

IRAN

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The Islamic Republic of Iran with a population of over 65 million, is not only one of the world's major oil and gas producers, it also has a significant mining sector with good potential and vast mineral resources. The Supreme Leader of the Islamic Revolution has outlined the guidelines for an economy that is not wholly dependent on oil, and the reformist government of President Khatami (now re-elected for a second four-year term in office), has given the mining sector priority in its wish to reduce reliance on oil and gas, its principal source of foreign earnings. The government has formally decided to open up the economy for large-scale foreign investment, particularly to international mining companies.

Iran has been running something akin to a closed war-economy since the revolution in 1979 when all foreign investment was nationalised. However, since then, the combination of weak economic growth, astounding population pressure (over 50% of Iranians are under 20 years of age), high unemployment, the inability to generate enough investment capital directly in Iran and popular dissatisfaction with the economic performance, have all served to push the more open-minded and tolerant government towards considering opening up the resource sector to foreign investment.

The expectation, perhaps unrealistic, is that mining will reduce Iran's absolute dependence on oil and gas, and increase the mining and metal sector's current contribution to GNP of 6.5%. GNP currently amounts to some US\$101 billion (*per capita* US\$1,600). Oil exports are the main source of income, contributing about US\$22 billion last year.

Iran's current five-year economic development plan aims to develop natural resource industries, create jobs, encourage

private sector activity, promote production and investment and, in particular, to develop export-oriented industries.

Oil and Gas

Oil and gas dominate Iran's economy, and oil exports are the principal source of income, contributing some 80% of foreign currency earnings. Reserves, located principally in the southern part of the country and offshore in the Persian Gulf, amount to some 90,000 Mbbl of oil and 24,000 billion m³ of natural gas, representing 9.5% and 16% respectively of the world's known reserves. Last year, Iran was the second largest OPEC producer of crude oil, with a daily production of some 3.56 Mbbl of which around 2.5 Mbbl were exported. Natural gas production last year totalled 57 billion m³, equivalent to only 3.1% of world output. However, it provided 40% of the country's primary energy use.

Buy-back agreements are important for Iran in the development of its oil and gas reserves. In this regard, an agreement has been reached with Shell whereby it will act as a contractor to National Iranian Oil Co. (NIOC) to redevelop two offshore oilfields in the Persian Gulf, Nowroos and Soroosh, which were first discovered in the early 1960s. Shell will be repaid to the value of the capital expended plus a remuneration fee of US\$800 million. Reserves are estimated at some 500 Mbbl of heavy crude in each field. Full production from both fields is expected to start in 2003 at 190,000 bbl/d.

Since 1997, buy-back agreements for the development of the country's oil and gas reserves have effectively generated nearly US\$10 billion in foreign investment. Last July, a contract worth US\$3.8 billion was awarded to a consortium led by Agip of Italy for phase four and phase five of the South Pars offshore field. There have since been buy-

back agreements with Total-Fina-Elf, the Royal Dutch/Shell group and other investors.

Iran has completed its section of a gas pipeline which is part of a contract to supply Turkey with gas over a 22-year period. Production will initially amount to some 2 billion m³/y rising to some 10 billion m³/y.

Iron and Steel

The steel sector is dominated by state-owned National Iranian Steel Co. (NISCO). Production last year reached 6.8 Mt and the target is to reach 10 Mt/y by 2005. Iran possesses in excess of 1,800 Mt of proven reserves of iron ore and new mines are being developed to meet the needs of the domestic steel sector. NISCO operates three iron-ore mines.

The principal operation, Tchogart near Bafq, supplies more than 5 Mt/y of lumpy agglomerated high-grade magnetite ore to NISCO's blast furnaces at Isfahan, and an expansion is in progress with the construction of a new US\$115 million ore-processing plant. Voest-Alpine of Austria, ABB of Switzerland and Taim-TFG of Spain are involved in the project. At NISCO's new Chadormalou mine located 180 km northeast of Yazd, there have been some teething problems at the concentrator and the nominal capacity of 5.1 Mt/y of concentrates has yet to be achieved. The US\$600 million project is based on 400 Mt of magnetite-haematite reserves, and feeds the Mobarakeh steelworks at Isfahan. Last year, the operation produced around 2.8 Mt of steel products. The Mobarakeh steelworks is also being supplied at the rate of 2.5 Mt/y of concentrates by NISCO's Gol-e-Gohar mine near Sirjan in Kerman Province. Capacity is being increased to 5 Mt/y.

The Sangan iron-ore mine in the northeast Province of Khorrasan near the border with Afghanistan is still under development. It is expected to produce 3.4 Mt/y of concentrates within a few years. As well as using domestic funds, it is hoped to attract international

investment for the project. The concentrate will feed the Neyshaboor steel mill, also in Khorrasan, which is due on stream shortly and scheduled to produce 550,000 t/y of cast iron.

Coal

Iran possesses more than 1,000 Mt of coal reserves, mainly coking and bituminous coal, and apart from its iron-ore mines, NISCO also operates a number of coal mines to meet the requirements of its Isfahan steelworks. Washed coal is transported by rail from Zarand, north of the city of Kerman, and from Zirab and Shahroud in northern Iran at the foot of the Elborz mountains. Total production amounts to some 1.2 Mt/y, and NISCO has to import about 700,000 t/y of coking coal to meet the balance of its needs.

In southern Khorrasan, pre-mining has begun at the Tabas coal project where there are estimated reserves of 500 Mt. Some local, private-sector companies are involved, and a contract worth US\$153 million for washing and upgrading of the coal has been signed by NISCO and the Iranian consortium Iritec and its Italian-based subsidiary Irasco. A major goal for NISCO is to introduce greater mechanisation at its coal mines and to modernise its washing plants.

Non-Ferrous Metals

Funding problems have slowed the progress of the semi-private Almahdi aluminium smelter complex at the Gulf port of Bandar Abbas, where the US\$300 million first phase is for an annual capacity of 110,000 t. It is currently producing at the rate of about 15,000 t/y. A second phase is envisaged which would expand capacity to 220,000 t/y. Iran's principal smelter is the 120,000 t/y facility at Arak operated by state-owned Iralco. Iran's total primary aluminium output last year is estimated at 137,000 t. Little progress has been reported on the US\$50 million, 33,000 t/y capacity smelter proposed on the Island of Qeshm in the Straits of Hormuz. UK-based Prime International is reportedly interested in the project.

Iran has been importing all of its alumina requirements for Arak and Almahdi. It possesses large but relatively low-grade bauxite deposits at Jajarm in northeast Khorrasan. A contract for a US\$260 million, 280,000 t/y capacity alumina refinery based on these deposits was awarded to Czech-Techno Export, and the facility was scheduled for commissioning last year. However, commissioning has been interrupted by problems relating to plant design. Additionally, a prefeasibility study is under way for producing alumina at the rate of 80,000 t/y from a nepheline syenite deposit near Kaleiber in eastern Azerbaijan.

Meanwhile, Iran expects to secure much of its future raw materials requirement through a government-to-government agreement committing it to invest in bauxite mining in Guinea, West Africa.

Iran possesses huge copper resources and numerous copper porphyries occur in an arcuate belt extending from northwest Iran southeast into Pakistan. They are estimated to contain 5% of the world's copper inventory.

The world-class Sar Cheshmeh open-pit mine, concentrator, smelter and refinery near Rafsanjan in Kerman Province is operated by state-owned National Iranian Copper Industries Co. (NICICO). Last year, it processed 14.5 Mt of ore and produced 383,000 t of copper concentrates yielding (with some imported concentrates) some 181,200 t of anode copper. Refined output plus heap-leach SX-EW production amounted to 155,850 t of cathodes. Sar Cheshmeh also produced 3,460 t of molybdenum concentrate, 460 kg of gold and 16,500 kg of silver.

Separately, a new 80,000 t/y flash smelter is being built at Khatoon-Abad, 40 km southeast of Sar Cheshmeh by NFC of China and is expected to be operational shortly.

Iran plans to double its copper production within three years, and expansion projects at

Sar Cheshmeh include boosting concentrate output to 700,000 t/y, increasing smelting capacity by 75% and refinery capacity to 200,000 t/y. To the west of Sar Cheshmeh, at Meydook near the town of Shahr-e-Babak, a new mine is under construction based on 400 Mt of reserves and scheduled to produce 150,000 t/y of concentrates beginning in 2005. It will provide feed for both the Sar Cheshmeh smelter and the flash smelter at Khatoon-Abad.

The Swedish company Svedala has a contract to expand and modernise the Sar Cheshmeh concentrator. It will also build and equip plants at Meydook under a contract worth some US\$55 million, and provide equipment for the Songoun project.

Songoun is located in northwestern Iran near the town of Ahar, and the deposit has a resource averaging 0.6% Cu and 0.1% Mo. A US\$360 million mine project is to be developed which will produce initially 45,000 t/y of copper concentrates, rising eventually to 170,000 t/y.

Elsewhere, NICICO and the Iranian company Zar Mess are exploring and assessing copper deposits at Kuh-e-Panj and Dareh-Zar in Kerman Province, and Ehya Khorrasan Co., together with Union Capital, have been investigating a polymetallic copper deposit at Taknar in Khorrasan. In southeastern Iran near Zahedan in Baluchistan, close to the Pakistan border, Zarcán International Resources Inc. of Vancouver has completed first-phase exploration at Kuh-e-Lar where there is a copper porphyry with peripheral gold-bearing skarn mineralisation. Zarcán is in joint venture with NICICO.

Zarcán is also exploring for gold at Agh-Darreh in Azerbaijan Province in northwest Iran. A measured and indicated resource of 3.46 Mt at 3.9 g/t Au has been identified, with the mineralisation associated with silver and antimony in an epithermal system at the silicified contact of a limestone karst with sandstone and clay. Iran possesses one

active gold mine, at Mouteh north of Isfahan. Production amounts to about 250 kg/y.

Lead and zinc are mined at six locations but there are three main operations: Angouran, 90 km west of the city of Zanjan; Irankuh on the outskirts of Isfahan; and Kushk-Bafq east of Yazd. Last year 1.26 Mt of ore were processed yielding concentrates containing 25,100 t of lead and 73,000 t of zinc. The Angouran mine produced about 400,000 t of mainly oxide ore which was processed in a local zinc calcining plant.

The 40,000 t/y Zanjan lead smelter had insufficient feed material from Angouran but a number of small local zinc smelting operations produced a total of 23,500 t of zinc ingots. At Bafq, a 27,000 t/y capacity smelter is still at the pre-production stage but should be fully operational shortly.

Cominco Ltd of Canada is establishing a joint venture with Iranian Zinc Mines Development Co. to build a leaching plant to treat the Angouran oxides. It is expected to produce 100,000 t/y of refined zinc, and the cost of the project is estimated at US\$200 million.

Last December, it was announced that Anzex Resources Ltd of Vancouver had signed an agreement with the Government of Iran for the exploration and assessment of the sulphide portion of the Angouran deposit which has previously been partially drilled by state-owned General Iranian Mining Co. (GIMC). Anzex had four months in which to submit a report to GIMC.

Another zinc project involving foreign investors is Mehdiabad located south of Yazd. Union Capital (formerly Union Mining NL of Australia) is proceeding with Iranian Union Itok in a joint venture to conduct a bankable feasibility study. The Mehdiabad deposit contains an indicated resource of 42.5 Mt averaging 10% Zn, 2.6% Pb and 45 g/t Ag. Union Capital is also involved in the Talnak polymetallic project and in a titanium project at Khanooj near Bandar Abbas.

Iran's other metal-mining activity includes the exploitation of chromite. There are three active operations, at Faryab northeast of Bandar Abbas, at Esfandegh south of Kerman and at Foroumad-Gaft north of Sabzevar in Khorrasan. Last year, total production was 206,000 t of chromite concentrates. Most of the production is exported but some is used to feed a ferroalloys plant near Roudan (100 km northeast of the port of Bandar Abbas). Two Iranian private companies, Baft Ferrochrome and Navid Enya Sepahan, have reached agreement with a European consortium led by the engineering and construction group ABB and Export Bank of Switzerland concerning the construction of two 25,000 t/y capacity ferrochrome plants at a cost of US\$47 million.

Finally, Iran is major producer of industrial minerals. For example, it produces in excess of 10 Mt/y of gypsum, and extraction of decorative and dimension stone (mainly travertine, onyx, marble and granite) totalled 7.8 Mt last year.

A new project reported during 2000, was the exploitation of potash from salt brine in a playa lake area near the oasis of Koor on the southern edge of the great salt desert in central Iran. Kali-Umwelttechnik Sonderhausen of Germany is involved in carrying out the feasibility study and engineering work for a 500,000 t/y capacity KCl operation.

Minerals and Metals

Currently, the minerals and metals sectors account for 19.3% of employment in Iran and contribute 16% of GDP. Last year, almost 107 Mt of raw mineral commodities were mined from about 2,000 active operations, mostly small quarries for the production of construction materials and decorative stone. Annual production has a market value worth some US\$4.2 billion. Mining and metals contribute 6.5% to the GNP total of US\$101 billion, and the export value of metals and minerals production is about US\$500 million.

Future policies for the sector will be fashioned by the newly established Ministry of Industries and Mines which is aiming to improve productivity by attracting more foreign investment and to develop more downstream industries to derive more added

value from mineral products. Over the past three years, Iran has sought about US\$1.5 billion in foreign financing to boost steel and copper output, including investment on buy-back terms.