	4.46	4.68	4.00	4.02	3.98
Lead—do	12.91	12.84	14.25	12.66	13.08
Zinc—do	4.35	3.72	4.24	3.75	3.90
Concentrate production:					
Copper-lead concentrate:					
Gross weight—metric tons	128,880	128,079	137,700	132,605	163,999
Metal content:					
Copper—percent	10.33	10.16	7.99	7.21	6.33
Lead—do	45.85	49.17	52.88	55.93	53.46
Silver—grams per ton	167	189	158	116	109
Copper concentrate:					
Gross weight—metric tons	14,395	20,426	24,849	33,671	41,185
Metal content:					
Copper—percent	47.80	48.92	37.33	41.25	39.77
Lead—do	11.18	10.44	8.52	8.25	8.63
Silver—grams per ton	959	875	665	676	635
Zinc concentrate:					
Gross weight—metric tons	23,438	20,539	19,693	19,031	23,293
Metal content:					
Zinc—percent	55.53	55.96	58.07	57.35	57.00
Cadmium—do	1.45	1.40	1.56	1.38	1.23
Total concentrate production—metric tons	166,713	169,044	182,242	185,307	228,477
Mill recovery (in all concentrates):					
Copper—percent of metal in ore milled	87.79	91.27	91.26	89.45	91.22
Lead—do	93.54	94.04	95.45	93.72	94.69
Zinc—do	50.60	47.65	45.18	42.80	46.23
Kombat mine and mill:					
Sulfide ore mined and milled:					
Gross weight—metric tons	---	19,591	182,968	247,354	220,831
Metal content:					
Copper—percent	---	2.40	3.79	3.99	4.31
Lead—do	---	2.60	2.59	1.41	1.60
Concentrate production:					
Copper concentrate:					
Gross weight—metric tons	---	493	16,940	21,374	19,791
Metal content:					
Copper—percent	---	37.39	36.40	42.51	41.87
Lead—do	---	6.42	2.47	3.49	4.98
Silver—grams per metric ton	---	NA	243	356	409

Table 3.—South-West Africa: Operations of Tsumeb Corp. Ltd.—Continued

	Year ending June 30				
	1961	1962	1963	1964	1965
Kombat mine and mill—Continued					
Lead concentrate:					
Gross weight, metric tons	---	788	6,727	4,110	4,028
Metal content:					
Copper, percent	---	18.67	7.66	7.98	10.20
Lead, do	---	38.98	61.96	61.05	60.21
Silver, grams per metric ton	---	NA	59	95	137
Copper-lead concentrate:					
Gross weight, metric tons	---	476	---	---	---
Metal content:					
Copper, percent	---	22.50	---	---	---
Lead, do	---	26.25	---	---	---
Total concentrate production, metric tons	---	1,757	23,667	25,484	23,819
Mill recovery (in all concentrates):					
Copper, percent of metal in ore milled	---	NA	96.46	95.37	91.31
Lead, do	---	NA	96.67	93.63	96.34
Grand total ore output, metric tons	591,436	668,109	780,524	926,138	957,552
Grand total concentrate output, do	166,713	170,801	205,909	210,791	252,296
Grand total recoverable metal content of concentrates produced:					
Copper, metric tons	19,621	23,459	24,510	31,150	31,525
Lead, do	59,519	65,222	72,227	73,943	83,253
Zinc, do	10,563	9,551	9,507	9,071	11,035
Cadmium, do	123	109	114	99	108
Silver, thousand troy ounces	1,118	1,301	1,143	1,436	1,541
Smelting and refining:					
Copper smelter:					
Concentrates and other new metal-bearing material smelted, metric tons	---	---	38,910	61,810	75,279
Copper content of material smelted, percent	---	---	32.78	40.98	42.40
Blister copper produced, metric tons	---	---	11,448	24,573	29,409
Average assay of blister copper:					
Copper, percent	---	---	98.78	98.70	98.58
Silver, grams per ton	---	---	1,246	1,239	1,305
Lead smelter:					
Concentrates and other new metal-bearing material smelted, metric tons	---	---	---	57,640	139,759
Lead content of material smelted, percent	---	---	---	52.26	48.35
Refined lead produced, metric tons	---	---	---	21,507	57,235
Average assay of refined lead: lead, percent	---	---	---	99,998	99,998

NA Not available.

As of June 30, 1965, ore reserves at the company's two mines were estimated as follows:

	Metric tons	Grade, percent		
		Copper	Lead	Zinc
Tsumeb mine:				
Positive ore	8,149,381	4.91	11.02	3.64
Kombat mine:				
Positive ore	1,015,870	2.64	2.37	---
Probable ore	2,333,211	2.29	2.87	---

Source: Tsumeb Corp. Ltd. Annual Report, 1965.

In addition to normal exploration and development at the Tsumeb and Kombat mines, the company performed 1,499 meters of diamond drilling on the Gross Otavi Mining Area which gave encouraging results leading to plans for further drilling. Also, at the Matchless Mine, 42 kilometers southwest of Windhoek, 1,522 meters of diamond drilling was completed in testing copper pyritic mineralization, as a part of a continuing effort to locate areas of higher copper content. On the Tsumeb Exploration, Ltd. Concession Area unsuccessful surface diamond drilling was done at the

Domingo Copper Prospect, and further drilling to determine structures was carried out at the Kombat South Prospect.

During the fiscal year, studies continued on refractory ores being encountered at depth in the Tsumeb mine. Mill operations were put on a 7 day week two and sometimes three weeks each month in order to meet the production schedule. (Normally, mill operations are on a six day week.) At the Kombat mill the feed during the period October to January contained a high proportion of highly oxidized ore, mixed with phyllite, and this adversely affected the copper-lead separation.

Throughout the year the copper smelter operated on copper concentrates from the Tsumeb and Kombat mines, together with soda matte and speiss from the lead smelter. Production approached the annual capacity of 32,600 metric tons. The lead smelter and refinery increased production over that of 1964, the initial year of operation, as difficulties in the blast furnace section were overcome with the addition of continuous slag and base bullion tapping and modfications in the sinter plant.

Initial production from the silver refinery was reported in the first quarter of 1965. The cadmium plant, which has an approximate capacity of 181 metric tons of metal per year, operated as a pilot plant until May 1965, when it was suspended because of the high-aresenic content of the lead blast-furnace dust which constitutes the feed. Test work showed that retorting of the cadmium sponge would permit production of high-grade cadmium, and operations commenced again later in the year. Production of germanium has been at a standstill since 1963 because of market conditions, but shipments continued to be made from stocks. The sulfuric acid plant operated intermittently to supply the cadmium plant. The arsenic oxide plant operated satisfactorily, producing black arsenic assaying 88.10 percent As_2O_3 from lead plant speiss and copper smelter flue dust. Market demand for this product, however, was not great.

The South-West Africa Co. Ltd. (SWAC).—Ore broken at SWAC's Berg Aukas lead-zinc-vanadium mine during 1965 was 174,780 metric tons, and about 108,800 tons was milled. In addition 5,933 tons of massive zinc-lead ore were handpicked for shipment. After completion of the main shaft to 262 meters (the 860-foot level), development was increased, largely on the 660-foot level, for production in 1966. Further drilling will be undertaken to test ore known to exist to at least 610 meters below surface.

The tonnages of flotation concentrates and handpicked ore produced in 1964 and 1965 were as follows:

Commodity	Output (metric tons)	
	1964 r	1965
Concentrates:		
Lead-vanadium	9,920	11,480
Zinc silicate	11,020	12,750
Zinc sulfide	7,180	340
Zinc-lead sulfide and oxide	7,550	5,610
Ore:		
Zinc-lead sulfide and oxide	16,400	5,930
Total	52,070	36,110

r Revised.

Source: South-West Africa Administration, Mines Division. Annual Report, 1965. Windhoek, South-West Africa, 1966, p. 24.

Ore reserves at the Berg Aukas mine were reported at the end of calendar year 1965 to be about 517,000 metric tons of assured ore, carrying 0.8 percent vanadium pentoxide (V_2O_5), 5.0 percent lead, and 32.0 percent zinc; and 254,000 tons analyzing 0.8 percent vanadium pentoxide, 4.0 percent lead, and 38.0 percent zinc. There was a decrease of 45,000 tons in total assured and indicated ore from the total of 1964, and the vanadium pentoxide content of the assured ore was recalculated and was given as 0.8 percent in 1965, rather than 1.56 percent as reported in 1964.

In 1966 the company plans to expand the crushing plant, and to provide additional housing and office accommodations.

Other Operations.—Copper production was reported from two small mines during the year. The Emka Mining and Trading Co. (Pty.), Ltd. produced 307 tons of concentrate assaying 26 percent copper at its Onganya mine, near Windhoek, and the Khan mine of Khan Mine (Pty.) Ltd., near Swakopmund, produced 450 tons of 50 to 55 percent copper concentrate. The Klein Aub mine in the Rehoboth Gebiet, operated by the Klein Aub Kopermaatskappy (Edms.) Bpk., which is controlled by Federale Volksbeleggings, Bpk., will come into production in 1966. Two inclined shafts have been completed to permit development of the ore body.

The South African Iron and Steel Corporation (ISCOR), early in 1966 exercised its option, held through its subsidiary Industrial Minerals Corporation, to mine zinc ore in the Lorelei area bordering the Orange River. Preliminary estimates are that ore reserve is about 5 million tons containing 6 percent zinc and minor amounts of lead and silver.

Iron Ore.—The only production of iron ore in 1964 was from the Kalkfield mine, operated by the Tsumeb Corp. to supply flux for its lead smelter. Production in 1965 was more than double that of 1964, as smelter operation was increased to near capacity.

Manganese.—The Otjosondu manganese mine was leased on tribute by the owner, S. A. Minerals Corp. Ltd., early in the year, and mining of ore commenced in March 1965.[7] Production was increased to 943 metric tons in December. All ore mined, which averaged 43 percent manganese, was stockpiled pending sale. The leasing company, Walvis Bay Mining Company (Pty.) Ltd., a subsidiary of Consolidated African Mines, proposes to build a portable screening and sorting plant to produce four grades of ore, down to 35 percent manganese. An ultimate production of 3,600 tons monthly is envisioned. At the end of 1965 the ore reserve was estimated at 135,000 metric tons.

Tin and Tungsten.—Production of tin concentrate increased 3.7 percent in 1965, following completion of expansion early in the year at the Uis mine of Industrial Minerals Exploration (Pty.) Ltd., a subsidiary of ISCOR. During the year large-scale waste stripping of the pegmatite ore bodies was started, and several thousand feet of diamond drilling was carried out to outline the ore. The reserve was estimated to be 18 million long tons of ore averaging 0.13 percent tin.[8] Early in 1965 ISCOR started operation of a tin smelting plant at its Vanderbijlpark works in South Africa, to smelt all Uis concentrates. It is expected that virtually all ISCOR requirements, presently about 53 long tons of tin per month, will be met by production at Uis.[9]

Production of tin-tungsten concentrates at the Brandberg West mine of the South West Africa Co. declined for the second year, to 598 metric tons in 1965; 345,417 tons of ore were broken, and 85,385 tons were milled. Both production and working costs were adversely affected by the need to change the shape of the quarry.[10] Ore reserves decreased by 272,000 metric tons during the year, and at the end of 1965 stood at 1,360,000 tons containing a total of 0.23 percent tin and WO_3,[11] of which about three-quarters was tin.

Strathmore Tin (Pty.) Ltd. prospected in its concession area northeast of Cape Cross. Tin-bearing pegmatites were exposed by bulldozing and blasting trenches in the overlying layers of gypsum, and depth and continuity were tested through 1,205 meters of drilling. A pilot plant was erected for bulk testing. Results of the test work were to be available in 1966.

NONMETALS

Diamond.—The Consolidated Diamond Mines of South-West Africa Co. Ltd. (CDM) again produced most of the Territory's diamond output, accounting for over 86 percent of the total. Other significant production was by the Marine Diamond Corp. Ltd. (MDC), control of which was acquired by CDM in October 1965. Salient diamond industry statistics are summarized in table 4.

Consolidated Diamond Mines of South-West Africa Co. Ltd.—The company's goal of producing 1.5 million carats of diamond annually was almost attained during 1965; output reached 1,436,766 carats, compared

[7] South-West Africa Administration, Mines Department. Annual Report, 1965. Windhoek, South-West Africa 1966, p. 27.
[8] Page 26 of work cited in footnote 7.
[9] South African Mining & Engineering Journal. Dec. 24, 1965.
[10] The South-West Africa Co. Ltd. Annual Report for the Fiscal Year to June 30, 1965.
[11] Page 26 of work cited in footnote 7.

Table 4.—South-West Africa: Salient diamond industry statistics

Company	Overburden stripped (thousand cubic meters)		Gravel treated (thousand cubic meters)		Diamond recovered (carats)	
	1964	1965	1964	1965	1964	1965
Consolidated Diamond Mines of South-West Africa Ltd.:						
Mining	10,789	15,826	3,614	4,440	1,253,453	1,436,744
Prospecting	---	---	---	1	192	22
Total	10,789	15,826	3,614	4,441	1,253,645	1,436,766
Marine Diamond Corp.:						
Sea Concession Area:						
Mining	XX	XX	142	[1] 187	286,571	218,688
Prospecting	XX	XX	1	[1] 1	80	70
Subtotal	XX	XX	143	[1] 188	286,651	218,758
Foreshore of Diamond Area I:						
Mining	---	421,669	---	40,616	---	1,504
Prospecting	---	---	---	117	---	25
Subtotal	---	421,669	---	40,733	---	1,529
Total	XX	XX	143	40,921	286,651	220,287
De Beers Consolidated Mines Ltd.:						
Mining	29	22	3	4	554	513
Prospecting	---	---	1	1	14	9
Total	29	22	4	5	568	522
Sarusas Ontwikkelings-Korporasie [2]	NA	NA	[3]	NA	405	[4]
Tidal Diamonds (S.W.A.) Pty. Ltd.:						
From old dumps	---	---	NA	NA	205	[4]
Prospecting	NA	NA	[3]	NA	2	[4]
Total	NA	NA	NA	NA	207	[4]
Desert Diamonds (Pty.) Ltd.	NA	NA	[3]	NA	64	[4]
Oranje Kunene Diamante Beperk	---	NA	---	NA	---	6
Sundries	NA	NA	NA	NA	4	[4]
Grand total	XX	XX	XX	XX	1,541,544	[4] 1,656,234

NA Not available. XX Not applicable.

[1] Volume dredged totaled 1,879,000 cubic meters, including 1,869,000 cubic meters in mining operations and 10,000 cubic meters in prospecting activities.

[2] Property held in 1964 by Westies Minerale (Edms.) Beperk, and ceded to Sarusas Ontwikkelings-Korporasie during 1965.

[3] Less than ½ of unit.

[4] Of total output, origin by company of 182 carats is not reported; this quantity presumably originated from one, some, or all of the companies indicated by this note.

with 1,253,645 carats in 1964, of which 95 percent was gem stones, averaging 0.96 carats per stone. Larger scraper loaders and rear dumpers have been introduced. Two Vacuveyors, a vacuum cleaner-like bedrock cleaning machine, were in operation at yearend as a possible solution to this difficult problem which heretofore has required much hand labor; five additional Vacuveyors were to be installed. Three new field-screening plants were commissioned, bringing the total number to 18, and thus completing the expansion program. Eight of the field-screening plants have been equipped with Yuba jigs, to decrease the volume of material that must be transported to the central plant. At the central-treatment plant some initial difficulties were experienced with the heavy-media circuit that was installed in 1965 and that incorporates Wedag drum separators, but these difficulties have been overcome, and the old section of the plant was closed down in September.

At the end of 1965 the company's reserve of diamondiferous gravel was estimated at 65.6 million cubic meters, containing 19.7 million carats, a 6.6-percent decline in carat content with respect to the yearend 1964 estimate.

Revenue from diamonds was $92.3 million in 1965, compared with $75.6 million in 1964. The increase was due to firm market conditions and the expanded production at the mine.[12]

[12] The Consolidated Diamond Mines of SWAC Ltd. Annual Report, 1965.

Marine Diamond Corporation (MDC).—The MDC recovered the bulk of its diamond output from the bed of the ocean between the mouth of the Orange River and Diaz Point; a small proportion of the company total was recovered from the foreshore area bordering CDM's Diamond Area No. 1. MDC acquired this area from CDM in May 1965 when the latter obtained a 29-percent interest in MDC. Serious loss of production occurred as a result of the grounding of the mining barge Colpontoon for one and a half months early in 1965; the Diamantkus, a former naval vessel converted to mining, was withdrawn from service for overhaul during May. Early in 1966 it was decided to replace the Diamantkus with a new mining barge. In the financial year ending June 30, 1965, a net loss of nearly $2 million was incurred by the company, and a further net loss of $1.88 million was sustained in the period July 1 to December 31, 1965; a large proportion of this loss was attributed to the depreciation of fixed assests and to the writing off of obsolete equipment.[13] In October, control of MDC was acquired by CDM, through its effective control of Orama Holdings, which holds 58 percent of MDC, and of Sea Diamond Corporation, which has 29 percent of MDC.

Salient figures on costs for the recovery of diamond from the seabed and sale values of such output by MDC were as follows:

	1964	1965
Field cost per carat recovered:		
Mining operations	$7.14	$27.73
Prospecting operations	4,390.48	6,060.01
Average	r 8.58	29.53
Sale value, average per carat	29.40	31.46

r Revised.

About 99 percent of the diamonds recovered were gem quality, and the average size was 0.40 carats each.

Other Producers.—Production of diamonds by De Beers Consolidated Mines, Ltd., in three grant areas between the Unjab and Hoanib Rivers again declined because of a lower content of diamond in the material mined. Prospecting continued while plans for the future program were under review.

Westies Minerale (Edms.) Bpk. ceded its 10-mile-wide concession area on the coast between the Hoanib River and 18° south latitude to Sarusas Ontwikkelings-Korporasie. Very little mining for diamonds was carried out.

Tidal Diamonds SWA (Pty.) Ltd., a subsidiary of CDM and the Tidewater Oil Co. carried out prospecting on the seabed and on its land concession in Diamond Area II. Some diamonds were found in the sea at Hottentot Bay, but none of economic value in the Saddle Hill area on land. Further prospecting was contemplated at yearend in the Meob and Oyster Cliff areas, further north. Sand dunes are a major obstacle to prospecting operations.

Prospecting was continued by Desert Diamonds (Pty.) Ltd. in its 5-mile-wide grant area on the coast between the Ugab and Unjab Rivers. A program of plant expansion was completed in December, and the expanded screening facility reportedly will handle 40 tons per hour of gravel. Other equipment installed during the year included a heavy-media separation unit and a jig. A mobile screening plant to facilitate field operations was under construction at yearend.

Oranje-Kunene Diamante Bpk. continued to hold its sea concession areas betwen Diaz Point and Hottentot Bay and between the northern boundary of Diamond Area II and the Kunene River, as far west as the continental shelf. The former area has been charted and contoured. The firm developed a new suction head which enables its prospecting vessel to draw core samples from deposits in water up to 150 feet deep, but during 1965, little valuation work was done, and diamond recovery totaled only 6 carats.

Lithium Minerals and Associated Minerals.—S.W.A. Lithium Mines (Pty.) Ltd. produced 898 metric tons of petalite, 193 tons

[13] Work cited in footnote 12.

of lepidolite, and 28 tons of amblygonite in 1965, which represented over 73 percent of the lithium minerals produced in the Territory; in addition the company produced 4 tons of beryl, 41 tons of beryl fines, and 1 ton each of pollucite and bismuth ore. Reserves at the company's Helikon and Rubicon mines in the Karibib area were reported to be approximately 1,600 metric tons for hand sorting, and about 900,000 tons that could be concentrated by flotation.[14]

Salt and Soda Ash.—Investigations into methods of producing soda ash from the Otjivalunda pans, west of the Etosha pan, have been suspended by the South-West Africa Co. Ltd., pending a decision by the South-West Africa Administration on the question of transport.[15]

The major producer of salt was the South-West Africa Salt Company (Pty.) Ltd., from seawater in pans near Swakopmund. Output totaled 92,576 tons of which 24,770 tons were treated; sales totaled 71,317 tons. R. Gossow was the principal rock salt producer, from operations in the same area. Three other salt producers were reported active during the year.

MINERAL FUELS

No production of petroleum or coal was reported in the Territory during 1965, and virtually all energy material requirements continued to be met by imports from South Africa. Major consumers of coal and coke were the Tsumeb mine, which has lead and copper smelters, coal-fired steam-driven generators, and public power stations. Other mines employed diesel generators to supply power; the railroads also have been largely dieselized.

Etosha Petroleum Company (Pty.) Ltd.'s concession passed to control of the Kewanee Overseas Oil Company, a subsidiary of the Kewanee Oil Company of Pennsylvania, during the year. Surface exploration was continued, but no drilling was undertaken. The Artnell Exploration Company, Ltd. relinquished its concession near Mariental and ceased all operations in the Territory in 1965. A new concession to prospect for oil was granted to Mankor Beleggings Bpk. for an area of 8,950 square miles west of Windhoek.

[14] Page 27 of work cited in footnote 7.
[15] South-West Africa Co. Ltd. Annual Report for the Fiscal Year to June 30, 1965.

The Mineral Industry of Sudan

By Henry E. Stipp [1]

The mineral industry of Sudan continued to play a minor part in the nation's economy in 1965. Production of metal and mineral commodities valued at $4.2 million [2] was equal to only 0.3 percent of the gross national product of $1,367 million, and employment by the mineral industry constituted only a very small part of the total labor force estimated at 3.5 million. Despite the small size of Sudan's mineral industry, the nation had a number of prospects for exploiting mineral deposits on a larger scale. Significant developments in 1965 included the offer of a British firm to exploit iron ore deposits at Jebel Abu Tulu, southern Kordofan Province; the possibility that deposits of asbestos recently discovered at Qala en Nahl in Kassala Province would be exploited by a joint Canadian and Sudanese firm; and the discovery of tin and tungsten deposits near the sixth cataract of of the Nile River at Saba Loqa.

A loan of $31 million for assistance in financing improvement and expansion of Sudan's railway system and river and port facilities was granted by the World Bank.[3] The development of an improved and expanded transportation system remained essential to further development of Sudan's mineral resources.

PRODUCTION

Sudan's total output of metal and mineral commodities was estimated to have increased somewhat over that of 1964. Significant increases in production of chromite and iron ore were recorded, while manganese output apparently declined. Gold output continued the steady decline that began in 1963. Production of mineral commodities in 1965 was valued at about $4.2 million compared with output valued at $3.9 million in 1964.

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from Sudanese pounds (£S) to U.S. dollars at the rate of £S1 equals US$2.87.

[3] International Financial News Survey. Sudan. V. 18, No. 2, Jan. 14, 1966, p. 12.

Table 1.—Sudan: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Chromite	---	8,000	[1] 20,000	[1] 17,000	[e] 30,000
Gold, troy ounces	[r] 1,266	[r] 932	[r] 868	877	[e] 300
Iron ore	---	20,000	---	300	[e] 35,000
Manganese ore	---	1,016	[e r] 250	[e r] 8,500	[e] 1,000
Silver, troy ounces	---	---	---	40	---
Nonmetals:					
Cement, thousand tons	83	85	[r] 116	[r] 91	80
Gypsum	5,500	7,502	[e] 4,520	4,520	[e] 4,290
Salt, thousand tons	53	[r] 58	37	[r] 60	[e] 52
Vermiculite	50	[e] 50	---	---	---

[e] Estimate. NA Not available.

[1] Data reported are not official and may represent mine shipments rather than actual production.

TRADE

Sudan reported a negative trade balance in both mineral commodities and total trade; however, the 1965 trade deficit in both categories was reduced considerably from that of 1964, as shown in the following table:

	Million dollars		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports and reexports:			
1964	1.7	197.0	0.9
1965	2.5	195.0	1.3
Imports:			
1964	41.7	274.0	15.2
1965	26.5	207.5	12.8
Trade balance:			
1964	−40.0	−77.0	XX
1965	−24.0	−12.5	XX

XX Not applicable.

[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

Exports and reexports of metal and mineral commodities increased 47 percent over those of 1964 but still accounted for only a very small part of Sudan's total exports. These commodities consisted principally of petroleum products valued at $932,000, nonferrous scrap valued at $604,000 and iron ore valued at $473,000.

Imports of metal and mineral commodities in 1965 decreased substantially from those of 1964. Principal mineral commodity groups imported in 1965 were petroleum refinery products, valued at $9.6 million, iron and steel products, valued at $7.0 million; and cement valued at $1.7 million. Metal and mineral imports were supplied mainly by United Kingdom ($4.9 million), Belgium-Luxembourg ($2.6 million), Japan ($2.2 million), Italy ($1.7 million), West Germany ($1.4 million) and India ($1 million).

Table 2.—Sudan: Exports and reexports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal destinations, 1965
Exports:			
Metals:			
Chromite	11,612	10,160	All to United States.
Iron ore	------	34,569	Yugoslavia 19,409; United States 10,160; Finland 5,000.
Iron and steel scrap	2,053	1,680	United Arab Republic (Egypt) 877; Yugoslavia 400; Japan 298.
Manganese ore and concentrate	------	1	All to Yugoslavia.
Nonferrous metal scrap	1,073	1,387	United Arab Republic (Egypt) 826; Italy 214; Netherlands 204.
Nonmetals:			
Salt	996	785	Chad 525; Ethiopia 260.
Other crude minerals	------	1	All to Ethiopia.
Reexports:			
Metals:			
Copper, bars, wire	------	100	All to Denmark.
Iron and steel, tubes and pipes	(1)	------	
Mineral fuels:			
Petroleum refinery products:			
Gasoline	(2)	------	
Kerosine	(3)	(4)	Mainly to bunkers
Residual fuel oil	------	20	All to United Kingdom.

[1] Value $133,000.

[2] Value $384,000.

[3] Value $542,000.

[4] Value $758,000.

Source: Sudan, Department of Statistics. Foreign Trade Statistics Annuals 1964 and 1965, pp. 271 and 236.

Table 3.—Sudan: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal sources, 1965
Metals:			
Aluminum and alloys	905	882	United Kingdom 470; mainland China 256.
Copper and alloys	249	296	United Kingdom 196; Denmark 75.
Iron and steel:			
Scrap iron	6	18	Chad 16.
Semimanufactures	224,155	108,364	Belgium-Luxembourg 67,308; United Kingdom 15,522; Italy 8,915; Japan 2,686.
Lead and alloys	174	192	United Kingdom 142; Sweden 49.
Tin and alloys—long tons	296	45	Malaya 20; United States 19.
Zinc and alloys	59	169	Belgium-Luxembourg 158.
Metallic oxides, not otherwise specified	153	141	Mainland China 45; West Germany 42; United Kingdom 20.
Nonmetals:			
Abrasives, natural	155	35	Greece 30.
Cement	337,417	82,811	United Arab Republic 36,584; Yugoslavia 31,750; Italy 5,248; United States 4,100.
Chalk	286	761	Belgium 677.
Clays	199	253	United Kingdom 145; West Germany 58; Belgium 50.
Fertilizer materials:			
Nitrogenous	50,737	76,606	Japan 16,106; West Germany 12,457; Belgium-Luxembourg 12,056; Italy 10,398; United Kingdom 6,499; U.S.S.R. 6,202; Norway 6,000.
Phosphatic	70	49	Belgium-Luxembourg 30; Netherlands 19.
Potassic	10	20	West Germany 10; France 10.
Mixed	5,239	861	United States 801; Netherlands 55.
Gypsum	264	196	All from Cyprus.
Lime	314	29	Italy 24.
Mica	5	1	All from Japan.
Potash, caustic	76	1	All from Denmark.
Salt	1,230	59	All from United Kingdom.
Sand, gravel, stone, crushed	28	40	Italy 24; Belgium 15.
Soda, caustic	2,768	2,196	Netherlands 819; West Germany 775; United Kingdom 252.
Sulfur and pyrites:			
Iron pyrites, unroasted	10	3	All from West Germany.
Sulfuric acid	357	146	United Kingdom 74; West Germany 33; Greece 20.
Mineral fuels:			
Coal	------	6,362	All from Southern Rhodesia.
Coke	300	909	All from Netherlands.
Petroleum refinery products:			
Gasoline	88,716	49,121	Unspecified 48,821; Uganda 300.
Kerosine	65,203	31,138	NA.
Distillate fuel oil	115,386	81,835	Unspecified 81,685; Uganda 150.
Residual fuel oil	222,282	55,425	United Kingdom 44,765; Unspecified 10,659.
Lubricants	12,093	11,488	United Kingdom 5,444; United States 1,697; Netherlands 1,213; Italy 1,183; Austria 779.
Mineral jelly and wax	56	116	West Germany 43; Indonesia 64.
Asphalt and bitumen	8,176	3,808	Iran 2,344; Saudi Arabia 1,427.
Gas, natural and manufactured	987	791	Unspecified 763; Italy 28.

NA Not available.

Source: Sudan, Department of Statistics. Foreign Trade Statistics Annuals 1964 and 1965, pp. 271 and 236.

COMMODITY REVIEW

METALS

Chromite.—The Mining and Trading Company Ltd. of Sudan mined a small quantity of ore from an open-pit mine in the Ingenessa Hills region of Blue Nile Province.[4] Reportedly the ore contained 48 to 52 percent chromium. Chromite ore sold for $22.00 to $24.00 per metric ton. Ore was trucked 127 kilometers from the mine to the railhead at Damasin. The Sudan Railways has been requested by the mining company to extend the railway to Begis to reduce the truck haul. General Mining Enterprises, an associate firm, was developing several properties in the Ingenessa Hills.

Copper.—Deposits near Hofrat el Nahas in southern Darfur Province remained un-

[4] U.S. Embassy, Khartoum, Sudan. State Department Airgram 393, May 29, 1966, 3 pp.

developed in 1965.[5] A team of mining specialists from Japanese and Italian mining firms planned to drill 20 holes to explore the property, but the project was abandoned. Ore would have to be trucked 320 kilometers to a railhead because plans for extending the rail line southward from Nyala also have been abandoned.

Iron Ore.—The Central Desert Mining Co. exploited deposits of the Fodikum group in the northern Red Sea hills area of Kassala Province, 269 kilometers north of Port Sudan.[6] A British firm was interested in developing deposits at Jebel Abu Tulu in southern Kordofan Province. The firm was contemplating an initial investment of $5.7 to $8.6 million. Ore from these deposits was estimated to contain 61.2 percent iron and 7 percent silica. Reserves were said to total 35 million tons.

Manganese.—The Central Desert Mining Company reportedly exported 500 to 600 tons of ore to Yugoslavia.[7] The ore was produced by Sudanese miners from deposits in the Holaib Triangle area and purchased by the company.

Tin and Tungsten.—Deposits were recently reported to occur near the sixth cataract of the Nile at Saba Loqa.[8]

NONMETALS

Asbestos.—Deposits were discovered recently at Qala en Nahl in Kassala Province.[9] Two representatives of a Canadian mining firm were investigating the possibility of establishing a joint mining venture.

MINERAL FUELS

Petroleum.—The Port Sudan oil refinery processed imported oil throughout 1965. In August, a fire damaged part of the plant and stopped gasoline production for a brief period,[10] however, output of other products continued.

Agip Mineraria (Sudan) Ltd. renewed its oil exploration concession with the Sudan Government for 2 more years. The concession covers exploration along the Red Sea coast.

Four distributors continued to operate in Sudan, importing most of their requirements. These were Shell and BP (Sudan) Ltd., Mobil Oil de l'Afrique Occidentale, Nile Import and Trading Oil Co.—Total Afrique Ouist, and AGIP (Sudan) Ltd. Some petroleum products were trucked to the Abeche area of eastern Chad from Nyala, Darfur Province. Transportation costs were reportedly lower to eastern Chad from Port Sudan than from Nigeria.

[5] Page 2 of work cited in footnote 4.
[6] Page 1 of work cited in footnote 4.
[7] Page 2 of work cited in footnote. 4.
[8] Pages 2 and 3 of work cited in footnote 4.
[9] Page 2 of work cited in footnote 4.
[10] Page 2 of work cited in footnote 4.

The Mineral Industry of Tunisia

By Henry E. Stipp [1]

Tunisia's mineral industry recorded increased production of almost all mineral commodities in 1965. Notable gains were made in output of iron ore, 20 percent; phosphate rock, 11 percent; lead concentrate, 18 percent; zinc concentrate, 25 percent; and salt, 66 percent. Production of metals and minerals was valued at $51 million,[2] and was equivalent to almost 6 percent of the gross national product.

The mineral industry was of significant importance to the nation's economy; mineral products accounted for over 30 percent of the total value of exports. Sales of phosphates increased substantially, owing to strong world demand for fertilizer materials. Increased output of the new NPK Engrais plant provided more phosphates for export. The value of lead exports almost doubled as the price of lead on the world market increased. Iron ore exports also showed growth.

Probably the most significant event in the minerals sector was the disclosure that the oil discovery near El Borma by Société Italo-Tunisienne d'Exploitation Pétrolière (SITEP) constituted a major oilfield. Reserves of the field were estimated at about 250 million barrels.

Employment in the principal mines (iron, lead-zinc, and phosphate) in December 1965 totaled 13,582 workers, compared with 11,681 in December 1964. This was almost 0.3 percent of the total population of 4,630,000 persons, or about 0.9 percent of the estimated working force of 1,543,000.

The Government of Tunisia provisionally removed the 15 percent ad valorem export tax on hyperphosphates and superphosphates in a decree issued July 19, 1965.

An exploration project was being conducted in the Foussana Basin near Kasserine under a special fund of the United Nations. The work consisted of geophysical exploration and drilling of about 16,000 meters (52,520 feet) of rock.

PRODUCTION

Production of most metals and minerals increased, compared with the 1964 output, resulting in a value increase for metals and minerals output (exclusive of petroleum refinery products) of 16 percent to $51 million, compared with the 1964 value of $44 million.

TRADE

The role of mineral commodities in the total foreign trade of Tunisia is reflected in the following tabulation:

	Value (million dollars)		Minerals share of total (percent)
	Mineral commodities	Total	
Exports:			
1963	36	126	29
1964	39	130	30
Imports:			
1963	40	222	18
1964	45	248	18
Trade balance:			
1963	−4	−96	XX
1964	−6	−118	XX

XX Not applicable.

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from Tunisian dinars (DT) to U.S. dollars at the rate of DT1=US$1.905, except where otherwise noted.

263-927 O-67—60

Table 1.—Tunisia: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Iron ore—thousand tons	849	r 761	865	939	1,117
Lead:					
Concentrate, metal content	17,348	14,331	r 13,808	r 13,421	15,888
Metal	18,451	15,828	12,801	r 11,457	14,178
Antimonial	1,201	2,087	2,833	r 846	1,250
Mercury—76-pound flasks	152	-----	-----	87	174
Silver—troy ounces	69,767	24,627	r 9,034	12,635	33,758
Zinc concentrate, metal content	4,169	r 4,272	r 4,363	r 3,252	4,081
Nonmetals:					
Cement—thousand tons	329	363	361	455	454
Clay, for brick and tile	-----	-----	40,000	44,000	-----
Fertilizer materials:					
Phosphate rock—thousand tons	1,982	r 2,143	r 2,367	2,751	3,040
Hyperphosphate—do	69	35	86	101	110
Triple superphosphate	NA	NA	NA	e 152	e 248
Fluorspar	-----	-----	-----	-----	5,000
Gypsum	16,000	16,000	18,000	-----	-----
Lime	r 120,660	r 128,748	r 132,800	r 174,961	e 168,000
Salt—thousand tons	162	r 175	301	214	356
Mineral fuels:					
Gas:					
Gashouse—thousand cubic feet	563,220	564,480	560,875	505,680	NA
Natural, marketed r—do	254,135	250,810	255,395	274,400	287,035
Petroleum refinery products:					
Gasoline	-----	-----	-----	92,408	71,357
Kerosine	-----	-----	-----	42,185	51,368
Distillate fuel oil	-----	-----	-----	175,680	216,661
Residual fuel oil	-----	-----	-----	254,616	308,501
Liquefied petroleum gas	-----	-----	-----	5,938	8,291

e Estimate. r Revised. NA Not available.

Significant increases were posted in exports of phosphates, iron ore, zinc, mercury, and cement. Phosphates were the most valuable commodity exported at $27.6 million,[3] followed by iron ore valued at $5.5 million, lead valued at $2.8 million, and cement valued at $1.3 million.

Rolled-steel products valued at $22.3 million, were the most costly group of mineral commodity imports. Imports of petroleum refinery products decreased noticeably to $6.6 million in 1964 compared with $18 million in 1963. This was owing to production from the new oil refinery, located near Bizerte, which began producing in 1964. Imports of crude oil increased consequently and were valued at $8.7 million in 1964 compared with $1.2 million in 1963.

COMMODITY REVIEW

METALS

Iron Ore.—Production of iron ore from the Djérissa mine increased 5 percent from 716,015 tons in 1964 to 753,119 tons in 1965.[4] Output from the Tamera-Douaria mine increased 63 percent from 223,557 tons in 1964 to 363,557 tons in 1965. There was no production from the Nebeur (iron-lead ore) mine, which was inactive throughout the year. National consumption of iron ore totaled 66,345 tons in 1965. The Djérissa mine exported 772,994 tons compared with 720,803 tons in 1964, while the Tamera-Douaria mine exported 204,353 tons compared with 224,150 tons in 1964.

Iron and Steel.—The integrated iron and steel mill at El Fouladh, near Menzel Bourguiba, began test operations in November.[5] The plant which was expected to produce 40,000 tons of rolled products in 1966, was completely automated, and employed modern steelmaking techniques. It was scheduled to reach full capacity of 70,000 tons in 1967.

Lead and Zinc.—The decrease in ore production from mines such as El Gréfa, Sidi Bou Aouane, Djebel Semène was more

[3] On September 28, 1964, the Tunisian dinar was devalued from a par value of US$2.38 to US$1.905. Value of trade for 1963 converted at old rate. Value of trade for 1964 converted at rate of 1D=US$2.261.

[4] Mines et Métallurgie. L'Activité Minière de la Tunisie en 1965 (Mining Activity of Tunisia in 1965). No. 3605, April 1966, p. 165.

[5] U.S. Embassy, Tunis. State Department Airgram A-447, Mar. 19, 1966, p. 22.

Table 2.—Tunisia: Exports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum:			
Unwrought	293	183	Italy 124; United Kingdom 59.
Scrap	12	7	All to Italy.
Manufacturers and others	NA	1	France 0.3; Morocco 0.2.
Copper:			
Scrap	526	466	France 197; Italy 142; West Germany 96.
Semimanufactures	NA	25	Algeria 12; Libya 9.
Iron and steel:			
Iron ore	767,899	830,755	United Kingdom 304,778; Italy 226,536; Greece 160,291; Poland 49,085; United Arab Republic (Egypt) 42,037; West Germany 37,780.
Scrap	9,983	11,102	Italy 8,813; Yugoslavia 1,429; Libya 500; United Kingdom 360.
Semimanufactures	9	50	France 45; Algeria 5.
Lead:			
Ore	NA	2	Mainly to France.
Scrap	201	58	Italy 58.
Unwrought	13,078	10,766	France 8,554; United Arab Republic (Egypt) 1,005; Italy 550.
Magnesium, unwrought and scrap	12	8	All to Italy.
Mercury, 76-pound flasks	-----	60	All to United States.
Nickel	-----	2	Italy 2.
Precious metals, scrap troy ounces	56,585	262,479	All to France.
Silver and silver alloys, do	-----	9,034	All to France.
Zinc:			
Ore	7,082	8,984	All to France.
Unwrought and scrap	10	8	Mainly to France.
Other metals, unwrought and semimanufactures	NA	7	NA.
Nonmetals:			
Cement	84,453	130,493	Italy 65,610; Spain 26,654; Nigeria 13,614.
Clays	1	5	Algeria 4; Italy 1.
Fertilizer materials:			
Phosphate rock, thousand tons	r1,966	2,215	France 538; Italy 474; India 217; West Germany 191; Yugoslavia 176.
Superphosphate, do	147	125	France 60; Greece 25; Other Territories 10; Algeria 10.
Others	NA	493	Malagasy Republic 390; France 101.
Gypsum	7,298	726	Nigeria 508; Yugoslavia 218.
Salt	267,430	194,674	France 87,275; United States 36,201; Japan 26,513; Finland 22,815.
Others	810	109	France 103.
Mineral fuels:			
Petroleum, refinery products:			
Gasoline	NA	5,935	Ethiopia 4,059; Italy 1,876.
Distillate fuel oil	12,865	258	Bunkers.
Lubricants	125	145	Bunkers.
Coke, kilograms	NA	292	All to Italy.
Others	1	5	United Arab Republic (Egypt) 5.

r Revised. NA Not available.

than compensated by increased output of several other developments as shown in the following table.[6]

Mine	Production (metric tons)	
	1964	1965
Djebel Hallouf	7,191	9,749
Sidi Bou Aouane	4,710	4,613
El Gréfa	4,150	2,915
El Akhouat	1,338	1,609
Khonguet Kef Tout	878	1,327
Loridia (Trozza)	-----	1,276
Oued El Kohol Sidi	-----	770
Sidi Ajmed	-----	312
Djebel Semène	340	254
Hammam Djedidi	-----	151
Other mines	2,205	2,468
Total	20,812	25,444

Total production of lead, apparently including antimonial lead from Tunisia's two smelters increased 26 percent over that of 1964.

[6] Page 14 of work cited in footnote 4.

Smelter	Production (metric tons)	
	1964	1965
Mégrine	10,140	14,870
Djebel Hallouf	2,094	558
Total	[1] 12,234	15,428

[1] Data differ from that officially reported and given in table 1 of this chapter; difference cannot be reconciled from available data.

Table 3.—Tunisia: Imports of major metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals: [1]			
Aluminum	r 389	406	France 174; Switzerland 95; West Germany 65.
Copper	r 410	657	France 570; Belgium-Luxembourg 26; Italy 20.
Gold and gold alloys_troy ounces	5,691	1,317,408	France 1,316,314; West Germany 1,093.
Iron and steel:			
Ore	-----	13	All from Morocco.
Pig iron and ferroalloys	-----	543	West Germany 375; France 168.
Scrap	560	119	United States 44; France 38; Sweden 31.
Semimanufactures	76,724	86,195	France 46,125; Italy 2,562; West Germany 2,508.
Lead:			
Ore	8	6	All from Morocco.
Metal	369	135	France 129.
Mercury_____76-pound flasks	645	9	France 7; West Germany 2.
Nickel	9	5	United Kingdom 2; West Germany 2; France 1.
Silver_____troy ounces	1,093	5,080	Hong Kong 4,501; France 450.
Tin_____long tons	r 26	85	West Germany 58; France 22; United Kingdom 5.
Zinc	107	88	France 70; Belgium-Luxembourg 18.
Other, unspecified	30	16	Mainly from France
Nonmetals:			
Abrasives, natural	48	125	France 54; Italy 52; West Germany 7.
Asbestos	70	466	Rhodesia 280; France 97; United Kingdom 52.
Barite	1,439	4,350	Italy 3,120; France 940; Libya 250.
Cement and asbestos-cement	16,605	22,366	France 11,854; Italy 7,697; Algeria 1,798.
Chalk	111	115	All from France.
Clays	r 1,767	2,838	Morocco 1,037; Italy 734; Algeria 730.
Cryolite	NA	NA	
Dolomite	149	235	Norway 130; France 105.
Fertilizers:			
Nitrogenous	26,284	25,008	France 20,903; West Germany 2,528; Italy 1,577.
Phosphates	351	354	France 283; Italy 71.
Potassic	5,145	6,513	Spain 3,095; France 1,618; West Germany 1,200.
Mixed	2,727	2,153	France 1,300; Italy 853.
Graphite	2	199	U.S.S.R. 190; France 9.
Gypsum	211	549	France 420; United Kingdom 129.
Stone, building, including marble	r 4,629	4,791	Italy 4,778; France 13.
Pyrite	12,955	17,161	All from Spain.
Salt_____kilograms	51	791	France 780; West Germany 11.
Sulfur	r 10,895	23,991	Canada 11,685; Mexico 9,776; France 2,500.
Talc	699	629	France 628; West Germany 1.
Other	14,256	NA	
Mineral fuels:			
Coal	28,639	34,250	U.S.S.R. 24,208; Poland 6,059; United Kingdom 3,981.
Coke and coal byproducts	9,098	6,682	Belgium-Luxembourg 3,200; Netherlands 2,683; West Germany 731.
Petroleum:			
Crude	85,669	618,700	Saudi Arabia 409,052; Algeria 126,883; United Arab Republic (Egypt) 33,502.
Refinery products:			
Gasoline	77,198	18,950	American countries 11,788; France 3,645; Italy 3,084.
Kerosine	51,614	18,316	American countries 10,102; Italy 2,962; France 1,818.
Distillate fuel oil	161,218	29,255	American countries 17,085; Italy 10,072; U.S.S.R. 1,597.
Residual fuel oil	240,051	64,949	United Arab Republic (Egypt) 27,030; American countries 8,641; Greece 6,940.
Lubricants	11,172	12,977	France 12,404.
Liquefied petroleum gas	6,907	2,032	France 1,345; Italy 438; Algeria 248.
Others	14,872	18,345	Italy 15,069; France 2,566; West Germany 14.

r Revised. NA Not available.

[1] Includes unalloyed and alloyed unwrought and semimanufactured forms.

The Mégrine smelter also produced 33,758 troy ounces of silver in 1965.

Total zinc concentrate output increased 26 percent over that of 1964 as shown below:

Mine	Production (metric tons)	
	1964	1965
El Akhouat (55 percent zinc content)	5,896	6,738
Djebel Semène (35 percent zinc content)	-----	683
Total	5,896	7,421

Mineral mixtures containing zinc also were produced at Sidi Bou Aouane (2,717 tons) and Fedj El Adoum (2,020 tons) in 1965.

Mercury.—The Djebel Arja mine produced 36 flasks of mercury (76-pound flasks) with a working force of 92 employees.[7]

The development of the El Arja mercury mine, about 6 miles from Tabarka in the province of Sank El Arba, was described.[8] The polymetal ore, which was being produced at a rate of 1 million tons per year, was reportedly equally rich in lead and zinc. The construction of a washing plant for separating the ores of the three metals has extended the life of the deposit. The resulting mercury concentrate contains 70 kilograms of mercury per cubic meter in contrast to the run of mine ore grade of 2 kilograms per cubic meter.

NONMETALS

Clay Products.—A new brick factory at Djemmal near Sousse, inaugurated on August 31,[9] was expected to produce 50,000 tons per year of various types of brick. The bulk of output will be exported to Libya.

Fertilizer Materials.—Production of phosphate rock in 1965 increased almost 11 percent over that of 1964,[10] with gains recorded by each producer as follows:

Mine	Production (metric tons)	
	1964	1965
Gafsa	1,858,826	2,100,646
M'Dilla	538,183	542,210
Koloa-Djerda	353,930	396,980
Total	2,750,939	3,039,836

The three phosphate companies operating in Tunisia were placed under control of Osman Bahri, President Director General of the National Office of Mines (Office National des Mines).[11] The Compagnie des Phosphates et du Chemin de Fer Gafsa (GAFSA) (51-percent Government-owned), which produces two-thirds of the nation's phosphate, had a 20-percent interest in the Compagnie Tunisienne des Phosphates du Djebel M'Dilla (CIPHOS) complex and a 100-percent interest in the Société Tunisienne d'Exploitation Phosphatière (STEPHOS) company, the two other producers of phosphates.

In June the Government of Tunisia signed an agreement with Poland for $6 million worth of mining equipment in exchange for phosphate rock.[12] The equipment would go to the Gafsa Company. This firm signed a contract financed by the U.S. Agency for International Development (AID) with the Ralph M. Parsons Co. of Los Angeles for a feasibility study on renewal of equipment and expansion of production capacity.

Production of triple superphosphate increased appreciably during 1965 owing to operation of the new NPK fertilizer plant near Sfax. This plant became an important source of foreign exchange in the first 6 months of 1965, with exports of 57,000 tons of all types of phosphates, and was expected to reach full capacity of 150,000 tons of superphosphates in 1966. Expansion of the Société Industrielle d'Acide Phosphorique et d'Engrais superphosphate plant (40-percent Government-owned) to 170,000 tons per year was planned.[13]

A feasibiilty study was conducted by a U.S. firm to determine if a phosphate rock deposit at Kef el Dour could be used to manufacture superphosphoric acid.[14]

A nitrogenous fertilizer complex will be built at Gabes for Industries Chimiques Maghrebines S.A. by Cia. Tecnica Industria Petroli Spa., an Italian firm.[15] The $30

[7] Page 14 of work cited in footnote 4.

[8] Industriés et Travaux D'Outremer, Information d'Outre Mer (Overseas Information) No. 134, Jan. 1965, p. 86.

[9] U.S. Embassy, Tunis. State Department Airgram A–135, Sept. 11, 1965, p. 5.

[10] Page 14 of work cited in footnote 4.

[11] U.S. Embassy, Tunis. State Department Airgram A–160, Sept. 25, 1965, p. 7.

[12] U.S. Embassy, Tunis. State Department Airgram A–129, Sept. 4, 1965, p. 24.

[13] Work cited in footnote 5.

[14] Work cited in footnote 5.

[15] Nitrogen. New Plants and Projects. No. 33, January 1965, p. 13.

million complex will consist of a 65,000-ton-per-year anhydrous ammonia plant, a 200,000-ton-per-year ammonium phosphate facility, and an 80,000-ton-per-year ammonium nitrate plant. The bulk of output from this plant will be exported.

A report was published that described production, trade, and utilization of phosphate, nitrate, and potassium fertilizers in Tunisia.[16] Annual consumption of fertilizers, estimated at 65,000 to 70,000 tons for 1965 was expected to increase significantly in 4 or 5 years with further development of the agricultural industry.

Fluorspar.—Three mines, Hammam Zriba, Djebel Ouest, and Djebel Staa, produced 5,000 tons in 1965.[17]

Salt.—From 1955 through 1962 marine salt was recovered from three salinas for local consumption and export.[18] In 1962 the last year for which details were available, output of the Mégrine salina was reported as 16,000 tons, Sousse-Monastir 85,000 tons, and Sfax 69,000 tons. Local consumption in 1962 was 25,000 tons, and 145,000 tons was exported.

MINERAL FUELS

Petroleum.—The El Borma field in southern Tunisia, discovered in May 1964 by Société Italo-Tunisienne d'Exploitation Pétrolière (SITEP), was estimated to have reserves of about 250 million barrels.[19] Twelve producing wells were completed on a 14-kilometer north-west south-east trend. Production, which was scheduled to begin in 1966 at a rate of 20,000 barrels per day, will be moved through a 115-kilometer 14-inch feeder line that will connect with the Compagnie de Transport pai Pipe-lines au Sahara (TRAPSA) pipeline. This pipeline goes from the Edjeleh area of Algeria northwards to La Skhirra on the Tunisian coast.

In addition to the concession at El Borma, SITEP was granted a permit in January for a 16,162-square-kilometer area south of El Borma.[20] In December Ente Nazionale Idrocarburi (ENI), the parent concern of SITEP, was granted a 12,010 square kilometer concession tract in the Bir Aouine section north of El Borma. The total acreage assigned to Italian firms now consists of 29,785 square kilometers. In order to obtain these concessions, AGIP Mineraria, an affiliate company of ENI, offered a bonus of $9 million to the Tunisian Government, and ENI also gave a $12 million loan repayable in 7 years at 6 percent interest. A new company, Société Anonyme d'Exploitation (SAEP), was formed to work the new Bir Aouine concession.

Western Tunisia Co., a subsidiary of Signal Oil & Gas Co., acquired a new concession in the Sahel area near Kairouan and Sousse.[21] Western Tunisia, acting for a group of six companies, carried out operations on two groups of exploration permits. On the Rimrock Tidelands, Inc. permit one well was abandoned at 7,918 feet, and a second well was started in August. At the end of 1965 this well was being drilled below 13,500 feet. Another well was started in December near the city of Sfax. On the Tunisian Husky Oil Corp. permit onshore Western Tunisia drilled a dry hole to 9,782 feet near Bou Thadi. Three dry wells were drilled on the Husky permit offshore. The first, located 24 kilometers northeast of the Kerkennah Islands, was abandoned at 12,962 feet, the second, 19 kilometers southeast of Djerba Island, was abandoned at 4,176 feet, and the third well near the southern Kerkennah Island was abandoned at 10,015 feet.

---

[16] Industriés et Travaux d'Outre-Mer. Information d'Outre Mer (Overseas Information). No. 148, Mar. 1966, p. 192.
[17] Page 14 of work cited in footnote 4.
[18] Annuaire Statistique de la Tunisie (Annual Statistics of Tunisia). V. 13, 1961–62, p. 108, table 9.
[19] Oil and Gas International. Tunisia. V. 6, No. 3, Mar. 1966, p. 43.
[20] Pages 43–44 of work cited in footnote 19.
[21] U.S. Embassy, Tunis. State Department Airgram A–243, Nov. 20, 1965, p. 4.

The Mineral Industry of the United Arab Republic (Egypt)

By Henry E. Stipp [1]

The mineral industry of the United Arab Republic (Egypt) made a significant contribution to that nation's economy in 1965. Total mineral industry output valued at about $462 million [2] accounted for almost 10 percent of the estimated 1965 gross national product of $4,700 million. The petroleum sector's output valued at over $368 million led that of other segments of the mineral industry, followed by phosphate rock valued at $6.1 million, cement $4.1 million, iron ore $3.8 million, salt $3.7 million, and limestone $3.6 million.

Exports of salt, manganese ore, gypsum, and most petroleum refinery products increased; however, exports of crude petroleum and fertilizer materials decreased appreciably from those of 1964.

The extractive industry employed approximately 19,000 persons [3] in 1965 out of a total labor force of 7.3 million workers.

The second 5-year plan for social and economic development (1965–70) included 27 mining projects scheduled for completion. A total of $141.3 million was set aside for these projects. The sum of $28.5 million was desnigated for exploration and development, chiefly of iron ore, dolomite, limestone, coal, and phosphate deposits.

The Governing Council of the United Nations Special Fund appropriated $1.8 million in June 1965 for assessment of the mineral potential of the Aswan region.

PRODUCTION

Metals and minerals production in the United Arab Republic (Egypt) generally showed a decreasing trend; however, output of several commodities increased over that of 1964. From the economic viewpoint, the 4-percent increase in crude oil output, the 38-percent increase in gypsum production were most significant, but from the mineral requirements viewpoint, increases in production of asbestos (85 percent), barite (237 percent), and talc (135 percent) were of interest. The most important mineral commodities that decreased in output from 1964 were manganese ore (44 percent), phosphate rock (3 percent), iron ore (2 percent), and salt (27 percent).

---

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from Egyptian pounds (£E) to U.S. dollars at the rate of £E1=US$2.872.

[3] Estimate based upon statistics cited in National Bank of Egypt (Cairo), Econ. Bull. V. 18, No. 4, 1965, p. 299 (6/2)

Table 1.—United Arab Republic (Egypt): Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Chromite	1,390	----------	----------	----------	----------
Gold—troy ounces	931	----------	----------	----------	----------
Iron and steel:					
Iron ore—thousand tons	422	461	481	447	436
Pig iron—do	174	204	205	NA	e175
Steel ingots and castings—do	158	190	197	38	e 165
Rolled shapes and plates	67,412	77,608	83,009	101,411	93,552
Iron oxide pigments and dyes	NA	----------	NA	325	370
Lead, metal content of ore	35	540	500	----------	NA
Manganese ore:					
With more than 35 percent Mn [1]	r 2,061	38,625	26,067	NA	NA
With 35 percent or less Mn	r 276,386	147,057	145,760	NA	NA
Total	278,447	185,682	171,827	[2] 328,011	182,145
Titanium minerals:					
Ilmenite	43,069	44,643	541	21	NA
Rutile	e 1,000	r 180	4	----------	NA
Tungsten ore, 60 percent WO_3 basis	83	----------	----------	----------	----------
Zirconium ore	95	171	r 40	NA	NA
Nonmetals:					
Asbestos	230	550	r 174	1,578	2,926
Barite	1,573	1,230	4,123	4,551	15,353
Cement:					
Portland—thousand tons	r 1,822	1,693	r 1,722	2,384	2,320
Other—do	----------	543	805	[3] 39,989	[3] 72,915
Diatomite	301	50	831	4,728	NA
Feldspar	----------	----------	----------	337,450	465,213
Gypsum	462,350	467,570	453,718	62,796	47,775
Kaolin	27,180	14,601	24,043	7,322	8,297
Limestone—thousand tons	7,677	8,347	4,148	613,237	593,699
Phosphate rock	626,530	601,747	644,423	21,572	NA
Pumice	3,933	2,065	8,722	675	494
Salt—thousand tons	517	560	r 392	NA	NA
Sulfur, elemental:					
From sulfur ore	45,409	31,051	4,750	2,466	3,707
Other	2,586	2,072	2,393	16,821	39,628
Talc	5,956	6,126	7,131	416	580
Vermiculite and mica	77	284	30	----------	20,000
Mineral fuels:					
Coal	----------	----------	----------	----------	NA
Coke, low temperature e—thousand tons	30	35	35	35	
Petroleum:					
Crude—thousand 42-gallon barrels	26,136	r 32,321	38,759	43,915	45,556
Refinery products:					
Gasoline	386,483	552,517	713,692	756,766	855,070
Kerosine and jet fuel	481,821	592,215	846,336	983,670	887,661
Distillate fuel oil	717,795	894,887	1,037,815	[4] 199,312	1,232,344
Residual fuel oil	2,650,900	2,822,615	3,392,241	NA	4,690,673
Asphalt	123,700	152,803	147,887	150,775	134,422
Liquid petroleum gas	25,288	31,313	39,225	NA	58,486
Other	----------	----------	----------	----------	75,956
Total	4,385,987	5,046,350	6,177,196	NA	7,934,612

e Estimate. r Revised. NA Not available.

[1] Includes annually about 5,000 tons of MnO_2.

[2] It is estimated that of this amount, 42,600 tons were ore with 13 percent Mn.

[3] Contains refractory clay in 1963 and is believed also to contain clay in 1962.

[4] As reported; subject to revision.

TRADE

The role of mineral commodities in the total foreign trade of the United Arab Republic (Egypt) is reflected in the following tabulation:

	Value (million dollars)		
	Mineral commodities [1]	Total	Minerals' share of total (percent)
Trade balance:			
1963	135	r 493	XX
1964	144	517	XX
Exports:			
1963	r 70	r 651	11
1964	72	673	11
Imports:			
1963	205	1,144	18
1964	217	1,190	18

r Revised. XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

Destinations for exports and origins of imports were available only for several of the more important commodities.

Exports of most petroleum products increased, but this was more than offset by decreased crude oil and residual fuel oil shipments. Exports of phosphate materials, and cement decreased significantly; whereas manganese ore, gypsum and salt sales increased substantially. Shipments of manganese ore went principally to Italy (61,400 tons), Belgium (40,640 tons), and West Germany (28,193 tons). Sales of phosphate rock were made chiefly to Yugoslavia (114,123 tons), India (69,393 tons), and Ceylon (49,198 tons). Significant quantities of steatite were exported in 1964 to East Germany and the United Kingdom. Crude oil exports went mainly to East Germany (1,712,000 tons), Spain (1,093,000 tons), and Italy (752,000 tons). Gasoline exports were sent to Netherlands (154,00 tons), United States (132,000 tons), and United Kingdom (82,000 tons). The destination for the total quantity of kerosine (13,000 tons) exported in 1964 was given as Gaza, Palestine.

Table 2.—United Arab Republic (Egypt): Exports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity		1963	1964
Metals: Manganese ore		r 162,769	182,447
Nonmetals:			
Cement		r 215,939	175,754
Fertilizer materials:			
Phosphate rock		420,192	327,737
Phosphatic		r 35,110	31,249
Gypsum		r 51,844	78,594
Salt		r 162,700	332,452
Steatite		NA	1,590
Talc		1,120	55
Mineral fuels:			
Petroleum:			
Crude	thousand tons	r 3,441	3,030
Refinery products:			
Gasoline		r 147,808	478,406
Kerosine and jet fuel		r 4,478	13,200
Residual fuel		r 842,774	145,801
Asphalt		r 10,850	23,777
Liquid petroleum gas (LPG)		1,407	NA

r Revised. NA Not available.

In the absence of complete data on distribution of mineral commodity trade in 1964, the following particulars on distribution of total trade are included. In 1964, the U.S.S.R. purchased the largest share of United Arab Republic products (17.9 percent of total exports) valued at $120.3 million, followed by Czechoslovakia (9.6 percent) valued at $64.9 million, India (5.7 percent) valued at $38.2 million, and West Germany (5.5 percent) valued at $37 million.[4]

Imports of metals and minerals listed in table 3 for 1964 were valued at $211 million compared with imports of $205 million in 1963; an increase of about 3 percent. Crude petroleum, the largest import commodity increased from $78.4 mil-

[4] Central Bank of Egypt. Econ. Rev. V. 5, No. 2, 1965, pp. 153–154.

Table 3.—United Arab Republic (Egypt): Imports of selected metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity		1963	1964
Metals: [2]			
Aluminum		4,603	5,215
Copper		10,294	5,306
Iron and steel:			
Iron pyrite, unroasted		61	NA
Scrap		51,780	44,353
Pig and cast iron		49,947	46,995
Ferroalloys		5,102	3,811
Semimanufactures:			
Bars and rods		68,641	106,737
Angles and shapes		32,553	31,866
Plates and sheets		53,560	84,113
Hoop and strip		14,564	8,637
Wire, not insulated		19,840	7,250
Railway rails and sleepers		5,075	16,165
Tubes, pipes, and fittings		45,342	17,734
Nails		2,682	2,199
Alloy and high-carbon steel		3,433	6,961
Others		3,377	3,770
Lead		5,325	5,618
Lead oxides		1,333	1,122
Tin	long tons	442	662
Zinc		2,450	----------
Nonmetals:			
Asbestos		7,860	3,414
Brick, refractory		10,446	3,797
Dolomite and magnesite		4,661	----------
Fertilizers		409,484	516,505
Kaolin		10,337	7,921
Pyrite, unroasted		161,601	59,208
Stone, (marble)		6,896	255
Sulfur (except sublimed)		21,474	59,208
Mineral fuels:			
Coal		29,185	301,353
Coke		268	216
Petroleum:			
Crude	thousand tons	4,323	4,750
Refinery products:			
Gasoline		23,520	8,883
Kerosine		140,847	22,061
Fuel oil (distillate and residual)		r 175,973	137,975
Lubricants		66,548	57,951
Wax		2,237	2,150

r Revised. NA Not available.
[1] Origin of imports are generally not available for 1964.
[2] Includes unwrought, semimanufactures, and scrap.

lion in 1963 to $87.8 million in 1964; whereas petroleum refinery products decreased by about $8.3 million. Imports of iron bars and rods increased $8.9 million to $13.2 million in 1964. Imports of iron sheets rose by $6 million; but tubes and pipes decreased by about $5.7 million. Coal and coke imports for use principally by the steel mills, increased by $4.3 million. Increased local production of kerosine, was reported to be responsible for a decrease of $5.2 million in imports of liquefied petroleum gas.[5]

As in the case of export data, information on the geographic pattern of imports is not available for 1964, but the following information on distribution of total imports by origin has been provided. In 1964, the United States was reportedly the origin of 29.8 percent of total imports, these imports from the United States were valued at $354.6 million. West Germany ranked second with 11.3 percent or $134.9 million and the U.S.S.R. was the third most important source with 7.7 percent or $92.2 million.

During 1965 the United Arab Republic signed trade protocols or agreements with Algeria, Bulgaria, Czechoslovakia, East Germany, Ethiopia, Ghana, Greece, Hungary, India, Kenya, North Korea, Sierra Leone, Somalia, Spain, and Sudan. Mineral commodities that will be exported to these countries include crude oil, petroleum

[5] Central Bank of Egypt. (Cairo) Econ. Rev. V. 5, No. 2, 1965, p. 149.

refinery products, petrochemicals, manganese ore, phosphate and nitrate fertilizers, and cement. Imports from these countries include iron ore, iron bars, iron and steel pipes, reinforced steel bars, other steel products, bauxite, fertilizers, equipment and parts for copper and steel mills, and excavating, leveling, and extracting machinery.

Trade talks on integrating the economy of Egypt and Iraq were held during the latter half of 1965.

The Phillips Petroleum Co. of the United States received an order for the sale of 157,000 tons of ammonium sulfate to the Misr Foreign Trade Co. of the United Arab Republic Government.[6]

COMMODITY REVIEW

METALS

Aluminum.—No additional information was reported on the proposed aluminum reduction plant to be constructed at Aswan by Centrozap, a Polish trade organization.

Iron and Steel.—Czechoslovakia was scheduled to build an electric furnace steel plant for smelting iron at Aswan, under terms of an agreement with the United Arab Republic signed in June. The integrated iron and steel plant at Helwan, south of Cairo was slated for expansion. Production of pig iron will be increased from the reported 360,000 tons capacity to about 1.2 million tons in 1970. Production costs at the Helwan plant have been increasing in recent years, owing chiefly to the higher price paid for iron ore from the Aswan mines. These mines achieved a record production of 436,000 tons in fiscal year 1965, owing to the practice of mining selectively in order to obtain ore of about 44-percent iron and 19-percent silica content. Several beneficiation processes have been investigated; however, none has been able to increase the iron content above 53.9 percent. Reserves at Aswan were estimated recently at 27 million tons, whereas future demand (supply for Helwan plant until Bahariya ore becomes available about 1968 and to supply proposed Aswan mill for 50 years) could total approximately 134 million tons.[7] Adequate deposits are believed to exist in the Aswan area, but their quantity, quality, and location needs to be determined. Transportation of iron ore from Aswan also presents problems.

One of the principal exploitation projects of the second 5-year plan is the development of the Bahariya iron ore deposits. This project, which has a planned output of 4 million tons of high-grade ore by 1972, was still in the planning stage in 1965. Transportation was also one of the chief problems involved in using iron ore from the Bahariya area. The General Organization for Industrialization, a Government agency, was studying offers by foreign companies for construction of a 330-kilometer railway and highway between Bahariya and the Egyptian Iron & Steel Co. plant in Helwan. Total cost of the project was estimated at $143.6 million.

The ferromanganese plant at Abu Zenima to operate on Sinai manganese ore was nearing completion. This facility, which will have a production capacity of 10,000 tons of ferromanganese and 27,000 tons of cast iron per year, was expected to cost $21,597,440. The plant was designed to use natural gas from the Belayim oilfields. Also, it will provide for the region potable water, distilled by using the hot gases from the gas turbine generators that supply electric power to the smelter.

Titanium.—The Black Sands Co. was seeking foreign aid to exploit the ilmenite and rutile deposits of the Nile Delta. Expansion of the company's facilities was to be completed in 1969, as an industrial project of the second 5-year plan. Under the 5-year plan, a report was published that evaluated reserves of the Black Sands Co. and reviewed plans for development of the deposit.[8] A 4.6-square-mile area contained proved reserves of 37 million tons of economic minerals.

Uranium.—Deposits of pitchblende were discovered in the Eastern Desert near

[6] U.S. Embassy, Cairo, U.A.R. (Egypt). Department of State Airgram A-981, June 23, 1965, p. 2.

[7] Ebasco Services Inc., Cairo U.A.R. Team. Review and Analysis of Exploration, Development, and Operations of Aswan Iron Ore Mines. Cairo, United Arab Republic (Egypt). (Contract AID/Nesa-37) August 1964, 93 pp.

[8] Ebasco Services Inc. Evaluation of Proposed Program for Development of Mineral Deposits of Egyptian Black Sands Company, Cairo, United Arab Republic (Egypt). April 1964, 71 pp.

Quseir on the Red Sea, in the Wadi al-Gemal north of Qarum Lake, and between Port Said and Damietta.[9] A preliminary estimate of reserves in the Port Said-Damietta area totaled 80 million tons containing 0.6 percent monazite, 0.03 percent thorium, and 0.0025 percent uranium. A second plant for processing atomic fuel from monazite was completed. Uranium ore, found in the Eastern Desert area, was treated with a recently developed method designed to provide fuel for nuclear reactors. Government officials were considering bids, received from four foreign companies, for construction of a nuclear power and desalinization plant near Alexandria.

NONMETALS

Dolomite and Limestone.—Expansion of dolomite and limestone producing facilities was included as part of the project to construct a rail line and highway from Bahariya to Helwan.

Gypsum.—Capacity of the Abou Ghosen gypsum deposit will be expanded from its 1965 output of 216,000 tons per year to 900,000 tons per year under the second 5-year plan. Exports will be expanded, and more gypsum will be made available for domestic use. Gypsum and anhydrite deposits at Ras Gemsa, Safaga, and Ras Malaab were investigated by a team from EBS Management Consultants Inc. for the General Organization for Industrialization, a Government agency.

Fertilizer Materials.—Phosphate rock production decreased 3 percent compared with that of 1964, and 8 percent below the peak year of 1963 despite Government emphasis on increased agricultural production. Sales of phosphate have been declining, because the low grade rock produced has difficulty competing with the beneficiated phosphate exports of other North African countries. The tricalcium phosphate content of exports from the United Arab Republic averaged from 63.6 to 67.7 percent compared with tricalcium phosphate contents of up to 72 percent for exports from other nations in the area. The country's phosphate industry has been confronted with problems including rising production costs, shortages of transportation, inefficient, costly handling, and lack of spare parts and replacement units for older installations.

Reviews on the manufacture of metaphosphates and the potential development of a phosphorus and phosphate industry in the nation were published.[10]

A new ammonium sulfate plant of a 200,000-ton-per-year capacity was to be constructed at Attaka, near Suez, for Société el Nasr d'Engrais et d'Industries Chimiques. The plant will use naphtha as a source of ammonia, and ammonium sulfate will be produced by double decomposition of gypsum and ammonium carbonate.

Superphosphate producing capacity was scheduled for expansion at Abu Zaabal and a superphosphate plant with a 120,000-ton annual capacity was to be completed at Kafr El Zayat. No progress was reported on the construction of a 200,000-ton-per-year superphosphate plant in Assiut. The triple superphosphate plant to be erected at Aswan was still in the planning stage. This plant is to include a 25-ton-per-day electric furnace for production of elemental phosphorus.[11] The acid produced from the phosphorus will be used to manufacture 25,000 tons per year of triple superphosphate, 8,000 tons per year of tetrasodium pyrophosphate, and 8,000 tons per year of sodium tripolyphosphate. A dicalcium phosphate plant of 12,000-ton-per-year capacity also was scheduled for construction at Aswan.

Current nitrogen production capacity was scheduled to increase to about 450,000 tons per year by 1970, almost double present output. A urea plant of 95,000-ton-per-year capacity was to be erected at the coke and chemical works of El Nasr Coke & Heavy Chemicals Co., S.A.A., at Helwan. Calcium ammonium nitrate also will be produced from byproduct gas of the urea manufacturing process.

Salt.—Annual production from marine salt pans in the Port Said and Alexandria area was to be increased from about 600,000 to 1.1 million tons. The bulk of the increased output would be exported and a

[9] Mining Journal (London). Uranium Mines In Egypt. V. 264, No. 6762, Mar. 26, 1965, p. 231.

[10] EBS Management Consultants Inc., Cairo, U.A.R. Team. Evaluation of the Manufacture of Metaphosphate in the U.A.R. (Contract AID/Nesa-37) Cairo, United Arab Republic (Egypt), October 1965, 25 pp.

Ebasco Services Inc., Cairo, U.A.R. Team. Evaluation of Proposed Program for Development of the Phosphate Industry in the United Arab Republic. (Contract AID/Nesa-37) Cairo, United Arab Republic (Egypt), September 1964, 47 pp.

[11] Nitrogen. New Facilities for Egypt's Fertilizer Industry. No. 37, September 1965, p. 20.

small part would be consumed by domestic caustic soda plants.

MINERAL FUELS

Coal.—Production of the El Meghara coal mine on the Sinai Peninsula was reported as 20,000 tons per year, but it was scheduled to increase to about 620,000 tons per year when the deposits are fully developed. The coal will be consumed by the Helwan iron and steel works and will partially replace imported coking coal. Work was progressing on a road from Ismailia to the mine site at Meghara.

Coke.—Coke-oven gas from two 900-ton-per-day batteries and one 1,800-ton-per-day unit of the El Nasr Coke & Heavy Chemical Co. at Helwan will provide basic raw material for manufacturing urea.

Petroleum.—*Exploration.*—The oil strike of Pan American U.A.R. Petroleum Co. in the Gulf of Suez near the village of El Tor was probably the most important event of the year. The discovery well found oil at two different levels; at a depth of about 5,000 feet, a flow of 2,000 barrels per day of 24° to 26° A.P.I. crude oil and at a depth of about 6,000 feet, a flow of 10,820 barrels per day of 25° to 30° A.P.I. crude oil. It has been estimated that Pan American's discovery, named the El Morgan field, indicated preliminary reserves of 630 million barrels, and the field, when fully developed, was expected to produce 100,000 barrels per day.[12] Present production of crude oil in the United Arab Republic (Egypt) is estimated at about 125,000 barrels per day. A second well, drilled about 3 kilometers from Pan American's El Morgan well, also struck oil. The second well was said to be similar to the first in quantity and quality of oil, but the pay zone was not nearly as thick. In the latter part of the year a third well was completed in the El Morgan field with results similar to the first two. A platform was to be located at the site of the first well by mid-1966, from which multiple wells will be directionally drilled. A new company has been formed by Pan American U.A.R. Petroleum Co. and the Egyptian General Petroleum Corp. to develop the El Morgan field. Pan American also started a new well on a recently discovered structure in its Western Desert concession in preparation for starting its first well in November.[13]

Five seismic crews were operating in the Western Desert concession of Phillips Petroleum Co. Phillips' first well was to be started in November about 95 kilometers west of Alexandria and 26 kilometers inland from the Mediterranean Coast.

International Egyptian Oil Co. had two seismic crews surveying its Delta concession. A seismic survey of International's Gulf of Suez concession area at Khalig al-Zait was completed in the latter part of the year. Compagnie Orientale des Petroles d'Egypt (COPE) also made a discovery near Gharah, offshore from the Sinai Peninsula in the Gulf of Suez.[14] The well produced 2,500 barrels per day of 31° A.P.I. crude oil from a depth of 7,218 feet. COPE produced 97,377 barrels per day from its concession on the Sinai Peninsula.

An oil strike was made by Egyptian General Petroleum Corp. (EGPC) 4 miles north of its Ras Bakr pool. Results of flow tests were not announced.

Total reserves of crude oil as of June 1965 were estimated at 2 billion barrels,[15] and gas reserves apparently were about 1.5 million cubic feet.

Refining.—The Suez refinery's coke plant began producing in April. Output of the plant was estimated at 1.7 million tons per year. The plant, which cost about $57.5 million, was built by Compagnie Italiani Petroli for the Suez Oil Processing Co. Other units of the complex were expected to be inaugurated in midyear.[16]

A powerplant, that was designed to consume 360,000 tons per year of coke produced by the Italian built Suez refinery coke plant, also began operating in April. The plant consisting of four 25,000 kilowatt units and space for another unit was constructed by U.S.S.R. technicians.[17]

The second 5-year plan allocated $126.5 million for construction of a petrochemical complex at Alexandria. Ten separate fac-

[12] U.S. Embassy, Cairo, U.A.R. (Egypt). Department of State Airgram A-73, July 24, 1965, p. 4.
[13] U.S. Embassy, Cairo, U.A.R. (Egypt). Department of State Airgram A-422, November 22, 1965, p. 9.
[14] Petroleum Management, Egypt (U.A.R.). June 1965, p. 86.
[15] Petroleum Management, Egypt (U.A.R.). June 1965, p. 86.
[16] U.S. Embassy, Cairo, U.A.R. (Egypt). Department of State Airgram A-174, Aug. 26, 1965, p. 13.
[17] U.S. Embassy, Cairo, U.A.R. (Egypt). Department of State Airgram A-39, Oct. 13, 1965, p. 2.

tories will be built to produce synthetic rubber, plastics, raw pharmaceuticals, synthetic fibers, fertilizers, alcohol, insecticides, and other petrochemicals.

Transportation, Suez Canal.—The Canal Authority increased tolls for all ships 1 percent, effective July 1, 1965. From January through September 1965 oil tankers accounted for about 74 percent of total new tonnage (184,028,905) passing through the canal. Of the 15,207 ships traversing the canal during this period 7,280 were oil tankers; of the 167,554,000 tons of cargo 120,762,000 tons was petroleum. The largest part of the petroleum 115,151,000 tons was northbound with Italy (29,585,000 tons), England (18,954,000 tons), and France (18,912,000 tons) receiving the largest quantity. The chief sources of supply for this petroleum were Kuwait (47,502,000 tons), Iran (28,682,000 tons), and Saudi Arabia (20,006,000 tons). Of the petroleum northward bound 106,037,000 tons was crude oil.

Other minerals that passed through the canal northward during the 9 months included iron ore (2,510,000 tons), manganese ore (854,000 tons), ilmenite and rutile (348,000 tons), lead (340,000 tons), zinc (247,000 tons), chrome (214,000 tons), tin (168,000 long tons), copper (140,000 tons), bauxite (82,000 tons), others (246,000 tons).

Southbound petroleum totaled 5,611,000 tons of which 1,465,000 was crude oil. Sources of the petroleum were U.S.S.R. 3,906,000 tons, Rumania 777,000 tons, and Italy 559,000 tons. Destinations of the southbound petroleum were Japan 2,811,000 tons, India 1,153,000 tons, and Pakistan 361,000 tons.

The Mineral Industry of Other Areas of Africa

By Walter C. Woodmansee [1]

Contents

Of the 16 countries and territories covered in this chapter, all except Gambia and the Spanish Sahara are overseas associates of the European Economic Community (EEC).[2] Except for Burundi, Gambia, Rwanda, Somali Republic, and the Spanish Sahara, all also are members of the Communauté Française Afrique (CFA) for which the franc is the standard monetary unit. Where necessary for the 13 CFA members, CFA francs have been converted to U.S. dollars at the rate of CFAF245 = US$1.00. Monetary conversion rates for each of the 5 nonmembers are indicated in the sections on these countries.

BURUNDI

Reported mineral production in the Kingdom of Burundi during 1965 was limited to cassiterite, bastnaesite, and limestone, although construction materials such as clay, sand, and gravel probably were produced in small quantities for local use. The mineral industry was of little importance to the economy; output of cassiterite and bastnaesite contributed only an estimated $80,000 to $90,000 to the gross national product (GNP) of about $150 million.[3]

Although mining activity was small, mineral prospecting and exploration were advanced during the year. The Département Géologie et Mines, staffed with Belgian and French personnel, some under United Nations auspices, undertook geological and mineral studies. Mineral commodities under investigation included diamond, bauxite, iron ore, and kaolin. Iron ore deposits of relatively high grade are known, but distance from markets precluded development. Discovery of a large gossan in the Crete Congo-Nil was reported, and investigation was proceeding.

[1] Physical scientist, Division of International Activities.

[2] Other African continent associates, covered in other chapters of this volume, are Algeria, Democratic Republic of the Congo (Léopoldville), Gabon, Ivory Coast, Malagasy Republic, and Senegal.

[3] Where necessary, Burundi francs (BF) have been converted to U.S. dollars at the rate of 50BF=$1.00 prior to Feb. 11, 1965, when the Burundi franc was officially devaluated, and 87.5BF=$1 after that date.

PRODUCTION

Cassiterite mining continued by contract workers who supplied the operating company, Syndicat Minier d'Etain (MINETAIN), with a specified quantity and disposed of the remainder in other markets. Bastnaesite production, which began in August, totaled 75 tons during the year. A large increase was planned during 1966.

Table 1.—Burundi: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity [1]		1961	1962	1963	1964	1965
Metals:						
Columbium-tantalum concentrate		(2)	2	2	NA	NA
Rare earth metal concentrate (bastnaesite)		---	---	---	---	75
Tin:						
Cassiterite concentrate	long tons	(2)	35	25	22	16
Content of concentrate	do	(2)	26	16	NA	NA
Nonmetals: Limestone		NA	NA	360	120	150

NA Not available.
[1] In addition, construction materials such as clay, sand, and gravel are produced, but quantitative data are not available.
[2] Production, if any, included with that of Rwanda.

TRADE

Minerals produced entered the export market. The United States received about 10 tons of bastnaesite concentrate in 1965, and a large part of the remainder reportedly went to West Germany. In addition, some 2.3 million carats of diamond were reported as exports during 1965. Most of these apparently originated in the Democratic Republic of the Congo (Léopoldville) and were sold in Burundi.

Reported mineral imports during 1964 and 1965 were as follows:

	1964		January through September 1965	
	Metric tons	Value (thousands)	Metric tons	Value (thousands)
Cement	8,752	$340	5,363	$211
Salt	6,970	288	6,841	267
Petroleum fuels	16,099	1,368	7,795	595
Lubricants	900	214	355	113

The main sources of these commodities were the Democratic Republic of the Congo (cement), Tanzania (salt and gasoline), Iran (various petroleum refinery products), and the Netherlands (lubricants).

An estimate of the relationship between mineral and total trade during these years is given below (excluding diamond, which originated in other countries):

	Value (thousands)		Mineral commodities share of total trade (percent)
	Mineral commodities (estimate)	All commodities	
Exports:			
1964	$40	$19,600	0.2
1965	90	14,000	.6
Imports:			
1964	2,200	17,200	12.8
1965	1,600	18,600	8.6
Trade balance:			
1964	−2,160	+2,400	XX
1965	−1,510	−4,600	XX

XX Not applicable.

CAMEROON

The mineral industry of the Federal Republic of Cameroon in 1965 essentially remained limited to aluminum production, which contributed 3 to 4 percent to the estimated GNP of $575 million. Although there were few known economically exploitable minerals, the search continued for new mineral deposits. In January President Ahidjo requested Federal Assembly approval of the Office Nationale de la Recherche Scientifique et Technique to replace the Institut de Recherches Scientifiques du Cameroon. In March 20 geologists arrived to study granites in the north. The group was organized by the Association of African Geological Services, financed by the United Nations and the Union of Geological Sciences.

Late in the year, the President signed two decrees granting mineral exploration rights to the French Bureau de Recherches Géologiques et Minières (BRGM) for copper, lead, silver, cadmium, germanium, and gallium in the Ntole, Mamfe, and Kumba regions of the west. Duration of the concession is 4 years, renewable for two 4-year periods.[4]

There was new activity in oil exploration, and prospects for oil discovery were considered good. Offshore drilling was underway by one company, and a second company was granted a concession and planned drilling in 1966.

PRODUCTION

Aluminum ingot from the Edéa reduction plant was Cameroon's only important mineral product. Small quantities of gold from the Bétaré-Oya region and tin concentrate from Mayo-Darlé represented the only other recorded mineral production. Guinea was the principal source of alumina for processing at Edéa.

TRADE

The year 1964 was the first in which trade statistics of East and West Cameroon were combined in national sources since unification in 1961. East Cameroon accounted for a large part of both mineral and total trade.

Union Douanière et Economique de l'Afrique Centrale (UDEAC), a trade union comprising Cameroon, Central African Republic, Chad, Congo (Brazzaville), and Gabon, was organized in 1965 and was in effect as of January 1, 1966. Final negotiations between these countries, regarding fiscal and customs tariffs, were conducted at a conference at Douala in October 1965.

During 1964, the latest year for which complete data are available, the principal mineral imports (with values in parentheses) were petroleum refinery products ($8.5 million), alumina ($7.2 million), and iron and steel ($6.3 million). Aluminum exports were valued at $21.1 million, nearly 98 percent of total mineral exports. The relationship between mineral and total trade during 1963 and 1964 was as follows:

[4] U.S. Embassy, Yaunde. Department of State Airgram A-81, Oct. 26, 1965, p. 1.

	Value (thousand dollars)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	$22,594	$118,334	19.1
1964	21,574	140,900	15.3
Imports:			
1963	25,807	108,989	23.7
1964	30,218	134,100	22.5
Trade balance:			
1963	−3,213	+9,345	XX
1964	−8,644	+6,800	XX

XX Not applicable.
[1] Includes only those commodities listed in tables 3 and 4 of this chapter.

Table 2.—Cameroon: Production of metals and minerals

Commodity [1]		1961	1962	1963	1964 r	1965
Metals:						
Aluminum	metric tons	47,578	52,250	52,913	51,507	50,827
Gold	troy ounces	537	r 579	r 1,865	739	1,454
Tin, content of concentrate	long tons	65	23	r 25	40	41

r Revised.
[1] In addition to commodities listed, construction materials such as clay, sand, and gravel are produced, but quantitative data are not available.

Table 3.—Cameroon: Exports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:[1]			
Aluminum, mainly ingot	52,459	49,195	France 44,491; United States 2,773.
Copper	2	1	All to Gabon.
Iron and steel:			
Scrap	2,502	2,813	Japan 1,600; France 1,212.
Pig iron and ferroalloys	260	----	
Steel ingots	3	----	
Semimanufactures	52	95	Central African Republic 47; Chad 18; Gabon 16.
Lead	68	43	Belgium-Luxembourg 29; Denmark 10.
Tin ore and concentrate, long tons	37	76	Netherlands 59; Spain 17.
Nonferrous ore and concentrate, n.e.s.	159	70	Belgium-Luxembourg 23; Netherlands 17.
Nonferrous metals, n.e.s.	----	2	All to France.
Nonmetals:			
Cement, lime and other building materials [2]	47	38	Central African Republic 30.
Clay construction materials [2]	----	7	Gabon 5.
Fertilizers, manufactured	----	23	Nigeria 10; Spanish Guinea 8; Gabon 5.
Nonmetallic minerals, crude, n.e.s. [2]	78	636	Netherlands 495; Nigeria 126.
Nonmetallic mineral manufactures [2]	383	----	
Mineral fuels:			
Petroleum refinery products	32	222	Netherlands Antilles 201.

[1] Includes unwrought and semimanufactures unless otherwise specified.
[2] For details on specific commodities included, see section on source materials.

Table 4.—Cameroon: Imports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals: [1]			
Aluminum:			
Alumina	124,995	94,056	Guinea 83,256; Spanish Guinea 10,800.
Metal	1,487	2,198	Belgium-Luxembourg 1,300; France 857.
Copper	66	73	France 67.
Iron and steel:			
Pig iron and ferroalloys	138	225	France 222.
Steel ingots and equivalent forms	----	10	United Kingdom 9.
Semimanufactures:			
Bars, rods, and sections	r 9,661	11,536	France 9,886; Belgium-Luxembourg 1,145.
Plate, sheet, and strip	8,562	9,287	France 8,376; Japan 450.
Rails and accessories	4,596	9,392	All from France.
Wire	216	1,391	United Kingdom 723; France 629.
Tubes, pipes, and fittings	1,671	2,649	France 2,080; Italy 418.
Castings and forgings	1,198	702	France 510; United States 173.
Total	r 25,904	34,957	
Lead	56	24	France 14; Belgium-Luxembourg 8.
Nickel	33	----	
Tin, long tons	2	18	West Germany 8; United Kingdom 6.
Zinc	14	672	Japan 428; Belgium-Luxembourg 215.
Nonferrous metals, n.e.s.	----	11	West Germany 7; Belgium-Luxembourg 4.
Nonmetals:			
Abrasives, natural [2]	87	108	All from France.
Cement, lime, and other building materials.[2]	74,417	100,514	France 51,027; Belgium-Luxembourg 32,635.
Clay construction materials [2]	1,306	1,524	France 1,199; West Germany 230.
Fertilizer materials:			
Natural	----	620	France 609.
Manufactured	14,249	41,593	France 39,470.
Stone, sand, and gravel [2]	124	257	France 185; Chad 62.
Nonmetallic minerals, crude, n.e.s.[2]	11,897	20,728	West Germany 8,229; Senegal 5,016; Spain 3,196.
Nonmetallic mineral manufactures [2]	122	1,424	France 1,041; Belgium-Luxembourg 300.
Mineral fuels:			
Coal, coke, and briquets	476	383	All from France.
Gas, natural or manufactured	623	693	France 466; Netherlands 223.
Petroleum:			
Crude or partly refined	5	44	Belgium-Luxembourg 42.
Refinery products	150,946	185,624	Netherlands Antilles 48,073; Venezuela 40,541; West Germany 26,602; Italy 26,471.
Tar, pitch, and other crude chemicals from coal, oil and gas distillation.	5	328	United States 200; United Kingdom 116.

r Revised.
[1] Includes unwrought and semimanufactures, unless otherwise specified.
[2] For details on specific commodities included, see section on source materials.

COMMODITY REVIEW

Metals.—*Aluminum.*—Compagnie Camerounaise d'Aluminium Péchiney—Ugine (ALUCAM), producer of ingot at Edéa, celebrated its 10th anniversary of operation in Cameroon. The company is the second largest capitalized enterprise in the country. It employed 57 French and 30 Cameroon technical personnel and 450 Cameroon laborers. A gradual shift to greater operation by Cameroon nationals continued.

Société Camerounaise de Transformation de l'Aluminium (SOCATRAL) was organized as operating company for the proposed rolling mill at Edéa. Companies also were formed for power and the production of finished aluminum products.

Gold.—No details were reported on gold-mining operations, although there was a significant increase in reported output. Early in the year, the Government began negotiations with a West German geological firm for investigations for alluvial gold in Lom and Kadéi Departments.

Mineral Fuels.—*Petroleum.*—The new offshore drilling barge of Société de Recherches et d'Exploitation des Pétroles au Cameroon (CEREPCA) was inaugurated on February 6. The barge was built by Chantiers de France Gironde at a cost of $8.2 million. It has four sliding 164-foot columns and can operate in water 66 to 98 feet deep; sections added to columns can increase operating depth to 180 feet. Drilling started in February on a structure detected by seismic methods in the Sanaga Maritime permit between the Sanaga and Nyong Rivers. The well was abandoned dry at 12,467 feet in June. Further offshore drilling was planned to test the Miocene section.

Early in the year, representatives of Marathon International Oil Co., Mobil Exploration Equatorial Africa, Inc., and Continental Oil Co. arrived in Yaoundé to negotiate for offshore concessions. By Presidential decree of June 16, 1965, Mobil was granted a 3,750-square-kilometer offshore oil and gas concession. Under terms of the concession, an expenditure of $1.5 million was required during the concession period. Mobil conducted 2 months of seismic reconnaissance and planned drilling in 1966.[5]

CENTRAL AFRICAN REPUBLIC

During 1965 the Central African Republic produced 3.7 percent of world output of gem-quality diamond and 0.9 percent of world output of industrial diamond. Essentially the country's only mineral product, diamond output contributed $14,985,000 to the GNP, estimated at $70 million.

The search for minerals continued. Recent discoveries of copper, iron ore, tin, and zinc have been reported, but economic value of these mineral occurrences remained unreported.

PRODUCTION

Diamond output increased to a record high, but output of byproduct alluvial gold, the only other mineral commodity for which output is recorded, decreased substantially.

TRADE

Metal and mineral trade showed an increased surplus in 1965 because of expanded diamond output and export, whereas total trade again showed a small deficit. These data for 1963–65 were as follows:

	Value (thousands)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	$10,636	$21,996	48.4
1964	12,625	28,921	43.7
1965	14,446	26,359	54.8
Imports:			
1963	2,829	26,340	10.7
1964	r 3,384	29,848	11.3
1965	3,635	27,427	13.3
Trade balance:			
1963	+7,807	−4,344	XX
1964	+9,241	−927	XX
1965	+10,811	−1,068	XX

r Revised. XX Not applicable.
[1] Includes only those commodities listed in table 6 of this chapter.

Export earnings from diamond totaled $14.2 million in 1965, compared with $12.4 million in 1964. Diamond therefore com-

[5] Bulletin of the American Association of Petroleum Geologists. V. 50, No. 8, August 1966, p. 1709.

prised 98 percent of mineral export value and 54 percent of total export value.

The principal mineral imports in 1965 and corresponding values were petroleum refinery products, $1.8 million ($1.3 million in 1964), and iron and steel, $673,000 ($867,000 in 1964).

COMMODITY REVIEW

Metals.—*Uranium.*—The BRGM, in conjunction with Compagnie Française des Minerais d'Uranium, performed preliminary geological exploration near M'Patou in the Bakouma region. Results were favorable, and a detailed study was planned.

Nonmetals.—*Diamond.*—Of the 1965 output, which increased 21 percent over that of 1964, 445,016 carats were mined by private diggers and 91,794 carats by industrial companies, principally Compagnie Centrafricaine de Mines (CENTRAMINES). Although exact data were not available, about half of this output was gem-quality diamond and the other half was industrial diamond. Prospecting and exploration continued in the Berberati area.

By a 1964 decree, the Government had attempted to regulate diamond markets and prices. All foreigners, including Senegalese, Mauritanians, and Malians, who had bought from native diggers and sold to offices of European companies in Bangui

Table 5.—Central African Republic: Production of metals and minerals

Commodity [1]		1961	1962	1963	1964	1965
Metals: Gold	troy ounces	80	100	r 76	r 77	23
Nonmetals: Diamond	carats	111,484	265,417	402,364	442,281	536,810

r Revised.
[1] In addition, construction materials such as clay, sand, and gravel are probably produced, but quantitative data are not available.

Table 6.—Central African Republic: Foreign trade in selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources or destinations, 1964
Exports:				
Metals:				
Iron and steel, semimanufactures.	----	7	----	Ivory Coast 7.
Scrap, nonferrous	----	5	----	All to Italy.
Nonmetals: Diamond—carats	e 364,000	418,055	506,900	Israel 185,000;e United States 110,000;e Netherlands [1] 55,000.e
Mineral fuels: Petroleum refinery products.	----	1,388	1,267	All to bunkers.
Imports:				
Metals:				
Aluminum	180	298	291	France 161; Cameroon 128.
Copper	6	20	10	All from France.
Iron and steel:				
Pig iron and ferroalloys	----	3	3	Do.
Semimanufactures	2,399	3,833	3,500	France 3,477; Belgium-Luxembourg 239.
Lead	4	2	5	France 1; Netherlands 1.
Nonferrous metals, n.e.s	----	2	2	All from France.
Nonmetals:				
Abrasives, natural [1]	7	28	20	Do.
Cement, lime, and other building materials.[1]	18,203	20,370	15,753	Democratic Republic of the Congo (Léopoldville) 11,320; France 5,997.
Clay construction materials [1]	207	230	96	France 129; West Germany 100.
Fertilizer materials:				
Natural	----	128	----	West Germany 126.
Manufactured	1,786	2,096	2,377	France 1,790; Italy 143.
Nonmetallic minerals, crude, n.e.s.[1]	5,110	3,839	2,571	Portuguese Guinea 3,116; Portugal 299.
Nonmetallic mineral manufactures [1].	18	22	28	France 19.
Mineral fuels:				
Gas, natural or manufactured	234	306	264	France 286; Belgium-Luxembourg 20.
Petroleum refinery products	25,045	26,004	35,706	Netherlands Antilles 9,772; Venezuela 7,991; France 4,066.
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation.	5	44	10	All from France.

e Estimate.
[1] For details on specific commodities included, see section on source materials.

and Carnot, were barred from diamond-mining areas. In October 1965, several foreign firms engaged in diamond trade were granted licenses for buying offices. Most were undisclosed, but new offices included those of Harry Winston, Inc., New York; Société Diamantaire de France, Paris; and Compagnie Internationale d'Exploitation des Diamants et d'Or, Brussels. The total number of international offices authorized to purchase diamond was eight—3 French, 3 American, 1 Israeli, and 1 Belgian.

CHAD

There were no economically important mineral developments in the Republic of Chad during 1965; natron, mined near Lake Chad, remained the only recorded mineral product. Its export value in 1965 was $256,000 and it therefore contributed only about 0.1 percent to an estimated GNP of $190 million.

A 5-year plan announced by the Government of Chad included study of minerals in the Doba area, evaporites in the Lake Chad region, mineralized veins at Soborom, and reconnaissance geological mapping at Abeche Est. Early in the year, M. Louis Joffret, Director of Mines, reporting to the Comité National de Recherches Hydrologiques et Géologiques, mentioned interest in uranium in the Tibesti Mountains of the north, granite in the Ouaddaï region of the east, and gas in the Lake Chad area. In September the Government announced plans to seek United Nations Special Fund Aid in mineral development.

The BRGM continued hydrogeologic study and mapping in the Fort Lamy area and investigations for clay, kaolin, talc, and diatomite in other parts of the country.

PRODUCTION

Natron production at the Liwa and Kaya works along Lake Chad was estimated to be 7,100 tons in 1965 (r 6,757 tons in 1964 and r 8,654 tons in 1963). In addition, small quantities (1,000 to 2,000 tons annually) of natron and salts are gathered for domestic use in the Borkou-Ennedi-Tibesti northern region,[6] and simple construction materials such as clay, sand, and gravel presumably were extracted for local use, but extent of these activities was not reported.

TRADE

Chad mineral trade remained characterized by exports of natron, reexports of petroleum refinery products, and imports of iron and steel semiproducts and petroleum refinery products. The relation of mineral trade to total trade during 1963–65 was as follows:

	Value (thousands)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	$335	$22,707	1.5
1964	r 869	26,510	3.3
1965	1,237	27,253	4.5
Imports:			
1963	6,505	29,034	22.4
1964	7,599	34,585	22.0
1965	8,395	31,193	26.9
Trade balance:			
1963	−6,170	−6,327	XX
1964	−6,730	−8,075	XX
1965	−7,158	−3,960	XX

r Revised. XX Not applicable.
[1] Includes only those commodities listed in table 7 of this chapter.

The values for total trade indicated above do not include UDEAC and noncontrolled trade, which are not accurately reported but were considered substantial. Including these markets, total trade values for 1965 were estimated as follows: Exports $37.3 million and imports $47.6 million.[7]

Exports of natron were valued at $256,000 in 1965 ($189,000 in 1964), and reexports of petroleum refinery products were valued at $963,000 ($678,000 in 1964). The main metal and mineral imports and their values were iron and steel, $825,000 ($1.4 million in 1964), and petroleum refinery products, $6.3 million ($4.8 million in 1964). The decline in the latter was attributed to lower demand following withdrawal of French military forces.

COMMODITY REVIEW

Mineral Fuels.—*Petroleum.*—The French company, Société de Participations Pétrolières (PETROPAR), terminated its

[6] Annales des Mines. V. 9, September 1966, p. 768.
[7] U.S. Embassy, Fort Lamy. Department of State Airgram A-4, July 6, 1966, enclosure No. 1.

Table 7.—Chad: Foreign trade in selected metals and minerals
(Metric tons)

Commodity	1963	1964	1965	Principal sources or destinations, 1964
Exports:				
Metals:				
Iron and steel, semimanufactures	----	5	----	All to Cameroon.
Scrap, nonferrous	----	----	52	
Nonmetals: Natron	6,412	5,355	6,271	Nigeria 4,524; Cameroon 571.
Mineral fuels: Petroleum refinery products.	449	[1] 3,942	5,723	Bunkers 3,886; Cameroon 56.
Imports:				
Metals: [2]				
Aluminum	47	83	59	Cameroon 43; France 33.
Copper	7	14	8	France 11.
Iron and steel:				
Pig iron and ferroalloys	1	1	4	All from France.
Semimanufactures	4,711	[r] 5,550	2,802	France 4,364; West Germany 923.
Lead	4	6	6	All from France.
Zinc	3	2	----	Do.
Nonmetals:				
Abrasives, natural	----	2	4	Italy 1.
Cement, lime, and other building materials [3].	9,690	13,021	6,802	West Germany 5,834; Democratic Republic of the Congo (Léopoldville) 2,343; France 2,326.
Clay construction materials [3]	242	165	68	West Germany 132; France 33.
Fertilizers, manufactured	----	364	489	Italy 363.
Nonmetallic minerals, crude, n.e.s.[3]	3,348	4,460	3,746	West Germany 3,114; Sudan 341; Senegal 334.
Nonmetallic mineral manufactures [3].	37	42	37	France 35.
Mineral fuels:				
Gas, natural or manufactured	144	157	175	France 57; United States 53.
Petroleum refinery products	34,628	39,992	39,689	Netherlands Antilles 24,609; United States 10,108.

[1] Includes gasoline 2,696; kerosine 1,190; residual fuel oil 21; and lubricants 35.
[2] Includes unwrought and semimanufactures, unless otherwise specified.
[3] For details on specific commodities included, see section on source materials.

activities on the Erdis plateau, Borkou-Ennedi-Tibesti northern region. In August a presidential decree cancelled PETROPAR's 152,000-square-kilometer concession. M. Louis Joffret, Minister of Mines, sought United States participation in exploration. Representatives of Ente Nazionale Idrocarburi (ENI), the Italian Government company, conferred with Chadian officials on oil exploration.[8]

CONGO (BRAZZAVILLE)

As in previous years, mineral activity of the Republic of Congo (Brazzaville) was confined to the production of copper-lead-zinc ores, cassiterite, alluvial gold, and crude petroleum. Based on export value, these materials contributed $2.1 million to a GNP of about $45 million.

The most significant mineral industry news was the continued development of the Holle potash deposit, which will provide considerable needed revenue and foreign exchange earnings. The target date for initiation of production is 1968. The country's first cement plant also was under construction. The Government's 1964–68 economic plan provided funds for exploration for several metals, diamond, and petroleum. Under terms of a technical cooperation agreement late in 1964, the U.S.S.R. provided an $8.9 million credit, including funds for mineral exploration, potash mine development, and hydroelectric power development at the Kouilou Dam.[9]

PRODUCTION

Mine production of copper, lead-zinc, and tin were reported only in terms of concentrate and estimated grade, and contained metal tonnages are therefore only approximate. Output of these metals and gold showed a significant increase during 1965. Crude oil, the only other mineral commodity produced, showed a continued decline as small reserves at the Point Indienne field were being depleted.

[8] World Petroleum Report 1966. V. 12, Mar. 15, 1966, p. 92.
[9] Africa Report. The African-American Institute, Inc., Washington, D.C. February 1965, p. 42.

Table 8.—Republic of Congo (Brazzaville): Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals: [2]					
Copper	160	840	290	----	e 60
Gold, troy ounces	3,376	r 3,720	2,958	r 3,279	3,713
Lead	1,482	334	330	2,169	e 2,300
Tin, long tons	46	46	43	34	48
Zinc	1,280	713	713	5,060	e 6,910
Mineral fuels:					
Petroleum, crude	102,939	123,393	109,217	82,506	71,273

e Estimate. r Revised.
[1] In addition, construction materials such as clay, sand, and gravel are probably produced, but quantitative data are not available. Diamond output, credited by some sources to the Congo (Brazzaville), is believed to have originated wholly outside the country.
[2] Metal content of marketable ore or concentrate produced, except gold which is fine metal recovered in mining.

TRADE

Congo (Brazzaville) depends heavily for export earnings on diamond entering the country through illicit channels, chiefly if not entirely from the Democratic Republic of the Congo (Léopoldville); exports of diamond from Congo (Brazzaville) have averaged more than 5 million carats annually in recent years. They were valued at $19,957,000 in 1965 ($19,716,000 in 1964), or 90 precent of the mineral exports from Congo (Brazzaville) and nearly 43 percent of total exports of all goods. The following tabulation indicates how these exports contributed to a large trade surplus in minerals and alleviated substantially the unfavorable overall trade balance:

	Value (thousands)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	$21,283	$41,631	51.1
1964	21,710	47,407	45.8
1965	22,032	46,804	47.1
Imports:			
1963	8,292	61,755	13.4
1964	8,637	64,839	13.3
1965	8,980	67,709	13.3
Trade balance:			
1963	+12,991	−20,124	XX
1964	+13,073	−17,432	XX
1965	+13,052	−20,905	XX

XX Not applicable.
[1] Includes only those commodities in tables 9 and 10 of this chapter.

These totals do not include small quantities of gold which are officially exported annually. In 1964, the latest year for which data are available, 1,833 troy ounces valued at $51,000 was exported. Principal mineral exports and their value in 1965, other than diamond, were crude oil, $973,000 ($1,042,000 in 1964), and nonferrous concentrates (lead-zinc and cassiterite), $793,000 ($442,000 in 1964).

Congo (Brazzaville) mineral imports in 1965 comprised principally petroleum refinery products valued at $3.6 million ($4.1 million in 1964) and iron and steel valued at $3.3 million ($2.4 million in 1964).

COMMODITY REVIEW

Metals.—*Copper.*—Production of mine copper was renewed in 1965. Output was 168 tons of ore and concentrate of 27 to 40 percent copper. The source was unreported but presumably was the M'Passa lead-zinc deposit, where byproduct copper was produced in 1963.

Gold.—Increased output was reported by diggers in the Kelli, Kouilou, and Dolisie areas.

Lead and Zinc.—The M'Passa mine of Syndicat de M'Passa (SMM), an association of the BRGM and Compagnie Minière de Congo (CMC), produced 19,740 tons of concentrate containing about 15 percent lead and 35 percent zinc; output was 36 percent higher than in 1964.

Tin.—Compagnie Métallurgique et Minière (CMM) produced 60 tons of cassiterite containing about 70 percent tin at Moufoumbi in the northern part of Kouilou prefecture. Prospecting and exploration continued. A concentrating plant was under construction as part of a plan to double production capacity.

Nonmetals.—*Cement.*—Ground was broken for the Cementerie Domaniales $6.3 million, 80,000-ton plant at Loutété, 180 kilometers from Brazzaville. West Germany provided a $2.5 million credit. West Ger-

Table 9.—Republic of Congo (Brazzaville): Exports of selected metals and minerals [1]

(Metric tons)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:[2]				
Iron and steel:				
Scrap	880	612	1,016	All to Japan.
Semimanufactures	23	14	9	Democratic Republic of the Congo (Léopoldville) 13.
Lead	----	15	5	Netherlands 8; Italy 7.
Zinc	----	----	3	
Nonferrous ore and concentrate [3]	2,326	8,954	16,687	United Kingdom 8,894.
Nonferrous, scrap	11	56	43	West Germany 50; Italy 5.
Nonmetals: Minerals, crude, unspecified.[4]	6	----	11	
Mineral fuels:				
Petroleum:				
Crude	101,060	79,203	71,001	All to France.
Refinery products	847	[5] 12,574	7,253	Bunkers 12,571.

[1] Does not include reexport of diamond, which enters the country illegally and is the main mineral source of export earnings.

[2] Includes unwrought and semimanufactures unless otherwise specified.

[3] Mainly lead-zinc concentrate.

[4] For details on specific commodities included, see section on source materials.

[5] Includes gasoline 1,246; kerosine 11,306; and lubricants 22.

Table 10.—Republic of Congo (Brazzaville): Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals:[1]				
Aluminum	265	300	263	France 152; Cameroon 141.
Copper	38	27	57	France 24.
Iron and steel:				
Pig iron and ferroalloys	7	5	10	All from France.
Semimanufactures:				
Bars, rods, and sections	3,773	5,349	3,827	France 4,699; Belgium-Luxembourg 419.
Plate, sheet, and strip	4,839	4,256	5,539	France 2,950; Belgium-Luxembourg 1,043.
Rails and accessories	1,681	2,640	3,513	France 2,633.
Tubes, pipes, and fittings	1,040	852	2,262	France 687; Italy 85.
Other	413	220	63	France 152; West Germany 40.
Total	11,746	13,317	15,204	
Lead	18	25	18	France 23.
Tin—long tons	5	2	6	France 1; United Kingdom 1.
Zinc	9	16	7	France 12; Italy 4.
Nonmetals:				
Abrasives, natural [2]	61	4	133	All from France.
Cement, lime, and other building materials[2]	49,956	58,169	44,060	Belgium-Luxembourg 10,774; Angola 36,526; France 5,529.
Clay construction materials[2]	580	450	251	West Germany 222; France 182.
Fertilizer materials:				
Natural	----	----	722	
Manufactured	2,818	3,622	5,522	France 3,620.
Stone, sand, and gravel [2]	68	34	37	Italy 20; France 14.
Sulfur and pyrite	----	----	160	
Nonmetallic minerals, crude, unspecified[2].	4,451	2,837	2,269	Angola 2,353; Senegal 312.
Nonmetallic mineral manufactures [2]	58	63	116	France 47; West Germany 7.
Mineral fuels:				
Coal, coke, and briquets	179	123	187	All from France.
Petroleum refinery products	84,849	102,110	89,569	Netherlands Antilles 29,943; Venezuela 26,682; Bunkers 15,951; Italy 10,958.
Gas, natural and manufactured	730	715	616	France 678.
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation.	7	2	3	All from France.

[1] Includes unwrought and semimanufactures, unless otherwise specified.

[2] For details on specific commodities included, see section on source materials.

man firms will build the plant and also provide technical and administrative personnel for a 5-year period.

Potash.—Exploration and development continued at Hollé, 45 kilometers inland from Pointe Noir, where a large, rich potash deposit was discovered in 1960. During shaft-sinking operations, it was necessary to freeze the ground because of a groundwater problem. A 900,000-ton potassium chloride (KCl) plant (500,000 tons K_2O equivalent) was planned for completion in 1968.[10] Development investment was estimated at $70 million, the International Bank for Reconstruction and Development (IBRD) providing 60 percent, with the remainder from participating companies.[11]

Mineral Fuels. — *Petroleum.* — Crude oil output at the small Point Indienne field continued a downward trend because of a gradual depletion of limited reserves. Output was at the rate of about 1,670 barrels per day. At yearend, reserves were estimated at 5 million barrels crude oil and 10 billion cubic feet of natural gas, sufficient only until 1970 at the planned production rate.[12]

An exploration arrangement between Société des Pétroles d'Afrique (SPAFE) and Mobil Oil Co., Inc., was terminated because of unfavorable exploration results in previous years. No wells were drilled during 1965. SPAFE was engaged in interpretation and review of data in Paris.[13]

Shell Co. of Equatorial Africa was granted authorization for a lubricant plant at Pointe Noir. Under terms of the agreement, Shell will have preferential status under terms of the investment code, which includes relief from customs duties and other fiscal advantages for 7 years.[14]

DAHOMEY

As in 1964, the Republic of Dahomey had no recorded crude mineral production, although small quantities of alluvial gold, marine salt, and simple construction materials were produced. In the coastal urban areas, Société Acier et Béton produced steel pipe and cement blocks, and Usines de Préfabrications Dahoméennes made tiles and cement blocks. These mining and processing activities contributed insignificantly to a GNP estimated at $90 million.

Mineral prospecting and exploration continued in several parts of the country. The BRGM was active along rivers and in the mountainous north. The Prakla organization, Hanover, West Germany, conducted an airborne magnetometer-radiometric survey, and Service des Mines geological teams made ground investigations of recorded anomalies from this survey.

Mineral commodities under investigation included beryl, cassiterite, chromite, columbite-tantalite, gold, ilmenite, iron ore,

[10] Engineering and Mining Journal. V. 166, No. 2, Feb. 1965, p. 160–H.
[11] FDC Newsletter. V. 5, issue No. 9, September 1965, p. 9.
[12] Petroleum Management. V. 38, No. 6, June 1966, p. 86.
[13] Work cited in footnotes 5 and 8.
[14] Industries et Travaux d'Outremer. No. 142, September 1965, p. 763.

Table 11.—Dahomey: Exports of selected metals and minerals
(Metric tons)

Commodity	1963	1964	Principal destinations, 1964
Metals: Iron and steel, semimanufactures	20	176	Togo 155; Guinea 10.
Nonmetals:			
Abrasives, natural [1]	2	----	
Cement, lime, and other building materials [1]	----	24	All to Togo.
Clay construction materials [1]	8	3	All to France.
Stone, sand, and gravel [1]	4,870	----	
Nonmetallic minerals, crude, unspecified [1]	----	16	Nigeria 9.
Nonmetallic mineral manufactures [1]	43	56	Nigeria 55.
Mineral fuels:			
Gas, natural and manufactured	18	15	All to Togo.
Petroleum refinery products	97	[2] 366	Curacao 261; Togo 74.

[1] For details on specific commodities included, see section on source materials.
[2] Includes residual fuel oil 291; lubricants 7.

Table 12.—Dahomey: Imports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal Sources, 1964
Metals: [1]			
Aluminum	82	51	France 41; Ivory Coast 10.
Copper	32	46	All from France.
Iron and steel:			
Pig iron and ferroalloys	20	3	Do.
Scrap	46	----	
Steel ingots and equivalent forms	295	261	Do.
Semimanufactures:			
Bars, rods, and sections	4,693	4,522	France 4,364.
Plate, sheet, and strip	4,745	3,003	Belgium-Luxembourg 1,701; France 1,280.
Other	845	1,022	France 729; Belgium-Luxembourg 99; Nigeria 97.
Total	10,283	8,547	
Lead	37	26	France 17; Belgium-Luxembourg 7.
Tin—long tons	1	3	France 2; West Germany 1.
Zinc	4	4	All from France.
Nonmetals:			
Abrasives, natural [2]	16	15	All from France.
Cement, lime, and other building materials [2]	67,755	56,536	Norway 27,467; France 12,497; Poland 9,012.
Clay construction materials [2]	549	364	West Germany 167; France 148.
Fertilizers, manufactured	174	1,110	All from France.
Stone, sand, and gravel [2]	690	394	Nigeria 383.
Sulfur and pyrite	199	15	France 14.
Nonmetallic minerals, crude, unspecified [2]	7,621	10,411	Senegal 8,891; Nigeria 617.
Nonmetallic mineral manufactures [2]	18	17	France 14.
Mineral fuels:			
Coal, coke, and briquets	82	52	All from France.
Gas, natural and manufactured	238	253	France 63; Italy 30; United Kingdom 30.
Petroleum refinery products	43,453	48,873	Venezuela 11,587; Iraq 9,097; Curacao 6,619; Algeria 6,520.
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation.	60	45	United Kingdom 27; France 12.

[1] Includes unwrought and semimanufactures unless otherwise specified.
[2] For details on specific commodities included, see section on source materials.

manganese, monazite, nickel, rutile, scheelite, diamond, lignite, limestone, marble, phosphate rock, and potash. Plans for a proposed cement plant near the large limestone deposit at Yamaigo Onigbolo remained in the negotiating stage as financing was still unarranged. A 5-million-ton marble deposit was discovered near the Ouémé River, a few kilometers from Dadjo village.

TRADE

In 1964, the latest year for which complete data were available, mineral exports were negligible, consisting largely of reexported petroleum refinery products ($14,000). Dahomey's principal mineral import commodity groups in 1964 and their values were petroleum refinery products ($1.8 million) iron and steel ($1.7 million), and cement and other building materials ($1.2 million). Lower imports in the latter was attributed to a decline in construction activity. The following tabulation indicates the role of mineral and metal trade in Dahomey's total trade:

	Value (thousands)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	$60	$12,779	0.5
1964	30	13,182	.2
Imports:			
1963	6,169	r 33,417	18.5
1964	5,537	31,445	17.6
Trade balance:			
1963	−6,109	−20,638	XX
1964	−5,507	−18,263	XX

r Revised. XX Not applicable.
[1] Includes only those commodities listed in tables 11 and 12 of this chapter.

COMMODITY REVIEW

Metals.—*Aluminum.*—A new firm, Aluminium Alcan du Dahomey (DALCAN), was organized as operator of a plant for roofing sheet at Cotonou. Aluminum Company of Canada (ALCAN) holds a 51-percent interest; the remainder is held by Banque Dāhoméenne de Développement

and private Dahomey investors. Planned capacity was 1,500 tons per year of corrugated and other sheet. Late in the year, an announcement indicated that ALCAN had agreed to provide $80,000 on long-term loan and to extend a credit of $160,000 for importing aluminum sheet. The new company was granted class A status under the investment code, whereby it is tax exempt and pays no import duty on operating supplies for 5 years.

Nonmetals.—*Diamond.*—In August, Diamond Corp. of Ivory Coast Ltd., a subsidiary of DeBeers Consolidated Mines Ltd., was granted the first diamond prospecting permit in Dahomey—a 3-year permit for investigation of kimberlite-type formations in various parts of the country. In November two British geologists representing the Diamond Corp. arrived for a 10-month survey of the Dassa-Zoumé and northern regions.[15]

Fertilizer Raw Materials.—Shell West Africa Ltd. was granted 20 prospecting permits for potash, phosphate, and associated salts in the coastal sedimentary basin. A Shell company geologist also was in Dahomey investigating the phosphate-bearing formation which extends across Dahomey between Togo and Nigeria.

Mineral Fuels.—*Petroleum.*—Union Oil Co. of Dahomey, which late in 1964 was granted a concession covering the entire coastal region of the country, conducted geologic and photogeologic work onshore and seismic work offshore. The latter indicated the presence of a deep sedimentary basin, where further work was planned.

A joint venture involving Cabol Enterprises Ltd. (Canada) and Baho American Oil Co. (United States) was also granted a concession for 1965–66. No information was available on activities of this operation.

FRENCH SOMALILAND

Through 1965 there was no organized mineral industry in French Somaliland and no recorded production or export of mineral commodities. However, small quantities of crude construction materials such as clay, sand, and gravel were presumably extracted for local use. The principal metal and mineral imports and their values were petroleum refinery products, $489,000 ($477,000 in 1964), cement and other construction materials, $284,000 ($240,000 in 1964), and rough castings and forgings of iron and steel, $152,000 ($150,000 in 1964). Value of total mineral imports was $1,009,000, only 4.4 percent of value of all imported goods during 1965.

Table 13.—French Somaliland: Imports of selected metals and minerals

(Metric tons)

Commodity	1964	1965	Principal sources, 1964
Metals: Iron and steel: Castings and forgings, unworked.	512	1,030	Japan 181; France 172; Belgium-Luxembourg 102.
Nonmetals:			
Cement, lime, and other building materials [1].	12,427	15,691	U.S.S.R. 5,454; Poland 2,683; France 1,941; Israel 1,699.
Nonmetallic minerals, crude, unspecified [1].	1,101	466	Italy 514; United Kingdom 261; Poland 250.
Mineral fuels:			
Petroleum:			
Crude and partly refined	1,517	1,694	Aden 67; others unspecified.
Refinery products	14,350	14,453	Kenya 207; United States 113; Netherlands 94; others unspecified.

[1] For details on specific commodities included, see section on source materials.

GAMBIA

Gambia, granted independence on February 18, 1965, had no organized mineral-producing industry through yearend. The only mineral activity was in the petroleum sector. Société des Pétroles du Senegal (SPS), an association of Bureau Recherche des Pétroles and British Petroleum Exploration Co., held an exploration concession for the entire country. A brief marine seismic survey was conducted in January 1965.[16]

[15] Mining Journal. V. 266, No. 6811, Mar. 4, 1966, p. 152.

[16] Page 99 of work cited in footnote 8.

MALI

Mineral production contributed little to the economy of the Republic of Mali in 1965. Reported mineral industry activity was limited to the extraction of salt, gold, and marble, but simple construction materials such as clay, sand, and gravel presumably also were extracted for local use. According to the Director of the Bureau de Documentation Minière (formerly Bureau Minière) about 3,000 tons of salt are regularly produced by solar evaporation annually, but there was no significant production of gold or marble. Gold was panned near Kangaba and Kéniéba by natives in cooperation with the Bureau de Documentation Minière. Marble blocks and chips were quarried near Bafoulabé for use in a small tile plant in Bamako, where equipment for sawing and preparation of blocks was recently installed.

The search for minerals continued by the BRGM and the U.S.S.R. in conjunction with the Bureau de Documentation Minière. The BRGM was involved mainly in petroleum exploration in the Taoudenni basin, diamond investigations in the kimberlite-type deposits of the Faléme basin near Kéniéba, and geologic mapping in the Gourma area. The Bureau de Documentation Minière studied iron ore deposits along the Dakar-Bamako railroad, petroleum possibilities west of Gao, and phosphate deposits near Lahoualou.

Representatives of Selection Trust Exploration Ltd. and Harry Winston, Inc., New York, also were interested in diamond possibilities near Kéniéba.

In January authorities of the Government of Mali signed an agreement with the U.S.S.R. for construction of a $6 million, 50,000-ton cement plant at an unreported location.

TRADE

Malian mineral trade in 1964, the latest year for which complete data are available, was characterized by imports mainly of petroleum refinery products and iron and steel and reexport of petroleum products. Recorded mineral exports and reexports during 1963 and 1964 were as follows, in metric tons:

Commodity	1963	1964
Iron and steel, scrap	42	----
Cement, lime, and other building materials[1]	22	----
Nonmetallic minerals, crude, unspecified [1]	539	270
Petroleum refinery products	65	[2] 5,543

[1] For details on specific commodities, see section on source materials.
[2] Includes gasoline 2,706; kerosine 2,799; and lubricants 38. Principal destinations were Venezuela 3,018; British Guiana 737; United States 501; and France 447.

Value of imported petroleum products was $2.3 million and of iron and steel, $1.3 million. The role of mineral trade in overall trade values was as follows:

	Value (thousands)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities [2]	
Exports:			
1963	$ r 79	$r 10,556	0.8
1964	231	16,590	1.4
Imports:			
1963	4,499	34,246	13.1
1964	4,699	36,578	12.8
Trade balance:			
1963	r −4,420	r −23,690	XX
1964	−4,468	−19,988	XX

r Revised. XX Not applicable.
[1] Includes only those commodities listed in table 14 and in the preceding tabulation on mineral exports.
[2] Includes only trade under control of customs service; does not include imports of equipment for various aid projects and substantial uncontrolled trade with neighboring countries.

Table 14.—Mali: Imports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:[1]			
Aluminum	20	37	France 24; Upper Volta 7.
Copper	17	19	All from France.
Iron and steel:			
Scrap	23	23	Ivory Coast 18.
Pig iron and ferroalloys	1	3	All from France.
Semimanufactures	7,811	7,378	France 4,425; U.S.S.R. 2,314.
Lead	2	23	All from France.
Tin—long tons	2	8	France 6; United Kingdom 2.
Zinc	1	----	

See footnotes at end of table.

Table 14.—Mali: Imports of selected metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals:			
Abrasives, natural [2]	3	----	
Cement, lime, and other building materials [2]	21,808	15,624	U.S.S.R. 5,902; Senegal 5,397; France 2,540.
Clay construction materials [2]	195	401	France 212; U.S.S.R. 58; Bulgaria 49.
Fertilizers, manufactured	3,565	10	All from France.
Stone, sand, and gravel [2]	89	2	U.S.S.R. 1.
Sulfur and pyrite	4	6	All from France.
Nonmetallic minerals, crude, unspecified [2]	17,386	18,076	Poland 11,063; Algeria 6,571.
Nonmetallic mineral manufactures [2]	14	16	France 14; U.S.S.R. 2.
Mineral fuels:			
Coal, coke, and briquets	150	----	
Gas, natural and manufactured	186	212	France 156; Netherlands 56.
Petroleum:			
Crude and partly refined	7	----	
Refinery products	95,923	70,357	Venezuela 29,144; France 16,157; Netherlands Antilles 8,663.

[1] Includes unwrought and semimanufactures unless otherwise specified.
[2] For details on specific commodities included, see section on source materials.

MAURITANIA

In 1965 iron mining became the most important sector of the economy of the Islamic Republic of Mauritania and the key to the attainment of economic viability. Iron ore exports, valued at $50.7 million, were nearly equal to half of the country's GNP, estimated at $110 million. Mauritania ranked second, after Liberia, among African iron-ore exporting nations. According to estimates made in the Government's operating budget for 1966, royalties from iron ore sales would provide $5,750,000, nearly 30 percent of estimated total government revenue. This income was expected to terminate dependence on French budgetary support.

The iron-mining sector employed 3,419 persons, including 2,700 Mauritanians and 719 foreigners, largely Europeans. The country's total labor force was estimated at 17,200 including 8,200 in the public sector.[17]

The BRGM conducted geologic, hydrogeologic, and mineral investigations in several parts of the country. A geologic map of Mauritania was in preparation in six sheets at a scale of 1:1,000,000. An airborne magnetic-radiometric survey was carried out, and anomalies discovered were investigated on the ground. Systematic exploration, including a drilling program, were planned in the Amsaga area.

PRODUCTION

Expansion of iron ore output continued toward a planned annual rate of 7.5 million tons in 1968. Salt output, probably on the order of several hundred tons per year, fluctuates considerably depending on local demand. The only other mineral products of domestic origin were construction materials, used largely in the building of the iron-mining installations and roads, but data on production or consumption were not available.

TRADE

Iron ore again dominated Mauritania's export picture in 1965; shipments abroad were valued at $50.7 million. Data on total exports of all goods were not available for 1965, but iron ore undoubtedly accounted for a larger share of the total than in 1964,

[17] U.S. Embassy, Nouakchott. Department of State Airgram A-219, June 10, 1966, p. 1.

Table 15.—Mauritania: Production of metals and minerals

Commodity [1]	1961	1962	1963	1964	1965
Metals: Iron ore—thousand metric tons	300	1,000	r 1,678	r 5,080	6,284
Nonmetals: Salt [e]—metric tons	500	500	600	600	600

[e] Estimate. [r] Revised.
[1] In addition construction materials such as gypsum, clay, sand, and gravel are produced, but quantitative data are not available.

when it accounted for an estimated 94 percent of total export earnings.

Statistical data on Mauritanian trade were incomplete. European Economic Community statistics, which are the basis for most of the trade figures given in this chapter, do not include iron ore exports and have been modified in totals given in the accompanying tabulation. Official Mauritanian statistics include customs trade to and from Mauritanian seaports and airports but may not include goods entering the country from Senegal (Mauritania-Senegal customs union) and goods involved in traditional uncontrolled commercial activity between these countries and Mali.

In1964 the Mauritanian trade balance was favorable for the first time, apparently by a substantial margin, because of the growing shipments of iron ore. Values for mineral and total trade are estimated as follows:

	Value (thousands)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	$r 10,801	$r 15,853	68.1
1964	42,524	44,944	94.6
Imports:			
1963	r 3,986	30,016	13.3
1964	2,102	15,714	13.4
Trade balance:			
1963	r +6,815	r −14,163	XX
1964	+40,422	+29,230	XX

r Revised. XX Not applicable.
[1] Includes only those commodities listed in tables 16 and 17 of this chapter.

Iron-ore mining operations have accounted for about one-quarter of the value of total imports annually in recent years. Principal mineral imports in 1964 were petroleum refinery products, $1,019,000 ($803,000 in 1963), and iron and steel, $603,000 ($2,645,000 in 1963, apparently mainly for rails for iron-ore haulage). Mineral export trade other than iron ore was essentially reexports of petroleum products.

COMMODITY REVIEW

Metals.—*Copper.*—Société de Cuivre de Mauritanie (SOCUMA), a firm established in June 1964 and representing U.S., Canadian, French, and Mauritanian Government interests, studied methods of mining and milling the copper-gold ore at the Akjoujt deposit. The company held an 18-month option which terminated at the end of 1965. Negotiations for financing development operations continued during the year, although no definite financial arrangements were made. The Mauritanian Government sought financial assistance through the International Bank for Reconstruction and Development (IBRD) and the Fond Européen du Développement. Estimated development cost was $40 million.

Iron Ore.—Production and export of iron ore from the Fort Gourand mine showed continued expansion in 1965. During the year, 5,965,000 tons were shipped from Port Étienne; value, based on a rate of $8.50 per ton, was $50.7 million (4,983,000 tons, $42.3 million in 1964). Société des Mines de Fer de Mauritanie (MIFERMA) paid royalties totaling $5,081,633 to the Mauritanian Government in 1965. Principal export destinations were, in thousand tons: United Kingdom 1,554; West Germany 1,181; France 1,165; Italy 996; Belgium-Luxembourg 576; Netherlands 324; and United States 139.[18]

Three mining sections were in operation in 1965. Their output was as follows in thousand metric tons:

Mining section	Shipping grade ore	Mixed ore
Tazadit	5,412	708
F'Derick	757	---
Rouessa	115	53
Total	6,284	761

The Rouessa section was opened during the year. A 7-kilometer road was built, connecting the mine to the crushing plant at Tazadit. The road can accommodate 65-ton trucks and was built over difficult terrain. MIFERMA invested $8.5 million in the Rouessa operation.

In late 1964 the conveyor belt to the rail loading station at Tazadit was badly damaged by fire, necessitating a shutdown for several weeks. A new belt system of larger capacity was installed. MIFERMA planned production of 6.4 million tons in 1966, 6.8 million tons in 1967, and 7.5 million tons in 1968. Total investment to June 1965 was $180 million. The company planned to invest an additional $34 million, including

[18] Page 762 of work cited in footnote 6.

Table 16.—Mauritania: Exports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Copper concentrate	----	247	All to United States.
Iron and steel:			
Iron ore—thousand tons	1,250	4,983	United Kingdom 1,395; West Germany 1,246; France 947; Italy 747.
Scrap	----	775	Japan 500; France 275.
Semimanufactures	24	480	All to France.
Tin—long tons	----	1	Do.
Mineral fuels: Petroleum refinery products:			
Gasoline	1,342	3,156	Bunkers 2,300; Netherlands Antilles 620.
Distillate fuel oil	2,725	1,224	Bunkers 1,220.
Lubricants	8	67	Netherlands Antilles 51.
Total	4,075	4,447	

Table 17.—Mauritania: Imports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals: [1]			
Aluminum	14	8	All from France.
Copper	18	15	France 14.
Iron and steel:			
Pig iron and ferroalloys	----	2	All from France.
Semimanufactures:			
Rails and accessories	16,138	1,528	Do.
Other	2,499	1,324	France 1,304.
Total	18,637	2,852	
Lead	----	5	All from France.
Tin—long tons	2	4	Do.
Zinc	----	1	Do.
Nonferrous metals, unspecified	1	1	Do.
Nonmetals:			
Cement, lime, and other building materials [2]	14,730	6,551	France 4,556; Spain 1,358.
Clay construction materials [2]	159	74	France 35; Spanish Sahara 18.
Fertilizers, manufactured	683	2,099	All from France.
Stone, sand, and gravel [2]	----	36	Do.
Nonmetallic minerals, crude, unspecified [2]	76	9	Do.
Nonmetallic mineral manufactures [2]	21	----	
Mineral fuels:			
Coal, coke, and briquets	----	15	Do.
Gas, natural and manufactured	227	247	France 157.
Petroleum refinery products	22,105	33,718	Netherlands Antilles 12,900; Venezuela 7,045; Iran 6,382.
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation.	----	6	All from France.

[1] Includes unwrought and semimanufactures unless otherwise specified.
[2] For details on specific commodities included, see section on source materials.

Rouessa development and general expansion to the projected 1968 mining rate.

Established ore reserves at the three main sites in million metric tons were as follows in 1965: [19]

Mining section	Proven	Probable	Total
Tazadit	87	20	107
F'Derick	23	10	33
Rouessa	15	45	60
Total	125	75	200

Mineral Fuels.—*Petroleum.*—Exploration permits of Société de Participations Pétrolières (PETROPAR), covering an area extending from Nouakchott northward to Port Étienne, and of Société Africaine des Pétroles (SAP) in the Port Étienne area, expired on April 1, 1965, and were not renewed. Société des Pétroles de Valence (SPV) explored the northern region of Mauritania with unfavorable results. The company retained a permit in the northeast, but all work was suspended.[20]

[19] U.S. Embassy, Nouakchott. Department of State Airgram A–219, June 10, 1966, p. 8.
[20] Page 1719 of work cited in footnote 5.

NIGER

Mineral production in the Republic of Niger was limited to cassiterite and quarried construction materials. A cement plant was under development with production expected in 1966. With cassiterite output valued at $190,000, gypsum at $37,000, and construction materials probably at less than $100,000, the mineral industry apparently contributed little to a GNP estimated at $240 million.

The French Commissariat d'Energie Atomique (CEA) continued its search for uranium in northern Niger, apparently with encouraging results. By decree on August 18, 1965, the BRGM was granted a prospecting permit covering 9,500 square kilometers in the northwest corner of Niger. The permit was effective as of October 1, 1965, for 3 years. Minerals to be sought include bismuth, copper, lithium, molybdenum, tin, tungsten, and others. The BRGM, committed to expenditure of $48,000 per year in the permit area, had worked in the area during 1961–63 and apparently located favorable mineral indications.[21]

The Direction des Mines geological mapping program continued in several localities. A geological map of Niger at 1:2,000,000 was in preparation.

PRODUCTION AND TRADE

There were no major changes in Niger's mining industry. Output of cassiterite, the only metallic mineral produced, improved slightly. Construction materials were quarried in greater quantity for use mainly in road building. Gypsum was produced for the first time for use in a new cement plant.

Niger's mineral and metal trade again involved essentially export of cassiterite concentrate and import mainly of petroleum refinery products and iron and steel semimanufactures, particularly construction steel. The country's balance of trade remained in deficit, as indicated below, including the latest available data:

	Value (thousands)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	^{re} 163	^{re} 19,809	0.8
1964	^{e}198	^{e} 21,453	.9
Imports:			
1963	3,835	22,712	16.9
1964	4,962	33,539	14.8
Trade balance:			
1963	^{re} −3,672	^{re} −2,903	XX
1964	−4,764	−12,086	XX

^{r} Revised. ^{e} Estimate. XX Not applicable.
[1] Imports include only those commodities listed in table 19 of this chapter.

The above statistics are from EEC and Niger Government sources and do not include widespread unrecorded trade principally between Niger and Nigeria. Mineral exports reported by the EEC do not include official Niger estimates for value of cassiterite concentrate, which was $190,000 delivered at Jos, Nigeria ($149,000 in 1963). Imports of petroleum refinery products were valued at $2.7 million, about the same as in 1963. Imports of iron and steel semimanufactures more than doubled, from $448,000 in 1963 to $1,028,000 in 1964.

COMMODITY REVIEW

Metals.—*Gold.*—The BRGM continued reconnaisance and detailed exploration along the Sirba River, a tributary of the Niger River north of Niamey, and in the Tillabery region. Several indications of gold were revealed.

The Niger Government granted a 5-year research permit to a private individual

[21] U.S. Embassy, Niamey. Department of State Airgram A–134, Jan. 17, 1966, 1 p.

Table 18.—Niger: Production of metals and minerals

Commodity [1]	1961	1962	1963	1964	1965
Metals: Tin:					
Concentrate—long tons	67	58	81	74	77
Metal content of concentrate—do	47	41	54	48	52
Nonmetals:					
Building stone—cubic meters	1,447	2,589	757	455	604
Clay, common brick—do	----	----	300	----	----
Gravel—do	2,722	986	1,534	4,822	3,020
Gypsum—metric tons	----	----	----	----	1,500
Sand—cubic meters	31,480	9,862	6,808	4,207	11,663

[1] In addition, salt is produced at several localities, but quantitative data are not available.

Table 19.—Niger: Imports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals: [1]			
Aluminum	41	96	France 52; Ivory Coast 43.
Copper	11	10	France 9.
Iron and steel:			
Pig iron and ferroalloys	2	----	
Semimanufactures	2,295	4,219	France 3,990.
Lead	1	2	All from France.
Tin—long tons	6	----	
Nonferrous metals, ore and concentrate, unspecified	----	39	All from Senegal.
Nonmetals:			
Cement, lime, and other building materials [2]	9,411	13,861	France 7,191; Belgium-Luxembourg 3,502; Nigeria 1,113.
Clay construction materials [2]	203	171	West Germany 100; France 71.
Fertilizer materials:			
Natural	----	37	All from Senegal.
Manufactured	101	358	Senegal 201; West Germany 97.
Stone, sand, and gravel [2]	38	----	
Nonmetallic minerals, crude, unspecified [2]	5,330	6,755	Senegal 5,627; Algeria 853.
Nonmetallic mineral manufactures [2]	3	17	France 16.
Mineral fuels:			
Coal, coke, and briquets	42	----	
Gas, natural and manufactured	112	188	France 117; Netherlands Antilles 35.
Petroleum refinery products	29,657	31,013	Netherlands Antilles 15,384; United States 5,142; Iran 2,933; Iraq 2,658.
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation	----	25	All from France.

[1] Includes unwrought and semimanufactures unless otherwise specified.
[2] For details on specific commodities included, see section on source materials.

who had prospected the Sirba area with a small native crew. The permit covers 2,960 square kilometers.

Molybdenum.—In August the BRGM was granted a prospecting permit in the Liptako region, west of the Niger River. This French State agency planned to start investigations in January 1966.

Tin.—Cassiterite production increased slightly at El-Mecki and Taraouadji in the Aïr region, north of Agaden. Value of the concentrate delivered at Jos, Nigeria, was $2,436 per ton, or $190,000. Société Minière du Niger, the operating company which is owned 75 percent by the Niger Government, continued exploration in the region. The company employed 281 staff personnel and laborers at yearend.

Uranium and Other Radioactive Minerals.—The CEA continued prospecting, geological study, drilling, and airborne surveys in northern Niger and reportedly made a significant uranium discovery, although details were not known. This French agency held permits totaling 348,000 square kilometers and planned to spend $1.6 million per year for exploration in the region. Further drilling in mineralized areas was planned for 1966.

Nonmetals.—*Cement.*—A cement plant of 45,000-tons annual capacity was under construction at Malbaza, a village 460 kilometers east of Niamey. A large limestone deposit was developed nearby.

Gypsum.—Production began on a small scale near Malbaza for use at the new cement plant. The Direction des Mines et de la Géologie planned a detailed ore reserve study in the region.

Other.—At yearend 31 construction material pits, near Niamey, Maradi, and Zinder, were registered with the Direction des Mines. Clay, sand, gravel, and crushed rock were used mainly in roadbuilding.

Salt was produced at Bilma in the east and at several other locations for local consumption, but no output estimates were made.

Mineral fuels.—*Coal.*—The CEA discovered coal at Tchirezine, Agades region, during uranium investigations. The coal reportedly is noncoking but has high calorific value. Government authorities planned eight to ten exploratory bore holes in 1966.

Petroleum.—Exploration was discon-

tinued in 1964, and none took place in 1965. Société de Participations Pétrolières (PETROPAR) allowed its 38,000-square-kilometer Djado permit to lapse on July 1, 1965, and planned interpretation and evaluation of data gathered in exploration.

According to the Direction des Mines, domestic consumption of major petroleum products, supplied wholly by imports, was as follows during 1964 and 1965, in thousand 42-gallon barrels:

Commodity	1964	1965
Aviation gasoline	22	23
Jet fuel	34	30
Motor gasoline	96	96
Kerosine	28	27
Distillate fuel oil	78	90
Total	258	266

RWANDA

Production of cassiterite, the principal mineral commodity of the Republic of Rwanda, showed a slight decrease in 1965, but most other minerals showed increases. Principal minerals produced and their export values during 1965 were as follows:

Commodity:	*Value* [1]
Beryl	$90,997
Cassiterite	2,530,190
Columbite-tantalite	40,998
Tungsten	58,547
Natural gas, methane	40,000
Total	2,760,732

[1] Where necessary, values have been converted from Rwandan francs (RF) to U.S. dollars at the unofficial rate of RF100=$1.

Considering that Rwanda has a fairly well-developed construction materials sector involving quarry operations and brick, tile, and pottery installations, it appears that minerals contributed about 2 percent of the GNP, which was estimated at $140 million in 1965.

Illegal traffic in gold, cassiterite, and the other metallic minerals was heavy and caused a substantial loss in revenue to the Rwandan Government. Regulations required deposit in the Banque Nationale of all foreign exchange earned from mineral sales. These funds were deposited to the seller's account at the official exchange rate (RF50=$1.00), which is about one-half of the free rate. This policy encouraged smuggling to Uganda, where the more favorable exchange rate was available.

Of a total labor force of 51,400, about 7,000 miners were employed in Rwanda at yearend.

PRODUCTION AND TRADE

Mining of beryl, columbite-tantalite, gold, cassiterite, and wolframite continued to be an important source of foreign exchange. Significant quantities of these minerals, including practically all gold, also were involved in illegal traffic across the border into Uganda, where higher prices were obtainable because of a more favorable exchange rate for the seller.

Table 20.—Rwanda: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity [1]	1961	1962	1963	1964	1965
Metals:					
Beryl	476	357	256	298	686
Columbite-tantalite concentrate	46	37	30	29	50
Gold, troy ounces	900	29	NA	NA	NA
Tin:					
Cassiterite concentrate [2], long tons	2,001	1,809	1,866	2,020	2,006
Content of concentrate [2], do	1,474	r 1,325	1,271	e 1,680	e 1,424
Wolframite ore and concentrate	535	138	12	138	157
Nonmetals: Lithium mineral (amblygonite)	1,682	326	368	295	NA
Mineral fuels: Natural gas, methane, million cubic feet	----	----	----	----	35

e Estimate. NA Not available.

[1] Based mainly on exports; few production statistics are available.

[2] Includes small quantity of mixed cassiterite-columbite-tantalite concentrate.

Statistics reported by the Direction de l'Office Général des Statistiques indicate the following relationships between mineral and total trade during 1964 and 1965:

	Value (thousands)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1964	$2,115	$5,776	36.6
1965	2,721	6,825	39.9
Imports:			
1964	1,283	6,004	21.4
1965	1,838	10,472	17.6
Trade balance:			
1964	+832	−228	XX
1965	+883	−3,647	XX

XX Not applicable.
[1] Includes only those commodities listed in table 21 of this section.

Cassiterite concentrate provided 93 percent of the foreign exchange earnings from minerals during 1965 and 96 percent in 1964. The main mineral imports and values in 1964 and 1965, respectively, were petroleum refinery products, $458,630 and $691,120; iron and steel, $380,730 and $553,480, and cement, $302,550 and $368,640.

Countries of origin and destination of Rwandan mineral trade were not reported, but most of this trade presumably involved Belgium and other countries of western Europe. Trade patterns developed during colonial times have not changed greatly since independence. Products have been specifically designed in these countries for mining companies in Rwanda and other central African countries.

COMMODITY REVIEW

Metals.—*Columbite - Tantalite.*—Production of concentrate was 49,550 kilograms at 42 percent columbium pentoxide and 28 percent tantalum pentoxide. This output was valued at $40,998 in the export market. Data on mining activity are lacking, but a large part of this output presumably was separated from mixed cassiterite concentrate by MINETAIN (formerly Société des Mines d'Etain du Ruanda-Urundi) at its Katumba plant. The company produced 315 tons of this mixed concentrate in 1964, compared with 235 tons in 1963.

Gold.—Most gold mined in Rwanda leaves the country illegally, although black-market placer gold has occasionally been offered for sale in the country. Output from various sources probably was 100 to 200 ounces annually. MINETAIN reported sales of 26 ounces to the Banque Nationale in 164.

Tin.—Cassiterite mining was approximately at the 1964 level, based on reported output. However, an estimated 20 percent of actual output, or about 30 tons per month, was smuggled across the border into Uganda. Details on mining activities were not available, but it appeared that the following companies were involved: MINETAIN, Compagnie Géologique et Minière du Rwanda (GEORWANDA), Société Minière de Muhinga et de Kigali (SOMUKI, and Compagnie de Recherches et d'Exploitation Minière (COREM).

Table 21.—Rwanda: Principal metal and mineral trade [1]

(Metric tons unless otherwise specified)

	1964	1965
Exports:		
Beryl	117	686
Cassiterite concentrate [2] long tons	2,324	2,006
Columbite-tantalite concentrate	7	50
Lithium mineral (amblygonite)	295	---
Wolframite ore and concentrate	138	157
Imports: [3]		
Aluminum	84	128
Copper	5	34
Iron and steel, mainly semimanufactures	1,348	2,740
Cement	10,916	12,422
Salt	3,355	4,953
Fuels, mainly petroleum products	9,051	13,128

[1] Sources and destinations were not reported.
[2] Includes small quantity of mixed cassiterite-columbite-tantalite concentrate.
[3] Includes unwrought and semimanufactures unless otherwise specified.

MINETAIN, a subsidiary of Union Minière du Haut Katanga, produced nearly 600 tons of cassiterite concentrate annually from 1963 to 1965 from several mining localities and its concentrator at Katumba. Mine development was underway to double production at Mount Kigali, where an average of 1.5 kilograms of cassiterite was recovered per cubic meter of alluvial material. The Rwandan Government owned 30 percent of MINETAIN.

GEORWANDA, a subsidiary of Géomines, North Katanga, Democratic Republic of the Congo (Léopoldville), operated the Rwinkwavu mine in the southern part of the Parc National. Output averaged about 25 tons of cassiterite concentrate monthly. The mine is the most mechanized in Rwanda, and production was rising. Crude ore is shoveled to a conveyor belt and undergoes washing, crushing, jigging, and shaking at the concentrator. Recovery was about 95 percent. According to the mine manager, reserves were 12,000 tons cassiterite at 800 grams per cubic meter of alluvium. The company employed 5 Europeans and 800 natives.[22]

Data on SOMUKI mining activities during 1965 were not available. The company is a subsidiary of Société Financière des Caoutchoucs, a large holding company with numerous interests, primarily in rubber plantations, and is partially owned (30 percent) by the Rwanda Government. Its Rutongo mine is situated 20 kilometers south of MINETAIN's Kigali mines.

COREM's mines at Nemba and Ntebe were managed by GEORWANDA. The mines were small producers but were considered to have good potential. Nemba produced an average of about 2 tons of cassiterite concentrate monthly from a lateritic zone in schistose rocks. An overhead cable bucket conveyor carries ore from the mine to a washing plant at Lake Rugwero. Dredging operations in the lake and nearby Nyabarongo Swamp were considered. At Ntebe, southeast of Kigali on the north shore of Lake Mugesera, the concentrate was produced by handpanning methods.[23]

About 1 ton per month was sold to the mining company; the remaining output apparently was smuggled to Uganda.

Tungsten.—The average grade of reported wolframite output was 68 percent WO_2, and output was valued at $58,547. MINETAIN produced 38 tons of ore and concentrate in 1964; data on other sources were not available. Activity apparently centered in the northwest, where the Bugarama and Kifurwe mines were reopened by private companies. Much output was stockpiled following the closure of the Cyanika-Kisoro border and the resulting loss of markets in Uganda.

Operators sought United States financing through sale, lease, or partnership at the Gahengere mine, Kigali. A proposal was made for a union of all producers in a cooperative company which would mine tungsten ore and produce tungsten metal and semifinished products.

Nonmetals. — *Construction Materials.* — Clay, sand and gravel, building stone, and lime were produced for building purposes, but no production data were reported. Brick, tile, and pottery plants were in operation. A 1964 United Nations study recommended a cement plant at Shangugu but, insofar as known, no further efforts were made to establish an industry. A quartzite deposit 40 kilometers from Kigali provided building stone for Kigali airport construction. Clay deposits derived from weathered basalt were investigated by the Direction des Mines in the Mibirizi area but appeared of limited extent.

Mineral Fuels.—*Natural Gas.*—Methane, dissolved in deep waters of Lake Kivu, reportedly was produced but details were not available. One source reported sale of 1 million cubic meters 35 million cubic feet) at a price of 4 cents per cubic meter. Authorities reported reserves of 57 billion cubic meters.

SOMALI REPUBLIC

Mineral production did not gain in importance in the Somali Republic during 1965 and remained confined to limestone, meerschaum, and salt. Total value of these products was not reported but probably did not exceed $200,000, so that mineral

[22] U.S. Embassy, Kigali. Department of State Airgram AID A–20, Sept. 27, 1965, 5 pp.
[23] U.S. Embassy, Kigali. Department of State Airgram AID A–22, Oct. 18, 1965, 3 pp.

industry contribution to the GNP of approximately $100 million was inconsequential.[24]

The Somali Government continued to encourage mineral investment in the country. Petroleum exploration concessions included duty free provisions, generous provisions for renewal, and a 50 : 50 split of profits realized between the Government and the concessionaire. A United Nations Special Fund mineral survey, underway for 3 years, made progress toward delineating iron ore deposits in the Baidoa region and continued in other known mineralized areas.

PRODUCTION AND TRADE

In addition to known production activity for salt and meerschaum, the Somali mineral industry probably also produced clay, sand and gravel, limestone, and other construction materials for local use. Quantitative data on output are available only for salt; available recorded production and estimates from 1961 to 1965 have been as follows:

	Metric tons
1961	2,000
1962	e 2,000
1963	2,200
1964	5,581
1965	e 5,000

r Revised.

Most metals and minerals were imported for domestic markets. Principal mineral imports during 1964, the latest year for which complete data were available, were iron and steel, $1.5 million ($1.7 million in 1963); petroleum refinery products, $2.4 million ($1.9 million in 1963); and cement, $930,000 ($534,000 in 1963).

Mineral exports were negligible and included small quantities of iron and steel scrap. Iron and steel semimanufactures, cement, and nonferrous metals were reexported on a small scale.

Trade, as shown in the accompaning table, was differentiated by region in offi-

[24] Where necessary, values have been converted from Somali shillings (SoSh) to U.S. dollars at the rate of 1 SoSh=US$0.14.

	Value of trade (thousands)						Mineral commodities share of total trade (percent)		
	Mineral commodities [1]			All commodities					
	North	South	Total	North	South	Total	North	South	Total
Exports:									
1963	$1	$39	$40	$13,026	$18,761	$31,787	(2)	0.2	0.1
1964	1	31	32	14,646	21,452	36,098	(2)	.1	.1
Imports:									
1963	941	4,023	4,964	13,850	30,827	44,677	6.8	13.1	11.1
1964	1,588	4,092	5,680	18,443	36,260	54,703	8.6	11.3	10.4
Trade balance:									
1963	−940	−3,984	−4,924	−824	−12,066	−12,890	XX	XX	XX
1964	−1,587	−4,061	−5,648	−3,797	−14,808	−18,605	XX	XX	XX

XX Not applicable.
[1] Includes only those commodities listed in tables 22 and 23 of this chapter
[2] Less than 0.1 percent.

Table 22.—Somali Republic: Exports of selected metals and minerals
(Metric tons)

Commodity	1963	1964	Principal destinations, 1964
Metals: [1]			
Aluminum	----	13	All to Italy.
Iron and steel:			
Scrap	87	20	Ethiopia 12; Aden 8.
Semimanufactures	107	126	Ethiopia 89; Malagasy Republic 21.
Lead	----	26	All to Italy.
Zinc	----	1	Do.
Nonferrous metals, scrap	----	51	Do.
Nonferrous metals, unspecified	10	29	Do.
Nonmetals:			
Asphalt, natural [2]	159	24	All to Saudi Arabia.
Cement, lime, and other building materials [2]	----	2	All to Aden.
Salt	3	50	Saudi Arabia 45; Tanzania 5.

[1] Includes unwrought and semimanufactures unless otherwise specified.
[2] For details on specific commodities included, see section on source materials.

Table 23.—Somali Republic: Imports of selected metals and minerals [1]
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals: [2]			
Aluminum	37	9	Italy 3; Kenya 3.
Iron and steel semimanufactures	[3] 5,672	[3] 4,286	Italy 2,188; Japan 779.
Lead	12	4	Italy 3.
Tin—long tons	6	1	All from Italy.
Nonferrous metals, n.e.s.	5	15	Kenya 13.
Nonmetals:			
Cement, lime, and other building materials [4]	26,076	44,469	U.S.S.R. 24,701; Kenya 17,491.
Clay construction materials [4]	[3] 1,865	[3] 776	Italy 709; U.S.S.R. 47.
Fertilizers:			
Natural	85	222	Kenya 138; Italy 84.
Manufactured	----	2,395	Italy 1,970; U.S.S.R. 425.
Salt	110	425	Aden 403; United Kingdom 22.
Nonmetallic minerals, crude, unspecified [4]	513	[3] 257	Italy 209; United States 22.
Nonmetallic mineral manufactures [4]	[3] 990	[3] 1,059	Czechoslovakia 576; Italy 193; Belgium-Luxembourg 132.
Mineral fuels:			
Gas, natural and manufactured	[3] 113	[3] 103	Italy 91; Kenya 12.
Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	68	139	Iran 96; Italy 37.
Kerosine—do	29	42	Iran 39.
Distillate fuel oil—do	231	186	Iran 148; Italy 20.
Lubricants—do	10	13	Iran 8; Italy 3.
Other—do	e 37	----	
Total—do	e 375	380	
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation	[3] 2,869	17	United Kingdom 13.

e Estimate.
[1] Statistics for the Northern and Southern Regions, reported separately, are combined where complete data were available.
[2] Includes unwrought and semimanufactures unless otherwise specified.
[3] Partial figure; other imports given in terms of value only.
[4] For details on specific commodities included, see section on source materials.

cial statistics of the Central Statistical Office. A large part of both mineral and total trade involved the Southern Region.

COMMODITY REVIEW

Metals.—*Iron Ore.*—Deposits in the Bur Dur and Bur Galan hills, near Baidoa, which have been under investigation by a United Nations survey team for 3 years, have not been exploited. Latest reserve estimates indicated the presence if two 100-million-ton deposits with grade of 42 percent iron.

Iron and Steel.—On October 14 President Aden Abdulla Osman inaugurated Fersomala S.R.L., Somali's first steel plant. This plant produces reinforcing rods from scrap. The production rate is 20 tons per day. Twenty Somalians and 8 Italians were employed at the plant.

Other Metals.—Possibly exploitable deposits of several metals occur in the northern mountainous region and in the Baidoa-El Bur area. Occurrences include minerals containing beryllium, bismuth, columbium-tantalum, cobalt, copper, lead-zinc, manganese, molybdenum, nickel, tin, and titanium.

Nonmetals.—*Cement.*—Imports from the U.S.S.R. and Kenya increased substantially. Proceeds from the sale of Soviet cement were loaned to the Somali Government for use in financing Soviet aid projects. Cement provided by Kenya originated at the Mombasa cement works.

The possibility was considered of constructing a cement plant in the Berbera area, where deposits of limestone and clay are known, but no definite project had materialized by yearend.

Gypsum.—A report by a United Nations survey team in 1963 indicated that a high-quality deposit of gypsum and anhydrite, about 30 kilometers from the port of Berbera, has reserves adequate to support a 200,000-ton-per-year mining rate for 50 years. However, further exploration was necessary for an accurate reserve estimate. The Somali Government attempted to arrange financing for this exploration and

for an engineering and feasibility study of the deposit. Foreign markets also were sought, particularly to the east. If markets are found, the Somali Government hoped to obtain international financing for mining and processing facilities.

Meerschaum.—Deposits of good-quality meerschaum, with low density and high porosity, near the town of El Bur, have several potential industrial uses. Interest in Somali meerschaum has increased as supplies from other world sources reportedly were dwindling. Traditional Somali artisans and one manufacturer of crude and semifinished smoking pipes used minor quantities. One official estimate placed annual production at 20 tons to 30 tons. Reserves have not been definitely established but were believed to total several million tons.

A small quantity of meerschaum was exported to the United States for use in the manufacture of pipes and accessories. The Somali Government reported that a British firm may take several thousand tons annually for use in drilling muds.

Salt.—Salt production continued almost entirely for the domestic market with small quantities exported. Output was not reported, but total output of Gezira, Zeila, and numerous other coastal evaporation basins was about 5,000 tons per year.

The Somali Government sought foreign assistance in reactivating the Hafun saltworks where an annual output rate of 200,000 tons ceased in 1941. An Italian firm reportedly expressed interest in performing a detailed feasibility study at this site, but no agreement had been reached at yearend.

Other Nonmetals.—Limestone and sandstone were quarried for construction uses, but production was unrecorded. A small marble deposit was discovered at Bur Acaba, near Mogadiscio, and may be used for construction in the capital area.

Occurrences of feldspar, fluorspar, kaolin, mica, and talc were under investigation by Government agencies.

Mineral Fuels.—*Petroleum.*—Late in 1965, interest in oil exploration appeared to be waning. Somali Gulf Oil Co., following similar action taken by Mobil Petroleum Co. in 1964, discontinued operations and relinquished its concession, effective at yearend. Sinclair Somal Oil Co. also considered withdrawal from Somalia but discovered gas, although not in commercial quantities, at its Afgoi No. 1 well in December and apparently decided to renegotiate its contract with the Somali Government.

U.S. companies spent $30 million in oil exploration to the end of 1964, and British and Italian firms spent $15 million before leaving the country. From 1957 to 1965, 28 unsuccessful wells were drilled by the following companies: Sinclair 15, Mobil 7, Azienda Generale Italiana Petroli (AGIP) Mineraria 4, and Gulf 2.

Sinclair completed two dry wildcat wells at depths of 13,537 feet and 13,349 feet and, at yearend, was drilling its third well at 31,660 feet. The company also completed a 10-month seismic survey. In May, half of the original concession was relinquished.[25]

Somali Gulf, the only other company actively engaged in drilling during the year, plugged and abandoned its first wildcat well, 53 kilometers west of Afmadu, at a depth of 9,405 feet. A second wildcat, started in March, 45 kilometers to the northwest, was abandoned at 10,110 feet.

Based on imports, the domestic market apparently absorbed 350,000 to 400,000 barrels of refinery products yearly during 1963 and 1964, the latest years for which data were available. AGIP Mineraria supplied all products in the south from its Mogadiscio terminal. Shell Oil Co. imported all refined products in the north and supplied retailers from its Berbera depot.

SPANISH SAHARA

Progress apparently was made toward partnerships and development of the large phosphate deposit at Bou-Craa, about 100 kilometers southeast of l Aaiún in the Province of Sahara. However, most details on activities during the year remained of a confidential nature; little information on the deposit and negotiations for its development were made available to the public.

Discovery of the phosphate basin was made by Empresa Nacional Minera del Sahara, S.A. (ENMINSA), the Spanish national company, during geological investigations in May 1963. ENMINSA conducted exploration, including 473 drill holes and 244 pits and trenches, during 1963–64. Data

[25] Page 1735 of work cited in footnote 5.

released indicated ore reserves exceeding 1 billion tons and grade of about 70 percent bone phosphate of lime, amenable to open pit development.

At yearend, negotiations for partners and construction contracts were underway, largely clouded in secrecy. ENMINSA contacted U.S. and other companies of the Western industrialized nations having financial resources and technical skills.

TOGO

The Republic of Togo's mineral industry remained dominated by the mining of phosphate rock. According to the Direction des Mines, output value of this commodity was $10.7 million, making it an important contributor to a GNP of about $150 million. In 1965 Togo produced 1.5 percent of the world supply of phosphate rock. Togo followed Morocco and Tunisia and ranked about on a par with Senegal among African producers. At yearend, the phosphate industry employed 1,050, including 883 miners and laborers.

In October Davison Chemical Corp., a division of W. R. Grace and Co., which holds a substantial interest in the phisphate property, planned a feasibility study for a fertilizer plant in Togo.

The United Nations Special Fund sponsored a mineral exploration program, which will be in effect until mid-1967. As a result of this survey, limestone perhaps suitable as a basis for a cement industry, was discovered near Lomé.

The first 5-year development plan (1966–70), adopted in July by the National Assembly, contained proposals for brick, cement, and fertilizers plants, marine salt production, and a small metal-working establishment. A new investment code improved an already good investment climate. New benefits included exemption from taxes on exports, imports, and profits; accelerated depreciation allowances; and guaranteed availability of foreign exchange.

PRODUCTION AND TRADE

As in previous years, phosphate rock was Togo's only recorded mineral product, although small quantities of simple construction materials such as clay, sand, gravel, and stone were presumably extracted for local use.

Output of salable phosphate rock has been reported as follows:

Year	*Metric tons*
1961	117,897
1962	193,000
1963	587,500
1964	r 752,000
1965	973,635

r Revised.

Togo's mineral trade was characterized by export of phosphate rock and import of iron and steel, cement, and petroleum refinery products. Phosphate rock accounted for essentially all export earnings from minerals. Its significance as an earner of foreign exchange and as a favorable influence on a continued unfavorable trade balance is indicated in the following tabulation:

	Value (thousands)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	$4,396	$18,265	24.1
1964	7,942	30,173	26.3
1965	8,714	27,056	32.2
Imports:			
1963	4,868	29,031	16.8
1964	4,795	41,664	11.5
1965	4,888	44,963	10.9
Trade balance:			
1963	−472	−10,766	XX
1964	+3,147	−11,491	XX
1965	+3,826	−17,907	XX

XX Not applicable.

[1] Includes only those commodities listed in tables 24 and 25 of this chapter.

These values are from European Economic Community (EEC) sources and are substantially less for phosphate rock than values quoted by the Togolaise Direction des Mines. According to the EEC, value of phosphate rock exports was $7,891,000 in 1964 and $8,690,000 in 1965. Principal mineral imports were iron and steel, $1.5 million ($1.6 million in 1964); cement, $1.2 million ($742,000 in 1964); and petroleum products, $1.5 million ($1.8 million in 1964).

Table 24.—Togo: Exports of selected metals and minerals [1]

(Metric tons)

Commodity	1963	1964	1965	Principal destinations, 1964
Metals:				
Iron and steel:				
Scrap	530	536	228	France 461; Nigeria 75.
Semimanufactures	----	58	52	Cameroon 26; Dahomey 25.
Nonmetals:				
Clay construction materials [2]	34	18	----	All to Dahomey.
Fertilizer materials:				
Phosphate rock	441,434	778,240	981,767	Australia 145,840; France 130,124; Netherlands 109,675; Japan 106,342.
Manufactured	23	11	----	All to Ghana.
Stone, sand, and gravel [2]	116	----	59	
Nonmetallic minerals, crude, unspecified [2]	1,249	321	103	Nigeria 224; Ghana 54.
Mineral fuels: Petroleum refinery products, mainly lubricants	6	22	24	Dahomey 19.

[1] Official trade returns of Togo for phosphate rock; European Economic Community for other commodities.

[2] For details on specific commodities included, see section on source materials.

Table 25.—Togo: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1964
Metals: [1]				
Aluminum	52	63	67	West Germany 27; France 21; Ivory Coast 15.
Copper	12	10	37	France 9.
Iron and steel:				
Scrap	65	39	4	All from Ghana.
Pig iron and ferroalloys	5	23	2	All from France.
Semimanufactures:				
Bars, rods, and sections	2,055	2,663	3,609	France 1,421; Belgium-Luxembourg 1,158.
Plate and sheet	2,778	3,519	2,489	Japan 2,929; France 586.
Rails and accessories	4,546	1,608	578	West Germany 1,337; France 270.
Tubes, pipes, and fittings	614	812	1,903	France 569; West Germany 234.
Other	63	79	120	France 49; Ivory Coast 15.
Total	10,056	8,681	8,699	
Lead	33	20	7	Belgium-Luxembourg 9; France 8.
Tin—long tons	4	1	1	All from France.
Zinc	3	1	31	Do.
Nonferrous metals, ore and concentrate, unspecified	2	4	----	Do.
Nonmetals:				
Cement, lime, and other building materials [2]	40,578	31,647	48,439	Poland 10,954; Belgium-Luxembourg 6,006; France 4,801.
Clay construction materials [2]	378	203	539	France 115; West Germany 82.
Fertilizers, manufactured	----	84	245	France 81.
Stone, sand, and gravel [2]	1,466	38	68	France 10; Ghana 6.
Sulfur and pyrite	----	----	5	
Nonmetallic minerals, crude, unspecified [2]	11,061	11,418	7,080	Spain 6,861; Senegal 3,650.
Nonmetallic mineral manufactures [2]	22	131	45	France 118.
Mineral fuels:				
Coal, coke, and briquets	74	107	26	Nigeria 100.
Gas, natural and manufactured	103	146	161	Netherlands Antilles 42; France 32; Italy 30.
Petroleum refinery products	37,285	44,595	45,988	Venezuela 15,419; Netherlands Antilles 10,129; Iraq 6,385; Spain 5,068.
Tar, pitch, and other crude chemicals from coal, oil and gas distillation	154	136	107	France 131.

[1] Includes unwrought and semimanufactures unless otherwise specified.

[2] For details on specific commodities included, see section on source materials.

COMMODITY REVIEW

Nonmetals.—*Limestone.*—Discovery of a large limestone deposit near Lomé was reported. This could form the basis for a cement industry in Togo.

Phosphate Rock.—Expansion continued at the Hahotoe mine of Compagnie Togolaise des Mines du Bénin (CTMB). The 1965 output of 973,635 tons of marketable dry phosphate rock at a grade of 80 to 81 percent bone phosphate of lime was derived from 1,963,309 tons of crude rock, according to the Direction des Mines. Annual capacity was expanded to 1.2 million tons of marketable product with addition of a third washing line in August at the Bpeme processing plant, 22 railroad kilometers from the mine. New equipment planned during the year included a wheel excavator, a stacker-loader, and a power shovel. Total investment was estimated at $30 million.

In 1965 phosphate rock was shipped to 12 countries, mainly France (237,858 tons), the Netherlands (231,034 tons), Australia (135,444 tons), Japan (113,011 tons), and Italy (90,585). Other recipients, in order of tonnage received, were Belgium, West Germany, the United States, the United Kingdom, Brazil, Sweden, and Uruguay.

Mineral Fuels.—*Petroleum.*—There was little interest and no activity in oil exploration during 1965.

Storage tank capacity for gasoline, distillate fuel oil, and lubricants was approximately doubled with construction of a second depot, 8 kilometers east of Lomé, by Société Togolaise d'Entreposage (STE). This new company is a consortium of the following five petroleum companies: British Petroleum Ltd., Compagnie Française de Distribution des Pétroles en Afrique, Mobil Oil Co. of West Africa, Shell Oil Corp., and Texaco Africa Ltd. Late in 1964, AGIP Mineraria had opened a storage depot 30 kilometers east of Lomé, using a pipeline from the phosphate-loading pier.

Estimated capacity of these storage facilities by product at yearend was in thousand 42-gallon barrels:

Product	AGIP	STE
Gasoline	20	19
Distillate fuel oil	12	19
Lubricants	9	13

UPPER VOLTA

The mineral industry of the Republic of Upper Volta remained small and was a minor contributor to the overall economy. Value of the limited mineral output was not reported but was on the order of $1.5 million, based on estimates for gold, gold-bearing materials, and construction materials such as clay, sand, gravel, stone, and brick, produced for small local consumption. The GNP was estimated to be $212 million.

United Nations Special Fund and United States Agency for International Development (AID) assistance continued in hydrogeological and mineral investigations. United Nations studies involved a ground water survey south and southeast of Ouagadougou and gold, copper, diamond, and other mineral studies in the Gaoua region. This was a $1.7 million project of which the United Nations provided 58 percent.

The French national company BRGM conducted an airborne geophysical survey and anomaly study in the east, geological work in the east and southwest, and investigations for diamonds along the Volta Noire and Comoe Rivers. Other nations (ECC countries, the United States, Japan, Israel, and Taiwan) also were involved in development projects and technical assistance.

PRODUCTION AND TRADE

Gold mining at Poura, the only active mining operation recording production in Upper Volta, showed little change from prevoius activities. No new reserves were established, and it appeared that closure of the mine was imminent. Although no quantitative data are available, simple construction materials and small numbers of bricks were produced for local use. Output of crude gold, approximately 75 percent

fine, from amalgamation at Poura was as follows in recent years:

	Troy ounces
1961	15,497
1962	39,770
1963	44,786
1964	r 32,665
1965	34,468

r Revised.

Upper Volta's principal mineral exports were crude gold and gold-bearing materials from Poura mining and amalgamation. Iron and steel semimanufactures and petroleum refinery products were reexported.

Main mineral imports during 1964, the latest year for which complete data were available, were iron and steel semimanufactures, $1 million ($1.2 million in 1963); petroleum products, $1.4 million ($1.3 million in 1963); and cement $546,000 ($603,000 in 1963). These materials comprise a significant share of total trade, as indicated in the following:

	Value (thousands)		Mineral commodities share of total trade (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1963	r $314	r $9,317	3.4
1964	244	12,172	2.0
Imports:			
1963	r 3,771	36,997	10.2
1964	3,654	39,674	9.2
Trade balance:			
1963	r −3,457	r −27,680	XX
1964	−3,410	−27,502	XX

r Revised. XX Not applicable.
[1] Includes only those commodities listed in tables 26 and 27 of this chapter.

These totals do not include gold, which traditionally goes to Paris markets. At world prices, this gold presumably was valued at about $1.2 million.

COMMODITY REVIEW

Metals.—*Gold.*—The Poura mine, 175 kilometers southwest of Ouagadougou, continued operations at a rate similar to that of 1964. Established reserves were further depleted, and Société des Mines de Poura, which has operated at a loss in recent years, expected to terminate operations in 1966. Average gold content of ore was 0.5 troy ounces per ton.

Essentially all crude gold, 34,273 ounces in 1965, went to Paris for sale. Metallurgical rejects from Poura were exported mainly to Sweden for processing and reimported as fine gold.

Manganese.—Progress was made toward development of the Tambao deposit, Oudalan Province, 360 kilometers northeast of Ouagadougou. This deposit was discovered in 1960 by the BRGM, which subsequently established a substantial reserve. The deposit comprises two steeply dipping lenticular ore bodies. Workings include two exploratory adits, each intersecting the ore bodies.

Japanese interest, representing five Japanese companies, and African Manganese Co., the British subsidiary of Union Carbide Corp., negotiated for joint development of the deposit. The Japanese sent a 15-man survey mission, which concluded that ore reserves exceed 15 million tons of 48 to 53 percent manganese. Final negotia-

Table 26.—Upper Volta: Exports of selected metals and minerals

(Metric tons)

Commodity [1]	1963	1964	Principal destinations, 1964
Metals:			
Aluminum	----	2	France 1.
Iron and steel:			
Scrap	24	78	Ivory Coast 71.
Semimanufactures	67	18	Mali 7; Niger 2.
Nonferrous ore and concentrate, mainly gold	771	665	Sweden 633; France 16.
Nonmetals:			
Cement, lime, and other building materials [2]	----	52	France 50.
Clay construction materials [2]	2	4	All to Niger.
Nonmetallic minerals, crude, unspecified [2]	604	133	Niger 67; Ghana 53.
Mineral fuels: Petroleum refinery products, mainly gasoline and kerosine	300	80	Ivory Coast 38; Mali 33.

[1] Does not include crude gold, which was exported to France.
[2] For details on specific commodities included, see section on source materials.

Table 27.—Upper Volta: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals: [1]			
Aluminum	17	37	France 29; Ivory Coast 5.
Copper	77	9	All from France.
Iron and steel:			
Scrap	569	470	United Kingdom 173; West Germany 40; Ghana 38.
Semimanufactures:			
Bars, rods, and sections	2,535	2,752	France 2,751.
Plate and sheet	3,118	1,645	France 1,167; Belgium-Luxembourg 433.
Other	537	1,153	France 1,097.
Total	6,190	5,550	
Lead	9	8	France 7.
Tin—long tons	----	1	All from France.
Zinc	2	2	Do.
Nonferrous metals, n.e.s.	3	----	
Nonmetals:			
Cement, lime, and other building materials [2]	28,051	26,627	France 22,155; Belgium-Luxembourg 2,445; Algeria 1,169.
Clay construction materials [2]	437	263	West Germany 171; France 85.
Fertilizer materials:			
Natural	----	80	Senegal 70; France 10.
Manufactured	287	645	France 577; Belgium-Luxembourg 54.
Stone, sand, and gravel [2]	61	23	All from France.
Sulfur and pyrite	11	11	France 10.
Nonmetallic minerals, crude, unspecified [2]	11,506	12,906	Senegal 7,217; Algeria 3,169.
Nonmetallic mineral manufactures [2]	61	34	France 31.
Mineral fuels:			
Gas, natural and manufactured	202	262	France 213; Netherlands 49.
Petroleum refinery products	31,641	35,646	Venezuela 20,200; France 3,714; Iraq 2,981; Kuwait 2,640.
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation	7	8	All from France.

[1] Includes unwrought and semimanufactures unless otherwise specified.

[2] For details on specific commodities included, see section on source materials.

tions were underway at yearend. An investment of $26.5 million was envisioned, including a 216-kilometer railroad extension to the property.

A loan for construction of transportation facilities was sought through the International Bank for Reconstruction and Development. The Government requested United Nations Special Fund assistance in a feasibility study and exploration in 1966.

SOURCE MATERIALS

Principal sources of information on metal and mineral production and on exploration, mining, metallurgical, and petroleum activities were professional journals and dispatches from U.S. embassies and other U.S. Department of State posts located in the countries discussed in this chapter. Of particular use were annual minerals reports from L. M. Rives, Bujumbura, Burundi; J. P. Ferriter, Nouakchott, Mauritania; R. S. Thompson, Niamey, Niger; and A. M. Hardy, Mogadiscio, Somali Republic.

Trade data for the most part were derived from European Economic Community (EEC) volumes on overseas associates in Africa; for Rwanda and the Somali Republic, official trade statistics of the respective governments were used. The EEC sources include several general reporting categories, each of which encompasses a number of mineral commodities. The following table indicates items included within each category:

Descriptive category used in trade tables in this chapter	SITC category number [1]	Full list of items included
Abrasives, natural	275	Industrial diamonds; dust and powder of natural or synthetic precious or semiprecious stones; infusorial earths; pumice stone; emergy; natural corundum and other natural abrasives.
Cement, lime, and other building materials.	661	Cement (all types); lime; worked building and monumental (dimension) stone; asbestos cement and fiber cement building materials including vegetal substances agglomerated with mineral binding substances; asphalt building materials.
Clay construction materials	662	Refractory bricks and other construction materials of infusorial earths, kieselguhr, and siliceous earths, other; refractory bricks; refractory cements and mortars; nonrefractory ceramic bricks, tiles, pipes and similar products including roofing tiles, ceramic piping, unglazed tile and glazed tile.
Stone, sand, and gravel	273	Building and monumental (dimension) stone, not further worked than roughly split, roughly squared or squared by sawing (including sandstone, slate, marble, limestone, granite, porphyry, and others); gypsum plasters; limestone flux; calcareous stone used for manufacture of lime and cement; sand (excluding metal-bearing sand); gravel and crushed stone (including tarred macadam).
Nonmetallic minerals, crude, unspecified.	276	Natural asphalt and bitumen; clays and other refractory minerals including graphite, dolomite and magnesite; salt; asbestos (crude washed or ground, including asbestos waste); mica; feldspar; fluorspar; cryolite; chiolite; natural quartz; quartzite; slag, dross, scalings and similar waste from iron or steel manufacture (except Thomas slag); chalk; earth colors; barite; witherite; meerschaum; amber; jet; steatite; talc; natural arsenic sulfides; crude borate minerals; and others not specified.
Nonmetallic mineral manufactures.	663	Abrasive products such as grinding wheels, grinding stones, abrasive cloths, and abrasive papers; worked mica, mineral insulating materials other than in the crude mined state; articles made of plaster, cement, concrete or artificial stone; refractory products other than refractory construction materials; asbestos manufactures; and ceramic materials, not elsewhere listed, including laboratory and industrial ceramic products.

[1] Standard–International Trade Classification categories, as outlined in Standard Industrial Trade Classification Revised. Statistical Papers Series M, No. 34, Statistical Office of the Department of Economic and Social Affairs, United Nations, New York, 1961, 135 pp.

Although a wide variety of items is included in each group, it is unlikely that many items were actually involved in trade. Category 661 probably involved mainly cement; and category 662, mainly simple brick, tile, and ceramic piping. Trade in other categories may include one or several commodities.

Estimates on dollar value for GNP of each country were derived from Overseas Business Reports, Market Indicators for Africa, and Market Profiles for Africa, published by the Bureau of International Commerce, U.S. Department of Commerce.

Regional Mineral Industry Review of the Near East

By James A. West [1]

Near East region countries continued to supply a large share of the world's energy requirements in 1965. The area accounted for nearly 27 percent of estimated total world crude oil output and for about 60 percent of world exports of this commodity. Also, it was the source of more than 40 percent of the world's petroleum refinery products exports. Although other mineral industry activities remained relatively insignificant in comparison with petroleum, regional production and export of certain metallic and nonmetallic mineral commodities were of world significance. Of these commodities, chief in importance were chromium, copper, mercury, antimony, boron, potash, and phosphate rock.

The Near East region contains the largest and most productive oil resources in the world. Petroleum exploration and development operations during 1965 resulted in crude oil reserve additions of almost 8 billion barrels to increase proved reserves to 219 billion barrels at yearend, an amount equal to nearly 68.5 percent of the world's proved oil reserves. Near East countries' production of crude oil averaged a record 8,337,575 barrels per day in 1965, an increase of nearly 11 percent over that of 1964. On an annual basis, Kuwait continued as the leading oil producer in the Near East; however, Saudi Arabia was a close second and its rate of production in late 1965 exceeded that of Kuwait. The major oil producing nations and their percentage of total area crude oil output was Kuwait, 26.0; Saudi Arabia 24.3; Iran, 22.3; and Iraq 15.9.

In 1965, petroleum remained the dominant industrial activity of the Near East and continued to have a pronounced impact on economic, social, and political developments in the region. Crude oil and refinery products production was valued at an estimated $5,536 million, accounting for almost 22 percent of the combined gross national product (GNP) of all countries in the Near East region. Regional governments received an estimated $2,434 million in revenues from the petroleum industry. Also, it was the principal source of foreign exchange that resulted in a favorable trade balance of an estimated $2,000 million in 1965.

The most significant petroleum industry developments in the Near East in 1965 were the increased offshore exploration activity in the Persian Gulf that resulted in major new oilfield discoveries; the continued development of previously discovered oilfields in the Persian Gulf; the rapid emergence of the Sheikdom of Abu Dhabi as a prolific oil producer; and the completion of the world's largest crude oil shipment terminal at Kharg Island in the offshore area of Iran.

Negotiations between oil concessionaires and the Governments of Iraq and Kuwait continued in 1965. A tentative agreement was reportedly reached between the Government of Iraq and the Iraq Petroleum Companies group on the long-standing dispute concerning the relinquishment of concession areas. However, at yearend the accord had not been submitted to the Iraqi Parliament to obtain the required ratification. The Kuwait National Assembly did not ratify a 1964 agreement with Kuwait Oil Co. providing for expensing of royalty oil payments and changes in tax accounting procedures. The agreement was reached as a result of negotiations between major oil concessionaires and country members of the Organization of Petroleum Exporting Countries (OPEC), a semiofficial organization representing the Near East

[1] Chief specialist, Near East and South Asia, Division of International Activities.

countries of Kuwait, Saudi Arabia, Iran, Iraq, and Qatar. The OPEC agreement was ratified by the Governments of Saudi Arabia, Iran, and Qatar.

Continuing the trend of recent years, Near East Governments increased their share of participation in petroleum industry operations and earnings in 1965. All new oil concessions and most industrial development projects, such as petrochemical and refinery construction, were awarded only on a joint venture basis with Government-owned national companies having majority equity. The concessionaire provides essentially all risk capital, and the Governments are assured a minimum of 75 percent of profits under equity and tax provisions.

Table 1.—Near East: Salient statistics of the petroleum industry in 1965

Country	Production (thousand 42-gallon barrels)		Exports (thousand 42-gallon barrels)		Estimated reserves (million 42-gallon barrels)	Estimated revenue to Government (million dollars)	Estimated value of production (million dollars)	GNP [1] (million dollars)
	Crude oil	Refinery throughput	Crude oil	Refinery products				
Aden	---	51,215	---	54,344	---	30	140	235
Abu Dhabi	102,804	---	102,804	---	10,000	80	175	e 185
Bahrain	20,788	74,358	---	67,074	230	21	175	e 200
Iran	678,213	140,009	534,785	101,668	40,000	525	1,100	5,638
Iraq	482,461	21,194	459,363	e 200	25,000	368	860	1,900
Israel	1,469	29,273	---	e 3,915	30	10	65	3,650
Jordan	---	2,979	---	---	---	2	6	470
Kuwait	791,903	84,827	710,299	76,670	62,500	608	1,250	e 1,375
Kuwait-Saudi Arabia Neutral Zone	132,285	35,716	108,707	19,362	12,400	---	190	---
Lebanon	---	10,986	---	e 3,000	---	9	25	950
Muscat and Oman	---	---	---	---	500	3	---	e 10
Qatar	84,215	230	83,354	---	3,000	75	155	e 160
Saudi Arabia	739,078	115,561	623,515	103,948	63,700	653	1,300	e 1,400
Syria	---	7,416	---	e 100	1,200	35	15	e 850
Turkey	9,999	31,299	---	3,470	500	15	80	8,600
Total	3,043,215	605,063	2,622,827	433,751	219,060	2,434	5,536	25,623

e Estimate.
[1] In current prices.

Aside from petroleum, Near East countries continued to produce and export important quantities of certain metals and nonmentals during 1965. Turkey and Iran remained large producers of chromite and increased chromite output in 1965 over that of 1964 by 37.5 and 25 percent, respectively. The combined chromite output of Near East countries was nearly 15 percent of world production. Other significant metals produced in the region and percent of 1965 world output were as follows: Antimony, 3.4; copper, 1.2; and mercury, 1.0. Certain nonmetallic minerals produced in regional countries were of world significance. Turkey increased its production of boron minerals by nearly 31 percent and continued to account for about one-sixth of the total world output. Potash production in Israel and phosphate rock produced in both Israel and Jordan accounted for 2.3 and 1.8 percent of the world output of these fertilizer raw materials in 1965. The gross value of polished diamond exports from Israel reached $138 million in 1964, ranking Israel third among world diamond processors.

The Governments of the Near East region implemented and expanded programs for the development of mineral resources other than petroleum. The Governments of Iran and the U.S.S.R. entered into an agreement for the construction of Iran's first integrated iron and steel mill. Soviet technical and financial assistance for the steel mill is to be repaid by Soviet purchase of Iranian natural gas. Iran plans to construct a pipeline system to transport natural gas to major Iranian cities and to the Soviet border. In Saudi Arabia, the Government expanded and initiated new projects to explore and assess mineral resources

in the northeast area of the country where recent surveys indicated potentially significant deposits of iron ore, gold, silver, copper, barite, phosphate, and other minerals. Israel increased the capacity of its Dead Sea works to produce potash. In Jordan, progress was made on projects to develop mines, roads, and port facilities to increase phosphate rock output. All units of Turkey's new Eregli steel plant became fully operational during 1965.

Near East countries continued to make an important contribution to world mineral trade. The area supplied about one-half of total world exports of crude oil and petroleum products in 1964. In general, area countries were dependent on imports for most metallic and nonmetallic minerals needed for their growing economic development. On the basis of official trade statistics available for 1964, supplemented by estimates where necessary, the relative significance of mineral trade to total trade for the whole region is shown in the following tabulation:

Near East: Mineral trade balance in 1964

	Value of mineral trade (million dollars)	Value of total trade (million dollars)	Share of mineral trade to total trade (percent)
Exports	5,226	6,456	81
Imports	1,076	4,424	24
Trade balance	+4,150	+2,032	--

The contributions of each of the major mineral commodity categories to total minerals trade in 1964 was as follows:

	Value of imports (million dollars)	Value of exports (million dollars)
Metals	400	60
Nonmetals	278	172
Fuels	398	4,994
Total	1,076	5,226

263-927 O-67—63

The Mineral Industry of Bahrain

By James A. West [1]

Petroleum refining and production continued as the major industrial activity and only significant mineral industry of Bahrain in 1965. A substantial increase in indigenous crude oil production, a new offshore oil concession award, completion of facilities required to place the offshore Abu Safah field in production, and increased exploration activity were the most notable oil industry developments affecting Bahrain this year.

Although crude oil production from the single oilfield on the island increased by 15.5 percent over that of 1964, Bahrain continued to account for less than 1 percent of Middle East oil production in 1965. As in recent years, Bahrain continued as a major oil refining center in the Middle East and accounted for about 7.5 percent of the production and 6 percent of the exports of petroleum refinery products from this area during 1965.

In 1965, the petroleum industry contributed an estimated $34 million to the Bahrain economy. It was the direct source of nearly 80 percent of all government revenue and provided about 90 percent of foreign exchange earnings. The industry employed about 5,000 Bahraini personnel and 1,000 persons of other nationalities.

In September 1965, the Government awarded an oil concession to the Continental Oil Co. (CONOCO) on offshore areas previously relinquished by Bahrain Petroleum Co. (BAPCO), an affiliate of Standard Oil Co. of California and Texaco, Inc., that until then was the sole petroleum concessionaire in Bahrain.

The Governments of Bahrain and Saudi Arabia completed arrangements for placing the offshore Abu Safah field on production at a rate of 30,000 barrels per day, beginning on January 1, 1966. The field is in an offshore area where each Government has agreed to jointly share oil revenues before oil development.

PRODUCTION

For the second consecutive year, a significant gain in crude oil production was realized from the Bahrain field, the only producing field on the island. Output during 1965 was 15.5 percent greater than that of 1964 and 26 percent greater than that of 1963. Output of petroleum products from the BAPCO refinery in 1965 declined 4.7 percent from that of 1964. Although all indigenous production is processed, crude oil imported by pipeline from Saudi Arabia continued to supply more than two-thirds of the feedstock for the refinery.

[1] Chief specialist, Near East-South Asia, Division of International Activities.

Table 1.—Bahrain: Production of minerals

(Thousand 42-gallon barrels)

Commodity [1]	1961	1962	1963	1964	1965
Crude petroleum	16,444	16,446	16,503	18,000	20,788
Petroleum refinery products:					
Gasoline	13,577	16,815	16,361	16,704	14,876
Jet fuel	4,715	5,972	5,138	6,580	8,431
Kerosine	4,920	4,532	4,228	3,469	3,171
Distillate fuel oil	18,412	20,410	19,804	15,764	12,772
Residual fuel oil	31,483	34,827	33,362	27,682	27,534
Other	1,150	379	187	740	837
Total	74,257	82,935	79,080	70,939	67,621
Refinery fuel and loss	5,632	5,745	5,608	8,361	6,737

[1] In addition to commodities listed, small quantities of construction materials are produced, but quantitative data on output are not available.

TRADE

Refined petroleum products, having an estimated gross value of $175 million, continued as the only significant mineral export of Bahrain during 1965.

Imports of Saudi Arabian crude oil continued the downward trend of recent years because of reduced refinery runs and increased Bahrain crude oil production.

Bahrain continued in its traditional role as a major trading center in the lower Persian Gulf area. Available statistics for 1964 show that all imports, excluding petroleum, were valued at $78 million and that reexports were valued at $24 million. Limited information suggests that the value of mineral and metal imports was about 5 percent of the total.

Table 2.—Bahrain: Imports, exports, and bunker deliveries of crude oil and petroleum refinery products [1]

(Thousand 42-gallon barrels)

Commodity	1963	1964	1965
Imports:			
Crude oil	66,450	57,231	50,025
Petroleum refinery products:			
Gasoline	893	1,159	1,178
Lubricants	8	5	11
Exports:			
Petroleum refinery products:			
Gasoline	16,848	16,544	14,836
Jet fuel	5,125	6,429	8,310
Kerosine	4,245	3,247	3,244
Distillate fuel oil	19,032	15,454	12,222
Residual fuel oil	28,961	21,597	21,625
Other	162	630	827
Total	74,373	63,901	61,064
Bunker deliveries:			
Distillate fuel oil	394	206	269
Residual fuel oil	4,687	6,066	5,741

[1] Data on origin of imports and destination of exports not available.

COMMODITY REVIEW

MINERAL FUELS

Petroleum and Natural Gas.—The offshore concession awarded to CONOCO consists of two areas comprising approximately 600,000 acres. The largest is north-northwest of Bahrain island and adjoins CONOCO's offshore Qatar concession. The smaller is an irregular area surrounding Huwar Island to the south of Bahrain. Detailed terms of the agreement have not been announced, but they conform generally to those of other recent agreements in the area except that there is no participation by the Government in the operating company.

Oil exploration activity increased markedly during 1965. BAPCO conducted seismic surveys on Bahrain, on Umm Nasan and Sitra Islands, and adjoining marine areas. Also, BAPCO drilled a deep exploration well on the west coast of Bahrain 4.5 miles south of Zallaq. The well was plugged and abandoned because no commercial oil was discovered. CONOCO began marine seismic surveys on its new concession areas and the initial surveys were being evaluated at yearend.

The Arabian American Oil Co. (ARAMCO) completed facilities to place the Abu Safah offshore field on production at 30,000 barrels per day. The Governments of Bahrain and Saudi Arabia will share equally in profits from the field. Six wells were connected to a central production platform and a 31-mile 18-inch-diameter submarine pipeline to transport production from the platform to ARAMCO's Ras Tanura terminal was completed.

All oil production was from the Bahrain field which was discovered in 1932. The field attained a record output in excess of 60,000 barrels per day in the last quarter of 1965. This increase was largely a result of infill drilling and the installation of high-capacity pumping units on several wells.

Proved crude oil reserves were reported [2] as 230 million barrels at yearend.

The BAPCO refinery operated at about 80 percent of capacity, processing crude oil at an average rate of 196,340 barrels per day.

An estimated 20 million cubic feet per day of natural gas was utilized as fuel by the Government-owned powerplant at Manama. Lesser quantities were utilized for reinjection, gas lift, and other field operations.

[2] Oil and Gas Journal. V. 63, No. 52, Dec. 27, 1965, p. 83.

The Mineral Industry of Cyprus

By E. Shekarchi [1]

Minerals remained one of Cyprus' most important resources, accounting for about 34 percent of its total export. Copper concentrates, pyrites, chromite, and some nonmetals, such as asbestos, gypsum, and mineral pigments, continued to be the principal source of foreign exchange. Directly, mining contributed 8 percent to the estimated 1965 gross national product (GNP) of $348 million.[2]

The largest company, the U.S.-owned Cyprus Mines Corp., produced between 60 and 70 percent of the island's mineral output. Of the total labor force, 2 percent, or approximately 5,500 people, were employed in mining and quarrying operations. The total population of Cyprus showed an annual growth of 1 percent at the end of 1964. The GNP based on 1962 prices was estimated at about $348 million in 1965, a drop of about 4.4 percent from the $364 million recorded for 1963.

Both consumption and investment decreased, and unemployment increased in 1964. The island's per capita gross national product, based on 1962 prices, decreased about 4 percent from the highest level in 1963.

Agreements were signed between the Governments of Cyprus and the U.S.S.R. which provided for the exchange of goods manufactured in the participating countries. Under these agreements in 1965, 1,000 long tons of iron and steel rolling-mill products, 25,000 long tons of cement, and 3,000 long tons of superphosphates were to be delivered to Cyprus. It was expected that these figures would be increased to 1,500, 3,000, and 50,000 tons, respectively, by 1967.

After 2½ years of investigation, Parliament, on July 30, 1965, ratified the creation of a refinery, the largest single foreign capital investment since Cyprus became independent. The Cyprus Government and a Consortium composed of subsidiaries of the Royal Dutch/Shell group, British Petroleum Co. Ltd., and Socony Mobil Oil Co. Inc. will participate on a 50–50 basis in a refinery to be located at Larnaca. The initial capacity is to be 500,000 tons per year, but it is hoped that by 1975 it will have been expanded to supply all of the island's needs.

The Cyprus Geological Survey Department reportedly organized a drilling crew in 1964 and commenced drilling in an area southwest of Nicosia with two government-owned rigs. Drilling operations at Kato Moni, Potami, Pera, and Nikitari resulted in completion of six holes with a total footage of 3,350. Four successful holes yielded from 850 to 4,300 barrels of oil per day.

The only mineral exploration drilling in 1965 was in the Ayios Ioannis area; a small rig found disseminated chalcopyrite at a depth of 70 feet. A second hole drilled in Kambia encountered no economically significant mineral zone.

PRODUCTION

The 1965 value of Cyprus' mineral production totaled about $30 million, about 20 percent higher than values of 1962. Since the cessation of political disturbances, mineral production generally seemed to return to the 1962 level. Among the metals, copper and chromite production in 1965 showed increases of 57 percent and 66 percent, respectively, compared with that of 1964. Of nonmetals, noticeable increases shown included those of 35 percent in crude gypsum and 142 percent in lumber production.

[1] Foreign mineral specialist, Division of International Activities.

[2] Where necessary, values have been converted from Cyprus pounds (C£) to U.S. dollars at the rate of C£.357143=US$1.00.

Table 1.—Cyprus: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	[e] 1965
Metals:					
Chromite	17,981	6,538	[r] 5,000	3,000	4,990
Copper [1]	25,800	22,900	[r] 26,000	13,000	20,450
Nonmetals:					
Asbestos	14,703	20,313	[r] 18,109	[r] 11,827	14,302
Cement	[r] 95,000	[r] 98,000	[r] 96,000	[r] 70,000	98,357
Gypsum:					
Crude	104,486	104,406	100,000	45,000	60,975
Calcined	25,000	30,949	52,000	30,000	20,325
Lime	41,196	45,610	59,341	NA	20,325
Mineral pigments:					
Terre verte	4	10	10	10	10
Umber	4,320	6,727	6,000	[e] 6,000	14,532
Yellow ocher	303	610	500	[e] 400	304
Pyrites (sulfur content)—thousand tons	402	395	[r] 447	[r] 329	469
Salt	2,088	5,651	[r] 7,000	NA	5,355

[e] Estimated. [r] Revised. NA Not available.
[1] Estimated content of concentrates, cement copper, and cupreous pyrite; excluding content in iron pyrite ore which may or may not be recovered.

TRADE

The importance of mineral commodity trade in the total trade of Cyprus in 1964 is illustrated in the following tabulation:

Cyprus: Mineral trade balance in 1964

	Mineral trade value (million dollars)	Total trade value (million dollars)	Share of total trade accounted for by mineral trade (percent)
Exports	20.0	58	34
Imports	18.8	109	20
Trade balance	1.2	51	XX

XX Not applicable.

A large portion of the total exports, approximately $13 million, resulted from the sale of metals, while nonmetals brought only $7 million. Among nonmetals, pyrites accounted for the highest share, approximately $4 million. Barter arrangements for Cypriot chromite were concluded with Czechoslovakia and Bulgaria during 1965.

Of the total value of mineral imports, mineral fuels, metals, and nonmetals accounted for $8.8 million, $5.3 million, and $4.7 million, respectively.

Historically, the United Kingdom and West Germany have supplied the iron and steel demands of Cyprus which totaled approximately $4.5 million. However, under a trade agreement signed in 1965, the U.S.S.R. became a main supplier during 1965 and will continue until 1967. The agreement was based on barter arrangement rather than on hard currency payment. Cyprus will receive mineral commodities in exchange for nonmineral commodities.

Table 2.—Cyprus: Exports of metals and minerals

(Metric tons)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Chromite	406	9,297	Sweden 5,030; Canada 3,556.
Copper:			
Ore and concentrate	110,197	62,120	West Germany 42,597; Spain 12,557; Japan 4,525.
Cement	3,146	2,935	France 2,435; West Germany 500.
Cupreous pyrite	105,515	87,510	West Germany 40,795; Netherlands 40,435.
Manganese	106	----------	
Nonmetals:			
Asbestos, crude	13,676	11,499	Thailand 3,943; Denmark 3,003; Sweden 1,384.
Gypsum:			
Crude	55,150	43,205	Lebanon 29,015; Taiwan 12,990; Philippines 1,200.
Calcined	1,642	1,697	Lebanon 1,235; Sudan 339.
Mineral pigments:			
Ocher	276	418	United States 186; United Kingdom 128, Pakistan 49.
Terre verte	6	10	United States 5; United Kingdom 3.
Umber:			
Crude	544	900	United States 474; United Kingdom 358.
Burnt	3,799	5,219	United States 2,646; United Kingdom 1,960.
Pyrites	760,804	735,760	Italy 161,612; France 74,323; Belgium 17,890.

Source: Department of Statistics and Research, Ministry of Finance, Nicosia, Statistics of Imports and Exports, 1964; May 1965.

Table 3.—Cyprus: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys	272	252	Greece 85; United Kingdom 76; Italy 20.
Copper, including brass	70	59	United Kingdom 24; France 14; Italy 14.
Gold—troy ounces	10,219	7,581	United Kingdom 7,545.
Iron and steel:			
Pig iron	202	147	United Kingdom 97; West Germany 50.
Ferroalloys	1	2	United Kingdom 1; West Germany 1.
Semimanufactures	r 51,252	32,524	Belgium 8,040; France 7,640; West Germany 4,699.
Lead and alloys	64	82	United Kingdom 41; Belgium 20.
Nickel and alloys	1	2	All from West Germany.
Tin and alloys	488	398	United Kingdom 396.
Zinc and alloys	47	56	Belgium 31; Australia 14.
Nonmetals:			
Asbestos	4,658	2,732	Yugoslavia 1,193; Egypt 761; Czechoslovakia 455.
Building stone:			
Unworked—value, dollars	r 8,483	9,122	Italy 8,256.
Worked—do	r 3,511	4,363	Spain 3, 982.
Cement	87,758	64,928	Israel 16,338; U.S.S.R. 13,225; Lebanon 9,940.
Clays	170	260	Greece 130; United Kingdom 128.
Fertilizer materials, manufactured:			
Nitrogenous	43,288	26,838	Israel 11,008; Italy 7,957; Austria 5,823.
Phosphatic	33,866	31,762	Lebanon 13,369; Spain 7,306; Netherlands 5,424.
Potassic	26,277	23,950	Portugal 12,210; Italy 10,420.
Pumice		933	All from Greece.
Salt	274	231	United Kingdom 196.
Sulfur, refined	1,858	1,510	Greece 1,480.
Mineral fuels:			
Coal	288	407	West Germany 339.
Coke	554	371	West Germany 348.
Petroleum refinery products:			
Motor gasoline thousand 42-gallon barrels	492	477	Italy 231; Aden 164; France 58.
Aviation gasoline—do	33	58	Netherlands Antilles 40; Iran 13.
Kerosine	228	209	Italy 94; Netherlands Antilles 83.
Jet fuel—do	230	163	Aden 93; France 28.
White spirits and solvents—do	3	3	United Kingdom 0.8; Netherlands Antilles 0.7.
Gas oil—do	373	610	Italy 289; Aden 102; Saudi Arabia 63.
Fuel oils including diesel—do	909	712	Italy 398; Spain 130; Turkey 122.
Liquefied petroleum gas—do	51	64	Italy 33; Greece 30.
Lubricating oil and grease—do	33	21	United Kingdom 16; United States 2.
Other, including pitch, wax, and asphalt—thousand 42-gallon barrels	103	98	India 30; Indonesia 26.

Source: Department of Statistics and Research, Ministry of Finance, Nicosia, Statistics of Imports and Exports for 1964; May 1965.

COMMODITY REVIEW

METALS

Chromite.—Exports of chromite in 1964 more than doubled those of 1963 because world marketing conditions were better, although prices remained relatively low. In a barter agreement signed between the Governments of Cyprus and Czechoslovakia in February 1965, chromite was specifically mentioned as one of the raw material exchange items. A similar agreement was signed between the Governments of Cyprus and Bulgaria on April 19, 1965.

During 1964 Hellenic Mining Co. of Cyprus acquired the Cyprus Chrome Co. holdings which had been idle for several years. It appears that production as well as export of chromite in Cyprus is on an upswing after the very low production level in 1964.

Copper.—Two major copper producing companies, Cyprus Mines Corp. (CMC) and Hellenic Mining Co., were active during 1965.

Since the end of World War II, CMC has both extended the volume of its operations and incorporated a number of improved techniques in its ore treatment processes. Entirely dependent on exports, CMC has shipped its products to seven countries in Western Europe. High-grade nonarsenical flotation pyrites, of which CMC has been Europe's largest supplier,

have been delivered at an annual rate of between 500,000 and 600,000 tons.

Stripping of the Skouriotissa ore body, which began in 1962 in preparation for the foreseen decline in production of the Movrovouni ore body, continued in 1965, and full production was maintained.

As a result of a research program undertaken by Battelle Memorial Institute in the United States and Lurgi G.m.b.H. in West Germany, a technique was perfected by which excellent pyrite pellets can be produced from Cypriot pyrite flotation concentrate. However, no decision was taken to enter into pellet production, because the sulfur price level was uncertain.

The Hellenic Mining Co., which has been mining in Cyprus since 1948, transferred all company interest to the Greek Community of Cyprus in 1964. The production of Hellenic Mining Co. has come from two mines, Kalovassos and Tamassos. Most of the Kalovassos mine output comes from several small underground veins. Tamassos mine is one of the largest open pit operations in Cyprus. It yields noncupreous pyrites which are treated in the nearby Mitsero mill (capacity 3,600 tons per day) and shipped from Karavostassi, one of the most modern ports on the Mediterranean. At the port, 1,000 tons per hour can be loaded, and water depth at pierhead is 10 fathoms, permitting vessels of any size to dock.

NONMETALS

Asbestos.—The island's only asbestos mine, situated in the Greek Cypriot belt of the Troodos Mountain, produced about 14,300 metric tons in 1965 or 2,300 tons more than the 1964 production.

Lime.—Production of lime in 1965 has declined almost threefold from the peak year of 1963 because of the sluggishness of the country's construction industry.

The Mineral Industry of Iran

By E. Shekarchi [1]

Iran's mineral industry, marked by increased production of petroleum, chromium, manganese, and many nonmetallic minerals, set new records in 1965. Among crude petroleum producing nations, Iran, ranked sixth, and in the Middle East, it ranked third, after Kuwait and Saudi Arabia. With the expansion of chromite production, Iran has been recognized as a dependable source of metallurgical-grade ore and as a producer with an even brighter future.

The Iranian Government's income from the Consortium (Iranian Oil Exploration and Producing Co. and Iranian Oil Refining Co.) totaled approximately $514 million [2] in 1965 compared with $480 million in 1964.

The total gross national product (GNP) based on current prices was estimated at $5,638 million in 1965, slightly higher than that of 1964. This also was the case with per capita GNP which was estimated at about $221 in 1965. Approximately 200,000 people were engaged in industrial employment with the petroleum industry providing employment for about 26 percent. Unemployment fluctuated between 5 and 15 percent of the total force owing to seasonal changes. Population was estimated by the United Nations to be about 23.4 million with a 2.5-percent annual growth.[3]

The Iranian Parliament passed a petrochemical industry act in 1965, by which the National Petrochemical Co., a Government corporation, could enter into a joint venture with Iranian or foreign firms provided that 50 percent of shares in such a venture are held by the National Petrochemical Co. A further stipulation requires that any contracts negotiated be approved by the High Petroleum Council, the General Assembly of the National Iranian Oil Co., the Council of Ministers, and the joint Parliamentary Economic and Finance Committee.

In the first half of 1965, the World Bank approved two separate loans to Iran totaling $40.5 million for a road development program. This development program, it is said, will provide important access to six agricultural and two large mineral producing regions in Iran. One loan was for $32 million and the other for $8.5 million. The former loan was to be used for the construction and improvement of 1,050 miles of highway from the Afghanistan border to Bandar Abbas on the Persian Gulf and the latter was to improve feeder roads to the main highway.

Additional development work and reorganization of existing loading and storage facilities of the Iranian petroleum industry continued in 1965. The work involved expanding the depot on Kharg Island into one of the largest crude petroleum terminals, not only in the Persian Gulf, but in the world. The 10-square-mile island had a 2.5-million-barrel-per-day capacity as of January 1966.

On November 20, 1965, a new agreement was signed between the Ministry of Economy and Pomeroy (Pomeroy-Hawaiian Dredging-Morrison-Knudsen), a U.S. firm that was building a new port facility at Bandar Abbas. The contract calls for three additional commercial berths to handle 10,000-ton ships and related facilities, as well as a naval base adjacent to the

[1] Foreign minerals specialist, Division of International Activities.

[2] Where necessary, values have been converted from rials (Rls) to U.S. dollars at the rate of Rls75.75 = $1.00.

[3] The Iranian calendar year begins on March 21; where information given in this chapter is on the basis of the Iranian calendar year, such years have been indicated by hyphenated years (i.e. 1963-64).

port. These additions will double the originally planned facilities and will cost about $7.6 million, all of which will be financed by the Iranian Government. With approximately 30 percent of the previous contract work completed, it was estimated that with newly announced additions, the port will be completed within 5 years.

PRODUCTION

Production of crude petroleum in 1965, with a 10-percent increase over the 1964 level, and an increased production of natural gas (22.7 percent higher than that of 1964) were the most remarkable achievements in the mineral industry of Iran during the year. Among the nonmetals, production of barite and cement apparently leveled off to supply the domestic demand, while with the introduction of the new petrochemical and fertilizer industry, output of sulfur is expected to increase substantially.

Chromite production was up 25 percent and since there has been difficulties with the supply from African sources, Iran has gained more status as a world source of metallurgical-grade ore. Not much change was reported in manganese production, whlie lead ore production showed a 13-percent increase over that of 1964. With the first steel plant of Iran in the planning stage, an intensive search and increased production activities in iron ore occurred in 1965. Iron ore production reached a new high of 59,000 tons. Copper ore production attained a new peak with about 70-percent increase over the 1964 production level.

Table 1.—Iran: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Chromite	r 74,000	r 90,000	100,000	120,000	150,000
Copper ore (3 to 4 percent copper)	5,000	5,000	5,200	5,200	8,835
Iron ore—thousand tons	42	8	r 21	21	60
Lead:					
Content of concentrate	15,000	10,000	10,000	15,000	17,000
Ingots (smelter output)	1,304	400	e 500	NA	NA
Manganese ore	2,100	r 1,000	3,000	3,000	3,500
Zinc, content of concentrate	13,500	7,500	e 10,000	r e 15,000	e 15,000
Nonmetals:					
Barite	19,000	15,000	20,000	r e 72,000	72,000
Cement, hydraulic—thousand tons	745	e 745	e 745	r 745	e 785
Ochre	8,330	8,000	8,700	9,000	e 10,000
Salt—thousand tons	145	269	345	e 345	345
Sulfur e	20,000	15,000	20,000	105,000	110,000
Mineral fuels:					
Coal—thousand tons	200	200	e 200	e 200	274
Coke—do	20	e 20	e 20	e 20	e 20
Natural gas—million cubic feet	296,646	324,281	364,928	r 415,400	509,900
Petroleum:					
Crude—thousand 42-gallon barrels	431,654	481,903	538,098	618,731	678,213
Refinery products: [1]					
Gasoline—do	18,946	22,630	23,629	22,515	23,660
Kerosine—do	13,811	15,441	16,139	18,507	15,378
Jet fuel—do	4,248	5,787	7,286	7,497	9,763
Distillate fuel oil—do	19,263	22,870	22,262	21,094	22,035
Residual fuel oil—do	45,928	52,032	60,611	66,229	68,092
Liquefied petroleum gas—do	64	81	68	73	NA
Lubricating oil—do	133	135	178	247	306
Bitumen—do	1,813	1,424	1,078	1,227	1,105
Other—do	2,680	3,294	1,190	1,412	1,339
Total—do	106,886	123,694	132,441	138,801	141,678

r Revised. e Estimate. NA Not available.
[1] Output of Abadan and Kermanshah refineries only; excludes output of Masjed-e Soleyman, Naft-e Shah, Alborz, and other topping plants, some small part of which may have been sold.

TRADE

In the Iranian calendar year beginning March 20, 1964, among the leading export items crude petroleum set a peak and as usual led all other commodities, with a total of approximately $1,110 million, which was about $298 million, or 36 percent, higher than in the previous year. Quantitatively, lead ore and concentrates, manganese ore, and zinc ore exports showed increases of about 58 percent, 121 percent, and 195 percent, respectively. Of nonmetals, export of cement was marked by a 48-percent increase, while that of coal and lignite decreased about 120 percent in 1964 compared with that of 1963.

The export of fertilizers was especially noticeable because for the first time the Iranian petrochemical industry, which be-

Table 2.—Iran: Exports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal destinations, 1964–65
Metals:				
Antimony	-------	-------	60	All to India.
Chromite, 48 percent Cr_2O_3	73,758	91,245	124,478	Japan 36,650; France 27,100; Netherlands 23,658.
Copper, all forms	7	-------	68	West Germany 32; India 28.
Iron and steel:				
Iron ore	4,900	2,000	5,318	Czechoslovakia 3,768; United Kingdom 1,550.
Scrap	716	3,365	6,178	All to Japan.
Other	337	280	30	Kuwait 22; Afghanistan 3.
Lead and alloys:				
Ore and concentrate	30,527	28,498	44,284	U.S.S.R. 26,212; Belgium 12,770; United Kingdom 4,500.
Ingots	507	-------	-------	
Manganese ore	250	12,142	26,855	Norway 6,990; Netherlands 6,500; Czechoslovakia 6,000.
Zinc ore	15,210	25,101	74,234	United Kingdom 26,750; Belgium 24,574; U.S.S.R. 10,610.
Nonmetals:				
Cement	r 815	68,396	101,410	Oman 66,046; Kuwait 24,400; Afghanistan 8,564.
Chalk	254	771	481	Oman 324; Dubai 126.
Clays	2,686	107	1,464	Dubai 949; Kuwait 266.
Fertilizer materials	10	121	10,178	All to Republic of South Africa.
Gypsum	4,161	4,067	2,559	Kuwait 2,086; Oman 406.
Lime	81	-------	267	All to Kuwait.
Ochre and earth colors	r 5,647	11,832	10,816	France 6,000; United Kingdom 2,100.
Salt	1,986	2,470	3,390	Oman 1,664; Dubai 1,007.
Stone, building [2]	8,240	20,136	15,349	Kuwait 7,411; Italy 1,804; Oman 1,577.
Sulfur	87	10	1	All to Kuwait.
Mineral fuels:				
Coal and lignite	617	253	115	Iraq 76; Kuwait 29.
Petroleum:				
Crude thousand 42-gallon barrels	335,428	384,772	427,794	Japan 73,300; India 30,060; Netherlands 29,685; West Germany 28,163.
Refinery products:				
Gasoline ----------do----	22,774	16,273	17,593	Australia 2,882; Malaysia 2,387; Mozambique 1,563.
Kerosine ----------do----	6,275	[3] 10,651	12,861	Indonesia 4,390; Malaysia 1,618; Philippines 1,090.
Gas oil ----------do----	10,777	8,454	8,971	Pakistan 1,337; United Kingdom 1,298; Indonesia 873.
Diesel oil ----------do----	4,226	3,589	2,939	Pakistan 640; French Somaliland 369; Malaysia 317.
Fuel oil ----------do----	44,721	47,989	54,070	United Kingdom 9,495; Japan 9,347; French Somaliland 5,068.
Asphalt ----------do----	601	467	543	Ethiopia 109; Pakistan 90.
Total ----------do----	89,374	87,423	96,977	

r Revised.

[1] Data are for Iranian calendar years beginning March 20 of year indicated.

[2] Includes 3,148 metric tons of marble in 1962–63; 2,224 metric tons in 1963–64; and 2,249 metric tons in 1964–65.

[3] Includes 5,153,000 barrels of kerosine and 5,498,000 barrels of jet fuel.

Source: Foreign Trade Statistics of Iran.

gan limited operation only a couple of years ago, entered the international market.

Imports of industrial metals and minerals were valued at about $92.4 million, of which about $80.5 million were spent on iron and steel. The total value of nonmetals imports in 1964 was approximately $72 million.

Table 3.—Iran: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	Principal sources, 1964–65[1]
Metals:				
Aluminum and alloys:				
Ingots	1,859	1,937	3,654	United States 1,341; Canada 837; Norway 658.
Semimanufactures	r 1,866	1,502	2,292	West Germany 506; Yugoslavia 363; United Kingdom 273.
Copper and alloys:				
Ingots	409	1,221	507	Rhodesia 221; United Kingdom 142.
Semimanufactures	7,185	4,302	4,468	Yugoslavia 1,425; Iraq 594; West Germany 476.
Gold, all forms—troy ounces	[2] 1,993	NA	[3] 56,521	All from United Kingdom.
Iron and steel:				
Cast iron and ferroalloys	6,708	2,668	19,465	United Kingdom 9,929; West Germany 6,324
Scrap	r 2,943	5,092	5,736	Kuwait 2,892; Oman 1,183; Qatar 857.
Ingots	473	173	466	All from West Germany.
Semimanufactures	330,417	368,082	509,985	West Germany 173,466; United Kingdom 55,088; Japan 42,546.
Lead and alloys:				
Ingots	38	60	373	West Germany 337; United Kingdom 29.
Oxides	219	242	232	United Kingdom 71; Denmark 35.
Semimanufactures	r 265	329	506	West Germany 408; U.S.S.R. 45.
Nickel, all forms	329	306	211	Italy 174; West Germany 19.
Platinum—troy ounces	r 257	1,318	450	All from United Kingdom.
Silver—do	r 108,859	39,608	48,998	United States 32,182; United Kingdom 15,465.
Tin and alloys:				
Ingots—long tons	r 205	276	216	Malaysia 185; United Kingdom 25.
Semimanufactures—do	152	9	113	United Kingdom 84; West Germany 24.
Titanium, all forms	98	118	309	West Germany 146; United States 90.
Zinc and alloys:				
Zinc oxide	298	456	319	Netherlands 175; United Kingdom 65.
Semimanufactures	r 912	97	271	United Kingdom 172; West Germany 50.
Nonmetals:				
Abrasives	r 349	650	825	West Germany 294; United Kingdom 127.
Asbestos	r 2,518	1,722	2,765	Canada 1,883; United Kingdom 285.
Cement—thousand tons	26	23	24	United Kingdom 5,096; Japan 3,453; West Germany 3,737.
Clays [4]	21,933	3,186	3,446	Italy 698; France 525; West Germany 464.
Fertilizer materials:				
Nitrogenous	5,288	7,623	4,781	West Germany 4,233; U.S.S.R. 493.
Phosphatic	17,293	17,311	14,101	Tunisia 5,750; Italy 4,878; Belgium 2,403.
Potassic	715	1,501	700	All from Italy.
Mixed	r 22,818	23,359	19,794	West Germany 11,876; Italy 6,696.
Graphite	43	44	46	West Germany 31; Taiwan 15.
Mica, all forms	1,110	1,234	668	United Kingdom 601; West Germany 57.
Sulfur	15,745	6,619	273	France 144; West Germany 94.
Talc	462	88	82	India 41; France 20.
Mineral fuels:				
Petroleum refinery products:				
Lubricating oil thousand 42-gallon barrels	178	58	--------	

r Revised. NA Not available.

[1] Source: Foreign Trade Statistics of Iran, March 21, 1964–March 20, 1965.

[2] Jewelry gold not included.

[3] Includes unworked (lumps, bars, ingots, cast and powder).

[4] Includes kaolin, fire clay and drilling mud.

COMMODITY REVIEW

METALS

Chromite. — Chromite production advanced to a new high of about 150,000 metric tons, 25 percent greater than 1964 production. A twofold output increase by 1967 was forecast for both main producing companies, Esfandegeh Mining Co. and Faryab Mining Co. Apparently good quality of the hard lumpy metallurgical-grade ore and a favorable chronium-iron ratio has placed Iranian chromite in great demand in the world market. Among the most interested customers for Iran's chromite, Japan ranked first, followed by France, West Germany, and Australia. By overcoming transport and loading difficulties by 1967, Iran's chromite producers expect to claim an even larger share of the world market.

Copper. — Exploration for copper was continued by the Geological Survey of Iran during 1965, both in producing mines and in the three separate mineralized regions, Azerbaijan, Sistan, and Kerman. No findings of substantial interest were reported; however, exploration was scheduled to continue in 1966.

Iron and Steel.—It was announced in the first part of 1965 that construction of Iran's first rolling mill had begun in Khuzestan, 10 kilometers south of Ahwas. The participants in the project are said to include: A West German firm, Demag A.G., with 9-percent equity which will handle the engineering work; a U.S. firm, Philipp Brothers Corp., with 31-percent interest; the Industrial and Mining Development Bank of Iran with 15 percent; Iranian industrialists, the Rezai brothers, with a 40-percent equity; and other Iranian private shareholders with 5 percent. The mill was slated to be completed in 20 months at a cost of about $8 million. The initial annual capacity reportedly would be 75,000 metric tons with provisions for increase to 100,000 metric tons annually.

After considering proposals submitted by West Germany, Czechoslovakia, the United States, and the U.S.S.R. for development of Iran's steel industry, Government officials found the Soviet proposal advantageous to Iran. A tentative agreement was signed in the latter part of 1965 by which the U.S.S.R. agreed to supply an integrated steel mill, expenses of part of a gas pipeline to the Soviet border, and a machine tool plant. In exchange, Iran was to supply the U.S.S.R. with $911 million worth of natural gas during the next 15 years.

The steel mill will have an initial annual capacity of 500,000 to 600,000 tons of steel which is to be doubled in the second phase and is to go into production in 1968. The machine tool plant is to have an operational capacity of 25,000 metric tons annually. The gas pipeline is to be built from the Iranian gas reservoir in oilfields to Astara, a small port on the Iran-Soviet border on the midwestern shore of the Caspian Sea.

According to press reports, part of the 1963 French credit of $61 million will be used to cover the foreign exchange costs of Shah Abbas dam on the Zayandeh Rud River, 100 kilometers west of Isfahan. The Shah Abbas dam will provide an adequate supply of water for the Isfahan steel mill as well as for irrigation purposes. A contract was signed between the Government and a consortium of three French companies (Enterprises Campenon - Barnard S.A., Etablissements Billiard, and Société Française d' Entreprises de Dragages et de Travaux Publics S.A.) for the construction of the dam at an estimated cost of $33 million.

Lead and Zinc.—Systematic exploration of the lead-zinc district near Yazd in west-central Iran by the Iranian Ministry of Economy and the U.S. Agency for International Development (AID), and private mine developments by the British firm Rio Tinto Co. Ltd., resulted in a conspicuous increase of lead-zinc ore exports from Iran in 1965. As reported in 1964, drilling work had confirmed 35 million metric tons of reserves containing 4.0 percent lead and 11 percent zinc in four deposits which have been systematically explored. A map accompanying an AID publication [4] indicated that at least 48 different lead-zinc deposits have been recognized in Iran, primarily in the west-central and north-central sections of the country. Elimination of transportation problems could make Iran a significant source of lead and zinc for the international market.

[4] Wright, Wilford S. Lead and Zinc in Iran. Agency for International Development. 231 pp.

NONMETALS

Barite.—Iran's barite producers, Sherkat Sahami Magcobar-e-Iran (Magcobar Iran S.A.) and Iran Barite Co. enjoyed another successful year of operations as a result of the country's oil industry drilling activities. Magcobar Iran S.A. was founded in 1959 by Magnet Cove Barium Corp. Ltd. and Iranian private companies, while Iran Barite Co. was formed in 1962.

Most of the barite deposits in Iran are of the replacement type, along fractures and faulted planes. Barite deposits occur either as narrow lenses or pods and veinlets.

Fertilizer Materials. — Construction of Iran's first fertilizer plant, north of Shiraz on the Shiraz-Isfahan highway, began in 1959, and the facility was inaugurated in the latter part of 1964. The plant, wholly owned by the Iranian Government, was the first enterprise in the country outside of the petroleum industry to use natural gas commercially as a feedstock. Gas is brought to the plant by a 260-kilometer pipeline from the Gach Saran oilfield. Daily production of the plant reportedly would be 120 metric tons of urea and 120 metric tons of ammonium nitrate.

National Petrochemical Co. (NPC), a subsidiary of the National Iranian Oil Co., concluded an agreement with Allied Chemical Corp. of the United States, calling for formation of a 50-50 partnership to set up major petrochemical facilities near Bandar Shahpour, a port on the northeastern tip of the Persian Gulf. The initial phase of the petrochemical complex will involve an investment of $100 million to build a plant to produce daily 1,000 tons of ammonia, 1,000 tons of sulfur and mixed fertilizers, and an unspecified quantity of urea. Future expansion envisaged will permit production of melamine, methanol, formaldehyde, and other chemical compounds. Feedstock natural gas for the complex will come from Masjid-e Suleyman oilfield. Construction of the plant is expected to start in early 1966 and completion is scheduled for 1968.

No detailed information on the phosphate deposits found in the Zagros range in 1964 were available. Apparently the Geological Survey team was examining the finds with a hope to prove a substantial reserve. Unconfirmed reports also indicated a new phosphate occurrence in the Gorgan region in northern Iran.

Glass Sand.—The Pan American Corp. of New York and the Industrial Mining and Development Bank of Iran signed an agreement in July of 1965 for the establishment of a sheet glass plant near the city of Kazvin. The plant is expected to produce 10,000 to 13,000 tons of sheet glass annually. Proven reserves of high quality raw material (95 percent SiO_2) near Kazvin reportedly is estimated to be 3 million metric tons.

MINERAL FUELS

Petroleum.—Most of Iran's exports of petroleum were made through the major trading companies that hold shares in the Consortium (Iranian Oil Exploration and Producing Co. and Iranian Oil Refining Co.).

While total export of Iranian crude oil and products has increased more than fivefold over the past 10 years, exports of products alone have increased at only about half that rate; thus the proportion of the products to total exports has accordingly decreased from 40 percent in 1955 to only 19 percent in 1964.

Table 4.—Iran: Summary of petroleum exports (Consortium)
(Thousand 42-gallon barrels)

Year	Crude oil	Products	Total exports	Products as percent of total
1955	61,767	40,517	102,284	40
1956	105,819	76,087	181,906	42
1957	141,830	103,341	245,171	42
1958	178,585	99,279	277,864	36
1959	212,656	101,443	314,099	32
1960	246,285	109,993	356,278	31
1961	305,181	92,409	397,590	23
1962	338,373	109,629	448,002	24
1963	388,404	111,441	499,845	22
1964	460,273	109,936	570,209	19

Consortium.—Aside from setting a record by producing 2 million barrels of oil on 1 day (August 2, 1965), and averaging 1,808,000 barrels per day in 1965, the Consortium's most noticeable achievement during the year was the impressive progress of the scheme known as The Cham Project, whereby Kharg Island and Bandar Mashur port, both in the Persian Gulf, will become Iran's most important ports for oil exports. By the end of the year, construction work at Kharg Island on 11 new tanks, each capable of holding 0.5 million barrels, was well advanced. Progress on extending the jetty from an L-shape to a T-shape continued during the year. The jetty, when completed, will provide 10 berths with sufficient depth of water and loading facilities to handle future supertankers.

Another achievement of the Consortium was the successful completion of 170 kilometers of 42-inch-diameter pipeline from Agha Jari to Ganaweh and of two additional 30-inch-diameter submarine lines from Ganaweh to Kharg Island, a distance of 43 kilometers. Reportedly loading of Agha Jari crude oil through new facilities at Kharg Island began in November 1965.

During 1965, a net total of 662.6 million barrels of crude oil was produced, a 9.2 percent increase over 1964. Agha Jari remained the largest producing field throughout the year, with an average daily output of 833,000 barrels; Gachsaran was second with 509,000 barrels per day, followed by Ahwaz field. Other fields operating throughout 1965 included Masjid-e Suleyman, Lali, Haft Gel, Naft-e Safid, Pazanun, Kharg, Bibi Hakimeh, and Karanj. During the latter part of 1965, the Marun field was placed on production at an initial rate of 20,000 barrels per day.

Extensive development activities in 1965, including completion of 18 development wells, of which 5 were development-delineation and reservoir observation wells at Bibi Hakimeh, 4 at Marun, 3 at Karanj, 1 at Faris, 2 at Rag-e Safid, 1 at Paznun, 1 at Agha Jari, and 1 at Gachsaran. During 1965, the Consortium completed work on 50 drilling and workover wells, of which 36 were producers with an initial production potential of 399,000 barrels per day.

Total drilled footage in 1965 for exploration and development was reported to be 34,601 feet and 157,702 feet, respectively. In Kupal, a significant new field, two exploration wells were drilled with positive results, while the exploration well at Darquain was found to be nonproductive.

The Consortium's Abadan refinery throughput for 1965 totaled 18,561,000 metric tons. Approximately 80 percent of the total refinery products were exported by the trading companies to various countries throughout the world and the remainder were delivered to the National Iranian Oil Company (NIOC) for Iran's domestic consumption.

By developing and expanding programing procedure through increased use of computers, Iranian Oil Refining Company was able in 1965 to offer a wider product-yield choice for a given crude run. By this means, the Abadan refinery will be able to better tailor its product yield to market demands.

The construction and testing of the new 26-inch hot block oil line between Abadan and Bandar Mashur port on the Persian Gulf was completed in 1965, except for the pump units and heaters that are ultimately to be used.

National Iranian Oil Co. (NIOC).—In 1965, the former Iran Oil Company was revived to act as NIOC's export subsidiary. Up to the latter part of 1965, this organization exported about 3 million barrels of Darius crude oil and 7 million barrels of Bahregansar crude oil in Iran's account and, jointly with American International Oil Co., exported an undisclosed amount to joint customers.

An agreement that was signed between NIOC and Afghanistan in 1960 to supply refinery products to Afghanistan was extended in 1965; also, NIOC accepted the managing and fueling of Afghanistan's Kandhar and Kabul airports. NIOC, along with Iran Pan-American Oil Co. (IPAC), has accepted in 1965 to supply petroleum to the Madras refinery in India. Under this acceptance, IPAS will handle both marketing and transportation. Reportedly, the Indian Government agreed to import 40 million tons of IPAC crude oil over the next 20 years. The Madras refinery, a joint venture between IPAC (26 percent) and the Indian Government

(74 percent), has a 50,000-barrel-per-day capacity and is expected to be completed by 1967.

As in the past several years, NIOC, the only agent for domestic distribution and marketing of refinery products in the country, drew two-thirds of its supplies from the Abadan refinery and the remainder from the Consortium's Masjid-i Suleyman topping plant and from its own Naft-e Shah topping plant and Kermanshah refinery.

Construction work on NIOC's new refinery near Tehran, with an 80,000-barrel-per-day capacity, continued in 1965. Crude oil for this refinery will be transported by the Ahwaz-Tehran pipeline. The Tehran refinery reportedly will include an Isomex unit designed to maximize yield of middle distillates which are in great demand in northern provinces of the country.

In 1965, the activities of NIOC included drilling Alborz well No. 14 for development purposes, but operations were abandoned at 1,113 meters. Exploratory drilling was mostly in South Siah Kuh, Tange-Bijar, Pahlavi-Dej, and Eymer areas with a total of approximately 7,846 meters. NIOC's net production from Naft-e Shah was about 2,761,000 barrels which was used as feedstock in Naft-e Shah's topping plant and the Kermanshah refinery. Geologic and seismic crews of NIOC completed about 36 crew-months of investigation and mapping work in Dezful, Behbahan, Gachsaran, Kermanshah, and other parts of the county during 1965.

In the area of joint Iranian Government-private enterprise ventures, five separate agreements were signed between the NIOC and representatives of the successful bidders for offshore oil district No. 1 in the Persian Gulf. All five agreements provided for a 75-25 profit split in favor of NIOC. Under the agreement, the companies have consented to pay taxes on their 50-percent share of the crude oil produced on the basis of the posted rather than realized prices. Also, the companies agreed and paid a total of $185 million as bonus payments. The agreements with companies will run for 15 years and are renewable for three terms of 5 years each. The names of the companies, initial bonus, and approximate coverage of area are given in table 5.

It was agreed also that all exploration costs until discovery of commercial crude oil will be carried by the participating oil company. NIOC was to be liable for half of exploration cost only if the crude oil found is commercial, in which case NIOC will amortize its share by paying in crude petroleum from its one-half share of output over a period of several years.

Some of the activities of newly organized companies were as follows: Dashtestan Offshore Petroleum Co. (DOPCO) drilled one well to a depth of 2,788 meters; Iranian Marine International Oil Co. (IMINOCO) drilled two wells totaling 5,704 meters; Faris Petroleum Co. (F.P.C.) drilled one well to a depth of 2,449 meters; Iranian Offshore Petroleum Co. (IROPCO) drilled one well to a depth of 2,317

Table 5.—Iran: National Iranian Oil Company's partners [1]

Name of joint company	Partners	Initial bonus (million dollars)	Approximate area (square kilometers)
Dashtestan Offshore Petroleum Co. (DOPCO).	Royal Dutch/Shell Oil Co.	$59	6,075
Iranian Offshore Petroleum Co. (IROPCO).	Tidewater Oil Co., Skelly Oil Co., Superior Oil Co., Sunray DX Oil Co., Kerr McGee Corp., Cities Service Oil Co., Richfield Oil Co.	40	2,250
Faris Petroleum Co. (F.P.C.)_____	Bureau de Recherches Petrolieres (BRP), Societe Nationale des Petroles d' Aquitaine (SNPA), Regie Autonomes des Petrles (RAP).	27	5,800
Lavan Petroleum Co. (LAPCO)_____	Atlantic Oil Co., Union Oil Co. of California, Murphy Oil Corp., Sun Oil Co.	25	8,000
Iranian Marine International Oil Co. (IMINOCO).	Phillips Petroleum Co., AGIP/Indian Oil and Natural Gas Commission	34	7,960

[1] Petroleum Press Service. V. 32, No. 4, April 1965, p. 14.

meters; and one well was drilled to a depth of 2,912 meters by Lavan Petroleum Co. (LAPCO), which was the only announced producer among those drilled by the newly organized petroleum companies.

Iran Pan-American Oil Co. (IPAC).—IPAC drilled in Darius, Syrus, and other Persian Gulf concessions in 1965 to a total of approximately 17,019 meters. Of the total drilling, 13,161 meters was for development and the remainder was for exploratory purposes. Crude oil production of IPAC amounted to almost 6.9 million barrels compared with 1.1 million barrels in 1964, most of which was exported.

Société Iran-Italienne Des Pétroles (SIRIP).—SIRIP drilled four wells, primarily for exploratory purposes, in Palinorus, Galal, and Kuh-e Rij for a total of 3,067 meters in 1965. SIRIP's production from Bahregansar was approximately 8.7 million barrels, slightly less than that of 1964, and was mostly exported.

Natural Gas.—Iran reportedly has the largest known natural gas reserves in the Middle East, approximately 70 trillion cubic feet. A conservative estimate made in 1964 put the gases flared every day in three Iranian oilfields at about 700 million cubic feet, equivalent to about 55 million barrels of crude petroleum per year. Coordinated efforts by the NIOC and the Government of Iran to utilize properly the vast economic and industrial energy of natural gas were increased in 1965; talks were initiated on installation of an aluminum plant, petrochemical works, and additional fertilizer manufacturing facilities. Moreover, distribution and marketing of natural gas to small industry and industrial users in Iran was suggested, and a tentative agreement for export of natural gas to the U.S.S.R. was concluded.

In 1965, natural gas was utilized mostly in the Marvdasht fertilizer plant near Shiraz at the same rate as that of 1963 and 1964, approximately 40 billion cubic feet. No detailed information was available on the amount that was used in the cement and sugar factories in Fars Province in 1965.

Table 6 summarizes the natural gas production and consumption from 1961 to 1965, both by the Consortium and NIOC.

Table 6.—Iran: Natural gas production and consumption

(Million cubic feet)

Company	Year	Production	Consumption	Used, then flared [1]	Flared
Consortium	1961	294,500	34,000	69,500	191,000
	1962	322,100	36,500	70,000	215,600
	1963	362,700	40,000	68,000	254,700
	1964	413,000	41,400	80,400	291,200
	1965	507,400	42,400	80,000	385,000
NIOC (Naft-e Shah)	1961	2,100	700	----------	1,400
	1962	2,200	700	----------	1,500
	1963	2,200	700	----------	1,500
	1964	2,400	700	----------	1,700
	1965	2,500	700	----------	1,800

[1] Used expansively to drive turbines and then flared.

The Mineral Industry of Iraq

By James A. West [1]

The long established petroleum industry continued to maintain Iraq among the world's leading producers of liquid fuels in 1965 despite extremely limited development of oil resources and no exploration activity since 1961. The cement industry increased production and exports during 1965. Small quantities of salt, minor building materials, natural bitumen, gypsum, and clays were the only other mineral products.

In 1965, Iraq's crude oil output, averaging nearly 1.322 million barrels per day, was about 4.3 percent of total world production and 15.2 percent of Near East output. Direct oil payments to the Government amounted to nearly $368 million in 1965, accounting for an estimated 80 percent of all Government revenues and about 22 percent of Iraq's national income. The oil industry employed directly an estimated 14,000 Iraqis, or about 20 percent of the total industrial labor force. Cement plants employed about 2,500 persons.

In June, the Government of Iraq announced that an agreement in principle had been reached with the Iraq Petroleum Companies group (IPC group) on the long-standing dispute over law 80 of December 1961 which required relinquishment of 99.5 percent of the oil concession areas long held by the IPC group. At year-end, the agreement had not been ratified by the Council of Ministers. Law 11 of February 1964, which established the wholly Government-owned Iraqi National Oil Co. (INOC) to develop and exploit oil resources in relinquished areas, was amended to establish INOC as a commercial company subject to law 88 of July 26. This amendment permits INOC greater freedom to operate as a private company while retaining the privileges of a Government entity.

The Government announced a new 5-year development plan for the period April 1, 1965, to March 31, 1970. The plan provides for total expenditures in excess of $2,000 million, of which about $1,500 million is scheduled for public sector projects. Approximately $260 million is earmarked for investment in public sector minerals industry projects. This total includes about $130 million for chemical and petrochemical industries, $75 million for oil and natural gas projects, $35 million for steel projects, and $20 million for construction materials industries.

PRODUCTION

The trend of annual gains in crude oil production each successive year continued with 1965 output exceeding that of 1964 by 4.4 percent. In 1965, cement output increased by nearly 20.0 percent over that of 1964. Total mineral output was valued at an estimated $880 million, with oil accounting for about 98 percent of this total.

TRADE

Petroleum exports in 1964 were valued at almost $789 million and accounted for 95 percent of the value of all exports. The only other significant mineral export was cement which was valued at $5.4 million.

Essentially all metals and most industrial minerals are imported. In 1964, total mineral imports were valued at $30.3 million. Iron and steel, valued at $25.6 million, continued as the most significant mineral commodity imported.

[1] Chief specialist, Near East-South Asia, Division of International Activities.

Table 1.—Iraq: Production of metals and minerals

Commodity	1961	1962	1963	1964	1965
Nonmetals:					
Cement—thousand metric tons	937	921	[1] 901	1,075	1,285
Salt—metric tons	36,956	38,450	e 40,000	e 40,000	e 40,000
Mineral fuels: Petroleum:					
Crude—thousand 42-gallon barrels	365,594	366,832	422,581	r 461,961	[2] 482,461
Refinery products:					
Gasoline—do	2,230	2,394	2,315	r 2,586	2,703
Kerosine and jet fuel—do	2,938	3,015	3,228	r 3,958	4,049
Distillate fuel oil—do	2,906	3,034	3,110	r 3,943	4,472
Residual fuel oil—do	6,900	7,044	6,796	r 7,732	8,565
Lubricants and other—do	165	162	e 681	r 618	544
Asphalt—do	264	226	e 226	r 180	79
Liquefied petroleum gas—do	11	21	34	r 48	e 60
Refinery fuel and loss—do	1,443	1,656	989	r 1,595	e 722

e Estimate. r Revised.
[1] For year Oct. 1, 1962 to Sept. 30, 1963.
[2] Includes an estimate of 5,000,000 barrels from Government-operated Naft Khaneh and Quayara fields.

Table 2.—Iraq: Exports and reexports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum	21	NA	
Iron and steel	481	NA	
Lead	321	NA	
Nonmetals:			
Cement	289,381	377,576	Kuwait 171,550; Saudi Arabia 75,314; Bahrain 60,965; Ceylon 31,500; Qatar 17,847.
Other (reexport only)	10	--	
Mineral fuels: Petroleum:			
Crude—thousand 42-gallon barrels	403,058	440,994	United Kingdom 87,366; France 64,006; Italy 51,291; Netherlands 42,824; West Germany 38,741; Japan 22,903; Republic of South Africa 13,671; Spain 13,503; Belgium 12,814; Australia 10,179; Turkey 8,721; Brazil 8,413; Portugal 7,086.
Refinery products:			
Asphalt—thousand 42-gallon barrels	68	--	
Gasoline, distillate, and other refined products—do	e 164	199	Syria 57.

e Estimate. NA Not available.

COMMODITY REVIEW

METALS

Iron and Steel.—Feasibility studies for a proposed iron and steel plant were nearing completion. The studies, being performed by Koppers International Co. for the Government, were to determine whether to proceed with construction of the plant. Some scrap iron was exported from Iraq during the year. Scrap iron exports were banned in 1958 in the expectation that an Iraqi steel mill would be constructed and would require all local scrap.

NONMETALS

Cement.—Operating under Government ownership, the six cement plants increased output in 1965 by nearly 20 percent over that of 1964. This increase resulted from rising internal consumption and higher export demand. Consumption during 1965 amounted to 65 percent of the total output of 1,285 million tons. Total 1965 cement production was valued at an estimated $18 million.

On April 1, the Cement Marketing Bureau & Construction Materials Co. was formed by the Government Economic Establishment. The new company is responsible for marketing and exporting all locally produced cement and was authorized to import white cement and other construction materials. The company began

Table 3.—Iraq: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys:			
Ingots, including scrap	210	--	
Semimanufactures	1,891	2,466	Lebanon 858; U.S.S.R. 735; West Germany 394; mainland China 202; Belgium 179; United Kingdom 65.
Copper, all forms	1,077	508	Belgium 257; United Kingdom 77; West Germany 68; Sweden 39.
Iron and steel:			
Pig iron, powder, and scrap	1,219	--	
Cast iron	15,378	17,675	United Kingdom 9,981; West Germany 1,890; U.S.S.R. 1,412; India 964; Italy 800.
Semimanufactures	137,205	178,290	Belgium 69,361; U.S.S.R. 41,712; West Germany 15,717; India 11,069; United Kingdom 10,070; Japan 7,002.
Lead:			
Ingots, including scrap	3	--	
Semimanufactures	62	--	
Magnesium	2	--	
Nickel	21	--	
Tin:			
Ingots, including scrap--long tons	123	--	
Semimanufactures--do	75	--	
Zinc:			
Ingots, including scrap	61	--	
Semimanufactures	44	--	
Other	13	--	
Nonmetals:			
Asbestos	868	2,784	Republic of South Africa 2,035; Canada 749.
Barite	18	--	
Cement	7,988	10,162	United Arab Republic (Egypt) 3,624; Denmark 2,447; Japan 1,995; Belgium 1,013; West Germany 846.
Chalk and earth colors	457	--	
Clay	473	--	
Fertilizers, mineral and chemical:			
Nitrogenous	8,471	9,263	West Germany 7,947; Italy 1,012; Netherlands 304.
Phosphatic and potassic	1,840	961	United States 645; West Germany 306.
Gypsum and lime	153	--	
Steatite	330	--	
Stone:			
Building stone	1,341	--	
Crushed stone and sand	1,166	--	
Sulfur	2,119	--	
Other	66	--	
Mineral fuels:			
Coal and coke	1,398	--	
Petroleum refinery products:			
Lubricating oils--42-gallon barrels	11,130	33,656	Netherlands 21,945; United Kingdom 5,201; West Germany 2,961; United States 2,170.
Asphalt and bitumen--do	5,320	--	
Tar and pitch--do	679	--	
Waxes--do	2,495	--	
Petroleum jelly--do	283	--	
Gasoline--do	728	--	

negotiating for imports of these materials with several foreign suppliers.

Ceramic Materials.—On March 3, the Ministry of Industry announced that a contract for engineering design and construction supervision of the ceramics plant at Ramadi was awarded to the Japanese Consulting Institute. An economic feasibility study on the project prepared by this firm was approved by the Government on January 6. The $6 million plant will utilize dolomite and other local raw materials to produce an estimated 34,000 tons of ceramics annually.

On November 15, a contract was awarded to an Iraqi firm for the first stage of construction of the long-delayed glass factory at Ramadi. This project is being built with Soviet economic and technical assistance.

Sulfur.—On January 31, the Government awarded a contract to the U.S. firm Ralph M. Parsons Co. and its British subsidiary, Powergas Co., for construction of a sulfur extraction plant at Kirkuk. The plant will

process about 78 million cubic feet per day of sour natural gas from the Kirkuk oilfield and recover an estimated 100,000 tons of elemental sulfur annually. The estimated cost of the plant is $23 million. Completion of the plant is scheduled for May 1, 1967.

MINERAL FUELS

Petroleum and Natural Gas.—As of January 1, 1966, the proved crude oil reserves of Iraq were reported [2] as 25 billion barrels, or nearly 7 percent of total world reserves.

Except for relatively minor quantities of oil production from the Government-operated Naft Khaneh field in the Khanaqin area along the Iraq-Iran border and heavy oil for the Quayara asphalt plant, all crude oil was produced from seven fields operated by the Iraq Petroleum Companies group (IPC group). The Kirkuk, Bai Hassan, and Jambur fields in the Iraq Petroleum Co. (IPC) area produced at an average rate of 908,925 barrels per day, accounting for nearly 70 percent of total output. The giant Kirkuk field continued to produce at sustained rates in excess of 800,000 barrels per day in response to a highly successful water injection program. Water injection at an average rate of about 1.2 million barrels per day during 1965 permitted record high production while maintaining reservoir pressure. The Rumaila and Zubair fields of Basrah Petroleum Co. (BPC) in southern Iraq together produced nearly 373,000 barrels per day, with Rumaila accounting for 80 percent of the total. Output of the Ain Zalah and Butmah fields of Mosul Petroleum Co. (MPC) remained steady at about 26,000 barrels per day.

Exploration by the IPC group companies remained suspended in 1965. Drilling operations were limited to development drilling with only two rigs active throughout most of the year.

An estimated 900 million cubic feet per day of associated natural gas was produced in Iraq during 1965. About 5 percent of this gas was utilized in field operations or supplied to the Government power-generating stations at Dibbis and Najibiyah.

Government oil agencies took actions to implement a number of major petroleum and natural gas processing and distribution projects. Construction of a 4,000-ton-per-year grease plant at the Daura refinery was nearing completion at yearend. A contract was awarded to Societa Nazionale Metanodotti Progetti (SNAM) of Italy for construction of a 36,000-ton-per-year lubricating oil plant to supplement the existing 25,000-ton-per-year plant at the Daura refinery. The estimated cost of the plant is $11.6 million and completion is scheduled for the latter part of 1967. Techno-export of Czechoslovakia was awarded a contract for construction of a hydrogen desulfurization plant at Daura to process 7,000 to 12,500 barrels per day of kerosine. The U.S. firm, Kellogg International, submitted specifications for expansion of the Daura refinery capacity from 50,000 to 75,000 barrels per day of petroleum products. Construction of a 12- to 16-inch-diameter loop on the existing Kirkuk-Baghdad oil pipeline was begun in October to increase pipeline capacity to meet refinery expansion requirements.

On September 20, bids were opened for construction of two 300-kilometer parallel pipelines (a 16-inch natural gas and an 8-inch liquids line) from Kirkuk to Baghdad, a natural gas distribution system in Baghdad, and a 12,000-barrel-per-day liquefied petroleum gas (LPG) plant at Taji near Baghdad. SNAM submitted a low bid of $16.5 million for the pipelines while Société Parisienne pour l'Industrie Electrique of France was low bidder at $9.8 million on the LPG plant. Other projects under active consideration were an oil products storage depot at Zaafaraniya, refineries at Basra and Mosul, and various petrochemical projects.

[2] Oil and Gas Journal. V. 63, No. 52, Dec. 27, 1965, p. 83.

The Mineral Industry of Israel

By E. Shekarchi [1]

Although Israel is not richly endowed with mineral resources, its mineral industry continued to receive significant attention in 1965. The mineral industry is a foreign exchange earner in this country where exports are still only about half the imports.

The potash industry of the Dead Sea area, phosphate production in the Oron fields, and the diamond-cutting industry remained the most significant mineral industry contributors to the Israeli economy. Preliminary data on production of other minerals—cement, gypsum, elemental bromine, bromine compounds, and copper—suggest that the total production value increased in 1965. The high level of economic activity was maintained, the total gross national product (GNP) at current prices rose to approximately $3,670 million,[2] and per capita GNP, based on 1962 prices, rose to about $1,165 in 1965.

As immigration fell to less than 2,000 persons per month, the labor force was believed to have grown about 3.2 percent as compared with 4.5 percent growth in 1963 and 1964. The labor force employed in the country was about 856,000. The mineral industry and mining claimed about 25 percent of the labor force in 1965.

In June 1965 a loan agreement amounting to about $4.4 million was signed by U.S. Agency for International Development (AID) and Timna copper mines of Israel.

It was announced in the latter part of 1965 by the Director of the Ministry of Commerce and Industry that an investment of about $7 million in petroleum and chemical enterprises would be made during the next 3 years.

The Geological Survey of Israel extended its research into the mineralized areas rather than concentrating on known mineral deposits. Results of their activity included locating new sand deposits for glass manufacturing, discovery of 3 million metric tons of copper ore in the Timna area, and discovery of phosphate reserves in in the Negev region.

According to Israeli Government, the World Bank and some private U.S. banks agreed in the first part of 1965 to finance three projects at the Dead Sea Works Ltd. in Sedom. These projects consisted of the following: An addition to present potash production facilities bringing annual capacity to 1 million tons; construction of a $4 million plant to produce magnesite, the first of its kind in Israel; and an investment of $1.7 million in a plant which will produce 7,000 metric tons of chlorine annually.

In the latter part of 1965 it was announced that Haifa Refiineries Ltd. was actively seeking cooperation of a U.S. partner to erect a new refinery at Eilat, which is Israel's port on the Red Sea, with an initial annual throughput capacity of 250,000 metric tons.

An agreement was signed between Israel's Ministry of Commerce and Industry and an unidentified U.S. firm to erect a phosphoric acid plant in the Arad region of the northern Negev.

PRODUCTION

New production records were set in 1965. The most noticeable increases were 44 percent in copper, 22 percent in cement, and 29 percent in phosphate rock production. The production of potash almost doubled in 1965 when compared with that of 1964. Total refinery production set a new high in 1965, almost three times the 1961 level.

[1] Foreign mineral specialist, Division of International Activities.

[2] Where necessary, values have been converted from Israel pounds (I£) at the rate of I£1=US$0.33.

Table 1.—Israel: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964 e	1965 e
Metals:					
Copper [1]	6,253	5,909	7,720	r 7,000	10,000
Steel	62,000	80,000	82,798	83,000	84,000
Nonmetals:					
Bromine:					
Elemental	4,400	1,800	2,941	3,800	4,500
Compounds	3,300			NA	NA
Cement—thousand metric tons	e 846	920	1,021	1,030	1,258
Clays, all types	38,670	39,000	27,302	30,000	40,000
Crushed stone—cubic meters	800,000	3,700,000	NA	NA	NA
Gypsum	80,000	74,000	76,000	80,000	110,000
Lime	NA	NA	NA	110,000	130,000
Marble—cubic meters	5,000	5,500	NA	7,500	7,500
Phosphate, beneficiated	220,000	210,000	300,000	300,000	388,000
Potash (KCl)	140,000	153,000	170,000	260,000	500,000
Salt	44,000	45,000	52,000	52,000	55,000
Silica sand	26,000	34,000	50,000	40,000	50,000
Mineral fuels:					
Natural gas—thousand cubic feet	99,821	374,851	347,097	1,068,000	2,705,000
Peat—thousand metric tons	8	e 10	e 12	e 14	14
Petroleum, crude—thousand 42-gallon barrels	1,133	1,126	1,091	1,435	1,469
Refinery products:					
Gasoline—do	1,613	2,350	2,674	2,948	3,647
Kerosine—do	1,592	1,833	1,884	2,333	2,670
Distillate fuel oil—do	3,022	4,157	5,433	5,500	8,211
Residual fuel oil—do	4,124	6,028	7,379	8,700	13,952
Other—do	827	1,149	NA	478	793
Refinery fuel and loss—do	582	817	NA	1,072	NA
Total refinery products—do	11,760	16,334	NA	21,031	29,273

e Estimate. NA Not available.

[1] Metal content of cement copper exports, calculated on basis of 75 percent copper.

TRADE

In 1964, gross export earnings from minerals and metals, excluding petroleum and diamond, were about $16 million in comparison to $12.5 million in 1963, or an increase of 28 percent. The gross value of diamond exports amounted to $137.6 million compared with $116 million in 1963. Among metals and concentrates, copper showed the leading export value, about $10 million, and among nonmetals, fertilizer accounted for approximately $2 million.

Gross imports of minerals and metals in 1964 were at the same rate as those of 1963, except there was a $10 million (or 18 percent) increase in iron and steel imports in 1964. Israel's foreign trade publications do not give the countries of destination and origin for exports and imports; however, from the available information, the United States, United Kingdom, and the European Economic Community apparently remained the principal trading partners.

COMMODITY REVIEW

METALS

Copper.—The Timna copper mine, 25 kilometers north of Eilat, continued its successful operation producing 10,000 tons of copper cement in 1965, an increase of 3,000 tons over the 1964 level. Plans were being studied to raise annual output to 15,000 tons of copper cement in 1966 by improving mining techniques and ore recovery. In this connection a loan agreement between AID and Timna copper mines was signed. The loan, said to be about $4.4 million, is repayable in dollars in 20 years.

NONMETALS

Diamond.—In 1964, the gross value of polished diamond exports reached about $138 million compared with $116 million in 1963, a rise of 19 percent. The annual rate of growth of diamond exports, on the

Table 2.—Israel: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum, all forms	1,663	1,039	West Germany 189; Netherlands 183; Belgium 126.
Copper, all forms	12,908	16,611	Japan 7,488; Spain 5,006; Hungary 2,660.
Iron and steel:			
Scrap	1,218	1,441	West Germany 911; Netherlands 321.
Semimanufactures	r 7,726	6,950	Turkey 1,554; Bulgaria 1,363; Poland 423.
Lead, all forms	r 81	965	NA.
Zinc, all forms	r 775	266	NA.
Nonmetals:			
Asbestos	475	233	NA.
Bromine and compounds	995	p 1,240	NA.
Cement	116,246	108,000	Italy 53,000; Spain 22,000; Cyprus 16,000.
Clays	6,943	12,895	West Germany 10,726; Netherlands 1,447.
Diamond, worked—carats	1,152,787	1,244,300	United States 443,000; Belgium 157,000; Netherlands 121,000.
Fertilizer materials:			
Nitrogenous	r 20	NA	NA.
Phosphatic	r 156,637	159,647	Japan 38,517; Bulgaria 29,751; Netherlands 22,291.
Potassic	r 9,018	5,195	Viet Nam, not otherwise specified 2,199; Tanganyika 1,409; Greece 1,000.
Lime	213	210	NA.
Mineral fuels: Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	452	659	NA.
Kerosine—do	21	--	
Diesel oil—do	2,409	3,072	NA.
Bitumen, including natural asphalt—do	34	28	NA.
Total refinery products—do	2,916	3,759	

p Preliminary. r Revised. NA Not available.

Source: State of Israel, Ministry of Commerce and Industry. Foreign Trade Export Bulletin, Yearbook 1964. 459 pp.

Table 3.—Israel: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964
Metals:		
Aluminum:		
Unwrought	4,500	6,774
Semimanufactures	1,306	1,407
Copper:		
Unwrought, including alloys	1,848	2,191
Semimanufactures	6,015	7,408
Gold, all forms—troy ounces	31,820	20,382
Iron and steel:		
Pig iron	r 20,248	43,434
Scrap and others	6,455	1,627
Ferromanganese and spiegeleisen	5,084	2,748
Other ferroalloys	455	388
Semimanufactures	r 399,509	497,099
Lead:		
Unwrought	r 858	1,149
Semimanufactures	r 808	895
Magnesium, all forms	r 26	56
Nickel, all forms	89	88
Platinum, all forms—troy ounces	2,765	1,286
Silver, all forms—do	r 388,402	664,475
Tin, all forms—long tons	118	151
Zinc, all forms	r 3,230	3,082
Other metallic ores	124	315
Nonmetals:		
Abrasives, natural, except diamond	107	114
Asbestos	r 9,294	7,557
Barite	r 484	462
Cement	r 11,787	r 11,849

Table 3.—Israel: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity		1963	1964
Nonmetals—Continued			
Chalk		35	NA
Clays:			
Refractory		934	867
Other		6,813	11,321
Cryolite and chiolite		NA	64
Diamond:			
Unworked	thousand carats	2,962	2,972
Bort	do	440	542
Industrial	do	213	442
Feldspar		1,665	2,081
Fertilizer materials:			
Nitrogenous		r 794	2,052
Other		5	7
Fluorspar		768	521
Fuller's earth		r 3,771	4,599
Graphite		43	52
Magnesite		r 961	1,466
Mica		89	107
Quartz and quartzite		280	787
Steatite and talc		1,182	1,441
Sulfur		r 50,301	70,165
Other		554	423
Mineral fuels:			
Coal		12,934	18,562
Peat briquets		412	246
Coke, including semicoke		7,638	8,685
Coal tar and derivatives		1,062	NA
Petroleum:			
Crude	thousand 42-gallon barrels	e 19,941	20,755
Refinery products:			
Diesel oil	do	r 38	47
Lubricants, including grease	do	r 128	133
Paraffin and waxes	do	38	40
Total refinery products	do	204	220

e Estimate. r Revised. NA Not available.
[1] Does not include portland cement.

Source: State of Israel, Ministry of Commerce and Industry. Foreign Trade, 1964. 162 pp.

whole, surpassed that of all other exports together. Rough diamond took first place in imports for industry with regard to import value. In 1964, imports of rough diamond totaled $117 million compared with $100 million in 1963.

Table 4.—Value of export of polished diamond [1]
(Million dollars)

	1960	1961	1962	1963	1964
Gross exports	60.9	70.3	89.3	116.0	137.6
Returned exports	4.5	5.3	5.5	12.0	19.4
Net exports	56.4	65.0	88.8	104.0	118.2
Returned exports as percent of gross exports	7.3	7.6	7.5	10.3	14.1
Net exports as percent of total exports	26.7	27.2	30.9	30.7	33.6

[1] Source: State of Israel, Ministry of Commerce and Industry, Foreign Trade, 1964. pp. 162.

The spectacular expansion which characterized Israeli export of polished gem diamond over the past decade has apparently slowed down. It is possible that the saturation point has been reached for the type of stones being worked and that a new diversification in the industry has to be expected.

Phosphate.—Production of phosphate from the Oron fields increased, amounting to 388,000 tons of beneficiated ore.

It was announced in the latter part of 1965 that an agreement had been concluded between the Israeli Ministry of Commerce and Industry and a U.S. firm for building a phosphoric acid plant in the Arad region of the northern Negev. The U.S. interest will provide marketing and technical knowl-

edge and the Israeli Government will furnish basic services such as railways, road construction, and water supply. Detailed information on the capacity of the plant and the investment involved were not available.

Potash.—Preliminary steps for expansion of existing potash installations and for erection of new plants for magnesite and chlorine production were taken by the Dead Sea Works Ltd. in Sedom. The potash project will include an additional plant with a capacity from 0.6 million to 1 million tons. The new projects envisage a magnesite plant with an annual capacity of 30,000 tons and a chlorine production plant with an annual capacity of 7,000 tons to be ready by 1967.

It was reported that construction of new potash evaporation basins in the southern part of the Dead Sea was nearing completion in the latter part of 1965.

MINERAL FUELS

Petroleum.—*Crude Oil and Natural Gas.*—Apparently the amendment to Israel's petroleum law that was aimed at stimulating oil prospecting produced results. Although the country has not showed rich reservoirs, capital backing for both foreign private and domestic exploration has increased rapidly, and such activities continued throughout 1965.

The economy, demanding an annual increase of 15 percent in petroleum and its products, has stimulated oil exploration because Heletz field is providing only about one-tenth of annual demand, and the chance of finding new fields seems highly possible.

One of the most aggressive of the foreign companies was Petrocana Ltd. of Montreal, operating on the basis of encouraging results of a seismic survey completed in the Israeli continental shelf area. Several promising structures in its five blockholdings were discovered. In 1965 Livingston Oil Co. of Oklahoma took a half interest in Petrocana's offshore holdings. A capital investment of about $5 million would be allotted for drilling on these properties with a spudding date set in the early spring of 1966.

Another foreign group known as Arava Corp., composed of United States Smelting, Refining and Mining Co. (50-percent share), Detroit's Max Fisher (25 percent), and the Paz, Oil and Trading Co. Ltd. (25 percent), completed a gravimetric survey on its holdings south of the Dead Sea in 1965 and were preparing background work for a detailed seismic study in 1966. Paz was also seeking exploration rights in the Dead Sea for its own company.

Natural gas from the Negev fields was used primarily as power for the tremendous potash and phosphate plant and for small industries in the Dinona-Oron-Sedom area. A growing domestic demand for petroleum and petrochemical products has stimulated new projects in both fields.

Four Israeli companies were actively searching for petroleum and gas during 1965. Lapidoth Israel Oil Prospectors Corp. Ltd. (LTOP), 56.2-percent Government-owned, has been the most successful domestic company in petroleum production. In 1965 alone, the company completed 7 producing wells out of 18 drilled. In its Heletz field complex, the only producing field in the country, LTOP has completed through yearend 41 producing wells out of 73 operations. Heletz field was found in September 1955 by LTOP. As the field developed, a complex subsurface structure evolved, and it was thought that there were three principal pools—Heletz, Kokhav, and Brur. However, reexamination of the area's structure showed that, for all practical purposes, the three pools are one, and a step-out well was planned in each area. Also in 1965, LTOP spudded a new remote wildcat well on its Ashkelon permit along the Mediterranean coast.

Naphtha Israel Petroleum Corp. Ltd. (NIPC), 62.75-percent Government-owned, has been very successful in finding natural gas. Three promising developed fields are Zohar field with eight wells and an estimated 40-billion-cubic-foot reserve, Hakanaim field with two wells and an estimated 10-billion-cubic-foot reserve, and Kidod field with two wells and an estimated 10-billion-cubic-foot reserve.

Petroleum Services Ltd. (PSL), 100-percent Government-owned, has functioned primarily by handling all Government interests in Israel's small oil area and by providing housekeeping operations.

National Oil Company, also wholly Government-owned, held a major portion of the coastal plain permits through late 1965. After spending $9 million during 5 years of

unsuccessful drilling, the operation was suspended, and all personnel and equipment were transferred to LTOP. Reportedly, the companies' permits will be farmed out to interested groups under PSL direction.

The most important element influencing exploration in Israel was the discovery of oil deep in Jurassic beds. Previously, all production was from Lower Cretaceous sands at an average depth of 4,000 to 6,000 feet, while recent findings were at depths of about 3,000 to 7,000 feet. It should be pointed out that gasfields in the northeastern Negev region of Arad are also in Jurassic beds at depths of 3,000 to 6,000 feet.

Refineries and Pipelines.[3]—Haifa Refineries Ltd. plant underwent a rapid expansion by boosting its daily capacity to 92,000 barrels in 1965. A further expansion to boost daily capacity to 110,000 barrels was planned for 1966. Sonol Refineries Ltd. in the south on the Gulf of Aqaba continued the construction of its new refinery at Eilat. The completion date reportedly is set for the latter part of 1966, and daily plant capacity should be 5,000 barrels.

In 1965, capacity of the 413-kilometer, 16-inch Trans-Israel pipeline from Eilat to Haifa was increased to 74,000 barrels per day. Through installation of new pumping facilities, a target capacity of 100,000 barrels per day was planned and a subsequent increase to 120,000 barrels per day was envisioned.

[3] Oil and Gas Journal. V. 64, No. 13, Mar. 28, 1966, pp. 119–120.

The Mineral Industry of Jordan

By E. Shekarchi [1]

Phosphate rock remained the most important mineral product of the Hashemite Kingdom of Jordan in 1965. The country's output constituted over 1 percent of the total world production for the year. The importance of phosphate rock production to the domestic economy was evident in that it accounted for about 29 percent of the value of total exports or $6.6 [2] million in 1964. Jordan's gross national product (GNP) was estimated at $415 million in 1965, only slightly above that of 1964, and the value of mineral production was estimated at about $16 million.

Out of a total labor force estimated at 440,000, approximately 25 percent remained unemployed simply because of a lack of jobs. Moreover, persons of Jordanian birth, including semiskilled and skilled workers who have been unable to find jobs in Jordan continued to find employment in neighboring oil-producing Arab States. The mineral industry employed only a small fraction of the total labor force.

The mineral industry, dominated by production of phosphate rock, cement, and petroleum refinery products, in recent years has played a much more significant role in the country's economy than in the past, chiefly as a result of expansion programs completed during the last 5 years. In 1965, the country's only cement plant furnished virtually the entire domestic demand. Phosphate rock output again increased, and with new developments in transportation facilities, including harbor expansion, further increases seem feasible.

On August 10, 1965, Jordan and Saudi Arabia signed an agreement in Amman on the modification and demarcation of the international boundary between these countries. By this agreement, the length of the Jordanian coast on the Gulf of Aqaba was extended to 25 kilometers, an increase of 19 kilometers; however, if petroleum is discovered in this extension area, the countries would share the income equally.

Jordan retained its membership in the General World Association of Raw Phosphate Producers which now has a membership comprised of Jordan, Tunisia, and Morocco. Prices of phosphate were raised in June 1964 by agreement among the members; however, no attempt has yet been made for market allocation among the producing countries.

After Jordan's House of Representatives on April 19, 1965, passed a law creating a regional organization to carry out the Arab plan for exploiting the Jordan River and its tributaries, the Arab Jordan River Board announced in the latter part of 1965 that the site for the Mukheibeh Dam was approved and an order was issued to the contractor to begin work. Details of plans concerning the reservoir, electric potentiality, and irrigation possibilities were not available except that the Othman Contracting Co. of the United Arab Republic (Egypt) was the lowest bidder and was going ahead with work.

To extract potash from the Dead Sea, the Arab Potash Co., owned by the Jordanian Government, contracted with Jacobs Engineering Co. of Pasadena, Calif., to do a feasibility study. In 1965, for the first time an iron and steel company was established in Jordan by the Government.

[1] Foreign mineral specialist, Division of International Activities.

[2] Where necessary, values have been converted from the Jordanian dinar (JD) at the rate of JD1=U.S.$2.80.

PRODUCTION

Phosphate rock extraction reached a new high in 1965, over 36 percent greater than in 1964. Available preliminary information, however, indicated that the high level of production in 1965 was not reflected in export sales because inadequate facilities for handling and storage at Aqaba remained a bottleneck.

Although no major mineral deposits were discovered in 1965, prospecting was continued for new deposits and known deposits of iron, manganese, and copper were test drilled.

Table 1.—Jordan: Production of minerals

Commodity [1]	1961	1962	1963	1964	1965
Nonmetals:					
Cement—thousand metric tons	223	235	285	308	341
Gypsum—metric tons	7,000	8,660	e 8,700	NA	NA
Marble—square meters	15,400	15,600	11,450	1,800	e 2,000
Phosphate rock—thousand metric tons	422	r 681	r 614	e r 630	858
Salt—do	19	19	18	20	--
Mineral fuels: Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	254	328	NA	e 450	460
Kerosine—do	242	432	NA	e 511	595
Distillate fuel oil—do	236	812	NA	e 813	954
Residual fuel oil—do	230	256	NA	e 506	600
Other—do	34	104	NA	e 406	410
Total (including refinery fuel and losses)—do	1,154	2,032	[2] 2,235	2,685	2,979

e Estimate. r Revised. NA Not available.
[1] In addition to commodities listed, Jordan also produces limestone for cement manufacture.
[2] Estimate, based on reported 10 percent increase in refinery output.

TRADE

Despite increases in production of phosphate rock, Jordan's most important mineral export, the country in 1965 apparently had a negative trade balance in mineral commodities of about the same magnitude as in 1964, when the value of mineral imports exceeded that of mineral exports by about $8.9 million.

In 1964, the total export value of nonmetallic minerals from Jordan amounted to $6.9 million, or about 28 percent of total export and about $2.5 million more than in 1963. Among various export commodities, phosphate rock export practically doubled in 1964 and was again a main exchange earner while cement, marble, and granite rock followed. Yugoslavia assumed first place as a destination for Jordanian phosphate rock exports, followed by India and Turkey.

Imports of metals, nonmetals, and mineral fuels were valued at approximately

Table 2.—Jordan: Exports of minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Nonmetals:			
Cement	6,874	11,708	All to Saudi Arabia.
Granite and other stone n.e.s.	4,147	2,003	Lebanon 1,029; Other countries 974.
Lime	342	335	All to Saudi Arabia.
Marble	921	1,062	Iraq 446; Lebanon 419; Syrian Arab Republic 183.
Phosphate (dry)	357,137	627,074	Yugoslavia 154,375; India 123,608; Turkey 96,290; Czechoslovakia 79,440; Italy 44,962.
Salt	1,260	NA	
Mineral fuels: Petroleum refinery products:			
Gasoline—42-gallon barrels	4,223	NA	
Kerosine—do	443	NA	

NA Not available.

Source: Ministry of Finance, Department of Statistics. Statistical Yearbook, No. 15, 1964, 600 pp.

Table 3.—Jordan: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum, semimanufactures	300	211	Mainland China 117; West Germany 66; Italy 10.
Copper, semimanufactures	130	252	Netherlands 110; West Germany 39.
Iron and steel, semimanufactures	60,602	57,185	Belgium 8,154; France 6,179; West Germany 5,845.
Lead, unwrought	286	--	
Tin, all forms, long tons	34	19	United Kingdom 17; Malaya 2.
Zinc, all forms	101	--	
Nonmetals:			
Asbestos	293	--	
Cement	8,202	4,279	Denmark 2,970; United Arab Republic (Egypt) 670.
Coal	504	617	Lebanon 606; West Germany 11.
Fertilizer materials:			
Nitrogenous	4,594	2,563	West Germany 954; Austria 630; Italy 500.
Phosphatic	1,733	2,245	Lebanon 790; West Germany 494; East Germany 445.
Potassic	1,512	4,080	West Germany 2,787; United Kingdom 349; Italy 297.
Marble	463	359	Italy 313; Lebanon 24.
Sulfur	[1] 2,832	2,356	United States 1,288; West Germany 707.
Mineral fuels: Petroleum:			
Crude, thousand 42-gallon barrels	2,426	2,648	All from Saudi Arabia.
Refinery products:			
Gasoline, do.	10	45	United States 23; Netherlands Antilles 12.
Kerosine, do.	126	85	United States 48; Saudi Arabia 16.
Distillate fuel oil, do.	235	49	All from Saudi Arabia.
Lubricants, do.	33	41	United States 15; Netherlands 11.
Asphalt, do.	--	NA	
Total, do.	404	NA	

NA Not available.
[1] Includes 692 colloidal sulfur.

Source: Ministry of Finance, Department of Statistics. Statistical Yearbook. No. 15, 1964, 600 pp.

$7.4 million, $920,000, and $7.5 million, respectively. Among the metals, iron and steel ranked first with about $7 million, while copper and aluminum semimanufactures imports were valued at about $184,000.

COMMODITY REVIEW

METALS

Iron and Steel.—Jordan Iron Industries Co., the country's first steel company, was established in 1965 with a capital of $1.4 million. The company ordered an Italian-built steel plant which will use scrap and pig iron and will have an annual capacity of 40,000 metric tons of finished iron and steel, including concrete reinforcing rods, wire, and door and window frames.

Manganese.—Following recommendations of West German geologists who completed preliminary studies of the Wadi Dana manganese deposits in 1965, the Jordan Development Board reportedly planned further exploration of the area aimed at finding additional ore bodies and to determine if the property is economically feasible. Initial unconfirmed reports listed an indicated reserve of 65,000 tons of unspecified grade.

NONMETALS

Phosphate Rock.—Available information indicates that phosphate rock exports in 1965 did not increase as significantly as did production, reversing the stock change pattern of 1964 when exports exceeded output by a sizable margin, permitting a reduction of excessive unsold stocks.

The Jordan Phosphate Co. board of directors, which was dismissed by the King in 1963, reconvened and the company was returned to private shareholders in 1964. At that time, the capitalization was expanded and the government's share was increased to slightly more than 50 percent. In August 1965, the cabinet approved a

plan for the consolidation of all phosphate mining operations in Jordan, including Rusaifa and Al Hasa, merging them into one company. The cabinet also approved capitalization for the expanded company at a level of $8.4 million and authorized a board of directors composed of five government and four stockholder representatives.

Several companies from abroad had expressed an interest in participation in exploitation and marketing of Jordanian phosphate; however, by the end of 1965, no agreement was reached.

The consulting firm of Ralph M. Parsons Co. of Los Angeles, Calif., which showed a proven reserve of 30 million tons of commercial grade phosphate (average bone phosphate of lime (BPL) content of 68 percent) in the first stage of its contract, continued with the second stage of the contract and was completing the design of mining facilities at Al Hasa. The new Al Hasa plant reportedly will have a capacity of 500,000 metric tons annually, expandable to 1 million tons.

Potash.—The Arab Potash Co. contracted with Jacobs Engineering Co. of Pasadena, Calif., to do a feasibility study on development of a plant at the southern tip of the Dead Sea for extraction of potash.

Arab Potash Co. is a cooperative enterprise of the Governments of Jordan, Kuwait, Lebanon, and Saudi Arabia, as well as private Jordanian capital. The feasibility study, which includes detailed estimates of the potential output volume and market value, was to be completed by mid-1965; however, through the latter part of 1965, detailed results of the study were not made available to the public.

By yearend the Economic Minister opened talks at the World Bank headquarters, seeking a loan to help finance a potash project in Jordan. Apparently the scheme will cost about $60 million, of which Jordan was asking World Bank to finance $30 million and U.S. Agency for International Development to supply $15 million.

Sulfur.—Preliminary information indicated that the Ministry of National Economy gave concession rights to a newly established firm, Jordan Sulfur Mines Development Co. Ltd., for exploitation of sulfur deposits in the Jordan valley. The deposits are parallel to the Jordan River, extending from 4 to 21 kilometers north of the Dead Sea. Estimated reserves were reported to be approximately 400 million tons with a recoverable sulfur possibility of 35 million tons. By yearend, no sulfur production was reported.

MINERAL FUELS

Petroleum.—John W. Mecom (Mecom Oil Co.), an independent U.S. oil operator who has a 40-year concession agreement for petroleum exploration with drilling obligation of 2,000 feet annually, continued wildcat drilling in 1965. The first and second holes drilled to depths of 12,468 and 4,648 feet, respectively, were abandoned. The third wildcat at Azzum, 30 kilometers northwest of Nablus, had to be abandoned at a depth of only 1,800 feet due to adverse conditions. In the latter part of 1965, the company reportedly was surveying a fourth well site, 14 kilometers southeast of Kacak.

The crude throughput in the petroleum refinery at Zerka during 1964 was 2,648,000 barrels, a 9-percent increase over that of 1963.

The Mineral Industry of Kuwait

By James A. West [1]

Kuwait retained its position as the leading crude oil producing country of the Near East and ranked fourth among world oil-producing nations in 1965. The small sheikdom accounted for about one-fourth of area production and nearly 7 percent of world petroleum supply during 1965.

The petroleum industry remained the mainstay of Kuwait's economy, providing more than 90 percent of all Government revenues and foreign exchange earnings. In 1965, total Government revenues from petroleum operations in Kuwait and in the Kuwait-Saudi Arabia Neutral Zone were an estimated $608 million. This sum does not include additional revenues which may accrue to the Government if it ratifies a 1964 agreement with Kuwait Oil Co. (KOC) providing for the expensing of royalty oil payments and other changes in tax-accounting procedures. The failure of the National Assembly to ratify this agreement, and subsequent lack of a solution, was the most serious problem between oil concessionaires and the Government throughout 1965.

The Government continued to encourage and participate in projects to expand and diversify the industrial development of the economy. In early 1965, the National Industries Law was promulgated by the National Assembly. The law requires licenses for all processing and manufacturing activities and offers Government assistance in low-interest loans, site allocation, and tariff protection.

Substantial progress was made in the construction of new plants and facilities in the Government-sponsored Shuaiba industrial complex. The Kuwait Chemical Fertilizer Co. (owned 60 percent by Kuwait Petrochemical Industries Co. and 20 percent each by British Petroleum Co. and Gulf Oil Corp.) continued construction of four petrochemical fertilizer plants to produce ammonia, urea, ammonium sulfate, and sulfuric acid at rates of 400 to 500 tons per day. Construction of a 95,000-barrel-per-day oil refinery by the Fluor Corp. for Kuwait National Petroleum Co. (KNPC) (60 percent Government-owned) was begun late in 1965. Construction of a cargo pier, powerplant, salt water conversion plant, and other ancillary facilities progressed satisfactorily.

PRODUCTION

Crude oil production at a record rate of 2,169,600 barrels per day in 1965 maintained Kuwait as the leading producer in the Near East. Nevertheless, this rate was only 2.2 percent greater than that of 1964 and Kuwait's share of total area output declined from about 28 percent in 1964 to 26 percent in 1965. Refinery runs averaged 220,037 barrels per day in 1965.

Minor construction materials and building stones are produced but quantitative data are not usually reported. Available data for 1964 show that 12,067 tons of lime and 32.8 million sand lime bricks were produced from local materials. These materials were valued at about $1.9 million.

[1] Chief specialist, Near East-South Asia, Division of International Activities.

Table 1.—Kuwait: Production of petroleum and petroleum products
(Thousand 42-gallon barrels)

Commodity	1961	1962	1963	1964	1965
Crude petroleum	600,226	669,284	705,471	774,816	791,903
Refinery products:					
Gasoline	1,410	2,505	2,167	1,625	1,901
Jet fuel	105	151	204	202	224
Kerosine	311	300	317	345	335
Distillate fuel oil	10,312	16,072	18,604	20,284	19,766
Residual fuel oil	47,648	37,292	38,419	41,455	41,878
Liquefied petroleum gas		956	1,774	2,886	4,030
Other refinery products	224	5,302	5,101	4,853	16,154
Refinery fuel and loss	2,423	8,303	7,483	6,457	539
Total output, including refinery fuel and loss	62,433	70,881	74,069	78,107	84,827

TRADE

Kuwait continued to supply more than 10 percent of the world petroleum export demand in 1965. These exports, from Kuwait proper (excluding those from the Kuwait-Saudi Arabia Neutral zone), were valued at about $1,200 million.

Available trade statistics show that total imports declined in value from $324 million in 1963 to $322 million in 1964. Imports of metals and minerals were valued at about $25 million. Iron and steel products accounted for nearly three-fourths this value while cement made up most of the remaining one-fourth. About 10 percent of total imports are reexported.

In July 1965, the Kuwait National Assembly voted against participation by Kuwait in the Arab Economic Unity Agreement and Common Market.

Table 2.—Kuwait: Exports of mineral fuels
(Thousand 42-gallon barrels)

Commodity	1964	1965	Principal destinations, 1965
Crude petroleum	696,675	710,299	Italy 190,950; Japan 127,073; United Kingdom 103,979; France 59,710; Netherlands 40,312; United States 28,310; Malaya and Singapore 22,437; Australia 18,636; Aden 17,022; Belgium 15,701; West Germany 14,713; Canary Islands 8,904.
Refinery products:			
Light distillate	9,157	12,164	Japan 4,193; United Kingdom 2,445; United States 1,290; Australia 958.
Distillate fuel oil	19,217	18,696	United Kingdom 3,209; Netherlands 3,030; Malaya and Singapore 2,067; South Korea 1,111; Canary Islands 897; Japan 538.
Residual fuel oil	15,329	17,079	Japan 4,634; Malaya and Singapore 3,036; Canary Islands 2,161; Netherlands 692.
Liquefied petroleum gas	2,852	4,031	Japan 3,945; Canary Islands 79.
Total	46,555	51,970	
Bunkers, all flags:			
Diesel oil	789	656	(1).
Residual fuel oil	26,037	24,044	(1).

[1] Not distributed.

Table 3.—Kuwait: Imports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals: Iron and steel	95,288	108,746	Belgium 35,285; mainland China 14,972; Japan 14,121; Italy 8,925; United Kingdom 7,995; Poland 7,787; U.S.S.R. 7,084.
Nonmetals:			
Cement	429,674	369,536	Japan 133,666; U.S.S.R. 124,923; Poland 86,192.
Gypsum and lime	826	NA	NA.
Mineral fuels: Lubricants—thousand 42-gallon barrels	12	12	NA.

NA Not available.

COMMODITY REVIEW

METALS

Iron and Steel—Imports continued to supply all iron and steel required for Kuwait's booming construction industry. The Kuwait Pipe Co. operated throughout the year producing spiral welded pipe utilizing imported steel skelp. The Kuwait National Industries Co. (half Government-owned) considered a joint-venture proposal by Japanese steel companies for construction of a 30,000-ton-per-year welded-pipe plant in Kuwait.

NONMETALS

Construction Materials.—The Kuwait National Industries Co. was formed to service construction material needs and encourage development of light industry. This company, owned 50 percent by the Government and 50 percent by private investors, operates a sand-lime brick plant, a concrete block and pipe plant, and an asbestos-cement works. The company proceeded with plans to construct a 150,000-ton-per-year cement plant in Kuwait to use indigenous limestone resources. Bids for construction of the $3 million plant are being evaluated.

MINERAL FUELS

Petroleum.—With an estimated proved crude oil reserve of 62,500 million barrels [2] as of January 1, 1966, Kuwait ranked first among nations having developed oil resources. The reserve declined by 500 million barrels during the year because exploration and development drilling did not provide additions to reserves sufficient to offset the record producing rate. Nevertheless, the reserve-to-production ratio of about 80:1 was among the largest in the world.

KOC, owned jointly by British Petroleum Co. Ltd., and Gulf Oil Corp., continued as the only oil producer in Kuwait proper in 1965. As in the past, most oil was produced from the Burgan and Magwa-Ahmadi fields where about 415 producing wells are completed in Cretaceous sandstone reservoirs at depths of 3,500 to 5,000 feet. Significant quantities of oil were produced from about 62 deeper wells (8,000 to 10,000 feet) completed in Cretaceous reservoirs of the Raudhatain, Minagish, Sabriya, Umm Gudair, and Bahra fields. The KOC refinery at Mina al-Ahmadi continued to operate at about 90 percent of its rated capacity of 250,000 barrels per day. The liquefied petroleum gas (LPG) processing facilities of the refinery were expanded to meet rising LPG export demands.

In July, KOC effected a 10-percent pay increase for its approximately 5,500 employees, about one-fourth of whom are Kuwait nationals and 35 percent are Arabs from neighboring countries. KOC payments to employees and contractors and local purchases of materials contributed more than $40 million to the local economy.

The Government-controlled Kuwait National Petroleum Co. negotiated an agreement with HISPANOIL (a group of Spanish industrial, banking, and oil interests) to exploit the oil concession areas relinquished by KOC in 1963. Although final terms of the agreement have not been ratified by the Kuwait Government, it is reported that the Spanish Government as-

[2] Oil and Gas Journal. V. 63, No. 52, Dec. 27, 1965, p. 83.

sured the company 25 percent of Spain's crude oil import market for a period of 15 years, beginning in 1970. Exploration costs will be borne by HISPANOIL until commercial oil production is established. Thereafter, KNPC will compensate HISPANOIL for 51 percent of the costs and participate in ownership of the joint company on this basis.

Natural Gas.—More than 1.1 billion standard cubic feet per day of natural gas was produced in association with oil recovery. Nearly 10 percent of this gas was utilized by local powerplants and light industry. Approximately 90 million cubic feet per day was reinjected in the Burgan field for reservoir pressure maintenance. KOC completed the construction of a 50-million-cubic-foot-per-day injection plant in the Raudhatain field and began construction of a 150-million-cubic-foot-per-day plant for injecting Burgan gas into the main reservoir of the Minagish field.

The Mineral Industry of the Kuwait-Saudi Arabia Neutral Zone

By James A. West [1]

Petroleum remained the only mineral industry activity of the Neutral Zone during 1965. The small treaty zone, held jointly by Kuwait and Saudi Arabia, ranked fifth in oil production among Near East producing States, accounting for nearly 4.5 percent of the area's output. The Governments of Kuwait and Saudi Arabia together received about $70 million in oil revenues from Neutral Zone operations in 1965. About 2,400 persons were employed by the operating companies.

The Governments of Kuwait and Saudi Arabia assumed administration of separate areas of the Neutral Zone in accordance with their 1964 agreement. Discussions were continued in efforts to reach agreement on the ownership of offshore islands and fixing of boundaries of the zone.

PRODUCTION

The record crude oil production rate of 362,424 barrels per day in 1965 was divided almost equally between the offshore and onshore areas of the Neutral Zone. This rate was only 0.7 percent greater than that of 1964. Onshore production declined about 2.4 percent while offshore output increased by 4.1 percent. In August, a tanker fire destroyed the offshore oil-loading jetty at Khafji. This accident and reduced export demand limited offshore production throughout most of the year.

About 98,000 barrels per day of onshore crude oil was partially refined to produce fuel oil and naphtha. These products are frequently mixed with crude oil prior to export.

[1] Chief specialist, Near East-South Asia, Division of International Activities.

Table 1.—Kuwait-Saudi Arabia Neutral Zone: Production of petroleum and petroleum products

(Thousand 42-gallon barrels)

	1961	1962	1963	1964	1965
Crude petroleum	65,153	89,224	114,533	131,416	132,285
Refinery products:					
Residual fuel oil	e 14,600	25,971	27,390	28,694	31,984
Other refinery products	e 1,180	1,885	2,707	2,200	2,891
Refinery fuel and loss	e 520	967	955	910	841
Total output refinery products	e 16,300	28,823	31,052	31,804	35,716

e Estimate.

TRADE

Neutral Zone trade consists of crude petroleum and refinery products exports only. These exports were valued at an estimated $185 million in 1965.

Table 2.—Kuwait-Saudi Arabia Neutral Zone: Exports of petroleum and petroleum products

(Thousand 42-gallon barrels)

Commodity	1963	1964	1965	Principal destinations, 1965
Crude petroleum	92,908	108,792	108,707	Japan 83,272; United States 8,950; Italy 7,246; West Germany 3,623; Netherlands 1,728.
Refinery products:				
Residual fuel oil	15,692	17,876	16,393	Japan 9,828; Singapore 3,082; Netherlands 901.
Other refinery products	566	797	629	All to Japan.
Bunkers (residual fuel oil)	3,100	3,598	2,340	All flags.

COMMODITY REVIEW

MINERAL FUELS

Petroleum.—No new additions to proved crude oil reserves were reported in 1965 and reserves declined to an estimated 12.4 billion barrels [2] at yearend.

The American Independent Oil Co. (Aminoil) and Getty Oil Co. (Getty) continued to obtain most of their joint onshore production from the multizone Wafra field. The south Fuwaris field, placed on production in mid-1964, was found to have a very limited sustained producing capacity. Although facilities to produce up to 20,000 barrels of oil per day were installed, current production from eight wells is 5,000 barrels per day. Almost two-thirds of the 408 producing wells in the Wafra field are now equipped with pumping units or are shut in. A number of the shallow Eocene wells were deepened and recompleted in the Ratawi zone. An exploratory deep test well was drilled to below 12,000 feet with negative results.

The Japanese-owned Arabian Oil Co. Ltd. (AOC) production was entirely from the Khafji field. Only 44 of the 54 wells completed in the field are connected to production facilities. Most of these wells are completed in the Bahrain sandstone zone at an average depth of 5,500 feet while a few are completed in the Ratawi limestone at an average depth of 7,200 feet. Several of the Bahrain zone wells were deepened for dual completion in the Ratawi zone. AOC used temporary loading facilities, which were installed in a remarkably short time following the tanker fire in August, and began reconstruction of the permanent oil-loading jetty. Completion of permanent facilities is scheduled for August 1966.

The Aminoil refinery in Kuwait and the Getty refinery in the Neutral Zone processed an average of 97,852 barrels per day of crude oil. Fuel oil and naphtha were the only products produced. Construction was nearing completion on modifications to the Getty refinery which will permit this plant to produce a wider range of products. Construction of AOC's 30,000- barrel-per-day Ras al-Khafji refinery was progressing on schedule.

[2] Oil and Gas Journal. V. 63, No. 52, Dec. 27, 1965, p. 83.

The Mineral Industry of Lebanon

By James A. West [1]

Lebanon has traditionally served as a leading entrepôt for an extensive area of the Near East. Its strategic location, enterprising merchants, and liberal commercial and trade policies have made trade the most important sector of the national economy. About 30 percent of the national income, estimated at $628 million in 1964, was derived from this sector. The domestic mineral industry was a relatively insignificant contributor to the national economy, but Lebanon continued to serve as a transit and export point for Iraqi and Saudi Arabian crude oil. Petroleum refining, cement manufacture, and iron and steel rerolling are the major mineral industries of the country. These industries employed an estimated 20 percent of the industrial labor force of about 60,000 workers and accounted for about 7 percent of the gross national product, estimated at $950 million, in 1964.

PRODUCTION

The general trend of annual increases in the production of metal and mineral products in recent years continued during 1965. Total mineral output in 1965 was valued at an estimated $69 million. Petroleum refinery output accounted for about 48.5 percent of this total, while cement, iron and steel semimanufactures, and salt accounted for about 27, 22, and 2.5 percent of the total, respectively.

[1] Chief specialist, Near East–South Asia, Division of International Activities.

Table 1.—Lebanon: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Iron and steel:					
Iron ore	-----	2,000	-----	-----	-----
Pig iron	-----	-----	600	-----	-----
Semimanufactures e	-----	20,000	36,000	45,000	55,000
Nonmetals:					
Cement	874,451	861,000	e 896,000	896,618	990,000
Lime e	7,500	9,000	35,000	26,650	40,000
Salt e	17,000	16,000	19,000	20,000	24,000
Mineral fuels:					
Bitumen e	100	100	-----	-----	-----
Petroleum:					
Refinery products:					
Gasoline---thousand 42-gallon barrels	882	1,105	1,655	2,034	2,405
Kerosine---do	517	807	888	961	1,008
Distillate fuel oil---do	1,384	1,226	1,182	1,628	1,774
Residual fuel oil---do	2,368	2,768	3,118	4,408	5,136
Other, including liquefied petroleum gas---do	23	62	96	140	220
Refinery fuel and loss---do	241	256	669	392	443
Total output, including refinery fuel and loss---do	5,415	6,224	7,608	9,563	10,986

e Estimate.

TRADE

Lebanon continued to depend on imports for most of its mineral requirements. The relative importance of mineral commodity trade to total trade during 1964, the latest year for which statistics are available, is shown in the following tabulation:

	Value of mineral trade (million dollars)	Value of total trade (million dollars)	Share of mineral trade to total trade (percent)
Exports	7	68	10
Imports	129	431	30
Trade balance	−122	−363	--

The contributions of each of the major mineral commodity categories to total mineral trade in 1964 were as follows:

	Value of imports (million dollars)	Value of exports (million dollars)
Metals	101	4
Nonmetals	8	2
Fuels	20	1
Total	129	7

Lebanon remained a major world gold marketing center, and gold imports in 1964 were valued at $81 million or 80 percent of all metal imports. Iron and steel imports were valued at about $17 million. Fertilizer minerals, valued at about $2.5 million in 1964, were the major nonmetallic mineral import. Gem stones, cement, and marble imports were valued at about $1 million each.

COMMODITY REVIEW

METALS

Iron Ore.—The occurrence of extensive deposits of ferruginous sediments near the Cedars of Lebanon, a resort area about 25 kilometers southeast of Tripoli, has been known for centuries. Ancient Roman diggings attest to the earliest efforts to exploit these deposits. The deposits outcrop over a wide area, and reserves are probably large. However, sample analyses indicate that most of the deposits are of low grade, having less than 50-percent iron content.

From 1953 to 1962, small quantities of iron ore were mined and processed into pig iron at a nearby plant operated intermittently by the National Iron & Steel Manufacturing Co. The pig iron was produced by a special fuel oil reducing process using a rotary kiln instead of a conventional blast furnace. About 200,000 metric tons of pig iron was exported to West Germany between 1953 and 1958. Exports ceased thereafter because of increased freight rates and a decline in ore quality. The plant was operated sporadically until 1961 and produced 2,000 to 3,000 tons of pig iron annually for local consumption. Production since 1961 has been insignificant.

In recent years, a number of Lebanese firms have acquired exploration permits and conducted limited investigations to determine if the deposits could again be commerically exploited. In 1964, the National Ores Co. initiated an exploration and processing study of the deposits in an area where it holds large exploration permits. Under a consulting contract from this company, a group of Czechoslovakian technicians began preliminary field and laboratory tests. The results of their efforts are unknown.

Iron and Steel.—There were two steel processing mills in Lebanon at yearend. The Consolidated Steel Co. of Lebanon (CSL) plant at Amchit has a rolling capacity of 90,000 tons annually and, has scrap smelting facilities to produce 40,000 tons of ingots annually. The Ghandour Steel Co. plant at Tripoli has similar facilities, but the capacity of this plant is reported to be approximately half that of CSL. During 1965, both plants operated rolling mills only, utilizing imported steel ingots. The scrap smelting facilities were not operated because they proved uneconomic under prevailing marketing conditions.

Both of the plants produce mostly bars and sheets and began marketing these products in 1962. Long established importers of finished steel products provided stiff competition to the local industry. To afford some protection to the Lebanese steel industry, the Government raised the customs tariff on finished steel from 8 to 15 percent ad valorem, effective September 7, 1965.

Table 2.—Lebanon: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum and alloys:			
Unwrought	96	121	Syria 78; Italy 31; West Germany 11.
Semimanufactures	963	1,234	Iraq 707; Syria 472.
Copper and alloys:			
Unwrought	11	269	Japan 161; Netherlands 70; West Germany 25.
Semimanufactures	11	15	Saudi Arabia 6; Syria 5; Kuwait 3.
Gold and alloys—troy ounces	70,054	61,344	Kuwait 29,514; Syria 9,388; Greece 7,684; Jordan 6,173; Saudi Arabia 5,241; Switzerland 3,215.
Iron and steel:			
Iron and steel scrap	157	808	Yugoslavia 350; Belgium 295; Syria 162.
Pig iron	69	39	All to Syria.
Shot, powder, and sponge	1	4	All to Saudi Arabia.
Ferroalloys	89	585	All to Belgium.
Ingots and primary forms	37	8	All to Saudi Arabia.
Semimanufactures	8,100	9,482	Jordan 3,250; Syria 1,289; Saudi Arabia 1,064; Yugoslavia 822; Kuwait 768; United Arab Republic (Egypt) 395; Iraq 276.
Lead and alloys:			
Unwrought and scrap	-----	37	United Kingdom 20; Jordan 16.
Semimanufactures	10	32	Saudi Arabia 12; Kuwait 10; Jordan 3.
Magnesium, all forms	7	-----	
Platinum and alloys—troy ounces	4,388	405	Switzerland 148; Hong Kong 96; Belgium 84.
Zinc and alloys:			
Unwrought and scrap	25	6	All to Syria.
Semimanufactures	9	72	France 36; Netherlands 31.
Other, not otherwise specified	377	497	Belgium 192; United Kingdom 191; France 91; Japan 23.
Nonmetals:			
Asbestos, all forms	14,723	15,263	Kuwait 6,290; Syria 2,304; Libya 1,669; Saudi Arabia 1,184.
Cement	117,915	61,790	Nigeria 22,500; Liberia 10,000; Saudi Arabia 9,880; Cyprus 8,771; Sudan 5,000.
Chalk	5	-----	
Clays, all forms	1,712	1,592	Syria 565; Saudi Arabia 231; Jordan 221; Kuwait 210; Libya 160.
Earth colors	9	7	Saudi Arabia 6.
Fertilizers:			
Nitrogenous	23	685	Syria 682.
Phosphatic	13,577	13,080	Cyprus 8,150; Syria 4,128; Jordan 790.
Potassic	117	23	Qatar 22.
Gypsum	42	74	Syria 40; Kuwait 33.
Lime	6	10	Syria 7; Saudi Arabia 3.
Salt	4	-----	
Sand	399	755	Syria 608; Iraq 81; Kuwait 60.
Stone:			
Marble	527	837	Belgium 567; Iraq 107; Kuwait 95.
Gravel and crushed stone	447	533	Jordan 477; Iraq 15; Saudi Arabia 12.
Other	233	285	Kuwait 132; Iraq 98; Saudi Arabia 27.
Sulfur, refined	119	143	Jordan 132; Saudi Arabia 10.
Talc	1	1	All to Syria.
Mineral fuels:			
Bitumen, natural	19	150	All to Cyprus.
Coal, all ranks	2,176	2,245	Syria 1,292; Jordan 580; Iraq 290.
Coke, all types	387	701	Iraq 314; Jordan 181; Syria 176.
Petroleum refinery products:			
Gasoline—42-gallon barrels	-----	14,566	All aviation bunkers.
Kerosine—do	-----	92,334	All aviation bunkers.
Gas oil and fuel oil—do	2,921	2,784	All marine bunkers.
Lubricants—do	372	418	Aviation bunkers 163; Jordan 163; Saudi Arabia 27.
Liquefied petroleum gas—do	8,213	1,045	Cyprus 942.
Asphalt and other—do	91	51	Saudi Arabia 27; Jordan 9.

Table 3.—Lebanon: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Unwrought, including scrap	2,062	2,376	France 1,961; United States 225; Canada 122.
Semimanufactures	517	593	West Germany 124; Switzerland 79; Italy 72; Belgium 63; Netherlands 61; United Kingdom 51; Austria 42; United States 30.
Arsenic, oxides and acids	5	16	East Germany 5; West Germany 5; mainland China 4.
Chromium, oxides and hydroxide	2	7	West Germany 4; United Kingdom 3.
Copper and alloys:			
Unwrought	39	25	United Kingdom 8; Iraq 6; Israel 4.
Semimanufactures	510	679	Yugoslavia 217; Italy 156; France 83; Belgium 52; Austria 43; West Germany 36; United States 32.
Gold and alloys:			
Unwrought—troy ounces	1,415,661	2,271,836	United Kingdom 1,794,236; United States 289,357.
Semimanufactures—do	2,797	2,283	Japan 932; West Germany 494; Austria 482.
Iron and steel:			
Ores and concentrates	558	139	Australia 131.
Pig iron	6,113	7,150	West Germany 6,300; East Germany 838.
Ferroalloys	548	1,294	West Germany 506; France 480; Netherlands 100; U.S.S.R. 98.
Scrap and other	2,742	11,606	United Kingdom 4,852; Syria 3,200; Portugal 2,000; United States 752.
Ingots and primary forms	7	30	United Kingdom 25; West Germany 5.
Semimanufactures	208,609	217,968	Czechoslovkia 56,687; France 39,975; Belgium 38,260; U.S.S.R. 19,360; Italy 13,729; West Germany 12,785.
Lead and alloys:			
Unwrought	304	507	United Kingdom 116; United States 68; West Germany 62; Belgium 48; Netherlands 47.
Lead oxides	160	107	France 66; West Germany 10; Poland 10; Netherlands 10.
Semimanufactures	43	42	Netherlands 15; United Kingdom 11; Belgium 10.
Mercury—76-pound flasks	87	116	All from United States.
Nickel, all forms	3	3	West Germany 2; United Kingdom 1.
Platinum—troy ounces	3,039	3,057	United Kingdom 1,870; Netherlands 1,026.
Silver and alloys—do	42,667	59,839	United Kingdom 49,191; France 3,955; Netherlands 3,215; West Germany 1,646.
Titanium oxides	417	574	Finland 218; United States 134; West Germany 130.
Zinc and alloys:			
Unwrought and scrap	701	666	Belgium 641; Canada 25.
Oxides	59	60	France 31; West Germany 9; Netherlands 6; Belgium 5.
Semimanufactures	253	67	Belgium 34; Poland 22; West Germany 10.
Other metals, ores, and oxides	153	182	Syria 111; Belgium 20; West Germany 15; Japan 12.
Nonmetals:			
Asbestos:			
Crude products	2,610	3,997	Canada 1,606; Republic of South Africa 635; U.S.S.R. 528.
Semimanufactures	432	246	Yugoslavia 161; United Kingdom 26; Czechoslovakia 19; France 15; Belgium 15.
Barite	230	209	Jordan 200; West Germany 8.
Boron compounds	11	18	United States 13; France 5.
Cement:			
Hydraulic	44,885	95,117	Rumania 76,580; United Arab Republic (Egypt) 6,100; Denmark 6,009; France 4,233.
Semimanufactures	55	105	Italy 74; France 29.
Chalk	1,003	1,142	Belgium 530; France 422; Cyprus 87.
Clay and clay products:			
Crude products, all forms	1,757	1,494	United Kingdom 871; Jordan 143; West Germany 116; France 114.
Semimanufactures	6,762	9,031	West Germany 2,408; Czechoslovakia 1,276; Luxembourg 1,082; Morocco 770; France 638; Syria 601.
Corundum, artificial	2	307	France 301.
Earth colors	142	183	West Germany 99; United Kingdom 48; Belgium 23.
Feldspar and flourspar	1,104	1,253	France 1,250.

Table 3.—Lebanon: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Nonmetals—Continued			
Fertilizers:			
Nitrogenous	53,833	53,591	Italy 15,344; West Germany 15,320; United Kingdom 6,299; Chile 4,400; France 3,801; Belgium 3,422; Austria 3,050.
Phosphatic	20,622	22,064	Jordan 20,279; Italy 501; Portugal 400.
Potassic	3,545	4,670	France 2,385; West Germany 1,510; East Germany 775.
Gem stones, precious and semiprecious—thousand carats	17,685	3,035	West Germany 798; France 731; mainland China 609; India 185; Brazil 148; Italy 95.
Graphite	37	547	Canada 473; mainland China 24.
Gypsum	38,146	34,868	Kuwait 30,412; Syria 3,622.
Infusorial earths	758	662	Jordan 561; United States 90.
Lime	14	5	Saudi Arabia 3; United Kingdom 2.
Magnesite	84	257	Spain 149; Yugoslavia 100.
Mica	10	25	Italy 16; United States 4.
Quartz	651	17	United Kingdom 15.
Salt	1,122	1,462	United Arab Republic (Egypt) 1,055; West Germany 255.
Sand	102	284	Syria 254.
Stone:			
Abrasives	789	1,029	United States 720; France 283.
Marble	18,421	18,615	Italy 15,386; Belgium 500; Jordan 414; Iran 401.
Other dimension stone	2,478	2,126	Jordan 1,614; Syria 449.
Gravel and crushed stone	10,163	7,193	Italy 6,885; Jordan 204.
Other worked stone	334	300	Italy 205; Belgium 73.
Sulfur:			
Elemental	8,598	1,323	France 620; United States 354; Greece 200.
Pyrites, unroasted	10	30	All from France.
Talc	222	221	Mainland China 130; India 40; France 20; Norway 18.
Mineral fuels:			
Bitumen, natural	17,210	17,578	Italy 11,514; Jordan 5,041.
Coal, all ranks	2,162	4,529	Belgium 4,399; West Germany 100.
Coke, all types	9,098	10,413	West Germany 9,928; United Arab Republic (Egypt) 274; Belgium 200.
Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	1,757	2,000	Saudi Arabia 993; Iraq 852; Venezuela 124.
Kerosine—do	364	371	Saudi Arabia 236; Iraq 120; Italy 13.
Gas oil and fuel oil—do	3,347	3,211	Saudi Arabia 2,293; Iraq 917.
Lubricants—do	69	62	United States 23; United Kingdom 17; Netherlands 6.
Liquefied petroleum gas—do	282	366	Italy 176; Saudi Arabia 118; Iraq 42.
Asphalt and other—do	2	6	Rumania 1; U.S.S.R. 1; West Germany 1; Netherlands 1.
Total—do	5,821	6,016	

NONMETALS

Cement.—Lebanon's two cement producers, Societe des Ciments Libanis and Cimenterie Nationale, have a combined annual capacity of approximately 1,150,000 tons. Both plants are at Chekka, about 18 kilometers south of Tripoli on the Mediterranean where there are extensive limestone deposits. In 1965, the plants operated at 86 percent of capacity and supplied essentially all domestic consumption. Cement output in 1965 exceeded that of 1964 by 10 percent. This increase was due largely to a substantial increase in customs duty on cement imports. Early in 1965, the import duty on cement was increased from 8 percent ad valorem to a specific duty of $6.49 per ton, provided this was not less than 40 percent ad valorem.

In late 1964, the Government Council of Ministers approved plans for construction of a new cement plant at Siblin in the Chouf District of south Lebanon.

Salt.—All salt was produced by solar evaporation of sea water. Production was from numerous small saltworks in the northern coastal area which are operated seasonally from May to September.

Other.—Lime was produced for manufacture of cement and as a building material. A hydraulic lime plant at Fatri began operations in 1964. Numerous small mines and

quarries produced building stone, sand, gravel, and other minor construction materials for local consumption, but quantitative data on their output are unavailable.

MINERAL FUELS

Petroleum.—Although Lebanon has no known indigenous petroleum resources, petroleum pipeline, terminal operation, and refining remained the most important of the few basic industries of the country. Lebanon serves as a transit and export point on the Mediterranean for both Saudi Arabian and Iraqi crude oil. Crude oil from Saudi Arabia passes through south Lebanon in a pipeline operated by Trans-Arabian Pipeline Co. (Tapline) to an export terminal at Sidon. Iraq Petroleum Co. (IPC) operates pipelines that transport Iraqi crude oil to an export terminal at Tripoli in northern Lebanon. Crude oil receipts at Tapline and IPC terminals during 1965 averaged 441,544 and 325,628 barrels per day, respectively. Government revenue from transit fees in 1965 was an estimated $8.6 million.

Petroleum refinery product output has increased steadily in recent years in response to increased domestic consumption and export demand. Crude oil runs to the nation's two refineries averaged slightly more than 30,000 barrels per day in 1965 with each refinery processing almost equal amounts of crude oil. The IPC refinery at Tripoli processed Iraqi crude oil supplied from the company's pipeline terminal. Construction of facilities to expand the crude oil processing capacity of the Tripoli refinery from 15,000 to 35,000 barrels daily was nearing completion at yearend. The Mediterranean Refining Co. (MEDRECO) refinery at Sidon processed Saudi Arabian crude oil supplied from the Tapline terminal. In late 1965, the Government and MEDRECO concluded an agreement (subject to ratification by the Parliament) which amends the 1945 refinery construction and operating agreement. The agreement provides for increased royalty payments on processed crude oil, fixes the net profit, settles past tax claims, and requires distribution of 20 percent of refinery production to national distribution companies.

The Mineral Industry of Saudi Arabia

By James A. West [1]

With a greatly accelerated rate of crude oil output in 1965, Saudi Arabia strengthened its position among the leading oil producing and exporting nations of the world. Crude oil production during 1965 exceeded that of 1964 by nearly 18 percent. Producing at an average rate of 2,024,870 barrels per day, Saudi Arabia accounted for nearly 7 percent of the world's total crude oil output in 1965. On an annual basis, Kuwait continued as the leading oil producing nation in the Near East area; however, Saudi Arabia was a close second and its rate of production during December exceeded that of Kuwait.

Petroleum remained the dominant industrial activity and the only significant mineral industry of Saudi Arabia. In 1965, cement, salt, gypsum, and small quantities of minor construction materials were produced for domestic consumption. Gold and silver mines were formerly operated commercially, but production was discontinued in 1954. Recent mineral surveys indicate potentially significant deposits of iron ore, gold, silver, copper, barite, phosphate, and other minerals. Investigations to determine the feasibility of commercial exploitation of these resources are in progress.

Petroleum produced during 1965 was valued at an estimated $1,300 million. In 1965, direct payments to the Government by oil companies operating in Saudi Arabia and in the Kuwait-Saudi Arabia Neutral Zone were an estimated $653 million, accounting for about 90 percent of total Government revenues. In addition, the petroleum industry indirectly contributed about $120 million to the economy in wages and local expenditures for goods and services. The petroleum industry employed approximately 14,250 persons and about 1,000 workers were engaged in other mineral industry activities.

The Government initiated several new projects to explore and assess the mineral resources of Saudi Arabia. The Ministry of Petroleum and Mineral Resources (Petromin) concluded a bilateral agreement with the U.S. Geological Survey (USGS) to provide scientific and technical assistance in mineral exploration and evaluation programs. Under an earlier agreement, the USGS prepared and published a series of geological maps that cover the kingdom on a scale of 1 inch to 500,000 miles. The Bureau de Recherches Geologiques, Geophysiques et Minieres (BRGM), a French Government agency, began mineral exploration in three areas of northwestern Saudi Arabia under the auspices of Petromin. A consortium of three international companies began an aerial survey of the 15,000-square-mile area in an effort to find new mineral resources. Under the direction of BRGM, the survey will utilize the latest airborne magnetometer and scintillation counter equipment.

On March 14, the Government ratified an oil concession agreement with the French Government firm, Régie Autonome des Petroles (RAP). The concession includes three coastal and offshore areas along the Red Sea, comprising 26,500 square kilometers. Negotiations were continued with numerous other oil companies inter-

[1] Chief specialist, Near East–South Asia, Division of International Activities.

ested in acquiring new oil concessions in the central and Red Sea coastal areas.

Occidental Petroleum Corp. concluded an agreement with Petromin for the supervision of construction and for the operation of a 600-ton-per-day anhydrous ammonia plant at Dammam. The Saudi Arabian Fertilizer Co. was formed to manage the plant. The wholly Saudi Arabian-owned company was capitalized at $22 million, and 48 percent of the shares were offered to the public. Negotiations were continued with several international firms for the establishment of various petrochemical, oil processing, and other mineral development projects.

The Government continued efforts to resolve boundary disputes with neighboring countries. Agreements were concluded with Jordan and Qatar, defining their offshore and onshore boundaries. Saudi Arabia and Iran agreed to cooperate in a photographic mapping and Hiran survey of the Persian Gulf. Negotiations to establish agreement on a median line boundary were continued.

A "Regulations for Companies" law was enacted by Royal Decree on July 20. The new law is mainly a codification of existing practice and sets forth comprehensive regulations for the incorporation, operation, and liquidation of virtually all businesses in the country.

PRODUCTION

Saudi Arabia registered an outstanding gain in crude oil and refinery products production in 1965. Crude oil output reached a record high rate of 2,024,870 barrels per day, exceeding 1964 production by 308,765 barrels daily. Refinery throughput averaged 316,606 barrels per day.

Table 1.—Saudi Arabia: Production of minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals:					
Cement	105,000	152,000	186,000	239,817	264,000
Gypsum	--	10,500	36,000	NA	22,599
Lime	NA	NA	6,200	NA	30,000
Marble	NA	240	48,400	NA	NA
Salt	--	--	9,700	NA	NA
Mineral fuels:					
Crude petroleum, thousand 42-gallon barrels	508,269	555,056	594,592	628,095	739,078
Refinery products:					
Aviation gasoline, do.	427	313	335	373	244
Motor gasoline, do.	9,046	8,327	10,440	13,537	17,052
Jet fuel, do.	3,361	4,428	4,506	6,159	8,345
Kerosine, do.	5,839	3,775	3,805	3,197	2,190
Distillate fuel oil, do.	13,065	12,310	15,174	13,689	12,737
Residual fuel oil, do.	r 49,758	51,951	53,388	56,376	63,811
Liquefied petroleum gas, do.	NA	1,058	2,116	4,031	5,062
Miscellaneous, do.	4,322	3,535	4,866	5,814	281
Refinery fuel and loss, do.	4,994	4,180	3,872	4,525	5,839
Total, do.	90,812	89,877	98,502	107,701	115,561

r Revised. NA Not available.

TRADE

Except for crude petroleum and refinery product data, no detailed statistics are available for trade in mineral commodities.

Crude oil and petroleum product exports in 1965 were valued at an estimated $1,300 million and accounted for approximately 99 percent of the value of all exports.

Total imports were valued at an estimated $394 million in 1964. Imports of mineral commodities, mainly iron and steel, cement and other construction materials, comprise an estimated 10 percent of this total. Also, petroleum lubricants and aviation gasoline imports accounted for about 10 per cent of the value of all mineral imports. In 1965, petroleum product imports consisted of an estimated 155,000 barrels of aviation gasoline and 20,000 barrels of lubricants.

Table 2.—Saudi Arabia: Exports and reexports of petroleum and petroleum products [1]

(Thousand 42-gallon barrels)

Commodity	1963	1964	1965
Crude petroleum	494,992	527,011	623,515
Refinery products:			
Aviation gasoline	115	144	83
Motor gasoline	8,421	10,755	15,349
Jet fuel	4,445	5,913	8,174
Kerosine	3,018	2,201	1,053
Distillate fuel oil	13,813	11,390	10,428
Residual fuel oil	42,901	40,613	44,177
Liquefied petroleum gas	1,674	4,076	4,650
Total	74,387	75,092	83,914
Bunkers, all flags:			
Distillate fuel oil	557	417	458
Residual fuel oil	15,446	15,754	19,576

[1] Data on geographic distribution on individual items are not available. The continental distribution of total crude oil and refinery products produced by the Arabian American Oil Co. (ARAMCO) (excluding bunkers) in 1965 was as follows, in percent: Europe 43.7; Asia and Australia 37.4; North America 9.7; South America 6.0; and Africa 3.2.

COMMODITY REVIEW

METALS

Iron and Steel.—Construction of a steel rolling mill at Jidda was begun in July. The mill is scheduled for completion in October 1966. Initially, the mill will process imported steel pellets to produce up to 45,000 tons per year of bars, sections, and other steel construction materials. Beneficiation tests of local iron ores were continued in order to determine the technical and economic feasibility of utilizing the large deposits of low-grade iron ores, known to occur in the Red Sea coastal area.

NONMETALS

Construction Materials.—Saudi Arabia's two cement plants (the Arabian Cement Co. plant at Jidda and the Saudi Cement Co. plant at Hofuf) operated at about 90 percent of their combined daily capacity of 750 tons per day during 1964 and 1965. These plants supplied about 30 percent of the estimated domestic demand for cement. The Saudi Cement Co. proceeded with plans to install a second kiln and double its capacity from 300 to 600 tons per day. Small quantities of gypsum, lime, marble, and other minor construction materials continued to be produced for local consumption, but quantitative data on their output are not available.

MINERAL FUELS

Petroleum and Natural Gas.—The Arabian American Oil Co. (Aramco) continued as the only oil operating company in Saudi Arabia proper. In August, the cumulative oil production by Aramco reached 7,000 million barrels. The company announced that estimated petroleum and natural gas reserves at yearend were 63,707 million barrels and 26,438 billion cubic feet, respectively. The petroleum reserve is nearly 20 percent of the total reported world reserve and places Saudi Arabia first among the world's oil producing countries.

Aramco increased its oil-producing capacity by the installation of additional oil-handling facilities and expanded exploration and development well-drilling programs throughout 1965.

The producing capacity of the Safaniya offshore field was increased by 150,000 barrels per day to 600,000 barrels daily and work to increase capacity further was in progress at yearend. Twelve additional wells were connected for production and a fourth submarine pipeline was completed. A 66-mile section of 40/42-inch-diameter pipeline from Khursaniya to Ras Tanura was completed and placed in service. A parallel pipeline was released and will be used to place the offshore Manifa field into production at rates up to 90,000 barrels per day by early 1966. Six additional wells in the Qatif field were connected to new production facilities and raised the capacity of the field by 30,000 barrels daily. A 29-mile, 8-inch-diameter submarine pipeline from the offshore Abu Safah field (shared jointly by Saudi Arabia and Bahrain) was completed. Abu Safah

was placed on test production and was scheduled to produce up to 30,000 barrels per day in early 1966. Work progressed on the construction of production facilities and pipelines to increase capacity of the southern area of the Ghawar field by 190,000 barrels daily.

Drilling was completed on 50 wells and 3 additional wells were abandoned. Total footage drilled in 1965 was 348,474 feet, an increase of 39 percent over that of 1964. Completions included 38 producing wells, 9 water injection wells, and 3 observation wells. An offshore well drilled 16 miles east of the nearest Safaniya well resulted in the discovery of the Zuluf field. An exploratory well at Niban on the northern fringe of the Rub al-Khali desert proved nonproductive and was abandoned. Two stratigraphic wells drilled in the Dibdibah gravel plains area were abandoned. An exploration well at Jaham, 28 miles northwest of the Khurais field, was drilling at yearend.

The record 1965 oil production of nearly 2,025,000 barrels daily was from nine fields having about 300 wells connected to producing facilities. The giant Ghawar field was the leading producer, accounting for 44 percent of total output. Other major producing fields and their percent of total output were: Safaniya, 23.3; Abqaiq, 20.2; and Khursaniya, 6.4. The Abu Hadriya Qatif, Dammam, Fadhili, and Khurais fields combined produced the remaining 6.1 percent.

Reservoir fluid injection programs to assure maximum economic oil recovery were continued and expanded by Aramco. Average daily rates of water injection into the Abqaiq, Ghawar, and Khursaniya fields were 629,035, 202,605, and 14,420 barrels per day, respectively. Gas injection into the Abqaiq field averaged 164 million cubic feet daily. The Ain Dar gas injection plant underwent extensive modification throughout most of the year, but was returned to partial operation on October 5 and injected gas at an average daily rate of 143 million cubic feet to yearend. Also, liquefied petroleum gases, equivalent to about 28 million cubic feet per day, were injected into the Abqaiq and Ghawar fields.

The Mineral Industry of the Syrian Arab Republic

By E. Shekarchi[1]

The Syrian mineral industry remained insignificant as a foreign exchange earner during 1965; however, income from transit royalties of the Trans-Arabian Pipeline Co. (Tapline) and the pipeline of the Iraq Petroleum Co. (IPC) contributed significantly to government revenues, approximately $30 million in 1964. Total export of metals and minerals, including refinery products, amounted to about $583,000[2] in 1964, whereas imports of metals and minerals amounted to about $44 million.

Total gross national product (GNP) in current prices was $850 million in 1964 with a per capita GNP of $155, compared with $148 in 1963. Annual population growth based on 1965 estimation was 3 percent. Of the total population of 5.7 million people, 39 percent constituted the labor force. An estimated 6,600 persons were engaged in mineral-based industry, including mining, quarrying, and cement factories, and petroleum refineries.

The first 5-year development plan, which dated from the union with Egypt, was terminated after 4½ years, at the end of 1964. The Government, rather than present a new plan immediately, elected to make 1965 a year of transition and to prepare a new 5-year plan for 1966–71.

Progress on the project to dam the Euphrates River has been extremely slow. Although a loan of $14 million was arranged at 3¼-percent interest, payable over 20 years, beginning when signed by the Economy Ministers of West Germany and Syrian Arab Republic, only technical studies of the project were conducted in 1965. The project was to study utilization of the land to be irrigated by the proposed dam on a pilot plant scale.

In March 1965, the Government of Syria took possession, under the nationalization act, of the country's nine private oil marketing companies and placed them under the direction of the Ministry of Industry to be operated by the Syrian General Petroleum Authority. Properties nationalized were entirely in marketing and were formerly owned by such major companies as the Royal Dutch/Shell group, Standard Oil Co. of New Jersey, and Socony Mobil Oil Co. Although the owners were said to be compensated, details of the arrangements were not disclosed.

In the latter part of 1965, the Director of Tartous Port Construction stated that the terminus of the Karatchuk oil pipeline would not be placed within the port of Tartous itself, but rather that it would be extended as a sea line to where the depth of the water is sufficient for large tankers. The authorities hoped that the first stage of the port construction would be completed by mid-1966 so that it could be utilized in importing material needed for the construction of the pipeline.

On April 27, the electrical powerplant of the Homs-Hama Electric Co. was inaugurated. The plant, which was constructed by the Czechoslovakian firm, Techno-Export, will produce 30,000 kilowatts per day. Some of this power is to be used at the nearby Homs refinery.

An agreement between the Government of Syria and a British consortium to build an oil pipeline from Karatchuk oilfields to Homs refinery was signed in 1965.

---

[1] Foreign mineral specialist, Division of International Activities.

[2] Where necessary, values have been converted from the Syrian pound (SL) at the rate of SL3.83=U.S.$1.00 although there was a currency fluctuation of 10 to 15 percent during the year.

PRODUCTION

The small mineral production of the Syrian Arab Republic in 1965 only slightly exceeded that of 1964. However, 5-year production records for some commodities showed significant increases. Production of natural asphalt, cement, gypsum, and salt have almost doubled. During the past 5 years, no such outstanding increase has been made in production of petroleum refinery products. Comparison of refinery production figures for 1961 and 1965 shows an increase of only about 30 percent.

Table 1.—Syrian Arab Republic: Production of minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 e
Nonmetals:					
Asphalt, natural	27,476	32,633	36,782	36,000	56,900
Cement—thousand tons	540	607	685	720	834
Glass sand	NA	[1] 8,000	NA	NA	10,000
Gypsum	8,000	15,000	e 15,000	20,000	15,000
Salt—thousand tons	7	18	e 18	20	20
Sulfur	47	--	NA	NA	NA
Mineral fuels: Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	1,024	995	1,076	1,223	1,293
Kerosine—do	846	818	819	938	1,131
Diesel fuel—do	1,464	1,501	1,881	2,138	1,939
Residual fuel—do	2,150	2,183	2,222	2,532	2,777
Asphalt—do	165	127	158	185	180
Liquefied petroleum gas—do	39	49	84	92	96
Total refinery products—do	5,688	5,673	6,240	7,108	7,416

e Estimate. NA Not available.
[1] Minimum estimate based on Damascus plant capacity and 1962 Syrian production. Plant supplied from nearby sand deposits.

TRADE

Syria remained dependent on imports for supplies of all metals, most industrial minerals, and a significant part of commercial fuels. The value of all imports for 1964 was $235 million, nearly the same as in 1963. Imports of metals and minerals accounted for approximately $44 million in 1964. Imports of ingot and scrap copper, ingot lead, and iron and steel decreased because of reduced light construction in the country.

Total export of the country in 1964 was valued at about $176 million, compared with $189 million in 1963. Since Syria is primarily an agricultural country, export of industrial minerals and metals remained insignificant, only about $500,000 worth in 1964.

Table 2.—Syrian Arab Republic: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Iron and steel:			
Scrap	5,125	7,612	Lebanon 4,402; Italy 1,700; Yugoslavia 1,500.
Rolled and other	61	98	Lebanon 85; Saudi Arabia 5.
Lead: Scrap and manufactures	--	120	Lebanon 112; Saudi Arabia 4.
Nonmetals:			
Abrasives, all types	83	50	Iraq 23; Jordan 15.
Asphalt	300	100	All to Cyprus.
Gypsum	9,251	3,989	Lebanon 3,623; Jordan 364.
Talc	173	138	Jordan 135; Kuwait 2.
Mineral fuels: Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	333	114	All to Netherlands.

Source: Ministere Des Finances, Damascus. Statistiques Du Commerce Exterieur. 1964, 1022 pp.

Table 3.—Syrian Arab Republic: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Ingots	404	292	Lebanon 94; Kuwait 74.
Semimanufactures	1,045	1,115	Lebanon 428; West Germany 174; mainland China 123.
Copper:			
Ingots, including scrap	478	85	NA.
Semimanufactures	1,665	1,023	United Kingdom 472; West Germany 192; Italy 144.
Gold, platinum, and alloys—troy ounces	110	11,799	France 4,823; Switzerland 4,565; United Kingdom 2,411.
Iron and steel:			
Cast iron	984	1,944	West Germany 1,713; U.S.S.R. 200.
Scrap	2,119	1,652	Lebanon 680; Kuwait 563; United Kingdom 144.
Ingots	277	--	
Semimanufactures	92,088	99,431	Poland 18,940; mainland China 12,383; France 7,576.
Lead:			
Ingots	604	357	West Germany 200; United Kingdom 78.
Semimanufactures	35	177	France 100; Belgium 63.
Silver—troy ounces	2,866	2,625	NA.
Tin:			
Ingots—long tons	60	86	Malaysia 66; mainland China 13.
Semimanufactures—do	7	4	United Kingdom 3; Belgium 1.
Zinc, all forms	70	116	Belgium 46; Lebanon 34.
Nonmetals:			
Abrasives, all forms	310	119	Greece 63; West Germany 25.
Asbestos	4,667	5,166	Lebanon 2,290; Italy 2,143.
Building stone	3,770	3,500	Italy 2,607; Jordan 768.
Cement	17,951	20,508	Yugoslavia 7,965; Denmark 4,443.
Chalk	1,642	1,580	France 850; Belgium 729.
Clays	1,205	151	West Germany 86; France 36.
Fertilizers (mineral and chemical)	65,230	41,731	West Germany 19,473; Netherlands 8,829.
Fuller's earth	115	460	East Germany 213; Italy 162.
Graphite	17	51	West Germany 20; Japan 10.
Magnesite	16	--	
Marble	1,674	1,462	Turkey 662; Jordan 459.
Ocher and other earth colors	31	88	Turkey 40; Spain 24.
Salt	23,480	--	
Sand (including quartz)	r1,734	2,378	Lebanon 2,302; Jordan 55.
Sulfur	567	248	Bulgaria 150; Libya 55.
Talc	r278	378	Mainland China 375; West Germany 3.
Mineral fuels:			
Coal (including briquets)	r1,931	2,328	Belgium 1,783; Lebanon 403.
Coke (including petroleum coke)	1,074	2,028	West Germany 1,172; Belgium 802.
Petroleum:			
Crude—thousand 42-gallon barrels	6,561	7,563	All from Iraq.
Refinery products:			
Gasoline—do	69	61	United States 45; Netherlands Antilles 13.
Kerosine—do	57	64	Netherlands Antilles 29; Aden 20.
Diesel fuel oil—do	2,081	[1] 2,477	Rumania 978; Kuwait 550; U.S.S.R. 395.
Lubricants—do	120	76	United Kingdom 23; United States 12; Austria 9.
Liquefied petroleum gas—do	17	46	United States 35; West Germany 2.
Other—do	34	15	Rumania 4; United Kingdom 3.
Total liquids—do	2,378	2,739	
Asphalt	8,712	2,183	All from Iraq.

r Revised. NA Not available.
[1] Includes 2,000 barrels fuel oil from Lebanon.
Source: Ministere Des Finances, Damascus. Statistiques Du Commerce Exterieur, 1964, 1022 pp.

COMMODITY REVIEW

METALS

No significant discovery of metals of economic value was reported in 1965, although geological investigation continued. Most of the domestic requirement of metals and related industrial minerals continued to be met by imports.

NONMETALS

Cement.—The Société Nationale pour la Fabrication du Ciment et Materiaux du Construction continued its expansion program in 1965 by addition of facilities 5 miles out of Damascus for producing prefabricated cement goods such as telephone poles, and of a plant for the production of asbestos cement.

An agreement was signed between the Ministry of Communication and the Soviet Union for construction of a prestressed concrete factory to produce telegraph poles. The factory is to be built in Aleppo and will have a capacity of three poles per day.

Fertilizer Materials. — *Nitrogenous.* — The nitrogen fertilizer plant at Homs which has been under consideration since 1957, moved a step forward in 1965. At yearend, it appeared that the planned annual capacity of the plant had been increased to 150,000 tons of Cal-Nitro fertilizer of 25 percent nitrogen content, and that it will consist of three major units for the production of ammonia, nitric acid, and Cal-Nitro fertilizer. According to the Ministry of Industry's estimate, the plant will cost $30 million and will begin production in late 1968. The plant will be built by Soviet, Czechoslovakian, and Italian interests.

Phosphatic.—The exploitation of Syrian phosphate at Palmyra, which was the subject of a feasibility study by a U.S. engineering firm, also progressed, with shipment of 500 tons to Poland, East Germany, and Rumania for analysis and beneficiation test purposes. No contracts were signed by the end of 1965.

MINERAL FUELS

Petroleum.—*Refining.*—A contract for the expansion of the Homs oil refinery was signed between the Ministry of Industry and the Czechoslovakian State firm, Techno-Export, in 1965. Under the contract, the capacity of the refinery, owned by the Syrian Government, was to be increased from 1 million tons to 1.7 million tons annually. The General Petroleum Authority was experimenting at Homs refinery with Syrian crude oil extracted from the Suwaidiyah and Karatchuk fields (23° to 24° API and 22° API, respectively, and with high sulfur content) either to use this crude directly or to blend it with IPC and Tapline crude oil. Through yearend, the refinery ran on feedstock crude from IPC and Tapline which have an obligation to supply crude at reduced rates to Homs as part of their agreement.

Pipelines.—An agreement was signed between the Government of Syria and a British consortium, consisting of Coustain & Press (Overseas) Ltd. and Stewarts & Lloyds Ltd., to build a crude oil pipeline through Syria in the latter part of 1965. The pipeline is to be extended from Karatchuk in northwestern Syria to Homs refinery and from Homs to the port of Tartous on the Mediterranean. The distance is about 640 kilometers and construction is expected to take about 2½ years. The project, calling for a loan of $38.5 million, would be financed by five British banks and would be repayable over 10 to 15 years at 5½-percent interest. The initial throughput will be 5 million tons a year, capable of being expanded to 7.5 million tons annually. The planned diameter of the pipeline was 18 to 22 inches with five pumping stations. It was scheduled to go into operation in 1968 with an initial capacity of 100,000 barrels per day.

The Mineral Industry of Turkey

By E. Shekarchi [1]

The mineral industry of Turkey experienced a record high year in 1965, both in volume of mineral production and export value of minerals and primary products. The gross value of minerals and primary metals and nonmetals, excluding petroleum products and iron ore, was estimated to be approximately $391 million, an increase of 30 percent over that of commodities reported for 1964. Total value of mineral commodity exports, including fuels, in 1965 comprised 9.5 percent of the country's total export value and reached approximately $43.6 million, 18 percent and 65 percent higher than export values of 1964 and 1963, respectively. With production of more than 500,000 tons of chromite of all grades, Turkey contributed about 11 percent to the total world production of this commodity and ranked third among the chromite-producing nations.

According to estimates made by the Agency for International Development (AID) in 1965, the population of Turkey has almost doubled during the last 30 years. It was reported to be about 31.1 million with an annual growth rate of 2.5 percent. Labor status reportedly remained the same as in 1964 with 75 percent engaged in agriculture and the remaining 25 percent employed in the industrial sectors of the economy, including mining and mineral processing.

Based on 1962 prices, the total gross national product (GNP) in 1965 was reported to be $7,245 million [2] or an increase of 5.4 percent over that of 1964, while per capita GNP increased 2.6 percent.

Turkey at the end of 1965 completed the third year of its first 5-year plan. The overall rate of growth as originally planned (7 percent) was not reached and international advisors to the State Planning Organization (SPO) were doubtful that the 1966 planned growth rate would be achieved. The work on the second 5-year plan (1968–73) began in 1965; SPO, with the experience of the problems of the first 5-year plan, had a more realistic view and established general guidelines to approach the problem.

The Government in power at the start of the year fell in February 1965. The new government formed following the October election did not have sufficient time to do much more than organize itself and prepare its legislative program; therefore, no legislation of importance relating to the mining industry was acted upon during 1965.

All sectors and units of the Ereğli iron and steel plant, owned by Ereğli Demir ve Çelik Fabrikalari T.A.S. (Erdemir), a private enterprise financed by U.S., German, and Turkish capital, became fully operational in March of 1965. All of the expanded facilities of the State-owned Karabük plant were operating at near capacity at yearend except the structural steel and foundry units which remained incomplete.

A magnesite mining and calcining operation controlled by U.S. interests and known as Continental Magnezit Ltd. secured approval under the foreign investment law No. 6224 to increase its investment in order to double production of caustic magnesite for export.

As an associate member of the European Economic Community and as a full member of the Organization for Economic Cooperation and Development, Turkey received in 1965 considerable assistance, not

[1] Foreign minerals specialist, Division of International Activities.

[2] Where necessary, values have been converted from Turkish lira (TL) to U.S. dollars at the rate of TL1=US$0.11.

only in the form of loans but also in the form of special concessionary import quotas which were granted in an effort to support development of Turkey's natural resources.

A number of protocols involving metal and mineral projects were signed between the Turkish Government and the U.S.S.R. Among these were proposals for a sulfuric acid plant, a petroleum refinery, and an aluminum complex extending from bauxite to the finished product. However, by year-end, no definite commitments were made by either side on these projects.

The Mineral Research and Exploration Institute (MTA), a government agency with a budget increased to $6.5 million annually, continued throughout 1965 a broad mapping and exploration program for phosphate, uranium, lignite, bauxite, and petroleum. The 1:25,000 scale geological mapping program of MTA made good progress in the Zamanti River lead-zinc province, and geochemical surveys for nonferrous metals were conducted in the Zamanti, Kure, Keban, and Balya districts. However, no detailed information on results of these studies was available by the end of 1965.

Even though no new discoveries of mineral deposits were reported in 1965, the mining department of the Ministry of Energy and Natural Resources issued 63 mineral concessions including 27 for lignite, 12 for iron, 12 for chromite, 3 for boron minerals, 2 each for asbestos, lead-zinc, and magnesite, and 1 each for zinc, flourspar, and pyrite. Mining activities and claims on new areas for future development were clearly in high gear.

Turkiye Petrolleri A.O. (TPAO), a State-owned exploration and refining company, awarded contracts for construction of a pipeline from the Batman refinery in southeast Turkey to the Mediterranean Sea port of Iskenderum during 1965.

In the preparation of this chapter, the author has drawn background information from the extensive reporting of the U.S. Foreign Service dispatches and the annual mineral report prepared primarily by Clarence A. Wendel, the minerals attaché with the U.S. Embassy in Ankara, and furnished to the Bureau of Mines. Detailed statistics on the mineral trade of the country were obtained primarily from the Office of Statistics of the United Nations.

PRODUCTION

The gross value of mineral products, including some manufactures such as steel and cement but excluding petroleum products and iron ore, increased by 30 percent in 1965 or from $300 million to about $391 million. Crude minerals alone, excluding fertilizers, cement, coke, pig iron, steel, and ferrochrome, showed a gain of 7 percent in 1965 compared to the 1964 figures. Among the major minerals contributing to this gain were chromite, copper, iron ore, borates, magnesite, and petroleum. Chromite production was up 37 percent in 1965 compared with the 1964 output and registered the highest production level since the peak year, 1958. Output of blister copper showed a 1-percent increase in 1965, while iron ore production increased 5.6 percent to a new record level in an effort to supply both steel plants.

Within the nonmetallic mineral sector of the industry, boron mineral producers continued an expansion program which led to a 33-percent production increase in 1965, while magnesite output was almost doubled. Production of lignite increased by 7.6 percent, as bituminous coal output fell off slightly in 1965 in comparison to the 1964 production level. Reflecting Turkey's determination to be self-sufficient in petroleum, the output of crude petroleum was increased by 64 percent in 1965.

TRADE

The value of all mineral commodity exports from Turkey in 1965 was approximately $44 million, which constituted about 9.5 percent of total commodity export of $459 million. Copper exports, valued at $18.7 million in 1965, remained the leading mineral exchange earner, followed by chromite and ferrochromium, together valued at $10.7 million, and borates with a value of $4.1 million. Quantitatively, copper shipments in 1965, ore and blister combined, increased 32 percent over those

Table 1.—Turkey: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum: Bauxite	---	---	---	4,500	10,283
Antimony:[1]					
Ore and concentrate	2,213	2,991	3,030	3,294	3,534
Regulus	---	---	48	58	107
Chromite (all grades)	402,729	469,149	463,890	412,685	567,062
Copper:					
Ore (copper content):					
Kûre copper ore for export	NA	NA	610	843	810
Kûre cupriferous pyrite	NA	e 3,000	e 2,300	r 2,600	3,555
Other ore for domestic processing	NA	28,427	23,863	28,187	31,760
Total	28,842	r 31,427	r 26,773	r 31,630	r 36,125
Blister	19,994	25,775	24,790	25,981	26,300
Iron and steel:					
Iron ore—thousand tons	758	813	747	976	1,530
Pig iron and blast furnace ferroalloys[2]—do	236	293	r 210	r 293	e 300
Steel ingots—do	r 323	r 313	r 388	r 485	666
Lead:					
Concentrate (lead content)	r 1,893	r 1,100	r 992	1,626	1,682
Metal	633	637	1,881	1,960	918
Manganese ore	30,000	21,248	6,304	20,290	14,220
Mercury—76-pound flasks	1,864	2,661	2,982	2,582	2,460
Pyrite, cupreous (gross weight)	98,417	107,088	97,082	133,000	132,159
Zinc:					
Zinc-lead ore, hand-sorted	10,930	6,929	4,500	12,500	16,548
Zinc ore, calcined	5,700	6,399	4,000	8,950	e 8,500
Zinc concentrate	2,512	2,112	1,867	1,858	1,758
Nonmetals:					
Asbestos	450	643	370	1,171	1,248
Barite	---	1,900	981	6,050	11,980
Boron minerals	65,026	113,941	88,088	r 128,254	170,977
Cement—thousand tons	2,028	2,323	2,698	2,940	3,244
Clays, including fire clay—do	NA	11,000	13,000	e 13,000	e 13,500
Emery	8,327	3,408	7,490	12,400	12,573
Fertilizer (chemical)	---	165,066	322,257	300,930	397,900
Fluorspar	38	581	652	1,303	1,077
Gypsum	60,000	140,000	180,000	200,000	e 220,000
Magnesite	2,190	9,740	17,917	39,000	75,587
Marble—cubic meters	NA	10,000	e 10,000	15,000	15,000
Meerschaum—kilograms	45,850	82,400	10,500	24,100	99,400
Perlite	200	700	1,000	1,200	NA
Salt, all types—thousand tons	268	431	399	352	493
Sodium sulfate	2,485	4,774	1,264	r 2,425	4,963
Sulfur	15,755	18,539	19,430	22,200	23,000
Mineral fuels:					
Bituminous coal (salable)—thousand tons	3,773	3,899	4,156	4,448	4,401
Coke—do	730	740	1,071	r 1,107	1,434
Lignite (salable)—do	2,608	2,979	3,237	3,871	4,166
Petroleum:					
Crude—thousand 42-gallon barrels	3,075	r 4,517	5,090	r 5,986	9,816
Refinery products:					
Gasoline—do	1,013	4,457	4,600	5,388	5,933
Kerosine and jet fuel—do	127	2,185	3,066	3,809	3,791
Distillate fuel oil—do	585	4,593	6,563	8,515	8,270
Residual fuel oil—do	1,828	7,426	9,400	11,277	11,461
Liquefied petroleum gas—do	7	70	130	279	549
Other (includes asphalt, solvent, and miscellaneous)—do	799	546	677	1,023	1,285
Total—do	4,359	19,277	24,436	30,291	31,289

e Estimate. r Revised. NA Not available.

[1] Ore and regulus contain 45 percent and 49 percent antimony, respectively, in 1965.

[2] Includes remelted scrap through 1962.

of 1964; exports of chromite and ferrochrome were up 22 percent in total and those of borate minerals were up 29 percent. Increased export value of copper and chromite was primarily due to premium prices in the international market. Exports of magnesite, crude and calcined, and cupreous pyrite increased by 71 percent and 29 percent, respectively, in 1965 compared with 1964 export while shipments of manganese ore and mercury decreased.

Total merchandise imports in 1965 were valued at $572 million; of this, mineral commodities were valued at about $154 million. Among metallic mineral commodities imported in 1965, iron and steel, in-

Table 2.—Turkey: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Metals:				
Antimony ore and concentrate.	3,781	2,629	3,434	Czechoslovakia 1,900; West Germany 1,387.
Chromite (all grades)	212,664	r 344,134	424,226	United States 136,679; Czechoslovakia 52,065; France 32,332; Italy 26,647; Austria 24,691.
Copper:				
Ore (10 percent)	---	8,430	8,100	All to West Germany.
Blister	r 10,044	13,004	20,195	Belgium 11,218; United States 7,318; Spain 1,659.
Ferrochromium	1,369	5,863	5,946	Italy 2,605; United Kingdom 1,473; United States 700.
Iron and steel:				
Iron ore (concentrate)	12,100	---	---	
Iron and steel scrap	---	---	500	All to West Germany.
Lead ore and concentrate	7,090	2,540	1,500	All to United Kingdom.
Manganese ore	12,043	18,140	14,943	United States 6,000; Yugoslavia 3,913.
Mercury—76-pound flasks	2,742	3,230	2,318	Netherlands 1,068; United Kingdom 838.
Pyrite, cupreous	85,495	95,650	123,158	Italy 97,608; West Germany 25,550.
Silver concentrate	---	---	60	All to West Germany.
Zinc:				
Calcined ore	4,000	4,450	7,836	Belgium-Luxembourg 5,286; France 1,250.
Concentrate	---	r 2,886	---	
Zinc-lead ores	4,500	12,126	16,500	NA.
Nonmetals:				
Abrasives (natural)	8,352	9,217	16,655	United States 6,714; Netherlands 5,725.
Borates	r 91,640	118,408	152,564	Italy 60,454; France 31,470; United Kingdom 15,319; United States 8,608.
Cement	2,460	2,460	---	
Magnesite:				
Crude	10,604	19,785	15,669	Austria 12,864; East Germany 2,805.
Calcined			18,228	Austria 15,000; Belgium-Luxembourg 3,228.
Stone and gravel:				
Marble	4,421	5,344	6,353	Switzerland 1,663; Italy 1,302.
Other stone and gravel	222	r 170	306	All to Syria.
Meerschaum	41	58	46	Austria 24; United States 12.
Salt	58,736	128,938	88,519	Japan 79,319; Bulgaria 9,200.
Other nonmetals	708	r 301	70	NA.
Mineral fuels:				
Coal (bituminous)	5,950	16,464	9,195	All to Greece.
Coke	---	---	929	All to Syria.
Lignite	---	38	---	
Petroleum refinery products:				
Gasoline	41,855	r 47,004	17,897	United Kingdom 11,775; Netherlands 6,122.
Distillate fuel oil	r 20,832	r 15,122	---	
Residual fuel oil	674,398	690,285	497,869	United Kingdom 312,836; Netherlands 88,500.

r Revised. NA Not available.

Table 3.—Turkey: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals:				
Aluminum:				
Ingots	1,216	1,579	5,640	United States 1,846; Canada 1,567; France 1,436.
Semimanufactures	2,642	1,670	1,577	Israel 326; Austria 213; Hungary 196.
Copper and alloys, all forms	428	395	259	Italy 81; West Germany 54.
Iron and steel:				
Scrap	9,688	25,791	29,029	All from United States.
Pig iron, including cast iron.	23,044	r 25,527	25,824	U.S.S.R. 16,684; Bulgaria 5,371; West Germany 2,680.
Ferromanganese and other ferroalloys.	1,093	6,305	8,495	Norway 4,079; United States 2,300; U.S.S.R. 1,041.
Ingots and other primary forms[1].	r 76,443	r 96,196	116,230	U.S.S.R. 32,551; United States 25,577; Hungary 25,132; Bulgaria 14,966.
Semimanufactures	286,579	r 208,669	206,580	U.S.S.R. 77,827; United States 67,066; Hungary 47,056.
Lead and alloys, all forms	2,357	1,515	94	Belgium 23; United States 13; Denmark 13.
Nickel and alloys, all forms	118	108	80	West Germany 25; Italy 22.

Table 3.—Turkey: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals—Continued:				
Tin and alloys, all forms long tons	509	867	923	United States 765; United Kingdom 119.
Zinc and alloys, all forms	5,291	5,046	6,934	Belgium-Luxembourg 2,846; U.S.S.R. 1,200; West Germany 1,078.
Metallic ores, slags and ashes	443	r 763	435	All from United Kingdom.
Other nonferrous metals and semimanufactures.	21	9	28	All from West Germany.
Nonmetals:				
Asbestos	1,254	r2,455	2,654	United Kingdom 1,355; U.S.S.R. 1,086.
Barite	NA	2,455	200	NA.
Cement	91,068	91,533	47,647	U.S.S.R. 45,633; Italy 1,184.
Clays, all types	1,689	2,357	2,651	Greece 783; Italy 621; United States 34.
Feldspar and fluorspar	725	1,939	2,651	Mexico 1,489; Italy 997.
Graphite	107	139	140	West Germany 53; United Kingdom 44.
Infusorial earths	279	65	76	United States 33; West Germany 27.
Magnesite	93	3	7	All from Austria.
Mica	18	53	33	United Kingdom 15; Norway 15.
Phosphate rock	116,248	92,517	100,529	Israel 73,795; Jordan 22,280.
Quartz and quartzite	15	38	84	Netherlands 52.
Sulfur	248	210	100	United States 67; West Germany 30.
Talc	284	96	220	Italy 214.
Mineral fuels:				
Coal	---	300	132	All from West Germany.
Coal tars	1,248	4,083	1,045	All from Netherlands.
Coke	4,143	r4,083	4,200	France 3,200; U.S.S.R. 1,000.
Petroleum:				
Crude thousand tons	3,080	r3,430	3,051	Saudi Arabia 1,257; Iraq 1,063.
Refinery products:				
Gasoline	4,957	2,571	4,673	United States 3,671; United Kingdom 697.
Kerosine	38,500	36,943	33,763	Rumania 19,512; United States 10,416.
Lubricants	91,778	60,804	52,515	United States 49,945; France 593.
Other	2,017	1,750	2,652	West Germany 1,971; Rumania 241.
Total petroleum products.	137,252	102,068	93,603	

r Revised. NA Not available.
1 Includes coil for rerolling and alloying steels.

cluding (primary) ingots, and semimanufactures, but excluding pig iron, ferroalloys, and scrap, were valued at $47.2 million compared with $39.7 million in 1964. In spite of substantial improvements during 1965, the petroleum industry of Turkey remained dependent on foreign crude oil to the extent of about $48 million. Other notable changes in imports were a 257-percent increase in aluminum ingot, valued at $3 million in 1965, and a 50-percent decrease in cement imports in 1965.

COMMODITY REVIEW

METALS

Aluminum.—The first production of bauxite in Turkey was reported in 1964 when MTA mined and shipped high-silica bauxite ore from the Akseki deposits. Output of bauxite more than doubled in 1965.

SPO reportedly has entrusted Etibank with the responsibility of developing the deposits and producing 50,000 metric tons of aluminum annually. Apparently the proposed aluminum industry in Turkey will be based on two high-grade bauxite deposites discovered near Seydişehir known as Mortas and Dogan Kuzu. A systematic drilling of the Seydişehir deposits was completed in 1965 and reserves of about 30 million tons were established with the following chemical analysis: 60 to 65 percent alumina, 6 to 7 percent silica, and 14 to 16 percent ferric oxide. In the latter part of 1965, the drilling program was shifted to the Saimbeyli area southeast of Kayseri where bauxite beds similar to those at Seydişehir were encountered. Preliminary estimates of reserve in this locality have been determined to be over 10 million tons.

At yearend, no firm decision regarding

the erection of proposed plants for production of alumina and aluminum metal producing facilities were available. However, various foreign participation offers were said to be under consideration.

Antimony.—Özdemir Antimuan Madenleri A/S Sirketi produced about 90 percent of total Turkish antimony ore and concentrate in 1965. The remaining 10 percent came mostly from the newly discovered polymetallic mines of Rasih ve Ihsan Madençilik Sirketi near Nigde. The Mutlu Battery Co. completed a new plant in Kartal in 1965 and regulus production of the company reached a new high of 107 tons, a twofold increase over 1964 output. Most of the company's production was used domestically.

Chromite and Ferrochrome.—In 1965 the Turkish chromite industry experienced the highest production level within the last 5 years. Under the stimulus of higher market prices, run-of-mine production reached about 567,062 tons, of which some 300,000 tons had to be concentrated. Etibank produced from its Güleman property 143,000 tons of metallurgical-grade ore and 13,670 tons of refractory grade ore, and from its Üçköprü mines 14,435 tons of concentrate and 76,205 tons of high-grade metallurgical ore. Among principal private producers, Türk Maadin ranked first with about 110,000 tons of concentrate and 5,000 tons of lump ore from its operation at Kavak and Göçük near Eskişehir, followed by Sitki Koçman with production of about 50,000 tons of high-grade lump ore from the Muğla area, and by Ömer Inönü and associates with production of about 30,000 tons of concentrate from the Harmancik and Tokat areas.

The entire production of 7,473 tons of ferrochromium from Etibank's Antalya plant was sold during the year. In preparation of this ferrochrome, 13,447 tons of concentrates and 7,125 tons of lump ores from domestic production were utilized.

Copper.—The State enterprise, Etibank, remained the sole copper producer of Turkey. Production of blister copper in 1965 from Etibank's Ergani and Murgul smelters was 18,500 and 7,800 tons, respectively. This blister copper was derived from the Ergani and Murgul mines. Production of straight copper ore at Ergani totaled 322,025 tons including 226,980 tons of direct smelting ore averaging 7.32 percent copper, and 95,045 tons of milling grade ore averaging 2.72 percent copper. Output of the Murgul mine consisted entirely of milling grade ore—495,352 tons containing 1.93 percent copper. In addition, 8,100 tons of hand-sorted ore containing 10 percent copper was produced by Etibank's Küre mine for direct shipment to West Germany and this property also produced 132,166 tons of cupriferous pyrite containing 2.69 percent copper for the export market. However, export of blister in 1965 was about double that of 1963 and 55 percent greater than the 1964 export level.

In order to utilize the low-grade ore from Ergani mine, the flotation plant was expanded, and by yearend 800 tons per day was being treated. The Minister of Power and Natural Resources confirmed that Etibank has signed a contract with the Ralph M. Parsons Co. for AID-financed feasibility study of ore discovered in the Murgul region. The new deposit is only 1 kilometer from the present opencast mine area and has an estimated reserve of 20 million tons of ore containing 0.5 percent or more copper and averaging 1.25 percent copper.

Tentative overall plans of the copper industry call for erection of a new 2,500-ton-per-day concentrator at the Murgul mine, a pipeline to transport concentrates to the port of Hopa on the Black Sea coast, and a smelter and sulfuric acid plant at Samsun to produce 40,000 tons of anode copper and 150,000 tons of sulfuric acid annually.

Geologists of MTA reportedly have discovered large high-grade copper deposits near Farkisli not far from Iskenderun in southern Turkey. No detailed information on grade and reserves of this discovery was available at yearend.

Iron and Steel.—Production of iron ore, primarily for domestic consumption, registered an alltime high of 1.53 million tons in 1965. The State-owned and operated Karabük Steel Co.'s Divriği mine lead all ore producers with approximately 897,000 tons, followed by Demir Export (Koç) Co.'s production of about 257,000 tons from two mines. Shipments of salable ore from operating mines and companies from 1963 to 1965 is shown in table. 4.

The private mines supplying iron ore to Ereğli fell short of the scheduled delivery and it seemed probable that if this trend continues and no new discoveries are

Table 4.—Turkey: Shipments of salable ore from selected iron ore mines
(Thousand tons)

Mine	Operator	1963	1964	1965
Divriği	Turk Demir ve Çelik	580	655	872
Kesikköprü	Kesikköprü Mining	80	95	e 60
Otlukilise	Demir Export (Koç)	11	77	116
Çetinkaya	----do	14	58	141
Karakuz	Bilgin Maden	10	40	59
Deveci	----do	5	38	e 50
Akdağ	Necati Akin	15	--	31
Büyük Eğmir	Dümeks	32	--	37
Karamadazi	Özkoyuncu	--	4	37
Bünyan	Zafar	--	3	
Aşvan	Arslanlar	--	5	e 24
Divriği	NA	--	3	
Calti	Kepman [1]	--	--	15
Total shipments		747	978	1,442

e Estimate. NA Not available.
[1] New company.

found within the country, Turkey may seek a new source of raw material abroad. Although no new discoveries were reported in 1965, reassessment of Rasih ve Ihsan Mining Co.'s Sakarkaya mine near Milâs indicated the possibility of 12 million tons of magnetite ore containing 1 to 2 percent sulfur.

The Ereğli iron and steel plant of Erdemir was brought into full operation 6 months ahead of the orginal work schedule. Erdemir, a private enterprise engineered and built by a consortium of U.S. companies (Koppers Co., Inc., Blaw-Knox Co., and Westinghouse International), received a loan of $129 million from AID, the largest single industrial loan of its kind ever granted. The remaining cost of $146 million was raised privately and in the form of a loan to the Turkish Government from the West German Government. However, the consortium, as part of their pay for services, equipment, and funds advanced, collectively hold a minority stock interest in Erdemir. Erdemir has already sold nearly $11 million worth of common stock to nearly 2,000 Turkish citizens.

Present plans call for production of about 400,000 tons a year of crude steel, plus 100,000 tons of pig iron. The 400,000 tons of ingot produced annually is then to be processed into about 300,000 tons of steel semimanufactures.

Turkey's other integrated plant, the State-owned Karabük steel works, was operated at near capacity by the end of 1965; however, some of the most recent expanded facilities for structural sheet and foundry section remained incomplete and no completion date was given.

In the private sector of the steel industry, Metaş plant at Izmir increased production of ingot steel from imported scrap to almost 45,000 tons in 1965. Also during the year, the company initiated an active campaign to find an indigenous supply source of iron ore for a sponge iron plant. If successful, this campaign would eliminate the dependence on imported scrap.

Lead and Zinc.—In 1965 mine production of lead and zinc ores in general was about the same as that of 1964. Due to decreasing prices in export markets, particularly for calcined zinc ore, the high production and export expectation of 1964 was not realized in 1965. In addition to decreased prices, a strike at the Simav mine which began in August and was not settled by yearend contributed to the reduced output in 1965.

A new potentially important discovery was reported in the Hekimhan area near Malatya province by Rasih ve Ihsan Madencilik Şirketi. No detailed information regarding grade or reserves was available.

Rasih ve Ihsan remained the principal producer of mixed lead-zinc ore mined from company holdings in Akdağ Madeni, located betwen Yozgat and Sivas, and from various small mines in the Black Sea area. Özdedeoglu Co. which produced zinc carbonate and mixed sulfide ores from four mines, all in the Zamanti River area, ranked second.

Manganese.—Available data indicate that manganese ore production during 1965 was 30 percent less than in 1964 and was about equal to manganese ore export in 1965. In addition, a substantial tonnage of mangani-

ferous iron ore containing 2 to 5 percent manganese reportedly was produced in the country. However, the manganese requirements of both Ereğli and Karabük steel plants apparently were met by indigenous manganese output other than that reported.

Mercury.—Both mercury production and export declined during 1965, although several new mines came into production.

Etibank produced 1,250 flasks from Haliköy property near Izmir, as well as from the new operation that it had acquired the previous year near Konya. Most promising were the new openings in the Ladik concessions in the Konya area where Etibank produced about 54 flasks of mercury during the year. The average mercury content of Haliköy mine ore was given at 0.25 percent while the Ladik property's grade is said to be about 0.5 percent. No detailed information was available on reserves of these properties.

Among the private producers, the most promising mercury operation was that of Rasih ve Ihsan's Eskigümüş mine where recoveries of up to 3 flasks a day were reported. The ore body was described as a stibnite and scheelite-bearing quartz vein with cinnabar pockets containing 2 to 10 percent mercury. In order to have the maximum recovery at present, a very selective mining concentrating mostly on cinnabar pockets was adopted.

NONMETALS

Asbestos.—Production of crude asbestos was slightly higher in 1965 than in 1964, but the increase had no effect on imports of high-quality material. Total asbestos imports in 1965 were 8 percent greater than in 1964 and practically doubled those of 1963.

Barite.—The Turkish Mining Development Fund awarded credits in 1965 to a private mine operator, Hamdi Bozbag, to improve mining conditions at newly acquired properties and to erect a new modern grinding plant at Elazig. The plant will treat 2,000 tons of ore annually. Bozbag reportedly exported a total 14,200 tons of high-grade ore to the United States in 1964 and 1965 but these shipments are not reflected in official trade statistics. Reportedly, Bozbag's newly acquired properties near Maraş have an indicated reserves of 150,000 tons of high-quality ore, suitable for grinding.

Boron Minerals.—Both production and export of boron minerals set a new record in 1965, with totals of 170,977 and 152,564 tons, respectively. Production was up 33 percent and export increased about 28.8 percent from that of 1964.

Etibank remained the main single producer, followed by private producer Türk Boraks Madencilik (Turk Borax), a subsidiary of Borax Consolidated Ltd., and Rasih vs Ihsan and Haşamettin Yakal.

Construction on the borax and boric acid plants, Etibank ventures at Bandirma, continued during the year with a tentative completion date set for yearend 1966 or the early part of 1967. The plant reportedly will process 35,000 tons of ore to produce 20,000 tons of borax and 500 tons of boric acid annually.

Rasih vs Ihsan Maden Ltd., formed a joint venture with Pilkington Brothers of England to supply 25,000 to 50,000 tons of clean crushed colemanite annually for direct use in fiberglass production. Drilling by the British partner and detailed mapping has proven ore reserves of about 3 million tons in Rasih ve Ihsan's property.

Cement.—Continuing a straight-line growth rate, cement output reached a new high in 1965 with about a 10-percent increase over the 1964 production level. This increase resulted from expansion of existing plants at Söke, Gaziantep, Afyon, and Elazig.

Among the various State and private cement producing organizations, Turkiye Çimento Sanayii T.A.S. ranked first, with an output of 1,495,000 tons. Private sector production supplied by several plants totaled 1,569,000 tons including 197,000 tons produced by Sümerbank Çimento Sanayii Muessesesi. The Ankara municipal plant recorded an output of 180,000 tons.

Emery.—In 1965 export of emery, principally to the United States and the Netherlands, expanded by 80 percent over that of 1964. The reported average value of exportable material was slightly over $12 per ton, f.o.b. Turkish port.

Fertilizer Materials.—Most of Turkey's phosphate rock requirement was met by imports from Israel and Jordan; receipts increased 8 percent in 1965 compared with those of 1964.

MTA continued exploration and research in the recently found phosphate deposits of southeast Turkey. The announced reserves of 100 million tons of phosphate

rock reportedly consist of low-grade material averaging 10 to 12 percent phosphorus pentoxide (P_2O_5) in beds about 1 to 1½ meters thick. In an effort to determine whether this low-grade material can be upgraded, Etibank in June 1965 announced that a contract for a second feasibility study had been signed with a West German firm. However, by the end of 1965, no detailed information from this study was available.

Fertilizer output increased 32 percent in 1965 over the 1964 level. Although this was a substantial increase, about doubling 1962 production, SPO placed highest priority on further increases in production of fertilizer materials so as to increase the agricultural output of Turkey. On this basis, SPO has recommended doubling of the production capacity of Azot Sanayii T.A.S. (Turkish Nitrate Corp.) plant at Kütahya during the year. Also a five-man fertilizer team from the U.S. Tennessee Valley Authority operating under an AID loan to Turkey, agreed in principle to cooperate with SPO on the improvement of the fertilizer industry.

The 46-percent increase in superphosphate output from the 1964 level was most remarkable in comparison with the slight increase in ammonium sulfate output and the slight decrease in ammonium nitrate production in the same period. However, 1964 superphosphate output was considerably below the 1963 level.

Magnesite.—Production and export of magnesite in 1965 almost doubled the 1964 figures. Most of the production was from the Bursa-Eskişehir area where the high-grade ore occurs. Magnesite occurs in veins, stockworks, and lenses of considerable size in serpentinized ultrabasic rocks throughout Turkey. The wide distribution of ultrabasic rock in the country enhances the possibilities for even greater development of magnesite than that already assured on the basis of the present limited exploration. Indicated reserves of magnesite in 1965 remained around 15 million tons.

The prospects for commercial production of calcined magnesite for marketing in Europe were so attractive that the Turkish subsidiaries of both Continental Ore Co. and Vietscher Magnesit Werke, A.G. of Austria, Continental Manyezit Ltd. Şirketi and Manyezit Anonim Şirketi, respectively, applied for expansion permits in 1965. The former was importing equipment to expand production of caustic-grade magnesite to 28,000 tons annually with plans for future expansion to 28,000 tons of caustic and 30,000 tons of dead-burned magnesite for export by 1969. The latter until 1965 had purchased crude magnesite from private producers as feed for its calcining plant, but during the year it acquired exploration permits and was in process of developing its own mine. This firm's expansion plans called for an expansion of plant capacity from 10,000 tons to 20,000 tons of dead-burned magnesite annually.

On the basis of MTA's extensive drilling and evaluation, Sümerbank decided to establish a plant with a 26,500-ton annual capacity at Meram near Konya to produce sintered magnesite. Production from this plant is expected to meet most of Turkish metallurgical grade requirements. The contract for the construction of the plant was apparently awarded to a Japanese firm at an approximate cost of $5.5 million.

Marble.—Although marble production remained at the same level in 1965 as in 1964, export increased by about 18 percent. Most of the production came from Marmara, Afyon, Sögüt-Bilecik, and the Gebze region, all located in the northwest section of the country.

Pyrite.—In 1965 output of the Küre pyrite operations, 31 kilometers south of the Black Sea, remained at about the same level as in 1964. Ore produced reportedly contained about 2.69 percent copper. About 8,100 tons of high-grade ore averaging 10 percent copper was hand sorted from various mines in the Küre region and was shipped to West Germany. Systematic diamond drilling

Table 5.—Turkey: Production of chemical fertilizer
(Metric tons)

Commodity	1963	1964	1965
Ammonium nitrate	58,744	85,913	85,000
Ammonium sulfate	88,513	63,487	91,600
Superphosphate	175,000	151,530	221,300
Total	322,257	300,930	397,900

by Etibank continued during the year and new massive ore bodies were delineated, containing an average of 3 to 4 percent copper with estimated reserves of 2 million tons.

Sulfur.—Despite Turkey's pressing need for more fertilizer, estimated refined sulfur output totaled only 23,000 tons, about 4 percent more than in 1964. Possible establishment of new plants in Ergani, Izmir, and elsewhere by Etibank remained under consideration, but no actual construction work was reported by yearend. One of the Etibank proposals most recently advanced was for a sulfuric acid plant to be established at Samsun in connection with the new 40,000-ton-per-year copper smelter.

MINERAL FUELS

Although Turkey has large reserves of lignite scattered throughout the country, the two largest contributors to the total energy supply of Turkey remained fuelwood or charcoal and animal waste. Apparently these materials supplied 48 percent of the total energy requirement in 1965, while petroleum, coal, and hydroelectric power furnished the remainder.

Bituminous Coal.—Production of washed coal for the first time in recent years decreased by 1.3 percent at the Zonguldak-Armaçuk group of mines operated by the Türkiye Kömür Işletmeleri Kurumu (TKI), the Turkish State coal mining enterprise. Apparently wage increases granted in 1964 resulted in an operating loss in 1965, and profits realized in 1963 and 1964 were not repeated. After many years of production experience, TKI's operation suffered 70 fatalities and 8,400 lost-time injuries with a daily working force of 19,000 men.

During the year, a greater percentage of sales of Zonguldak coal was made to the Karabük and Ereğli steel plants for production of metallurgical grade coke.

A small private mine near Diyarbakir produced on a commercial scale about 12,000 tons of bituminous coal; this represented the first private enterprise bituminous coal production since nationalization of foreign and Turkish mining operations at Zonguldak was completed in 1936.

During the year a decrease in use of coal for domestic and industrial consumption was recorded as greater quantities of domestic lignite and fuel oil became available. The reserves of bituminous coal that are known on the Black Sea coast in the Zonguldak coal basin were variously estimated from 1,000 million to 5,000 million metric tons.

Coke.—Production of all types of coke reached a record high of 1.434 million tons in 1965. The record production represented an increase of 29.5 percent over that of 1964. Karbük steel mill was the leading coke producer in 1965 with about 860,000 tons, followed by Ereğli steel plant, 383,000 tons, municipal gas plants about 116,000 tons, and Zonguldak semi-coke plant 75,000 tons.

Lignite.—Turkey has large lignite deposits scattered throughout the country with reserves estimated to total between 150 million and 300 million tons. Although the only extensive recorded lignite production is from the western provinces, there are numerous deposits known in the eastern provinces which produced on a commercial scale for the first time in 1965.

Production of lignite in 1965 from State-owned mines operated by TKI remained almost at the same level as in 1964. However, output of numerous privately operated mines, ranging from 100 metric tons to 308,000 tons annually in individual output, together recorded an increase of about 22.6 percent compared with the 1964 level. Production of some of the principal private mines is shown in table 7. Due to lack of

Table 6.—Turkey: Salable production of bituminous coal
(Thousand metric tons)

Producer	1963	1964	1965
Public sector:			
Çelik (Karadon)	1,594	1,701	1,670
Üzülmez	1,253	1,325	1,273
Kozlu	1,011	1,113	1,130
Kandilli (Armutçuk)	294	309	317
Private sector:			
Diyarbakir	--	--	12
Total	4,152	4,448	4,402

detailed information on small privately operated mines, they have not been included.

In 1965 Western Lignite Operations of TKI concluded a loan agreement with AID for expansion of the Tunçbilek washing plant to 2 million tons annual capacity and for modernization of the Seyitömer opencast mining operations.

Petroleum.—*Crude Oil.*—According to announcements made by the Ministry of Industry, Turkish crude oil output in 1965 reached a new high, 64 percent greater than in 1964; the increase was shared by all producing companies as shown in table 8.

For the first time, the combined production of the privately owned companies exceeded the production of the Government-owned TPAO. It was expected that until the Batman-Iskenderun pipeline is completed, production will not exceed the 1965 level appreciably.

The discoveries during 1963 and 1964 at fields such as Selma raised hopes that Turkey might soon be self-sufficient in the production of crude oil. However, the extensive exploration activity in 1965 and the drilling of several dry holes at Selma indicated that these hopes will not be realized in the near future if at all, and that Turkey must depend on the foreign market for crude petroleum.

Foreign companies producing petroleum in Turkey reported the following results of exploration activities for all operating firms: TPAO drilled a total of 76 exploratory wells and discovered oil in 5; Mobil drilled 29 exploratory wells, of which 5 were discovery wells; and Shell has drilled 17 exploratory wells, of which 4 were discovery wells.

By yearend, it was reported that the French firm, Société de Participations Pétrolières, made a discovery of good quality 35° API gravity oil in district V at Malahermo Number 1. However, no details on reserves or well-test results were available.

Table 7.—Turkey: Salable production of lignite
(Thousand metric tons)

Producer	1963	1964	1965
Public sector:			
Tunçbilek	1,042	1,288	1,181
Soma	380	551	623
Değirmisaz	189	195	161
Seyitömer	441	506	544
Dodurga	NA	NA	25
Subtotal	2,052	2,540	2,534
Private sector:			
Çamlica, Soma	NA	NA	308
Krolin, Soma	NA	NA	244
Demirci, Çan	NA	NA	98
Aligut, Amasya	NA	NA	167
Yeni Çeltek	NA	NA	87
Eski Çeltek	NA	NA	675
Others	NA	NA	53
Subtotal	1,185	1,331	1,632
Total	3,237	3,871	4,166

NA Not available.

Table 8.—Turkey: Production of crude oil by company
(Thousand 42-gallon barrels)

Company	1964	1965	Percentage of increase
Turkiye Petrolleri A.O. (TPAO)	4,042	4,487	11
Mobil Exploration Mediterranean Inc. (Mobil)	1,103	2,837	157
N.V. Turkse Shell (Shell)	646	2,228	245
Ersan Petrol Sansyii (Ersan)	195	264	35
Total	5,986	9,816	64

Detailed geological mapping and geophysical studies by MTA in Erzurum province near the village of Tekman were augmented by a drilling program using a rig capable of reaching a depth of 1,000 meters. The drilling program was to be completed sometime in 1966; detailed information on results in 1965 was not available at yearend.

Refining.—Turkish refinery production totaled about 31 million barrels from three plants, one each in Batman, Izmit, and Mersin. Most of the domestic production of about 9.8 million barrels and nearly 22.6 million barrels of crude oil imported from Saudi Arabia and Iraq constituted the feedstock.

Pipelines.—TPAO awarded a contract for construction of a pipeline from Batman (southeast Turkey) to the Mediterranean seaport of Iskenderun to Enterprise de Recherche et d'Activités Petrolièrs of France and Tekint Co. of Italy. The 18-inch pipeline will be 560 kilometers long and cost about $34 million. The initial capacity of 70,000 barrels daily can be expanded to 100,000 barrels per day with the addition of more pumps. Initial plans call for construction of 14 storage tanks, each with a 150,000-barrel capacity, 2 pumping stations, and 1 port facility. Feasibility studies were carried out by Brown and Root Engineering Co. of the United States, which also has been awarded supervision of the project that is scheduled for completion in early 1967.

The pipeline will be used primarily by TPAO, Royal Dutch/Shell, and Socony Mobil Oil Co. which have developed substantial production and reserves east of the Tigris River in southeast Turkey.

The Mineral Industry of Other Arabian Peninsula Areas

By James A. West [1]

CONTENTS

QATAR

The petroleum industry of Qatar accounted for about 2.6 percent of Near East area crude oil production in 1965. Essentially all oil produced was exported as crude oil. These oil exports, valued at an estimated $155 million in 1965, were the source of essentially all foreign exchange and most Government revenues. Direct payments to the Government by the oil operating companies in 1965 were an estimated $75 million. As the sheikdom's only significant industrial activity, the petroleum industry indirectly supports much of the local commercial and construction activity. Oil operators employ about 2,400 persons, or nearly 14 percent of the estimated total work force.

The Governments of Qatar and Saudi Arabia reached agreement on the definition of their onshore and offshore boundaries. Negotiations were continued with other neighboring States in an effort to resolve boundary disputes.

The Qatar Petroleum Co. (QPC) relinquished to the Government an additional 1,104 square miles of its oil concession area. Originally, QPC held oil rights to the entire peninsula but had relinquished much of the area previously in 1961 and 1963. At the end of 1965 QPC retained only about 20 percent of the original concession, the immediate area of the Dukhan oilfield on the west coast of the peninsula.

PRODUCTION

Crude oil continued as the only significant mineral commodity produced in Qatar. Increased offshore oil production was largely responsible for the 8 percent gain in 1965 output over that of 1964. A trend of rapidly expanding offshore oil production and relatively stable onshore production is indicated.

Small quantities of crude oil were partially refined at the QPC topping plant at Doha to recover about 425 barrels per day of gasoline and other fuels required for domestic consumption.

TRADE

Crude oil exports, valued at an estimated $155 million in 1965, continued as Qatar's only significant mineral commodity export.

Very limited information suggests that the value of all imports into Qatar in recent years averaged about $25 to $30 million annually. Mineral commodity imports, consisting mostly of construction materials, fuels, and lubricants have accounted for about 10 percent of the value of all imports.

[1] Chief specialist, Near East and South Asia, Division of International Activities.

Table 1.—Qatar: Production of petroleum and petroleum products

(Thousand 42-gallon barrels)

Commodity	1961	1962	1963	1964	1965
Petroleum:					
Crude	64,386	67,911	r 70,158	r 77,885	84,215
Refinery products: e					
Gasoline	60	60	51	59	64
Kerosine	36	30	27	32	35
Distillate fuel oil	60	50	47	50	56
Residual fuel oil	84	----	61	----	----
Other	----	5	4	4	----
Refinery fuel and loss	12	5	NA	73	75

e Estimate. r Revised. NA Not available.

Table 2.—Qatar: Exports and imports of petroleum and refinery products [1]

(Thousand 42-gallon barrels)

Commodity	1963	1964	1965
Exports:			
Petroleum, crude	69,623	r 77,510	83,354
Imports: e			
Petroleum refinery products:			
Gasoline	104	96	90
Kerosine	36	30	30
Distillate fuel oil	38	35	35
Lubricants, including grease	6	6	6

e Estimate. r Revised.
[1] Data on destinations and origins not reported in detail.

COMMODITY REVIEW

Mineral Fuels.—*Petroleum.*—The long-developed Dukhan field, operated by QPC, continued as the major oil producer and the only onshore field. Its 1965 output averaged 193,682 barrels per day, exceeding that of 1964 by 2.4 percent. QPC drilling activity was limited to well workover operations. Mechanical troubles idled the miscible gas injection plant throughout most of the year; however, a water injection program was begun and about 1.25 million barrels of water was injected into the main producing reservoir. These fluid injection projects are to maintain reservoir pressure and increase ultimate oil recovery.

Shell Oil Co. of Qatar Ltd. (Shell) continued to develop the offshore Idd al Sharqi and Maydam Mazam fields near Halul Island. Several additional producing wells were drilled in these fields. A production platform designed to handle 120,000 barrels per day of crude oil from the Maydam Mazam field was constructed. Construction of a permanent terminal on Halul Island, together with oil-gathering pipelines and tanker loading facilities to handle up to 150,000 barrels per day of output from both fields, was nearing completion at yearend. This facility will replace the existing temporary loading facilities at Idd al Sharqi that have limited oil production to about 30,000 barrels per day. In December, the first tanker was loaded from the new terminal.

Continental Oil Co. (CONOCO) continued seismic exploration activities in offshore and onshore areas of its recently acquired oil concessions in Qatar.

Proved oil reserves in Qatar were reported[2] as 3,000 million barrels at yearend.

TRUCIAL STATES

The Trucial States include the seven coastal area sheikdoms of the southeastern Arabian peninsula that border on the Persian Gulf. They are Abu Dhabi, Dubai, Sharjah, Ajman, Umm al-Qaiwain, Ras al-Khaimah, and Fujairah. The area was the scene of accelerated petroleum exploration and development activity in 1965 although oil production has been established only in Abu Dhabi. Crude oil production from the onshore and offshore areas of Abu Dhabi continued to be expanded rapidly.

[2] Oil and Gas Jour. V. 63, No. 52, Dec. 27, 1965, p. 83.

As the only major industrial activity of the Trucial States, the petroleum industry continued to have a marked impact on the economy of the entire area. The industry employed an estimated 2,500 persons. Also, a large expansion in trade and a minor boom in construction and commercial activities in this largely underdeveloped area has resulted from oil company expenditures and direct oil payments to the States. In September, the Ruler of Abu Dhabi and the Abu Dhabi Petroleum Co., Ltd. (ADPC), agreed to revise their oil concession agreement to provide sharing of profits on a 50-50 basis, effective January 1, 1965. The original agreement, signed in 1939, provided generally a fixed royalty at a much lower rate. Since direct oil payments account for more than 90 percent of all revenues to the Trucial States, these revenues increased sharply from an estimated $20 million in 1964 to $85 million in 1965. As a result of the revised profit-sharing agreement, essentially all of the monetary increase resulting from greater oil output accrued to Abu Dhabi.

On March 1, the Rulers of the Trucial States agreed to jointly plan for development of the area and to seek unconditional aid from any source to finance needed development. The Trucial States Development Office, operating under the Trucial States Council, was established to administer funds and carry out approved development programs. The United Kingdom, Saudi Arabia, Abu Dhabi, Qatar, and Bahrain have agreed to contribute nearly $7 million to a fund to be called the Trucial States Development Fund. The first major project was that of constructing an all-weather road from Dubai to Ras al-Khaimah, thus linking five of the seven sheikdoms.

PRODUCTION AND TRADE

Crude oil was the only significant mineral commodity produced in the Trucial States in 1965; however, small quantities of simple building materials were produced for local use. All crude oil production was from Abu Dhabi where output was expanded throughout 1965. Gains of more than 50 percent in 1965 crude oil production over that of 1964 were registered in both onshore and offshore areas. The increases resulted from new fields' development and completion of additional oil handling facilities.

All oil produced is exported as crude oil. In 1965, these oil exports, valued at an estimated $175 million, accounted for an estimated 97 percent of the value of all exports. Other exports were chiefly reexports from Dubai.

The port of Dubai remained the Trucial States' principal import and transit trade center. Total imports during the first half of 1965 were valued at $24.4 million, an increase of about 20 percent over the corresponding period of 1964. Mineral imports, consisting of construction materials and petroleum refinery products, accounted for 10 percent of the value of all imports.

COMMODITY REVIEW

Mineral Fuels.—*Petroleum.*—Active exploration, development, and exploitation of the oil resources of Abu Dhabi continued throughout 1965. Onshore, ADPC discovered a major new oilfield at Abu Jidu about 80 kilometers southeast of the Murban field. As a result of negative exploratory drilling in other areas, ADPC relinquished four separate areas of its concession to the Government. The original oil concession covered all of Abu Dhabi and adjoining territorial waters. Additional de-

Table 3.—Trucial Coast and Muscat and Oman: Production and imports of petroleum and its products

(Thousand 42-gallon barrels)

Commodity	1961	1962	1963	1964	1965
Production (Abu Dhabi):					
Petroleum, crude	447	5,551	17,571	67,465	102,804
Imports:					
Petroleum refinery products:					
Gasoline	NA	e 84	e 120	e 160	e 170
Kerosine	NA	e 32	e 25	e 20	e 20
Distillate fuel oil	NA	e 76	e 130	e 190	e 200
Lubricants	NA	e 4	e 6	e 8	e 8

e Estimate. NA Not available.

velopment wells, production facilities, and a 35-kilometer, 24-inch-diameter spur pipeline that provides production capacity of up to 150,000 barrels per day from the Bu Hasa field were completed. The field was placed on production in April. These new facilities at Bu Hasa, together with existing Murban field facilities, raised ADPC producing potential to 240,000 barrels per day, the nominal capacity of the 24-inch-diameter pipeline to the loading terminal at Jebel Dhanna. In 1965, these two fields accounted for all onshore production at a record rate averaging almost 192,500 barrels daily.

In the offshore area of Abu Dhabi, Abu Dhabi Marine Areas, Ltd. (ADMA), discovered a new oilfield at El Bunduq, about 18 miles southwest of Das Island. Additional delineation drilling at the Zakum field, about 80 kilometers southeast of Das Island, confirmed this 1963 discovery as a major field. Average production of nearly 91,000 barrels per day was all from the Umm Shaif field. Development at the field was completed late in 1964 when 8 additional wells were connected for production to bring the total number of wells to 26. All production is piped to the Das Island export terminal which has a nominal oil-handling capacity of 90,000 barrels per day.

In Dubai, the Dubai Petroleum Co. continued exploration in the onshore areas of the sheikdom. A deep exploration well drilled at Remah in the southeast corner of Dubai proved nonproductive and was abandoned at an undisclosed depth early in 1965. Previously, one offshore well and another well onshore had been abandoned as dry holes. At yearend, preparations were being made to drill a second well in the offshore area.

In Sharjah, Ajman, and Umm al-Qaiwain, oil exploration was continued by John W. Mecom on a concession held in partnership with Pure Oil Co. A well drilled in northeast Umm al-Qaiwain to a depth of 8,500 feet was abandoned as dry. At yearend, a well was being drilled in Sharjah near the Ajman border.

In Ras al-Khaimah, seismic surveys were conducted by Union Oil Co. of California on concessions held jointly with Southern Natural Gas Co. No drilling operations were initiated during the year.

Negotiations were continued for oil concessions in the sheikdom of Fujairah but no definite agreements were reported.

MUSCAT AND OMAN

Petroleum Development Oman, Ltd. (PDO), began to implement its $75 million program to bring into commercial production the oil resources in its onshore concessions of the Sultanate of Muscat and Oman. The company awarded a contract to Williams Brothers of Tulsa, Okla., for construction of a 250-kilometer 32- to 36-inch-diameter pipeline from the Natih, Fahud, and Yibal fields of western Oman to Saih al-Malih on the Gulf of Oman. Contracts for construction of an oil terminal, offshore tanker loading facilities, oil storage tanks, and related facilities were awarded to several other international construction firms. Two rigs were active throughout the year drilling additional development wells in the Natih and Fahud fields. Construction was in progress at yearend and completion of facilities to export up to 200,000 barrels per day of crude oil by mid–1967 is planned.

In the Dhofar area of the Sultanate, seismic oil exploration surveys were continued but no new well drilling was reported. Continental Oil Co. acquired a one-third interest in the oil concession, covering all of Dhofar and its offshore area, previously held jointly by John W. Mecom and Pure Oil Co.

Negotiations for oil concessions in the offshore area of the Sultanate were reported but no definite agreements were announced.

FEDERATION OF SOUTH ARABIA

The Aden Colony continued as the only political entity among the 14 sheikdoms of the East and West Aden Protectorates comprising the Federation of South Arabia that had significant mineral production and trade in 1965. Although significant quantities of salt were produced by solar evaporation of sea water, refining of im-

ported crude oil, export of petroleum products and bunkering remained Aden's dominant industrial activity. In 1965, petroleum refinery production was valued at an estimated $140 million, including value added of about $42 million. Petroleum refining and port operations (largely bunkering and petroleum trade) contributed an estimated $70 million to Aden's gross national product of about $235 million. The mineral industry employed about one-fourth of the industrial labor force or an estimated 3,100 persons, including about 2,000 in petroleum refining, 1,000 in bunkering, and 80 in salt production.

Petroleum exploration operations were continued in the East Aden Protectorate sheikdoms of Qu'ayti, Kathiri, and Mahrah. Although these States are not members of the Federation of South Arabia, their economies are directly related to it.

The Federation continued to receive development assistance from the United Kingdom. Construction of roads has been emphasized in development plans as essential to the economic development of the area. Considerable progress was made on construction of a 146-kilometer road from Abyan to Mudiyah.

PRODUCTION AND TRADE

The British Petroleum Co. (Aden) Ltd. (BP) refinery operated at full capacity of 136,000 barrels per day. The gross value of refinery output in 1965 was valued at an estimated $140 million while that of salt production was about $200,000.

Trade in petroleum and refinery products continued to account for about 50 percent of the value of total trade. In 1965, exports of refinery products (excluding bunkers) were valued at an estimated $95 million. As a result of political and labor disturbances, bunkers supplied to ships at Aden in 1965 declined by about 18 percent from that of 1964. The estimated value of all bunkers delivered to 5,727 ships in 1965 was $45 million.

Table 4.—Federation of South Arabia: [1] Production of minerals

Commodity	1961	1962	1963	1964	1965
Nonmetals:					
Salt—metric tons	118,132	78,000	86,360	81,280	72,481
Mineral fuels:					
Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	4,122	3,760	3,463	3,393	3,428
Jet fuel and kerosine—do	4,083	5,092	5,430	6,112	5,448
Distillate fuel oil—do	7,811	8,703	9,356	9,479	9,280
Residual fuel oil—do	17,987	21,258	25,327	23,584	24,991
Other refined products—do	2,920	3,617	3,262	4,083	4,354
Refinery fuel and loss—do	2,109	2,488	2,574	3,252	3,714
Total	39,032	44,918	49,412	49,903	51,215

[1] All recorded production is from Aden Colony.

Table 5.—Federation of South Arabia: Exports and reexports of metals and minerals from Aden [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965
Metals:			
Iron and steel	671	NA	NA
Nonmetals:			
Cement	4,152	NA	NA
Salt	73,739	e 70,000	e 65,000
Mineral fuels:			
Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	3,145	4,663	3,161
Kerosine and jet fuel—do	4,804	4,898	4,795
Distillate fuel oil—do	6,467	6,686	7,033
Residual fuel oil—do	10,948	11,631	11,341
Other, including LPG and feedstocks—do	3,244	2,996	5,732
Bunkers—do	r 26,351	r 26,977	e 22,272

e Estimate. r Revised. NA Not available.
[1] Destinations not available.

Imports of metals and minerals in 1965 were valued at an estimated $125 million. Crude oil and petroleum accounted for about 95 percent of the value of all mineral imports.

COMMODITY REVIEW

Nonmetals.—*Salt.*—The Indo-Aden Salt Co. was the sole producer of salt in Aden. The trend of declining production and export continued. Most sales were for export to the low-priced Japanese market. Increased labor costs and low salt prices combined to limit output by this company.

Mineral Fuels.—*Petroleum.*—Despite labor instability during the first 5 months of 1965 at the BP refinery, production was maintained at a level slightly in excess of the rated nominal capacity (136,000 barrels per day) of the plant. In May, BP granted a 20-percent wage increase to all employees.

The American International Oil Co., a Standard Oil Co. of Indiana affiliate, continued oil exploration operations in its East Aden Protectorate concessions. A well drilled to a depth of 5,750 feet at Tarfayt (about 100 miles northeast of Thamud) was nonproductive. Initial seismic exploration surveys were completed and suspended pending evaluation of results.

YEMEN

The mineral industry continued to play an unimportant role in the economy of Yemen. As an almost totally underdeveloped industrial nation, Yemen's minerals exploration has been limited. Rock salt deposits are Yemen's only known mineral resource of significant commercial value. The exploitation of these salt deposits had been discontinued in 1964 and was not resumed in 1965.

Continuing civil strife and armed conflict in Yemen had a mixed influence on the economy. The negative aspects of political conflict were partially offset by foreign technical and financial assistance to various development programs. The United States Agency for International Development completed construction of the 225-mile Mocha-Taiz-Sanaa road project. Also, Yemen concluded agreements with the Soviet Union and mainland China for additional road projects. Building and other construction continued active in Sanaa, Hodeida, and Taiz. Soviet and Rumanian geological exploration teams were active in Yemen but the results of their efforts are unknown.

PRODUCTION AND TRADE

Except for small quantities of simple construction materials produced for local consumption, the only mining activity of

Table 6.—Federation of South Arabia: Imports of selected metals and minerals to Aden

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals:				
Iron and steel	10,070	NA	NA	NA.
Nonmetals:				
Cement	77,763	NA	NA	NA.
Salt	30	NA	NA	NA.
Mineral fuels:				
Coal	1,266	NA		
Petroleum:				
Crude—thousand 42-gallon barrels	46,935	50,080	51,772	Iran, 21,535; Kuwait 17,565; Abu Dhabi 5,393; Qatar 4,769; Iraq 2,392.
Refinery products:				
Gasoline—do	306	510	803	NA.
Kerosine and jet fuel—do	NA	158	71	NA.
Distillate fuel oil—do	NA	NA	667	NA.
Residual fuel oil—do	10,976	4,283	5,982	NA.
Lubricants[e]—do	12	12	12	NA.

[e] Estimate. NA Not available.

recent years was production of salt for export to Japan. Under terms of a 5-year contract that expired in February 1964, the following salt production was reported:

Year	Quantity (metric tons)	Year	Quantity (metric tons)
1959	100,000	1963	100,000
1960	100,000	1964	35,000
1961	120,000	1965	-----
1962	150,000		

Trade statistics for 1964 show that total Yemeni exports were valued at approximately $4 million. No minerals or metals exports are indicated. Total imports were valued at approximately $19 million, with minerals and metals accounting for almost 26 percent of this total. Principal mineral imports and estimated values were building materials ($2.7 million); petroleum products ($1.8 million); iron and steel ($0.25 million).

COMMODITY REVIEW

Nonmetals.—*Salt.*—The Salif Salt Co. (jointly owned by the Governments of Yemen and the United Arab Republic (Egypt)) began to repair and rehabilitate the salt mining and loading facilities at Salif. In November, a contract was signed with a Japanese firm under which the company will undertake to export 120,000 to 150,000 tons annually to Japan. The first shipment was scheduled for January 1966.

Mineral Fuels.—*Petroleum.*—No petroleum exploration activity was reported during 1965. The jointly owned Yemen Petroleum Co. (held 51 percent by the Government of Yemen and 49 percent by the United Arab Republic (Egypt)) supplied all petroleum refinery products to Yemen under its monopoly granted by the Government. Estimated domestic consumption of petroleum products in 1965 was gasoline, 59,000 barrels; kerosene, 115,000 barrels; diesel fuel, 52,000 barrels; and small quantities of bottled liquefied petroleum gases.

Regional Mineral Industry Review of South Asia

By James A. West [1]

The South Asian countries of India, Pakistan, Afghanistan, Ceylon, Nepal, Bhutan, and Sikkim are to varying degrees just beginning to achieve significant economic and industrial development. These countries are richly endowed with certain mineral resources, and development of these resources is being accelerated. In 1965, the mineral industry remained a relatively small sector of the region's economy, accounting for only about 1 percent of its estimated gross national product of $62,528 million. Nevertheless, the estimated $630 million total value of minerals produced in South Asia during 1965 represented an increase of nearly 15 percent over that of 1964.

India continued as the dominant mineral producer of the region, accounting for 85 percent of the total value of all minerals produced in 1965. India increased its output of iron ore, manganese, mica, coal, and petroleum. Pakistan accounted for 13 percent of the value of the region's output and recorded increased output of iron ore, chromite, coal, natural gas, and most other minerals. The small mineral industry of Ceylon attained remarkable growth in the production of ilmenite, graphite, and gem stones. The mineral industry of Afghanistan remained relatively insignificant, although development of large known resources of natural gas was continued. Nepal, Bhutan, and Sikkim produced no commercially significant quantities of minerals in 1965.

South Asian production of certain mineral commodities was of world significance. The most important minerals produced in 1965 and South Asia's share, in percent of total world output, were as follows: Mica, 19.1; manganese ore, 9.1; salt, 4.9; talc and soapstone, 4.4; iron ore, 3.9; cement, 2.8; gypsum, 2.8; coal, 2.5; magnesite, 2.5; bauxite, 1.9; and graphite, 1.7.

Trade in mineral commodities continued as an important sector of total trade in South Asia in 1965. On the basis of the most recent statistics available for 1964, the relative significance of mineral trade to total trade for all seven countries combined was as follows:

	Value (million dollars)		Mineral commodities share of total
	Mineral commodities	All commodities	
Exports	221	2,752	8
Imports	951	4,287	22
Trade balance	—730	—1,535	XX

XX Not applicable.

Principal exports were iron ore, manganese ore, mica, and graphite. The region was dependent upon imports for most base metals, crude oil and petroleum products, fertilizers, much iron and steel semimanufactures, and many industrial minerals. The contributions of each of the major mineral commodity categories to total minerals trade in 1964 follow:

Commodity group	Value (million dollars)	
	Imports	Exports
Metals	540	155
Nonmetals	138	37
Fuels	273	29
Total	951	221

[1] Chief specialist, Near East-South Asia, Division of International Activities.

Governments of the region initiated and expanded programs for the development of mineral resources. The planned development and exploitation of mineral resources as scheduled in successive 5-year plans continued as key programs in the Government of India's policy to expand and diversify the industrial base of the national economy. Projects to expand iron and steel, nonferrous metals, petroleum, and other mineral production capacity were assigned high priority in the fourth 5-year plan (1966–71). Under the third 5-year plan (1965–70), the Government of Pakistan embarked on an ambitious program of mineral resource development aimed at greatly expanding the output of natural gas, coal, and petroleum. The Governments of Afghanistan and the U.S.S.R. concluded an agreement for exploitation of the large natural gas reserves of northern Afghanistan. The U.S.S.R. agreed to continue financial and technical assistance in developing natural gas reserves, pipelines, a thermal powerplant, and a fertilizer plant in exchange for large-scale gas exports to the U.S.S.R. In Ceylon, the Government awarded a contract to an Italian firm for construction of the island's first petroleum refinery.

The Mineral Industry of Afghanistan

By James A. West [1]

The economy of Afghanistan has always been predominantly agricultural and pastoral. In 1965, the mineral industry continued as a relatively insignificant sector of the nation's economy, accounting for less than 0.6 percent of the estimated gross national product of $1,200 million.

During 1965 cement, coal, and salt were the only mineral commodities produced commercially for domestic consumption. Small quantities of lapis lazuli were mined seasonally for export. Large natural gas reserves have been discovered and partially developed in the northern area of the country. Other mineral resources of potential importance include a reportedly large deposit of high-grade iron ore and small deposits of chromite, beryl, lead, zinc, mica, talc, and uranium. The remote geographical location of landlocked Afghanistan, inadequately developed internal transportation facilities, lack of domestic markets, and insufficient financial and technological resources have limited exploration for and exploitation of these mineral resources.

The most significant mineral industry development in 1965 was the conclusion of an agreement between the Governments of Afghanistan and the U.S.S.R. for exploitation of natural gas reserves in the Shibarghan area of northern Afghanistan. The U.S.S.R. agreed to finance and assist in the construction of pipelines, a thermal powerplant, and a fertilizer plant. Large-scale exports of natural gas to the U.S.S.R. will be made in repayment of the Soviet loan financing the entire project.

The completion or near completion of major road construction projects during 1965 has substantially improved internal communications and enhanced prospects for mineral industry exploration and development activities. The Salang road and tunnel from Kabul to Pul-i-Khumri, opened in August 1964, was kept open throughout 1965 despite heavy snowfalls. The Kabul-Kandahar road, being built with U.S. assistance, was near completion. The Kandahar-Herat-Torghundi road, built with U.S.S.R. assistance, was completed. Construction was begun in May on a highway to extend the Salang Pass road from Pul-i-Khumri to Mazar-i-Sharif and ultimately to Shibarghan. This road, being built with U.S.S.R. assistance, should greatly aid in the development of natural gas and coal resources in the north-central area of the country.

PRODUCTION

Production of all commercially significant mineral commodities during 1965 increased substantially over that of 1964. The estimated value of listed mineral production increased from $4.6 million in 1964 to $6.98 million in 1965. In addition to those commodities listed, small quantities of minor construction materials, clays, gypsum, talc, and marble were produced and consumed locally, but data are insufficient for quantitative estimates of output.

[1] Chief specialist, Near East and South Asia, Division of International Activities.

Table 1.—Afghanistan: Production of selected metals and minerals

Commodity	1961	1962	1963 [1]	1964 [1]	1965 [1]
Metals:					
Beryl—kilograms	--------	--------	--------	500	---------
Nonmetals:					
Barite—metric tons		NA	[r] 1	2	[e] 2
Cement—thousand metric tons	41	[e] 70	95	[e] 125	170
Lapis lazuli—kilograms	[2] 3,268	[2] 2,823	5,421	5,000	8,550
Salt:					
Rock—thousand metric tons	[r] 23	[r] 31	21	13	18
Other—do			12	12	20
Total—do	23	31	33	25	38
Mineral fuels: Coal:					
Bituminous—do	68	69	98	113	132
Briquets—do	19	[e] 19	[e] 20	[e] 20	[e] 14

[e] Estimate. [r] Revised. NA Not available.
[1] Data for Afghan calendar year beginning Mar. 21.
[2] Data for Afghan fiscal year beginning Sept. 21.

TRADE

In 1965, Afghanistan had no significant mineral commodity exports and remained dependent on imports for essentially all its requirements for metals, petroleum products, and most nonmetallic minerals. Based on Central Bank exchange data, total trade during the Afghan calendar year ending March 20, 1965, was valued at $212.1 million. Total imports were valued at $141.4 million, with reported mineral commodities comprising at least 10 percent of this total. Quantitative data are only available for petroleum products imports.

Table 2.—Afghanistan: Imports of petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1963–64 [1]	1964–65 [1]	Principal sources, 1964–65
Gasoline	856	913	U.S.S.R. 691; Iran 120; Pakistan 102.
Kerosine	57	153	U.S.S.R. 114; Iran 28; Pakistan 11.
Diesel fuel oil	296	416	U.S.S.R. 237; Iran 90; Pakistan 89.
Lubricants and other	16	46	U.S.S.R. 43; United States 2.

[1] Afghan calendar year beginning Mar. 21.

COMMODITY REVIEW

METALS

Beryl.—A U.S.S.R. minerals survey team continued exploration and evaluation activities to assess the importance of recent beryl discoveries in the Kunar area. The Afghan Ministry of Mines and Industries announced in July that deposits discovered at Dari-i-Noor, Dari-i-Paich, and Chapa-Dari contain an estimated 51,000 tons of beryllium and 39,300 tons of lithium oxide.

Iron Ore.—The presence of an extensive iron ore deposit at Hajigak in the Hindu Kush Mountains has been known for many years. As a result of geological investigations, conducted by a Soviet-assisted survey team, the Ministry of Mines and Industries announced that the Hajigak deposit contains an estimated reserve of 2 billion tons of hematite ore having an average iron content of 63 percent. Various plans for exploitation of the deposit are under consideration, including the possible use of natural gas for direct reduction of the ore to pig iron.

NONMETALS

Barite.—The small quantity of barite produced was utilized for oil and gas well-drilling operations in the north-central area of the country. The barite was mined

from deposits in the immediate area for this specific purpose.

Cement.—The Government-owned Ghori and Jabal-i-Seraj cement plants steadily increased output throughout 1965 to near their rated capacities of 400 and 100 tons per day, respectively. These plants continued to supply all the domestic cement requirements in 1965, but demand was expected to exceed plant capacity in the near future. The Government announced plans for construction of a 300-ton-per-day capacity plant at Herat.

Lapis Lazuli.—Deposits in the Badakshan province of northern Afghanistan were reported to contain an estimated 1,300 tons of lapis lazuli. Small mines were operated seasonally, and output, mostly of fair to poor quality, was exported to West Germany to be cut and polished.

Salt.—Most rock salt was produced from opencast mines near Tallequan where salt domes outcrop. In the summer months, salt continued to be obtained from the evaporation of brine from salt lakes near Mukhar and along the Iranian border southeast of Herat. Lack of adequate transportation continued to limit salt output.

MINERAL FUELS

Coal.—Nearly all coal produced in 1965 was from the Government-owned Karkar and Ishpushta mines in north-central Afghanistan. These mines continued to supply the nation's two cement plants and the Kabul area with coal. However, the Karkar and Ishpushta coal reserves are limited and the coal is of poor quality. The U.S. Agency for International Development continued to assist in the development of a coal mine at Darra-i-Suf. Although located some 400 miles from Kabul, the Darra-i-Suf coal reserves, an estimated 60 million tons, are being developed to supply up to 150,000 tons annually to meet Afghanistan's growing coal demand. It was reported that a U.S.S.R. survey team had discovered an estimated 25-million-ton coal reserve at Shaba-shak, approximately 10 miles from Darra-i-Suf.

A portion of the coal produced was made into briquets by hand methods, and by the use of simple machinery. Construction of a modern briqueting plant, purchased in France, was continued. This plant was scheduled to begin operating in 1966.

Petroleum and Natural Gas.—In 1965, the Afghan Petroleum Exploration Department (APED), Ministry of Mines and Industries, continued oil and gas exploration activities but concentrated on the development of known gasfields in the Shibarghan area of north-central Afghanistan. Assisted by the U.S.S.R., APED drilled additional wells to delineate the gas reserves and develop the Khwaja Gogirdak and Yatim-Tagh gasfields for exploitation. At yearend, a total of 11 wells had been drilled to depths ranging from 2,400 to 9,200 feet at Khwaja Gogirdak, and 16 wells had been drilled to depths of 1,300 to 7,400 feet at Yatim-Tagh and the nearby Yalanghach structure. Proved gas reserves in the Cretaceous gas reservoirs of these fields were an estimated 2,400 billion cubic feet. A second well drilled at Khwaja Borhan confirms this 1964 discovery as a commercial gas and condensate field. At Andkhoi (Aska), the deepest well drilled to date in Afghanistan was completed in the Jurassic section at a depth of 11,516 feet and was being tested.

At midyear, the Governments of Afghanistan and the U.S.S.R. signed contracts providing Soviet financial and technical assistance for construction of facilities to exploit and utilize natural gas reserves from the Shibarghan area. Planned facilities include a 98-kilometer, 32-inch-diameter pipeline to export up to 240 billion cubic feet of gas annually to the U.S.S.R. on the border at Kelif; a 24,000-kilowatt-hour thermal powerplant and a chemical fertilizer plant with a capacity to produce 105,000 tons of urea annually at a site near Mazar-i-Sharif; and an 88-kilometer, 12¾-inch-diameter pipeline to supply up to 200 million cubic feet of gas annually to these plants. Initial construction was begun late in 1965, and all facilities were scheduled to be completed in 3½ years. Proceeds from the sale of exported gas are to be used to repay Soviet loans for the project.

A geological survey team from West Germany, conducting mineral investigations in southern Afghanistan, encountered surface indications that there may be hydrocarbons in the province of Paktia. On September 20, 1965, the German mission concluded an agreement with the Afganistan Government to conduct an aerial magnetometer survey of a 150,000-square-kilometer area in an effort to locate oil and gas prospects.

The Mineral Industry of Ceylon

By E. Shekarchi [1]

Ceylon's mineral industry, although small, experienced a remarkable growth in 1965 with production valued at about $6.9 million. Ilmenite and graphite remained the main contributions of Ceylon to world mineral supplies. Exports of minerals, excluding precious and semiprecious stones, were valued at $1.6 million in 1964. Total gross national product (GNP) in 1965, based on 1962 prices, was estimated to be about $1,575 million with a GNP per capita of about $139, slightly lower than in 1964. The estimated population in 1965 was reported to be 11.3 million with an annual growth rate of 3 percent. Of the population, 3 percent or about 339,000, constituted the country's total labor force, and of this, agriculture accounted for about 52 percent, manufacturing (including the minerals industry) 12 percent, trade and commerce 8 percent, service 12 percent, and others 16 percent. Registered unemployment in 1964 was about 157,000 people.

The most significant development in the island's mineral industry was the signing of a contract in October 1965 between Ceylon Petroleum Corp. and Ente Nazionale Idrocarburi (ENI) of Italy to build a refinery in Ceylon that was planned to reduce import expenditures for energy requirements.

On March 16, 1965, the Government of Ceylon issued a statement summarized in the booklet, "Government Policy on Private Foreign Investment," outlining the need for private foreign investment in Ceylon, facilities granted to foreign investors, security of investment, area of investment, and the inducements offered to investors. The whole effort seems to be favorable and logical, especially the announcement that all foreign investments' approval will be under one department, eliminating the previous multiplicity of departments involved.

In early 1965, a resolution sanctioning the investment of $40 million initial capital for a State fertilizer manufacturing corporation was passed. The proposed initial capacity of such an operation was about 250 tons per day. No details on the type of products expected were available.

Utilizing a great deal of geophysical equipment and many methods, the Geological Survey of Ceylon continued mineral exploration in 1965 with emphasis mostly on magnesite graphite, gem pits, and iron ore. The Geological Survey continued its program for geologic mapping of the country.

PRODUCTION

Several commodities showed significant increases in production in 1965. Among them, the 33 percent increase in salt output was most significant, followed by glass sand output, up 77 percent; cement production, up 14 percent; and ilmenite output, up 7 percent with respect to 1964 production levels. Official production figures on graphite were not available, but exports, a fairly reliable gage of output, declined 19 percent in 1965 from the 1964 level.

[1] Foreign minerals specialist, Division of International Activities.

Table 1.—Ceylon: Production of metals and minerals
(Metric tons)

Commodity [1]	1961	1962	1963	1964	1965 e
Metals:					
Ilmenite	10,160	4,220	19,088	r 46,158	49,200
Monazite	r 75	--------	--------	r 50	36
Nonmetals:					
Cement	81,765	84,781	75,238	75,000	85,850
Feldspar	108	57	111	r 50	615
Glass sand	1,941	3,932	4,339	4,000	7,100
Graphite (exports)	9,086	8,769	8,447	11,000	8,820
Kaolin	NA	NA	1,016	1,500	816
Salt	34,544	46,529	r 23,000	r 58,000	77,200

e Estimated. r Revised. NA Not available.
[1] Ceylon also produces a wide variety of precious and semiprecious gems but no reliable data on output are available. Exports for all types of gem stones in 1965 reportedly totaled 71,254 carats.

TRADE

Total value of recorded mineral exports in 1964, the last year for which complete data are available, was about $3.12 million, almost double that of 1963. Although complete quantitative data on precious and semiprecious gem stone exports were not available, they remained the leading mineral export commodity, followed by graphite and ilmenite.

Requirements for most metals, some nonmetals, and all mineral fuels were met through imports, valued at $17.5 million, $11.6 million, and $21.7 million, respectively. In the metals sector, iron and steel accounted for about $12.4 million, and in the nonmetallic segment, fertilizers were the largest in value at $7.3 million. Quantitatively, imports of petroleum products were 17 percent higher than those of 1963, the U.S.S.R. was the main source of supply.

Table 2.—Ceylon: Exports of metals and minerals [1]
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals: Ilmenite ore and concentrate	20,176	37,575	Japan 26,075; France 1,500.
Nonmetals:			
Gems, precious and semi-precious	[2] $801,277	$1,515,703	India 886,730; United Kingdom 500,633.
Graphite	8,419	10,847	United States 3,112; United Kingdom 2,451; Japan 2,412.

[1] Ceylon Customs Returns, Government Press, No. 745, Colombo, Ceylon.
[2] Jewelry of gold and silver group metals and set gems.

Table 3.—Ceylon: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys, all forms	3,031	3,848	Hong Kong 1,759; United Kingdom 1,001; Belgium 525.
Antifriction metals	r 218	93	United Kingdom 50; Belgium 10.
Copper and alloys, all forms	1,039	814	United Kingdom 546; France 80.
Gold, troy ounces	11,940	12,092	All from United Kingdom.
Iron and steel:			
Pig iron	528	1,108	United Kingdom 912; U.S.S.R. 186.
Semimanufactures	r 64,598	81,602	Belgium 20,837; United Kingdom 20,097; Japan 16,208; U.S.S.R. 7,896.
Lead and alloys, all forms	439	288	United Kingdom 159; Australia 65.
Silver, troy ounces	18,032	NA	
Tin and alloys, all forms, long tons	3,922	4,360	United Kingdom 2,855; United States 968.
Zinc and alloys, all forms	220	149	United Kingdom 64; Belgium 42.
Nonmetals:			
Abrasives	344	127	United Kingdom 80; West Germany 22.
Asbestos, all forms	3,817	1,421	Australia 740; Canada 485.
Cement, thousand tons	203	189	U.S.S.R. 41; mainland China 37; Poland 31.
Fertilizer materials:			
Nitrogenous	169,088	181,908	United Kingdom 128,491; Japan 21,302 West Germany 14,832.
Phosphatic	73,401	68,136	United Arab Republic (Egypt) 52,222; Tunisia 7,112; Jordan 6,544.
Potassic	62,114	51,430	France 31,072; West Germany 10,601.
Other	15,574	14,185	West Germany 7,283; Italy 2,561.
Salt, thousand tons	37	33	All from India.
Sulfur	4,120	2,603	Greece 1,016; West Germany 509.
Talc	1,914	1,023	India 842; mainland China 87.
Mineral fuels:			
Coal, thousand tons	145	173	Republic of South Africa 157; Australia 13.
Coke, do	608	1,956	Republic of South Africa 1,350; United Kingdom 427.
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	1,193	1,255	U.S.S.R. 1,078; Iran 160.
Kerosine, do	1,089	1,393	U.S.S.R. 1,188; Iran 204.
Distillate fuel oil, do	1,359	1,634	U.S.S.R. 1,479; Iran 142.
Residual fuel oil, do	487	562	U.S.S.R. 420; Iran 137.
Lubricants, do	118	84	United States 58; Netherlands 20.
Asphalt, do	46	74	West Germany 29; Iraq 21.
Total, do	4,292	5,002	

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Iron and Steel.—Progress was made in the construction of the U.S.S.R.-aided steel plant on 307 acres of land in Oruwela. The first stage of the three-stage project is expected to go into operation in 1967. The annual capacity of this stage, originally set at 35,000 tons with two shifts, has been increased to 90,000 tons in three shifts.

According to a Ceylon Steel Corp. report, some larger iron ore findings by the Geological Survey Department of Ceylon have been evaluated by U.S.S.R. geologists. It is reported that these deposits will satisfy the iron ore requirements of the steel plant. These findings, in the Kottekekanda-Panirendawa area on the west coast, reportedly have a possible reserve of 6 million metric tons of high-grade ore.

Ilmenite.—Heavy storm damage in the Pulmoddai area apparently did not hamper the production of ilmenite; production reached a new high in 1965.

Expansion of the fully mechanized factory at Pulmoddai continued through the year. Titaniferous sand was mined by Priestman excavators and heaped into large dunes on the beach. The collected sand was passed through 60-mesh screens and electromagnetic separation units to separate and concentrate the ilmenite. The resulting concentrate average 99 percent ilmenite with the following chemical analysis:

titanium dioxide (TiO_2)—54.40 percent; ferrous oxide (FeO)—20.07 percent; ferric oxide (Fe_2O_3)—21.66 percent; traces of manganese oxide (MnO), chromic oxide (Cr_2O_3), sulfur and phosphorous.

Reported visible reserves of 4 million tons of pure ilmenite apparently are maintained by fresh deposition resulting from wave action in the lagoon following each period of excavation; such replacement evidently requires only a few months. To date, the operating company had limited its action to an area about 1,000 feet long and 200 feet wide in which the deposit varies from 5 to 10 feet in depth; however, similar deposits extend about 6.4 kilometers along the coast.

NONMETALS

Monazite.—According to reports of the Geological Survey of Ceylon, the pilot plant installed in the Katukurunda area on the west coast of Ceylon operated through 1965, processing black sand and producing about 600 metric tons of monazite-containing sand. No detailed information was available on reserves of the monazite deposits; however, thorianite and baddeleyite reported to be associated with the monazite may have economic value.

Fertilizer Materials.—In 1965, a program of long-term loans was initiated for fertilizer storage facilities. The program called for increasing the storage capacity with an expenditure of $3.2 million. The funds reportedly will be used for putting up buildings as well as purchasing land that will provide small and medium-sized storage areas in many parts of the country.

MINERAL FUELS

Coal.—Coal imports in 1964, according to Ceylon's customs' reports, were almost 30,000 tons more than in 1963. Favorable prices offered by the Republic of South Africa seemed to be the principal factor for Ceylon's choice of supply source. Apparently South Africa can deliver coal at $13 c.i.f. per long ton which is almost $4.00 below Indian coal or approximately $7.00 under Australian coal.

Petroleum.—The Government of Ceylon in 1965, in spite of delaying tactics by the opposition within the Government, finally signed a formal agreement with Shell Co. of Ceylon Ltd., Caltex Ceylon Ltd., and Esso Standard Eastern, Inc. (Ceylon), that concerned the compensation for oil companies' marketing assets which were taken over by Ceylon Petroleum Corp. The total payment is about $11.6 million; of this Shell will receive approximately $6.9 million and within 5 years the other two companies will each get about $2.35 million with 3-percent interest. Also, it was agreed that the companies will maintain for 5 years their bunkering trade of about 400,000 tons per year of aviation refueling rights.

The newly constituted State Ceylon Petroleum Corp. carried on exploration throughout 1965 with the cooperation of the Geological Survey of Ceylon in the northwestern coastal area. Reportedly, a seismic survey by both organizations has been scheduled on land and offshore in this area by early 1966.

In 1965, about 5 million barrels of major refinery products were imported by the Ceylon Petroleum Corp. and consumed in the country; about 80 percent came from U.S.S.R. and the remainder from Rumania and other sources. However, Ceylon Petroleum Corp. hopes to supply this demand by processing imported crude oil in a domestic refinery, thus saving substantially on foreign exchange.

The contract for the long delayed and the much discussed Ceylon refinery finally was signed with ENI of Italy in October 1965. Although it was reported in 1964 that the Czechoslovakian firm, Techno Export, had a turnkey contract, apparently the negotiations did not go through, and ENI, the lowest bidder (about $16 million), will build the refinery. Details on refinery capacity and expected completion date were not available.

The Mineral Industry of India

By James A. West [1]

India has outstanding resources of high-grade iron ore, coal, manganese, mica, bauxite, rare-earth minerals, beryl, gypsum, refractories, and building materials. The nation's most serious mineral deficiencies are a complete lack of or inadequate domestic resources of most nonferrous metals; certain nonmetallic minerals including sulfur, fertilizer raw materials, asbestos, borax, and other industrial minerals; and petroleum and natural gas.

The Indian mineral industry continued as an important segment of the national economy. The value of mineral production (exclusive of minor minerals and prescribed fissionable minerals) in 1965 totaled an estimated $536 million or about 1.1 percent of the gross national product of India. Foreign exchange earnings from the exports of ores and minerals during 1965 totaled an estimated $170 million, accounting for about 10 percent of the value of all Indian exports.

Total mineral industry employment in 1965 was nearly 6.5 percent of the total industrial labor force of an estimated 14 million workers. An estimated 591,000 workers were engaged in mines and quarries; iron and steel plants employed about 215,000 persons, and nonferrous metal processing plants, petroleum operations, and cement plants employed about 100,000 persons.

The Government of India participates to a large extent in the minerals industry of the nation through various agencies and many public sector enterprises. The planned development and exploitation of mineral resources as scheduled in successive 5-year plans continued as key programs in the Government's policy to expand and diversify the industrial base of the national economy. Although considerable progress was made in 1965, most of the projects to expand iron and steel, nonferrous metals, petroleum, and other mineral production capacity by the end of the third 5-year plan (1965–66) were far behind schedule. This has resulted in revised and more realistic targets in the fourth 5-year plan. The investment program for fiscal 1966–67 provides $113 million for mineral development, most of which was allocated to coal, iron ore, copper, and lignite projects. Steel plant development and expansion costs were estimated at $235 million for the same period.

In 1965, India's already serious shortages of foreign exchange became more acute because of the necessity to increase food imports, the excessive costs of the Indo-Pakistan conflict, and the subsequent suspension of financial and technological aid from the United States and other countries. This caused shortages of most nonferrous metals and other mineral raw materials that are normally imported. Also, expansion and development of the minerals industry was seriously impeded because of restrictions placed on the purchase of modern machinery, special equipment, and spare parts from external sources.

In contrast to the short supply position of most minerals, coal remained in a serious oversupply position. As in 1964, coal production greatly exceeded demand and a serious coal supply-demand imbalance existed throughout 1965. Anticipated demand failed to develop because of delays in the completion of planned coal-consuming industrial projects, partial conversion of national railroads from coal to diesel fuel, and other factors.

[1] Chief specialist, Near East-South Asia, Division of International Activities.

PRODUCTION

In general, both the quantity and value of all important minerals produced in India during 1965 was greater than that of 1964. In contrast to the relatively lower output of minerals in 1964, the 1965 increases reestablished the general upward trend evident during the 1961 to 1963 period.

Quantitatively, the overall trend of increased output was reflected by a substantial rise of 10.3 points in the index of mineral output. The 1965 index (base: 1960=100) was 130.5 compared with 120.2 in 1964. Among selected sectors, the 1965 index of coal mining, metal mining, and nonmetallic minerals was 132.5, 119.3, and 137.2, respectively. Domestic production of crude oil and refinery products during 1965 increased 33 percent and 4 percent, respectively, from that of 1964.

Excluding minor minerals and fissionable minerals protected under the Atomic Energy Act of 1948, the value of minerals produced in India (including Goa) during 1965 was an estimated $536 million. Mineral fuels accounted for 75.5 percent of the total value; metallic minerals, 14.0 percent; and nonmetallic minerals, 10.5 percent. Individual commodity valuations of the most important minerals were as follows: Coal and lignite, $368 million; iron ore, $39.5 million; petroleum and natural gas, $36 million; limestone, $25.8 million; manganese, $16.7 million; salt, $15.3 million; gold, $8.8 million; copper ore, $5.2 million; and mica, $4.8 million.

Table 1.—India: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Bauxite—thousand tons	476	577	r 569	591	706
Metal	18,382	35,403	55,208	r 56,667	67,169
Antimony, smelter	616	661	909	840	848
Beryl	803	136	NA	NA	1,367
Chromite	r 48,745	r 66,043	64,790	33,424	59,672
Copper:					
Ore—thousand tons	423	492	474	473	468
Smelter (fire refined)	8,336	9,780	r 9,593	r 9,455	9,360
Gold—troy ounces	156,510	163,326	138,280	r 148,504	130,628
Iron and steel:					
Ore—thousand tons	18,753	18,802	20,500	20,541	23,391
Pig iron—do	4,987	5,796	6,603	6,593	6,968
Ferroalloys—do	112	121	138	149	170
Steel ingots and metals for casting—do	4,084	r 5,090	r 5,970	6,032	6,316
Semimanufactures—do	2,816	3,564	4,257	4,343	4,515
Lead:					
Concentrate	5,532	6,384	5,920	6,148	5,496
Smelter	3,664	2,849	3,537	3,624	2,905
Manganese ore:					
Over 35 percent Mn—thousand tons	873	937	766	867	1,019
Under 35 percent Mn [2]—do	357	546	309	396	485
Mn content not disclosed—do	e 100	----	e 105	----	111
Total—do	1,330	1,483	1,180	1,263	1,615
Silver, smelter—troy ounces	191,008	138,698	128,314	152,204	168,309
Titanium:					
Ilmenite—thousand tons	174	138	26	11	30
Rutile	815	1,616	1,871	1,871	1,317
Tungsten (wolfram)	10	11	5	9	4
Zinc:					
Concentrate	9,254	10,024	10,627	10,744	9,641
Metal content of concentrate	5,100	5,533	5,860	5,915	5,317
Nonmetals:					
Apatite	20,140	29,018	13,127	4,049	4,050
Asbestos	r 1,468	1,692	2,712	2,967	4,526
Barite	15,717	32,662	r 37,877	46,225	45,914
Calcite	10,885	13,541	13,554	12,862	20,331
Cement—thousand tons	8,245	8,587	9,355	9,690	e 10,503
China clay—do	371	390	r 503	r 519	595
Corundum	329	301	658	540	481
Diamond—carats	1,313	1,131	1,432	2,260	4,466
Dolomite—thousand tons	721	901	1,070	507	958
Feldspar	9,862	19,221	r 21,236	20,098	24,211
Fire clay—thousand tons	270	346	368	360	425
Fluorspar	NA	657	708	389	272
Garnet	241	415	r 404	r 286	224

Table 1.—India: Production of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals—Continued:					
Gypsum thousand tons	865	1,124	r 1,191	880	1,148
Kyanite	27,155	49,618	31,665	34,091	37,447
Limestone thousand tons	14,346	16,907	17,057	16,919	19,855
Magnesite do	210	213	235	208	239
Mica, crude	28,347	28,354	r 25,322	r 21,698	e 37,450
Ocher	19,248	17,449	20,991	28,056	29,312
Quartz and silica	97,452	200,350	215,826	226,093	287,378
Salt thousand tons	3,488	3,895	4,549	4,647	4,703
Sillimanite	8,113	8,255	11,285	12,362	11,276
Steatite	98,793	110,449	117,974	135,306	149,365
Vermiculite	632	r 433	677	r 429	731
Mineral fuels:					
Coal thousand tons	56,065	61,370	r 65,956	r 63,991	67,161
Lignite	63,765	210,748	999,000	1,569,000	2,300,000
Coke, all types thousand tons	9,428	9,271	r 9,758	r 10,139	11,193
Petroleum:					
Crude thousand 42-gallon barrels	3,356	8,016	12,266	r 16,965	e 22,500
Refinery products:					
Gasoline do	9,084	10,381	12,229	r 12,689	r 9,975
Kerosine do	7,864	9,488	11,536	r 12,993	e 13,125
Distillate fuel oil do	12,447	13,489	12,466	r 15,148	e 15,300
Residual fuel oil do	12,062	11,041	13,369	r 15,183	e 15,375
Lubricants do	177	176	274	r 286	e 285
Other do	3,186	5,252	5,717	r 7,537	e 12,315
Natural gas million cubic feet	e 4,000	e 8,000	e 10,000	e 12,000	e 18,000

e Estimate. r Revised. NA Not available.

[1] Includes production of Goa.

[2] Includes ferruginous manganese ore.

TRADE

Trade in mineral commodities continued to account for a relatively large share of total Indian trade. The latest available statistics (for the financial year ending March 31, 1965) are as shown in the following tabulation:

	Million dollars		Share of mineral trade to total trade (percent)
	Value of mineral trade	Value of total trade	
Exports	206.2	1,754.0	11.7
Imports	599.3	2,652.9	22.6
Trade balance	−393.1	−898.9	----

In terms of value, the contributions of each of the major mineral commodity categories to total mineral trade during the 1964–65 financial year were as follows:

	Million dollars	
	Value of imports	Value of exports
Metals	353.8	152.7
Nonmetals	88.4	28.5
Fuels	157.1	25.0
Total	599.3	206.2

India's principal mineral exports were iron ore, manganese ore, and mica, valued at $81.4 million, $28.2 million, and $20.2 million, respectively for the year ending March 31, 1965. The nation remained dependent on imports to supply most of its requirements for nonferrous metals and continued to import large quantities of iron and steel, certain nonmetallic minerals, and petroleum. In 1964–65, iron and steel imports were valued at $225.5 million; copper, $47.3 million; lead and zinc, $33.5 million; fertilizer minerals, $61.5 million; sulfur, $11.4 million; and petroleum, $157 million.

Table 2.—India: Exports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963–64	1964–65	Principal destinations, 1964–65
Metals:			
Aluminum:			
Bauxite and alumina	139,260	74,878	Japan 50,147; West Germany 18,091; East Germany 3,150.
Metal, including alloys:			
Ingot	7,320	591	Japan 318; Belgium 176; United States 61.
Semimanufactures	77	305	Aden 214; Malaysia 32.
Chromite	11,653	30,957	Japan 18,756; United States 12,089.
Copper and alloys:			
Unwrought, scrap, and equivalent forms	218	903	Belgium 445; Japan 263; United States 157.
Semimanufactures	681	945	South Viet-Nam 375; Hong Kong 157; Nepal 42; Iraq 41; Taiwan 40; Iran 35.
Ilmenite	43,841	19,488	Japan 18,150; United Kingdom 928.
Iron and steel:			
Ore and concentrate thousand tons	9,868	10,950	Japan 7,374; West Germany 782; Czechoslovakia 702; Rumania 484; Italy 389; Poland 366; Yugoslavia 347.
Scrap	383,927	477,720	Japan 474,652.
Ferroalloys	21,927	91,408	United States 71,944; Netherlands 7,981; Italy 5,335.
Semimanufactures	33,029	103,640	Iraq 19,576; South Viet-Nam 15,729; Iran 8,212; Pakistan 7,981; Thailand 7,610; Nepal 4,247.
Lead, all forms	120	583	West Germany 140; Belgium 130; South Viet-Nam 98; United Kingdom 67.
Manganese ore and concentrate	954,398	1,614,330	Japan 565,723; United States 318,127; West Germany 214,402; Belgium 107,610; Czechoslovakia 84,894; Netherlands 65,296; Poland 55,440; United Kingdom 52,412.
Zinc:			
Ore and concentrate	9,922	7,482	All to Japan.
Metal, including scrap	1,794	3,268	West Germany 1,352; Belgium 820; Netherlands 366; Japan 348.
Other nonferrous base metals:			
Ore and concentrate	2,532	1,971	Japan 1,950.
Metal and scrap	420	379	Japan 180; Yugoslavia 104; United Kingdom 54.
Nonmetals:			
Abrasives, all forms	2,149	3,306	Pakistan 3,154; Malaysia 86.
Barite	8,807	7,886	Japan 6,835; United Kingdom 370; Australia 200.
Cement	68,973	30,919	Nepal 19,721; Pakistan 5,738.
Chalk	37	42	Pakistan 40.
Clays, including bentonite	601	1,433	Pakistan 1,040; Burma 290.
Feldspar	2,109	5,407	Japan 2,408; West Germany 903; United Kingdom 793; East Germany 510.
Gravel and crushed stone	12,958	44,801	Pakistan 44,717.
Kyanite	25,844	33,098	United Kingdom 8,637; Denmark 3,500; France 3,174; Belgium 2,675; Japan 2,634; United States 2,275; West Germany 2,208.
Limestone	109,576	107,364	Pakistan 107,334.
Magnesite	35,382	38,358	United Kingdom 7,872; United States 7,200; West Germany 5,010; Netherlands 3,744; Japan 1,820; France 528.
Mica:			
Block	1,758	1,871	Japan 518; United Kingdom 289; United States 286; West Germany 86.
Splittings	7,902	8,417	United States 3,538; United Kingdom 1,026; Japan 542; West Germany 507; France 346; Poland 296.
Condenser films	208	94	United States 37; U.S.S.R. 31; United Kingdom 11.
Scrap	20,037	21,210	United Kingdom 6,395; Norway 3,728; West Germany 2,993; Japan 1,928; France 1,678; Libya 1,043.
Total	29,905	31,592	
Salt	194,686	283,114	Japan 202,684; Italy 41,320; Nepal 37,628.
Sillimanite	6,144	8,445	West Germany 2,794; Belgium 1,872; Netherlands 1,687; Thailand 931.
Steatite (block and powder)	13,380	12,253	Italy 2,644; United Kingdom 2,078; West Germany 867; Yugoslavia 723; Ceylon 707; Pakistan 684.
Stone (including marble)	7,515	4,710	United Kingdom 2,756; Netherlands 717; Pakistan 650.
Miscellaneous nonmetallic and building raw materials	13,727	8,083	Pakistan 4,871; Japan 1,374; Finland 800.

Table 2.—India: Exports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1963–64	1964–65	Principal destinations, 1964–65
Mineral fuels:			
Coal—thousand tons	864	1,306	Pakistan 1,092; Burma 168.
Coke	-----	10,741	Burma 6,471; Pakistan 3,980.
Petroleum refinery products:			
Gasoline			
thousand 42-gallon barrels	3,245	3,452	Singapore 1,714; United Kingdom 728; Indonesia 356.
Paraffin—do	75	108	Peru 53; Malaysia 18; United Kingdom 8.
Other—do	63	267	Nepal 263.
Total—do	3,383	3,827	

[1] For financial year ending March 31.

Table 3.—India: Imports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963–64	1964–65	Principal sources, 1964–65
Metals:			
Aluminum:			
Alumina	3,543	2,095	United States 1,852; West Germany 94; United Kingdom 89.
Metal, including alloys:			
Ingot	r3,937	3,529	Canada 1,793; United States 1,598.
Semimanufactures	20,739	19,410	Canada 7,197; United States 6,400; Yugoslavia 2,522; Italy 967.
Antimony:			
Ore and oxides	2,077	1,770	Bolivia 1,453; Australia 121.
Metal	39	50	Belgium 26; West Germany 15.
Arsenic:			
Oxides	18	86	Belgium 33; United Kingdom 26.
Metal	226	446	U.S.S.R. 308; Sweden 70; Belgium 55.
Cadmium	61	107	Australia 32; United Kingdom 31.
Cobalt	36	19	Belgium 17.
Copper and alloys:			
Scrap, ashes and dross	r1,482	1,985	United States 1,127; Ghana 325.
Metal:			
Ingots and equivalent forms	34,795	21,815	United States 14,585; Federation of Rhodesia 3,591; Belgium 1,151; West Germany 1,054.
Semimanufactures:			
Unalloyed	37,087	34,204	United States 28,376; Federation of Rhodesia 2,296; United Kingdom 1,349.
Alloyed	2,563	2,365	West Germany 636; United Kingdom 430; Japan 322; Yugoslavia 286; United States 264.
Iron and steel:			
Ore and concentrate	102	152	Netherlands 60; United Kingdom 56; Spain 36.
Iron and steel scrap	1,232	697	United States 447; United Kingdom 209.
Pig iron	210	106,370	U.S.S.R. 99,924; West Germany 3,464; East Germany 1,750.
Ferroalloys	2,002	3,520	United Kingdom 903; Norway 750; Japan 466; United States 386; Yugoslavia 250.
Ingots and equivalent forms	53,401	60,480	United Kingdom 13,104; Sweden 9,509; Japan 8,970; Canada 7,579; United States 7,444.
Semimanufactures	927,932	1,021,030	Japan 293,701; United Kingdom 203,024; United States 202,615; West Germany 78,732; U.S.S.R. 56,443.
Lead, all forms	36,676	34,136	Burma 9,028; Canada 7,423; Peru 6,071; Australia 5,501; United Kingdom 4,127.
Magnesium, all forms	281	161	Norway 70; United States 22; Canada 22.
Manganese ore	10,575	4,879	All from Ghana.
Mercury—76-pound flasks	5,244	5,802	Spain 3,336; Mexico 870; Italy 812; United Kingdom 754.
Nickel and alloys:			
Unwrought and scrap	1,883	2,093	United Kingdom 1,188; Canada 510; United States 107.
Semimanufactures	271	405	Canada 170; United Kingdom 79; Australia 65; West Germany 42.
Platinum—troy ounces	8,516	10,283	France 4,768; U.S.S.R. 3,577; United Kingdom 998.

Table 3.—India: Imports of metals and minerals [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1963–64	1964–65	Principal sources, 1964–65
Silver—do	45,911	46,294	Belgium 40,266; West Germany 3,346; United Kingdom 2,669.
Tin and alloys:			
Unwrought—long tons	4,974	4,791	Malaysia 3,423; Singapore 731; United States 549.
Semimanufactures—do	172	133	Malaysia 115; Canada 11.
Zinc and alloys:			
Unwrought	84,114	70,489	Australia 16,399; United States 14,307; Republic of the Congo (Léopoldville) 11,914; Canada 11,846; U.S.S.R. 7,881.
Semimanufactures	1,158	1,133	Canada 227; Japan 219; United States 170; Australia 120.
Miscellaneous nonferrous metals and alloys	118	103	United States 37; United Kingdom 28; Japan 12.
Nonmetals:			
Abrasives, all forms	3,645	3,888	United States 2,184; United Kingdom 892; West Germany 381.
Asbestos, crude	39,820	39,663	U.S.S.R. 14,594; Canada 14,036; United States 6,393; Southern Rhodesia 3,886.
Barium compounds:			
Carbonate	1,274	621	East Germany 335; United Kingdom 219.
Nitrate and other	165	1,467	West Germany 571; East Germany 515; United Kingdom 265.
Borax	6,006	10,665	United States 9,084; United Kingdom 890; Netherlands 277.
Chalk	1,604	1,662	United Kingdom 1,514; Austria 90.
Clay, including bentonite	10,987	8,104	Czechoslovakia 3,545; United Kingdom 2,534; United States 1,477.
Cryolite	2,428	2,453	Netherlands 942; France 570; Denmark 435; West Germany 200.
Diamond, industrial, including bort thousand dollars	326	539	France 194; United Kingdom 106; West Germany 98.
Diatomite, including fuller's earth	1,481	1,811	United States 1,360; West Germany 387.
Fertilizers:			
Nitrogenous:			
Crude	14,973	6,444	All from Chile.
Manufactured	717,783	651,699	United States 315,529; Japan 99,678; Netherlands 42,476; France 41,215; West Germany 35,424; Italy 29,139; Belgium 24,819.
Phosphatic:			
Crude	336,781	426,310	Morocco 183,804; Jordan 96,488; Tunisia 82,437.
Manufactured	27,965	47,678	United States 45,629; West Germany 1,092.
Potassic, manufactured	75,083	86,764	East Germany 39,063; West Germany 33,295; France 8,114.
Fluorspar	8,116	4,294	Mexico 2,500; United Kingdom 902; mainland China 800.
Graphite	1,068	2,218	Ceylon 1,105; Hong Kong 553; Norway 177; South Korea 139.
Gypsum	42,295	100,459	All from Pakistan.
Salt	28	3,590	Pakistan 3,564; Nepal 15.
Sulfur:			
Crude	231,084	277,781	United States 271,142; Canada 5,435.
Refined	1,671	464	United States 291; West Germany 112.
Other nonmetallics and building materials	1,753	867	Netherlands 250; West Germany 181; United Kingdom 100.
Mineral fuels:			
Coal, all ranks	2,061	1,813	United States 1,587; Italy 192.
Coke, all types	411	220	Italy 200; West Germany 20.
Petroleum:			
Crude thousand 42-gallon barrels	52,601	31,068	Iran 15,348; Saudi Arabia 13,258; Indonesia 2,462.
Refinery products:			
Gasoline—do	710	559	Iran 545; Bahrain 9.
Kerosine—do	10,142	6,675	Iran 3,051; U.S.S.R. 1,162; Saudi Arabia 766; Bahrain 727.
Distillate fuel oil—do	4,245	28,221	U.S.S.R. 25,677; Iran 206.
Residual fuel oil—do	2,337	2,005	Iran 926; U.S.S.R. 480; Saudi Arabia 400.
Lubricants—do	2,708	2,000	United States 1,279; United Kingdom 226; Yugoslavia 162.
Other—do	120	176	United States 130.
Total—do	20,262	39,636	

r Revised.

[1] For financial year ending March 31.

COMMODITY REVIEW

METALS

Antimony.—India produces no antimony ore and all metal continued to be processed from imported concentrates solely by Star Metal Refinery, Ltd., of Bombay. In 1965, the plant operated at about 85 percent of its rated capacity of 1,000 tons annually.

Aluminum and Bauxite.—Bauxite is the only nonferrous metal ore found in abundance in India and aluminum production continued as its major nonferrous metal industry. Extensive exploration in recent years has resulted in the discovery of bauxite deposits throughout the country, having estimated total reserves of about 276 million metric tons. An estimated 74 million tons of this reserve has an alumina content greater than 50 percent.

Demand for aluminum continued to exceed the supply from domestic production and licensed imports even though domestic output has nearly quadrupled in the past 5 years. Acute shortages have developed largely because of the Government's policy requiring the substitution of aluminum for copper in an effort to decrease foreign exchange expenditures. Estimated total demand in 1965 was about 120,000 tons compared with a supply of less than 100,000 tons.

The Government took additional steps to expand domestic aluminum-producing capacity in both the private and public sectors of the industry. The planned target for ingot production capacity to be reached by the end of the fourth 5-year plan (1970–71) is 272,500 tons. The Madras Aluminum Co. integrated aluminum processing plant at Mettur (constructed by Montecatini Co. of Italy in collaboration with private Indian investors) began operation in 1965. This plant, with an ingot capacity of 10,000 tons per year, increased total Indian capacity to almost 70,000 tons.

The Hindustan Aluminum Co. (jointly owned by Kaiser Aluminum Co., Birla Brothers, and the Indian public) continued construction to expand the present capacity of its Renukoot smelter from 20,000 to 60,000 tons per year. Also, the Government issued a letter of intent to the company to further expand the capacity of the Renukoot plant to 120,000 tons annually during the fourth 5-year plan (1966–71).

The privately owned Indian Aluminum Co. continued construction at its Alwaye, Kerala, plant to expand ingot production from present capacity of 10,600 to 15,600 tons annually.

The Government continued negotiations for the establishment of three proposed public sector aluminum plants. An initial project report for a proposed plant at Korba in Madhya Pradesh to produce 120,000 tons of alumina and 30,000 tons of metal annually was completed by Chemokomplex of Hungary. Later, the Soviet Union offered assistance to India for construction of a 100,000-ton-capacity smelter at Korba. As a result, India concluded an agreement with Hungary to prepare a new project study to increase the capacity of the alumina plant to 200,000 tons to form an integrated project with the larger smelter. The proposed Koyna and Mysore projects for new plants with annual capacities of 25,000 and 30,000 tons, respectively, were under consideration but no definite plans were announced.

Chromite.—India has adequate resources of chromite to meet demands of its growing iron and steel industry. The largest deposits are those in the Keonjhar district of Orissa, Singhbhum district of Bihar, and Hassan and Mysore districts of Mysore. Reserves of all grades are estimated at 4.9 million tons. About 20 percent of the reserve is of metallurgical grade (45 percent or more CR_2O_3).

Production of chromite in 1965 was expanded largely in response to increased export demand. Domestic demand of about 25,000 tons was used mostly in the manufacture of refractory bricks for the iron and steel plants.

Copper.—Throughout 1965, demand for copper far exceeded the available supply. Limited domestic production and restricted imports, due to foreign exchange shortages, were sufficient to meet only about 60 percent of the estimated annual demand of 120,000 tons.

The Indian Copper Corp. (ICC) was the sole commercial producer of copper ore and metal. The company produced ore from three mines in the Ghatsila region of the Singhbum district in Bihar and operat-

ed a smelter at Moubhandar to produce fire refined metal. ICC continued construction of facilities to expand output. Its 8,400-ton electrolytic refinery at Ghatsila was nearing completion at yearend despite continued delays. Under a $16.8 million expansion program, ICC plans to replace its existing smelter with a modern flash smelter having an annual capacity of 12,950 tons and install byproduct recovery plants to produce 260 tons per year of nickel sulfate and 100 tons per day of sulfuric acid.

The Bureau of Mines and Geological Survey of India conducted exploration surveys in eight copper mineralization areas in the States of Rajasthan, Bihar, and Andhra Pradesh. Proved reserves of about 33 million tons of 1 percent copper ore at Khetri, Rajasthan are reported by the Indian Bureau of Mines. The agencies reported estimated proved reserves of 70 million metric tons of 0.8 to 2.0 percent ores in the Singhbum copper belt of Bihar.

The Government of India continued to support projects for the development of domestic copper resources and invited proposals by foreign investors for joint ventures in establishing smelters in India to process imported ores.

In June, the Government-owned National Minerals Development Corp. (NMDC) and a consortium of French industrialists signed an interim agreement for development of the Khetri copper deposits. Later, the French Government agreed to extend an $18 million credit to finance equipment purchases required for the planned 21,000-metric-ton-per-year-capacity project. NMDC continued to evaluate the Rakha copper deposit in Bihar and issued a preliminary study indicating a potential production of 31,000 tons per year of copper metal from this deposit. Negotiations for technical and financial assistance in the development of Rakha were conducted but no definite agreements were announced.

Gold.—All gold production was from mines in the State of Mysore. Most production was from mines operated by Kolar Gold Mining Undertakings, a Federal Government entity, in the Kolar goldfields. The State of Mysore operated the Hutti mines in the Raichur district to produce small quantities of gold. Construction proceeded on a new crushing and grinding plant at Hutti to increase mine output from 350 to 1,000 tons daily.

Proved ore reserves in the Kolar goldfields are reported as 3.8 million metric tons and those of Hutti as 500,000 tons. The average extraction grade of gold ore produced during 1964 at Kolar goldfields was 7.42 grams per metric ton.

Iron Ore.—Indian iron ore resources are of world importance and are the nation's most valuable metallic mineral asset. An estimated 22,000 million tons of high-grade ore reserves and about four times this quantity of low-grade ore resources are reported from every State of India. The most important deposits are those in Goa, Bihar, Orissa, Mysore, Madhya Pradesh, Maharashtra, and Andhra Pradesh.

The estimated minehead value of iron ore produced in 1965 was nearly $40 million. Almost one-half of ore produced was exported. These exports, valued at about $83 million f.o.b. for calendar 1965, were the largest earner of foreign exchange among mineral commodities traded. Total 1965 output was from approximately 250 opencast mines; however, six largely mechanized mines accounted for about one-half of total ore produced.

The Government of India continued to give top priority to the development of public sector iron ore projects to expand exports and meet the increased demand of the growing domestic iron and steel industry. Planned annual production targets to be achieved by the end of the fourth 5-year plan (1970–71) are 33 million tons for domestic consumption and 25 million tons for exports. Planned programs to achieve this expansion of capacity by 35 million tons include large-scale mine mechanization, the construction of beneficiation and pelletization plants to upgrade quality and utilize fines, improvement of transportation, and the simultaneous development of ore-handling facilities at six ports.

The Government-owned National Mineral Development Corp. made substantial progress in the development of the Kiriburu and Bailadila iron ore deposits. These deposits are being developed, with Japanese technical and financial assistance, to export 6 million tons of ore annually to Japan under long-term purchase agreements. The Kiriburu project, with facilities to produce 2 million tons per year, was completed but production was limited because of delay in completion of modern mechanical ore-handling facilities at the

Table 4.—Production of finished steel by categories

(Thousand metric tons)

Category	1964	1965
Structurals and special section	860	811
Rails, railroad ties, wheels, tires, and axles	622	603
Sheets, plates, galvanized plates, and tinplate	934	979
Bars and rods	1,495	1,579
Wire	99	113
Hoops and strips	140	252
Skelp	193	198
Total	4,343	4,515

Source: Iron and Steel Control, Monthly Bulletins for January to December, 1964 and 1965, Ministry of Steel and Mines, Calcutta, India.

port of Visakhapatnam. In August, the mechanical loading plant began operating at limited capacity. Upon completion, the port will have an ore-handling capacity of 8.2 million tons per year.

Development of large high-grade iron ore deposits at Dhalli Pahar in Madhya Pradesh was begun. These mines will supply ore required to expand capacity of the Bhilai steel mill from 1.2 to 3.5 million tons annually.

Iron and Steel.—In 1965, the Indian iron and steel industry achieved a fuller utilization of existing plants, made substantial progress in construction of facilities to expand existing plant capacity, and implemented planned programs for new public sector steel plants.

As in recent years, the industry maintained the trend of marginal increases in the production of crude and finished steel. Both the private and public sectors, which share almost equally the current installed producing capacity of about 6.4 million metric tons of ingot steel annually, operated at near capacity. Production of nearly all categories of finished steel by primary producers, secondary producers, and rerollers during 1965 exceeded that of 1964.

The Government-owned Hindustan Steel Ltd., operator of the Rourkela, Bhilai, and Durgapur public sector plants, reportedly realized a net profit of $4.2 million in 1965 after allowing for interest and depreciation charges of $61.3 million. This profit is the first earned by the company since its inception in 1958. Construction of facilities to expand the capacity of all three plants continued. The expansion program to increase the capacity of the Bhilai plant from 1 to 2.5 million tons of ingots per year was nearly completed at yearend. The U.S.S.R., which provided financial and technical assistance in the construction of Bhilai, agreed to provide further assistance to expand the annual ingot capacity of the plant to 3.5 million tons. Work continued on the expansion of the Durgapur (British assisted) and Rourkela (West German assisted) steel mills to increase their capacities from the existing 1 million tons each to 1.8 and 1.6 million tons, respectively. The Governments of India and the United Kingdom reached an agreement covering a credit of $168 million to a British consortium to supply equipment and machinery for the further expansion of Durgapur to a capacity of 3.4 million tons. Negotiations with the West German Government for a further expansion of the Rourkela plant were in progress.

In January, the Governments of India and the U.S.S.R. signed an agreement for construction of India's fourth public sector iron and steel plant. In December, the U.S.S.R. presented to the Indian Government a detailed project report for the proposed plant. The report provides for the construction of a plant at Bokaro in Bihar State with an initial annual capacity of 1.7 million tons of ingot steel to be expanded to 4 million tons in a second stage and ultimately to 5.5 million tons. The U.S.S.R. has agreed to provide a credit of $211 million to assist in financing the foreign exchange costs of the first stage of the plant. The reported total cost for completion of the first stage of the project was an estimated $1,300 million.

The British-American Steel Works for India Consortium (BASIC) completed a study for the Indian Government concerning the proposed construction of a fifth public sector plant. BASIC has reportedly agreed to finance the foreign exchange costs of the project and provide technical

assistance in the design and construction of the plant. It recommended that a plant with an annual ingot capacity of 1.5 million tons be located at Viskhapatnam, Andhra Pradesh.

The Mysore Iron and Steel Works Ltd. (owned 60 percent by the Government of Mysore State and 40 percent by the Federal Government) completed an expansion program to raise the mild steel capacity of its Bhadravti plant to 145,000 tons per annum. Construction of facilities to produce 77,000 tons of alloy and special steels was continued. One 20-ton electric arc furnace a second 20-ton furnace and an 8-ton furnace was scheduled for April 1966.

In the private sector, the most significant development was the resolution of questions concerning the repayment of government loans granted to Tata Iron and Steel Co. (TISCO) and Indian Iron and Steel Co. (IISCO). Under recent legislation, the Government was empowered to convert outstanding loans of both companies to equity and thus, in effect, give the Government financial and management control of the companies. Under these circumstances, expansion plans were deferred because of the reluctance of the International Bank for Reconstruction and Development to extend financial assistance to the companies. The companies have agreed to repay half of their outstanding loans now and the balance with interest by 1972. TISCO was authorized to expand its annual ingot producing capacity from 2 to 4 million tons. IISCO proceeded with plans to expand its capacity from 1 to 2 million tons.

The iron and steel industry remained India's major consumer of mineral raw materials. In 1965, steel plants consumed the following quantities, in millions of metric tons, of raw materials: Iron ore, 10.9; coking coal, 10.1; noncoking coal, 1.0; limestone, 3.3; dolomite, 0.8; scrap, 1.5; and managanese, 0.3.

Demand for iron and steel continued to exceed supply. Only 5.5 million tons of finished steel was available to meet the officially estimated demand of 6.2 million tons. The quantity of salable pig iron continued to meet less than half the estimated demand of 2.5 million tons. Alloy and special steels, essentially all of which were imported, continued to be in very short supply. The gap between domestic steel production and demand is expected to continue until current investments in expansion result in greatly increased production.

Effective August 31, the Government removed statutory price and distribution controls on pig iron. This action was a continuation of the policy initiated in 1964 to remove such controls on about two-thirds of all domestic steel products.

Lead-Zinc.—Known resources of lead and zinc are extremely limited and all domestic production was solely from mines at Zawar in Rajasthan operated by the Metal Corporation of India Ltd. (MCI). The company operated a smelter at Tundhoo near Udaipur to process lead concentrate but zinc concentrate was shipped to Japan for smelting on a toll basis with recovered metal returned to India.

The major mine development and processing plant expansion program undertaken by MCI suffered severe setbacks during the year. Construction of ore processing and smelting plants to recover 18,000 tons of zinc and 11,000 tons of lead annually was delayed because of serious financial and other problems. In October, the Government of India promulgated an ordinance expropriating the company and assumed management responsibilities. On November 22, the Lok Sabha (Parliament) approved a bill to nationalize MCI. Court cases to settle the legality of the action are in progress. Meanwhile, construction was suspended and production was minimal.

The Cominco Binani Zinc Ltd. made progress on construction of its Alwaye, Kerala smelter. Upon completion in 1966, the plant will process imported concentrate to produce 12,000 tons of zinc annually. Capacity is to be expanded to 20,000 tons ultimately.

The Government of Poland offered financial and technical assistance for construction of a proposed 30,000-ton-per-year zinc smelter at Visakhpatnam, Andhra Pradesh, to process imported concentrates. A preliminary project report was completed and submitted to the Indian Government.

Imports continued to supply about 90 percent of lead and zinc requirements. These metals were in short supply owing to limited foreign exchange funds and these shortages are expected to become even more acute in the next few years.

Manganese.—The manganese ore reserves of India total about 180 million tons, or nearly 10 percent of the known world re-

sources of commercially recoverable ore. The great manganese ore belt of Maharashtra and Madhya Pradesh contains an estimated 80 million tons of 35 percent grade ore. Other large deposits occur in Goa and in various areas of Orissa, Bihar, Gujurat, Andhra Pradesh, and Rajasthan.

India has long been one of the largest producers and suppliers of manganese ore in the world market. Indian production of all grades of manganese ore in 1965 exceeded that of 1964 by nearly 28 percent. This increase was largely in response to increased export demand in 1964; however, in 1965 both the quantity and value of manganese ore exports declined sharply. Exports of 1.15 million tons having a value of $19.7 million in 1965 were about 30 percent below those of 1964. The decline was largely due to the discontinuance of barter sales, effective January 1, 1965.

In July, the Government-owned Minerals and Metals Trading Corp. (MMTC) assumed sole responsibility for the negotiation and coordination of all manganese ore exports, except for ore produced or acquired by Manganese Ore Ltd. in which the Government owns 51 percent equity. This Government of India action was taken in an effort to stimulate exports, provide financial assistance, and accelerate modernization and development of the nation's mines.

Most of the nearly 400 mines are small to medium-sized operations that are inadequately mechanized. Low productivity, combined with rising labor and transportation costs, has lessened India's competitive position in world manganese markets.

Domestic consumption of manganese ore by the iron and steel industry was 324,600 tons in 1965, an increase of 16.6 percent over that of 1964.

Mineral Sands.—The rare-earth minerals contained in beach sand deposits along the coast of Kerala and Madras are of world significance. Reserves have never been fully assessed but the sands are known to contain large quantities of ilmenite, rutile, zircon, sillimanite, and monazite. In 1962, the Indian Bureau of Mines estimated the reserves of ilmenite in the beach sands at 356 million tons. Recoverable monazite in these sands has been estimated as 5 million tons.

India produced and exported more than 75 percent of total world ilmenite output before World War II. Exports reached a peak of about 350,000 tons in 1957 and have since declined to an insignificant 15,000 tons in 1965. Contaminants that adversely affect metal recovery and world competition from highly developed deposits in other countries are the major factors responsible for India's loss of world markets. Domestic consumption of about 15,000 tons in 1965 was processed by Travancore Titanium Products, Ltd. to produce titanium dioxide for paint pigments.

All rutile was produced by F. X. Pereira Minerals Co. from tailings at its mines at Quilon, Kerala. All output was consumed locally.

Data on monazite production is withheld under government laws for prescribed substances. Monazite is processed at the Atomic Energy Establishment plant at Trombay to produce thorium nuclear fuels for the country's electric power generating reactors.

NONMETALS

Cement.—In recent years, demand for cement has exceeded supply even though an increasing trend in production has been maintained. In 1965, the domestic supply was 2.5 million tons short of the estimated demand of 13 million tons. The Indian cement industry, consisting of 34 private and 3 public sector plants located throughout India, operated at about 95 percent of its installed capacity of 11 million tons per year.

The most significant development during 1965 was the lifting of price and distribution controls on the industry by the Indian Government. For over 23 years, the cement industry has operated under various controls set by the Government-owned State Trading Corp. of India (STC). The decision of the Government to relax controls was announced on August 26 but did not become effective until January 1, 1966. Delay in implementation was caused by the Indo-Pakistan emergency. An industry organization was formed to coordinate allocation and distribution functions previously handled by STC. Effective January 1, 1966, the industry raised the uniform free-on-rail-destination price of cement by $3.36 per metric ton. Fifty percent of each company's output was reserved for government purchase at a rebate of $1.26 per ton. Also, the industry agreed to freeze dividends at current levels and utilize extra earnings to expand plant capacity.

The Government-owned Cement Corp. of India was registered as a private limited company on January 18. The company was established to promote expansion of the cement industry in an effort to meet the production target of 23 million tons per year by the end of the fourth 5-year plan (1970–71). It was announced in Parliament that the company would construct eight new cement plants, each with a capacity of 200,000 tons annually.

Mica.—In 1965, India remained the world's leading producer and exporter of block and sheet mica and mica splittings. As in the past, India continued to supply nearly 80 percent of the annual world requirements for these commodities. Mica exports, valued at $23.1 million in 1965, were second only to those of iron ore as India's most valuable export mineral commodity.

Although quantitative data on reserves are unknown, the deposits of muscovite mica in Bihar, Rajasthan, and Andhra Pradesh are considered virtually inexhaustible for the foreseeable future at current producing rates. Bihar was the leading producing State, accounting for nearly one-half of total output. An estimated 23,000 persons were employed in some 700 small mines and mica dressing operations in India.

The regulatory measures imposed on the mica trade by the Indian Government during 1964 appear to have corrected certain malpractices and increased foreign exchange earnings. In 1965, the value of mica exports exceeded that of 1964 by $2.6 million.

Salt.—Nearly all salt was produced by solar evaporation of sea water along the coasts of Gujarat, Madras, Maharashtra, and Andhra Pradesh. Rock salt mines at Mandi in Himachal Pradesh continued to produce about 3,000 tons annually. Despite a small increase in 1965 salt production, the value of total output declined from $18 million in 1964 to $15.4 million in 1965. A sharp fall in salt prices that began in 1964 continued in 1965.

In 1965, exports of salt (mainly to Japan) increased to 267,000 tons, a gain of almost 12 percent over that of 1964. Nearly 95 percent of total output was for domestic consumption, principally for human use.

The fourth 5-year plan target for salt production was set at 8 million tons by 1970–71. Most of the increase was earmarked for export.

Sulfur and Pyrite.—India produces no sulfur and foreign exchange problems limited the available supply from imports to about 80 percent of the estimated demand of 350,000 tons in 1965. As a result, the open market prices of crude, roll, and powder forms of sulfur in Bombay increased from $84 per metric ton at the end of 1964 to $168 per ton.

The Pyrites and Chemical Development Co., Ltd., a government entity established in 1960 to exploit the large Amjhore pyrite deposits in Bihar, continued efforts to establish sulfur and sulfur-based industries to develop these deposits. The company arranged for pilot plant tests for sulfur extraction from pyrites to be conducted in Finland. Also, the Central Fuel Research Institute proceeded with research projects to this end. In January 1965, the Indian Government approved a mining project for the annual production of 240,000 tons of pyrite ore at Amjhore.

MINERAL FUELS

Coal.—Coal remained as India's most valuable mineral resource in 1965, accounting for 73 percent of the value of all mineral production. As in recent years, coal supplied nearly one-half of the total commercial energy consumed in 1965. Indian reserves of bituminous coal are estimated in excess of 115 billion metric tons; however, only about 2.5 million tons of this reserve is of coking grade.

Since 1964, coal production has greatly exceeded demand and a severe coal supply-demand imbalance existed throughout 1965. Government planners initially established a production-consumption goal of 98 million tons to be achieved by the end of the third 5-year plan (1965–66) but this was subsequently revised downward to about 70 million tons. The anticipated increased demand for coal failed to develop because of delays in the expansion and completion of planned coal-consuming industrial projects, declining consumption by the national railroads as a result of partial electrification and dieselization, increased use of fuel oil by certain industrial plants, and related factors. During 1965, total coal mine production reached 67 million tons despite curtailed mining operations. At

yearend, pithead and purchaser stocks were about 8 million tons.

An estimated 800 coal mines were in operation in Indian coalfields during 1965. Most mines are nonmechanized and less than half the total produced more than 25,000 tons monthly. Average daily employment in all mines was about 400,000 persons. Bihar was the leading producing State, accounting for about 45 percent of total output. West Bengal mines accounted for nearly 30 percent and Madhya Pradesh, Andhra Pradesh, Orissa, Maharashtra, and Assam accounted for the remaining production.

Most mines are privately owned but the Government-owned National Coal Development Corp. (NCDC) operated 21 public sector mines and 2 washeries in the major coalfields that accounted for about 20 percent of total production. Planned expansion and development of both the private and public sectors of the coal industry to supply the major share of India's growing commercial energy needs continued as the main energy policy of the Government. Coal production and consumption targets under the fourth 5-year plan are for annual increases of 5 million tons to reach a total of 92 million tons by 1970–71. Most of the increase was scheduled for the development of public sector mines by NCDC with technical and financial assistance from various foreign governments. Polish collaboration in the development of seven underground mines in the Jhari coalfields of Bihar for coking coal production was continued. Work on the first two mines and a washery was in progress. The U.S.S.R. extended assistance for the development of two deep mines, an open-cast mine, and a washery at Korba in Madhya Pradesh. The United States, United Kingdom, and France provided assistance for other NCDC projects.

In an effort to increase coal exports, the Indian Government gave the Government-owned Minerals and Metals Trading Corp. a monopoly on coal exports, effective September 1, 1965. On December 24, the Government authorized an increase of all coal and coke prices of 8 and 11 cents per ton, respectively.

Lignite.—Production of lignite in 1965 increased by 47 percent over that of 1964. Essentially all output was from the open-cast mines in the Neyveli area of Madras operated by the Government-owned Neyveli Lignite Corp. All production was utilized at the corporation's 250,000-kilowatt thermal powerplant and its briqueting and carbonization plants, which began initial operation in July 1965. Lignite production of 3.56 million metric tons annually was planned to meet requirements of the powerplant, a fertilizer plant, and the briqueting plant. Under the fourth 5-year plan, it was proposed to increase mine output to 6.3 million tons to facilitate expansion of the thermal powerplant capacity to 600,000 kilowatts.

Lignite reserves in the Neyveli area are estimated at 2,000 million tons. An estimated 200 million tons are easily workable by opencast methods. The deposit occurs in a single seam at a depth of about 160 feet.

Petroleum.—All phases of the petroleum industry are regulated and largely controlled by the Government of India. Various agencies continued and implemented programs to develop indigenous petroleum resources, expand refining capacity, and increase the public sector role in petroleum products distribution and marketing.

All oil exploration and most petroleum and natural gas producing operations are conducted by the Government-owned Oil and Natural Gas Commission (ONGC) and Oil India, Ltd., owned 50 percent by Burmah Oil Co. and 50 percent by the Indian Government. Oil India operations are limited to concession areas in Assam and in the Northeast Frontier Agency. The ONGC operates throughout India. Aside from these organizations, oil was produced from the long-established Digboi oilfield in Assam by the Assam Oil Co., a wholly owned subsidiary of Burmah Oil Co.

Petroleum and natural gas production was about equally divided between the States of Assam and Gujarat, the only areas in India having proved petroleum resources. The ONGC carried out extensive exploration and development well drilling throughout India, drilling a total of 98 wells. Most wells were drilled to develop the Ankleshwar and Kalol oilfields and the Cambay gasfield of Gujarat and the Lakwa field in Assam. Drilling at Lakwa was reported to have discovered probable oil reserves of 300 to 350 million barrels. New oilfield discoveries were reported at Navagaon in Gujarat and at Rudrasagar in Assam. Also, ONGC drilled exploration wells

in the Cauvery Basin in Madras and in various other States but no commercial oil deposits were found. Oil India operated four rigs to drill additional development wells in the proven Nahorkatiya, Hugrijan and Moran fields of upper Assam. Exploration activities on the concession area near these fields, acquired in 1963, was continued. Five wells drilled in this area since 1963 have proved nonproductive.

As in recent years, ONGC continued to receive substantial technical and financial assistance from foreign governments in its efforts to find and develop additional petroleum resources. The U.S.S.R. has provided about $85 million in foreign credit and much technical aid. ONGC has received about $20 million in foreign credits and assistance from Italy and France and some technical assistance from the United Kingdom, Rumania, Yugoslavia, and Czechoslovakia. During 1965, ONGC concluded contract drilling agreements with an Italian Government oil entity for offshore and onshore operations. French and Yugoslavian oil entities were awarded contracts for other onshore drilling operations. A Soviet seismic ship conducted geophysical surveys off the coast of south India and a French firm continued seismic surveys of the Jaisalmar area of Rajasthan.

During 1965, Indian crude oil refinery capacity was increased by 40,000 barrels per day to reach a total capacity of 240,000 barrels per day. All expansion was in the public sector, since the Government adhered to its policy of prohibiting the private sector from expanding beyond its present capacity of about 165,000 barrels per day. Planned new refinery construction programs are all in the public sector, although private companies may be allowed to participate on a minority equity basis.

On October 11, 1965, the first 20,000-barrel-per-day unit of the Soviet-assisted Koyali refinery near Bombay was commissioned and began processing domestic crude from the Ankleshwar oilfield in Gujarat. Construction of a second 20,000-barrel-per-day unit was nearing completion at yearend. A third and final unit to bring the total capacity to 60,000 barrels per day was scheduled for completion in 1966.

The first 20,000-barrel-per-day unit of the Barauni refinery in Bihar, built and financed with U.S.S.R. assistance, was formally commissioned in January 1965. A second unit of equal capacity was completed late in 1965 and the U.S.S.R. agreed to assist in expanding the capacity further to 60,000 barrels per day. This refinery and the public sector Gauhati refinery in Assam processed domestic crude; however, the high wax content of the crude caused considerable difficulties. Barauni refinery products were not up to specifications and the refinery was operated intermittently to permit modifications of the plant to overcome operational difficulties.

Construction of the 50,000-barrel-per-day Cochin refinery in Kerala progressed but was behind schedule. It was expected to be completed in 1965 but delays required rescheduling of the completion date to March 1966. This refinery is being built with private industry participation by Cochin Refineries, Ltd., a company owned 51 percent by the Government of India, 25 percent by Phillips Petroleum Co., 11 percent by the State of Kerala government, and 13 percent by private Indian investors.

After lengthy negotiations, an agreement for construction of a 50,000-barrel-per-day refinery at Madras was signed on November 18 between the Indian Government and the National Iranian Oil Co. (NIOC) and the American International Oil Co. (AMOCO). The agreement provides for construction of the refinery by a newly formed company owned 74 percent by the Indian Government and 26 percent jointly by NIOC and AMOCO. These companies will finance $30 million of the estimated $50 million cost of the refinery and supply up to 50,000 barrels per day of crude to the refinery under a long-term supply contract.

The Government of India and Esso Standard Eastern, Inc. signed an agreement on September 15, 1965, for the construction of a lubricating oil products plant at Bombay. Each party owns 50 percent equity in a newly formed company that will build and operate a plant with a planned output of 145,000 metric tons annually of automotive and industrial lubricants. Completion of the $15 million plant was scheduled for 1968.

The public sector Indian Oil Corp. (IOC) extended its petroleum products distribution and marketing operations in 1965. In efforts to conserve foreign exchange, the Indian Government concluded additional bilateral trade agreements with the U.S.S.R. for petroleum products imports by IOC. Under previous agreements.

the U.S.S.R. agreed to supply 1.5 million tons of products over the 3-fiscal-year period 1963–66 and an additional 800,000 tons in fiscal 1965–66. Effective April 1, 1965, the Government suspended private sector imports of kerosine and diesel oil during the period April to September and substituted imports of Soviet products by IOC. This substitution strained IOC capabilities and the Government urged the private companies to handle and exchange Soviet product imports. The companies refused but continued normal exchange of domestic products between marketing areas to minimize distribution and marketing problems. Private companies' imports of aviation turbine fuel and fuel oil were also in effect suspended by government actions that increased excise taxes on these products. On November 1, IOC began to supply aviation fuel to civil airlines for the first time.

The Government continued to exert pressure on private companies to reduce the price of crude oil imports to their refineries. In January, private companies reduced the price of crude oil imports by about 2 cents per barrel and further reduced prices on July 1 to a greater extent. The companies priced crude imports at $1.34 to $1.48 per barrel that had previously ranged up to $1.55 per barrel. An Oil Prices Inquiry Committee, otherwise known as the Talukdar Committee, was established by the Government to investigate and recommend crude oil and petroleum products pricing policy.

Total consumption of petroleum products in 1965 was an estimated 81.3 million barrels, an increase of 4.5 percent over that of 1964. Crude oil imports supplied about 70 percent of all oil processed and petroleum products imports accounted for 26.7 percent of total consumption.

The Mineral Industry of Pakistan

By E. Shekarchi [1]

Pakistan's mineral industry, although of little impact in the world mineral supply picture, continued in 1965 to contribute to the overall rapid rate of economic growth of the Nation, a growth pattern that in general has prevailed through the entire second 5-year plan that ended in June 1965. The country's gross national product (GNP) [2] rose by more than 28 percent, and per capita income increased about 13 percent in the 5 years covered by the plan, compared with goals of 24 percent and 11 percent, respectively. The rate of growth of the GNP was estimated to have declined to about 4 percent during 1965, compared with an average of 5.5 percent in the previous 4 years. The lower rate for 1965 was attributed mainly to a decline in agricultural output because of unfavorable weather, while the sharp rising trend of industrial production, particularly in the mineral industry, continued in 1965.

Total population in both sections of Pakistan was estimated at about 113.8 million with an annual growth of 2.6 percent. The labor force comprised 32 percent of the total population or approximately 30 million (13 million in West Pakistan and 17 million in East Pakistan). Only a small fraction of the labor force was employed by the mineral industry. As a result of emergency conditions stemming from the Indian-Pakistani crisis including shortages of some raw materials, a substantial number of workers were idle in 1965.

In 1965, the Government of Pakistan published an outline of its third 5-year plan (1965–70) which is part of a broad 20-year program for economic development in the country. With the beginning of the third 5-year plan, Pakistan embarked on an ambitious program of mineral resource development which envisages annual production targets of 200,000 million cubic feet of natural gas, 3 million metric tons of coal, and 5 million barrels of petroleum by 1970.

To close the gap between successful exploration for minerals and full economic exploitation of these resources, the Pakistan Government established a mineral processing and metallurgical institute in 1965 at Quetta, West Pakistan. The intended purposes of the institute are to identify and analyze mineral samples, recommend sound beneficiation processes for economic exploitation of suitable resources, and report their findings, thus bringing discoveries to the attention of industry.

West Pakistan Water and Power Development Authority (WAPDA), a Government agency, announced as one of its goals for the third 5-year plan an expansion of its electric power-generating capacity to more than 1.6 million kilowatts, as compared with the yearend 1965 capacity of 650,000 kilowatts. The new output will come primarily from Mangla Dam (600 megawatts) and from enlarged thermal generator plants in the north and south operating on natural gas from the Sui gasfields.

During 1965, construction work progressed according to schedule on the major Indus Basin installations, namely construction on the Mangla Dam complex, three replacement link canals, and three barrages.

At the end of 1965, total installed electric capacity in both wings of Pakistan

[1] Foreign minerals specialist, Division of International Activities.

[2] Where necessary, values have been converted from Pakistan rupees (PRs) at the rate of PRs 4.76 = US$1.

was estimated at 1.4 million kilowatts; however, in the third 5-year plan, total capacity is expected to increase to 2.4 million kilowatts. About three-quarters of the present power production is hydroelectric power from West Pakistan.

PRODUCTION

Among the metallic ores and metals produced in Pakistan during 1965, iron ore showed the greatest gain, with nearly a fourfold increase over the 1964 output. Chromite production increased 5 percent, while antimony output showed a 25-percent decrease in comparison to the 1964 level. Manganese production was not reported for 1965, but it was estimated that about 1,000 metric tons of ore was produced and consumed domestically.

Noteworthy among the nonmetallic commodities produced in the country were china clay, fuller's earth, mica, and salt which increased about 33 percent, 69 percent, 59 percent, and 21 percent, respectively. Fertilizer production in 1965 showed a 17-percent decrease compared with the estimated 1964 figure and a 2.5 percent decrease, compared with the reported 1963 figures. Production of cement increased about 14 percent in 1965, while total limestone and marble output slightly decreased.

Despite the large natural gas resources of the country, production of this commodity increased only 13 percent in 1965. With the completion of new refineries and fertilizer plants, it is expected that natural gas output will be doubled in the near future. As a result of extensive exploration and the initiation of a large-scale exploitation program, coal production was slightly above the 1963 and 1964 levels, while petroleum output apparently leveled off, reflecting the fact that extensive petroleum exploration has not had very promising results during the previous 3 years. Governmental opinions on the prospects of significant oil discoveries and development were manifested in efforts to seek a partnership arrangement with oil-producing countries of the Persian Gulf region.

Table 1.—Pakistan: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Antimony:					
Concentrate	20	107	r 15	160	119
Metal content of concentrate e	14	75	r 8	82	61
Chromite	25,506	r 21,474	r 14,536	13,511	14,281
Iron and steel:					
Iron ore [2]	3,865	----------	68	4,824	23,429
Crude steel	11,842	[3] 10,706	[3] 11,590	12,169	NA
Lead ore	63	114	73	22	NA
Manganese ore	350	r 925	1,409	996	e 1,000
Nonmetals:					
Barite	444	2,870	r 4,841	p 12,007	8,835
Bentonite	982	r 290	r 432	290	NA
Celestite	419	r 379	r 380	235	445
Cement [4] thousand tons	1,243	1,395	1,498	e 1,500	1,707
China clay	717	20	NA	970	1,289
Dolomite	352	482	r 648	720	259
Fertilizer [5]	NA	158,280	254,481	e 300,000	248,000
Fire clay	16,323	10,005	35,900	16,790	13,610
Fuller's earth	9,698	8,708	12,800	7,000	11,823
Gypsum [6]	101,197	r 120,000	r 130,000	r 140,000	147,160
Limestone thousand tons	1,195	1,156	r 1,418	1,900	1,850
Magnesite	163	r 940	e 1,000	617	523
Marble	5,000	2,259	7,289	9,736	7,328
Mica kilograms	---------	----------	726	4,318	6,858
Salt:					
Rock thousand tons	201	r 192	r 239	197	231
Other do	188	257	212	325	e 400
Silica sand	13,359	17,287	23,870	25,965	30,947
Sulfur	NA	NA	NA	1,500	NA
Talc (reported as soapstone)	1,235	1,120	1,870	2,500	2,843
Mineral fuels:					
Coal thousand tons	921	r 979	r 1,223	1,195	1,230
Natural gas [7] million cubic feet	34,665	42,076	49,459	59,100	67,000
Petroleum:					
Crude thousand 42-gallon barrels	r 2,832	r 3,341	r 3,517	3,732	3,627
Refinery products:					
Gasoline do	776	1,089	r 2,219	e 2,700	2,873
Kerosine do	189	507	r 1,546	e 2,239	3,853
Distillate fuel oil do	685	1,137	NA	e 3,800	5,440
Residual fuel oil do	762	1,695	NA	e 4,000	7,680
Lubricants do	73	63	NA	97	95
Other do	157	494	NA	183	[8] 92
Total do	2,642	4,985	NA	13,019	20,033

e Estimate. NA Not available. p Preliminary. r Revised.

[1] Except where otherwise noted, output is all from West Pakistan.

[2] Officially reported as iron ore, but consists of test lots obtained during exploration which were not used to recover iron.

[3] Includes East Pakistan as follows: Ingot steel: 1962—139, 1963—2,118.

[4] Includes East Pakistan as follows: 1959—44, 1960—70, 1961—96, 1962—90, 1963—77.

[5] Includes: Urea 117,350; superphosphate 8,128; ammonium sulfate 43,283; and ammonium nitrate 79,251 in 1963.

[6] Revisions made from Central Treaty Organization (CENTO) publications.

[7] Includes East Pakistan.

[8] Includes bitumen only.

TRADE

Although detailed information on the quantity of mineral exports was not available for 1964, data on the value of exports of several commodities indicated substantial increases. Metalliferous ore and scrap export values in 1964 were nearly four times those of 1963, while export values for iron and steel increased threefold, and salt export value nearly doubled. The value of total exports in 1964 was reported at $494 million, of which mineral commodities accounted for 2.5 percent, showing that Pakistan remains primarily an agricultural country, depending heavily on imports of metals and minerals.

The value of all mineral imports was given at $253 million, which constituted about 25 percent of the value of all commodities imported in 1964. Available information on metal imports indicate that total iron and steel receipts increased 45 percent while zinc and tin commodity imports each nearly doubled in 1964 compared with that of 1963. Also the imports of lead metal and its alloys were nearly six times the 1963 level. Crude petroleum imports showed an increase of 19 percent in 1964 over that of 1963, while total refinery products registered an 8-percent decrease, and coal and coke categories decreased about 42 percent.

Table 2.—Pakistan: Imports of selected metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964
Metals:			
Aluminum and alloys:			
Unwrought	NA	NA	NA
Semimanufactures	NA	7,582	NA
Arsenic and oxides	33	24	NA
Copper and alloys:			
Unwrought	2,512	2,513	327
Scrap	148	126	NA
Semimanufactures	NA	5,226	713
Iron and steel:			
Scrap	50	886	988
Pig iron	77,569	51,525	65,397
Ferroalloys	943	582	294
Ingots and primary forms	233,393	229,893	346,256
Lead and alloys:			
Ore	237	259	338
Unwrought	NA	1,144	6,160
Semimanufactures	NA	15	98
Mercury, 76-pound flasks	294	925	153
Tin and alloys, long tons	461	380	683
Zinc and alloys	224	r 2,825	5,040
Nonmetals:			
Asbestos cement sheets	1,683	527	NA
Barite	83	9	NA
Borax	292	345	NA
Cement, thousand tons	135	[2] 937	NA
China clay	9,211	1,439	NA
Fertilizer materials:			
Nitrates	109,580	153,718	NA
Potash salts	609	147	1,176
Graphite	397	448	NA
Salt	9,053	1,946	2,601
Sulfur	9,053	4,842	17,220
Mineral fuels:			
Coal, coke, pitch and tar, thousand tons	1,333	1,251	726
Petroleum:[2]			
Crude, thousand 42-gallon barrels	2,461	13,100	15,592
Refinery products:			
Gasoline, do	1,273	576	696
Kerosine, do	3,300	2,708	3,166
Distillate fuel oil, do	4,169	2,720	1,768
Residual fuel oil, do	6,009	2,074	1,749
Lubricants, do	----	2	----
Other, do	174	114	153
Total, do	14,925	8,194	7,532

r Revised. NA Not available.

[1] Except where otherwise noted, data are derived from Statistical Summary of the Mineral Industry World Production, Exports and Imports 1959–64. Overseas Geological Surveys, Mineral Resources Division, London, 1966, pp. 416.

[2] Based on data from various dispatches from the U.S. Embassy, Karachi, Pakistan.

Table 3.—Pakistan: Value of selected imports and exports of metals and minerals
(Thousand dollars)

Commodity	Imports		Exports	
	1963 r	1964	1963 r	1964
Metals:				
Iron and steel	104,428	143,852	11	44
Metalliferous ore and scrap	346	460	178	725
Nonferrous metal and scrap	13,177	18,782	30	34
Nonmetals:				
Abrasives	71	125	----	----
Asphalt and bitumens (natural)	809	1,495	----	----
Building material	473	595	630	849
Cement and building products	7,349	20,935	92	----
Clays and refractory material	967	1,466	----	----
Fertilizer (crude and manufactured)	12,493	3,884	912	6,306
Refractory minerals	327	501	----	----
Salt	90	96	245	456
Sulfur	174	353	----	----
Mineral fuels:				
Coal, coke briquets	9,969	11,503	----	----
Petroleum:				
Crude	13,425	27	----	----
Refinery products	39,209	44,149	93	4,007
Total value	203,307	248,223	2,191	12,421

r Revised.

COMMODITY REVIEW

METALS

Chromite.—The 5-percent increase in chromite output in 1965 was possible primarily because of an agreement to a barter arrangement with communist European countries involving Pakistan chromite exports, and probably was influenced as well by political problems in Southern Rhodesia whose continued contribution to free-world chromite supplies was questionable. It was expected by chromite mine owners that Pakistan might achieve in 1966 an output level near that of the peak year of 1960.

Several articles published by the Geological Survey of Pakistan claimed that low-grade deposits of chromite could be exploited economically, but such exploitation would be profitable only under detailed cost estimates, given in these reports, which included low mining costs and introduction of ore concentration facilities.

Iron and Steel.—Salzgitter Industriebau G.m.b.H. of West Germany was asked by the West Pakistan Industrial Development Corp. (WPIDC) to act as general consulting engineers for the heavy mechanical, electrical, and hydroelectric complexes which will be installed at Kalabagh and which were based upon feasibility reports submitted by this firm. The total cost of the Kalabagh steel mill was given as approximately $100 million.

In the latter part of 1965, the East Pakistan Industrial Development Corp. (EPIDC) announced that work on the iron and steel mill at Chittagong, the first such facility in East Pakistan, was continuing, and it was expected that the mill would go into trial production sometime in 1966. The initial capacity of the mill presumably is 150,000 metric tons of iron and steel products annually, with provision for expansion to 250,000 tons.

By the end of 1965, no confirmed details on the construction of a steel mill in Karachi were available. The mill reportedly will have an initial annual output capacity of 350,000 tons. Both the Karachi and Chittagong plants will use imported pig iron and scrap as raw material, and together they are expected to supply about half of Pakistan's current steel requirement.

A ban on domestic sales of iron and steel products imposed during the Indian-Pakistani conflict was lifted, effective October 1965; written permission from the Government's controller to engage in trade of such products was no longer needed.

NONMETALS

Barite.—Recent geological investigation of the barite deposits of Pakistan by the

Pakistan Geological Survey indicated that all known barite deposits are located in the western provinces of the country. These deposits in Khuzdar and Hazara regions were estimated to contain more than 1.5 million tons. Most of the potentially commercial deposits are reported to be vein and replacement type in Precambrian, Jurassic, and Pleistocene rocks. However, it is concluded in the geologic report that successful commercial exploitation of Pakistan's barite resources would require some improvements in existing transportation facilities as well as development of milling and concentration installations. By yearend 1965, no detailed information was available on the 2,400-ton-per-year crushing and grinding plant previously reported under construction in Quetta. The original target completion date for this facility, financed by West German and local private investments, was mid-1965.

Cement.—Cement production in 1965 increased about 14 percent over that of 1964. Most of the cement plants are located in West Pakistan, and shortage of raw material in East Pakistan has made manufacturing of this commodity economically difficult. Moreover, apparently because of transport costs, shipment of cement from West Pakistan to East Pakistan has not been feasible; therefore, East Pakistan has regularly imported 60 to 70 percent of its annual consumption from neighboring countries, principally mainland China.

Even in West Pakistan, cement shortages continued and, as a part of overall efforts to alleviate this problem, the first of two 600-ton-per-day kilns of the Pakistan Cement Co. factory at Hattar near Rawalpindi was commissioned in December 1965. Both kilns were expected to be in full production in 1966, with a total annual production of 400,000 tons.

In East Pakistan, discovery of suitable limestone deposits at Baklabozar in the northeast district of Sylhet, just inside the East Pakistan border with India, may provide the raw material base for additional output in this section. The Assam Bengal cement plant now can be operated continuously from indigenous limestone. Production capacity of this formerly Indian-owned facility reportedly is around 200,000 tons per year, and the EPIDC, which operated this facility in 1965, reportedly was considering a second plant of the same capacity near the limestone quarry at Baklabozar if the quarry can supply sufficient feedstock for the existing plant and the new facility as well.

Fertilizer Materials.—With the demand for fertilizer surpassing domestic production, the Government of Pakistan has given priority to the construction of 10 new fertilizer plants in the third 5-year plan, which began July 1, 1965. Estimated cost of the new facilities is approximately $253 million with six plants scheduled for East Pakistan and four plants planned for West Pakistan. In addition to the state plants, the Government of Pakistan will allow two fertilizer plants to be set up by private concerns. By the end of the third 5-year plan, it is expected that 1 million tons of urea, and over 500,000 tons of ammonium sulfate and nitrate, and 24,000 tons of triple superphosphate will be produced annually.

The Agriculture Department reported that consumption of fertilizer increased threefold during the past 5 years. To assure a steady growth of consumption, the Government is pushing an agricultural education campaign over the next 5 years providing a more effective distribution of agents to permit explanation of application of balanced fertilizers to more consumers.

To make the fertilizer program a reality, the United Nations will grant during the next 3 years a total of about $1.5 million for feasibility studies of the petrochemical and fertilizer industry in Pakistan with emphasis on planning, including plant location, marketing system, and training of personnel.

In 1965, Esso Standard Eastern Oil Co., Inc., and the Government of Pakistan signed an agreement to build a $26 million ammonia-urea complex. The plant will use natural gas from the Mari field as feedstock and will produce about 173,000 tons of urea and 100,000 tons of ammonia per year. Completion of the plant is expected sometime in 1967.

The Hitachi Shipbuilding & Engineering Co. of Japan, under a Japanese consortium pledge of $30 million to Pakistan, was to provide an ammonium sulfate plant with a 150-metric-ton daily capacity at an estimated cost of $1.7 million. It is reported that the plant will be built at

Dandkhel for the WPIDC with completion scheduled for 1967.

Gypsum.—The gypsum industry, with production 5 percent higher than 1964, remained in the preliminary stages of growth. It is assumed that gypsum production will increase in view of the existence of vast known reserves in economically feasible deposits and the growing domestic demand in the cement and fertilizer industries. Although plans of the Gypsum Board of Pakistan to meet any demand by the fertilizer and cement industries were underway, no details of the plans were available at the end of 1965. Known reserves in two localities, the Salt Range of the Sargodha-Rawalpindi Division and the Kohat Salt Range in Peshawar Division, exceed 100 million tons of pure gypsum.

Marble.—Marble output, 25 percent lower in 1965 than in 1964, was about the same as that of 1963. A recent report issued by the Geological Survey of Pakistan showed proved reserves of green marble (onyx) in the Chagai district about 400 kilometers west-southwest of Quetta and showed proved reserves of other marbles in the Peshawar, Nowshera, and Mardan regions to be about 120 million cubic feet. Also, possible reserves of 13 million cubic feet of marble were mentioned in Azad Kashmir, 48 kilometers from Muzaffarabad. All of the marble deposits are located in West Pakistan.

According to reports by the Investment Advisory Center of Pakistan, if the quarrying technique, quality control, transportation, and packing facilities could be improved, the marble industry of Pakistan could become a main source of foreign exchange earning.

MINERAL FUELS

The search for oil in Pakistan, as undertaken most recently by Pakistan Oil and Gas Development Corp., has discovered no commercially significant oil after almost 5 years of planning, surveying, and drilling; however, during 1965, Pakistan's production of petroleum hydrocarbons (petroleum, natural gas, and condensate) increased 9 percent over that of 1964 and met about 41 percent of the country's total petroleum hydrocarbon requirements. Even though increased use of natural gas for industrial purposes resulted in reduced fuel imports, particularly of petroleum products, the country continued to be dependent on foreign supplies for about 60 percent of total fuel requirements.

Coal.—Pakistan continued efforts to expand and modernize mining facilities but was unable to increase the total output of its coalfields at Makarwal, Sor Range, Degari, and Shariagh significantly over the 1964 total of 1.2 million tons.

Apart from the proved reserves of the previously mentioned coalfields totaling 20 million tons, possible reserves in new findings by the Geological Survey of Pakistan at Bogra (East Pakistan) and Lakhar (West Pakistan) have been estimated at 925 million tons. Reportedly, out of an estimated 750 million tons possible reserve at Bogra, only 200 million tons have been considered possibly economic under existing conditions. Although most of the area is affected by a high-water table for much of the year, an exploration shaft was started by EPIDC in cooperation with Geological Survey of Pakistan at Jamalganj in 1965. Full-scale mining operation is envisioned under the fourth 5-year plan period (1970–75).

Petroleum.—*Crude Oil.*—During 1965, indigenous production of crude oil was 3.62 million barrels, all of which came from the Dhulian oilfield near Rawalpindi. This was processed by the Attock Oil Company's (AOC) refinery at Morgah. The AOC refinery products satisfied less than one-fifth of the country's requirements, and the balance was met from imports.

The Government of Pakistan in 1965 authorized Regie Autonome des Petroles (RAP), a French firm, to conduct a geological survey to determine the oil and gas reserves and possibilities in East Pakistan. The investigation was not expected to begin until after the 1966 monsoon season.

Drilling work of Pakistan Petroleum Ltd. and Burmah Oil Co. in conjunction with Pakistan Oilfields Ltd. (Attock Oil Co. plus Pakistani Government and private capital) continued during 1965 at Kundian, Adhi, and Pezu. No information was available on their findings at yearend.

Refineries.—In the east wing of Pakistan, construction work stopped in 1965 at Chittagong refinery because of the withdrawal of RAP, which supplied the foreign exchange and had a 50-percent share of the crude oil supply rights for 10 years. The

EPIDC stepped in temporarily while foreign investors were being invited to take RAP shares; however, by the end of 1965, no permanent solution had been found.

National Refinery Ltd. continued construction of its 10,000-barrel-per-day refinery near Karachi in 1965. This refinery reportedly will produce lubricants and asphalt from feedstock supplied by Pan American Oil Co. from its Darius offshore field in the Persian Gulf. Completion was scheduled for 1966, and estimated cost is said to be approximately $17 million.

Natural Gas.—Total natural gas production from the gasfield at Sui and Dhulian in West Pakistan and Sylhet and Chhatak in East Pakistan during 1965 rose to a new level of 67,000 million cubic feet, about 13 percent more than the 1964 production level. About 81 percent of total 1965 production came from Sui gasfield, Pakistan's major gasfield, which has an estimated recoverable reserve of 6.3 million million cubic feet. About 9 percent came from the Dhulian field, and the remaining 9 percent was produced by the Sylhet and Chhatak fields.

Approximately 98 percent of the Sui gasfield production was utilized by industrial units, such as electricity generation and cement and fertilizer production, while the entire output of Sylhet and Chhatak went to the Fenchuganj fertilizer factories.

In June 1965, completion of the Multan-Lyallpur pipeline section extended the transmission systems 555 kilometers north from the Sui gasfield, and thus Sui gas was made available to several industrial units in the Lyallpur area. At the end of November 1965, the 144-kilometer Lyallpur-Harawpur section of the pipeline was completed to carry Sui gas to cement plants at Gharibwal and Dandot. Work on the Lyallpur-Lahore branch of the gas pipeline, with an expected completion date in 1966, continued during 1965.

To provide feedstock for Esso-Pakistan's fertilizer plant being built at Daharki, Esso Southeast Asia started drilling in November 1965 on the first development well at the Mari gasfield, 760 kilometers northeast of Karachi.

The Pakistan Oil and Gas Development Corp. which has been drilling for oil with the help of the U.S.S.R. technicians since 1961, announced that it had struck natural gas at Jaldi in East Pakistan in May 1965 and at Sari Sing in West Pakistan in November 1965. No detailed information pertinent to reserves and quality of new findings were available.

Regional Mineral Industry Review of the Far East[1]

By J. M. West[2]

Expanded war in Viet-Nam overshadowed activities in the Far East in 1965, diverting capital and materials from potential regional development projects. Japan withstood a period of business recession that was particularly felt by its coal mining and iron and steel industries. Toward yearend signs of improvement began to show. Despite the recession with attendant credit restrictions and forced cutbacks in areas of overproduction, Japan's overall industrial output rose nearly 5 percent during the year. Foreign trade, liberalized in 1964, was a strong point in the Japanese economy and took the place of lagging domestic demand. Japan maintained its third place in world production of iron and steel ahead of West Germany and in 1965 was the world's foremost exporter of iron and steel in primary and semimanufactured forms.

Economic setbacks in mainland China caused by its "Great Leap" failures and subsequent withdrawal of Soviet technical assistance were difficulties relegated to the past. However, a newly formed "Red Guard" political group, part of a so-called cultural revolution, was due to cause new disruptions in 1966. Nevertheless, significant gains were claimed in Chinese industry, and the country approached self-sufficiency in petroleum in 1965 by virtue of its Tach'ing oilfield. Restoration of friendly relations was achieved between South Korea and Japan accompanied by Japanese offers of industrial aid and increased trade. Indonesia's economy was deteriorating; the country withdrew from regional development organizations and continued its stubborn confrontation policy against Malaysia throughout 1965. Late in the year, after a Communist uprising had been quelled, there was a period of political retrenchment and it was hoped that economic improvements would follow. Petroleum remained a strong area in Indonesia's varied resources, and its production was increasing. Tin output declined, however, because of operating difficulties.

The Philippines, Thailand, and Malaysia all showed significant industrial growth and promising mineral potential. From the standpoint of foreign investment, the Philippines remained a questionable area, although positive legislative actions had been discussed. Proposals for large-scale nickel development were turned down and at least one major copper development was blocked because of uncertainties about the laws. Tin mining in Thailand and Malaya made major gains. In Taiwan, U.S. aid was phased out, although cooperative projects remained in some fields. The country was considered to have reached the economic position whereby new industrial investment was self-generating.

An event of substantial importance to the Far East was the founding of the Asia De-

[1] The area considered in this review is defined as that part of east Asia which lies southeast of the Soviet Union and east of the Indian-Pakistan subcontinent; the Soviet Far East, Australia, and Oceania are not included in the area described. For convenience in discussion the area has been subdivided into the following three geographical regions: Southeast Asia-Burma, Thailand, Laos, Cambodia, South Viet-Nam, Malaysia, Indonesia, and the Philippines; Northeast Asia-Japan, South Korea, Taiwan, and Hong Kong; and mainland East Asia-mainland China, North Korea, Mongolia, and North Viet-Nam.

[2] Far East specialist, Division of International Activities.

Table 1.—Basic data and significance of minerals to countries of the Far East in 1965

Country	Population, millions	Area, thousand square miles	GNP [1] million U.S. dollars	Level of significance [2]	
				Crude minerals	Mineral processing
Non-Communist countries:					
Brunei	0.1	2.2	120	3	4
Burma	25	262	1,630	3	4
Cambodia	6	67	800	4	4
Hong Kong	4	0.4	1,500	4	4
Indonesia	106	576	7,200	2	3
Japan	98	143	77,000	1	1
Laos	2.6	91	155	4	4
Malaysia:					
Malaya	8.0	51	2,550	2	2
Sabah	.5	29	120	4	4
Sarawak	.9	48	180	4	4
Philippines	32	116	5,060	2	3
Singapore	2	0.2	900	4	3
South Korea	28	38	3,510	3	4
South Viet-Nam	16	66	1,820	4	4
Taiwan	13	14	2,600	3	3
Thailand	31	198	3,825	3	4
Communist countries:					
Mainland China	730	3,692	50,000–100,000	1	1
Mongolia	1–2	593	300–400	4	4
North Korea	13	47	2,000	2	2
North Viet-Nam	18	63	1,500–2,000	3	3

[1] Approximate Gross National Product.
[2] Significance according to roughly estimated production value and value added by processing is ranked in the following order: 1—Over $500 million, 2—$100-500 million, 3—$50-100 million, and 4—Less than $50 million.

velopment Bank (ADB).[3] The bank, in which the majority of the capital was subscribed by Far East countries, will be the nucleus of a wide range of development projects in Asian countries. Capitalized at $1,000 million, the ADB will be located in Manila, Philippines. Another encouraging development was reactivation of the Association of Southeast Asian States (ASA), bringing together the area's developing countries for cooperative efforts. Various other organizations were active, in particular, the United Nations' Economic Commission for Asia and the Far East, (ECAFE) which carried out intensive surveys and planning of mineral and related industrial development possibilities. The great interest of the Far East in petroleum and fuels, was expressed at the ECAFE symposium at Tokyo, Japan, in November 1965.[4]

On the whole, the mineral industry of the region made impressive advances, with Japan the outstanding example of growth and technical improvements in processing. Mainland China was not far behind in size of industry but remained technologically less advanced although trying hard to compensate for isolation from the non-Communist world. Between them, the two countries probably were responsible for at least four-fifths of the Far East's mineral output.

Mainland China, with all its resources and nearly two-thirds of the population of the Far East, had an equivalent or possibly lower level of mineral output value including value added by processing than did Japan. Industries in both countries were diversified. Other major mineral producers included North Korea, noted for nonferrous metals; Indonesia with oil, tin, nickel ore, and bauxite; the Philippines with copper, iron, and chromite ores; Malaysia with tin, bauxite, and iron ore; Thailand with tin; and South Korea with tungsten.

Overall, the Far East in 1965 produced approximately 55 million tons of iron ore, 58 million tons of steel, 56 million tons of hydraulic cement, almost 390 million tons of coal, and 288 million barrels (about 41 million tons) of crude oil. The area remained important in the world production of tin and tungsten.

Japan was by far the area's most important country in mineral trade, requiring exceptionally large imports of crude oil, fertilizer raw materials, iron ore, and base metal ores to supply its active smelting

[3] Dr. Y. P. Pant. ADB Takes Off. Far East Economic Review, v. 50, No. 12, Dec. 23, 1965, pp. 561–563.
[4] United Nations' Economic Commission for Asia and the Far East. Report of the Third Symposium on the Development of Petroleum Resources of Asia and the Far East. (United Nations E/CN. 11/I & NR/59). Dec. 23, 1965, 93 pp.

Table 2.—Far East contribution to world production of major mineral commodities

Commodity	Percent of 1965 world output	Major producing countries of the Far East in order of significance
Metals:		
Aluminum	6	Japan, mainland China, Taiwan.
Antimony	27	Mainland China, Thailand, Japan, Burma.
Bauxite	5.7	Malaysia, Indonesia, mainland China.
Bismuth	30	Japan, South Korea, mainland China.
Chromite	13	Philippines, Japan, North Viet-Nam.
Copper:		
Mine	5	Japan, mainland China, Philippines.
Smelter	8	Japan, mainland China, North Korea.
Iron and steel:		
Iron ore	9	Mainland China, Malaysia, North Korea, Japan, Philippines.
Pig iron	14.6	Japan, mainland China, North Korea.
Steel ingot	12.6	Japan, mainland China, North Korea.
Lead:		
Mine	9	Mainland China, North Korea, Japan.
Smelter	10.5	Japan, mainland China, North Korea.
Mercury	12	Mainland China, Japan, Philippines.
Molybdenum	4	Mainland China, Japan, South Korea.
Tin (mine)	62.5	Malaysia, mainland China, Thailand, Indonesia.
Tungsten	51	Mainland China, South Korea, North Korea.
Zinc:		
Mine	10	Japan, North Korea, mainland China.
Smelter	13.2	Japan, mainland China, North Korea.
Nonmetals:		
Cement	13	Japan, mainland China, Taiwan, North Korea, Philippines, South Korea, Thailand.
Fluorspar	15	Mainland China, Mongolia, Thailand, South Korea, Japan.
Graphite [1]	60	South Korea, North Korea, mainland China.
Gypsum	3	Japan, mainland China.
Magnesite	20	Mainland China, North Korea.
Phosphate	3	North Viet-Nam, mainland China, North Korea.
Salt	15	Mainland China, Japan, Taiwan.
Sulfur	3	Mainland China, Japan.
Mineral fuels:		
Coal:		
Anthracite only	27	Mainland China, North Korea, South Korea, North Viet-Nam, Japan, South Viet-Nam.
All coal including anthracite	13.8	Mainland China, Japan, North Korea, South Korea, Taiwan, North Viet-Nam.
Crude oil	2.6	Indonesia, mainland China, Brunei, Japan, Burma.

[1] Mostly amorphous graphite used as fuel.

and manufacturing industries. Japanese mineral products also maintained a strong position in the Far East as well as in world trade. Nearly one-third of its steel exports, most fertilizer exports, two-thirds of the cement exports, and one-tenth of its refined oil exports went to countries within the region. However, as can be concluded from the accompanying trade table, a large part of Japanese trade was conducted with countries outside the region. These countries included the United States, countries of the Middle East and West Europe, the Latin American countries, Australia, Canada, and African countries. Japan's main trading partners with the Far East were, in descending order of mineral trade values, the Philippines, mainland China, Malaya, Taiwan, Thailand, and the Ryukyu Islands. Mineral trade with Far East countries comprised 25 percent of Japan's mineral export value and 18 percent of its mineral import value. The Communist Far East accounted in 1965 for 12.5 percent of Japan's Far East mineral export value and 17.5 percent of its mineral import value, compared with 10.2-and 14.6-percent shares in 1964 and 5.0-and 8.4-percent shares in 1963. Coal and pig iron were among those Japanese imports to rise while Japanese exports to the Communist Far East included increasing quantities of fertilizers and iron and steel products.

Table 3.—Japan's trade in selected mineral commodities with other Far East countries in 1965

Commodity	Total quantity traded throughout the world (thousand metric tons unless otherwise specified)	Percent to or from Far East	Principal destinations or sources within the Far East
Exports:			
Metals:			
Aluminum, unwrought	29	10	Mainland China, Burma, South Korea, Thailand.
Copper, unwrought	3	52	Taiwan.
Iron and steel:			
Ingots, blooms, and billets	458	23	Philippines, Ryukyu Islands, South Korea.
Coils for rerolling	889	3	Philippines and Taiwan.
Semimanufactures	8,343	33	Philippines, Thailand, Taiwan, Hong Kong, mainland China, Malaya, South Korea, Singapore, Indonesia, Burma.
Lead, unwrought	9	42	Taiwan, South Korea, Indonesia, Philippines.
Zinc, unwrought	55	27	South Korea, Philippines, Taiwan, Malaya, Singapore.
Nonmetals:			
Cement	1,601	64	Indonesia, Hong Kong, Singapore, Ryukyu Islands.
Fertilizers, manufactured (including anhydrous ammonia)	1,789	93	Mainland China, South Korea, Taiwan, Philippines.
Mineral fuels:			
Coal and coke	96	100	South Korea.
Petroleum products million 42-gallon barrels	8	9	Ryukyu Islands, Hong Kong, South Korea, Thailand, Philippines.
Imports:			
Metals:			
Antimony ore	5	31	Mainland China, Thailand, Malaysia.
Bauxite	1,675	71	Malaysia, Indonesia.
Chromite	360	31	Philippines.
Copper ore and concentrate	619	42	Philippines, Taiwan.
Iron ore	39,018	30	Malaysia, Philippines, Thailand, South Korea, North Korea, mainland China.
Pig iron	2,640	26	Mainland China, North Korea, North Viet-Nam.
Lead ore and concentrate	67	11.5	South Korea, North Korea.
Manganese ore	1,065	9	Philippines, Thailand, mainland China, Indonesia.
Nickel ore	967	82	Indonesia.
Tin:			
Ore and concentrate	1	97	Thailand.
Unwrought	15	100	Malaysia, mainland China.
Titanium concentrate	212	45	Malaysia, North Korea.
Tungsten concentrate	2	36	South Korea, mainland China, Thailand, Burma.
Zinc:			
Ore and concentrate	380	12.6	South Korea, Burma, North Korea.
Unwrought	7	21.4	North Korea.
Nonmetals:			
Barite	14	78	Mainland China, North Korea.
Dolomite	21	100	South Korea.
Fluorspar	172	86	Mainland China, Thailand, South Korea.
Graphite	52	92	South Korea, North Korea.
Kaolin	60	39	South Korea, Hong Kong.
Magnesite and magnesia clinker	26	71	North Korea, mainland China.
Quartz and quartzite	42	96	South Korea, mainland China, North Korea.
Salt	3,543	30	Mainland China, Taiwan, Indonesia, South Viet-Nam.
Silica sand	97	100	South Viet-Nam, North Viet-Nam.
Sulfur	54	47	Mainland China.
Talc and soapstone	54	69	Mainland China, South Korea, North Korea.
Mineral fuels:			
Anthracite coal	1,165	66	North Viet-Nam, South Korea, mainland China.
Bituminous coking coal	15,965	3	Mainland China.
Petroleum:			
Crude million 42-gallon barrels	508	6	Indonesia, Malaysia.
Partly refined do.	21	8	Indonesia.
Refinery products do.	105	12	Singapore, Indonesia.

SOUTHEAST ASIA

Troubles in Southeast Asia deepened with intensified warfare in South Viet-Nam, counteraction in North Viet-Nam, Communist harrassment in many sections, division of Singapore and Malaysia, and Indonesia's economic deterioration. On the brighter side, Malaysia, Thailand, and the Philippines made significant advances in the minerals sector. Thailand became an oil refiner of some significance and placed a tin smelter in operation; Malaysia and Singapore had additional oil refineries and iron and steel facilities under construction; and the Philippines increased metal ore reserves, added cement capacity, expanded oil refining and fertilizer facilities, and began construction on a major integrated iron and steel plant. Tin production within the area increased 6 percent in 1965 to nearly 100,000 tons of tin-in-concentrates on the strength of activities in Thailand and Malaya. The subject of offshore prospecting came to the forefront and worldwide interest focused on the potentials of Thailand, Malaysia, and Indonesia offshore tin and oil reserves. Mineral advances were minor in other countries of the area. No development was reported on a potentially large iron ore discovery in Laos; Burma seemed to have de-emphasized minerals; Cambodia discussed plans with the French to build an oil refinery; and South Viet-Nam was unable to carry out its limited industrial plans.

Indonesia's international debts continued to accumulate in 1965, and foreign assistance in mineral development, although still available, was more difficult to obtain. Production of crude oil, a major source of foreign exchange, increased, and there were increases in nickel and bauxite output for export to Japan. However, production of refined oil, cement, and coal all decreased, which offset other gains. High labor costs, broken equipment, bad transportation, and inadequate planning hampered mining.

Crude oil production reportedly reached 178 million barrels in 1965 but the surplus of refined oil for export declined. More of the oil was consumed domestically partly because of the extremely low prices set by the Government. A new lubricant plant reduced dependence on foreign sources for lubricating oils. Exploration for oil was relatively successful. New fields were under active development by the Japanese in the Medan area of northern Sumatra, and by others in Kalimantan (Borneo) and in central and southern Sumatra. At yearend P. T. Shell Indonesia sold its extensive properties to the Indonesian Government.

Re-equipping of tin mines with European assistance continued slowly, and tin production declined because of domestic unrest. A large new dredge built in the United Kingdom was due to arrive in early 1966 to boost tin output. Completion of the new tin smelter at Muntok was delayed by technical problems, so tin concentrates continued to be exported. Mining of nickel in Sulawesi (Celebes) and bauxite on Bintan Island, near Singapore, expanded; revived interest was shown in a large disseminated copper deposit in West Irian (West New Guinea), and copper deposits were studied in southern Sulawesi. Attempts were made to resume gold mining in southern Sumatra and West Java. Construction of the Tjilegon steel plant in West Java was slowed, and the unfinished Tonassa cement project, near Macassar, was struck by fire. A Dutch company began diamond mining in Kalimantan.

Malaysian tin accounted for about 9 percent of the Nation's GNP in 1965, with production rising to nearly 64,000 long tons of tin-in-concentrates, a postwar record. Gravel pump mines, requiring limited capital, were important contributors to the GNP with an increase of over 200 individual operations during the year. The Government conducted further examinations of Malay reservations for tin and assisted landowners in forming mine organizations. New areas were opened for tin exploration including offshore waters, for which prospecting rights were hotly contested by major companies.

Trade with Malaysia was interrupted when Singapore decided to leave the Federation of Malayasia in August 1965, but minerals were not greatly affected except for tariff changes. Plants for manufacturing chemicals and fertilizers neared completion at Klang, Malaya. Expansions in oil refining were underway in both Singapore and Malaya. The Malayawata Iron and Steel Co., a joint Japanese venture which is to include blast furnaces, was finally under construction at Prai, Malaya, and steel-from-

263-927 O-67—70

scrap facilities were being expanded in Singapore. Several more iron mines operated in Malaya in 1965 and output was higher although ore prices were lower than in 1964. The Rompin-Pasaki iron mines under development in southern Trengannu increased output. Several new bauxite mines operated in Johore State, Malaya, but the Sematan mine, in Sarawak, closed down when reserves ran out.

Prospecting continued in northern Borneo for gold, bauxite, oil, and copper; offshore drilling was successful in Brunei providing good flows of oil and natural gas; geophysical surveys were in progress in Sabah. Copper discoveries were under investigation in the mountains of central Sabah, and the potential for the area appeared promising.

Thailand produced about 10 percent of the world's tin in 1965, increasing output to 19,045 long tons of tin-in-concentrates, 22 percent over the 1964 level. Gravel pump operations in the south, encouraged by high tin prices, were major contributors to the rise. The new tin smelter at Phuket opened shortly after midyear with combined capacity of its two furnaces rated at 20,000 tons of tin-in-concentrates per year. Simultaneously, a ban went into effect on concentrate exports, and tin metal exports began shortly after. Plant operators, having startup problems, found tin ore stockpiles growing faster than anticipated and planned immediate furnace expansions. Surveys of offshore tin deposits were fruitful, and considerable increase in tin production was anticipated from these sources. Efforts were underway to modernize Thai mining laws, to establish offshore regulations, and to encourage mining and prospecting for various minerals in the north.

Fluorspar, manganese, and antimony mining remained active. Reports were issued describing Thai manganese and fluorspar deposits. The new Sriracha oil refinery performed well, and the Government's Bangchak refinery was to be expanded to a more economic level of operation. There were reports of another refinery in planning to produce asphalts. A fertilizer plant was under construction; a cement plant neared completion in the south; a new cement plant was scheduled for construction in the northeast; and cement expansions were scheduled for other locations.

Cement requirements have risen sharply in connection with construction projects for roads, electric power facilities, irrigation, and harbor improvements. Several steel pipe plants were opened, and a steel mill was being built in the Bangkok area. A large new iron mine was in production; iron ore reserves in the Loei area were increased by United Nations surveys; and interest was stronger in a reportedly large zinc deposit in northwestern Thailand.

Affairs of government superseded mineral development in Burma, although future plans called for more attention in this area. There were reports of successful oil exploration, but crude output declined. Refineries drew on imported crude oil for expanded throughputs to meet domestic requirements. A new section of the Syrian oil refinery operated satisfactorily. Production at the famous Bawdwin lead-zinc-silver mines, now under government ownership, was less than in 1964 and, apparently, the mine-run ore was lower grade. Proposals to build a new flotation plant and zinc smelter were revealed, but plans remained vague. In the south, recently found iron deposits remained undeveloped, and tin-tungsten mines operated at reduced levels. The Thayetmyo cement plant was scheduled to expand capacity. Trade was more strictly controlled in 1965, and the country became even more isolated in pursuing its policy of independence and nonalinement.

In Laos, tin mining continued but nothing further was reported on the large iron ore discovery near Xieng Khouang said to be suitable, in part, for open pit mining. Surveys of potential hydropower projects were conducted, and preliminary work was started on the Nam Ngum hydroelectric development north of the capital. Little was done on reported lead, gold, coal, and nonmetallic deposits or on oil investigations. Mineral imports, largely of iron and steel, oil products, and cement, were increasing.

Cambodia produced cement, fertilizer, gem stones, a little salt and gold, and had several hydroelectric projects under construction. Cement, glass, fertilizer, and electric power plants were scheduled for construction with aid from Soviet and mainland China assistance programs; France was to supply power, transportation, and port facilities. A small oil refinery was to be built by a French firm.

Philippine mineral production rose significantly, with notable increases in copper, chromite, and iron ore. Cement and refined oil production also made important gains. An uncertain investment climate continued over the minerals industry, but the removal of a 20-percent retention system on exports led to some improvement of income to mineral producers.

Construction began on a long-waited integrated iron and steel plant at Iligan on Mindanao. Delays occurred later because domestic funds, though committed, were withheld from the project. A second steel complex lacked capital to get started. A third smaller plant was still in planning. Oil exploration was in a depressed condition, and capital for further search seemed exhausted. However, several helpful bills were passed by the Philippines Congress, including one that eliminated exploration taxes and another that extended a moratorium on work obligations of oil leaseholders.

A new fine-ore treatment plant for chromite was in operation; output more than offset a decline in lump ore and plus 10-mesh tonnages, but market demand for the upgraded ore was not up to expectations. Refractory chromite reserves increased by nearly 5 million tons of ore; mine capacity for metallurgical-grade ore was expanded. A new iron ore pelletizing plant began operations but had technical problems; the process was found to require an excessive amount of bentonite as binder and sulfur content of pellets was higher than expected.

Potential for copper in the Philippines appeared even better than previously estimated. One of the newest developments was on Balabac Island, Palawan, where Benguet Consolidated, Inc., acquired rights to mine a 500,000-ton deposit containing 4.5 percent copper ore and considerable pyrite. New or expanded mills were being built at several important mines, and copper leaching was expected to add to production. Marcopper Mining Corp. (formerly Pamex) suspended development work at its large and promising Marinduque Island copper deposit while a determination of rights and assurances were sought.

Native sulfur deposits were discovered in Leyte, and a reportedly large lead-zinc deposit was found in Mindaneao. Extensive nickel laterite deposits remained untapped, the Government having rejected bids for development by foreign investors. The cement industry expanded and output rose sharply. A new fertilizer plant started operation slowly because of malfunctioning equipment. Tinplate and steel-casting facilities were enlarged. Domestic coking coal was blended successfully, and a new source of silica sand was in production. There were large increases in crude oil imports and refining.

NORTHEAST ASIA

Favored by relative political stability, the northeast region of Asia, with Japan the dominant influence, made excellent progress in 1965. Opportunities for investment were considered good throughout the area. Japanese mineral industries, although held back by lower demand in some sectors, responded well to development efforts. Domestic markets were generally depressed, but much of the slack was taken up by larger export sales. Japan continued to exploit its own resources and to process both indigenous and imported raw materials from many parts of the world. Thus, the mineral industries provided more than one-tenth of Japan's 1965 GNP. Taiwan's mineral industry increased nearly one-fourth in extractive output value in 1965 and set impressive goals emphasizing fuels and power. In South Korea, overall mine output value increased only 4 percent in 1965; most of this output was coal. Progress in the mineral processing sector continued, with steel, fertilizer, and cement expansions, and a new oil refinery in full operation. Hong Kong advanced mainly in light industries and because of its trading dominance there were resulting increases in consumption of fuels, metals and minerals.

Japan intensified mineral activities abroad in 1965 through its private mining and trading companies and quasi-Government Overseas Mineral Resources Development Co., Ltd. These activities included exploring, developing, equipping, financing, and supplying technical knowledge. There were few areas of the world that did not feel Japanese influence in the competition for minerals. Involvement generally took the

form of cooperative projects or outright purchases of minerals at tightly negotiated prices. Often, accompanying sales of Japanese equipment and contracts for related transportation, power, or other facilities and services were consumated. Among areas where notable investment was indicated were Canada, Alaska, Australia, South America (Brazil and West Coast), central Africa, India, and the East Indies. Even mainland China and the Soviet Far East were not beyond the realm of Japanese contact, with overtures for cooperative mineral projects reported from those areas.

Japan's own mineral-processing industries, notably iron and steel, oil refining, cement, fertilizers, and nonferrous metal smelting, were still undergoing considerable expansion, although industrialists were less confident about investment than in previous years. Domestic metal mining made little progress and nonmetallic mining actually declined. Coal output was 1.5 million tons lower than in 1964. This decrease was offset in the nation's energy balance by imported petroleum, which was processed domestically by a refining industry which by 1965 had become firmly ranked as third in the world. Crude steel output, despite being held down by industry-wide curtailment, increased through the help of large exports of steel products to the United States where inventories were being accumulated. Vigorous efforts to sell steel aboard were expected to continue in 1966.

Copper production was particularly notable because of the world shortage, and electrolytic output increased 9 percent. Copper ores were more expensive, and increasing ingot prices barely kept up with rising ore and other costs. One result of the copper shortage was that the Government began considering some form of stockpiling to protect the metal-working industries and to provide some stability. Stockpiling could extend similarly to other commodities. Domestic mining companies were granted a special tax privilege related to rising costs of exploration and mining at greater depths.

Supply of iron ore from foreign sources was further diversified by additional contracts with new Australian producers. Steel scrap requirements declined because of increasing use of oxygen converters. Major steel producers made further plant improvements; seven more blast furnaces and nine more oxygen converters were placed in operation. Major additions were made at Kawasaki Steel Corp's. Chiba plant, Sumitomo Metal Industry Ltd's. Wakayama works, and Yawata Iron and Steel Co's. Sakai plant. Nippon Kokan K. K.'s new Fukuyama works, to start with 1.5 million tons of crude steel capacity in 1966, was scheduled by 1970 to become Japan's largest steel center.

In nonferrous metals, a major event was the startup of the 60,000 ton-per-year Onahama copper smelter of the combine, Mitsubishi Metal Mining Co. Ltd., Dowa Mining Co. Ltd., and Furukawa Electric Industry Co. Ltd. Renewed activity in lead-zinc and competitive requirements prompted Dowa Mining and Nippon Mining Co., Ltd., to plan a 60,000-ton-per-year smelter on Japan's west coast using an adaptation of the Imperial Smelting Process to treat Dowa's metallurgically complex "black ores." The smelter would replace an outmoded plant at Kosaka. Construction of mine facilities was underway to exploit such black ores, recently discovered in quantity in northeast Honshu where reserves are said to total over 60 million tons. Ores contained significant values in copper, zinc, lead, gold, and silver. Zinc exports increased by nearly 50,000 tons of metal in 1965; the rise was due to a sharp increase in ore imports from Peru and to the expanding zinc smelter capacity.

Aluminum substitution for copper increased and contributed to an upsurge in demand for the light metal. As a result, imports of aluminum ingot rose, including those from the Soviet Union, and Japan's three aluminum refiners planned to boost total smelting capacity to 340,000 tons per year in 1966–67. Capacity for alumina exceeded consumption and nearly one-fifth of the output was exported in 1965. A further increase in supply of bauxite from Australia was expected, because of recent mine developments.

Coal mining costs were higher and the specter of increasing coal imports, valued at more than $60 million above those of 1964, accelerated the shift to petroleum and natural gas as fuel in Japan. Crude oil imports, largely from the Middle East, rose 16 percent to 73 million tons, and refining capacity expanded to 2 million barrels (about 300,000 tons) per day. Showa Oil Co. was completing a new refinery at Niigata to

replace the one destroyed by an earthquake in 1964, and at least four other refineries were being expanded. Additional capacity of more than 155,000 barrels per day was scheduled for 1966. Imports of liquefied natural gas (methane) where due in sizable quantity by 1968.

Coal production, which is largely used for thermal electric power and is a major factor in South Korea's mineral industry, advanced during the year; output increased by over 0.5 million tons; cement also made a large gain, nearly 30 percent more being produced in 1965. Iron ore output rose, and exports reached a value of $7.5 million, almost one-fourth higher than those in 1964. Fluorspar and talc were among nonmetallics realizing declines in output. Output of tungsten, for which South Korea is noted, slumped greatly, although export earnings rose nearly two-fifths to $6.6 million owing to better world prices. At the rich Government-owned Sangdong tungsten mine, work started belatedly on an expansion program to include shaft deepening and mill improvements. Byproduct bismuth and molybdenum recoveries improved.

A potentially large disseminated molybdenite deposit was found in the Toktong-Choyang area. The new lead refining section at the Changhang nonferrous smelter had furnace problems, and the flotation plant lacked adequate water. Changhang treated a larger tonnage of domestic copper ore but produced less electrolytic copper for export in 1965. The nonferrous outlook was improved by development of significant ore reserves and milling facilities in various parts of the country.

Work began on another cement plant, and plans were reported for a major installation (3 million tons or more), which would be the country's seventh plant. Oil refining at Ulsan's new industrial center was scheduled for expansion to a capacity of 55,000 barrels daily by late 1966. As development of the large Hongchon Chaun iron ore property progressed northeast of Seoul further discussions were held on building an integrated iron and steel plant. Major fertilizer manufacturing additions were underway, and an aluminum refinery may be established. The United States continued to actively assist the Government in conducting mineral resource surveys and provided technical support. Japanese influence in South Korea was expected to rise following a normalization of long-strained relations between the two countries.

On Taiwan, a promising oil and natural gas belt was discovered in the Paoshan area of Hsinchu Province, adding to previously developed gas resources in the Miaoli area. Natural gas output nearly doubled to about 11 million cubic feet. Prospects were so good that industrialists planned an extensive petrochemical industry based on natural gas. As part of oil refining at Kaohsiung, a naptha cracking unit was under construction as a base for petrochemicals, plastics, and synthetic rubber. The Kaohsiung oil refinery was to be doubled in capacity to about 3 million tons annual throughout, and domestic oil exploration was to be stepped up. Government plans called for an oil refinery to be built in northern Taiwan, oil and natural gas plant expansions at Miaoli, and pipeline transport of oil. Coal output was slightly higher in 1965, and was consumed largely in electric power generation. Investigation of potential geothermal power sources centered on the Yangmingshan area where plans were made to start extensive drilling and testing. Taiwan's aluminum industry operated close to capacity, except as limited by power supply in dry months and processed its own alumina from bauxite imported from Malaysia. Further expansions were planned in all phases of the operation. More aluminum fabricating facilities were being built, covering a wide variety of products. Export markets for surplus cement were good; South Viet-Nam remained a large purchaser. A plan was outlined to build an integrated iron and steel plant, possibly at Kaohsiung. A 5-million-ton nickel sulfide deposit containing 0.14 to 0.35 percent nickel was discovered overlapping Ilan and Hualien Provinces. Fertilizer capacity approached the million-ton-per-year mark, with further increases planned on the basis of natural gas developments. A 2-million-ton bentonite deposit was discovered in Ping Tung Province in the south.

Hong Kong continued to produce and export iron ore from its Ma On Shan mine in the New Territories and produced small quantities of other minerals. Land reclamation was an important activity in Hong

Kong's thriving harbor area. Construction was at record levels; cement, fuel oil, and electrical power requirements were rising sharply. Metal fabrication and gem cutting continued to be sizable industries. Ship-breaking for scrap steel declined.

MAINLAND EAST ASIA

Mainland East Asia, with its four contiguously situated Communist countries centered around mainland China, had another year of fair industrial advancement, which was partly due to the war in Viet-Nam. Mineral industries held high priorities in economic development programs. In mainland China during the year great effort was expended on attaining international atomic status, on developing heavy industry, on producing fertilizers and chemicals for agriculture, on increasing coal production, and on reaching virtual independence in crude oil production. Not so large, but locally significant were mineral achievements in North Korea and North Viet-Nam. Mongolia made moderate progress with its Darkhan industrial project and in mineral surveys.

The domestic orientation of mainland China's mineral industry remained little changed in 1965; a few shortages were supplemented by imports. Shipments of some traditional mineral export commodities such as tin and tungsten apparently declined, while imports of chemical fertilizers, fertilizer raw materials, machinery, special steels, copper, and several other mineral products increased. Efforts to import complete manufacturing plants, including oil refining, metallurgical, and fertilizer units were notable. A decline in petroleum imports signified that mainland China was on the verge of self-sufficiency at least in crude oil production. The country's second atomic bomb blast took place on May 14 in the western desert, suggesting that in the field of radioactive raw materials and atomic technology China might be more advanced than previous estimates have indicated. Three uranium mines were reported to have come into production in Kiangsi and Kwangtung Provinces with combined daily output of 2,500 tons of uranium ore.

Productivity in coal mining was said to have improved through wider mechanization, and coal quality was somewhat better but remained generally poor by Western standards. Output of coal reached about 300 million tons, surpassed only by outputs of the Soviet Union and of the United States. Production from the Pingtingshan mines, in Honan Province, where major expansions had been recently completed, was about two-thirds higher than that in 1964. Centrally controlled conveyers and a hydraulic transport system were placed in operation at Fushun. Improved washing and blending of coking coals and conservation of best quality coals for appropriate purposes were widely promoted. Greater quantities of coking and other coals were shipped to Japan.

Oil production improved significantly, particular success was claimed at the Tach'ing field, near Anta, in Manchuria. Moreover, Tach'ing became a symbol of progress to be emulated in other industries; a large local refinery had been completed, but crude output exceeded capacity and the excess was being piped or shipped elsewhere for processing. China's supply of crude oil had improved so much through this and other developments that excess crude oil reportedly was offered for export to Japan. Meanwhile, although domestic manufacture of refinery and oilfield equipment was expanding, large orders for refining plant equipment were placed abroad, chiefly in West Germany and Italy. Improvement in supply of refined oil products was indicated by the drop in such imports from the Soviet Union and by one-fifth decrease in the price of domestic gasoline.

Increased Chinese steel production was related mainly to greater smelting efficiency and more rolling capacity. Introduction of fuel injection for blast furnaces resulted in lower coke ratios; equipment was being installed for vacuum casting of steel to improve ingot quality. Large contracts were negotiated for Austrian, West German, and Japanese steelmaking equipment. A number of projects were completed at Anshan, China's largest steel center, including rebuilding of 4 of its 10 blast furnaces. Wuhan, with two large blast furnaces, operated at full capacity of about 1.5 million ingot tons. Maanshan became better integrated,

with ingot and mill improvements, and China's first top-blown oxygen converter went into operation at Shihchingshan.

News on nonferrous metals was not very conclusive. Copper was imported in various forms, and, while much new copper ore was said to have been found, smelting facilities remained relatively poor. The Chinese reportedly were negotiating with the Japanese for new copper smelting facilities. They also were interested in assistance to expand aluminum production and to obtain titanium ingots and titanium manufacturing equipment. China remained acutely short of chromite and nickel but had surplus manganese and pushed antimony, gallium, and selenium sales on the world market.

Some improvements in the cement industry resulted in slightly higher output. Fertilizer facilities were expanded under a high priority program, and raw materials exploitation received emphasis. Both cement and fertilizer industries were characterized by a multitude of small local operations in addition to those at main centers. Byproduct oil shale was utilized as a raw material in one cement plant; use of pozzolanic materials and slags in concrete increased. Several large phosphate mines were under development in Hupeh and Kweichow Provinces; utilization of low-grade ores containing as little as 18 percent phosphorus pentoxide was deemed practical. It was a good year for evaporation of salt. A rich new asbestos deposit was being developed, and overtures were made for Canadian asbestos milling equipment.

A 12-percent increase in mine output value was claimed for North Korea's well diversified minerals industry, with a large increase in investment devoted to mine development. Official sources also claimed exceptional advances in electric power, coal, and iron ore developments. Tungsten, graphite, and magnesite output were of world prominence, and many other industry sectors including producers of fertilizer, chemicals, steel, and nonferrous metals contributed to the country's standing as a minerals producer. Production of coal, mainly anthracite, increased to approximately 19.2 million tons in 1965; output of iron ore rose almost one-fourth to about 5.9 million tons and production of steel was one-tenth higher. Musan, the large iron mine in the north, expanded production to about 2.4 million tons and increased its ore shipments to Japan. An Austrian-designed oxygen-converter steel plant with a planned capacity of 600-tons-per-year was scheduled for construction. This plant would add about one-third to total steel capacity. Nonferrous metal mines were opened and expanded; pyrite processing increased. In the energy sector, coal and hydroelectric power were emphasized over oil which was dependent on Soviet sources. Nevertheless, in this connection the country's first oil refinery which would operate on imported crude oil, was being seriously considered. Strip mining of coal expanded; ground support in the underground mines was a growing concern.

North Viet-Nam's mineral industry remained active with considerable assistance from its Communits partners. Despite the disruptions of war, anthracite and iron ore outputs appeared undiminished, and phosphate, cement, and nonferrous metal industries either improved or maintained their standings. Coal, salt, cement, chromite, and pig iron were exported; chromite went to mainland China. The Soviet Union supplied most of the refined oil products consumed. At the Thai Nguyen iron and steel complex, a third blast furnace neared completion and hydropower, iron ore sintering, coking, and byproduct facilities were being installed. A rolling mill was under construction with Communist Chinese help. In Quang Nai Province, a large iron deposit suitable for open pit mining was under investigation. Cement expansion was completed at Haiphong, and capacity for nitrogenous fertilizers was increased by a plant at Ha-Bao.

Superphosphates were produced from large resources of domestic apatite rock. Rumanian assistance was given to establishing a 500,000-ton-per-year apatite-processing plant at Laokai, in the northwest.

Mongolia produced fluorspar, its one mineral product of world consequence, at somewhat higher levels than in 1964. Locally, coal was important; output was greater in 1965, although it was far short of planned goals. A little oil was produced and refined at Dzuun Bayan. Construction

of steelmaking facilities progressed at the new Darkhan industrial complex, north of Ulan Bator, where power, coal, iron ore, and other industrial minerals were also under development. More East European and Soviet assistance was provided in mineral exploration, and perlite, rare metals, and gold were said to have been discovered.

The Mineral Industry of Burma

By J. M. West [1]

Burma has an agricultural economy, but has long been considered a potentially mineral rich region, with its oil, gas, lead, zinc, silver, tin, and tungsten resources in 1965 less than fully developed. Mineral output had fallen behind that of neighboring Thailand, whose production in 1964 was of about the same order of value. Production of crude oil, the major item, failed to keep pace and output declined in 1965, and petroleum refinery output, which was partly from imported crude oil, strained to supply domestic demand. At the same time, greater efforts went into increasing crude oil supplies by exploration and secondary recovery experiments. Cement and salt production continued at a steady level, but metallic output appeared to be declining.

In trade, payments for some imports were withheld, which led to temporary constraints by suppliers, even though the Government's Central Deposit financial reserves position appeared quite sound. Following completion of Japanese war reparations in April, Japan initiated a 12-year $140 million [2] economic assistance program. Mainland China assisted Burma with the construction of bridges over the Salween River at Ta-Kaw, at Kunhing, and at Kunlong. The U.S.S.R. offered assistance in mining, was interested in a dam to be built on the Baluchaung River, near Mobye, Kayah State, and helped with the construction of the Kyetmauktaung dam. This assistance moved the anticipated completion date to August 1966. Burma's gross national product was probably even lower in 1965 than the $1.63 billion reported in 1963–64, its mineral industry contributed an estimated 3 percent of the overall product. For this country of about 25 million people, only metallic lead and silver had international significance and the country's output of each of these was less than 1 percent of world demand.

Burma's Minister of Mines in 1965, Commander Thaung Tin, was connected with the military leadership, as were most other members of the Government. The Revolutionary Government, which came to power on March 2, 1962, was committed to socialism and nationalization and in 1965 took another step in that direction when General Ne Win, Chairman of the Union of Burma Revolutionary Council, Rangoon, signed into law on October 18 the 1965 Socialist Economic System Construction Rights Act. This reserved to the Government the right to set up any economic undertaking as a new nationalized enterprise, and to nationalize, take over temporarily, step in and supervise, and/or prescribe rules and regulations for all or part of an economic enterprise. A new Trade Council, which succeeded the People's Stores Corp. in October, exercised increasing control over domestic commerce and took actions to overcome the widespread illegal trading. Mineral products were included in an expanded list of controlled commodities; Burma's chronic problem of purchase and distribution of goods continued to hamper growth of the mineral industry. Moves toward greater centralization left a gap in supervision, and reliable trade and production data became scarce. The National Planning Ministry submitted a draft of a 5-year economic development plan for fiscal years 1965–66 to 1969–70 (Burma's fiscal year runs from October 1 to September 30), in which the emphasis on minerals was expected to be

[1] Far East specialist, Division of International Activities.

[2] Where necessary values have been converted from Kyats (K) to U.S. dollars at the rate of K4.73=US$1.00.

increased. Capital investment due for mining had been raised previously from $7.6 million in 1964–65 to $12.3 million in 1965–66.

PRODUCTION

The level of mineral production declined in 1965, with the industry's contribution to the economy probably $40 to $45 million, and with petroleum and gas accounting for one-half or more of this. About one-fourth of the total was from nonferrous metals and ores produced by the famous Bawdwin mines, now in Government hands, and Mergui-Tavoy area tin-tungsten properties. Metallic production showed little evidence of responding to higher world prices, because of domestic controls. Iron and steel was a single plant industry. Cement production continued at about capacity, and Japanese machinery arrived for an addition at the Thayetmyo cement plant to increase output to 1,000 tons daily. Burma's electric power generation was higher in 1965, reaching 33,158 million kilowatt hours in the first 10 months; in 1964 it totaled 37,730 million kilowatt hours. Industrial users consumed about one-fourth of the total. Installed capacity remained at 191,000 kilowatts.

Table 1.—Burma: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 [e]
Metals:					
Antimonial lead (18 to 20 percent antimony) [1]	413	459	578	[e] 500	560
Antimony ore (40 to 50 percent antimony)	151	68	NA	NA	50
Copper matte (40 percent copper) [1]	279	370	NA	[e] 300	340
Gold, refined—troy ounces	194	[e] 200	[e] 200	[e] 200	200
Iron and steel:					
Iron ore	[e] 15,000	9,162	NA	NA	5,000
Steel ingot [e]	11,000	13,000	15,000	15,000	15,000
Rolled steel [e]	8,000	10,000	12,000	12,000	12,000
Lead:					
Concentrate (50 to 60 percent lead) [1]	29,007	33,449	32,936	31,002	30,000
Refined metal (99.99 percent lead) [1]	15,763	17,385	17,738	18,053	16,000
Manganese ore	178	193	[e] 200	NA	600
Nickel speiss (20 to 22 percent nickel)	650	536	462	[e] 300	200
Silver, refined [1]—thousand troy ounces	1,325	1,498	1,511	[2] 1,867	1,120
Tin concentrate (68 to 72 percent tin)—long tons	1,030	909	795	830	880
Tin-tungsten concentrate (35 percent tin and 30 percent tungsten trioxide)—long tons	1,222	1,161	1,279	957	600
Tungsten concentrate (55 to 65 percent tungsten trioxide)	378	215	89	86	100
Zinc concentrate (54 to 56 percent zinc) [1]	13,122	15,119	15,224	14,666	13,600
Nonmetals: [3]					
Barite	2,039	4,048	NA	NA	3,000
Cement	39,570	53,282	124,130	[r] 129,541	120,000
Gypsum	853	2,084	NA	NA	1,000
Limestone	36,065	65,289	NA	NA	50,000
Marl	23,171	26,293	NA	NA	20,000
Salt	126,544	155,697	160,700	127,000	174,000
Mineral fuels:					
Coal	1,611	2,423	[e] 5,000	[e] 8,000	20,000
Natural gas—million cubic feet	333	440	NA	NA	500
Petroleum:					
Crude oil—thousand 42-gallon barrels	4,218	4,366	4,761	[r] 4,164	4,100
Refinery products: [4]					
Gasoline—do	1,312	1,292	1,238	1,216	1,300
Kerosine—do	718	702	854	923	1,050
Other—do	1,260	1,229	1,280	1,356	1,450
Total—do	3,290	3,223	3,372	3,495	3,800

[e] Estimate. [r] Revised. NA Not available.
[1] Output of Burma Corp. (1951), Ltd. as reported in 1961–63; figures tantamount to national production. Other companies sporadically produce small quantities of lead, zinc, and silver.
[2] Crude silver; compares with 2,076,000 ounces produced in 1963.
[3] Burma also produces a variety of semiprecious and precious stones, including amber, jade, ruby, sapphire, and spinel.
[4] For 1962 and 1963, residual fuel is apparently not included and "Other" is comprised mainly of distillate fuel.

TRADE

Publication of detailed trade data was at a standstill but it was known that most metallic ores and concentrates, except tin, continued to go to Japan and silver presumably to the United Kingdom. Japan imported 14,387 tons of zinc concentrate and 71 tons of tungsten ore and concentrate from Burma in 1965. Tin ore continued to go to Malayan smelters for refining. Mineral exports made up less than 5 percent of Burma's total shipments; the balance was chiefly rice. It was necessary to import crude oil to meet expanding refinery demand at Syriam, and paraffin wax remained an exported byproduct. U.S.S.R. was the principal source of such crude oil. Jade was handled by Myanma Export/Import Corp., a Government agency, and, along with other gems, about 70 tons of unpolished jade was being exported annually to Hong Kong. Fertilizers were imported, of which about 34,000 tons, mostly phosphatic, was consumed in the 1964–65 season. Imports of coal and coke in 1964 were valued at $3.1 million and cement at $700,000. Base metal manufacture imports, valued at $26.6 million in 1964, comprised nearly 10 percent of all imports and were second only to machinery and transport equipment, emphasizing the undeveloped state of such domestic industries. It was announced in October that People's Stores Corp. was dissolved, and activities were taken over by the new Trade Council, which proceeded to bring strict controls to sales of mineral products and industrial raw materials, as well as other goods.

COMMODITY REVIEW

METALS

Iron and Steel.—Burma's only steel mill, at Ywama, Insein, continued to use domestic scrap iron, but supplies were about depleted. Its 12-ton electric furnace was capable of producing 20,000 tons of steel ingot annually. Steel mill products in the 1963–64 fiscal year included:

Product	*Quantity (metric tons)*
Bars and rods	6,330
Sheets	6,400
Wire nails	1,320
Barbed wire	560

No progress was reported on iron ore developments following earlier West German surveys in the Pangpet area by Krupp Industries and Japanese studies of deposits in the Mergui, Toungoo, and Thaton areas of southern Burma.

Lead, Zinc, and Silver.—Burma Corp. Ltd., formerly British-owned in part, and nationalized in early 1965, was renamed People's Bawdwin Industry and continued to operate about as before. Compensation to be paid former stockholders was not immediately determined. Details on production were not available, since issuance of regular monthly company reports stopped in mid-1964, but output probably was maintained at about the same or at a slightly lower rate. A proposal to invest about $2 million in a mill to produce 40,000 tons or more of lead-zinc concentrates annually and to build a zinc smelter at Namtu was reported in a Burmese newspaper. Japan was again successful in bidding on zinc ore and concentrate exports and continued to take virtually all of the Bawdwin mine output. Smelted lead was exported as in the past. Depletion has made mining more difficult but large tonnages of low-grade ores remain.

Tin and Tungsten.—Ore buying centers were operated by the Government in the southern tin-tungsten producing area of Burma since mid-1964, but prices were too low to encourage mining, and several step increases appeared to have little inducement. The once large producer, Mawchi mines, in southern Shan States, continued operating; the Yawa tin lode mine and Tenasserim Mining Co. operations had been combined into the Kyaukmedaung Mine Project; and Anglo-Bruma Tin Co. Ltd., was now the Heinda Mine Project. Shipments took place from several ports; Tavoy exports alone were reported ni 1964 to include 195 long tons of tin concentrate, 32 long tons of tin blocks, and 621 tons of tungsten (probably tin and tungsten) concentrates.

MINERAL FUELS

Coal.—Limited work was done on developing the Kalewa coalfield, which sup-

plied coal for local use by a brick plant and railroad. At least seven workable seams are known in northern Burma. Coal and coke were imported at the rate of about 300,000 tons annually.

Petroleum.—Crude oil production continued to decline as outputs dropped at the Chauk and Lanywa oilfields, although intensified exploration was beginning to bring results. Three waterflood projects were in operation at Chauk, and projects for hydraulic fracturing and hot oil injection were planned at both the Chauk and Yenangyaung fields. The latter field reportedly produced at a rate of about 4,600 barrels per day in 1964, supplying 40 to 45 percent of Burma's output.

In addition to contract oil studies by foreign firms, several Burmese field groups were making geophysical surveys, and a total of five exploratory drill units, including two that were Rumanian-equipped, were active in the Myanaung, Prome, Chauk, and Yenangyat areas. A successful 8,500-foot hole was drilled at the northern edge of Yanangyaung's Pin Chaung field, adding to its extent. Pin Chaung has a number of free-flowing wells and during high water from monsoons its old and new sections become isolated. Myanaung reportedly had a 300-barrel-per-day exploratory hole. After oil was discovered in the Henzada district, road construction was started to the Irriwaddy River to move equipment and transport oil. Also promising was an oil discovery in the Kogwe Hills, near Inma, in the Prome district. Rumanian-assisted explorations at Chauk were said in early 1966 to have found additional oil at 6,000 feet, and natural gas was expected at deeper levels.

Burma's refining capacity was estimated at 21,900 barrels per day; 11,900 barrels were from the new section of the Syriam plant. Overall operations were considerably below capacity, but were considered adequate for the country's requirements. Crude oil from U.S.S.R. continued to go to the Syriam refinery in 1965. Construction of liquefied petroleum gas and lubricating oil plants was contemplated.

The Mineral Industry of Mainland China

By K. P. Wang [1]

Mainland China continued to be an important mineral producer by world standards, although not in terms of per capita output. Its estimated 1965 mineral output value (mine output plus added value derived from smelting and processing) of approximately $4 billion ranked the country just within the first 10 top mineral producing nations of the world. Although far behind that of Japan, mainland China's mineral output value exceeded that of the rest of the Far East countries put together. The mining component of the Chinese mineral industry remained much stronger than the metallurgical component. As in previous years, basic industries like coal, steel, cement, oil, and salt constituted the backbone of mineral enterprises. Many well-known export minerals and metals were also produced.

The country was one of the three foremost world producers of bituminous coal, anthracite coal, tin, tungsten, antimony, salt, and magnesite. It also ranked about fifth or better in the output of bismuth, manganese, mercury, molybdenite, asbestos, fluorspar, pyrite, talc, and graphite; about seventh in iron and steel; and about tenth in the major nonferrous metals, cement, barite, phosphate rock, and sulfur. Notable production deficiencies continued in chromite, nickel, copper, and phosphate rock. Mainland China imported sizeable tonnages of special finished steels and chemical fertilizers from Japan and Western Europe.

The most significant mineral developments again concerned petroleum. In 1965 the country had clearly become "mainly self-sufficient" in oil, with the Tach'ing field primarily responsible. A large refinery has also been built at the Tach'ing field. This, however, was not adequate for handling local crude; and the surplus was shipped to other areas in a special pipeline. Chinese offers to sell Tach'ing crude to Japan apparently were serious, although conceived as a temporary measure. Importance of Tach'ing is such that it probably furnished about one-third of mainland China's crude and one-fourth of the refined petroleum. Large increases in refinery production were reported for the Karamai refinery in Sinkiang; this is rather significant in the light of completion of the western railroad connecting Tihua (Urumchi), the provincial capital, with the North China coast. Additional, and more diversified, refining equipment was also installed at Lanchow in Kansu. Shanghai and other industrial centers manufactured many types of oil-drilling and refining equipment.

On May 14, mainland China exploded its second atomic bomb somewhere in the west, almost certainly in Sinkiang Province. It was more sophisticated than the first, and again uranium 235 apparently was used instead of plutonium. Although a plant in Lanchow was believed to have gaseous diffusion capability, most of the U–235 used may mave been made in Czechoslovakia from Chinese ores.

In iron and steel, the effort was to increase production through application of new techniques in existing facilities; to further diversify the variety of products made; to continue construction of partially completed steel centers; to employ more coal blending to conserve coking coal for blast furnace operations; to introduce oxygen converters to complement the open hearths; to relieve the shortage of special rolled products through production and imports; to negotiate purchase of some foreign steel equipment and plants; and to plan for expanded operations in the fu-

[1] Chief specialist, East Europe-Far East, Division of International Activities.

ture. A million-ton increase in steel output over that of 1964 may have been achieved. At yearend, a big steel deal was being negotiated to have an international consortium headed by West German firms (DEMAG Aktiengesellschaft and others) build a large integrated steel plant valued at possibly $150 million and presumably equipped with pelletizing plant, oxygen converters, hot and cold rolling mills, and tube and railing facilities.

The coal industry continued to make progress along conventional lines of development. The shaft sinking program was accelerated for both old and new mines. Mining productivity was raised through greater mechanization, but the best output per man-day was still below 2.5 metric tons of coal. Improvements were specifically mentioned for the Fushun, Fuhsin, Tatung, Huainan, Pingtingshan, Chinghsi, and Yangchuan mines, among others. Much stress was placed on blending weakly-caking coals with good coals for iron smelting. Despite slightly higher production, increased coal demand called for economies in coal consumption.

Continued great emphasis was given to fertilizers. A substantial increase in output was claimed, so that the 1965 figure was at least 5 million tons of chemical fertilizers; imports from Japan and western Europe were also much higher than in the previous year. Local phosphate rock was still inadequate, in view of the 603,571 metric tons exported by Morocco to mainland China during the 12 months of 1965. Cement output increased by perhaps 5 percent, with at least one large new plant in operation. At the foremost asbestos center— Shihmien in Szechuan— an expansion program was nearly completed and new ore reserves were found. A long-term contract was signed with the Japanese to supply them with large tonnages of fluorspar. Salt output reached the highest level in the last 5 years.

By yearend, mainland China was making preparations to start on its third 5-year plan covering 1966–70. This would mean a 3-year lapse since the end of the second 5-year plan. No announcement was made regarding the national targets for the coming years. However, specific industries were urged to devise plans for expanded production. Policies and programs, pursued in recent years in terms of consolidation and maximum utilization of available facilities, have brought about notable improvements in industrial growth and overall economy. In fact, the Chinese claim that industrial output rose by 15 percent in 1964 and that the target of another 11 percent in 1965 was overfulfilled.

Mainland Chinese economic planning still stressed agriculture, light industry, and heavy industry, in that order. However, heavy industry was gaining ground and more basic construction was underway. The Chinese realized that new facilities had to be created in order to make significant further advances in industrialization. In 1965, there was evidence that industries such as machinery and equipment, machine tools, power and electronics, nonferrous metals, and building materials were being built up in anticipation of greater effort in basic construction.

Minerals and certain heavy industries, such as coal mining, petroleum extraction, iron and steel, cement, and chemicals, have long been recognized by the regime as being indispensable to the country's economic development. Accordingly, continued stress was placed on optimum performance from facilities at hand. Production targets were raised only slightly. Rather, the policy was to improve product quality, diversify products, streamline operations, and conserve materials. Improvements were made at many mines and plants, and the more promising of the smaller mines and plants were slated for expansion. Construction of new projects was at a greater pace than last year. Special attention was given to the development of metal fabrication facilities.

Much effort went into assisting agriculture. Production of chemical fertilizers and their raw materials was greatly expanded; imports of fertilizers were doubled; and foreign help in building fertilizer plants was sought. Even steel production was partly geared to agricultural requirements, resulting in the manufacture of more agricultural tools and machinery. Pesticide output was increased by petroleum refineries and chemical processing plants.

Mainland China pursued an independent policy in mineral trade, doing less business with the U.S.S.R. than previously and trading more with other Communist countries as well as non-Communist countries. In carrying out a program of developing a strong self-reliant industrial

system, many mineral and industrial facilities of Chinese design and construction were placed in operation. Withdrawal of Soviet technical aid dictated this policy. To keep up with world developments, a special effort was also made in 1965 to procure additional advanced technical know-how through purchase of foreign plants and materials and permitting foreign technicians and advisers to come in.

The Chinese Communists continued to stress "specialization and cooperation in developing mass production." Numerous national technical conferences were held on specific subjects. The larger and more established industrial units helped the smaller and newer ones. Some factories and cities exchanged workers for the purpose of pushing adult education and improving industrial skills. There was close cooperation between universities and institutes and mines and industries. Such were some of the steps taken in preparation for an "industrial upsurge."

PRODUCTION

Mineral output value rose by possibly 5 percent over that of 1964. The 1965 level was more than in any of the preceding 5 years, except for the exaggerated figures claimed for 1960. The mineral industry, with a strong mining base and an improving metallurgical sector, operated substantially in a conventional manner, having done away with most of the haphazard operations.

Coal and iron and steel each accounted for more than one-third of the mineral output value; petroleum, nonferrous metals, and cement together made up for about one-fourth. Output of many individual metals and nonmetals represented significant shares of world totals.

The Chinese Communists have not reported any mineral output statistics for 5 years, having been traditionally secretive about their "colored" metals (nonferrous metals, etc.). Nevertheless, general trends are clear. Fertilizer, salt, and petroleum production made the most notable gains in 1964, followed by steel, cement, and coal. Nonferrous base metals remained somewhat stationary, whereas output of a few of the famous "export" metals may well have dropped.

It was claimed that the Ministries of Metallurgy, Coal, Power, Petroleum, and Chemical Industry met their 1965 targets in November, and that iron and steel, nonferrous metals, coal, petroleum, chemicals, fertilizers, cement, salt, and many others reportedly achieved remarkable increases in output.

Table 1.—Mainland China: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Bauxite [2]	400,000	400,000	400,000	400,000	400,000
Alumina	200,000	200,000	200,000	200,000	200,000
Metal, refined	100,000	100,000	100,000	100,000	100,000
Antimony, mine	15,000	15,000	15,000	15,000	15,000
Bismuth, mine	300	300	300	300	300
Copper:					
Mine	80,000	90,000	90,000	90,000	90,000
Metal, refined	100,000	100,000	100,000	100,000	100,000
Gold, troy ounces	60,000	60,000	60,000	60,000	60,000
Iron and steel:					
Iron ore [3], thousand tons	35,000	30,000	35,000	37,000	39,000
Pig iron, do	15,000	15,000	17,000	18,000	19,000
Steel ingot, do	9,500	10,000	12,000	14,000	15,000
Rolled steel, do	8,000	9,000	10,000	11,000	12,000
Lead:					
Mine	90,000	90,000	100,000	100,000	100,000
Metal, refined	85,000	85,000	90,000	100,000	100,000
Magnesium	1,000	1,000	1,000	1,000	1,000
Manganese ore, thousand tons	800	800	1,000	1,000	1,000
Mercury, 76-pound flasks	26,000	26,000	26,000	26,000	26,000
Molybdenum, mine	1,500	1,500	1,500	1,500	1,500
Silver, troy ounces	800,000	800,000	800,000	800,000	800,000
Tin, refined, long tons	30,000	28,000	28,000	25,000	25,000
Tungsten concentrate, about 68 percent WO_3	20,000	20,000	20,000	18,000	15,000
Zinc:					
Mine	100,000	100,000	100,000	100,000	100,000
Metal, refined	90,000	90,000	90,000	90,000	90,000
Nonmetals:					
Asbestos	90,000	90,000	100,000	120,000	130,000
Barite	80,000	80,000	80,000	100,000	100,000
Cement, thousand tons	8,000	8,000	10,000	10,500	11,000
Fluorspar	200,000	200,000	200,000	200,000	220,000
Graphite	40,000	40,000	40,000	40,000	40,000
Gypsum	400,000	400,000	500,000	600,000	600,000
Magnesite, thousand tons	700	800	900	1,000	1,000
Phosphate rock	500,000	600,000	700,000	800,000	900,000
Pyrite, thousand tons	1,000	1,100	1,200	1,300	1,500
Salt, do	11,000	10,000	10,500	r 10,000	13,000
Sulfur	250,000	250,000	250,000	250,000	250,000
Talc	150,000	150,000	150,000	150,000	150,000
Mineral fuels:					
Coal, thousand tons	250,000	250,000	270,000	290,000	300,000
Coke, do	15,000	15,000	15,000	15,000	16,000
Petroleum:					
Crude, do	6,200	6,800	7,500	8,500	10,000
Refinery products, do	5,500	6,500	7,000	8,000	9,000

r Revised.
1 Estimated.
2 Mostly diasporic bauxite. Data shown include only the bauxite for aluminum manufacture; in addition 100,000 to 200,000 tons were produced each year for making refractories.
3 Converted to equivalent 50 percent Fe ore.

TRADE

Overall trade volume of mainland China, never much of a trading country, showed a one-sixth increase in 1965 to possibly $3.8 billion. Minerals and metals remained significant in total trade, although occupying lesser positions than in 1963–64. Apparently, oil imports declined, imports of metal products increased, imports of chemical fertilizers rose sharply, exports of traditional surplus minerals and metals dropped somewhat, exports of cement may have declined slightly, and exports of asbestos and salt increased. There were no published trade figures from mainland China, and data from countries trading with China were used. Accordingly, official trade statistics from the U.S.S.R., Japan, and Poland have been presented to show trends. Political differences and completion of debt payment by mainland China brought about reduced Sino-Soviet mineral trade. Conversely, trade with Western Europe and Japan rose by more than 50 percent and trade with Eastern Europe also was higher. On April 29, a new Sino-Soviet trade agreement was

signed that might lead to an improved trade relationship.

Increased trade with the British was brought about mainly through Chinese purchases of $120 million worth of gold, $6 million worth of platinum, copper and copper alloys, steel products, and machinery and chemicals. Trade with the French declined momentarily, whereas trade with the West Germans and Italians soared. While continuing to export seamless steel pipes to China, West German firms were negotiating to furnish various metallurgical plants, a Lurgi oil plant, a naphtha cracking plant, and a glass plant, among others. An important deal involving the Italians was the sale and construction of a catalytic reforming oil refinery in Manchuria. A contract was signed with Swedish companies (Atlas-Copco AB, ASEA or Allmanna Svenska Elektriska AB, and AB Svenska Flaktfabrieken) to develop a copper mine and an iron mine in China. An Austrian firm agreed to provide oxygen converters. The British and Italians each have a contract to build a fertilizer plant. The Japanese were furnishing fertilizers, steel products, and steel fabrication and fertilizer manufacturing facilities to mainland China. Thus, Chinese imports of plants, equipment, and know-how in the mineral-related fields constituted an important part of the overall trade.

Table 2.—Mainland China: Exports of selected metals and minerals to the U.S.S.R.
(Metric tons unless otherwise specified)

Commodity	1962	1963	1964
Metals:			
Antimony		2,000	
Iron, pig	93,700	154,500	150,300
Lead concentrate	100	3,800	
Mercury 76-pound flasks	34,810	11,600	2,900
Tin long tons	8,600	4,200	1,082
Tungsten concentrate	13,000	12,000	6,000
Nonmetals:			
Borax	6,400	6,900	14,000
Cement	689,000	373,000	
Fluorspar	42,700	39,900	30,700
Salt	94,600	103,400	102,000
Sulfur	20,100	20,200	25,100
Talc	57,700	40,300	40,600
Mineral fuels:			
Bituminous coal	201,000	205,000	202,000

Source: Official trade returns of the U.S.S.R.

Table 3.—Mainland China: Imports of selected metals and minerals from the U.S.S.R.
(Metric tons)

Commodity	1962	1963	1964
Metals:			
Aluminum	1,375	1,500	
Cobalt		15	
Copper, rolled	245	142	62
Ferroalloys	2,000	1,000	600
Iron and steel semimanufactures	95,200	88,900	71,000
Nickel:			
Ingot	1,020	1,000	997
Rolled	57	141	96
Mineral fuels:			
Petroleum refinery products:			
Gasoline	764,700	455,400	269,900
Kerosine	488,300	476,000	139,100
Diesel fuel	378,400	333,200	79,500
Lubricants	210,200	134,700	15,200
Greases	3,200	3,300	1,000
Paraffin	2,500	2,400	100

Source: Official trade returns of the U.S.S.R.

Table 4.—Mainland China: Exports of selected metals and minerals to Japan
(Metric tons unless otherwise specified)

Commodity	1962	1963	1964
Metals:			
Antimony:			
Ore and concentrate	712	634	1,328
Sulfide	130	NA	NA
Iron and steel:			
Iron ore		22,848	51,497
Pig iron	19,678	80,271	997,492
Manganese ore	10,154	9,436	6,265
Silver, thousand troy ounces	318		
Tin, long tons	820	1,174	1,454
Tungsten concentrate	56	158	317
Nonmetals:			
Alumina shale	1,960	510	5,138
Asbestos		41	282
Barite	1,792	2,210	2,881
Feldspar	397	1,103	350
Fluorspar	26,518	51,415	69,048
Magnesia clinker	5,041	1,514	1,021
Quartz and quartzite	305	540	2,080
Salt	309,788	439,263	697,790
Steatite (soapstone)	5,000	4,944	7,898
Talc	2,126	3,335	9,341
Mineral fuels:			
Coal:			
Anthracite	16,505	26,337	71,772
Coking bituminous	157,875	67,426	156,480

NA Not available.

Source: Official trade returns of Japan.

Table 5.—Mainland China: Exports of selected metals and minerals to Poland
(Metric tons unless otherwise specified)

Commodity	1962	1963	1964
Metals:			
Antimony	1,000	NA	NA
Manganese ore			20,100
Mercury, 76-pound flasks	812	928	1,014
Molybdenum concentrate	241	238	319
Tin, long tons	226	199	198
Tungsten concentrate	3,400	2,402	1,350
Nonmetals:			
Asbestos	4,383	1,077	1,432
Barite	7,737	4,990	5,008
Fluorspar	14,300	11,200	15,200
Graphite	154	150	1,258
Magnesite	11,300	15,300	
Sulfur	20,000	22,000	19,000
Talc	700	1,242	1,080

NA Not available.

Source: Official trade returns of Poland.

COMMODITY REVIEW

METALS

Iron and Steel.—The Chinese Communists claim that 1965 output targets for iron ore, coking coal, pig iron, crude steel, and steel products were fiulfilled a month ahead of schedule.[2] Most likely, Chinese steel production increased to about 15 million tons.

Higher output was mainly achieved through improvements in furnace efficiency and operation of additional rolling mills at existing steel bases, rather than establishment of new steel bases. Smelting processes were intensified, with the introduction of fuel injection in blast furnaces (resulting in reduced coke ratios), greater use of oxygen and magnesia-alumina bricks in open-hearth furnaces, and placing into operation the first locally made top-blown oxygen converter.

The need for employing advanced know-

[2] Ta-kung-pao (Peiping). Dec. 23, 1965, p. 1.

how was shown by efforts to buy foreign equipment and plants. A contract was signed at yearend to obtain a few LD (Linz Donawitz) converters from Oesterreich-Alpine Montangesellschaft of Austria. Negotiations were underway to explore the possibility of purchasing equipment from West Germany. Contracts were concluded in the fall of 1965 to purchase a "medium, light shape mill" and wire-drawing plant from the Kobe Steel Co. Ltd. of Japan, possibly for $8.33 million.[3] Electric furnaces were being bought from the Daido Steel Manufacturing Co. and other Japanese firms.

The Chinese Communists also claim successful trial production of more than 500 new types of steel and rolled steel including many stainless and other alloy steels. Among the new steel products are high pressure nonrust plates for boilers and fertilizer plants, thick cold-rolled steel, durable shaft steel for cars, channel beams for tractors, alloy steel plates for oil cracking, steel tubing for deep oil drilling, and spiral-shape coolers for petroleum refining.[4]

Despite many new products, the need for imports remained serious. Small quantities of pig iron have long been traded with the Soviet Union for finished steel. Western Europe supplied sizable quantities of special steels. Steel imports from Japan, already large, were increasing. The Chinese may import as much as half a million tons of steel products from Japan in 1966. During the Kwangchow Fair alone, held in China late in 1965, the Japanese received bookings (for delivery in April 1966 to March 1967) for 330,000 tons of ordinary steels and 27,500 tons of special steels, about twice the previous annual shipments to China. Exports of pig iron to Japan were down perhaps two-fifths from the previous high of about 1 million metric tons in 1964. Not much Hainan or other Chinese iron ore went to Japan, and coal shipments were only somewhat more than a half million tons.

Anshan, the country's great steel center which may have produced as much as 6 million tons of steel ingot and roughly 170 types of new steel products, overfulfilled its 1965 targets 25 days ahead of schedule while completing a number of basic engineering projects. The Chinese Communists claim that the following projects were brought into operation: A primary crushing plant at the Yench'ien'shan iron mine; replacement of spiral classifiers with hydrotators at various iron ore washing plants resulting in a 9-percent increase in iron recovery to 83 percent; screening and sizing units at the East Anshan sintering plant; an acid-alkaline pickling unit to complement an existing rolling mill; and a large size oxygen plant to provide oxygen for open-hearth furnace operations.[5]

Four of the 10 blast furnaces at Anshan (Nos. 4, 7, 9, and 10) were reconstructed.[6] High-temperature corrosion-resistant "carbon bricks" were substituted for refractory bricks in furnace bottoms. New cooling systems were built around the furnaces. The latest kind of automatic viewers were installed at the base of furnaces to keep continual surveillance of corrosion by molten iron. These innovations resulted in prolonging furnace life between repairs by one-fourth. At the No. 9 furnace, the hot-draft temperature was raised from 1,100° to 1,230° C, coke consumption per metric ton of pig was reduced by about 40 kilograms, and output was raised by 8 percent. Operation of the No. 10 furnace (1,513 cubic meters and Anshan's largest) was improved, bringing pig iron output up to 2,600 tons daily.

The Wuhan steel center, with two large blast furnaces (1,386 and 1,436 cubic meters), five open-hearth furnaces (one 250-ton and four 500-ton), a sintering plant, three byproduct coke plants, a large blooming mill, and various finished steel rolling mills, was operating at full capacity with the equipment available, producing just over 1.5 million tons of steel ingot.

The Paotou steel center had integrated operations oriented around a 1,513-cubic-meter blast furnace, possibly two 600-ton open-hearth furnaces, a large ore concentrator, a byproduct coke plant, and necessary rolling facilities. Steel ingot output probably is on the order of 0.8 million tons. Much work was done on coal blending, with more than half of coal needs satisfied by local weakly caking or non-

[3] Japan Metal Bulletin, (Sangyo Press Ltd.; Tokyo). Aug. 31, 1965, p. 1.
[4] Jen-min Jih-pao (People's daily; Pieping). Dec. 23, 1965, p. 1.
[5] Ta-kung-pao (Pieping). Oct. 26, 1965, p. 1.
[6] Jen-min Jih-pao (People's Daily; Pieping). Sept. 1, 1965, p. 2.

caking coals which greatly reduced the amount of coking coal brought from Hopeh and Shansi.

The Shanghai steel industry increased output somewhat over that of 1964, in line with greater local industrial activity. Steel ingot production was probably 1.5 to 2 million tons. The Shanghai No. 1 and Shanghai No. 3 plants were specifically cited as having improved operations to reach the national advanced level.

The Maanshan steel plant became truly integrated, with a build-up of steel ingot and products capacities since early 1964 to match the pig iron capacity. Maanshan has more than a dozen small blast furnaces of 100 to 250 cubic meters, five converter shops and two open-hearth shops, and presumably two rolling mills. All told, Maanshan is potentially capable of producing more than 1 million tons of steel products annually. This steel center was singled out as having made basic improvements in 1965 that resulted in large increases of output.[7]

The Shihchingshan-Tangshan-Tientsin-Peiping complex, with an annual capacity of more than 1.5 million tons of steel, had a good year. Shihchingshan's pig iron output still came from three blast furnaces (largest is 1,000 cubic meters), but steel output increased as a result of China's first top-blown oxygen converter being placed in operation.[8]

The Taiyuan steel works, located in a new industrial center, was fully integrated and capable of producing more than two-thirds of a million tons of steel yearly. Five blast furnaces were in existence, the largest being 963 cubic meters (also 291 and 146 cubic-meter ones); three 30 to 50 ton open-hearth furnaces plus electric furnaces and converters, and corresponding rolling facilities. A coke byproduct fertilizer plant went through its first full year of operation.

The Chungking steelworks, with a 620-cubic-meter blast furnace (also 134 and 55-cubic-meter ones), four open-hearth furnaces (two 50-ton and two 20-ton), byproduct coke ovens, converters, and rolling mills, is a little smaller than the Taiyuan steelworks. Chungking was thoroughly inspected late in 1965, resulting in technical improvements such as less downtime in open-hearth operations, reduction of raw material consumption, and better heat and energy balances. More than 40 new products were made, and a large size coal grader-mixer was installed. As at most other steelworks, coal blending resulted in greater use of local coals and less consumption of high grade coking coals obtained from elsewhere.

At the Penshi (Penhsihu or Pench'i) steelworks in Manchuria, better known for blast furnaces and byproduct coke ovens, steel producing facilities have been gradually built up in recent years. This center is about the size of Taiyuan and Chungking for pig iron but considerably smaller in terms of steel.

Other Metals.—The Chinese Communists have hardly mentioned their "colored" metals industries in recent years. However, fragmentary information on trade and developments indicated nonferrous base metals had a reasonably good year, whereas the so-called "export metals" apparently did not fare too well. It was claimed that "colored" metals in general achieved significant increases in output and that many mining and metallurgical projects in manganese, magnesite, copper, lead, zinc, aluminum, and tin were under construction.

Manganese ore output, ranking fifth in the world, was more than adequate to meet the demands of the steel industry. Hsiangt'an in Hunan, Mukwei and Leip'ing in Kwangsi, Ch'in Hsien and Fangch'eng in Kwangtung, Tsunyi in Kweichow, and Wafangtzu in Manchuria were among the principal producers. There was a small surplus for export. In 1964, Poland imported 20,100 tons of Chinese manganese ore, Japan 6,265 tons, and West Germany 3,222 tons. Chromite was in short supply, with Albania furnishing 66,000 tons in 1963. Magnesia-alumina brick was widely substituted for refractory chromite. The nickel shortage was also severe, with imports probably coming from the Soviet Union, Cuba, and France (originating in New Caledonia). A contract to purchase 9,300 tons of nickel from Société Le Nickel over a 4-year period was being negotiated in April 1965. The Chinese steel industry consumed only a minor part of large quantities of tungsten and molybdenum produced in the country.

With regard to nonferrous base metals

[7] Ta-kung-pao (Peiping). Dec. 3, 1965, p. 2.
[8] China Reconstructs (Peiping). Sept. 1965, p. 19.

and light metals, copper and aluminum were the items of short supply. A Chinese nonferrous delegation visiting Japan made some interesting observations on their country's copper situation.[9] Copper was being imported; recent imports included 7,500 tons of wires and bars from Chile. Much new ore has been delineated, and copper reserves are believed to be larger than those of Chile. Poor smelting facilities held back mine production. Accordingly, the Chinese delegation was negotiating the purchase of copper smelters from the Japanese. Nonferrous scrap drives have been conducted in China.

According to the Japanese, mainland China was importing about 1,000 tons of aluminum ingot per month, mainly from Canada, Norway, and France.[10] The shortage was not great, however, since aluminum output, primarily from the Fushun plant in Manchuria, was nearly ten times that of imports. The Chinese Communists continued to show interest in getting European and Japanese help in expanding aluminum facilities. Late in the year, they were also interested in acquiring titanium ingots or titanium manufacturing equipment from the Japanese. China had recently been importing about 5,000 tons of rutile annually from Australia. Lead-zinc production apparently was at stabilized levels, and there was little trade.

Little information was available in 1965 on mainland China's famous "export metals"—tin, tungsten, antimony, mercury, molybdenum, and bismuth. However, China ranked fourth or higher among world countries in the production of all these metals. Compared with 1963 and earlier, lesser quantities entered world trade, implying that output may have declined or stocks increased. Tin output possibly held its own, whereas accountable exports declined considerably. Some electrolytic tin of 99.95 percent was offered for sale. Tungsten production probably dropped to the lowest level in a decade; exports were hard to push despite rising prices towards yearend. More Chinese antimony regulus was offered in the world markets during 1965, although there were few takers. Kwangsi became a significant new source of antimoy ore. Mercury production remained at high levels, but exports declined despite the very high quality product offered for sale. There was no news on bismuth. During 1964, Poland and Japan each imported 300 to 400 tons of Chinese molybdenum concentrates and the Soviet Union, unreported additional quantities. Generally speaking, the country was not able to increase export of minerals because potential buyers questioned its capability to maintain steady supplies.

The second atomic blast on May 14 and another one forecasted for 1966 raised the question of Chinese capabilities and resources of radioactive materials. One possible answer to the puzzle was given by a technician who escaped the country late in the year.[11] Three mines were reported to have started production: Maoshan and Chushan in Chuannan County of Kiangsi Province, and Hsiachuang in Weiyuan County of Kwangtung Province. Their combined daily output was said to be 2,500 tons of uranium ore. This was partly processed at the Chuchou plant in Hunan Province and from there sent to Czechoslovakia for further treatment. Mainland China paid no cash but gave the Czechs half of the processed uranium. This might explain why the country has been able to produce uranium 235 cheaply rather than overburden the Lanchow gaseous diffusion plant in Kansu Province.

Mainland China has been producing various kinds of rare earth metals and alloys for use in the optical, metallurgical, and atomic energy industries. Probably the most important producing center was Chinchow in Liaoning Province, Manchuria. The China National Metals and Minerals Import and Export Corporation was offering gallium and selenium of 99.99 percent purity for export.

NONMETALS

Asbestos.—Asbestos production probably increased slightly as compared with the previous year. Most of the 10 new projects at Shihmien, Szechuan—the country's main asbestos center—were presumably completed. A new large and rich deposit was reportedly discovered a few years ago, and the Chinese Communists were intent on developing it. When some Canadian asbestos experts were in Szechuan, the

[9] Japan Metal Bulletin (Sangyo Press Ltd.; Tokyo). Aug. 10, 1965, p. 2.
[10] Japan Metal Bulletin (Sangyo Press Ltd.; Tokyo). July 31, 1965, p. 3.
[11] Far Eastern Economic Review (Hong Kong). Dec. 9, 1965, p. 476.

Chinese were interested in buying beneficiation equipment from them. Shihmien asbestos is good grade, and some was sold in foreign markets. For example, Poland and Japan imported 1,432 and 282 metric tons respectively in 1964. Most of the roughly 130,000 tons of asbestos produced in 1965, however, was consumed domestically.

Cement.—Significant progress was claimed for the cement industry. It appears that output had risen slightly, and product quality and variety improved considerably. The 11-million-ton cement production estimated for 1965 was still several million tons less than the high claimed for 1960. Small plants contributed 15 to 20 percent of the total output. Internal demand for cement increased somewhat, whereas exports apparently declined. Through 1964, the country had been exporting about 1 million tons annually, with Hong Kong the leading purchaser and the Soviet Far East an important second. In 1965, however, Hong Kong imported about 715,000 tons during the year from mainland China, and the U.S.S.R. may have stopped imports altogether.

Nearly half of the approximately 50 large and medium cement plants (100,000-ton to 1-million-ton annual capacity) were mentioned in the Chinese press during 1963–65, and it was claimed that more than 10 modern plants (200,000 to 700,000 tons) and some 80 small plants (less than 100,000-ton size) had been built in the last few years. Some of the larger newly built plants are: Tatung in Shansi, Kunming in Yunnan, Yao Hsien in Shensi, Yungteng in Kansu, Chungking in Szechuan, Kwangchow in Kwangtung, Liuchow in Kwangsi, Kweiyang in Kweichow, and Mutanchiang in Kirin.

Development and expansion of mines and quarries for cement production continued. Sufficient limestone reserves had been developed at the K'ungshan quarry near Nanking to meet the needs of the Chungkuo and Kiangnan cement plants in Kiangsu for 50 years. The Huangchinshan limestone quarry in Hupeh developed for the Huasin cement plant was brought into full-scale production around August; it was said to be highly mechanized and equipped with electric shovels.[12] The Fushun cement plant in Manchuria continued to use byproduct oil shale as a raw material. Increasing quantities of clinker and slag were being used in concrete mixing. Gypsum has never been a problem; indigenous mines provided about 400,000 tons of gypsum consumed in cement manufacture in 1965.

Fertilizer and Chemical Materials.—To cope with the food problem for a growing population, continued emphasis was placed on developing fertilizers and chemical raw materials. Extraction of pyrite and phosphates were given high priority. The apparent substantial increase in overall fertilizer output indicates that pyrite production topped 1.5 million tons. The only two known large pyrite mines in operation were Hsiangshan (near Maanshan) in Anhwei Province and Yingte in Kwangtung Province, which together probably provided half of the national output. Many small pyrite mines were being worked, and one additional large, high-grade deposit was under development. A large quantity of pyrite mined in Szechuan and Shansi Provinces was converted to elemental sulfur. Byproduct sulfur from nonferrous ores was utilized to some extent to supplement pyrite in sulfuric acid manufacture.

Phosphate rock production presumably increased somewhat over that of 1964. The principal mine was Chinghsiang in Hupeh Province; a second important deposit—K'aiyang in Kweichow Province—was under development. Low-grade phosphate ores from Liuyang in Hunan and Nantung in Kiangsu were successfully converted into chemical fertilizers containing 18 percent or more P_2O_5 at local plants.[13] There were many other small producers in Southwest China. However, indigenous output met only about half the demand. Phosphate rock imports from Morocco alone were 778,406 tons in 1964 compared with 603,571 tons in 1965 (Moroccan figures). Some apatite also came from Laokay, North Viet-Nam.

Chemical fertilizer production in mainland China during the first 11 months of 1965 reportedly topped that for all of 1964 by 2.79 million tons.[14] This would imply that the country produced at least 5 million tons of all chemical fertilizers,

[12] Kung-jen Jih-pao (Workers Daily; Peiping). Sept. 1, 1965, p. 3.
[13] Ta-kung-poa (Peiping). Nov. 2, 1965, p. 1.
[14] Ta-kung-pao (Peiping). Dec. 12, 1965, p. 1.

perhaps a little less than half phosphatic and most of the rest nitrogenous. There were about 11 sizeable phosphate plants, headed by Nanking with possibly ½-million-ton annual capacity and including a new plant—Chuchow in Hunan. Nanking, Dairen, Lanchow, Kaifeng, and Wuching (in Shanghai) were among the larger nitrogenous fertilizer plants. Many dozens of small fertilizer plants were also in existence.

The nation can consume far more chemical fertilizers than those produced in that country. Even the Chinese themselves talk about the need for 15 to 20 million tons of phosphatic fertilizers, not to mention other fertilizers. Imports were increased to relieve the shortage—about 1.2 million tons in 1964 and 2.5 million tons in 1965 (two-fifths from Japan and the rest from Western Europe). Imports from Japan are expected to be 50 percent greater in 1966 as compared with those of 1965. A number of European-built fertilizer plants have been contracted for delivery in 1965–66, including a large plant from Humphreys and Glasgow Ltd., of the United Kingdom for Luchow (southwest of Chungking) and another one from the Italian firm, Montecatini, Soc. Generale per l'Industria Mineraria e Chimica.

With pyrite as the main sulfur-bearing raw material used in making sulfuric acid and fertilizer, it was possible to save the elemental sulfur extracted for other vital uses and for export. During 1965, about half of the roughly 250,000 tons of sulfur produced came from pyrite and the other half was derived from 20-percent sulfur ores. In 1964, the Soviet Union imported 25,000 tons of sulfur from China and Poland and Japan 19,000 and 10,500 tons, respectively.

With regard to potassic fertilizer raw material, the progress in exploiting a multibillion-ton carnallite deposit at Charkhan Lake in Tsaidam Basin, Tsinghai, is not known, although extraction was started many years ago.

Fluorspar. — Chinese fluorspar production, which ranks high by world standards, apparently increased somewhat as compared with that of the last few years. Output from Chekiang and North China remained steady, but Kwangsi Province has become a significant new source. Slightly more than half of the fluorspar was exported. During 1964, importing countries gave the following figures, in metric tons: Japan 69,048, U.S.S.R. 30,700, Poland 15,200, and West Germany 3,218. In mid-1965, the Kamisho Company of Tokyo, which specializes in fluorspar, concluded on behalf of the Japanese consumers a long-term contract with the Chinese, whereby China is to supply all that Kamisho needs for an indefinite period beginning in April 1966. Domestically, fluorspar was consumed in the manufacture of steel, aluminum, and ceramics, and in atomic energy.

Magnesite.—Southern Manchurian magnesite found in a belt extending from Tashihch'iao northeast to Lienshankuan continued to be of great world significance. Output of perhaps 1 million tons was on a par with the previous year and the probable peak in 1960. The Anshan Steelworks pioneered the use of magnesia-alumina refractory bricks for iron and steel smelting in China, and the practice has been extended to most other large steel centers. Despite growing domestic demand, small quantities of magnesite and magnesia have been traditionally available for export.

Salt.—Mainland China retained its position as the world's second largest producer of salt, after the United States. The national target was achieved 20 days ahead of schedule and output, substantially more than in 1964, was claimed to be the highest in the last 5 years.[15] Although most salt was consumed for food purposes, industrial demand was rising and it was necessary to stress quality along with increased output. Byproduct recovery made significant headway, in terms of the production of potassium chloride, bromine, boric acid, iodine, and barium chloride, etc.

Operating conditions were particularly good for the four main producing provinces—Kiangsu, Shantung, Hopeh, and Liaoning—which furnished nearly three-fourths of the national output. Last year was an unproductive year for these provinces because of excessive rainfall. In contrast, most salt fields surpassed their production quotas in 1965, including all the fields in Kiangsu, the Chinchow field and the P'itzuwo chemical plant in Liaon-

[15] Jen-min Jih-pao (People's Daily; Peiping). Dec. 25, 1965, p. 1.

ing, the Yangk'o, Shoukuang, and Ts'ai-yangtzu fields in Shantung, and the Hanku, Nanp'u, and Tawop'eng fields in Hopeh.[16]

Many technical changes were made during the year to improve operations, both in the coastal salt fields and in the salt wells and rock salt mines in Southwest China. More dredges, trawlers, cable traction devices, tractors, small cars, and scrapers were used. Strong dikes were built in some salt fields in Liaoning Province where a supply of rocks was easily available. At the Tzuliuching salt wells near the gasfields of Szechuan Province, operations were improved by lengthening the pipe sections, decreasing the pipe diameter, recycling more of the mother liquor, and cutting down on natural gas consumption. In the rock salt mines of Kunming, Yunnan Province, the double-pipe-water-solution method (solution mining) was introduced in place of solid rock mining with great savings in cost.[17]

Increased production of salt stimulated slightly higher exports than in 1964. In 1965, mainland China exported roughly 1 million tons of salt, mainly to Japan. In 1964, Japan imported 697,790 tons of Chinese salt and the Soviet Union 102,000 tons.

Other Nonmetals. — Barite production was maintained at a significant level—about 3 percent of the world total. Despite meeting the growing needs of oil drilling, roughly one-tenth of the barite was exported. Approximately two-fifths of the high-grade steatite talc from Taling, Liaoning, was exported, mainly to the U.S.S.R. and Japan. A surplus of borax continued, although no information was available on the very large boron-bearing lake deposits in the Iksaydam area of Tsaidam, Tsinghai. Erection of a number of new glass plants called for new supplies of high-grade silica. Polished marble slabs became established as a new nonmetal export product.

MINERAL FUELS

Coal.—The Chinese Communists claim that their 1965 coal production target was fulfilled during the first 10 days of December. "Based upon data on the 71 large coal mining enterprises directly under the Ministry of Coal Industry . . . average productivity increased by 14 percent over the previous year, ash content of coals went down significantly, and timber consumption per 10,000 metric tons of coal output decreased by more than 30 cubic meters." [18] By shortening construction time, about 16 "pairs of new coal shafts" were scheduled to be brought into production in 1965;[19] this would mean roughly 10 million tons of additional annual capacity. This information indicates improved performance and slightly higher production.

Of the approximately 300 million tons of coal estimated to have been produced by mainland China in 1965, the bulk was bituminus coal with only about 20 million tons of anthracite. Hydraulic mining may have contributed 20 million to 25 million tons of output. The big seven coal mining centers (Fushun, Fuhsin, Kailan, Huainan, Chihsi, Hokang, and Tatung, roughly in descending order) each produced 10 million to 20 million tons and together some 100 million tons. More than a dozen mines were in the 2- to 9-million-ton range, and many others were in the 1- to 2-million-ton range. The rest of the country's coal output came from numerous small mines with annual capacities from 100,000 to 1 million tons.

The Chinese press gave some general indiction of the production status for certain coal producing areas. Eight large mines of Liaoning Province (includes Fushun and Fuhsin) reportedly achieved their combined 1965 targets 28 days ahead of schedule. The Tatung coal mines in Shansi Province presumably met their quota 25 days ahead of schedule. The Huainan coal mines in Anhwei Province underwent modernization, particularly the Hsieh-chia-chi mine, leading to greater productivity. During the first 11 months of 1965, output of the Pingtingshan mines (supplier of coking coal to the Wuhan Steelworks) in Honan Province was 69 percent higher than during the corresponding period of 1964. The Yangchuan mines in Shansi also topped its 1965 target in early December. Pingtingshan and Yangchuan are 5 to 9 million-ton mines. Many small mines in Szechuan Province were streamlined to raise combined capacity by about 3 million

[16] Jen-min Jih-pao (People's Daily; Peiping). June 15, 1965, p. 1.
[17] Ta-kung-pao (Peiping). June 25, 1965, p. 2; Dec. 11, 1965, p. 1.
[18] Ta-kung-pao (Peiping). Dec. 23, 1965, p. 1.
[19] Jen-min Jih-pao (People's Daily; Peiping). June 16, 1965, p. 1.

tons or about half of existing annual capacity.

Various specific developments were reported. The Fushun mines underwent substantial mechanization in the underground part of its operations, with the installation of centrally controlled belt conveyors and a hydraulic transport system to bring coal up from a 600-meter depth. The Ch'inghomen vertical shafts of the Fuhsin mines, rated at 600,000 tons of coal yearly, were brought into production. The Meiyukou pit of the Tatung mines was further mechanized, with "cutter loader" breaking and loading the coal on to conveyor belts. The 900,000-ton Shuiku coking coal mine of Fenhsiao in Shansi, the 600,000-ton Wanhouyao mine in Huaipei area of Anhwei, and the ½-million-ton plus Hungyuan mine in Szechuan were placed in operation near yearend. The 450,000-ton Peit'outsui vertical shafts of the Yangchuan mines became operative, along with similar capacity vertical shafts at the Tunghua mines, Kirin. The Shihch'echieh mines of Shansi, in attaining a per capita daily output of 2.456 metric tons, was said to have achieved the highest productivity in the country. The Chinshi mines, China's most famous anthracite producer, set a national record of 351 meters per month in tunnelling, and its drilling crews were sent to many other mines for demonstrations. The Shuangyashan mines in Heilungkiang Province have been using concrete supports to a great extent. The Chiaotso anthracite mine in Honan was finally dewatered.

Much was accomplished in improving coal quality and extraction indices. Large coal beneficiation capacities have been developed in recent years and most coal bases, particularly the new shafts and pits, have such facilities. There was considerable emphasis on washing and blending of coking coals to meet the needs of the steel industry; local weakly and noncaking coals near the steel centers were used as much as possible. A great drive was in progress to conserve quality coal for the most appropriate uses and to achieve economies in the consumption of coal. These efforts resulted in improved efficiency rather than overall shortage. The domestic supply of coking coal remained adequate, but in addition the Chinese have been shipping increasing quantities of coking coal and anthracite to Japan. In the first 10 months of 1965, the Japanese received about 450,000 tons of Chinese coal from mines like Chunghsing and Fengfeng. Production figures indicated that the country's coal exports were still negligible.

Petroleum.—The Chinese Communists claimed that mainland China's 1965 crude oil target was achieved 47 days ahead of schedule and that goals for production of kerosine, gasoline, diesel fuel, and lubricants were fulfilled by November 4.[20] A conservative estimate of crude oil output for 1965 would be 10 million tons, possibly 1 million tons more than refinery output.

Additional production altered the overall supply position, as the country truly became virtually self-sufficient in oil. Imports, primarily consisting of refined products from the Soviet Union, were much smaller than a few years ago; the amount brought in from the U.S.S.R. dropped to nominal levels as compared with 504,900 tons in 1964. Rumania and Albania apparently no longer furnishing China with much oil. However, Chinese offers to sell crude oil to Japan appeared to materialize, and there was talk about extending a pipeline from Manchuria to North Korea. More oil was distributed to the civilian economy, and the price of gasoline was cut 18.6 percent.[21]

The main factor which improved the oil supply was the continuing success of the Tach'ing field around Saert'u just northwest of Anta, which in turn is north of the Harbin-Tsitsihar railroad in Manchuria. Much specific information was reported on this field, and Tach'ing was often mentioned in the press as the example to emulate by other industries. Discovered in 1959, Tach'ing started large-scale production in 1963 and steadily expanded output of crude oil to probably more than 3.5 million tons annually. A large oil refinery has been built locally,[22] but its capacity was not large enough to handle crude output. Surplus crude oil was being shipped out in a special pipeline, heated to prevent the high-paraffin crude from solidifying. The Chinchou subfield is said to be in the same district.

Many articles described the technical

[20] Ta-kung-pao (Peiping). Dec. 23, 1965, p. 1.
[21] Petroleum Press Service (London). V. 32, No. 4, Apr. 1965, p. 155.
[22] Ta-kunk-pao (Peiping). Jan. 1, 1966, p. 3.

achievements of Tach'ing.[23] Drilling techniques have attained efficient levels, with good straight holes drilled in record speed, very high recovery of cores, and successful wells to a depth of more than 4,500 meters. Steel casings for deep holes are being partly made by Chinese plants. After 1.7 million analyses and "20,000 kilometers of curves on graphs," the early simultaneous (multiformation) water injection method was adopted, which reportedly had paid off in steady and very high-level production since the beginning of operations. A new and smaller "Christmas tree" assembly was introduced to solve the valve problem. Three separate oil refining units were installed. Tach'ing with about 40,000 workers had become the training base for supply technicians to other fields.

The Karamai complex (oilfield and refinery at Karamai and another refinery at Tushantzu) may have reached a stabilized annual production level of 1.5 million to 2 million tons. More than a dozen projects were completed, including the new Karamai refinery,[24] which was undoubtedly responsible for large increases claimed in the production of petroleum products.

The Yumen oilfield has long been stabilized at the 1.5-million- to 2-million-ton annual level. Surplus crude went to the Lanchow refinery in the same province. Six new installations were placed in operation in 1965, mainly to improve quality and diversification of products; among these installations was one to upgrade lubricants and another to convert or liquefy waste refinery gases into gasoline.[25] Most equipment was made in the machinery plant attached to the Lanchow refinery. Lanchow has produced increasing quantities of ammonium fertilizers (mainly urea).

The Shanghai refinery's thermal cracking plant was producing at higher rates after having been enlarged. Shanghai has become an important center for producing oil-refining and drilling equipment. The Szechuan gasfields and the smaller oilfields were presumably operating at the previous year's levels, with better distribution of products. There was hardly any news of Tsaidam, which was considered a major field a few years ago.

The Fushun shale oil center in Manchuria, with 7,000 workers, produced about 2 million tons of refined oil—roughly the same amount as in 1964. Modernization of the No. 1 Refinery resulted in much more efficient operations. There was no news on the Maoming shale oil center in Kwangtung, reportedly completed a few years ago and probably rated at more than 1 million-ton annual capacity.

Much drilling equipment as well as many rail, truck, and river and coastal tankers were produced, but more significant was the large amount and variety of refinery equipment made. Mainland China was able to make most of the simpler types of equipment needed in the oil industry. But need for imported refinery equipment persisted. The West German firm, Lurgi Gesellschaft, was supposed to have delivered a $12.5 million oil-cracking and olefin separation plant. Orders were also placed with the Italian firm, Sham-Projetti (subsidiary of ENI or Ente Nazionale Idrocarburi), for a $9 million refinery to be installed in 1966; a report late in 1965 states that the equipment had arrived and Italian experts were supervising construction of this 100,000-ton catalytic reforming plant somewhere in Manchuria.[26]

[23] Ta-kunk-pao (Peiping). Jan. 10, 1966, p. 1.
[24] China Reconstructs (Peiping). January 1966, pp. 26–30.
[25] Jen-min Jih-pao (People's Daily; Peiping). Dec. 31, 1965, p. 3.
[26] Far Eastern Economic Review (Hong Kong). Nov. 4, 1965, pp. 192–193.

The Mineral Industry of Indonesia

By J. M. West [1]

Crude petroleum, providing four-fifths of Indonesia's mineral income and accounting for about 2 percent of the world production, was a relatively strong factor in the nation's precarious economy in 1965. Production rose during the year and several significant discoveries were made as explorations continued. While P. T. Stanvac Indonesia and Caltex Pacific Oil Co., the two U.S. oil companies with major operations, remained in business, the facilities and property of the British/Dutch-owned P. T. Shell Indonesia were sold to the Government at yearend. Output of tin, also an important foreign exchange earner, declined in tonnage and accounted for approximately 7 percent of the world total in 1965, placing Indonesia behind Thailand and down to sixth in world rank. Muntok's new tin smelter was still idle in December, although test runs had been made a year earlier, and concentrates continued to be sent to the Netherlands for smelting. Besides oil, bauxite and nickel ore appeared to be he only minerals to gain in output, bolstered largely by Japanese demand. Total value of mineral production was somewhat less than that of 1964. Indonesian copper potential was of increasing interest.

Indonesia terminated membership in the United Nations on January 20 and in the Economic Commission for Asia and the Far East (ECAFE) on March 31. Money exchange became more complicated, and following an attempted coup at the end of September, living costs rose steeply. On December 9 the open exchange rate was US$1.00 equals 30,000 rupiahs, and the tourist rate was pegged at US$1.00 equals 5,250 rupiahs. Currency revaluation in December resulted in exchange of 1 new rupiah for each 1,000 old ones at a 10-percent discount.

Despite all of the problems, foreign aid continued to be received in the mineral field, such as tin mining equipment from the Netherlands, West Germany, and United Kingdom; assistance with coal mining, and cement, iron and steel, and fertilizer plants from Communist countries; and with development in oil, bauxite, and nickel by Japan. First deliveries were due on 250 West German trucks, some probably for mine use, and three West German 14,000-kilowatt gas-turbine powerplants were on order at yearend. The Export-Import Bank-financed Surabaya steam powerplant was commissioned, and construction began on a Japanese 150,000-kilowatt thermal powerplant at Tanjoengpriok, near Djakarta. The French-engineered Djatiluhur hydroelectric project, in West Java, was progressing. Five powerplants having a combined potential for 1.2 million kilowatts were included in plans being prepared by Soviet experts for the Asahan River hydroelectric project in North Sumatra. Probably the first of these will be the 320,000-kilowatt Siguragura plant to supply power both for a planned aluminum plant at Mabar and for the city of Medan.

Typifying the Government attitude, at least to the time of the attempted coup, was President Sukarno's August 17 announcement on the occasion of the nation's twentieth anniversary that Indonesia has the full right to nationalize or even to confiscate any foreign capital which is antagonistic to Indonesian policies. This followed the July 13 repeal of the Indonesian law on foreign investment (enacted in 1958) which had offered a degree of protection but never was applied. The Gov-

[1] Far East specialist, Division of International Activities.

ernment had been following a generally unsuccessful production-sharing concept in foreign investment since 1962, whereby a foreign enterprise would advance equipment, technical knowledge, and advisory personnel to an Indonesian partner for a mining, industrial, or other project, with repayment in the form of a specified percentage of production. However, it became evident that regulations were too inflexible, so in January changes were made. These changes included the following:

Credit could be repaid out of other export commodities without waiting for an enterprise to begin production, a foreign firm may exercise its own control for a specified time, duties and taxes will be exempted on commodities imported for project construction, and the Bank of Indonesia will relax somewhat its guarantee conditions.

Compensation for nationalized private property remained a question. The Minister of Mines was busy revamping an 8-year plan that had been found too optimistic; worker's welfare projects were among intended improvements. On March 31 the Department of Basic Industry and Mining was split into three departments, with Chairul Saleh remaining as Minister of Oil and Natural Gas, as Minister and Coordinator for Development, and as Third Deputy Prime Minister. New ministers were named for Basic Industry and for Mining, and the President of the Government's Permina Oil Co., Brigadier General Ibnu Sutowa, was named Minister of Oil and Gas Affairs attached to the Presidium. Government supervisory teams were active in private oil company affairs. Transportation was a weak point in the economy. The Government particularly felt the need to improve deteriorating rail equipment and shipping. The Government boosted prices on gasoline and other oil products to somewhere near production costs after a period of almost giveaway sales.

PRODUCTION

Indonesia's Central Bureau of Statistics suspended publication of statistical reports on September 22; thus most of the production data herein for 1965 have been estimated. Crude oil, the main export product, gained, with output approximately 5 percent higher in 1965. Tin production dropped, after having risen in 1964; the output was estimated at only 14,698 long tons of tin-in-concentrates, but was expected to respond to operations of one or more new dredges and renovations due to be completed in 1966. Bangka Island continued to be the leading source of tin. A small amount of tin was refined, but the new smelter at Muntok apparently was not yet operational. Bauxite and nickel mining were bright spots because of Japanese endeavors. Production of coal and most other commodities was lower.

TRADE

Mineral exports continued to be a major source of foreign exchange, with Japan the chief destination except for tin concentrates. These went to the Netherlands, since access to Penang refineries was cut off by the so-called confrontation with Malaysia, and new domestic refining had not started. Netherlands imports for the first 10 months totaled about 13,500 long tons of tin-in-concentrates, with 2,500 tons in October alone. Shipments in 1964 totaled 19,300 long tons. During 1964 the Netherlands had also imported 1,212,000 metric tons of refined Indonesian oil products, largely residual fuel oil. Exports of metals and equipment to Indonesia from Japan, West Germany, and the Netherlands were generally increasing, while U.S. trade declined. Over $24 million in iron and steel was supplied to Indonesia from all sources in 1964, and sulfur totaling an estimated 7,500 tons was shipped from the United States and Canada. U.S. lubricating oils valued at $2.3 million were shipped to Indonesia in the first 9 months of the year. This compared with lubricants valued at $6.3 million shipped by various countries to Indonesia in 1964, of which over half was from the United States. Trade representatives wanted to purchase cement and sheet glass from South Korea. Complexities of Indonesian trade were dis-

Table 1.—Indonesia: Production of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Bauxite	419,856	491,298	493,111	647,805	e 700,000
Gold [1] ---troy ounces--	5,337	4,469	4,437	6,400	6,750
Lead	------	------	------	650	NA
Manganese ore	r 13,300	r 6,510	r 2,845	5,600	e 5,300
Monazite sand	101	139	153	140	25
Nickel ore (3.5 percent nickel)	18,000	12,722	45,705	47,950	78,800
Silver ---thousand troy ounces--	324	248	280	r 240	299
Tin:					
Concentrate, metal content long tons--	18,574	r 17,310	r 12,947	16,345	14,698
Metal ---do--	e 2,000	e 2,000	e 2,000	e 1,800	e 1,800
Nonmetals:					
Asbestos	436	32	70	------	------
Asphalt rock	5,590	6,053	10,489	5,315	e 5,000
Cement ---thousand tons--	445	r 505	r 330	439	e 364
Diamond ---carats--	NA	NA	NA	NA	e 2,000
Iodine (content of cuprous iodide) kilograms--	3,144	4,373	NA	NA	NA
Phosphate rock	r 9,862	r 5,984	1,125	3,408	NA
Salt:					
Government (reported) thousand tons--	447	304	NA	NA	NA
Private (estimated) ---do----	250	240	NA	NA	NA
Total ---do----	697	544	NA	NA	NA
Sulfur	817	932	1,050	e 1,000	NA
Mineral fuels:					
Coal	563,530	470,703	591,356	446,213	390,253
Petroleum:					
Crude oil thousand 42-gallon barrels--	155,369	167,771	162,500	r 169,250	178,190
Refinery products [2] ---do----	79,840	e 80,000	e 75,000	e 70,000	e 65,000
Natural gas ---million cubic feet--	95,577	100,988	e 103,222	e 110,000	NA

e Estimate. NA Not Available. r Revised.

[1] Officially reported Indonesian statistics representing government output; private production by small unorganized producers may be as much as 30,000 troy ounces per year.

[2] Breakdown reported for 1961, in thousand barrels, as follows: Gasoline 18,215, kerosine 14,766, distillate fuel oil 18,883, residual fuel oil 26,168, and other 1,810.

cussed.[2] Although past records of payment were generally good, longer payment terms were wanted; because of increasing financial weakness, foreign suppliers became more cautious.

Provisional data available for 1964 showed $271 million of $744 million in total exports (excluding West Irian) brought in by petroleum, the highest since 1961. Tin, with a gross value of $29 million in 1964, was the third ranking export product after oil and rubber and was just ahead of coffee and palm oil. West Irian exports of all goods totaled $43 million in 1964, 40 percent of which was attributed to petroleum. The lack of data on oil necessitates omission of the export table for crude petroleum and refinery products shown in the 1964 edition of the Minerals Yearbook.

COMMODITY REVIEW

METALS

Aluminum (Bauxite).—Bintan Island bauxite production expanded to a rate of about 60,000 tons monthly, virtually all going to Japan and supplying about one-third of Japanese requirements.

Copper.—Reports indicated that copper mining might be resumed in 1966 in the Sankoropi area of South Sulawesi (Celebes) a a result of Yugoslavian surveys. Interest in a major West Irian copper discovery of a few years ago revived, and a possible

[2] Webbert, M. V. Foreign Trade Regulations of U.S. Dept. of Commerce Overseas Business Reports, OBR 65-3, January 1965, 11 pp.
———. Indonesian Trade Stagnates as Economy Deteriorates, Government Actions Jolt Businessmen. International Commerce, v. 71, No. 3, Jan. 18, 1965, p. 34.

Table 2.—Indonesia: Exports of selected metals and minerals to Japan [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965
Metals:			
Bauxite	568,316	614,869	563,952
Manganese ore	7,828	5,614	5,293
Nickel ores and concentrates	30,913	39,500	79,450
Tin metal ---long tons--	------	117	------
Petroleum:			
Crude oil ---thousand 42-gallon barrels--	38,450	40,820	38,856
Heavy fuel oil ---do----	1,210	2,558	2,466
Distillate for petrochemical manufacture ---do----	------	------	447

[1] Data shown in lieu of official Indonesian import figures.
Source: Official trade returns of Japan.

$60 million development was under discussion.

Gold and Silver.—It was announced late in the year that gold and silver mines, including the principal producer of record, the Tjikotok, in West Java, would be nationalized, with operations closely regulated henceforth. One source speculated that five times the officially reported gold may have been produced secretly. The Government joined in investigating a 1964 discovery of gold at Lagos, in the Riau Island group. Rehabilitation of idle mines at Lalos, Tutut, and Leban Tandai in South Sumatra and at Tjikondang in West Java was part of an 8-year Government program initiated in 1963, but no renewed mining was reported in this connection.

Iron and Steel.—Construction on the Soviet-assisted Tjilegon iron and steel project, due for completion in 1967 with 100,000 tons annual capacity, made virtually no advance and remained only about one-fourth complete at yearend. A West German blast furnace unit arrived for installation at Lamping, Sumatra.

Manganese.—Operations were virtually all at one small mine in Java.

Nickel.—Nickel ore output and exports, all to Japan, rose sharply in 1965, because of stimulation by a production-sharing contract with the Japanese Sulawesi Nickel Development Co., signed with Indonesian Nickel Mining Corp., which provided a 7-year credit for mining equipment and expertise. By August the newly expanding Pomalaa mine, in southeast Sulawesi, was producing about 12,000 tons of ore monthly, while the older Mantang Island mine was approaching half that rate. The Japanese developer was reported considering plans to build a $22 million 32,000-ton-per-year ferronickel smelter in Sulawesi, based on extensive Indonesian reserves, which have been estimated at 40 million tons containing 1.5 to 2.3 percent nickel with 0.005 percent cobalt. Ores are lateritic, containing 25 to 48 percent iron and a little chromium. Deposits in the Malili district of Sulawesi were under study.

Tin.—Although reports were incomplete, tin output apparently fell to less than 15,000 long tons of tin-in-concentrates, owing partly to labor problems and to setbacks in rebuilding mine and dredge equipment. Production in the first 11 months totaled 13,573 long tons compared with 14,869 tons in the same period of 1964, with Bangka Island the source of three-fifths of production, Billiton one-fourth, and Singkep supplying the rest. Hopes for doubling production in a few years seemed far from realization, although tin resources were more than adequate. One report estimated 610,000 tons of tin-in-concentrates of good grade remained, without considering potentials of unexplored and offshore areas.

Bangka No. 1, one of the largest tin dredges designed for offshore service and capable of operating to depths of 131 feet with 420,000 cubic yards monthly capacity, was launched in the United Kingdom and was scheduled at yearend to move to Indonesian waters. West German sources were due to supply by April 1966 10 small dredges, including suction-cutter and grab types, having a total capacity of about 2,000 tons of concentrates yearly; Netherlands' firms negotiated a contract to overhaul and modernize a number of tin dredges and to rebuild the central electric power station at Mantung. Work on the first two dredges was to start in 1966. Negotiations also went ahead with Netherlands interests for rehabilitating 70 open

tin mines and with a West German firm to rehabilitate the Kelapa Kampit underground mine on Belitung, once producing 2,000 tons yearly. Eight dredges operated in offshore waters in 1965, and the arrival of Bangka No. 1 will add one more. A French concern was also approached for help in an offshore tin-dredging project. A similar project to have been conducted under the United Nations Special Fund was shelved earlier by Indonesia's withdrawal from the United Nations.

The Muntok tin smelter, designed for production of 25,000 tons of tin metal annually, was reported to have run successful tests in late 1964; however, it was not expected to start up commercially until 1966 because of uncompleted portions. Tin concentrates continued in the interim to go to the Netherlands for smelting.

NONMETALS

Asphalt.—Although badly needed for road construction and repair, supplies of asphalt rock, mined on the remote island of Butung, south of Sulawesi, were lower because of transportation difficulties.

Cement.—Shortages of cement delayed completion of industrial plants and slowed the completion of hydroelectric construction and repairs to deteriorating highways. The partially completed $6.5 million Tonasa cement project, near Macassar, being built with Czechoslovak assistance, was seriously damaged by two successive fires in September, and production, planned to start in 1966 or 1967, was further delayed. Meanwhile, output of the important Gresik cement plant dropped because of poor machinery maintenance and labor troubles. Limited supplies of better quality limestone were being depleted unnecessarily at the Gresik quarry. Production was estimated to have reached only about 220,000 tons in the first 10½ months of 1965 compared with a projected annual production of 325,000 tons. The Indarung cement plant, also Government-owned, continued to operate at Padang. Govemment projects received priority for available outputs, while others relied on an allocation system of cement imports, which came from Japan and mainland China. The latter was reported to have offered to help in building several small cement plants.

Diamond.—The Netherlands firm, Asscher Diamond Company, Ltd., signed an agreement with the Indonesian Government to exploit the Kalimantan diamond fields, where gem quality stone has been produced in the past. Diamond smuggling was expected to be reduced by stricter security measures under the new arrangement. Yearly output in the millions of dollars was predicted.

Fertilizer Materials.—Output of the Government's 100,000-ton urea plant (new in 1963) in Palembang, Sumatra, declined an estimated one-fifth in 1965 as foreign operating personnel were replaced by less-experienced workers, and warehouses were filled because of transportation shortages. Production costs remained relatively low, and officials were considering export possibilities to help with foreign exchange, even though domestic demand for fertilizer was quite strong as indicated by the black market. Nothing was reported on the country's other fertilizer plant, privately owned by M. V. Tjirebon Phosphate and General Industrial Co., at Tjirebon, Java, and operation may have ceased. A Government purchasing agent signed a contract in March to buy 10,000 tons of ammonium sulfate and phosphate mixed fertilizer from Japan at $87.47 per ton, f.o.b. West Germany was another source of sulfate fertilizers. Two major projects were under discussion: Japanese doubling of the Palembang plant's capacity and a new Italian-backed 100,000-ton urea plant that would use bunker oil for methane and be situated near Surabaya.

MINERAL FUELS

Coal.—East German technicians conducted a survey of the Bukit Asam coal mines in South Sumatra, Indonesia's largest, but at midyear had not yet decided on what kind of assistance would be forthcoming. A Hungarian group discussed designs for a carbon electrode plant to be supplied by that country. Coal production continued to decline and could hardly meet two-thirds of the 35,000 tons of coal needed monthly by railroads to maintain schedules. Railways in the latter half of the year expected both coal supply and operating rates to drop to about half of normal.

Petroleum.—Crude oil production and exports continued to rise, but increased do-

mestic consumption of refined products left smaller quantities of such products for export. Crude oil outputs during the first 9 months of 1965 were as follows for private companies, in thousand 42-gallon barrels: Caltex Pacific Oil Co., 88,027; P. T. Stanvac Indonesia, 15,291; and P. T. Shell Indonesia, 18,906. Government companies, Pertamin, Permina, and Permigan, together produced an estimated 10.9 million barrels in the same period. Compared with 1964 production, output by P. T. Shell Indonesia was falling behind, while the others were ahead. P. T. Shell Indonesia operated two refineries, one with a 110,000-barrel-per-day capacity at Pladju, near Palembang, Sumatra, and the other, a 75,000-barrel-per-day unit at Balikpapan, Borneo. The South Sumatra field produced nearly two-thirds of Shell's crude oil and the rest, except for a small quantity from Java, came from Borneo. P. T. Stanvac Indonesia operated its 72,000 barrel-per-day refinery at Sungai Gerong, also near Palembang, and produced crude oil in approximately equal amounts from the South and Central Sumatran fields. About four-fifths of Caltex Pacific Oil Co. crude oil came from Minas, and the remainder came from its Duri fields. Crude oil was produced by Pertamin in South Sumatra and Kalimantan, by Permina in North Sumatra, and by Permigan in Java. In addition, Permina operated a small refinery in North Sumatra and Permigan operated one in Tjepu, Java.

Exports of crude oil continued, chiefly to Japan and Australia. The 1964 domestic consumption of refined products, based on refinery shipments, was estimated at 32.8 million barrels, including the following, in million barrels: Aviation gasoline, 0.2; motor gasoline, 8.97; turbine fuel, 0.4; kerosine, 10.3; automotive diesel, 7.58; industrial diesel, 1.03; and fuel oil 4.32. Lubricants, based on imported stock, were coming into short supply. Several blending plants remained active, and Permina's new lubricating oil plant at Pangkalan Brandau operated at about two-thirds of eventual capacity of 36,000 barrels annually. Sharply higher gasoline and oil prices accompanied a reverse in government policy to sell at a loss on these items.

At least three new oilfields have been outlined by Caltex at Bekasop, Pematang, and Petani, all east of the major field at Duri, Central Sumatra. Minas and Duri crude oil continued to flow from these fields via a 30-inch pipeline to the port at Dumai, and branches were under construction to Bekasop and Pematang. Shell had success with several wildcat drill holes at Warukin, near Tandjung in Kalimantan, and at Belimbing, near Pladju in South Sumatra. The Asamara Oil Co. (Canadian) strike in North Sumatra, in Atjeh, north of Medan, yielded 52-degree gravity oil, and flows from three wells were capped pending completion of a pipeline to the coast. Pan American Oil Co. (United States), on its 10th dry hole, was not so fortunate. Pertamin made its first strike, flowing 500-barrels-per-day, northwest of Palembang. Northern Sumatran Petroleum Development Co. (Japan) purchased the offshore concession of Refining Associates, Inc. (United States) in Sumatra and and planned a $14 million expenditure in the next few years. The Japanese company agreed to take just 40 percent of any output in repayment and profits. In West Irian, Serang Oil Co., under Permina control, continued producing a few hundred tons of crude oil daily for export, while Dutch New Guinea Oil Co. closed down because of depletion. Japan Petroleum Exploration Co. discussed possibilities of exploring for oil on West Irian's offshore islands.

Shell signed a contract on December 30 to sell its Indonesian assets to the Government of Indonesia, including two refineries and its oilfields, for $110 million paid over 5 years, with 90 percent probably to be taken in the form of products. Final agreements were being worked out. U.S.-owned P. T. Stanvac Indonesia and Caltex Pacific Oil Co. maintained operations under the shadow of nationalization.

The Mineral Industry of Japan

By Benjamin H. Lim [1] and J. M. West [2]

Japan's mineral industry retained its approximate sixth place in the world with an estimated mineral and metal output value (mine output value plus added value derived from smelting and processing) on the order of $5,100 million, slightly higher than in 1964. These impressive values were achieved mostly as the result of accelerated expansion of Japan's mineral industry during the last 5 years. While the country's domestic mineral resource base was only of moderate significance in 1965, its metallurgical and petroleum refining industries had become very large and diversified to meet the demands of the Japanese industrial-manufacturing economy.

Japan's mineral industry in 1965, however, did not enjoy the brisk business activity of the last several years, a time of unprecedented economic growth. The tight money policy initiated by the Government near the end of 1963 to stop erosion of the nation's international payment credits was felt by the economy throughout 1965 with serious repercussions on the nation's basic industries.

After a record expansion rate throughout 1964, some 10 percent above the 1963 pace, the 1965 growth rate in the mineral industry, for the most part, became almost static, and there were bankruptcies among small, less efficient, and financially weak mining and mineral fabricating firms. Petroleum and chemical processing, both restrained, nonetheless went counter to the general trend in the mineral industry and maintained high rates of expansion.

The influence of the tight money policy and the attendant economic slump on the nation's mineral-based industries, except for petroleum, was reflected in lowered production indexes:

Industry	Production index (1960=100)			Index change (points)	
	1963	1964	1965	1963–64	1964–65
Mining	107.7	107.9	106.1	+0.2	−1.8
Manufacturing	143.7	169.1	175.7	+25.4	+6.6
Chemical	152.7	178.9	201.9	+26.2	+23.0
Petroleum and coal products	159.8	184.5	209.7	+24.7	+25.2
Ceramics	136.0	155.6	159.6	+19.6	+4.0
Iron and steel	140.4	172.8	177.7	+32.4	+4.9
Nonferrous metals	132.9	161.9	161.2	+29.0	

Source: Japanese Economic Statistics. Economic Planning Agency, Japanese Government, Tokyo, Japan. Bull. 92, May 1966, p. 8.

However, a continued feeling of optimism as to future business conditions was shown by growth indexes of production capacity:

Industry	Capacity index (1960=100)		Index change (points)
	1964	1965	1964–65
Steel	181.2	199.0	+17.8
Nonferrous metals	165.7	182.1	+16.4
Overall mining and manufacturing	168.6	183.8	+15.2

The increased level of nonferrous metal capacity was to a significant extent the result of greater activity on the part of copper smelting firms stemming from the general world copper shortage; an 8 percent increase in smelter copper output to 366,000 tons was recorded, as well as an increase in the copper price to nearly $2,300 per ton by yearend, about 60 percent above the yearend 1964 level. Despite the price increase, Japanese copper

[1] Physical scientist, Division of International Activities.

[2] Far East specialist, Division of International Activities.

smelters claimed that little profit was earned in 1965.

Japan's steel industry, with a phenomenal expansion rate in the recent past, expanded without abatement in 1965. The industry's rapid growth, however, has been attended by development of economic imbalances such as inadequate internal fund accumulation by many enterprises and by delays in modernization. Structural changes in the expanding steel industry either were not matched with corrective measures or were matched at too late a date, and these imbalances became more apparent as the tight money policy took firmer hold on the economy. Inventories mounted, particularly those of semimanufactures such as hot- and cold-rolled steel, despite a rigidly enforced 10-percent cutback in crude steel output in September 1965. The supply surplus, resulting from both overproduction and greatly diminished domestic demand, weakened the market. Producers then attempted downward price adjustments to bring supply and demand functions to a closer approximation, but the lower prices aggravated already taut financial circumstances of many firms in the industry. As the recession deepened toward the end of 1965, heavy debt burdens coupled with dwindling domestic sales and inaccessibility to more credit forced some less efficient, less affluent, and small-scale steel manufacturers into bankruptcies or mergers.

The strikingly high rate of iron and steel export in 1965 (9.7 million tons, or nearly one-half more than in 1964) may turn out to be only a temporary windfall to the Japanese steel producers. The high 1965 outflow was chiefly due to unusually large purchases by U.S. importers as a hedge against the possibility of a prolonged strike by U.S. steelworkers. It was also a result of aggressive efforts by Japanese exporters to locate overseas markets in the face of diminished domestic demand.

The coal industry's plight worsened in 1965. The industry was caught between expanding consumption of petroleum and its own rising operation costs. It appears the 1964 policy of scrapping inefficient mines and building efficient ones gave a small measure of success; financial returns of some companies showed small profits in 1965 after many years of heavy losses.

To alleviate problems of the country's mining industry, the Japanese Government in 1965 instituted a variety of programs directed toward assisting domestic mining in the form of loans and subsidies, favorable taxation, protective tariffs, special measures for small and marginal mines, technical cooperation, management consulting services, and surveys by the Government's geological branch. For example, from April 1, 1965, Japanese mining companies were allowed a special tax privilege in that the companies were entitled to tax exemption for 15 percent of their ore sales. The tax-exempt portion of the ore sales was to be used by the firms for prospecting and developing new mines.

The Resources Research Institute, under the Ministry of International Trade and Industry (MITI), conducted studies on a number of mineral problems, stressing coal and fuel. Fields of activities included hydraulic mining, underground gasification, large-diameter boring, transport of coal slurry, oil refining, fuel utilization, mine safety, and industrial pollution control.

As for the overall economy, excessive expansion of industry in the past 5 years and business recession in 1965 led the Government to take special measures to aid recovery. In the fiscal 1966 budget, the Government stressed programs of economic recovery and social development, with special attention given to public works, home construction, and disaster relief. Plans featured home construction, reduction of rates charged by financial institutions on loans to medium and small enterprises, expanded funds for highway construction, increased shipbuilding, and government underwriting of local public bonds.

Inflation and rising wages were serious problems in 1965. An Economic Planning Agency report stated that Japan's rate of consumer price increases in the 10 years ending in 1965 was four times that of the United States and twice that of the United Kingdom and West Germany. Rising labor costs induced further investment in plant and machinery despite conditions of overcapacity. To counter the recession, cartel agreements were encouraged by the Government with the object to limit output on an industrywide basis, thus distributing individual company business losses more evenly. The Fair Trade Commission in late January 1965 approved such a cartel by nine special steel manufacturers and an agreement to cut back production followed.

Among industries designated by The Ministry of International Trade and Industry (MITI) early in 1965 as suffering from overcapacity and in need of corrective measures were steel, special steel, cement, and oil refining. These became subject to government approval of financing plans on an industrywide basis rather than on an individual company basis. Although the Government in 1965 approved a number of major investments in Japan by foreign corporations and a rising number of technological assistance contracts, the latter largely in the field of chemicals, there was mounting criticism of restrictive investment policies. The value of foreign investments approved in fiscal 1965 (ending March 1966) dipped to $528.5 million compared with $912.8 million in fiscal 1964. A large proportion of the fiscal 1965 total went into mineral processing industries such as oil.

Rationalization and modernization of metallurgical and refining facilities processing indigenous and imported materials continued. Government efforts to support and modernize the coal industry were only partially successful in limiting further deterioration, and new measures were called for, specifically, increased coal prices, subsidies to deficit-laden companies, and increased compensation for hazardous mining conditions.

A program was underway in 1965 to stimulate foreign investments, including participation in mineral exploitation, particularly in North and South America, Australia, and central Africa. Measures being considered to promote external investments included a system to prevent double taxation and to allow tax deductions on interests and profits, greater investment backing by the Japanese Export-Import Bank, an increase in maximum insurance on investment from 50 to 90 percent, establishment of an Overseas Investment Center within Japan's Asian Economic Research Institute increasing investment services to businessmen, and a new organization for special assistance to medium and small enterprises interested in investing abroad.

Japan's quasi-Government Overseas Mineral Resources Development Co., Ltd., with 50 percent private industry participation by some 13 principal nonferrous metal mining companies, expanded its activities in exploration and development of raw material sources abroad. Surveys and negotiations were in progress in west coast South American countries for copper, lead, and zinc properties, and in Africa on manganese deposits in Upper Volta and various minerals in southern Katanga in the Republic of the Congo (Léopoldville). Iron and steel was the subject of other development in Brazil. Japan continued assistance to Indonesia in development of Sumatran oil resources. Normalization of relations with South Korea brought Japanese assistance in the form of industrial loans and the prospect of greater participation in the South Korean mineral industry. The Japan Resources Survey Council planned in 1965 to send a mission to Australia to conduct studies of iron ore, bauxite, lead, zinc, and copper ores to encourage Japanese investment and trade. Japanese contacts with mainland China and the U.S.S.R. increased along with expanding mineral trade with those countries. In regard to trading with mainland China a government advisory agency recommended that a single export channel be established to handle all agreements on trade and payments. There were overtures from the U.S.S.R. for Japan to assist in developing natural gas in the Soviet Sakhalin area, an oil pipeline across eastern Siberia, and copper mining in the Lake Baikal region. Japan would supply equipment and technical skills in exchange for mineral raw materials.

PRODUCTION

In 1965, Japan retained third position behind the United States and the Soviet Union among world steel producers, having overtaken West Germany by a small margin in 1964. Among Free World producers, Japan ranked fifth in aluminum production, second in titanium, first in pyrite and pyrophyllite, and fourth in cement. In mineral fuels, Japan ranked third among world crude petroleum refiners although the country produced only a very minute amount of crude oil.

Value of Japan's mineral industry output in 1965 of approximately $5,100 million was equivalent to about 6.0 percent of the country's gross national product (GNP) of $83,901 million (in current dollars) in 1965 compared with about 6.5 percent of

the GNP of $76,899 million in 1964. Although the GNP of these 2 years in current dollars indicated an approximate 9-percent expansion, the real growth rate for 1965 was reportedly only about 3 percent after using the appropriate deflater.

While Japan's mineral processing industries, notably its iron and steel and nonferrous metal smelting industries, expanded rapidly in the last few years, the domestic metal mining industry has remained somewhat static. Mine output of most metals in 1965 was on a par with or slightly above 1964 levels. Nonmetallic mine output in 1965 showed a slight overall decline when compared with the 1964 output. Significant decreases were noted for clay (kaolin), dolomite, gypsum, and sulfur. Increases took place in feldspar (aplite), quicklime, and limestone.

The value (at factor costs) of the 1965 indigenous crude mineral output alone was reported at approximately $714 million compared with $653 million in 1964. The value of these crude minerals to the end users was estimated to total $1,400 million in 1965 and $1,200 million in 1964. Two categories of minerals, primary metal ores (other than iron) and coal, accounted for nearly three-fourths of the total value of 1965 output. Value added to crude domestic minerals via transportation and processing amounted to about $800 million in 1965 and about $600 million in 1964. Thus, approximately 55 to 60 percent of the total value of mineral industry output during 1965 was derived from transporting and processing imported raw materials. Of the total derived from imported raw materials, iron and steel accounted for about 40 percent; nonferrous metals, chiefly aluminum, copper, and zinc, for 8 percent; and that from petroleum refining for 10 percent.

A significant event in Japan's mining industry during 1965 was the start of construction of production facilities to exploit major deposits of so-called "black ores" developed in the last few years in northeast Japan. These ores are now known to contain rich amounts of copper, gold, lead, silver, and zinc, economically recoverable by modern smelting processes. During the year, Dowa Mining Co. and at least three other large mining firms have completed development plans for the area. Reserves of black ore reportedly totaled 60 million tons valued at approximately $3,000 million.[3]

Despite the intensity with which Japanese companies have attempted to locate indigenous ores, the domestic mineral resource base is inadequate to support the country's mineral processing and consuming industries. For this reason and the relatively lower costs of imported raw materials, the nation's industry continued to participate in developing foreign mineral deposits despite the slower economic pace and added financial strains during 1965. Japanese ore smelters were extremely active in negotiating long-term contracts to procure foreign mineral supplies; for example, Japan's iron and steel industry had investments totaling more than $5,040 million by yearend 1965 for prospecting and developing foreign iron ore deposits. Similarly, Japanese nonferrous metal smelters at yearend 1965 had investments in overseas mines amounting to more than $8,400 million.

[3] Watanabe, K. Far East: Japan. Mining Annual Review. Mining Journal (London), May 1966, p. 259.

Table 1.—Japan: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum:					
Alumina	420,518	424,469	510,539	r 588,741	625,711
Metal, ordinary	152,513	169,664	222,073	263,862	292,076
Metal, superpure	1,186	1,786	1,869	1,898	1,827
Oxide, fused	NA	35,830	33,728	36,876	30,091
Antimony:					
Mine	195	172	192	503	507
Regulus (metal)	2,127	2,268	2,067	r 2,324	1,675
Oxide	1,237	1,091	1,175	1,615	1,129
Arsenic (white)	950	917	820	r 499	NA
Bismuth, metal kilograms	191,566	259,839	373,450	506,038	610,889
Cadmium, metal	724	883	1,012	1,215	1,479
Cerium kilograms	65,630	96,181	122,361	NA	126,971

See footnotes at end of table.

Table 1.—Japan: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals—Continued					
Chromium:					
Concentrate, almost all low-grade	70,192	58,082	43,731	r 43,955	41,834
Metal	509.8	211.0	456.4	e 500	1,090
Cobalt—kilograms	5,365	48,385	20,273	16,380	4,473
Copper:					
Mine	96,409	103,620	107,217	r 106,174	115,418
Metal, primary electrolytic	277,005	270,430	295,201	341,699	365,682
Metal, secondary	NA	87,881	88,863	118,086	121,602
Germanium, metal—kilograms	24,373	22,368	14,493	23,962	17,633
Germanium, oxide—do	14,724	18,619	14,385	NA	NA
Gold, refined—thousand troy ounces	r 379	r 421	r 433	460	519
Iridium—troy ounces	139,084	150,658	NA	NA	NA
Iron and steel:					
Direct smelting ore—thousand tons	1,159	1,144	1,127	1,135	1,133
Iron sands—do	1,712	1,443	1,295	1,388	1,375
Pyrite sinter—do	1,909	2,004	1,767	1,926	1,965
Pig iron—do	15,821	17,972	19,936	23,778	27,502
Ferroalloys:					
Ferrochrome	100,095	84,528	81,880	136,792	116,817
Ferromanganese	185,531	166,593	165,594	211,590	220,744
Ferromolybdenum	1,985	505	1,017	1,429	1,247
Ferronickel	62,647	35,972	46,883	78,323	73,786
Ferrosilicon	98,120	75,355	94,174	113,792	120,789
Ferrotitanium	456	457	172	NA	NA
Ferrotungsten	1,703	883	760	1,178	726
Ferrovanadium	1,289	608	1,287	1,128	1,057
Silicomanganese	95,849	e 100,000	e 115,000	148,400	152,400
Steel ingots—thousand tons	28,268	27,546	31,501	39,799	41,161
Rolled steel, hot rolled—do	20,392	20,809	23,307	29,381	30,972
Lead:					
Mine	46,280	53,455	52,717	r 54,072	54,976
Metal, primary refined	83,283	92,192	101,106	107,961	108,542
Metal, secondary refined	NA	NA	68,182	61,338	56,707
Magnesium, primary only	2,247	2,087	2,439	2,937	3,785
Manganese:					
Ore, mostly low-grade	304,121	308,590	276,717	r 284,698	r 295,852
Oxide	7,477	9,396	10,308	NA	20,622
Metal, electrolytic	4,568	4,800	4,952	NA	5,567
Mercury:					
Mine	189	153	169	161	162
Metal	875	566	641	358	325
Molybdenum:					
Mine, MoS_2	610	623	553	NA	537
Metal—kilograms	90,346	106,667	134,087	NA	102,865
Nickel: Metal	6,065	5,665	6,190	6,673	6,701
Palladium—troy ounces	1,550	1,372	1,326	1,874	3,022
Platinum—do	2,247	1,872	1,714	2,199	2,797
Selenium—kilograms	136,198	140,304	142,200	r 147,839	157,409
Silicon, high-purity—do	4,068	6,315	10,743	13,608	12,414
Silver, electrolytic—thousand troy ounces	12,514	14,753	15,214	15,966	16,658
Tantalum—kilograms	5,702	4,704	5,319	11,298	9,441
Tellurium—do	7,478	10,509	6,013	3,435	9,129
Tin:					
Mine—long tons	852	859	r 857	r 796	786
Metal, electrolytic and fire—do	1,644	1,822	1,976	1,954	1,634
Titanium:					
Slag	1,609	524	874	1,960	2,894
Metal	2,283	1,513	1,759	2,993	4,840
Tungsten:					
Concentrate	825	920	651	715	600
Metal	570	440	516	703	621
Zinc:					
Mine	168,259	192,481	197,956	r 216,456	220,872
Metal, electrolytic	135,743	158,895	177,127	202,224	245,124
Metal, distilled	76,688	86,413	87,210	83,529	96,965
Sulfate	27,685	24,944	26,405	r 28,641	27,718
Oxide	4,726	6,656	8,425	NA	35,709
Zirconium—kilograms	44,377	83,000	53,000	NA	92
Nonmetals:					
Asbestos, chrysotile	17,054	13,977	16,520	16,310	14,925
Barite	29,250	38,116	37,521	38,111	40,187
Bromine	2,772	2,887	3,546	4,681	3,962
Cement, all types—thousand tons	24,636	28,787	29,948	32,981	32,689
China clay (kaolin)	26,939	71,860	99,229	r 107,350	93,364
Dolomite—thousand tons	1,874	1,796	1,752	1,838	1,676
Feldspar, aplite	124,848	162,254	206,613	256,316	276,458
Fire clay—thousand tons	1,002	904	r 813	914	984
Fluorspar	14,811	15,531	20,899	r 19,122	e 20,000

See footnotes at end of table.

Table 1.—Japan: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Nonmetals—Continued					
Graphite:					
Amorphous	481	428	457	394	374
Crystalling	2,999	3,030	2,541	2,056	1,878
Gypsum thousand tons	725	800	783	753	666
Iodine	1,120	1,409	1,686	2,025	2,193
Lime, quick thousand tons	r 1,139	r 1,246	1,385	1,631	1,692
Limestone do	44,026	49,964	53,857	60,603	61,091
Phosphates (superphosphates) do	1,879	1,809	1,663	1,661	1,550
Potash, carbonate	4,184	5,906	5,583	7,565	7,493
Pyrite thousand tons	2,273	2,349	2,345	2,764	2,725
Pyrrhotite do	244	231	210		
Cupriferous pyrite do	384	445	497	NA	NA
Salt do	828	856	782	887	848
Pyrophyllite (powder)	283,546	266,575	288,639	r 320,750	316,716
Sulfur, refined from ore	242,282	223,975	r 222,610	r 241,222	213,334
Sulfur, recovered from oil	8,294	8,686	11,612	r 18,796	36,485
Sulfur ore, for making acid thousand tons	736	656	NA	NA	NA
Sulfuric acid do	4,683	4,910	4,991	5,372	5,655
Talc	55,853	57,237	68,051	r 92,502	92,373
Silica:					
Soft silica stone thousand tons	1,891	2,139	2,124	r 2,829	2,878
High-grade sand	1,380	1,524	1,603	1,684	1,938
Mineral fuels:					
Coal:					
Anthracite thousand tons	1,893	1,874	1,798	1,709	1,630
Bituminous do	52,151	52,017	49,748	48,673	47,382
Lignite do	1,283	1,061	934	691	573
Coke from coal:					
From coke ovens do	10,913	11,548	11,247	12,933	15,001
From gas plants do	3,797	3,454	3,374	3,721	3,670
Natural gas million cubic feet	35,464	45,120	63,243	r 69,368	43,964
Petroleum:					
Crude oil thousand 42-gallon barrels	4,590	5,316	r 5,485	r 4,590	4,944
Refinery products:					
Gasoline thousand 42-gallon barrels	45,645	50,362	58,370	62,507	68,611
Naphtha do	-----	14,621	20,651	31,142	45,929
Jet fuel do	3,016	3,396	4,299	6,344	8,105
Kerosine do	14,606	18,649	24,779	28,395	34,922
Gas oil do	18,229	22,270	29,498	34,401	38,329
Fuel oil A do	10,207	11,185	11,926	16,329	18,418
Fuel oil B do	29,992	32,750	34,788	38,677	40,417
Fuel oil C do	89,296	107,175	153,111	189,456	222,174
Lubricating oil do	4,632	5,099	5,403	7,250	7,670
Liquefied petroleum gas	582,471	760,812	1,452,452	2,041,076	2,700,808
Paraffin	45,680	49,102	54,200	67,033	68,096
Petroleum asphalt	605,580	622,933	944,318	1,302,520	1,467,420
Petroleum coke	56,865	59,414	69,660	84,140	82,940
Petroleum grease	34,599	36,344	35,876	37,990	38,659
Total refined products thousand 42-gallon barrels	234,080	280,260	361,100	439,800	498,033
Carbon black	42,609	66,690	80,233	r 110,935	122,911

e Estimate.
r Revised. NA Not available.

Sources: U.S. Embassy, Tokyo, Japan. Mineral Production Statistics Questionnaire 1964. State Department Airgram A-1422, Apr. 21, 1965. Mining Yearbook of Japan, 1959–63. Ministry of International Trade and Industry. Petroleum Yearbook of Japan, 1961–63. Ministry of International Trade and Industry.

TRADE

The value of total Japanese trade in mineral commodities (except gold) increased by about $742 million in 1965 over that of 1964, reaching a new high of $4,966 million, while total Japanese merchandise trade increased by $2,010 million to $16,622 million. These increases occurred despite the much lower economic growth rate in 1965; that is, 3.9 percent compared with 17.8 percent in 1964. Comparative data on mineral commodity trade and total merchandise trade for recent years follow:

	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities	All commodities	
Exports:			
1963	928	5,453	17.
1964	1,161	6,674	17.4
1965	1,666	8,452	19.7
Imports:			
1963	2,395	6,737	35.5
1964	3,063	7,938	38.6
1965	3,300	8,170	40.3
Trade balance:			
1963	−1,467	−1,284	XX
1964	−1,902	−1,264	XX
1965	−1,634	+282	XX

XX Not applicable.
Source: Statistical Office of the United Nations.

Japan's chief mineral export was iron and steel, chiefly semimanufactures, that accounted for 78 percent of the total mineral exports in 1964 and 77 percent in 1965 (scrap excluded). In this category, the United States was, by far, Japan's best customer. In 1964 and 1965, the United States bought respectively $307 million and $513 million of these commodities. These levels of purchases represented 34 and 40 percent respectively of the total value of iron and steel products exported during 1964 and 1965. In the category of nonferrous metal ores, metals and semimanufactures (except gold), the United States also led all other countries by taking 34 percent ($20 mil-

Table 2.—Japan: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Metals:				
Aluminum:				
Bauxite	400	600	800	Taiwan 400.
Alumina	102,100	104,268	95,038	United States 70,169; Australia 22,734.
Aluminum hydroxide	3,635	NA	7,104	NA.
Metal and alloys:				
Scrap	-------	-------	154	India 102.
Unwrought	r 14,112	r 19,173	29,168	United States 24,257; Argentina 1,864.
Semimanufactures	r 18,227	17,187	25,221	United States 9,160.
Bismuth and alloys, all forms	162	249	197	United Kingdom 146.
Cadmium and alloys, all forms	194	351	716	United Kingdom 432; United States 118; Netherlands 97.
Chromium:				
Ore and concentrate	-------	-------	1,537	North Korea 1,437.
Oxides and hydroxides	-------	-------	532	South Korea 147; Taiwan 142; Australia 58; United States 58.
Cobalt oxides and hydroxides	-------	-------	21	West Germany 20.
Copper:				
Ore concentrate and matte	-------	255	-------	
Metal and alloys:				
Scrap	-------	-------	6,169	Netherlands 1,906; West Germany 885; Italy 745; Sweden 676.
Unwrought	1,481	1,621	2,681	Taiwan 1,571.
Semimanufactures	r 18,315	26,652	50,440	United States 15,112; Hong Kong 7,307.
Iron and steel:				
Ore and concentrate (mainly roasted pyrite).	-------	-------	11,013	All to Taiwan.
Scrap	1,785	4,307	2,801	Ryukyu Islands 1,163; Taiwan 1,118.
Pig, sponge, and cast iron, iron powder, and shot.	654	1,848	6,422	Philippines 3,274; United States 1,000.
Ferroalloys:				
Ferrochrome	7,964	3,861	23,733	United States 12,728; United Kingdom 6,450.
Ferromanganese	14,385	8,864	15,314	United States 10,591; United Kingdom 2,476.
Ferrosilicomanganese	3,760	434	723	United States 417; Singapore 153.
Ferrovanadium	382	327	311	North Korea 305.
Other	r 960	582	1,818	NA.
Primary forms:				
Ingots, thousand tons	1	26	39	Philippines 23; Ryukyu Islands 14.
Blooms, billets, and slabs, do	56	33	419	Argentina 229; Australia 55.
Coils for rerolling, do	272	630	889	United States 637; Spain 101.
Semimanufactures:				
Wire rod, do	479	545	742	United States 620.
Bars and other rods, do	840	r 602	757	United States 177; Taiwan 90; Australia 72.
Large sections, do	170	235	397	United States 171; Australia 62.
Small sections, do	65	168	323	United States 159; Republic of South Africa 43.
Plates and sheets:				
Heavy, including universals, do	464	680	926	United States 336; Republic of South Africa 93.

See footnotes at end of table.

Table 2.—Japan: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Metals—Continued				
Plates and sheets—Continued				
Medium ---do---	129	102	227	United States 126.
Thin, uncoated ---do---	1,054	1,338	1,889	United States 739.
Tinplate ---do---	r 189	296	356	United States 75; Taiwan 34.
Other coated ---do---	420	503	571	United States 266; Burma 29.
Hoop and strip ---do---	81	94	166	United States 22; South Korea 22; Canada 20; Thailand 16.
Rails and accessories ---do---	59	33	170	Australia 62; Mexico 32; Thailand 18; Pakistan 18.
Wire ---do---	269	329	393	United States 208; Thailand 36.
Pipes, tubes, and fittings:				
Cast pipes and tubes	20	7	10	Hong Kong 4; Ryukyu Islands 2; Singapore 2.
Seamless pipes and tubes	230	253	401	U.S.S.R. 112; mainland China 68; United States 43.
Other pipes and tubes	467	667	869	United States 488; Saudi Arabia 67.
Fittings	35	34	145	United States 98; Peru 10.
Castings and forgings	(1)	(1)	1	Mainly to United States.
Lead:				
Oxides	-------	-------	222	U.S.S.R. 200.
Metal and alloys, unwrought and semimanufactures.	3,897	1,301	11,535	United States 4,791; Taiwan 3,157; South Korea 1,404.
Magnesium metal and alloys, all forms	20	22	107	United States 52; Netherlands 50.
Manganese:				
Ore and concentrate	486	-------	362	United Kingdom 173.
Oxides	r 9,102	11,577	18,939	West Germany 2,042; United Kingdom 1,700.
Mercury ---76-pound flasks---	464	-------	2,610	Taiwan 1,595; Netherlands 725.
Molybdenum metal and alloys, all forms	28	125	25	Australia 13; New Zealand 5.
Nickel:				
Ore, concentrate, matte and speiss	-------	657	723	All to West Germany.
Metal and alloys, unwrought and semimanufactures.	133	250	384	Mainland China 186; Thailand 58.
Platinum group metals and alloys, all forms thousand troy ounces	44	5	6	United States 5.
Selenium	48	46	31	United Kingdom 22.
Silver and alloys, unwrought and semimanufactures ---thousand troy ounces---	142	2,913	154	Taiwan 60; United States 50; South Korea 36.
Tantalum, metal and alloys, all forms	51	-------	4	West Germany 3.
Tin:				
Ore and concentrate ---long tons---	-------	-------	18	All to United Kingdom.
Oxides ---do---	-------	-------	87	United States 56; United Kingdom 15.
Metal and alloys, unwrought and semimanufactures ---long tons---	1,049	112	331	Thailand 110; Netherlands 70; United Kingdom 64.
Titanium:				
Oxides:				
Rutile type	13,234	20,812	21,129	Mainland China 4,029; United States 3,271.
Other	10,720	15,166	16,984	United States 9,358; mainland China 2,734.
Metal including alloys, all forms	1,435	1,689	3,536	United States 2,433; United Kingdom 683.
Tungsten:				
Ore and concentrate	-------	-------	20	All to North Korea.
Metal and alloys, all forms	56	15	106	India 80; West Germany 8.
Zinc:				
Oxides	159	173	337	Indonesia 217; Singapore 44.
Dust (blue powder)	-------	-------	440	India 323; Taiwan 60; South Korea 52.
Metal and alloys:				
Unwrought	1,139	5,405	55,404	United States 13,090; Italy 7,748; India 7,703.
Semimanufactures	797	858	1,071	Taiwan 186; Indonesia 167; Hong Kong 118; India 117; Philippines 109.
Other:				
Ores and concentrates, n.e.s.	-------	-------	1,705	Unspecified 1,023; Taiwan 610.
Metalliferous nonferrous waste and scrap	421	135	19	All to United Kingdom.
Arsenic, boron, phosphorus, silicon, and tellurium.	NA	NA	461	United States 182; India 119; Pakistan 48.
Alkali, alkaline earth, and rare-earth metals	-------	-------	49	NA.
Ferrocerium and other pyrophoric alloys	71	111	113	Hong Kong 45; Thailand 18; Singapore 13.
Nonferrous base metals, n.e.s.	7,502	6,157	11,271	United States 3,463; United Kingdom 2,704; U.S.S.R. 1,420; West Germany 1,360.

See footnotes at end of table.

Table 2.—Japan: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Nonmetals:				
Abrasives, except diamond, n.e.s.	348	463	496	Taiwan 339.
Asbestos, crude	108	54	769	NA.
Cement thousand tons	2,011	r 1,781	1,601	Indonesia 263; Hong Kong 241; Ryukyu Islands 218; Singapore 209.
Chalk	9,753	8,350	8,470	Thailand 1,997; Hong Kong 1,996; Singapore 1,455.
Clays and clay products:				
Crude, clay, n.e.s.	9,897	30,651	46,534	Pakistan 30,486; Philippines 6,310.
Construction materials:				
Refractory	11,273	19,617	39,545	Philippines 8,262; Pakistan 7,895; South Korea 6,074.
Nonrefractory thousand tons	188	NA	NA	Over half to United States on basis of value.
Diamond:				
Industrial thousand carats	70	65	110	United Kingdom 50; South Korea 15.
Gem, not set or strung do	16	2,006	676	Netherlands 557; Australia 75.
Diatomite and other infusorial earths	156	456	443	Malaya 190.
Dolomite, crude and calcined	1,845	2,316	2,277	Philippines 2,080.
Feldspar, fluorspar and nepheline syenite	1,802	1,776	2,619	Taiwan 2,280.
Fertilizer materials:				
Crude:				
Phosphatic	11,477	723	-------	
Other	170	11	-------	
Manufactured, excluding ammonia:				
Nitrogenous thousand tons	1,576	919	1,363	Mainland China 498; South Korea 394; Taiwan 194.
Phosphatic do	85	207	194	Mainland China 153.
Potassic do	9	10	18	Indonesia 9; Ryukyu Islands 7.
Mixed do	77	163	143	Mainland China 55; Philippines 21; Thailand 20; South Korea 18.
Ammonia, anhydrous do	45	58	71	Philippines 47; Australia 22.
Gems, including industrial precious and semi-precious stones, not elsewhere specified:				
Dust and powder, including diamond dust thousand carats	15	NA	25	Sweden 5; United Kingdom 5; United States 5.
Other, excluding diamond and including piezoelectric quartz kilograms	9,810	12,817	10,324	United States 4,505; India 3,203; Hong Kong 1,889.
Graphite, natural	421	351	700	Thailand 459; Burma 153.
Gypsum and plasters	7,502	7,002	7,335	Singapore 6,477.
Iodine	1,128	1,329	1,396	United States 366; France 312; West Germany 256; India 143.
Limestone, excluding dimension stone thousand tons	293	359	423	Hong Kong 216; Australia 200.
Lime	6,716	5,984	6,255	Singapore 1,827; Hong Kong 1,692; Ryukyu Islands 1,773.
Magnesite	3,452	13,605	10,895	United States 8,502; Canada 2,000.
Mica, all forms	529	72	82	Taiwan 38; mainland China 8.
Phosphorus, red	216	316	344	India 116; United States 97; Pakistan 48.
Pigments, mineral, iron oxides and hydroxides	273	403	333	Taiwan 220; West Germany 40.
Sodium and potassium hydroxides and peroxides	30,729	42,655	55,142	U.S.S.R. 19,943; Burma 8,200; India 7,637; Philippines 6,045.
Stone, sand and gravel:				
Dimension stone; n.e.s.:				
Crude, roughly split and roughly squared.	544	443	409	Ryukyu Islands 323.
Worked	950	1,292	1,104	Cambodia 750; Ryukyu Islands 164.
Gravel and crushed stone	3,074	4,965	1,063	Ryukyu Islands 269; United States 204; Singapore 104.
Grinding and polishing wheels and stones	531	801	988	United States 166; Philippines 153.
Quartz and quartzite	-------	-------	371	NA.
Sand, excluding metal-bearing	918	1,462	1,969	Hong Kong 1,337; Philippines 439.
Sulfur:				
Elemental, all forms	135	156	191	NA.
Sulfuric acid	2,669	750	634	Indonesia 239; Ryukyu Islands 145.
Talc, soapstone and steatite	3,029	639	4,836	NA.
Other:				
Slags, dross, scalings, and other non-metal-bearing wastes of metallurgical works.	1,065	6,777	1,888	NA.
Oxides of barium, magnesium, and strontium.	NA	NA	13,260	United States 7,150; Australia 4,670.
Crude nonmetallic substances, n.e.s.	NA	NA	1,723	Taiwan 1,339.

See footnotes at end of table.

Table 2.—Japan: Exports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Mineral fuels:				
Coal, coke, and briquets:				
Coal—thousand tons	92	60	67	Mainly to South Korea.
Coke	16	10	29	South Korea 18; Hong Kong 4; Philippines 3; Thailand 3.
Carbon black	4,789	9,000	9,675	Mainland China 2,222; U.S.S.R. 1,831; Taiwan 1,537; Indonesia 1,140.
Gas, fuel, natural and manufactured	2,181	3,037	1,184,572	France 1,175,289.
Hydrogen and rare gases	30	49	42	Singapore 10; Philippines 4.
Petroleum:				
Partly refined oil thousand 42-gallon barrels	-------	18	46	South Korea 45.
Refinery products:				
Gasoline—do	2,062	r 2,585	3,333	Ryukyu Islands 1,124; United States 1,112; Australia 888.
Kerosine—do	683	1,383	1,407	Hong Kong 467; Ryukyu Islands 371; Australia 165.
Fuel oil:				
Distillate—do	578	1,217	1,327	Ryukyu Islands 443; Australia 309; Thailand 151.
Residual—do	1	r 192	106	South Korea 97.
Lubricating oil—do	2,785	r 647	916	Taiwan 525; South Korea 293.
Greases	4,533	1,488	4,924	Malaya 3,198.
Petroleum jelly and wax thousand tons	8	12	13	Philippines 2; Taiwan 2; Brazil 2; South Korea 1; Peru 1; Dominican Republic 1.
Bitumen—do	176	96	94	Indonesia 42; Pakistan 18; Burma 13.
Other—do	30	37	24	All to South Korea.

r Revised. NA Not available.
[1] Less than ½ unit.

Table 3.—Japan: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals:				
Aluminum:				
Bauxite and concentrates of aluminum thousand tons	1,421	1,622	1,675	Indonesia 564; Malaya 457; Australia 419.
Alumina, all forms	r 49,900	r 50,233	54,747	Australia 54,212.
Metal and alloys:				
Scrap	18,526	25,231	9,376	United States 4,328; Canada 1,363; Hong Kong 1,048.
Unwrought	23,239	r 34,395	42,310	Canada 22,933; U.S.S.R. 13,850; United States 4,895.
Semimanufactures	838	1,817	940	United States 704.
Antimony, ore and concentrate	6,196	6,501	4,545	Bolivia 1,606; mainland China 1,144.
Arsenic, oxides and acids	2,676	2,204	2,567	France 1,749; Sweden 760.
Chromium:				
Chromite[1]	226,516	396,427	360,299	Philippines 113,971; Turkey 109,200; Republic of South Africa 52,223.
Oxides	50	52	106	All from West Germany.
Copper:				
Ore, concentrate and matte	600,150	620,381	618,621	Philippines 246,631; Canada 188,998.
Metal and alloys:				
Scrap	82,850	107,907	64,949	United States 42,227.
Ingot	r 56,377	r 122,418	115,038	Zambia 81,251; United States 22,827.
Semimanufactures	1,279	5,978	11,527	Chile 7,394; United Kingdom 2,936.
Iron and steel:				
Iron ore, including roasted pyrite thousand tons	26,268	31,236	39,018	India (including Goa) 7,913; Malaya 6,956; Chile 6,929; Peru 4,532.
Scrap[2]—do	4,368	4,986	3,363	United States 2,315; India 432.
Pig iron and ferroalloys—do	1,565	3,423	2,640	U.S.S.R. 775; South Africa 541; mainland China 528.
Ingots and other primary forms—do	4	7	2	Spain 1.
Semimanufactures—do	49	27	22	Australia 8; United States 7.

See footnotes at end of table.

Table 3.—Japan: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals—Continued				
Lead:				
Ore and concentrate	68,649	51,704	67,247	Australia 33,089; Bolivia 11,041; Peru 10,361; South Korea 6,782.
Metal, all forms	25,084	70,417	41,262	Peru 10,659; Australia 9,297; Republic of South Africa 8,827.
Magnesium, unwrought and semimanufactures	495	898	569	United States 394.
Manganese ore and concentrate[3]	367,730	558,951	1,064,839	India 457,080; U.S.S.R. 108,228; Brazil 103,402.
Mercury—76-pound flasks	3,026	5,065	2,747	Italy 1,329; Spain 1,279.
Molybdenum:				
Ore and concentrate	3,100	5,078	5,032	United States 3,010; Canada 1,066.
Metal, all forms	6	112	62	U.S.S.R. 40; United States 12.
Nickel:				
Ore and concentrate (low grade)	679,496	1,143,228	966,742	New Caledonia 862,829; Indonesia 79,450.
Matte	r 3,931	5,429	4,357	New Caledonia 4,344.
Metal and alloy products	r 9,960	r 3,398	3,314	Canada 1,709; Norway 826.
Palladium—thousand troy ounces	147	168	261	U.S.S.R. 213; United Kingdom 34.
Platinum—do	277	166	181	U.S.S.R. 84; United Kingdom 55.
Silver—do	3,675	9,937	4,789	United States 3,212; Peru 1,382.
Tantalum	6	119	137	United States 106.
Tin:				
Ore and concentrate—long tons	1,589	2,811	762	Thailand 741.
Metals and alloys, unwrought and semimanufactures—do	14,357	16,029	14,621	Malaya 12,835; mainland China 1,673.
Titanium:				
Ore and concentrate	141,890	185,986	211,949	Malaya 93,443; Australia 54,958; Ceylon 45,343.
Slag	26,739	42,110	32,676	All from Canada.
Tungsten:				
Concentrate	2,327	2,852	1,501	Australia 381; Peru 246; South Korea 209; mainland China 174.
Metal, all forms	8	2	2	Mainly from the United States.
Vanadium concentrate	758	NA	93	South Africa 41; Republic of the Congo (Lèopoldville) 25; United States 17.
Zinc:				
Ore and concentrate	147,506	288,447	380,332	Peru 204,117; Mexico 44,237.
Metal, including alloys, unwrought and manufactures.	8,484	69,041	7,129	Australia 2,223; North Korea 1,489; U.S.S.R. 1,460.
Other:				
Precious metal ores	32	15	1,353	Peru 1,300.
Metal-bearing ash, slag, and other waste	9,177	93,378	10,496	United States 3,781; Australia 2,644; Zambia 1,059.
Metal oxides, primarily for use in paint	1,189	1,778	1,183	United States 469; West Germany 280; Belgium-Luxembourg 254.
Metals:				
Alkali and alkaline earth	11	16	19	West Germany 13.
Arsenic, boron, phosphorous, selenium, silicon, and tellurium.	312	203	530	United States 490.
Nonferrous base metals and alloys, n.e.s.	1,107	2,667	1,513	Republic of the Congo (Lèopoldville) 664; Belgium-Luxembourg 556.
Pyrophoric alloys	8	3	6	Australia 3.
Nonmetals:				
Abrasives, natural, crude, except diamond	1,854	2,382	2,172	United States 2,052.
Asbestos	115,492	143,969	133,522	Canada 71,767; Republic of South Africa 26,271.
Barite	5,904	11,343	14,310	Mainland China 8,902; India 3,094.
Boron materials:				
Crude natural borates	1,397	2,525	4,452	Turkey 3,358; United States 1,094.
Boric oxides and acids	6,146	7,504	6,235	United States 6,234.
Cement	2,564	5,458	3,663	France 3,262.
Clay and clay products:				
Kaolin	49,066	53,769	60,068	United States 31,533; South Korea 21,050.
Other crude clay	64,113	108,991	111,228	Republic of South Africa 53,234; United States 24,453; South Korea 16,369.
Clay products including refractories	5,237	9,389	5,917	United States 4,585.
Cryolite and chiolite	6,411	7,547	6,334	All from Denmark.
Diamond:				
Industrial—thousand carats	170	385	390	United Kingdom 135; United States 120; Netherlands 60; Belgium 30.
Other, not set or strung—do	574	699	330	Belgium 108; Israel 83; Netherlands 41, United Kingdom 26.
Dolomite	4,905	12,671	20,649	South Korea 20,619.

See footnotes at end of table.

Table 3.—Japan: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Nonmetals—Continued				
Fertilizer materials:				
Crude:				
Phosphatic—thousand tons	2,063	2,316	2,418	United States 1,646; Morocco 271; Senegal 162; French Oceania 145; Togo 110.
Potassic	-------	2,561	19,511	United States 18,001.
Organic, including guano	3,540	5,763	544	United States 543.
Manufactured:				
Potassic—thousand tons	1,075	1,073	1,083	Canada 356; United States 341; U.S.S.R. 168.
Other, including mixed	26	1,161	7,624	All from United States.
Feldspar, fluorspar, and nepheline syenite:				
Fluorspar	128,892	206,840	171,561	Mainland China 62,420; Thailand 50,887; South Korea 30,413.
Other	2,909	5,985	4,325	South Korea 2,445.
Gem stones, including industrial:				
Dust and powder, including diamond—kilograms	253	-------	359	United States 132; United Kingdom 101.
Unworked and partly worked, excluding diamond—do	153,254	258,711	296,632	Brazil 172,186; Republic of South Africa 46,542.
Graphite:				
Crystalline and special amorphous	4,952	6,483	6,195	Ceylon 1,782; South Korea 1,596; Malagasy Republic 1,004.
Amorphous	56,346	50,185	46,067	South Korea 40,201; North Korea 5,815.
Gypsum and plasters	108,312	90,988	50,332	Morocco 25,232; United Arab Republic 25,016.
Limestone, excluding dimension stone	-------	1,016	-------	
Magnesite, including magnesia clinker	23,454	24,007	26,171	North Korea 12,046; mainland China 6,257; U.S.S.R. 4,123.
Mica, crude and partly worked	3,397	5,588	6,612	India 5,493.
Salt—thousand tons	2,948	3,634	3,543	Mexico 911; mainland China 785; United States 374.
Stone, sand and gravel:				
Quartz and quartzite:				
Electronic and optical grade	173	228	226	Brazil 162; United States 46.
Other crude and partly worked	16,919	41,764	41,847	South Korea 35,543.
Dimension stone:				
Crude and partly worked	12,933	31,063	32,164	Italy 7,443; Sweden 5,039; Republic of South Africa 3,294.
Worked	830	3,341	1,219	Mainland China 967.
Gravel and crushed stone	7,602	13,256	11,943	South Korea 5,073; France 3,738; mainland China 1,798.
Sand, excluding metal-bearing sand	133,343	179,199	96,607	South Viet-Nam 94,494.
Grinding stones and wheels	117	128	NA	NA.
Sulfur and pyrite:				
Sulfur, all types	13,794	24,615	53,972	Canada 28,749; mainland China 25,200.
Pyrite, unroasted	13,215	-------	29,440	U.S.S.R. 15,155; Canada 8,806.
Talc, soapstone, and pyrophyllite:				
Talc	15,854	26,827	25,094	Mainland China 11,303; South Korea 5,000; U.S.S.R. 4,465.
Soapstone (natural steatite)	30,602	33,931	28,582	U.S.S.R. 10,335; mainland China 8,630; South Korea 7,145.
Other:				
Nonmetals, crude, n.e.s.	46,402	77,247	61,077	Philippines 34,142; South Korea 6,585.
Slag and similar metallurgical waste, not containing metal	121,714	123,390	162,187	India 94,708; Canada 32,676.
Oxides of barium, strontium, and magnesium.	13,237	4,750	115	United States 83.
Mineral fuels:				
Asphalt and bitumen, natural, crude	3,648	3,944	3,269	United States 3,266.
Carbon black	3,971	2,716	2,075	United States 1,924.
Coal and coke:				
Anthracite coal—thousand tons	1,238	1,238	1,165	North Viet-Nam 428; South Korea 215; Republic of South Africa 182.
Heavy coking coal:				
With less than 8 percent ash—do	5,707	6,856	8,769	United States 6,745; Australia 1,745.
With more than 8 percent ash—do	2,736	3,450	4,721	Australia 2,855; U.S.S.R. 783.
Other bituminous coal, mainly for coking—do	1,462	1,689	2,475	Australia 2,020.
Total—do	11,143	13,233	17,130	
Coke—do	-------	-------	49	Mainly from West Germany.
Gas, natural and manufactured (liquefied)	198,001	380,929	503,160	Kuwait 319,282; Saudi Arabia 157,179.
Gases, hydrogen and rare	13	20	109	Canada 91.

See footnotes at end of table.

Table 3.—Japan: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Mineral fuels—Continued				
Petroleum:				
Crude—thousand 42-gallon barrels	r 365,530	r 444,877	508,467	Kuwait 205,084; Iran 110,318; Saudi Arabia 96,353, Kuwait-Saudi Arabia Neutral Zone 69,869.
Partly refined—do	9,109	9,117	20,777	Kuwait 10,292; Venezuela 3,058.
Refinery products:				
Gasoline—do	740	3,544	4,114	Kuwait 1,056; United Arab Republic 892; Saudi Arabia 712; Indonesia 447.
Kerosine—do	881	219	202	Mainly from United States.
Distillate fuel oil—do	15,637	200	220	Venezuela 211.
Residual fuel oil—do	r 51,917	76,497	89,366	Kuwait 13,440; Iran 11,588; Saudi Arabia 11,024; U.S.S.R. 9,051.
Lubricants—do	2,982	3,064	3,650	NA.
Petrolatum and waxes—do	61	74	67	Mainly from United States.
Petroleum coke—do	r 3,256	r 4,892	5,288	United States 4,716.
Other—do	8	20	1,783	U.S.S.R. 706; Saudi Arabia 302; Netherlands Antilles 265; Venezuela 221.

NA Not available.
[1] Includes both refractory and metallurgical chromite; originating in the Philippines is refractory grade.
[2] Includes only that scrap classified as for smelting; scrap classified as suitable for remanufacturing comprising 223,549 tons in 1963, 113,439 tons in 1964, 43,479 tons in 1965 is not included.
[3] Includes ferruginous manganese ore, which amounted to 115,430 tons in 1963, 226,424 tons in 1964, and 365,109 tons in 1965.

lion) of the total in 1964 and 36 percent ($47 million) in 1965. All metals as a group together accounted for 83 percent and 85 percent of the total mineral commodity exports in 1964 and 1965 respectively. Exports of nonmetals, chiefly cement and chemical fertilizers, and petroleum refinery products accounted for most of the remainder of the mineral exports. Of these latter commodities, the United States imported less than $1 million while most of the balance was exported to mainland China and other Far Eastern countries.

Approximately 32 percent of Japan's total mineral commodity import expenditure was for crude and partly refined petroleum in 1965. Kuwait, Iran, Saudi Arabia, and the Kuwait-Saudi Arabia Neutral Zone accounted for 79 percent of the crude petroleum shipped to Japan in that year. Petroleum refinery products, mainly for domestic consumption for energy purposes and as feedstocks for the expanding petrochemical industry, accounted for an additional 9 percent of total mineral commodity imports. Ranking behind petroleum and its products among Japanese mineral imports in 1964 and 1965 was iron ore, which came mainly from Malaya, Peru, and Chile, and was valued at $420 million in 1964 and $524 million in 1965, accounting for 14 and 16 percent of the total mineral imports during these 2 years, respectively. Adding the iron and steel scrap and semimanufactured imports to iron ore the combined sum would total over 25 percent of the aggregate mineral commodity imports in 1964 and 1965. In these latter categories, especially the scrap, the United States was the chief supplier. Nonferrous ores and metals (including scrap), mostly from nearby Far Eastern countries, totaled about 18 percent of the mineral imports in both 1964 and 1965. Coal, coke, and briquets, predominantly from the United States and Australia, amounted to $211 million in 1964 and $272 million in 1965 and accounted for 7 and 8 percent, respectively, of total mineral imports during these years.

COMMODITY REVIEW

METALS

Aluminum.—Japan's aluminum industry remained entirely dependent upon foreign sources for its bauxite; Indonesia, Malaysia, and Australia together provided approximately 86 percent of Japan's bauxite imports in 1965. At yearend 1965, Japan's ingot aluminum production capacity was almost 350,000 tons. Approximate capacities of major Japanese aluminum smelters at yearend 1965 were Mitsubishi Chemical Industries Limited, 60,000 tons; Nippon Light Metal Co., Ltd., 125,000 tons; Showa

Denko K.K., 80,000 tons; and Sumitomo Chemical Co., Ltd., 80,000 tons.[4]

Aluminum ingot production in 1965 increased about 11 percent to nearly 294,000 tons while that of semimanufactured aluminum products declined almost 6 percent to 157,000 tons. The decline in output of semimanufactures, including rolling mill and diecast products, resulted from production cutbacks in Japan's electric machinery industry, the country's major consumer of the metal. Decreased demand for aluminum semimanufactures also brought about the slower expansion rate in ingot output (11 percent between 1964 and 1965 compared with 19 percent between 1963 and 1964). In addition to a slackened domestic consumer demand, the smallness of Japan's share of the international market and growing inventories of all types of aluminum products concomitant with increasing capacities all along the production line, aggravated the Japanese aluminum industry in 1965.

Despite these market conditions, several aluminum smelters expanded or made plans to expand their facilities in 1965; an overall expansion of 100,000 tons by 1968 was planned. Capacity of Mitsubishi Chemical's aluminum refinery at Naoetsu, on the west coast of Honshu, was doubled to 60,000 tons per year by completion of new facilities during the latter part of 1965. An official of Nippon Light Metal Co., Ltd., announced in late 1965 that his company completed plans to establish a 50,000-ton-per-year aluminum smelter. Reportedly, the new plant will be either near Shimizu or near Kambata, and construction was planned to begin in 1966 with completion expected during 1968. Also Sumitomo Chemical Co., Ltd., announced completion of plans for a refinery at Niihama in North Shikoku. Construction of the new plant was to be achieved in several stages, with completion of the 30,000-ton-per-year first stage due in October 1967 at an estimated cost of approximately $22 million. Under existing plans, the second and third stages will each add 30,000 tons per year to capacity. Completion dates for these later two stages were scheduled for 1969 and 1971. The fourth and final currently planned stage will add another 15,000 tons to annual capacity to give a total plant capacity of 105,000 tons yearly. Completion date for the fourth stage was scheduled for 1973. These capacities, together with those of the firm's facilities existing in 1965, will give Sumitomo a total annual capacity of 185,000 tons of primary aluminum by 1973.[5]

Because domestic aluminum consumption showed little promise for significant increase in the foreseeable future under existing market conditions, aluminum manufacturers were active during 1965 in promoting wider application of aluminum in existing products and in obtaining a larger share of the existing international market. In developing greater use for aluminum, Nippon Light Metal, Furukawa Electric Co., Showa Denko, and Hitachi Wire and Cable Co. have organized their affiliated firms to specialize in utilizing aluminum in the manufacture of vehicles, construction materials, and household utensils and appliances. In developing foreign markets, Nippon Light Metal Co. signed a contract with mainland China for the export of 600 tons of aluminum ingots. This company also has been seeking other Communist countries as outlets for aluminum, while other companies sought to expand their share in Southeast Asia's market. Japanese aluminum industry officials specifically sought long-term contracts for ingots. Notably, Mitsubishi Chemical in midyear concluded a contract to deliver ingots to a firm in the Philippines, and by yearend had shipped to that firm 2,000 tons on a trial basis.

Copper.—Japan's total ingot copper production increased by nearly 6 percent in 1965 with respect to 1964 output. Slightly over half of total output in both years was derived from imported ores, concentrates, and matte, and about a quarter of the total was produced from scrap; domestic ores provided slightly less than 25 percent of total metal production (primary and secondary).

Total value of copper imports in 1965 was approximately $271.7 million, including $128.2 million for copper ores, concentrates, and matte; $98.4 million for copper and copper alloy ingots and semimanufactures; and $45.1 million for copper scrap. The 1964 total was $253.4 million of which $102.2 million was for ores, concentrates, and matte, $87.0 million was for ingots and

[4] Japan Metal Bulletin. The Sangyo Press, Ltd. (Tokyo). No. 1887, Dec. 18, 1965, p. 3.
[5] Far Eastern Economic Review (Hong Kong). V. 49, No. 1, July 1, 1965, p. 29.

semimanufactures, and $64.2 million for scrap. The severe shortage of copper raw materials in 1965 brought about significant price increases. In 1964, Japanese buyers paid an average price of $154 per ton for copper ore and concentrate and $660 per ton for ingot; whereas, in 1965 the average price for ore and concentrate was $185 per ton and that for ingot was $750. Copper scrap prices went up to $695 per ton in 1965 from $595 in 1964. At these high prices, Japan's importers were extremely aggressive in locating copper raw materials, and this aggressiveness drew a formal protest from West Germany to the Nonferrous Metal Committee of the Organization for Economic Cooperation and Development (OECD).

One effect of the copper ore shortage was to induce some of the Japanese copper smelters to import greater amounts of blister copper. In this regard, Toho Zinc Co., Ltd., contracted for 8,000 tons of such copper from a South African firm to be delivered over a 2-year period beginning in April 1966.

The price increases for copper raw materials were exceeded by gains in world prices for copper products, and the heavy international demand resulted in increased exports of copper products from Japan. Export of unwrought copper and alloys in 1965 amounted to 2,681 tons compared with 1,621 tons in 1964 and copper and copper alloy semimanufacture shipments totaled 50,440 tons compared with 26,652 tons in 1964. Value of 1965 exports totaled $2.5 million for unwrought metal and $50.4 million for semimanufactures. In 1964, value for unwrought metal exports was only $1.2 million and that for semimanufactures $21.8 million. The most notable increase in the export of copper was in the case of materials for electrical purposes, which went from 3,200 tons in 1964 to 10,400 tons in 1965. Largest importers of these particular items during the year were West Germany, Taiwan, Thailand, and Hong Kong. International demand for copper commodities was so heavy in 1965 that Japanese firms acting previously as importers of copper commodities became exporters of copper alloys, scrap, sheets, wire, and other copper semimanufactures to the extent that there was a shortage of such commodities in the domestic market.

Thus, under conditions of heavy exports of copper in all forms and high raw material costs, prices for copper in Japan's domestic market in 1965 soared, with prices for some of the semifinished goods more than doubling by the latter part of 1965. As a consequence, Japan's copper consumers suffered from rising prices and declining domestic material availability. These factors and others depressed domestic consumption of copper more than one-half in comparison with the 1964 level. In an attempt to bring relief to the domestic users, the Ministry of International Trade and Industry issued regulative measures to restrict copper exports. These measures, however, were put into effect too late to have any great effects during 1965.

The general Japanese recession during a greater part of 1965 further aggravated the situation. Had there been no recession or one of much shorter duration, the severity of the Japanese copper consumers' plight might have been much less; but, as it was, Japanese copper producers were confronted with a dilemma by yearend. If they raised domestic prices commensurate to those in the world market, they risked the possibility that local consumers might cease operations thereby reducing the producers' sales, but if the producers did not raise prices, they would suffer losses because of raw material costs and the embargo on copper exports.

Believing that the copper ore shortage would persist at least into the foreseeable future, six Japanese copper smelters jointly accepted a request from the U.S.S.R. to develop a copper mine about 480 kilometers east of Lake Baikal. Participants in the joint venture were Mitsui Mining and Smelting Co., Ltd., Dowa Mining Co., Ltd., Nippon Mining Co., Ltd., Mitsubishi Metal Mining Co., Ltd., Sumitomo Shoji Kaisha, Ltd., and Sumitomo Metal Mining Co., Ltd. These six firms also have been negotiating jointly with the Indian State of Madras to develop a copper mine there with Japanese capital.[6] Dowa Mining Co., Ltd., with the cooperation of the Daiwa Bank, Ltd., laid plans to establish a new copper mining company in Fiji under the name of Fiji Mining Co. The new firm, capitalized at about $835,000, will have Banno Mining Co. carry out its mining operations at the Undu mine on the island

[6] Far Eastern Economic Review (Hong Kong). V. 51, No. 7, Feb. 17, 1966, pp. 331–332.

of Vanua Levu. Development of the mine will start with surface deposits, reserves of which were estimated to total 135,000 tons of ore with an average 5 percent copper content. Initial output has been scheduled for 2,500 tons per month, beginning in early 1967.[7] Furukawa Mining Co. discovered a new copper vein at its Ashio mine with reserves estimated at 500,000 tons with a copper content between 1.8 and 2.0 percent. Officials of the firm believed the new vein can be economically exploited because of the existing equipment at the mine.[8]

This intensive search for copper raw materials is in keeping with the industry's increased smelting capacity. In September 1965 Onahama Smelting and Refining Co. inaugurated its 5,000-ton-per-month copper smelting facilities. Onahama was jointly formed by Mitsubishi Metal Mining Co., Dowa Mining Co., and Furukawa Electric Industry Co. in 1962 for large-scale smelting. Onahama has made plans to double its existing capacity in the immediate future and has invited three other large copper smelting concerns to participate in the second phase of the joint venture. Should these concerns—Mitsui Mining and Smelting Co., Sumitomo Mining Co., and Nippon Mining Co.—accept the invitation, Onahama will become a unique company in which all the six firms currently constituting Japan's copper smelting industry will have a share.

Although electrolytic copper output was 30,000 tons more in 1965 than that produced in 1964, semimanufactured copper products output, chiefly rolled copper, was down to 312,000 tons in 1965 from 392,000 tons in 1964. Moreover, as a result of raw material costs and other economic factors, smelter output was cut by about 10 percent in late 1965.

Monthly rolled copper consumption in Japan in 1965 by various major users were as follows: Industry, 110 tons; chemical industry, 242 tons; metal products, 6,547 tons; electric machines, 3,139 tons; telecommunication, 1,573 tons; rolling stocks, 1,540 tons; shipbuilding, 585 tons; military ordnance, 130 tons; general machinery, 2,367 tons; other manufacturing industry, 4,721 tons; construction, 984 tons; semifinished products, 2,770 tons; exports, 2,568 tons.[9] Total monthly domestic requirement of rolled copper averages approximately 25,000 tons; and with exports added, the requirement would be 28,000 tons per month or about 336,000 tons annually.

Ferroalloys, Ferroalloy Metals, and Their Ores.—Output of ferroalloys in 1965 was 687,566 tons compared with the record high of 692,632 tons achieved in 1964. The 1965 production, however, slightly exceeded the year's target output of 684,002 tons by Japan's 33 ferroalloy producers and was considerably more than the projected demand of 609,400 tons.[10]

The curtailment in ferroalloy output was precipitated by cutbacks in special steel production during the latter half of 1965. Although the decline was small when compared with the 1964 figure, it was sufficient to cause some diseconomies of scale of production which in turn induced some financial strains, especially among the smaller producers and traders. As a result of generally unfavorable events during early 1965 and an expected sluggish market in the immediate future, Japanese ferroalloy producers hastened during the late months of 1965 to restructure their industry via mergers and cartelization. Upon the recommendation of the Ministry of International Trade and Industry (MITI), Tekkosha Co., Lt., Azunia Kako Co., Ltd., and Toshiba Denko Co., Ltd., were studying the feasibility of a merger. In 1964, the combined output of these firms constituted 27.8 percent of total ferromanganese output, 11.6 percent of ferrosilicon output, 32.1 percent of total ferrochrome output, and 25.5 percent of total ferroalloy production. If merged, the resulting company would be the largest ferroalloy producer in Japan.[11] In late November 1965, the Fair Trade Commission approved a 21-firm application for the formation of a ferroalloy cartel during the period October 18, 1965, to March 31, 1966. Primary function of the cartel was to regulate production and sales to maintain prices.[12]

Japan continued to rely very heavily on

[7] Mining Journal (London). V. 266, No. 6818. Apr. 22, 1966, p. 290.
[8] Engineering Mining Journal. V. 37, No. 1, Jan. 3, 1966, p. 2.
[9] Japan Metal Bulletin. The Sangyo Press, Ltd. (Tokyo). No. 1836, Aug. 17, 1965, p. 3.
[10] Japan Metal Bulletin. The Sangyo Press, Ltd. (Tokyo). No. 1770, Mar. 13, 1965, p. 3.
[11] Japan Metal Bulletin. The Sangyo Press, Ltd. (Tokyo). No. 1866, Oct. 28, 1965, p. 1.
[12] Japan Metal Bulletin. The Sangyo Press, Ltd. (Tokyo). No. 1878, Nov. 27, 1965, p. 1.

imports for its sources of ferroalloy metals. India has been the chief source of manganese, and in 1964 supplied 84.4 percent of Japan's total manganese imports. However, in 1965 India's share fell to 457,000 tons (inclusive of ferruginous manganese ore and concentrates) or 42.9 percent of a total of 1,065,000 tons. The decline in India's share was principally caused by the 1965 confrontation between India and Pakistan. Subsequently, Japan imported higher cost manganese ores and concentrates from Brazil at an average price of about $33 per ton, Australia, $36 per ton, and New Hebrides, $38 per ton, compared with $29 per ton for Indian ore. However, Japan paid the Soviet Union, the second largest supplier of the commodity to Japan in 1965, only $18 per ton in 1964 and 1965. Chromite ores were still principally supplied by the Republic of the Philippines (32 percent) and nickel ores by New Caledonia (89 percent) in 1965. Molybdenum ores and concentrates were principally supplied by the United States (60 percent) and Canada (21 percent) during the same year.

Iron and Steel.—Despite the business recession during the second half of 1965, Japan's steel industry fared well and continued expansion and renovation plans. Overall production of pig iron, crude steel, and steel semimanufactures all attained new highs. Japan thus kept its place as the third largest producer of crude steel in 1965, outpaced only by the United States and the U.S.S.R. It was particularly noteworthy that the 1965 record outputs were attained in spite of a 10-percent production cutback, in force since July 1965, reflecting the significantly higher output rate during the first 6 months.

Production.—Of the total output of pig iron in 1965, blast furnaces accounted for 27.0 million tons. Blast furnaces in actual operation during 1965 numbered 46. Three new giant blast furnaces were put into commission in 1965: The No. 5 blast furnace (capacity, 2,142 cubic meters) at the Chiba Steel plant of Kawasaki Steel Corp. in March; the No. 3 blast furnace (1,650 cubic meters) at the Wakayama Works of Sumitomo Metal Industries in April; and the No. 1 blast furnace (2,047 cubic meters) at the Sakai installation of Yawata Iron and Steel Co., Ltd., in June.[13]

Fuji Steel Co. converted the No. 2 furnace at its Muroran complex (1,042 cubic meters capacity) into a high-pressure furnace (1,239 cubic meters). Total number of high-pressure furnaces at yearend 1965 was 13, 4 more than in 1964. Average blast furnace productivity in 1965 was 1.4 tons per cubic meter per day an average consumption of coke per ton of pig iron was 506 kilograms compared with 508 kilograms in 1964 and 521 kilograms in 1963. Yawata Steel Co. held the record during the year with an average of 486 kilograms for its 11 blast furnaces. The industry continued its research during the year on feasibility of using naphtha, natural gas, and light oils as reducing agents in developing new direct iron ore to steel processes.

The significant increase in output of pig iron in 1965 was ascribed to the rising proportion of crude steel produced by the Linz-Donawitz (LD) process which depends more heavily on pig iron as raw material. With the reduction in steel output during the second half of the year, leading Japanese steel producers continued to raise the operation rate of oxygen converters, resulting in a 10-percent increase in LD output compared with the first 6 months, while the more costly open-hearth output declined by 40 percent. LD steel production in 1965 amounted to 22.6 million tons, 5.0 million tons above the 1964 level, and 55 percent of the total 1965 crude steel output compared with 44 percent in 1964 and 38 percent in 1963. This proportion of oxygen converter steel is extremely high compared with that of the other leading steelmaking countries. The open-hearth method in Japan accounted for 21.6 percent of all the steel produced in 1965, and electric furnaces for 19.9 percent.

The product mix of the 1965 output of hot-rolled ordinary steel semimanufactures differed widely from that of 1964. In 1965, strip mill production was considerably below the 1964 level, while output of steel sections, shapes, and bars was significantly higher. Production of special or alloy steel products during 1965 declined from approximately 2.5 million tons to 2.4 million tons, chiefly because of slackened demand

[13] The Oriental Economist. Iron and Steel Industry Going Strong. V. 34, No. 666, April 1966, pp. 233–237.

for these steels by their prime consumers, the machine manufacturers. Approximate annual capacities and number of production units for various iron and steel products in Japan at yearend 1964 and 1965 were as follows:

Facility	Rated 1964 yearend capacity (thousand metric tons)	Units	Rated 1965 yearend capacity (thousand metric tons)	Units
Pig iron capacity:[1]				
Blast furnaces	22,162	41	25,534	48
Electric furnaces	632	72	523	55
Other furnaces	321	10	334	9
Total	23,115	123	26,391	112
Steelmaking capacity:[1]				
Open-hearth	16,463	118	11,318	82
Converters	16,468	36	24,745	45
Electric furnaces	11,346	763	11,357	722
Total	44,277	917	47,420	849
Heavy shape mills[2]	3,015	14	4,905	16
Medium and light shape mills[2]	16,532	592	18,440	594
Wire rod mills[2]	4,471	24	5,383	28
Heavy plate mills[2]	6,517	38	6,817	39
Hot strip mills[2]	15,900	11	16,974	14
Cold strip mills[2]	8,116	43	e 10,000	48
Steel tube mills[2]	3,859	187	e 4,000	187

e Estimate.
[1] Statistical Year Book for 1965. The Japan Iron and Steel Federation (Tokyo), 1966, pp. 24–25.
[2] Japan Metal Bulletin. Sangyo Press, Ltd. (Tokyo). Jan. 30, 1965, p. 3 (1964 data). Feb. 13, 1965, p. 3 (1965 data). May 27, 1965, p. 2 (1965 data). Nov. 11, 1965, pp. 1–2 (1964 data).

Trade.—Japan's lack of sufficient domestic raw materials to supply its steel industry continued to necessitate imports of huge quantities of iron ore, coal, and iron and steel scrap. In 1965, only 1.5 million tons of domestic iron ore (iron sand) was produced, while about 39 million tons was imported. Thus, more than 95 percent of Japan's annual iron ore needs were met by imports. Of the 1965 total import, about 20 percent came from Malaya, 19 percent from India (including Goa), 17 percent from Chile, 11 percent from Peru, 7 percent from the United States, and 5 percent from Canada.

Imports of iron ore in the near future may be even closer to 100 percent of requirements since Yawata Iron and Steel Co., Ltd., decided recently to dissolve its affiliated Ariake Iron Manufacturing Co., which was established in March 1961 to produce steel from iron sand in Ariake Bay, Kyushu. Reasons for the dissolution were that steel production from iron sand was not economical, iron sand resources in Ariake Bay were not accurately surveyed, and iron sand found in deeper areas of the ocean floor was uneconomical to exploit. Officials of Yawata also decided to dismantle Ariake's equipment and transported it to one of Yawata's complexes to produce sponge iron. Ariake's 50-acre site will house some other company in the Yawata group.[14]

Japan's 1965 importation of iron and steel scrap was 1.7 million tons lower than in 1964, chiefly because of increased operations of LD converters, and because of a continuing trend toward greater use of these furnaces and reduced use of open hearths, further decreases in scrap imports are expected. Of the 1965 total scrap iron and steel imports, the United States supplied approximately 68.8 percent; India, 12.8 percent; Australia, 8.6 percent; and U.S.S.R., 2.6 percent.

Exports of iron and steel products in 1965, at 9.91 million tons, were equivalent to 12.71 million tons of crude steel, compared with 6.92 million tons, equivalent to 8.95 million tons of crude steel, in 1964. Ordinary rolled steel products constituted by far the largest part of the total. For example, in 1964 and 1965, respectively, the exports of this commodity were 5.91 million tons (valued at $735 million) and 8.24 million tons (valued at $1,009 million). The United States purchased 2.10 million tons of these products in 1964 and 3.73 million tons in 1965. The other major categories of iron and steel commodities exported during 1964 and 1965 were, respec-

[14] Japan Metal Bulletin. Yawata Dissolves Affiliated Ariake Iron Mfg. The Sangyo Press, Ltd. (Tokyo). No. 1897, Jan. 22, 1966, p. 2.

tively, reprocessed steel products, 707,000 and 808,000 tons; incompletely finished steel products, 59,000 and 459,000 tons; and rolled special steel products, 221,000 and 346,000 tons. The United States was also a major buyer in these categories except in the incompletely finished products in which it bought only very small amounts in both years.

Consumption.—Domestic consumption of iron and steel products was approximately 77.5 percent and 69.2 percent of the 1964 and 1965 crude steel output, respectively. Out of a total of 32.45 million tons of rolled steel products produced in 1965, domestic users consumed 25.30 million tons during the year, an increase of 9.4 percent over the previous year's total. Breakdown of domestic end uses for 1965 was as follows, in thousand metric tons: Construction and civil engineering, 4,049; shipbuilding 2,153; autos, 1,200; billets, semis, and casting steel, 887; industrial machinery, 645; electrical machinery, 463; household and business machines, 148; rolling stock 95; bicycles 40; other machinery and tools, 20; deliveries to dealers, 4,743.[15]

Financial Situation.—Japan's steel industry's rapid growth in very recent years, 26.3 percent in 1964 and 14.4 percent in 1963, was not without growth pains, external economic dislocations, and internal structural imbalances. One of the more serious problems facing the industry in 1965 was its financial structure vulnerability. Reportedly[16] large investments in plant and equipment during recent years have not been compensated sufficiently by increases in production and sales; thus overall net profits were not proportional to physical expansion of the industry. To offset lower net profits, there was some reduction in raw material and other factor costs, but, in general, these reductions were not sufficient to offset investment costs. Aggravating the situation further was the general decrease in the number of governmental policies to hedge business earnings; such as accelerated depreciations, retained profits, and other nonoperating expenses. These and other conditions resulted in an increased rigidity in the industry's income-expense structure with a concomitant rise in Japan's steel industry break-even point, which, for example, went from 77 percent of sales in 1960 to 90 percent of sales in 1963.

The weak financial structure of the industry was emphasized by Sanyo Special Steel Co., Ltd., which went into receivership in early 1964. An article pointed out that the bankruptcy of Sanyo Steel and other large industrial enterprises in recent years revealed weaknesses in the interlocking structure of Japanese business and banking firms.[17]

Capital investment plans of 107 steel companies for the 1966 Japanese fiscal year (April 1, 1966, through March 31, 1967) were recently summed up and released by the Ministry of International Trade and Industry (MITI). These data together with comparable figures for the previous fiscal year were as follows, by categories:

Category	Number of companies	Capital investment (million dollars)	
		1965[1]	1966[1]
Ordinary steel	35	441.7	517.5
Special steel	21	39.6	38.6
Special wires	7	1.7	1.9
Ferroalloys	26	6.7	8.6
Secondary products	18	20.3	15.6
Total	107	510.0	582.2

[1] Fiscal year ended March 31.
Source: Japan Metal Bulletin. The Sangyo Press, Ltd. (Tokyo). No. 1934, Apr. 19, 1966, p. 1.

Technology.—Japan's steel industry has also increased use of automatic and automated controls. In 1965, more automatic equipment was installed to handle raw materials, especially of ore from carrier to blast furnace, and computers for operation of open-hearth furnaces were initiated at Nippon Kokan Kabushiki Kaisha's Kawasaki plant. The latter operation was said to be the first in the world. More rolling mills were also equipped with automated devices in 1965 with concomitant production increases. As an illustration, output of buttwelded pipes increased from 7.5 tons per hour in 1964 to from 9 to 10 tons per hour after automation.

There also has been a rapid increase in Japanese utilization of continuous casting

[15] Japan Metal Bulletin. How Was the Steel Used in 1965? The Sangyo Press, Ltd. (Tokyo). No. 1919, Feb. 22, 1966, p. 2.
[16] Survey of Japanese Finance and Industry. An Analysis of the Steel Industry's Investment Levels. The Industrial Bank of Japan, Ltd. (Tokyo). V. 12, No. 4, October–December 1965, 12 pp.
[17] Conde, D. Far Eastern Economic Review (Hong Kong). V. 50, No. 6, Nov. 11, 1965, pp. 294–297.

machines in recent years. During 1965, a Rossi type continuous casting machine (180,000 tons per year) was installed at the Kawasaki plant of Nippon Yakin Kogyo Co., Ltd., and Yamote Steel Co. reportedly planned to install a Rossi type continuous slab casting machine also. Yawata Iron and Steel Co., Ltd., and Toshiba Steel Co. planned to install Olsson type machines in the near future. Kobe Steel Works, Ltd., began installing in 1965 continuous casting machines of Soviet design, and Fuji Iron and Steel Co., Ltd., continued pilot operation of a continuous slab casting machine developed by itself.

Japan's exports of steel industry technology in 1965 included the manufacturing techniques for electrical steel sheets by Kawasaki Steel Corp. to Compagnie des Ateliers et Forges de la Loire of France and a special method of treating steel sheets by Toyo Kohan Co., Ltd., to Rasselstein A.G. of West Germany. Major imports of iron and steel technology from the United States in 1965 included these: Electric Furnace Co. to Yawata Iron and Steel Co., Ltd., design and manufacture of heating furnaces for 72-inch continuous galvanizing lines; Armco Steel Corp. to Fuji Iron and Steel Co., Ltd., manufacture of hot- and cold-rolled steel pipes and tubes; Republic Steel Corp. to Kawasaki Steel Corp., manufacture of hot- and cold-rolled steel sheets; Blaw-Knox Co. to Sumitomo Metal Industries, Ltd., seamless pipemaking machines; Wheeling Steel Corp. to Kobe Steel, Lt., continuous galvanizing of steel sheets and coil; General Alloys Co. to Daido Steel Co., Ltd., manufacture of corrosion-and heat-resistant steel casting; Union Carbide Corp. to Tekkosha Co., Ltd., manufacture of low-carbon ferro-alloys by vacuum furnaces.[18]

Lead.—Japan's lead industry in 1965 experienced difficulties stemming from excess stocks and depressed prices. Prior to the 1965 recession normal monthly lead demand had averaged 13,000 to 14,000 tons, but, with the recession, demand from the battery industry, the largest user, decreased to 8,000 tons. As the recession deepened during the closing months of 1965, lead inventories built up rapidly, and prices fell from the approximately $389 per ton level reached at the beginning of the year,[19] to approximately $269 per ton, the lowest Japanese price for lead since the end of World War II. Because world lead prices did not decline as markedly as did the Japanese price, producers acted to expand export sales. As a result of these efforts, total lead and lead alloy exports increased 887 percent to 11,535 tons and at yearend Japan was hoping to continue to export surplus lead ingots while trying to delay additional contracted shipments of lead raw materials into the country.

As a consequence of the economic difficulties, output of lead ingot from both primary and secondary sources declined by 2.4 percent to about 165,250 tons, and lead semimanufactures output in 1965 fell about 7 percent to approximately 42,100 tons.

Despite the fall in Japan's 1965 economy, some major Japanese lead producers went ahead of schedule in expanding their plant facilities. In May 1965, Mitsubishi Cominco Smelting Co. was formally established with an authorized capital of $2.8 million between Mitsubishi Metal Mining Co., Ltd. (55 percent) and Consolidated Mining and Smelting Corp. of Canada (COMINCO) (45 percent). Plans were completed to construct a $2.2 million plant at Mitsubishi's Naoshima Smelting Works with an initial annual capacity of 3,000 tons. Completion date of the plant was scheduled for June 1966. One of the provisions of the joint venture was the supply of 22,500 to 31,500 tons of dried lead ore per year by COMINCO for 10 years. The ore or concentrate with a 75 percent metal content will be supplied by Pine Point Mining Co., a subsidiary of COMINCO.[20]

Sumitomo Metal Mining Co. Ltd.'s $7.5 million lead production facilities in its new plant at Harima were nearing completion at the end of 1965. In January 1966, production of electrolytic lead using the Imperial Smelting Process began with an initial output of 60 tons. Rated capacity of the new plant was 1,500 tons of lead and 3,000 tons of zinc per month. Ore for the Harima plant will be supplied mainly by the Rio Tinto-Zinc Corp., Ltd. Mitsui Mining and Smelting Co., Ltd., announced in

[18] Far East Iron and Steel Trade Reports. Technical Developments in Japan's Steel Industry 1965. No. 133, Feb. 12, 1966, pp. 7–8.
[19] Japan Metal Bulletin. The Sangyo Press, Ltd. (Tokyo). No. 1747, Jan. 19, 1965, p. 1.
[20] Japan Metal Bulletin. The Sangyo Press, Ltd. (Tokyo). No. 1801, May 27, 1965, p. 1

mid-1965 that its Central Research Laboratory's staff developed segregation methods for treatment of Japanese "black ores." Using the new methods in conjunction with the Imperial Smelting Process, greater efficiency can be attained in extracting copper, gold, lead, silver, and zinc from the black ores than by using conventional flotation methods. Mitsui Mining and Smelting applied for patents for its segregation methods.[21]

Magnesium.—Despite the 1965 recession that severely affected many of Japan's metal manufacturers and fabricators, magnesium producers achieved record output levels. Total magnesium output for 1965 was reported as 7,950 tons, but this figure included only 3,785 tons of primary metal, the balance being magnesium recovered from titanium reduction, which after recovery is reused by the titanium producers. Furukawa Magnesium Co. was the sole Japanese primary producer of magnesium in 1965. Ube Industries, Ltd., however, announced plans in July 1965 to produce magnesium from magnesium chloride in conjunction with its affiliated company, Ube Chemical Industries Co., Ltd.[22]

The Magnesium Commission of the Japan Light Metals Society estimated that the country's magnesium industry, including those facilities recovering magnesium from titanium reduction operations, will have an average growth rate of 18 percent per year and will be producing at a rate of 13,090 tons per year by 1968. Estimated 1968 demand divided by the various uses were as follows: Reductants, 8,500 tons; aluminum manufacturing, 1,730 tons; nodular iron, 1,550 tons; forging, 660 tons; alloying, 290 tons; other uses, 360 tons. The projected 1968 amount was criticized as being too conservative and did not take into consideration the probable demand for magnesium by Japan's rapidly expanding automobile and structural industries.

Although magnesium smelting started in Japan in 1929, mainly to supply the metal to Japan's growing aircraft industry, it suspended operation after World War II when the aircraft industry went out of business. Magnesium production was revived in 1957, primarily to supply the metal as a reducing agent to the titanium industry. In 1965, more than 60 percent of the total annual output of magnesium was used to produce titanium.

Titanium.—Osaka Titanium Co. Ltd. and Toho Titanium Co. Ltd. were Japan's only titanium producers in 1965. Output for 1965, generally unaffected by the recession, was about 5,200 tons of sponge, ranking Japan third among world titanium metal producers after the United States and the U.S.S.R. Titanium rolling and forging were undertaken by a few firms with Kobe Steel Works, Ltd., having 80 percent of the market. The remainder was largely divided between Sumitomo Light Metal Co. Ltd. and Nippon Mining Co. Ltd.[23]

In recent years there was a notable growth of Japanese domestic titanium consumption, particularly that by the country's petrochemical industry. The increased domestic demand together with that in the world market, especially from Communist countries, prompted expansion of smelting capacities. Toho Titanium raised its smelting capacity in September 1965 to 28,000 tons per year, 4,000 tons above its 1964 capacity; and Osaka Titanium increased its capacity to 3,000 tons per year in October 1965, 6,000 tons above the company's 1964 level.[24]

Zinc.—Japan's zinc industry in 1965 fared somewhat better than those of copper and lead even though the industry's chief domestic consumers, galvanized steel and rolled copper fabricators, substantially reduced their purchases in 1965 with respect to those of 1964. Fortunately for the country's zinc industry, however, there was a relatively heavy demand in the world market for unwrought zinc during 1965 and Japan was able to export much of its surplus zinc. Spurred by the business in the international zinc market, some of the largest Japanese producers either renovated and expanded their existing facilities or made definite plans to construct new ones. Among those zinc producers who expanded their facilities in 1965 were Mitsui Mining and Smelting Co. Ltd., Toho Zinc Co. Ltd., Mitsubishi Metal Mining Co. Ltd., Dowa Mining Co. Ltd., and Nippon Soda Co. Ltd.

At yearend 1965 Japan's zinc producing capacity was estimated at about 450,000

[21] Japan Metal Bulletin. The Sangyo Press, Ltd. (Tokyo). No. 1805, June 5, 1965, p. 2.
[22] Japan Metal Bulletin. The Sangyo Press, Ltd. (Tokyo). No. 1816, July 1, 1965, p. 1.
[23] Mining Journal (London). V. 265, No. 6799, Dec. 10, 1965, p. 424.
[24] Metal Bulletin (London). No. 4975, Feb. 23, 1965, p. 25.

tons, of which approximately 300,00 tons was electrolytic and the remainder was distilled and other types of refined zinc. Domestic mine zinc production in 1965 was 221,000 tons, 5,000 tons more than the 1964 output, and total smelter output of zinc metal in 1965 was about 342,100 tons compared with 285,800 tons in 1964. Domestic consumption (production less exports) of zinc in 1965 was slightly above the previous year's level, 286,000 tons in 1965 compared with 279,500 tons in 1964. Announced plans for further expansion by the Japanese zinc smelters, if carried out, would add an additional 200,000 tons to existing capacities, and would give the industry an annual total capacity of 650,000 tons. To head off problems that could result from excess capacity, the Ministry of International Trade and Industry (MITI) urged Japanese zinc smelting firms to curtail their expansion plans drastically but the zinc smelters disagreed with MITI's recommendations. While they did not question the projections as drawn up by the Mining Industry Council, they reportedly believed that the international market could absorb any excess zinc Japan might produce, apparently basing their conclusions on the fact that during 1965 Japan exported nearly 57,000 tons of zinc and alloys valued at about $18 million compared with only about 6,000 tons in 1964 valued at about $4 million. Moreover, the Japanese zinc smelters believed they could enhance the industry's world market position, especially with regard to Southeast Asian countries, by negotiating for long-term supply contracts.[25]

NONMETALS

Cement.—Japan ranked almost equal to West Germany in world cement production behind the United States and the Soviet Union and held on to first place as a cement exporter despite lagging markets both at home and abroad. Some decline in domestic demand was not altogether unexpected after the construction spurt brought on by the Olympic Games in 1964, but a dip in private demand resulting from the general business slump and an unduly long rainy season held consumption down even more through most of 1965. Toward yearend, consumption was responding to government business support programs, especially in the sector of private homc construction. With overcapacity and overproduction, fierce sales competition forced profits down and nearly all companies suffered. Average wholesale price of cement, $16.32 per ton in January, rose to $16.65 per ton in December; the market price, however, was reported to have dipped as low as $15.70 per ton in July, but from that point rose sharply as producers resisted price-cutting.

Cement exports decreased 10 percent in tonnage and 16 percent in value, partly the result of increasing self-sufficiency of other Far East countries. Clinker shipments to Hong Kong and Singapore found competition from Taiwan and mainland China suppliers. The tonnage of cement shipped to Indonesia was greater but shipments to other destinations declined. Total value of cement exports was $21 million, or about 1 percent of all mineral exports in 1965.

Japan's cement production capacity increased about 2 million tons during the year to 54.1 million tons in December, with expansions by such companies as Nihon Cement Co., Ltd., Sumitomo Cement Co., Ltd., Chichibu Cement Co., Ltd., and Daiichi Cement Co., Ltd.; Nozawa Cement Co., Ltd.'s, installation of two 2,300-ton-per-day Lepol kilns at its Hikone plant was completed. Overall utilization of capacity was estimated at only 65 percent. The question of economic use of certain idle capacity arose; it was pointed out that probably one-third of the 220 kilns in use were more than 15 years old and generally of substandard operational efficiency. Because of excessive capacity, the Japanese Government announced in June 1965 that for a 3-year period no new plants or expansions would be permitted. Replacement of old equipment, it is assumed, would be encouraged by this move. Based on an anticipated 8-percent annual increase in demand, cement output was predicted by 1970 to reach 50 million tons annually.

Fertilizer and Chemical Materials.—Leading Japanese chemical firms in 1965 included Sumitomo Chemical Co., Ltd., Mitsubishi Chemical Industries, Ltd., Ube Industries, Ltd., and Showa Denko, K.K., with Toyo Koatsu Industries, Inc., singularly outstanding as a fertilizer producer. Japanese fertilizers and chemicals maintained their strong world position in 1965, amply provided with domestic resources in some raw materials but almost completely

[25] Japan Metal Bulletin. The Sangyo Press, Ltd. (Tokyo). No. 1895, Jan. 18, 1966, pp. 2–3.

lacking in others. Phosphate rock, potassium salts, and increasing amounts of sulfur were particularly needed. Outputs of various fertilizers included 2.49 million tons of ammonium sulfate, 1.25 million tons of urea, 340,000 tons of calcium cyanamide, 1.55 million tons of calcium superphosphate, and 3.35 million tons of compound fertilizers. Basic chemicals produced amounted to 2.16 million tons of ammonia, mostly going into fertilizers, 770,000 tons of soda ash, 230,000 tons of liquid chlorine, and 1.34 million tons of caustic soda. Production of pyrites, a major source of sulfur, increased 4 percent in 1965, while refined sulfur output decreased 12 percent. Sulfuric acid production, about one-half for fertilizers, increased 5 percent to 5.65 million tons (100 percent acid) and stimulated elemental sulfur imports, as sulfur from domestic sulfide ores became more expensive to produce.

In efforts to hold down the cost of acid in Japan the Ministry of International Trade and Industry (MITI) urged construction by private industry assisted by government loans of at least two 1,000-ton-per-day sulfuric acid plants operating on imported elemental sulfur, one plant at Osaka and the other in the Choguku area. Sulfide ore producers were expected to oppose the plan because of possible depressing effects on sulfide prices, but it was felt the increased use of imports was necessary. Requirements amounting to about 200,000 tons of sulfur annually would probably come from Canada.

While ammonia continued to be made mostly by nitrogen fixation, a sharp turn was seen toward utilizing naphtha for the necessary hydrogen, leading to the probable replacement of crude oil feedstocks for this purpose. Quantities of naphtha needed for ammonia were estimated about 1.6 million barrels in 1965 rising to nearly 6 million barrels in 1967. Butane was also expected to come into use for hydrogen in Toyo Koatsu's operations, with quantities consumed in fertilizers rising from 200,000 to 1.5 million barrels in the same period. Most sulfur and pyrite consumed were of domestic origin, but shortages were showing up and sulfur imports more than doubled in 1965, nearly one-half of the total coming from mainland China and the rest from Canada. Salt imports of 3.54 million tons in 1965 were slightly lower than in 1964. Salt processing in Japan has reached a relatively high degree of efficiency; however, imported salt continues about half as costly as domestic salt, and has brought the Government to place arbitrary restrictions on quantities produced. About half of the crude fertilizer materials imported in 1965 came from the United States.

At Niigata, Toyo Gas Chemical Industry, Ltd., a subsidiary of Toyo Koatsu, was adding a 36,000-ton-per-year complex fertilizer plant, to include 30-ton-per-day phosphoric acid and 60-ton-per-day ammonium phosphate units. Other companies installing complex fertilizer facilities included Nitto Chemical Industry Co., Ltd., Nisson Chemical Industries, Ltd., and Onoda Chemical Industry Co., Ltd. Capacity of 20 Japanese producers of phosphoric acid more than doubled in 1964–65 to 397,900 tons of acid annually as of April 1, 1965, and further expansions were underway by at least 6 companies. Following trial marketing of a new slow-acting fertilizer called cyclodiurea, Chisso Corp. decided to build a 12,000-ton-per-year plant for its manufacture at the Minamata works. Showa Denko K.K. planned to build a 500-ton-per-day ammonia plant at its Kawasaki works under Imperial Chemical Industries, Ltd., (United Kingdom) license. Japanese companies were active in selling complete fertilizer plants for installation abroad and vied for contracts in the Soviet Union, mainland China, South Korea, the State of Alaska, and elsewhere.

Exports of fertilizers rose sharply in 1965, chiefly the result of increased demands for ammonium sulfate and urea types. Total exports reached 1.79 million tons of fertilizers, of which 39 percent went to mainland China, 23 percent to South Korea, 11 percent to Taiwan, and most of the remainder to Indonesia and the Philippines. Value of these exports totaled $87 million, 53 percent higher than in 1964. About 19 percent of all fertilizer production was exported. In contrast, nearly 52 percent of the ammonium sulfate production was exported compared with 38 percent in 1964. Exports to South Korea and Taiwan were expected to drop because of new fertilizer plants scheduled soon for operation, but according to trade discussions in progress, mainland China's imports from Japan could expand by as much as 70 percent in 1966–1968. Mitsui & Co., Ltd., continued to handle a large share of the fertilizer export business.

Other Nonmetals.—Besides the use of Japan's widely occurring limestone in cement and for construction it found a variety of less important uses for such products as burned lime, flux, calcium carbide, and fillers. Low-grade domestic gypsum from northern Honshu filled most of the requirements for cement; some byproduct gypsum was also utilized. High-quality gypsum was imported from Morocco and the United Arab Republic to supply needs for the purer material. Pyrophyllite was an outstanding product of Japan and together with feldspars, clays, talc, and silica, contributed to a flourishing ceramics industry. Special types of kaolin were imported from the United States and South Korea. Barite output was adequate for moderate demands; fluorspar, locally not abundant, was supplemented by imports, about one-third of which came from mainland China. Asbestos, generally of short fiber length, was mined in the Yamabe district of Hokkaido (chrysotile) and in Kyushu (amphibole), but most industrial demand was met by imports, of which over half came from Canada.

MINERAL FUELS

Coal.—Japan's 1965 coal output amounted to only about 49.5 million tons, continuing its unabated decline extending back to 1961. Distribution of 1965 production by type was as follows: Steam quality, 35 million tons; coking, 12.4 million tons; anthracite, 1.6 million tons; and natural coke, 500,000 tons.

At yearend, coal reserves in Japan were estimated at about 20,200 million tons, but quality was generally low. Moreover, the price of domestic coal remained relatively higher than foreign coal owing to mining conditions such as depth (average depth of working seams is about 1,200 feet, and the maximum depth in most fields are 3,000 feet), inclination and pitch of seams, faulting, and the gassy nature of many mines. Also the extensive underground workings require relatively long travel time for miners. In some instances, this travel time plus the usual downtime in operations reduced actual productive time to 40 percent of the total shift time. An added consideration was the fact that a substantial portion of Japan's coal reserves are undersea and must be worked by special methods, particularly at the important Kyuslm seams. Approximately 20 percent of the output came from about 15 undersea coal mines.[26] As a consequence of such conditions, the productivity of Japanese coal miners was less than 1 ton per man-shift for underground workers compared to almost 14 tons in the United States.

Kyushu and Hokkaido continued to be the principal producing areas, each accounting for about 45 percent of total output. East and West Honshu accounted for most of the remainder. Seventeen major companies produced 70 percent of the output while about 300 smaller and generally inefficient operators provided the remainder.

High operating costs have raised serious financial difficulties in Japan's coal industry. The cumulative losses of the 17 major coal mine operators by March 1965 amounted to $227.8 million while short-term debt was $474.2 million, and by March 1966 operating deficits were estimated to total $277.8 million and short-term debt to reach $555.6 million. Moreover, in face of these financial difficulties, Japanese coal operators have been compelled to reduce coal prices because of competition from petroleum products. In a rationalization program coal prices were reduced by an average of $3.33 per ton and production methods were realined; changes included substantial reduction of labor force, closing of submarginal mines, and introduction of huge quantities of capital equipment.

To alleviate the interest burden on Japan's coal industry, MITI proposed to sell $333.3 million in bonds to the Coal Mining Industry Council. According to the MITI plan, the 10-year bonds would be issued at an annual interest rate of 3.5 percent to creditors of coal mining companies in the next fiscal year to cover debts accumulated through their reorganization programs. In addition, direct subsidies of $0.56 or more per ton would be paid to cover operating losses, and any increase in railway freight rates would be born by public funds.[27]

Despite generally poor conditions in the industry, there was a mark of optimism. It was reported that Mitsubishi Mining Co. has plans to develop a new coal deposit on Hokkaido. Initial development was sched-

[26] O'Brian, C. L. Some Comments on the Japanese Coal Industry. Canadian Min. and Met. Bull. (Montreal, Canada). V. 58, No. 637, May 1965, pp. 539–546.

[27] Takita, K. Unprofitable Coal. Far Eastern Economic Review (Hong Kong). V. 50, No. 11 Dec. 16, 1965, pp. 524–525.

uled for sometime in 1966 and the start of production for 1970. This will be the first development of a major coal mine in Japan in several years.

Virtually all of the domestically produced coking grade of bituminous coal is consumed by the country's iron and steel industry, while the boiler and anthracite varieties are used for steam generation in thermal power stations, locomotives, and space heating boilers.

In 1965, approximately 16.0 million tons of bituminous coal and 1.1 million tons of anthracite coal were imported. Nearly all of the bituminous coal imports in 1965 consisted of coking qualities, amounting to 15.9 million tons or 93.2 percent of total foreign coal receipts, compared with 1964 figures of 12 million tons or 90.6 percent of the total. Total value of 1965 coal imports was $272.0 million including anthracite coal valued at $19.8 million. The previous year's total was $211.2 million including anthracite coal valued at $21.8 million. The United States continued to be Japan's main supplier of coal in 1965 followed by Australia, the U.S.S.R., and Canada.

Petroleum and Natural Gas.—Japan's petroleum industry continued to boom, relying heavily on foreign investment capital and imported crude and fuel oils, with domestic crude oil production accountable for less than 1 percent of requirements. Oil imports, including products, were valued at $1,304 million in 1965 compared with $1,160 million in 1964; the value of crude oil imports alone rose to $1,031 million in 1965 compared with $931 million in 1964. Imported petroleum represented 16 percent of the total value of all Japanese imports in 1965. The quantity of crude oil imported was 73.3 million tons, 16 percent higher than in 1964; an increase of 13 million tons or 17 percent was recorded in fuel oils. Middle East producers supplied about 88 percent of 1965 crude oil imports. Major oil companies supplying foreign crude oil to Japan included the following, in approximate order of importance: California Texas Oil Corp. (Caltex), Esso Standard Eastern, Inc. (Esso), Arabian Oil Co., Koninklijke Nederlandsche Petroleum Maatschappij N.V. (Royal Dutch Shell), Mobil Oil Co., Union Oil Co. of California, Gulf Oil Co., and Tidewater Oil Co. Arabian Oil, with its Khafji offshore field in the Kuwait-Saudi Arabia Neutral Zone, was the only Japanese-owned overseas crude producer with the exception of one company getting started in North Sumatra.

Consumption, as indicated by domestic refined product sales, increased 19 percent in 1965 to about 535 million barrels. A major factor in the rise was increased use of heavy fuel oil in manufacturing at the expense of coal. Jet fuel increases were associated with expanding international air traffic. Burgeoning petrochemicals took more oil, and naphtha, used largely in fertilizer manufacture, showed a significant consumption gain. Natural gas, a domestic resource, was increasingly important in the chemical industry, in home heating, and other uses. In both consumption and refining, Japan maintained third place in the world after the United States and the Soviet Union. Its total rated refinery throughput capacity rose 17.4 percent to 2,017,640 barrels per day at yearend 1965.

The petroleum share of total energy supplies has grown steadily in recent years. Under Japan's Medium-Term Economic Plan (1964–68), total energy demand in fiscal 1968 (April 1968 through March 1969) is to reach 286 million tons in standard terms of 7,000 kilocalories per kilogram of coal, 1.6 times higher than in fiscal 1963. Energy sources are expected as follows: 65 percent from petroleum, 23 percent from coal, 9 percent from hydropower, and 3 percent from other sources including natural gas and atomic power. The Government is charged under the plan to take measures to assure the stable supply of inexpensive petroleum while maintaining the industry's independence, to disperse supply sources, develop domestic oil and natural gas, build large capacity oil tankers, increase storage facilities, and to rationalize distribution systems.

Table 4.—Domestic sales[1] of refined petroleum products in Japan, 1964–65

(Million 42-gallon barrels)

Product	1964	1965	Percent change
Gasoline	60.9	66.5	9
Naphtha	29.9	46.1	54
Jet fuel	2.7	3.3	22
Kerosine	26.9	31.9	19
Gas oil	30.1	33.9	13
Fuel oil	254.6	298.6	17
Lubricating oil	8.7	9.1	4
Asphalt	7.2	8.3	15
Greases	.3	.3	--
Paraffin	.4	.5	25
LP gases[2]	27.8	36.4	31
Total	449.5	534.9	19

[1] Sales by refiners, importers, and dealers to domestic end users.
[2] Includes producers private consumption.

Japanese overseas operations in 1965 provided an estimated 15 percent of imported crude, nearly all high-sulfur oil from Khafji in the Kuwait-Saudi Arabia Neutral Zone. In North Sumatra, the Japanese North Sumatra Oil Development Cooperation Co., Ltd. operated the Rantau, Paluh, and Tabuhan fields under a production sharing agreement with Permina, and Indonesian Government oil corporation. Several prospecting and other development programs were underway in Indonesia, Sabah, Canada, and Alaska. Far East Oil Trading Co., established for the purpose of importing Indonesian oil, was expected to handle about 6 million barrels of crude oil imports in Japan's fiscal 1965 (ending March 31, 1966), increasing to 12 million barrels annually in fiscal 1967 and thereafter. Idemitsu Kosan Co., Ltd., the largest importer of Soviet crude oil and grade C fuel oil, was expected to increase its crude imports from the Soviet Union to about 15 million barrels annually following trade discussions with that country.

In 1965, 20 refining companies with 37 refineries were in operation in Japan. Of the refineries, 28 with 95 percent of the total capacity were located on the east coast, 7 on the west coast, and 2 in Hokkaido. Some major foreign company affiliations with Japanese refiners, with foreign capital shares totaling 50 percent in each case were these: California Texas Oil Corp.-Koa Oil Co., Ltd., and Nippon Petroleum Refining Co., Ltd., Tidewater Oil Co.-Mitsubishi Oil Co., Ltd., Anglo-Saxon Petroleum Co. (United Kingdom)-Showa Oil Co., Ltd., and Esso Standard Eastern, Inc., and Mobil Oil Co.-Toa Nenryo Kogyo K.K. Other affiliations through loans and investments included Union Oil Co. with Maruzen Oil Co., Esso with General Sekiyu Co., Ltd., and Shell with a Showa subsidiary, Showa Yokkaichi Sekiyu Co., Ltd. Most companies maintained close relations with their Japanese partners, providing technical assistance, financing when needed, crude oil supply, marketing, and other services.

There was no letup but some government restraint in the continuing trend of expansion and integration of refining units. Several hydrocracking units for producing liquefied petroleum gases, (LPG) gasoline, and kerosine were completed or under construction in 1965. Hydrotreatment plants for processing lubricant oils were gaining in use. Production of hydrogen from light naphtha was becoming important. Proposed investment in refining set for 1965 was 12 percent higher than in 1964, rising to about $191 million, nearly one-fourth of this for new refinery construction. Scheduled for 1966 were two topping plants, adding 155,000 barrels per day capacity, and two reformer plants, adding 12,100 barrels per day to reforming capacity. Among additions in progress in 1965 were four topping, five catalytic reforming, and two hydrocracking plants.

Showa Oil, whose refinery at Niigata was virtually destroyed in the 1964 earthquake, was completing a new 40,000-barrel-per-day plant there and a merger of Showa with Shell Sekiyu, Royal Dutch Shell's subsidiary, was discussed. Shell had helped finance Showa's rebuilding. Idemitsu Kosan Co., Ltd., planned an 80,000-barrel-per-day refinery at Himeji, near Osaka, and a 30,000-barrel-per-day hydrodesulfurizing plant at either Himeji or Chiba. The latter would be one of Japan's first major plants for desulfurizing heavy grade C fuel oil. Negotiations were in progress with Gulf Oil Corp. for a $40 million loan on the project tied in with a supply agreement with Gulf for Idemitsu to purchase 150 million barrels of Kuwait crude oil over a 15-year period.

Fuji Sekiyu, Ltd., formed by a consortium of Arabian Oil and others, was expected to receive a $20 million loan from Gulf Oil to build a 70,000-barrel-per-day refinery at Chiba tied to a contract with Gulf to supply three-fifths of the crude oil requirements, probably from Iran's Gach Saran field, the rest coming from Khafji. Among companies scheduled to increase capacity in fiscal 1966 were Mitsubishi Oil Co., Ltd., at Mizushima, Maruzen Oil Co., at Chiba, and Asia Oil Co., Ltd., at Yokohama, together adding 155,000 barrels per day by April 1967. Other refiners permitted to expand included Idemitsu, Toa Oil Co., Ltd., and Nichimo Oil Co., Ltd., with plants of 80,000, 60,000 and 30,000 barrels per day capacity, respectively, due for completion by April 1968; new firms, Kyokuto Oil Co., Ltd., and Kansai Oil Co., Ltd., were authorized to build 60,000-barrel-per-day plants at Chiba and Sakai, respectively, for completion in October 1968; Fuji Sekiyu, Ltd., received authority to build a 70,000-barrel-per-day plant at Chiba (see previous Gulf Oil negotiations)

and Seibu Oil Co., Ltd., for a 50,000-barrel-per-day plant in Yamaguchi Prefecture in fiscal 1969. Shell Sekiyu concluded a basic agreement with the last-named Seibu for its financing and product sales. The flood of activity on new refineries brought a recommendation from the Petroleum Council, a government advisory body, that no further applications for construction be accepted until 1973.

Major domestic marketers of oil products were Nippon Oil, with about one-fifth of total sales, followed by Idemitsu with one-sixth. A new joint sales company was formed under government guidance in July by Nippon Mining, Asia Oil, and Toa Oil, the three together accounting for 12 percent of the domestic product market, and a similar arrangement was being considered for Maruzen Oil and Daikyo Oil, having about 9 and 5 percent of the market, respectively, in 1965. A proposed merger of Showa Oil and Shell Sekiyu would give the resulting company about one-eighth of the total market. Japan had about 21,000 service stations operated by 14 companies during 1965 and was building new stations at the rate of 1,500 annually.

Domestic crude oil production on west coast Honshu continued to decline from the high in 1963 and was several percent lower than in 1964. Natural gas output from the same general area declined 4 percent in volume. Teikoku Oil Co. produced about two-fifths of all natural gas and oil in Japan, with quasi-Government Japan Petroleum Exploration Co., Ltd. (Japex), accounting for most of the balance of crude oil and nearly one-fourth of the natural gas output. Natural gas was used increasingly for production of ammonia and methanol, principally in Niigata, Akita, and in Yamagata Prefecture. Import of liquefied natural gas to these areas was in the planning stages. Tokyo Gas Co. was preparing a request for government permission to import 315,000 barrels of liquefied natural gas annually starting in 1968. As plans materialized, it appeared that Alaska would be at least one source, with U.S. and Japanese companies cooperating to probably build a liquefaction plant near the Alaskan coastal town of Nikishka. Over half of the natural gas consumed went to the chemical industry in 1965. The largest gasfield was Kubicki, producing 1.4 million cubic meters of gas daily, and including offshore wellheads. Japex also had offshore operations near Akita where oil was produced from the Tsuchizaki field.

Overseas oil transportation and the trend to large tankers has been an exceptional feature of the Japanese industry in recent years. Japan has become the world's leading shipbuilder and provides tankers not only for itself but for many other countries too. One of the newest superships is a 160,000 deadweight-ton tanker to be delivered to its Norwegian owner in 1967. Idemitsu Oil has announced plans for a 205,000 deadweight-ton tanker to operate in conjunction with its Himeji refinery due for startup in April 1968, and larger ships are on the drawing boards. One of the world's largest LPG tankers was launched in 1965 in Japan. It was designed to carry 46,100 cubic meters of liquefied propane and butane and will operate between Kuwait and Japan.

The Mineral Industry of North Korea

By J. M. West [1]

Minerals and mineral processing contributed more than one-half billion dollars to North Korea's economy in 1965, a sum greater than that produced in any other Far East Asian country except Japan and mainland China, and triple the output value of South Korea's mineral industry. Furthermore, in per capita terms, the nation ranked second only to Japan in the Far East in mineral and metal output value. In world standing, North Korea was among the first five in output of tungsten, graphite, and magnesite. The country was important for lead, zinc, pyrite, and barite production also, besides having a notable production of coal, iron ore, pig iron, cement, gold, copper, bismuth, cadmium, fluorspar, phosphate, salt, and talc.

There seemed little doubt that important advances were made in expanding electric power, coal, and iron ore facilities in 1965. Gross industrial output value was reportedly 14 percent more than that of 1964, and investment in the mining sector was reportedly 72 percent higher. Overall mine output gained approximately 12 percent in value.

Although no conversion rate for the North Korean won is established, an idea of the share of the national budget allotted to minerals can be had by comparing a few published figures. Capital investment in mining, 67 million won in 1963, rose to 82 million won in 1964, and was 80 million won in the first half of 1965. Capital construction in 1964 totaled 680 million won, and total expenditure, according to the 1964 budget, was given as 3,418 won. Hence, mining was allotted about 12 percent of the total capital construction funds and 2.4 percent of the total expenditures in that year. The 1965 budget called for increased spending to 3,722 million won, including 879 million won for heavy industry and 124 million won for light industry.

An intensive drive underway in 1965 to expand coal production showed signs of success. Strip mining in particular was responsive. Greater overall labor efficiency was claimed, as represented by a 12-percent increase in industrial productivity, although such gain was not reflected in wages. The extractive industry was said to have been supplied in the first half of 1965 with 45 new excavators, 500 vehicles, 90 trams, 200 mine cars, 100 air compressors, 200 winches, and 3,600 rock drills. Major advances were made at the Musan iron mine. New blast and open-hearth furnaces were opened at the Hwanghae steel plant. Facilities were renovated and expanded at the Kimchaek steel plant and at the Namp'o and Munpyong nonferrous smelters. Also during 1965 the completion of 35 big pits and 29 medium and small ore mines was reported. Besides varying progress on a number of ore dressing plants, approximately 130 small-to-medium coal mines were said to have opened.

Hydroelectric plants suffered from dry weather and operated below capacity, but new thermal installations more than made up the deficiency. Construction of a new railway linking the east and west coasts, Pokkye to Chihari to Pyongsan, made progress, and the Chongjin railway, extending to the Chinese border, was opened. About one-fifth of North Korea's railways have been electrified. Double tracking of the Musan-Komusan line continued, as did electrification of the Pyongyang-Sinsongchon line.

---

[1] Far East specialist, Division of International Activities.

PRODUCTION

Estimates of production value for the North Korean mineral industry, including value added by primary processing, indicated a possible 18-percent gain in output over that of 1964 to a value of roughly $520 million. Greatest gains were in coal and steel, which contributed slightly less than one-third and one-quarter, respectively, of the total value. Such increases roughly paralleled a reported 14-percent increase in gross industrial output value for 1965, slightly less than the 17-percent increase claimed in 1964, and seemed to substantiate reports of good progress in North Korean economic development. Other outstanding mineral products, in approximate order of value, were iron ore, pig iron, cement, zinc, lead, copper, and magnesite. Despite apparent successes in achieving some mineral production goals the output figures for steel and cement were less than the announced targets.

Table 1.—North Korea: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity [2]	1961	1962	1963	1964	1965
Metals:					
Cadmium, electrolytic	80	90	100	100	100
Copper:					
Mine	6,000	8,000	8,000	10,000	12,000
Electrolytic	8,000	10,000	10,000	10,000	12,000
Gold, troy ounces	160,000	160,000	160,000	160,000	160,000
Iron and steel:					
Iron ore [3], thousand tons	3,550	3,340	3,860	4,800	5,900
Pig iron [4], do	930	1,213	1,159	1,340	1,600
Steel ingot, do	776	1,050	1,022	1,132	1,230
Rolled steel, do	536	633	762	950	1,080
Ferroalloys, do	20	25	25	30	35
Lead:					
Mine	50,000	50,000	50,000	55,000	60,000
Smelter, primary	40,000	40,000	40,000	45,000	50,000
Nickel, electrolytic	400	400	400	500	1,000
Silver, troy ounces	640,000	640,000	640,000	640,000	640,000
Tungsten concentrate	5,000	4,000	4,000	4,000	4,400
Zinc:					
Mine	90,000	90,000	100,000	100,000	105,000
Electrolytic	60,000	60,000	65,000	70,000	75,000
Nonmetals:					
Apatite	150,000	200,000	200,000	200,000	200,000
Barite	55,000	60,000	70,000	70,000	80,000
Cement, thousand tons	2,262	2,376	2,530	2,610	2,400
Fluorspar	30,000	30,000	30,000	30,000	30,000
Graphite	65,000	65,000	70,000	70,000	70,000
Magnesite:					
Ore as mined, thousand tons	200	500	800	900	900
Clinker, do	100	200	385	400	400
Pyrite, do	300	350	400	420	450
Salt, do	392	421	450	400	500
Talc and soapstone	15,000	20,000	20,000	20,000	20,000
Mineral fuels:					
Coal:					
Anthracite, thousand tons	7,500	9,000	9,700	11,200	14,900
Bituminous [5], do	4,000	4,000	4,000	4,000	4,000
Other, do	290	200	340	300	300
Total, do	11,790	13,200	14,040	15,500	19,200
Coke, do	900	1,100	1,200	1,400	1,600

[1] All figures are estimated, except for iron and steel items (ferroalloy data are estimated), magnesite (1963 only), salt (1961–62 only), and coal. The firm figures are official North Korean data.

[2] Many other mineral commodities are produced, but reasonable output estimates cannot be made. These include antimony, beryl, bismuth, chrome, cobalt, manganese ore, mineral sands (ilmenite, zircon, columbite, rutile, monazite), minor and rare metals (selenium, tellurium, germanium, indium, silicon), molybdenite, alum, arsenopyrite, asbestos, boracite, clays, kaolin, lepidolite, limonite, mica (phlogopite), and silica (including glass sands).

[3] 1961 data apparently represent crude ore, most of which was 30 to 40 percent iron grade. 1962–65 data undoubtedly included some concentrates.

[4] Includes Krupp-Renn granulated iron or luppe.

[5] Low calorific value, much of which might be classified as low-rank coals.

TRADE

Mineral and metal exports were important components of North Korean trade, possibly on the order of 15 percent of the total value of trade in 1965. Of first importance has been trade with the Soviet Union, second with mainland China, and probably third with Japan. Japan's imports, mostly metals and ores from North Korea in 1964, were valued at about $20 million. Minerals also have been traded with the East European countries, metallic lead is an outstanding example, and some trade appeared to be developing with West Europe, notably France. Specific trade information is not available from official North Korean sources nor is mainland China's trade reported. In the absence of official statistics, mineral imports from North Korea by the Soviet Union and Japan and petroleum exports by the Soviet Union to North Korea have been provided to indicate trends.

Available 1964 data show a general decline in the Soviet imports from North Korea compared with the 1964 imports, although rolled steel, zinc metal, and talc tonnages were all higher. A decline was registered in Soviet petroleum product exports to North Korea; the total was 437,500 tons in 1964 compared with 451,300 tons in 1963. Soviet exports to North Korea in 1964 also included 5,400 tons of ferroalloys, 10,182 tons of iron and steel semimanufactures, 1,700 tons of nonferrous metals and alloys of which 633 tons was in rolled products, and 800 tons of asbestos. Japan's purchases were moderately diversified and included a number in the metal and nonmetal categories. Iron concentrates from North Korea's Musan mine and zinc concentrates going to Japan marked significant increases in 1965, but pig iron shipments declined. During 1965 North Korea imported approximately 35,000 tons of iron and steel products, 1,437 tons of chromium ore and concentrate, and ferroalloys, including 840 tons of ferronickel, 305 tons of ferrotungsten, and 375 tons of other ferroalloys from Japan. In 1964 Japan exported 327 tons of ferrovanadium to North Korea. Lead ingot exports to the Soviet Union and East Europe were reportedly rising in the second half of 1965; European shipments

Table 2.—North Korea: Exports of selected metals and minerals to the Soviet Union and Japan

(Metric tons unless otherwise specified)

Commodity	Soviet Union		Japan		
	1963	1964	1963	1964	1965
Metals:					
Cadmium	NA	NA	15	21	23
Copper	------	------	58	279	136
Iron and steel:					
Iron ore	------	------	26,399	351,463	407,524
Pig iron	75,200	45,100	89,031	147,014	97,563
Sponge iron	------	------	3,286	15,568	------
Granulated iron	------	------	4,035	15,922	2,988
Ferrosilicon	1,700	1,000	------	------	20
Rolled steel	64,900	66,900	------	------	------
Lead:					
Concentrate	------	------	------	------	867
Metal	21,300	17,600	170	195	762
Silver—troy ounces	------	------	39,700	48,330	32,149
Titanium ores	------	------	8,408	6,243	1,478
Zinc:					
Concentrate	36,200	32,200	------	1,033	14,117
Metal	22,400	24,700	214	7,839	1,489
Nonmetals:					
Barite	57,900	23,400	------	1,918	2,314
Cement	193,000	21,000	------	------	------
Fluorspar	NA	NA	2,972	5,698	3,639
Graphite (mostly amorphous)	------	300	7,370	4,714	6,035
Magnesia clinker	87,500	80,100	10,637	13,567	10,469
Magnesite	------	------	------	------	1,577
Quartz and quartzite	------	------	1,752	1,919	2,322
Soapstone	NA	NA	2,124	2,793	2,471
Talc	12,000	18,800	2,619	3,230	2,241
Mineral fuels: Anthracite	------	------	13,627	33,095	13,573

NA Not available.

[1] Derived from official import statistics of the Soviet Union and Japan.

Table 3.—North Korea: Imports of petroleum products from the Soviet Union [1]

(Metric tons)

Commodity	1963	1964
Gasoline	238,300	209,100
Kerosine	4,900	6,200
Diesel fuel	162,200	168,700
Mazut (mainly fuel oil)	2,600	2,100
Lubricating oil	38,000	47,300
Greases	2,100	1,400
Paraffin	1,500	1,700

[1] The U.S.S.R. is North Korea's main source of petroleum. Data are derived from official export statistics of the Soviet Union.

from North Korea were said to have reached several thousand tons monthly.

Another agreement was signed to supply mainland China in 1965–66 with commodities including magnesia clinker, anthracite, magnetite and other ores, pig iron, rolled steel, cement, and chemical products in exchange for Chinese coking coal, coke, petroleum products, ores, chemical products, rolled steel and metal alloys. A considerable increase in overall trade with China was proposed. An agreement with the Soviet Union called for North Korea to export rolled steel, various special steels, nonferrous metals, magnesia clinker and other nonmetals, building materials, and chemicals in exchange for Soviet machinery, oil products, ferrous and nonferrous rolled stock, and chemicals. Trade was to exceed that of 1965. A French company voiced interest in establishing a long term contract for purchase of North Korean nonferrous metals, iron and steel products, and cement. Japanese officials studied ways by which private Japanese trade associations might transact trade agreements with North Korea without involving the Japanese Government.

COMMODITY REVIEW

METALS

Iron Ore.—Nearly one-fourth increase in iron ore output was claimed in 1965; output during the first half of the year was 520,000 tons greater than in the first half of 1965. The Musan mine, in the northeast, provided 138,000 tons more concentrate than in 1964. Efforts were to be made in 1966 to fulfill output plans in 11 months and produce 200,000 tons of concentrate above the amount planned during the year. This would place Musan production at about 2.4 million tons in 1966. Musan's mill was expanded and magnetite recoveries increased several percent. At the Mandok magnetite-pyrite-copper mine in Hamgyong-Namdo, a large new mill with annual capacity of 560,000 tons of ore was in operation. In the western part of the country, Hasong, the Unyul (Ullyul), and several other iron mines jointly produced about one-tenth more than in 1964.

Iron and Steel.—The biggest news in the iron and steel industry was the negotiation between Vereinigte Oesterreichische Eisen- und Stahlwerke A.G. (VOEST), the important Austrian steel firm, and the North Korean government for construction of a $30 million Linz-Donawitz (L-D) steel plant with an annual capacity of 600,000 tons of steel. Location for the plant was not revealed, but Musan wtih its large iron ore reserves and rail links to mainland China's coking coal producing area was considered the likely choice. Progress on arranging financial backing was not disclosed.

Outputs of ingot and rolled steel during the year increased 9 and 14 percent, respectively. In comparing progress in the first half of 1965 to the corresponding period of 1964, blast furnace utilization of capacity increased 4 percent, and average steel output of open-hearth furnaces, per square meter of furnace area, increased 12 percent. Consumption of electric power per ton of steel declined 3.5 percent. A 50,000-ton blast furnace, No. 5, was completed at Hwanghae, where through the first 9 months of 1965, 80,000 more tons of steel was produced than in the corresponding period of 1964. The plant also placed in operation a new 200 cubic-meter open-hearth furnace, No. 6. Hwanghae was credited at the beginning of 1965 with 400,000 tons of annual steel capacity. At Kimchaek, the No. 2 blast furnace, with renovation and automatic controls, was said to have increased capacity by 80 tons of heat. The No. 1 furnace was also undergoing expansion.

The steel industry produced more than 20 major varieties of rolled products in 1965. Improved balance of products according to types and sizes was achieved, and at the Kangson and Songjin Steel Works, high-

speed steel and single-seam pipe production processes were improved. Songjin's No. 3 electric furnace was modernized. Output of rolled steel and of pig iron and luppe (granulated iron) exceeded plans for the first quarter of 1966 by 4 percent, indicating that continued advances could be expected during 1966. Targets previously set for 1967 included 2.3 million tons of pig iron and granulated iron, 2.3 million tons of steel, and 1.7 million tons of rolled steel products. The Chongjin Steel Works produced mainly luppe and was boosting output. A drive was started to collect and conserve scrap steel, suggesting a shortage in that commodity. It was necessary to import iron and steel products, some ferroalloys, and chromite in 1965 to supplement production.

Nonferrous Metals.—Nonferrous ore output was reported about 8 percent higher in 1965. Output of the Hungnam smelter, a major nonferrous metallurgical plant on the east coast, surpassed planned quotas in 1965. Also the value of production rose 44 percent from that of 1964, largely a result of higher metal prices. At the Namp'o copper-zinc smelter on the west coast, the No. 2 nonferrous rolling mill was completed, and at the Munpyong lead-zinc plant, the second Waelz kiln was installed. Mill expansions were completed at the Komdok lead-zinc mine and at the Nagyon, Kyongsu, and Tanchon mines.

A number of small-to-medium-sized mines were being reopened. Tunnel advance in these mines, during the first half of 1965, was about two-thirds greater than in the first half of 1964. Automatic control devices were installed at a number of mines, including the Songhung, North Korea's largest gold-silver-copper mine, where a pyrite flotation plant has been opened. Recent major mine developments were made at Hochon, the Kyongsu, and Tokyon mines; recently reopened or expanded were the Holtong, Manyon, and Taeyutong mines, the last-named a major gold-copper-scheelite producer. The Yongyang mine, in South Hamgyong Province, and the Manyon mine were said to be making good progress at the turn of the year.

Cement.—Less Soviet demand for North Korean cement apparently was responsible in part for the 1965 production decrease of 8 percent, approximately 210,000 tons. Soviet imports had fallen during 1963–64 by 172,000 tons, but mainland China remained an important market. Some six cement plants are active in North Korea. One of the smaller plants, the Komusan, increased output 70 tons daily through a one-third expansion in grinding capacity. The Haeju cement plant made minor improvement.

Fertilizer Materials.—The 1964 fertilizer production target of 950,000 tons apparently was not reached. Only 640,000 tons was reported delivered to farmers, indicating distribution problems. Output in 1965 was 5 percent lower than in 1964, but was probably higher than the 853,000 tons reported in 1963. Larger quantities reached the market in the first half of the year than in the corresponding period of 1964. Fertilizer facilities were being expanded in 1965. The first phase of a synthetic ammonia plant, based on gasification of coal, was completed at the Hungnam fertilizer plant. Progress was made on an ammonia plant at the Aoji Chemical Factory, on the No. 2 carbide plant at the Pongung Chemical Factory, and on a nitrogenous fertilizer plant at the Chongsu Chemical Factory. The Sunchon nitrogenous fertilizer plant was also expanded.

Large quantities of apatite were mined for making superphosphate, and pyrite was recovered for its sulfur from metallurgical plants to meet requirements. A new pyrite recovery plant, with an output capacity of 20,000 tons of concentrate yearly, operated at the Songhung mine.

Magnesite.—Production estimates have been based largely on reported magnesia clinker output for 1963. Output has grown significantly since 1960. The U.S.S.R. has received considerable tonnages of clinker each year. China and Japan have also been markets. Large reserves of magnesite were reported in 1962, with estimates ranging from 1 to 6.5 billion tons. One of the important areas is in the Machon Mountain Range along the borders of Hamgyong-Namdo, Hamgyong-Pukto, and Yanggang-Do.

Silica.—Silica production at the Yongan so-called "silicate ore" plant in North Hamgyong-Namdo increased and probably contributed to the reported 9-percent rise in plate glass production during 1965.

MINERAL FUELS

Plans were disclosed for construction of North Korea's first oil refinery, although the location was not given. Crude oil, together with technical assistance, is to be supplied by the U.S.S.R.; capacity will be 40,000 barrels per day. Petroleum product imports from the U.S.S.R., which declined 3 percent from 1963 to 1964, apparently were being replaced by increasing imports from China in 1964 and 1965.

Electrical power output increased 7 percent in 1965, even though some hydroelectric plants failed to operate at full capacity, because of a dry season. The Pyongyang thermal electric plant reached two-fifths of its planned 500,000-kilowatt capacity with the installation of its fourth generator. The 260,000-kilowatt Kanggye Youth Power Station (hydroelectric) was in operation, the Songwoncho and No. 3 Chongdan powerplants came on line, and construction continued on the 400,000-kilowatt Unbong powerplant, as well as on many smaller plants including the Kuan and Hasinwon. Power output was said to have increased by 627 million kilowatt-hours during 1964, reaching a total of 12,393 million kilowatt-hours.

Coal.—Coal output during the first half of 1965 exceeded that of the corresponding half of 1964 by 1.62 million tons and for the year increased 25 percent over the total output in 1964. Increases were attributed to a one-third rise in anthracite output. Strip mines, in particular, were active, and about 130 small-to-medium-sized mines, mostly of 10,000 tons or less annual capacity, were opened. Among the larger mines operating were the Anju, Aoji, Hamyon, Kocham, Kogonwon, Onsong, Yongdong, and Yongnon. New shafts were constructed during the year at the Anju, Aoji, Hamyon, and Kogonwon mines. At Anju, output increased by 15,000 tons and good progress was made on the concreting of passageways; Yongdong's output rose 70,000 tons in the first 11 months of 1965 and the need for timbering decreased. More steel roof supports were in use, and most coal was said to be transported by machine in the larger pits. During the first half of 1965 overall mine development work included 144,000 meters of tunneling and 43,000 meters of concreting.

Major strip mines included the Choyang, Hungnyong, and Sinchang; new ones were opened in the Hokyong, Hyongpong, Masin, and Yongtae areas. Equipment installed in new strip mines included 16 large excavators, 10 bulldozers, and 90 heavy-duty trucks. Both the amount of stripping and coal output from open cut mines doubled.

Small-to-medium-sized mines produced approximately 2 million tons more than in 1964 and accounted for one-fifth of the total coal produced. Improvements were made at a plant in Hoeryong where coal mining equipment is being manufactured.

The Mineral Industry of South Korea

By J. M. West [1]

Progress toward industrialization of this basically agricultural country of over 28 million people with only limited mineral resources was outstanding in 1965. The mineral and quarrying sector supported by Agency for International Development (AID) geological and engineering assistance, made impressive gains, showing a growth rate of 14.8 percent and contributing 2.9 percent (on value added basis at 1960 constant prices) to the gross national product (GNP). Extractive industry gains were estimated at 30 percent, based on current prices, reflecting in part the inflationary trend. This compared with a net GNP rise estimated at 8 percent in 1965. In mineral processing, the manufacture of cement, iron and steel, fertilizers, and refining of petroleum accounted for approximately 2 to 3 percent of the GNP.

Coal, tungsten, and iron ore remained the principal crude mineral products. South Korea supplied about 6 percent of the world's tungsten and nearly half of its graphite (largely the amorphous variety). Nonmetallic minerals were becoming more important, and fertilizers, in particular, were due for great expansion with construction starting or about to start on at least three large plants to supplement imports. During 1965 construction began on another cement plant, the Ulsan oil refinery reached capacity and was due for expansion, and coal mine output continued to rise.

Tungsten production failed to respond to stronger markets, apparently because of mine problems. An iron ore development, Hongchon Chaun, northeast of Seoul, appeared promising as the supply base of a much-wanted integrated iron and steel mill. Electric power, given high priority in government planning, contributed greatly to the economy, with a large increase in 1965 and more to come as about 6 new installations were expected on line in 1966–68. Thermal power, mostly from coal, supplied about 72 percent of the electrical output. Mining costs increased as wholesale price indexes went up 15 percent for fuels and power and 18 percent for building materials, chiefly cement.

A proposed Foreign Capital Induction Law under review late in 1965 contained the provision that foreign investors could repatriate dividends without limit. If this provision were to remain in the final act, it would be an important inducement for foreign participation in South Korean industry. New foreign investments were being actively promoted through industrial feasibility studies financed by a $2 million AID loan approved in September. Besides approving some major investments, the Government guaranteed various commercial loans, including the largest to date—$44 million for a Japanese-financed fertilizer plant—and at least one technical assistance contract for Kukdong Oil Corp.

In search of a way to control excess foreign capital inflow from a single source, the Government considered forming an international investment consortium. Normalization of relations with Japan drew nearer, and massive Japanese investments were being arranged in anticipation, including $200 million in government loans and $300 million in private commercial loans.

Government-owned enterprises continued to dominate such major enterprises as electric power, steel, oil refining, coal, railroads, tungsten, base metal refining, and fertilizers. President Pak Chong-Hui announced in his State-of-the-Nation address plans to build thermal powerplants in Seoul and elsewhere, an integrated iron

[1] Far East specialist, Division of International Activities.

and steel mill, an aluminum refinery, another major cement plant, and to establish other industrial centers similar to the one at Ulsan.

The second 5-year Economic Development Plan, being drawn up to go into effect in 1967 and concentrating on industrialization, called for doubling the GNP in 1971. An integrated transportation investment plan was being prepared for 1967–71 with the help of the International Bank for Reconstruction and Development. To expand foreign trade, the Government took steps to liberalize restrictions, particularly emphasizing export development.

In other developments, U.S. scientists examined the feasibility of joining with South Korean scientists in establishing an Institute of Applied Science and Industrial Technology; electrification of the Seoul-Inchon Railway was considered after double tracking the line.

The Government was especially active in electric power. Following multiple-purpose development studies with U.S. Department of the Interior assistance in the Han River Basin, the Government announced a 10-year plan for construction of nine dams, four each on the Han and Naktong Rivers and one on the Kum River, to generate a total of nearly 500,000 kilowatts. The first of these, an 80,000 kilowatt French-financed installation was getting underway at Paltang at yearend. Japanese credits were to be used for hydroplants at Chungju (150,000 kilowatts); Tanyang (86,000 kilowatts); at a site on the Soyang River (90,000 kilowatts); and to add a third 40,000-kilowatt unit to the Chongpyong hydroplant. Thermal powerplants were planned for completion at Seoul by 1968 (125,000 kilowatts) and at Yongnam by 1969 (150,000 to 200,000 kilowatts). Advance planning for the 125,000 kilowatt Yongdong plant, on the east coast, indicated that a site closer to coal mines was desirable. The 50,000-kilowatt second generator at Yongwol went into operation in June.

PRODUCTION

Mineral production including processing value rose an estimated $12 million, about 7 percent over that of 1964, the greatest gains again having been in cement, with nearly a 40-percent increase, and in coal, 6 percent higher than in 1964. Mine production indices, however, declined 4 percent for metals and 10 percent for nonmetals, as export demand lagged for such minerals as amorphous graphite and kaolin. Output of gold and silver fell behind during installation of a cyanide treatment plant at Changhang, and tungsten production was held back by the need for development work at Sangdong, where all but about 5 percent of South Korea's tungsten is mined. Output of fertilizers by two plants was higher than the approximately 130,000 tons produced in 1964. Oil refining at Ulsan reached capacity and was adequate for most domestic needs. Electrical power output rose an impressive 20.4 percent in 1965 to 3,249 million kilowatt hours, much of the increase attributed to new thermal plant capacity, thus calling for more coal.

Table 1.—South Korea: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Aluminum semimanufactures	6,650	7,310	7,272	6,720	e 6,000
Bismuth:					
Concentrate (30 to 45 percent bismuth)	505	534	528	1,670	NA
Smelter (99 percent bismuth)	108	154	135	132	80
Copper:					
Ore (4 to 10 percent copper)	5,296	10,726	12,297	12,147	17,587
Content of metal e	318	430	615	850	1,400
Electrolytic	1,321	2,210	2,379	2,810	2,697
Sheet	545	740	1,518	1,651	NA
Gold, troy ounces	84,105	107,880	90,093	75,778	62,821
Iron and steel:					
Iron ore and concentrate (45 to 57 percent iron), thousand tons	505	471	501	685	735
Pig iron, do	9	2	5	1	18
Steel ingots (mostly from scrap), do	66	148	160	129	NA
Lead:					
Concentrate (50 percent lead)	1,750	2,825	3,834	6,695	8,849
Plate	270	299	585	926	639
Manganese ore (40 percent manganese)	1,377	1,002	4,155	4,312	6,691
Molybdenum concentrate (90 percent MoS_2)	59	138	130	223	376
Nickel ore (3 to 4 percent nickel)	934	868	855	599	37
Silver, thousand troy ounces	460	413	444	404	434
Tungsten ore and concentrate (65 to 85 percent tungsten trioxide)	5,720	5,797	4,740	4,657	3,837
Zinc:					
Concentrate (50 percent zinc)	900	839	2,260	5,080	14,232
Oxide	2,441	2,208	2,568	3,130	NA
Nonmetals:					
Asbestos	309	1,209	1,923	1,272	1,551
Barite (90 to 95 percent barium sulfate)	700	920	2,758	2,743	1,287
Cement, thousand tons	523	790	778	1,242	1,614
Diatomite	1,804	688	1,694	37,223	579
Feldspar	7,641	4,726	11,575	13,684	16,281
Fluorspar (90 to 95 percent calcium fluoride)	27,932	32,970	39,785	56,397	39,167
Graphite:					
Amorphous (75 to 80 percent carbon)	88,489	183,879	337,985	262,382	254,251
Crystalline (74 to 87 percent carbon)	1,224	1,216	1,692	2,076	2,768
Kaolin	51,177	38,193	52,262	60,536	72,244
Limestone, thousand tons	1,265	1,260	1,363	2,220	3,090
Monazite	25	--------	--------	--------	--------
Pyrite	735	--------	38	e 100	171
Pyrophyllite	23,985	18,112	31,811	46,158	48,914
Salt, thousand tons	122	388	230	386	669
Silica sand [1] (95 percent silica)	4,238	21,153	16,363	49,718	34,008
Talc (30 percent magnesia)	21,674	28,368	32,393	43,900	35,732
Mineral fuels:					
Coal, anthracite, thousand tons	5,884	7,444	8,859	9,622	10,248
Fuel briquets (anthracite-clay mix), do	e 4,000	4,953	3,452	5,976	6,738
Peat, do	41	124	116	115	NA
Petroleum refinery products: [2]					
Gasoline, thousand 42-gallon barrels	--------	--------	--------	555	e 1,450
Solvent, do	--------	--------	--------	11	e 30
Kerosine, do	--------	--------	--------	316	e 550
Diesel oil, do	--------	--------	--------	1,150	e 3,100
Fuel oil, do	--------	--------	--------	2,644	e 3,660
Bunker "C", do	--------	--------	--------	76	e 1,100
Total, do	--------	--------	--------	4,752	e 9,890

e Estimate. NA Not available.

[1] Previously reported as quartzite.

[2] Production started in March 1964 at Ulsan refinery; 1964 data as reported by Korea Oil Corp.

TRADE

The following tabulation indicates the relative changes in major components of South Korean mineral trade between 1964 and 1965:

	Value (million dollars)	
	1964	1965
Exports:		
Metalliferous ores (mainly tungsten and iron)	13.2	17.8
Iron and steel	4.5	12.7
Other metals and products	2.9	2.9
Nonmetals and products	1.9	2.8
Anthracite coal (including coke and briquettes)	2.4	1.9
Total	24.9	38.1
Imports:		
Fertilizers	55.9	66.0
Petroleum and products	25.9	28.9
Iron and steel	14.8	24.7
Nonferrous metals and products	4.2	9.0
Bituminous coal	2.5	2.4
Total	103.3	131.0

Crude mineral exports rose in value from $21.8 million in 1964 to an estimated $27.6 million and comprised about 15 percent of overall exports, which were valued about $180 million, nearly half again the previous year's total. Besides crude minerals, $12.7 million worth of iron and steel products was exported in 1965 compared with $4.5 million in 1964. The rise is largely attributed to shipments of galvanized sheets, imported as plain sheets from Japan, coated, and exported to South Viet-Nam. In base metals, new export products were copper scrap and plate; lead metal was to be exported for the first time. Nonmetallic mineral exports rose in value, probably because of initiation of cement exports, including white cement, in late 1965.

Imports of mineral products were higher in 1965, with $10 million increases each in the fertilizer and iron and steel categories. More nonferrous metals and petroleum were imported, the oil largely in crude form since the start of refining operations. Japan's share of trade was increasing, both as a result of normalizing relations with South Korea and gradual cutback of AID-supported trade. In 1965, AID financed only 30 percent of total imports compared with 85 percent in 1957 and 62 percent in 1962. Both Japan and the United States were large suppliers of fertilizer and iron and steel products. A number of simplifications were made in South Korea's trade system [2], and a fluctuating exchange rate was placed in effect, with a lower limit of 255 won to U.S. $1.

[2] U.S. Department of Commerce. Korea Eases Import Restriction, Adopts Fluctuating Exchange Rate. Internat. Commerce, v. 71, No. 18, May 3, 1965, p. 24.

Table 2.—South Korea: Exports of metals and minerals

(Metric tons)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum semimanufactures	NA	1,078	South Viet-Nam 973.
Copper:			
Unwrought	NA	1,400	Japan 800; Netherlands 600.
Semimanufactures	NA	663	South Viet-Nam 363; Sweden 200.
Iron ore	558,648	486,898	All to Japan.
Iron and steel	70,986	35,331	South Viet-Nam 28,617.[1]
Lead concentrate	4,982	10,991	Japan 5,251; Belgium 5,202.
Manganese ore	NA	1,115	All to Japan.
Molybdenum:			
Metal	NA	263	Japan 198.
Concentrate	NA	101	Japan 83.
Nickel ore	546	--------	
Tungsten concentrate (including synthetic scheelite)	5,107	5,463	United Kingdom 1,363; Japan 1,286; Belgium 1,030; United States 910.
Zinc concentrate	3,144	5,085	Japan 4,400.
Nonmetals:			
Barite	1,688	2,601	All to Taiwan.
Cement	--------	21,723	Unspecified.
Dolomite (including calcined)	NA	12,000	Japan 11,500.
Feldspar	NA	4,196	Japan 3,516.
Fluorspar	31,896	22,270	Japan 20,628.
Graphite:			
Amorphous	47,416	39,150	Japan 35,909; Taiwan 1,670; United States 1,311.
Crystalline		3,559	Japan 3,037; Taiwan 300.
Kaolin	13,845	13,381	Japan 13,149; Taiwan 230.
Quartz and quartzite	NA	22,413	Japan 22,163.
Silica sand	NA	4,472	All to Japan.
Talc	17,570	26,908	Japan 20,427; South Viet-Nam 2,937.
Mineral fuels: Anthracite coal	262,954	251,533	Japan 249,074.

NA Not available.

[1] Includes 10,919 metric tons of plates and sheets.

Table 3.—South Korea: Imports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum	r 7,117	2,695	Taiwan 2,435.
Copper:			
Ore	--------	828	All from Japan.
Metal	[1] 517	100	Unspecified.
Iron and steel:			
Scrap	60,938	44,481	United States 43,840.
Ferroalloys	4,855	3,129	Taiwan 1,804; Italy 377.
Pig iron	6,658	18,785	West Germany 8,170.
Steel ingots	44,421	25,300	Japan 16,256; Belgium 4,370; West Germany 3,941.
Semimanufactures	279,409	85,759	Japan 68,024.
Lead	3,726	514	Australia 225; Hong Kong 50.
Mercury 76-pound flasks	385	983	Italy 968.
Nickel	179	[2] 45	United States 30.
Tin long tons	215	218	United States 184.
Titanium oxide	983	1,605	United States 547; Japan 277.
Zinc	10,467	3,836	United States 2,619; Japan 689; Netherlands 154; Spain 147.
Nonmetals:			
Asbestos	2,630	3,104	United States 2,973; Canada 68; Japan 52.
Cement	274,294	28,237	Japan 28,201.
Fertilizers (manufactured):			
Ammonium sulfate	609,652	208,034	Japan 176,740.
Others	365,528	548,822	United States 341,441; Japan 113,480.
Total	975,180	756,856	United States 341,441; Japan 290,220.
Gypsum	29,972	46,191	Mexico 42,180; United States 4,011.
Magnesite	2,077	2,004	United States 1,260.
Potash	27,982	50,723	United States 48,763.
Sulfur	[3] 10,907	7,710	All from United States.
Mineral fuels:			
Coal, bituminous	r 130,208	161,093	Australia 67,586; Japan 57,605; Taiwan 35,902.
Petroleum:			
Crude and partly refined, thousand 42-gallon barrels	341	e 5,400	Mostly from Middle East.
Refinery products:			
Gasoline do	633	e 175	Mostly from United States.
Kerosine do	402	78	Do.
Distillate fuel oil do	3,869	2,080	Do.
Residual fuel oil do	4,173	1,280	Do.
Lubricants do	237	140	Mostly from Japan.
Pitch and asphalt do	394	200	Do.
Others do	58	25	Mostly from United States.
Total do	9,766	3,978	

e Estimate. r Revised.
[1] All reported as alloys.
[2] Includes anodes for electroplating.
[3] May include unroasted iron pyrites.

Sources: 1963 data from External Trade Statistics, Fourth Quarter 1963, Research Department, Bank of Korea; 1964 data from Monthly Foreign Trade Statistics, January 1965, Customs Bureau, Ministry of Finance, Republic of Korea, except petroleum figures which are estimated.

COMMODITY REVIEW

METALS

Iron Ore and Steel.—Development of the country's iron ore resources was making good progress, and iron ore output rose for the year despite heavy midyear rains that hampered mining. The Mulkum mine, northwest of Pusan, and Kyongin mine, west of Seoul, largely responsible for the spurt in 1964 output, were fully operating, and a new mine was scheduled to start production at Ulsan. Ore exports to Japan continued to rise; imports of iron and steel products also increased. Sizable tonnages of iron and scrap from the United States were consumed in the domestic steel industry. Annual steelmaking capacity was estimated at 275,000 tons,[3] with rolling capacity at about 400,-

[3] U.S. Embassy, Seoul, South Korea. Department of State Airgram A-119, Sept. 26, 1965, 2 pp.

000 tons. Seoul, Pusan, and Inchon were the main centers. Inchon Heavy Industry Corp. operated the largest plant, equipped with a 70,000-metric-ton open hearth furnace, a 100,000-ton blooming and medium section mill, a 18,000-ton sheet mill, and a 10,000-ton galvanizer.

A significant discovery of iron ore was made in following up favorable aerial surveys, and the property known as the Hongchon Chaun iron mine near Chaun-ni, about 65 kilometers northeast of Seoul, was under development. Limited core drilling indicated probable ore reserves of 25 million tons, and possibly twice this amount, containing 35 to 40 percent iron. The ore is said to contain several percent manganese; phosphorus in the form of apatite, which tests indicate can be removed; and a carbonate gangue. Proven reserves at the Soyonpyong-do Island titaniferous magnetite iron mine were listed at 2.7 million tons, as outlined by the current drilling program. The Wongdong iron mine, east of Hwanghii, Kangwon-do, was producing 1,000 tons per month of 56 percent ore for Samhwa Iron Manufacturing Co., South Korea's only pig iron producer, whose capacity was being expanded to 36,000 tons annually. Diamond-drilling of geophysical anomalies was proceeding at Kyung In iron mine; ore from the Okchon iron mine was going to a smelter in Pusan; and the Puk Samchok iron mine produced about 1,000 tons monthly.

At least two proposals were being considered for new iron and steel plants. One, with a designed capacity of 300,000 to 400,000 tons of ingots, would be financed by a $22 million Japanese loan and be constructed by Choil Iron Manufacturing Co. (South Korea). The other would be for addition to the Government's Inchon Heavy Industry plant, possibly financed in part by West German companies, providing an added 125,000 tons of ingot capacity plus fabricating facilities. Public sale of shares in the Inchon plant was discussed as a means of financing.

Outlook for iron and steel indicated a rise in demand to 710,000 tons annually by 1975. Current demand for cold-rolled sheet alone has been estimated at 3,000 to 4,000 tons monthly. Japan's Yawata Iron & Steel Co. Ltd., contracted to supply a South Korean firm with a 5,000-ton per month thin-plate and sheet-rolling reversing mill and to furnish necessary feedstock. A procedure by which cold-rolled sheets were imported from Japan on consignment, were galvanized, exported to South Viet-Nam, and were paid for by AID funds was found to contradict AID procurement rules, and such trade was stopped in November. However, later in December restrictions were removed under conditions that all dollar earnings from steel products be used to import U.S. raw material or certain goods of U.S. origin. Kyung Sung Industrial Co., Ltd., of Seoul, in view of pipe demand for urban water supply lines, applied for $430,000 in AID funds to set up large-diameter pipe facilities to produce 8,000 tons annually. A Japanese industrial group studied feasibility of an integrated steel mill, possibly at Pusan.

Tungsten, Bismuth, and Molybdenum.—Despite improved world prices and firm demand, tungsten output declined again as it has every year since 1961, because of the hesitancy in expanding the famous Sangdong mine. The Government-owned Korea Tungsten Mining Co. Ltd., operator of the large mine, was starting on a 3-year expansion program aimed at development of a 15-to 20-year ore reserve, the first phase included a major shaft-sinking project made necessary because of the depth of the workings—over 2,000 feet. In the mill, plans were made to expand daily flotation capacity from 1,200 to 1,800 tons of ore. Mill tests showed that better size distribution and other operating improvements could raise capacity. Tungsten was recovered both as flotation concentrate and from middling and off-grade ores as synthetic scheelite. Average overall recoveries of tungsten were about 76 percent.

Bismuth and molybdenum concentrates from flotation were treated at the Yongdongpo refinery; a low-grade molybdenum byproduct from chemical treatment was sold separately. Doré (gold and silver bullion) was recovered in Seoul from crude bismuth metal. In the area around the Sangdong mine, geophysical and soil surveys showed promising anomalies and more detailed studies were recommended. The Wolak tungsten mine in Chungchong Province continued production at a rate of 50 to 60 tons of wolframite concentrates plus 8 to 10 tons of molybdenite concentrates annually. Bismuth was recovered by onsite roasting. A disseminated molybdenite deposite, thought to be sizable, was discovered

bordering a stock of Pulkuksa granite during geochemical sampling in the Toktong-Choyang area, and a detailed geological study of the area was urged. Exploration at the Dalsung tungsten mine showed favorable gold/silver values, and vein sampling continued. At the Changsu molybdenite mine, a heavy mineral survey of the area was unsuccessful, but mine reserves were increased and a small mill was being built after pilot mill testing.

Copper, Lead, Zinc, and Gold.—Still unresolved were troubles in blending stockpiled ores from many sources at the Changhang smelter to achieve proper plant feed. Complex ores were separated at Changhang in a flotation mill, copper concentrates treated in a copper circuit, lead in the lead plant, zinc concentrates sold, and pyrite tailings cyanided along with other gold-silver ores. In the copper section a pelletizer and second blast furnace and converter went into operation. Monthly output reached about 320 tons of blister copper by yearend. Cupola furnaces melted brass shell casings. The electrolytic copper refinery produced 229 tons of cathodes and 5 tons of copper sulfate during November. At the lead plant, a 3-month shutdown of the reverberatory furnace was necessary for flue repairs, but in November 141 tons of refined lead bar was produced. Roasting of lead ores was troublesome and attempts to recover metals lost in flue dusts continued; successful pilot plant recovery was made of an 82 percent arsenic trioxide product. A brief test was run at the new cyanide plant before going into operation. In May, it was necessary to close the flotation plant for lack of fresh water. From tests it was determined that saline water could be substituted from the Kumi River, and although some smelting loss was expected because of chlorides, operations were resumed using this supply.

Appreciable reserves of 1.5 percent copper ore were developed at the Il Kwang mine, north of Pusan, formerly the country's largest copper producer; exploration continued with plans to rebuild the mill and operate at 200 ore-tons per day in 1966 shipping to Changhang. Pilot plant milling was considered at the Chilgok and Kwimyong lead-zinc-copper mines, and the Yeong Hwa lead-zinc mine was getting a portable crushing plant. Taisung Industrial Co. dedicated a 100-ton-per-day copper-and-zinc flotation mill at its Mooil mine in Kyongsang Province, where 200,000 tons of reserves have been developed. The Renka mines, supplying Toho Zinc Co. Ltd., in Japan, were expanding monthly output to 15,000 ore-tons. This was expected to yield 1,200 tons of zinc and 900 tons of lead concentrates. Suiho Mining Co. (South Korea) was interested in reactivating the long-closed Nichigetsu and other mines in the south. Beach sands near Mosulpo, on the southwest tip of Cheju Island, reportedly were found to have interesting gold and silver values. The Kwang Chon gold dredge of Yang Wang Industrial Co. operated in tidal flats south of the town of Kwang Chon on the west coast, daily handling of 3,000 cubic yards to a depth of 30 feet and recovering about 20 cents worth of gold per cubic yard.

NONMETALS

Barite.—A promising barite mine was being developed near Yong Tap-ni. A U.S. company, International Minerals & Chemicals Corp., expressed interest in finding a sizable source of barite to provide return cargo to the United States on ships carrying phosphate rock to South Korean fertilizer producers. Potential purchases of up to 10,000 tons monthly were envisioned.

Cement.—Following the entry into production of three cement plants in 1964, slack winter demand forced plants to cut back sharply from December 1964 through February 1965. Regular operations resumed in March and output reached a monthly record in July of 186,525 metric tons, with the year's output showing a substantial gain. Sangyong Cement Co. and Mitsubishi Shoji Kaisha Ltd., of Japan, were reportedly negotiating the construction of a single large plant that could double or even triple South Korean cement capacity by 1971, despite the current cement surplus for the internal market. Domestic consumption was estimated at 1.35 million tons in 1965, about 70 percent of capacity.

Looking ahead, the Government nevertheless was starting on construction of a 400,000-ton plant at Kyong-won. In addition to five major cement plants in operation, the small Koryo Cement Co. plant at Changsong produced about 50 tons of cement daily for a local block, pipe, and tile

factory. To make South Korean cement more competitive for foreign export, the industry requested government supports in the form of special power and fuel rates or even direct subsidy. High-quality limestone was generally abundant and efforts were being made to improve mining practices.

Feldspar.—Bo In Industrial Co. Ltd., operated the An Yang pegmatite mine, southwest of Seoul, a long-time source of soda feldspar near exhausion.

Fertilizer Materials. — Promotional efforts by the Government to encourage farmers in adequate and beneficial use of fertilizers, particularly mixed types, intensified, and consumption rates rose. South Korea continued heavy imports of Japanese fertilizers in the second year of a large 3-year purchase agreement ($24 million worth in the first half of 1965); the United States remained a large supplier of phosphatic fertilizers.

Two Government-owned plants producing urea operated near capacity at Chungju and Naju, and plans were readied for construction of three new plants. Two of these, approximately identical and costing about $45 million each with annual capacities of 180,000 metric tons of mixed fertilizers and 84,000 tons of urea, were to be built by Fluor Corp. of the United States, one at Chinhae, west of Pusan, and the other at Ulsan. Both projects were joint ventures of United States companies and the South Korean Government. Gulf Oil Corp. with a $10.5 million equity joined with Chinhae Chemical Fertilizer Co. in the Chinhae project, and a consortium of Swift & Co. and Skelly Oil Co. investing $10 million shared in the Ulsan project with Yongnam Chemical Co. and Chungju Fertilizer Co. AID loans were authorized in June for half of the estimated costs, and risk guarantees were provided to protect U.S. investors. Plants were due for completion in early 1967. The third new plant was to be supplied by the Japanese through Mitsui Bussan in partnership with Hankuk Fertilizer Co., which was, in turn, backed by the Interore Corp. of the United States and South Korean investors. It was expected to be built at Pusan, to cost about $44 million, and to produce 330,000 tons of urea annually, utilizing the Toyo Koatsu Industries, Inc., process.

In addition, the Government granted Korea Fertilizer Industrial Co. Ltd., approval of a $700,000 investment for production of fused magnesium phosphate fertilizer.

Fluorspar.—About one-fifth of South Korea's fluorspar output came from the Kumi mine, near Tanyang, where reserves were estimated to exceed 20,000 tons of plus 50 percent calcium fluoride; most of this property's output in 1965 was of plus 65 percent calcium fluoride grade. The Chunchon-Sinpo mine, in Kangwon-do, produced about 1,000 tons monthly of hand-sorted fluorspar, 70 percent and higher grade, all for export, and operators planned to install a mill.

Graphite.—At the Shiheung graphite mine, improvements were made in ore handling and transportation. New mills operated at Tansan and Pyongtaek with combined annual capacity of 3,500 tons of graphite. A fairly broad distribution of surface showings of graphite was disclosed by mapping in the Kimpo area; mixed anthracite and graphite beds were mapped in the central part of the country.

Kaolin.—A 30,000-ton kaolin plant, finished last year, operated at Masan. An excellent description of the South Korean kaolin industry was published.[4] Eighty-two individual mines operated in 1964, with the main center in the Hadong area, 15 miles west of Chinju. Products consisted primarily of pink and white halloysite clay, of which about one-third was being exported to Japan.

Pyrophyllite.—Tongnae Pyrophyllite Co. operated the Tongnae mine, producing 900 tons per month of pyrophyllite for domestic and export markets, and the company planned to open the Imke deposit, 0.6 mile south of the main workings. About 1,000 tons of pyrophyllite monthly was produced from the Hwangson mine, where there were plans to double output. The Wando mine, located on Nohwa Island, south of Mokpo, operated on about the same scale. In 1965 the Kooam mine, Hyongsang Province, supplied 3,200 tons of pyrophyllite, mostly to domestic buyers.

Quartz.—Hansung Trading Co's. Chonnam silica mine, in Cholla-namdo, produced quartz from a 50-foot-wide vein for export

[4] Heikes, G. C., Hyung Ki Kim, and others. The Kaolins of Korea. Agency for International Development, U.S. Operations Mission to Korea, Seoul, Korea, August 1965, 104 pp.

to Japan. With a probable million-ton reserve, the company considered a plan to develop by adit and expand output.

Talc.—Il Shin Industrial Co., with its Tongyang talc mine in Chungchong Province, produced at a rate of 20,000 tons annually, operated a grinding mill at Chungju, and was developing a new talc orebody. A new 12,000-ton talc grinding plant was operating at Sinbo.

Vermiculite.—Heung Kook Industrial & Housing Co. recognizing the possibilities of substantial quantities of vermiculite in its 10-square-mile landholding in the Sanjon area, operated a pilot exfoliation plant near Seoul and planned to use the product in low-cost housing.

MINERAL FUELS

Coal.—Coal production continued its upward trend, with six main Government-owned mines, operated by Daihan Coal Corp., supplying just under half of the output. At the Changsong mine, source of nearly two-fifths of Daihan's output, preparations were made to purchase a new main hoist. Changsong is the site of a $9.5 million AID development loan project for a deep shaft and modern preparation plant scheduled for completion by 1967. A Pittsburgh firm has been awarded the contract for building the preparation plant. Pierce Management Corp., of the United States, continued its advisory role here and in other coal development projects under Government contract and AID supervision. Lignites in the southeast and mixed anthracite-graphite beds in central Korea were investigated.

Coal prices, already boosted 15 percent in November 1964, were due for a similar increase in May 1965, as rising costs caused Daihan Coal's fiscal balance to narrow. Sizable exports of coal and amorphous graphite-coal mixtures continued to Japan. Bituminous coal was imported chiefly for the iron and steel industry. The Government's current development program for coal envisaged a 14.5 million-ton rate of output by 1971, about three-fourths of the output to come from private mines. Amalgamation of small private mines was being pushed, especially in the northwest, to attain more efficient unit operations.

Petroleum.—Lacking any oil resource, South Korea imported crude oil from Kuwait under a 15-year supply contract with Gulf Oil Corp., a principal in the 35,000-barrel-per-day Ulsan refinery. Opened in 1964, the plant is operated by the Government's Korea Oil Corp. Refining rates reached capacity in May 1965 and plans were announced to expand throughput to 55,000 barrels per day in 1966.[5] During 1964, 5.29 million barrels of crude oil spiked with gas oil and heavy fuel oil was processed, yielding an estimated 4.84 million barrels of products. Imports in the same period included 5.83 million barrels of spiked crude oil plus 0.24 million barrels of cutting oil. Total oil and product imports in 1964 were valued at $25.9 million, including $13.3 million worth of crude oil. Consumption of refined products was estimated to total 7.46 million barrels in 1964, an increase of nearly 2 million barrels since 1961. Demand was expected to rise to 28 million barrels by 1971, assuming a proposed petrochemical industry is established. Improvements were made in transportation and storage facilities, but more tanker ships were needed and negotiations were under way to get them. About one-half of the refined product was being transported by sea; future increases to 70 percent were projected.

Petroleum's contribution to national energy supply was expected to rise from 14 percent in 1965 to 24 percent in 1971. Plans were reported to build a lubricating oil plant to supplement several small existing blending plants, and a tentative plan was under consideration to use forthcoming Japanese Government credits in financing a $40 million petrochemical complex that would crack 400,000 tons of naphtha annually. Raw materials apparently would come from a second South Korean refinery yet to be built.

The Korean Geological Survey investigated the east coast Pohang sedimentary basin for oil. Private company drilling in 1964–65, south of Pohang, detected minor flows of natural gas, chiefly after reaching the Hungnae formation at about the 1,900-foot depth. Drill cores were being studied for indications of oil.

[5] Korea Oil Corp. ECAFE Symposium Report (Nov. 8, 1965, 12 pp.), and Summary Account of the Petroleum Industry of the Republic of Korea (Oct. 8, 1965, 4 pp.) Papers presented at Economic Commission for Asia and Far East, Third Symposium on the Development of Petroleum Resources of Asia and the Far East, Nov. 10–20, 1965, Tokyo, Japan.

The Mineral Industries of Malaysia and Singapore

(Including Independent Sultanate of Brunei)

By J. M. West [1]

Singapore on August 9 officially separated from the Malaysian Federation of 11 States of Malaya plus the regions of Sarawak and Sabah in north Borneo, after attempts for economic and trade consolidation failed for several years. Malaysia with roughly 9.4 million people and Singapore with its 1.8 million people continued on friendly terms although internal trade was disrupted temporarily. The separation had little effect on extractive mineral industry because this was largely confined to the Malayan States and Sarawak, but it did raise questions about which area might be the more favorable for industrial investment. Both Malaysia and Singapore have benefited from major new industries in recent years, including oil refineries, metal fabrication and smelting facilities, and cement plants; both openly invited foreign investment and offered substantial incentives.

Malaysia, exclusive of Singapore, lists rubber, tin, timber, and iron ore among its leading export products. The first two were credited in 1965 for nearly one-third of the gross national product (GNP) and over one-half of the export earnings; tin alone accounted for nearly 9 percent of the GNP. Malaysia recorded a 6-percent increase in tin output during the year, maintaining first place in world production, well ahead of Bolivia and mainland China, and supplying nearly one-third of the world's total production of tin concentrate as well as a major portion of the refined metal. Other minerals, including iron ore, bauxite, petroleum, and cement, contributed an estimated 3 percent to the GNP.

Singapore's GNP, estimated at $824 million in 1964 or about 30 percent of the Malaysian GNP, was apparently higher in 1965, with the Singapore Government emphasizing both industrialization and traditional entrepôt trade to expand the economy. Petroleum refining and iron and steel manufacturing were recent industrial acquisitions.

The economy of the Sultanate of Brunei continued to be tied to oil, the source of nearly all income, and the outlook for future revenues was improving with offshore discoveries and the possibility for sale to Japan of natural gas in liquefied form.

Among significant developments in the entire area during 1965, the expansion of Malayan tin mining, largely by increase in gravel pump operations, ranked foremost. This required considerable effort in the face of declining ore grades and was spurred by favorable tin prices. Active prospecting for offshore tin deposits was about to get underway. Several major tin dredges were under construction and at least one was commissioned in 1965.

The outlook for iron ore producers improved with the start of construction of an integrated iron and steel plant on the west coast of Malaya. Producers will become less dependent on the export market as a result. Singapore's steel facilities were expanding and the installation of a blast furnace which would utilize Malayan iron ores was under consideration. Copper discoveries in Sabah were hailed as promising, and exploration was accelerated. Two more bauxite mines opened in Malaya, but

[1] Far East specialist, Division of International Activities.

the one mine in Sarawak was closed. In Malaya a cement plant, new in 1964, was in process of doubling capacity and a large fertilizer and chemical complex on the west coast neared completion. Oil prospecting was active in 1965 with emphasis on offshore areas of Sabah, Brunei, and Sarawak. At Singapore, another major oil refinery neared completion, and one more was in the planning stage; expansion of a recently completed refinery at Port Dickson, Malaya, also was being planned.

Malaysia and Singapore continued to have stable and prosperous economies based on free-enterprise with minimum controls, encouraging investment through a variety of Government activities. Singapore, for example, placed no restriction on capital participation and allowed free repatriation of profits and capital; special tax incentives and concessions were negotiated. In a speech by Singapore's Minister of Finance on November 19, 1965, added incentives were disclosed; the Government was preparing to allow fast depreciation for certain industries, particularly those export-oriented, with writeoffs within as short a period as 3 years, and would allow greater tax deductions on sales promotions. Another incentive was Singapore's removal of duty on fuel oil where used in manufacturing. U.S. investors were encouraged by a revision of the U.S.-Malaysia Investment Guaranty Agreement to extend coverage of losses due to war risks to all of Malaysia.

Singapore's 5-year plan (1966–70) was announced under which about two-thirds of planned Government expenditures of $500 million would go for economic development projects. Malaysia also announced its first 5-year plan (1966–70), providing for systematic industrial expansion with equal treatment for both foreign and domestic firms. Under the plan greater efforts were to be made in Sarawak and Sabah to develop natural resources and infrastructure such as roads and power. In estimating available income, Malaysia's plan assumed a 4.6-percent-per-year decline in contribution from the mining sector because of anticipated decline in mineral reserves, particularly tin and iron ore. The plan foresaw a marked decline in output of tin by dredging.

The Malaysian Government reversed a decision not to join the Third International Tin Agreement, a plan largely producer-oriented to stabilize tin markets, and in late December gave authority to ratify the document. Government prospecting units continued exploration of potential tin-bearing areas, and direct financing to miners was offered in several instances. Aerial photographic surveys were underway in eastern Malaysia and were begun in western Malaysia with Canadian Government assistance.

Government plans for electric power included development expenditure in the 1966–70 period totaling $120 million. Among major projects were the $40 million Batang Padang hydroelectric project and a $35 million 600,000-kilowatt thermal powerplant at Negri Sembilan, near Port Dickson. Sabah and Sarawak were to receive small generating facilities including units powered by natural gas. A Japanese firm signed a $20 million contract to start construction of multipurpose dams and other works as part of the $65 million to $70 million Muda River development in Kedah State. Malaysia's power generation in 1964 (exclusive of Singapore) totaled 1,756.5 million kilowatt-hours. About two-fifths of this was used in tin mining. Singapore produced 914.2 million kilowatt-hours of power in 1964 and planned to double generating capacity by 1967.

Government-promoted industrial sites, established in a number of locations, were gaining new factories. Petaling Jaya, near Kuala Lumpur, was an outstanding example, with new plants including a major refinery and an aluminum rolling mill. At Singapore's Jurong Industrial Estate, located in the southeastern part of Singapore Island and boasting an excellent natural deep-water harbor, steel mills, oil refineries, chemical plants, and light industries have been attracted by the 5-year "tax holiday" and other concessions of the Government's "pioneer industries" program. A feature here also was low industrial power rates—as low as 1 cent per kilowatt-hour.

PRODUCTION

Malaysia's mineral commodity output value, about three-fourths accountable to tin, increased to an estimated $335 million in 1965—a gain of about 10 percent over 1964 figures. Iron ore was the second most valuable product, with cement, bauxite, and refined petroleum as other major components. Bauxite, oil, and gold of Sarawak origin contributed less than 5 percent to total output value; Sabah produced only minor quantities of bricks, coral, construction stone, and charcoal. Singapore's mineral industry was limited to oil refining, steelmaking, cement, and mining of about 1 million cubic yards of granite annually for local construction. Brunei oil and gas production was valued at an estimated $50 million to $55 million, about $5 million higher than in 1964.

Table 1.—Malaysia, Singapore, and Brunei: Production of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Antimony ore (Sarawak)	--	--	6	157	NA
Bauxite:					
Malaya thousand tons	417	355	451	470	857
Sarawak do	257	229	157	r 168	160
Total do	674	584	608	638	1,017
Columbite-tantalite concentrate, columbium-tantalum ratio 4:1, 70 to 80 percent pentoxides	e 100	112	89	57	59
Copper, flotation concentrate e	2,000	2,000	2,000	1,085	1,750
Gold:					
Malaya (crude) troy ounces	12,486	6,923	9,116	7,295	3,982
Sarawak (fine) do	4,132	2,885	2,773	3,115	2,602
Iron ore, 60 to 64 percent iron thousand tons	6,842	6,612	7,381	6,569	6,985
Manganese ore, 30 to 40 percent manganese	6,468	309	6,982	--	1,590
Tin:					
Mine (contained 75 to 76 percent tin concentrate) long tons	56,028	58,603	59,947	60,004	63,670
Smelter [2] do	79,114	82,073	84,001	71,351	72,469
Titanium concentrate (ilmenite; exports)	108,585	103,289	149,366	r 131,319	123,547
Tungsten ore and concentrate (wolframite and scheelite)	37	10	6	6	9
Zirconium concentrate (zircon; exports)	57	65	r 206	r 150	591
Nonmetals:					
Cement:					
Malaya thousand tons	331	326	362	417	738
Singapore (from imported clinker) do	NA	122	194	e 200	203
China clay do	2	4	1	1	2
Lime (Sarawak)	106	120	166	226	NA
Monazite (exports)	708	637	899	308	705
Xenotime (yttrium mineral; exports)	e 5	5	5	e 10	e 10
Mineral fuels:					
Coal, bituminous, low-grade thousand tons	--	--	--	--	--
Gas, natural (Brunei) million cubic meters	1,382	1,280	1,127	e 1,200	1,328
Petroleum:					
Crude:					
Brunei thousand 42-gallon barrels	30,016	27,868	29,266	25,913	28,991
Sarawak do	435	418	373	352	351
Natural gasoline (Brunei) do	628	645	676	e 600	546
Refinery products:					
Sarawak [3] do	16,877	e 17,500	e 17,500	e 18,500	19,656
Malaya-Singapore do	13,337	39,931	44,544	e 50,000	e 55,000

e Estimate. r Revised. NA Not available.

[1] Production from Malaya unless otherwise shown.

[2] Includes metal smelted from imported tin concentrates.

[3] Processed at Lutong refinery; mostly from crude supplied by pipeline from Brunei.

TRADE

Overall exports from Malaysia (excluding Singapore) in 1965 were valued at $1,017 million, compared with $855 million in imports leaving a favorable balance of $162 million. Tin, mostly in the form of block tin, accounted for about 28 percent of export value, and iron ore for 5 percent, other mineral commodities adding probably another 1 to 2 percent. The U.S. share of all export goods was about $122 million, of which four-fifths was for tin in 1965 compared with $86 million in 1964 of which two-thirds was for tin. Both tonnage and unit value of tin were higher in 1965. Sarawak exported a little less bauxite in 1965 and continued exporting crude and refined oils; most of the crude, however, originated in neighboring Brunei.

Of Singapore's total 1964 export value of about $893 million, nearly one-fourth was for processed minerals, largely petroleum products. Overall export values were higher in 1965 at $985 million. Imports of all goods into Singapore in 1964 were valued at $1,140 million, of which about one-fifth was attributable to mineral commodities. Total imports rose to $1,250 million in 1965. Trade between Singapore and Malaya dropped in the last half of 1965 after separation, but prior to this, mineral trade had amounted to about one-fourth of the Singapore total for imports from Malaya and one-third of the Singapore total for exports to Malaya.

Sarawak in 1964 imported 3.54 million tons of crude oil valued at $58.32 million from Brunei and exported 1.76 million tons of crude oil valued at $30.63 million and 1.73 million tons of refined products valued at $36.07 million, the net thus contributing roughly $5 million to the local economy. Nevertheless, it was necessary to import petroleum products for domestic use valued at $3.89 million in 1964. Bauxite exports in 1964 totaled 172,000 tons valued about $1 million, with 122,500 tons going to Japan and nearly all of the balance to Taiwan. During 1964 Sarawak imported 33,000 tons of cement, nearly half from mainland China, 12,400 tons of iron and steel products, and about 630 tons of nonferrous metals.

Sabah imports included about 117,000 tons of petroleum products, 46,300 tons of cement, mainly from Taiwan and Japan, 15,450 tons of iron and steel products, and 435 tons of nonferrous metals. Oil product imports were valued at $8.6 million in 1964 compared with $6.8 million in 1963.

Brunei exported 3.52 million tons of crude oil valued at $57.64 million, 48,100 tons of gasoline, 1,020 tons of other oil products, and $180,000 worth of natural gas in 1964. Imports included 18,100 tons of cement (10,600 tons from main-

Table 2.—Values of major categories of metal and mineral trade

(Million U.S. dollars) [1]

	Imports		Exports	
	1963	1964	1963	1954
Malaya:				
Iron and steel	33.9	35.6	0.9	1.4
Metalliferous ores and metal scrap	49.6	36.4	65.9	62.3
Nonferrous metals	5.4	5.5	209.4	237.4
Crude minerals and fertilizers	6.2	7.0	.2	.3
Fertilizers, manufactured	11.0	12.3	.1	.1
Mineral fuels	50.0	54.8	4.3	14.1
Singapore:				
Iron and steel	34.8	27.2	17.4	15.7
Iron and steel scrap	.3	.5	.7	.7
Nonferrous metals	6.2	5.6	9.5	3.9
Nonferrous ores	4.5	2.6	2.5	2.5
Metal scrap (nonferrous)	2.2	.6	3.8	4.0
Cement, stone, lime, other nonmetals	7.7	6.9	6.2	5.2
Fertilizers, manufactured	3.8	4.4	5.4	5.2
Petroleum:				
Crude	49.8	30.0	18.2	------
Products	145.3	123.7	123.5	118.6
Bunkers	------	------	48.6	45.2

[1] Converted at M3.05 = US$1.

Table 3.—Malaya and Singapore: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
MALAYA			
Metals:			
Bauxite—thousand tons	457	557	Japan 506; Taiwan 50.
Columbite-tantalite concentrate	66	6	All to United States.
Copper concentrate [1]	r 2,300	1,087	Singapore 1,016.
Gold bullion—troy ounces	r 1,468	1,230	Singapore 1,213.
Ilmenite concentrate—thousand tons	149	131	Japan 64; France 53; Belgium 13.
Iron ore—do	6,690	6,420	Japan 6,366; Taiwan 54.
Iron and steel scrap	35,600	45,700	Japan 24,600; Singapore 17,300.
Manganese ore	7,000	--	
Monazite	899	327	United States 193; Japan 104.
Nonferrous metal scrap	3,710	5,500	Singapore 2,130; Japan 1,780.
Tin:			
Ore—long tons	r 737	683	Singapore 682.
Slag and hardhead—do	11,400	--	
Unwrought—do	84,551	71,149	United States 25,733; Japan 14,370; India 4,221; Canada 3,848; Italy 3,796; United Kingdom 2,779; France 2,414; U.S.S.R. 2,100.
Tungsten concentrate	10	17	Netherlands 9.
Zircon	r 262	150	Japan 147.
Mineral fuels:			
Coke	610	850	Thailand 550; Singapore 300.
Petroleum:			
Partly refined—thousand tons	68	254	Singapore 217; Australia 37.
Refinery products—do	59	509	Singapore 342; Thailand 85.
SINGAPORE			
Metals:			
Aluminum, all forms	1,430	810	Malaya 521.
Copper and alloys, all forms	940	415	Malaya 317.
Iron and steel:			
Pig iron	892	866	Malaya 863.
Semimanufactures:			
Steel bars and rods	34,000	37,000	Malaya 31,300.
Angles and shapes	9,800	7,410	Malaya 6,280.
Other	65,700	58,200	Malaya 46,800.
Lead, all forms	319	562	Denmark 247 (unwrought); Malaya 187.
Silver—thousand troy ounces	1,736	522	Mainly to United Kingdom.
Tin:			
Ore—long tons	1,395	987	All to Malaya.
Unwrought—do	2,268	608	New Zealand 249; United Kingdom 93; Philippines 57; Republic of South Africa 31; France and Monaco 25.
Zinc, all forms	568	155	Sarawak 84; Malaya 34.
Nonmetals:			
Cement and clinker—thousand tons	101	50	Malaya 45; Brunei 3.
Phosphate rock	17,500	26,200	Malaya 25,100.
Mineral fuels:			
Petroleum:			
Crude (reexports)—thousand tons	1,236	--	
Refinery products:			
Nonbunker:			
Gasoline—do	1,010	936	South Viet-Nam 222; Thailand 172; New Zealand 164; Australia 123.
Kerosene—do	748	526	Thailand 119; South Viet-Nam 100; Hong Kong 87; Australia 57; Malaya 42; Sabah 37.
Distillate fuel oil—do	1,230	1,074	South Viet-Nam 262; Thailand 257; Hong Kong 159; Malaya 144.
Residual fuel oil—do	1,010	1,776	Hong Kong 984; Japan 543; South Viet-Nam 153.
Lubricants—do	32	58	Thailand 23; Malaya 14; Burma 7.
Bunker fuels:			
Ships—do	2,649	2,511	United Kingdom 529; Norway 338; Japan 284; Greece 202; Netherlands 195.
Aircraft—do	61	55	United Kingdom 27; Australia 13; India 6.

r Revised.

[1] Exported principally to Japan via Singapore.

Sources: Department of Statistics, Kuala Lumpur. States of Malaya, Annual Statistics of External Trade, 1964. V. 1, Exports and Re-Exports, 1965, 337 pp.
Department of Statistics, Singapore. Singapore External Trade Statistics for 1964 and October to December 1964, 1965, 926 pp.

land China), 13,550 tons of iron and steel products, and 133 tons of nonferrous metals.

Upon the separation of Singapore from Malaysia, a number of trade restrictions were imposed and interflow of goods was cut back sharply. Toward yearend, as regulations became re-established, restrictions began to ease. In October, Malaysia moved toward greater integration of the Malayan States, Sabah, and Sarawak by exempting a number of goods from duty. Barter trade was resumed on a small scale between Singapore and Indonesia late in 1965, and the outlook for complete resumption of trade in 1966 was good. Singapore, after losing some of its major markets, employed a variety of incentives to encourage exports. Singapore and Malaysia tariff structures were discussed.[2]

[2] Hillson, Louise H. Foreign Trade Regulations of Malaysia. U.S. Department of Commerce, Bureau of International Commerce, Overseas Business Reports OBR 65–18, March 1965, 12 pp.

Table 4.—Malaya and Singapore: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
MALAYA			
Metals:			
Aluminum, all forms	3,400	3,100	United Kingdom 1,260; Canada 489; Japan 401; India 254.
Copper and alloys, all forms	2,020	2,090	Rhodesia-Nyasaland 1,060; United Kingdom 605.
Iron and steel:			
Pig iron	5,240	4,860	Mainland China 3,060; Australia 935.
Semimanufactures:			
Bars and rods	71,600	77,800	Japan 43,700; mainland China 18,670; Singapore 8,700.
Angles and shapes	24,100	23,200	Japan 9,640; Belgium 6,240; United Kingdom 4,950.
Plates and sheets	60,000	67,500	Japan 56,500.
Other	85,000	88,700	Japan 24,400; Singapore 20,000; mainland China 13,950; United Kingdom 13,800.
Lead, all forms	732	750	Australia 451; United Kingdom 116; Singapore 102; Burma 51.
Manganese ore	703	1,071	India 1,040.
Mercury ---76-pound flasks	40	126	United Kingdom 112;
Tin:			
Ore ---long tons	27,612	14,089	Thailand 11,815; Laos 678; Singapore 637; Burma 584; Sumatra 230; Kenya 145.
Metal and alloys, all forms ---do	217	218	Sumatra 142; Singapore 28.
Zinc:			
Ore	408	1,685	Australia 1,428; Belgium 257.
Metal and alloys, all forms	1,140	910	Australia 855.
Nonmetals:			
Asbestos	3,220	6,050	Rhodesia-Nyasaland 2,500; Canada 1,110; Australia 1,044.
Cement, including clinker ---thousand tons	200	172	Mainland China 54; Taiwan 42; Japan 37; Singapore 16.
Fertilizer materials:			
Crude:			
Phosphate rock	90,600	85,700	Christmas Island 52,800; United States 27,000; Tunisia 3,560.
Potash	2,120	2,130	West Germany 2,120.
Manufactured	194	203	West Germany 82; United Kingdom 70; Singapore 19.
Gypsum and plasters	17,700	35,800	Australia 27,600; United Arab Republic (Egypt) 7,640.
Salt	60,700	66,900	Thailand 47,200.
Sulfur	3,200	3,140	France 2,990.
Talc	2,760	2,520	Mainland China 1,330; India 326.
Mineral fuels:			
Coal (mostly anthracite)	29,950	24,280	North Viet-Nam 17,500; South Viet-Nam 6,700.
Coke	4,900	5,420	Netherlands 2,210; Taiwan 1,300.
Petroleum:			
Crude ---thousand tons	r 609	2,188	Kuwait 1,502; Sarawak 277; Iran 238.
Refinery products:			
Gasoline ---do	161	77	Iran 26; Singapore 25.
Kerosine ---do	109	63	Singapore 30; Iran 16.
Distillate fuel oil ---do	418	242	Saudi Arabia 87; Singapore 69; Iran 35; Bahrein 23.
Residual fuel oil ---do	410	87	Iran 51; Sumatra 13; Singapore 12.
Lubricants ---do	20	20	Singapore 9; United States 7.
Asphalts and bitumens ---do	36	9	Singapore 7.
Other ---do	4	2	United States 1.

See footnote at end of table.

Table 4.—Malaya and Singapore: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
SINGAPORE			
Metals:			
Aluminum, all forms	5,500	2,860	Japan 958; United Kingdom 660; Belgium 385.
Copper and alloys, all forms	1,500	1,145	Japan 502; United Kingdom 251.
Iron and steel:			
Pig iron	10,480	5,870	Republic of South Africa 3,560; mainland China 1,860.
Scrap	11,500	18,400	Malaya 17,300.
Semimanufactures:			
Bars and rods	82,980	49,600	Mainland China 24,100; Japan 17,400.
Angles and shapes	26,700	22,500	Japan 9,630; Belgium 4,220; mainland China 3,750.
Plates and sheets	84,500	69,800	Japan 62,600.
Other	63,900	80,500	Japan 37,300; United Kingdom 8,250; mainland China 6,040.
Lead, all forms	385	319	United Kingdom 136; Australia 68; Burma 50.
Manganese ore	-----	3,540	India 3,220.
Tin:			
Ore—long tons	2,485	810	Malaya 683; Kenya 100.
Unwrought—do	727	442	All from Malaya.
Zinc, all forms	681	470	Australia 148; Yugoslavia 80; United Kingdom 73.
Nonmetals:			
Asbestos	6,630	8,350	Rhodesia-Nyasaland 4,890; Australia 1,925; Canada 1,510.
Cement and clinker—thousand tons	423	365	Japan 236; mainland China 58; North Viet-Nam 44.
Fertilizer materials: Phosphate rock	30,200	35,300	United States 19,000; Christmas Island 13,600.
Gypsum	9,420	19,050	Japan 17,500.
Lime	4,220	5,800	Malaya 3,130; Japan 2,260.
Salt	22,400	20,600	Thailand 20,200.
Talc	3,680	3,000	Mainland China 2,400.
Mineral fuels:			
Coal	3,600	4,940	Australia 4,730.
Coke	5,410	3,240	Taiwan 1,840; Netherlands 835.
Petroleum:			
Crude oil—thousand tons	3,370	2,336	Kuwait 1,723; Iran 288; Malaya (partly refined) 226.
Refinery products:			
Gasoline—do	827	735	Iran 248; India 177; Sarawak 135; Netherland Antilles 63.
Kerosine—do	725	530	Iran 166; Sarawak 149.
Distillate fuel oil—do	1,386	1,031	Kuwait 371; Sarawak 290; Saudi Arabia 134.
Residual fuel oil—do	2,740	3,485	Sarawak 910; Kuwait 610; Australia 472; Saudi Arabia 328; Malaya 251.
Lubricants—do	53	64	United States 36.

r Revised.

COMMODITY REVIEW

METALS

Bauxite.—Sarawak's only bauxite mine, at Sematan, depleted reserves and closed in December. However, Sarawak has other deposits of possible economic grade that may be developed in the future. Four mines, compared with only two during 1964, operated most of the year producing bauxite in Johore State, on the southern tip of the Malayan Peninsula. Increased output of the Malayan mines was principally because of strong Japanese demand; Malaysian exports to Japan totaled about 850,000 tons in 1965 valued at $4.7 million.

Copper.—Copper has been a consistent byproduct of Malaysian tin mining, and, for the most part, is traded through Singapore. In 1965 there was increasing possibility of economic copper development in the Sabah region of the country. Copper has long been known to occur in Sabah in and near basic and ultrabasic intrusions cutting basalt and sedimentary rocks in the Labuk Valley, near Ranau, east of Maruda Bay, and on Banggi Island. More recently geo-

chemical prospecting has led to discoveries such as those of Soriamont Investment Co. (United States) at Pinanduan in the Karamu Valley and by Malaysian Goverment and United Nations geologists in the Labuk Valley. Soriamont in 1965 was prospecting at Gunong Nungkok on the western slope of Mt. Kinabalu and reported finding commercial copper ore as disseminations in steeply dipping intrusives. Malaysia's Borneo Region Geological Survey conducted mapping and explorations in the Bidu Bidu Hills and near Mt. Kinabalu. After discovery in 1964–65 of "decidedly commercial quantities" of copper at Mamut, east of Mt. Kinabalu, the Government closed the area to private prospecting until its potential could be assessed. The area is inland and is situated in a deeply dissected mountain range rising to elevations of about 4,000 feet. Silver was reported to have been discovered on the east coast of Sabah at the head of Darvel Bay but there was no indication whether copper was present.

Gold.—Drilling by Government crews continued in the Bau Gold Mining District of Sarawak with limited success. Some veins have produced antimony and one deposit, the Kwei Fah Gold Mine, south of Bau, the source of 132 tons of antimony ore valued at $16,000 in 1964, remained active on a small scale. The Research Division of the Department of Mines, Malaysia, conducted beneficiation tests to find means of treatment for such ores common to the district. Sarawak gold production was valued at $104,000 in 1965. Gold also was a byproduct of Malayan tin mining.

Iron Ore.—At yearend, 27 iron mines, an increase of four for the year, were in operation in 6 Malayan States, which was 1 State less than in 1964. During the year about five other mines operated intermittently. In the second half of 1965 ore production by States was distributed as follows, in percent of total: Pahang, 36; Trengganu, 27; Johore, 16; Perak, 13; and Kedah, Kalantan, and Selangor nearly 3 each. Output rose 6 percent for the year and exports were also higher at 6,710,000 tons, but value declined slightly because of tightened Japanese contracts to $52.2 million. Stricter contract terms came as the result of Japan's diversification of sources of iron ore and, in part, depletion of Malayan high-grade reserves. Prices paid for iron ore in 1965 declined about 45 cents per ton. As before, the largest producers were the Buket Besi or Dungun mine in Trengganu State and the Buket Ibam or Rompin mine in Pahang State, the two together accounting for over half of all production. Labor involved in iron mining was estimated to total 6,000 workers. Kalantan's only iron mine, operated by the Oriental Mining Co. at Temangan, 50 miles from Kota Bharu and in which Kalantan State has a share, was closed in September after exhausting reserves. Production since its opening in 1958 totaled 3.5 million tons. Plant and equipment were being sold. Development continued and more ore was mined at the Pasaki iron deposit, operating in conjunction with the Rompin mine in southern Trengganu.

Iron and Steel.—Construction was underway, after considerable delay in arranging for financing, on the Malayawata Iron and Steel Co. integrated plant at Prai. The plant is to have two blast furnaces, the first to operate in 1967 and the second in 1969. Initial annual capacity is planned for 53,000 tons of pig iron, 52,000 tons of steel, and 47,000 tons of rolled products, with completed capacity about double these amounts. High-grade iron ore is available from nearby Kedah and Perak States in Malaya.

In Singapore, the National Iron and Steel Mills, Inc., plant, at Jurong, in production since 1963, was about to start up its second electric furnace, doubling capacity to 120,000 tons of steel annually, and had a third furnace on order. Other equipment being installed included a continuous casting line and rolling facilities to produce diversified shapes, channels, and wire rods. Scrap steel was used as raw material; however, purchase of a 250,000-ton blast furnace which would utilize Malayan iron ores was under consideration, and the company's managing director described plans to expand over all plant capacity to 300,000 tons of steel yearly. Also, Japanese businessmen discussed plans to build a $15 million steel sheet plant at Singapore with the outcome that a preliminary agreement for investment was signed by Japan's Nippon Kokan K. K. and the Singapore Government. The company is to be known as Union Steel Ltd., and will supply cold-rolling steel sheets to

Singapore and Malaysian markets. Singapore Galvanizing Industries Ltd., brought its new 12,000-ton per year galvanizing plant into production at Jurong.

Rare Earths.—Xenotime, containing 10 to 55 percent of the rare-earth yttrium group elements and a byproduct of some 36 small tin mines in one section of east coast Malaya, was marketed chiefly by Oriental Thai Corp. of Kuala Lumpur. Much of the demand was from Japan and in 1966, prices are expected to rise sharply, possibly reaching $7 per pound for high grade concentrates, owing to the new use for yttrium in color television tubes. Annual capacity of the mines has been estimated at 100 tons of xenotime.

Tin.—Efforts to boost tin production in the Malayan States were rewarded by significant increase in output of tin-in-concentrates. Perak remained the chief producing State, followed by Selangor, with lesser amounts from Pahang, Johore, and other States, except for Kelantan which recorded no production. Most of the increase was credited to gravel pump mines, those operational rising from 768 at the beginning of the year to 979 at yearend. Dredges in operation, conversely, declined from 69 to 65 at yearend, with three stopping in October-November. At yearend 1965, 1,103 tin mines were active in Malaya. The total includes 28 underground tin mines, the largest of which is in Pahang State and most of the remainder in Perlis State. The total number of tin mines also includes miscellaneous types of mining operations. It was considered questionable by some industry spokesmen whether in the face of declining ore grades the rate of production reached in 1965 could be maintained. Developers were particularly looking toward exploitation of offshore deposits and hitherto untapped Malayan reservation lands. At the same time much ground was being reworked at marginal profit. Average grade of once-rich Kinta Valley dredge lands was estimated to have fallen to about 0.4 pound per cubic yard.

Tin smelting was adversely affected by a ban on Thailand's exports of concentrates in July 1965, occasioned by startup of a new smelter there; consequently, a drop in imports to Malayan smelters. Larger than normal imports had been recorded in the first half of the year, however, dampening the impact of the ban. Straits Trading Co. Ltd., and Eastern Smelting Co. Ltd., continued their Penang and Butterworth operations apparently at reduced rates. Straits Trading Co. Ltd., also maintained a small smelting operation at Palau Bukom, Singapore, processing low-grade tin ores. The small but modern Japanese-financed Oriental Tin Smelters Ltd., completed in 1964 at Klang, was also in operation, the company shipping tin through the Port of Butterworth. Exports of tin metal and tin-in-concentrates in 1965 totaled 73,383 long tons, compared with 71,315 tons in 1964. Block tin exports were reported to total 73,287 long tons valued at $283.2 million. Unit value, f.o.b., of tin metal exports in 1965 averaged $3,870 per long ton compared with $3,330 in 1964. Stocks of tin metal and tin-in-concentrates at Malaysian smelters, en route and awaiting shipment totaled 5,532 long tons at yearend compared with 6,730 tons at yearend 1964. Exports of tin in 1965 included 31,522 long tons to the United States (compared with 25,733 tons in 1964), 12,969 tons to Japan, 4,612 tons to Eastern Europe, 3,968 tons to Canada, 3,636 tons to Italy, and 3,544 tons to India. Concentrates imported in 1965 contained 7,165 long tons of tin compared with 9,690 tons in 1964 and came from Thailand (9,072 tons), Laos (536 tons), Kenya (100 tons), Indonesia (30 tons), and Australia (5 tons).

Among companies operating or managing tin properties in Malaya, the foremost was Anglo-Oriental (Malaya) Ltd., providing about one-fourth of the output (42 dredges), followed by Osborne and Chappel Ltd. (9 dredges) and Associated Mines Ltd. which includes the Tronah Mines Ltd., group (12 dredges), providing about one-tenth each of the output. Other partly or totally foreign-owned companies, with 1 to 3 percent each of production, included Pahang Consolidated Co. Ltd. (large lode mine), Austral-Malay Tin Ltd. of Australia (5 dredges), Pacific Tin Consolidated Corp. of the United States (4 dredges), Renong Tin Dredging Co. of the United Kingdom, and La Société Anonyme des Etains de Kinta of France. The remainder, accounting for about 44 percent of production, came mainly from small Chinese-owned mines. As an example of grade problems, Pacific Tin in 1965 re-

ported recovery of 1,510 long tons of tin-in-concentrates, only 2 percent higher than in 1964, from 13.3 million cubic yards of material handled, 24 percent more than in 1964. Nonetheless, earnings increased, chiefly as a result of a 20-cent-per-pound average rise in price for tin sold.

A number of companies had placed applications for offshore prospecting rights, and forms were being processed, although the Central Government had not yet decided on its regulatory role. Malacca and Perak States by yearend had or were about to permit offshore mining to their territorial limits of 3 miles, and at least five companies were being considered. These included Conzinc Riotinto of Malaysia Ltd., newly formed by Rio Tinto Zinc Corp. (United Kingdom) and an Australian subsidiary to invest in Malayan ventures. In the case of Malacca, which has a 60-mile coastline, it was stated that Malaysian firms would be given priority in award of concessions, and local firms were encouraged to pool capital for joint operations. Easing of tension vis-a-vis Indonesia was due to spur development in the Malaccan area.

Modernization and replacement of dredges made progress. In March, Berjuntai Tin Dredging Ltd., put its new $3 million No. 6 dredge into operation in the Deep area of the company's Batang Berjuntai property. Malayan Tin Dredging Co. Ltd., was well along on construction of its new $4 million No. 7 dredge, one of the world's largest, designed to excavate to a depth of 150 feet. This dredge was to go into operation in 1967.

Renong Tin Dredging Ltd., continued its project in Selangor State, which requires diversion of the Selangor River in order to dredge the main river bed. Reconstruction of Malaya's main north-south highway and railroad, passing through the property, was also necessary. Three of Renong's dredges, two over 50 years old, continued operation at Rasa. Extensive relocations were also necessary at the project of La Société Anonyme des Etains de Kinta, on the outskirts of Kampar, where a 73-acre plot with a deposit estimated to contain 16,250 tons of tin concentrates was being prepared for mining. Selangor Dredging Co. Ltd., held a 960-acre lease in Selangor's Kuala Langat Forest Preserve with potential for 24,000 tons of tin concentrates and applied for a mining certificate covering another 421 acres after favorable drill results. The company has a dredge under construction scheduled for operation in September 1966.

Tronah Mines Ltd., acquired more dredging property in the Sungei Bidor area, its Sungei Besi mines showed improvement, and a new dredge was scheduled to start operation late in 1966 in the Ayer Kunnig area. Tongkah Harbour Tin Dredging Ltd., had sharply reduced recoveries in its offshore tin operations—0.7 pound per cubic yard treated compared with about 1.7 pounds in 1964—but increased its reserves by additional drilling.

Pahang Consolidated Co. Ltd., premier lode tin producer, reported higher profits and production of 2,283 long tons of concentrates in its fiscal year ending July 31, 1965. Ore reserves were placed at 346,000 tons on that date; annual milling capacity was 220,000 tons of ore. Several promising ore bodies were revealed at the 300-foot level in the Willinks section of the company's famous Sungei Lembing mine in Pahang and a tin placer of some 350,000 cubic yards was established nearby.

The Malayan Government began offering direct aid for mining Malayan Reservation lands, making $500,000 available to finance mining in the Changkat Tualang area, 90 miles north of Kuala Lumpur. A Malayan investment company, Sharikat Permodalan dan Perusahan, was licensed to prospect 1,700 acres of Malayan Reservation land at Jeram Mengkuang in the Batang Padang district of southern Perak which was found favorable for tin by Central Government exploration teams. Such teams have established at least a dozen potential areas for development on these reserved lands.

NONMETALS

Asbestos.—United Asbestos Cement Ltd., a local firm, in a joint venture with an Australian affiliate of Turner Newall Ltd. (United Kingdom) and the Eternit Group (West Europe), was building a $4 million asbestos products plant at Tasek, near Ipoh, Malaya. This will be the third asbestos processing plant in Malaysia and it is due to open in 1966.

Cement. — Cement consumption in the States of Malaya, exclusive of Singapore, was estimated at 657,000 tons, an increase

of 6.2 percent from that of 1964. Prices were said to have fallen disastrously during 1965 owing to additional cement made available by northern producers after recent expansions. The growth rate in consumption was faster in the Singapore market; 354,000 tons was consumed in 1965, 15.6 percent above that of 1964. Capacity in Malaya reached approximately 1 million tons. Singapore imported cement and clinker, receiving some 385,000 tons in 1965 from Malaya and other Asian countries. The local cement industry was estimated to be operating at 70 percent of capacity. Markets in eastern Malaysia (Borneo region) were expected to expand in the near future, but probably not beyond one-tenth of Malaya's current production capacity.

Tasek Cement Ltd's., plant at Ipoh, Malaya, which went into production in September 1964, signed for a $4 million addition that will more than double capacity to about 400,000 tons annually. A second kiln will be installed and other work will be done under joint contract with Kobe Steel Co. Ltd. (Japan), and Polysius G.m.b.H. (West Germany). The plant has been operating at or near capacity. Malaysia Cement Co. did not go ahead with planned expansion at Rawang because of the tight cement marketing situation. Planning on a cement plant for Sarawak was postponed.

Chemicals and Fertilizers. — Chemical Co. of Malaysia, an Imperial Chemical Industries Ltd., affiliate, was completing its $30 million chemical complex and compound fertilizer plant at Padang Jawa, near Klang, Malaya. Special formulations will be produced for Malaysia's rubber and oil palm industries. Full operations by 1970 will see 208,000 tons of mixed fertilizers produced annually, approximately 85,000 tons above the amount imported by Malaysia in 1964. Esso Standard Malaya Ltd., was well along on a $8 million 50,000-ton-per-year anhydrous ammonia plant which will utilize off-gas from its nearby refinery. Another part of the chemical complex, a 100-ton-per-month liquid chlorine plant for water purification, was completed. A nitric acid plant was due for completion in 1966.

Marble. — Langkawi Marble Co. Ltd., operating since 1963 and Malaysia's only marble producer, sold a product said to compare with Italian white Carrara marble although lower priced. The marble is mined on the islands of Langkawi, Dayang, Bunting, Paku, Pasu, and others in the Malacca Straits. White and black marbles were obtained, and a red marble quarry was about to open. Cut slabs were polished at quarry sites followed by shipment to Kuala Lumpur for marketing. Production is to be tripled to 9,000 square feet annually by erecting a central finishing plant at the Baku Tiga Industrial Site near Port Swettenham.

Silica.—Demand for high-quality silica was expected to rise as a result of a new glass factory to be purchased from and built by Czechoslovakian suppliers in Johore Bahru, Malaya. The first of its kind in Malaya, the $7 million plant will produce sheet and figured glass for domestic and export markets. Sales are expected to reach $2 million annually by 1972. Malayan Glass Manufacturing Corp. will operate the plant.

MINERAL FUELS

Coal.—A detailed survey was in progress on the Bintulu coalfield in Sarawak under the United Nations Special Fund. Progress on development of the Silantek coking coalfield in Sarawak, under study by Nippon Coal Mining Co. (Japan), was limited by its proximity to the Indonesian border and insurgent harrassment. Nippon Mining's work in 1964 was confined to testing and attempting to find a market for Silantek's industrial cokes.

Petroleum.—During 1965, Malaysia and Singapore refineries processed 7.25 million tons of crude and partly refined oils, producing 7 million tons of refined oil products of which fuel oils comprised about one-half. Imports of crude and partly refined oils to Malaysia and Singapore totaled 8.21 million tons of which 1.48 million tons was reexported. Petroleum product imports totaled 4.9 million tons while exports of these commodities totaled 9.5 million tons, of which about 3 million tons consisted of bunkers. Domestic consumption still exceeded refining capacity and was estimated about 8.6 million tons of oil products in 1965 (exclusive of bunkers), somewhat less than half of this being consumed in Malaysia and the rest in Singapore.

Production from Sarawak's small Miri oilfield, operated by Sarawak Shell Oil-

fields Ltd., maintained a slow decline and was valued at $695,000 in 1965, compared with $720,000 in 1964.

Brunei's Seria field, operated by Brunei Shell Petroleum Co., rounded out a 10-year general decline. The field was estimated currently to be producing 67,000 barrels daily. Brunei crude was exported by pipe to Shell's 45,000-barrel-per-day Lutong refinery in Sarawak where part was processed along with the Miri crude; products and the balance of crude were exported from Lutong. Refinery runs in 1964 totaled 18.52 million barrels of crude oil; 26.01 million barrels of crude oil and products valued at $67.2 million was exported. Brunei also produced natural gas and gasoline; in addition, in 1965 about 110,000 barrels of a locally refined gasoline was reported to have been marketed.

Mobil Refining Co. (Malaysia) Ltd. continued to work on its new $18 million refinery at Jurong, Singapore, scheduled for completion early in 1966 with 21,000-barrel-per-day capacity. Investment guarantees were secured from the Malaysian Government covering the financing of service stations, a bulk storage terminal, and lubricant inventories in Malaya; Mobil was expected to begin deliveries of crude oil to its $1.3 million marine terminal at Jurong in February 1966. Shell Refining Co. (Federation of Malaysia) planned a $5 million expansion of its new Port Dickson, Malaya, refinery to 30,000 barrels per day by April 1967. Also Shell Refining announced plans to construct a second refinery alongside its Pulau Bukom refinery near Singapore, which went into production in 1960. The second refinery will cost about $13 million and will have the capacity to process 60,000 barrels per day. A large share of the second refinery's output has been initially planned for export.

Considerable exploration activity was reported during the year. A Malaysian Government committee prepared legislation to cover offshore exploration, and foreign consultants, including a U.S. specialist, Walter J. Levy, were engaged. Particular interest centered on offshore Sabah and Sarawak, with Brunei also active. Sabah Petroleum Co., a subsidiary of Brunei Shell Petroleum Co., explored concessions totaling about 70,000 square miles off Sabah and Sarawak and planned a drilling program for a newly purchased Japanese-made $7 million deepwater exploration platform. Plans suffered a major setback, however, when the platform was lost at sea in December while under tow to the exploration area.

A U.S. firm, Clark Brunei Oil and Refining Corp., was completing an aerial photographic survey and planned exploration in 1966 of its 1,820-square-kilometer concession in the Tutong area of Brunei. Although Clark held rights to prospect also within the territorial waters, no work was imminent on offshore drilling. Texas Crude Oil Co. (United States) has also applied for Brunei exploration rights. Shell was reported planning to drill at least 30 holes, including several offshore, within the next 5 years. Aquitaine Petroleum Co. Ltd., received an oil prospecting license to explore the shelf area off the east coast of Sabah and conducted an aeromagnetic survey there. Esso Exploration (Malaysia) Inc. obtained both offshore and onshore concessions in November along Sabah's northeast coast between Marudu Bay and Sandakan and completed aeromagnetic surveys of the area early in 1966. Sabah Teiseki Oil Co. studied geology of its land and sea concessions at Sebatik Island, near Tawa, and planned shallow drilling on the island in 1966. One company reported that the use of a hovercraft proved successful in its oil survey.

The production prospects for Shell's successfully completed wells in Brunei's offshore area were good, and the company hoped that their forthcoming production would offset declining onshore flows. Development of Brunei's natural gas resources received a boost with the reported offer by a Japanese firm, Joint Venture Development Co., for purchases. Plans included a pipeline from Seria to Mura, where a new port and liquefaction plant would be built.

The Mineral Industry of Mongolia

By J. M. West [1]

In 1965 sparsely populated, largely nomadic Mongolia or Outer Mongolia, with nearly one-fourth of its 1 million people centered in the capital city of Ulan Bator, moved closer to the Soviet-East European sphere of economy than to that of its southern neighbor, China. Fluorspar remained the country's only mineral product of world significance. However, resources of other minerals, notably coal, phosphate, iron ore, and a few nonferrous metals in early stages of development were of increasing importance. Lagging exploitation of extensive reserves of coal forced the sizable imports of coal from the U.S.S.R. to continue. Domestic oil production, never large, gave way to rising crude oil and product imports for lack of new discoveries.

Prospecting in 1965 resulted in several mineral discoveries, including perlite, rare metal ores, and gold. Approximately, 21 million tugriks (about $5 million), 2 to 3 percent of total State capital investment, was spent on surveys and prospecting. This included mapping, 24,900 meters of core drilling, 400 meters of tunneling, 50,800 cubic meters of stripping, and 10,100 meters of other drilling and test pitting. Water supply investigations were expanded and technical assistance was given by approximately 400 engineers and specialists from the U.S.S.R. Hungarian experts assisted in explorations for water and planned to locate and drill 225 wells in the 1966-70 period.

Progress on the Darkhan (Darhan) industrial complex, north of Ulan Bator, was difficult to assess. One report stated that "work continues day and night at the enormous Darkhan construction site," and another report stated that plans for output by the Darkhan powerplant (150,000-kilowatt thermal electric) were fulfilled or overfulfilled by 10 to 33 percent. The first phase of the plant was said to be complete, along with the first section of the Sharyn Gol coal mine. Power was being transmitted over a 110,000-volt line north to Sukhe Bator near the Soviet border. Lines were also being constructed to Ulan Bator, where sections 4 and 5 of the local powerplant were just completed. The Darkhan steel project apparently made limited headway. However, a cement plant was due for completion in 1966.

In mid-April an agreement was signed with the U.S.S.R. to supply economic and technical assistance during the 1966–70 period. Promised aid would increase to more than 660 million rubles ($732 million) during that time, and would include help in coal mining, in construction of a cement plant, and in exploration of mineral deposits. On April 27, France announced it would establish diplomatic relations with Mongolia, a sign that Mongolian interests are rising beyond traditional bounds. With Chinese assistance a 23-kilometer highway was completed between Ulan Bator and the Nalaikha coal mines.

[1] Far East specialist, Division of International Activities.

PRODUCTION

The mineral industry, though accounting for about one-tenth of the country's industrial production in 1965, was of little significance, even for the Far East. Output of nonferrous and rare metals, while small, appeared capable of increasing. Output could become significant in future years because of a reasonably favorable geological potential and a growing emphasis on prospecting. Official data on coal, crude oil, gasoline, and diesel fuel outputs in 1965 were published; other data have been estimated. The 15,900 tons of crude oil production reported for 1965 is considerably below the estimated outputs of previous years, probably a result of the declining output at the Dzuun Bayan oilfield. Electric power production totaled 198.6 million kilowatt-hours, approximately 8 percent more than in 1964, and was scheduled to increase to 217.9 million kilowatt-hours in 1966, the first year of the fourth 5-year plan.

Table 1.—Mongolia: Production of minerals [1]

(Metric tons)

Commodity	1961	1962	1963	1964	1965
Nonmetals:					
Alabaster (gypsum)	10,000	10,000	15,000	20,000	20,000
Fluorspar (fluorite)	38,000	37,900	50,000	57,000	75,000
Lime	13,000	21,000	25,000	30,000	35,000
Salt	7,000	8,000	8,000	8,000	8,000
Mineral fuels:					
Coal [2]	748,600	860,000	845,000	710,000	989,500
Petroleum:					
Crude oil	50,000	50,000	50,000	50,000	15,900
Refinery products:					
Gasoline	18,000	17,900	18,200	18,000	17,000
Diesel oil	7,280	7,100	7,680	8,200	6,600
Residual fuel oil	30,000	30,000	32,000	32,000	30,000

[1] All figures are estimated, except fluorspar for 1961–62, lime for 1961–62, coal for 1961–63, and coal, crude oil, gasoline, and diesel fuel for 1965. Other metals and nonmetals known to be produced include gold, lead, zinc, tungsten, clays, dolomite, limestone, phosphate, and sand, but quantitative information is not available.
[2] Mainly so-called brown coal.

TRADE

Official Mongolian trade data are not available, so U.S.S.R. imports from Mongolia and exports to Mongolia have been substituted to show trends. The U.S.S.R. and East Europe reportedly have accounted for nearly 90 percent of Mongolia's foreign trade, of which, however, minerals comprise only a small part. Value of all types of imports into Mongolia has been estimated at $150 million annually and the value of exports has been estimated at approximately 75 million annually. The U.S.S.R. reported imports of metal ores and concentrates from Mongolia valued at 195,000 rubles ($216,000) in 1964 compared with a value of 218,000 rubles ($242,000) reported in 1963. Fluospar has been the most significant mineral export. The U.S.S.R. imported 66,500 tons of fluorspar from Mongolia in 1964 and probably more than that in 1965. Lead-zinc and tungsten ores have been relatively minor exports. Imports from the U.S.S.R. included mainly iron and steel, mineral fuels, and cement.

COMMODITY REVIEW

METALS

Iron and Steel.—Work presumably continued on the Soviet-designed 300,000-ton integrated iron and steel plant. This plant is a part of the Darkhan complex being developed in conjunction with an electric power station, the Sharyn Gol coalfield, and other facilities. Plans for steel production were said to be ahead of schedule.

Tungsten.—An aerial cableway was installed at the Ih Hairhan wolfram-scheelite mine to transfer ore to the mill. The mine, developed with Soviet help, is 100 miles south of Ulan Bator and has been in opera-

Table 2.—Mongolia: Imports of metals and minerals from the U.S.S.R.

(Metric tons)

Commodity	1963	1964
Metals:		
Iron and steel:		
Pig iron	200	800
Rolled steel	16,800	12,400
Iron and steel pipes	4,200	3,200
Nonferrous metals and alloys	267	237
Nonmetals:		
Cement	14,000	11,000
Mineral fuels:		
Bituminous coal	31,000	256,000
Coke	2,000	1,000
Petroleum:		
Crude	37,300	39,700
Refinery products:		
Gasoline	80,600	89,200
Diesel fuel	47,300	58,400
Lubricants	10,900	12,100
Other	r 1,100	500

r Revised.
Source: Official trade returns of the U.S.S.R.

tion about 5 years. Workings extend to 200 feet in depth, and a system of water-jet mining is said to have been introduced. Ore grade is about 1 percent wolfram. Output has been 100 to 200 tons annually. The mine was said to have realized more than 1 million tugriks (roughly, US$250,000), which was more than anticipated.

Other Metals.—Gold mining continued north and northwest of Ulan Bator in the Hobsogol Dalay region and on the tributaries of the Yoroo Gol River, in the Baydarag Gol River Basin, west-central Mongolia, and in the Altai Mountains of western Mongolia. No statistics on gold are available, but output probably amounts to only a few thousand ounces annually. Molybdenum and copper deposits in the northern part of the country were being explored under Soviet aid projects. New discoveries of gold and rare metal ores were reported in 1965. Mongolian production of nonferrous and rare metals was reported one-fifth higher than in 1960.

NONMETALS

Construction materials, such as lime, brick, and gypsum, were produced. During the first half of 1965, 2,200 tons of feldspar was mined. Expansion was scheduled in fluorspar mining. Major deposits are being developed southwest of Ulan Bator in the Dorono Gobi district. In 1965 discoveries of perlite and quartz albitite (a source of feldspar) were reported. Phosphorite was also being mined. Projects slated for completion in 1966 include a 100,000-ton cement plant and a 30-million unit-per-year firebrick plant at Darkhan, seven brick plants each with a capacity of 35 million brick per year in different districts, and a lightweight concrete plant at Ulan Bator.

MINERAL FUELS

Coal.—The first section of Darkhan's Sharyn Gol opencut coal mine went into production. Eventual capacity is estimated at 1.1 million tons. Overall capacity of Mongolia's 10 underground and open pit coal mines was approximately 2 million tons. At the Nalaikha coal mine, east of Ulan Bator, a record 2,947 tons (compared with the planned daily output of 2,000 tons) was produced in 1 day. Nevertheless, during the third quarter of 1965, output was 20 to 30 percent behind schedule, owing to labor problems compounded by unsafe conditions and machinery breakdown. Approximately 65 Soviet miners were employed; 103 Mongolian miners were trained as the result of a Soviet-sponsored program. Donbas-1 and PK-3 Soviet-built coal-cutting and loading machinery was in use. Progress at smaller mines varied. Progress was considered satisfactory at the Bayan-Teeg mine, in the Obor Hangay district, the Tsagaan-Oboo mine, in the Dund-Gobi district, and the Oldziyt mine, in the Suhe Bator district, but was considered behind at the Har Tarbagatai and Nurstiuy mines. The Ministry of Industry had planned to open three new coal mines in 1965. The Bulgan and Hobsgol district coal mines and a branch mine at Tsagaan-Obbo, Omono-Gobi district, were to be opened in 1966. Output was scheduled to increase by one-third to 1.315 million tons by 1966.

Petroleum.—Domestic oil refining provided approximately 20 percent of gasoline and 15 percent of the diesel needs of the country. Refinery requirements had to be made up by increasing tonnages of crude oil imported from the U.S.S.R. (39,700 metric tons in 1964). Operations at the Soviet-built Dzuun Bayan refinery, having an estimated 100,000-ton input capacity, apparently were limited by declining production from the local oilfield. Refined product imports rose 15 percent in 1964 and this trend continued into 1965.

The Mineral Industry of the Philippines

By J. M. West [1]

Copper, gold, iron, and chromite were the chief components of the Philippines' crude mineral production, the value of which rose one-fifth in 1965 to about $146 million, roughly 3.0 percent of the gross national product. Base metal ores were largely exported and were an important source of foreign exchange. Copper exports alone were valued at $50.9 million in 1965. In contrast, cement, iron and steel, fertilizers, and refined petroleum were produced chiefly, if not entirely for internal consumption.

The Philippines was being prospected actively, particularly for copper, iron, and nickel.

Construction began on an integrated iron and steel plant at Iligan, Mindanao, and a start was impending on a second to be situated in Rizal Province, near Manila. Investigations were conducted on possible use of domestic coal to supply part of future coking-coal needs. Development of a large copper deposit on Marinduque Island was halted by lack of agreement on investment terms. Bids for development of the Government-owned Surigao nickel-cobalt laterite deposits were rejected as inadequate. Promising copper deposits were being explored in Batangas and Marinduque Provinces and on Rapu Rapu Island; a sizeable lead-zinc discovery was reported in southwestern Mindanao. There was greater recovery of chromite fines, and the Parcel I Zambales Mineral Reservation deposit became a major source of chromite. The Bagacay mine began supplying pyrite for a fertilizer plant nearing completion at Limay, Bataan. A new cement plant was under construction in Rizal Province, and an agreement was signed to build a plant at Davao, Mindanao.

A new president, Ferdinand Marcos, was elected late in 1965, and a number of government reforms were promised, including clampdown on smuggling and stepped-up economic development. The existing 5-year development plan, now in the third year, was somewhat behind schedule, as capital inflow slowed and money supplies became tight. The decontrolled peso remained stabilized and was officially set on November 6 at 3.90 pesos to US$1.00. Rescinded at the same time was the system by which exporters were penalized by reduction in payment to 2 pesos to US$1.00 on 20 percent of all foreign exchange earnings turned in to the Central Bank. Exporters, including most mining companies, were encouraged by the action.

Various sections of the Philippine Mining Law, Commonwealth Act 137, were amended by House Bill 2522, and the act was signed into law. The "Mining Engineering Law of the Philippines," designed to regulate mining engineering and to provide for licensing and registration of personnel of mines and quarries was signed into law in mid-1965. Also, an act was introduced to provide for licensing and registration of geologists in the Philippines.

Investment climate and effects of various Philippine laws on investors were discussed.[2] The Government created a committee to study problems of the petroleum industry. The Philippine Petroleum Association, representing exploration firms, called for special tax exemption, a 5-year moratorium on work requirements on Government leases, and provision of annual subsidies to encourage search for oil. The plea was prompted by shortage of risk capital. Foreign investment was deterred by uncertainty about rights and privileges. U.S.

[1] Far East specialist, Division of International Activities.

[2] U.S. Department of Commerce. Establishing a Business in the Philippines. Overseas Business Reports, OBR 65–89, December 1965, 16 pp.

investors were particularly concerned with the future of the Laurel-Langley agreement affecting trade and the Retail Trade Nationalization law limiting foreign participation. The Chairman of Filoil Refinery Corp., Filemon Rodriguez, speaking in Baguio City on December 4, suggested a number of improvements that could be made as inducements to foreign investors but stressed that rising feelings of nationalism must be recognized and dealt with fairly.

Bids on the Government's nickel deposits in the Surigao Mineral Reservation were regarded as unacceptable, and further action was undecided. U.S. Agency for International Development-sponsored mineral development activities continued in cooperation with the Philippine Bureau of Mines. Programs included an iron resource survey, studies of coal, manganese, and chromite, assistance with mining laws, a geological structure map of the Philippines, and plans for a much needed new metallurgical laboratory. Also, a water resources survey was being conducted with the help of the U.S. Bureau of Reclamation. The country continued to receive capital and consumer goods as war reparations from Japan. Greater public works construction was planned, including dams, highways, and irrigation. The Angar River multipurpose project, near Manila, made headway and loans were discussed for a thermal powerplant on Bataan ($9.5 million) and additional work on the Maria Cristina hydroelectric projace in Mindanao ($2.5 million). Also under discussion was a geothermal power station for Albay province.

PRODUCTION

Value of crude minerals and cement produced was about $146 million in 1965 compared with $121 million in 1964; base and precious metal ores continued to account for two-thirds of the total. Production of most commodities was higher than in 1964, and output value increased because of greater volume and better export prices. Metallurgical chromite gained a few dollars per ton, and gold mining remained subsidized. Bagacay pyrite began moving to market, and copper reached a new high in output, with increasing development activity. Iron ore production rose 8 percent in 1965, and one company began making a pellet product. Part of the iron ore consisted of magnetite recovered from copper milling. Copper mining provided byproduct molybdenite, and zinc was the source of byproduct cadmium. Mercury from a single Palawan deposit responded to good prices and output increased, although ore grade continued poor. Cement plants operated near capacity. The mineral fuels sector showed no improvement. Cement and oil industries have been reviewed.[3]

[3] Ramiro, Mariano P., and Policarpio, Ricardo R. The Development and Status of the Cement Industry. Philippine Economy Bull., v. 2, No. 3, Jan.–Feb. 1964, pp. 5–19.
Rodriguez, Filemon C. The Oil Industry: Its Growth and Development. Philippine Economy Bull., v. 2, No. 3, Jan.–Feb. 1964, pp. 20–24.

Table 1.—Philippines: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Cadmium, content of zinc concentrate-kilograms		600	11,200	11,000	10,000
Chromite:					
Metallurgical-thousand tons	144	98	86	79	96
Refractory-do	496	433	373	426	458
Total-do	640	531	459	505	554
Copper, metal content of concentrates (largely 22 to 29.5 percent copper)	51,875	54,728	63,685	60,489	63,328
Gold-troy ounces	423,983	423,394	376,006	425,770	435,545
Iron and steel:					
Iron ore and concentrate, 55 to 58 percent iron-thousand tons	1,171	1,387	1,385	1,367	1,438
Ferroalloys	288	1,475	1,296	1,532	1,744
Steel ingots (from scrap) e-thousand tons	100	120	NA	NA	[1] 114
Lead, metal content of 50 to 60 percent concentrate	101	82	71	103	105
Manganese ore	19,038	11,939	7,666	8,005	51,744
Mercury, estimated content of concentrate-76-pound flasks	3,167	2,767	2,651	2,496	2,384
Molybdenum, metal content of 94 percent MoS_2 concentrate	113	113	107	105	77
Nickel, content of concentrate	9	11	------	------	------
Palladium, content of nickel concentrate-troy ounces	215	141	------	------	------
Platinum, content of nickel concentrate-do	177	172	------	------	------
Silver-do	812,793	675,570	767,249	851,814	932,944
Zinc, content of concentrate [2]	3,313	4,460	3,893	2,136	2,059
Nonmetals:					
Asbestos	75	941	382	532	e 500
Asphalt rock	6,651	6,933	5,186	------	------
Barite, 85 to 90 percent $BaSO_4$	1,913	416	914	1,476	e 1,500
Cement-thousand tons	1,019	961	951	1,062	1,517
Clays, white	10,823	e 8,000	6,703	6,967	e 7,000
Dolomite	7,252	4,995	5,089	5,220	5,149
Feldspar	14,759	15,571	6,669	8,051	12,289
Gypsum (mostly byproduct)	8,404	14,453	30,694	35,070	27,488
Lime	25,282	e 43,000	31,396	r 32,305	23,831
Limestone-thousand tons	1,454	e 1,400	1,480	1,799	NA
Phosphatic materials:					
Guano	402	95	1,473	1,191	4,172
Phosphate rock	------	3,773	1,251	2,857	10
Pyrite	51,591	56,000	58,055	32,004	105,293
Salt, sea-thousand tons	93	96	70	47	225
Silica sand (ordinary glass sand)-do	106	110	111	r 197	280
Sulfur	161	941	48	69	------
Talc	190	118	95	98	593
Mineral fuels:					
Coal-thousand tons	152	163	157	115	92
Petroleum refinery products:					
Gasoline-thousand 42-gallon barrels	6,264	6,903	8,660	9,189	9,474
Kerosine-do	1,943	2,139	2,509	2,544	3,238
Distillate fuel oil-do	4,083	4,893	5,872	6,881	7,139
Residual fuel oil-do	4,873	5,942	7,561	9,757	11,093
Refinery fuel (including losses)-do	892	1,005	1,374	1,500	1,700
Other products-do	429	1,455	1,545	954	e 1,442
Total-do	18,484	22,337	27,521	30,825	34,086

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Rolled steel in 1965.
[2] Includes zinc content of copper-zinc concentrates containing 46 percent zinc and 3 percent copper.

TRADE

Japan and the United States received the major share of Philippine metallic mineral exports. Export earnings continued to rise owing primarily to higher copper and chromite prices. The quantity exported of most commodities exceeded those of 1964. All metallurgical-grade chromite went to Japan, while the United States bought nearly half of the refractory-grade product. Copper ore and concentrate went to Japan except for output of the Lepanto mine, which was shipped to American Smelting and Refining Company, Tacoma, Wash. Iron ore and concentrates continued to go to Japan, and about yearend, pelletized ore began to come from Philippine Iron

Mines, Inc. Mining, largely an export industry, gained an important step when the Monetary Board of the Philippines approved relief from an existing 20-percent retention fee on export receipts. The fee had applied to all minerals except molybdenum and was costing producers about 10 cents on each dollar received.

Lacking oil, the Philippines relied on imports to satisfy increased refinery requirements. Value of imported crude oil totaled $56.7 million in 1964 and was higher in 1965. The quantity imported rose nearly one-third to 5.5 million tons in 1965.

Japan and the United States remained supply sources for refined metal ingots and semimanufactures as well as petroleum refinery products.

Table 2.—Philippines: Exports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Brass scrap	1,008	1,137	All to Japan.
Chromite:			
Metallurgical	77,135	130,230	Do.
Refractory	406,664	457,094	United States 212,782; United Kingdom 155,149; Japan 42,581; Canada 18,694; Australia 15,636; Italy 11,236.
Copper:			
Ore	19,498	16,804	All to Japan.
High-gold concentrate	52,066	46,148	All to United States.
Ordinary concentrate	263,688	269,432	All to Japan.
Metal content of ore and concentrate [e]	63,000	63,400	Japan 53,600; United States 9,800.
Scrap	892	1,208	All to Japan.
Gold:			
Bullion, troy ounces	160,494	240,242	All to United States.
Concentrate and matte [1]	2,546	6,784	Unspecified.
Iron ore and equivalent:			
Ore, thousand tons	1,283	1,311	All to Japan.
Concentrate, do.	183	204	Do.
Pyrite cinder, do.	8	-------	
Manganese ore	5,342	16,537	Japan 12,981; United States 3,556.
Mercury, 76-pound flasks	1,928	1,447	United States 1,247; Japan 200.
Molybdenum concentrate	172	275	Japan 139; United Kingdom 136.
Zinc ore and concentrate	11,968	4,888	United States 3,538; Japan 1,350.
Mineral fuels:			
Crude oil (reexport), thousand tons	-------	18	All to Australia.
Gas oil (bunker fuel), do.	51	48	Malaya 41; Hong Kong 7.

[e] Estimate. [1] Includes gold- and silver-bearing lead-copper concentrates.

Table 3.—Philippines: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals and metallic ores:			
Aluminum:			
Ingots, bars, and alloys	4,800	4,460	United States 3,550; Canada 490; Taiwan 303.
Semimanufactures	800	950	Japan 290; United States 270.
Copper:			
Ingots and bars	2,600	3,400	Japan 3,150.
Semimanufactures	1,700	1,320	Japan 550; Canada 328; United States 290.
Iron and steel:			
Pig iron	10,103	21,150	Spain 9,144; Australia 8,713.
Ferroalloys	989	1,991	Norway 1,179; Taiwan 430; Belgium 120.
Ingots and semimanufactures [e] thousand tons	335	500	Japan 355.
Scrap	660	10,182	United States 9.684.
Lead:			
Ingots, bars, and alloys	1,942	2,003	Australia 1,516; United States 136.
Semimanufactures	150	428	Australia 197; West Germany 152; United States 35.
Pigments [e]	45	704	United States 346; Australia 297.
Nickel, all forms	41	65	United States 30.
Tin ingots and alloys long tons	600	4,600	Japan 3,932; Malaya 457.
Titanium oxide	1,986	2,295	Japan 647; United States 478; United Kingdom 345.
Zinc:			
Ingots and alloys	7,818	10,363	Australia 5,184; United States 1,677; Canada 1,281.
Semimanufactures	1,600	2,290	Australia 1,900; United States 166.
Pigments	1,300	1,100	Netherlands 600; United Kingdom 190.
Nonmetals:			
Abrasive, including diamond	236	333	Greece 162; United States 84.
Asbestos	1,354	1,894	Canada 1,178; Australia 348; Rhodesia-Nyasaland 192.
Cement	49,120	185,851	Taiwan 160, 260; Japan 17,140.
China clay	2,273	2,857	Japan 1,172; United States 875; United Kingdom 797.
Diatomaceous earth	1,368	2,382	United States 1,983.
Dolomite	2,848	2,699	Japan 1,430; Austria 820.
Fertilizers, chemical thousand tons	73	234	Japan 120; West Germany 48; United States 40.
Gypsum	20,107	27,581	Australia 21,769; Mexico 4,400.
Phosphate rock	12,177	18,754	All from United States.
Sulfur	3,824	5,212	Canada 3,019; United States 1,944.
Talc	2,726	2,572	South Korea 1,251; United States 576; Japan 546.
Mineral fuels:			
Coke from coal	14,603	11,521	Taiwan 6,787; United States 2,878.
Petroleum:			
Crude thousand tons	3,617	4,216	Indonesia 1,330; Saudi Arabia 827; Iraq 712; Sarawak 481; Qatar 433; Iran 382.
Refinery products:			
Gasoline do	37	38	Iran 15.
Kerosine do	6	------	
Distillate fuel oil do	41	11	Mostly from Japan.
Residual fuel oil do	4	------	
Lubricants do	60	89	United States 73.
Other do	18	19	United States 10.
Total do	166	157	United States 83; Iran 15; Japan 11.

[e] Estimate.

COMMODITY REVIEW

METALS

Chromite.—Refusal of some buyers to purchase chromite from Southern Rhodesia improved the bargaining position of Philippine producers. Acoje Mining Co., the leading metallurgical chromite producer of the Far East—also with manganese, copper, and varied industrial interests—went on a 6-day work week and placed orders for equipment to expand production. The ore reserve at its Santa Cruz, Zambales, property was 2.21 million tons on January 1, 1965—6 percent lower than the year before. Metallurgical-grade shipments to Japan rose to 102,200 tons, with values during the four quarters of 1965 averaging

about $18.50, $21.20, $21.60, and $20.40 per ton, respectively, compared with $13.40 per ton in the third quarter of 1964. A $3-per-ton price hike was under consideration for the contract period starting in April 1966. At Acoje's mines, main crosscuts were being driven and stope preparation was underway to expand production. Studies continued on ways to recover by-product nickel and precious metals,[4] but the company's pilot plant was inactive.

At Consolidated Mines, Inc's. Masinloc operations, where Benguet Consolidated, Inc., is prime contractor, refractory-grade ore output and shipments were a little higher and the outlook was excellent; greater emphasis was placed on recovery and sales of fine and disseminated ores. In the first three quarters, output totaled 308,961 tons, and shipments for the year included about 300,400 tons to the United States, 95,000 tons to Europe, 36,200 tons to Japan, and 11,500 tons to Canada. The bulk of the ore came from the Parcel I Zambales Mineral Reservation deposit which the company opened in early 1964; the Coto pit supplied most of the rest. Feed to the Coto mill averaged 25 to 26 percent chromium sesquioxide (Cr_2O_3) and products included lump refractory ore with 33 to 34 percent Cr_2O_3 and fines of minus 10 mesh with 33 to 44 percent Cr_2O_3, both containing 11 to 12 percent iron. Doubling the capacity of the fines treatment plant, where heavy media separation is used,[5] was completed, boosting its output potential to 33,000 tons of concentrate monthly and permitting further reclamation of old mine dumps and sections of disseminated ore bodies not suited for selective mining. A 120-ton-per-day crushing and grinding plant was set for operation in the second half of the year to begin on a large stockpile of disseminated ores.

Development continued southwest of the Coto pit on the 787 and 815 ore bodies, first recognized by geophysical surveys and now planned for further surveys. Company reserves on January 1 totaled 8.6 million tons, over 2 million tons greater than on January 1, 1964, and included 3.95 million tons of run-of-mine mill-feed ore, 1.6 million tons of stockpiled fines, and 3.1 million tons of disseminated ore. Continued exploration of the Zambales Parcel 2 deposit was unsuccessful but Parcel 3 appeared to have good promise.

Copper.—Proposals to establish Philippine copper smelter and refinery made little headway. Financial backing was reported, and Marinduque Mining & Industrial Corp. was still considering the project. During the first half of 1965, about 30,700 tons of contained copper was produced; Atlas Consolidated Mining & Development Corp. accounted for 42 percent, Marinduque Mining for 24 percent (Sipalay mine, 17 percent, and Bagacay mine, 7 percent), Lepanto Consolidated Mining Co. for 19 percent, and Philex Mining Corp. for 11 percent. Other producers included Samar Mining Co., Inc., Surigao Consolidated Mining Co., Inc., and Copper Belt Mining Co. Copper output from Atlas Consolidated's leaching plant through June totaled only 18 tons.

Underground mining with block caving was scheduled to start by Atlas Consolidated in early 1967. After troubles with the hanging wall in the Lutopan pit, the bulk of Atlas ore was being drawn from the lower-grade Biga Road pit, where stripping was accelerated to meet demand. Leaching of dumps was curtailed in the aftermath of 1964's heavy storms. Marinduque Mining continued stripping its Cansibit property and river diversion at Sipalay, Negros Occidental, for an early start on mining. Meanwhile, production continued from two other deposits, Binulig and Baclao, where mill grades were falling below 0.6 percent copper. With an expanded molybdenum plant, the output of molybdenum concentrate was about 15 tons per month. At Bagacay, on Samar island, Marinduque's ores were averaging about 3 percent copper, and a start was made on pyrite shipments to supply the new Bataan plant of Esso Standard Fertilizer Chemical Co., Inc., with its sulfide requirements. The company continued blocking out ore in the Guila-Guila pit area.

Lepanto's ore grade continued falling, and in March it averaged 2.88 percent copper with 0.104 ounce per metric ton in gold. Ore reserves at the beginning of 1965 totaled about 6.15 million tons, slightly higher than a year earlier. The com-

[4] Newman, William A. Recovery of Trace Nickel and Platinum Group Metals From Acoje Metallurgical Chromite Concentrates. Philippine Min., J., v. 7, No. 5, May 1965, pp. 14–20.

[5] Besa, Ramon, A. Heavy Media Separation of Refractory Chromite Ore at Coto, Masinloc, Zambales. Philippine Min. J., v. 7, No. 5, May 1965, pp. 6–12.

pany's traditional conservative policy was modified and equipment was being installed under a $1.7 million loan to expand milling capacity from 1,300 to 2,000 tons daily. Other activities included exploration of the Botolan copper group, Zambales asbestos study, and improvement of Lepanto dock facilities.

Philex milled about 100,000 tons of disseminated copper-gold ore monthly at its Santo Thomas II mine, in Mountain Province. Samar Mining continued shipping copper concentrate from its Masara project, in Mabini, as well as from its iron ore operations elsewhere. Copper Belt Mining Co. had difficulty with heavy ground at its Lobo, Batangas, mine and tried to improve its mining methods. The mill handled about 100 tons of 2- to 3-percent copper ore daily, and the reserve situation was somewhat improved. Benguet Consolidated, Inc. reported Rapu-Rapu Island exploration had confirmed several million tons of copper ore; geophysical work on the western half of the island was inconclusive and further study was planned there. A drilling program based on geophysical anomalies was planned on Lubang Island, off Mindoro.

The potential for copper industry expansion in the Philippines further improved in 1965, as additions were reported to already sizeable reserves. Frontino, Inc., completed initial development at the apparently sizeable El Paso disemminated copper deposit, about 6 miles northeast of Lobo, Batangas, and Black Mountain, Inc., took over further operations. Some 2 million tons of 0.8 percent copper ore containing about 4 percent magnetite and small gold, silver, and molybdenite values had been outlined, and a possible 1,000-ton-per-day mill was visualized. Frontino, whose exploration at Surigao Consolidated Mining Co's. Lipawan mine has disclosed an extensive vein system with ores averaging 2.5 to 3.0 percent copper, signed an agreement to manage Surigao's Guripan and Lipawan mines. Consolidated Mines continued to explore the Magpog properties in Marinduque Province, where it had blocked out 5 million tons of oxide-sulfide ores averaging about 2 percent copper, minable by open pit. In early 1965, diamond drilling and four exploration tunnels were underway. A large tonnage with about 0.4 percent copper content was considered suitable for leaching.

Development was discontinued on the large open pit deposit on Marinduque Island, where a reserve of 80 million tons of ore averaging about 0.8 percent copper was previously outlined by a United States-Canadian group. Efforts by developers to secure investment assurances from the Government were unsuccessful, and the property stood idle most of the year.

Gold.—Benguet Consolidated, Inc., was installing crushing and flotation equipment and continued as the Philippines' leading gold producer, with Itogon-Suyoc Mines, Inc., second, and Benguet Exploration, Inc., probably third. Baguio Gold Mining Co's. gold property at Baguio was nearly out of minable ore, but the corporate outlook nevertheless improved as surveys continued on the company's new Santo Nino copper project in Mountain Province, Luzon. Paracale-Gumaus Consolidated Mining Co. was also an active gold producer but lacked significant reserves; it shipped some gold bullion and lead-zinc concentrates to Selby, Calif. for smelting and refining. The balance of gold production came from copper mining, chiefly Lepanto Consolidated, Philex Mining, and Atlas Consolidated, in about that order. Benguet Exploration developed a rich vein on its 500-foot level, extending the life of its Camp 6, Benguet district, Mountain Province, mine. Benguet Exploration also operated a new flotation plant with a capacity of 40 tons of ore per day. Itogan-Suyoc stabilized its mill-ore grade, explored new veins, and increasing reserves at both the Itogan and Suyoc mines. Gold producers received Government marginal mine assistance under Republic Act 3089, as amended.

Iron and Steel.—As interest in capitalizing on rich domestic supplies of iron ore increased, the first integrated iron and steel mill was being constructed, and two others were proposed. Construction began in the third quarter on the Iligan Integrated Steel Mills, Inc., plant, rated at about 270,000 tons of steel annually, at Iligan City; rolling facilities were scheduled for operation by late 1967 and full operations for about 1970. Feed is to in-Iron Mines. Port facilities at Iligan are being constructed to help handle increased shipping. Santa Inez Steel Corp. was planclude pelletized iron ore from Philippine

ning a 250,000-ton-Linz-Donawitz (LD) smelter and continuous casting plant to serve mainly for production of bars and structural steel shapes. The company's Santa Inez mine, with a 30-million-ton reserve, is to have installed beneficiation and pelletizing facilities, and the completed overall development was scheduled to produce steel by 1969. Also, Black Mountain, Inc., was considering a 50,000-ton-per-year steel plant in connection with its Pioneer iron mine, Zamboanga del Sur, Mindanao. Considered for this plant was the Swedish Stora process using oxygen and charred coal or coke breeze. The deposit contains an estimated ore reserve of 6 million tons.

Elizalde Iron and Steel Corp., which produced 30,853 tons of tinplate in 1964 on its new electrolytic and hot-dip lines, expected to boost output to 54,000 or even 60,000 tons in 1965. Marcelo Steel Corp. installed two electric furnaces and could make castings up to 13,000 pounds. Southern Rolling Mills, Inc., made a small initial shipment of black iron sheets to Taiwan. National Shipyards and Steel Corp's. 40-ton-per-day low-shaft blast furnace at Jose Panganiban remained idle, lacking suitable iron ore, but startup was expected upon arrival of pelletized feed from Philippine Iron Mines. The company operated its Iligan electric furnace and rolling mills below capacity because of scrap shortages. Philippine Iron Mines' 750,000-ton-per-year ore-pelletizing plant at Larap was completed in August, but production was limited by startup problems.

Iron ore production suffered from typhoon damage in late 1964, and there were difficulties in the operation of the Larap concentrator; nevertheless, output in 1965 rose more than 10 percent. The new aerial tramline at Samar Mining Co., Inc's. Sibuguey mine came into full operation, and additional mill modifications were being made as ore changed from high-grade to predominantly milling grade. High-grade ores that could be easily washed and shipped without further processing were mined from the nearby Conakon-Diutay deposit. Surface material was also a significant source of ore supply, amounting to 58,943 tons in 1964. Philippine Iron Mines had a reserve of about 44 million tons of ore averaging 40.1 percent iron at Larap, including about 4 million tons of direct-shipping grade averaging 56.4 percent iron.

A study was made of possibilities for steelmaking from black sands found extensively on Philippine beaches and in river sediments, for example, from the Camiguin Island region.[6] Suitability for steel was demonstrated. Exploitation of Mayorga Mining Co's. iron-sand deposits on Leyte was being considered, along with possible electric smelting. Byproduct magnetite produced from copper ores by both Atlas Consolidated and Filmag, Inc., supplied about one-tenth of total iron ore production.

Lead and Zinc.—Although some lead and zinc have been produced in connection with copper and gold mining, the Philippines until recently appeared to have minor potential for these metals. However, in searching for copper in southwestern Mindanao, a 10-million-ton lead-zinc ore deposit was reportedly found by Zambales Mining Co. Consolidated Mines recently has studied and sampled a lead-zinc prospect of unreported size and grade in Torrijos.

Manganese.—In 1965, a total of 56,000 tons of manganese ore was exported to Japan. Most of this came from Acoje Mining Co's. Sierra Madre property in Isabella Province, but in the second quarter a newcomer, Pan Asia Mining Co., began shipping a small tonnage of 33-percent-grade ore from its deposit at Dingalan, Quezon. During wet weather, landslides interfered with Sierra Madre operations.

Mercury.—Higher prices encouraged the country's lone producer, Palawan Quicksilver Mines, Inc., to improve facilities and boost mining rates; although grade continued to fall, recoveries were a little better. Most production was from the Tagburos mine. Average millhead grade was down to 2.99 pounds of mercury per metric ton of ore in 1964 but overall recovery was up to 81.75 percent. Roasting costs were lowered and capacity raised as an ore-drying plant, supplied by Gordon I. Gould & Co. of San Francisco, Calif., went into operation before the rainy season. Exploration and minor production took place at the company's Sugod project. To ex-

[6] San Miguel, A. F., Jr., A. C. Flores, and C. R. Sison. Preliminary Utilization Studies on Black Sand From Camiguin Island, Cagayan. Philippine Bureau of Mines Rept. of Inf. 56, April 1965, 15 pp.

ploit large tonnages of subgrade ores containing less than 2.5 pounds of mercury per ton, the management proposed to build a 300-ton-per-day beneficiation plant based on data gained from pilot plant operations. A bank of six Rossi retorts was installed, and stainless steel was to replace cast-iron condenser tubes.

Nickel.—The Government's Surigao Mineral Reservation Board received only two responses to an invitation to bid for operation of Parcel 2 of its Surigao del Norte, Mindanao, nickel reserve. The area under consideration was estimated to contain 147 million tons of ore averaging about 1 percent nickel, 0.08 percent cobalt, and 46 percent iron. Contract terms required production within 5 years of effective signing date and payment of 3.5 percent of gross output receipts to the Government. A $150 million investment was anticipated. One bid came from Benguet Consolidated, Inc. (about 90 percent U.S.-owned) and the other from a Philippine law firm acting as agent for MacArthur International Minerals Co. Benguet's offer was conditional pending clarification of questions on Philippine investment and trade laws.

NONMETALS

Cement.—Cement production rose dramatically; new plants and equipment boosted output over one-fifth. The largest producers, with outputs in thousand tons, were Republic Cement Corp., 720; Rizal Cement Co., 680; and Bacnotan Cement Industries, 270. The Philippine cement industry continued to oppose the importing of cement and the infusion of foreign investment in the predominantly domestic industry. Whether in fact there were cement shortages was debated; in Manila a major market area, cement prices at midyear remained relatively high, being quoted at slightly over $20 per ton. During the year, Mindanao Portland Cement Corp. completed Mindanao Island's first cement plant, but operations were limited because of faulty foundation support requiring costly corrective measures. Lone Star Cement Co. (United States) offered funds and technical assistance to get the plant going but some industrialists saw this as a foreign attempt to move into the domestic scene. Both Lone Star and Koppers Corp. (also of the United States) were unsuccessful in previous proposals to build plants. Tayabas Cement Co., Inc., having concluded a contract with a Japanese manufacturer for a $7-million plant, was going ahead with its plans for construction at Padre, Burgos, Quezon.

Marinduque Mining and Industrial Corp. began construction in the third quarter of a 380,000-ton-per-year wet process plant at Barrio Tagbak, Antipolo, Rizal, about 20 miles from Manila. Island Cement & Industrial Corp. was connected with the project. Cepoc Industries, Inc., looked for partners in building new cement plants and sent samples of raw materials to Japan for testing. The newly organized Abra Industrial Corp. explored for raw materials, trying to establish a cement plant in Bucay, Abra, to serve the Ilocos area. Apo Cement Corp., which previously had taken over Cebu Portland Cement Co. operations, planned to produce pozzolanic cement after locating a large deposit of suitable pozzolan. Apo added a kiln in August increasing its annual capacity to 220,000 tons and had plans to add another kiln that would make its annual cacapity 390,000 tons by late 1966. The new plant of Filipinas Cement Corp. received a second kiln, raising capacity to 220,000 tons, and plans have been made to triple this eventually. A third kiln was to come into operation in early 1966. Universal Cement Co. was doubling capacity with a second kiln which was expected to operate about midyear. Bacnotan Cement Industries at Bacnotan, La Union, operated three kilns at full capacity since December 1964. Also, the company negotiated with Mitsui & Co. (Japan) for construction of a 150,000-ton-per-year plant at Davao.

Feldspar.—Nin Bay Mining Co. upgraded sands containing about 20 percent alumina at its Porac River plant, producing about 20 tons of high-alumina sand daily for sale mainly to the San Miguel Corp. for glassmaking.[7]

Fertilizer and Pyrite.—Esso Standard Fertilizer and Agricultural Chemical Co. was completing its large new plant at Limay, Bataan, with annual capacity of 300,000 tons of various fertilizers. Developments at Marinduque Mining's Bagacay mine were completed to supply pyrite

[7] Unson, Miguel R. Recovery of Feldspar From Arkosic Sand. Philippine Min. J., v. 7, No. 5, May 1965, pp. 22–24.

under a contract with Esso calling for 180,000 tons annually beginning in mid-1965. The Esso plant boasts one of the world's largest fluosolids systems, capable of producing 750 tons of sulfuric acid daily; a phosphoric acid unit will process phosphate rock from the U.S. Atlas Fertilizer Corp. produced mixed fertilizers and, in addition to expanding its ammonia plant, was doubling its capacity for sulfuric acid. Atlas in 1964 produced 31,882 tons of sulfuric acid and 8,130 tons of phosphoric acid, with mixed fertilizers amounting to 53,035 tons. Marcelo Fertilizer Corp. installed a modern naphtha-steam reforming plant to boost anhydrous ammonia capacity to 39,600 tons annually. Philippine fertilizer output was 104,170 tons valued about $8 million in 1964 and was probably higher in 1965.

Silica Sand.—Initial production was reported from Pioneer Glass Manufacturing Co's. Sherman Hills mine in Negros Occidental, with hope of competing with South Vietnamese sands marketed in Japan. Quality was said to compare with that of high quality sand from the Ottawa, Ill., area, and the company envisioned establishment of glass manufacturing and other silica-related enterprises in the Philippines.

MINERAL FUELS

Coal and Coke.—Cebu and Mindanao provided most of the country's limited coal production, but attention was turned to the Malangas coal reservation, Zamboanga del Sur, in attempts to establish a domestic source of coking-quality coal that might supply forthcoming iron and steel operations. Coking tests were made by the Philippine Bureau of Mines on Melangas coal from the Lumbog area mixed with a newly discovered noncoking coal from the Katipunan Siay area. Resulting coke was judged suitable for iron and steel making; overall reserves were adequate for 5.2 million tons of such coke. At the Katipunan deposit three or more workable seams were being investigated, each several meters thick and with outcrops traceable about a mile. The Philippines has undeveloped coal seams on other islands, including Bataan, Polillo, Catanduanes, Negros, Mindoro, and Semirara. Koppers International Inc. (United States) was studying plans to build a byproduct coking plant using Malangas and Australian coal blends to fill future domestic needs.

Petroleum.—Import of crude oil and some supplementary refined products rose as the country's four refiners, Caltex (Philippines) Inc., Esso Standard Philippines, Shell Co. of the Philippines Ltd., and Filoil Refinery Corp., all expanded capacities and tried to catch up with demand.

Although some geological and seismic work was done, the amount of oil exploration drilling was insignificant. Philippine refiners continued to increase throughputs, using imported crude oil. Crude oil suppliers included Indonesia, Saudi Arabia, and Sarawak-Brunei. Exploration companies were becoming discouraged; one, the Philippine Oil Development Co., was about to go out of business after 30 years. Private financial resources were said to be near exhaustion and available foreign capital minimal. The Philippine Petroleum Association asked that the Government provide relief in the form of tax exemptions, a 5-year work moratorium on leases, and annual subsidies. The President created a committee to study the situation. Philex Oil Development Co. still had plans to drill test wells in the Ilocos Basin, renounced several leases on the east edge of the Central Luzon Basin, and planned holes for stratigraphic study in Cebu and Negros Occidental. Visayan Exploration Co., Inc., subsidiary of Standard Oil Co. of New Jersey, stepped up geological studies but lost a partner, as Mobil Philippines Exploration, Inc., withdrew from the Visayan Sea venture.

The Mineral Industry of Taiwan

By Benjamin H. Lim [1]

Coal remained the dominant product of the extractive sector of Taiwan's mineral industry in 1965, accounting for almost 75 percent of the value of all crude mineral output, but as a result of industrial growth of this island nation, the output value of the mineral industry's extractive sector has become less important to the economy than the aggregate output value of mineral processing facilities, many operating primarily on imported materials. Economically exploitable raw materials are rather limited: Coal, copper, gold, limestone, pyrite, oil, and gas are the most significant, but in the case of each commodity, Taiwan's output is only a small fraction of total world production, and only in the case of cement does the country have significance as a mineral product exporter.

The extractive sector's contribution to the island's 1965 gross national product (GNP) of about $2,600 million [2] was estimated at $66 million compared with $53 million in 1964; in both years, extractive industry output constituted about 2.5 percent of the GNP. The value index (1961 = 100) for the extractive sector's 1965 production, quoted at 129.7, gained 8.3 and 17.4 points over those of 1964 and 1963 respectively.

Major components in the sector had the following output value indices (1961 = 100):

Year	Coal mining	Metal mining	Crude petroleum and natural gas	Salt evaporation	Miscellaneous mining, nonmetallic mining, and quarrying
1963	111.3	92.2	135.4	151.5	115.3
1964	116.3	82.8	452.6	139.0	122.7
1965	116.9	90.9	833.1	141.0	128.9

Despite Taiwan's modest domestic mineral base, industrialization has forged ahead rapidly during the last few years. Indices for the manufacturing sector, including mineral processing facilities and other important components of the economy were as follows (1961 = 100):

Year	Manufacturing (sugar processing excluded)	Construction of buildings	Public utilities
1963	131.2	129.1	120.9
1964	168.6	154.2	142.6
1965	192.7	532.6	154.6

Source: Industry of Free China (Tapei, Taiwan). V. 25, No. 2, February 1966, pp. 68–69.

Beginning in 1965, Taiwan initiated its fourth 4-year plan (1965–68), under which the annual growth targets in the various sectors of the economy were approximately: Agriculture, 4 percent; industry, 11 percent; and all other sectors combined, 6 percent. The new plan also called for an annual increase of 7 percent in the GNP. To implement the various projects in the new plan, a capital investment of about $2,500 million was envisaged.

Taiwan's third 4-year plan increased the island's GNP over the 4 years by 35 percent, its per capita income by 19 percent, and its industrial production by 72 percent. The average annual increase in the GNP approximated closely the original target of 8 percent. Record production in agricultural and industrial sectors during 1964 buoyed up the economy considerably and

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from New Taiwan dollars (NT$) to U.S. dollars at the rate of NT$40.10=US$1.00.

despite some minor dips in a few of the areas during 1965, the economy remained sound and the new plan was off to a good start.

The soundness of Taiwan's economy in recent years has been due to, in no small part, its liberal investment policies. The success of the island's ability to attract foreign investment is evidenced by the increase in the average annual inflow of overseas capital into Taiwan, from some $6 million before 1959 to more than $25 million in 1965. Some of the factors that generated this favorable investment climate included continuous development of industrial sites, ample supply of skilled and inexpensive labor, and political, economic, and social stability. In some respects Taiwan is becoming more attractive to international investors than Hong Kong and Japan.

To enhance the island's investment climate further, the Taiwan Government has approved recently several major projects specifically designed to improve and expand the island's infrastructure in anticipation of the rapid industrialization during the years of the new plan. Some of the new projects started in 1965 included modernization and extension of railway facilities, dredging and expanding the harbors at Keelung, Kaohsiung, and Hualien, construction of airports and highways, and electrification of more remote areas of the island. Completion dates for these projects have been scheduled for 1969.

To augment the incentives for foreign investments still further, Taiwan revised the Statute for Encouragement of Investment in January 1965. Some of the more important provisions of the revised statute were as follows:

1. An enterprise conforming to the prescribed encouragement criteria and established through new investment or an existing enterprise of this category increasing its capital investment is exempted from business income tax for 5 years.

2. The maximum rate of business income tax, including all forms of surtax, shall not exceed 18 percent of the total annual income.

3. Enterprises conforming to the encouragement criteria are entitled to a 10-percent reduction of business income tax after the expiration of the 5-year tax exemption period.

4. Undistributed profits used for expansion are tax exempt, provided they do not exceed 25 percent of annual taxable income.

5. Investors may repatriate each year 15 percent of the invested capital starting 2 years after completion of the investment project.

6. Enterprises in which 51 percent or more of the capital comes from foreigners or overseas Chinese are not subject to Government requisitions or expropriation for 20 years.

Such promotions for foreign investments, especially those likely to lead to increased exports, have reaped much success in recent years. In 1965, total foreign investment approvals reached $48.2 million, compared with $28.5 million in 1964. Of the 1965 total, $31.4 million represented U.S. investments.

Taiwan's Government liberal investment policy was drawn up, in part, in anticipation of the termination of American aid to the island, which was officially ended on June 30, 1965. During the fiscal year, ended June 30, 1965, U.S. aid consisted of about $2 million in development grants, $37 million in development loans, and $20 million in surplus farm products. Since the start of U.S. aid to Taiwan, the United States has extended to the island $1,360 million worth of goods and services. This aid helped immeasurably in constructing one of the strongest economies in the Far East. Commitments made prior to the termination date will add $95 million more to the total.

On April 9, 1965, an agreement was reached between the United States and Chinese Governments that $50 million of counterpart funds, to be known as the Sino-American Fund for Economic and Social Development, should be made available annually for economic development projects. The agreement specified that the use of the money would be determined by the Chinese Government. The United States Government, however, retained the right of supervision of the projects selected. On April 26, 1965, an agreement was concluded with the Japanese Government for loans totaling $150 million. Funds from these loans will help to finance the construction of several major projects including the proposed $100 million Tseng Wen

Dam, a second harbor at Kaohsiung, a hydroelectric power station on the Lower Tachien, a steel mill and a new fertilizer plant, and new installations for several major metallurgical and metal-fabricating firms in Taiwan.

The development of industrial sites underwent rapid expansion in 1965. In the latter part of the year, the Taiwan Government designated 59 industrial districts in different parts of the island with a total area of about 6,300 acres. During 1965 the 150-acre industrial complex at Liutu was completed. Thirty-eight firms with a total capitalization of about $7 million were building facilities in various stages of completion. Since demand exceeded the supply of land in Liutu, an additional site at Kweishan was being prepared. In addition to these developments, a site of 540 acres was being readied simultaneously at Kaohsiung, 170 acres of which have been designated as the "export processing zone." Firms in the zone will enjoy exemptions from import and other duties. Construction of public utilities and a few private factories have already begun late in 1965 in the area.

PRODUCTION

Most of Taiwan's mineral commodity products showed slight output gains in 1965 and some recorded significant increases. Output of a few declined from the previous year's levels. The greatest increase in mineral production in 1965 occurred in natural gas, which almost doubled the 1964 rate and was six times that of 1963. Significant increases also occurred in the production of gold, silver, asbestos, dolomite, and gypsum.

Of the island's basic industries, production of aluminum ingots, still near peak capacity, showed a slight decrease compared with last year's record high, but production of aluminum sheets increased 14 percent from that of 1964. Output of iron and steel products, mostly semimanufactures, apparently increased only slightly but production of iron ores, limonite, and magnetite was substantially above 1964 levels.

Total value of output of the mineral extractive sector and the mineral-based component of the manufacturing sector amounted to $458 million for 1965 and $392 million for 1964. Of the 1965 total, basic metals accounted for $50 million; metal products, $25 million; nonmetallic mineral products, $87 million; products of petroleum and coal, $76 million; and chemical and chemical products, $154 million. The remainder of $66 million was from the extractive industries with the following breakdown: Metals, $4 million; salt evaporation, $7 million; nonmetallic mining and quarrying, $2 million; coal, $48 million; and crude petroleum and gas, $5 million.

Table 1.—Taiwan: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Alumina	e 20,000	e 24,000	e 26,000	e 43,000	42,000
Aluminum ingots	r 9,017	11,009	11,928	r 19,372	18,912
Aluminum sheet	4,749	6,234	5,687	8,104	9,237
Copper:					
Ore, 0.61 to 0.77 percent Cu	195,900	166,849	117,618	119,973	114,191
Concentrates, 13 to 14 percent Cu	10,922	12,167	8,272	9,291	10,313
Mine	2,232	2,107	1,619	r 1,738	e 1,900
Electrolytic copper	2,268	r 2,490	1,481	1,605	1,916
Gold:					
Gold-copper ore [1]	189,503	196,433	170,392	200,494	212,500
Gold ore (1.50 ounces Au per ton in 1965)	NA	NA	1,553	1,483	1,581
Refined gold, troy ounces	17,619	24,026	31,710	17,660	32,148
Iron and steel:					
Iron ore:					
Limonite, 35 to 40 percent Fe	557	515	576	1,021	5,633
Magnetite, 50 percent Fe	12,488	5,814	4,705	5,877	8,852
Pig iron, thousand tons	53	63	54	62	72
Steel ingots and castings, do	r 198	182	275	300	e 315
Rolled steel, do	NA	NA	NA	260	e 270
Silver, troy ounces	77,303	80,129	61,440	r 60,633	87,315
Nonmetals:					
Asbestos	40	476	548	477	801
Cement, thousand tons	r 1,509	r 1,871	r 2,246	2,355	2,444

Table 1.—Taiwan: Production of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Clays:					
Ceramic and pottery thousand tons	40	40	40	40	NA
Paper filler do	3	3	3	3	NA
Used in cement do	207	372	460	471	NA
Brick and tile do	500	500	500	500	NA
Total do	750	915	1,003	1,014	1,314
Dolomite, about 19 percent MgO	22,182	29,837	30,904	32,684	50,577
Gypsum, 75 to 96 percent gypsum	11,934	16,285	26,588	17,094	27,822
Lime	75,918	75,123	79,491	91,275	102,954
Limestone thousand tons	2,479	3,292	3,680	3,717	4,076
Pyrites, 25 to 45 percent sulfur	47,467	r 45,373	46,760	46,324	39,260
Salt, sea thousand tons	453	595	626	602	572
Sand, glass do	40	68	80	94	115
Sulfur:					
Refined, 97 to 99 percent sulfur	r 5,824	7,582	7,259	6,492	4,495
Contained in pyrites	r 19,936	r 20,483	r 17,242	17,081	16,000
Recovered from refinery gases, 99 percent sulfur	2,000	2,164	2,347	2,825	2,386
Talc, mostly soapstone grade	13,448	13,409	14,787	16,981	15,229
Mineral fuels:					
Coal, subbituminous to high-volatile bituminous:					
Dust and lump thousand tons	3,220	3,618	3,878	3,978	NA
Coking do	1,017	936	932	1,050	NA
Total do	4,237	4,554	4,810	5,028	5,054
Coke:					
Coke oven and beehive (including semi-coke) do	200	109	199	85	84
Gas plants do	----	119	34	160	173
Natural gas million cubic feet	1,309	1,356	1,789	5,982	10,932
Petroleum:					
Crude thousand 42-gallon barrels	17	14	19	61	131
Refinery products:					
Gasoline do	1,970	2,001	e 2,040	2,170	2,239
Kerosine do	22	24	e 25	250	189
Jet fuel do	NA	NA	NA	1,390	1,673
Distillate fuel oil do	1,453	1,609	e 1,420	1,717	2,164
Residual fuel oil do	2,916	3,578	e 3,830	3,944	5,856
Asphalt thousand tons	61	68	e 56	40	53
Other thousand 42-gallon barrels	NA	NA	NA	NA	88

e Estimate. r Revised. NA Not available.
1 Average grade about 0.1 ounce gold per ton, 3.2 ounces silver per ton, 0.3 percent copper, and 5 percent sulfur.

TRADE

Taiwan's industrial growth has been marked by a growing foreign trade deficit with respect to mineral commodities, as the value of imports of these goods has consistently increased more rapidly than has the value of exports of materials in this class, as shown in the tabulation below:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total	
Gross exports:			
1963	31.3	331.2	9.5
1964	33.5	433.0	7.7
1965 e	34.0	491.0	6.9
Gross imports (including AID imports):			
1963	78.2	361.3	21.6
1964	102.4	428.0	23.9
1965 e	130.0	544.0	23.9
Net trade balance:			
1963	−46.9	−30.1	XX
1964	−68.9	+5.0	XX
1965 e	−96.0	−53.0	XX

e Estimate.
XX Not applicable.

Of the total value of imports in 1963, 1964, and 1965, funds from the U.S. Agency for International Development (AID) were used to finance $76.1 million, and $67 million, respectively.

Taiwan's mineral exports were dominated on a value basis by iron and steel semimanufactures and by cement, while metal imports, chiefly semimanufactures of iron and steel, accounted for the preponderance of total mineral imports in 1963 and 1964 as shown in the table that follows and presumably this situation continued to be the same in 1965.

Commodity group	Value (million dollars)			
	Exports		Imports	
	1963	1964	1963	1964
Metals	14.0	15.5	40.1	57.6
Nonmetals	14.2	14.6	12.4	18.6
Mineral fuels	3.1	3.4	25.7	26.2
Total	31.3	33.5	78.2	102.4

Taiwan's principal trading partners have been Japan and the United States for the last several years. In 1964, Japan received approximately 33 percent of all of Taiwan's exports in exchange for 42 percent of the island's imports. The United States purchased about 19 percent of Taiwan's exports in return for 26 percent of all the imports from the United States. Value of shipments from the United States was exclusive of those financed by AID.

Table 2.—Taiwan: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal destinations, 1964
Metals:			
Aluminum and alloys:			
Unwrought	3,431	7,206	South Korea 2,793; United Kingdom 1,558; West Germany 660; United States 500.
Semimanufactures	r 2,365	3,277	South Viet-Nam 1,626; Hong Kong 611; United States 272.
Copper:			
Ore and concentrate	r 9,400	14,485	Japan 14,478.
Unwrought	------	3	Hong Kong 2; Philippines 1.
Semimanufactures	315	211	South Viet-Nam 200; Singapore 11.
Iron and steel:			
Pig iron	3,211	4,533	South Viet-Nam 4,283; Malaya 200.
Semimanufactures----thousand tons	r 79	66	South Viet-Nam 41; Philippines 7; Hong Kong 6.
Ferroalloys	3,803	1,469	South Korea 864; Philippines 465.
Nonmetals:			
Asbestos	251	893	South Viet-Nam 783; Philippines 51.
Cement:			
Portland----thousand tons	892	899	South Viet-Nam 368; Hong Kong 218; Philippines 172.
White	7,164	11,519	South Viet-Nam 8,511; Philippines 2,559.
Fertilizers, chemical	r 15,588	19,987	South Korea 10,950; South Viet-Nam 9,000.
Salt----thousand tons	283	399	Japan 370; South Korea 10; Malaya 9.
Mineral fuels:			
Coal----thousand tons	92	96	South Korea 45; Japan 43; Hong Kong 7.
Coke, petroleum and other	r 7,377	14,957	Philippines 7,900; Singapore 1,780; Hong Kong 1,743.
Petroleum refinery products:			
Kerosine---thousand 42-gallon barrels	------	110	All to Hong Kong.
Fuel oil----thousand tons	51	82	Hong Kong 49; Japan 17.
Lubricating oil----42-gallon barrels	98	214	Japan 111; Hong Kong 77.
Pitch and asphalt----thousand tons	28	13	South Korea 6; Thailand 3.

r Revised.

Source: Chinese Maritime Customs, Statistical Department, Inspectorate General of Customs (Taipei, Taiwan). The Trade of China 1963 (pub. 1964), 434 pp.; 1964 (pub. 1965), 468 pp.

Table 3.—Taiwan: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys:			
Bauxite	53,013	89,865	Malaya 83,891; British North Borneo 5,324.
Scrap	269	596	United States 416.
Unwrought	1,345	1,091	United States 684; India 400.
Semimanufactures	116	195	United States 80; Japan 53; Switzerland 9.
Chromium ore and concentrate	159	------	
Copper and alloys:			
Unalloyed:			
Unwrought	2,286	2,029	Japan 1,562; United States 416.
Semimanufactures	r 445	1,631	Japan 1,317; South Korea 150; Australia 90.
Brass:			
Unwrought	1	17	Malaya 14; Thailand 2.
Semimanufactures	479	1,197	Japan 1,048; United States 94.
Iron and steel:			
Ore and concentrate	43,711	77,501	Malaya 77,482.
Scrap----thousand tons	174	250	United States 126; Hong Kong 33; Japan 10.
Ferroalloys	126	245	West Germany 121; Japan 103; United Kingdom 20.
Billets, blooms, and other unwrought products	1,010	3,056	United States 2,841; West Germany 200.
Semimanufactures----thousand tons	r 179	219	Japan 175; United States 19, West Germany 10.
Lead and alloys:			
Unwrought	2,521	2,482	Australia 1,857; Hong Kong 300.
Semimanufactures	r 86	144	West Germany 111; Australia 31.
Manganese dioxide	369	513	Japan 473; United States 40.
Mercury----76-pound flasks	r 276	1,279	Italy 697; Spain 340; Mexico 235.
Nickel:			
Ingot and other primary forms	180	102	Canada 48; Norway 39.
Semimanufactures	3	5	Canada 2; United States 2; United Kingdom 1.
Tin and alloys, semimanufactures--long tons	185	102	Malaya 64; Thailand 30.
Titanium dioxide	791	1,385	Japan 1,091; United States 176; West Germany 59.
Zinc:			
Unwrought	3,800	4,198	Australia 1,703; Belgium 1,218; West Germany 200.
Semimanufactures	148	254	Japan 92; West Germany 70; United States 68.
Other metal scrap	15	1,289	Hong Kong 1,101.
Nonmetals:			
Abrasives	588	823	Japan 745; United States 72.
Asbestos	1,142	1,441	Canada 612; Portuguese East Africa 180; Japan 352.
Fertilizer materials:			
Ammonium sulfate	107,400	173,753	Japan 172,453.
Other nitrogenous	85,202	76,550	All from Japan.
Phosphatic	17,834	10,100	All from United States.
Potassic	47,480	94,482	United States 34,550; Canada 29,925; West Germany 20,005.
Others	100	500	All from Japan.
Graphite:			
Plumbago	1,852	1,546	South Korea 1,425; Japan 83.
Other	119,695	138,314	Morocco 115,652; Japan 8,127; South Korea 6,154.
Gypsum	22,620	59,610	United Arab Republic (Egypt) 29,900; Cyprus 13,000; Mexico 10,300.
Sulfur	40,413	88,229	Canada 85,716; United States 2,501.
Mineral fuels:			
Coke, petroleum and others	7,209	5,713	United States 5,693.
Petroleum:			
Crude----thousand tons	1,494	1,286	Iraq 1,082; Kuwait 168.
Refinery products:			
Lubricating oil--thousand 42-gallon barrels	94	168	United States 84; Japan 81.
Lubricating grease	r 464	1,337	Japan 741; United States 546.
Paraffin wax	1,865	1,997	Japan 1,272; United States 346; Indonesia 308.
Transformer oil	246	1,311	United States 757; Japan 644.
Mineral oils	253	1,266	Japan 967; United States 225.
Pitch and asphalt	2,775	4,025	United States 3,704; Japan 305.

r Revised.

Source: Chinese Maritime Customs, Statistical Department, Inspectorate General of Customs (Taipei, Taiwan). The Trade of China 1963 (pub. 1964), 434 pp.; 1964 (pub. 1965), 468 pp.

COMMODITY REVIEW

METALS

Aluminum.—In 1965, Taiwan's aluminum industry produced approximately 42,000 tons of alumina, 19,000 tons of ingot, 9,000 tons of sheets, 2,000 tons of extrusions, 1,000 tons of foil, and 3,000 tons of various aluminum semimanufactures and finished goods. These production rates approximate the capacities of the island's industry.

The Taiwan Aluminum Corp. (TALCO), a wholly Government-owned enterprise with plants located in Kaohsiung, remained the only fully integrated aluminum company in the country. In anticipation of continued growth of demands for aluminum products by the domestic market, and elsewhere in Southeast Asia, the company continued the second phase of an overall expansion plan in 1965. The first phase, completed in 1964, consisted of renovation and expansion of smelting capacity; the second phase with a target completion date late in 1966, involves increasing the firm's annual mill capacity to about 15,000 tons of sheets and plates. When this expansion is completed, plans call for raising annual alumina production to 70,000 tons and annual ingot output to 30,000 tons. Total investment for these projects was estimated to be about $5 million. Early in 1965, TALCO announced additional plans for a $7 million expansion program designed to increase production of aluminum manufactures. When completed the firm will produce automotive chassis, fishing boats, textile spindles, electrical plates, and various accessories for household appliances.[3]

Because Taiwan lacks bauxite resources, the island has imported this material, chiefly from Sarawak, India, and other Far Eastern countries. During early 1965, however, representatives from Taiwan visited Jamaica to study the feasibility of importing bauxite from that country.

Iron and Steel.—Production of iron and steel ingots and castings in Taiwan in 1965 was estimated to be slightly above the 1964 level and pig iron output was 16 percent higher than in 1964. Output of rods, bars, and slabs in 1965 totaled 260,000 tons compared with 236,000 tons in 1964.

Taiwan's steel industry, comprising some 50 firms of various sizes and specializations, was recently surveyed and reported to be somewhat technologically behind and economically inefficient. This was especially true of the island's iron foundries as noted by Taiwan's Metal Industries Development Center. Some of the Center's findings indicated that equipment in the foundries was obsolete, resulting in low productivity per man-hour, that metallurgical practices and technological control were inadequate, that molding techniques needed much improvement, that plant layouts were poor, and that general working conditions needed attention from management and Government. The survey also recommended a training program for upgrading skills of foremen, supervisors, and other management personnel, ways and means to improve the cost and price structures of foundry products, and a comprehensive market study of the industry's goods.[4]

In order to improve the technological efficiency of Taiwan's steel industry (capacity estimated at 400,000 tons per year), a plan was drawn up during the latter part of 1965 to establish an integrated steel plant at Kaohsiung. Proposed capacity of the new plant was on the order of 500,000 tons per year, with provisions to possibly double this by the late 1970's. The final plans emphasized the conventional blast-furnace oxygen converter process during the initial stages of the industry's development. Higher levels of technological sophistication will be acquired as the industry develops.

The establishment of an integrated steel plant on Taiwan has been a strong desire of many Taiwan industrialists and officials, who believe that such a plant is essential to future industrial development. During the last 5 years several large U.S. and Japanese steel and engineering consulting firms have suggested various plans for improving Taiwan's steel industry. The Kloechner Industrie-Anlagen G.m.b.H. survey team from West Germany, after studying the island's steel industry, reported late in 1965 that it would be feasible to establish an integrated plant on the island. The Kloechner reports will serve as a major guide for Taiwan's experts in planning construction.

The Taiwan Government, upon the recommendation of the International Bank for

[3] International Commerce. Taiwan Aluminum Firm to Broaden Production. V. 71, No. 9, Mar. 1, 1965, p. 25.

[4] Industry of Free China (Taipei, Taiwan). The Iron Foundries of Taiwan. V. 24, No. 1, July 1965, pp. 10–28.

Reconstruction and Development (IBRD) has engaged the consulting firm of Arthur G. McKee & Co., Cleveland, Ohio, to do a comprehensive study, and presumably a definitive investigation of the various proposals for the plant's establishment. It was reported that on conclusion of the McKee investigations the Taiwan Government will make some final decisions as to whether or not to construct the steel plant.

Nickel.—Nickel ore was discovered in the Ilan and Hualien Provinces. The ores consist mainly of pentlandite, pyrrhotite, pyrite, and chalcopyrite. Investigations indicated a reserve of some 5 million tons of this ore with a nickel content ranging from 0.14 to 0.35 percent.[5]

NONMETALS

Bentonite.—A bentonite deposit, estimated in preliminary studies to contain about 2 million tons, valued at $100 million, was discovered in Ping Tung County in southern Taiwan.

Cement.—At yearend 1965, cement capacity of 10 major Taiwan producers was about 3 million tons. Planned output for the year was 2.5 million tons, slightly more than the actual production. Of the 1965 actual output, approximately 900,000 tons were exported and the remainder of 1.5 million tons was consumed primarily by construction projects. Rate of construction during the year was especially rapid, as shown by the expenditure of approximately $31.9 million in the private sector alone, compared with $9.3 million in 1964 and $8.7 million in 1963.

It is expected that foreign trade returns for 1965 will show a decline in cement exports compared with 1964 figures because of the completion of cement producing facilities in traditional customer countries—mainly South Viet-Nam, the Philippines, and Hong Kong. Although escalation of the conflict in South Viet-Nam has hindered cement production in that country, leading to a December 1965 order through open tender for the supply of 400,000 tons by Taiwan cement manufacturers in 1966,[6] the cement companies continued to look ahead and were seeking new outlets, especially in Middle Eastern countries. By gaining new customers, they hope at least to retain their position as the world's fourth largest exporter of cement, preceded in rank only by Japan, Belgium, and France.

Preliminary reports indicated that Taiwan's export of white cement in 1965, although small in comparison with that of the Portland type, increased rapidly during the year with sales exceeding $1 million, more than double the 1964 figure. The Chiahsin Cement Corp., the only large white cement manufacturer in Taiwan, was expanding its annual capacity from 14,000 tons to 25,000 tons.

Fertilizers.—Although Taiwan has experienced rapid industrial development in recent years, agriculture has remained the mainstay of the island's economy, both supplying indigenous demand and providing foreign exchange through export sales. Recent increases in agricultural production have been due partly to much wider use of chemical fertilizers of which a significant percent has been provided by the island's fertilizer producers, who have built up this industry to become one of the country's largest.

At yearend 1965, Taiwan had three major manufacturers of chemical fertilizers: The Taiwan Fertilizer Co. (TFC), The Kaohsiung Ammonium Sulfate Corp. (KASC), and the Mobil China Allied Chemical Industries, Ltd. (MCAC). KASC produced only ammonium sulfate in its single plant at Kaohsiung with an annual capacity of about 140,000 tons. MCAC also operated one plant, a facility at Miaoli that uses natural gas as raw material, with a capacity to produce 100,000 tons of urea and 45,000 tons of liquid ammonia annually. TFC operated seven plants with a total annual capacity of about 600,000 tons of various types of fertilizers by yearend 1965. These plants included a 36,000-ton-per-year calcium cyanamide plant at Keelung; a 50,000-ton-per-year calcium superphosphate plant also at Keelung; a facility at Kaohsiung that was renovated late in 1964, increasing capacity from 70,000 to 150,000 tons of various types of phosphatic fertilizers; and a plant at Lotung that produces mainly fused phosphates and calcium carbide. Carbide production capacity at the latter plant was recently increased from 5,000 to 8,600 tons. Other TFC facilities include a quarry at Suao, operated by the Lotung plant that supplies limestone

[5] Far Eastern Economic Review (Hong Kong). Nickel From Taiwan. V. 49, No. 1, July 1, 1965, p. 29.

[6] Taiwan Industrial Panorama. A Further Increase of Taiwan's Cement Export is Expected for 1966. V. 4, No. 12, Dec. 31, 1965, item 1527, p. 4.

to the firm's plants at Keelung and Hsinchu, and the Hsinchu plant, which is capable of producing annually 39,000 tons of calcium cyanamide and, since June 1964, ammonium sulfate at a rate of 120,000 tons per year. Another plant at Nankong produces mainly urea with an annual capacity of 75,000 tons and an installation at Hualien, the only fertilizer plant on the island's east coast, has the capacity to produce 60,000 tons of nitrochalk per year.

In 1965, TFC continued expansion in order to meet the expected goal of 1 million tons of fertilizers per year by 1969, including 777,250 tons of nitrogenous and 251,000 tons of phosphatic varieties. Most notable of the firm's projects occurred in the Hsinchu plant, where the company plans to spend upwards of $20 million to renovate the installation into a large chemical complex capable of producing 180,000 tons of ammonia a year. The ammonia, in tum, will be used to make 140,000 tons of ammonium sulfate and 90,000 tons of urea. The complex will use natural gas as a raw material.

MINERAL FUELS

Coal.—Known coal reserves at yearend 1965 were estimated at 200 million tons. At the projected annual rate of consumption, approximately 7.5 million tons by 1974, Taiwan's known reserves will not last much beyond the current century. In attempting to head off this prospect, The Ministry of Economic Affairs employed five mining experts from Japan in March 1965 to survey deposits off the island's north coast. This team located deposits around Keelung totaling an estimated 100 million tons, one-half of which is reported to be extractable. The team also located other coastal coal pockets with a total of about 300 million tons, but the amount that is minable from these areas was not given.

More than one-third of Taiwan's coal production has been consumed by Taiwan Power Co. (Tiapower). Demand for coal will be even greater if Taipower implements its plans to generate more thermoelectric power. At yearend 1965, Taipower was operating 34 stations capable of generating a little more than 1 million kilowatts, of which 53 percent was hydroelectric and the remainder thermal. The average consumption of coal per kilowatt in solid fuel thermal plants was approximately 0.474 kilogram in 1964, a slight improvement over the 1963 figure of 0.485 kilogram. (The amount of coal used in the United States in 1964 and 1965 to generate 1 kilowatt was 0.391 kilogram.)

Of the total sales of 5,185 million kilowatt-hours in 1964, 82 percent went to industries and the rest to residential and commercial users. In recent years, the average annual growth rate for power generated has been 13 percent, very close to the average overall industrial growth rate. The six largest industrial groups in Taiwan—fertilizer, iron and steel, aluminum, cement, textiles and chemicals—accounted for 57 percent of total power sales.

Natural Gas.—Production of natural gas in 1965 was nearly double that of 1964 and six times that of 1963. In view of the increasing gas reserves and production, Taiwan industrialists and Government officials decided to establish a petrochemical industry to manufacture intermediate products, heretofore imported at a cost of about $60 million annually, chiefly from Japan and the United States, for other industries.

To implement the decision, the Chinese Petroleum Corp. (CPC) has constructed a plant at Miaoli to process 35.3 million cubic feet of gas per day. To distribute the product, the Taiwan Cabinet recently approved a CPC plan to seek $20 million to build a network of pipelines throughout Taiwan.[7] Taiwan Government development officials have considered establishing an industrial zone including petrochemical installations at Towfen. Preliminary plans called for an area of about 125 acres.

In 1965, CPC broke ground for a naphtha cracking unit at its Kaohsiung refinery to produce ethylene, propylene, butylene, butadiene, and various aromatic chemical intermediates. When this project of CPC is completed, new units for extracting aromatic compounds will be added to increase the output of benzene and xylene. In addition to this project, a number of others were either under construction or in the last phases of the planning stage at yearend, including National Distillers & Chemical Corp.'s plans to build a plant to produce about 20,000 tons per year of polyethylene, utilizing CPC's ethylene as the main starting material. Construction presumably was under way on this project at

[7] Far Eastern Economic Review (Hong Kong). Chemicals: Gas Works. V. 49, No. 13, Sept. 23, 1965, pp. 580–581.

yearend and completion of the facility was expected in 1968. It was reported that Allied Chemical Corp. applied to Taiwan's Central Government for approval to develop a sizable petrochemical project, including facilities to produce 25 tons per day of caprolactam, a starting ingredient for the synthesis of Nylon 6, and installations to manufacture 20 tons per day of dimethyl-terephthalate, a raw material for manufacturing polyester fiber. Taiwan development officials were also considering establishing a vinyl chloride installation that would use ethylene instead of the more expensive acetylene as the raw material, resulting in substantial savings in production costs and thereby improving the competitive position of Taiwan-produced polyvinyl chloride. Other noteworthy projects include the manufacturing of acrylonitrile from propylene and ammonia utilizing the process developed by the Standard Oil Co. of Ohio and the preparation of synthetic rubber (cis-polybutadiene) from the anticipated quantities of butadiene from the naphtha cracking unit.

The Taiwan Government also reportedly planned to construct a styrene unit. In 1965, there were only two local firms manufacturing polystyrene using imported styrene. Because of the cheap domestic supply of styrene, many more companies using this commodity are envisioned. Major uses for styrene include polymers, and various resins and plastics.[8]

Petroleum.—In 1965, the Chinese Petroleum Corp. (CPC), wholly Government-owned and the only petroleum refinery in Taiwan, decided to invest approximately $30 million in a 4-year plan of petroleum exploration. CPC also planned to increase the production of its Kaohsiung refinery over the next 2 years from 1.6 to 3 million tons of fuel oil annually. One of the first expansion projects will be the addition of a new topping plant capable of handling 50,000 barrels per day. This new plant will be used to supply fuel oil to a 600,000-kilowatt thermal powerplant, which is expected to consume an estimated 500,000 tons of fuel oil per year. The new installation was partly financed by the United States Export-Import Bank and will be constructed by the Taiwan Power Co.

In April 1965, China Gulf Oil Corp., a joint venture between CPC and the Gulf Oil Corp., completed and put on stream an $11 million lubricating oil plant at Kaohsiung. Processing units of the new installation were designed by the M. W. Kellogg Co., New York, N.Y., and the auxiliary off-site equipment was designed and constructed by China Technical Consultants. The capacity of the new plant was estimated at 1,500 barrels per day. Products from the company were expected to be about four times the present rate of consumption in Taiwan. Gulf will distribute the surplus abroad, while CPC will supply the domestic market.

---

[8] Wang, K. C. Petrochemicals. Far Eastern Econ. Rev. (Hong Kong), v. 50, No. 2, Oct. 14, 1965, pp. 77–79.

The Mineral Industry of Thailand

By J. M. West[1]

According to preliminary estimates the gross national product (GNP) of Thailand rose in 1965 to about $3,800 million,[2] while value of mineral industry output totaled about $110 million. Value of output in the mining and quarrying sector was 2.4 times that of 1957; in the same period the GNP increased only 1.7 times. The Government's new objective is to double the GNP within the next 10 years. The emphasis on mineral development that this would entail is clear. In 1965, newly discovered deposits of tin, already a well developed and leading resource, were being explored, and the outlook was favorable for significant expansion in production. Iron ore became prominent in 1965, output approaching 800,000 tons. Fluorspar and antimony have reached significant levels in recent years, and resources of zinc, manganese, gypsum, and salt were expected among the next to come under development. The potential for rare elements, such as columbium and tantalum, associated with tin deposits was regarded as excellent. Search for fertilizer raw materials and oil and the study of means of developing and utilizing rich oil shale deposits were among matters of urgency prompting government inquiries in these fields.

In 1965, Thailand ranked third in tin production among non-Communist countries and fifth in the world, contributing 12.5 and 9.6 percent of the respective totals. It also produced about 2 percent of the antimony, and close to 1 percent of the tungsten.

A major milestone in industry development was the opening of the Phuket tin smelter. Under Thai law, virtually all domestic tin concentrates produced at least for the next 5 years must be processed by this plant. Many small tin mines were opened or reactivated, and at least two and possibly three large tin dredges for working offshore tin deposits were under construction.

Further efforts were made to justify an iron and steel smelter in the north-central area, which would utilize electric power from Mekong River and tributary stream developments. Steel sheet and bar rolling facilities were being installed at Bangkok. Cement expansions were planned or underway, one fertilizer plant was under construction with the start on a second imminent, and a glass plant neared completion. The new Sriracha oil refinery operated at near capacity, and the Government's Bang Chak refinery was to be enlarged to make its operation more economical.

Progress was made during the year in port and highway construction and in power development. Work proceeded on a draft of new Thai mining laws; meanwhile, the Department of Mineral Resources in Bangkok in March 1965 published an English translation of the Mining Act of 1919 and the Mining Amendment Act of 1931. Major changes were expected in the mining laws during the coming year, including at least a modification of the restriction on foreign participation in mining north of the 11th parallel, thus opening a large new area to stepped-up development. New regulations being written would permit foreigners to acquire concessions in the northern mining area for petroleum, iron ore, zinc, and other minerals, providing certain standards are met on size of operation.

[1] Far East specialist, Division of International Activities.

[2] Where necessary, values have been converted from the Thailand baht (B) at the rate of B20.8 = US$1.

263-927 O-67—77

The system by which the Mining Organization, a State enterprise that operates mines and the agency through which miners in the north sublease concessions, was to be changed so that all Thai concession grants would be handled by the Mineral Resources Department. The Mining Organization would continue to operate its own mines and possibly open a training school for miners. Government mineral survey and development centers continued their activities at Chiengmai, Songkhla, and Phuket.

An agreement signed with the U.S. Government provided for guarantee against investment loss through revolution or insurrection and extended guarantees covering loan capital and various financial risks. Under the agreement, each project must be approved in advance by the Thai Government and must meet Agency for International Development requirements. Opportunities for investment in Thai minerals were outlined in a report issued by a U.S. Government agency.[3]

United Nations geologists continued surveys of iron, manganese, nonferrous metal, and nonmetal deposits in north and northeast Thailand, and a team of West German geologists was assisting in training Thai geologists. A mining convention sponsored by the Ministry of National Development was scheduled for early 1965 at Chiengmai on the major theme of nonmetallic minerals. A mining and industrial safety equipment show was planned to coincide with the convention, affording an opportunity for international manufacturers to display their products.

Thailand continued to offer a good investment climate, with the Government taking firm action to develop an industrial infrastructure. A handicap to orderly development was the Communist-inspired terrorism in the extreme south and northeast. As part of the announced second 5-year economic development plan (1967–71), the Government was to spend $2,500 million on various construction projects. Among these were port facilities, highways, irrigation works, communications, and power projects. Highways were particularly favored in the 1966 budget with a one-half increase over the 1965 budget figure to $72 million. Allocations for industry and mining (exclusive of mineral resource development), conversely, were to decrease to less than $12 million, or only 1.7 percent of total government expenditures. Mineral resource development fared better than in the 1965 budget, with $2.2 million assigned. A possible new project under study was construction of a port capable of accommodating 5,000-ton ships at Songkhla in southern Thailand.

A main north-south peninsular highway extending from Bangkok to the Malayan border was being planned besides about 1,600 kilometers of other roads in the south. It was announced that $7 million in Australian aid would go toward a highway north of Bangkok between Tak and Mae Sod, on the Burmese border, opening an access route to the zinc deposits in that area. A plan was considered for mine developers to cover part of the roadbuilding costs. Italian, Japanese, South Korean, and West German firms have signed or were about to sign contracts for other road construction, as follows: Phrakhanong-Bangna section of the Bangkok-Sriracha highway, Lampang-Chiengmai highway, Pattani - Narathivas highway (southern Thailand), and Nakhorn-Pathom-Petburi highway. Work started in August on the Korat-Kabinburi military highway; the 100 - kilometer Chachoengsao- Kabinburi link of the route from the Gulf of Thailand neared completion.

In electric power, the National Energy Authority completed a map of electric generation and transmission facilities (drawing 7D.77 01, dated Dec. 16, 1965) showing the many potential hydroelectric sites, substations, and existing and planned distribution lines in Thailand. Installation of the fifth and sixth generators at Yan Hee hydropower plant and another 75,000-kilowatt termal generator in North Bangkok was under consideration. The West German-financed Ubol Ratana Dam on the Nam Pong River neared completion with two 8,300-kilowatt generators to supply the northeast area and Vientiane in Laos; the 6,300-kilowatt Nam Pung hydroplant was opened in November 1965. Nam Ngum, a 90,000-kilowatt hydroelectric project in Laos, was to begin supplying power to the Thai northeast in 1970–71. A $65 million loan was being considered by the

[3] Scholla, Paul F., and Associates. Mining Resources and Mining Investment Potential in Thailand. Agency for International Development, U.S. Operations Mission to Thailand, 1965, 96 pp.

World Bank for the Tha Pla irrigation and power scheme in northern Thailand. In the south at Krabi the Lignite Authority operated two 20,000-kilowatt thermal generators and planned to install a third; the Provincial Electric Authority was installing distribution lines to carry Krabi power into eight southern provinces. Despite new availability of thermal power it was felt that because of the poor quality of coal, long-term power needs in the south must depend on hydroelectric sources and a step-up in investigative work was urged. A site on the Pattani River near Bangrang was considered a prime location for a 30,000-kilowatt plant. Other promising power sites included Tone Nga Chang, near Songkhla; Kra Rome Falls and Klai Kao, both near Nakhon Sithammarat; Lang Suan, Kang La Waeng, and Kang Pra Chao, all near Chumyshon; and Sai Buri, near Narathiwat.

PRODUCTION

Thai mineral production value in 1965 was estimated at $110 million, significantly higher than in 1964 owing mainly to increased tin values. Cement and iron ore also showed important gains, but fluorspar, antimony, and gypsum outputs declined. Low-quality lignite was used principally for generating electric power; oil produced and refined at one inland field was a minor fuel item. Output and sales of hydroelectric power were on an upswing, signifying increased industrial activity. A moderate share of manganese production went to battery makers in Bangkok, the rest was exported. Iron ore came chiefly from one mine on the southern peninsula, from which it was shipped to Japan.

Table 1.—Thailand: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Antimony:					
Ore	61	r 53	r 1,239	2,819	2,502
Mine	r 23	r 27	r 613	r 1,269	r 1,130
Metal, plus 99 percent antimony	-------	35	105	258	173
Iron and steel:					
Iron ore, 55 percent iron--thousand tons	56	45	16	r 191	750
Pig iron--do	5	5	6	5	5
Steel ingots and castings--do	8	7	r 7	4	7
Lead, mine	2,211	2,359	2,264	3,656	5,581
Manganese ore	533	2,898	r 6,520	11,054	33,428
Tin:					
Ore and concentrate--long tons	18,096	19,997	21,276	21,288	25,996
Mine--do	13,270	14,680	r 15,590	15,600	r 19,045
Metal [1]--do	-------	--------	--------	--------	e 5,611
Tungsten concentrate (65 percent tungsten trioxide)	474	394	189	397	510
Zinc, mine (in lead-zinc ore)	900	950	855	1,380	2,110
Nonmetals:					
Cement--thousand tons	r 810	963	996	r 1,060	1,249
Fluorspar, 80 to 85 percent calcium fluoride	4,755	10,710	29,230	63,538	51,829
Gypsum	12,040	21,000	23,890	41,900	11,240
Marl (used for cement)--thousand tons	e 650	936	e 1,000	1,058	1,105
Salt, sea, 85 to 90 percent sodium chloride--thousand tons	r 194	r 258	r 266	e 250	e 100
Mineral fuels:					
Coal, lignite--thousand tons	108	135	137	104	125
Petroleum, [2] crude e--thousand 42-gallon barrels	50	50	45	45	40

e Estimate. r Revised.
[1] Smelting began in August at Phuket.
[2] Petroleum refining began in September 1964 at Sriracha; Government refinery at Bang Chak began partial operation during 1965. Data on refinery products not available.

TRADE

Preliminary data indicate that Thailand's mineral exports were valued at about $70 million in 1965, over 11 percent of all exports, and were led by tin valued at $55.2 million, compared with $46 million in 1964. Iron ore was second in importance valued at $5.9 million and cement was third at close to $1.5 million. The bulk of the tin concentrates went to Malaya for refining; tin metal exports beginning in September went to the United States.

Final data on the value of mineral trade for 1963 and 1964, and its relationship to total trade are summarized in the following table:

	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities	Total	
Exports:			
1963	40.6	452.0	9.0
1964	52.5	574.9	9.1
Reexports:[1]			
1963	6.4	12.3	52.0
1964	6.4	16.9	37.9
Imports:[1]			
1963	125.6	607.3	20.7
1964	145.5	679.0	21.4
Net trade balance:			
1963	−78.6	−143.0	XX
1964	−86.6	−87.2	XX

XX Not applicable.
[1] Reexports are recorded because Thailand import statistics include merchandise imported for reexport; goods in transit are not included in either import or export statistics.

In 1965 imports of mineral fuels, lubricants, and related products were valued at about $61 million, compared with $70 million in 1964; the lower value reflected the change in type of petroleum imports from products to crude oil, because local refining came nearer to satisfying domestic markets. Of the 1965 figure, 8.4 percent was the U.S. share, mainly in lubricants. Steel and fertilizers continued to be major import items, but domestic fertilizer production, due for expansion in 1966–68, was expected to replace a large share of the imported fertilizers. Of Thailand's overall imports in 1965, the U.S. share was nearly one-fifth, with about one-third of the imports from the United States entering under various foreign assistance programs. Machinery, including transport and construction equipment, was an important component of the latter segment of trade. Gem stones shared a small but locally significant part in Thai trade, since Bangkok is one of the gem stone cutting centers of the Far East. In 1964 uncut and cut gem stone imports were valued at $360,000 and $80,000, respectively. There was also possibly large unofficial trade in Thai gem stones. Silver bars imported in 1964 totaled 614,000 troy ounces, about four-fifths of U.S. origin. Mineral products moving through Thailand from Laos to Penang in 1964 were valued at $680,000 for tin and $73,800 for copper ores; petroleum products valued at $3.48 million moved through Thailand to Laos.

Table 2.—Thailand: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965 p	Principal destinations, 1964
Metals:				
Aluminum, semimanufactures	-------	38	NA	All to South Viet-Nam.
Antimony:				
Ore and concentrate	[1] 1,032	[1] 2,448	2,646	West Germany 500; Belgium-Luxenbourg 300; Italy 260.
Metal	20	204	110	NA.
Copper scrap	150	251	NA	Japan 196.
Iron and steel:				
Iron ore----thousand tons	7	[1] 110	723	All to Japan.
Scrap	2,892	2,566	NA	Taiwan 1,981; Japan 586.
Pig iron	400	1,100	NA	All to Hong Kong.
Semimanufactures	1,971	1,773	NA	Laos 1,683.
Lead ore and concentrate	r 5,079	r 6,989	11,948	Belgium-Luxembourg 5,038; United Kingdom 1,551.
Manganese ore	r 2,755	r 6,735	18,879	Japan 5,163; Hong Kong 851; South Viet-Nam 721.
Tin:				
Ore and concentrate----long tons	r 21,656	r 21,986	14,923	Malaya 11,892; Netherlands 6,576; Japan 1,178; Brazil 1,019; Spain 925.
Metal [2]----do	-------	--------	4,705	
Tungsten ore and concentrate	r 257	r 87	527	Japan 57.
Nonmetals:				
Cement----thousand tons	r 144	r 102	103	South Viet-Nam 66; Laos 18; Singapore 13.
Clay products, nonrefractory	354	--------	--------	
Feldspar, fluorspar and cryolite [3]	15,875	38,666	48,664	Japan 38,200.
Salt----thousand tons	r 117	r 140	80	Japan 63; Malaya 45; Singapore 20.
Stone, sand, and gravel	555	--------	NA	
Slag and ash, non metal-bearing	707	801	NA	Japan 463; Hong Kong 278.
Mineral fuels: Petroleum refinery products:				
Residual fuel oil----42-gallon barrels	-------	1,918	--------	All to Singapore.

p Preliminary. r Revised. NA Not available.
[1] Data obtained from official Thai Government sources.
[2] Export began in September 1965.
[3] Almost entirely fluorspar.

Sources: Except as noted, 1963 and 1964 data from Statistical Office of the United Nations; 1965 data from official Thai Government sources.

Table 3.—Thailand: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum:			
Bauxite	---	1,010	British Guiana 1,000.
Metal and alloys:			
Unwrought	1,651	3,166	Canada 1,021; United States 869; Japan 635.
Semimanufactures	3,196	2,373	Japan 1,317; West Germany 204; Hong Kong 198.
Copper and alloys:			
Matte	120	---	
Scrap	97	45	NA.
Unwrought	37	338	Japan 203; Republic of South Africa 61; United Kingdom 58.
Semimanufactures	2,213	3,118	Japan 2,330; Australia 167; United Kingdom 130.
Iron and steel:			
Scrap	283	1,521	United States 503; West Germany 392; United Kingdom 353.
Pig iron	393	---	
Ferroalloys	617	1,140	Norway 884; Republic of South Africa 147.
Ingots and other primary forms	---	55	NA.
Semimanufactures	336,055	353,290	Japan 263,057; Hong Kong 45,430; United States 12,295; United Kingdom 6,541.
Lead:			
Oxides	243	141	Australia 51; Poland 47.
Metal and alloys:			
Unwrought	685	831	Australia 501; Burma 239.
Semimanufactures	125	98	Japan 30; Belgium-Luxembourg 23.
Manganese:			
Ores	---	92	All from United States.
Oxides	997	1,343	Japan 927; United Kingdom 251; Netherlands 150.
Mercury---76-pound flasks	---	87	NA.
Molybdenum	6	---	
Nickel, all forms	77	179	United Kingdom 120; Japan 44.
Platinum-group metals, all forms---troy ounces	[1] 2,800	---	
Silver and alloys, all forms---do	[1] 425,120	[1] 633,000	United States [1] 482,220; Hong Kong [1] 132,100.
Tin and alloys, all forms---long tons	11	5	NA.
Zinc:			
Oxides and peroxides	348	401	Netherlands 123; West Germany 112; Poland 55.
Metal and alloys:			
Unwrought	9,319	10,618	Australia 7,123; Canada 1,364.
Semimanufactures	1,621	1,689	Poland 1,203; Belgium-Luxembourg 154; West Germany 144.
Metals, not elsewhere specified:			
Metalloids, including arsenic, phosphorus, silicon, and others.	971	456	West Germany 52; Japan 14.
Pyrophoric alloys	21	33	Japan 28.
Other nonferrous metals and alloys:			
Scrap	54	73	NA.
Unwrought and semimanufactures	21	68	United States 25.
Nonmetals:			
Asbestos, crude	8,021	7,866	Cyprus 3,892; Canada 2,379; Republic of South Africa 1,533.
Boron materials: boric acid and oxide	108	109	All from United States.
Cement	20,144	9,504	Japan 8,959.
Clays and refractories:			
Crude clay, not elsewhere specified	3,410	2,828	United States 1,046; India 980; United Kingdom 307; Japan 305.

See footnotes at end of table.

Table 3.—Thailand: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Clay construction materials:			
Refractory	1,219	1,556	United Kingdom 528; Switzerland 238; Denmark 205.
Nonrefractory	5,914	8,547	Japan 4,091; West Germany 3,033; Czechoslovakia 866.
Feldspar, fluorspar, and nepheline syenite	536	354	Hong Kong 232.
Fertilizer materials, manufactured:			
Nitrogenous	46,730	39,437	West Germany 16,249; Japan 9,737; Netherlands 8,620.
Phosphatic	5,892	3,091	Netherlands 1,320; Japan 876; West Germany 410.
Potassic	2,006	782	West Germany 330; Israel 252.
Mixed	42,750	65,666	Japan 33,310; West Germany 14,265; United States 7,151.
Ammonia, anhydrous	350	432	United Kingdom 164; Japan 92; Taiwan 65.
Graphite	498	494	Japan 268; Hong Kong 125.
Gypsum	107	106	Japan 96.
Limestone, excluding dimension stone	490	890	Japan 837.
Pumice, emery, corundum, and other natural abrasives.	634	558	Netherlands 361; United Kingdom 169.
Sodium and potassium compounds:			
Caustic soda	6,925	7,124	Japan 3,821; United Kingdom 1,743.
Caustic potash and peroxides of potassium and sodium.	28	----------	
Stone, sand and gravel, not elsewhere specified:			
Dimension stone:			
Crude	204	2,270	NA.
Worked	154	421	Hong Kong 158.
Gravel and crushed stone	4,162	888	NA.
Sand, excluding metal-bearing	696	1,031	Hong Kong 351.
Grinding and polishing wheels and stones	241	301	United Kingdom 106; Japan 52; West Germany 35.
Sulfur:			
Elemental	6,751	9,441	United States 6,636; France 1,570; Italy 606.
Sulfuric acid	1,099	287	Japan 261.
Talc, soapstone and steatite	1,204	2,607	South Korea 1,270; Japan 1,088.
Other nonmetallic materials:			
Quartz, mica, cryolite and chiolite	142	127	NA.
Other not specified	525	371	NA.
Mineral fuels:			
Coke	3,243	2,767	Japan 1,565; Netherlands 900.
Carbon black	789	1,312	United States 661; Japan 365.
Gas, natural and manufactured, including liquefied petroleum gas.	1,409	1,159	Indonesia 1,120.
Petroleum:			
Crude and partly refined.—thousand 42-gallon barrels	4	50	United Arab Republic 14; United Kingdom 16; Saudi Arabia 10.
Refinery products:[2]			
Gasoline—do	3,607	3,509	Indonesia 1,515; Iran 689; Singapore 536; Japan 255.
Kerosine—do	1,869	1,849	Indonesia 894; Iran 312; Singapore 381.
Distillate fuel oils—do	4,373	4,842	Indonesia 1,732; Iran 1,242; Singapore 756; Malaya 379.
Residual fuel oils—do	2,707	2,777	Indonesia 947; Iran 856; other Arabian States 613.
Mineral jelly and wax	3,348	4,326	Indonesia 2,408; United States 867; Japan 636.

See footnotes at end of table.

Table 3.—Thailand: Imports of metals and minerals—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Refinery products—Continued			
Bitumen	45,640	47,922	Japan 26,061; Singapore 18,089.
Other	16,288	13,299	Singapore 8,094; Iran 4,000.
Tar and other crude chemicals from coal, oil and gas distillation.	724	251	Taiwan 150.

NA Not available.
[1] Approximate.
[2] Exclusive of lubricants for which quantitative data are not available in primary source. Official Thai statistics record the import of 403,000 barrels of lubricants at Bangok port in 1964, including 174,000 barrels from the United States and 144,000 barrels from Singapore.

Source: Statistical Office of the United Nations.

COMMODITY REVIEW

METALS

Antimony. — Most of Thailand's antimony production continued to come from the Bansong mine in the south, where both ore and metal output declined. However, ore exports were slightly higher in 1965, reaching a record of 2,646 tons valued at about $580,000. Meanwhile, exports in metal form dropped nearly one-half to 110 tons valued at $63,200. Smelting operations were conducted at Bansong by relatively primitive means.

Iron Ore and Steel.—Thai output of iron ore, nearly all for export to Japan, increased as the result of the development of a deposit in Nakhon Sithamarat Province by Thailand Steel Co. The latter operations, which began in May 1964 and provided 176,125 tons of iron ore during that year, produced 737,296 tons in 1965, of which 716,942 tons valued at $5.86 million was exported. Small mine operations were maintained by Siam Cement Co. in Lopburi Province, which produced 9,069 tons in 1965, and by Eastern Mining Development Co. in Nakhon Sawan Province.

Exploration by United Nations specialists continued in the Loei area of north-central Thailand near the bend of the Mekong River where estimates for ore reserves have risen to nearly 30 million tons. This strengthened efforts by Mekong development interests and the Thai Government to establish a steel smelter based on local raw materials and power. However, the economy of an inland plant was in doubt. It appeared a seaboard site would be favored instead, initially using mainly imported raw materials. Part of the iron ore requirements would probably come from southern Thailand, gradually utilizing admixtures of the Loei area ores.

At Phrapadaeng, Samut Prakan, 16 kilometers from Bangkok, G. S. Steel Co. Ltd., a joint Japanese-Thai venture, 60-percent owned by Mitsubishi Shoji Kaisha Ltd., and Kawaichi Steel Co. Ltd., was building a mill to produce 90,000 tons of steel bars annually starting in early 1967. Two steel pipe plants opened in the third quarter of 1965 Thai-American Steel Works Co., controlled by Castle and Cooke Co. Ltd. (United States) and Thai Steel Pipe Industry Co. Ltd., in which the Japanese had a 70-percent interest. The small Tha Luang Iron and Steel Works, operated by Siam Cement Co., placed an order for a new 5-ton-capacity electric arc furnace.

Lead and Zinc.—Output of lead ore containing some zinc increased about one-half in 1965 as mine activity increased in Kanchanaburi Province where the Nong Phai deposit was prominent. Exports increased to 11,948 tons valued at $481,000. The Thai Government planned to invite bids to establish a zinc smelter and for mining rights to three concession areas in Tak Province of northwestern Thailand. Here was claimed to exist a total of 3.8 million tons of zinc ore averaging 35 percent zinc in one of the world's largest deposits of smithsonite (zinc carbonate). Only companies 50-percent or more Thai-owned were to be eligible to bid.

Manganese. — Production in 1965 included 4,069 tons of battery-grade ore, 29,259 tons of metallurgical-grade ore, and

100 tons of chemical-grade ore. Almost half of the battery-grade and nearly three-fifths of the metallurgical-grade ore was exported. Average export value was about $52 per ton of ore. The major manganese deposits are in the northwest, west of Lampang and north of Tak; among these the Ban Mae Jong, east of the Li River, is the chief producer.[4] Estimates for ore reserves at Ban Mae Jong were given as follows: 20,000 tons convertible to battery grade, 60,000 tons suitable for chemical grade, and 450,000 tons of metallurgical grade. Total reserves of 8 or more known Thai deposits were estimated as high as 3 million tons with grades up to 65 percent manganese dioxide, and large areas favorable for manganese were said to remain unexplored.

Tin and Tungsten.—Particular interest centered on the new tin smelter of Thailand Smelting & Refining Co. Ltd., a partnership of Union Carbide Co. (United States) and Thai Eastern Mining Co. Ltd., which was formally opened at Phuket on July 29. By yearend, 4,705 tons of Thai-smelted tin valued at $19.2 million had been exported. Deliveries of Thaisarco brand tin were made chiefly to the United States and marketed by Union Carbide Co., prime investor in the new enterprise.

With the addition of production from an estimated 50 smaller mines and the rebuilt bucket dredge of Aokam Tin Ltd., Thailand's tin concentrate output increased one-fifth to a record high in 1965. Some tungsten and other minerals were recovered as byproducts. Effective July 24, exports of tin ore were suspended in accordance with a government control requiring tin producers to refine ore at the new Phuket smelter. Thereafter, ore exports declined to only a few hundred tons of offgrade concentrates specially exempted from controls. For the year, tin-in-concentrate exports thus declined to 10,759 long tons valued at $36 million compared with the 15,666 tons shipped in 1964. As before, such exports went to Penang in Malaya for smelting.

The new smelter started operation with two furnaces having combined annual capacity of 20,000 tons of tin concentrates. From the upward trend of mine production it became evident added capacity would be needed and immediate expansion to 30,000 tons began, two more furnaces being scheduled for completion by November 1966. Probably influencing the expansion was the announced discovery after a 2-year survey by the company of offshore tin deposits with a reported value of at least several billion baht; this was the only given indication of their extent. Mining operations were expected to begin in 1966, although surveys remained incomplete. Two $3.5 million dredges were on order.

In another development, the discovery of substantial tin deposits was reported in the Khao Luang mountain range of southern Thailand. No details were given nor was it stated whether these were alluvial or hard-rock deposits.

A new suction dredge being built by Southern Kinta Consolidated Ltd., for offshore mining at Takuapa, on the west coast, was scheduled for operation in early 1967. Together with yet uncommitted leases, the area to be mined was estimated to contain 43,000 tons of tin concentrates. The Siamese Tin Syndicate Ltd. dredge at Takuapa was being moved to new ground, and its Kota Bahru dredge resumed operation at yearend after a shutdown for repair. Aokam Tin placed an order for a second bucket dredge to replace its offshore grab dredge.

Tungsten, mostly produced with tin, made further gains; output increased more than one-fourth. A few tons of scheelite were included in the mainly wolframite production. Exports, amounting to 527 tons, while lower than in 1964, were valued higher at $680,000.

NONMETALS

Cement. — Production of cement was nearly one-fifth higher in 1965 because of intensive construction activity throughout the country. Domestic consumption was estimated at 885,000 tons in 1965 and was expected to rise to 1,020,000 tons in 1966. In 1965, 18 percent of the output was exported. In the last quarter of 1965 an order for 150,000 tons of cement was placed with the Siam Cement Co. Ltd., to go to South Viet-Nam, the major export market, and increased rates of shipments were anticipated in 1966. Output began

[4] Gardner, Louis S., Tuan Damrongmanee, and Roscoe M. Smith. The Ban Mae Jong and Other Manganese Deposits in Northwestern Thailand. Thailand Dept. of Mineral Resources, Rept. of Inv. 8, 1965, 51 pp.

to lag behind demand, and a temporary cut in import duty on cement clinker was asked while new calcining equipment was obtained. An added demand factor was the 80,000 tons of cement needed for the Sataheep Naval Base airfield, southeast of Bangkok, about to come under contract. This represented Thailand's largest single order for cement since building the Yan Hee Dam. In view of such activity, Siam Cement planned to install an additional kiln at Tha Luang and expand its Bangkok grinding capacity in 1966. The other Thai producer, Jalaprathan (Cholpratan) Cement Co. Ltd., with a 300,000-ton-per-year plant was planning to expand to about 500,000 tons annual capacity. Siam Cement's annual capacity, including its just completed 300,000-ton Tungsong plant in southern Thailand, was estimated at 1,245,000 tons.

Fertilizer Materials. — Thai-controlled Chemical Fertilizer Co. Ltd., was building the country's first fertilizer plant to supply demand stimulated by a nationwide rural development program emphasizing broad use of fertilizers. The plant, at Mae Moh in Lampang Province, was scheduled to start operation in the last half of 1966 with an annual capacity of 30,000 tons of urea and 60,000 tons of ammonium sulfate. The company also planned mixing plants near Bangkok, in Nakhon Ratchasima (Korat), and at Mae Moh, and intended to import phosphate rock, potash, and sulfur as ingredients. The need for sulfur was especially urgent, and because of world shortage the company had difficulty locating suppliers. Initial operations were expected to require about 1,000 tons of sulfur monthly. The Government approved a proposal by Thai Oil Refinery Co. to build a $20-million fertilizer plant which would use waste products from its new oil refining operations at Sriracha. Investment agreements were not quite complete at yearend. The $15 million project would produce about 180,000 tons of mixed fertilizers annually.

Fluorspar.—All but a few thousand tons of the fluorspar produced was exported. The average export value was only about $19.20 per ton. Six mining companies worked in three widely separated districts.[5] Most production was from the Ban Hong mine in northwest Thailand where at least three major veins occur in metasediments intruded by granites. Limited measured reserves exist, but indicated and inferred ore reserves have been estimated as high as 3.6 million tons in the Ban Hong deposits and 500,000 tons at Doi Tao, also in the northwest. The Yang Hak district, southwest of Bangkok, was estimated to contain 200,000 tons of ore.

Gypsum.—Domestic consumption of gypsum, largely in cement, was estimated at 27,700 tons in 1965. Output was lower than in 1964 as excess stocks of gypsum were used. Gypsum was valued at $17.25 per ton. A Bangkok consulting firm was engaged to do a market study for Thai Gypsum Co. Ltd.

Silica.—A group of small islands off the west coast of southern Thailand—Palau Tertau, Telok Poh, Telok Bantae Malaca, Ko Bulon, Haad Kaseng, Telok Serai, and Tanjong Batu—have deposits containing an estimated 15 million tons of glass sands averaging 95 percent silicon dioxide. The sands were first explored by a Japanese firm. In 1965, Indo-Thai Corp., a Thai firm, began mining, and marketed the sands through Malaysia Silica Quarry Enterprise Ltd., a Malaysian firm; the output went largely to Japan.

Thai-Asahi Glass Factory, the country's first sheet glass plant, was to start up at yearend. Capacity was reported at 650,000 cases of glass (100 square feet per case) annually, over twice what was imported from Japan in 1964. Sands mentioned above presumably will be used by the glass plant.

MINERAL FUELS

Lignite.—Production from the Krabi lignite mines increased from 13,367 tons in 1964 to 77,728 tons in 1965, the first full year of operation. The coal went principally to the Krabi powerplant; 91,095 tons valued at $4.12 per ton was consumed in 1965. The Mae Moh lignite mine, north of Bangkok in Lampang Province, produced 47,236 tons of coal in 1965, only about one-half of the 1964 output as recently developed Yan Hee hydroelectric power replaced part of the thermal demand. A mobile crusher was being purchased for use in Mae Moh's opencast

[5] Gardner, Louis S., and Roscoe M. Smith. Fluorspar Deposits of Thailand. Thailand Department of Mineral Resources. Rept. of Inv. 10, 1965, 42 pp.

mining, and preparations were made to supply coal to a new fertilizer plant.

Petroleum.—According to the Defense Energy Department, oil found in drilling to date in the Mae Soon area, Chiengmai Province, in northern Thailand, could amount to between 1 and 10 million barrels. The oil differed from that of the Farng area where a small oil refinery has operated since 1959. Quantities of crude oil available at Farng have been limited, and further search in that area has been unproductive. According to new information the Farng field produced 180,000 barrels from 1959 through 1964, and the 1,000-barrel-per-day refinery processed only about 145,000 barrels in total during this period.

The search for oil in other areas of Thailand intensified; eight or more companies and individuals applied for concessions. Under current regulation each applicant is limited to three sections of not more than 25,000 square kilometers. Standard Oil Co. of New Jersey and Shell Oil Co. submitted applications to explore the offshore shelf, and Continental Oil Co. was also studying possibilities; Union Oil Co. of California held rights to exploration in seven northeast provinces. In view of such activity, the Government was in the process of reviewing and revising its petroleum laws to establish an equitable and attractive investment basis.

Summit Industries Corp. (United States) continued negotiations with the Thai Defense Energy Department over operation of the Department's Bang Chak refinery and prepared to start work on expansion from 5,000 to 20,000 barrels daily capacity by mid- 1968 under a $12 million contract with Japanese Shiyada Chemical Engineering Co. The plant, operating at 10,000 barrels of products per day by simple topping in 1965, produced fuel oil in excess of what Summit was able to sell, so a trade of fuel oil for diesel was arranged with Shell Oil Co. Shell continued its management role of Thai Oil Refining Co. Ltd.'s 36,000-barrel-per-day Sriracha refinery and produced 26,000 to 30,000 barrels per day in its first full year of operation.

The Third Symposium on the Development of Petroleum Resources of Asia and the Far East, meeting in November 1965 at Tokyo, Japan and sponsored by the Economic Commission for Asia and the Far East (ECAFE), included presentation of papers on the subject of Thai oil industry and potential. Among these were the following reports: Exploration and Exploitation of Petroleum in the Mae Farng basis of Northern Thailand Since the Time of the Second Symposium; Notes on the Khorat Series of Northeastern Thailand; The Investigation of the Li Oil Shale Deposit, Northern Thailand; and Petroleum Refining and Imports of Products into Thailand.

The Mineral Industry of Other Far East Areas

By Benjamin H. Lim [1]

CONTENTS

CAMBODIA

Cambodia had only minor mineral activities in 1965, including some quarrying of phosphate and limestone, manufacture of cement, and extraction of precious and semiprecious stones. Salt production was limited to the evaporation of seawater. The once relatively productive gold mine at Phnom Long in Kompong Thom Province has been near depletion for some years.

Having renounced all United States aid in late 1963, and finally severing diplomatic relations on May 3, 1965, Cambodia counted in 1965 on military and economic assistance from the Communist countries and from France. Mainland China in 1965 granted a new economic aid program which included a glass plant, a fertilizer plant, and an airstrip at Battambang, in addition to providing military equipment for 27,000 men. Soviet technical experts started work on a dam at Kam Chay, and Yugoslavia was building a powerplant at Kirirom. France prepared to help finance construction of the Phnom Penh-Sihanoukville railway and a dam at Prek Thnot. France was also to provide aid in expanding port facilities at Sihanoukville. Aid was also coming to Cambodia in 1965 from Czechoslovakia, West Germany, and Japan.

PRODUCTION

Cambodia's mineral production in 1965 remained insignificant. Phosphate rock was mined in one locality. Except for small quantities of gold from almost depleted mines, salt from the ocean, and minor amounts of precious and semiprecious stones, Cambodia produced practically no other minerals.

[1] Physical scientist, Division of International Activities.

Table 1.—Cambodia: Production of metals and minerals

Commodity	1961	1962	1963	1964 e	1965 e
Metals:					
Gold, troy ounces	4,180	965	6,687	6,000	e 4,500
Nonmetals:					
Cement, thousand metric tons	-----	-----	-----	10	50
Salt, do	54	e 40	60	60	-----
Phosphate rock, metric tons	NA	r 150	r 150	r 150	r 150

e Estimate. r Revised. NA Not available.

TRADE

Cambodia's mineral exports remained insignificant amounting to only $106,000 in 1964 and $129,000 in 1963. Its chief mineral export, or reexport, consisted of petroleum products, which totaled in 1963 and 1964 $121,000 and $92,000, respectively. Total exports aggregated $89.0 million in 1963 and $87.5 million in 1964. Mineral imports for these same years were, respectively, $24.7 million and $17.2 million from total imports of $107.2 million in 1963 and $81.8 million in 1964. France, Japan, mainland China, and Indonesia were Cambodia's chief trading partners for all commodities during these years. South Viet-Nam was Cambodia's chief mineral importer; this trade consisting mostly of petroleum products.

COMMODITY REVIEW

Metals.—*Copper, Gold, Manganese.*—Recent geological surveys of the Kompong Thom area revealed the presence of copper, gold, and manganese. More investigations are needed to ascertain whether these deposits are sufficiently rich to warrant extraction.

Iron Ore.—Iron ore deposits at Phnom Dek in the province of Kompong Thom have aroused interest from time to time. Before World War II, plans were made to establish a plant capable of processing 60,000 tons of ore per year and producing 25,000 tons of cast iron per year. These plans were later rejected, and French development in Cambodia after the war made no mention of an iron project. In 1962, surveys were carried out for construction of a small steel mill based on these iron deposits and use of locally produced charcoal. Technical and economic aid was to be provided by mainland China. These plans were also later abandoned. It was reported that the deposits will be surveyed in more detail by French experts under a provision in the latest economics assistance agreement with France.

Nonmetals.—*Cement.*—The cement plant at Chakrey Ting, in Kampot, on the Gulf of Siam, was in full operation in 1965, producing at capacity of about 50,000 tons per year. The plant was inaugurated and went into production in September 1964. The plant, built with mainland Chinese technical and economic assistance, depends on local deposits of limestone.

Fertilizer.—A small fertilizer plant was reported to have been constructed recently in the town of Battambang utilizing the phosphate found in the provinces of Battambang and Kampot.

Mineral Fuels.—*Petroleum.*—On July 1, 1965, a contract was consummated between the Cambodian Government and a French State firm, the Union Générale des Pétroles (UGP), to construct an oil installation at Sihanoukville capable of refining 50,000 tons of crude oil a year. The plant has been scheduled for completion in 1967 and will be managed by the Société Khmère de

Table 2.—Cambodia: Imports of selected metals and minerals
(Metric tons)

Commodity	1963 [1]	1964	Principal sources, 1964
Metals:			
Iron and steel [2]	50,540	36,597	Japan 14,936; mainland China 11,272; Bulgaria 2,310; Hong Kong 1,743.
Nonferrous	941	598	Japan 396; Belgium-Luxembourg 108.
Nonmetals:			
Asphalt, natural	24,428	7,666	All from Japan.
Cement	189,391	111,602	North Viet-Nam 47,247; Japan 23,616; U.S.S.R. 11,610.
Fertilizers, chemical	6,615	8,368	Tunisia 7,169.
Gypsum	255	1,189	Mainland China 1,159.
Talc	378	-----	
Mineral fuels:			
Coal	-----	12,010	Mainland China 12,000.
Petroleum refinery products:			
Gasoline	70,214	42,885	Indonesia 42,869.
Kerosine	25,760	25,552	Indonesia 25,541.
Distillate fuel oil	94,844	94,864	All from Indonesia.
Residual fuel oil	9,493	12,288	Do.
Lubricants	9,311	3,346	Singapore 1,894; United States 1,244.
Others	6,864	2,889	Indonesia 1,527; Singapore 807.

[1] Data for 1963 have been revised to conform with official United Nations statistics.
[2] Semimanufactures except for 169 metric tons in primary forms imported in 1963.

Raffinage, a joint venture with 65 percent of the total funds (approximately $10 million) provided by the Cambodian Government and the remainder from UGP. Crude oil for the refinery is expected to be imported from the Middle East.[2]

Power.—Several dams were under construction in 1965 to provide power and irrigation water. Surveys were made during the year to investigate the feasibility of building a dam at Prek Thnot, an area south of Phnom Penh, capable of providing 18,000 kilowatts as well as enough water to irrigate approximately 225,000 acres. France has earmarked assistance for this project. Ground had previously been broken for the construction of a dam and an hydroelectric power station at Kam Chay. A 163-mile transmission line was also to be built to carry current to Phnom Penh. Soviet aid was extended on this project. Concomitant with these projects, Yugoslavia was helping in the establishment of a 3,000-kilowatt thermal power station at Kirirom by providing all the necessary equipment for the plant as well as sufficient material to build a 66-mile transmission line.

HONG KONG

As in previous years, Hong Kong's production of minerals in 1965 was not very important. Minerals produced in this small but densely populated British colony were limited to iron ore, and small amounts of wolframite, kaolin, feldspar, and quartz. All ores produced in 1965 were mined by open pit methods. Total value of the 1965 mine output was nearly $1.2 million.[3] Iron ore accounted for more than 90 percent of the total value. The entire iron ore output was exported to Japan in the form of concentrates. Other minerals were shipped to the United States, the United Kingdom, and Japan. All feldspar and quartz were consumed by domestic ceramic and enamelware manufacturers. Approximately one-fourth of the kaolin was used in local rubber factories, and the remainder was exported, chiefly to Japan and Taiwan.

The Mining Ordinance of 1954 vests ownership and control of minerals in Hong Kong and the New Territories in the Crown of the United Kingdom. Under the Ordinance the Commissioner of Mines is empowered to issue prospecting and mining licenses and the land officer to issue mining leases. Prospecting and mining licenses are valid for periods of 6 months and are renewable up to a maximum of 5 years. Mining licenses may extend beyond 5 years upon the consent of the Governor of Hong Kong. Mining leases are granted for periods up to a maximum of 21 years. No change in the laws was reported.

In 1965, approximately 20 prospecting and mining licenses and 3 mining bases were in force. Hong Kong Government reports indicated that prospectors made no discoveries of any importance in 1965. Hong Kong's mining industry employed about 2,500 persons in 1965, including approximately 500 in iron ore and wolframite mining and 2,000 in stone quarrying, clays, sand, and other nonmetallic mining.

The Hong Kong Land Development Commission enlarged on its initial decision to reclaim land at Kwun Tong from an earlier estimate of some 90 acres to 514 acres. Estimated cost of the reclamation was set at about $17.5 million. In view of Hong Kong's rapidly rising construction costs, however, this estimate may have to be revised. The project was divided into an industrial section (275 acres) and a housing and commercial section (239 acres). In addition to Kwun Tong, a new area of some 70 acres at Kwai Chung has been selected for reclamation and development. A small number of industrial enterprises have been built in Kwai Chung and in nearby Tsuen Wan.

In addition to these areas, the Hong Kong Government has continued to improve existing industrial areas in urban parts of the colony. Plans have been completed to provide 500 additional acres for 24 different industrial sites within the next decade. The scheme for reclamation and development of these areas will follow those of Kwun Tong and Kwai Chung.[4]

---

[2] Far Eastern Economic Review. Cambodia: Power and Transport. 1966 Year Book, Dec. 15, 1965, p. 109.

[3] All values converted at the rate of H.K. $5.7=US$1.

[4] Kirby, R. N. Basic Data on the Economy of Hong Kong. U.S. Dept. of Commerce. Overseas Business Reports OBR 64-59, June 1964, 24 pp.

Table 3.—Hong Kong: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Iron ore concentrate thousand tons	119	113	114	116	134
Wolframite	18	16	8	1	6
Nonmetals:					
Cement thousand tons	184	212	217	215	241
Feldspar	1,225	952	1,707	1,581	1,137
Graphite	1,692	818	808	721	-----
Kaolin	8,565	6,476	5,099	5,124	4,787
Quartz	4,110	4,220	3,040	1,649	1,939
Mineral fuels:					
Coke and breeze thousand tons	e 9	17	15	13	14

e Estimate.

PRODUCTION

Hong Kong's mineral production showed an appreciable increase in iron ore and wolframite output, and a slight increase in quartz production. Feldspar and kaolin registered small declines. Prospectors for graphite made no discoveries of any importance in 1965 and no graphite production was recorded. Total value of Hong Kong's mine production was estimated at $1,179,000 in 1965, slightly more than the $1,000,000 in 1964. Of the total in 1965, iron ore accounted for $1,039,925, kaolin $114,697, wolframite $11,698, feldspar $6,861, and quartz $6,016.

In addition, cement made from imported clinker was valued at an estimated $3.6 million, up from the previous year's $3.2 million. Value of coke and breeze produced in 1965 was estimated at $290,000.

FOREIGN TRADE

Although Hong Kong has only a small mining industry, it does a brisk trade in mineral products. In 1965, the island's total value of mineral trade—imports plus exports including reexports—was $312 million, compared with $249 million in the previous year.

Table 4.—Hong Kong: Value of mineral trade
(Million dollars)

Category	1964	1965
Metals:		
Imports	$82	$87
Exports	18	19
Reexports	9	9
Nonmetals:		
Imports	64	95
Exports	4	5
Reexports	23	41
Mineral fuels:		
Imports	46	51
Exports	(1)	(1)
Reexports	3	5

1 Less than $1 million.

Imports of metal commodities in 1965, as in previous years, consisted primarily of aluminum, copper, and steel semimanufactures; metal exports and reexports were comprised mainly of ferrous and nonferrous scrap. Imports of nonmetals consisted chiefly of construction materials, pearls, and precious and semiprecious stones. Of the nonmetal imports, pearls and precious and semiprecious stones accounted for 67 percent of the total value. The latter commodities were also included in exports and reexports. Refined petroleum products, mainly kerosine and lubricating oils, made up approximately 94 percent of the total value of mineral fuel imports in 1965. Petroleum exports and reexports were primarily kerosine and lubricants.

COMMODITY REVIEW

Metals.—*Aluminum.*—Hong Kong's aluminum industry is limited to a number of small metal fabricators that import semimanufactured products and produce consumer goods. Two of Hong Kong's leading aluminum manufacturers are Hong Kong Chiap Hua Manufacturing Co. and Meyer Manufacturing Co. Chiap Hua is engaged primarily in manufacturing extrusion aluminum products while Meyer's main operations are concerned in rolling aluminum sheets.

The Chiap Hua Manufacturing Co., originally a shipbreaking and iron and steel rerolling business, has capacity to produce about 2,500 tons of rods, tubes, and sections annually. These products are generally sold to local fabricators to make such consumer products as aluminum door and window frames, store fronts, panels, and other aluminum products used in con-

Table 5.—Hong Kong: Exports and reexports of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal destinations, 1965
Metals:				
Aluminum and aluminum products	1,692	2,803	2,337	South Viet-Nam 942; United Kingdom 604; Ceylon 449.
Aluminum scrap	802	1,008	1,479	Japan 1,011; Taiwan 438.
Brass and bronze scrap	5,745	4,904	4,912	Japan 4,082.
Copper scrap	682	908	1,228	West Germany 347; Taiwan 237; Japan 216; Netherlands 169.
Iron and steel:				
Iron ore—thousand tons	122	132	145	All to Japan.
Semimanufactured products—do	57	56	69	Thailand 53.
Scrap—do	138	151	129	Japan 90; Taiwan 38.
Nonmetals:				
Cement:				
Exports—thousand tons	15	8	10	Indonesia 6; Oceania 3.
Reexports—do	16	16	12	Indonesia 9; Macau 2.
Feldspar and fluorspar	650	597	525	Philippines 300; Thailand 204.
Graphite:				
Exports	102	467	357	United States 203; Singapore 110.
Reexports	73	394	156	Thailand 125.
Gravel, crushed stone, and tarred macadam	25,336	8,088	4,655	Brunei 3,705; Indonesia 916.
Kaolin	4,190	2,947	3,724	Japan 2,745; Taiwan 979.
Quartz	454	542	652	Thailand 623.
Mineral fuels (reexports):				
Petroleum refinery products:				
Gasoline—42-gallon barrels	17,383	16,796	25,279	Macau 22,260; Taiwan 1,973.
Kerosine—do	33,892	31,066	37,964	Macau 37,557.
Gas oil—do	29,753	40,298	19,755	All to Macau.
Diesel oil—do	14,760	19,331	22,993	Macau 22,907.
Fuel oil—do	9,507	5,648	10,720	All to Macau.
Lubricating oils—do	31,163	61,324	111,557	Taiwan 26,916; Thailand 25,001.
Other mineral oils and blended oils—42-gallon barrels	23	97	120	All to Taiwan.
Greases	61	32	46	Indonesia 23; Japan 9.
Petroleum jelly	39	29	112	Saudi Arabia 62; Taiwan 17.
Waxes	96	127	658	Taiwan 431; Singapore 188.

Source: Hong Kong Trade Statistics. Exports and Reexports. December, 1965. Commerce and Industry Department, Hong Kong. 481 pp.

struction. It was reported recently that Chiap Hua's management, realizing the current construction boom in the colony, may integrate its present operations to include a broader line of products. Comalco Industries Pty., Ltd., an Australian company, has been supplying aluminum billets to Chiap Hua's Tokwawan plant.

Meyer Manufacturing Co., also located in Tokawawan and only a short distance from Chiap Hua, produces mainly aluminum circles and sheets. Annual capacity of the Meyer was reported to be about 400 tons, of which about one-half was derived from scrap. Of its production, the firm markets about 250 to 300 tons in form of circles and sheets to local fabricators. The remainder is consumed in flashlights and lanterns.

Iron Ore.—During 1965, the Ma On Shan iron mine increased capacity by 40 percent; additional equipment was installed in the grinding section of the ore-dressing plant.

Iron and Steel.—Hong Kong's iron and steel industry, consisting chiefly of small capacity rolling mills, experienced a mild recession in 1965, during which 6 mills were closed. A number of factors aggravated the industry's situation. In the first place, construction, the chief consumer of steel products, lost much of its buoyancy of previous years. Secondly, foreign iron and steel bars, beams, and other construction material became increasingly competitive with those of local manufacture. Another factor was the continued sluggishness of Hong Kong's shipbreaking industry, upon which the colony's iron and steel mills rely heavily for their raw materials.

The continued recession of Hong Kong's shipbreaking in 1965 was, in part, due to the closing of the shipscrapping sites at Ngau Tau Kok in March because of progress made on reclamation projects in Kowloon Bay. It was also due to the fact that fewer ships were available in 1965 for scrapping owing to increased worldwide shipping.

Table 6.—Hong Kong: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	Principal sources, 1965
Metals:				
Aluminum and aluminum products	9,790	15,910	10,465	Canada 3,265; Japan 2,387; Australia 1,408.
Copper and copper alloys	8,699	12,708	9,740	Japan 6,405; United Kingdom 2,050.
Gold—thousand troy ounces	1,179	NA	NA	
Iron and steel:				
Iron ore	12,450	1,570	9,995	All from mainland China.
Scrap, iron and steel thousand tons	42	60	93	United Kingdom 38; West Germany 30.
Pig iron (sponge)	9,730	7,578	9,887	North Korea 3,414; mainland China 3,326; North Viet-Nam 2,852.
Ferroalloys	121	r 185	154	Mozambique 41; Republic of South Africa 38.
Semimanufactures thousand tons	411	373	528	Japan 244; mainland China 132.
Ingots and equivalent forms	3,040	818	8,222	Belgium 2,530; United Kingdom 2,021; West Germany 1,776; Japan 1,496.
Lead and lead products	378	607	917	North Korea 600; Australia 81.
Platinum (unworked) troy ounces	22,426	24,382	22,049	West Germany 17,223; United Kingdom 2,318.
Silver (unworked)—do	86,333	106,596	278,800	North Korea 129,527; Japan 73,356; Macau 43,392.
Zinc:				
Scrap	77	265	64	Singapore 32; Malaya 25.
Ingots and equivalent forms	4,520	8,310	3,548	Australia 2,211; North Korea 705.
Semimanufactures	531	538	348	Belgium 74; mainland China 67.
Nonmetals:				
Cement—thousand tons	831	1,809	1,116	Mainland China 715; Japan 210.
Diamonds, gem—carats	426,203	193,469	383,316	Belgium 153,465; Israel 109,742.
Fertilizers—thousand tons	132	7	7	West Germany 5.
Gravel, crushed stone and tarred macadam	3,498	12,233	4,661	Mainland China 2,880; Taiwan 668.
Gypsum	NA	10,148	10,027	Australia 7,924; mainland China 1,340.
Lime—thousand tons	59	63	66	Mainland China 45; North Viet-Nam 11.
Limestone—do	351	234	329	Japan 231; mainland China 98.
Quartz	2,058	2,891	3,417	All from mainland China.
Salt—thousand tons	35	33	32	Mainland China 25; Thailand 3.
Mineral fuels:				
Coal—thousand tons	193	175	172	Mainland China 112; Australia 45.
Coke	4,100	6,321	5,520	Japan 4,120; Taiwan 930.
Petroleum refinery products:				
Gasoline—42-gallon barrels	705,420	685,177	767,858	Singapore 551,798; Bahrain 178,671.
Kerosine—do	1,148	1,059	1,065	Singapore 444; Japan 213; Bahrain 171.
Jet fuel—do	840,077	771,638	1,252,675	Japan 445,597; Singapore 419,303; Saudi Arabia 138,774.
Gas oil—do	406,988	503,880	689,348	Iran 356,753; Bahrain 220,020.
Diesel oil thousand 42-gallon barrels	1,800	1,697	1,795	Singapore 1,456.
Fuel oil—do	7,667	8,348	9,247	Singapore 6,324; Iran 2,288.
Lubricating oil 42-gallon barrels	127,173	202,387	210,411	United States 89,684; Netherland West Indies 45,138; Singapore 37,477.
Other mineral oils and blended oils 42-gallon barrels	2,225	3,939	5,146	United Kingdom 3,248; mainland China 1,672.
Bitumens	11,244	13,870	13,042	Singapore 6,451; Japan 3,684; Taiwan 1,514.
Bitumen and mineral mixtures	768	216	332	United Kingdom 252.
Petroleum jelly	359	411	298	United States 151; West Germany 90.
Pitch	NA	46	75	United Kingdom 62.
Waxes	1,610	1,784	1,811	Indonesia 1,107; mainland China 301.
Byproducts of petroleum refinery	127	58	17	Japan 9; United States 8.

r Revised. NA Not available.

Source: Hong Kong Trade Statistics. Imports. December, 1965. Commerce and Industry Department, Hong Kong. 236 pp.

LAOS

Laos is a landlocked, agricultural nation where 90 percent of the people are engaged in farming, animal culture, and timber industries. The country possesses, however, a variety of minerals, some deposits of which have been reported of considerable interest. Of these the only one currently mined is tin, providing the country's only mineral export. Tin output in Laos has remained relatively constant averaging approximately 650 tons of concentrate annually with a 50-percent metal content. If all the known tin deposits in the country were worked, it has been estimated that 2,000 to 3,000 tons of tin concentrate could be produced annually.

Notable among the minerals yet to be exploited in Laos is iron ore. According to a French technologist the Laotian ore is exceptional both in grade and reserves but details have not become available yet. If deposits approach expectations, Laos will certainly need financial and technical help in developing this resource. The establishment of an iron ore mining industry leading eventually to a possible iron and steel industry would have a stimulating effect upon the development of other minerals in Laos; and this, in turn, could lead the way for a gradual shift from its present predominant agricultural economy to one with some measure of industry.

One of the most important factors in industrial development of Laos is to obtain a cheap source of power. Since the country lacks an abundant reserve of coal, the Laotian Government has planned to construct hydroelectric dams. Power from these dams would be channeled mostly to industry.

Surveys for a minor dam site at the Selabam Waterfall on the Sedone River were completed in 1965. The equipment for the dam will come from France. Completion of this dam has been scheduled for 1968. When completed it will operate two 750-kilowatt generators. Surveys for a dam site on the Nam Dong River, 6 miles south of Luang Prabang also were completed in 1965.

Access roads were constructed in 1965 to dam site on the Nam Ngum River, 60 miles north of Vientiane; bidding for construction of the proposed 220-foot high dam has been scheduled for early 1967 with the expectation that work will begin in that year. When completed in 1971, Nam Ngum will initially provide 30,000 kilowatts of electricity and sufficient water to irrigate 12,500 acres. Ultimately, the dam will have the capacity to generate 120,000 kilowatts, not only to meet the increasing requirements of the Vientiane area but also to satisfy the energy needs of neighboring areas in Thailand. The dam also will have the capacity to provide water to irrigate 80,000 acres. Half of the cost of the $24.1 million project has been pledged by the United States, which is one of 8 countries contributing to the project.

PRODUCTION

Tin was the only mineral for which production statistics were available in 1965. Output of tin concentrate and approximate metal content have been as follows:

Year	Concentrate (long tons)	Metal content (long tons)
1961	667	335
1962	709	367
1963	650	326
1964	686	343
1965	569	285

Other mineral commodities such as copper, iron, clays, gravel, sand, coal, and petroleum from seeps, have been produced in Laos at one time or another, but no output statistics were available for them. These minerals were locally consumed.

TRADE

Laos' mineral imports in 1964 amounted to $5.3 million,[5] of which metals (mostly iron and steel commodities) accounted for $1.3 million; nonmetals (mostly cement and salt), $0.5 million; and mineral fuels (mostly petroleum refinery products), $3.5 million. Laos' lack of even small processing facilities necessitated imports of metal products chiefly in their final forms. This lack also accounted for the fact that the value of the country's mineral imports equalled only about 20 percent of the total value of all imports during 1964.

[5] Converted at the official rate of 240 kip=US$1. However, an unknown proportion of transactions was actually conducted at the legal free market rate of 500 kip=US$1.

Laos' principal mineral export in 1964 continued to be tin concentrates. The amount exported during 1964 totaled 727 long tons valued at approximately $690,600. Of this, Penang, Malaysia received 523 tons ($504,000) and Singapore 204 tons ($186,600). In 1963, Laos exported 546 long tons of tin concentrates valued at $155,000, of which Penang received 232 tons ($64,400) and Singapore 314 tons ($90,600).

Total value of Laos' imports in 1963 and 1964 were, respectively, $8.8 million and $25.5 million, while the country's exports amounted to only $238,700 in 1963 and $888,900 in 1964.

Table 7.—Laos: Imports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum	83	65	Thailand 20; Japan 19; United Kingdom 11.
Copper	57	47	Thailand 30; United States 16.
Iron and steel:			
Semimanufactures	r 7,822	4,706	Thailand 2,835; Taiwan 615; Japan 258.
Lead	9	5	All from Thailand.
Tin—long tons	---	98	United States 95.
Zinc	15	NA	All from Thailand.
Nonmetals:			
Calcium carbide	113	36	Taiwan 35.
Cement	31,324	13,693	Thailand 13,652.
Fertilizers, mostly potassic	17	360	Thailand 316.
Salt	r 980	422	Thailand 421.
Sulfur	NA	201	All from Thailand.
Mineral fuels:			
Petroleum refinery products:			
Aviation gasoline thousand 42-gallon barrels	138	164	Indonesia 100; Singapore 35.
Motor gasoline—do	155	166	Indonesia 95; United States 37.
Kerosine—do	39	37	Indonesia 17; United States 13.
Distillate fuel oil—do	59	63	Indonesia 33; Singapore 22.
Residual fuel oil—do	19	31	Indonesia 16; Singapore 9.
Lubricants—do	13	22	United States 9; United Kingdom 5.
Other—do	1	8	Indonesia 6.
Paraffin wax	712	152	Indonesia 151.
Asphalt, bitumen, petroleum coke	1,981	832	United States 794.

r Revised. NA Not available.

Table 8.—Laos: Total value of imports
(Thousand dollars)

Country	1963	1964
Thailand	$2,983	$7,133
United States	2,468	7,111
United Kingdom	172	2,477
Indonesia	753	1,886
Japan	1,059	1,351
Taiwan	269	1,160
France	571	1,102
Total	8,275	22,220

COMMODITY REVIEW

Metals.—*Gold.*—Gold occurs in several places in Laos, especially along the Mekong River and its tributaries. Samples from these tributaries have yielded assays ranging from 0.28 to 0.47 ounces of gold per ton of ore. On the banks of the Mekong River at Ban Dou Men, south of Pak Ley, one exceptional sample yielded as high as 3.33 ounces of gold per ton. Other samples from this location have yielded 1.86 ounces per ton.

Iron Ore.—Between Xieng Khouang and Phong Savan in central Laos a huge deposit of oolitic iron ore was reported in late 1962. Preliminary reports made by French surveyors indicated the deposit had reserves of about 1,000 million tons with an iron content approximating 60 percent. More recent reports indicated the deposit might contain several thousand million tons. It was further reported the deposit could be economically exploited with open-cast methods. A second deposit of high grade iron ore was reported in an area 50 miles south of Xieng Kouang. Since there has been little prospecting other than preliminary surveys, size and grade of the deposits have not been established with any certainty. It is believed the latter deposit may compare favorably with the former. Other smaller and somewhat lower grade

iron ore beds have been discovered recently in various areas of Laos. If these deposits prove as good as preliminary reports claim, Laos presumably could develop mines and possibly establish an iron and steel industry.

Tin.—Of the various metal deposits found in Laos, the only ones being worked commercially are those of tin. The deposits currently exploited are located at Phontieu in Khammoune Province. The mine is operated by a French firm, Société d'Études d'Exploitation Minière de l'Indochine, which employs about 400 workers. Another company holding tin concessions as a combined private-government venture, Société d'Enterprise d'Étain du Laos, had no production in 1965.

Laos' tin production in 1965 was approximately 569 tons of 50 percent tin concentrate, valued at about $1,500 a ton. About 500 tons of ore are required to produce 1 ton of concentrate. The entire production is exported, mostly to Penang, Malaysia, and constitutes the largest single item in Laos exports, in the past few years amounting to 50 to 75 percent of the total value of exports.

Other Metals.—Recent preliminary reports from survey teams of various countries have confirmed the existence of several other metal deposits. Lead ores have been discovered in the Annam Cordillera below Tchepone and in several other areas in the country, and some are reported to be of sufficient size and grade to warrant mining. Silver and zinc have been found associated with the galena, and could be significant byproducts or coproducts. In addition, deposits containing antimony, manganese, molybdenum, and cobalt are known. Preliminary surveys indicate little about the commercial value of the latter deposits.

Nonmetals.—*Cement.*—The cement plant at Thakhek, to have had an estimated annual capacity of 25,000 tons, was still uncompleted in 1965. Construction of the plant started in 1954, and after many delays it was scheduled for completion in 1963. The plant is located in an area where gypsum and large quantities of limestone are readily available. Additional deposits of gypsum have been discovered in the Savannakhet Plain.

Salt.—Salt deposits exist in several parts of Laos, but at present salt is extracted only by primitive methods and on a small scale to satisfy local needs. The total production is estimated to be about 2,500 tons per year. An additional 1,000 to 1,500 tons of salt are estimated to be imported every year.

Mineral Fuels. — Coal. — Commercial amounts of low grade anthracite were located near Saravane about 5 years ago. Although detailed plans had been completed for the construction of electric power plants utilizing the anthracite, they have as yet to be implemented. Proposed sites of the latter plants were Saravane, Pakse, and Thakhek. A few thin coal beds have also been reported to occur in the northern part of the country.

Petroleum.—Geological surveys have revealed favorable structures for oil in Laos, one between Thakhek and Pakse and another in the Vientiane Valley. An agreement was made between the Laotian Government and a group of French companies in 1959 for further investigation of these potential petroleum areas. At yearend 1965, nothing had yet come of the project.

NORTH VIET-NAM

North Viet-Nam's mine output, consisting mainly of chromite, apatite (for phosphate), and anthracite, was comparable with that of 1964; production of its mineral-related light industry reportedly gained 20 percent during 1965. Total value of North Viet-Nam's mineral industry product in 1965 was probably a little over $100 million. Because specific data, information as to the country's pricing system, and other details pertaining to North Viet-Nam's economy are limited, it is difficult to assess the overall contribution of minerals, but it could be as high as 15 percent of the gross domestic product.

For its size of approximately 63,000 square miles, North Viet-Nam is well endowed with a variety of minerals, in contrast with South Viet-Nam. Thus, North Viet-Nam is one of the fairly rich countries in mineral resources in Southeast Asia. In addition to having large deposits of high-quality anthracite, of which reserves are reported over 1,000 million tons in the Hon

Gai region alone, there are extensive beds of iron, tin, zinc, and apatite. Surveys also indicate existence of antimony, wolfram, bauxite, and manganese. These mineral resources, save those of anthracite, have been worked either very little or remain virtually unworked.

North Viet-Nam's Second Plan (1961–65) has emphasized the search for and development of mineral resources. In this respect, Hongay, Campha, Vong Bi, Mao Khe, Trang Bach, Lang Cam, and other mineral centers in the country have received particular attention by economic planners. To exploit known deposits, plans have been made to construct mining and smelting facilities to produce aluminum, iron, and zinc. Industrial complexes have also been planned and are in various stages of completion. Other industrial projects in the second plan include the modernization and expansion of existing installations, such as the cement plant in Haiphong, the iron and steel mill in Thai Nguyen, various fertilizer installations throughout the country, and power generating stations. Among major projects in the second plan is the expansion of the port at Haiphong to enable it to handle larger ships and twice the amount of present traffic. Financial and technical aid for these and other projects is expected to come from mainland China, the U.S.S.R., and other Communist countries.[6]

PRODUCTION

Despite disruptions caused by war, North Viet-Nam's 1965 output of primary minerals was reported to be approximately the same as that of the previous year. Trade data of some of the countries that have commerical ties with North Viet-Nam confirm this. Estimating from trade statistics, North Viet-Nam exported about one-third of its mineral production, chiefly anthracite and salt to Japan.

Anthracite was by far the most important mineral produced in 1965, followed by cement and apatite. Output of pig iron in 1965 was probably about 100,000 tons and that of cast iron and steel totaled about 50,000 tons.

North Viet-Nam also produced undisclosed quantities of tin, zinc, asbestos, clays, dolomite, glass sands, kaolin, mica, and pyrite. Facilities to process or refine lead, antimony, copper, manganese, and mercury were reportedly in operation at yearend 1965.

TRADE

Official trade statistics for North Viet-Nam have not been published. In lieu of them, Soviet data on mineral exports to North Viet-Nam have been shown in this chapter. Japan, mainland China, and West and East European countries have also been factors in North Viet-Nam trade. In addition to metal products received from the U.S.S.R., North Viet-Nam imported from Japan iron and steel semimanufactures totaling 3,340 tons in 1964 and 10,540 tons in 1965. It also purchased from Japan small amounts of copper and aluminum semimanufactures in these 2 years. Imports of petroleum refinery products have been mainly of U.S.S.R. origin.

[6] Industries et Travaux D'Outre-Mer. (Paris, France). La Situation de l'Industrie au Vietnam-Nord. No. 133, December 1964, pp. 1049–1052.

Table 9.—North Viet-Nam: Production of selected metals and minerals
(Metric tons)

Commodity [1]	1961	1962	1963	1964 [e]	1965 [e]
Metals:					
Chromite	29,500	32,600	30,300	30,000	30,000
Iron ore	-----	-----	-----	NA	300,000
Iron and steel	-----	-----	-----	80,000	150,000
Nonmetals:					
Apatite	563,600	678,000	925,000	1,000,000	1,000,000
Cement thousand tons	458	462	496	649	750
Phosphate rock	58,100	34,000	[e] 50,000	50,000	50,000
Salt	106,100	144,000	127,600	150,000	175,000
Mineral fuels:					
Coal (mainly anthracite)	2,829,400	3,468,000	3,370,000	[r] 3,640,000	3,700,000

[r] Revised. [e] Estimate. NA Not available.
[1] In addition to commodities listed, North Viet-Nam also produced gold, iron ore, pig iron, cast iron, steel, lead, tin, zinc, asbestos, clays, dolomite, glass sands, kaolin, mica, and pyrite and had begun or was about to begin producing antimony, copper, manganese, and mercury. Data on production of these commodities are not sufficient to establish reliable estimates.

Table 10.—North Viet-Nam: Imports of selected metals and minerals from the Soviet Union
(Metric tons)

Commodity	1963	1964
Metals:		
Aluminum semimanufactures	72	188
Copper semimanufactures:		
Unalloyed	271	81
Alloyed	281	155
Iron and steel:		
Pig iron	4,000	200
Ferroalloys	400	200
Semimanufactures:		
Pipes	1,400	600
Other	21,900	13,700
Lead semimanufactures	78	188
Mineral fuels:		
Petroleum refinery products:		
Gasoline	28,800	37,600
Kerosine	18,800	21,100
Diesel oil	37,400	34,100
Lubricating oil	5,200	7,500
Greases	800	300

North Viet-Nam's chief mineral export has been anthracite coal, much of which was shipped to Japan. In this regard, North Viet-Nam has been the chief supplier of anthracite to Japan in the last few years. In 1963, 1964, and 1965, respectively, Japan received 541,265 tons, 402,855 tons, and 427,948 tons of anthracite from North Viet-Nam. Mainland China has also been receiving sizable quantities of anthracite from North Viet-Nam, in addition to large amounts of apatite and chromite. East European countries receive large quantities of apatite from the country.

COMMODITY REVIEW

Metals. — *Chromite.* — North Viet-Nam's chromite mines are centered about Co Dinh, about 25 miles from Thanh Hoa, in the Nong Cong District. One of the major mines in the vicinity of Le River employs about 2,000 workers and has a mechanized section as well as two manual sections. The mechanized section employs hydraulic monitors while the manual is confined to simpler methods. In the manual sections employees are divided into small work groups of four and five individuals. Climatic conditions, monsoons and drought, hamper the work to some extent. Because there is as yet no smelter to extract the metal, the ore is exported to the U.S.S.R. and mainland China.

Iron and Steel.—The Thai Nguyen iron and steel complex, North Viet-Nam's first steel mill and under construction since September 1963, was nearing completion at yearend 1965. The 200,000-ton mill had been scheduled for final completion in 1966. By early 1965, the complex had put into operation two blast furnaces, and a third blast furnace was nearing completion at the time. It was presumably finished by the end of 1965.

Ore for the mill will come from the large deposit at Trai Cau, North Viet-Nam's first iron ore mine. This mine reportedly had reserves totaling more than 2 million tons of ore containing about 60 percent iron. The Trai Cau mine went into trial operation in 1964, and was said to have the capacity to supply approximately 300,000 tons of ore per year. Concurrent with the construction of the Thai Nguyen steel complex, a power station capable of generating 24,000 kilowatts was also being built. The power station was reported to have been completed in the early part of 1964 and was scheduled to supply electricity not only to the steel mill, but also to Hanoi and the Viet Bac autonomous region.

The coking component of the mill was completed ahead of schedule and placed in trial operation in December 1964. The coking plant was reported to have an annual capacity to produce 150,000 tons of coke, sufficient to supply three furnaces. Equipment was set up to extract byproducts of coking. An iron ore sintering plant with an annual capacity of 130,000 tons was also put into trial operation at the same time.

On December 12, 1964 construction of the rolling mill was started. Removal of earth ahead of schedule for foundations

permitted builders to take advantage of dry winter and spring months. The construction of the steel rolling mill has been technically assisted by the mainland Chinese and its completion has been scheduled for some time in 1966.

In 1965 North Viet-Nam geological survey teams were reported to have discovered an iron ore deposit in the Quang Nai Province with an estimated reserve of about 40 million tons. An open pit operation was said to be feasible to mine the ore.[7]

Tin.—Although there are a number of tin occurrences in North Viet-Nam, especially in the Tinh Tuc district of Cao Bang Province, production of the metal was never very great.

Since the partition of Viet-Nam, the North Viet-Namese Government has reopened, expanded, and mechanized the Tinh Tuc mine with capital and technical assistance from the U.S.S.R. and East European countries. When the mine and smelter were reopened, there were difficulties in recruiting labor, especially those with skill necessary to operate heavy earth-moving equipment. A training program was instituted to meet the requirement. At yearend 1965 an estimated 3,000 to 3,500 workers were engaged in extracting tin in Tinh Tuc.

Nonmetals.—*Cement.*—Haiphong had the principal cement manufacturing plant in North Viet-Nam in 1965. Capacity of the single large plant, with its 4 rotary kilns, had been estimated at 500,000 tons per year; by yearend 1965, an expansion program was to have increased this by 30 to 35 percent. The expansion projects centered on restoration of vertical kilns 7.5-feet in diameter. Modernization aimed at rendering the plant fully mechanized and integrated. In addition to Haiphong there were several small plants at Nghe An and Sai Son whose combined annual capacity was reported to be in proximity of 150,000 to 200,000 tons. Production of cement with vertical kilns was reported to have struck quality control problems. Other problems in using these kilns were in the proper handling of equipment, maintenance, and efficient use of raw materials.

Fertilizers.—At yearend 1965, North Viet-Nam had about 6 phosphate plants of various sizes producing at capacity of approximately 200,000 tons of phosphate fertilizers. The Soviet-equipped superphosphate plant at Lam Thao, with an annual capacity of 100,000 tons has been reported as one of the most modern of its kind in Asia. The superphosphate product has 20 to 21 percent available phosphorous pentoxide (P_2O_5). The plant is equipped to produce 40,000 tons of sulfuric acid. Raw material for Lam Thao comes from the rich Laokay apatite mine, which contains more than 300 million tons of ore grading from 11 to 37 percent of P_2O_5. North Viet-Nam requires about 700,000 tons of phosphate fertilizer annually, based on the present 5.4 million acres of cultivated area, and assuming application needs of approximately 185 pounds per acre. The Lam Thao plant supplies about 14 percent of the total annual requirement.

Throughout 1965 work continued on construction of the nitrogenous fertilizer plant at Ha-Bao. Completion of the plant has been reported near; presumably, it will operate by the early part of 1966. Capacity of the plant has been estimated to be several hundred thousand tons of fertilizers. The Ha-Bao plant's first section was inaugurated on February 3, 1965, Mainland China provided technical assistance in construction.[8]

While waiting for the Ha-Bao plant to go into production, nitrogenous fertilizer had to be imported. In mid-1965, Nitrex A.G., a European international nitrogen cartel with headquarters in Zurich, Switzerland, concluded a contract with North Viet-Nam to supply an additional 20,000 tons of ammonium sulfate at an approximate price of $49 a ton. Sales of Nitrex A.G. to North Viet-Nam for the fertilizer season 1964–65 totaled about 60,000 tons.

Mineral Fuels.—*Coal.*—Despite a major effort to produce one-third more coal in 1965 than in 1964, the estimated output for the year was only slightly above the previous year's production. A larger labor force, of approximately 8,000 workers, was employed in the Hon Gai coal mine. Capital investment remained low although in recent years coal mining equipment had been added. Some imported equipment,

[7] Engineering and Mining Journal. Metal and Mineral Market. V. 36, No. 17, Apr. 26, 1965, p. 3.

[8] Far Eastern Economic Review. North Viet-Nam: Industry. 1966 Year Book, Dec. 15, 1965, p. 256.

chiefly from the Soviet Union and Czechoslovakia, lay idle for want of parts and general repair. Aside from technical difficulties coal output was hampered in 1965 by war escalation. It was claimed that 700 miners at the Deo Nai coal mine, located 25 miles from the Hon Gai coal mine, were forced to abandon operations on account of the destruction of facilities.[9] Other difficulties in coal mining in North Viet-Nam were lack of equipment and construction material, lack of mining machinery, little skilled labor, and few technical personnel.

Of the total coal output, approximately 20 to 25 percent has been exported, chiefly to Japan, mainland China, Hong Kong, and France. The remainder was consumed domestically for industrial purposes. Very little of the output was channeled directly for private utilization. Conservation efforts were revealed by a Hanoi news report on the Hon Gai mine where work groups were formed to glean coal for cooking purposes.

SOUTH VIET-NAM

South Viet-Nam's 1965 mineral production was limited to a few minerals in relatively small quantities. On account of the unsettled conditions in the country, output of minerals, as of other products, continued a downtrend in 1965. According to Japanese trade returns, South Viet-Nam produced about the same quantities of white sand and salt as in 1964. Production of coal in the Nongson area was stopped because of Viet-Cong harassment. Where there was some measure of security, industrial production fared somewhat better, as was the case with cement output at the Ha-Tien plant.

Little progress was made during 1965 in implementing South Viet-Nam's industrialization program. Intensified military action and political disturbance during the year discouraged capital investment. Moreover, the escalating military struggle made it practically impossible to construct industrial facilities for lack of material. One project called for development of an industrial complex at An Hoa, about 40 miles southwest of Tourane. The original plans called for construction of a 25,000-kilowatt thermal power installation, an ammonia plant, a sulfuric acid plant, and other facilities capable of manufacturing 42,000 tons of urea and 48,000 tons of ammonium sulfate a year. Funds for the fertilizer complex were provided by France and West Germany. Construction began in mid-1964 but ceased in mid-1965 owing to insecurity of the area. As a consequence, oil, cement, and other construction material were airlifted to An Hoa by United States cargo planes. This allowed construction to proceed at about 15 percent of original plan. In the wake of such troubles, construction of an industrial complex was considered near Cam Ranh Bay, where a major seaport was under construction. Surveys were made during the year for possible construction of a small rolling mill capable of producing 15,000 to 20,000 tons a year of structural steel from scrap or imported steel ingots. Originally this had been proposed for the An Hoa area.

PRODUCTION

Mineral production data for South Viet-Nam are incomplete with the exception of cement. Construction and completion of new industrial complexes, such as Bien Hoa and An Hoa-Nong Son, were either slowed or ceased altogether. The only bright note in 1965 production was the fact that cement output was nearly triple that of the previous year.

[9] Trybuna Ludu (Warsaw, Poland). Mar. 14, 1965, p. 6.

Table 11.—South Viet-Nam: Production of metals and minerals

Commodity	1961	1962	1963	1964	1965
Nonmetals:					
Cement—thousand metric tons	---	---	---	75	198
Clays—thousand cubic meters	16	27	35	e 120	e 100
Salt—thousand metric tons	100	193	128	r 90	e 95
Silica sand—thousand cubic meters	27	107	255	e 220	e 220
Mineral fuels:					
Coal, anthracite—thousand metric tons	57	71	105	77	75
Fuel briquets—do	e 55	e 55	55	55	55

r Revised. e Estimate.

TRADE

South Viet-Nam imported most of its mineral commodities in 1964 from the United States ($20.0 million, chiefly iron and steel products and coal), Taiwan ($16.2 million, chiefly cement and iron and steel products), Indonesia ($10.3 million, chiefly petroleum refinery products), South Korea (5.9 million, chiefly copper products), and Singapore ($3.4 million, chiefly petroleum refinery products). Value of mineral commodities from these countries in 1963 were United States, $23.7 million; Taiwan, $18.8 million; Indonesia, $14.1 million; South Korea, $12.4 million; and Singapore, $242,000. Composition of imports from these countries in 1963 were similar to those in 1964.

South Viet-Nam's main mineral exports continued to be essentially salt and sand in 1964, which totaled 39,050 tons and 199,165 tons, and were valued at approximately $175,000 and $685,000 respectively. In 1963, salt exports amounted to 20,595 tons valued at $90,000, while sand exports totaled 136,885 tons valued at $476,000. All the exportable salt and sand was shipped to Japan in both years. Total mineral exports in 1963 amounted to $577,000 and in 1964, $876,000. As in previous years, South Viet-Nam continued to suffer an extremely unfavorable trade balance. During 1964, its imports of all types totaled in value $297.8 million while its exports amounted to only $48.5 million leaving a trade deficit of $249.3 million. In 1963, imports and exports were valued at $286.2 million and $76.7 million respectively, giving a trade imbalance of $172.6 million.

COMMODITY REVIEW

Metals.—*Iron Ore.*—At Mo Duc, south of Quang Ngai, there exists a laterite deposit with an iron content between 30 to 40 percent. The deposit has been reported very easy to mine and under one proposal foreign firms were invited to determine its possible utilization. Reserves have been estimated at about 100 million tons.

Several other deposits of iron ore are known in the northern part of South Viet-Nam. In the same region presence of gold, silver, lead, copper, zinc and graphite is known. The amounts and grades of these ores and the possibilities for exploiting them have not been ascertained.[10]

Iron and Steel.—The An Hoa-Nong Son area was under Viet Cong harassment throughout 1965. In view of this trouble, a steel rolling mill has been abandoned. A site near Cam Ranh Bay was being considered instead.

Nonmetals.—*Cement.*—Output of the Ha Tien cement plant on the Gulf of Thailand in 1965 was nearly double that produced in 1964. Despite the increase there

[10] Mining Journal (London). South Viet-Nam. Annual Review, 1965. May 1965, p. 251.

Table 12.—South Viet-Nam: Value of selected mineral imports
(Thousand dollars)

Commodity	1963	1964
Metals:		
Ferrous:		
Iron and steel	$30,723	$23,056
Iron and steel scrap	17	13
Nonferrous:		
Aluminum products	2,123	4,070
Copper	868	1,224
Metalliferous ores	19	13
Other metallic materials	3,597	5,882
Total	37,347	34,258
Nonmetals:		
Abrasives	76	134
Fertilizers	2,973	1,869
Sand, stone, etc.	46	42
Other crude minerals	375	556
Other nonmetallic materials	36	16
Total	3,506	2,617
Mineral fuels:		
Coal and coke	330	872
Petroleum refinery products	19,394	18,337
Total	19,724	19,209

Table 13.—South Viet-Nam: Imports of selected metals and minerals
(Metric tons unless otherwise specified)

Commodity	1963	1964	Principal sources, 1964
Metals:			
Aluminum and alloys, all forms	2,753	5,631	United States 1,808; Taiwan 1,344; Hong Kong 786; South Korea 687.
Copper and alloys, all forms	r 834	1,386	South Korea 402; India 233; Taiwan 211.
Iron and steel:			
Pig iron	3,455	4,099	Taiwan 3,956; United States 91.
Bars, rods, angles, shapes, and sections	71,030	64,329	Taiwan 29,607; South Korea 13,526; United States 8,168; India 8,125.
Universals, plates, and sheets	82,255	55,416	United States 37,042; South Korea 13,506.
Hoop and strip	671	456	United States 195; West Germany 125.
Rails and track materials	130	2,651	United States 2,625.
Wire (exclusive of wire rod)	17,907	9,094	Taiwan 4,649; South Korea 1,939; Japan 1,537.
Tubes, pipes and fittings	10,767	10,095	France 2,231; Taiwan 2,145; United States 2,009; India 1,736.
Lead and alloys, all forms	344	488	United States 411.
Metallic oxides for paint	1,272	1,336	United States 596; India 259; Finland 177.
Tin and alloys, all forms—long tons	209	213	West Germany 45; Malaysia 20; other Asian Countries 123.
Zinc and alloys, all forms	422	416	Belgium-Luxembourg 298; Japan 52.
Nonmetals:			
Abrasives, natural	568	967	United States 579; Greece 348.
Asbestos, crude	229	1,172	All from the United States.
Cement and lime—thousand tons	446	437	Taiwan 349; Thailand 64.
Clays:			
Construction and refractory	2,229	50,334	Taiwan 47,050; Japan 2,160.
Others	r 177	100	NA.
Feldspar, mica, quartz, and related nonmetals	r 151	169	United States 105.
Fertilizers:			
Natural phosphates	79,078	46,662	Tunisia 32,951; United States 9,066.
Manufactured:			
Nitrogenous—thousand tons	185	77	United States 46; Portugal 27.
Phosphatic	16,263	34,485	Tunisia 16,460; United States 8,344.
Potassic	11,786	7,329	Israel 5,569; United States 1,560.
Sulfur	r 405	161	United States 131.
Mineral fuels:			
Coal	r 8,090	22,485	United States 20,584; India 1,900.
Coke	881	979	Taiwan 734.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	r 1,232	1,123	Indonesia 753; Singapore 239.
Kerosine—do	r 645	598	Indonesia 347; Singapore 135.
Fuel oil:			
Distillate—do	r 1,296	1,260	Indonesia 877; Singapore 246.
Residual—do	r 1,243	1,407	Indonesia 999; Singapore 300.
Lubricating oils and grease—do	r 144	152	United States 89; Netherlands Antilles 47.
Mineral jelly and wax	r 4,385	6,199	Indonesia 5,596; United States 347.
Asphalt	18,235	20,684	Singapore 8,100; United States 5,340; Iran 4,396.

r Revised. NA Not available.
Source: Statistical Office of the United Nations.

still existed an acute cement shortage in coping with both civilian construction demand and stepped-up military needs. To supplement domestic production, significant amounts of cement were imported during the year, notably from Taiwan. In anticipation of even greater demand the South Viet-Nam Government in late 1965 contracted for about 500,000 tons of cement from Taiwan for delivery during 1966.

Mineral Fuels.—*Coal.*—Coal production ceased in 1965. The Nong Son mine was flooded by a typhoon in late 1963. Also the area was becoming increasingly insecure as a result of Viet Cong action since late 1964. Finally in 1965 the area around the mine was occupied by the Viet Cong. Thus, it was more difficult and dangerous to transport coal from the mine via surface transports to Tourane, where the coal could be used.

Cut off from domestic supply, South Viet-Nam has increased its imports of coal, the chief source of which has been the United States.

Petroleum.—Construction of an oil refinery scheduled at Nhatrang and utilizing imported crude oil, would have started in early 1965 had not the political situation deteriorated. Capacity would be about

24,400 barrels per day, a quantity sufficient to meet South Viet-Nam's domestic product requirements. Cost of the refinery was estimated at $15 million, three-quarters of which was to be provided by a private U.S. loan, and the remainder by the South Viet-Nam Government.

Power.—Saigon's electricity supply encountered serious difficulties in 1965, especially in the latter half of the year. Power shortage was aggravated by sabotage of transmission lines from the Danhim hydroelectric complex. It was also due in part to greater requirements in the city. Saigon, which requires some 80,000 kilowatts of installed power at peak hours, had only 65,000 kilowatts available in October 1965. Thus, it was necessary to cut the supply of electricity for several hours every 5th day in each district. The situation was expected to return to normal after a 33,000-kilowatt thermal powerplant is installed at Thu Duc. The $13 million plant, financed by the United States, is scheduled for completion in January 1966. Another project, to build a dam some 40 miles north of Saigon was abandoned.[11]

[11] Far Eastern Economic Review. South Viet-Nam: Power and Transport. 1966 Year Book, Dec. 15, 1965, p. 315.

Regional Mineral Industry Review of the South Pacific[1]

By Lester G. Morrell[2]

While developments in Australia dominated the minerals industry of the South Pacific area, New Caledonia's nickel, manganese ore from New Hebrides, gold from Fiji and New Guinea, and phosphate rock from several small islands were significant in world supplies of those materials. The total value of mineral commodities produced in this area in 1965 has been estimated at about $763 million,[3] an increase of nearly 16 percent over the value reported in 1964. Increases were recorded in mineral production value with respect to that of 1964 for all of the countries except Papua-New Guinea where lower gold output resulted in a drop of about $300,000 and in the several phosphate-producing islands that collectively recorded a value decline of around $1.3 million.

Exploration and development activities continued at an intensified level, not only in Australia and New Zealand but also in the British Solomons, Bougainville, and Fiji. Substantial additions to world supplies of iron ore and bauxite are assured and recent discoveries of natural gas, manganese ore, and nickel combine to give Australia a brilliant mineral outlook. Important discoveries of copper on Bougainville Island and on Vanua Levu, the north island of the Fiji group, and a gold mine on Misma Island were being developed during the year, with plans for early production underway. In New Zealand progress has been made on the New Zealand Steel Company project, and preliminary appraisal of a new titano-magnetite beach sand resource on the South Island has aroused considerable industrial interest. Extensive geophysical investigations were carried out in the British Solomon Islands and on Fiji's goldfields. The expansion program that will double output of products by New Caledonia's Société Le Nickel continued through 1965, and several foreign private companies have expressed a desire to initiate additional industries based on nickel prospects in New Caledonia.

The South Pacific area's contribution to world mineral supplies is summarized in table 1. Australian beach sands again in 1965 were the non-Communist world's leading source of rutile titanium concentrates and zirconium concentrates. Australia, which ranked as the leading mine producer of lead in 1964 may have been surpassed in 1965 by U.S.S.R. The South Pacific area as a whole produced over 10 percent of the non-Communist world output of lead, nickel, monazite, titanium concentrates, and zinc in mined ores.

According to United Nations data[4] Australia and New Zealand trade (exclusive of other South Pacific areas) in 1965 included total c.i.f. imports valued at $4,650 million and f.o.b. exports of $3,830 million. Though incomplete, these amounts represent a substantial increase over the previous years' figures. As before, much of the South Paci-

[1] South Pacific area, for this purpose includes Australia and New Zealand together with their respective insular territorial possessions and trusts (specifically Nauru and Papua-New Guinea); the British Solomon Islands, Fiji, Gilbert and Ellice, New Hebrides, and other islands; and the French Overseas Territories of New Caledonia and French Polynesia. Excluded are the United States Trust Territories of the Pacific Islands and the many small islands having no commercial mineral industries or resources.

[2] North America-South Pacific specialist, Division of International Activities.

[3] Values are given in U.S. dollars.

[4] United Nations, Statistical Office. Monthly Bulletin of Statistics, September 1966, v. 20, No. 9, New York, pp. 102–103.

Table 1.—South Pacific contribution to world production of selected mineral commodities [1]

Commodity	1964 r			1965 p		
	Metric tons (unless otherwise specified)	Percent of— Non-Communist world [2] production	Percent of— World production	Metric tons (unless otherwise specified)	Percent of— Non-Communist world [2] production	Percent of— World production
Metals:						
Aluminum:						
Bauxite	854,606	3.1	2.5	1,176,372	3.9	3.2
Metal	80,008	1.7	1.3	87,764	1.7	1.3
Beryllium concentrate	112	3.0	2.4	13	.3	.3
Cadmium metal	502	4.6	3.8	e 543	5.3	4.3
Copper:						
Mine (content)	106,322	2.7	2.2	92,776	2.3	1.8
Smelter	82,157	1.9	1.6	75,345	1.7	1.4
Gold—troy ounces	1,113,531	2.8	2.4	1,030,864	2.5	2.2
Iron:						
Ore, concentrate, etc.—thousand tons	6,067	1.6	1.0	7,032	1.7	1.1
Pig iron—do	4,104	1.9	1.3	4,291	1.9	1.3
Steel, ingots and castings—do	5,098	1.7	1.2	5,527	1.7	1.2
Lead:						
Mine (content)	381,999	21.5	14.9	360,868	19.2	13.3
Smelter	285,921	16.1	11.2	264,390	14.5	10.1
Manganese ore	123,275	1.7	.8	171,254	2.0	1.0
Nickel (in smelter products and ores)	e 52,800	18.9	13.8	e 52,100	16.3	12.2
Silver—thousand troy ounces	18,536	8.8	7.5	16,793	8.0	6.7
Tin:						
Mine (content)—long tons	3,638	2.4	1.9	e 4,000	2.6	2.0
Smelter—do	3,045	2.1	1.6	3,143	2.1	1.6
Titanium concentrate:						
Ilmenite	308,668	13.1	NA	456,937	18.5	NA
Rutile	182,925	95.0	NA	218,401	[3] 99.3	NA
Tungsten concentrate (60 percent WO_3)	1,692	7.4	2.9	1,993	9.5	3.7
Uranium oxide (U_3O_8) e	380	1.6	NA	335	1.8	NA
Zinc:						
Mine (content)	350,131	11.4	8.7	351,160	10.6	8.1
Smelter	188,509	6.7	5.1	202,182	7.0	5.3
Zirconium concentrate	183,943	[4] 75.0	NA	e 215,000	[4] 80.0	NA
Nonmetals:						
Cement—thousand tons	4,445	1.5	1.1	4,684	1.5	1.1
Gypsum	799,126	2.0	1.7	e 860,000	2.1	1.8
Magnesite	32,365	1.0	.4	e 25,850	.7	.3
Monazite concentrate	2,073	[5] 50.0	NA	2,341	[5] 48.8	NA
Phosphate rock—thousand tons	2,572	5.9	4.4	2,196	4.6	3.3
Pyrite (gross weight) e	223,524	1.5	1.1	212,000	1.3	1.0
Mineral fuels:						
Coal, all ranks—thousand tons	50,104	4.1	8.1	55,653	4.6	2.0

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Mineral commodities produced in quantities of less than 1 percent of world total are omitted.
[2] Excludes Albania, Bulgaria, mainland China, Cuba, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Rumania, U.S.S.R., North Viet-Nam, and Yugoslavia.
[3] Exclusive of U.S. production.
[4] Bureau of Mines approximation.
[5] Percentage based on total of seven reporting countries.

fic trade was within the area, but the mineral resources of Australia and New Caledonia in particular increased in importance to the consuming industries of United States, Western Europe, and Japan. Table 2 records quantities and percentage of dependence upon South Pacific supply sources for various mineral products by selected principal consumer nations.

United States trade with countries of the South Pacific is summarized in table 3. Approximately 1.2 percent of the value of U.S. minerals, metals, and fuels imports (exclusive of petroleum) in 1965 were from the South Pacific. Shipments to countries in the area made up about 3.1 percent of U.S. minerals product exports during the year.

Private investors in United States, United Kingdom, Japan, Canada, France, and other countries continued to play a major role in financing exploration and development of the South Pacific area's mineral resources. Virtually all of the foreign investment has been provided on the basis

Table 2.—Principal consumer markets for selected South Pacific mineral products, 1965

(Metric tons unless otherwise specified)

Commodity	United States			United Kingdom			Japan		
	Total imports	Imports from South Pacific	Percent of total	Total imports	Imports from South Pacific	Percent of total	Total imports	Imports from South Pacific	Percent of total
Metals:									
Aluminum:									
Alumina and bauxite—thousand tons	13,125	---	---	474	---	---	1,730	473	27.3
Metal, unwrought	478,332	11,203	2.3	324,074	7,193	2.2	42,310	---	---
Beryllium concentrate	7,068	1,358	19.2	NA	---	---	NA	---	---
Cadmium metal	962	93	9.7	1,454	231	1.6	23	NA	---
Copper:									
Ore and concentrate (content) [1]	10,367	78	[2]	[1] 811	---	---	[1] 584,298	[1] 42,044	7.2
Metal, unwrought	402,147	3,933	.1	562,620	2,558	.5	115,038	1,954	1.7
Iron and steel:									
Iron ore, concentrate, etc.—thousand tons	45,829	[2]	---	19,176	14	[2]	39,018	20,477	52.5
Pig and cast iron—do	800	1	[2]	333	---	---	2,609	[3] 18	.7
Steel ingots, etc., including alloy—do	257	---	---	30	2	6.7	2	---	---
Lead:									
Ore and concentrate (content)	111,277	24,183	21.7	21,163	6,569	31.0	[1] 67,247	[1] 33,089	49.2
Metal, unwrought	202,756	46,662	23.0	219,039	124,100	56.7	38,262	9,297	24.3
Manganese ore and concentrates (content)	1,666,521	---	---	[1] 503,258	---	---	[1] 1,064,839	[1] 144,192	13.5
Nickel: [1]									
Ore and concentrate	---	---	---	---	---	---	966,742	862,829	89.3
Matte and speiss	---	---	---	65,076	---	---	4,357	4,344	99.7
Metal, unwrought	118,991	---	---	26,861	---	---	2,655	---	---
Silver, base and refined bullion—thousand troy ounces	54,708	1,796	3.3	46,825	5,293	11.3	4,789	---	---
Tungsten concentrate (content)	1,641	152	9.3	[1] 8,063	[1] 554	6.9	[3] 1,501	[1] 381	25.4
Titanium concentrate	236,810	182,400	77.0	288,203	[3] 180,642	62.7	211,949	54,958	25.9
Tin:									
Ore and concentrate—long tons	---	---	---	45,370	1,849	4.1	762	---	---
Metal, unwrought—do	---	---	---	9,265	[3] 39	.4	14,840	---	---
Zinc:									
Ore and concentrate (content)	369,378	3,000	.8	120,667	90,815	75.3	[1] 380,332	[1] 30,354	8.0
Metal, unwrought	141,067	160	.1	196,950	23,984	12.2	7,015	2,222	31.7
Zirconium concentrate	53,409	52,385	98.1	42,920	[3] 49,303	[4] 100.0	25,981	25,295	97.4
Nonmetals:									
Asbestos, crude, all types	652,770	236	.4	178,958	---	---	133,522	---	---
Gypsum and anhydrite—thousand tons	5,362	---	---	---	---	---	50	---	---
Phosphate rock	134,385	---	---	1,694,000	244,648	14.4	2,418,256	145,805	6.0
Mineral fuels:									
Coal, bituminous—thousand tons	178	---	---	[5] 56	---	---	15,965	6,620	41.5

NA Not available.
[1] Gross weight. Metal content not available.
[2] Insignificant.
[3] Australia exports during 1964–65 fiscal year.
[4] Apparent percentage.
[5] Includes coke and briquets.

Source: United Nations Statistical office and official trade statistics of United States, United Kingdom, and Japan.

of cooperative participation with local funding. United States direct investment in Oceania at the close of 1965 totaled $1,811 million, of which minerals investments comprised $661 million. The bulk of the U.S. minerals investments was in the petroleum industry ($499 million). During 1965, U.S. direct investments in mining and smelting industries increased $61 million, bringing the total value of United States holdings in those Australian industries to $161 million.

Table 3.—United States trade with South Pacific Area [1]

(Thousand dollars)

Area and mineral category	Imports		Exports	
	1964	1965	1964	1965
Australia:				
Minerals, metals, and fuels	29,381	48,085	51,283	56,223
Total merchandise	273,866	305,863	625,633	695,981
New Guinea:				
Minerals, metals, and fuels	---	---	12	49
Total merchandise	1,351	2,964	1,166	1,955
New Zealand [2]:				
Minerals, metals, and fuels	11	7	11,340	11,120
Total merchandise	148,124	129,782	86,683	125,872
British West Pacific Islands:				
Minerals, metals, and fuels	---	250	27	37
Total merchandise	7,235	7,766	2,204	2,374
French Pacific Islands:				
Minerals, metals, and fuels	47	---	2,213	2,916
Total merchandise	932	368	13,392	16,056
Oceania total: [3]				
Minerals, metals, and fuels	29,439	48,342	64,875	70,345
Total merchandise	431,508	446,743	729,078	842,238

[1] Mineral categories include SITC Commodity Classifications 271, 273–276 inclusive, 281–286 inclusive, 321, 331, 332, 341, 513–535 inclusive, 661–663 inclusive, 671–679 inclusive, 681–689 inclusive.
[2] Includes Western Samoa.
[3] Exclusive of United States Trust Territory of the Pacific Islands.

Source: U.S. Department of Commerce, Bureau of the Census. United States Trade Statistics.

The Mineral Industry of Australia

By Lester G. Morrell [1]

The estimated total US $602.2 million [2] value of Australia's mineral output including fuels in 1965 represented an increase of 9.3 percent over that of 1964. While greater quantities were reported in most mineral commodities, higher unit prices accounted for a substantial part of the increase. The value added by primary processing brought the total value of the mineral industry product to an estimated US$813 million. In relation to the national economy, the value of mineral industry output was equal to 3.6 percent of the estimated US$22.5 billion (at current prices) gross national product for calendar year 1965.

As in previous years, coal, with an estimated value of $181 million, was the leading crude mineral commodity produced, contributing 30 percent of the 1965 value of crude mineral output. Lead and zinc ores accounted for 23 percent, while construction materials provided 14 percent, and copper ores 9 percent. On the basis of output quantity, outstanding percentage gains were recorded during 1965 in petroleum—75 percent, manganese ore—61 percent, ilmenite—48 percent, bauxite—38 percent, and natural gas—36 percent. Iron ore production was up 17 percent, and steel ingots and castings were up 8 percent. Compared with that of 1964, mine output of several minerals fell in 1965. Largely as a result of labor problems at the Mount Isa mine, copper production was down 13 percent. Lead was down 5 percent, gold and silver each about 9 percent, and asbestos production was 28 percent below the 1964 level.

The uptrend in value of mineral output and value of mineral industry products including primary processing and byproducts for selected recent years is shown in the following tabulation, in millions of U.S. dollars:

Year	Mine output value	Total value including domestic primary treatment
1955	334.7	413.3
1961	403.6	531.1
1962	420.2	571.4
1963	466.6	631.3
1964	551.9	747.1
1965	602.6	813.1

In 1964, the most recent year for which category summaries on output value are available, metallic minerals contributed 49 percent, nonmetallic minerals 6 percent, fuels 30 percent, and construction materials 15 percent of the total value of crude minerals produced in Australia. In order of importance, with values in millions of U.S. dollars, were black coal—143.6, lead ores and concentrates—90.0, construction materials, total—82.0, copper ores and concentrates—57.5, zinc ores and concentrates—39.7, gold—29.8, titanium (rutile and ilmenite) concentrates—27.6, brown coal (lignite)—19.4, tin concentrates—11.5, and limestone—10.2.

On a regional basis, New South Wales, embracing the rich lead-zinc-silver deposits of Broken Hill and Australia's most pro-

[1] North America-South Pacific specialist, Division of International Activities.

[2] Effective Feb. 14, 1966, Australia adopted decimal currency on the basis of one Australian pound (A£1) equivalent to two Australian dollars (A$2). Values given herein have been converted to US$ at the current exchange rate of A$1=US$1.12.

ductive coal mines, has traditionally ranked as the leading mineral State. In 1964 New South Wales output was valued at over US$260 million. Queensland's minerals, dominated by the output of the nation's largest copper mines, totaled US$109 million. Western Australia's output was valued at about US$51 million, South Australia's at US$44 million, and Tasmania's at US$28 million.

According to data compiled by the Bureaus of Census and Statistics and Mineral Resources, the national price index relevant to basic materials rose to 349 in 1965, compared with 342 in 1964. The metals sector index which includes aluminum, iron and steel, copper, lead, tin, and zinc, stood at 485 in 1965, compared with 455 in the preceding year. Of major importance in offsetting the lower output of some nonferrous metals in 1965 were the average prices received for copper: US$1,103.27 per long ton (US$803.51 in 1964) and lead: US$314.88 per long ton (US$268.06 in 1964). Aluminum and tin prices were also higher in 1965.

Much of the effort expended by mineral companies during the year went into development, expansion, transportation, and arrangements for marketing. Expansion was taking place in output of bauxite, aluminum, beach sands, coal, copper, iron ore, steel, manganese, and zinc.

Heavy rains delayed construction at iron ore mines in Western Australia, but initial export shipments were made by two new companies early in 1966. Mining and metallurgical operations in New South Wales, Queensland, and Tasmania were curtailed to varying extent by water shortages. Because of full employment the labor market was generally tight, and skilled mine workers were in short supply throughout the year. Mining companies were especially concerned with the lack of trained geologists, mining engineers, and metallurgists. The small number of graduates and students enrolled in these fields at Australian universities was also a concern to the industry.

In 1964, the most recent year for which data are available, 925 mines and quarries were active, approximately the same number as in the preceding year. Of the total which excludes operations employing less than four persons, 148 were classed as metal mines, 183 coal, and 594 nonmetal and construction material operations. Average employment in the mining industry during 1964 totaled 44,812, compared with 44,848 in 1963. Metal mines employed 19,178 persons, coal mines 17,037, and other mines and quarries 8,597. Salaries and wages paid to employees amounted to US$149 million in 1964, an increase of 8 percent above the corresponding figure for 1963. Materials and power used by the mining and quarrying industry totaled US$105.3 million and capital additions and replacements during the year in the larger mines and quarries amounted to US$86.5 million.

The high level of interest in Australia's mineral potential was reflected in data compiled by the Commonwealth Statistician showing expenditures on minerals exploration in recent years, which were as follows:

Year	Value, thousand U.S. dollars					
	Private enterprise funds		Commonwealth Government assistance			Total
	Foreign	Australian	Petroleum [1]	Gold and copper [2]	Other [3]	
1962	12,794	15,382	6,642	3,051	2,858	40,727
1963	14,082	18,672	11,781	3,262	6,114	53,911
1964	20,420	20,019	10,216	2,742	29,277	82,674
1965	NA	NA	11,662	2,229	28,960	NA

NA Not available.
[1] Petroleum Search Subsidy Act.
[2] Gold Mining Industry Assistance Act, Gold Mines Development Assistance Act, and Copper Bounty Act.
[3] Pyrites Bounty Act, Sulfuric Acid Bounty Act, and Phosphate Fertilizers Bounty Act.

Foreign companies engaged in exploration or development of mining operations, exclusive of oil companies, according to a survey conducted early in 1966 by the American Chamber of Commerce in Australia, included 42 United States firms, 20 Canadian firms and 15 others including British, French, Japanese, Swiss, and South African firms. The United States direct investment in Australian mining and smelting ventures in 1965 amounted to US$161 million, compared with US$100 million in 1964, according to U.S. Department of Commerce sources.

Although private enterprise and field crews of the States and Federal Government were increasingly active in 1965, the year's most spectacular developments were in arranging contracts and preparing iron ore deposits for production in Western Australia, establishing the bauxite and alumina industry in Queensland, and commencing shipment of high-grade manganese from Groote Eylandt in the Gulf of Carpentaria. Equally important was the resumption of copper mining on an expanded scale at Cobar, New South Wales, and continuing investigation of the large lead-zinc deposits at McArthur River in the Northern Territory and nickel occurrences in Western Australia. Significant discoveries of oil and gas were made during 1965 in Western Australia, in the Victoria offshore Gippsland Shelf area, and in the Northern Territory.

Several publications of interest to the mining industry were released in 1965. In honor of the Eighth Commonwealth Mining and Metallurgical Congress, held in Australia and New Zealand during March and April, seven commemorative volumes were produced under sponsorship of the Australasian Institute of Mining and Metallurgy. These included: Volume 1, Geology of Australian Ore Deposits; Volume 2, Exploration and Mining Geology; Volume 3, The Australian Mining, Metallurgical and Mineral Industry; Volume 4, Economic Geology of New Zealand; Volume 5, Proceedings (Petroleum); Volume 6, Proceedings (General); and Handbook-Australia and New Zealand. Also in 1965, the Department of National Development, Bureau of Mineral Resources, Geology and Geophysics, released Bulletin 72—Australian Mineral Industry: The Mineral Deposits, a timely and exceptionally comprehensive work.

PRODUCTION

Output figures for the year 1965 show continued growth in both value and volume of Australia's mineral industry. Of the 77 items that comprise the national production, approximately 40 recorded increases over that of 1964. Statistics reflect the start of what appears to be a long period of expansion in output of bauxite and its products, iron ore, manganese, petroleum, and beach sand minerals. Although 23 commodities show quantity decreases in 1965, several of these, notably copper, lead, and silver, result from the temporary shutdown of the Mount Isa mine during part of the year.

TRADE

The value of minerals and mineral products[3] accounted for 16.0 percent of total imports and 13.3 percent of total exports recorded for the 1964–65 fiscal period by the Commonwealth Bureau of Census and Statistics.

Exported minerals and mineral products itemized in the accompanying tables were valued at US$384.4 million. Metals made up 77 percent of the total, and nonmetals and fuels (including petroleum products) accounted for 3 percent and 20 percent respectively. The leading export items and their value in millions of U.S. dollars were coal—$57.4, steel semimanufactures—$51.2, unwrought lead—$47.0, slab zinc—$27.3, and titanium concentrates—$22.5.

The value of minerals and mineral product imports during the same period amounted to US $521.2 million, of which metals, nonmetals, and fuels comprised 35.6, 11.9, and 52.5 percent respectively. Values of leading import items, in millions of U.S. dollars were crude petroleum—$211.6, steel semimanufactures—$104.7, refined petroleum products—$58.2, copper ingots, etc.,—$41.1, and fertilizer materials—$27.5.

[3] Includes commodities listed in tables 2 and 3.

Table 1.—Australia: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Metals:					
Aluminum:					
Bauxite	16,232	30,021	r 359,891	854,606	1,176,372
Alumina	29,941	34,349	47,094	160,659	202,446
Refined metal	13,416	16,460	41,925	80,292	87,764
Antimony, metal content	120	67	75	277	34
Beryl	311	227	112	112	13
Bismuth (in ore) ---kilograms	410	44	-------	-------	-------
Cadmium, refined metal	316	359	494	503	536
Chromite	-------	375	163	73	NA
Cobalt (in cobalt oxide)	17	16	17	17	18
Columbium and tantalum concentrate	14	20	14	14	10
Copper:					
Ore and concentrate (content)	97,161	108,689	r 114,780	r 106,322	92,776
Blister (primary)	63,500	88,739	89,912	82,483	75,345
Refined (primary)	64,748	80,725	85,734	83,568	64,460
Gold ---troy ounces	1,076,292	1,068,837	1,023,970	963,834	877,139
Iron and steel:					
Iron ore ---thousand tons	5,428	4,921	5,603	r 5,760	6,750
Pig iron ---do	3,210	3,489	3,658	4,050	4,291
Ferroalloys: [1]					
Ferrochromium, high carbon	716	580	1,112	2,480	1,358
Ferro and silico manganese	2,448	22,393	38,937	47,297	56,901
Ferrosilicon	8,275	7,557	8,435	5,095	4,475
Steel ingots and castings thousand tons	3,947	4,234	4,650	r 5,098	5,527
Steel semimanufactures [1] ---do	2,374	2,716	2,869	3,606	NA
Lead:					
Ore and concentrate (content)	273,987	376,050	416,876	381,999	360,868
Refined (primary)	164,868	193,177	228,210	206,360	196,409
Bullion, for export	48,862	74,283	81,956	79,561	67,981
Manganese ore, all grades	88,814	72,796	r 36,640	62,097	99,914
Selenium ---kilograms e	1,360	1,590	1,590	1,590	2,380
Silver:					
Ore and concentrate (content) thousand troy ounces	13,059	17,554	19,642	r 18,427	16,713
Refined ---do	7,099	7,378	r 8,887	9,258	8,502
Tin:					
Ore and concentrate (content) long tons	2,745	2,715	r 2,860	3,638	3,803
Smelter ---do	2,546	2,704	2,626	3,045	3,143
Titanium concentrates:					
Ilmenite	169,071	r 181,738	r 204,209	r 308,668	456,937
Rutile	103,059	121,108	r 186,201	r 182,925	218,401
Tungsten ores and concentrates (WO_3 content)	1,561	1,059	975	1,012	1,195
Uranium oxide (U_3O_8) e	1,422	1,247	1,101	382	335
Zinc:					
Ore and concentrate (content)	316,151	342,949	357,111	350,131	351,160
Smelter	140,920	170,623	182,662	188,508	202,183
Zirconium concentrate	138,651	135,991	r 187,797	183,942	215,002
Nonmetals:					
Asbestos:					
Chrysotile, fibre and fines	879	839	748	1,572	1,138
Crocidolite	14,313	15,868	11,385	10,954	9,428
Barite	19,525	12,735	8,352	r 12,499	10,515
Cement ---thousand tons	2,858	2,933	3,119	3,626	3,802
Clays:					
Bentonite and bentonite clay	908	797	1,555	1,015	NA
Brick clay and shale thousand tons	4,414	4,453	r 4,622	5,248	e 5,800
Cement clay and shale ---do	191	316	225	282	NA
Fire clay ---do	205	200	r 208	225	NA
Kaolin and ball clay ---do	52	37	r 45	41	NA
Stoneware and tile clay ---do	312	343	423	494	NA
Other ---do	164	30	96	12	NA
Diatomite	5,504	7,429	5,927	r 8,872	e 2,300
Feldspar	8,341	8,650	8,984	r 9,157	e 8,200
Fertilizer materials: Phosphate rock	4,952	4,455	5,004	r 5,780	e 6,000
Fluorspar	-------	-------	15	-------	-------
Fuller's earth	153	398	276	162	NA
Gem stones ---value, thousand US$	e 1,880	e 2,432	e 2,922	e 3,469	NA
Gypsum	619,696	r 641,036	698,350	799,126	e 860,000
Limestone, including shell and coral thousand tons	6,245	6,479	6,650	7,267	e 7,600
Lithium, minerals [2]	127	137	r 439	264	315
Magnesite	100,381	63,189	57,860	r 31,752	e 25,000

Table 1.—Australia: Production of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965 p
Nonmetals—Continued					
Mica:					
Scrap	84	-------	7	14	-------
Damourite clay	516	493	500	r 576	e 580
Monazite concentrate	1,572	827	r 2,024	r 2,073	2,341
Pyrites, including cupreous pyrites	216,848	150,950	197,158	r 223,524	212,354
Salt ---thousand tons	517	544	592	554	NA
Talc and soapstone	15,071	15,232	r 14,167	17,369	e 19,000
Mineral fuels:					
Coal:					
Bituminous [3] ---thousand tons	24,391	24,862	25,256	27,841	31,908
Lignite ---do	16,540	17,412	18,753	19,338	21,044
Coke:					
High-temperature ---do	2,756	2,818	2,896	3,092	3,241
Low-temperature [4] ---do	777	774	r 706	r 704	70
Fuel briquets ---do	1,871	1,816	1,917	1,885	1,934
Natural gas ---million cubic feet	12	56	96	106	144
Petroleum:					
Crude thousand 42-gallon barrels	-------	-------	-------	r 1,491	2,614
Refinery products:					
Gasoline ---do	34,347	35,089	35,089	40,809	43,901
Kerosine and jet fuels---do	3,537	3,448	3,673	4,459	4,224
Distillate fuel oil ---do	19,319	19,077	20,369	19,549	20,095
Residual fuel oil ---do	25,067	28,582	32,151	33,493	34,580
Lubricants ---do	152	106	551	1,400	1,805
Other products ---do	5,194	5,285	4,767	5,366	7,523
Refinery fuel and loss---do	6,442	8,398	9,435	9,809	11,441
Total ---do	94,058	99,985	106,035	114,885	123,569

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Ferroalloys and steel semimanufactures are reported for fiscal years ending Nov. 30.
[2] Petalite, amblygonite, and spodumene.
[3] Includes semianthracite and subbituminous.
[4] Year ended June 30 of year stated.

Table 2.—Australia: Exports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1963–64	1964–65	Principal destinations, 1964–65
Metals:			
Aluminum:			
Bauxite	236,800	518,144	Japan 314,244; West Germany 182,182.
Scrap	364	598	Japan 353; West Germany 149.
Unwrought	5,271	22,313	United States 8,516; United Kingdom 5,414.
Semimanufactures	262	643	New Zealand 205; Philippines 141.
Beryllium ore and concentrate	118	87	All to United States.
Cadmium, refined metal [2]	372	380	United Kingdom 260; United States 56.
Copper:			
Ore and concentrate, gross weight	40,053	46,611	Japan 46,566.
Blister, cement, etc	989	169	Japan 107; Sweden 62.
Scrap	1,999	905	Japan 744; West Germany 97.
Ingots, blocks, billets	25,691	2,171	Japan 2,014; Netherlands 124.
Semimanufactures	3,971	3,304	New Zealand 3,171; Philippines 33.
Pipe, tubes, and wire	1,684	1,369	New Zealand 1,080; Ghana 132.
Gold:			
Ore and concentrate, content [3] troy ounces	r 50,683	49,869	NA.
Crude bullion, content---do	562	157	New Zealand 127; Fiji 30.
Mint bullion ---do	449,003	576,575	Hong Kong 576,460; United States 100.
Sheet, strip, dust ---do	7,680	8,274	New Zealand 7,890; Fiji 219.
Iron and steel:			
Iron ore and concentrate	12,397	98,202	Japan 97,894.
Iron pyrites and cinder	108,428	75,098	All to Japan.
Scrap	357,258	374,404	Japan 349,763; Taiwan 13,897.
Pig iron	74,219	60,672	Japan 18,827; New Zealand 8,620; West Germany 8,238.
Steel ingots, blooms, slabs, etc	79,088	17,122	United Kingdom 14,423; Argentina 2,033; Japan 556.
Steel semimanufactures	368,571	347,979	Mainly to New Zealand.

See footnotes at end of table.

Table 2.—Australia: Exports of metals and minerals [1]—Continued
(Metric tons unless otherwise specified)

Commodity	1963–64	1964–65	Principal destinations, 1964–65
Metals—Continued			
Lead:			
Ore and concentrate, gross weight	120,379	103,569	United States 43,398; Japan 25,643.
Refined, unwrought	171,747	153,637	United Kingdom 84,906; United States 36,913.
Bullion, lead and silver-lead	84,669	59,156	United Kingdom 36,857; Netherlands 7,619.
Semimanufactures	9,100	5,570	New Zealand 1,423; United States 1,079.
Manganese ore	27,593	55,615	Japan 52,444; West Germany 3,138.
Platinum-group metals:			
Ore and concentrate, gross weight [4] kilograms	1,865	2,123	All to United Kingdom.
Platinum metals [4]—troy ounces	548	1,262	United Kingdom 1,060; West Germany 143.
Silver:			
Ore, concentrate, crude bullion, content [3]—thousand troy ounces	8,101	8,305	NA.
Mint bullion—do	4,537	1,367	Undisclosed 985; United Kingdom 214; France 164.
Sheet, strip, dust—do	33	92	New Zealand 89; United Kingdom 3.
Tantalite-columbite concentrate	20	48	United Kingdom 39; United States 8.
Tin:			
Ore and concentrate, gross weight—long tons	34	1,254	United Kingdom 1.194; Spain 30.
Unwrought—do	6	39	All to United Kingdom.
Titanium concentrates:			
Ilmenite, minimum 45 percent TiO_2	226,011	280,316	United Kingdom 160,830; Japan 50,065.
Rutile, minimum 90 percent TiO_2	159,791	245,548	United States 136,940; United Kingdom 19,812.
Tungsten concentrates:			
Scheelite	1,062	1,753	United Kingdom 584; West Germany 427.
Wolframite	483	367	United Kingdom 139; United States 81.
Zinc:			
Ore and concentrate, gross weight	231,256	206,317	United Kingdom 150,928; Belgium-Luxembourg 21,842.
Ingots, blocks, slabs, etc	84,874	86,016	United Kingdom 27,529; India 26,544.
Semimanufactures	1,984	2,228	Malaysia 763; India 712.
Other forms	138	135	Japan 50; New Zealand 47.
Zircon concentrate, minimum 30 percent $ZrSiO_4$	185,943	216,382	United States 57,350; Japan 28,866.
Nonmetals:			
Abrasives:			
Industrial diamond [4]—carats	100,639	70,573	United Kingdom 29,248; United States 25,565.
Other natural abrasives	16	82	New Zealand 50.
Asbestos:			
Crocidolite	3,838	NA	
Other, amphibole and chrysotile	5	NA	
Cement, construction types	6,095	3,956	Christmas Island 1,880; Gilbert and Ellice Islands 753.
Clay, fire, sillimanite and others	1,632	1,990	New Zealand 1,072; Japan 658.
Gem stones:			
Diamond [4]—carats	1,357	3,006	Belgium-Luxembourg 1,524; United Kingdom 687.
Opal [4]—value, thousand US$	6,427	5,551	Japan 3,017; Hong Kong 1,222.
Other, cameo, intaglio—do	344	430	United Kingdom 179; France 72.
Graphite	4	20	NA.
Gypsum	183,925	169,228	New Zealand 109,498; Philippines 18,118.
Magnesite	743	2,614	France 1,419; United States 900.
Mica, crude	32	33	New Zealand 31; Fiji 2.
Monazite concentrate	2,325	2,172	United States 1,209; France 613.
Salt	109,070	113,463	Japan 94,829; New Zealand 14,229.
Stone, construction—value, thousand US$	7	13	New Zealand 4; undisclosed 9.
Talc and steatite	5,166	5,135	West Germany 1,602; New Zealand 1,135.

Table 2.—Australia: Exports of metals and minerals [1]—Continued
(Metric tons unless otherwise specified)

Commodity	1963–64	1964–65	Principal destinations, 1964–65
Mineral fuels:			
Coal ——thousand tons—	3,866	6,160	Japan 5,756; New Caledonia 213.
Coke and semi-coke ——	80,707	108,463	New Caledonia 76,921; New Hebrides 18,132.
Petroleum refinery products:			
Gasoline, total thousand 42-gallon barrels ——	1,861	483	New Zealand 415; Malaysia 40.
Kerosine and jet fuel ——do——	292	507	New Zealand 290; Malaysia 103.
Distillate fuel oil ——do——	3,819	1,891	New Zealand 984; United Kingdom 189.
Residual fuel oil ——do——	7,923	5,369	Malaysia 3,228; Japan 1,253.
Lubricants ——do——	426	461	Republic of South Africa 218; New Zealand 176.
Other products ——do——	54	98	Mainly to New Zealand.

NA Not available.
[1] Periods shown are fiscal years July 1 to June 30.
[2] Data not available on quantities of cadmium exported in lead and zinc concentrates.
[3] Quantities given are for 1963 and 1964 calendar years, respectively.
[4] Includes reexports.

Table 3.—Australia: Imports of metals and minerals [1]
(Metric tons unless otherwise specified)

Commodity	1963–64	1964–65	Principal sources, 1964–65
Metals:			
Aluminum:			
Scrap ——	2,120	1,001	New Zealand 277; Kenya 219.
Pigs, ingots, blocks, etc ——	3,026	331	Canada 71; United Kingdom 35.
Semimanufactures ——	1,233	1,602	United Kingdom 779; Canada 163.
Pipe, tubes, powder, wire ——	1,117	1,243	United Kingdom 332; United States 321.
Antimony:			
Ore and concentrate, gross weight ——	43	21	Republic of South Africa 20; mainland China 1.
Metal ——	342	255	Mainland China 189; Netherlands 41.
Bismuth metal ——	18	11	Mainly from United Kingdom.
Chrome ore and concentrate ——	16,719	29,388	Philippines 15,535; Southern Rhodesia 8,155.
Cobalt and cobalt base alloys ——	63	51	Zambia 21; Belgium-Luxembourg 10.
Copper:			
Scrap ——	283	534	Canada 211; United States 125.
Ingots, blocks, billets ——	5,118	18,621	United States 9,480; East Germany 6,295.
Semimanufactures ——	144	2,449	United Kingdom 966; United States 696.
Pipe, tubes, powder, wire ——	r 300	506	United Kingdom 297; Canada 159.
Gold:			
Crude bullion, gold content troy ounces—	148,968	128,778	Fiji 94,410; Papua-New Guinea 28,349.
Refined bullion ——	210	1,032	Japan 549; West Germany 290.
Iron and steel:			
Ore and concentrate, includes pyritic materials ——	278,643	281,950	New Caledonia 281,508.
Scrap ——	228	535	NA.
Ferroalloys:			
Ferrochromium ——	3,245	3,358	Southern Rhodesia 1,808; Republic of South Africa 751.
Ferromanganese ——	11,859	9,728	Republic of South Africa 5,793; India 1,938.
Ferromolybdenum ——	264	185	U.S.S.R. 102; United States 56.
Ferrosilicon ——	10,348	8,727	Republic of South Africa 7,289; Canada 925.
Ferronickel ——	NA	1,378	New Caledonia 1,289; United Kingdom 88.
Other ——	3,346	1,927	Republic of South Africa 826; Southern Rhodesia 422.
Ingots, blooms, etc ——	3,500	57,339	Japan 57,165; United States 102.
Semimanufactures ——	182,426	570,390	Japan 234,217; United Kingdom 117,695.
Lead and lead base alloys ——	239	447	New Zealand 317; United Kingdom 44.

See footnotes at end of table.

Table 3.—Australia: Imports of metals and minerals [1]—Continued
(Metric tons unless otherwise specified)

Commodity	1963–64	1964–65	Principal sources, 1964–65
Metals—Continued			
Magnesium and magnesium base alloys	497	463	United States 226; Canada 160.
Manganese ore:			
Battery grade	3,471	8	NA.
Metallurgical grade	46,865	74,509	Republic of South Africa 42,443; New Hebrides 16,352.
Mercury ——76-pound flasks	1,511	2,681	Spain 1,695; Italy 335.
Nickel:			
Matte and other crude forms	84	1,432	Canada 1,422; United Kingdom 10.
Pigs, ingots, granulated	962	1,272	Canada 524; United Kingdom 567.
Bars, rods, anodes, powder	624	568	United Kingdom 382; Canada 128.
Platinum-group metals troy ounces	4,343	3,792	United Kingdom 3,379; New Zealand 201.
Silicon metal	1,594	638	Japan 339; Sweden 133.
Silver:			
Crude bullion, silver content troy ounces	102,453	89,417	Fiji 55,499; New Guinea 16,671.
Refined bullion ——do	11,546	2,807	United States 1,940; United Kingdom 800.
Tin and tin base alloys long tons	1,325	1,788	Malaysia 1,774; United Kingdom 14.
Tungsten and tungsten base alloys	35	31	United Kingdom 14; West Germany 7.
Zinc and zinc base alloys	198	278	Australia (reimport) 155; United Kingdom 95.
Nonmetals:			
Abrasives:			
Industrial diamond ——carats	512,062	416,080	Republic of South Africa 243,059; United States 69,422.
Pumice and tripoli	1,675	1,573	New Zealand 815; United States 545.
Garnet	106	130	United States 128; United Kingdom 2.
Flintstone and pebbles	1,147	1,545	Canada 848; United States 242.
Asbestos:			
Chrysotile	25,963	31,358	Canada 30,532; United States 410.
Amosite	6,722	7,756	Republic of South Africa 6,808; Mozambique 354.
Other	3,290	2,582	Canada 2,271; U.S.S.R. 105.
Barite, ground and unground	NA	2,243	Mainland China 800; United States 600.
Boron minerals, crude and concentrate	991	1,313	United States 1,294.
Cement, construction types	28,097	62,430	United Kingdom 25,944; Japan 21,285.
Clays:			
Kaolin and pottery	21,236	20,924	United Kingdom 16,332; United States 4,461.
Fire and ball	6,803	8,101	Republic of South Africa 4,202; United Kingdom 2,656.
Bentonite	12,223	15,191	United States 14,682; United Kingdom 296.
Other	9,424	12,985	United States 10,023; United Kingdom 1,405.
Cryolite, natural and synthetic	4,477	3,532	United States 3,188; Denmark 343.
Diatomite	4,652	5,882	United States 5,571; United Kingdom 291.
Fertilizer materials:			
Phosphate rock thousand tons	2,021	2,558	Australian territories 1,500; Ocean Island 555.
Nitrogenous, all types	137,092	85,481	United Kingdom 18,185; Italy 16,433.
Potassic, all types	98,226	110,773	United States 53,675; West Germany 32,076.
Mixed and other	17,562	42,198	Italy 21,484; West Germany 9,615.
Fluorspar	6,010	8,565	Republic of South Africa 5,437; United Kingdom 2,543.
Gem stones:			
Gem diamond ——carats	29,783	35,237	Belgium-Luxembourg 10,996; Republic of South Africa 10,898.
Cameos ——value, thousand US$	r 1,579	1,465	Australia reimports 881; India 158.
Graphite:			
Colloidal	131	95	Undisclosed 70; United Kingdom 25.
Flake	453	477	Ceylon 212; Malagasy 165.
Crystalline	157	176	Undisclosed 96; United Kingdom 80.
Amorphous	546	820	Ceylon 430; mainland China 159.

Table 3.—Australia: Imports of metals and minerals [1]—Continued
(Metric tons unless otherwise specified)

Commodity	1963–64	1964–65	Principal sources 1964–65
Nonmetals—Continued			
Iodine, crude	------	4	NA.
Iron oxide pigments	5,089	6,328	Spain 2,792; West Germany 1,651.
Kyanite	1,350	1,805	India 1,611; United States 194.
Lithopone	1,090	1,161	United Kingdom 593; West Germany 307.
Magnesite, crude, calcined and fused	50,857	42,342	Japan 21,456; United States 13,109.
Mica:			
Block or sheet	34	44	India 41; United Kingdom 3.
Splittings	111	143	All from India.
Ground and scrap	583	1,042	India 338; United Kingdom 170.
Phosphorus	468	887	Canada 640; United Kingdom 225.
Quartz crystals	96	44	United States 18; Brazil 1.
Salt	7,185	6,673	United Kingdom 6,316.
Sillimanite	449	341	India 187; Republic of South Africa 148.
Stone, construction----------value thousand US$	613	562	Italy 461; Sweden 26.
Sulfur, elemental	309,189	380,824	Canada 178,483; United States 137,423.
Talc, steatite and chalk	2,675	2,378	Mainland China 1,760; United States 104.
Vermiculite	2,029	2,923	Republic of South Africa 2,734.
Mineral fuels:			
Asphalt, bitumen and pitch:			
Natural minerals	1,517	494	United States 325.
Petroleum derivatives	1,636	2,242	Taiwan 1,168; Malaysia 608.
Coal tar and coal tar pitch	7,677	12,257	United States 11,785; United Kingdom 472.
Carbon and carbon black	NA	4,056	United States 2,826; United Kingdom 841.
Coal	13,022	9,429	Republic of South Africa 6,620; United States 1,583.
Coke and semi-coke	37,882	52,316	United States 38,246; Netherlands 13,750.
Peat	1,013	1,414	West Germany 1,045; Ireland 244.
Petroleum:			
Crude ----thousand 42-gallon barrels	109,014	117,986	Arabian States 64,556; Indonesia 29,675.
Refinery products:			
Gasoline ----------do----	7,321	6,635	Iran 2,088; Venezuela 1,022.
Kerosine and jet fuel do----	2,067	1,911	Malaysia 639; Indonesia 389.
Distillate fuel oil---do----	1,014	1,472	Arabian States 563; Malaysia 363.
Residual fuel oil ---do----	568	700	United States 425; Arabian States 210.
Lubricants --------do----	1,395	926	United States 504; Netherlands Antilles 196.
Petroleum turpentine do----	395	202	Iran 92; United States 56.
Other products ----do----	509	464	Indonesia 175; Arabian States 143.

r Revised. NA Not available.
[1] Periods shown are fiscal years, July 1 to June 30.

COMMODITY REVIEW

METALS

Aluminum.—All segments of the aluminum industry showed notable gains in 1965. Production of bauxite passed the million-ton mark in November, and the year's total, more than half of which was exported, was nearly 38 percent above the 1964 output. The great bulk of bauxite exports, which totaled over half a million metric tons in 1965, was shipped from the Weipa deposits on Cape York Peninsula to Japan and West Germany. In June 1965, the initial 3-year contract with Japanese interests was enlarged and extended 10 years into 1976, for a total supply of 3.5 million tons of bauxite. A new marketing company, Comalco Bauxite (Hong Kong) Ltd. has been formed by Comalco Industries Pty. Ltd. which holds 52 percent of the new firm, and the two Japanese firms, Showa Denko K.K. and Sumitomo Chemical Co. Ltd., each of which hold 24 percent. The marketing company has also undertaken to supply 2.5 million tons of bauxite for sale to Nippon Light Metal Co. Ltd. (Japanese

subsidiary of Aluminum Ltd. of Canada) beginning in 1967. Comalco Industries Pty. Ltd. mining and port facilities at Weipa will ship 2.5 million tons of bauxite annually by 1967. The Queensland Alumina Ltd. plant of Gladstone is scheduled to take 1.25 million tons per year, and approximately 600,000 tons was covered under export contracts leaving a further 600,000 tons annually available for other markets.

In Western Australia, Alcoa of Australia Pty. Ltd. plans to increase its yearly output of bauxite at Jarrahdale, in the Darling Range, from about 450,000 tons to more than 1 million tons. This will coincide with expansion underway at the company's alumina plant at Kwinana, the annual capacity of which is being increased from 210,000 to 410,000 tons. Beginning in January 1968, the increased output will be exported to Intalco Aluminium Corp. (controlled by American Metal Climax Inc.), at Bellingham, Washington, U.S.A., under a recently concluded contract that calls for 200,000 tons of alumina annually for 20 years.

The Australian Government in 1965 accepted the tender of Nabalgo Pty. Ltd., a consortium[4] of Swiss Aluminium Ltd. and eight Australian companies, to develop the bauxite deposits containing an estimated 100 million tons on the Gove Peninsula. Under the terms of the lease, Nabalgo has agreed to establish mining and to commission an alumina plant of 500,000 tons per year capacity by 1971. The total project is expected to cost about $112 million. As presently planned, the entire output will be exported to the Swiss company's smelters.

United States Metals Refining Co. Ltd., a wholly owned subsidiary of American Metal Climax, Inc., (United States) recently announced discoveries of bauxite at Kimberly in Western Australia. The company holds temporary reserves totaling 2,558 square miles south and southeast of Admiralty Gulf. Deposits are reportedly extensive and of sufficiently high grade to warrent a drilling and evaluation program.

Construction of the Queensland Alumina Ltd. plant at Gladstone, Queensland, continued throughout 1965. The plant is designed for 600,000 tons annual capacity to be completed in 1967 and ultimately to increase capacity to 1.8 million tons per year. Alumina from this plant will supply the Commonwealth Aluminium Corp. Pty. Ltd. (Comalco) smelter at Bell Bay, Tasmania, where annual ingot capacity is currently being raised from 54,000 to 71,500 tons. A part of the alumina output will be exported, and eventually alumina will be supplied to a smelter that will be built at Kurri Kurri near Newcastle, New South Wales, by Australian Aluminium Co. Ltd. (Australuco).

Australuco, a subsidiary of Aluminum Company of Canada Ltd., was the largest Australian fabricator of aluminum in 1965. Construction of the new smelter, which will have a capacity of between 30,000 and 40,000 tons of metal is expected to get underway in 1967 and production to start in 1969. The New South Wales Electricity Authority has agreed to a long-term contract to furnish the necessary electrical energy based on coal. Australuco holds bauxite leases with reserves estimated in excess of 75 million tons adjacent to Comalco at Weipa.

The 1965 outut of metallic aluminum was credited, 49,242 tons to the Comalco smelter at Bell Bay and 38,522 tons to the Alcoa of Australia Pty. Ltd. smelter at Port Henry, Victoria. Domestic consumption of aluminum in 1965 was estimated at 87,400 tons, approximately 95 percent of the existing plant capacity. Exports of unwrought and semimanufactured aluminum products totaled almost 23,000 tons in the 1964–65 fiscal year, thus achieving nearly a fourfold increase over the previous fiscal year.

Copper.—Reflecting the effect of the labor dispute at Mount Isa Mines Ltd., which began in 1964, Australia's mine output of copper in ore and concentrate fell in 1965 to the lowest level since that of 1958. The domestic copper shortage prompted the Federal Government to impose an export ban on virtually all unmanufactured copper in November 1964. With the return to full-scale operation at Mount Isa and the start of production at Cobar, New South Wales, the embargo was lifted in September. However, following the lead of United States, Canada, and Britain, an embargo was reimposed on December 20, 1965, ap-

[4] Swiss Aluminum Ltd.—50 percent, Colonial Sugar Refining Co. Ltd.—27.5 percent, Australian Mutual Provident Society—5 percent, Bank of New South Wales, Commercial Banking Co. of Sydney Ltd., Elder Smith Goldsbrough—Mort Ltd., and Mount Morgan Ltd., each 2.5 percent, Mutual Life and Citizens Assurance Co. Ltd., and Peko-Wallsend Investments Ltd., each 3.75 percent.

plicable to export of copper and copper alloy scrap and ingots, wire bars, anodes, and similar primary forms. Despite these restrictions, the Australian copper production outlook at yearend appeared bright. Producers received payments under the Copper Bounty Act 1958–65 totaling US$5,893 during the early part of 1965. In August the Australian price to producers rose above the cutoff US$761.60 per long ton, and bounty payments were suspended. The Act was extended through 1966 by legislation enacted on November 18, 1965.

The principal industrial facilities and quantities of their output in recent years are summarized in the accompanying tabulation.

The new Cobar Mines Pty. Ltd. operation at Cobar, New South Wales, started in July and by December was approaching the anticipated annual production rate of 10,000 tons contained copper. Plans call for raising output capacity to 20,000 tons by the end of 1966; however, since the mill is dependent upon rainfall for water supply, an extended dry period would constitute a threat to production. Concentrates were shipped by rail to Electrolytic Refining and Smelting Co. of Australia Pty. Ltd. at Port Kembla. Ore reserves indicated by diamond drilling prior to February 1962 amounted to 18 million tons containing 3.5 percent copper. Additional orebodies have since been proven. A technical description of the history, engineering, and general features of the Cobar development was recently published.[5]

Mount Isa Mines Ltd. treated 2.2 million tons of ore in the company year ending June 30, 1965, compared with 3.7 million in the previous period. Output of refined copper was down in 1964–65 to 40,339 tons, from 68,508 tons in 1963–64. Ore reserves as of Jnue 30, 1965, included 33.5 million tons of copper ore averaging 3.5 percent copper and 27.1 million tons of lead-zinc-silver ore containing 7.8 percent lead, 5.9 percent zinc, and 5.6 ounces of silver per ton.

Mount Morgan Ltd. milled 1.2 million metric tons of ore which yielded blister copper containing 6,631 tons of copper and 80,030 ounces of gold during the year ending June 27, 1965. Ore reserves in the opencut mine were estimated at 9.3 million tons averaging 2.34 percent copper in addition to gold and pyrite.

Mount Lyell Mining and Railway Co. Ltd. produced 12,320 tons of refined copper in the year ending June 30, 1965, from 2.2 million tons of ore. Reserves were reported at 21.4 million tons averaging 0.94 percent copper plus substantial quantities of gold, silver, and recoverable pyrite. The company is contemplating conversion from opencut to underground mining.

The several mines in the vicinity of Tennant Creek, Northern Territory, produced about 7,500 tons of copper in concentrate during the year. A new prospect, to be known as the Warrego Mine, is being developed by Peko-Wallsend Investments Ltd.

[5] Australian Mining. The Cobar Mines Story. Tait Publishing Co. Pty. Ltd., Melbourne, Victoria. V. 58, No. 5, May 16, 1966, pp. 34-59.

Table 4.—Australia: Major copper industry facilities

Facility	Production (metric tons of copper [1])		
	1962	1963	1964
Mines:			
Mount Isa Mines Ltd	75,975	74,709	68,334
Mount Morgan Ltd	7,483	8,613	7,542
Broken Hill field	3,522	3,805	3,378
Mount Lyell Mining and Railway Co. Ltd	13,408	15,598	13,737
Electrolytic Zinc-Rosebery	1,307	1,476	1,381
Ravensthorpe Copper Mines, N.L.	995	1,378	1,011
Tennant Creek field	7,639	7,714	9,269
Smelters:			
Mount Isa Mines Ltd	65,534	65,655	58,223
Mount Morgan Ltd	7,811	8,163	7,534
Electrolytic Refining and Smelting Co. of Australia Pty. Ltd.—Port Kembla	3,287	1,805	2,271
Mount Lyell Mining and Railway Co. Ltd	13,106	14,290	14,455
Refineries:			
Mount Isa Mines Ltd	57,664	64,812	61,507
Electrolytic Refining and Smelting Co.—Port Kembla	11,156	10,632	10,455
Mount Lyell Mining and Railway Co. Ltd	11,905	12,053	11,606

[1] Metal content of ore for mines, blister copper for smelters, and electrolytic for refineries.

about 50 miles south of the main operations at Tennant Creek. The new mine is to be equipped for underground operation beginning in 1970 or 1971 at an annual rate of 400,000 tons of ore. Reserves delineated by diamond drilling are estimated at 3 million tons of 2.6 percent copper with a small gold content.

Copper exports in 1965 included 46,859 tons of concentrate, the bulk of which went to Japan, 5,949 tons of copper matte to Belgium-Luxembourg, 2,149 tons of blister to Japan, and 11,891 tons of refined copper mostly to Europe. Apparent domestic consumption of refined copper totaled 85,958 tons of which 34,258 tons were derived from secondary sources.

Gold.—Mine output of gold in 1965 continued the downtrend that began nearly 10 years ago, and was 9 percent below the 1964 level. Western Australia, dominated by the production from the Kalgoorlie field contributed 74.8 percent, Northern Territory 9.7 percent, Queensland 8.6 percent, and other States 6.9 percent of the 1965 national total.

Federal aid to the gold mining industry in 1965 amounted to US$2,223,000, compared with US$1,548,000 in 1964. The bulk of the 1965 payments (US$2,100,000) came under the Gold Mining Industry Assistance Act 1954–65, and the balance comprised assistance under Gold Mines Development Assistance Act 1962. Both acts expired on June 30, 1965. A 5-year extension and amendment of the former was effected in July 1965 with passage of the Gold Mining Industry Assistance Act 1965 which retains basic features but moderately liberalizes conditions and increases the rates of payments. The Development Assistance Act has not been renewed.

By source material, gold output of Australian mines and refineries in recent years was as follows:

Source material	Troy ounces		
	1963	1964	1965 e
Mines:			
Bullion [1]	895,202	811,003	751,772
Copper ore and concentrate	91,742	116,468	90,925
Lead concentrate	13,820	12,395	11,018
Lead-copper concentrate	18,820	19,271	19,247
Zinc concentrate	4,386	4,697	4,177
Total	1,023,970	r 963,834	877,139
Refineries:			
Newly won gold [2]	958,381	892,726	820,491
Scrap	20,404	19,282	24,449
Imported, including scrap	161,373	141,458	148,434
Total	1,140,158	1,053,466	993,374

e Estimate. r Revised.
[1] Includes alluvial and retorted gold.
[2] Gold content recovered from minerals produced in Australia.

According to Commonwealth Bureau of Census and Statistics data for 1964, the Australian gold mining industry employed an average of 4,753 workers in 246 mines (compared with 5,287 workers in 257 mines in 1963). In Western Australia 4,357 workers were employed in 148 mines. The principal companies, all in Western Australia, and their scale of operation in 1964 were as follows:

Company	Location	Ore treated (long tons)	Gold produced (troy ounces)	Average number of employees
Central Norseman Gold Corp	Norseman	181,184	100,340	338
Gold Mines of Kalgoorlie (AUS) Ltd	Fimiston and Kalgoorlie	704,369	146,366	816
Great Boulder Gold Mines Ltd	Fimiston	425,292	111,415	687
Hill 50 Gold Mine	Mt. Magnet	185,232	69,554	243
Lakeview and Star Ltd	Fimiston	683,488	165,435	913
Moonlight Wiluna Gold Mines Ltd	Mt. Ida	29,353	14,386	66
North Kalgurli (1912) Ltd	Fimiston	379,630	82,602	468

Refinery production of new gold of Australian origin during 1965 was 820,491 ounces. In addition, 148,240 ounces of newly mined gold was refined from foreign sources, mostly Fiji and Papua-New Guinea and 24,643 from domestic and imported scrap. Total refinery output was 993,374 ounces in 1965, compared with 1.05 million ounces in 1964 and 1.14 million ounces in 1963. Domestic industrial consumption in 1965 was estimated at 94,611 ounces, compared with 77,580 ounces in 1964 and 61,042 ounces in 1963.

Iron and Steel.—The Australian iron and steel industry continued expansion in 1965 with iron ore production up 17 percent, pig iron up 7 perecnt, and steel up 8 percent from the 1964 levels. With the exception of 40,958 tons of pig iron produced by the small State-owned blast furnace plant at Wundowie, in Western Australia, the Australian iron and steel industry is a monopoly of the Broken Hill Pty. Co. Ltd. (BHP) group of companies which operate an integrated network of mines and plants. BHP set new records in 1965, with pig iron production of 4,248,783 tons and ingot steel production of 5,487,605 tons.

Iron Ore.—During the company year ending May 30, 1965, output of iron ore from the BHP open pit mines near Whyalla, South Australia, totaled 4,501,474 tons. In addition, 1,496,602 tons were shipped from Cockatoo and Koolan Islands in Yampi Sound, Western Australia, to blast furnaces and steel plants at Port Kembla and Newcastle in New South Wales.

Negotiations for exports and preparations for exploiting the vast iron ore resources of Western Australia and Tasmania have continued through 1965. As of December, eight contracts had been arranged with Japanese steel mills involving future deliveries totaling 334.2 million tons of ore and pellets valued at US$3.37 billion. Capital expenditures related to these projects were estimated in excess of US$590 million of which US$486 million will be spent in Western Australia, approximately US$90 million in Tasmania, and the remainder in Northern Territory. Aside from the establishment of the mines and townsites, there will be three pellet plants, about 625 miles of standard gage rail lines, and four new seaports capable of handling 60,000-ton and larger vessels. Operating companies and contract features as of December 20, 1965, are summarized as follows:

State and operating company	Area	Shipments		Ore		Capital (million US$)
		Start	Years	Million metric tons	Percent Fe	
Western Australia:						
Cliffs Western Australian Mining Co. Pty. Ltd	Robe River	April 1868	21	72.5	[1] 64	125.4
Goldsworthy Mining Pty. Ltd	Mt. Goldsworthy	April 1966	7	16.8	64	56.0
Hamersley Iron Pty. Ltd	Mt. Tom Price	August 1966	16	87.9	[1] 53–64	141.1
Mount Newman Iron Ore Co. Ltd	Mt. Newman	April 1969	22	101.7	64	156.8
Western Mining Corp. Ltd	Koolanooka	March 1966	8	5.2	60	6.7
Tasmania:						
Pickands Mather & Co. International	Savage River	Early 1968	20	45.7	[1] 67.5	89.6
Northern Territory:						
Frances Creek Iron Mining Corp. Pty. Ltd	Frances Creek	Late 1966	8	3.0	63	7.4
Morgan Mining and Industrial Co. Pty. Ltd	Mt. Bundy	Early 1967	7	1.4	62	NA

NA Not available.
[1] Includes pellets.

Source: Bureau of Mineral Resources, Geology and Geophysics. The Australian Mineral Industry. V. 18, No. 2, Quarterly Review, December 1965, p. 22.

Adhering to contract schedules, Goldsworthy Mining Pty. Ltd. and Western Mining Corp. Ltd. initiated export shipments from Port Hedland and Geraldton Harbor, respectively, early in 1966. During 1965 Hamersley Iron Pty. Ltd. announced plans to construct a pelletizing plant and to supply Japanese mills with 16 million tons of pellets beginning in 1968.

The Cliffs Western Australian Mining Co. Pty. Ltd. contract was signed in August to supply 72.5 million tons of pellets over 21 years beginning in 1968. This company's leases adjoin the Deepdale project being

developed by Broken Hill Pty. Co. in the Robe River area of Western Australia. The mines will be worked separately but the two companies have agreed to share pelletizing, rail transportation, and port facilities at Cape Preston.

A contract to develop the Savage River iron ore deposit in Tasmania was finalized by Pickands Mather & Co. International and Mitsubishi (Aust.) Pty. Ltd. on December 9, 1965. Port Latta on the northwest coast near Brickmakers Bay has been selected for development as the shipping port. The ore will be upgraded, slurried, and transported about 60 miles by pipeline to a pellet plant that will be constructed at Port Latta. Output at a rate of 2 million tons per year is expected to begin early in 1968.

Pig Iron and Steel.—The new BHP steel plant at Whyalla, South Australia, was officially opened on May 6, 1965; however, the basic oxygen unit had commenced operations in February at a limited rate of approximately 300,000 tons per year. The new (No. 2) blast furnace was blown-in in October. With both blast furnaces and other facilities at full operation, the Whyalla capacity is expected to reach 1 million tons annual capacity in the second half of 1966. In Western Australia, construction of the integrated steelworks at Kwinana was well ahead of schedule.

A US$90 million expansion program at the Port Kembla works of Australian Iron and Steel Pty. Ltd. was announced by the parent BHP company in July. A new blast furnace (No. 5) with annual capacity in excess of 1 million tons and new plate and hot strip mills will be added, raising the flat rolled product capacity from 2 million to 4.5 million tons per year. The new facilities are scheduled for completion in 1967–68. The long range US$200 million expansion plans for Port Kembla include new coke ovens, steel furnaces, rolling mills, and additions to the tinplate plant that will make Port Kembla one of the world's major producing centers for flat products.

The State of Western Australia early in 1966 assigned management of its Wood-Distillation, Charcoal Iron and Steel Industry at Wundowie, to the privately owned Australian National Industries Ltd. (ANI). The company has been given a 10-year option to purchase the plant.

Production of ingots and steel products by Broken Hill Pty. Ltd. and its subsidiaries (Australian Iron and Steel Pty. Ltd. and Commonwealth Steel Co. Ltd.) was reported as follows for the fiscal years ending May 31:

Commodity	Thousand metric tons	
	1964	1965
Steel ingots	4,822	5,190
Blooms and slabs	4,143	4,586
Sheets, bars, billets, etc.	2,213	2,354
Plate and strip	1,618	1,936
Merchant	1,393	1,401
Rod	302	376
Narrow cold-rolled strip	69	76
Tinplate	202	229
Steel castings	11	[1]12
Iron castings	135	[1]120

[1] Data for calendar year.

Lead and Zinc.—Although mine production of both lead and zinc in 1965 fell below the peaks attained in 1963, only lead output declined in 1965 compared with that of 1964. Output of refined primary lead and lead bullion followed the same trend, dropping 5 percent and 15 percent respectively below the 1964 levels. Slab zinc production in 1965 at over 202,000 tons was the highest annual ouput to date, 7 percent above that of 1964.

According to 1964 data, the most recent available, the lead-zinc-silver mining industry included 20 mines worked by 7,811 employees. Substantially more than half of the activity is in New South Wales which had a total of 13 mines with 4,288 employees. The majority of these were localized in the vicinity of Broken Hill. By principal company producers, mine output of lead and zinc for the 1962–64 years was as follows:

Mine	Metric tons					
	1962		1963		1964	
	Lead	Zinc	Lead	Zinc	Lead	Zinc
North Broken Hill Ltd	57,556	47,235	74,649	60,565	70,634	57,375
Broken Hill South Ltd	36,704	31,168	37,620	31,444	36,053	30,502
The Zinc Corp. Ltd	108,285	81,093	122,362	86,469	101,594	76,801
New Broken Hill Consolidated Ltd	92,830	86,303	98,920	91,423	92,097	95,038
Mount Isa Mines Ltd	63,648	45,421	67,821	37,901	62,920	38,180
Electrolytic Zinc Co. of Australasia Ltd	14,365	48,687	14,692	49,267	15,180	50,955

Reflecting the effect of the strike that lasted from August 28, 1964, to February 17, 1965, production at Mount Isa fell to 42,603 tons of lead bullion and 21,080 tons of zinc in concentrates during the company year ending June 30, 1965. Comparative output for the previous fiscal year amounted to 60,353 tons of lead and 26,171 tons of zinc. Normal operations were not resumed until the end of May 1965. During the strike, construction contracts related to the expansion program were suspended, deferring to March 1966 completion of the new No. 2 concentrator, which will raise daily treatment capacity from 14,600 to 16,300 tons.

In 1964, the Sulphide Corp. Pty. Ltd. smelter at Cockle Creek, New South Wales, produced 23,685 tons of lead bullion, 858 tons of lead in copper-lead dross, and 49,047 tons of refined zinc. During the 1964 calendar year, Mt. Isa Mines Ltd. smelter recovered 59,961 tons of lead in bullion and copper-lead dross. The Broken Hill Associated Smelters Pty. Ltd. smelter at Port Pirie produced 210,975 tons of lead (of which 4,615 tons were secondary). This company is currently building an electrolytic zinc plant to recover about 30,000 tons of zinc annually from lead slag dumps containing an estimated 1 million tons of recoverable zinc. Production of zinc from this source is expected to begin in 1966. The Electrolytic Zinc Co. of Australasia Ltd. smelter at Risdon, Tasmania, reported production of 139,462 tons of refined zinc in 1964.

Developments of interest to the lead-zinc industry included discovery of large pyritic copper-zinc orebodies in the lower levels of the Broken Hill South Ltd. copper mine at Cobar, New South Wales, and activities of the Mount Isa Mines Ltd. subsidiary, Carpentaria Exploration Co. Pty. Ltd., in the McArthur River area of Northern Territory. This discovery, which is being explored by diamond drilling and geophysical testing, has revealed very large, medium-grade lead-zinc deposits.

Domestic consumption of lead and zinc in 1961–64 was as follows:

	Metric tons			
	1961	1962	1963	1964
Lead:				
Primary, domestic origin	26,700	r 27,000	r 42,800	42,300
Primary, imported	3,600	3,600	1,600	100
Secondary	16,800	14,900	14,600	15,000
Total	47,100	45,500	59,000	57,400
Zinc [1]:				
Primary, domestic origin	77,500	83,400	93,300	109,400
Primary, imported	1,200	2,700	300	100
Total	78,700	86,100	93,600	109,500

r Revised.
[1] Sales. Secondary not reported.

Manganese Ore.—Domestic production of manganese ore, the bulk of which has been from mines in Western Australia, has ranged from a high of 91,415 tons in 1959 to 36,640 in 1963. The sharp rise to over 62,000 tons in 1964 and to nearly 100,000 tons in 1965 was in large measure a result of the easing of Federal export restrictions concurrently with growth in world demand. The Government action was due largely to the development of ample reserves, unofficially estimated in excess of 100 million tons on Groote Eylandt, in the Gulf of Carpentaria. The deposits are presently under development of BHP Co. Ltd. through its subsidiary Groote Eylandt Mining Co. Pty. Ltd. Under the terms of the special mineral lease the company was required to establish facilities for minimum annual output of 70,000 tons. Reportedly, developments have actually advanced enough to anticipate annual productive capacity of 200,000 tons by mid-1966. The first shipment for Bell Bay, Tasmania, was made in March 1966. The ore is to be used by Tasmanian Electro-Metallurgical Co. Pty. Ltd. (Tempco), wholly owned by BHP Co. Ltd. Tempco's ferromanganese production capacity is being increased to about 80,000 tons per year to supply about 40,000 tons for local consumption and the remainder for export. Direct shipment of ore from Groote Eylandt to Japanese markets is also the subject of contract negotiations.

Nickel.—Two nickel prospects in Western Australia have recently attracted considerable attention as potential producers. At Kambalda, about 30 miles south of Kalgoorlie, Western Mining Corp. Ltd. has been conducting geophysical surveys and diamond drilling a contract zone containing nickel sulfide minerals in an area 13 miles in circumference. Core intersections have shown vein widths up to 16 feet with analyses ranging from 1.8 to 8.3 percent nickel. Immediate underground development is scheduled. Several other companies have applied for leases adjoining those held by Western Mining Corp. Ltd.

The second prospect is near Wingelinna close to the common boundary of Western Australia, Northern Territory, and South Australia. Nickeliferous laterites and ochres containing garnierite (an important ore of nickel) were discovered in 1953 and extensively investigated by South Western Mining Ltd. Recent activities have resulted from affiliation with International Nickel Southern Exploration Ltd., a subsidiary of the International Nickel Company of Canada Ltd. Several orebodies have been explored in the extensive area held under lease. A preliminary estimate of indicated reserves has been put at 30 million tons averaging 1.7 percent nickel, with an additional 70 million tons inferred. Early in 1966 some 500 tons of Wingelinna ore was shipped to Canada for pilot plant tests by International Nickel Co. Plans to establish a nickel smelter near the mines, at a cost of US$110 million, are being considered. It has been suggested that natural gas from the new Mereenie field, 230 miles to the east in Northern Territory, could supply smelter fuel.

Silver.—In 1965 mine output of silver, again reflecting lower production of gold and base-metal ores with which it is coproduced, was nearly 10 percent below the 1964 output and the lowest total since that of 1961. However, the downtrend is expected to be reversed in the near future. Output from the new copper mine at Cobar, from the increased milling capacity at Mount Isa and New Broken Hill Consolidated Ltd., and from the treatment of zinc slag dumps by Electrolytic Zinc Co. of Australasia Ltd. is expected to add several million ounces annually during the years 1966-70.

In 1964 the great bulk of Australia's mine production of silver was by the following companies (in troy ounces): Mount Isa Mines Ltd.—5,511,055; North Broken Hill Ltd.—3,911,832; Broken Hill South Ltd.—1,868,204; Zinc Corp. Ltd.—2,419,333; New Broken Hill Consolidated Ltd.—2,373,063 and the Read-Rosebery mine—1,676,080.

Production of refined silver by the smelters at Port Pirie and Port Kembla was 7.9 million and 1.1 million ounces respectively in 1964. The Australian Mints at Melbourne[6] and Perth recovered a total of 239,049 ounces silver from refining of doré gold bullion.

Source materials from which silver production has been recovered in recent years were as follows:

Source material	Thousand troy ounces			
	1961	1962	1963	1964
Mines:				
Copper ore and concentrate	668	844	910	914
Lead ore and concentrate	10,695	14,792	16,835	15,485
Lead-copper concentrate	799	995	942	1,048
Zinc concentrate	679	698	731	725
Gold bullion, etc	218	225	224	255
Refineries:				
Smelter products	6,903	7,130	8,659	9,019
Mint, doré bullion	197	249	228	239

Details of Australian consumption of silver for industrial purposes are not available. As a result of greatly reduced requirements for coinage, domestic sales of refined silver in 1964 totaled 4,642,320 ounces compared with 7,810,943 in 1963.

Tin.—Production of tin in concentrates and refinery output rose slightly in 1965, despite drought conditions that curtailed operations at several of the small operations. According to 1964 data compiled by the Commonwealth Bureau of Census and Statistics, the tin mining industry included

[6] The Melbourne Mint ceased operation in August 1964 when facilities were transferred to Canberra. Silver materials formerly handled by the Melbourne Mint are currently treated at the Perth Mint and by Englehard Industries, Pty.

371 mines, of which 330 were classed as small, employing fewer than 4 persons. Of the total 1,494 workers engaged in tin mining, 787 were employed in the 11 mines that employed 21 or more persons. Alluvial dredging operations in Queensland and Tasmania in the past have provided the bulk of Australian tin. However, increased production from opencut mines in New South Wales and Western Australia as well as from new mines in Queensland and Tasmania is expected to shift the emphasis to hard rock sources in the years 1967–70.

Principal mine producers of tin concentrate and quantities of contained tin produced in 1963 and 1964 were as follows:

Area and company	Location	Long tons	
		1963	1964
New South Wales:			
Ardlethan Tin Co. N.L	Ardlethan	37	196
Tullabong Syndicate Ltd	Condoblin	e 145	229
Queensland:			
Ravenshoe Tin Dredging Ltd	Battle Creek and Nettle Creek	396	443
Tableland Tin Dredging N.L	Smith Creek	354	678
Tasmania:			
Aberfoyle Tin N.L	Rossarden	480	422
Renison Associated Tin Mines N.L	Renison Bell	227	300
Storeys Creek Tin Mining Co. N.L.	Gladstone	49	57
Endurance Tin Mining Co. N.L	Mount Cameron	76	42
Western Australia:			
Mineral Concentrates Pty. Ltd	Moolyella	127	107
H. V. Leonard	----do	67	39
Cooglegong Tin Pty. Ltd	Pilbara	68	126
J. A. Johnston	Eleys	63	88

e Estimate.

Developments in the tin mining industry during 1965 included start of operations near Irvinebank, Queensland, by Loloma Mining Corp., and at Greenbushes, Western Australia, by Greenbushes Tin N.L. The Ravenshoe dredge at Battle Creek, in northern Queensland, was dismantled and transferred to Nettle Creek during February–March 1965, and although operational conditions and adverse weather conditions were experienced at the new location, the company produced 629 tons of concentrates containing 443 long tons of tin.

Most of Australia's output of tin concentrate has been smelted by Sydney Smelters Pty. Ltd. (a subsidiary of the Patino Mining Corp. of Canada) and O. T. Lempiere & Co. Ltd., both in Sydney, New South Wales. Because of technical difficulties associated with treatment, concentrate produced at Ardlethan, New South Wales, have been exported to foreign smelters.

Domestic consumption of primary tin was estimated at 4,425 long tons in 1965, compared with 4,575 tons in 1964. Approximately 54 percent of the year's output was used in production of tinplate, the remainder in solder and other alloys.

Titanium.—Continued expansion in the beach sands industry resulted in an increase of 37 percent in output of ilmenite and rutile concentrates in 1965.

Shipments of ilmenite concentrate from five west coast producers accounted for the year's record output of nearly 457,000 tons. The increase was due largely to the recently completed expansion of Western Mineral Sand Pty. Ltd. at Capel. By mid-1965 Western Titanium N.L. had increased production capacity at Capel to about 162,000 tons per year. A new bulk-loading facility at Bunbury, designed to handle 860 tons per hour, was commissioned early in 1965. Consolidation of Ilmenite Minerals Pty. Ltd. and Cable (1956) Ltd., two west coast producers, was recently announced by Kathleen Investments (Australia) Ltd.

The beach sands industry of the east coast, comprising 12 companies, has accounted for the bulk of Australia's output of rutile concentrate. Associated Minerals Consolidated Ltd., the largest Australian producer, operated at an annual rate of 50,000 tons of rutile and 55,000 tons of zircon concentrates throughout 1965. The company recently opened a new dredge-concentrator operation at Big Swan Bay, in the Port Stephens area, and a new separation plant (of 27,500 tons annual capacity) at Hexham, near Newcastle, both in New South Wales. Queensland Titanium Mines Pty. Ltd. also commissioned a new separation plant at Tin Can Bay, Queensland, late in 1965. The North Stradbroke

Island works of Titanium & Zirconium Industries Pty. Ltd. was increased in 1965, and Consolidated Rutile Ltd. is constructing a 30,000 ton-per-year plant that is scheduled for completion in 1966. Murphyores Inc. Pty. Ltd. has undertaken a US$4.5 million project to develop ilmenite-zircon beach sands in the vicinity of Gladstone, Queensland.

While the great bulk of Australia's output of titanium concentrates as well as by-produced zircon and monazite concentrates are exported under long-term contracts, domestic industries absorb small quantities of rutile and ilmenite. Consumption of rutile, mainly as a coating for welding rods, was estimated at about 1,700 tons, and pigment manufactures took about 50,000 tons of ilmenite in 1964.

NONMETALS

Asbestos.—Australian production of asbestos fell to less than 10,600 tons in 1965, the lowest in many years. Although 15 or more asbestos deposits have been worked in Western Australia, New South Wales, and South Australia, most of the operations have been small. The principal producer has been Australian Blue Asbestos Pty. Ltd. (subsidiary of Colonial Sugar Refining Co. Ltd.) located in Wittenoom Gorge, about 7 miles southwest of Wittenoom, Western Australia. Output of crocidolite (blue asbestos) from this operation totaled 9,428 tons during the year, thus representing about half of the milling plant capacity. The labor force in 1964 consisted of 340 workers.

Chrysotile production in 1965 was credited to Asbestos Mines Pty. Ltd., at Baryulgil, New South Wales, and a few hundred tons were also reported from Lionel, Western Australia.

Exploration activities have recently been conducted in asbestos areas of Western Australia by geologists of the Western Australia Geological Survey. In New South Wales, a new company, White Asbestos (Mining) Pty. Ltd., formed by United States and Australian interests is developing leases in the Barraba area. The deposits in this area are believed to have potential for more than 18 million tons of chrysotile asbestos.

Fertilizer Materials (Phosphatic).—On the basis of mid-year estimates, the 1965 production of phosphate rock, all from South Australia, was slightly above the 1964 level. To supply the growing demand, imports of phosphate rock from Nauru and Ocean Islands in the Pacific, and Christmas Island in the Indian Ocean totaled approximately 2.5 million metric tons in 1965. The value of phosphate rock ranks second only to crude oil among Australia's mineral imports. And with the forseeable exhaustion of the island reserves, the quest for domestic sources of supply has become an urgent consideration of the Federal Government. In addition to field crews of the Bureau of Mineral Resources and various State agencies, at least 13 Australian and foreign private companies were engaged in the search for phosphate sources in 1965. Most of the recent activity has been in the Canning, Carnavon, and Perth sedimentary basins of Western Australia and in the Bowen Basin in Queensland.

The phosphate rock occurrences in Rum Jungle area, Northern Territory, tested by the Bureau of Mineral Resources in 1963 and 1964 have been summarily reported to consist of 16 deposits with inferred reserves of 5 million tons averaging 10 percent P_2O_5 and 1 million tons averaging 20 percent P_2O_5. A study recently completed by an oceanography specialist[7] suggests that submarine deposits of phosphorite nodules in Australian and nearby waters[8] may justify further investigation.

Production of superphosphate was estimated at 3,785,000 metric tons in 1965, compared with 3,727,000 tons in 1964. Under the Phosphate Fertilizer Bounty Act 1963, payments to producers totaled US$25,317,109 in 1965, bringing the total for the 3 years this Act has been in force to US$52,960,075.

Gem Stones.—The reported total value of gem stones produced in 1964, the most recent year for which data are available, was US$3,468,621, compared with US$2,922,078 in 1963. Production of opals was valued at a record high of US$3,272,500 in 1964. Approximately 90 percent of this was from the Coober Pedy and Andamooka fields in South Australia; virtually all of the balance was from the Lightning Ridge field, New South Wales.

The recorded value of sapphires produced in 1964 was US$142,589. Small syndi-

[7] Dr. Tj. H. van Andel, of Scripps Institution of Oceanography, University of California.
[8] Banks off northwestern Australia, banks near the Solomon and Bismark Islands, and banks in the Coral Sea.

cates and individuals operating in the Inverell and Glen Innes Mining Divisions, New South Wales, accounted for a total of US$63,600. The largest single producer was Inverell Sapphires Pty. Ltd., whose output from the Redstone Creek locality in the Glen Innes Mining Division was valued at US$63,000. The Anakie field in Queensland yielded US$16,000.

Chrysophrase, rhodonite, and other gem stones, output reported by the State Mines Departments of Queensland and New South Wales had a combined value of US$53,532.

The Queensland Department of Mines recently published three articles of interest to the gem stone industry in the form of prospector's guides.[9]

Gypsum.—Reflecting increased demand for use in manufacture of plaster and cement, mine output of gypsum was estimated at about 860,000 tons in 1965, considerably higher than in any previous year. According to 1964 statistics, the gypsum industry comprised 38 mines or quarries employing 176 persons; however, only 9 operations employed 4 or more workers. In 1964, the latest year for which details are available, South Australia accounted for 74 percent of the total Australian output of gypsum. Victoria, New South Wales, and Western Australia contributed 12, 8 and 6 percent respectively.

An exhaustive summary of Australia's gypsum deposits and potential was published in 1965 by the Bureau of Mineral Resources, Geology and Geophysics.[10]

Domestic consumption of gypsum by principal industries in 1964 totaled 517,671 tons.

Salt.—In 1964, the most recent year for which data are available, salt production fell 6 percent below the peak established in 1963.

Solar evaporation of seawater and lake salt deposits are the basis of Australia's substantial salt industry. Although about 80 percent of the national production has been from South Australia, similar occurrences in Western Australia, Victoria, and Queensland are also productive. In 1963 an oil test well in central Queensland penetrated a deep-seated salt bed 1,544 feet thick that may eventually be exploited.

The leading producer, ICI Alkali (Australia) Pty. Ltd., in 1964 reported production of 380,221 tons, nearly 70 percent of the national total, from its solar evaporating pans at Dry Creek, South Australia. Broken Hill Pty. Co. Ltd., at Whyalla, South Australia, accounted for 51,314 tons, and Central Queensland Salt Industries Ltd., near Rockhampton, Queensland, accounted for 44,061 tons. In Western Australia, the Shark Bay Salt Pty. Ltd. reportedly had completed construction of earthworks and ship loading facilities for the 250,000-ton-per-year project at Shark Bay but had experienced difficulties due to the permeable nature of pond floors.

While details of salt consumption are not reported, total domestic apparent consumption in 1964 was estimated at 443,800 tons, compared with about 476,000 in each of the preceding years. Recorded usage by the two principal consumer industries for recent fiscal years (July 1 to June 30) was as follows:

Industry	Thousand metric tons			
	1960–61	1961–62	1962–63	1963–64
Industrial chemicals	273	263	284	303
Salt refineries	163	183	204	209

Sulfur.—Since economic deposits of sulfur are unknown in Australia, domestic production is confined to that recovered from indigenous pyrite and base metal sulfide ores and from the processing of imported crude petroleum. The principal mine sources of pyrite include Mt. Morgan Ltd., Queensland; Norseman Gold Mines Ltd., Western Australia; Nairne Pyrites Pty. Ltd., South Australia; and Mount Lyell Mining and Railway Co. Ltd., Tasmania. Smelters utilized base metal sulfide ores in sulfuric acid plants at Port Pirie, South Australia; Cockle Creek, New South Wales; and Ris-

[9] Anderson, O. Anakie Sapphire Fields. Queensland Govt. Min. J. (Brisbane, Queensland), October 1965, pp. 464–474.

Connah, T. H. Opal in Western Queensland. Queensland Govt. Min. J., January 1966, pp. 23–39.

Hutchison, G. H. Agates at Agate Creek. Queensland Govt. Min. J., November 1965, pp. 516–519.

[10] Bureau of Mineral Resources, Geology and Geophysics. Australian Mineral Industry: The Mineral Deposits. Canberra, Bull. 72, 1965, pp. 297–308.

don, Tasmania. Recovery of elemental sulfur from petroleum is effected by Petroleum Refineries (Australia) Pty. Ltd. at Altona, Victoria, and Port Stanvac, South Australia, and by Shell Refining (Australia) Pty. Ltd. at Clyde, New South Wales.

Complete details on sulfur consumption are not available; however, the great bulk of sulfur consumption was for manufacture of sulfuric acid. In 1965, output was estimated at about 1.7 million tons, a new record, 8 percent above the 1964 production. Sulfur used in manufacture of sulfuric acid has been derived from the following source materials in the 1961–64 period:

Source material	Contained sulfur, metric tons			
	1961	1962	1963	1964
Domestic:				
Pyrite concentrate	102,133	99,499	110,437	101,500
Zinc concentrate	53,264	66,391	73,216	86,820
Lead concentrate	22,800	20,572	25,039	27,658
Other materials	14,251	16,044	12,789	6,814
Imported:				
Elemental sulfur	185,484	205,912	215,614	289,000

Source: Commonwealth Bureau of Census and Statistics. Statistical Bulletin, Minerals and Mineral Products. No. 1, 1964.

MINERAL FUELS

Overall consumption of energy in Australia continued to rise in 1965. Although quantities of energy derived from both black coal and lignite increased during the 1964–65 fiscal period, the coal sector of the energy pattern fell to less than half of the total. Usage of petroleum products showed an annual increase of 10 percent and accounted for 42.6 percent of the energy used in the 1964–65 fiscal year. Noteworthy also is the entry of natural gas in the national energy picture as a result of commercial use of natural gas from the Roma Field in Queensland. The Joint Coal Board Annual Report for 1964–65 summarizes Australian consumption of primary energy by sources, in terms of standard coal equivalent (SCE), for recent fiscal years—July 1 to June 30—as follows:

Source	1962–63		1963–64		1964–65	
	Thousand metric tons SCE [1]	Percent	Thousand metric tons SCE [1]	Percent	Thousand metric tons SCE [1]	Percent
Black coal	18,948	39.3	19,918	38.3	20,482	36.8
Lignite (brown coal)	6,114	12.7	6,440	12.4	6,711	12.1
Petroleum products	19,142	39.7	21,545	41.4	23,703	42.6
Natural gas	-----	----	-----	----	4	(2)
Firewood	894	1.9	871	1.7	841	1.5
Hydropower	3,110	6.4	3,214	6.2	3,907	7.0
Total	48,208	100.0	51,988	100.0	55,648	100.0

[1] Standard coal equivalent.
[2] Less than ½ unit.

Black Coal.[11]—Production of black coal totaled nearly 32 million metric tons in 1965, a new record and an increase of 15 percent over that of 1964. Reflecting large export shipments to Japan, New South Wales production rose 16 percent to a total of 24.5 million tons in 1965. The year's output of black coal from mines in Queensland represented an annual increase of 12 percent. Exports of black coal during the calendar year 1965 totaled 7.26 million tons, of which nearly 95 percent (6.86 million tons) went to Japanese markets.

The Commonwealth Bureau of Census and Statistics reported a total of 169 underground and 10 opencut mines active in 1964. Output of the two categories was 23.94 million and 3.90 million tons respectively, and employees numbered 14,733 and 736 respectively. The coal industry in New

[11] Includes bituminous, semianthracite, and subbituminous varieties.

Table 5.—Australia: Black coal production by States

(Thousand metric tons)

State	1962	1963	1964 r	1965 p
New South Wales	19,334	19,245	21,030	24,463
Queensland	2,845	3,298	3,841	4,290
South Australia	1,414	1,536	1,764	2,003
Western Australia	934	915	1,003	1,010
Tasmania	277	210	154	100
Victoria	58	52	49	42
Total	24,862	25,256	27,841	31,908

p Preliminary. r Revised.

South Wales comprised 94 mines (of which 3 were opencut) employing 11,367 workers. Queensland had 66 underground and 5 opencut mines with 2,680 employees. As reported by the Joint Coal Board, productivity in the principal black coal producing States by types of mines, for the past three fiscal years was as follows:

State	Production per man-shift [1] (long tons)					
	Underground mines			Opencut mines		
	1962–63	1963–64	1964–65	1962–63	1963–64	1964–65
New South Wales	6.7	7.4	7.9	18.5	20.1	23.1
Queensland	3.8	4.3	5.0	11.7	17.3	15.7
South Australia	--	--	--	21.3	22.7	26.1
Western Australia	4.4	4.4	4.2	11.6	12.5	11.9
Tasmania	4.6	5.3	6.0	10.5	---	---
Total	6.0	6.6	7.2	16.6	19.2	20.1

[1] On the basis of all employees.

Domestic consumption of black coal during the 1964–65 period was estimated at 22,035,000 tons, of which 16,225,000 tons was from New South Wales mines. By principal industries consumption in the 1962 to 1965 fiscal years was as follows:

Industry	Consumption (Thousand metric tons)		
	1962–63	1963–64 r	1964–65
Iron and steel	5,259	5,540	5,984
Electricity	7,935	8,777	9,387
Railways	1,567	1,477	1,315
Town gas	1,486	1,466	1,375
Cement	867	929	999
Metallurgical coke	343	352	416
Ships bunkers	119	152	112
Other	2,684	2,629	2,447
Total	20,260	21,322	22,035

r Revised.

The growing interest in conservation of coal resources for domestic use and exports has prompted a recent reevaluation of Australian black coal potential. During the 1964–65 year a summary of the coal reserve position was prepared by the Joint Coal Board Chief Geologist in consultation with Sir Harold Raggatt, former head of the Department of National Development.[12] Accordingly, latest available figures for Australian reserves of black coal are summarized as follows:

[12] Joint Coal Board Eighteenth Annual Report 1964–65. Australian Coal Resources (Appendix 5), Sydney, Australia, October 1965, pp. 143–150.

State	Million long tons	
	Measured and indicated	Inferred
New South Wales	[1] 2950.5	Large[2]
Queensland	1243.4	Large[2]
Western Australia	[1]119.	1,597
South Australia	[1]48.5	Small[3]
Tasmania	Small	137
Victoria	20	11

[1] Recoverable.
[2] More than 10,000 million tons.
[3] Less than 20 million tons.

Possibly not included in this estimate is the newly reported discovery of 260 million tons of recoverable, hard-coking coal on the coast of New South Wales by Coal Cliff Collieries Pty. Ltd.

Thiess-Peabody-Mitsui Coal Pty. Ltd. recently contracted to supply 30.1 million tons of coking coal from the Moura coalfield in Queensland to Japan, during a 13-year period. Export shipments were initiated in 1965; however scheduled delivery of 1.83 million tons annually will not be made until 1968 when the Gladstone-Moura railroad and port facilities are completed. Opencut mining will be used, employing one of the world's largest (130-cubic-yard bucket) dragline installations. The Moura mine is also under contract to supply 254,000 tons annually to the Gladstone alumina refinery.

The Utah Development Co. agreement to supply 13.7 million tons from the Black Water field, Queensland, to Japanese interests was concluded in June. This is also to be an opencut operation. Export shipments are to begin in 1968.

The Griffin Coal Mining Co. Ltd. Hebe mine in the Collie field, Western Australia, was closed due to flooding in March, but the loss of 20,000 tons per month from this mine was made up by other producers in the vicinity. Coal from this locality is the base of supply for the new Muja powerplant which was scheduled to start late in 1965.

As of June 1965, export contracts in effect, all with Japan, called for deliveries totaling 61.1 million tons during 13 years beginning in 1965. These are summarized as follows:

State and company	Total quantity (million metric tons)	Supply period, years	Shipping port
New South Wales:			
Bellambi Coal Co. Ltd	3.9	5	Port Kembla.
Coal & Allied Industries Ltd	5.1	6	Newcastle.
Kembla Coal & Coke Pty. Ltd	2.1	3	Port Kembla.
D. K. Ludwig Group	3.2	5	Port Kembla.
R. W. Miller & Co. Pty. Ltd	3.0	6	Newcastle, Sydney.
Queensland:			
Thesis-Peabody-Mitsui Coal Pty. Ltd	30.1	13	Gladstone.
Utah Development Co	13.7	10	Gladstone, Rockhampton.

Coke.—Metallurgical coke output was up again in 1965 as a result of increased demand by the steel industry. For the year ending May 31, 1965, Broken Hill Pty. Co. Ltd. coke plants produced 3,317,903 metric tons, a company record, 10 percent above the previous year's output. Still further increase in coke-making capacity is anticipated with completion of the No. 4 coke oven battery at Port Kembla in August 1966, and two batteries that are to be built at Whyalla.

The Queensland State-owned coke plants at Bowen and Ipswich produced 15,041 and 1,054 tons respectively in 1964, the latest year for which details are available. Gasworks made 779,310 tons of low-temperature coke and coke breeze in 1964 from 1,388,000 tons of black coal and 173,000 tons of brown coal.

Brown Coal.—Production of brown coal increased 9 percent in 1965 to a new record of over 21 million tons. The entire Australian output is from opencut mines situated within 100 miles to the southeast and southwest of Melbourne, Victoria. Although several small mines are operated by private companies, the great bulk of production is by the State Electricity Commission of Victoria mines at Morwell and Yallourn in the Latrobe Valley. The first 200-megawatt unit of the new Hazelwood Power Station located near the Morwell opencut was commissioned late in 1964, and the second in July 1965. When completed in 1971, the Hazelwood Station will have a capacity of

1,200 megawatts and will require about 13 million tons of brown coal which will be conveyed direct from the Morwell opencut.

Manufacture of brown coal briquets by the Morwell and the Yallourn briquet works totaled 1,934,000 tons in 1965, compared with 1,885,000 in 1964. According to data recorded for the 1963–64 fiscal period (July 1–June 30) the Yallourn briquet plant produced 553,740 and the Morwell plant 1,359,102 tons of briquets. The raw material for both plants consisted of 5,821,000 tons of brown coal from the Yallourn opencut.

Petroleum and Natural Gas.—Australia's first full year of indigenous production of crude oil resulted in an output of 2,614,000 barrels, the bulk of which was from the Moonie field. A part of the year's production was hauled by tank truck from the Alton field, 55 miles southwest of Moonie, for delivery by the 186-mile pipeline to the refineries at Brisbane. Domestic production during the 1964–65 fiscal period supplied about 1.7 percent of the total national requirement.

Exploration activities continued at a high level and several important developments were announced during 1965. Expenditures on oil and gas exploration during the year totaled US$79.36 million, of which private industry contributed US$62.61 million and various government agencies the remainder. Subsidy payments by the Federal Government amounted to US$11.66 million. According to preliminary figures compiled by the Bureau of Mineral Resources, Geology and Geophysics (BMR), 1,154,550 feet of hole was drilled during 1965 in 211 completed wells. Of the completed wells, 20 were classed as potential oil producers and 24 as potential gas producers. By geographic areas, 59 percent of the total drilling was done in Queensland, 18 percent in Western Australia, 7 percent in Northern Territory, 6 percent in Victoria, 4 percent each in New South Wales and South Australia, and 1 percent each in Tasmania and Papua-New Guinea.

A significant offshore discovery of gas was made early in the year by Esso Exploration Australia Inc. (in which Broken Hill Pty. Co. Ltd. has a 50 percent interest) on the Gippsland Shelf, about 16 miles off the Victoria coast. Initial tests indicated a potential 1.5 trillion cubic feet of gas, sufficient to supply the city of Melbourne for 20 to 30 years. Oil reserves on the Gippsland Shelf are tentatively estimated at 2.5 billion barrels.

In South Australia, recoverable reserves of natural gas in the Gidgealpa and Moomba fields, discovered in 1964 and 1965 by Santos Ltd. and Delhi Australian Petroleum Ltd., have been estimated at 1,500,000 million cubic feet of salable gas. A pipeline from these fields to serve the cities of Adelaide, Whyalla, and Port Pirie is under consideration.

In Western Australia, 18 wells, of which 11 are potential oil producers, have proven the commercial possibilities of the Barrow Island field. The company, Western Australian Petroleum Pty. Ltd. (WAPET) claims reserves on the order of 85 million barrels and is planning a development program involving up to 240 additional wells, pipelines, storage tanks, and shipping facilities. WAPET also struck gas, testing 12 million cubic feet per day from four zones in a well (Gingin No. 1) 55 miles north of Perth, Western Australia. French Petroleum Co. (Australia) Pty. Ltd. found a gas flow of 3.5 million cubic feet per day in Arrowsmith No. 1, 200 miles north of Perth near Dongara.

The intensive search in Queensland was rewarded with new discoveries by Amalgamated Petroleum Exploration Pty. Ltd. (gas, 5.65 million cubic feet per day, Oberina No. 1, and oil, 264 barrels per day, Trinidad No. 1) in the Yaleborne area. Associated Australian Oilfields N.L., struck gas in seven wells at Pine Ridge, 16 miles north of Roma, and in Maffra No. 1 and No. 2 (7.3 million cubic feet per day) 13 miles to the south of Roma. Union-Kern-A.O.G. found gas (2 million cubic feet per day and condensate 79 barrels per day in Major No. 1) north of the Alton field.

Activities in the Northern Territory included drilling by Exoil N.L., to determine limits of the gasfield at Mereenie, and discovery of gas (testing 14 million cubic feet per day in Palm Valley No. 1) near Mission by Magellen Australia Petroleum Ltd.

Domestic consumption of petroleum products totaled 127,147,000 barrels in 1965, an increase of about 9.5 percent above that of 1964. Output of Australian refineries totaled 123,569,000 barrels in 1965 compared with 114,885,000 barrels in 1964. Three new refineries came on stream in 1965: Amoco Australia Pty. Ltd. and

Ampol Refineries Ltd., located in suburbs of Brisbane, Queensland, and BP Refineries Pty. Ltd.'s second refinery in Westernport, 50 miles southeast of Melbourne, Victoria.

Capacity of the Australian petroleum refining industry at the close of the year totaled 26.7 million tons per year, distributed to the following plants:

Plant	Annual capacity (thousand metric tons)
Refineries:	
Amoco Australia Pty. Ltd.: Bulwer Island, Queensland	1,118
Ampol Refineries Ltd.: Lytton, Queensland	2,012
Australian Oil Refining Pty. Ltd.: Kurnell, New South Wales	4,470
Boral Ltd.:	
Matraville, New South Wales	914
Hamilton, Queensland	102
BP Refinery (Kwinana) Pty. Ltd.: Kwinana, Western Australia	4,267
BP Refinery (Westernport) Pty. Ltd.: Westernport, Victoria	2,540
Petroleum Refineries (Aust.) Pty. Ltd.:	
Altona, Victoria	2,571
Adelaide, South Australia	1,859
Shell Refining (Australia) Pty. Ltd.:	
Geelong, Victoria	2,540
Clyde, New South Wales	996
Lubricating oil plants:	
Australian Lubricating Oil Refinery Ltd.: Kurnell, New South Wales	142
BP Refinery (Kwinana) Pty. Ltd.: Kwinana, Western Australia	102
Shell Refining Pty. Ltd.: Geelong, Victoria	81

The Australian petrochemical industry in 1965 included 27 plants in operation, under construction, or planned. Strong emphasis has been on plants to make ammonia, nitrogenous fertilizers, and carbon black. Other products include nylon, synthetic rubber, ethylene and derivatives, ketone solvents, resins, and polystyrene. Elemental sulfur is recovered in two plants operated by Petroleum Refineries (Aust.) Pty. Ltd.

The Mineral Industry of New Zealand

By Lester G. Morrell [1]

Continuing the uptrend that has characterized New Zealand's mineral industry in recent years, value of production in 1965 increased 12 percent over that of 1964 to $65.78 million.[2] A substantially larger output of clays, construction materials, pumice, and salt was reported in 1965. Value declines occurred in coal and petroleum fuels. Nonmetallic minerals, collectively valued at $43.66 million, accounted for nearly two-thirds of the total value of mineral production in 1965. Relative contributions of the major mineral categories, together with total value for selected recent years are summarized as follows:

Year	Percent			Total value, million dollars [1]
	Metals	Nonmetals	Fuels	
1950	10.8	22.5	66.7	$26.07
1955	2.3	54.8	42.9	44.07
1960	2.2	55.2	42.6	55.38
1961	1.8	56.6	41.6	55.07
1962	1.5	59.7	38.8	51.28
1963	1.0	59.4	39.6	56.53
1964	.6	60.9	38.5	58.79
1965	.7	66.4	32.9	65.78

[1] Exclusive of cement and manufactured fertilizers.

Indicative of the importance of the minerals industry in the national economy, the value of minerals in 1965 amounted to 1.3 percent of the estimated $4,884 million gross national product. Employment in mines and quarries accounted for 0.8 percent (compared with 12.2 percent in agriculture and 26.9 percent in manufacturing industries) of the industrial labor force in 1965. Distribution by product categories and number of mine and quarry employees was as follows for 1961–65:

	1961	1962	1963	1964	1965
Metals, including gold	157	127	117	98	160
Nonmetals	3,791	3,927	3,977	3,885	4,136
Coal	4,044	3,852	3,660	3,631	3,447
Petroleum prospecting	147	153	112	157	46
Total	8,139	8,059	7,866	7,771	7,789

Although coal mining continued to dominate New Zealand's mineral industry, interest in petroleum and a wide variety of metal and industrial mineral prospects was growing. On December 31, 1965, there were 340 petroleum prospecting licenses covering 92,000 square miles of New Zealand's land and continental shelf areas. Mining rights and licenses granted during 1965 numbered 301, compared with 264 in 1964.

Direct government financial assistance to the mining industry in the year ending

[1] North America-South Pacific specialist, Division of International Activities.

[2] Where necessary and except where otherwise specified, values have been converted from New Zealand pounds (NZ£) to U.S. dollars at the rate of NZ£1 equals US$2.781.

March 31, 1966, included grants totaling $62,375 for 17 projects. While private companies, both domestic and foreign, have intensified field investigations, the New Zealand Government also has taken an active part in the search for and development of mineral resources.

The Mineral Resources Committee of the National Research Advisory Council administered the Government functions, coordinated research programs, and allocated priorities to insure that finance and resources were effectively used. The two major undertakings approved during the 1964–65 year were the iron and steel project based on titanomagnetite sands on Waikato Heads and the development of geothermal resources outside the Wairakei area. Mapping programs and long-term projects dealing with cement, clays, coal, ground water, electrochemical industries, and mineral beneficiation have continued.

Legislation enacted during 1965 included the Iron and Steel Industry Amendment Act 1965 which extends the expiration date of the original New Zealand Steel Industry Act of 1959 beyond January 1, 1968, and provides certain working details on the extracting of iron sands and the erection of works by New Zealand Steel Ltd. A 1965 amendment to the basic Mining Act removed the right of a prospector to a mineral lease and substituted a right of priority to a license for an area not exceeding 1,000 acres. The Mining Act amendment (section 3) also authorized the Minister of Mines to expand prospecting privileges to include gold, metals, or other minerals not specified in the original prospecting warrants.

Table 1.—New Zealand: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Copper ore, gross weight	------	104	234	736	144
Gold ---troy ounces	28,294	21,742	14,206	8,948	12,136
Iron ore, gross weight	1,773	1,525	3,123	2,591	2,272
Silver ---troy ounces	805	416	286	141	55
Tungsten ore, gross weight	5	8	5	5	------
Nonmetals:					
Asbestos	338	415	398	------	------
Bentonite	1,688	1,512	1,687	1,835	2,973
Cement	651,085	631,000	722,000	787,800	841,844
Clays:					
Pottery, etc	4,703	7,335	7,837	5,961	7,541
Structural types	418,183	321,214	293,859	304,221	360,145
Diatomite	3,593	1,904	1,629	1,706	1,757
Dolomite	3,607	5,840	4,457	9,311	7,677
Fertilizers, manufactured superphosphate thousand tons	1,306	1,249	1,480	1,795	1,968
Kauri gum	NA	e 44	e 44	38	41
Limestone:					
Agricultural and industrial thousand tons	960	901	929	1,247	1,163
For cement ---do	1,232	1,111	1,206	1,362	1,498
Magnesite	590	645	794	613	850
Perlite	393	393	573	929	1,142
Pumice	33,237	33,044	16,873	20,847	109,594
Salt	5,098	9,043	11,177	21,674	34,718
Sand, rock and gravel---thousand tons	15,988	18,394	20,071	19,900	10,443
Serpentine ---do	159	142	136	137	134
Silica (glass) sand	56,122	63,318	64,844	43,945	74,734
Stone, dimension	16,388	16,270	12,681	20,887	4,376
Mineral fuels:					
Coal:					
Anthracite---thousand tons	(1)	1	(1)	(1)	(1)
Bituminous ---do	769	711	671	693	674
Subbituminous ---do	2,044	1,728	1,951	2,071	1,868
Lignite ---do	159	151	164	159	160
Total ---do	2,972	2,591	2,786	2,923	2,702
Coke:					
High-temperature---thousand tons	6	6	6	6	6
Low-temperature ---do	78	88	78	80	e 69
Fuel briquets ---do	15	12	13	15	18
Natural gas---million cubic feet	5.1	4.1	4.6	5.1	4.9
Condensate---thousand 42-gallon barrels	------	3.3	3.5	3.5	0.2
Petroleum, crude ---do	4.4	4.0	4.0	4.1	4.3

e Estimate. NA Not available.
1 Less than ½ unit.

PRODUCTION

Although the year's output of several minerals was lower than that of 1964, the overall uptrend in value of New Zealand's mineral production continued in 1965. Among the metals, gold production was up 3,188 ounces, reversing the decline of recent years. Most of the gains were in nonmetallic and industrial minerals. Notable increases in both quantity and value were recorded for bentonite and other clays, magnesite, pumice, salt, and building materials.

TRADE

New Zealand's trade deficit in metals and minerals continued through the 1963–64 fiscal year; the value of imports outweighing exports by a ratio of nearly 95:1. In 1963–64 value of principal metals and minerals [3] exports totaled only $1.59 million, while value of imports amounted to $150.6 million.

Metals and minerals accounted for less than 1.6 percent of the value of New Zealand's total exports ($1,013 million); the corresponding figure for imports was 16.7 percent of the total $903 million. Scrap metals including copper, lead, aluminum, tin, and ferrous metals, with a combined value of $1,146 million comprised New Zealand's principal minerals and metals export commodities. Refined petroleum products valued at over $60 million in the 1963–64 fiscal year was again one of New Zealand's largest imports. Semimanufactured metal products, notably of copper and iron and steel were also substantial. Among the nonmetals, fertilizer materials, including sulfur for manufacture of sulfuric acid were the largest value items.

[3] Includes items listed in the accompanying tables.

Table 2.—New Zealand: Exports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962–63	1963–64	Principal destinations, 1963–64
Metals:			
Aluminum scrap	633	933	Japan 480; Australia 378.
Copper scrap	626	1,474	Japan 980; Australia 248.
Gold, refined [2] ----troy ounces--	18,300	8,400	NA.
Iron and steel:			
Iron ore and concentrate	13	217	West Germany 203; Sweden 14.
Iron and steel scrap	290	587	Japan 553; Canada 17; Hong Kong 15.
Lead scrap	1,146	2,720	Republic of South Africa 784; Japan 709; Australia 568; United Kingdom 422.
Silver and platinum ores--value, dollars--	40,477	65,350	United Kingdom 37,874; Australia 27,476.
Tin scrap ----long tons--	5,336	4,926	West Germany 2,564; Japan 1,994.
Nonmetals:			
Cement	6	11	Pitcairn Island 9; Australia 1.
Fertilizers: Superphosphates	175	254	Fiji 199; Western Samoa 55.
Kauri gum	35	53	United States 30; Italy 12; United Kingdom 7.
Pumice	231	865	Australia 720; Fiji 105.
Mineral fuels:			
Coal	10	151	West Germany 133; Sweden 10.
Coke	15	225	Australia 205; Tonga 10.

NA Not available.

[1] Fiscal period, July 1 through June 30.

[2] Estimated, includes gold of domestic and foreign origin as well as coin.

Table 3.—New Zealand: Imports of metals and minerals [1]

(Metric tons unless otherwise specified)

Commodity	1962–63	1963–64	Principal sources, 1963–64
Metals:			
Aluminum:			
Ingots, pigs, etc	5,207	6,739	Canada 4,389; United States 2,085.
Semifabricated	1,554	1,728	Canada 1,051; United Kingdom 242; Netherlands 176; United States 162; Australia 89.
Foil	810	772	United Kingdom 410; West Germany 139; United States 107.
Pipes and tubes	332	260	United Kingdom 137; Australia 121.
Antimony, metal	124	[r] 70	NA.
Copper:			
Ingots, pigs	132	186	United Kingdom 181; Australia 5.
Semifabricated	10,946	11,745	Australia 5,524; United Kingdom 4,445; Canada 1,767.
Wire (including alloys)	338	526	United Kingdom 198; Belgium-Luxembourg 165; Australia 138.
Gold, refined—troy ounces	10,808	10,838	Australia 8,282; United Kingdom 2,522.
Iron and steel:			
Pig iron	7,351	6,437	Australia 6,417; United Kingdom 20.
Steel ingots	2,679	52	United Kingdom 31; Austria 20.
Ferroalloys	1,054	1,094	Republic of South Africa 935; Canada 68; Norway 21.
Semifabricated	267,504	324,533	Australia 129,000; Japan 100,636; United Kingdom 85,643.
Kaolin and other clays	3,601	3,461	United States 1,771; United Kingdom 1,049; Australia 637.
Lead, metal: Ingots, pigs, etc	5,144	5,916	Australia 5,910; United Kingdom 6.
Mercury—76-pound flasks	151	205	Spain 63; United Kingdom 57; Turkey 45; mainland China 32.
Nickel, metal	29	32	United Kingdom 29; Canada 3.
Platinum group metals, refined—troy ounces	2,925	2,051	United Kingdom 1,941; Australia 56.
Silver, refined—do	1,842,574	1,693,933	United Kingdom 874,934; Australia 811,916.
Tin, metal—long tons	375	362	Malaysia 334; United Kingdom 24.
Zinc:			
Ingots, slabs, etc	2,768	3,412	Australia 3,359; United Kingdom 50.
Semifabricated	385	602	Australia 465; United Kingdom 62; Belgium-Luxembourg 55.
Nonmetals:			
Asbestos, crude	7,118	5,557	Canada 3,792; Republic of South Africa 1,695.
Barite (barium sulfate)	627	1,249	United States 559; West Germany 493.
Cement, portland	2,440	[2] 118	United Kingdom [2] 56; Denmark [2] 52.
Diatomaceous earth	909	660	United States 595; Australia 43.
Feldspar	2,900	1,422	Sweden 1,304; Norway 81.
Fertilizer materials:			
Rock phosphate, crude	607,534	734,473	Nauru 467,932; French Polynesia 172,874.
Basic slag	20,460	24,259	All from Belgium-Luxembourg.
Other phosphates	7,678	1,852	Portugal 1,036; United States 531.
Ammonium nitrate	957	1,063	Belgium-Luxembourg 689; West Germany 109; United States 107; United Kingdom 103.
Ammonium sulfate	10,008	6,853	Japan 2,281; West Germany 1,731; Netherlands 1,538; United Kingdom 1,257.
Other nitrates	649	654	West Germany 554; Netherlands 100.
Potassium chloride	83,756	98,417	West Germany 30,094; United States 27,203; U.S.S.R. 24,626; France 16,487.

See footnotes at end of table.

Table 3.—New Zealand: Imports of metals and minerals [1]—Continued
(Metric tons unless otherwise specified)

Commodity	1962–63	1963–64	Principal sources, 1963–64
Nonmetals—Continued			
Gypsum:			
Crude	90,442	88,633	Mainly from Australia.
Plaster of paris	1,724	2,400	West Germany 1,767; United Kingdom 360.
Magnesite	148	177	Australia 100; India 56.
Salt	66,211	[2] 46,591	United Kingdom [2] 20,647; Australia [2] 19,001; Netherlands [2] 5,338.
Sulfur, crude	110,424	176,949	United States 122,118; Mexico 41,421; Canada 13,080.
Titanium dioxide pigment	3,843	4,355	United Kingdom 2,407; Japan 1,317.
Mineral fuels:			
Coal	2,953	597	Mainly from Australia.
Coke	89	93	All from United Kingdom.
Bitumen, natural	647	443	Trinidad and Tobago 417; United States 17.
Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	8,581	8,903	Indonesia 1,642; Venezuela 1,434.
Kerosine and jet fuels—do	653	852	Australia 337; Malaysia 236.
Distillate fuel oil—do	3,028	3,697	Australia 2,937; Netherlands Antilles 163; Saudi Arabia 152.
Residual fuel oil—do	2,526	2,613	Australia 2,405; Iran 174.
Lubricants—do	295	295	United Kingdom 152; United States 66; Australia 60.
Asphalt—do	397	[2] 5	United Kingdom [2] 3; Australia [2] 2.
Other—do	174	211	United States 66; Indonesia 57; Malaysia 29.
Total—do	15,654	16,576	

[e] Estimate. NA Not available.
[1] Fiscal period, July 1 through June 30.
[2] Incomplete fiscal year.

COMMODITY REVIEW [4]

METALS

Bauxite and Aluminum.—New Zealand's only known occurrences of bauxite are in the vicinity of Kaeo, Kerikeri, and Otoroa in North Auckland.[5] Although soils containing bauxitic materials cover an area of about 30 square miles, the best deposits, containing some 20 million tons occupy about 1 square mile near Otoroa. Drilling has shown the bauxite to be 10 to 15 feet thick of the following analyses: Total Al_2O_3—37.4 percent, SiO_2—5.5 percent, Fe_2O_3—23.3 percent, TiO_2—6.4 percent. Consolidated Zinc Pty. Ltd., of Australia was conducting beneficiation tests on the material in 1965.

Plans of the Commonwealth Aluminium Corporation Ltd. (Comalco) of Australia, to construct an aluminum smelter at Bluff, on the southern tip of South Island, are still firm. Reservation of the smelter site was applied by the New Zealand Government in 1965. The project which has been estimated at $445 million will use power from the Manapouri hydroelectric scheme scheduled for completion in 1969. Comalco has an option, expiring in 1968, on Manapouri power necessary to produce 100,000 tons of aluminum per year. The raw material will consist of alumina imported from the new Queensland Alumina Ltd. plant at Gladstone, Australia.

Copper.—The small output of copper ore reported in 1965 was all from the Copper Queen mine, operated by Marriott Industries Ltd., at Parakao, North Auckland. No production was reported during the year from the company's Hazelbrook mine near Kaeo. The ore was sold locally for use as an additive in fertilizer.

Investigation of copper occurrences in New Zealand has been intensified during 1965. The Geological Division of the De-

[4] Information contained in this section is largely based on reports of the New Zealand Mines Department and Department of Statistics, Wellington, New Zealand.
[5] Fieldes, M., and others. Clays. Ch. in Economic Geology of New Zealand. Eighth Commonwealth Min. and Met. Cong., v. 4. New Zealand, 1965, pp. 366–367.

partment of Scientific and Industrial Research (DSIR) did some drilling on a copper prospect near Kaeo, North Auckland, but results have not been published. Conzinc Riotinto of Australia Ltd. recently applied for prospecting rights on Coppermine Island, in the Hen and Chickens group off Whangarei, North Island; and in the Ruahine Range near the south end of North Island, Government geologists were investigating reportedly rich occurrences of copper ore. Mineral Industries Ltd., a new company, has been organized to investigate the economic potential of copper deposits known to have been worked around 1905 in the Moke Creek area, near Queenstown, Otago, on the South Island.

Gold.—Increased recovery of alluvial gold (11,810 ounces in 1965) from the Kanieri Gold Dredging Ltd. operation on the Taramakau River in Westland, was effective in raising national output to 12,136 ounces in 1965. In addition, a small gold-quartz mine and several part-time sluicing operations in Buller County and beach claims on the west coast of South Island reported a combined output of 326 ounces during the year.

A local group recently organized Waikakaho Mines Ltd., of Marlborough, to investigate gold deposits in the vicinity of Waikakaho, about 10 miles north of Blenheim. Discoveries and a rush resulted in the taking of a substantial amount of gold from this area toward the end of the last century.

Iron and Steel.—In 1965, production of iron ore, all for local use in the manufacture of bricks, steel, cement, and for gas purification, was at a modest level as in previous years. Two companies, Kamo Potteries Ltd. and Webb's Refineries Ltd. operated five small open pit mines near Kamo and Kaeo in North Auckland. The Golden Bay Distributors Ltd. and Golden Bay Cement Co. Ltd. quarries at Parapara were the only South Island sources of iron ore during 1965.

The New Zealand Steel Company project to establish a steel industry based on titano-magnetite beach sand proceeded throughout 1965. A plant site at Glenbrook, 25 miles south of Auckland has been purchased and preparation of the ground for construction has started. The company announced that the Stelco-Lurgi process which involves reduction of the ore in rotary kilns with locally mined subbituminous coal and limestone to make sponge iron would be used. This sponge iron will be treated in electric furnaces yielding continuously cast steel.

Although iron-rich beach sands are known to exist in several localities, initial supplies will be taken from Waikato Head, 8 miles from the steel plant site. Scrapers will be used to mine the sand which will be concentrated by magnetic separation to a product containing 62 percent iron. The concentrate will be pelletized.

A second project involving beach sands, near Westport, on the South Island was proposed, and it stimulated considerable public interest during the year. The sands in this locality were reported to be worthy of further investigation as a potential source of not only iron but also of economically recoverable titanium minerals, zircon, and a small quantity of gold. By yearend Buller Minerals Ltd. in association with Rutile Zircon (Newcastle) Ltd. of Australia, as well as experts from the faculty of technology at Otago University and from the Department of Scientific and Industrial Research, were studying these prospects.

In its 4th year of operation, output of rolled steel by Pacific Steel Ltd., at Otahuhu, near Auckland, totaled in excess of 65,000 tons. The plant, 40 percent of which is owned by three British steel companies (Colvilles Ltd., GKN Steel Company Ltd., and Stewarts and Lloyds Ltd.), consists of a 40-ton electric furnace and a merchant bar mill. Domestic scrap collected by Pacific Scrap Ltd. is the principal raw material. Products include round bars, angles, and flats.

Lead and Zinc.—A new company known as Norpac Mining Co. Ltd. (including North Island Mines Inc., of United States, South Pacific Mines Ltd. of Canada; and Cable Price Downer Ltd. of New Zealand) has been formed to continue development of the old Tui mine at Te Aroha, South Auckland. While the quantity of reserve has not been fully determined, assays of the ore are said to average 5 percent lead, 15 percent zinc, with minor quantities of copper and silver. Construction of a 100-ton-per-day flotation mill to make separate concentrates of lead, zinc, and copper, was still being considered throughout 1965.

Lime and Marble Ltd., a New Zealand firm, reported discovery of a lead-zinc deposit near Takaka, on the north end of South Island. Details of this discovery have not been announced.

NONMETALS

Asbestos.—Although no production of asbestos was reported during 1965, the magnetometer survey, mapping, and test-drilling of asbestos deposits in the Upper Takaka Valley, South Island, continued throughout the year. The combined efforts of Mines Exploration Pty. Ltd. (subsidiary of Broken Hill South Ltd.) and Cobb Minerals Ltd. (subsidiary of Lime and Marble Ltd.) have outlined sufficient ore to justify a small operation and problems of recovery are being investigated.

Bentonite and Other Clays.—Production of bentonite, most of which was mined at Porangahau, near the southeast coast of North Island, was at a record level in 1965. On South Island, a program of drilling undertaken late in the year revealed substantial new reserves of bentonite in the vicinity of Hororata, 40 miles west of Christchurch. A description of the bentonite occurrences in this area was published in 1965.[6]

Lime and Marble Ltd. and Crown Lynn Potteries Ltd. carried out a prospecting and drilling program on halloysite clay deposits at Maungaparerua, near the north end of North Island. Several million tons of high-quality clay have been defined in this area. Deposits of clays suitable for pottery and other ceramic purposes have also been found in the Hauraki area.

Manufacturers of clay products reported output of selected items in 1965 as follows: Glazed pipe—6.6 million feet, field tiles—13.2 million feet, and bricks and hollow tiles—56.5 million pieces.

Cement.—The New Zealand cement industry in 1965 set a new production record, 7 percent above the 1964 output. Golden Bay Cement Co. Ltd., at Tarakohe produced 213,758 tons and Guardian Cement Co. Ltd., at Cape Foulwind accounted for 125,607 tons in 1965. Details of production by other New Zealand cement producers or details regarding the plant expansion program of the Wilson (N.Z.) Portland Cement Co. Ltd., were not available.

Dolomite.—Output of dolomite, most of which is produced by Golden Bay Distributors Ltd. and Lime and Marble Ltd. at Mount Burnett, near the north end of South Island, was somewhat below the 1964 production level. A recently completed geological examination by the New Zealand Geological Survey found reserves in this area probably in excess of 50 million tons. Although the product has in the past been exclusively for domestic use in superphosphate fertilizers and glass manufacture, export possibilities have recently been considered. The first bulk shipment of dolomite from the port of Collingwood to Auckland was made early in 1966.

Fertilizer Materials.—Manufacturers of fertilizers reported production of 1.97 million tons of chemical fertilizers in 1965, compared with 1.80 million tons in 1964. The superphosphate content of these products amounted to 1.61 million and 1.48 million tons, respectively. As in previous years imported raw materials from Nauru, Ocean Island, Christmas Island, and the United States supplied the great bulk of phosphate rock requirements. Basic slag, a high-phosphorous byproduct of the iron and steel industry, and potash were also imported in large quanties from West European countries.

Early in 1966, Dominion Fertilizer Co. Ltd., announced plans to install an acid plant to produce 250 tons of acid per day. The equipment, which has been ordered from Lurgi Chemical and Metallurgical Engineering Co. Ltd. (Lurgi Gesellschaft fur Chemie und Hüttenwesen G.m.b.H.), in West Germany, will also generate electricity from byproduct steam.

MINERAL FUELS

Coal.—During 1965 coal production in each of the nine New Zealand coalfields was below the 1964 production. National output was down 7.5 percent. The drop has been attributed mainly to lower requirements by railroads and paper mills, and the Meremere powerplant consumed only 194,000 tons in 1965, compared with 292,000 tons in 1964. The total number of coal mines that operated during the year (127) was also 9 fewer than in 1964. Of the total, 91 government-owned mines (including 6 mines owned jointly with private interests) with 2,770 employees, accounted for 82 percent of the national coal output. Net

[6] Richie, J. A., and D. R. Gregg. Bentonites of Canterbury. Proceedings of New Zealand meeting, Eighth Commonwealth Min. and Met. Cong., Wellington, New Zealand, 1965, pp. 1-13, 208.

loss in operation of the Government-owned mines amounted to $2.63 million in 1965, compared with $1.68 million in 1964.

By mining methods, underground mines produced 1,636,000 tons of coal (60.5 percent of the total) and open pit operations produced 1,066,00 tons of coal (39.5 percent). Basic industrial statistics and sources of New Zealand coal for the 1962–65 years are summarized in the following table:

	1962	1963	1964	1965
Strip mines:				
Output—thousand metric tons	867	1,138	1,245	1,066
Employees	418	364	449	405
Tons per man-year	2,075	3,126	2,772	2,633
Underground mines:				
Output—thousand metric tons	1,724	1,648	1,678	1,636
Employees	3,434	3,296	3,182	3,042
Tons per man-year	502	500	527	537
Total all mines:				
Output—thousand metric tons	2,591	2,786	2,923	2,702
Employees	3,852	3,660	3,631	3,447
Tons per man-year	673	761	805	783
Production by coalfield:				
North Auckland—thousand metric tons	3	3	2	2
Waikato and Taranaki—do	1,257	1,426	1,536	1,369
Nelson—do	18	18	18	15
Buller—do	287	262	271	266
Reefton—do	107	110	108	99
Grey—do	423	405	419	416
Canterbury—do	19	18	18	14
Otago—do	122	135	135	129
Southland—do	355	409	416	392
Total—do	2,591	2,786	2,923	2,702

A noteworthy achievement of the New Zealand coal mining industry in 1965 was the record of no fatal accident during the year. Not since 1866 has this record been equaled.

A technical description of the Glen Afton Collieries Ltd. open pit mine at Kopuku, largest New Zealand coal producer, was recently published.[7]

Total consumption of coal in 1963, as reported by the Department of Statistics was 2,807,300 tons, distributed to the following users: Household—525,300; electric power—606,600; dairy and meat industries —432,800; gasworks—272,300; railways—185,900; cement plants—213,400; pulp and paper mills—158,500; other manufacturing —213,400; and all other uses—199,100.

Coke and Briquets.—Smokeless Fuel Co. Ltd., at Sockburn, produced 5,938 tons of hard coke in 1965. For the fiscal year April through March 1964–65, gasworks reported total output of 69,000 tons of low-temperature coke.

The low-temperature coal carbonizing and briquet plant of Waikato Carbonisation Ltd. at Rotowaro, carbonized 28,400 tons of coal and purchased 16,270 tons of coke to produce 18,050 tons of briquets in 1965. This represented an increase of 21 percent over the 1964 output. Although separate production figures for the new State-owned briquet works at Ngakawau, Nelson, and South Island have not been given, tests reportedly are being conducted on the blending of various coals to improve the burning quality of the product.

Petroleum and Natural Gas.—New Zealand's 1965 production of crude petroleum, all from the four wells of Edgmont Oil Wells Ltd. at New Plymouth, totaled 4,314 barrels. The company also recovered 200 barrels of condensate from the Kapuni field.

During the year drilling activity was confined to a total of seven completed holes, and totaled 33,630 feet, compared with nearly 32,000 feet in 1964. With the exception of New Plymouth No. 2 well, drilled by Shell, BP and Todd Oil Services Ltd. in the Taranaki Basin, which yielded a small pocket of gas, and J. T. Benny No. 1 drilled by New Zealand Petroleum Exploration Co. Ltd., at Winton in Southland which showed oil, all holes were dry. Details are given in table 4.

[7] New Zealand Coal. Kopuku Open Cast Operations. v. 10, No. 4, March 1966, pp. 2–6, p. 44.

Table 4.—New Zealand: Wells completed in 1965

Company and location	Well	Total depth (feet)
North Island:		
Auckland Water Transport Co. Ltd.:		
Great Barrier Island	Tryphena	704
Do	Whangaparapara	302
E. W. Newbolt: Napier-Taupo Highway	Rangitaiki No. 2	637
Shell BP and Todd:		
Taranaki	Puniwhakau	7,041
Do	New Plymouth No. 2	14,605
South Island:		
New Zealand Petroleum Exploration Co. Ltd.:		
Winton	J. T. Benny No. 1	3,338
Drummond	J. W. Laughton No. 1	7,003

Geological and geophysical activities were at a relatively high level throughout the year. In the east coast area of North Island, the Société Nationale des Petroles d'Aquitaine with Shell, BP and Todd Oil Services Ltd. started seismic surveys. Offshore airborne magnetometer surveys were initiated by Tasman Petroleum Ltd., in the Tasman-Golden Bay areas and by J. H. Whitney and Co., off the west coast, south of Auckland. Shell, BP and Todd Oil Services Ltd. also conducted geophysical surveys of continental shelf areas off the Taranaki coast. Geological and geophysical surveys were conducted in several areas on the South Island by Hackathorn (N.Z.) Oils Ltd.

The New Zealand Refining Co. Ltd. refinery at Marsden Point, Whangarei produced 2.1 million tons of gasoline, gas oil, fuel oils, and asphalt in 1965, its first full year of operation. The year's output was equivalent to over 80 percent of the national consumption of petroleum products, estimated at 2.42 million tons in 1965. Since startup of the Marsden Point refinery in 1964, sales of refined products for ships' bunkers and export, mostly residual fuel oil to Malaysia, have been valued at $5.4 million.

From the wells at New Plymouth, Edgemont Oil Wells Ltd. supplied 4.9 million cubic feet of natural gas to gasworks in 1965. Utilization of gas from the Kapuni gas condensate field was the subject of studies continued throughout the year for the New Zealand Government by Zinder International (N.Z.) Ltd.[8] Until decisions are made, the Kapuni field, which has a production potential of 60 million cubic feet gas and 4,800 barrels of condensate per day for 30 to 35 years, will remain shut-in.

[8] Subsidiary of H. Zinder and Associates, Inc., Washington, D.C.

The Mineral Industry of Other South Pacific Islands

By Lester G. Morrell [1]

Contents

BRITISH SOLOMON ISLANDS

Exploration projects continued in 1965 to dominate mineral industry activities in the British Solomon Islands Protectorate (BSIP). Land areas of the Protectorate include the major islands of Choiseul, New Georgia, Santa Isabel, Malaita, Guadalcanal, San Cristobal, and Santa Cruz, alined for nearly 1,000 miles in a southeasterly direction from Bougainville Island, the eastern extremity of the Australian Territory of New Guinea.

Recorded production of minerals in the Protectorate has been limited to a few hundred ounces of gold and small quantities of manganese ore. Since 1950 the BSIP Geological Survey Department has mapped many of the islands and conducted geological reconnaissance, including magnetic and gravity surveys in some areas. More intensive geophysical investigations were begun in 1964. A gravity-magnetic-bathymetric survey of the sea between San Cristobal and New Britain was completed late in 1965 by the research vessel H.M.S. *Dampier*. This was a cooperative project with the U.S. National Science Foundation, U.S. Navy Institute of Oceanography, and University of Wisconsin. The A.B.E.M. Geophysical Company of Sweden has been engaged to conduct an airborne survey (magnetrometric, electromagnetic, and scientillometer) of the land areas. Funds for this work have been provided by a $952,800 United Nations Special Fund grant and counterpart British Government contribution amounting to $560,000. Flying commenced in November 1965 and is expected to be completed in 1967. The Geological Survey Department plans to conduct ground followup programs. Native Melanesians were being trained to assist in the fieldwork.

To await the findings of the aerial survey, Conzinc Riotinto of Australia Exploration Ltd. suspended activities on Guadalcanal in mid-1965. International Nickel Southern Exploration Co. Ltd. continued testing and feasibility studies related to nickel-bearing laterites of Santa Isabel and San Jorge Islands. The prospecting license covering the International Nickel projects was renewed in November, with the understanding that a decision regarding application for mining lease will be due in November 1967.

In 1965 a Royal Society Expedition found extensive deposits of bauxite soils on the 17-mile diameter volcanic island of Kolombangara, in the New Georgia group. The Protectorate Government closed the island to prospecting for 1 year so that the Survey Department may conduct test drilling and sampling to evaluate the discovery.

Recorded production of alluvial gold, all by natives, from various localities in the

[1] North America-South Pacific specialist, Division of International Activities.

islands in recent years was as follows: 1962, 18 troy ounces; 1963, 240 ounces; and 1964, 101 ounces.

Reported trade in mineral commodities is limited to imports of salt and petroleum refinery products, mainly from Australia. Quantities imported in the 1962–64 years were as follows, in metric tons:

Commodity	1962	1963	1964
Salt	55	66	81
Petroleum refinery products:			
Gasoline and aviation fuel	1,292	1,088	1,310
Kerosine	552	600	719
Fuel oils	3,411	3,227	4,278
Lubricating oils	121	147	192

CHRISTMAS ISLAND

The Australian Territory of Christmas Island in the Indian Ocean, 900 miles northwest of Australia remained an important Australian source of phosphate rock. The island's only economic activity is mining and exporting of phosphate. The Christmas Island Phosphate Commission, owned equally by the Governments of Australia and New Zealand, controls the property and retains the British Phosphate Commissioners as managing agents. Although several deposits are worked, the principal mining activity is at South Point, about 11 miles from the drying and shipping facilities at Flying Fish Cove. The entire mine output is exported.

Exports of phosphate rock in bulk and phosphate dust in bags for recent fiscal years were as follows:

Fiscal year ending June 30 of year stated	Metric tons			
	Australia	Singapore and Malaya	Borneo	Total
1961	604,836	74,744	-----	679,580
1962	630,660	71,765	1,628	704,053
1963	559,599	74,074	3,781	637,454
1964	764,081	67,938	-----	832,019
1965	779,902	76,916	-----	856,818

Fuel oil and gas oil, amounting to 15,477 metric tons; 12,948 tons and 17,004 tons in 1963, 1964, and 1965, respectively, have accounted for about half of the island's total imports.

A development program designed to expand the phosphate production on Christmas Island was recently approved by the Australia and New Zealand Governments. During 1965 studies aimed at increasing output to 1.6 million tons by 1968 and eventually to 2.5 million tons per year were being undertaken by the Australian Bureau of Mineral Reseources, Geology, and Geophysics, and the Christmas Island Phosphate Commission. Preliminary revised estimates place the reserves of all grades at 200 million tons.

FIJI ISLANDS

The value of Fiji minerals production in 1965 has been estimated at $5.3 million (F£2,097,000), about 14 percent above that of 1964. Despite a destructive hurricane in February and a drought late in the year, mining operations as well as exploration and development activities were maintained at a relatively high level. A total of 2,373 persons were employed in mining and quarrying industries in 1965, compared with 2,161 in 1963 and 2,222 in 1964. Output of gold set a new record high, manganese ore production was the highest since 1960, and substantial gains were reported in 1965 for cement, coral sand, and lime. The Geological Survey Department completed regional mapping on two areas totaling 440 square miles and conducted 4,655 feet of diamond drilling on various projects. A major function of the Geological Survey throughout 1965 has been the geochemical survey of the Tavua goldfield conducted jointly with Emperor Gold Mining Co. Ltd. Reconnaissance projects of the same type were carried out in the Mba River area in northwest Viti Levu and on islands of the Yasawa group.

Development and equipping of the open-

cut copper mines in northeastern Vanu Levu by Banno Mining Co., Ltd., and exploration activities of Kennecott Explorations (Australia) Pty. Ltd., on a 563-square-mile area of southwest Viti Levu continued during the year. The possibility of exploiting low-grade phosphates in several of the Lau group islands was also being investigated by a Canadian company; however, prospecting licenses will not be granted until completion of the Government-sponsored test program. Two small gold mines in the vicinity of Vunda and a porphyry copper prospect at Naivuvuni were also examined by the Geological Survey.

Mining Ordinance 25 of 1965, which vested control of mining and prospecting in the Director of Mines instead of the Mining Board, was approved in June. New regulations were being drafted to improve safety in mines and give better control of opencut workings.

Twenty-four Prospectors Rights were issued in 1965, and nine Prospecting Licenses covering areas totaling nearly 650 square miles were in force at yearend.

PRODUCTION

Details of mineral production for the years 1961–65 are given in table 1.

TRADE

In 1965 Fiji's total exports were valued at $45.0 million (F£17,823,000) and imports were valued at $73.4 million (F£29,081,000). Mineral product exports listed in table 2 accounted for nearly 10 percent of the year's total. Gold and silver in crude bullion shipped to Australia made up the great bulk of mineral product exports. Mineral imports were valued at $12.95 million and were equivalent to 17.7 percent of total imports in 1965. Principal mineral import categories were petroleum refined products, $7.1 million; steel semimanufactures, $3.2 million; and fertilizers, $2.2 million.

COMMODITY REVIEW

Metals. — *Copper.* — Initial metallurgical test shipments of copper ore from Banno Mining Co. Ltd., operations on Undu Peninsula of Vanu Levu were made during 1965 to the parent company's plants in Japan. Two sites were being prepared for mining, and equipment reportedly valued at $7.6 million has been landed at the port of Lambasa. Production from the Udu site was scheduled to begin late in 1966, at an annual rate of 30,000 tons of ore. Mining at Wainikoro was to be deferred until prospecting in that locality is complete.

Table 1.—Fiji: Production of metals and minerals
(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Copper ore, 10 percent copper	152	130	30	50	22
Gold, troy ounces	83,417	87,354	107,262	100,493	109,095
Iron ore, 55–60 percent iron, thousand tons	10	6	1	---	---
Manganese ore, 40–50 percent MnO_2	3,510	1,090	3,285	897	5,479
Silver, troy ounces	37,712	38,935	46,870	60,564	60,470
Nonmetals:					
Cement [1]	---	NA	NA	30,971	39,616
Coral sand, cubic yards	NA	19,548	26,032	35,998	42,971
Lime	3,542	2,592	5,438	3,416	[2] 18,347

NA Not available.
[1] Cement plant construction completed in 1962.
[2] Limestone.

Table 2.—Fiji: Exports of principal metals and minerals
(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal destinations, 1965
Metals:			
Copper ore	---	22	All to Australia.
Gold, in bullion, troy ounces	100,193	112,060	Do.
Manganese ore and concentrate	761	4,809	All to Japan.
Metal scrap	---	33	All to Australia.
Silver [1], troy ounces	60,262	61,536	Do.

[1] Contained in gold bullion.

Table 3.—Fiji: Imports of principal metals and minerals
(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal sources, 1965
Metals:			
Aluminum and alloys, semimanufactures	36	48	Australia 24; United Kingdom 21.
Copper and alloys, semimanufactures	61	68	United Kingdom 36; Australia 28.
Lead and alloys, semimanufactures	89	79	United Kingdom 38; Australia 34.
Tin and alloys, semimanufactures	311	308	United Kingdom 300.
Other nonferrous metals and alloys, semimanufactures	75	83	Australia 67; United Kingdom 14.
Steel:			
Primary forms	159	80	Australia 44; Japan 20.
Structurals, rails, pipe, etc.	13,742	16,488	Australia 9,057; Japan 4,839.
Nonmetals:			
Cement	1,699	1,140	Mainly from United Kingdom.
Salt	1,781	1,525	United Kingdom 924; Australia 600.
Fertilizer materials, all types	35,092	33,968	Japan 32,784; United Kingdom 636.
Mineral fuels:			
Coal	4,008	3,029	All from Australia.
Coke	336	314	Australia 293; New Zealand 21.
Petroleum, refinery products:			
Gasoline and benzine thousand 42-gallon barrels	303	292	Mainly from Iran and Australia.
Kerosine and jet fuel do	430	531	Do.
Diesel fuels do	548	502	Do.
Residual fuel oils do	281	121	Do.
Lubricating oil and grease do	18	16	Do.
Bitumen do	11	18	Do.

Gold.—During the fiscal year ending June 30, 1965, Emperor Gold Mining Co. Ltd., milled 296,238 metric tons of ore, of which approximately 11 percent was from opencut workings. Fine gold recovery amounted to 111,638 ounces, leaving about 3,400 ounces in the mill circuit at the close of the fiscal year. Despite record mining and milling performance, rising costs have prompted the company to apply to the Fiji Government for financial assistance in the form of a subsidy that will enable the company to continue programs of exploration, development, and research. In view of the demonstrated technological capabilities of the mine staff and the importance of this enterprise to the national economy, such assistance appears fully warranted. Measured ore reserves at the close of the fiscal year were estimated at 934,100 long tons averaging 8.6 pennyweights gold per ton (equivalent to 38.4 ounces per short ton).

The geophysical survey of the Tavua Basin, started in 1964 by Emperor Gold Mining Co. Ltd., in cooperation with the Geological Survey Department of Fiji, has included collection in 1965 of 9,300 soil samples from about 15 square miles. Four prospects considered worthy of followup drilling have been defined.

Manganese Ore.—The year's output of manganese ore was from the Nabu and Koroviko mines which reported production of 5,139 nd 340 tons respectively.

Nonmetals. — *Cement.* — Manufacture of cement in Fiji was started in 1962 by Fiji Industries Limited at Lami on Suva harbor. Rated annual capacity of the plant is 45,700 metric tons. Raw materials include coral sand dredged from the harbor and from Vunivandra Channel in Laucala Bay. Virtually all output has been consumed in Fiji.

MAKATEA

Exports of phosphate sands from the island of Makatea, the only island of French Polynesia that is credited with appreciable output of mineral products, amounted to 318,620 metric tons in 1965. Quantities exported in recent years have been as follows:

Year	Metric tons			
	Japan	New Zealand	Other countries	Total
1961	236,358	121,756	10,670	368,784
1962	219,637	87,900	14,054	321,591
1963	194,531	120,198	6,518	321,247
1964	171,424	195,585	7,108	374,117
1965	160,439	158,153	28	318,620

With the imminent exhaustion of minable reserves of phosphatic materials on Makatea, Compagnie Française des Phosphates de l'Oceanie (CFPO), the sole producer, has transferred its interest and removed some equipment and personnel to manganese mining on the New Hebrides island of Vate.

NAURU AND OCEAN ISLAND

The phosphate mining industries on the Australian Trust Territory of Nauru and Ocean Island of the British Gilbert and Ellice Islands Colony are both conducted by the British Phosphate Commissioners (representing the Governments of United Kingdom, Australia, and New Zealand). Together the islands supply the bulk of Australian and New Zealand phosphate rock requirements. Production and exports for recent years have been as follows:

During 1965 discussions relative to royalty rates for phosphate rock extraction were held between natives of both islands and government officials. Under terms of an interim agreement with the Gilbert and Ellice Islands Colony administration, announced on February 4, 1966, the existing rate of 23 shillings ($2.66) on exports from Ocean Island is to be increased by 2 shillings ($0.28) to a new rate of 25 shillings ($2.92) per ton. Revision of royalties payable to Nauruans has not been announced.

Year	Metric tons		
	Nauru	Ocean Island	Total
1961	1,302,740	342,950	1,645,690
1962	1,539,976	260,769	1,800,745
1963	1,572,075	361,344	1,933,919
1964	1,849,278	328,030	2,177,308
1965	1,495,755	375,299	1,871,054

NEW CALEDONIA

New Caledonia's mineral output including iron ores, nickel ores, and smelter products yielded exports valued at over $61 million in 1965, an increase of 11 percent over that of 1964. Following closure of the Tiebaghi mine at Paagoumene in 1962, production of chromite ore has not been reported. In addition to metallic ores, a small quantity of giobertite was produced and used locally as a metallurgical refractory.

Two Canadian companies, International Nickel Co. of Canada, Ltd., and Denison Mines, Ltd., reportedly have expressed interest in undertaking nickel ventures jointly with French partners. Late in 1965 two new joint-ownership companies were formed on a 50–50 basis by Kaiser Aluminum & Chemical Corp. (of the United States) and Société le Nickel. One company, under administration of Le Nickel, plans to establish a new ferronickel smelter to produce about 15,000 tons of contained nickel per year in New Caledonia. The other, Kaiser Nickel Co., with a plant which will be located in the United States, will process this product and market both refined nickel and ferronickel in North America. Under the long-term contract with Sherritt Gordon Mines Ltd., 5,259 tons of nickel matte was shipped during 1965 to Canada for refining at the Fort Saskatchewan refinery.

PRODUCTION

Increases in output of nickeliferous materials in 1965 were more than sufficient to balance modest declines in output of other commodities in terms of value.

TRADE

Mineral product exports valued at $61.4 million in 1965 accounted for 94 percent of New Caledonia's total exports. Traditionally the entire output of metal ores and products of the nickel smelter has been exported, with the bulk of crude ores going to Japan and Australia and smelter products to France. However, in recent years, large quantities of nickel matte and ferronickel have been shipped to Japan and Canada.

Table 4.—New Caledonia: Production of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1961	1962	1963	1964	1965
Metals:					
Chromite (51–53 percent chromium oxide)	36,662	15,455	---	---	---
Iron ore (55–56 percent iron)--thousand tons	277	303	299	292	279
Nickel:					
Ore [1]--do	2,310	1,458	1,931	2,576	2,603
Metallurgical products: [2]					
Ferronickel (nickel-cobalt content)	13,367	5,506	8,332	13,330	15,566
Matte (nickel-cobalt content)	12,034	9,858	14,146	13,298	15,816
Nonmetals: Giobertite [3]	---	1,176	12	1,007	755

[1] Mine-run ore, about 25 percent water; nickel content 2.8–3.5 percent by dry analysis.
[2] Ferronickel grading 24–28 percent nickel-cobalt, mattes about 79 percent nickel-cobalt.
[3] Magnesian mineral used for refractories.

Source: Mines Service of New Caledonia.

Table 5.—New Caledonia: Exports of metals and minerals

(Metric tons)

Commodity	1963	1964	1965	Principal destinations, 1965
Chromite	17,955	5,994	---	
Iron ore	294,148	292,480	288,276	All to Australia.
Nickel ore	639,913	1,098,861	870,609	All to Japan.
Smelter products: [1]				
Ferronickel:				
Electric grade (FN4 grade—25.1 percent nickel-cobalt)	1,704	2,473	3,456	France 3,064; Australia 336.
Sulfur extracted (FN3 grade—24.5 percent nickel-cobalt)	552	1,850	3,410	France 3,162; Italy 248.
Refined (FN2 grade—26.3 percent nickel-cobalt)	141	167	230	All to France.
Overrefined (FN1 grade—27.5 percent nickel-cobalt)	5,759	8,378	8,964	France 7,843; Japan 998.
Matte: Nickel matte (79 percent nickel-cobalt)	14,129	13,485	15,785	France 7,473; Canada 5,259; Japan 3,053.

[1] Data in terms of contained nickel plus cobalt.

Source: Mines Service of New Caledonia.

Table 6.—New Caledonia: Imports of metals and minerals

(Metric tons)

Commodity	1963	1964	1965	Principal sources, 1965
Metals:				
Iron and steel, semimanufactures	7,863	11,474	25,774	France 23,362; Australia 1,525.
Nonferrous metals, not further described	189	238	362	France 293; Australia 56.
Nonmetals:				
Cement, lime, dimension stone, and asbestos cement products	21,905	26,917	38,806	Japan 20,360; France 16,917.
Clay bricks and tile	3,249	5,239	8,498	France 5,959; Austria 1,578.
Fertilizers, processed	251	439	488	France 390; Japan 36.
Sand, gravel, and crushed rock	24,326	57,561	46,187	Mexico 46,039; France 138.
Other nonmetals	603	670	709	France 385; Belgium-Luxembourg 90; Australia 85.
Mineral fuels:				
Coal, coke, and briquets	173,508	287,673	304,006	All from Australia.
Petroleum products	135,119	154,887	172,123	Australia 124,772; Malaysia 12,180; Iran 9,536.
Gas, natural and manufactured	986	925	1,659	Australia 1,211; Indonesia 210.

Mineral and metal imports consist primarily of fuels, semifabricated and fully manufactured metals, and construction materials. In 1965 imports in these categories were valued at $20 million and made up 27 percent of New Caledonia's total imports, estimated at $76.0 million.

COMMODITY REVIEW

Metals.—*Iron Ore.*—The iron ore mine at Prony, operated by Société Calédonienne des Minerais de Fer, a subsidiary of Société le Nickel, produced 279,000 metric tons in 1965, compared with 292,000 tons in 1964.

As in previous years the entire output was exported to Broken Hill Pty. Co. Ltd. in Australia. Grade of exported ores averaged 55.6 percent iron, 0.22 percent nickel, 3.06 percent chromium, and 6.75 percent moisture.

Nickel.—Production of nickel ores totaled 2,602,697 tons in 1965, a slight increase over the 1964 record. Of the year's total, 870,609 tons (averaging 3.15 percent nickel and 23.6 percent moisture) was exported. Six independent producers accounted for 75 percent of the ore exports. Le Nickel mines at Thio, Bornets, Kouaoua, and the new site at Poro, all on the northeast coast, mined a total of 1.83 million tons in 1965, compared with 1.77 million in 1964.

The great bulk of this was transported in company-owned vessels to the smelter at Doniambo, near Noumea. The Poro opencut, which commenced ore shipments in 1965, is equipped with 7 excavators, 50 bulldozers, 20 power shovels, and 75 trucks. Plans call for erecting a pelletizing plant at Poro to produce 1.5 million tons of pelletized garnierite concentrates annually from the Poro and Nepoui mines. Annual mining capacity of the company's several mines exceeds 3 million tons. While details have not been published, Le Nickel claims its New Caledonia nickel ore reserves to be the world's largest.

The $70 million expansion program to which Le Nickel is committed is aimed at an annual output of 45,000 metric tons of nickel by 1969 and 65,000 tons in 1970. The program includes extensive additions in the smelter and ancillary works, new electric power facilities and two new ore carriers.

NEW HEBRIDES

Following studies conducted jointly by the French Bureau of Recherches Géologiques et Minières (BRGM) and opencut mining of manganese ores on Vate Island, of the New Hebrides group, commenced in 1961. Since that time, in anticipation of working out reserves of phosphate rock on Makatea Island, CFPO has been transferring personnel and equipment to the manganese operation on Vate Island. Although relatively low-grade ore is mined, the benefication plant, consisting of washing and agglomeration facilities, produces a metallurgical-grade product for export. In 1965 mine output of 390,300 metric tons averaging 20 to 25 percent manganese yielded 66,710 tons of agglomerate containing 49.92 percent manganese. Exports in 1965, which apparently were in part drawn from stocks, included 71,406 tons of agglomerates and 8,954 tons of concentrate. A major portion [2] of this went to Japan.

Production and exports of manganese products during the past 5 years were as follows:

Year	Metric tons	
	Production	Exports
1961	4,590	---
1962	19,830	14,181
1963	25,416	23,319
1964	60,546	66,104
1965	66,710	80,360

PAPUA AND NEW GUINEA

The Australian-administered territories of Papua and New Guinea, including the Manus, New Ireland, New Britain, Bougainville, and other islands remained largely unexplored. Although many mineral occurrences have been reported, only gold and small quantities of silver, platinum, copper, and manganese have been produced. Value of mineral output of the two territories totaled US$1.2 million in the fiscal year ending June 30, 1965, compared with $1.5 million for the preceding year. In a national economy based mainly on agriculture and forest products, minerals represented less than 0.5 percent of the territorial gross national product, estimated at US$321 million and $370 million in 1964 and 1965, respectively.

Exploration activities by Australian Government field teams and various foreign companies have been intensified in recent years, resulting in several potentially commercial discoveries. In addition to important findings of copper ores on Bougainville Island and gold-base metal deposits on Misma Island, interest has developed in

[2] Japan trade statistics show imports of 64,525 metric tons from New Hebrides in 1965.

beach sands on the Gulf of Papua, phosphate rock at Mullins Harbor of Milne Bay in southeast Papua, and copper-gold occurrences in the Bainings area of New Britain. The oil search activity in 1965 was confined to a single well drilled in southwestern Papua and seismic surveys in eastern Papua and offshore in the Gulf of Papua.

Salient features of the Papua-New Guinea minerals industry is summarized for recent fiscal years as follows:

Fiscal year ending June 30 of year stated	Mineral areas held (acres)	Number of mines	Number of workers [1]	Value of mineral output (U.S. dollars)
1961				
Papua	1,019	18	787	7,623
New Guinea	9,971	275	3,925	1,526,105
1962				
Papua	1,038	17	161	968
New Guinea	11,216	300	3,819	1,501,288
1963				
Papua	976	18	345	1,667
New Guinea	11,260	330	3,606	1,493,603
1964				
Papua	929	26	544	1,370
New Guinea	11,339	358	3,508	1,511,639
1965				
Papua	890	87	688	1,965
New Guinea	12,246	380	3,629	1,205,312

[1] Includes workers employed in petroleum exploration.

A historical summary of mineral production through June 30, 1965, from Papua and New Guinea was published [3] in 1965. These data are condensed as follows:

Territory and commodity	Years	Unit	Total quantity produced
Papua:			
Copper:			
Ore	1906–1922	Metric tons	11,244
Matte	1922–1941	do.	15,701
Gold	[1] Pre-1951–1965	Troy ounces	618,401
Manganese ore	1939–1965	Metric tons	2,134
Platinum	[2] 1934–1940	Troy ounces	219
Silver	[1] Pre-1951–1965	do.	257,577
New Guinea:			
Gold	[1] Pre-1951–1965	do.	3,564,176
Silver	[1] Pre-1951–1965	do.	2,185,753

[1] As reported.
[2] Platinum production 1940–65 not reported.

Minerals legislation enacted during 1965 included amendments to the Petroleum (Prospecting and Mining) Ordinance 1951–63 for Papua and New Guinea, and the Mining Ordinance 1928–62 of New Guinea. The new legislation provides for land titles better suited to modern, large-scale methods of prospecting and mining and defines the rights of surface owners. The present status of mining laws, royalties, and tax concessions to the mining industry are outlined in a publication.[4]

PRODUCTION

Quantities of minerals produced in Papua and New Guinea in recent calendar years follow:

[3] Department of Lands, Surveys, and Mines. Territory of Papua and New Guinea; The Mining Industry of Papua-New Guinea. Port Moresby, 1965, p. 8.
[4] Work cited in footnote 3.

Commodity	1961	1962	1963	1964	1965
Gold.....troy ounces..	41,820	39,052	43,599	38,977	32,494
Silver.....do....	30,246	24,511	23,696	23,206	19,664
Platinum.....do....	5	4	5	1	4
Manganese ore.....metric tons..	2	---	3	2	---

TRADE

Total territorial trade in the 1964–65 fiscal year was made up of exports valued at $55 million and imports totaling $96 million. Minerals exports accounted for $1.2 million of which gold bullion contributed over 99 percent. Imports of mineral and metal products were valued at $10.7 million, principally iron and steel products. ($4.42 million), fuels ($4.04 million), and cement ($0.55 million).

COMMODITY REVIEW

Metals.—*Copper.*—Throughout 1965 Conzinc Riotinto of Australia, Ltd., continued active exploration of the large low-grade porphyry-type copper deposit near Kieta on Bougainville Island, at the northwestern end of the Solomon group. Government assistance on this project in 1965 took the form of a regional mapping program by the Australian Bureau of Mineral Resources.

Gold.—Bulolo Gold Dredging Ltd., in the Bulolo Valley, eastern New Guinea, reported production of 8,747 ounces of gold and 3,729 ounces of silver from its dredging and sluicing operations during the company year ending May 31, 1965. Following a breakdown, the company's last operating dredge was closed on June 4. Subsequent production has been solely from hydraulic mining operations in the Widubosh area. Cubic yardage handled during the year totaled 4.86 million, and recovery averaged 6.85 cents per cubic yard. On May 31, 1965, reserves in the Widubosh sluicing area were estimated at 3.97 million cubic yards.

New Guinea Goldfields Ltd. milled 89,567 metric tons of ore yielding 12,984 ounces of gold and 11,410 ounces of silver from opencut workings near Wau in the fiscal year ending June 30, 1965. Remaining ore reserves in this locality included 428,000 tons positive and probable plus 162,000 tons possible. The company's sluicing operation, conducted jointly with Koranga Gold Sluicing Ltd., on Koranga Creek yielded 3,666 ounces of gold during the year.

In addition to the company operations, small groups and individual natives worked alluvial deposits in numerous, widely scattered areas. The number of persons so employed has been estimated at 3,000. A partial count revealed 84 such operations in Papua and 894 in New Guinea during fiscal year 1964–65.

Pacific Island Mines Ltd. of Australia since 1959 has ben conducting exploration and development on an old lode gold mine (with lead and zinc) on Misma Island, about 100 miles off the southeast tip of Papua. The mine was worked and a small mill operated prior to World War II. Recent drilling and underground development, completed with the participation of Cultus Explorations Ltd., a Canadian company, has indicated ore reserves in excess of 1 million tons and the company is planning to initiate production by 1968.

Mineral Fuels. — *Petroleum.* — Petroleum search activities in 1965 were limited to a single test well, Ivir No. 1, drilled to a depth of 12,015 feet by Australasian Petroleum Co. Pty. Ltd., subsidiary of Oil Search Ltd. in the delta of Kamau Creek on Papua's southwest coast. Seismic surveys were conducted in the northwest Wana area by Australasian Petroleum Co. Pty. Ltd., and offshore in the Gulf of Papua by Phillips Petroleum Company and associates. Marathon Petroleum Australia Ltd. with Continental Oil Company of Australia also conducted reflection-seismic studies, using two crews in eastern Papua.

Index to Political and Geographic Areas

Notes to users:

This index is not complete; space does not permit compete indexing of countries listed as trading partners in the section of each chapter dealing with trade and in tables accompanying such sections. Moreover it does not list passing mentions of the nationality of business enterprises or Government agencies where these differ from the nationality of the subject country of the chapter.

Direct references to pages appear under the version of the country or area name used in the chapter or chapter section dealing with that country or area (usually but not always the short form of the name approved by the Department of State[1]). Commonly used variations of these names, including names that have recently been changed, are listed with a cross-reference to the version of the particular country or area name used in this volume.

Boldface type has been used to indicate the pages of the chapter or chapter section dealing primarily with the indexed country or area; page numbers in regular type indicate specific mention of the country or area appearing in regional review chapters.

[1] U.S. Department of State, Bureau of Intelligence and Research. Status of the World's Nations. Geographic Bull. 2, Government Printing Office, May 1965, 21 pp.

[2] The Australian possession in the Indian Ocean, not to be confused with the British possession in the Pacific in the Line Island group.

U.S. GOVERNMENT PRINTING OFFICE: 1967 O—263-927