

# PORTUGAL

By Harold R. Newman

Portugal is essentially an agricultural country. The mineral industry was modest by world standards in terms of mineral production. The mineral industry growth rate during the past few years, however, has made it one of the country's significant industrial sectors. This was mainly because of the discovery and development of the rich copper and tin deposits at Neves-Corvo by Sociedade Mineira de Neves-Corvo S.A. (Somincor). Portugal was the largest producer of mined copper in the European Union (EU). The country was also an important producer of dimension stone and tungsten concentrates.

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 very complex. Massive sulfides linked to synorogenic volcanism in the southwestern part of the peninsula are well-known internationally. The metallogenic province stretches about 250 kilometers (km) from Seville, Spain, to the southwestern coast of Portugal.

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. Clusters of deposits occur around individual volcanic centers; the ore lies in zones within volcanic and sedimentary host-rock sequences.

The Government continued with the country's privatization program and was proceeding with legislation that would privatize many public companies. The privatization issue was part of a broader program to reduce the role of the state and to restructure the Portuguese economy to one that is more market driven.

Portugal's economic growth during the past decade has been accompanied by heavy investment in infrastructure improvements, which have been largely funded by the EU. Portugal has successfully parlayed a dozen years of EU funding into strong economic growth and substantial new foreign investment. The country has made a number of major infrastructure improvements, most notably a system of modern highways. Additional infrastructure projects, which included a new international airport at Lisbon, an upgrade of the country's rail system, a second phase of a natural gas pipeline system, and additional dams and port projects, were expected (U.S. Department of Commerce, 2002<sup>1</sup>).

In 2001, Portugal's inflation rate was 4.4%, which was well above the EU average, and economic growth slowed to 1.8%. Given the key importance of Portugal's trade with the EU, the growth rate will be affected by the performance of other EU economies, particularly Germany and Spain. Portugal became the first European Monetary Union member to breach the EU Stability and Growth Pact when it ended the year with a budget deficit of 4.1% of gross national product, which was well above the 3% agreed under the Pact (Australian Department of Foreign Affairs and Trade, 2002<sup>1</sup>).

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<sup>1</sup>References that include a section twist (§) are found in the Internet References Cited section.

The Neves-Corvo Mine of Somincor and the Panasqueira Mine of Avocet Mining plc were the two major operations in the metals mining sector. Pirites Alentejanas S.A.R.L. was the country's largest producer of pyrite. Lusosider Aços Planos SA and SN Longos SA were the major steel producers. Cimentos de Portugal S.A. (Cimpor), which was an important producer of cement, was one of the companies included in the Government's privatization plans. With the exception of copper, dimension stone, ferroalloys, tin, and tungsten, which were of international importance, production of other minerals and related materials had only domestic significance. Most of the large mineral-related companies were owned or controlled by the Government, although some operations were privately owned (table 2).

The Neves-Corvo Mine used a drift-and-fill mining method that was designed to produce 1.5 million metric tons per year of raw ore to yield a concentrate with an average copper content of 26%. A conventional drilling, blasting, and mucking cycle were used. Primary crushing of ore was underground, and the ore was moved by a conveyor to a vertical shaft where it was hoisted to the surface for secondary crushing and treatment. Based on estimated reserves, production was expected to last until at least 2010 (Richards and others, 1991).

In 2000, Rio Tinto Ltd. informed the Portuguese Government that it was selling its 49% interest in Somincor and initiated a search for prospective candidates. Murchison United of Australia was chosen as the preferred bidder in conjunction with Outokumpu Oyi of Finland. Rio Tinto said the decision reflected its increasing focus on larger scale open pit copper operations. The state-holding company Empresa Desenvolvimento Mineiro (EDM) was also prepared to sell a 17% share, which would reduce its share to 34% from 51%. If the sale is finalized, then Murchison would own 58% of Somincor, and Outokumpu, 8%. Outokumpu's involvement was designed to secure concentrate supply for its Harjavalta smelter in Finland (Metal Bulletin, 2001).

Gold exploration activities were continuing in the Jales-Tres Minas District. The joint venture of Sociedade des Mines du Bourneix and EDM was reevaluating some of the old deposits that had not been worked for some time. The area includes the ancient Jales Mine and is 150 km east of Oporto. By the end of its operation in the 1980s, the Jales Mine had produced more than 25 metric tons (t) of gold and more than 100 t of silver and reached a depth of 600 meters (m) (Neiva and others, 1989).

Connary Minerals plc announced that further exploration at the Banjas Mine within its Valongo Gondomar licence area confirmed the high gold values reported previously but over a more extensive area. The detailed underground mapping of structures, quartz veins and lodes, along with channel sampling was completed. Out of a total of 73 channel samples 1 m wide, 29 averaged more than 4 grams per metric ton (g/t) gold. The gold mineralization is associated with argillites. Underground drilling was planned to intersect the structures at different levels to test the possibility of a sequence of stacked argillites being

present that would be of sufficient volume to mine economically (Mining Journal, 2001).

Beralt Tin and Wolfram S.A., which was owned by Avocet Mining plc, operated the Panasqueira Mine, which was one of the world's largest producers of tungsten concentrates outside of China. Avocet commissioned a new subvertical shaft that accessed 4.7 million metric tons (Mt) of estimated ore resources with an in situ grade of 0.33% tungsten oxide (WO<sub>3</sub>), given an estimated 10-year life at current extraction rates. Avocet was continuing a program to develop these WO<sub>3</sub> resources to a mining reserve category with the possibility of expanding production (Avocet Mining plc, 2001§).

EuroZinc Mining Corp. announced that it had purchased EDM's controlling interests in the Aljustrel zinc project, which encompassed five massive sulfide deposits—Algares, Estação, Feitas, Gavião, and Moinho. These are typically zoned VMS deposits with barite, lead, silver, and zinc zones found at the top of the deposits and copper zones at the bottom of the deposits and are often separated by tens of meters of low-grade pyrite. The purchase included operating permits, modern mill facilities, underground development, buildings and a dedicated port facility (EuroZinc Mining Corp., 2001§).

The Feitas deposit was the most significant deposit in the Aljustrel project area because of its high zinc content, large tonnage, and existing infrastructure. It has extensive underground development in place. The deposit has a known strike length of 700 m; a projected strike length, based on gravity data, of 1,200 m; an average width of about 400 m; and an average thickness of about 60 m. The estimated proven and probable mineable reserves were 12 Mt of zinc ore with an average grade of 5.67% zinc, 1.7% lead, and 64 g/t silver. Proven and probable mineable reserves were estimated to be 1.6 Mt of copper ore with an average grade of 2.2% copper, 0.97% zinc and 14 g/t silver (EuroZinc Mining Corp., 2002§).

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.

Demand for cement continued because the building and construction industry maintained a high level of activity. This situation was expected to continue. The development of Portugal's infrastructure is expected to create a substantial volume of work requiring cement in coming years.

Several international groups were interested in acquiring a stake in Cimpor. The Government was preparing to sell a 10% share. Lafarge Group of France and Holcim Ltd. of Switzerland expressed interest along with the Portugese construction company Teixeira Duarte. Cimpor operated in Portugal, Spain, Mozambique, Morocco, Egypt, Tunisia, and Brazil (International Cement Review, 2001).

Marble was the most valuable of the stone products and accounted for the majority of stone production. The main area for marble mining continued to be the Evora District.

Since the closure in 1996 of Empresa Carbonifera de Douro S.A.R.L.'s Germunde Mine at Castello de Pavia, most coal has been imported. The mine closed because of high production costs and difficult mining conditions.

Petroleos de Portugal (Petrogal) has embarked on an ambitious plan to reposition itself as a multinational energy firm. ENI Group of Italy was to acquire a 33.3% share of Galp Petroleos e Gas de Portugal which includes Petrogal and Gas de

Portugal. The Portugese Government also planned to reduce its holdings to a minority stake through a public offering, thus making ENI the largest shareholder. ENI had plans to create a trans-European partnership that would also involve the Spanish power company Iberdrola SA. Petrogal itself has set basic targets—to develop its own production of hydrocarbons, to expand and upgrade its refineries to meet EU standards, to consolidate the distribution of petroleum products within the Iberian peninsula, to expand its cogeneration business, and to develop its chemicals business, namely aromatics (Wise, 2001§).

The present structure of the mineral industry could change in the near future because of significant mining exploration by several foreign companies. Copper, gold, kaolin, lead, lithium, pyrites, and tin were some of the minerals targeted for exploration. The IPB is the prime area for exploration activity and would appear to have an above-average potential for success on the basis of an unusually high number of large VMS deposits.

Portugal is one of the faster growing European economies but has limited domestic energy resources. Unless domestic gas resources come into production, energy imports are expected to increase significantly.

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## Major Sources of Information

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TABLE 1  
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1997	1998	1999	2000	2001 e/
<b>METALS</b>					
Aluminum, secondary e/ thousand tons	16	16	18	18	18
Arsenic, white e/	50	50	50	50	50
Beryl concentrate, gross weight e/	5	5	4	4	5
Copper, mine output, Cu content	106,479	114,637	99,459	76,200	82,965 2/
Iron and steel:					
Iron ore and concentrate:					
Gross weight, manganiferous e/	18,905 2/	18,000	16,000	15,000	14,500
Fe content, manganiferous	6,800	6,800 e/	11,733 r/	11,800 r/ e/	11,000
Metal:					
Pig iron thousand tons	431	385	389	382 r/	82 2/
Steel, crude do.	905	936 r/	1,038 r/	1,097 r/	728 2/
Lead, refined, secondary e/	6,000	6,500	6,000	5,000 r/	4,000
Manganese, Mn content of iron ore e/	500	500	500	500	500
Silver, mine output, Ag content kilograms	33,900	31,900	26,450 r/	20,430 r/	23,100 2/
Tin:					
Mine output, Sn content	2,667	3,000 e/	2,163 r/	1,227 r/	1,200
Metal, primary and secondary e/	100	100	100	50 r/	--
Tungsten, mine output, W content	1,036	831	434 r/	743 r/	700
Uranium concentrate, U <sub>3</sub> O <sub>8</sub>	18	16	12 r/	16 r/	5 2/
Zinc, smelter, primary e/	3,600	3,600	4,000	3,600	3,600
<b>INDUSTRIAL MINERALS</b>					
Cement, hydraulic thousand tons	9,395	9,784 r/	10,147 r/	10,343 r/	10,000
Clays:					
Kaolin 3/	180,000	180,000 e/	221,296 r/	162,674 r/	146,436 2/
Refractory e/	300,000	300,000	521,602 r/ 2/	712,951 r/	700,000
Diatomite e/	1,540	1,600	785 r/	686 r/ 2/	387 2/
Feldspar	121,380	120,000 e/	114,685 r/	119,837 r/	120,000
Gypsum and anhydrite e/	500,000	500,000	550,000	698,673	700,000
Lime, hydrated and quicklime e/	200,000	200,000	200,000	200,000	200,000
Lithium minerals, lepidolite	6,883	7,000	14,862 r/	9,352 r/	11,571 2/
Nitrogen, N content of ammonia	195,600	204,400	223,200	246,000 r/	201,600 2/
Pyrite and pyrrhotite (including cuprous), gross weight e/	10,000	10,000	10,000	10,000	10,000
Salt, rock	595,997	600,000 e/	558,807 r/ 2/	584,516 r/	625,785 2/
Sand e/ thousand tons	5,000	4,000	3,664 2/	8,311 r/	4,000
Sodium compounds, n.e.s.: e/					
Soda ash	150,000	150,000	150,000	150,000	150,000
Sulfate	50,000	50,000	50,000	50,000	50,000
Stone: e/					
Basalt	100,000	100,000	520,262 r/ 2/	500,000 r/	500,000
Calcareous:					
Dolomite thousand tons	500	500	500	500	500
Limestone, marl, calcite do.	15,000	15,000	35,580 r/ 2/	45,785 2/	45,000
Marble do.	900	900	1,215 r/ 2/	933 2/	1,000
Diorite do.	1,000	1,000	1,765 r/ 2/	1,700 r/	1,700
Gabbro do.	100	100	100	100	100
Granite, crushed do.	24,057 2/	25,000	22,400 r/ 2/	20,000 r/	20,000
Granite, ornamental do.	400	500	458 2/	631 2/	500
Graywacke do.	20	22	20	20	20
Ophite do.	9	5	3	178 2/	180
Quartz do.	14	15	15	38 r/ 2/	20
Quartzite do.	500	500	573 r/ 2/	600 r/	600
Schist do.	100	100	136 r/ 2/	149 2/	140
Slate do.	30	40 r/	46 r/ 2/	40 r/	40
Syenite do.	86	80	80	127 2/	130
Sulfur: e/					
Content of pyrites	5,000	5,000	-- r/	-- r/	--
Byproduct, all sources	30,000	30,000 r/	32,000 r/	30,000 r/	28,000
Total	35,000 r/	35,000 r/	32,000 r/	30,000 r/	28,000
Talc	8,236	8,400	9,554 r/	7,407 r/	7,500

See footnotes at end of table.

TABLE 1--Continued  
PORTUGAL: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity	1997	1998	1999	2000	2001 e/
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Coke, metallurgical e/ thousand tons	330	330	325	325	300
Gas, manufactured e/ million cubic meters	125	125	125	125	125
<b>Petroleum refinery products:</b>					
Liquefied petroleum gas thousand 42-gallon barrels	4,500	4,500 e/	3,874 r/	3,132 r/	3,200
Gasoline do.	15,000	15,000 e/	22,679 r/	20,213 r/	20,000
Kerosene and jet fuel do.	7,000 e/	7,500 r/ e/	7,680 r/	6,216 r/	6,500
Distillate fuel oil do.	20,000	20,000 e/	31,727 r/	29,131 r/	30,000
Residual fuel oil do.	20,000	20,000 e/	18,968 r/	18,828 r/	19,000
All other products do.	10,000	10,000 e/	17,018 r/	15,067 r/	16,000
Refinery fuel and losses do.	3,000	3,000 e/	4,031 r/	3,618 r/	3,800
Total do.	79,500 r/	80,000 r/ e/	105,977 r/	96,205 r/	98,500

e/ Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. r/ Revised. -- Zero.

1/ Table includes data available through March 2002.

2/ Reported figure.

3/ Includes washed and unwashed kaolin.

TABLE 2  
PORTUGAL: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of facilities	Annual capacity
Cement	Cimentos de Portugal S.A. (Cimpor) (Government, 10%)	Plants (3) at Alhandra, Loulé, and Souselas	5,450
Copper, concentrate	Sociedade Mineira de Neves-Corvo S.A. (Somincor) (Government, 51%; Rio Tinto Ltd., 49%)	Neves-Corvo Mine near Castro Verde	500
Diatomite	Sociedade Anglo-Portuguesa de Diatomite Lda.	Mines at Obidos and Rolica	5
Feldspar	A.J. da Fonseca Lda.	Seixigal Quarry, Chaves	10
Ferroalloys	Electrometalúrgia S.A.R.L.	Plant at Setubal	100
Petroleum, refined barrels per day	Petroleos de Portugal (Government 100%)	Refineries at Lisbon, Porto, and Sines	300,000
Pyrite	Pirites Alentejanas S.A.R.L.	Plant at Setubal	100
Steel, crude	SN Servicos S.A. (Corus Group, 50%, Usinor Group 50%)	Steelworks at Seixal	550
Do.	SN Longos S.A. (Metalurgica Galaica S.A., 50%, Riva Group, 50%)	do.	500
Tin	Somincor (Government, 51%; Rio Tinto Ltd., 49%)	Neves-Corvo Mine near Castro Verde	5
Tungsten	Avocet Mining plc	Panasqueira Mine and plant at Barroca Grande	1,600
Uranium tons	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