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The Mineral Industry of Argentina

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Argentina is a mineral rich country that produces and exports mineral commodities and raw materials. The value of production from the agriculture, fishing, forestry, hunting, and mining industries accounted for about 16% of the country's economy in 2010. The country has deposits of metals, including copper, gold, silver, and zinc; energy minerals, including natural gas, crude petroleum, and uranium; a wide variety of industrial minerals; and minerals that are important for numerous industrial and manufacturing applications, such as cadmium and lithium. The country was the world's leading producer and third ranked exporter of biofuels in 2010 (Ministry of Foreign Affairs, International Trade, and Culture, 2010, p. 42).

The Deseado Massif is located in the southern Argentine Patagonia and makes up much of Santa Cruz Province. The Deseado Massif represents a horst and graben setting developed in the Paleozoic basement where overlying Jurassic volcanic rocks host widely distributed fracture-controlled gold- and silver-bearing quartz veins that locally contain base metals. The most important geologic feature of the area is an extensive plateau composed of intermediate to acid volcanic rocks of the Bahia Laura volcanic complex. There are more than 50 epithermal occurrences within the massif and four operational mines in Santa Cruz Province, including the Cerro Vanguardia, Manantial Espejo, Martha, and San Jose Mines (Schalamuk and others, 1997).

In 2010, Argentina was estimated to be the world's second ranked producer of boron and the fourth ranked producer of both lithium and strontium (from celestite). The Puna Plateau in northwestern Argentina was estimated to contain more than 80% of the world's lithium brine reserves. These evaporite brines (referred to as salars), which contain lithium in aqueous solutions that are pumped from aquifers, are an economical and plentiful source of lithium, as well as a source of commercially important boron and potassium. The largest tonnages of lithium and potassium in brines are located in the Andes Mountains of Argentina, Bolivia, and Chile, and in western China and the Tibet [Xizang] Autonomous Region. Recent developments in the automotive industry and other industries that use lithium in manufacturing have led to an exploration boom within the salars of the central Andes, primarily because the brine bodies in China and Tibet have a more complex chemistry that makes recovery of the contained elements more difficult and less economical. At least a dozen brine projects were at various stages of development in Argentina (Angulo, 2011a, b; Houston and others, 2011; Jaskula, 2011).

Minerals in the National Economy

In 2010, the economy of Argentina recovered to a growth rate approaching that of the years preceding the international economic downturn of 2008–9. The year-on-year estimated gross domestic product (GDP) growth rate was 7.1% in 2010 compared with just 0.9% in 2009, 6.8% in 2008, 8.7% in 2007, and 8.5% in 2006. The value contributed to the nominal GDP in 2010 from the production of goods increased by 33% compared with that of 2009. The mining and quarrying sector accounted for 3.3% of Argentina's total GDP (including goods and services) in 2010 compared with a slightly revised 3.4% in 2009. The mining sector (not including quarrying), however, accounted for 8.8% of the value contributed to the GDP in terms of the production of goods alone compared with 9.3% in 2009. The value contributed by other sectors of the economy that produced goods, including the construction sector; the sector composed of electricity, gas, and water; and the manufacturing sector, decreased by less than 1% compared with that of 2009 (Ministry of Foreign Affairs, International Trade, and Culture, 2010, p. 18, 46, 51–52; Instituto Nacional de Estadística y Censos, 2011).

Argentina has a strong manufacturing sector. Manufacturing companies accounted for 60% of the country's top 500 nonfinancial companies in 2008 (the most recent year for which data were available); the mining and quarrying sector accounted for 8%; and the sector composed of electricity, gas, and water accounted for 7%. Foreign direct investment (FDI) into Argentina increased by 43% from 2003 through 2008 when it reached a record $9.7 billion, but in 2009, FDI decreased by nearly 60% to about 3.9 billion. Spain was the top source of FDI stock in 2009, representing 28% of the total, followed by the United States (17%), the Netherlands (9%), and Brazil and Chile (5% each). Companies from those five countries were also the leading foreign investors in Argentina from 2005 through 2009 (Ministry of Foreign Affairs, International Trade, and Culture, 2010, p. 18, 46, 51–52; Instituto Nacional de Estadística y Censos, 2011).

Government Policies and Programs

Argentina's current Mining Code [El Codigo de Mineria] was enacted by the Argentine Congress on November 25, 1886. The Mining Code underwent significant revisions in 1993 with the enactment of law No. 22,224 (Mining Reorganization Law), and law No. 24,228 (Federal Mining Covenant); in 1995 with the enactment of law No. 24,498 (Mining Modernization Law), law No. 24,523 (creation of the National Mining Trade System of the Mining Secretariat), and law No. 24,585 (Environmental Protection Mining Law); and in 1997 with the passage of law No. 25,225 (modifications) (Secretaría de Minería de la Nación, 2011).

Argentina had not traditionally been a mining country. Mineral production was primarily focused on construction materials until about the 1990s. In 1992, the Government implemented a plan to open the mining sector to private investment, which resulted in a more favorable climate for international trade and investment and increased exploration and mining activities. The strategy to grow the mining sector relied upon a competitive fiscal and legal framework for mining

investment, including the Mining Investment Law, which established incentives and tax benefits, such as a 30-year tax stability agreement that is granted at the time a feasibility study is submitted. The Mining Covenant defines policies relevant to Federal and Provincial authorities, and when passed in 1993, introduced modifications to the 1887 mining code. Even during Argentina's economic and political crisis that reached a climax at the end of 2001, the measures already in place provided a stable legal regime for the mining sector and, combined with what became a favorable domestic exchange rate in the wake of the crisis, resulted in increased investment in the mining sector (Bastida and others, 2005, p. 11–16.).

Production

Primary aluminum production increased by just 0.63% in 2010 compared with that of 2009 to about 413,000 metric tons (t) as Aluar Aluminio Argentino S.A.I.C. exceeded its recently expanded smelter capacity of 410,000 t. Gold mine output increased by about 36% in 2010 compared with that of 2009 to about 63,000 kilograms (kg) from 46,500 kg owing to production increases at Yamana Gold Corp. of Canada's Gualcamayo Mine, Pan American Silver Corp. of Canada's Mantial Espejo Mine, and Coeur d'Alene Mines Corp. of Idaho's Martha Mine. Silver mine output increased by 36% to about 723,000 kg in 2010 compared with a revised 533,000 kg in 2009 owing to increased production at Silver Standard Resources Inc. of Canada's Piriquitas silver and zinc operation and increased production at the Martha Mine. Production of boron increased by 23% to about 623,000 t compared with that of 2009. Iron and steel and ferroalloy production increased considerably compared with that of 2009. The increases brought production levels back to similar volumes of 2008 and may represent the rebalancing of global markets that drive supply and demand (table 1; Silver Standard Resources Inc., 2010, p. 8, 11; Yamana Gold, Inc., 2011, p. 19, 26).

Structure of the Mineral Industry

The mineral industry in Argentina was composed of domestic and foreign private and public companies. Argentina's Secretaría de Minería de la Nación [Mining Secretariat] was responsible for the administration, development, and promotion of mining and mining investment. The Dirección Nacional de Planificación Estrategica Regional [National Directorate of Regional Strategic Planning] and the Servicio Geológico Minero Argentino (SEGEMAR) [Geological and Mining Service of Argentina], the latter of which operated as a dependent decentralized agency, were under the authority of the Mining Secretariat. The Camara Argentina de Empresarios Mineros [Argentinian Chamber of Mining Companies] was a civil association dedicated to the development of a sustainable, prosperous mining industry. Table 2 is a list of the country's major mineral industry facilities (Ministerio de Planificacion Federal Inversion Publica y Servicios, 2011; Servicio Geologico Minero Argentino, 2011).

In 2009 (the most recent year for which data were available), the mining and quarrying and electric, gas, and water industries accounted for about 2% of the salaried employment in the private sector in Argentina. About 23,400 people were employed in the mining industry, of which about 15,000 worked in production. About 21,000 people were salaried, 1,200 were not salaried, and about 1,200 were contract or temporary employees. Construction and manufacturing each accounted for 7% of private sector employment (Ministry of Foreign Affairs, International Trade, and Culture, 2010, p. 58; Instituto Nacional de Estadistica y Censos, 2011).

Mineral Trade

Argentina was a net exporter in 2010, and the value derived from all exported goods increased by 22.4% to $68.1 billion compared with $55.7 billion in 2009. Brazil (which received 21.1% of Argentina's exports) was the leading recipient, followed by China (8.5%), Chile, (6.6%), the United States (5.1%), the Netherlands, (3.5%), and Spain (3.3%). The combined value of goods exported to those countries accounted for about 51% of Argentina's total exports. Imported goods to Argentina were valued at $56.5 billion compared with $38.8 billion in 2009, which was an increase of about 45.7%. Brazil (which supplied 26% of Argentina's imports) was also the leading supplier followed by China (11%), the United States (9%), Germany (5%), Mexico (3%), and France (2%). The combined value of goods received by Argentina from those countries accounted for 56% of the country's total imports in 2010 (Instituto Nacional de Estadistica y Censos, 2011).

Of Argentina's $68.1 billion worth of exported goods in 2010, the autonomous city of Buenos Aires reported exports valued at $22.9 billion of which, 16%, or $3.6 billion, was accounted for by the combined value of iron and steel products, petroleum and gas, and petrochemicals. Santa Fe Province reported total exports of $14.8 billion, of which 2%, or $383 million, was accounted for by the combined value of iron and steel products, petroleum and gas, and petrochemicals. Chubut Province reported exports of $3.3 billion, of which 62%, or about $2 billion, was accounted for by petroleum and gas and the rest was accounted for by aluminum products. San Juan Province reported exports of $2.1 billion of which 76%, or $1.6 billion, was accounted for by gold products and the rest was accounted for by iron and steel. Catamarca Province reported exports of $1.7 billion, of which 89%, or $1.5 billion, was accounted for by production of copper products and the rest was accounted for by the production of gold products. Other Provinces reported exported goods valued between about $25 million and $1.5 billion, which included some mineral products, including petroleum and gas, petrochemicals, and iron and steel products. For several of the other Provinces, no data were available (Ministry of Foreign Affairs, International Trade, and Culture, 2010, p. 40; Instituto Nacional de Estadistica y Censos, 2011).

Commodity Review

Metals

Copper.—In 2010, about 25 million metric tons (Mt) of ore was mined at Minera Alumbrera Ltd.'s Alumbrera Mine

[Xstrata plc of Switzerland (50%) and Canadian companies Goldcorp, Inc. (37.5%) and Yamana Gold (12.5%)] from which about 546,800 t of concentrate containing about 140,000 t of copper was produced. Alumbrera is a copper and gold deposit that formed by the intrusion of a dacite porphyry into the Farallón Negro volcano-sedimentary rocks, resulting in large-scale hydrothermal alteration and mineralization of the porphyry itself and surrounding host rocks. The Farallón Negro district occurs within the Tucuman fault zone, which bounds the Puna plateau to the north and the basin and range province of the Sierras Pampeanas to the south. Alumbrera is one of several porphyry-related ore deposits in the Farallón Negro district. Hydrothermal alteration in the Alumbrera deposit is zoned from a central quartz-magnetite and potassic altered core, outward through intermediate argillic, phyllic, and propylitic assemblages. The deposit's ore minerals are chalcopyrite, native gold, molybdenite, and pyrite. The bulk of the copper and gold ore occurs in the potassic alteration zone; however, significant sulfide concentrations are observed in the intermediate argillic and phyllic alteration assemblages (Harris and others, 2008, p. 295; Xstrata plc, 2011a).

Production of copper in concentrate at Alumbrera decreased by 2% in 2010 compared with that of 2009 as a result of lower head grades and reduced recoveries that resulted from the processing of higher volumes of oxidized ore material. Pit wall instability along a known fault also decreased mining rates and minimized access to a high-grade area of the pit in the fourth quarter. The situation was expected to continue to affect production in 2011, but output was expected to recover in 2012. In February 2010, GoldCorp released an updated resource estimate as of December 31, 2009. The updated proven and probable reserve estimate, which remained the most recent resource estimate at the end of 2010, was 284 Mt grading 0.39% copper and 0.4 gram per metric ton (g/t) gold (GoldCorp Inc., 2010; Xstrata plc, 2011b, p. 74).

In 2010, Yamana Gold signed an agreement with its joint-venture partners at Minera Alumbrera granting the company the option to acquire interests, which had been held through various Yamana Gold subsidiaries, in the Agua Rica copper gold, molybdenum, and silver porphyry project in Catamarca Province. The option was expected to remain valid for up to 4 years. As of December 31, 2010, proven and probable reserves at Agua Rica included about 909 Mt grading 0.49% copper, 0.22 g/t gold, 0.031% molybdenum, and 3.4 g/t silver (Yamana Gold Inc., 2011).

In 2010, Xstrata Copper (a subsidiary of Xstrata plc) was in the advanced feasibility stage at its wholly owned El Pachon project. Xstrata Copper acquired El Pachon in 2006. In December 2010, the company reported a 30% increase of its mineral resources at El Pachon, which totaled about 1.8 billion metric tons of copper ore grading 0.51%. The El Pachon feasibility study was expected to be completed in 2012 (Xstrata plc, 2011b, p. 29–30).

Gold.—In 2010, about 6,500 kg of gold was produced from the Cerro Vanguardia Mine in Santa Cruz. AngloGold Ashanti Ltd. of South Africa held 92.5% ownership in the mine, and the company's attributable gold production was about 6,034 kg compared with 5,971 kg in 2009. The Government of Santa Cruz Province retained the remainder of the ownership through its mining company Formicruz S.E. The Cerro Vanguardia Mine consists of multiple small open pits on hydrothermal vein deposits in the Cerro Vanguardia district where gold and silver epithermal mineralization formed within the Deseado Massif. The average grade of the ore recovered in 2010 was reported to be 6.11 g/t compared with 6.51 g/t in 2009. AngloGold Ashanti reported that Cerro Vanguardia was one of its two lowest cost mines in 2010, with total cash costs of $11.76 per gram (reported as $366 per troy ounce) (Schalamuk and others, 1997; AngloGold Ashanti Ltd., 2010, p. 45, 54).

Silver.—In 2010, the Cerro Vanguardia Mine produced 87,809 kg of silver compared with 68,400 kg in 2009. AngloGold Ashanti's share of the recovered volume was about 81,000 kg and 62,000 kg, respectively. About 50,000 kg of silver was produced at Coeur d'Alene's Martha Mine, which was a 57.5% decrease compared with that of 2009. The decrease at Martha Mine was primarily owing to a 48.3% decrease in the number of tons milled as mining operations were reduced, although the reason for the reduction was not clear. Silver and gold mineralization at the Martha Mine is also hosted in epithermal quartz veins and veinlets within the generally sub-horizontal volcanic rocks of the Bahia Laura volcanic complex. The main ore minerals of gold and silver are argentite, electrum, native silver, and silver sulfosalt minerals (Schalamuk and others, 1997; Coeur d'Alene Mines Corp., 2011, p. 31).

Pan American Silver produced about 137,000 kg of silver and about 2,000 kg of gold from its Manantial Espejo silver and gold mine in Santa Cruz Province compared with 118,000 kg of silver and the same amount of gold in 2009, which was the operation's startup year. Estimated proven and probable reserves at the Manantial Espejo Mine as of December 31 included about 1.13 million kilograms of silver and about 16,600 kg of gold. The Manantial Espejo district is located in the west-southwestern part of the Deseado Massif. Mineralization is in quartz veins with native gold or electrum and scarce sulfides, as well as in quartz stockworks, sinter, and silicified bodies associated with hydrothermal breccias (Schalamuk and others, 1997; Pan American Silver Corp., 2011, p. 13, 21).

In 2010, Silver Standard Resources produced about 196,000 kg of silver at its Pirquitas silver and zinc project, which is located in Jujuy Province. As of December 23, reserve estimates at Pirquitas included proven tonnage of 10.7 Mt grading 194.5 g/t silver, probable reserves of 19.7 Mt grading 202.4 g/t silver, and combined measured and indicated resources of 14.8 Mt grading about 54 g/t silver. Pirquitas started up in the first quarter of 2009. By the third quarter of 2010, the crushers, mill, and processing plant were fully operational, and the company began processing sulfide ore. The Pirquitas epithermal vein deposit is hosted by the Ordovician Acoite Formation in the Puna belt of Jujuy Province. The Puna belt is a geologic terrane to the west of the Eastern Cordillera. The bulk of the Pirquitas property covers intensely folded Acoite Formation marine sedimentary host rocks of graywacke, shale, and siltstone. The fracture and breccia-hosted mineralization at Pirquitas consists of iron and zinc sulfides with accessory cassiterite and a variety of sulfides and sulfosalts. Silver occurs in the sulfosalt minerals freiburgite, miargyrite, polybasite, and

pyrargyrite (Silver Standard Resources, Inc., 2010, p. 52, 54, 57; 2011, p. 3, 12).

Industrial Minerals

Lithium.—In 2010, FMC Corp. of the United States, which was the only company with a producing brine operation in Argentina, reported that it would increase production of lithium carbonate by 30% during the next year. In December, Lithium Americas Corp. of Canada announced that it had filed its updated NI 43–101-compliant resource estimate for its Cauchari-Olaroz lithium-potassium property located in Jujuy Province. The company's resource was increased by greater than 60% from the previous estimate, and the average lithium grade increased by up to 13%. The company reported that the estimate represented the third largest known lithium brine resource in the world behind the Uyuni deposit in Bolivia and the Atacama deposit in Chile. The Cauchari-Olaroz resource was estimated using accepted industry standard methods and results were estimated with a block model developed using ordinary kriging techniques (Lithium Americas Corp., 2010).

Salars are generally the end product of a basin infill process that starts with the erosion of the surrounding relief, initially depositing colluvial talus and fan gravels, grading upward into sheet sands, and playa silts and clays as the basin fills. A recent study by Houston and others (2011) classified two types of salars in Argentina's Puna Plateau—mature halite salars and immature clastic salars. The authors characterized immature salars as those with higher precipitation and lower evaporation, which tend to be found at higher elevations, and that have an alternating sequence of fine-grained sediments and evaporitic beds of halite and or ulexite with brines that barely reach halite saturation. Mature salars were characterized as having less moisture flux and were more common in the lower and drier parts of the region. Mature salars were classified by a relatively uniform and thick sequence of halite with silty clay deposits and volcanic fallout creating thin layers of varying permeability that may have led to the formation of alternating aquifers and aquicludes. The contained brines are halite saturated throughout the brine body. Both types of salar may contain commercially valuable brine resources that reach very high concentrations (Houston and others, 2011).

Most exploration taking place in brine prospects had been carried out by junior mining companies with experience in metallic deposits that complied with existing Australian, Canadian, or European stock market commission standards for reporting mineral resources and reserves. Those standards, however, were designed for solid mineral phases, not fluids (such as brines) that flow and mix relatively rapidly through aquifers during the course of a project lifetime (Houston and others, 2011).

An in situ brine resource is defined by the volume of the host aquifer, the specific yield of the aquifer, and the concentration (or grade) of the elements of interest in the brine. The product of the geometry and specific yield determines the volume of the brine resource. The resource is determined as the product of the brine volume and the grade of the element in the brine. Defining the host aquifer boundaries and especially determining essential parameters of effective porosity, specific yield, and specific retention of the salars, though, is challenging, and results may be equivocal for numerous reasons, including varying permeabilities within the different types of salars and varying densities of fluids, which can affect flow rates; that different parts of the same salar may be classified as mature or immature; and so on (Houston and others, 2011).

Houston and others (2011) pointed out that drawdown starts as soon as pumping begins and continues throughout the life of a project (for example, drawdown contributes to fluid mixing and reorganization, which ultimately affects the fringe of a resource, the surrounding groundwater, or even a nearby defined project or operation that is working on the same or an adjacent salar). The authors concluded that there is no single resource or reserve value that can be determined and that current requirements for disclosure and reporting of fluid mineral prospects needed revision. While the authors' paper was in press, the Ontario Securities Commission issued Staff Notice 43-704, "Mineral Brine Projects and National Instrument 43-101 Standards of Disclosure for Mineral Projects," which provides guidance on reporting standards for brine prospects and addresses many of the issues raised in the paper by Houston and others (Houston and others, 2011; Ontario Securities Commission, 2012).

Outlook

In 2010, Argentina had about 15 operations that produced base and or precious metals, borates, lithium, and iron ore; at least 36 base- and precious-metals projects that were in the resource development or feasibility stages; and nearly 600 mining projects in total (metal and nonmetal). Since 2003, investment in the mineral industry had increased annually from $660 million to a cumulative value of about $11 billion. Exploration had also increased every year since 2003, and the mineral industry continued to expand in most aspects as it had every year since restructuring in the 1990s. Growth of the sector is likely to continue, especially if demand for mineral commodities from countries such as Brazil, China, India, and Russia continued to increase (Metals Economics Group, 2011).

Vale S.A. of Brazil's Rio Colorado potash project in Mendoza Province and Barrick Gold Corp. of Canada's Pascua Lama project in San Juan Province are huge projects that are expected to start up in the near term but that have encountered delays and (or) rising costs in development. Rio Colorado had received the most investment of any mining project in Argentina's history, and Pascua Lama, which crosses the border of Argentina and Chile, is one of the largest gold deposits in the world.

Vale expected to invest about $1.08 billion in the Rio Colorado project in 2012 and projected startup during the second half of 2014. The projected total investment in the project was $5.92 billion and the nominal output capacity was 4.3 million metric tons per year (Mt/yr) of potash compared with a 2007 projection by previous owner Rio Tinto plc of the United Kingdom of a total investment of $900 million and a production capacity of 2.4 Mt/yr. Development of the Rio Colorado project was delayed recently when the government of Mendoza Province suspended work for about 1 month, claiming that Vale had not complied with an agreement that the company

contract 75% of the workforce, raw material purchases, and hiring of services from the Province (Metals Economics Group, 2011).

Barrick was reportedly on track for a 2013 startup at Pascua Lama, but the company expected preproduction costs to increase between 10% and 20% because of increased costs of labor and commodities, as well as a stronger Chilean peso and increased inflation in Argentina. In late 2010, the Argentine senate passed a law to prohibit mining exploration and operations in and around glaciers, which could directly affect development of Pascua Lama on Argentina's side of the border. Barrick, however, reportedly did not believe that the law would affect Pascua Lama's progress. Proven and probable reserves at Pascua Lama included about 385 Mt of ore grading 1.44 g/t gold, and measured and indicated resources were about 210 Mt grading 0.912 g/t for a total of almost 800,000 kg of contained gold (Metals Economics Group, 2011).

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TABLE 1

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2006	2007	2008	2009	2010
METALS						
Aluminum, primary		272,942	286,386	393,900	410,200 r	412,800
Antimony, refined, secondary		2,208	2,726	2,500	2,200 e, r	2,200 e
Cadmium:						
Mine output, Cd content		122	111	124	131 r	124
Refined		6	35	38	36	32
Copper:						
Mine output, Cu content		180,144	180,223	156,893	143,084	140,001
Refined, secondary[e]		16,000	16,000	16,000	16,000	16,000
Gold, mine output, Au content	kilograms	44,131	42,021	42,046	46,588	63,138
Iron and steel:						
Metal:						
Pig iron	thousand metric tons	2,481	2,593	2,581	2,042	2,532
Sponge iron (direct reduction)	do.	1,947	1,810	1,847	807	1,566
Total	do.	4,428	4,403	4,428	2,849	4,098
Ferroalloys, electric furnace:[e]						
Ferrosilicomanganese		9,268 r, 2	8,917 r, 2	9,172 r, 2	6,644 r, 2	10,900
Ferrosilicon		24,400	15,000	10,400	11,300	11,000
Steel, crude	thousand metric tons	5,533	5,387	5,543	4,014	5,138
Semimanufactures	do.	5,308	5,173	5,210	3,749	5,046
Lead:						
Mine output, Pb content		12,064	17,045	20,788	24,753	22,554
Refined:						
Primary		12,064	11,568	13,482	12,558	14,245
Secondary[e]		37,000	49,000	59,000	70,000	63,000
Total[e]		49,100	60,600	72,500	82,600	77,200
Mercury		--	3,484	1,028	1,000 e	NA
Molybdenum		--	--	228	200 e	NA
Silver, mine output, Ag content	kilograms	245,124	255,567	355,596	532,823 r	723,238
Zinc:						
Mine output, Zn content		29,808	27,025	30,349	31,869	32,566
Metal, smelter:						
Primary		42,584	42,876	39,479	32,989	39,540
Secondary		3,407	3,430	3,158	2,639	3,163
Total		45,991	46,306	42,637	35,628	42,703
INDUSTRIAL MINERALS						
Asbestos		299	282	298	322	341
Barite		6,276	37,979	3,170	3,416	2,944
Boron materials, crude		533,535	669,578	785,553	505,983 r	622,968
Cement, hydraulic	thousand metric tons	8,929	9,602	9,703	9,385	10,000 e
Clays:						
Bentonite		246,165	250,260	256,182	148,099	204,209
Common		6,117,199	7,854,569	6,901,410	6,941,736	7,110,621
Kaolin		49,619	69,354	73,838	78,792	78,722
Diatomite		38,543	49,604	36,996	62,270	1,252,741
Feldspar		170,728	291,562	220,234	213,551 r	217,213
Fluorspar		8,278	9,735	15,098	13,424	17,657
Gypsum, crude		1,202,812	1,226,530	1,257,310	1,355,260 r	1,346,535
Lime[e]		NA r	NA r	NA r	NA r	NA
Lithium:[3]						
Carbonate		8,228	3,584	4,037	3,467	4,520
Chloride		8,416	3,107	2,746	1,549	2,405

See footnotes at end of table.

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2006	2007	2008	2009	2010
INDUSTRIAL MINERALS—Continued						
Mica		6,223	10,171	8,790	8,668	9,638
Nitrogen, N content of ammonia		NA [r]	NA [r]	NA [r]	NA [r]	NA
Peat, agricultural (turba)		15,119	13,665	12,119	7,752 [r]	6,345
Perlite		25,146	35,838	26,545	21,802	27,182
Phosphate rock:						
Gross weight		NA [r]	NA [r]	NA [r]	NA [r]	NA
P_2O_5 content		NA [r]	NA [r]	NA [r]	NA [r]	NA
Pozzolan		3,994	4,207	5,839	5,000 [e]	5,000 [e]
Pumice		17,665	16,200	6,500	7,020	7,582
Salt:						
Common		1,917,656	2,357,674	1,681,261	1,477,532	1,526,659
Rock		NA [r]	NA [r]	NA [r]	NA [r]	NA
Sand and gravel:						
Sand:						
Construction		21,143,480	29,122,031	28,532,557	27,183,525 [r]	31,296,935
Silica sand (glass sand)		446,240	456,666	472,612	364,157	531,161
Gravel		10,832,689	19,423,869	20,383,579	19,591,112	22,127,580
Stone:						
Basalt		542,475	841,503	1,101,578	2,116,582	1,652,032
Calcareous:						
Calcite, nonoptical		57,800	131,357	139,119	137,931 [r]	178,504
Dolomite, including crushed		392,681	680,895	1,047,874	1,252,643	1,524,713
Limestone		12,993,352	16,757,861	15,631,899	15,746,676	88,270,673
Crushed, unidentified		12,269,384	22,586,494	23,851,939	19,663,410 [r]	22,127,580
Marble, onyx, travertine		160,535	151,306	151,889	152,911 [r]	162,281
Flagstone		550,529	268,662	237,684	197,877	147,923
Granite, in blocks		71,395	100,697	73,888	79,111 [r]	153,792
Quartz, crushed		206,282	287,138	220,979	218,218 [r]	228,679
Quartzite, crushed		854,560	959,053	1,017,938	946,682	1,164,418
Rhyolite		NA [r]	NA [r]	NA [r]	NA [r]	NA
Rhodochrosite	kilograms	78,832	50,593	136,371	122,117	122,839
Gemstones (agate, amethyst, and so forth)	do.	54,505	12,745	89,675	119,650	45,054
Sandstone		22,452	15,000	--	--	--
Serpentine, crushed		1,725	184,480	150,470	142,000	192,000
Shell, marl		276,233	314,113	357,952	353,137	425,872
Tuff (toba)	thousand metric tons	NA [r]	NA [r]	NA [r]	NA [r]	NA
Strontium minerals, celestite		19,822	4,909	14,910	8,169	8,512
Sulfates, natural:						
Magnesium (epsomite)		1,440	1,730	1,730	1,650 [r]	1,704
Sodium (mirabilite)		43,854	27,957	21,222	18,267	16,235
Talc and related materials		23,113	24,836	22,218	22,762 [r]	24,820
Vermiculite		1,585	1,726	1,813	2,150	2,500
Zeolites		NA [r]	NA [r]	NA [r]	NA [r]	NA
MINERAL FUELS AND RELATED MATERIALS						
Asphalt and bitumen:						
Natural (asphaltite)		1,475	6,758	6,190	6,210	4,576
Byproduct of refinery		658,389	680,821	675,000	641,420	NA
Coal, bituminous	thousand metric tons	295	220	208	181	140
Coke, all types, including breeze	do.	1,191	1,200	1,474	1,413	1,400 [e]
Gas, natural:						
Gross	million cubic meters	51,665	50,891	50,271	32,713	44,555
Marketed	do.	NA [r]	NA	NA [r]	NA [r]	NA
Natural gas liquids	thousand 42-gallon barrels	--	--	10,539	10,100 [r]	10,000 [e]

See footnotes at end of table.

TABLE 1—Continued

ARGENTINA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2006	2007	2008	2009	2010
MINERAL FUELS AND RELATED MATERIALS—Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	240,579	233,824	229,723	226,634 [r]	222,436
Refinery products:						
Liquefied petroleum gas	do.	11,464	11,027	11,000	9,168	10,000 [e]
Motor gasoline	do.	54,319	54,300	36,790	37,960	38,000 [e]
Aviation gasoline	do.	--	--	--	--	--
Jet fuel	do.	9,385	10,111	9,769	10,060	10,000 [e]
Kerosene	do.	178	167	63	87	90 [e]
Distillate fuel oil	do.	819	764	830	747	800 [e]
Residual fuel oil	do.	22,498	28,268	31,164	21,175	25,000 [e]
Lubricants	do.	2,435	2,150	2,000	2,456	2,500 [e]
Other	do.	34,823	137,059	154,949	188,993	189,000 [e]
Total	do.	135,921	243,846	246,565	270,646	275,390 [e]

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. NA Not available -- Zero.

[1]Table includes data available through January 12, 2012.

[2]Reported figure.

[3]In recent years, information available from Argentine sources prompted major revisions in how lithium production is reported.

TABLE 2
ARGENTINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity	Major operating companies and major equity owners	Location of main facilities	Annual capacity[1]
Aluminum	Aluar Aluminio Argentino S.A.I.C. (private, 100%)	Abasto, Buenos Aires Province, and Puerto Madryn, Chubut Province	410.
Boron	Rio Tinto Minerals-Argentina (Rio Tinto Borax, 100%)	El Porvenir Mine and plant, Jujuy Province; Sije and Tincalayu Mines and plants, and Campo Quijano refinery, Salta Province	100.
Do.	Procesadora de Boratos Argentinos S.A. (Ferro Corp.)	Loma Blanca, Jujuy Province, and plant at Palpala, Jujuy Province	36.
Do.	Ulex S.A. (private, 100%)	Pastos Grandes, Salta Province	2.
Cement	Cementos Loma Negra C.I.A.S.A. (private, 100%)	Buenos Aires, Cordoba, Corrientes, Salta, Salta Juan, Mendoza, and Jujuy Provinces	6,000.
Do.	Cementos Avellaneda, S.A. (Corporación Uniland S.A. and C. Molins International S.A.)	La Caldera plant, San Luis Province, and Olavarria plant, Buenos Aires Province	2,800 cement, 220 lime.
Do.	Juan Minetti S.A. (Holcim Ltd., 100%)	Cordoba, Jujuy, and Mendoza Provinces	1,700.
Coal	Yacimientos Carbonífero Río Turbio S.A. (private, 100%)	Rio Turbio, Santa Cruz Province	210.
Copper and gold[2]	Minera Alumbrera Ltd. (Xstrata plc, 50%; Goldcorp, Inc., 37.5%; Yamana Gold, Inc., 12.5%)	Alumbrera Mine, Catamarca Province	160 Cu, 13,000 Au.
Gold and silver kilograms	Cerro Vanguardia S.A. [AngloGold Ashanti Ltd., 92.5%, and FOMICRUZ S.E. (Government of Santa Cruz Province, 7.5%)]	Cerro Vanguardia Mine, Santa Cruz Province	100,000 Ag, 10,000 Au.
Do. do.	Coeur d'Alene Mines Corp., 100%	Martha Mine, Santa Cruz Province	120,000 Ag, Au NA.
Do. do.	Minera Santa Cruz (Hochschild Mining plc, 51%, and Minera Andes Inc., 49%)	San Jose, Santa Cruz Province	15,000 Ag, 2,400 Au.
Do. do.	Minera Argentina Gold (Barrick Gold Corp., 100%)	Veladero Mine, San Juan Province	21,000 Au, 125,000 Ag.
Do. do.	Pan American Silver Corp., 100%	Manantial Espejo, Santa Cruz Province	1,900 Au, 125,000 Ag.
Do. do.	Silver Standard Resources Inc., 100%	Piriquitas, Jujuy Province	215,000 Ag.
Do. do.	Yacimientos Mineros de Agua de Dionisio (Government, 100%)	Farallon Negro, Hualfin, and Belen, Catamarca Province	4,600 Au, 50,000 Ag.
Do. do.	Yamana Gold, Inc., 100%	Gualcamayo, San Juan Province	5,000 Au.
Iron and steel	Siderar S.A.I.C. (Ternium S.A., 60.93%)	San Nicolas, Buenos Aires Province	2,880 steel, 4,500 semimanufactures.
Do.	Acindar S.A. (AcelorMittal Group, 65%)	Plant Nos. 1 and 3, Buenos Aires Province; and Plant No. 2, near Rio Parana, Santa Fe Province	1,350 steel, 1,000 DRI.
Do.	Metallurgical Corp. of China Ltd.	Sierra Grande, Rio Negro Province	320 iron ore.
Do.	Siderca S.A.I.C. (Techint Group)	Buenos Aires Province	900 steel, 670 DRI.
Lead and silver, refinery[3]	AR Zinc Group (Glencore International AG, 100%)	Refineria Aguilar, Palpala Industrial Park, Jujuy Province	18,000 Ag. 15 Pb.
Lead, silver, and zinc[3]	do.	Aguilar Mine, Jujuy Province	49,800 Ag, 24 Pb.
Lithium metric tons	Minera del Altiplano S.A. (FMC Corp.)	Salar del Hombre Muerto, Salta Province	7,260 chloride, 11,350 carbonate.
Natural gas million cubic meters	Repsol YPF, S.A.	Neuquen, Rio Negro, Salta, Santa Cruz, and Tierra del Fuego Provinces	18,000.

See footnotes at end of table.

TABLE 2—Continued
ARGENTINA: STRUCTURE OF THE MINERAL INDUSTRY IN 2010

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity[1]
Petroleum	million 42-gallon barrels	Repsol YPF, S.A.	Chubut, Formosa, Jujuy, La Pampa, Mendoza, Neuquen, Rio Negro, Salta, Santa Cruz, and Tierra del Fuego Provinces	366.
Do.	do.	Pan American Energy (Sucursal Argentina) LLC (BP p.l.c., 60%, and Bridas Corp., 40%)	Offshore Chubut and Santa Cruz Provinces	100.
Do.	do.	Chevron Argentina S.R.L.	El Trapial Field, Neuquen Province and other concessions	46.
Do.	do.	Petrobras Energia S.A. (Petroleo Brasileiro S.A., 100%)	La Pampa, Mendoza, Neuquen, Rio Negro, Salta, and Santa Cruz Provinces	15.
Do.		Petro Andina Resources Ltd. (Pluspetrol S.A., 100%)	Neuquen Basin	10.
Do.	do.	Tecpetrol S.A.	Golfo San Jorge Basin, Neuquen Basin, Northeast Basin	10.
Do.	do.	Total Austral S.A. (Total S.A., 100%)	Neuquen Province	NA.
Zinc		Glencore International AG, 100%	Aguilar Mine, Jujuy Province	44.
Do.		Coeur d'Alene Mines Corp., 100%	Martha Mine, Santa Cruz Province	NA.
Do.		Silver Standard Resources Inc., 100%	Piriquitas, Jujuy Proveince	NA.
Zinc, refinery		Aguilar AR Zinc Group (Glencore International AG, 100%)	Rosario, Santa Fe Province	44.

[e]Estimated. Do., do. Ditto. NA Not available.

[1]Abbreviations used in this table for commodities include the following: Ag—silver; Au—gold; Cu—copper; DRI—direct-reduced iron; and Pb—lead.

[2]Gold data are in kilograms.

[3]Silver data are in kilograms.