

## THE MINERAL INDUSTRY OF

# ALGERIA

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In 1998, the nation's leading mineral sector, petroleum and natural gas, accounted for 95% of export revenues, or \$9.8 billion compared with \$13.6 billion in 1997 owing to lower oil prices (Arab Petroleum Research Center, 1999, p. 57). Production of metals and industrial minerals was modest. The Government's development priorities included expanding exploration activities, improving the recovery rate of oil and gas, augmenting hydrocarbon reserves, and increasing hydrocarbon production, transport, and export capacities. Although several exploitable mineral deposits have been identified by the Office de la Recherche Géologique et Minières, they were located in remote areas lacking infrastructure. A production-sharing agreement with Atlantic Richfield Co. (ARCO) of the United States was Algeria's first association with a foreign partner in exploiting a producing field, the Rhourde El Baguel. The agreement permits ARCO to receive up to 49% of the field's output. The field was expected to reach peak production of 125,000 barrels per day (bbl/d) by 2000.

Since the decree of April 6, 1996, a foreign company engaged in hydrocarbon exploration and development is no longer required to form a commercial company subject to Algerian law with headquarters in Algiers if it sets up a joint stock company with the Government's Société Nationale pour la Recherche, la Production, le Transport, la Transformation, et la Commercialisation des Hydrocarbures (SONATRACH). If a field has not yet been developed or is under development, then the foreign company is required to pay a bonus to access reserves. If a foreign company finances a pipeline, then priority will be given to transporting hydrocarbons from the field operated by that company. SONATRACH's foreign partners have the right to use the proceeds of natural gas exports covered by joint marketing agreements with SONATRACH. The foreign partners are not required to return their share of proceeds from these sales to Algeria.

In 1998, crude oil production was 816,000 bbl/d, lease condensates were produced at an average of 430,000 bbl/d, and natural gas plant liquids averaged 155,000 bbl/d (Energy Information Administration, 1999). A variety of nonfuel minerals were produced in minor amounts, but only iron ore, mercury, and phosphate rock outputs were significant. All iron ore produced was consumed domestically. Phosphate rock and mercury were produced entirely for export. Algerian production of mercury has fluctuated widely along with the price of this commodity in the world market. (See table 1.)

Natural gas and liquid fuels accounted for the bulk of

Algeria's export earnings. Exports of natural gas totaled 52.41 billion cubic meters in 1998. Italy continued to be the principal market for Algerian natural gas, followed, in decreasing order of volume, by France, Spain, Belgium, Turkey, and others. Algeria's share of the European gas market ranks third behind Russia with 36% and the Netherlands with 26%. Liquefied natural gas (LNG) exports were directed principally to Europe and the United States. In 1998, the United States imported 1.95 billion cubic meters of LNG from Algeria, representing a 5% increase over 1997 imports and nearly double the amount of LNG imported from Algeria in 1996. Two-thirds of the Algerian LNG arriving in the United States was received at the Distrigas Corp. terminal north of Boston at Everett, Massachusetts. The remaining LNG was received at the Trunkline LNG Co. terminal at Lake Charles, Louisiana. Most of Algeria's natural gas exports were sourced from the Hassi R'Mel Field (Energy Information Administration, 1999c).

In 1998, about 260 million barrels (Mbbbl) of Algerian crude oil and refined products were exported to Western Europe and 105 Mbbbl were exported to the United States. Nearly one-half of the U.S. imports from Algeria were slated as feedstock for the petrochemical industry (Energy Information Administration, 1999b). Algeria's nonfuel mineral exports included helium, iron ore, metals, liquid and gaseous nitrogen, and phosphates. Algeria imported about 750,000 metric tons (t) of cement in 1998, a significant increase compared with 430,000 t in 1997. Major sources of imported cement were Spain, Tunisia, and Turkey.

Algeria's overall foreign trade surplus fell dramatically in 1998 to \$79 million compared with \$5.79 billion in 1997. Any decline in oil prices had serious implications for the Government's domestic finances. The average spot price for Algeria's Saharan Blend crude oil was \$13.07 per barrel in 1998 compared with \$19.62 per barrel in 1997.

Entreprise d'Exploitation des Mines d'Or (ENOR), the state gold development company, initiated fund raising for the development of the Tamesmessa and the Tirek gold deposits in southern Algeria. Government funding for the ENOR project will come from SONATRACH and the Algerian Central Bank, \$6 million each; SAA (Algeria's insurance company), \$3 million; and ENOF, \$1.5 million. Completion of the project was expected to cost \$40 million. Foreign capital was expected to finance the remaining \$23.5 million (OPEC Bulletin, 1997).

The bulk of Algeria's iron ore output was extracted from the mine at Ouenza. Mining operations were spread over 17 square kilometers with the main orebody 2 kilometers (km)

<sup>1</sup>Deceased.

long and 500 meters wide (Mine & Quarry, 1989). 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 were operated by Entreprise Nationale de Fer de la Phosphates.

Production of cement was obtained from 12 subsidiaries of a newly created holding company, Batiment et Materiaux de Construction. The plants had a combined total capacity of 10.55 million metric tons per year (Mt/yr) of clinker and 12.35 Mt/yr of cement. Capacity utilization is a little more than 60% with improvement to 70% anticipated in 1999.

The fertilizer industry, based on indigenous natural gas, had the capacity to produce 990,000 metric tons per year (t/yr) ammonia, 825,000 t/yr ammonium nitrate, 660,000 t/yr nitric acid, and 550,000 t/yr nitrogenous fertilizers.

Helium was produced at the Helios Co.'s Bethious plant near Arzew. SONATRACH owned a 51% equity in the company, and Air Products & Chemicals, Inc. of the United States and L'Air Liquide of France shared the remaining equity. Virtually all production was exported to Europe. The plant's capacity was 16 million cubic meters per year of liquid helium, accounting for 20% of world output and 33,000 t/yr of liquid and gaseous nitrogen. The possible construction of the nation's second helium plant is under consideration.

In 1998, SONATRACH announced the discovery of 14 new fields—2 by the state-owned company and others by foreign operators, including Anadarko Petroleum Corp. of the United States; the Broken Hill Proprietary Co. Ltd. of Australia; LL&E Algeria Ltd., a subsidiary of Burlington Resources Inc. of the United States; Neste Oyj of Finland; and Petro-Canada. New discoveries were made principally in the Illizi and Berkine Basins (Arab Petroleum Research Center, 1999, p. 19).

Anadarko brought the Hassi Berkine South Field in Block 404 on-stream in early May 1998, producing 60,000 bbl/d by midyear from nine wells linked to a central processing facility. The crude oil was slightly heavier than Saharan Blend at 42° API but was lower in sulfur. Full-field development plans called for 150,000 bbl/d from 50 wells. This represented Anadarko's first production in Algeria where it has made a total of 14 discoveries. In the exploitation phase, concession partners reduced their equity by about 50% to accommodate SONATRACH at 51%. Anadarko retained 24% equity interest; Lasmopl of the United Kingdom, 12%; and Mærsk Olie og Gas AS of Denmark, 12.5% (Middle East Economic Digest, 1998).

In 1998, gross production of natural gas was nearly 129 billion cubic meters, about 50% of which was reinjected to maintain petroleum reservoir pressure. The combined total production of LNG at the three liquefaction plants at Arzew and the one at Skikda was about 41 million cubic meters (Arab Petroleum Research Center, 1999, p. 49). The addition of 15.5 billion cubic meters per year capacity to Algeria's natural gas export lines was proposed—an increase of 6 billion cubic meters for the Trans-Med line and 9.5 billion cubic meters for the Maghreb-Europe line (Petroleum Economist, 1998).

Repsol of Spain was committed to invest \$540 million during the coming 5 years to implement three hydrocarbon projects and one petrochemical project. The investment included the

development of the Tin Fouye Tabankort natural gas field; the development of the Tifemine Oilfield, which came on-stream in late 1998; and the petrochemical plant to be built at Skikda by Société Méditerranéenne des Polymères (Middle East Economic Digest, 1998b). Most of Algeria's crude oil production of 298 Mbbl was derived from the Hassi Messaoud and the Haoud El Hamra Fields in the Sahara and the Tin Fouyé Tabankort and the In Amenas Fields near the Libyan border.

The national petrochemicals company, Entreprise Nationale d'Industrie Petrochimique, established a joint venture with Repsol Quimica of Spain to construct linear low-density polyethylene, polyvinyl chloride, and high-density polyethylene plants. To support this development, the Algerian Government provided investment guarantees that include the provision of public utilities and raw materials, and preferential tax treatment.

Hydrocarbon reserves on January 1, 1999, were 4.1 trillion cubic meters of natural gas. Hassi R'Mel accounted for 58% of the natural gas reserve. Recoverable petroleum reserves were reported to be 10 billion barrels with the Hassi Messaoud accounting for 65% of the total. ARCO's use of in-fill drilling and miscible gas injection technology was expected to add 50 to 100 Mbbl to the Rhourde El Baguel Field's recoverable reserves by 2000 (Arab Petroleum Research Center, 1999, p. 17). Iron ore reserves are 3,500 million metric tons (Mt), lead/zinc ore at 1.6 Mt metal content, mercury at 37,000 t metal content, and gold at 110 t metal content (Mining Journal, 1999).

Algeria's railroad system, which totaled 4,060 km of track, and its road network, which covered more than 90,000 km, were in the northern section of the country and supported long-established mining and other export-oriented industries.

More than 11,400 km of pipeline served the hydrocarbon industries within Algeria. The center of the crude oil pipeline network was Hassi Messaoud, in the southeast, from which three crude lines ran north to Skikda, Bejaia, and Arzew. The center for the natural gas pipeline network was Hassi R'Mel, with pipelines connecting to liquefaction facilities at Arzew and Skikda. Hassi R'Mel was also the source for natural gas exports to southern Europe by means of the 24-billion-cubic-meter-per-year-capacity Trans-Mediterranean pipeline and the 8-billion-cubic-meter-per-year-capacity Maghreb-Europe pipeline. The Transmed natural gas export pipeline extended for 2,340 km from Algeria northeastward through Tunisia and under the Mediterranean Sea to Sicily and the Italian mainland. Natural gas was exported to Slovenia by means of a 35-km spur line near the Italian end of the Trans-Mediterranean pipeline. The 1,845-km Maghreb-Europe pipeline traverses Algeria northwestwards through Morocco and the Straits of Gibraltar to southern Spain. The pipeline was inaugurated in November 1996 at an initial capacity of 8 billion cubic meters per year. The second phase of the Maghreb-Europe pipeline construction will include extensions to Portugal, France, and Germany.

Algeria used seven marine terminals for the export of hydrocarbons, including La Skhirra, Tunisia. The largest terminal was Arzew-Bethioua, which accommodated 40% of all hydrocarbon exports. Port capacity at Skikda was limited to 90,000-cubic-meter (m<sup>3</sup>) LNG carriers. Efforts were underway to augment the port facilities to eventually accommodate

125,000-m<sup>3</sup> LNG carriers.

Algeria's implementation of the International Monetary Fund economic structural reform proposals have resulted in a substantial deceleration of inflation, strengthening of the fiscal position, and further progress towards a market-oriented economy. In future years, recoverable hydrocarbon reserves should increase as a result of new discoveries, improved data on existing fields, and the installation of enhanced recovery systems.

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### Major Sources of Information

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TABLE 1  
ALGERIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/ METALS	1994	1995	1996	1997	1998
Cadmium, refined e/	75 r/	75 r/	75 r/	75 r/	75
Iron and steel:					
Iron ore, gross weight thousand tons	2,047	2,200 r/	2,245	1,637 r/	1,783
Metal:					
Pig iron do.	919	940	800 e/	700 e/	700
Steel, crude do.	808	827	620 r/	427	400
Lead:					
Concentrate, Pb content	1,100	1,383	1,016	845 r/	730
Metal, refined	8,000	8,000	8,000	7,000 r/	7,000
Mercury kilograms	414,000	292,000	367,800	447,034 r/	223,965
Silver e/ do.	3,000	2,000	2,000 r/	1,600 r/	1,500
Zinc:					
Concentrate, Zn content	5,700	7,174	5,912	3,690 r/	4,555
Metal, smelter output e/	30,000 3/	30,000 3/	25,000	25,000	25,000
INDUSTRIAL MINERALS					
Barite, crude	20,584	29,838	31,348	39,140 r/	37,006
Cement, hydraulic	6,060	6,200 r/	6,500 r/	7,000 r/	7,500
Clays:					
Bentonite	20,215	17,088	17,200	17,657 r/	15,655
Fuller's earth	4,550	4,500	4,500 e/	3,960 r/	3,942
Kaolin	16,984	24,068	25,000 e/	18,533 r/	13,640
Diatomite	2,800	3,700	3,700 e/	2,332 r/	2,133
Feldspar e/	6,900 3/	7,000 3/	7,000	7,000	7,000
Gypsum e/ 4/ thousand tons	225 3/	250 3/	250	250	250
Helium, liquid e/ million cubic meters	-- 3/	10 3/	15	15	16
Lime, hydraulic e/	62,000	62,000	62,000	62,000 r/	62,000
Nitrogen, N content of ammonia	243,000	176,100	149,900	380,000 r/	350,200
Phosphate rock:					
Gross weight thousand tons	730	1,596	1,051	1,063 r/	1,155
P <sub>2</sub> O <sub>5</sub> content do.	251	500	320	330 r/ e/	358
Salt, brine and sea salt	178,000	178,000 r/ e/	178,000 r/ e/	137,317 r/	172,025
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	23,000	23,000	23,000
MINERAL FUELS AND RELATED MATERIALS					
Gas, natural:					
Gross million cubic meters	131,100	114,779	143,100 r/	125,012 r/	125,971
Dry 5/ do.	51,100	58,100	62,300	97,458 r/	96,873
Natural gas plant liquids thousand 42-gallon barrels	51,500	53,000	53,000 r/	56,575	56,575
Petroleum:				r/	
Crude including condensate do.	430,700	438,730 r/	453,300	466,105 r/	454,750
Refinery products:					
Liquefied petroleum gas do.	9,500	10,000	60,000 r/	75,539 r/	86,048
Gasoline do.	18,900 e/	21,900	20,000 r/	17,313 r/	17,836
Naphtha do.	31,000	31,000	31,000	33,233 r/	31,688
Kerosene e/ do.	8,540 3/	8,030 3/	8,100	8,000 r/	8,000
Distillate fuel oil do.	49,800	51,976	50,000 r/	48,661 r/	46,245
Lubricants do.	825 e/	850	850 e/	686 r/	728
Residual fuel oil do.	37,400 e/	36,646	36,800 r/	37,002 r/	33,753
Other e/ do.	3,000	3,500	3,500	2,500 r/	2,000
Total do.	158,965 r/	163,902 r/	210,250 r/	222,934 r/	226,298

e/ Estimated. r/ Revised.

1/ Table includes data available through July 1, 1999.

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

3/ Reported figure.

4/ Includes about 50,000 metric tons per year of plaster.

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