

# THE MINERAL INDUSTRY OF

# IRAN

By Bernadette Michalski

The mineral industry, particularly petroleum, continues to sustain its prominent role in Iran's economy, providing the bulk of the country's foreign exchange and nearly 16% of the Iranian gross national product of \$43.7 billion in 1995. Iran remains the world's fourth largest producer of crude oil averaging more than 3.6 million barrels per day (Mbbbl/d). Other significant mineral and metal output includes aluminum, chromite, copper, gypsum, iron and steel, and lead and zinc.

The reduction of subsidies on domestic petroleum prices was initiated by the doubling of prices in March 1995 to be followed by annual increases of 20% until the year 2000 when product prices should reflect actual market values.

As Iran fell further behind on its largely short-term debt, it renegotiated payment schedules with its major debtholders. Iran had only limited success in rescheduling a fraction of its \$19 billion<sup>1</sup> external debt by 1995. Debt service repayment is \$4,800 million in 1995 absorbing nearly one-third of Iran's oil earnings. Thus, Iran faces annual debt servicing charges of \$4 to \$5 billion between 1996 and 1999.

## Government Policies and Programs

The results of the First Five Year Plan (March 1989 to March 1994) were not made available. The Government's Second Five-Year Plan to be implemented between March 1994 to March 1999 was postponed for a year. The plan's objectives were to be implemented in 1995 through 2000. The plan includes a progressive liberalization of the economy with the private sector participation heightened. The plan also requires the gradual reduction of subsidies on fuels, electricity, and air transport.

## Environmental Issues

The Iranian Government has not given high priorities to environmental considerations in the mining sector although significant problems continue. For example, emissions of nearly 100 metric tons per day of sulfur dioxide were reported from the Sar Cheshmeh copper smelter.

## Production

Expansion activities at the Gol-e Gohar iron ore and Sar

Cheshmeh copper ore mines accounted for increased metallic ore production. Iran also was a significant producer of industrial minerals, ranking as the world's third largest producer of gypsum, mainly from the mines in the Semnan region about 200 kilometers (km) east of Teheran. Crude oil production has been relatively stable over the past 3 years at 3.6 Mbbbl/d with sustainable capacity near 4 Mbbbl/d in 1995 (*See table 1.*). Onshore fields produced 3.2 Mbbbl/d and offshore 0.4 Mbbbl/d. Output was running at about one-half the peak rate reached in the mid-1970's when production exceeded 6 Mbbbl/d and the sustainable capacity approached 7 Mbbbl/d.

## Trade

According to the Middle East Economic Digest of January 26, 1996, page 3, total exports in 1995 were reported at \$19,651 million, of which petroleum was \$14,756 million. Comparable figures for 1994 were \$19,054 million, of which \$14,604 million was attributed to petroleum. The principal markets for Iranian products, particularly crude oil, were Japan, importing nearly one-half Mbbbl/d in 1995; France, 156,000 bbl/d; and Italy, 143,000 bbl/d. Petroleum exports averaged 2.4 Mbbbl/d in 1995.

Total imports were estimated to be about \$12.8 billion for 1995. The leading suppliers of goods and services to Iran, in order of importance, were Germany, Japan, Italy, France, and the United Kingdom.

## Structure of the Mineral Industry

The overall management of the minerals sector was under the auspices of the Ministry of Mines and Metals. The Ministry's authority covers all mining, smelting, and refining industries except oil and gas which were under the Ministry of Petroleum.

The Government continued to emphasize privatization of the mining industry. However, this included mostly small mines and excluded large operations, such as the Sar Cheshmeh copper complex; the Chadormalu, Choghart, Gol-e Gohar, and Sangan iron deposits; and the Angouran lead-zinc mine. However, many of the operations for sale, which deteriorated owing to ineffective management and lack of technical expertise in the 1980's, did not attract buyers.

## Commodity Review

### Metals

**Aluminum.**—Primary aluminum production was for the most part derived from the reconstructed 120,000 metric tons per year (t/yr) capacity Iralco plant in Arak. Construction of the Almahdi Aluminum Corp.'s \$1.5-billion smelter at Bandar Abbas, was behind schedule owing to credit unavailability. First scheduled to commence production in 1994 at an initial rate of 220,000 t/yr of aluminum, the startup date was uncertain.

**Chromium.**—Faryab Mining and Chrome Smelting Co. completed construction of a ferrochromium smelter near Bandar Abbas. The plant consists of two 15-megavolt -ampere electric furnaces with a combined production capacity of 14,000 t/yr.

**Copper.**—A new copper smelter was being built in Khatounabad, 40 km from the Sar Cheshmeh copper complex in southeastern Iran. The China National Non-Ferrous Metals Co. was commissioned to build the \$106-million copper smelter with a capacity of 80,000 t/yr. Iran was expected to pay for about \$17 million of the cost through copper exports to China.

A new open pit copper mine at Meiduk, 120 km northwest of Sar Cheshmeh, was being developed with the assistance of Outotec, a subsidiary of Finland's Outokumpu Oy. The Government reports economic reserves of the deposit vary from 50 million metric tons (Mt) to 125 Mt, depending upon copper prices under consideration. The project includes an on-site concentrator to treat 3 million metric tons per year (Mt/yr) to 5 Mt/yr of ore grading about 1.1% copper. Capital costs were projected at \$300 million for the open pit mine and concentrator.

**Iron and Steel.**—Demands of the steel manufacturing industry prompted increased domestic iron ore output to sustain Government-owned steel plants. Iran has four main iron mines: Chadormalu, 125 km northeast of Yazd; Choghart in Bafq, 200 km east of Yazd; Gol-e Gohar, 55 km southwest of Sirjan; and Sangan, about 250 km southeast of Mashad, close to the border with Afghanistan. These mines were under expansion to support the country's anticipated iron ore needs of more than 10 Mt/yr.

Direct Reduction Iron (DRI) production was growing at a rapid pace as 12 gas-fueled DRI modules, with a total capacity of 5.84 Mt/yr, were either in operation or were being constructed in Ahwaz and Mobarakeh.

The Esfahan steel mill was now completing its own \$470-million expansion to raise output to 2.4 Mt/yr by March 1996 from the current 2-Mt/yr level.

**Lead and Zinc.**—Most of the Nation's lead and zinc production was derived from eight principal mines—Ahangaran, Angouran, Douna, Emarat, Irankouh, Kushk, Nakhlak, and Ravanj. While most lead and zinc companies exported its product as concentrate, the 40,000-t/yr-capacity lead smelter at Angouran produced lead bar in quantities well below capacity level. A 60,000-t/yr zinc smelter, also planned for Angouran, was scheduled to start up in 1997. A second zinc smelter, with the capacity of 27,000 t/yr, was proposed for the Kushk Mine, near Yazd.

### Mineral Fuels

**Coal.**—The Babnizou and Pabedana coal mines, near Kerman, and other mines around Shahroud, supplied about 65% of the coking coal used in Iran's steel industry with the remainder supplied through imports. A major coal deposit at Tabas, 300 km northeast of Yazd, was being considered for development as an underground mine; however, inadequate infrastructure coupled with the scarcity of foreign exchange prohibits immediate development.

**Petroleum and Natural Gas.**—Crude oil production including lease condensate averaged more than 3.6 Mbbbl/d in 1995. Iran's crude oil exports were about 2.4 Mbbbl/d. On March 14, 1995, the U.S. Government issued an executive order banning U.S. companies from undertaking oil development projects in Iran. As a result Conoco Inc. withdrew from a contract for the development of the offshore Sirri A and E structures. Total CFP of France signed a \$600 million agreement in July 1995 to develop the two offshore oil fields originally awarded to Conoco. United States legislation on a secondary boycott of Iran passed in the Senate in December. The boycott subjects non-U.S. companies aiding Iran to a range of sanctions in the US market, including exclusion from official insurance, lending and export license provision and primary securities transactions.

According to the ranking in the International Petroleum Encyclopedia, Iran possesses the second largest proven gas reserve in the world reported at 23 trillion cubic meters ( $m^3$ ) by the National Iranian Gas Co. The Government plans to expand gas production to meet growing domestic demand and permit the export of significant quantities of natural gas. Agreements have been concluded with India and Pakistan for the export of natural gas by pipeline. The possibility of exporting gas to Western Europe via Turkey remains under consideration.

Japan has expressed interest in a \$380 million investment on three onshore gas projects known as Amak, natural gas liquids (NGL) 1200, and NGL 1300.

Development of the South Pars Gasfield remains in various planning stages. The gasfield is an apparent extension of Qatar's giant North Field. When developed, the field is expected to produce 35 million cubic meters per day ( $Mm^3/d$ )

of natural gas for the domestic market and up to 60,000 barrels per year (bbl/yr) of condensate for export.

### **Reserves**

Published reserve data were inadequate to provide a meaningful inventory of Iran's mineral resources. The Oil Ministry has reported the country's total oil reserves at 90,000 million barrels (Mbbbl) and 23 trillion m<sup>3</sup>, respectively. The Geological Survey of Iran was actively involved in a number of exploration programs for base and precious metals and had commissioned French and German firms to carry out a nationwide survey of all mineral resources.

### **Infrastructure**

Efforts were being made to rehabilitate or improve transportation facilities throughout the country. A rail extension from Kerman to Zahedan was planned as a long-term project to open trade to Pakistan and India and aid development of southeastern Iran. A 220-km rail spur was planned to link Chadormalu Mine with the existing rail route running through Yazd to Esfahan. Construction of large mineral loading and unloading facilities were underway at the port of Bandar Abbas for the export of mineral products from eastern and southeastern mines, as well as the import of iron ore for the large steel complexes of Esfahan and Ahwaz.

Thermoelectric plants accounted for about 85% of power generation. An ambitious electric power generation and distribution program was underway throughout the country. Installed capacity was reported in excess of 16,000 MW.

### **Outlook**

Iran's relationships with its Gulf neighbors remains tense because of island ownership disputes with the United Arab Emirates. However, some improvement in intra Gulf

relationships is evidenced by the agreement with Qatar for cooperation in the oil and gas sector. Kuwait and Oman expressed an interest in investing in Iran's Henjam condensate/gasfield.

Iran has a number of comparative advantages in terms of steel production. Low labor costs, cheap energy from natural gas, sizable-if relatively low-grade-iron ore deposits, and domestic supplies of coking coal and limestone should support the development of a significant steel industry.

The Government's main challenge was to successfully implement its economic restructuring phase. Expansion of the mineral industry can be expected as trends favoring privatization and foreign investment continue.

---

<sup>1</sup>As a result of a long-awaited currency reform in early 1993, the Government eliminated the three-tiered exchange rate system for the Iranian rial (IR), relying on a variable, or floating, rate of IR 1,538=US\$1.00. The floating rate dropped to IR1,640=US\$1.00 in Apr. 1993 and continued its decline throughout 1993. By yearend 1993, the rate had reached the IR 2,000=US\$1.00 level. In a reversal of policy, the Government reintroduced the multiple exchange rate in 1994. The rial continued its decline throughout 1994 and reached IR 4,400=US\$1.00 by yearend. In March of 1995 IR 4,000=US\$1.00. Most transactions are now based on a floating rate set by the Central Bank at IR 1,750=US\$1.00.

### **Major Sources of Information**

Geological Survey of Iran  
P.O. Box 13185-1491  
Tehran, Iran  
Ministry of Mines and Metals  
P.O. Box 1416  
14155 Tehran, Iran  
Telephone: (98) 21 836050  
Ministry of Petroleum  
Taleghani St.  
Tehran, Iran  
Telephone: (98) 21 661120  
Fax: (98) 21 666293

TABLE 1  
IRAN: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1991	1992	1993	1994	1995 e/
<b>METALS</b>					
<b>Aluminum:</b>					
Bauxite, gross weight e/	100,000	100,000	100,000	100,000	100,000
Metal, primary ingot	107,743 r/	117,230 r/	109,190 r/	116,000 r/	118,000
Arsenic, orpiment and realgar, concentrates	552	492	500 e/	500 e/	500
<b>Chromium, chromite, mine output:</b>					
Concentrate (48% to 50% Cr <sub>2</sub> O <sub>3</sub> ):					
Gross weight	90,119	130,265	114,780 r/	129,000	130,000
Cr <sub>2</sub> O <sub>3</sub> content e/	44,000	64,000	64,000	64,000	64,000
<b>Copper:</b>					
Mine output:					
Ore mined (1% to 1.2% Cu):					
Gross weight	9,240	9,230	10,800	12,400 r/	13,150 3/
Cu content	105,000	108,000	86,600 r/	100,040 r/	120,000
Concentrate (29% to 35% Cu):					
Gross weight	290,000	304,000	290,000 e/	360,000 r/ e/	325,000
Cu content	84,300	105,400	86,600	117,900 r/	102,000
<b>Metal:</b>					
Smelter output, blister/anode	81,900	86,400	85,000	123,800 r/	81,300
Refinery output, cathode	79,700	101,800	84,900	64,000	64,000
Gold, mine output, Au content e/	500	500	417 3/	723 3/	650
<b>Iron and steel:</b>					
Ore and concentrate:					
Gross weight	4,890	5,647	9,870	8,690	9,080
Fe content e/	2,700	3,000	4,800	4,300	4,500
<b>Metal:</b>					
Pig iron	1,952	2,053	1,961	1,883	1,532 3/
Direct reduced iron	470	709	1,631	2,861	3,301 3/
Ferroalloys, ferrochromium e/	--	--	--	5	8
Steel, crude, ingots and castings	2,203	3,081 r/	3,672	4,498	4,696 3/
<b>Lead:</b>					
Mine output, concentrate (56% to 60% Pb):					
Gross weight	27,500 3/	20,000 r/	22,000 r/	30,000 r/	30,000
Pb content	16,900 r/	12,400 r/	12,700 r/	18,300 r/	18,300
Refinery output, includes secondary	-- r/	42,000 r/	52,000 r/	51,000 r/	55,000
<b>Manganese, mine output, (30% to 35% Mn):</b>					
Gross weight	49,690 r/	38,475 r/	75,978 r/	75,000 r/ e/	88,000
Mn content e/	16,000	12,000 r/	25,000 r/	25,000 r/	25,000
<b>Molybdenum, mine output, concentrate (56% Mo):</b>					
Gross weight	707	1,510	1,200 r/ e/	1,200 r/ e/	1,600
Mo content	395	847	700 r/ e/	670 r/ e/	560
Silver, mine output, Ag content e/	40	50	60	60	60
<b>Zinc, mine output, concentrate (50% to 55% Zn):</b>					
Gross weight e/	135,000 3/	130,000	122,000 r/	146,000 r/	100,000
Zn content	70,000 e/	65,000 r/	60,800 r/	72,900 r/	75,000
<b>INDUSTRIAL MINERALS</b>					
<b>Asbestos:</b>					
Concentrate, (3% to 8% marketable fiber)					
Marketable fiber e/	3,000	4,300	4,500	4,500	3,500
Barite	191,238	181,174	226,377 r/	225,000 e/	185,000
Boron, borax	1,030	420	500 e/	500 e/	500
Cement, hydraulic e/	15,000	15,200 r/	16,000 r/	16,000 r/	16,300
<b>Clays:</b>					
Bauxite and refractory clays					
Bentonite	98,400	215,000	220,000 e/	220,000 e/	220,000
Other:	40,452	62,000 r/	53,667 r/	70,000 r/	32,000
<b>Industrial clays</b>					
Kaolin	217,000	120,000	250,000 e/	300,000 r/ e/	250,000
Total	150,473	264,083	254,413 r/	250,000 r/ e/	250,000
Diatomite	367,473	384,083	504,413 r/	550,000 r/ e/	500,000
Feldspar	90	100 e/	85	90 e/	90
Fluorspar, fluorite	64,754	52,120	76,873 r/	80,000 r/ e/	80,000
Gemstones, turquoise e/	12,300	9,180	10,000 e/	10,000 e/	10,000
See footnotes at end of table.	20,000	1,000	5,000	5,000	5,000

TABLE 1--Continued  
 IRAN: PRODUCTION OF MINERAL COMMODITIES 1/ 2/

(Metric tons unless otherwise specified)

Commodity	1991	1992	1993	1994	1995 e/
<b>INDUSTRIAL MINERALS--Continued</b>					
Gypsum thousand tons	8,839 r/	8,253 r/	7,799 r/	8,430 e/	8,230 3/
Industrial sand and gravel (quartzite and silica)	832,000	756,000	932,000	950,000 e/	1,000,000
Lime e/ thousand tons	650	650	650	650	650
Magnesium compounds	29,291	36,165	49,424 r/ e/	45,000 r/ e/	55,000
Mica	4,140	7,850	1,224 r/ e/	3,000 r/ e/	3,000
Nitrogen, ammonia, N content	468,000	664,000	722,500	696,200	715,400 3/
Perlite	6,280	5,000	6,000 e/	6,000 e/	6,000
Pigments, mineral, natural iron oxide	3,750	2,310	2,500 e/	2,500 e/	2,500
Pumice and related volcanic materials	215,000	330,000	185,000	200,000 e/	200,000
Salt	901,000	1,018,000 r/	988,700 r/	1,050,000	936,000 3/
Sodium compound, caustic soda e/	15,000	15,000	15,000	15,000	15,000
Stone:					
Construction and building, crushed, n.e.s. thousand tons	3,070	4,340	4,500 e/	4,800 e/	4,800
Dimension and decorative:					
Granite do.	11	24	30 e/	20 e/	20
Marble:					
Blocks do.	4,470	3,970	3,200 e/	4,500 e/	4,500
Crushed do.	425	786	400 e/	450 e/	450
Slabs do.	73	19	20 e/	50 e/	50
Travertine:					
Blocks do.	463	341	300 e/	500 e/	500
Crushed and slabs do.	56	93	60 e/	70 e/	70
Total 3/ do.	5,498	5,233	4,010 e/	5,590 e/	5,590
Dolomite do.	105	227	173	200 e/	243 3/
Limestone do.	24,200	23,800	26,000	28,000 e/	28,000
Strontium, celestite	28,500	13,100	20,000 e/	20,000 e/	20,000
Sulfates, natural:					
Aluminum potassium sulfate (alum) e/	12,000	12,000	12,000	12,000	12,000
Sodium sulfate	144,000	237,000	280,000	295,000 r/ e/	248,000 3/
Sulfur: e/					
Byproduct of petroleum and natural gas	650,000	700,000	750,000	830,000	840,000
Byproduct of metallurgical processing, S content of acid	50,000	50,000	50,000	50,000	50,000
Total	700,000	750,000	800,000	880,000 3/	890,000
Talc	6,676	23,707	18,000	18,000 r/ e/	20,000
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Coal thousand tons	1,481	1,508	1,665 r/	1,720	1,500
Coke do.	496	506	600 e/	700 e/	700
Gas, natural:					
Gross million cubic meters	57,800 r/	58,200 r/	60,000 r/	61,000 r/	61,000
Dry do.	25,800 r/	25,000 r/	27,100 r/	28,200 r/	28,200
Natural gas plant liquids thousand 42-gallon barrels	18,300	20,000	23,300	23,500	23,500
Petroleum:					
Crude do.	1,252,875 r/	1,256,900 r/	1,332,000 r/	1,325,000 r/	1,329,700 3/
Refinery products:					
Liquefied petroleum gas do.	13,500	19,000	20,000 e/	21,000 r/ e/	24,000
Motor gasoline do.	49,600	50,400	50,000 e/	51,500 r/ e/	54,500
Jet fuel do.	7,300	8,030	8,000 e/	8,500 r/ e/	9,000
Kerosene do.	29,200	30,700	32,000 e/	34,400 r/ e/	37,000
Distillate fuel oil do.	90,500	101,000	100,000 e/	105,000 r/ e/	117,000
Residual fuel oil do.	95,300	96,700	100,000 e/	103,000 r/ e/	114,000
Other do.	39,800	35,800	40,000 e/	40,000 e/	43,000
Total do.	325,200	341,630	350,000 r/ e/	363,400 r/ e/	398,500

e/ Estimated. r/ Revised.

1/ Data are for Iranian years beginning Mar. 21 of that stated, except data for natural gas, plant liquids, and petroleum, which are for Gregorian calendar years.

2/ Table includes data available through May 15, 1996.

3/ Reported figure.