

## THE MINERAL INDUSTRY OF

# ALGERIA

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The Nation enjoys a diverse, but modest production of metals and industrial minerals; however, hydrocarbons remained by far the leading mineral sector, providing about \$9.5 billion<sup>2</sup> in export earnings in 1994 and accounting for 97% of the Nation's hard currency earnings. The Government announced its chief priorities: expanding exploration activities, improving the recovery rate of oil and gas, augmenting hydrocarbon reserves, and increasing hydrocarbon production, transport, and export capacities.

With an accumulated external debt of \$26 billion, any decline in oil prices has serious implications for the Government's domestic finances. The dinar was devalued by 40% in the spring of 1994, opening the road to a \$1 billion IMF package and international debt rescheduling.

The stipulation that the Government's Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures (SONATRACH) was to hold a 51% interest in all associations with foreign partners was relaxed except for equity holding in existing fields where SONATRACH will retain at least 51%. Exploration activity reflected the improved incentives offered under the December 1991 legislation, which modified the terms and conditions of oil exploration in Algeria. The Government also offered foreign companies equity interest in producing fields, an area from which they were excluded previously. At least 10 fields, including the giant Hassi Messaud Field, have been opened to foreign investors, particularly those with expertise in secondary and tertiary recovery. Although petroleum production remains significant, the Nation's more mature wells required gas reinjection to maintain pressures. Other enhanced recovery technologies were under consideration.

A variety of nonhydrocarbon minerals were produced in minor amounts, but only iron ore, mercury, and phosphate rock production was significant. The entire output of iron ore was consumed by the national iron and steel industry. Phosphate rock production was exported. Mercury was produced entirely for export, and production fluctuates with the price of this commodity in the world market. (See table I.)

Natural gas and liquid fuels accounted for about 97% of Algeria's export earnings. Crude oil exports were expected to increase in mid-decade with the application of enhanced recovery technology and the development of recently discovered fields. Algerian exports of natural gas exceeded 30 billion cubic meters (m<sup>3</sup>) in 1994, down from 34 billion

m<sup>3</sup> in 1993. According to SONATRACH, the reduction was due to the revamping of the liquefied natural gas (LNG) unit at Arzew, which necessitated a 3-month shutdown. This unit represents 40% of the country's liquefaction capacities. Western Europe absorbed more than 90% of Algeria's crude oil exports in 1994. Depleting oil reserves in mature fields diverted marketing attention to natural gas, condensates, and refined products. Future gas sales are directed to pipelines connecting Algeria with southern Europe through Italy and Spain rather than LNG exports, offering the lowest cost option to meet Europe's predicted growth in natural gas demand by 2010. Italy continued as the principal market for Algerian natural gas, importing approximately 15 billion m<sup>3</sup>, followed by France at 9 billion m<sup>3</sup>, Spain and Belgium at about 4 billion m<sup>3</sup> each, and the United States at 2.3 billion m<sup>3</sup> in 1993 and 1.4 billion m<sup>3</sup> in 1994. In August 1994, SONATRACH delivered the first cargo of Algerian LNG to Turkey. By 1996, Algerian exports should approach 60 billion cubic meters per year (m<sup>3</sup>/a). Contracts have been concluded for 24 billion m<sup>3</sup>/a of LNG and 34 billion m<sup>3</sup>/a of natural gas in a gaseous state. Algeria has become a major supplier of gas in southern Europe. Algeria's share of the European gas market ranks third behind the Netherlands with 26% and the former Soviet Union with 36%.

The export of crude oil exceeded 300,000 barrels per day (bbl/d) and petroleum product exports averaged about 410,000 bbl/d in 1994. Combined crude oil and product exports to the United States averaged 240,000 bbl/d for 1993 and 244,000 bbl/d in 1994. Other exports, by order of value, were metals and metal products, phosphates, and iron ore. Helium exports commenced in mid-1994.

The Algerian Government traditionally has controlled all mining and mineral processing industries. However, private capital is being encouraged as SONATRACH'S majority participation in all hydrocarbon production contracts had been relaxed, except for equity in existing fields where 51% majority participation by SONATRACH was still required.

Local mining companies and agencies were to be amalgamated into the Office de Recherche Géologique & Minières (ORGM) with the objective of bringing international involvement to the Algerian mineral industry. Working with local and international companies, ORGM would become responsible for information distribution relating to the mining sector, as well as for the publication of geological maps and the development and evaluation of deposits. ORGM has identified several exploitable mineral

deposits; however, they are located in remote areas devoid of any infrastructure. To further interest foreign investment capital, ORGM was reviewing the 1991 Mining Code and planned to introduce more attractive terms to the Investment Code.

The bulk of Algeria's iron ore output was extracted from the mine at Ouenza. Mining operations were spread over 17 square kilometers (km<sup>2</sup>), with the main seam 2 kilometers (km) long and 500 meters (m) wide. Production totaled 2.3 million metric tons (Mmt) of hematite ore ranging from 53% to 60% iron content. Iron ore also was mined at Bou Khadra and shipped with Ouenza ore by rail to the El Hadjar processing plant, near Bejaia, a distance of 170 km. Both mines are operated by Entreprise Nationale de Fer et de Phosphates.

Gross production of natural gas was 127.2 billion m<sup>3</sup>, and more than 60% was reinjected to maintain petroleum reservoir pressure. Liquefaction of natural gas for the export market averages about 90,000 cubic meters per day (m<sup>3</sup>/d). The gas liquefaction complexes, three at Arzew and one at Skikda, were operating well below the design capacity because of disrepair and lack of funds for replacement parts. Contracts for engineering and other services involved in overhauling and upgrading the complexes were awarded to Bechtel Corp. and M. W. Kellogg Co. of the United States and Sofregas of France. By yearend 1994, work on the new gas liquefaction plant in Skikda was compromised by the withdrawal from the country of 200 expatriate staff members of Sofregas due to activities of the Islamic Salvation Front (FIS).

The production of helium commenced in 1994 from the Helios Co.'s Bethious plant, near Arzew. SONATRACH enjoys a 51% equity in the company, while Air Products & Chemicals, Inc. (APCI) of the United States and L'Air Liquide of France share the remaining equity. The plant's capacity is 16 million m<sup>3</sup>/a of liquid helium, which represents about 20% of world output, and 33,000 mt/a of liquid and gaseous nitrogen. Helium exports were destined for Europe. The nitrogen will be sold in Algeria and other north African markets. The plant employs APCI's production process and also has a retreatment process for the cooling and distillation of the residual gas produced by the GL 2-Z liquefaction complex, which contains on average 10% helium and 45% nitrogen.

Most of Algeria's crude oil production was derived from Hassi Messaoud-Haoud el Hamra Fields in the Sahara, the Zarzaitine-Edjeleh Field near Ohanet, and In Amenas near the Libyan border.

Refining capacity has been stabilized since the early 1980's when the 323,000-bbl/d-capacity Skikda refinery and the 6,500-bbl/d-capacity In Amenas refinery entered production elevating national refining capacity to 474,500 bbl/d.

Hydrocarbon reserves in January 1994, as reported by the Ministry of Mines and Industry, were 3.6 trillion m<sup>3</sup> of natural gas. Unassociated natural gas accounted for 85% of these reserves. Recoverable petroleum reserves were reported at 9.24 billion bbl of light, low-sulfur crudes. Iron ore

reserves were reported at 35 Mmt averaging 53% iron; however, an estimated 970 Mmt of ore grading 53% iron was identified at the undeveloped Gara Djebilit deposit.

Algeria's railroad system, which totals 4,060 km of track, and its road network, which spreads over 90,000 km, are in the northern section of the country supporting long-established mining and other export-oriented industries. The existing infrastructure is too distant to lend support to the development of commercial mineral deposits reported in the south.

More than 11,400 km of pipeline serve the Nation's hydrocarbon industries. The center of the crude oil pipeline network is Hassi Messaoud, in southeastern Algeria from which three crude lines run north to Skikda, Bejaia, and Arzew. The center for the natural gas pipeline network is Hassi R'Mel, with pipelines connecting to liquefaction facilities at Arzew and Skikda. Hassi R'Mel is also the source for natural gas exports to southern Europe via the Trans-Mediterranean pipeline and, when completed, the Maghreb-Europe pipeline. In operation since 1983, the Transmed natural gas export pipeline extends for 2,340 km from Algeria northeastwardly through Tunisia, under the Mediterranean to Sicily and the Italian mainland. Access to the Slovenian gas network is achieved through a 35-km spur line near the Italian end of the Trans-Mediterranean pipeline. Current capacity of the Trans-Mediterranean pipeline is 16 billion m<sup>3</sup>/a. However, expansion activities should increase throughput to 30 billion m<sup>3</sup>/a before the turn of the century. The 1,845-km Maghreb-Europe pipeline was under construction and should traverse Algeria northwestwardly through Morocco, through the Straits of Gibraltar to Seville, Spain. The pipeline was scheduled for completion by 1996 at the initial capacity of 8 billion m<sup>3</sup>/a. The second phase of the Maghreb-Europe pipeline construction will include extensions to Portugal, France, and Germany. Financing was a major issue delaying startup of this second pipeline to Europe. However, construction finally commenced in August 1994. The 530-km Algerian section was being laid by Bechtel of the United States. The 540-km Moroccan section was being laid by a subsidiary of Enagas, the Spanish gas utility company. Saipem of Italy has begun construction on the marine portion of the pipeline. The project was estimated to cost \$2.8 billion. In the second phase of construction, the pipeline will be extended to provide access to Portugal, France, and Germany.

Algeria used seven marine terminals for the export of hydrocarbons, including La Skhirra in Tunisia. The largest terminal is Arzew-Bethioua, which accommodates 40% of all hydrocarbon exports. Port capacity at Skikda is limited to 90,000-m<sup>3</sup> LNG carriers. Efforts are underway to augment facilities to permit the accommodation of 125,000-m<sup>3</sup> carriers.

Stimulating foreign investment interest in Algeria's aging energy industries is vital to the economy because the Nation does not have cash or access to sufficient credit to sustain economic activity. In pursuing this course of action, the Algerian Government has not only encouraged exploration

agreements but has offered a portion of production rights in existing oilfields and gasfields to private companies with capital and enhanced recovery capabilities. This action represents the most significant change in oil policy since nationalization in 1971. Without sufficient foreign capital to refurbish the natural gas extraction and processing facilities, as well as the transportation infrastructure, Algeria may be unable to satisfy demand within a few years. Natural gas exports to Italy alone will double to 30 billion m<sup>3</sup>/a when the Trans-Mediterranean pipeline is expanded. The demand for natural gas may outstrip Algeria's capacity to supply it.

The World Bank extended a \$150 million economic rehabilitation support loan under an agreement reached in May 1994. Specific reform requirements include preparing legislation for privatization, selling public enterprises, and restructuring major public enterprises, such as the steel and fertilizer industries.

With the political crisis undermining local and international

confidence, economic stability remains distant. Conflict between security forces and FIS have resulted in a growing violence since 1992.

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<sup>1</sup>Text prepared May 1995.

<sup>2</sup>Where necessary, values have been converted from Algerian dinars (AD) to U.S. dollars at the rate of AD38.2=US\$1.00 in 1994.

### **Major Sources of Information**

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

(Metric tons unless otherwise specified)

Commodity 3/	1990	1991	1992	1993	1994 e/
<b>METALS</b>					
Cadmium, refined	65	78	75	75	75
Iron and steel:					
Iron ore, gross weight	2,940	2,340	2,560	2,000	2,350
Metal:					
Pig iron	1,040	877	900	1,300	1,300
Steel, crude	836	1,390	1,400	1,400	1,400
Lead:					
Lead, concentrate, Pb content e/	1,100	900	1,200	1,540	1,540
Lead, refined	4,500	4,500	4,500	4,500	4,500
Mercury	637	431	476	455	455
Silver e/	2,500	2,500	3,500	3,500	3,500
Zinc:					
Concentrate, Zn content	4,160	7,900	7,500	6,800	6,800
Metal, smelter output	23,600	24,900	31,000	35,000	35,000
<b>INDUSTRIAL MINERALS</b>					
Barite, crude	53,100	44,400	51,200	47,200	47,500
Cement, hydraulic	6,330	6,320	6,400	6,940	6,950
Clays:					
Bentonite	33,700	25,800	25,000	20,800	21,000
Fuller's earth e/	4,000	4,530	4,550	3,230	3,250
Kaolin	18,000	21,500	20,000	12,600	12,000
Diatomite	4,160	3,630	3,600	3,470	3,500
Gypsum	250	152	234	200	200
Lime, hydraulic	32,000	61,300	62,000	62,000	62,000
Nitrogen: N content of ammonia	288,000	269,000	438,000	380,000	400,000
Phosphate rock:					
Gross weight	1,130	1,100	1,140	730 r/	738
P2O5 content	333	322	340	225 r/	226
Salt	222	259	251	247	250
Sodium compounds: Caustic soda e/	700	700	700	700	700
Strontium minerals: Celestite, gross weight e/	5,400	5,400	5,400	5,400	5,400
Sulfur, elemental e/	20,000	20,000	20,000	20,000	20,000
<b>MINERAL FUELS AND RELATED MATERIALS</b>					
Gas, natural:					
Gross	110,000	126,000	127,000	127,000	127,000
Dry 4/	48,500	54,800	55,800	56,000	56,000
Natural gas plant liquids	56,000	55,000	52,900	53,000	53,000
Petroleum:					
Crude	290,000	204,000	270,000	277,000	275,000
Condensate	154,000	152,000	157,000	155,000	155,000
Total	444,000	355,000	427,000	432,000	430,000
Refinery products:					
Liquefied petroleum gas	10,600	10,700	10,000	10,000	10,000
Gasoline	18,600	19,000	18,800	18,900	18,900
Naphtha e/	28,000	28,000	30,000	32,000	32,000
Kerosene	3,850	3,100	3,000	3,500	3,500
Distillate fuel oil	57,500	56,400	56,400	57,000	57,000
Residual fuel oil	38,200	37,400	37,300	37,400	37,400
Lubricants	840	835	825	825	825
Other e/	3,000	3,000	4,000	4,000	4,000
Total	161,000	158,000	160,000	164,000	164,000

e/ Estimated. r/ Revised.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Table includes data available through May 1, 1995.

3/ In addition to the commodities listed, secondary aluminum, secondary lead, and secondary copper may be produced in small quantities, and crude construction materials presumably are produced for local consumption, but output is not reported, and available information is inadequate to make reliable estimates of output levels.

4/ Excludes gas used in reinjection, flaring, venting, transmission losses, and natural gas liquids extraction.