



2005 Minerals Yearbook

PORTUGAL

THE MINERAL INDUSTRY OF PORTUGAL

By Harold R. Newman

The southern Iberian Peninsula, which is known as the Iberian Pyrite Belt (IPB), is one of the most mineralized areas of Western Europe and is geologically complex. Massive sulfides linked to synorogenic volcanism were deposited in the southwestern part of the peninsula. The IPB's volcanogenic massive sulfide (VMS) deposits, which date to the Upper Devonian and the Lower Carboniferous ages, were deposited during submarine felsic volcanism. The IPB, with 85 known VMS deposits, was the main source of base metals in the European Union (EU). The country has considerable mineral wealth; the most important metallic mineral resources are copper, tin, and tungsten. Large reserves of uranium also exist, although they were not exploited. The most important mineral resources include such nonmetallic ores as high-quality marble, pyrites, and rock salt. Portugal also has an abundance of waterpower resources.

Portugal has a land area of 92,390 square kilometers (km²), which includes the Azores and the Madeira Islands, and is bordered on the east and north by Spain and on the south and west by the Atlantic Ocean. The country is a republic divided into 18 districts for administrative purposes. In 2005, the gross domestic product based on purchasing power parity was \$203 billion, and the per capita income based on purchasing power parity was \$19,335. The inflation rate was 2.1%, and the unemployment rate was more than 7.6% (International Monetary Fund, 2006§¹).

Although the mineral industry of Portugal was modest in size, it was one of the leading producers of mined copper in the EU. The country was also an important producer of dimension stone and tungsten concentrates (table 1).

EuroZinc Mining Corp. mined copper with tin as a byproduct at its Neves-Corvo Mine, and Beralt Tin & Wolfram S.A. mined tungsten at its Panasqueira Mine; these were the two major operations in the metals mining sector. 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).

Portugal's economy has become diversified and increasingly service-based since the country joined the EU. 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 and to encourage the economy to be more market driven. Portugal has been overshadowed by lower-cost producers in Central Europe and

Asia as a target for foreign direct investment (U.S. Central Intelligence Agency, 2006§).

Redcorp Ventures Ltd. signed an agreement on November 3, 2004, with the Government to acquire the Lagoa Salgada exploration contract. The 415-km² Lagoa Salgada property consisted of advanced drill-stage polymetallic VMS exploration targets in the northwestern end of the IPB. In July 2005, Redcorp commenced a diamond drilling program after completion of pre-collar drilling and casing of the Tertiary sediments, which overlie the host bedrock, to allow coring and evaluation of the exploration targets. Diamond drilling by previous owners on the concession resulted in the discovery of a VMS deposit hosted within a series of intensely hydrothermally-altered volcanic rocks. These rocks lie on an extension of the volcanic stratigraphy that hosts the Caveira and the Lousal VMS deposits to the south and the Neves-Corvo VMS deposit to the east (Redcorp Ventures Ltd., 2005b§).

Between August and December 2005, Redcorp completed a six-hole 2,000-meter (m) drill program to evaluate several density anomalies. The work was only partially successful because three of the holes were unable to be completely tested owing to problems with completing the holes. Copper, gold, lead, silver, and zinc occurrences were encountered in the massive sulfide deposit. Further drilling was planned in 2006 to complete the evaluation of the target area and assess other prospective zones (Redcorp Ventures Ltd., 2005a§).

EuroZinc Mining Corp. was a Canadian-based mining company that owned two base metal mines in southern Portugal. The Neves-Corvo Mine was operating and was a significant producer of copper concentrates. The Aljustrel Mine, which is situated 40 kilometers (km) from Neves-Corvo, was on care and maintenance status.

EuroZinc announced that it had completed the purchase of 100% of the shares of Sociedade Mineira Neves-Corvo SA (SOMINCOR). The shares were purchased from Empresa de Desenvolvimento SA (51%) of Portugal and the Rio Tinto Group (49%) of the United Kingdom for a purchase price of about \$155 million. The Neves-Corvo Mine was one of the highest grade copper mines in the world. Neves-Corvo consisted of five ore bodies that contain copper, tin, and zinc. In 2006, zinc production will start and supplant tin production, as there were insufficient tin reserves remaining in the deposits to support full-time production. The mine had estimated proven copper reserves of 6,835 million metric tons (Mt) at an average grade of 5.73%, and estimated probable copper reserves of 9,975 Mt at an average grade of 5.29%, and estimated probable zinc reserves of 10,626 Mt at an average grade of 7.96% (EuroZinc Mining Corp., 2005§).

EuroZinc reported that drilling continued to intersect high grade copper and zinc zones at Zambujal. The Zambujal ore body was one of five polymetallic massive sulfide ore bodies that make up the Neves-Corvo area. Underground infield drilling identified a thick and high-grade polymetallic zone

¹References that include a section mark (§) are found in the Internet References Cited section.

that averaged 21 m in thickness at grades of 13.1% copper and 7.6% zinc. Of the 46,000 m of drilling planned in the program, 3,000 m was completed in 2005, and the balance was scheduled for 2006 (MBendi Information Services (Pty) Ltd., 2005b§).

C2C Inc. of Canada announced that it had optioned the Penedono gold project from Rio Narcea Gold Mines. The property has a surface area of 220 km² where about €1.5 million (\$1.9 million²) worth of exploration work was completed between 1998 and 2004 with several gold occurrences revealed. The auriferous occurrences were generally associated with structural zones that consist of faults, shears, fractures, and deformation corridors with conjugate networks that would facilitate the controls of the mineralization. Diamond drilling started in early 2005 (MBendi Information Services (Pty) Ltd., 2005a§).

Iberian Resources reported that their drilling program had intersected high-grade gold mineralization in shallow depths at the Montemor gold project. Mineralization occurred from 16.1 m to 25.1 m with an average grade of 10.1 grams per metric ton (g/t) of gold. Montemor was reported to contain an inferred resource of 4.12 Mt at a grade of 2.74 g/t gold. The resource was contained in a series of 11 shallow deposits along a 12-km shear zone. Limited drilling had been done between the existing deposits or at depths of greater than 100 m. Iberian believed that there was potential to expand on the existing resource base with additional exploration drilling (MBendi Information Services (Pty) Ltd., 2005c§).

Beralt Tin & Wolfram SA (Beralt), which was owned by Primary Metals Inc. of Canada, operated the Panasqueira Mine in Beira Baixa Province. The mine was one of the world's leading producers of tungsten concentrates outside of China and produced a 75% tungsten oxide (WO₃) concentrate. Beralt announced that there was progress at the mine where new underground equipment was introduced and a refurbishment program was underway (Primary Metals Inc., 2006§).

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.

Cimpor was Portugal's leading cement manufacturer and was the number two 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§).

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.

Although Portugal was one of the faster growing European economies, it had limited domestic energy resources and imported about 90% of its oil needs. The leading suppliers were Russia, Libya, and Saudi Arabia. Portugal imported small

amounts of coal for electricity generation, which produced about 5% of the country's needs. One-third of Portugal's electricity was provided by hydropower. The energy sector was expected to become increasingly more dependent upon and integrated with Spain's energy sector (U.S. Energy Information Administration, 2006§).

The leading oil company was Petroleos de Portugal (Petrogal), which was a subsidiary of Government-owned Galp Energia SGPS, S.A. Petrogal controlled the domestic midstream and downstream oil sectors. The Government announced that it planned to offer part of its 30% stake in Galp Energia in a public offering in 2006 (U.S. Energy Information Administration, 2006§).

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 capacity, on the Iberian Peninsula. The project will 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 barrels per day. More than one-half of the output was to be exported to the United States (Petroleum Economist, 2006).

The EU Executive Commission blocked a proposed merger of Portugal's main electricity and gas groups because of objections raised by EU competition authorities. The transaction would have allowed Galp Energia to sell 51% of Gás de Portugal to Energia de Portugal and to sell the remaining 49% to ENI SpA of Italy (Alexander's Gas & Oil Connections, 2006§).

Outlook

The structure of the mineral industry could change in the near future because of continuing mineral exploration based on exploration models developed in the IPB. Copper, gold, kaolin, lithium, and pyrites were some of the minerals targeted for exploration. The IPB is a focus of interest for mining companies as well as for official institutions in Portugal and Spain and is a prime area for exploration activity; the IPB appears to have an above-average potential for success on the basis of the large VMS deposits discovered to date. Companies will be targeting the Portugal area of the IPB, which is considered to be underexplored. EuroZinc's copper-zinc exploration and mining operations reside in Portugal where the company plans to embark on a \$10 million 18-month exploration program to explore the area near its existing Neves-Corvo Mine. Redcorp Ventures Ltd. is exploring for copper, lead, silver, and zinc at its Lagoa Salgada property. Increased production of granite, marble, and slate in Portugal is also possible.

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²Where necessary, values have been converted from European Union euros (€) to U.S. dollars (US\$) at the rate of €1.00=US\$1.27.

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Major Sources of Information

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TABLE 1
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2001	2002	2003	2004	2005 ^c	
METALS						
Aluminum, secondary ^c	thousand metric tons	18	16	18	16	18
Arsenic, white ^e		50	25	25	15	15
Beryl, concentrate, gross weight ^c		5	5	5	5	5
Copper, mine output, Cu content		82,965	77,227	77,581	95,743	89,541 ²
Iron and steel:						
Iron ore and concentrate, manganiferous: ^e						
Gross weight		14,500	14,000	14,000	14,000	14,000
Fe content		11,000	10,000	10,000	10,000	10,000
Metal:						
Pig iron ^c	thousand metric tons	82 ²	100	100	100	100
Steel:						
Crude	do.	728	894	722	720	725
Hot rolled ^c	do.	865 ²	1,054 ²	1,000	1,000	800
Lead, refined, secondary ^c		4,000	4,000	4,000	4,000	3,000
Manganese, Mn content of iron ore ^c		500	300	300	300	300
Silver, mine output, Ag content	kilograms	23,100	19,500	21,800	24,400 ^{r,2}	23,800 ²
Tin:						
Mine output, Sn content		1,174	574	218 ^r	220	228 ²
Metal, primary and secondary		716	361	-- ^r	--	--
Tungsten mine output, W content		698	693	715	746 ^r	816 ²
Uranium concentrate, U ₃ O ₈		5	2	--	--	--
Zinc, smelter, primary ^c		3,600	3,000	3,000	3,000	2,000
INDUSTRIAL MINERALS						
Calcium carbonate ^c		100,000	100,000	100,000	100,000	100,000
Cement, hydraulic	thousand metric tons	10,162 ^r	9,759 ^r	8,567 ^r	8,843 ^r	9,000
Clays:						
Kaolin ³		146,436	148,706	150,000	152,077 ^{r,2}	160,000
Refractory		660,775	614,453	625,000	504,017 ^r	500,000
Diatomite		387	400	300 ^r	-- ^r	-- ²
Feldspar		112,923	124,117	126,116	98,262 ^r	133,344 ²
Gypsum and anhydrite		787,646	579,143	419,799 ^r	461,212 ^r	500,000
Lime, hydrated and quicklime ^c		200,000	20,000	200,000	200,000	200,000
Lithium minerals, lepidolite		11,571	16,325	24,606 ^r	28,696 ^r	26,185 ²
Nitrogen, N content of ammonia		201,600	190,300	244,700	243,900	244,000
Pyrite and pyrrhotite, including cuprous, gross weight ^c		10,000	10,000	10,000	10,000	8,000
Salt, rock		625,785	603,959	602,035	661,704 ^r	597,945 ²
Sand ^c	thousand metric tons	10,000	10,953 ²	10,000	10,000	10,000
Sodium compounds, n.e.s.: ^c						
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 ^e		500,000	500,000	403,233 ^{r,2}	456,300 ^{r,2}	500,000
Calcareous:						
Dolomite	thousand metric tons	1,700 ^e	1,758	1,932 ^r	1,900 ^e	2,000
Limestone, marl, calcite	do.	37,654	51,095	48,780 ^r	51,355 ^{r,2}	50,000
Marble	do.	835	802	705 ^r	749 ^{r,2}	800
Gabbro ^e	do.	100	100	100	100	100
Granite:						
Crushed	do.	29,246	28,645	30,000	29,665 ^{r,2}	30,000
Ornamental	do.	909	900	540	646 ^{r,2}	600
Graywacke ^c	do.	1,073 ²	1,000	806	428 ^{r,2}	500
Ophite	do.	149	120	52 ^r	52 ^{r,2}	60
Quartz ^c	do.	20	16	16	5 ^{r,2}	5
Quartzite	do.	1,036	455	414 ^r	301 ^{r,2}	400

See footnotes at end of table.

TABLE 1--Continued
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	2001	2002	2003	2004	2005 ^e	
INDUSTRIAL MINERALS--Continued						
Stone--Continued:						
Schist	thousand metric tons	140 ^e	150	173 ^r	259 ^{r,2}	260
Slate ^e	do.	40	40	38 ^r	36 ^{r,2}	40
Syenite	do.	256	185	160	116 ^{r,2}	150
Sulfur, byproduct, all sources ^e		30,000 ^r	28,000	27,000	25,000	25,000
Talc		8,362	8,916	5,459	6,231 ^r	5,362 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	4,417 ^{r,2}	3,869 ^{r,2}	4,489 ^{r,2}	3,200	3,200
Gasoline	do.	22,557 ^{r,2}	21,243 ^{r,2}	23,469 ^{r,2}	20,000	20,000
Kerosene and jet fuel	do.	5,293 ^{r,2}	4,052 ^{r,2}	5,694 ^{r,2}	6,500	6,500
Distillate fuel oil	do.	34,675 ^{r,2}	35,697 ^{r,2}	37,084 ^{r,2}	30,000	30,000
Residual fuel oil	do.	19,163 ^{r,2}	18,359 ^{r,2}	17,995 ^{r,2}	19,000	19,000
Unspecified	do.	15,148 ^{r,2}	16,206 ^{r,2}	16,535 ^{r,2}	16,000	16,000
Refinery fuel and losses	do.	6,059 ^{r,2}	6,278 ^{r,2}	6,716 ^{r,2}	3,800	3,800
Total	do.	107,312 ^{r,2}	105,704 ^{r,2}	111,982 ^{r,2}	98,500	98,500

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. -- Zero.

¹Table includes data available through June 2006.

²Reported figure.

³Includes washed and unwashed kaolin.

TABLE 2
PORTUGAL: STRUCTURE OF THE MINERAL INDUSTRY IN 2005

(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, 10%)	Plants (3) at Alhandra, Loule, and Souselas	12,000
Copper, concentrate	EuroZinc Mining Corp.	Neves-Corvo Mine near Castro Verde	500
Diatomite	Sociedade Anglo-Portuguesa 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	Saibraes 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 Petroleos de Portugal (Government, 100%)	Refineries at Lisbon, Porto, and Sines	300,000
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	EuroZinc Mining 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

