THE MINERAL INDUSTRY OF

IRAN

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In 2001, Iran was the world's fourth largest producer of crude oil, after Saudi Arabia, Russia, and the United States. Iranian oil production averaged about 3.74 million barrels per day (Mbbl/d), compared with a revised 3.70 Mbbl/d in 2000 and 3.56 Mbbl/d in 1999 (U.S. Energy Information Administration, 2002). Petroleum continued to provide the bulk of Iran's foreign exchange. In 2001, the gross domestic product (GDP) at current prices of this Middle Eastern country of about 66 million people was estimated by the International Monetary Fund (IMF) (2002b§[1]) to be almost $114 billion. The IMF (2002a§) reported that real GDP increased by about 4.8% in 2001 and 5.7% in 2000.

Minerals have been mined in Iran for several thousand years. While the focus of the mineral industry had shifted to the petroleum sector in the 1950s, the Government has recently encouraged investment in the exploitation of metals and industrial minerals to diversify the nation's economic dependence on oil and natural gas. Continued investment in the energy and transportation sectors will enhance Iran's ability to develop and market its mineral resources.

The U.S. Government's Iran and Libya Sanctions Act of 1996 (ILSA) (Public Law 104-172), which threatened to sanction any company (American or foreign) that exceeded a $20-million-per-year investment or trading limit with Iran in the petroleum sector initially hampered foreign investment in petroleum and other mineral industry projects in Iran. Despite the U.S. law, many European nations have not discouraged investment in Iran in recent years. There was some international expectation that the U.S. Government would allow the ILSA to expire in 2001; however, in August 2001, the U.S. Congress continued economic sanctions with the passage of Public Law 107-24 (the ILSA Extension Act of 2001), which extended the Iran and Libya Sanctions Act of 1996 through 2006 (Sipress and Behr, 2001).

In addition to ILSA, the Iranian Transactions Regulation, Title 31 Part 560 of the U.S. Code of Federal Regulations prohibited the exportation to Iran and importation from Iran of most goods and services. The prohibition of any involvement in the development of Iranian petroleum resources was specifically noted. American citizens and companies also were banned from investing or participating in Iran's mineral sector activities under Presidential Executive Orders 12957 of March 15, 1995; 12959 of May 6, 1995; and 13059 of August 19, 1997.

Structure of the Mineral Industry

The overall management of the minerals sector was under the auspices of the Ministry of Industry and Mines. The Ministry's authority covers all mining, smelting, and refining industries except the oil and gas segments which were administered by the Ministry of Petroleum. Most of the country's active mines (estimated to be about 2,700) were privately owned, although the Government retained operational control of many of the larger companies in the minerals sector especially in the aluminum, ammonia, coal, copper, iron, salt, steel, and sulfur sectors. A tabulation of the structure of the mineral industry is available in the USGS Minerals Yearbook 2000.

Commodity Review

Metals

Aluminum.—In 2001, Technoexport Foreign Trade Co. Ltd. of the Czech Republic managed the continued construction of the 280,000-metric-ton-per-year-(t/yr)-capacity alumina refinery at Jajarm for the Iranian Aluminium Co. (IRALCO). Alumina production from imported bauxite was rescheduled to start in 2002. When initially considered in 1990, the plant had been scheduled for completion in 1995. A subsequent September 1999 startup date had been missed owing to technical problems that arose during construction. IRALCO expected to be processing local bauxite within a year after commercial operations begin (Metal Bulletin, 2002a). Alumina production from the Jarjarm plant will be shipped to domestic aluminum smelters in Arak and Bandar Abbas to reduce the smelters' dependence on imported alumina.

Copper.—Iran ranked 16th in the rank of the world's copper producers (Edelstein, 2003§). In order of capacity, the Sar Cheshmeh, the Meiduk, and the Songun Mines of Government's National Iranian Copper Industries Co. (NICICO) were the country's predominant copper ore producers. There was some private industry participation in the copper milling, scrap recycling, and wire drawing sectors.

In 2001, Zarcan Minerals Inc., which was a subsidiary of Zarcan International Resources Inc. of Canada, filed applications for 15 exploration permits in the Sistan-va-Baluchestan Province. With the applications pending, Zarcan resumed exploration on the Chehel Kureh copper-gold-lead-zinc prospect, the Kuh-e Lar copper-gold prospect, and the Shurcha antimony-gold prospect.

Gold.—Much of the gold recovered in Iran was a byproduct of NICICO's Sar Cheshmeh copper complex operations. Additional gold was recovered from the Mouteh Mine and from gold placer mines in the Neyshabour area.

Pouya Zarcan Agh Darreh Co. (PZA), which was Zarcan's joint venture with IRAMCO Aluminum Raw Material Co., continued to explore the Agh Darreh gold prospect in northwestern Iran. In 2001, Zarcan reported measured resources at Agh Darreh of 420,000 metric tons (t) at a grade of 5.7 grams per ton (g/t) gold and indicated resources of 3.04 million metric tons (Mt) at a grade of 3.7 g/t gold (Zarcan International Resources Inc., 2001). In 2001, PZA completed an environmental assessment study for a carbon-in-leach mill on the property and applied for environmental permits for the gold mill and tailings dam.

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

Iron and Steel.—In recent years, Iranian crude steel production has ranged between 5 million metric tons per year (Mt/yr) and nearly 7 Mt/yr. In 2001, Iran's steel production of almost 6.9 Mt placed the nation 22d on the list of world producers (Fenton, 2002§, table 11).

During the past 4 years, the United States has been a significant market for the world's excess steel. Because the American embargo eliminated Iranian access to the U.S. market, Iranian steel production that exceeded domestic requirements was exported to Europe and the Middle East. Iranian steel exports to Europe, however, attracted the attention of the European Confederation of Iron and Steel Industries which considered antidumping action against Iranian steel. Simultaneously, the Iranian steel industry contended with increased imports of steel from Kazakhstan, Russia, and the Ukraine (Metal Bulletin, 2002b). Despite the availability of surplus steel, Iranian steel production was projected to more than double to 14.7 million metric tons per year (Mt/yr) by 2006 (Iran Daily, 2001a§). In 2001, there were numerous steel projects at various stages of planning or construction; these included the expansion of Isfahan Steel Co.'s plant with the addition of a 150-t electric-arc furnace and a third blast furnace (1.4-Mt/yr capacity), the continued expansion of hot-rolled coil capacity to 4 Mt/yr from 3.1 Mt/yr at the Mobarakeh Steel plant, and the construction of a 100,000-t/yr angles mill at Arak. Additional proposed facilities included a 4-Mt/yr iron ore pellet plant at Sirjan, a 1.65-Mt/yr direct reduction iron plant at Bandar Abbas, a 1.5-Mt/yr steel slab mill at Bandar Abbas, a 300,000-t/yr steel bar mill at Isfahan, and a 120,000-t/yr light section steel mill at Isfahan (Metal Bulletin, 2000, 2001a-c; Middle East Economic Digest, 2001d; Iran Daily, 2001c§).

Lead and Zinc.—Iran was a minor lead and zinc producer. Lead production accounted for about 0.5% of the world's lead and ranked Iran as the 20th leading lead-producing nation (Smith, 2002§). As the world's 18th leading zinc producer, Iran produced about 1% of the world's zinc (Plachy, 2002§). Most of the Nation's lead and zinc production was derived from four mines—the Angouran, the Emarat, the Irankouh, and the Kushk. Because of the number of zinc smelters that had come online during the past few years, exports of zinc concentrate to Turkey had been significantly reduced.

In 2001, state-owned General Iranian Mining Co.'s 50% equity interest in a joint venture with Itok GmbH of Austria (20%), and Union Capital Ltd. of Australia (30%) was transferred to the Iranian Mining and Industries Development and Renovation Organisation (an affiliate organization of the Ministry of Industry and Mines). The joint venture completed a prefeasibility study of the proposed development of the Mehdiabad zinc project as an open pit mine, applied for an exploitation license, and proposed to complete a $4 million bankable feasibility study 18 months after receiving the exploitation license. Union Capital reported that indicated and inferred resources of the deposit were 217.9 Mt of ore at a grade of 7.20% zinc, 2.34% lead, and 51 g/t silver using a 4% zinc cutoff grade (Union Zinc Ltd., 2001§; Union Capital Ltd., 2002§).

Industrial Minerals

There are numerous industrial mineral deposits in Iran. Minerals and mineral products produced included asbestos, alum, ammonia, barite, bentonite, boron, celestite, cement, other clays, diatomite, dolomite, feldspar, fluorspar, granite, gypsum, kaolin, lime, limestone, magnesite, marble, mica, ochre, perlite, pumice, salt, construction sand, glass sand, sodium sulfate, crushed stone, sulfur, talc, travertine, turquoise, and urea.

Feldspar and Glass.—New feldspar deposits were reported in Isfahan Province and the Lake Urourmeiyeh region (Industrial Minerals, 2001; H. Emami, written commun., November 21, 2002). A 180,000-t/yr-capacity float glass plant was proposed for Qazvin by the joint venture of Qazvin Glass Co. of Iran and Pilkington plc of the United Kingdom (Middle East Economic Digest, 2001f).

Fertilizer.—In 2001, National Petrochemical Co. awarded construction contracts for a 660,000-t/yr granulated urea plant in the Razi Petrochemical Economic Zone at Bandar Iman Khomeini and for a fertilizer facility with production capacities of about 750,000 t/yr of ammonia and about 1.2 Mt/yr of urea in the Bandar Assaluyeh Special Economic/Energy Zone (Middle East Economic Digest, 2001c, h). The Bandar Assaluyeh plant would use gas from the offshore South Pars Field. Additionally, the Qeshm Free Area Authority in a joint venture with the Indian Farmers Fertilizer Cooperative Ltd. of India and the Indian Government's Krishak Bharati Cooperative Ltd. proposed to build an ammonia plant in the Qeshm Free Area.

Stone.—Dimension stone quarries in Iran produced a wide variety of color and patterns of granite, marble, and travertine. Stone quarries accounted for about 20% of the mining and quarry operations active in Iran. Iran was strategically located to supply the demand for dimension stone of the construction industries of the Gulf States.

Mineral Fuels

Natural Gas.—The South Pars natural gas refinery at Bandar Assaluyeh in Bushehr Province was under construction in 2001. The gas plant was designed to recover 40,000 barrels per day of liquids and 200 metric tons per day of sulfur from a throughput of 56 million cubic meters per day of natural gas (Arab Petroleum Research Center, 2002, p. 147; Iran Daily, 2001e§). Other proposed natural gas plants included a 40-million-cubic-meter-per-day facility at Bidboland and the 10,000-cubic-meter-per-day plant at Ilam (Iran Daily, 2001d§).

Construction continued on the third transcountry gas pipeline, the 142-centimeter-diameter 85-million-cubic-meter-per-day capacity Iran Gas Trunkline 3 (IGAT-3), which will connect the South Pars gas facilities at Bandar Assaluyeh to distribution facilities in northwest Iran (Arab Petroleum Research Center, 2002, p. 149; Middle East Economic Digest, 2001a). Studies of the proposed 110 million-cubic-meter-per-day Iran Gas Trunkline 4 and a pipeline to Armenia were reportedly undertaken (Middle East Economic Digest, 2001e; Scientific Surveys Ltd., 2001, p. 5). Various options to ship natural gas to India from Bandar Assaluyeh, Iran, were under consideration; these included a deepwater offshore gas pipeline to Veraval, India; a shallow water offshore gas pipeline to Okha, India; an overland gas pipeline, which would cross through Pakistan, which would connect to an existing natural gas pipeline near Nagda, India; and a liquified natural gas facility (Middle East Economic Digest, 2001b, g).

The 14-billion-cubic-meter-per-year capacity gas export pipeline to Turkey was completed at yearend. Exports to

Turkey were to begin in 2002. In addition to gas exports, Iran imported natural gas from Turkmenistan.

Petroleum.—In 2001, Iran proposed to increase its crude oil production capacity, as did many oil-producing countries. The planned national crude oil production capacity increase to 2,900 million barrels (Mbbl) by 2005 from about 1,400 Mbbl was estimated to require an additional $40 billion in foreign investment. Any increase would be subject to the production quotas of the Organization of the Petroleum Exporting Countries (Iran Daily, 2001b§).

In the crude oil refining sector, contracts to upgrade the refineries in Tabriz and Tehran were awarded to China Petroleum and Chemical Corp. (Sinopec) and permits were issued to build a new refinery in Ardebil Province. Sinopec also was contracted to build crude oil terminal facilities at the port of Neka, Iran, which would facilitate the Iranian Ministry's crude oil swap program, in which crude oil from the inland nations surrounding the Caspian Sea would be delivered to Neka for use in northern Iran and swapped for equivalent amounts of Iranian crude which would be delivered to terminals in the Persian Gulf for export.

More extensive coverage of the natural gas and petroleum industry of Iran is available from the U.S. Energy Information Administration (2002§).

Infrastructure

Transportation improvements continued to be made throughout the country. Iran's network of 140,200 kilometers (km) of highway, 5,900 km of crude oil pipeline, 4,550 km of natural gas pipeline, 3,900 km of petroleum product pipeline, 6,130 km of rail, and an extensive port system on the Caspian Sea, Gulf of Oman, and Persian Gulf facilitated transport of minerals and mineral products with neighboring countries (Afghanistan, Armenia, Azerbaijan, Pakistan, Turkmenistan, and Turkey) and the rest of the world (U.S. Central Intelligence Agency, 2002§).

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

(Metric tons unless otherwise specified)

Commodity 3/		1997 e/	1998	1999	2000 e/	2001 e/
METALS						
Aluminum:						
Bauxite, gross weight		150,000	336,000	912,451	400,000	400,000
Metal, primary ingot		92,300	123,759	137,421	140,000	140,000
Arsenic, orpiment and realgar, concentrates e/		492	323	300	400	400
Chromite, mine output, concentrate 4/						
Gross weight		168,984 5/	211,555 r/	254,685 r/	153,000 r/	104,900
Cr_2O_3 content e/		82,800	104,000 r/	125,000 r/	75,000 r/	51,500
Copper:						
Mine output:						
Ore mined (1% to 1.2% Cu):						
Gross weight	thousand tons	14,200	13,740	13,770	13,800	14,400
Cu content e/		117,000	137,000	138,000	138,000	144,000
Concentrate (29% to 35% Cu):						
Gross weight		320,000	378,504	381,346	350,000	390,000
Cu content		108,000	128,300	131,000	125,000 r/	133,000
Metal:						
Smelter output, blister/anode		99,000	150,000	154,000	154,000	154,000
Refined output, cathode		103,300	129,000	131,700	132,000	132,000
Gold, mine output, Au content 6/	kilograms	684 5/	856	930	765 r/	770
Iron and steel:						
Ore and concentrate:						
Gross weight	thousand tons	12,750 5/	10,536	10,776	12,370 r/ 5/	12,100
Fe content e/	do.	6,300	5,200	5,300	5,500 r/	5,900
Metal:						
Pig iron	do.	2,053 5/	2,087	2,147	2,200	2,300
Direct-reduced iron	do.	4,380 5/	3,690	4,120	4,740	5,000
Ferrochromium		11,450 5/	13,745	13,680	11,505 r/ 5/	8,430
Ferrosilicon e/		40,000	40,000	46,000	40,000	40,000
Steel, crude, ingots and castings	thousand tons	6,322 5/	5,608	6,277	6,600	6,890
Lead:						
Mine output, concentrate:						
Gross weight e/		37,000	21,216 5/	22,000	27,000	27,000
Pb content		18,200	11,000	11,000 e/	15,000	15,000
Refinery output, includes secondary		49,400	47,000	50,000 r/ e/	53,000 r/ e/	50,000
Manganese, mine output, (30% to 35% Mn):						
Gross weight		135,000	101,390	104,096	105,000	100,000
Mn content e/		40,000	30,500	32,000	32,000	30,000
Molybdenum, mine output, concentrate (56% Mo): e/						
Gross weight		1,800	4,350 5/	4,906 5/	4,900	5,100
Mo content		600	1,400	1,600	1,600	1,700
Silver, mine output, Ag content		30	19	21	22	22
Zinc: e/						
Mine output, concentrate:						
Gross weight		132,000	160,000	160,000	182,000 5/	240,000 5/
Zn content		76,500	80,000	80,000	90,000	120,000
Metal		12,000 r/ 5/	23,000	31,000 r/ 5/	49,000 r/ 5/	73,000 5/
INDUSTRIAL MINERALS						
Asbestos: e/						
Concentrate, (3% to 8% marketable fiber)		86,200	45,000	40,000	40,000	40,000
Marketable fiber		4,300	2,258 5/	2,000	2,000	2,000
Barite		181,174 5/	187,677	183,850	185,000	218,000
Boron, borax		420	2,086	3,663	3,700	3,800
Cement, hydraulic	thousand tons	19,300	21,300 r/ e/	22,080	23,880 5/	24,000
Clays:						
Bentonite		105,300 5/	83,279	64,957	70,000	80,000
Industrial clays e/		350,000	450,000	400,000	450,000	450,000
Kaolin		478,964 5/	582,485	837,277	850,000 r/	800,000
Diatomite e/		90	600	4,350	4,500	4,500
Feldspar		125,000 5/	185,709	239,779	200,000 r/	200,000
Fluorspar		24,846 5/	25,904	18,387	20,000	20,000
Gemstones, turquoise	kilograms	14,000 5/	6,000	20,000	20,000	20,000
Gypsum	thousand tons	9,966 5/	11,843	10,834	11,000	11,000

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

Commodity 3/		1997 e/	1998	1999	2000 e/	2001 e/
INDUSTRIAL MINERALS--Continued						
Industrial or glass sand (quartzite and silica) e/		1,000,000	1,000,000	1,000,000	1,000,000	1,700,000
Lime	thousand tons	2,500 e/	2,737	2,138	2,200	22,000
Magnesite		119,000 5/	109,597	141,081	141,000	143,000
Mica		1,086 5/	1,084	1,425	2,000	2,000
Nitrogen:						
N content of ammonia		879,800 5/	1,034,000	865,000	965,000 5/	1,087,000
N content of urea		610,500 5/	744,000 r/	606,000 r/	624,000 r/	651,000
Perlite		10,000 e/	13,320	15,069	15,000	15,000
Pigments, mineral, natural iron oxide, ochre e/		10,000	13,300	13,300	13,500	13,000
Pumice and related volcanic materials e/		200,000	150,000	150,000	150,000	700,000
Salt		1,180,000	1,911,800	1,600,000	1,600,000	2,000,000
Sodium compound, caustic soda e/		15,000	20,000	20,000	20,000	20,000
Stone: e/						
Construction and building, crushed	thousand tons	14,828 5/	11,670 5/	11,000	12,000	12,000
Dimension and decorative:						
Granite	do.	195 5/	181 5/	195 5/	200	200
Marble:						
Blocks	do.	4,500	6,000	6,400	7,000	6,600
Crushed	do.	450	500	500	550	500
Slabs	do.	50	100	100	110	100
Travertine:						
Blocks	do.	550	516 5/	435 5/	500	400
Crushed and slabs	do.	70	100	65	100	100
Total	do.	5,820 r/	7,400	7,700	8,500	7,900
Dolomite	do.	267 5/	475	286	300	300
Limestone	do.	33,000	33,000	33,000	35,000	40,000
Strontium, celesite e/		2,000	2,000	1,650 5/	2,000	2,000
Sulfates, natural: e/						
Aluminum potassium sulfate (alum)		12,000	12,000	12,000	12,000	10,000
Sodium sulfate		480,000	264,973	308,093	300,000	300,000
Sulfur: e/						
Byproduct of petroleum and natural gas		850,000	889,000 r/	963,000 r/	963,000 r/	933,000
Byproduct of metallurgical processing, S content of acid		50,000	50,000	47,000 r/	50,000	50,000
Total		900,000	939,000 r/	1,010,000 r/	1,010,000 r/	983,000
Talc		29,660 5/	27,038	25,000 e/	25,000	25,000
MINERAL FUELS AND RELATED MATERIALS						
Coal	thousand tons	1,750	1,711	1,507	1,815 r/ 5/	2,000
Coke	do.	800	22,000	20,000 e/	25,000	25,000
Gas, natural:						
Gross	million cubic meters	82,600	89,000	90,600 e/	120,000	120,000
Dry	do.	47,000	50,000	51,000 e/	57,800 r/	65,000
Natural gas plant liquids e/	thousand 42-gallon barrels	22,000	23,000	24,000	25,000	25,000
Petroleum:						
Crude	do.	1,337,360 5/	1,325,000	1,300,000 e/	1,360,000	1,350,000
Refinery products: e/						
Liquefied petroleum gases	do.	14,500	15,700	15,000	16,000	16,000
Motor gasoline	do.	54,500	65,700	60,000	65,000	65,000
Jet fuel	do.	10,000	13,000	11,000	12,000	12,000
Kerosene	do.	36,000	40,000	36,000	40,000	40,000
Distillate fuel oil	do.	109,000	136,000	120,000	140,000	140,000
Residual fuel oil	do.	98,000	163,000	140,000	160,000	160,000
Other	do.	64,000	61,000	60,000	67,000	67,000
Total	do.	386,000	494,000	442,000	500,000	500,000

e/ Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. r/ Revised.
1/ Table includes data available through November 25, 2002.
2/ Data are for Iranian years ending March 21 of that stated, except data for natural gas, plant liquids, and petroleum, which are for Gregorian calendar years.
3/ In addition to commodities listed, the following may have been produced, but information is inadequte to estimate output: ferro-manganese, ferro-molybdenum, nepheline syenite, phosphate rock, selenium, shell, silicomanganese, vermiculite, and zeolite.
4/ Chromite content of concentrate estimated to be 48% to 50% Cr_2O_3 for 1997 and 42% to 45% Cr_2O_3 for 1998 and 1999.
5/ Reported figure.
6/ Includes gold recovered from the Mouteh gold mine and from the Sarcheshmeh copper complex.

TABLE 2
IRAN: STRUCTURE OF THE ZINC INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

Process stage	Major operating companies (and major equity owners)	Location of facilities	Annual capacity
Ore	Iran Zinc Mine Development Co.	Angouran Mine, Zanjan Province	500 1/
Do.	BAMA Co.	Irankouh (Goushfil, Tapeh Sorhk, and Kolah Darvazeh pits) Mine, Esfahan Province	290 1/
Do.	National Iranian Lead & Zinc Co.	Kushk Mine, Yazd Province	175 1/
Do.	Shahin Mining and Industrial Co.	Emarat Mine, Markazy Province	NA
Do.	Bafgh Mining Co.	NA	25
Do.	Sormak Mining Co.	Ahangaran Mine, Zanjan Province	5 1/
Do.	Calcimine Co.	Alam Candy Mine	
Concentrate	do.	NA	100
Do.	Iran Zinc Mine Development Co.	Dandi Calcination plant, Zanjan Province	50
Do.	Bafgh Mining Co.	NA	25
Do.	Iran Zinc Mine Development Co.	NA	20
Do.	Shahin Mining and Industrial Co.	NA	10
Do.	Mineral Processing Co. of Iran	NA	NA
Do.	Calcimine Co.	Khoramshar plant	4 2/
Metal	Bafgh Zinc Smelting Co.	Bafgh, Yazd Province	28
Do.	Angoran Zinc Melting Co. (Calcimine Co.)	Smelter at Angouran Mine, Zanjan Province	12
Do.	Faravari Mavad Madani Iran	Zanjan Province	10
Do.	Bandar Abbas Zinc Smelting Co.	Hormozgan Province	12
Do.	Qeshm Zinc Melting Co. (Calcimine Co.)	Qeshm Island, Hormozgan Province	5
Do.	Isfahan Zinc Smelting Co.	Esfahan Province	5
Do.	Zarin Rooy	Zanjan Province	3
Do.	Kavosh Kar Madan	Tehran Province	3
Do.	Iran Rooy Gostar	Zanjan Province	3
Do.	Rooy Sazan	do.	2
Do.	Negin Rooy	Semnan Province	2
Do.	Other producers	Various locations	14

NA Not available.
1/ Includes lead and zinc ores.
2/ Closed.