

THE MINERAL INDUSTRY OF ARGENTINA

By Pablo Velasco

In 1995, Argentina with a population of more than 34 million, had a gross domestic product (GDP) of about \$283 billion.¹ Minerals and related industries, excluding hydrocarbons, accounted for less than 1% of Argentina's 1995 GDP. Metallic mineral exports represented about 8.4%; nonmetallic minerals, 23.6%; construction materials, 67.8%; and semiprecious stones, 0.3% of Argentina's \$506 million total nonfuel mineral exports. Argentina, the second largest country in South America after Brazil, continued to be a modest producer of minerals. The 1995-99 5-year government plan for the mineral sector has been programmed to help promote exploration and development.

In 1995, Argentina continued its self-sufficiency in energy resources (natural gas, petroleum, and uranium) and was a large producer of electricity. Argentina was the fourth largest producer of crude oil and natural gas in Latin America and ranked third in world production of boron minerals. Argentina had the most advanced nuclear energy program in Latin America, with two nuclear plants in operation and a third one under construction (temporarily discontinued due to budgetary constraints). Nuclear plants provided 7,750 megawatts (MW) of electric power to Argentina in 1995, or 13.1% of the total of 58,958 MW.

Throughout 1995, a year of financial crisis, the government continued with policies originally outlined in 1989. It also accelerated its economic reform efforts, including those targeted to increase domestic and foreign investment. Deregulation and privatization of major Argentine industries set off a boom in the oil industry, which became open for exploration and production. Yacimientos Petrolíferos Fiscales Sociedad Anónima (YPF) S.A., privatized since 1991, saw its market capitalization reach to more than \$9 billion in assets; in 1995 it had a net income of \$793 million.

Argentina is a member of the Southern Common Market (Mercosur), the world's fourth largest trading block. The European Union (EU), the world's largest trading block, and Mercosur signed an accord paving the way for closer economic and political ties between the two entities. The EU-Mercosur Inter-Regional Framework Cooperation Agreement was finalized December 15, 1995, in Madrid by the 15-member EU. The accord still must be ratified by the governments of all 19 countries involved.

Government Policies and Programs

Argentina's mining code was enacted in 1966; since then there have been several amendments. The most recent updating occurred in August 1980 (Mining Code No. 22,259). The 1980 Mining Code was further clarified in 1995 with passage of the Federal Mining Agreement (law 24,228), the Mining Reorganization Law (law 24,224), and the Mining Investment Law (law 24,196). The adoption of these laws was the direct result of the Federal Government having appointed a Secretary of State specifically for the mining sector in December 1995; having been passed, with the full support of both chambers of Congress, they have given rise to a real upsurge in mineral-related activity.

The Mining Investment Law was created to provide a stable business environment for mining activities by alleviating the tax impact on early stages of development and promoting the importation of mining equipment and machinery. It also required individuals and corporations to be domiciled in Argentina and registered with the National Mining Department. The law is applicable in all the provinces that ratified it.

The key incentives provided by the law, in recognition of the special status given to minerals developments, included: (1) tax stability for a 30-years period, during which time municipal, provincial, and national taxes cannot be altered; (2) stable foreign exchange and customs treatment; (3) 100% income tax deductions on the costs of prospecting, exploration, and other studies. Installations under construction are also exempt from corporation tax liability; (4) income tax exemption for profits stemming from capital contributions involving mines and mining rights; (5) accelerated amortization of investments in infrastructure, machinery and equipment; (6) exemption from import duties on capital goods, equipment, and raw materials used in mining and exploration projects; (7) elimination of stamp duties on legal transactions related to mining projects; (8) a limit of 3% royalties based on the mine-mouth value of production; and (9) the ability for companies to establish tax-deductible special funds for environmental protection. This law specifically excluded oil and gas activities, as well as the manufacture of cement, tiles, ceramics, sand, pebbles, and gravel.

Corporate income tax is levied at a standard rate of 30% on a national basis. Individual income tax rises progressively to a maximum of 30%, and nonresidents working temporarily

in Argentina receive a concessionaire tax rate of 21%. Value added tax (VAT) is levied on virtually all transactions at a standard rate of 18%. Exports are not subject to VAT. The 1993 Mining Investment Regulation Law also removed a costly and cumbersome evaluation of investments.

Argentina's foreign investment rules are covered under the Foreign Investment Law 21,382 as amended by law 22,208, law 23,696, and later by law 23,697 of August 1989. The 1989 law entitled foreign investors to the same rights and made them subject to the same obligations as domestic investors. Foreign investors became entitled, without approvals or formalities, to repatriate capital and remit profits at any time and to have unrestricted access to foreign exchange markets.

Environmental Issues

Argentina initiated a number of measures to regulate, monitor, and improve its environmental standards especially water and air pollution and hazardous-waste disposal. The lack of clear delegation of environmental authority in Argentina has created difficulties in the implementation and enforcement of its environmental law. The Secretariat of Natural Resources and Human Environment (Secretaría de Recursos Naturales y Ambiente Humano [SRNYAH]) was created by Presidential Decree in November 1991, in order to foster environmental cooperation between the national and provincial governments. The SRNYAH was attempting to establish itself as the country's foremost expert, promoter, and enforcer of environmental protection. The first serious national attempt at environmental legislation was achieved by the enactment of the "Law on Hazardous Wastes" (law 24,051 of January 17, 1992, and its implementing bylaws in Decree No. 831 of April 23, 1993). Largely the result of public reaction to recent industrial accidents, the law requires companies to report on the kind and quantity of hazardous wastes they release into the environment as well as to prepare waste abatement plans. Encouraged by the mining law's success and assisted by the Inter-American Development Bank, the SRNYAH was involved in 1995 in drafting a new Federal Law intended to establish minimum levels of environmental quality to be maintained nationwide. The law emulates environmental regulations used in the United States and several European countries. SRNYAH hopes thereby to establish minimum environmental standards that must be met by all provinces.

Production

Argentina continued to be the world's third largest producer and exporter of boron minerals and byproducts, after the United States and Turkey. It also produced modest quantities of base metals, such as cadmium, copper, lead, manganese, and zinc; precious metals, gold and silver and other industrial minerals, such as asbestos, barite, bentonite, clays, celestite, diatomite, feldspar, fluorspar, graphite,

gypsum, kaolin, marble, sodium carbonate, and vermiculite. Mineral fuels, such as coal, coke, crude oil, natural gas, and uranium. Argentina's only primary aluminum producer, Aluminios Argentinos, S.A.I.C. (ALUAR), produced about 184,000 metric tons per year (t/yr) of aluminum ingot, billet, and slab. Crude steel production in Argentina increased 9.6% in 1995 to about 3.6 million metric tons (Mt), while domestic consumption increased to 3.1 Mt from 2.7 Mt in 1994. The largest producers of steel in Argentina were Aceros Paraná S.A. (formerly Sociedad Mixta Siderúrgica Argentina-SOMISA) and Acindar Industria Argentina de Aceros S.A., which were privatized in 1993. Production of crude oil increased nearly 10.3% in 1995, and refinery products increased 4.5% in 1995. (*See table 1.*)

Trade

The National Customs Administration and the National Institute of Statistics and Census reported the value of exported nonfuel minerals, mineral-related products, and metals to be approximately \$70 million, an increase of 40% compared with that of 1994. The export value of crude oil and refinery products increased 38.3% to \$848 million in 1995. Small quantities of crude oil and refinery products were exported to the United States. The following principal nonfuel mineral exports were classified in five groups based on their export value: borates, 25.9%, of which boron minerals were 2.2%, boric acid, 10.3%, and sodium borate, 13.4%; metals, 23.5%, of which refined zinc is 23.0% and refined lead, 0.5%; metallic minerals, 22.5%, of which lead minerals were 19.4% and zinc minerals, 3.1%; granites, 12.0%, of which manufactured is 11.6% and granite in blocks, 0.4%; and others, 16.1%. In 1995, the nonfuel mineral and mineral-related products exported went to 51 countries, including: Brazil, 30.5%; the United States, 15.1%; Belgium, 12.7%; Japan, 8.6%; Chile, 6.1%; Uruguay, 5.1%; Morocco, 4.7%; and Bolivia, 1.1%.

The total amount of steel imported reached 1,281,000 tons (t), of which 65% was from Brazil, 10% from Poland, 5% from South Africa, and the remainder from other countries. In 1995, the steel industry had to import about 1.8 Mt of iron ore and concentrate, for a total value of \$61.1 million, and 993,000 t of coal for the coke plants, for a value of \$66.4 million.

Structure of the Mineral Industry

The Secretariat of Mines was a unit under the Ministry of Economy and Public Works and Services, one of the eight ministries of the National Executive Branch. The Secretariat of Mines defined and controlled the tasks performed by the National Mining Board and the National Geological Service Board. The Mining Subsecretariat promoted and coordinated mining technology policy, established the development and incorporation of new technologies, and monitored and preserved a single data bank of mining and geological

information.

Following a privatization process, the nuclear powerplants formerly under The Comisión Nacional de Energía Atómica (CNEA) are now privately operated by Nucleoeléctrica Argentina S.A. (NASA), and the construction of the third nuclear powerplant Atucha II has been discontinued due to budgetary constraints.

The mineral industry in the private sector was composed of several mining and manufacturing companies, such as Aluminios Argentinos S.A.I.C. ALUAR, Cementos Loma Negra C.I.A.S.A., Cía. Boroquímica SAMICAF, Cía. Minera Aguilar S.A., Cía. Minera Tea SAMICAF, and Sulfacid SACIF.

In 1996, the largest copper and gold mining company, Minera Alumbreira Ltd., will start operations in Catamarca Province. Additionally hundreds of small metallic and industrial mineral companies were engaged in mining activities throughout Argentina. (*See table 2.*)

At yearend, there were 10.9 million people employed nationwide, of which 7,000 were in the cement industry, 36,000 in the metallurgical plants, 16,000 in the mining sector, and 21,000 in the oil and gas industry.

Commodity Review

Metals

Aluminum.—Primary aluminum in Argentina was produced by ALUAR. ALUAR's refinery in Puerto Madryn, Chubut Province, had installed production capacity of 185,000 t/yr of primary aluminum. ALUAR was studying the possibility of a bond issue to fund a \$300 million expansion of its plant at Puerto Madryn. The expansion will boost its annual refined aluminum output by 39.5% to 258,000 t/yr, ALUAR's official said. It would be completed by July 1999 and additional output will be powered by a 120-MW combined-cycle thermoelectric generator to be acquired by ALUAR. The entire extra output from ALUAR is to be sold to export markets. ALUAR already exports around two-thirds of its current output, a large part of it to Chile and Japan. The complex imported in 1995 about 350,000 t/yr of alumina feedstocks from Aluminum Company of America with about one-half coming from Australia and one-half from Brazil.

Copper.—The Bajo de la Alumbreira copper-gold project is located in the Province of Catamarca in northwestern Argentina at an elevation of 2,550 meters (m) above sea level. The project is being developed by Minera Alumbreira Limited, a company owned in equal parts by Mount Isa Mines (MIM) Holdings Limited of Australia and International Musto Explorations, owned by North Limited of Australia (50%). The property is owned by Yacimientos Mineros de Agua de Dionisio (YMAD), that retains a 20% net proceeds royalty interest in the project. Construction work on the project started in 1995 and concentrate production was scheduled to commence in 1997. The project

will consist of a conventional truck-shovel open pit mine, copper concentrator, gravity gold circuits, and the necessary infrastructure to support these facilities including power line, concentrate pipeline, access roads, and water well field and pipeline.

A copper-gold concentrate will be produced as well as a quantity of gold doré. The concentrate will be pumped through a 250-kilometer (km) slurry pipeline to a railhead south of San Miguel de Tucumán. After dewatering, the concentrate will be railed to Rosario on the Paraná River for shipping to various smelters in Asia, Brazil, Europe, and the United States. Combined copper concentrate and doré production were scheduled to contain an annual average of 180,000 tons of copper and 20,600 kilograms (kg) of gold over a 20-year mine life. On the basis of construction progress to yearend, Bajo de la Alumbreira was projected to commence production in August 1997, about 2 months earlier than initially forecasted. Long-term copper concentrate sales contracts for one-half of the planned annual production and for the first 10 years have been initiated, with letters of intent for an additional percentage of the production. The remainder will be sold on the spot market.

CAR Exploration Pty. Ltd. of Australia also completed an option agreement with YAMIRI Company of La Rioja to explore the well-known Famatina copper deposit in northwest Argentina.

Argentina was set to become a major world copper producer with the development of the El Pachón copper/molybdenum deposit, containing proven and probable resources of 834 Mt grading 0.62% copper and 0.014% molybdenum using a cutoff grade of 0.40% copper. Canada's Cambior Inc. had a 40% interest in El Pachón and Cía. Minera San José S.A. of Panamá had a 60% interest. Cambior is the project operator with option to increase ownership to 50%. By 1999, Pachón was expected to be among the world's major copper sources.

Gold and Silver.—The main sources of gold and silver production in 1995 were the Angela Mine in Chubut Province in southern Argentina, the Farallón Negro Mine in the northwestern province of Catamarca, and other properties in the mining district owned by YMAD, a company partially owned and controlled by the Province of Catamarca and the Federal Government. YMAD is a mineral producer and was seeking private partners to explore some 25 square kilometers, which includes the Farallón Negro Mine and the Alto de la Blenda Mine. These mines have been producing some 600 kg of gold and 7 t of silver annually. The Angela Mine, an underground operation owned by Cerro Castillo S.A., produced silver as well as gold, plus some base metals.

One of the most interesting developments in gold and silver exploration was in the southern province of Santa Cruz where Minorco-Perez Companac is to bring its Cerro Vanguardia gold-silver property into production by 1998 at a cost of \$180 million. The project was expected to yield 6 t/yr gold in doré and 60 t/yr silver. Minera Mincorp's feasibility study was completed in 1995, with construction

due to start by the end of 1996. Openpit mining and conventional carbon-in-pulp leaching were envisaged, with an anticipated mine life of 15 years. An environmental impact plan approved by officials will be monitored on an annual basis. Minera Mincorp is owned 50-50 by Minorco and the Argentinean industrial group Paras Companac.

Argentina Gold Corp. (ARP) and Barrick Gold were planning an extensive exploration program at their jointly owned Veladero and Del Carmen properties located on the Argentinian side of the El Indio gold belt of Chile. The 1996-97 program will consist of grid sampling, geologic and alteration mapping, and geophysical techniques, followed by some 9,000 m of drilling with the aim of evaluating areas of hydrothermal alteration for large, bulk tonnage and/or high sulphidisation bonanza-type gold ore bodies. At Veladero, where ARP holds 60% and is operator, several highly altered epithermal and hydrothermal areas have been outlined, with the main precious metal targets being Cerro Pelado and Veladero Sur. At Del Carmen, 60% owned by Barrick, the area is thought to be a geologic extension of Barrick's Tambo and El Indio deposits in Chile.

Tin.—In November 1995, Sunshine Mining and Refining Company, acquired the assets of Soc. Minera Piriquitas Picchetti, historically the largest producer of silver and tin in Argentina. Recent estimates of the reserves at Piriquitas suggest that at least 70,000 t of contained tin and more than 4,043 t of contained silver remain at the deposit. Followup work by Sunshine confirmed the presence of a large disseminated silver and tin resource that could be mined by an openpit method. Piriquitas is located in northwestern Argentina in the province of Jujuy. The Chilean and Bolivian borders lie 50 km west and 60 km north of Piriquitas at 4,100 m above sea level. Sunshine Argentina, Inc., a wholly owned subsidiary of Sunshine Mining and Refining Co.(U.S.), purchased 100% of the Piriquitas mineral and surface rights at a public auction in November 1995.

Iron and Steel.—According to the Government of the Río Negro Province, currently the owner of the Sierra Grande iron ore deposit, production of iron ore in 1995 was limited to about 4,500 t. Argentina imported 3.2 Mt of iron ore concentrate from Brazil (97%) and Chile (3%). Hierro Patagónico Argentino S.A., the new company in charge of the Sierra Grande Mine, announced that an evaluation study of the formerly Hierro Patagónico Sociedad Anonima Minera installation was completed. The study was conducted by Lurgie Metallurgical of Germany, which found the installation highly satisfactory, thus opening up a new perspective for reactivating the entire operation of the company.

Crude steel production in Argentina increased about 9.6% to 3.6 Mt compared with that of 1994, and output of semimanufactured products increased about 9.9% to 3.7 Mt. Meanwhile, apparent domestic consumption of rolled steel

products was estimated by the Siderurgical Industry Center of Argentina to be about 3.2 Mt, a decrease of about 20% compared with that of 1994, and a per capita consumption of about 100 kg.

Investment in the iron and steel industry in 1995 amounted to \$119 million, compared with \$91.7 million in 1994. Siderurgical Industries Grassi, producer of special steel products and ferroalloys, announced its departure to Paraguay, where the government assured the availability of cheaper and convenient energy for long-range planning and promotional industrial benefits and other advantages, such as the proximity to Brazilian manganese in the Alto Paraná River.

Uranium.—Preliminary figures released by the Secretaría de Hidrocarburos indicated that the production of yellow cake uranium (U_3O_8) in 1995 was about 68,000 kg, or 28% lower than that of 1994.

Argentina's CNEA is responsible for nuclear energy development, which also conducts research and development in nuclear physics, radioisotopes, nonconventional energy resources, and nuclear medicine and it operates a complex of research laboratories and institutes and reports to the Ministry of Culture and Education. Nucleoeléctrica Argentina S.A. (NASA), following a privatization process, now operates the two nuclear powerplants formerly under CNEA. Construction on a third nuclear powerplant (Atucha II) has been discontinued due to budgetary constraints. After privatization, NASA became a 60% private company and took over operation of the Atucha I and Embalse nuclear powerplants. In addition, NASA worked with an existing mixed public-private company, ENACE Inc., to complete the Atucha II. The Nuclear Regulatory Agency is responsible for security and safeguards in nuclear installations.

At yearend, the Argentine Congress began to debate a controversial bill to privatize two working power stations and one unfinished plant, the core of Argentina's nuclear program which was begun in the late 1950's and on which the state has spent billions of dollars. Having run out of cash, the State sought an estimated \$600 m-\$700 million from the private sector to finish Atucha II, a 750 MW plant that has since 1981 cost \$2 billion but has yet to produce energy. Cash flows from these two plants, which account for 14% of Argentina's energy consumption, would theoretically pay for Atucha II's completion.

Industrial Minerals

Boron.—Argentina ranked third in the world in boron mineral production with output of borates amounting to about 245,000 t in 1995, 13.9% higher compared with that of 1994. The main deposits are in the provinces of Jujuy, Salta, and Catamarca in the Argentine Andes.

The total installed boric acid production capacity in Argentina was about 30,000 t/yr, but currently most of the plants are on standby. The main producer was Norquímica

S.A. at 5,400 t/yr. Exports of boric acid were about 11,000 t in 1995.

Cement.—Estimated production of cement was maintained at about the same level as in 1994 of more than 6.2 Mt. For the year, the cement industry operated at about 52% of its installed capacity. According to the Portland Cement Manufacturers' Association, the average consumption of cement per capita increased from 100 t in 1982 to about 150 t in 1995. Total installed production capacity of about 12 million metric tons per year was far in excess of the present domestic requirements. Corporación Cementera Argentina S.A. was adding a cement grinding facility, storage silos, and packing plant to its Mendoza (Capdeville) plant. Startup is expected in early 1996. Juan Minetti S.A. has responded to the building boom in Argentina by ordering from Polysius, a new kiln line (3,100 metric tons per day clinker) for the existing Malagueño plant.

Lithium.—Reportedly, a lithium project is being developed in northwestern Argentina by FMC-LITHCO of the United States at a cost of \$50 million. Development was ongoing and the extraction plant will be built in 1996, with the initial production expected in late 1996. Cía Minera Altiplano S.A., wholly owned by U.S.-based FMC Corp., has invested some \$45 million since 1991 developing the first stage of the Salar del Hombre Muerto project. The first stage would recover up to 4,500 t/yr lithium carbonate from brines containing lithium compound and between 7,000 t to 15,000 t/yr of lithium salts when in full production. The Salar del Hombre Muerto project, which will become the first major lithium mine outside of (Chile and the United States) was based on an ancient dry evaporated lake bed about 4,000 m (13,200 feet) above sea level in the Andes. Reserves were estimated to be sufficient for 70 years.

Potassium.— CAR Ltd; through its subsidiary CAR Exploration Argentina S.A., has optioned the large undeveloped potash deposits along the Río Colorado, which forms the boundary between the provinces of Mendoza and Neuquén. The current owner is Potasio Río Colorado S.A., a subsidiary of Minera TEA S.A. development by CRA as project manager, including a mining feasibility study, over some 11/2 years will allow CRA to acquire an 89% interest in the deposits.

The reserves at the Río Colorado deposit consisted of a high-grade sylvite ore and were estimated to contain over 1 billion t of potash. The preliminary proposal envisaged producing a 250,000 t/yr of potassium chloride (KCL) valued at an estimated \$60 million. A mine with an operating capacity of 500,000 t/yr KCL was under consideration. The cost was estimated at about \$100 million.

Mineral Fuels

Argentina's estimated production of commercial energy totaled about 82.3 Mt of standard coal equivalent. Of the total energy produced, solid fuels accounted for only 0.2%; liquid fuel oils, 54.4%; natural gas, 38.4%; and hydropower, 7%. Energy consumption data were not available for years subsequent to 1993, when the total consumption was 68.9 Mt of standard coal equivalent. Solid fuels provided 1.3%; liquid fuels, 40.8%; natural gas, 49.2%; and hydropower, 8.7%. Of the total installed electrical generating capacity of 18,035 MW in 1993, 55.6% was thermal, 38.8% was hydroelectric, and 5.6% was nuclear. In that year, the latest for which complete data were available, a total of 63,038 kilowatt hours was produced, 49.4% by thermal plants, 38.3% by hydroelectric plants, and 12.3% by nuclear plants. Argentina had two operational nuclear powerplants, Atucha I and Embalse. Atucha II (under construction) would utilize the same source of domestic uranium oxide fuel for its power reactor. In September 1994, the \$7 billion Yacyretá hydroelectric power project generated its first electricity, after 20 years of work on the Paraná River between northern Argentina and Paraguay; the project was owned by the governments of both countries.

YPF, registered a \$793 million profit in 1995, or 41% more than in 1994.

Coal.—Production of bituminous coal in 1995 reached 210,000 t, down 2% from 1994. Yacimientos Carboníferos Fiscales (YCF), the state-owned coal company, produced coal from the Río Turbio Mine in Santa Cruz Province. The Ministry of Economy, Public Work and Services issued a tender for the concession to operate the Río Turbio coal mine and the railway linking the mine to the ports of Punta Loyola and Río Gallegos in Patagonia. The mine and transportation were operated by YCF. This was the second tender for the concession. After restructuring, the privatization process was expected to began.

Natural Gas.—Natural gas production in 1995 was maintained at about 22 billion cubic meters. During 1995, Argentina's proven reserves of natural gas were reported by the recently privatized YPF at about 526 billion cubic meters. Most natural gas produced in Argentina was controlled by YPF. About 53% of the gas was produced by YPF, and the rest either imported from Bolivia or produced under service contracts with private production companies. Gas imports from Bolivia in 1995 amounted to more than 2 billion cubic meters, valued at \$91.6 million, which was paid directly by Gas del Estado, the state-owned gas distribution company, now Transportadora de Gas del Norte.

Natural gas was an important fuel in the Argentine energy mix, accounting for about one-third of Argentina's total energy consumption in 1995. Most gas reserves in Argentina were discovered as a result of oil exploration. Current Argentine gas production was centered on five basins:

Noroeste in northern Argentina, Cuyana and Neuquina in the center of the country, and Golfo San Jorge and Austral in the south. Neuquina was the largest of these basins, accounting for approximately 59% of proven reserves. Noroeste ranked second, with about 23% of proven gas reserves. YPF controlled about one-half of Argentina's gas reserves.

The construction of a 700-km natural gas pipeline from Neuquén, Argentina, to Chile was underway in 1995 and was expected to be completed by 1996. The consortium building the pipeline was composed of YPF, Astra, Bidas, San Jorge, and Pluspetrol. The group expected to export 5 million cubic meters per day of natural gas through the pipeline and eventually export liquified natural gas from Chile's Pacific Ocean ports. The group has already signed a contract with Chile's Empresa Nacional de Petróleo to sell the gas at a rate of \$1.35 per million british thermal unit. The operator of the trunk pipeline was to be Tenneco of the United States, while British Gas was to be in charge of the urban distribution network within Chile.

Petroleum.—The deregulation and privatization of major Argentine industries started a boom in the oil industry, which became open for exploration and production. As a result, Argentine oil production has increased in recent years. Oil production in 1995, according to YPF, was 265 million barrels, an increase of 10.4% compared with 1994. The company, which accounted for 43% of the total production, opened up several central and secondary areas to the private sector.

YPF, announced the discovery of an important crude oil and natural gas field in the northern province of Salta. The San Pedrito X-1 prospection in Acambuco, registered a flow of natural gas and condensate equivalent to 9,500 barrels per day of crude oil, which volume was classified among the largest productive wells in the country.

Infrastructure

Inadequate infrastructure was an important constraint to mining development in Argentina. Argentina's railway system did not reach the mining areas and the road system in the mining provinces was underdeveloped. The major industrial centers and national ports are at great distances from the mining areas, raising the cost of inputs and of marketing. Costs of power and water supply were also high. Mining companies either connected to a regional power system or installed their own power generation. Water supply was an even more serious problem than power supply, as much of the present and potential mining activity was located in arid areas. Finally, the isolated location of mining operations required the establishment of fully developed mining camps. Roads were one of the principal transport methods used to move mine production to processing plants in Buenos Aires and other shipping centers. Argentina has

11,000 km of navigable inland waterways and an excellent navigable river system. River transport operates largely on the Río de la Plata estuary and its tributaries: the Paraná, Uruguay, Paraguay, and Alto Paraná Rivers.

Argentina had about 4,090 km of pipelines to transport crude oil and 2,900 km for refined products, and 9,918 km of gas pipelines from production centers to consumer centers. The system connected oilfields and refineries to the north, center, west, and southeast with main industrial centers. The pipeline to transport crude oil from Argentina's Neuquén Basin to Concepción, Chile, across the Andean Range was not completed at yearend 1995. Natural gas was imported from Bolivia by a gas pipeline through Yacuiba-Pocitos at the border to the northern provinces and Buenos Aires. The existing Argentine railroad network, owned and operated by the state enterprise, Ferrocarriles Argentinos, covered approximately 34,000 km.

Outlook

Argentina's energy resources, which are abundant and diverse, include crude oil, natural gas, hydropower, and fair amounts of coal and uranium, with a potential not fully determined. New investments in Argentina are directed toward several promising projects including copper, gold, crude oil, natural gas, petrochemicals, and gas pipelines. Both National and provincial laws encourage the development of mining by private enterprises, including foreign companies. Several major mining companies and more than 60 junior companies are exploring the whole range of the Argentine Andean chain. Argentina's mineral resources will be important in the future of worldwide investment, development, and mineral-resource analyses.

¹Where necessary, values have been converted from Argentine pesos to U.S. dollars at the rate of 1.00 peso=\$1.00, the average exchange rate in 1995.

Major Sources of Information

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Publications

Estadística Minera de la República Argentina,

Subsecretaría de Minería, Annual report.

Panorama Minero, Monthly magazine.

TABLE 1
ARGENTINA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1991	1992	1993	1994	1995 e/
METALS					
Aluminum:					
Primary	169,000 r/	155,600 r/	170,600 r/	175,900 r/	184,100 3/
Secondary e/	6,000	6,000	6,000	6,000	6,000
Beryllium: Beryl concentrate: e/					
Gross weight	34	34	35	--	--
BeO content	3	--	--	--	--
Cadmium concentrate:					
Gross weight	118	119	80	68 r/	82
Cd content	49 e/	37	34	35 e/	35
Columbium: Columbite concentrate: e/					
Gross weight kilograms	90	95	--	--	--
Cb ₂ O ₅ content do.	67	70	--	--	--
Copper: e/					
Mine output, Cu content	409 3/	300	300	300	300
Refined	12,000	15,000	15,000	15,000	15,000
Gold, mine output, Au content kilograms	1,510	1,300 e/	937	937 r/	837
Iron and steel:					
Iron ore and concentrate:					
Gross weight thousand tons	259	--	--	--	--
Fe content do.	171	3	2	28 r/	--
Metal:					
Pig iron do.	1,305	966	984 r/	998 r/	1,050
Sponge iron (direct reduction) do.	954	1,027	1,156 r/	1,266 r/	1,360
Total do.	2,259	1,993	2,140 r/	2,264 r/	2,410
Ferroalloys, electric-furnace:					
Ferromanganese	26,337	4,524	5,400	4,500 r/	5,000
Ferrosilicomanganese	14,564	30,790	18,500	20,000 e/	20,000
Ferrosilicon	14,437	8,073	19,579	10,000 e/	9,000
Total	55,338 r/	43,387 r/	43,479 r/	34,500 r/ e/	34,000
Steel, crude thousand tons	2,991 r/	2,700	2,886	3,300 e/	3,617 3/
Semimanufactures 4/ do.	2,930	2,640	2,850	3,340 e/	3,670 3/
Lead:					
Mine output, Pb content	23,697	17,956	11,826	9,981 r/	10,521 3/
Metal:					
Smelter, primary e/	11,000	14,600 3/	14,600	14,600	14,000
Refined:					
Primary	10,000 e/	14,597	12,473 r/	7,785 r/	2,430 3/
Secondary	13,697	15,000 e/	16,000 r/	17,600 r/	26,298 3/
Total	23,697	29,597	28,473 r/	25,385 r/	28,728 3/
Manganese ore and concentrate:					
Gross weight	4,943	3,840	3,900	3,900 e/	4,000
Mn content e/	965 3/	750	760	760	780
Silver:					
Mine output, Ag content kilograms	69,959	45,374	42,744	38,032 r/	47,787 3/
Metal, smelter e/ do.	109,000	107,000	108,000	108,000	110,000
Tin: Metal, smelter	240	140 e/	129	100 e/	100
Tungsten, mine output, W content	5	--	--	--	--
Uranium, mine output, U ₃ O ₈ content kilograms	2,100	146,000	148,000	94,000 r/	68,000 3/
Zinc:					
Mine output, Zn content	39,253	40,978	31,395	26,933 r/	32,104 3/
Metal: Smelter:					
Primary	35,800	34,500	31,000 r/	30,000 r/	31,000
Secondary e/	2,800	2,800	2,800	1,000 r/ 3/	2,000
Total	38,600	37,300	33,800 r/	31,000 r/	33,000
INDUSTRIAL MINERALS					
Asbestos	270	215	309	319 r/	250
Barite	23,900	10,000	14,761 r/	27,952 r/	27,000
Boron materials, crude	116,000	125,000	146,349	215,021 r/	244,933 3/
Cement, hydraulic thousand tons	3,399	5,051	5,647	6,306 r/	6,200

See footnotes at end of table.

TABLE 1--Continued
 ARGENTINA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1991	1992	1993	1994	1995 e/
INDUSTRIAL MINERALS--Continued					
Clays:					
Ball clay (plastic clay) e/	80	100	100	90	90
Bentonite	107,782	97,531	96,706	117,095 r/	113,760 3/
Foundry earth	100,000 e/	90,000 e/	96,709 r/	119,179 r/	120,000
Fuller's earth (decolorizing clay) e/	2,000	1,500	1,600	1,600	1,600
Kaolin	47,115	43,722	42,052	50,471 r/	40,000
Laterite (aluminous)	21,400	63,500	-- r/	-- r/	--
Refractory e/	30,900 3/	31,000	32,000	30,000	--
Other 5/	2,350	2,610	2,700 e/	2,600 e/	--
Diatomite	6,130	5,360	3,096	6,260 r/	4,928 3/
Feldspar	42,300	48,500	55,764	39,825 r/	36,901 3/
Fluorspar	16,500	4,590	4,611	3,585 r/	5,071 3/
Graphite	85	20	-- r/	-- r/	--
Gypsum, crude	384,000	514,000	519,181	515,269 r/	531,735 3/
Lithium: Spodumene, amblygonite, gross weight	287	620	300 e/	400 e/	400
Mica:					
Sheet	610	373	720	720 e/	700
Waste and scrap	1,038	635	1,226	1,104 r/	4,341 3/
Nitrogen: N content of ammonia e/	75,000	72,000	72,000	73,000 r/	70,000
Phosphates: Thomas slag e/ 6/	50	50	50	50	50
Pigments, mineral, natural: Other e/	77	40	28	35	30
Pumice and related volcanic materials (perlite, pozzolan, and toba, etc.)	69,700	89,100	98,631 r/	114,082 r/	52,255 3/
Salt:					
Rock e/	--	--	1	3 r/	1
Solar	943	952	1,030	852 r/	986 3/
Total	943	952	1,031	855 r/	987 3/
Sand and gravel:					
Sand:					
Construction	11,000	12,800	16,246 r/	14,327 r/	15,450 3/
Silica sand (glass sand)	374	340	396	247 r/	286 3/
Gravel	7,150	6,810	7,800 r/	8,157 r/	5,617 3/
Soda ash e/	300	290	300	250	200
Stone:					
Basalt	548	677	1,112	1,653 r/	1,879 3/
Calcareous:					
Calcite, nonoptical	7,520	13,600	34,513 r/	59,933 r/	52,577 3/
Calcium carbonate (chalk)	8,330	17,000	19,000	20,000 e/	20,000
Dolomite	402,000	353,000	434,000 r/	687,000 r/	1,083,000 3/
Limestone	9,240	10,800 e/	10,740 r/	11,970 r/	11,491 3/
Marble:					
Aragonite, broken	1,200	1,650	1,107	1,102	1,000
Onyx, in blocks and broken	2,520	2,920	1,701	928 r/	922 3/
Travertine, in blocks and broken	13,200	19,900	27,865	9,790 r/	18,350 3/
Unspecified, in blocks and broken	23,100	22,000 r/	24,426 r/	15,338 r/	9,760 3/
Flagstone	70,200	97,600	94,749	85,555 r/	109,791 3/
Granite:					
In blocks	53,900	53,900	87,337 r/	176,127 r/	125,487 3/
Crushed	4,500	5,130	5,656 r/	5,236 r/	6,835 3/
Quartz, crushed	121,000	106,000	101,399	67,936 r/	95,121 3/
Quartzite, crushed	538	400 e/	490 r/	618 r/	1,841 3/
Rhodochrosite	20	30 e/	58	46 r/	69 3/
Gamestone (agate, amatist, apolo, turmalin,	43,400	30,000 e/	4,963	4,900 r/	3,134 3/
Sandstone e/	250	240	240	230	200
Serpentine, crushed	19,900	36,800	26,518	26,816 r/	83,681 3/
Shell, marl	240,000	237,000	247,928	238,037 r/	869,650 3/
Tuff, (tosca)	2,330	3,280	5,148 r/	6,234 r/	7,002 3/
Strontium minerals: Celestite	1,200 e/	1,200 e/	4,806 r/	8,484 r/	9,325 3/
Sulfates, natural:					
Aluminum (alum)	71,900	85,300	29,240	56 r/	352 3/
Magnesium (epsomite)	6,500 e/	6,500 e/	2,820 r/	1,160 r/	720 3/
Sodium (mirabilite)	16,100	24,800	6,554	7,978 r/	10,604 3/

See footnotes at end of table.

TABLE 1--Continued
 ARGENTINA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

Commodity 2/	1991	1992	1993	1994	1995 e/
INDUSTRIAL MINERALS--Continued					
Talc and related materials:					
Pyrophyllite	--	--	1,962 r/	1,996 r/	4,189 3/
Steatite	274	425	840	500 e/	300
Talc	22,800	21,200	17,200	17,350 r/	17,300
Total	23,074	21,625	20,002 r/	19,846 r/	21,789 3/
Vermiculite	190	--	38	32 r/	44 3/
Water, mineral-containing e/	140,000	140,000	140,000	130,000	135,000
Zeolite e/	90	95	90	90	90
MINERAL FUELS AND RELATED MATERIALS					
Asphalt and bitumen, natural (asphaltite)	5,850	994	160 r/	121 r/	662 3/
Coal, bituminous thousand tons	294	212	200 e/	215 e/	210 3/
Coke, all types, including breeze e/ do.	830	820	800	200	300 3/
Gas, natural:					
Gross e/ million cubic meters	23,000 r/	18,000 r/	24,000 r/	26,000 r/	27,000
Marketed 7/ do.	17,900	19,100	21,500 r/	22,100 r/	22,000
Natural gas liquids: e/					
Butane thousand 42-gallon barrels	4,200	3,770	3,800 3/	3,850	3,847 3/
Propane do.	5,000	4,560 3/	4,600 3/	4,600	4,653 3/
Total do.	9,200	8,330 3/	8,400 3/	8,450	8,500
Peat, agricultural (turba)	1,210	1,180	2,880 r/	2,932 r/	4,000 3/
Petroleum:					
Crude thousand 42-gallon barrels	176,000 r/	203,000	213,000 r/	240,170 r/	265,000
Refinery products:					
Gasoline do.	35,900	30,700	31,200	31,200 e/	31,740
Kerosene do.	3,770	2,610	2,400	2,400 e/	2,700
Jet fuel do.	6,350	4,540	4,670	4,670 e/	4,700
Distillate fuel oil do.	61,000	48,800	48,700	48,700 e/	49,700
Lubricants do.	1,410	1,160	1,280	1,280 e/	1,200
Residual fuel oil do.	26,600	28,600	27,800	27,800 e/	29,530
Other do.	13,700	17,700	17,000	17,100 e/	18,350
Refinery fuel and losses do.	26,700	1,040	--	-- e/	1,080
Total do.	175,430	135,150	133,050	133,150 e/	139,000

e/ Estimated. r/ Revised.

1/ Table includes data available through July 1996.

2/ In addition to the commodities listed, bismuth, carbon black, columbite, lime, natural gasoline, perlite, and potassium sulfate (kalinite) were believed to be produced but output was not reported quantitatively, and available information was inadequate to make reliable estimates of output levels.

3/ Reported figure.

4/ Hot-rolled semimanufactures only; excludes castings and cold-rolled semimanufactures produced from imported hot-rolled semimanufactures.

5/ Includes plastic, semiplastic, and/or ferruginous clays used totally in the manufacture of portland cement.

6/ Thomas slag production was estimated from the Thomas crude steel reported in La Siderurgia Argentina annual, published by the Instituto Argentino de Siderurgia.

7/ Includes natural gas imported from Bolivia.

TABLE 2
ARGENTINA: STRUCTURE OF THE MINERAL INDUSTRY FOR 1995

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum		Aluminios Argentinos S.A.I.C. (ALUAR) (State, 52.1%; private 47.9%)	Puerto Madryn, Chubút Province	170.
Boron		Cía. Boroquímica S.A.M.I.C.A.F., (owned by Río Tinto Zinc Corp. Ltd.)	El Porvenir Mine, Jujuy Province; Tincalayu and Campo Quijano, Salta Province	146.
Cement		Loma Negra C.I.A.S.A., #1; Juan Minetti, S.A., #2; Corporación Cementera Argentina, S.A., #3 (private, 100%)	Buenos Aires, Córdoba, Corrientes, Salta, San Juan, Mendoza, and Jujuy Provinces	6,000.
Coal		Yacimientos Carbóníferos Fiscales (Government, 100%) (shutdown partially in 1991)	Río Turbio, Santa Cruz Province	200.
Gold and silver	kilograms	Yacimientos Mineros de Agua de Dionisio (YMAD) (Government, 100%), Angela Mine (private, 100%)	Farallón Negro, Hualfín and Belén Departments Gastre Department, Chubút Province	1,330 Au 50,000 Ag.
Iron ore		Hierro Patagónico de Sierra Grande, S.A. Minera (HIPASAM) (Government, 100%) (shutdown partially in 1991)	Sierra Grande, Río Negro Province	1,000.
Lead, silver, zinc	kilograms	Cía. Minera Aguilar, S.A. (A Bolivian Consortium Cía. Minera del Sur. {COMSUR}, private, 100%)	Estación Tres Cruces, El Aguilar, Jujuy Province	49,800 Ag, 24,000 Pb, 30,000 Zn.
Natural gas	million cubic meters	Transportadora de Gas del Sur, S.A. (TGS) and Transportadora de Gas del Norte (TGN) both private	Neuquén Santa Cruz, Tierra del Fuego, Salta, and Río Negro Provinces	28,000.
Petroleum	million barrels	Yacimientos Petrolíferos Fiscales (YPF, S.A.) (partially private)	Chubút, Santa Cruz, Neuquén, Río Negro, Mendoza, Salta, Tierra del Fuego, Jujuy. La Pampa, and Formosa Provinces	240.
Steel		Aceros Paraná, S.A., (private, 79.9%; Government, 20.1%)	7 km from San Nicolás de los Arroyos, Buenos Aires Province	3,300.
Do.		ACINDAR-Industria Argentina de ACEROS, S.A. (private, 100%)	Plant Nos. 1, and 3, Buenos Aires Province; Plant No. 2. near Río Paraná, Santa Fé Province	1,500.
Uranium (ore)		Empresa Nuclear Mendoza, subsidiary Nucleoeléctrica Argentina S.A. (NASA)	Sierra Pintada, San Rafael, Mendoza Province	160.
Zinc, refinery		Cía. Sulfacid S.A.C.I. y f (C.M.A.S.A., 50%; private, 50%)	Near Rosario on the Paraná River, Santa Fé Province	35.