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THE MINERAL INDUSTRY OF PORTUGAL

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In 2006, Portugal was a significant European minerals producer and one of Europe's leading copper producers. It was also a significant world producer of feldspar (eleventh after Italy, Turkey, and others), lithium (seventh after Chile, China, Australia, and others), and tungsten (sixth after China, Russia, Canada, and others) (MBendi Information Services (Pty) Ltd., 2007a; Ober, 2007; Potter, 2007; Shedd, 2007).

Portugal's Iberian Pyrite Belt (IPB) is one of the most mineralized geological provinces of Western Europe and is geologically complex. Massive sulfides linked to synorogenic volcanism were deposited in the southwestern part of the Iberian Peninsula where the IPB's volcanogenic massive sulfide (VMS) deposits are located. These deposits date to the Upper Devonian and the Lower Carboniferous ages and were deposited during submarine felsic volcanism. The IPB, which has 85 known VMS deposits, was an important source of base metals in the European Union (EU) (MBendi Information Services (Pty) Ltd., 2007a).

Minerals in the National Economy

Portugal has considerable mineral wealth. The most important metallic mineral resources are copper, tin, tungsten, and uranium. The most important resources of industrial minerals are high-quality marble, pyrites, and rock salt. The country has limited energy resources and depended upon imports for the bulk of its energy needs (MBendi Information Services (Pty) Ltd., 2007a, b; U.S. Energy Information Administration, 2007).

Portugal's economy had become a diversified and increasingly service-based one since the country joined the EU in 1986. In 2006, the Government continued with the country's privatization program and was proceeding with legislation that would privatize many state-owned companies. The privatization effort was part of a broader program to reduce the role of the state in the economy and to encourage the economy to be more market oriented. Privatization was helping the country to regain confidence in the Government's macroeconomic management and to create conditions for lower inflation and interest rates. The mining and mineral processing industries represented almost 1% of the gross domestic product (GDP) in 2006. The minerals sector employed about 1% (33,000) of the industrial sector's total (3.3 million). As a target for foreign direct investment, Portugal has been overshadowed by lower-cost producers in Central Europe and Asia (Instituto Nacional de Estatística, 2007; U.S. Central Intelligence Agency, 2007; U.S. Department of State, 2007).

Production

Portugal's industrial minerals sector was a modern and efficient producer of a variety of materials, most notably dimension stone and minerals for the manufacture of ceramics. The dimension stone industry continued to be an important segment of the mining industry in terms of value and trade. The country was one of the leading producers of mined copper in the EU and an important producer of salt rock, talc, and tungsten concentrates (table 1).

Structure of the Mineral Industry

Primary Metals Inc. (PMI) of Canada, through its subsidiary Beralt Tin & Wolfram S.A., mined tungsten at its Panasqueira Mine, which is located in central Portugal (Primary Metals Inc., 2007). On October 19, 2006, the Canadian corporations Eurozinc Mining Corp. and Lundin Mining Corp. merged into a joint venture, which was consolidated before yearend. The new company, Lundin Mining Corp. (LMC), became a part of the European copper, lead, and zinc industries. In Portugal, LMC acquired the Aljustrel zinc-lead-silver project and the Neves Corvo copper-zinc mine and was set to conduct greenfields exploration for base and precious metals near the Neves Corvo Mine as well (Lundin Mining Corp., 2007a, b).

Lusosider Aços Planos S.A. and SN Servicos S.A. were the major steel producers. Cimentos de Portugal S.A. (Cimpor) was an important producer of cement. With the exception of copper, dimension stone, and tungsten, production of other minerals and related materials had only domestic significance. Some of the leading mineral-related companies were partially owned or controlled by the Government, and some operations were privately owned (table 2).

PMI reported favorable results of underground gold sampling at its Quinta/Banjas gold property, which covers 44 square kilometers and is located about 20 kilometers (km) to the east of Porto City. The auriferous occurrences were generally associated with structural zones that consisted of faults, shears, fractures, and deformation corridors, which control the gold mineralization. PMI also announced that its Argimela tin deposit in eastern Portugal has a potential for oxide tin (cassiterite) and was in the development stage (Primary Metals Inc., 2007).

Commodity Review

Metals

Copper.—Production from the Neves Corvo Mine was 78,660 metric tons (t) in concentrate compared with 89,541 t in 2005, which was a decrease of 12.2%. The country's copper output was valued at $385 million, which was 26.5% higher than that of 2005; the increase in value was a result of the increase in the price of copper to $2.829 per pound in 2006 from $1.549 per pound in 2005. The Neves Corvo Mine was one of the highest-grade copper mines in the world. It consisted of five ore bodies that contain copper, tin, and zinc. In 2006, zinc production supplanted tin production, as there were insufficient tin reserves remaining in the deposit to support full-time production. The mine had proven copper reserves of 6,835 Mt at an average

grade of 5.73%, probable copper reserves of 9,975 Mt at an average grade of 5.29%, and probable zinc reserves of 10,626 Mt at an average grade of 7.96% (table 1; Instituto Nacional de Estatística, 2007; Lundin Mining Corp., 2007a, b).

Tungsten.—Production from the Panasqueira tungsten mine in Beira Baixa Province of central Portugal was 780 t in concentrate (W content) compared with 816 t in 2005, which was a decrease of 4.4%, owing to low tungsten prices. China is believed to have recently surpassed Europe as the leading user of tungsten, followed by the United States, Japan, Russia, and others. The Panasqueira Mine continued to be one of the world's leading producers of tungsten concentrates outside of China and produced a 75% tungsten oxide (WO_3) concentrate. On June 23, 2006, PMI announced that the mine has proven and probable reserves of 1.4 million metric tons (Mt) at a grade of 0.233% WO_3 and additional indicated (3.3 Mt at a grade of 0.263% WO_3) and inferred (1.6 Mt at a grade of 0.224% WO_3) resources. PMI announced that there was development progress at the mine where new underground equipment was introduced and a refurbishment program was underway. The main end-use application for tungsten was in the manufacture of cemented carbides (60%), steel and alloy (21%), electrical and electronics (11%), and catalysts and pigments (8%) (table 1; Primary Metals Inc., 2007).

Industrial Minerals

Cement.—Cimpor was Portugal's leading cement producer and was the second ranked cement company on the Iberian Peninsula after Cemex SA. In addition to cement, Cimpor also produced aggregates, precast concrete products, and dry mortars. The development of Portugal's infrastructure was expected to create a substantial demand for Cimpor's products in the coming years (Hoover's, Inc., 2006).

Stone, Dimension.—Marble was the most valuable of the stone products and accounted for the majority of stone production. The main area for marble quarrying continued to be the Evora District (Hoover's, Inc., 2006).

Mineral Fuels

Petroleum, Natural Gas, and Coal.—Portugal had limited domestic energy resources and imported about 90% of its energy requirements, of which about 66% was petroleum; 10%, natural gas; and 5%, coal for electricity generation. The country's leading domestic energy resource was hydropower, but at times it was unreliable, because it depended on rainfall. Portugal had two oil refineries that were operated by Petróleos de Portugal (Petrogal). They were located in the Porto and the Sines terminals, which had a combined capacity of 305,000 barrels per day (bbl/d). The Government of Portugal was planning to invest $1.8 billion to upgrade the country's refining processes by 2010. The Government also planned to invest about $11 billion in renewable energy projects by 2012, of which wind power's infrastructure would cost about $2.3 billion. The Government signed an agreement with Argus Resources of the United Kingdom to build a petroleum refinery that would be the largest, in terms of production, on the Iberian Peninsula. The project would be built 90 km south of Lisbon at Sines. The refinery, which was to be completed by 2010, was expected to cost $4.7 billion and would have a production capacity of 250,000 bbl/d (Alexander's Gas & Oil Connections, 2007; MBendi Information Services (Pty) Ltd., 2007b).

Outlook

Several gold and base metal projects were undergoing feasibility studies and most of them are focused on the Portuguese Zone of the IPB. The IPB is a focus of interest for mining companies and a prime target for exploration activities because it appears to have a good potential for success on the basis of the large VMS deposits discovered so far. Increased production of granite, marble, and slate in Portugal is also possible. Owing to its dependence on imported energy, the Portuguese Government plans to increase its investments in hydropower, solar power, wave power, and wind power.

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TABLE 1
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2002	2003	2004	2005	2006[e]
METALS						
Aluminum, secondary[e]	thousand metric tons	16	18	16	18	18
Arsenic, white[e]		25	25	15	15	15
Beryl, concentrate, gross weight[e]		5	5	5	5	5
Copper, mine output, Cu content		77,227	77,581	95,743	89,541	78,660 [2]
Iron and steel:						
Iron ore and concentrate, manganiferous:[e]						
Gross weight		14,000	14,000	14,000	14,000	14,000
Fe content		10,000	10,000	10,000	10,000	10,000
Metal:						
Pig iron[e]	thousand metric tons	100	100	100	100	100
Steel:						
Crude	do.	894	722	720	725	725
Hot rolled[e]	do.	1,054 [2]	1,000	1,000	800	800
Lead, refined, secondary[e]		4,000	4,000	4,000	3,000	3,000
Manganese, Mn content of iron ore[e]		300	300	300	300	300
Silver, mine output, Ag content	kilograms	19,500	21,800	24,400	23,786 [r]	20,076 [2]
Tin:						
Mine output, Sn content		574	218	220	243 [r]	25 [2]
Metal, primary and secondary		361	--	--	--	--
Tungsten mine output, W content		693	715	746	816	780 [2]
Uranium concentrate, U_3O_8		2	--	--	--	--
Zinc, smelter, primary[e]		3,000	3,000	3,000	2,000	7,505 [2]
INDUSTRIAL MINERALS						
Barite		NA	NA	NA	21	24 [2]
Calcium carbonate[e]		100,000	100,000	100,000	100,000	100,000
Cement, hydraulic	thousand metric tons	9,759	8,567	8,843	9,000 [e]	9,000
Clays:						
Kaolin[3]		148,706	150,000	152,077	164,072 [r]	NA [2]
Refractory		614,453	625,000	504,017	395,820 [r]	NA [2]
Diatomite		400	300	--	--	-- [2]
Feldspar		124,117	126,116	98,262	133,344	129,333 [2]
Gypsum and anhydrite		579,143	419,799	461,212	389,180 [r]	NA [2]
Lime, hydrated and quicklime[e]		20,000	200,000	200,000	200,000	200,000
Lithium minerals, lepidolite		16,325	24,606	28,696	26,185	28,497 [2]
Nitrogen, N content of ammonia		190,300	244,700	243,900	244,000	244,000
Pyrite and pyrrhotite, including cuprous, gross weight[e]		10,000	10,000	10,000	8,000	8,000
Salt, rock		603,959	602,035	661,704	597,945	586,190 [2]
Sand[e]	thousand metric tons	10,953 [2]	10,000	10,000	7,336 [r, 2]	NA [2]
Sodium compounds, n.e.s.:[e, 4]						
Soda ash		150,000	150,000	150,000	150,000	150,000
Sulfate		50,000	50,000	50,000	50,000	50,000
Stone:						
Basalt		500,000	403,233	456,300	464,236	NA [2]
Calcareous:						
Dolomite	thousand metric tons	1,758	1,932	1,900 [e]	1,021 [r]	NA [2]
Limestone, marl, calcite	do.	51,095	48,780	51,355	51,025 [r]	NA [2]
Marble	do.	802	705	749	752 [r]	NA [2]
Gabbro[e]	do.	100	100	100	100	100
Granite:						
Crushed	do.	28,645	30,000	29,665 [r]	30,000 [e]	30,000
Ornamental	do.	900	540	646 [r]	659	NA [2]
Graywacke[e]	do.	1,000	806	428 [2]	344 [r, 2]	NA [2]
Ophite	do.	120	52	52	51 [r]	NA [2]
Quartz[e]	do.	16	16	5 [2]	5	5
Quartzite	do.	455	414	301	256 [r]	NA [2]

See footnotes at end of table.

TABLE 1--Continued
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2002	2003	2004	2005	2006[e]
INDUSTRIAL MINERALS--Continued						
Stone--Continued:						
Schist	thousand metric tons	150	173	259	208 [r]	NA [2]
Slate[e]	do.	40	38	36 [2]	33 [r]	NA [2]
Syenite	do.	185	160	116	109 [r]	NA [2]
Sulfur, byproduct, all sources[e]		28,000	27,000	25,000	25,000	25,000
Talc		8,916	5,459	6,231	5,362	5,517 [2]
MINERAL FUELS AND RELATED MATERIALS						
Coke, metallurgical[e]	thousand metric tons	300	300	300	300	300
Gas, manufactured[e]	thousand cubic meters	125	125	125	125	125
Petroleum refinery products:[e]						
Liquefied petroleum gas	thousand 42-gallon barrels	3,869 [2]	4,489 [2]	3,200	3,200	3,200
Gasoline	do.	21,243 [2]	23,469 [2]	20,000	20,000	20,000
Kerosene and jet fuel	do.	4,052 [2]	5,694 [2]	6,500	6,500	6,500
Distillate fuel oil	do.	35,697 [2]	37,084 [2]	30,000	30,000	30,000
Residual fuel oil	do.	18,359 [2]	17,995 [2]	19,000	19,000	19,000
Unspecified	do.	16,206 [2]	16,535 [2]	16,000	16,000	16,000
Refinery fuel and losses	do.	6,278 [2]	6,716 [2]	3,800	3,800	3,800
Total	do.	105,704 [2]	111,982 [2]	98,500	98,500	98,500

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. NA Not available. -- Zero.
[1]Table includes data available through June 2007.
[2]Reported figure.
[3]Includes washed and unwashed kaolin.
[4]Not elsewhere specified.

Source: USGS Minerals Questionnaire, Portugal, 2005-06.

TABLE 2
PORTUGAL: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Calcium carbonate		Omya Mineral Portuguesa Lda. (Salmon & Cia Lda.)	Mine and plant at Fatima	100
Cement		Cimentos de Portugal S.A. (Cimpor) (Government, 100%)	Plants (3) at Alhandra, Loule, and Souselas	12,000
Copper, concentrate		Primary Metals Corp.	Neves Corvo Mine near Castro Verde	100
Diatomite		Sociedade Anglo-Portugesa de Diatomite Lda.	Mines at Obidos and Rolica	150
Feldspar		A.J. da Fonseca Lda.	Seixigal Quarry, Chaves	10
Ferroalloys		Electrometalúrgia S.A.R.L.	Plant at Setubal	100
Kaolin		Saibrais Arelas e Caulinos S.A. (Denain Anzin Mineraux S.A.)	Mines at Casal dos Bracais and Mosteiros	175
Petroleum, refined	42-gallon barrels per day	Petróleos de Portugal (Petrogal) (Government, 100%)	Refineries at Porto and Sines	305,000
Pyrite		Pirites Alentejanas S.A. (EuroZinc Mining Corp.)	Mine at Aljustrel, plant at Setubal	100
Steel, crude		SN Servicos S.A. (Metalúrgica Galaica S.A., 100%)	Steelworks at Maia and Seixal	600
Do.		Lusosider Aços Planos S.A. (Corus Group, 50%, and Sollac S.A., 50%)	Rolling mill at Seixal	400
Tin		Primary Metals Corp.	Neves Corvo Mine near Castro Verde	15
Tungsten, concentrate	metric tons	Beralt Tin & Wolfram S.A. (Primary Metals Inc.)	Panasqueira Mine and plant at Barroca	1,400
Uranium	do.	Empresa Nacional de Uranio S.A. (Government, 100%)	Mines at Guargia, plant at Urgeirica	150
Zinc, refined		RMC Quimigal S.A.R.L.	Electrolytic plant at Barreiro	12