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The Mineral Industry of Australia

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Australia was one of the world's leading mineral producing countries and ranked among the top 10 countries in the world in the production of bauxite, coal, cobalt, copper, gem and near-gem diamond, gold, iron ore, lithium, manganese ore, tantalum, and uranium. Since mid-2008, the global financial crisis had sharply weakened world economic activities, and the slowdown had been particularly pronounced in the developed countries in the West. Emerging Asian economies were also adversely affected by the sharply weaker demand for exports and tighter credit conditions. After a period of strong expansion, Australia's economic growth decreased by 0.5% in the final quarter of 2008. Overall, Australia's economy grew at a rate of 2.4% during 2008. During the past several years, owing to anticipated higher prices of mineral commodities in the world markets, Australia's mineral commodity output capacities expanded rapidly. As a result of the slowdown in demand for such commodities as iron ore, nickel, and zinc in the world, surplus productive capacity was expected and export earnings for Australia's energy and mineral commodities were expected to decline during the next couple of years (Australian Bureau of Agricultural and Resources Economics, 2009c, p. 13; Reserve Bank of Australia, 2009, p. 31).

Australia's total mineral exploration spending, excluding that of the petroleum sector, was US$2,000.9 million (A$2,223 million) in fiscal year 2008-09, which was a decline of 9.7% from that of fiscal year 2007-08 (the Australian fiscal year runs from July 1 to June 30). The decline in exploration spending was the result of decreases in spending for base metals, gold, and uranium. Exploration spending for coal, iron ore, and other commodities, such as manganese, molybdenum, phosphate rock, and tungsten, increased. The Northern Territory was the only Australian State or Territory that recorded an increase in exploration spending. Spending on coal exploration in New South Wales and Queensland increased but spending on other commodities decreased. Western Australia remained the leading destination for exploration spending and accounted for about 56% of the total exploration expenditure followed by Queensland, 16%; South Australia, 10%; New South Wales, 8%; and others, 10%. Total Australian petroleum exploration (onshore and offshore) spending was US$3.4 billion (A$3.8 billion) in fiscal year 2008-09, which was an increase of 26% from that of fiscal year 2007-08. About 66% of the country's total exploration expenditure was spent on existing deposits and the remaining 34% was spent on new exploration (Australian Bureau of Agricultural and Resource Economics, 2009d; Department of Mines and Petroleum, 2009b, p. 4).

As a result of the spending on exploration, significant mineral resources were discovered. These included the Henry George zinc deposit at Broken Hill in New South Wales, the Hillside copper deposit on the Yorke Peninsula in South Australia, the Prairie Downs zinc deposit at Newman in Western Australia, the Reedy Creek gold deposit near Melbourne in Victoria, the Bungalow mangnetite deposit near Cowell in South Australia, and the Brockman iron project in the Pilbara region of Western Australia (Australian Bureau of Agricultural and Resource Economics, 2009a).

Minerals in the National Economy

Australia's mining sector contributed more than $105 billion to the country's gross domestic product (GDP), or 7.7% of the GDP during fiscal year 2007-08. In 2008, the mining sector employed 173,900 people who worked directly in mining and an additional 200,000 who were involved in supporting the mining activities. Expectations of sustained levels of global demand for minerals led to increased production of minerals and metals in Australia, and the mineral industry was expected to continue to be a major contributor to the Australian economy in the next several years (Australian Bureau of Statistics, 2009b).

Government Policies and Programs

The powers of Australia's Commonwealth Government are defined in the Australian Constitution; powers not defined in the Constitution belong to the States and Territories. All powers that relate to mineral resources and their production belong to the States and Territories. Except for the Australian Capital Territory (that is, the capital city Canberra and its environs), all Australian States and Territories have identified mineral resources and established mineral industries. The Australian Government sets a company tax rate of 30% on profit and a 10% tax on goods and services. Royalties for metals are levied as a percentage of the sale value—concentrates, 5%; uranium, 5%; and pure metals, 2.5%. The royalty paid by a company is allowed to be deducted from reported income for income tax purposes. The amount of royalty paid can be reduced by deducting the costs incurred in the transportation of the mineral ore concentrate or metal (Department of Mines and Petroleum, 2009a).

In 2008, owing to the global financial crisis, Australia's manufacturing activity declined for 6 consecutive months as companies reduced production. The Federal Government announced that it would fund a A$42 billion nation-building and jobs plan in 2009 to strengthen employment and economic growth in the country. The Reserve Bank of Australia lowered the official interest rate to 3.25% in early 2009, which was a 400 percentage point reduction since September 2008. The Western Australian government announced an A$80 million exploration incentive package to encourage exploration in underexplored Greenfield regions of the State (Department of Mines and Petroleum, 2009b, p. 5).

The Australian Government permits uranium mining, provided that all the relevant environmental safeguards and health requirements are met. Regulation of Australia's uranium mines is mainly a State and Territorial government responsibility. Uranium mining had been permitted only in the Northern Territory and South Australia but in 2008, the Western

Australia government lifted an 8-year ban on uranium mining (Australian, The, 2008).

Production

Australia continued to be one of the world's leading producers of such commodities as bauxite, coal, cobalt, copper, gem and near-gem diamond, gold, iron ore, lithium, manganese ore, tantalum, and uranium. The country's refined metal production capacity was moderate compared with that of China and Japan in the Asia and the Pacific region. Because of its large mineral resources, Australia was virtually self-sufficient in most mineral commodities. Petroleum production, however, met only about 70% of the country's consumption. Australia was one of the leading exporting countries for alumina, coal, iron ore, and uranium in the world. In 2008, production of such commodities as refined copper, iron ore, lead metal, lithium and tantalum increased significantly. An increase of refined copper output was a result of the startup of the Lady Annie solvent extraction and electrowinning operation and increased output from the Townsville refinery and the Olympic Dam operation. The commissioning of the BHP Billiton Ltd., Fortescue Metals Group Ltd., and Rio Tinto Ltd.'s iron ore operations contributed to an increase in iron ore production. The increase in lead production was from the Mount Isa smelter. Production of chromate, diamond, mined gold, nickel metal, ilmenite, magnesite, and mined and refined tin decreased significantly. The rebuilding of the Kalgoorlie nickel smelter and the reduced availability of gas associated with the Varanus Island gas explosion caused the decrease of intermediate nickel output. The decrease in mined tin and tin metal production was caused by the shutdown of the Collingwood tin mine and smelter (table 1).

Structure of the Mineral Industry

The Australian mineral industry is characterized by free enterprise in which private companies are involved in exploration, mine development, mineral production, mineral processing, and marketing. A number of Australian mineral companies were affiliates or subsidiaries of European and U.S. companies, which controlled a large part of the mining, smelting, and refining sectors and a significant portion of the mineral fuels sector (table 2).

Ownership of the mineral rights in Australia generally are vested in the government of the relevant State or Territory or the Commonwealth Government for Federal lands and waters, regardless of ownership or tenure of the surface area. Mineral ownership is divided between State ownership in the State onshore areas and Commonwealth ownership in the Territories and in offshore areas beyond Australia's 4.8-kilometer (km) territorial limit. Each State and Territory government administers the mineral industries within its own borders, which includes registering land titles; issuing exploration and development permits; conducting inspections and assuring compliance with health, safety, and environmental regulations; and levying royalties and taxes. Because the Commonwealth may restrict mineral exports for the good of the country, however, it effectively has control over most mineral production.

Mineral Trade

Australia continued to rely heavily on exports of the majority of its mineral production to sustain the country's mineral industry development. In 2008, the value of Australia's total foreign trade was $408.4 billion (A$453.8 billion), of which the value of exports was $202.2 billion (A$224.7 billion) and the value of imports was $206.2 billion (A$229.1 billion). Mineral and metal exports accounted for about 60.0% of the total value of exports. Export volumes that were higher than in 2007 included alumina, thermal coal, and iron ore. The value of coal exports accounted for 31% of the total mineral and metal value followed by iron ore, 20%; gold, 10%; oil, 7%; and liquefied natural gas, 6%. Australia's mineral and metal exports went mostly to Asian countries. Australia remained the world's leading exporter of alumina, coal, diamond (gem, near-gem, and natural industrial), ilmenite, iron ore, mined lead, rutile, and zircon. Crude petroleum and its refined products remained Australia's leading imported mineral and fuel commodity, followed by gold, iron and steel, potassium fertilizer, and silver (Australian Bureau of Statistics, 2009a).

Commodity Review

Metals

Aluminum.—Australia was the leading bauxite producing country in the world. Bauxite came from the Gove Mine in the Northern Territory; the Weipa Mine in the northern part of Queensland; and the Huntly, the Willowdale, and the Worsley Mines in Western Australia. Australia was also the leading alumina producing country in the world. All Australia's alumina refineries were located in close proximity to their bauxite mines and shipping facilities. Western Australia accounted for 63% of the country's alumina output. China remained the leading destination for exported Australian alumina, which accounted for about 21% of the total exported volume followed by Bahrain, South Africa, and the United Arab Emirates, 14% each; Mozambique, 10%; and other countries, less than 10% each. Aluminum refineries in Western Australia produced about two-thirds of the country's total output. The consumption of domestic aluminum smelters was less than 20% of the country's total alumina output, and the remainder was exported. In 2008, Australia exported 1.68 million metric tons (Mt) of aluminum. Japan was the leading destination of Australian aluminum exports and accounted for 38% of the total, followed by the Republic of Korea, 14%; Thailand, 13%; Taiwan, 11%; and Malaysia, 7%; the remainder went to other countries in the world (Australian Bureau of Agricultural and Resource Economics, 2009e, p. 16).

Owing to increasing demand for alumina in recent years, Australian producers planned to expand their bauxite mines' and refineries' output capacity. Bauxite Resources Ltd. announced that the company was granted a mining license to develop the bauxite deposit at Bindoon in the

Darling Range, Western Australia. The company was waiting for approval from the Government to develop the bauxite deposit at Avon, which is located south of Bindoon. The Avon and the Bindoon deposits hosted inferred resources of 18.2 Mt of gibbsite ore at average grades of 43.1% aluminum oxide and 3.2% silicon oxide. The company planned to start open pit mine construction in mid-2009 and to complete the construction in mid-2010. The initial production rate was designed to be 1 million metric tons per year (Mt/yr), which would be increased to 3 Mt/yr in later years. The Australian Government approved China's Shandong Provincial Bureau of Geology and Resources' acquisition of a 15% share of Bauxite Resources. Most of the company's bauxite output would be destined for China, mainly Shandong Province. During the past several years, China had expanded its alumina refinery output capacity. Owing to a shortage of bauxite resources within China, the country's demand for bauxite imports increased. Chinese refineries were seeking reliable, long-term bauxite suppliers in politically secure countries. Australia is geographically close to China and is the leading destination for China's mineral investors. Bauxite Resources also signed a memorandum of understanding with China's Yankuang Group Corp. to build jointly an alumina refinery in Western Australia (Bauxite Resources Ltd., 2009, p. 9-20).

Aluminum Corp. of China Ltd. through its subsidiary CHALCO Australia planned to develop the Aurukun bauxite resource project, which is located 10 km northeast of Aurukun and 50 km south of Weipa in the Western Cape Region of Queensland. The company planned to mine 10 Mt/yr of bauxite ore and to produce 6.5 Mt/yr of beneficiated ore with an average aluminum oxide content of 65%. The project also included a plan to build a 2.1-Mt/yr-capacity alumina refinery and associated facilities at Abbot Point, which is located northwest of Bowen, Queensland. The beneficiated ore was expected to be transported by an overland conveyor to the port facility, which is located about 1.5 km south of Boyd Point. A feasibility study and an environmental impact study were underway. The decision on whether to proceed with the mine and refinery was expected to be made at the end of 2009; however, CHALCO decided to delay the decision to build the refinery at Abbot Point because of the uncertainty of the alumina market. In 2004, CHALCO was awarded a permit to mine the bauxite deposit at Aurukun on the condition that the company would also build a refinery in the area (CHALCO Australia, 2009).

Owing to the decline of external demand, Rio Tinto Alcan decided to defer some capital expenditures in 2009; however, the company continued to commit capital to certain high-priority projects. The company planned to invest $30 million in a feasibility study to develop a new bauxite operation to the south of the existing Weipa bauxite mine and port. If approved, Weipa's total bauxite production capacity would increase to 35 Mt/yr from 21 Mt/yr in 2008. The construction of the mine would take 3 years to complete. The expansion of the Yarwun alumina refinery was underway in 2008, and the cost was estimated to be about $1.8 billion. The production capacity would increase to 3.4 Mt/yr in 2011. The equipment at the new Yarwun plant was designed to reduce the refinery's greenhouse gas emissions. Flue gas desulfurization equipment would be installed at the coal-fired boiler to reduce the site's total sulfur dioxide emissions. Carbon dioxide emissions per metric ton of alumina would be reduced by 35% (Rio Tinto plc, 2009a, p. 40).

In 2008, the board of directors of BHP Billiton approved a proposal to expand the Worsley alumina refinery to 4.6 Mt/yr from 3.5 Mt/yr. The expansion project would include the expansion of the bauxite mining operation at Boddington and the upgrade of the port facility. The project was budgeted at $1.9 billion and was scheduled to be completed in the first half of 2011 (BHP Billiton Ltd., 2009a, p. 27).

Cape Alumina Ltd. held 100% interest in 2,400 square kilometers (km^2) of leased land outside of Rio Tinto Alcan's Weipa deposit. The company had invested more than $8 million to explore the leased area and discovered 130 Mt of bauxite resources at an average washed grade of 53.1% Al_2O_3 and 12.4% SiO_2 at Pisolite Hills, which is located 50 km northeast of Weipa on the western part of Cape York Peninsula. The company completed a feasibility study and prepared a bankable feasibility study and an environmental impact statement for the Pisolite Hills project. The project would involve the development of a greenfield bauxite mine that would produce between 8 and 12 Mt/yr of run-of-mine bauxite ore. The mined ore would be crushed and washed. As a result of beneficiation, about 7 Mt/yr of washed bauxite would be exported. The bankable feasibility study was planned to be completed in 2010, and production was expected to begin in 2013. Major shareholders of the company included Bondline Ltd. of Cyprus, Chiping Xinfa Huayu Alumina Co. Ltd. of China, Metallica Minerals Ltd. of Australia, and Resource Capital Funds of the United States. Xinfa had signed a 5-year, 1-Mt/yr bauxite offtake agreement with Cape Alumina (Cape Alumina Ltd., 2009, p. 10).

Antimony.—In 2007, Straits Resources Ltd. decided to redevelop the historic Hillgrove antimony and gold mine near Armidale in New South Wales. The construction of a demonstration processing plant started in 2007 and was completed in the first half of 2008. The designed output capacity was for 10,000 metric tons per year (t/yr) of antimony, 30 metric tons (t) of tungsten, and 622 kilograms (20,000 troy ounces) of gold. The mine contained recoverable resources of 40,000 t of antimony, 100 t of tungsten, and 6.9 t (222,000 troy ounces) of gold. In 2008, the company produced 222 t of antimony. Production, however, was hampered by a number of technical problems, including process water treatment management and the interface between the leaching and electrowinning sections of the plant. The operation was unable to meet its production target. The company planned to suspend plant operations temporarily to resolve technical issues at the plant. The development of an underground mine and exploration at the mine site area continued during the suspension period (Straits Resources Ltd., 2009, p. 33).

Cobalt and Nickel.—Australia's main nickel ores were primary sulfides of nickel, which occur as lodes within mafic and ultramafic (iron- and magnesium-rich) igneous rocks that have a volcanic and subvolcanic origin. Western Australia's mined nickel output accounted for more than 90% of the country's total output. The top five nickel producers accounted for 80% of the total sales. BHP Billiton's Nickel West was Australia's leading nickel operation. Nickel West included

the Leinster and the Mount Keith mines. A number of smaller sulfide nickel operations were operated by Mincor Resources NL and Xstrata Nickel Australia Pty Ltd. (a subsidiary of Xstrata plc). As a result of a rapid decline in world nickel prices during the second half of 2008, a number of Australian nickel producers reduced output or placed their mines on care-and-maintenance status during the fourth quarter. Most cuts in production took place at smaller operations that produced less than 6,000 t/yr of nickel in ore and concentrates. These mines included Fox Resources Ltd.'s Radio Hill Mine; OZ Minerals Ltd.'s Avebury Mine; Palmary Enterprises Ltd.'s Kambalda Mine; and Norilsk Nickel Mining and Metallurgical Co.'s Cawse, Silver Swan, and Waterloo Mines. Australia's mined nickel output was expected to decrease during the next 2 years but to begin to recover slowly starting in 2011. In 2008, Australia exported 209,000 t of nickel in concentrates, intermediate products, or metal (Australian Bureau of Agricultural and Resource Economics, 2009b, p. 193).

Barra Resources Ltd. announced that its joint venture project with Fission Energy Ltd.—the Mount Thirsty cobalt-nickel-manganese deposit—could have the potential to make the company one of the leading cobalt producers in the region. The deposit is located 20 km north-northwest of Norseman in Western Australia. The deposit contains resources of 29 Mt at grades of 0.88% manganese, 0.56% nickel, and 0.14% cobalt in an area 1.3-km long and 800-meters (m) wide. A majority of high-grade oxide ore was located close to the surface within 8 to 19 m. An engineering and metallurgical study found that the acid-leaching recovery rate was 99% cobalt, 98% manganese, and 78% nickel, and the operating cost was about A$100 per metric ton of ore. The Mount Thirsty deposit had the potential to support a throughput of 2 Mt/yr of ore to produce 27,000 t of manganese, 10,300 t of nickel, and 3,700 t of cobalt. The company used electromagnetic survey technology to detect any potential nickel sulfide at depth. The feasibility study would be carried out in 2009 (Barra Resources Ltd., 2009).

Western Areas NL's Forrestania nickel project is located 400 km east of Perth, Western Australia. More than 25 nickel occurrences had been identified. The first developed mine of the project was the Flying Fox underground nickel mine, which is located about 108 km south of Marvel Loch. The Flying Fox consisted of a number of zones of mineralization, labeled from T zero extending vertically down to the T7 zone to a depth of 820 m below the surface. The operation activity was concentrated at the T1 and T2 ore bodies during the first year of operation. The mine was estimated to have probable ore reserves of 3.6 Mt at a grade of 3.0% nickel and an inferred resource of 1.9 Mt at a grade of 4.7% nickel. The ore was carted to and processed at the Lake Johnson concentrator, which was operated by Norilsk Nickel. Western Areas' Cosmic Boy concentrator was scheduled to begin operating in 2009, and all ore from the Flying Fox Mine would be carted to the Cosmic Boy mill. Western Areas signed a contract with BHP Billiton to sell up to 10,000 t/yr of nickel in concentrates to a total of 75,000 t nickel from the Forrestania nickel project. As a part of the offtake agreement, BHP Billiton would provide A$45 million in financing to Western Areas, which would be used for the development of the Spotted Quoll deposit and a plant expansion. The Spotted Quoll deposit is located 114 km south of Marvel Loch and is part of the Forrestania nickel project. Spotted Quoll had mineral resources of about 2 Mt at an average grade of 6.2% nickel. Western Areas was targeting to produce between 20,000 and 25,000 t of nickel from the Flying Fox and the Spotted Quoll Mines beginning in 2010. Western Areas planned to upgrade the Cosmic Boy concentrator to 550,000 t in 2010 from 300,000 t. Western Areas also signed an offtake contract with China's Jinchuan Group Ltd. to supply up to 25,000 t of nickel in concentrates in 2010 and 2011. The balance of the company's nickel output that was not sold to BHP Billiton during 2010 and 2011 would be sold to Jinchuan (Western Areas NL, 2009, p. 8-24).

BHP Billiton was an integrated Australian nickel company that operated mines, concentrators, a smelter, and a refinery. The company's Kambalda nickel concentrator is located 60 km south of Kalgoorlie and produced between 35,000 t and 40,000 t of nickel in concentrates from raw materials supplied by third-parties. Concentrates from the Kambalda concentrator contained about 13% nickel. Concentrates from BHP Billiton's Nickel West operations and Kambalda operation were shipped to the Kalgoorlie smelter in Kalgoorlie to produce nickel matte, which contained about 68% nickel, 2% to 3% copper, and 1% cobalt; the smelter had an output capacity of 110,000 t/yr of nickel matte. In 2008, BHP Billiton exported about 31% of its nickel matte output. The remaining nickel matte was railed to the Kwinana refinery. The refinery had an output capacity of about 67,000 t/yr of nickel metal, which contained 99.8% nickel. In June, the company shut down its smelter and refinery for 3 months to rebuild it furnaces. As a result, the outputs of nickel from the Nickel West operation and the Yabulu refinery were lower in 2008 than in 2007. Owing to the decrease of nickel demand in the world market, BHP Billition decided to shut down its newly commenced Ravensthorpe operation. The Yabulu refinery would cease processing mixed nickel cobalt hydroxide product from Ravensthorpe (BHP Billiton Ltd., 2009c).

Copper.—Australia's copper resources occur largely at Olympic Dam in South Australia and at Mount Isa in Queensland. Other important copper resources are located at the CSA and the Northparkes deposits in New South Wales; the Ernest Henry, the Mammoth, and the Osborne deposits in Queensland; and the Golden Grove and the Nifty deposits in Western Australia. Australia's mined copper output ranked it among the top five producers in the world, which also included China, Chile, Peru, and the United States. In 2008, Australia's copper mine production remained relatively unchanged. Queensland continued to be the leading State for mined copper production, largely from the Mount Isa region, which accounted for 44% of the country's output. South Australia's output accounted for 22% of the total (all produced from the Olympic Dam Mine) and New South Wales's output accounted for 16% (largely from the Cadia-Ridgeway, the Northparkes, and the Tritton Mines). Western Australia's mined copper increased by 7% compared with that of 2007 and accounted for 14% of the country's total output, mainly from the Golden Grove and the Nifty Mines. Tasmania's mined copper output was mainly from Mount Lyell. In 2008, Australia exported a total of 1.8 Mt of

copper concentrates, which was an increase of 20% from that of 2007, to such countries as China, India, Japan, and the Republic of Korea (Australian Bureau of Agricultural and Resource Economics, 2009e, p. 19).

Owing to lower copper prices and to difficulties in securing financing, especially during the second-half of 2008, a number of copper mines were placed on care-and-maintenance status in late 2008, including the Browns Oxide, the Eloise, the Lady Annie, the Leichardt, and the Mount Gorden Mines. Australia's mined copper production was expected to increase during the next 2 years because a number of new projects—the Boddington, the Cloncurry, the Copper Hill, the Einasleigh, the Kanmantoo, the Mutooroo, the Prominent Hill, the Ridgeway Deeps, and the Rosebery—would be commissioned, and recently commenced projects would approach full capacity. With additional new capacity and the reopening of some mines closed in 2008, Australia's mined copper output was expected to grow at an annual rate of 5% to 1.2 Mt in 2014 (Australian Bureau of Agricultural and Resource Economics, 2009f).

CopperCo Ltd.'s Lady Annie copper deposit is located 100 km north-northwest of Mount Isa, Queensland. The company completed construction of the mine and started production in 2007. The copper oxide ore was located near the surface and has copper resources of about 11.3 Mt at an average grade of 1.0% copper. The ore was processed through a solvent extraction and electrowinning process on site. Full copper production of 19,000 t/yr of copper cathode was expected to be achieved in early 2008. A project to expand the output capacity to 30,000 t/yr was scheduled to begin in 2008 and to be completed in 2009. Owing to lower prices of copper, financial difficulties, and heavy rainfall in December 2008 that had a significant effect on production, the company decided to suspend the mine's operations. CopperCo decided to sell the Lady Annie operation and other assets to other investors. Cape Lambert Iron Ore Ltd. and Xstrata plc were potential buyers (Delotte Touche Tohmatsu, 2009).

The Northparkes Mine, which was a joint venture between Rio Tinto Ltd. and Sumitomo Group, is located in Central West, New South Wales. In 2006, the joint-venture partners approved the development of the E48 Block project to extend the mine's life to 2024. In 2008, copper production was about 18,000 t less than in 2007 because of the shutdown of the E26 Lift 2 Block for extension construction. The construction was completed in mid-2008. The company completed 75% of the E48 project at the end of 2008. Owing to the global financial crisis, Rio Tinto suspended the construction the E48 project in January 2009 (Rio Tinto Ltd., 2009).

OZ Minerals completed the construction of its Prominent Hill copper-gold mine in 2008 and was scheduled to put it into operation in February 2009. The open pit mine was designed to produce between 85,000 and 100,000 t/yr of contained copper and between 1.87 t (60,000 troy ounces) and 2.18 t (70,000 troy ounces) per year of gold in concentrates. The mine contained total (proven and probable) resources of 75.7 Mt of ore at an average grade of 1.19% copper, 3.01 grams per metric ton (g/t) silver, and 0.59 g/t gold. Concentrates would be transported by the Adelaide-Darwin railway to the Port of Darwin and exported to customers in China and India. Owing to lower metal prices in the world and the global financial crisis, OZ Minerals decided to refinance or sell off part of its facilities in mid-2008. OZ Minerals entered an agreement with China Minmetals Nonferrous Metals Co. to acquire all outstanding shares in OZ Minerals, including Prominent Hill. Owing to concerns about Australia's national security interests, the Australia Government did not approve the transaction because Prominent Hill is located in the Woomera prohibited weapons testing area. OZ Minerals and Minmetals agreed to exclude Prominent Hill in their agreement. OZ Minerals would sell all its assets other than the Prominent Hill to Minmetals for $1.2 billion (OZ Minerals Ltd., 2009, p. 11).

The bankable feasibility study of the Copper Strike Ltd.'s Einasleigh project, which is located about 70 km southeast of Georgetown, Queensland, was completed. The company's plan for the development of this project was based on the Einasleigh underground copper deposit and the Kaiser Bill open-cut copper deposit followed by open cuts from the lead, silver, and zinc deposits at Chloe and Jackson, which are located to the south of the Einasleigh and the Kaiser Bill copper deposits. The company planned to have open-cut production from Kaiser Bill at a rate of between 0.8 and 1.6 Mt/yr of copper ore in 2010 and to mine about 80,000 t/yr of copper ore from the high-grade Einasleigh deposit in 2011. Indicated and inferred resources at Einasleigh were 825,000 t at grades of 3% copper, 0.17 g/t gold, and 14 g/t silver; those for Kaiser Bill were 13.4 Mt at grades of 0.83% copper, 0.13 g/t gold, and 7 g/t silver. The design capacity of the processing plant at Kaiser Bill was 15,000 t/yr of copper concentrates. The concentrates would be shipped to Townsville, which was located about 300 km from the plant, for export. A full environmental management plan for the Kaiser Bill mining lease application was submitted to the Department of Environment and Resource Management and was awaiting Government approval. This was a major step in the granting process of the Kaiser Bill mining lease (Copper Strike Ltd., 2009, p. 5).

Havilah Resources NL completed the drilling feasibility study of its Kalkaroo copper and gold deposit, which is located about 91 km northwest of Broken Hill, South Australia. In 2007, Glencore International AG of Switzerland funded a $14 million feasibility study of the Kalkaroo project. Upon completion of the feasibility study, Glencore could elect to arrange project financing for the subsequent mining joint venture in exchange for a 14% participating interest and metal offtake. The feasibility study indicated that the Kalkaroo deposit had measured resources of 62 Mt at grades of 0.55% copper, 0.44 g/t gold, and 615 parts per million molybdenum. The feasibility study would incorporate with an economic model based on the optimum open pit mine design to produce 30,000 t of contained copper concentrates using current estimates of capital and operating costs in 2009 (Havilah Resources NL, 2009).

Gold.—Australia's gold mine output ranked fourth in the world after China, the United States, and South Africa. In 2008, Australia's mined gold output decreased by more than 10% from that of 2007. Western Australia remained the leading gold-producing State with a 62.3% share, followed by New South Wales, 14.4%; Queensland, 8.4%; Northern Territory, 7.0%; South Australia, 3.3%; and Tasmania and Victoria, 2.3%

each. The country's gold resources occur and are mined in all States, as well as in the Northern Territory, and much of the gold was produced from large open pit mines. Owing to higher prices of gold in the world markets, gold operators could afford to reduce the grade of ore fed into their processing plants in order to extend the mine life. Australia's gold production was expected to be higher during the next several years because a number of new projects were expected to increase production as they approached their full production potential, which was expected to offset the projected production declines at numerous mines that were nearing the end of their estimated mine life. In 2008, Australia exported 415 t of refined gold produced from imports of gold doré and scrap that were shipped from overseas, refined into gold bullion, and then reexported. India remained Australia's top gold export destination, accounting for 38% of total exports, followed by the United Kingdom, 35%; the United Arab Emirates, 11%; Thailand, 9%; and others, 7%. India was the leading gold consuming country in the world. London was a gold market trading center and many of Australia's gold transactions were being conducted in London (Australian Bureau of Agricultural and Resources Economics, 2009e, p. 21).

In 2004, Avoca Resources Ltd. acquired the Higginsville project from Gold Fields Ltd. and discovered the Trident deposit. The Higginsville Mine was in operation in the 1990s. The Higginsville Mine is located near Higginsville, which is 45 km north of Norseman, Western Australia. In 2007, Avoca Resources decided to build a new underground mine at Higginsville and purchased the neighboring Chalice deposit from Chalice Gold Mines Ltd. In 2008, the Higginsville project had a resource of 12.25 Mt at a grade of 3.7 g/t gold at the Trident deposit. In 2008, the company completed the construction of a 1-Mt/yr treatment plant and a 100-megawatt powerplant. Gold production at the mine began in 2008. Avoca Resources also acquired Two Boys Mine, which is located 1.5 km south of the Poseidon South pit, which was mined out (Avoca Resources Ltd., 2009, p. 6).

After 3 years in development, St. Barbara Ltd. commissioned its Gwalia underground mine, which is located 3 km south of Leonora, Western Australia, in 2008. The refurbished processing plant had a nominal capacity of 1.2 Mt/yr, which could be expanded to 1.8 Mt/yr. Initial production was about 2.6 t (83,000 troy ounces) in 2009 and would be increased to about 6.5 t (210,000 troy ounces) in 2012. The mine had resources of more than 7 Mt of ore grading 9 g/t gold. The company planned to develop the Tower Hill deposit, which is located 2 km from the Gwalia plant, in 2010. The Tower Hill deposit had reserves of 2.5 Mt at a grade of 4.6 g/t gold. The company continued exploring the Gwalia area and expected to discover more resources to extend the Leonora operation. St. Barbara's Southern Cross operation is located 30 km south of Southern Cross, Western Australia. The Marvel Loch processing plant had the capacity to process 2.4 Mt/yr of ore. Owing to low ore grades and a decrease in the demand for gold, the company decided to shut down all open pit operations at South Cross. The Marvel Loch underground mine was the only source of ore for the processing plant. As a result, the processing plant was operating on a biweekly basis (St. Barbara Ltd., 2009, p. 6-10).

In 2002, Newcrest Mining Ltd. commenced the Ridgeway gold-copper underground mining operation. The mine had resources of 152 Mt at grades of 0.77 g/t gold and 0.39% copper. The processing plant had a throughput capacity of 5.6 Mt/yr of ore. After 2 years of study, the company had decided to expand the development of the resource below the current Ridgeway Mine of approximately 300 m to about 1,100 m below the surface in 2007. The Ridgeway Deeps project was based on the construction of a block cave underneath the existing Ridgeway sublevel cave. After completion, it would be the deepest block cave in Australia, and the process of constructing it would provide valuable experience for the Australian mining industry as it explores and develops deeper mineral resources in the country. The operation was expected to produce 50 t/yr (1.6 million troy ounces per year) of gold and 210,000 t/yr of copper for 8 years. The commencement of Ridgeway Deeps was scheduled for 2010. The total capital cost for the construction of the mine was A$545 million (US$490 million). Continued exploration drilling indicated that a continuation of the ore body was present below the area designated for the Ridgeway Deeps block cave. The company was exploring development of a second block cave that could further extend the mine life of the Ridgeway Deeps (Newcrest Mining Ltd., 2009, p. 14-15).

Iron and Steel.—Australia was among the top three iron ore producers (in terms of iron content) in the world, along with Brazil and China. Australia's most significant iron ore mines are located in the Pilbara region of Western Australia, which accounts for 96.7% of the country's total iron ore production followed by South Australia, 2.3%; Tasmania, 0.7%; and Northern Territory, 0.3%. Owing to its limited iron and steel output capacity, Australia exported about 90% of its iron ore output to such Asian countries as China, Japan, the Republic of Korea, and Taiwan. China received 59.2% of Australia's iron ore exports followed by Japan, 24.8%; the Republic of Korea, 10.8%; Taiwan, 3.2%; European Union countries, 1.9%; and others, 0.1%. Increased demand for iron ore in Asian countries, especially China, stimulated substantial investment in new iron ore projects in Australia and other iron-ore-rich countries. Mines operated by BHP Billiton and Rio Tinto dominated the Pilbara area's output. In 2008, Australia's iron ore and pellet exports increased to 309 Mt from 267 Mt in 2007. China was the world's leading iron ore importing country and accounted for about 50% of the world iron ore trade. China's iron and steel industry was expected to continue to grow during the next several years. Because China had only a limited domestic supply of high-grade iron ore, China's iron and steel producers increasingly relied on imported iron ore to meet their demand. Australia's iron ore and pellet exports were expected to continue to increase to 349 Mt in 2010 and 395 Mt in 2011 (Australian Bureau of Agricultural and Resource Economics, 2009b, p. 173; 2009e, p. 22).

China was the leading iron ore consumer in the world. To sustain the development of its iron and steel industry, China's iron and steel producers looked for investment in countries that had rich iron ore resources. Australia had significant iron ore resources and accounted for $4.7 billion in mineral and exploration and development, or more than 50% of China's total investment in the Asia and the Pacific region during fiscal

year 2007-08. In 2008, the Australian Government approved Sinosteel Corp.'s acquisition of up to 49.9% of Murchison Metals, Aluminum Corp. of China Ltd.'s acquisition of up to a 14.99% share in Rio Tinto plc, and West Mining Co. Ltd.'s acquisition of a 10% share of FerrAus Resources Ltd. Other iron ore producer acquisitions by Chinese companies that were expected to be approved by the Australian Government included Anshan Iron and Steel Corp.'s investment in Gindalbie Metals Ltd.; Baotou Iron and Steel Group and Wuhan Iron and Steel (Group) Corp.'s investment in Centrex Metals Ltd.; Baosteel Group's investment in Auilia Resources Ltd.; China Railway Materials Corp.'s investment in FerrAus Resources; and Hunan Valin Iron and Steel Group's investment in Fortescue Metals Group and Golden West Resources Ltd. (Ministry of Treasury, 2008a, b; 2009).

The Pilbara region was the leading iron-ore-producing center in Australia. Besides BHP Billiton and Rio Tinto, many junior companies began iron ore operations in the region during the past 2 years. They had been hampered by uncertainty on how they would transport ore to export terminals because of the lack of rail service to Port Hedland. The Pilbara region's railways were operated mainly by BHP Billiton and Rio Tinto. Australian courts ruled that BHP Billiton and Rio Tinto must haul ore mined by other companies in the Pilbara region if and when they had spare rail capacity. BHP Billiton and Rio Tinto planned to expand their iron ore output capacity in the region and both companies fought against the idea of transporting other companies' iron ore through their railway system. Domestic analysts projected that the volume of exports from the Pilbara iron ore ports in northwestern Australia would reach 890 Mt by 2025 and could exceed the capacities of existing ports at Cape Lambert, Dampier, and Port Hedland. Iron ore producers urged the government of Western Australia to develop a plan to solve the congestion problems, such as a new railway system and a new port in northwestern Australia (Creamer Media (Pty) Ltd., 2009a).

BHP Billiton had seven iron ore mining operations and port facilities in the Pilbara region of Western Australia. Iron ore production in the Mount Newman area was mainly from the Mount Whaleback ore body, which was equipped with primary crushing plants and an 8-Mt/yr beneficiation plant. The Yandi area had two processing plants and a primary crusher and overload conveyor to crush and screen ore. The facility had the capacity to handle more than 42 Mt/yr of ore. The Jimblebar area had primary and secondary plants, and crushed ore was blended with ore produced from Mount Whaleback to create the Mount Newman blend. The Mount Goldsworthy open cut mine included the Area C, the Nimingarra, and the Yarrie deposits. The Nimingara and the Yarrie were equipped with primary crushers and Area C had an ore processing plant, a primary crusher, and a conveyor to handle more than 42 Mt/yr of ore. BHP Billiton's Rapid Growth project (RGP), which was set up in 2003, was a multiphase expansion project designed to help handle the increased demand for iron ore in the world. The RGP was expected to increase the company's iron ore handing capacity to 165 Mt/yr through the development of four new port berths. RGP 1 was completed in 2004 and RGP 2 was completed in 2006; as a result, the port's handling capacity was increased to 118 Mt/yr. The RGP 3's mine rail and port expansion, which was projected to cost $1.3 billion, was completed in 2008; the expansion was expected to increase the port's handling capacity to 129 Mt/yr. The Area C iron ore mine output capacity would be increased by 20 Mt/yr to 42 Mt/yr. In March 2007, BHP Billiton approved $1.85 billion in funding for RGP 4, which would be focused on expanding the Newman iron ore operation. The expansion was expected to increase capacity to 155 Mt/yr by early 2010. The company also approved $4.8 billion for the final stage RGP 5, including the construction of new lump rescreening plants at Nelson Port and Finucane Island, which would increase the port's total handling capacity to 165 Mt/yr in 2008. The expansion work would include the addition of two new berths and shiploading facilities at Harriet Point. It would also increase the rail capacity to 300 Mt/yr between the Yandi Mine and Port Hedland (BHP Billiton Ltd., 2009a, p. 39; 2009b).

The third ranked iron ore producer, Fortescue Metals Group Ltd., completed the construction of the Cloudbreak open pit iron ore mine, and the first shipment of ore was delivered to China in May 2008. The construction of the company's Anderson Point shiploading facilities and 256-km of rail infrastructure was in progress and was scheduled to be completed in 2009. The port and railway system was designed to handle 55 Mt/yr of ore. The Christmas Creek open pit iron ore mine was under construction and was expected to be completed in early 2009. The Christmas Creek and the Cloudbreak Mines are located 50 km apart in the Chichester Ranges in the Pilbara region. The two mines had a total ore reserve of 1.5 billion metric tons (Gt) at average grades of 58.8% iron, 4.18% silica, 2.36% alumina, and 0.056% phosphorus. The total iron ore resources under the Fortescue's tenement holdings could reach 4.1 Gt. Baosteel and Fortescue signed an exploration agreement on the prospective magnetite deposits in Glacier Valley. Baosteel agreed to pay for all exploration expenses and could earn up to 50% interest if the identified iron ore resources were more than 1 Gt. Fortsecue was seeking investors from a company in China and other international companies to provide funding for its $3 billion expansion plan to increase iron ore production capacity to 120 Mt/yr (Fortescue Metals Group Ltd., 2008, p. 12; 2009, p. 10).

Atlas Iron Ltd. had property that covered an area of more than 15,000 km^2 in the northeast Pilbara region. In 2007, the company completed a feasibility study of the Pardoo direct-shipping ore body, which is located 75 km from Port Hedland. Construction at the Pardoo Mine began in October 2008, and ore was transported to Port Hedland within 4 weeks. Atlas and Fortescue signed an infrastructure agreement to use Fortescue's shiploading facilities on a fee-for-service basis. The Pardoo deposit had ore resources of 28.1 Mt at a grade of 56.1% iron. The mine was designed to produce 1 Mt/yr during its first 12 months of operation, and the company planned to expand the output capacity to 3 Mt/yr by 2010. Atlas also planned to develop the Abydos, the Mount Webber, and the Wodgina deposits in the tenement holding area. The company planned to commence the construction of the Wodgina Mine in early 2010 to increase the company's iron ore production capacity to 6 Mt/yr. The Wodgina deposit, which is located 100 km south of Port Hedland immediately adjacent to the existing Wodgina tantalum mine, had resources of 42.1 Mt at a grade of 56.3%

iron. The Abydos deposit is located 100 km south-southeast of Port Hedland and had identified iron ore resources of 22.3 Mt at a grade of 57.1% iron. Atlas planned to construct a mine on the Abydos deposit to produce 3 Mt/yr of direct-shipping ore in 2011. The Mount Webber deposit is located 75 km southeast of the Wodgina deposit, which had identified iron ore resources of 32.6 Mt at a grade of 57.3% iron. A prefeasibility study of the Mount Webber development was underway. Atlas foresaw that development of the Mount Webber deposit would achieve the company's target to produce 12 Mt/yr of iron ore by 2012 (Atlas Iron Ltd., 2009, p. 6-17).

Australia's pig iron was produced from the Hismelt pig iron plant and two integrated plants—Blue Scope Steel Ltd.'s Port Kembla plant and OneSteel Ltd.'s Whyalla plant. Owing to weak demand for iron and steel products, Rio Tinto decided to shut down its Hismelt plant operation in December 2008 and planned to restart the plant in April 2010. Ferrowest Ltd.'s Yalgoo iron project had a 500,000-t/yr ironmaking plant that could produce 96% direct-reduced iron. The plant would be equipped with Midrex's ITmk3® technology, and iron ore would be supplied from Ferrowest's Yogi magnetite deposit near Yalgoo, Western Australia. An engineering study was completed in 2008 and the plant was expected to be operating at full capacity in 2011 (Ferrowest Ltd., 2009; Rio Tinto plc, 2009b, p. 2).

Lead, Silver, and Zinc.—Australia's lead, silver, and zinc mines were predominantly based on ore bodies with zinc as the major component and lead and silver as byproducts. An exception was BHP Billiton's Cannington underground mine in the State of Queensland where lead and silver were major components and zinc was a minor component. In 2008, Australian zinc mine production was higher than in 2007. The increased zinc production came from such existing mines as Cannington and Century in Queensland, the reopened Hellyer Mine in the State of Tasmania, and the Jaguar Mine in the State of Western Australia. In 2008, Australia exported 222,000 t of lead concentrates. The Republic of Korea was the leading destination for Australian lead concentrate exports and accounted for 28% of the total followed by China, 27%; Japan, 20%; and Belgium, 10%; the remaining went to other countries in the world. Australia also exported 218,000 t of refined lead, for which the Republic of Korea was also the leading destination followed by Hong Kong, Malaysia, Thailand, and India. In 2008, Australia exported 996,000 t of zinc concentrates mainly to such East Asian countries as China, Japan, and the Republic of Korea. Zinc metal exports increased by about 3% to 415,000 t and went to such destinations as, in descending order of volume exported, Taiwan, Hong Kong, Malaysia, Saudi Arabia, and Indonesia (Australian Bureau of Agricultural and Resource Economics, 2009d, p. 290, 342).

The discussion between CBH Resources Ltd. and Perilya Ltd. on merging their Broken Hill operations failed to proceed despite projected cost savings estimated to be up to $200 million. CBH Resources placed its Endeavor operation on care-and-maintenance status in the second half of 2008. In response to the collapse in metal prices and the global financial crisis, Perilya turned to China's Shenzhen Zhongjin Lingnan Nonfemet Co. Ltd. for financial support in 2008. Zhongjin Lingnan agreed to inject A$45,464,560 in cash to secure a 50.1% interest in Perilya, and shareholders were expected to approve the transaction in early 2009. Zhongjin Lingnan's interest in Perilya was expected to increase to 52% at yearend 2009. In 2008, Perilya decided to resize the Broken Hill operation to focus on sustaining long-term production. Ore production at the Broken Hill Southern operation decreased to about 0.95 Mt from about 1.6 Mt and production at other mining locations was halted. The new operation plan was based on the resequencing of mining areas and focused on production cost control rather than on a short-term high-grade approach. As a result, the production cost was reduced to $0.59 per pound of payable zinc from $1.01 per pound before the resize. The Southern operation had ore resources of 10.0 Mt at average grades of 6.1% zinc, 4.5% lead, and 46.7 g/t silver. The Broken Hill operation had ore resources of 19.3 Mt at average grades of 9.4% zinc, 7.3% lead, and 90.8 g/t silver (Perilya Ltd., 2009, p. 18).

Oxiana Ltd., which operated the Golden Grove and the Prominent Hill Mines, and Zinifex Ltd., which operated the Century, the Dugald River, and the Rosebery mines, merged to form OZ Minerals Ltd. in 2008. As a result of decreasing metal prices and high operation costs, OZ Minerals faced financial issues soon after it was formed mainly because of the construction of the Prominent Hill operation. OZ Minerals discussed investment issues with Minmetals (Creamer Media (Pty) Ltd., 2009b).

Xstrata completed the construction of its McArthur River open pit mine, which is located 60 km southwest of the township of Borroloola, Northern Territory, in 2008. The underground operation, which had commenced in 1995, was being converted to an open pit operation. The government of the Northern Territory had approved the development of the open pit operation in 2006. In 2007, Xstrata decided to increase the McArthur River concentrator throughput capacity to 2.5 Mt/yr from 1.8 Mt/yr. The mine had an ore resource of 43 Mt at grades of 10.2% zinc, 4.4% lead, and 45 g/t silver (McArthur River Mining Pty Ltd., 2009).

Molybdenum and Tungsten.—No molybdenum production was recorded in Australia in 2008. Queensland Ores Ltd. reported that the company was processing the first ton of molybdenum concentrates at its Wolfram Camp molybdenum-tungsten project, which is located 90 km west of Cairns in Queensland, in June 2008. The Wolfram Camp, which was discovered in 1894, has been previously mined for bismuth, molybdenite, wolframite, and mixed concentrates. Since 2004, Queensland Ores has explored the central portion of the prospective near-surface mineralization. The mine contained 598,200 t of measured resources at average grades of 0.42% tungsten trioxide, 0.17% molybdenum sulfide, and 0.03% bismuth. The processing plant was designed to process 150,000 t/yr of ore and to produce tungsten concentrates containing 65% tungsten oxide, molybdenum concentrates containing 50% molybdenum, and bismuthinite concentrate assaying 40.4% bismuth. The company, however, suspended the operation in November 2008 because of mining and metallurgical issues involving the performance of the processing plant and the production of the concentrates. The company had difficulties delivering the targeted grade material to the processing plant, and the treatment plant had technical problems

recovering an acceptable quality of concentrates from the ore feed. Queensland Ores had difficulties securing appropriate funding to continue operations at the Wolfram Camp project and the falling price of molybdenum in late 2008 compounded these issues. The company looked for investors to take over the project (Geoscience Australia, 2009, p. 51).

Moly Mines Ltd.'s subsidiary Moly Metals Australia Pty Ltd. contracted SRK Consulting (Australasia) Pty Ltd. to perform a technical study on the Spinifex Ridge molybdenum mine, which is located 50 km northeast of Marble Bar in the Pilbara region of the State of Western Australia, in 2008. The Spinifex Ridge had measured and indicated mineral reserves of 652 Mt at average grades of 0.05% molybdenum, 0.08% copper, and 1.3 g/t silver. Initially, in 2007, Moly Metals planned to develop and operate a 20-Mt/yr open pit mining operation and processing plant. Owing to a decline in molybdenum prices in late 2008, the company decided to change the ore throughput rate to 10 Mt/yr and to increase it to 20 Mt/yr in the seventh year, if warranted. The mineral resource at the Spinifex Ridge deposit was expected to support a mining operation for a period of 20 years. The company obtained approval by way of a Land Access Deed with representatives of the Njamal People of the east Pilbara; it obtained the environmental impact assessment and other pursuant permits to Mining Act WA 1978 and other statutes from Western Australia. The construction of the mine would begin in 2010 and the production of copper and molybdenum concentrates was scheduled to begin during the second half 2011 (Moly Mines Ltd., 2009, p. 6).

Australia also produced tungsten ore from the Kara Mine in Tasmania and the Wolfram Camp project. The scheelite concentrates from Kara contained an average of 55.7% tungsten trioxide. A trial shipment of 5.5 t of wolframite concentrate from the Wolfram Camp was exported.

Tantalum and Lithium.—Western Australia had two tantalum producers: Haddington Resources Ltd. and Talison Minerals Pty Ltd. Haddington reassessed the feasibility of the Bald Hill Mine and the Bald Hill extended area and decided that the mineralization would be uneconomical given the current market for tantalum. The Bald Hill Mine had remained on care-and-maintenance status since 2005 and Haddington sold the Bald Hill tenements, equipment, and plant in 2008 (Haddington Resources Ltd., 2009, p. 11).

In August 2007, Talison Minerals Pty Ltd. acquired the Greenbushes and the Wodgina Mines in Western Australia from Sons of Gwalia Ltd. The Wodgina's processing plant had a design capacity of 3.2 Mt/yr and produced tantalum concentrates at a grade of between 8% and 10% tantalum oxide. The concentrates were shipped to the Greenbushes operation for secondary processing, and about 550 t/yr of tantalum oxide was produced. The output of the Wodgina Mine accounted for about 30% of the world's tantalum. Tantalum was used primarily in the aerospace, electronics, medical, and nuclear power industries. Owing to a collapse in global demand and falling metal prices, Talison suspended its Wodgina tantalum operation in December 2008. Lower priced tantalum from central Africa, particularly from the Democratic Republic of the Congo [Congo (Kinshasa)], supplied a significant amount of tantalum to the world market. Reopening of the Wodgina tantalum mine would depend on market conditions. The Greenbushes tantalum underground operation remained on care-and-maintenance status in 2008. The company continued producing spodumene concentrate at Greenbushes, which contained a 35.5-Mt resource at an average grade of 3.31% lithium oxide. Talison planned to increase the ore throughput capacity to 600,000 metric tons per day to produce about 260,000 t/yr of lithium concentrates in 2009 (Talison Minerals Pty Ltd., 2008).

Industrial Minerals

Cement.—Australia has three major integrated cement companies (Adelaide Brighton Cement Pty Ltd., Blue Circle Southern Cement Ltd., and Cement Australia Pty Ltd.) and a number of small independent companies. The three major cement companies accounted for all integrated production of clinker and cement in Australia. Domestic clinker capacity was about 8 Mt/yr and cement capacity was about 9 Mt/yr. During the past several years, the three integrated cement producers produced about 8.5 Mt/yr for the domestic market. Small independent producers used imported clinker from Asian countries to produce cement and accounted for about 15% of the domestic supply of cement. Owing to environmental concerns and price competition from Asian cement producers, Australian cement producers were reluctant to expand their output capacity. Domestic analysts estimated that cement demand in Australia was expected to increase by 1.25% per year. The cement industry aimed to enhance the long-term sustainability of the industry and was focusing on such issues as energy efficiency, greenhouse emissions, regulatory reform, and transportation costs (Department of Resources, Energy, and Tourism, 2009, p. 21-26).

Diamond.—Australia was one of the leading diamond producing countries in the world. Diamond production was mainly from the Argyle and the Ellendale Mines in Western Australia. Argyle production was mostly industrial and lower quality gem diamond with an average price of less than $20 per carat. Rio Tinto and Wal-Mart Store Inc. jointly produced jewelry using diamond, gold, and silver from Rio Tinto mines. In 2005, Rio Tinto had invested $760 million to develop an underground block-caving operation; bringing the underground mine into full operation was expected to take 3 years. The capital cost was revised to $1.5 billion. The construction of major underground infrastructure was scheduled to begin in 2008, and full operation was expected to begin in 2010. In response to weak demand and prices, Rio Tinto decided to delay some critical development activities by reducing the workforce at the project. Full operation of the underground block cave would not take place until 2013. Output from the underground operation would account for 60% of Argyle's total output. The open pit operation was scheduled to be shut down in 2008; however, it was likely to be extended to 2011. The diamond output from the Argyle Mine was decreased because the AK1 pit experienced a wall failure at the end 2007. As a result, ore volume from the mine to the processing plant was decreased and lower grade stockpile ore was processed at the recovery plant. Mining would continue in the southern end of the pit to extract the remaining economic ore until 2009; mining would also be done at the northern bowl (Rio Tinto plc, 2009a, p. 53).

Phosphate Rock.—Australian phosphate rock production was mainly from the Phosphate Hill-Duchess Mine in Queensland, the phosphate mine on Christmas Island, and several small operations near Bendleby in South Australia. Legend International Holdings, Inc. planned to develop its Paradise South (formerly known as Lady Annie) and Paradise North (formerly known as Lady Jane) deposits in the Georgina Basin, Queensland. The deposits were discovered by BH South Ltd. in 1967 and had 486 Mt of resources at a grade of 17% phosphorus pentoxide. Legend decided to construct a 10-Mt/yr phosphate rock mine and a 5-Mt/yr beneficiation plant. The company planned to transport 5 Mt of phosphate rock slurry by a 300-km pipeline to a port facility in the Gulf of Carpentaria and to export it to the Indian Farmers Fertilizer Cooperative Ltd. under an offtake agreement for the purchase of up to 5 Mt/yr. The mining was scheduled to commence in 2009 and exports were planned to be between about 0.5 and 1 Mt of direct-shipping ore at grades of between 30% and 34% phosphate in 2010. Legend and China's Wengfu Group Co. Ltd. signed a strategic alliance agreement. Wengfu would provide assistance, such as mining and beneficiation of phosphate rock, at Legend's Georgina Basin phosphate project (Legend International Holdings, Inc., 2009).

Rare Earths.—Globally, the production and resources of rare earths was dominated by China. In 2008, there was no recorded production of rare earths in Australia. However, Lynas Corp. Ltd. completed a feasibility study and received Government approval to develop the Mount Weld rare-earth project. The feasibility study indicated that the Mount Weld deposit contained 12.24 Mt of resources (measured, indicated, and inferred) at an average grade of 9.7% rare-earth oxide (REO) at a cutoff of 2.5% REO. Lynas started the construction of the open pit mine and a concentration plant at the Mount Weld deposit in 2007; the deposit was located 35 km south of Laverton, Western Australia. Owing to the global financial crisis, Lynas had difficulty securing funding to continue in 2008 and the project was suspended. Lynas was looking for investors to participate in the development of the Mount Weld project. China Nonferrous Metal Mining (Group) Co. Ltd. was willing to arrange funding to support the Mount Weld project and to become a major shareholder in Lynas. The proposal investment was subject to regulatory and shareholder approval (Lynas Corp. Ltd., 2009, p. 3).

Alkane Resources Ltd.'s Dubbo Zirconia project, which is located 20 km south of Dubbo in New South Wales, had built a pilot plant to recover hafnium, niobium, rare-earth elements, tantalum, and zirconium. The company reported total (measured and inferred) resources of 73.20 Mt grading 1.96% zirconium oxide, 0.75% REO, 0.46% niobium oxide, 0.14% yttrium oxide, 0.04% hafnium oxide, and 0.014% uranium oxide. The process optimization and development work was conducted at the Australian Nuclear Science and Technology Organization at Lucas Heights (south of Sydney), and the pilot plant was designed to test the flowsheet and provide process and engineering data in 2008. Experimental results demonstrated that yttrium and rare-earth elements could be recovered from the niobium product participates. The company expected that the results from the pilot plant operations could lead to the development of a 200,000-t/yr ore processing plant to produce intermediate zirconium chemicals, niobium-tantalum concentrates, light rare-earth and yttrium-rare-earth concentrates. The definitive feasibility study would be carried out in 2009, and a final project development decision would be made in 2010 (Alkane Resources Ltd., 2009, p. 9-10).

Mineral Fuels and Related Materials

Coal.—Australia ranked behind China and India in the Asia and the Pacific region in coal output; the country, however, was the world's leading exporter of coal. Queensland and New South Wales were Australia's leading coal producing States and accounted for more than 95% of the country's total output. In 2008, Australia mined out 431 Mt of raw coal, of which 332 Mt of salable coal was black (bituminous and anthracite) coal. Queensland's coal output accounted for 54.8% of the country's total output and was mainly from the Bowen Basin, which extends south from Collinsville to Blackwater and Moura, and from mines at Blair Athol, Newlands, and near Brisbane. New South Wales's coal output accounted for 42.6% of the country's total output and was mined near the eastern and western edges of the large Sydney Gunnedah Basin. In 2008, Australia exported more than 261.2 Mt of coal (metallurgical coal, 134.8 Mt, and thermal coal, 126.4 Mt) compared with 250 Mt in 2007. Japan was the leading destination for Australian metallurgical coal, 37.7%; followed by India, 18.4%; the European Union, 16.3%; the Republic of Korea, 4.8%; and others 22.8%. Japan also was the leading destination for Australian thermal coal, 53.8%; followed by the Republic of Korea, 19.4%; Taiwan, 15.7%; and others, 11.1%. Domestic coal consumption was less than 70 Mt, of which the power sector accounted for about 85%; followed by steel, 6.7%; cement, 1.3%; and other, 7%. The Australian Government projected that Australian production of salable coal would increase to 404 Mt and exports would increase to 325 Mt in 2014 (Australian Bureau of Agricultural and Resource Economics, 2009d, p. 17).

The infrastructure bottlenecks held back Australia's mineral exports, especially coal. The government of Queensland committed $5 billion to expand coal transport infrastructure, including state-owned railways and ports and privately owned coal terminals. The total export capacity of rail and port systems would enable coal exports of more than 210 Mt/yr in 2010. The coal handling capacity of the Abbot Point, Brisbane, Gladstone, and Hay Point coal export terminals would be increased to 230 Mt in 2009 and then to 340 Mt if the State government of Queensland deemed it necessary. The government of Queensland also planned to list its coal and rail freight network for sale, and the State would keep between 25% and 40% of the business. The State government of New South Wales decided to increase the coal royalty tax rate by 1.5% to cover infrastructure development funding (Williams, 2008; Department of Primary Industries of New South Wales, 2009, p. 29).

Waratah Coal Pty Ltd. announced that the company had discovered coal resources of 4.4 Gt at the Galilee Basin in Queensland. Waratah Coal proposed to construct a 40-Mt/yr coal mine near Alpha (west of Emerald) and named it the "China First project." The China First project would use a right to mine 1.4 Gt of coal from tenements EPC 1040 and

EPC 1079 for 25 years. The development cost was estimated to be $6.75 billion (A$7.5 billion), which included the construction of a mine, processing plants, a 450-megawatt powerplant, and a 490-km railway line linking the mine site to the export coal terminal at Abbot Point. Waratah Coal signed a memorandum of understanding with China's state-owned China Metallurgical Group Corp. (MCC), for which MCC would provide the engineering and construction support for the China First project and would provide or arrange for 10% of the capital funding needed for the project. Under the terms of arrangement, MCC would have the right to purchase 30 Mt/yr of coal (Waratah Coal Pty Ltd., 2008, 2009).

Natural Gas and Petroleum.—The States of Western Australia and Victoria accounted for most of Australia's oil and condensate and liquefied natural gas (LNG) production. The Carnarvon Basin, which is located off the coast of Western Australia, accounted for 63% of the country's total production. Production from the Carnarvon Basin was mostly exported, and production from the Gippsland Basin, which is located off the coast of Victoria in southeastern Australia, was used mainly to feed local refineries. In 2008, Australia's oil production decreased slightly from that of 2007. The Angel condensate and gas project, which was located 115 km offshore Western Australia and the Vincent oil project, which was located off the shore of North West Cape, Western Australia, started production in 2008. Australian oil production was expected to increase by about 2% during the next several years. The increase would come from the Crux and the Skua/Swift oilfields in the Bonaparte Basin; the Basker/Manter, the Kipper, and the Turrum oilfields in the Gippsland Basin; and the Pyrenees and the Van Gogh/Coniston oilfields in the Carnarvon Basin. Australia was a net importer of oil and refinery products. In 2008, the country's net imports of crude oil and condensate totaled 64.46 million barrels (Mbbl) (10,248 million liters), and imported petroleum products totaled 101.74 Mbbl (16,175 million liters) (Australian Bureau of Agricultural and Resource Economics, 2009b, p. 141).

Uranium.—Australia was the second ranked uranium producer in the world after Canada. Australia's uranium production was mainly from three mines—the Beverley, the Olympic Dam, and the Ranger. A number of undeveloped deposits in the Northern Territory, Queensland, South Australia, and Western Australia also exist. The Australian Government permits uranium mining, provided that all the relevant environmental safeguards and health requirements are met. Regulation of Australia's uranium mines is mainly a State and Territorial government responsibility. Among the States and Territories, only the governments of the Northern Territory and South Australia permitted uranium mining before 2008. Western Australia lifted the ban on uranium mining in the State in 2008. BHP Billiton planned to reactivate its Yeelirrie uranium project in Western Australia. Owing to financial problems, Uranium One Inc. suspended the construction of the Honeymoon project in South Australia, but restarted construction after Japan's Alliance Resources Ltd. and Mitsui & Co. Ltd. purchased a 49% equity share in the project (Geoscience Australia, 2009, p. 81).

Outlook

Australia is a natural resource-rich country with significant resources of metallic, nonmetallic, and fuel minerals. Mineral and energy commodity exports are an important part of the country's economy. Reflecting strong world demand for mineral resources, especially in the Asia and the Pacific region, the Australian economy is expected to continue to benefit from higher commodity export earnings. Expenditures on mineral and energy exploration in Australia are expected to increase owing to higher costs of labor and equipment and global demand for natural resources in the future. Owing to global financial problems, the production of such commodities as bauxite, copper, iron ore, natural gas, nickel, and zinc is expected to slow down during the next several years. Major projects, such as the Yarwun alumina refinery project; BHP Billiton's RGP for iron ore; Hamersley Iron's Yandicoogina iron ore expansion; Fortescue Metals' iron ore project; Rio Tinto's Brockman 4, Hope Downs, and Mesa A iron ore projects and Clermont and Kestrel coal projects; and Xstrata's Mangoola coal project are expected to come onstream within this decade. Western Australia is Australia's leading State for metallic mineral exports and New South Wales and Queensland are major coal exporting States; however, to sustain export growth, the country's infrastructure requires significant expansion and upgrading so that minerals for export can be transported from inland to port terminals. Australia is expected to remain a major mineral and fuel exporting country.

References Cited

Alkane Resources Ltd., 2009, Annual report 2008: Perth, Australia, Alkane Resources Ltd., 68 p.

Atlas Iron Ltd., 2009, Annual report 2009: West Perth, Australia, Atlas Iron Ltd., 108 p.

Australian Bureau of Agricultural and Resource Economics, 2009a, A review of exploration for the year 2008: Canberra, Australia, Australian Bureau of Agricultural and Resource Economics, February, 19 p.

Australian Bureau of Agricultural and Resource Economics, 2009b, Australian commodities: Canberra, Australia, Australian Bureau of Agricultural and Resource Economics, March quarter, 256 p.

Australian Bureau of Agricultural and Resource Economics, 2009c, Australian commodity statistics 2009: Canberra, Australia, Australian Bureau of Agricultural and Resource Economics, 351 p.

Australian Bureau of Agricultural and Resource Economics, 2009d, Australian mineral exploration retreats from record high: Canberra, Australia, Australian Bureau of Agricultural and Resource Economics, issue 96, 3 p.

Australian Bureau of Agricultural and Resource Economics, 2009e, Australian mineral statistics 2009: Canberra, Australia, Australian Bureau of Agricultural and Resource Economics, June quarter, 36 p.

Australian Bureau of Agricultural and Resource Economics, 2009f, Minerals and energy major development projects: Canberra, Australia, Australian Bureau of Agricultural and Resource Economics, June quarter, 25 p.

Australian Bureau of Statistics, 2009a, International trade in goods and services: Canberra, Australia, Australian Bureau of Statistics, 4 p.

Australian Bureau of Statistics, 2009b, Mining statistics newsletter: Canberra, Australia, Australian Bureau of Statistics, 2 p.

Australian, The, 2008, Western Australia lifts its ban on uranium mines: (Accessed November 18 2008, at http://www.theaustralian.com.au/news/nation/resource-state-lifts-uranium-mine-ban.)

Avoca Resources Ltd., 2009, Annual report 2009: West Perth, Australia, Avoca Resources Ltd., 112 p.

Barra Resources Ltd., 2009, WA's Mt Thirsty cobalt-nickel project potentially world's fourth largest cobalt producer: West Perth, Australia, Barra Resources Ltd. press release, January 15, 5 p.

Bauxite Resources Ltd., 2009, Annual report 2009: East Perth, Australia, Bauxite Resources Ltd., 84 p.
BHP Billiton Ltd., 2009a, BHP Billiton annual report 2008: London, United Kingdom, BHP Billiton Ltd., 272 p.
BHP Billiton Ltd., 2009b, BHP Billiton quarterly report on exploration and development activities quarter ended 31 December, 2008: London, United Kingdom, BHP Billiton Ltd. press release, January 21, 4 p.
BHP Billiton Ltd., 2009c, Changes to BHP Billiton's nickel business: London, United Kingdom, BHP Billiton Ltd. press release, January 12, 1 p.
Cape Alumina Ltd., 2009, Annual report 2009: Brisbane, Australia, Cape Alumina Pty Ltd., 30 p.
CHALCO Australia, 2009, Project news—Abbot Point named preferred site for alumina refinery: Brisbane, Australia, CHALCO Australia, September, 4 p.
Copper Strike Ltd., 2009, 2009 annual report: Melbourne, Australia, Copper Strike Ltd., 62 p.
Creamer Media (Pty) Ltd., 2009a, Australian miners push for new iron-ore berths: Creamer Media (Pty) Ltd. (Accessed September 8, 2009, at http://www.miningweekly.com/print-version/australian-miners-push-for-new-iron-ore-berths.)
Creamer Media (Pty) Ltd., 2009b, OZ Minerals seals new $1.2bn deal with Minmetals: Creamer Media (Pty) Ltd. (Accessed April 15, 2009, at http://www.miningweekly.com/print-version/oz-minerals-seals-new-12bn-deal-with-minmetals.)
Delotte Touche Tohmatsu, 2009, Flooding disrupts CopperCo's Lady Annie mine: Sydney, Australia, Delotte Touche Tohmatsu press release, February 13, 1 p.
Department of Mines and Petroleum, 2009a, New investment opportunities in Western Australia: East Perth, Australia, Department of Industry and Resources, State of Western Australia, 8 p.
Department of Mines and Petroleum, 2009b, Western Australian mineral and petroleum statistics digest 2008-09: East Perth, Australia, Department of Industry and Resources, State of Western Australia, 76 p.
Department of Primary Industries of New South Wales, 2009, Annual report 2008-09: Sydney, Australia, Department of Primary Industries of New South Wales, 219 p.
Department of Resources, Energy, and Tourism, 2009, Punching about its weight—Australia's cement industry: Canberra, Australia, Department of Resources, Energy, and Tourism, 90 p.
Ferrowest Ltd., 2009, Project updates: Belmont, Australia, Ferrowest Ltd. press release, December 8, 2 p.
Fortescue Metals Group Ltd., 2008, Annual report 2008: East Pilbara, Australia, Fortescue Metals Group Ltd., 124 p.
Fortescue Metals Group Ltd., 2009, Annual report 2009: East Pilbara, Australia, Fortescue Metals Group Ltd., 105 p.
Geoscience Australia, 2009, Australia's identified mineral resources 2009: Canberra, Australia, Geoscience Australia, 101 p.
Haddington Resources Ltd., 2009, Annual report 2009: West Perth, Australia, Haddington Resources Ltd., 80 p.
Havilah Resources NL, 2009, Kalkaroo copper-gold deposit resource statement: Glenside, Australia, Havilah Resources NL press release, May 7, 8 p.
Legend International Holdings, Inc., 2009, Legend International Holdings Inc. announces update for phosphate project, Queensland, Australia: Melbourne, Australia, Legend International Holdings, Inc. press release, September 24, 5 p.
Lynas Corp. Ltd., 2009, Annual report 2009: Sydney, Australia, Lynas Corp. Ltd., 88 p.
McArthur River Mining Pty Ltd., 2009, Quick facts: Borroloola, Australia, McArthur River Mining Pty Ltd., 2 p.
Ministry of Treasury, 2008a, Chinalco's acquisition of shares in Rio Tinto: Canberra, Australia, Ministry of Treasury media release, no. 94, August 24, 1 p.
Ministry of Treasury, 2008b, Foreign investment approval—Sinosteel's interests in Murchison Metal Ltd.: Canberra, Australia, Ministry of Treasury media release, no. 100, September 21, 1 p.
Ministry of Treasury, 2009, Foreign investment decision: Canberra, Australia, Ministry of Treasury media release, no. 39, March 31, 1 p.
Moly Mines Ltd., 2009, Annual report 2009: West Perth, Australia, Moly Mines Ltd., 123 p.
Newcrest Mining Ltd., 2009, Annual report 2009: Melbourne, Australia, Newcrest Mining Ltd., 120 p.
OZ Minerals Ltd., 2009, Mineral resources and ore reserves explanatory notes: Melbourne, Australia, OZ Minerals Ltd., June 30, 14 p.
Perilya Ltd., 2009, Concise annual report 2009: Leederville, Australia, Perilya Ltd., 73 p.
Reserve Bank of Australia, 2009, Statement on monetary policy: Canberra, Australia, Reserve Bank of Australia, May 8, 71 p.
Rio Tinto Ltd., 2009, E48 project to restart: Parkes, Australia, Rio Tinto Ltd. press release, September 4, 1 p.
Rio Tinto plc, 2009a, 2008 annual report: London, United Kingdom, Rio Tinto plc, 180 p.
Rio Tinto plc, 2009b, 2008 fourth quarter 2008 operations review: London, United Kingdom, Rio Tinto plc, January 15, 27 p.
St. Barbara Ltd., 2009, Annual report 2009: Melbourne, Australia, St. Barbara Ltd., 109 p.
Straits Resources Ltd., 2009, Annual report 2009: West Perth, Australia, Straits Resources Ltd., 159 p.
Talison Minerals Pty Ltd., 2008, Tailson to suspend Wodgina tantalum operations: Perth, Australia, Talison Minerals Pty Ltd. press release, 2 p.
Waratah Coal Pty Ltd., 2008, Waratah announced Galilee Basin total of inferred resources now 4.355 billion tonnes: Brisbane, Australia, Waratah Coal Pty Ltd. press release, June 24, 5 p.
Waratah Coal Pty Ltd., 2009, China First project to create 6,000 jobs: Brisbane, Australia, Waratah Coal Pty Ltd. press release, May 21, 2 p.
Western Areas NL, 2009, Annual report 2009: Perth, Australia, Western Areas NL, 100 p.
Williams, Nikki, 2008, Coal tax undermines regions: Wollongong, Australia, Illawarra Mercury, November 19, p. 22.

TABLE 1
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless othewise specified)

Commodity		2004	2005	2006	2007	2008
METALS						
Aluminum:						
Bauxite, gross weight	thousand metric tons	43,993	59,959	61,780	62,398	64,038
Alumina	do.	16,525	17,704	18,312	18,844	19,446
Metal, refined:						
Primary	do.	1,894	1,903	1,932	1,957	1,974
Secondary[e]		127,000	127,000	130,000	130,000	130,000
Antimony, Sb content of ores and concentrates[e]		120	120	1,600	1,010	1,500
Cadmium:[e]						
Mine output, Cd content		700	700	700	700	700
Metal, smelter, refined		350	360	330	350	330
Chromium, chromite, gross weight		265,937 [r]	241,865 [r]	258,087 [r]	253,400 [r]	224,809
Chromite content[e]		105,000 [r]	97,000 [r]	103,000 [r]	103,000 [r]	90,000
Cobalt:						
Co content in laterite ore, Ni concentrate, and Zn concentrate[e]		5,600	5,600	6,000	5,900	5,500
Metal, refined		3,880	3,150	3,700	3,680	3,500 [e]
Copper:						
Mine output, Cu content	thousand metric tons	875	930	879	870 [r]	885
Metal:						
Smelter, primary and secondary	do.	440	412	377	399	447
Refined, primary	do.	498	461	429	442	503
Gold:						
Mine output, Au content		258	263	246	247 [r]	215
Metal, refined:						
Primary		313	291	266	259	244
Secondary		58	50	112	116	117
Iron and steel:						
Iron ore:[e]						
Gross weight	thousand metric tons	234,000 [r]	262,000 [r]	275,000 [r]	299,000 [r]	342,000
Fe content	do.	144,000 [r]	163,000 [r]	171,000 [r]	186,000 [r]	208,000
Metal:						
Pig iron	do.	5,735	6,203	6,433	6,351	6,409
Ferroalloys:[e]						
Ferromanganese		115,000	120,000	125,000	125,000	125,000
Silicomanganese		135,000	135,000	140,000	140,000	140,000
Total		250,000	255,000	265,000	265,000	265,000
Steel, crude	thousand metric tons	8,353	7,788	7,937	8,047	7,724
Semimanufactured products		6,671	6,920	7,000	7,200 [e]	7,000 [e]
Lead:						
Mine output, Pb content	thousand metric tons	674	767	686	641	645
Metal:						
Bullion	do.	140	159	118	125	167
Refined:						
Primary	do.	232	230	233	202	220
Secondary, excluding remelt	do.	36	33	27	27	24
Manganese ore, metallurgical:						
Gross weight	do.	3,431	3,830	4,549 [r]	5,265 [r]	4,812
Mn content	do.	1,570	1,908	2,190 [r]	2,540 [r]	2,310
Nickel:						
Mine output, Ni content	do.	175 [r]	192 [r]	175 [r]	160 [r]	188
Matte	do.	32 [r]	44 [r]	39 [r]	42 [r]	31
Metal, smelter, refined Ni and Ni content of oxide	do.	122	126	119	114	103
Platinum-group metals:[e]						
Palladium, Pd content	kilograms	800	550	750	600	700
Platinum, Pt content	do.	200	111	209	142	200
Total	do.	1,000	661	959	742	900
Silver:						
Mine output, Ag content		2,224	2,417	1,727	1,879	1,926
Metal, refined		650	727	634	625	644

See footnotes at end of table.

TABLE 1—Continued
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2004	2005	2006	2007	2008
METALS—Continued						
Tantalum, tantalite, Ta_2O_5 equivalent		985	1,043	584	538 r	680
Tin:						
Mine output, Sn content		1,196	2,819	1,478	2,071	1,783
Metal, refined:						
Primary		467	594	572	118	--
Secondary e		400	400	400	400	400
Titanium concentrates, gross weight:						
Ilmenite	thousand metric tons	1,921	2,030	2,377	2,340 r	2,082
Leucoxene e		44,000	46,000	131,000	163,000 r	148,000
Rutile		163,000	177,000	232,000	312,000 r	325,000
Zinc:						
Mine output, Zn content	thousand metric tons	1,334	1,367	1,362	1,514	1,519
Metal, smelter:						
Primary	do.	470	457	463	502	499
Secondary e		6,000 r	6,000 r	6,000 r	6,000 r	6,000
Zirconium concentrates, gross weight	thousand metric tons	441	427	491	601 r	550
INDUSTRIAL MINERALS						
Abrasives, natural:						
Beach pebble e		2,000	2,000	2,000	2,000	2,000
Garnet		125,404	246,128	278,233	294,007	294,007
Barite e		20,000	20,000	21,000	21,000	21,000
Cement, hydraulic e	thousand metric tons	8,000	8,475 2	9,000	9,500	9,400
Clays: e						
Bentonite and bentonitic clay		265,000	223,000	220,000	220,000	220,000
Brick clay and shale	thousand metric tons	8,000	8,000	8,000	8,000	8,000
Cement clay and shale	do.	500	500	500	500	500
Damourite clay		100	100	100	100	100
Fire clay		25,000	25,000	25,000	22,000	22,000
Fuller's earth, attapulgite		10,000	9,800	10,000	10,000	10,000
Kaolin and ball clay		285,000	230,000	250,000	230,000	230,000
Other	thousand metric tons	2,000	2,000	2,000	2,000	2,000
Diamond:						
Gem	thousand carats	6,008	8,577	7,305	231	273
Industrial	do.	18,172	25,730	21,915	18,960	15,397
Total	do.	24,180	34,307	29,220	19,191	15,670
Diatomite e		20,000	20,000	20,000	20,000	20,000
Feldspar, including nepheline syenite e		50,000	50,000	50,000	50,000	50,000
Gemstones, opal	value, $million	36	40	50	40	41
Gypsum	thousand metric tons	4,325	3,857	4,265	3,896	3,500 e
Kyanite e		1,000	1,000	1,000	1,000	1,000
Lime e		1,500,000	1,500,000	1,600,000 r	1,600,000 r	1,600,000
Lithium, spodumene		118,451	173,635	222,101	192,277	239,528
Magnesite		473,983	474,000	446,000	447,000	126,000
Nitrogen, N content of ammonia		790,000	790,000	1,200,000	1,200,000	1,200,000
Perlite, crude e		5,000	6,000	6,500	6,500	6,500
Phosphate rock: e						
Gross weight		2,200,000	2,080,000	2,140,000 r	2,850,000	2,950,000
P_2O_5 content		506,000	478,000	493,000	655,000	678,000
Salt 3	thousand metric tons	11,088	12,444	11,424	10,855	11,160
Soda ash e	do.	300	300	310	310	310
Stone and sand and gravel:						
Construction sand	thousand metric tons	27,995	30,438	30,540 r	35,530 r	34,000 e
Crushed and broken stone e	do.	76,000 r	75,000 r	81,000 r	95,000 r	80,000 e
Dimension stone	do.	266	237	200	190 r	230 e
Gravel e	do.	13,000 r	14,000 r	13,500 r	13,600 r	12,000
Dolomite e	do.	10,000	10,000	10,000	10,000	10,000
Limestone e	do.	17,100 r	18,400 r	18,300 r	19,100 r	19,000
Silica in the form of quartz, quartzite, glass sand	do.	4,142	5,169	5,200 e	5,200 e	5,200 e

See footnotes at end of table.

TABLE 1—Continued
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity		2004	2005	2006	2007	2008
INDUSTRIAL MINERALS—Continued						
Sulfur, byproduct:[e]						
Metallurgy	thousand metric tons	870	880	880	880	880
Petroleum	do.	60	60	58	58	60
Total	do.	930	940	938	938	940
Talc, chlorite, pyrophyllite, steatite[e]		150,923 [2]	155,000	130,000	125,000	120,000
MINERAL FUELS AND RELATED MATERIALS						
Coal, salable:						
Bituminous and subbituminous	thousand metric tons	298,000	303,000	309,000	320,000	332,000
Lignite[e]	do.	67,000	67,000	71,000	71,000	71,000
Total[e]	do.	365,000	370,000	380,000	391,000	403,000
Gas, natural, marketed	million cubic meters	41,680	42,630	44,100	39,960	38,256
Petroleum:						
Crude	thousand 42-gallon barrels	171,781	155,320	163,900	170,470 [r]	168,123
Refinery products	do.	280,242	255,863	229,748	252,443	246,717
Uranium, mine output, U_3O_8 content		10,600	11,218	8,970	10,145	9,989

[e]Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. [r]Revised. do. Ditto. -- Zero.
[1]Table includes data available through November 20, 2009.
[2]Reported figure.
[3]Does not include production from the Northern Territory and the State of Victoria.

TABLE 2
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Aluminum:			
Bauxite	Gove open pit bauxite mine (Rio Tinto Alcan, 100%)	15 km southeast of Nhulunbuy, NT	8,000
Do.	Huntly open pit bauxite mine (Alcoa World Alumina Australia, 100%)	80 km south of Perth, WA	20,000
Do.	Weipa-Andoom open pit bauxite mine [Comalco Ltd., operator (Rio Tinto Alcan, 100%)]	Weipa, QLD	21,000
Do.	Willowdale open pit bauxite mine (Alcoa World Alumina Australia, 100%)	130 km south of Perth, WA	8,600
Do.	Boddington-Worsley open pit bauxite mine {Worsley Alumina Pty. Ltd., manager [BHP Billiton Ltd., 86%; Japan Alumina Associates (Australia) Pty. Ltd., 10%; Sojitz Alumina Pty. Ltd., 4%]}	14 km south of Boddington, WA	13,200
Alumina refinery	Gladstone alumina refinery [Queensland Alumina Ltd., operator (Rio Tinto Alcan, 80%, and United Company RUSAL 20%)]	Gladstone, QLD	3,850
Do.	Gove alumina refinery [Alcan Gove Pty Ltd. (Rio Tinto Alcan, 100%)]	Nhulunbuy, Gove, NT	3,800
Do.	Kwinana alumina refinery (Alcoa World Alumina Australia, 100%)	Kwinana, WA	2,100
Do.	Pinjarra alumina refinery (Alcoa World Alumina Australia, 100%)	Pinjarra, WA	4,200
Do.	Wagerup alumina refinery (Alcoa World Alumina Australia, 60%, and Western Mining Corp., 40%)	Waroona, WA	2,600
Do.	Worsley alumina refinery [Worsley Alumina Pty. Ltd., manager (BHP Billiton Ltd., 86%, and Japan Alumina Associates (Australia) Pty Ltd., 10%)]	20 km northwest of Collie, WA	3,500
Do.	Yarwun alumina refinery (Rio Tinto Alcan, 100%)	Gladstone, QLD	1,400
Metal smelter	Bell Bay aluminum smelter (Rio Tinto Alcan, 100%)	Bell Bay, TAS	160
Do.	Kurri Kurri aluminum smelter (Hydro Aluminium Kurri Kurri Pty. Ltd., 100%)	Kurri Kurri, near Newcastle, NSW	165
Do.	Boyne Island aluminum smelter [Boyne Smelters Ltd., operator (Rio Tinto Alcan, 64%; Sumitomo Light Metal Industries Ltd., 17%; Ryowa Development Pty. Ltd., 12%; Kobe Steel Ltd., 5%; Sumitomo Chemical Co. Ltd., 2%)]	Boyne Island, QLD	550
Do.	Point Henry aluminum smelter (Alcoa of Australia, 100%)	Point Henry, VIC	185
Do.	Portland aluminum smelter [Alcoa of Australia, 55%, manager; China International Trust Investment Co. (China state-owned company), 22.5%; Marubeni Australia Pty. Ltd., 22.5%]	Portland, VIC	345
Do.	Tomago aluminum smelter [Tomago Aluminium Co. Pty. Ltd., operator (Gove Aluminium Finance Ltd., 36.05%; Rio Tinto Alcan, 51.55%; Hydro Aluminium, 12.40%)]	Tomago, NSW	525
Antimony	Augusta underground antimony-gold mine [AGD Mining operator (Cambrian Mining Plc, 100%)]	50 km east and southeast of Bendigo, VIC	5
Do.	Hillgrove Mine (Straits Resources Ltd., 100%)	25 km east of Armidale, NSW	10
Bentonite	Arumpo open pit bentonite mine (Arumpo Bentonite Pty. Ltd., 100%)	95 km northeast of Mildura, NSW	10
Do.	Cedars open pit bentonite mine (PCP Douglass Pty. Ltd., 100%)	10 km southwest of Yarraman, QLD	20
Do.	Cressfield open pit bentonite mine (Unimin Australia Ltd., 100%)	20 km north of Scone, NSW	12
Do.	Mantuan Downs (Pacific Enviromin Ltd., 100%)	West of Springsure, QLD	100
Do.	Miles open pit bentonite mine (Unimin Australia Ltd., 100%)	350 km west of Brisbane, QLD	100
Cement, plant	Adelaide Brighton Cement Pty Ltd., 100%	Angaston, SA	250
Do.	do.	Birkenhead, SA	1,200
Do.	do.	Geelong, VIC	800
Do.	do.	Munster, SA	590
Do.	Blue Circle Southern Cement Ltd., 100%	Berrima, NSW	1,200
Do.	do.	Maldon, NSW	700
Do.	do.	Waurn Ponds, VIC	250
Do.	Cement Australia Ltd., 100%	Brisbane, QLD	1,200
Do.	do.	Gladstone, QLD	1,600
Do.	do.	Kandos, NSW	450
Do.	do.	Railton, TAS	1,000
Do.	Cockburn Cement Ltd., 100%	Munster, 30 km south of Perth, WA	700
Chromite	Coobina open pit chromite mine (Palmary Enterprises Ltd., 100%)	80 km southeast of Newman, WA	250

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Coal	Angus Place longwall coal mine (Centennial Coal Co. Ltd., 50%, and SK Corp., 50%)	16 km northwest of Lithgow, NSW	3,000
Do.	Appin longwall coal mine [Illawarra Coal Holdings Pty Ltd., operator (BHP Billiton Ltd., 100%)]	40 northwest of Wollongong, NSW	8,800
Do.	Ashton open pit/underground coal mine (Felix Resources Ltd., 60%; Chu Corp., 10%; private, 30%)	14 km northwest of Singleton, NSW	4,000
Do.	Awaba underground coal mine [Powercoal Pty. Ltd., operator (Centennial Coal Co. Ltd., 100%)]	30 km southwest of Newcastle, NSW	2,000
Do.	Baal Bone coal mine [Oakbridge Pty. Ltd., 74.1% (Xstrata plc, 100%); Sumitomo Corp., 5%; Toyota Tsusho Mining (Australia) Pty Ltd. 4.75%; private, 14.44%]	24 km northwest of Lithgow, NSW	2,500
Do.	Bengalla open pit coal mine [Coal and Allied Industries Ltd., 40%, manager; Wesfarmers Bengalla Ltd., 40%; MCDA Bengalla Investment Pty. Ltd., 10%; Taipower Bengalla Pty. Ltd., 10%]	5 km west of Muswellbrook, NSW	6,600
Do.	Blackwater open pit coal mine (includes South Blackwater) [BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)]	195 km west of Rockhampton, QLD	14,000
Do.	Blair Athol open pit coal mine [Rio Tinto Ltd., 57.2%, manager; J-Power (Australia) Pty Ltd., 8%; private, 34.8%]	25 km northwest of Clermont, QLD	13,000
Do.	Broadmeadow open pit/underground coal mine [BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)]	30 km north of Moranbah, QLD[3]	3,000
Do.	Bulga open pit coal mine [Oakbridge Pty Ltd., manager (Xstrata plc, 68.25%; Nippon Steel Australia Pty. Ltd., 12.5%; Toyota Tsusho Mining (Australia) Pty Ltd., 4.38%; private 13.3%)]	16 km southwest of Singleton, NSW	10,000
Do.	Burton open pit coal mine (Peabody Energy Corp., 95%, and Thiess Pty. Ltd., 5%)	150 km southwest of Mackay, QLD	5,800
Do.	Callide coal mine (Anglo Coal Pty Ltd., 100%)	120 km southwest of the Port of Gladstone, QLD	10,700
Do.	Camberwell open pit coal mine [Camberwell Coal Pty. Ltd., manager [Toyota Tsusho Mining (Australia) Pty. Ltd., 90%, and Dia Coal Mining (Australia) Pty Ltd., 10%]	10 km northwest of Singleton, NSW	4,000
Do.	Clarence underground coal mine (Centennial Coal Co. Ltd., 85%, manager; and SK Australia Pty. Ltd., 15%)	10 km east of Lithgow, NSW	2,500
Do.	Commodore open pit coal mine Roche Mining Pty. Ltd., operator [Intergen (Australia) Pty Ltd., 100%]	80 km southwest of Toowoomba, QLD	3,600
Do.	Coppabella open pit coal mine (Macarthur Coal Ltd., 73.3%, and others, 26.7%)	140 km southwest of Mackay, QLD	4,000
Do.	Cumnock No. 1 open pit coal mine (Cumnock Coal. Ltd., 100%)	28 km northwest of Singleton, NSW	3,000
Do.	Curragh open pit coal mine (Wesfarmers Ltd., 100%)	70 km east of Emerald, QLD	9,000
Do.	Dartbrook coal mine (Anglo Coal Holdings Australia Ltd., 77.3%)	70 km north of Singleton, NSW[3]	3,750
Do.	Dawson coal complex (includes Moura, Theodore, and Taroom) [Anglo American plc, 51%, and Mitsui & Co. (Australia) Ltd., 49%]	230 km west of Bundaberg, QLD	7,000
Do.	Dendrobium underground coal mine (BHP Billiton Ltd., 100%)	15 km southwest of Wollongong, NSW	5,200
Do.	Donaldson open pit coal mine (Donaldson Coal Pty Ltd., 100%)	5 km southeast of Maitland, NSW	2,500
Do.	Drayton open pit coal mine [Anglo Coal Holdings Australia Ltd., 88.2%, manager; Mitsui Coal Development Australia Pty. Ltd., 3.8%; Mitsui Mining (Australia) Pty. Ltd., 3%; others, 5%]	35 km northwest of Singleton, NSW	5,000
Do.	Duralie open pit coal mine (Gloucester Coal Ltd., 100%)	110 km of Newcastle, NSW	2,000
Do.	Elouera underground coal mine (Gujarat NRE Resources NL, 100%)	15 km southwest of Wollongong, NSW	2,000
Do.	Ensham-Yongala open pit coal mine [Idemitsu Kosan Co. Ltd., 85%; J-Power (Australia) Pty. Ltd., 10%; LG International (Australia) Pty Ltd., 5%]	40 km northeast of Emerald, QLD	9,000
Do.	Ewington II open pit coal mine (Griffin Coal Mining Co. Pty. Ltd., 100%)	8 km east of Collie, WA	1,000
Do.	Foxleigh open pit coal mine (Foxleigh Mining Pty Ltd., 100%)	Bowen Basin, QLD	3,600
Do.	German Creek and German Creek East open pit/underground coal mines [Anglo American plc, 70%, and Mitsui & Co. (Australia) Ltd., 30%]	275 km west-northwest of Rockhampton, QLD	6,000

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Coal—Continued	Glennies Creek longwall coal mine (CVRD Inco Ltd., 85%; Nippon Steel Australia Pty Ltd., 5%; POSCO Australia Pty Ltd., 5%; private, 5%)	12 km north of Singleton, NSW	2,800
Do.	Goonyella-Riverside-Broadmeadow open pit coal mines (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)	140 km southwest of Mackay, QLD	16,000
Do.	Gregory Crinum open pit/underground coal mine [BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)]	60 km north of Emerald, QLD	5,500
Do.	Hunter Valley Operations (includes Carrington Chestnut, Howick, Hunter Valley No. 1, Lemington, Riverview open pit coal mines) (Coal and Allied Industries Ltd., 100%)	10 km west and 25 km north of Singleton, NSW	15,000
Do.	Hail Creek open pit coal mine (Rio Tinto Ltd., 82%; Nippon Steel Australia Pty Ltd., 8%; Marubeni Coal Pty. Ltd., 6.66%)	100 km west of Mackay, QLD	8,000
Do.	Hazelwood open pit coal mine (International Power Hazelwood, 100%)	150 km southeast of Melbourne, VIC	20,000
Do.	Jellinbah East open pit coal mine (Queensland Coal Mine Management Pty. Ltd., 70%; Marubeni Coal Pty. Ltd., 15%; Sojitz Australia Ltd., 15%)	90 km east of Emerald, QLD	4,000
Do.	Kestrel underground coal mine [Rio Tinto Ltd., 80%, and Mitsui & Co. (Australia) Ltd., 20%]	40 km north-northeast of Emerald, QLD	5,500
Do.	Liddell open pit coal mine (Xstrata Coal Australia Pty. Ltd., 67.5%, and Mitsui Matushima Australia Pty. Ltd., 32.5%)	25 km northwest of Singleton, NSW	4,000
Do.	Loy Yang open pit coal mine (Loy Yang Power Ltd., 100%)	165 km east of Melbourne, VIC	30,000
Do.	Mondalong underground coal mine (Centennial Coal Co. Ltd., 100%)	35 km southwest of Newcastle, NSW	4,500
Do.	Moorvale open pit coal mine (Macarthur Coal Ltd., 73.3%; CITIC Resources Australia Pty Ltd., 7%; Sojtz Australia Ltd., 7%; Nippon Steel Australia Pty Ltd., 2%)	10 km south of Coppabella, QLD	3,400
Do.	Moranbah North longwall coal mine (Anglo American plc., 88%, and Nippon Steel Australia Pty. Ltd., 5%)	150 km southwest of Mackay, QLD	5,800
Do.	Mount Arthur open pit coal mine (BHP Billiton Ltd., 100%)	5 km southwest of Muswellbrook, NSW	15,000
Do.	Mount Owen open pit coal mine (Xstrata plc, 100%)	20 km northwest of Singleton, NSW	7,700
Do.	Mount Thorley open pit coal mine (Coal and Allied Industries Ltd., 80%, and POSCO Australia Pty. Ltd., 20%)	14 km southwest of Singleton, NSW	12,000
Do.	Muja open pit coal mine (The Griffin Coal Mining Co. Pty. Ltd., 100%)	18 km southeast of Collie, WA	2,000
Do.	Muswellbrook No. 2 open pit coal mine (Muswellbrook Coal Co., 100%)	4 km northeast of Muswellbrook, NSW	1,700
Do.	Myuna underground coal mine (Centennial Coal Co. Ltd., 100%)	35 km south of Newcastle, NSW	1,500
Do.	New Acland open pit coal mine (New Hope Corp. Ltd., 100%)	35 km northwest of Toowoomba, QLD	3,750
Do.	Newlands-Collinsville-Abbot Point open pit coal mine (Xstrata plc, 55%; Itochu Corp., 35%; Sumitomo Corp., 10%)	130 km west of Mackay, QLD	15,000
Do.	Newstan longwall coal mine (Centennial Coal Co. Ltd., 100%)	30 km southwest of Newcastle, NSW	4,000
Do.	North Goonyella underground coal mine (Peabody Energy Corp., 100%)	40 km north Moranbah, QLD	3,000
Do.	Norwich Park open pit coal mine (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)	85 km north-northeast of Emerald, QLD	5,000
Do.	Oaky Creek longwall and Alliance open pit coal mines (Xstrata plc, 55%; Sumitomo Coal Australia Pty. Ltd., 25%; Itocho Corp., 20%)	300 km west-northwest of Rockhampton, QLD	9,500
Do.	Peak Downs open pit coal mine (BHP Billiton Ltd., 50%, and Mitsubishi Development Pty. Ltd., 50%)	145 km north of Emerald, QLD	9,000
Do.	Premier open pit coal mine (Wesfarmers Premier Coal Ltd., 100%)	10 km southeast of Collie, WA	4,000
Do.	Ravensworth-Narama open pit coal mine (includes Ravensworth East) (Xstrata Coal Australia Pty. Ltd., 100% of Ravensworth and 50% of Narama; Iluka Resources Ltd., 50% of Narama)	20 km northwest of Singleton, NSW	3,500
Do.	Rixs Creek open pit coal mine (Bloomfield Colliers Pty. Ltd., 100%)	5 km northwest of Singleton, NSW	2,000
Do.	Rolleston open pit coal mine (Xstrata plc, 75%; Itochu Corp., 12.5%; Sumitomo Corp., 12.5%)	90 south-southeast of Emerald, QLD	8,000
Do.	Saraji open pit coal mine (BHP Billiton Ltd., 50%, and Mitsubishi Corp., 50%)	125 km north of Emerald, QLD	6,500
Do.	South Walker Creek open pit/underground coal mine (BHP Mitsui Coal Pty. Ltd., 100%)	90 km southwest of Mackay, QLD	4,300
Do.	Springvale underground coal mine (Centennial Coal Co. Ltd. 50%; SK Corp., 25%; Korea Resource Corp. Australia, 25%)	16 km northwest of Lithgow, NSW	3,000

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Coal—Continued	Tahmoor longwall coal mine (includes Tahmoor North and Bargo) (Centennial Coal Co. Ltd., 85.79%, and private, 14.21%)	70 km southwest of Sydney, NSW	2,500
Do.	Tarong-Meandu open pit coal mine (Rio Tinto Ltd., 100%)	85 km north of Toowoomba, QLD	7,000
Do.	Ulan underground coal mine (Xstrata plc, 90%, and Mitsubishi Corp., 10%)	45 km northwest of Mudgee, NSW	5,000
Do.	United Collieries underground coal mine (Xstrata plc., 95%, and private, 5%)	15 km west of Singleton, NSW	3,000
Do.	Wambo open pit/underground coal mine (Peabody Energy Corp., 100%)	30 km from Singleton, NSW	6,000
Do.	West Cliff longwall coal mine (BHP Billiton Ltd., 100%)	43 km northwest of Wollongong, NSW	2,300
Do.	West Wallsend longwall coal mine (Xstrata plc, 70%; Marubeni Coal Pty Ltd., 17%; private 13%)	25 km southwest of Newcastle, NSW	2,500
Do.	Yallourn open pit lignite mine (CLP Power Asia Ltd., 100%)	140 km southeast of Melbourne, VIC	18,000
Cobalt:			
Mine	Cawse open pit nickel-cobalt mine (Norilsk Nickel Mining and Metallurgical Co., 100%)	50 km northwest of Kalgoorlie, WA	0.2
Do.	Murrin Murrin open pit nickel-cobalt mine (Minara Resources Ltd., 60%, and Glencore Australia Pty. Ltd., 40%)	60 km east of Leonora, WA	2.0
Do.	Radio Hill underground nickel-cobalt mine (Fox Resources Ltd., 100%)	35 km south of Karratha, WA	0.2
Do.	Ravensthorpe open pit mine (BHP Billiton Ltd., 100%)	155 km west of Esperance, WA	1.4
Refinery	Yabulu nickel-cobalt refinery (BHP Billiton Ltd., 100%)	Townsville, QLD	3
Copper:			
Mine, Cu content	Cadia Hill open pit gold-copper mine (Newcrest Mining Ltd., 100%)	21 km south-southwest of Orange, NSW	25
Do.	Cobar underground copper mine (Glencore International AG, 100%)	12 km northwest of Cobar, NSW	30
Do.	Eloise underground copper mine (FMR Investement Pty Ltd., 100%)	60 km southeast of Cloncurry, QLD	70
Do.	Ernest Henry open pit/underground copper-gold mine (Xstrata plc, 100%)	35 km northeast of Cloncurry, QLD	115
Do.	Golden Grove underground zinc-copper mine (Oxiana Ltd., 100%)	225 km east of Geraldton, WA	20
Do.	Hellyer underground zinc-lead-copper-silver mine (Bass Metals Ltd., 100%)	80 km south-southwest of Burnie, TAS	1
Do.	Lady Annie copper (SW-EX) mine (Cape Lambert Iron Ore Ltd., 100%)	100 km north-northwest of Mount Isa, QLD	19
Do.	Leichhardt copper mine (Matrix Metals Ltd., 100%)	110 km northwest of Cloncurry, QLD	10
Do.	Mount Gordon open pit copper (SW-EX) mine (Aditya Birla Minerals Ltd., 100%)	120 kilometers north of Mount Isa, QLD	50
Do.	Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton Mines) (Xstrata plc, 100%)	Mount Isa, QLD	190
Do.	Mount Lyell underground copper-gold mine [Sterlite Industries (India) Ltd., 100%]	2 km northeast of Queenstown, TAS	35
Do.	Nifty open pit copper (SX-EX) mine (Aditya Birla Minerals Ltd., 100%)	200 km southeast of Marble Bar, WA	25
Do.	Northparkes open pit/underground copper-gold mine (Rio Tinto Ltd., 80%; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; SC Mineral Resources Pty. Ltd., 6.7%)	30 km northwest of Parkes, NSW	90
Do.	Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	235
Do.	Osborne underground copper-gold mine (Barrick Gold Corp., 100%)	120 km northeast of Boulia, QLD	50
Do.	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), (GoldCorp Inc., 100%)	8 km south of Cobar, NSW	3
Do.	Prominent Hill open pit copper-gold mine (OZ Minerals Ltd., 100%)	650 km northwest of Adelaide, SA	100
Do.	Ridgeway underground gold-copper mine (Newcrest Mining Ltd., 100%)	5 km south of Orange, NSW	30
Do.	Rosebery underground zinc-lead-silver-copper-gold mine (OZ Minerals Ltd., 100%)	35 km north of Queenstown, TAS	2
Smelter	Mount Isa copper smelter (Xstrata plc, 100%)	Mount Isa, QLD	250
Do.	Olympic Dam copper smelter [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	70
Do.	Port Kembla copper smelter (Furukawa Co. Ltd., 52.5%; Nittetsu Mining Co., 20%; NisshoIwai Corp., 17.5%; Itochu Corp., 10%)	Port Kambla, NSW	120
Refinery	Olympic Dam copper refinery [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	235
Do.	Port Kembla copper refinery (Furukawa Co. Ltd., 52.5%; Nittetsu Mining Co., 20%; NisshoIwai Corp., 17.5%; Itochu Corp., 10%)	Port Kambla, NSW	120
Do.	Townsville copper refinery (Xstrata plc, 100%)	Townsville, QLD	300

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Diamond	thousand carats	Argyle Mine (AK-1 lamproite pipe and alluvial diamond mines) (Rio Tinto plc, 100%)	120 km southwest of Kununurra, WA	30,000
Do.	do.	Ellendale Mine (includes pipes 4 and 9) (Gem Diamond Ltd., 100%)	130 east southeast of Derby, WA	700
Do.	do.	Ellendale 9 North Mine (Blina Diamond NL, 100%)	140 east of Derby, WA	500
Diatomite		Barraba open pit diatomite mine (Australia Diatomite Mining Pty. Ltd., 100%)	85 km north-northwest of Tamworth, NSW	25
Dolomite		Ardrossan metallurgical dolomite quarry (OneSteel Ltd., 100%)	Northern York Peninsula, SA	650
Do.		Cookes Hill Mine (includes Nickol River and Warrawoona) (Haoma Mining NL, 100%)	Near Port Hedland, WA	400
Feldspar		Broken Hill open pit feldspar mine (includes Bakers, Lady Beryl, and Spar Ridge) (Unimin Australia Ltd.., 100%)	42 km southwest of Broken Hill, NSW	15
Garnet		Port Gregory open pit industrial garnet mine (GMA Garnet Pty. Ltd., 100%)	100 km north of Geraldton, WA	250
Gas:				
Condensate	thousand 42-gallon barrels per day	North West Shelf gas operations {Woodside Petroleum Pty. Ltd., manager [BHP Petroleum Pty. Ltd., BP Australia Holdings Ltd., Chevron Asiatic Ltd., Japan Australia LNG (MIMI) Pty. Ltd., Shell Development (Australia) Pty. Ltd., and Woodside Petroleum Ltd., 16.67% each]}	130 km offshore Dampier, WA	60
Natural	million cubic meters per day	do.	do.	20
Liquefied natural	million metric tons	do.	Four-train liquefaction plant, Burrup Peninsula, WA	12
Gold:				
Mine	kilograms	Agnew open pit/underground gold mine (Gold Fields Ltd., 100%)	23 km west of Leinster, WA	5,600
Do.	do.	Boddington open pit/underground gold mine (Newmont Mining Corp., 66.67%, and AngloGold Ashanti Ltd., 33.33)	100 km southeast of Perth, WA[3]	12,000
Do.	do.	Bronzewing underground gold mine (includes Mount McClure, Venus, Success, Cockburn, Corboys, Mount Joel) (Audax Resources Ltd., 100%)	65 km northeast of Leinster, WA	9,000
Do.	do.	Cadia Hill open pit gold-copper mine (Newcrest Mining Ltd., 100%)	21 km south-southeast of Orange, NSW	11,000
Do.	do.	Ernest Henry open pit copper-gold mine (Xstrata plc, 100%)	35 km northeast of Cloncurry, QLD	3,000
Do.	do.	Granny Smith open pit gold mine (includes Wallaby) (Barrick Gold Corp., 100%)	20 km south of Laverton, WA	16,000
Do.	do.	Gwalia underground gold mine (St Barbara Ltd., 100%)	3 km south of Leonora, WA	2,600
Do.	do.	Henty underground gold-silver mine (Barrick Gold Ltd., 100%)	30 km north of Queenstown, TAS	3,700
Do.	do.	Hillgrove Mine (Straits Resources Ltd., 100%)	25 km east of Armidale, NSW	650
Do.	do.	Jundee-Nimary open pit/underground gold mine (Newmont Mining Corp., 100%)	45 km northeast of Wiluna, WA	12,000
Do.	do.	Kanowna Belle underground gold mine (Barrick Gold Corp., 100%)	18 km northeast of Kalgoorlie, WA	7,000
Do.	do.	Lawlers underground gold mine (Barrick Gold Corp., 100%)	30 km southwest of Leinster, WA	3,000
Do.	do.	Mount Lyell underground copper-gold mine [Sterlite Industries (India) Ltd., 100%]	2 km northeast of Queenstown, TAS	1,000
Do.	do.	Mount Magnet open pit/underground gold mine (includes Hill 50 and Star) (Harmony Gold Mining Co. Ltd., 100%)	2 km from Mount Magnet, WA	8,500
Do.	do.	Norseman underground gold mine (Norseman Gold Plc, 100%)	Norseman, WA	3,700
Do.	do.	Northparkes open pit/underground copper-gold mine (Rio Tinto Ltd., 80%, and Sumitomo Metal Mining Oceania Pty. Ltd., 20%)	30 km north of Parkes, NSW	155,000
Do.	do.	Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	1,500
Do.	do.	Pajingo underground gold mine (includes Vera-Nancy) [North Queensland Metals Ltd. (operator), 60%; Heemskirk Consolidated Ltd., 40%]	60 km south-southeast of Charters Towers, QLD	6,400
Do.	do.	Plutonic open pit/underground gold mine (Barrick Gold Corp., 100%)	180 km northeast of Meekatharra, WA	8,000

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Gold—Continued:				
Mine—Continued	kilograms	Prominent Hill open pit copper-gold mine (OZ Minerals Ltd., 100%)	650 km northwest of Adelaide, SA	2,200
Do.	do.	Ravenswood open pit mine (includes Nolans, Sarsfield, and Mount Wright) (Resolute Mining Ltd., 100%)	100 km south of Townsville, QLD	3,000
Do.	do.	Ridgeway underground gold-copper mine (Newcrest Mining Ltd., 100%)	25 km south of Orange, NSW	10,800
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine (OZ Minerals Ltd., 100%)	35 km north of Queenstown, TAS	1,000
Do.		Saint Ives open pit/underground gold mine (Gold Fields Ltd., 100%)	75 km south-southeast of Kalgoorlie, WA	15,000
Do.	do.	Selwyn underground copper-gold mine (Barrick Gold Corp., 100%)	160 km southeast of Mount Isa, QLD	700
Do.	do.	Stawell underground gold mine (Perseverance Corp. Ltd., 100%)	250 km west of Melbourne, VIC	3,000
Do.	do.	Sunrise Dam open pit mine gold (includes Cleo) (AngloGold Ashanti Ltd., 100%)	55 km south of Laverton, WA	15,000
Do.	do.	Super Pit open pit gold mine (includes Fimiston) [Kalgoorlie Consolidated Gold Mines Pty. Ltd., manager (Barrick Gold Corp., 50%, and Newmont Mining Corp., 50%)]	Southeast corner of the Kalgoorlie-Boulder Township, WA	25,000
Do.	do.	Tanami open pit gold mine (includes Central Desert Joint Venture) (Newmont Gold Corp., 100%)	650 km northwest of Alice Springs, NT	15,000
Do.	do.	Telfer copper and gold mine (Newcrest Mining Ltd., 100%)	400 km east southeast of Port Hedland, WA	15,000
Do.	do.	Thunderbox gold mine (Lionore Mining International Ltd., 100%)	90 km northeast of Leonora, WA	5,000
Do.	do.	Trident gold mine (Avoca Resources Ltd., 100%)	Higginsville, WA	5,000
Do.	do.	Wiluna open pit/underground gold mine (Apex Minerals NL, 100%)	7 km south of Wiluna, WA	3,300
Smelter	do.	Kalgoorlie Consolidated Gold Mines Pty. Ltd., 100%	Gidji Roaster gold smelter, Kalgoorlie, WA	24,300
Refinery	do.	Perth Refinery [AGR Management Services Ltd. (Australian Gold Alliance Pty Ltd., 40%; Western Australian Mint, 40%; and Johnson Matthey (Australian) Ltd., 20%)]	Newburn, WA	300,000
Gypsum		Gypsum Resources Australia Pty. Ltd., 100%	Lake MacDonnell open pit gypsum mine, near Point Thevenard, SA	1,400
Do.		Dampier Salt Ltd., 100%	Lake MacLeod salt and gypsum solar	900
Iron and steel:				
Iron ore		Channar open pit iron ore mine [Hamersley Iron Pty. Ltd., 60% (Rio Tinto Ltd., 100%) and China Iron and Steel Industry & Trade Group Corp. (SINOSTEEL) (a China state-owned company), 40%]	70 km south of Tom Price, WA	11,000
Do.		Cockatoo Island open pit iron ore mine (BHP Billiton Ltd., 100%)	130 km north northeast of Derby, WA	1,500
Do.		Eastern Range open pit iron ore mine [Hamersley Iron Pty. Ltd., 54% (Rio Tinto Ltd., 100%), and Shanghai Baosteel Group Corp., 46%]	10 km east of Paraburdoo, WA	10,000
Do.		Hamersley Operations (includes Brockman No. 2, Marandoo, Mount Tom Price, Nammuldi, Paraburdoo, and Yandicoogina open pit iron ore mines) [Hamersley Iron Pty. Ltd., 100% (Rio Tinto Ltd., 100%)]	30 km to 85 km northeast, northwest, and south of Tom Price, WA	90,000
Do.		Hope Downs Mine [Hope Downs Iron Ore Pty Ltd. (Hancock Prospecting Pty Ltd. 100%), 50% and Rio Tinto Ltd., 50%]	75 km northwest of Newman, WA	30,000
Do.		Jimblebar open pit iron ore mine {[BHP Iron Ore (Jimblebar), 85% (BHP Billiton Ltd., 100%)]; [Mitsui Itochu Iron Pty Ltd., 10% (Mitsui & Co. (Australia) Ltd. 100%)]; [CI Minerals Australia Pty Ltd., 5% (Itochu Corp., 100%)]}	40 km east of Newman, WA	8,000
Do.		Koolyanobbing Central open pit iron ore mine (Portman Ltd., 100%)	50 km north-northeast of Southern Cross, WA	6,000
Do.		Mount Goldsworthy mining associates joint venture (includes Area C, Goldsworthy, and Nimingarra) (BHP Billiton Minerals Pty Ltd., 85%, manager; ITOCHU Minerals & Energy of Australia Pty Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%)	180 km east of Port Hedland, WA	42,000
Do.		Mount Gould open pit iron ore mine (Unimin Australia Ltd., 100%)	160 km west of Meekatharra, WA	6,000
Do.		Mount Newman open pit iron ore mine (includes Mount Whaleback, Orebody 23-25, Orebody 29, and Orebody 30-35) [BHP Billiton Minerals Pty Ltd., 85% (BHP Billiton Ltd., 100%); Mitsui Itochu Iron Pty Ltd., 10% (Mitsui & Co. (Australia) Ltd., 100%); CI Minerals Australia Pty Ltd., 5% (Itochu Corp., 100%)]	Within 13 km of Newman, WA	30,000
Do.		Pannawonica (includes Mesa J) open pit iron ore mine [Robe River Iron Associates, manager (Rio Tinto Ltd., 53%; Mitsui & Co. (Australia) Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; Sumitomo Metal Australia Pty. Ltd., 3.5%]	130 km south-southwest of Dampier, WA	32,000

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Iron and steel—Continued:			
Iron ore—Continued	Cloudbreak iron ore mine (includes Chicester Range, Christmas Creek, WhiteKnight, Mount Lewin, Mount Nicholas, and Flinders) (Fortescue Metals Group Ltd., 100%)	Chichester Ranges, East Pilbara, WA	55,000
Do.	Savage River open pit iron ore mine (Stemcor Holdings Ltd., 100%)	100 km southwest of Burnie, TAS	2,400
Do.	Whyalla open pit iron ore mines (OneSteel Ltd., 100%)	270 km northwest of Adelaide, SA	2,600
Do.	Yandi open pit iron ore mine (BHP Billiton Minerals Pty Ltd., 85%, manager; ITOCHU Minerals & Energy of Australia Pty Ltd., 8%; Mitsui Iron Ore Corp. Pty. Ltd., 7%)	92 km north of Newman, WA	42,000
Pig iron	Hismelt pig iron plant [Hismelt Corp. Pty Ltd. (Rio Tinto Ltd., 60%; Nucor Corp., 25%; Mitsubishi Corp., 10%; and Shougang Corp., 5%)]	Kwinana, WA	800
Steel	OneSteel Whyalla steelworks (OneSteel Ltd., 100%)	Whyalla, SA	1,200
Do.	Port Kembla steelworks (Blue Scope Steel Ltd., 100%)	Port Kembla, NSW	5,000
Do.	Smorgon Steel Group Ltd.	Laverton, Melbourne, VIC	700
Do.	do.	Waratch, NSW	285
Kaolin	Axedale Clays open pit kaolin mine (E Clay Pty Ltd., 100%)	18 km east of Bendigo, VIC	50
Do.	Pittong open pit kaolin mine (Imerys Minerals Australia Pty Ltd., 100%)	35 km southwest of Ballarat, VIC	110
Do.	Skardon River open pit kaolin mine (Queensland Kaolin Pty. Ltd., 96.6%, and private, 3.4%)	85 km north of Weipa, QLD	150
Lead:			
Mine, lead content	Broken Hill underground silver-zinc-lead mine (Perilya Ltd., 100%)	Broken Hill, NSW	90
Do.	Cannington underground silver-lead-zinc mine (BHP Billiton Ltd., 100%)	85 km southwest of McKinlay, QLD	265
Do.	Century open pit zinc-silver-lead mine (Zinifex Ltd., 100%)	250 km north of Mount Isa, QLD	90
Do.	Endeavor underground zinc-silver-lead mine (CBH Resources Ltd., 100%)	40 km northwest of Cobar, NSW	45
Do.	Hellyer underground zinc-lead-copper-silver mine (Intec Ltd., 50%, and Polymetals Mining Services Pty Ltd., 50%)	80 km south-southwest of Burnie, TAS	44
Do.	Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton Mines) (Xstrata plc, 100%)	Mount Isa, QLD	150
Do.	Rosebery underground zinc-lead-silver-copper-gold mine (OZ Minerals Ltd., 100%)	5 km north of Queenstown, TAS	25
Smelter	Mount Isa smelter (Xstrata plc, 100%)	Mount Isa, QLD	240
Do.	Port Pirie smelter (Nyrstar Corp., 100%)	5 km north of Queenstown, TAS	235
Magnesite	Kunwarara open pit magnesite mine (includes Marlborough) (private interest, 100%)	70 km northwest of Rockhampton, QLD	3,000
Manganese:			
Mine, concentrate	Bootu Creek open pit manganese mine (OM Holding Ltd., 100%)	110 km north of Tennant Creek, NT	600
Do.	Groote Eylandt open pit manganese mine [Groote Eylandt Mining Co., operator (BHP Billiton Ltd., 60%, and Anglo American Corp., 40%)]	Groote Eylandt, NT	3,100
Do.	Woodie Woodie open pit manganese mine (includes Bells and East Pilbara leases) [Pilbara Manganese Pty Ltd., operator (Consolidated Minerals Ltd., 100%)]	400 southeast of Port Hedland, WA	1,000
Alloys	Bell Bay Smelter [Tasmanian Electro Metallurgical Co. Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Bell Bay, TAS	250
Mineral sands	Eneabba open pit heavy-mineral sands mine (Iluka Resources Ltd., 100%)	260 km north of Perth, WA	NA
Do.	Hawks Nest heavy-mineral sands dredge (Mineral Deposits Ltd., 100%)	50 km northeast of Newcastle, NSW	NA
Do.	Jangardup heavy-mineral sands dredge (Cable Sands (WA) Pty. Ltd., 100%)	50 km south of Nannup, WA	NA
Do.	North Capel open pit heavy-mineral sands mine (Iluka Resources Ltd., 100%)	7 km north of Capel, WA	NA
Do.	North Stradbroke Island heavy-mineral sands dredge (Stradbroke Rutile Pty. Ltd., 100%)	35 km east of Brisbane, QLD	NA
Do.	Tiwest Joint Venture heavy-mineral sands dredge (KMCC Western Australia Pty. Ltd., 50%, and Ticor Resources Pty. Ltd., 50%)	180 km north of Perth, WA	NA
Do.	Wemen heavy-mineral sands dredge (Murray Basin Titanium Pty. Ltd., 100%)	80 km southeast of Mildura, VIC	NA

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Molybdenum metric tons	Wolfram Camp molybdenum-tungsten mine (Queensland Ore Ltd., 85%, and private, 15%)	85 km west of Caims, QLD	120
Nickel:			
Mine, Ni content	Avebury nickel mine (includes Bison, North Avebury, Saxon, and West Viking) (OZ Minerals Ltd., 100%)	Near Zeehan, TAS	7
Do.	Black Swan underground nickel mine (includes Silver Swan) (Norilsk Nickel Mining and Metallurgical Co., 100%)	53 km northeast of Kalgoorlie, WA	10
Do.	Carnilya Hill open pit mine (Mincor Resources NL, 70%, and View Resources Ltd., 30%)	25 km northeast of Kambalda, WA	5
Do.	Cawse open pit nickel-cobalt mine (Norilsk Nickel Mining and Metallurgical Co., 100%)	50 km northeast of Kalgoorlie, WA	9
Do.	Cosmos open pit nickel mine (Xstrata plc, 100%)	50 km north of Leinster, WA	13
Do.	Flying Fox underground mine (Western Areas NL , 100%)	108 km south of Marvel Loch, WA	10
Do.	Kambalda underground nickel mines (Palmary Enterprises Ltd., 100%)	5 km south of Kambalda, WA	35
Do.	Lake Johnson underground nickel mine (includes Maggie Hays, Maggie Hays Lake and Emily Ann) (Norilsk Nickel Mining and Metallurgical Co., 100%)	130 km west of Norseman, WA	12
Do.	Lanfranchi underground mine (includes Deacon, Schmitz, Tramway, and Winner) (Panoramic Resources Ltd., 100%)	42 km south of Kambalda, WA	10
Do.	Leinster open pit/underground nickel mines (BHP Billiton Ltd., 100%)	10 km north of Leinster, WA	44
Do.	Long underground mine (Independence Group NL, 100%)	Near Kambalda East, WA	10
Do.	Miitel underground nickel mine (includes Redross and Mariners) (Mincor Resources NL, 100%)	70 km south of Kambalda, WA	10
Do.	Mount Keith open pit nickel mine (includes Cliffs and Yakabindie) (BHP Billiton Ltd., 100%)	70 km south-southeast of Wiluna, WA	40
Do.	Murrin Murrin open pit nickel-cobalt mine (Minara Resources Ltd., 60%, and Glencore International AG, 40%)	60 km east of Leonora, WA	100
Do.	Radio Hill underground nickel-cobalt mine (Fox Resources Ltd., 100%)	35 km south of Karratha, WA	4
Do.	Ravensthorpe open pit mine (BHP Billiton Ltd., 100%)	155 km west of Esperance, WA	50
Do.	Savannah underground mine (Panoramic Resources Ltd., 100%)	120 km north of Halls Creek, WA	8
Do.	Waterloo underground nickel mine (includes Amorac) (Norilsk Nickel Mining and Metallurgical Co., 100%)	90 km north of Leonora, WA	5
Smelter	Kalgoorlie nickel smelter (BHP Billiton Ltd., 100%)	Kalgoorlie, WA	100
Refinery	Kwinana nickel refinery (BHP Billiton Ltd., 100%)	Kwinana, WA	67
Do.	Murrin Murrin nickel refinery (Minara Resources Ltd., 60%, and Glencore International AG, 40%)	Murrin Murrin, WA	45
Do.	Yabulu nickel-cobalt refinery (BHP Billiton Ltd., 100%)	Townsville, QLD	78
Opal	Many small producers	Andamooka and Coober Pedy areas, SA; Lightning Ridge area, NSW	NA
Petroleum thousand 42-gallon barrels per day	Exxon Mobil Corp., 100%	Altona Refinery, VIC	120
Do. do.	Bulwer Island Refinery [BP Amoco Refinery (Bulwer Island) Pty. Ltd., 100%]	Bulwer Island, QLD	69.3
Do. do.	Clyde Refinery [Shell Refining (Australia) Pty. Ltd., 100%]	Clyde, NSW	85
Do. do.	Geelong Refinery [Shell Refining (Australia) Pty. Ltd., 100%]	Geelong, VIC	110
Do. do.	Kurnell Refinery (Caltex Australia Ltd., 100%)	Kurnell, NSW	114
Do. do.	Kwinana Refinery [BP Amoco Refinery (Kwinana) Pty. Ltd., 100%]	Kwinana, WA	138
Do. do.	Lytton Refinery (Caltex Australia Ltd., 100%)	Lytton, QLD	106
Do. do.	Port Stanvac Refinery (Exxon Mobil Corp., 100%)	Port Stanvac, SA	69
Phosphate rock	Phosphate Hill-Duchess open pit phosphate mine (Incitec Pivot Ltd., 100%)	140 km northwest of Mount Isa, QLD	2,200
Salt	Dampier solar evaporation salt pans (Dampier Salt Ltd., 100%)	Near Dampier, WA	4,000
Do.	Lake MacLeod solar salt and gypsum evaporation pans (Dampier Salt Ltd., 100%)	65 km north of Carnarvon, WA	900
Do.	Port Hedland solar salt fields (Dampier Salt Ltd., 100%)	Port Hedland, WA	3,000

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity		Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Silica		Itochu Corp., 50%, and Tochu Corp., 50%	Kemerton silica sands dredge, 25 km northeast of Bunbury, WA	450
Silver:				
Mine, kilograms Ag content		Broken Hill underground silver-zinc-lead mine (Perilya Ltd., 100%)	Broken Hill, NSW	81,200
Do.	do.	Cannington underground silver-lead-zinc mine (BHP Billiton Ltd., 100%)	85 km southwest of McKinlay, QLD	700,000
Do.	do.	Century open pit zinc-silver-lead mine (OZ Minerals Ltd., 100%)	250 km north of Mount Isa, QLD	3,000
Do.	do.	Pasminco Ltd., 100%	Cockle Creek silver smelter, NSW	85,000
Do.	do.	Endeavor underground zinc-silver-lead mine (CBH Resources Ltd., 100%)	40 km northwest of Cobar, NSW	35,000
Do.	do.	Hellyer underground zinc-lead-copper-silver mine (Intec Ltd., 50%, and Polymetals Mining Services Pty Ltd., 50%)	80 km south-southwest of Burnie, TAS	60,000
Do.	do.	Henty underground gold-silver mine (Barrick Gold Ltd., 100%)	30 km north of Queenstown, TAS	1,100
Do.	do.	Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton Mines) (Xstrata plc, 100%)	Mount Isa, QLD	375,000
Do.	do.	Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	27,000
Do.	do.	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), (GoldCorp Inc., 100%)	8 km south of Cobar, NSW	6,000
Do.	do.	Rosebery underground zinc-lead-silver-copper-gold mine (OZ Minerals Ltd., 100%)	5 km north of Queenstown, TAS	35,000
Smelter	do.	Port Pirie smelter (Nyrstar Corp., 100%)	5 km north of Queenstown, TAS	450,000
Refinery	do.	Perth Refinery [AGR Management Services Ltd. (Australian Gold Alliance Pty Ltd., 40%; Western Australian Mint, 40%; and Johnson Matthey (Australian) Ltd., 20%]	Newburn, WA	81,000
Spodumene		Greenbushes open pit/underground tantalite-spodumene mine (Talison Minerals Pty Ltd., 100%)	70 km southeast of Bunbury, WA	150
Talc		Three Springs open pit talc mine (Rio Tinto Ltd., 100%)	330 km north of Perth, WA	150
Tantalum, metric tons tantalite, Ta_2O_5		Greenbushes open pit/underground tantalite-spodumene mine (Talison Minerals Pty Ltd., 100%)	70 km southeast of Bunbury, WA[3]	550
Do.	do.	Bald Hill tantalite mine (Haddington Resources Ltd., 100%)	60 km southeast of Kambalda, WA[3]	100
Do.	do.	Wodgina open pit tantalite mine (Talison Minerals Pty Ltd., 100%)	70 km southeast of Bunbury, WA[3]	250
Tin:				
Mine, Sn content	do.	Collingwood underground tin mine (Metals X Ltd., 100%)	35 km south of Cooktown, QLD	3,000
Do.	do.	Greenbushes open pit/underground tantalite-spodumene mine (Talison Minerals Pty Ltd., 100%)	70 km southeast of Bunbury, WA[3]	1,000
Do.	do.	Renison Bell underground tin mine (Metals X Ltd., 100%)	136 km south of Burnie, TAS[3]	4,000
Smelter	do.	Greenbushes Smelter (Talison Minerals Pty Ltd., 100%)	70 km southeast of Bunbury, WA	1,000
Tungsten, W content	do.	Kara magnetite and scheelite mine (Itochu Corp., 50%, and Tasmania Mines Ltd., 50%)	30 km south of Burnie, TAS	50
Do.	do.	Wolfram Camp molybdenum-tungsten mine (Queensland Ore Ltd., 85%, and private, 15%)	85 km west of Cairns, QLD	500
Uranium, U_3O_8 content	do.	Beverley in situ leach uranium operation (Heathgate Resources Pty. Ltd., 100%)	300 km northeast of Port Augusta, SA	1,000
Do.	do.	Olympic Dam underground copper-silver-gold-uranium mine [Olympic Dam Operations Pty. Ltd., operator (BHP Billiton Ltd., 100%)]	Roxby Downs, 80 km north of Woomera, SA	4,400
Do.	do.	Ranger open pit uranium mine (Energy Resources of Australia Ltd., 100%)	230 km east of Darwin, NT	5,000
Vanadium, V_2O_5	do.	Windimurra open pit mine vanadium (Precious Metals Australia Ltd., 90%, and Noble Group Ltd., 10%)	100 km east-southeast of Mount Magnet, WA	8

See footnotes at end of table.

TABLE 2—Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2008

(Thousand metric tons unless otherwise specified)

Commodity	Facilities, major operating companies, and major equity owners	Location of main facilities[1, 2]	Annual capacity[e]
Zinc:			
Mine, Zn content	Broken Hill underground silver-zinc-lead mine (Shenzhen Zhongjin Lingnan Nonfemet Co. Ltd., 50.1%, and Perilya Ltd., 49.9%)	Broken Hill, NSW	360
Do.	Cannington underground silver-lead-zinc mine (BHP Billiton Ltd., 100%)	85 km southwest of McKinlay, QLD	100
Do.	Century open pit zinc-silver-lead mine (OZ Minerals Ltd., 100%)	250 km north of Mount Isa, QLD	500
Do.	Endeavor underground zinc-silver-lead mine (CBH Resources Ltd., 100%)	40 km northwest of Cobar, NSW	125
Do.	Golden Grove underground zinc-copper mine (OZ Minerals Ltd., 100%)	225 km east of Geraldton, WA	150
Do.	Hellyer underground zinc-lead-copper-silver mine (Intec Ltd., 50%, and Polymetals Mining Services Pty Ltd., 50%)	80 km south-southwest of Burnie, TAS	130
Do.	Jaguar underground mine (Jabiru Metals Ltd., 100%)	250 km north of Kalgoorlie, WA	420
Do.	McArthur River open pit mine [McArthur River Mining Pty Ltd., operator (Xstrata plc, 100%)]	60 km southwest of Borroloola, NT	143
Do.	Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton Mines) (Xstrata plc, 100%)	Mount Isa, QLD	175
Do.	Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), (GoldCorp Inc., 100%)	8 km south of Cobar, NSW	8
Do.	Rosebery underground zinc-lead-silver-copper-gold mine (OZ Minerals Ltd., 100%)	35 km north of Queenstown, TAS	100
Smelter	Port Pirie smelter (Nyrstar Corp., 100%)	5 km north of Queenstown, TAS	45
Do.	Hobart smelter (OZ Minerals Ltd., 100%)	Hobart, TAS	320
Refinery	Sun Metals zinc refinery [Sun Metals Corp. Pty. Ltd., operator (Korea Zinc Co., 100%)]	Townsville, QLD	170

[e]Estimated; estimated data are rounded to no more than three significant digits. Do., do. Ditto. NA Not available.
[1]Abbreviations for States and Territories in this table include the following: NSW—New South Wales; NT—Northern Territory; QLD—Queensland; SA—South Australia; TAS—Tasmania; VIC—Victoria; WA—Western Australia.
[2]Abbreviation(s) used for unit(s) of measure in this table include the following: km—kilometer.
[3]Care and maintenance; expansion project development decision pending.

TABLE 3
AUSTRALIA: RESERVES OF MAJOR MINERAL COMMODITIES IN 2008

Commodity		Reserves[1]
Antinomy, Sb content	thousand metric tons	136
Bauxite	million metric tons	6,200
Cadmium, Cd content	thousand metric tons	61
Coal:		
Black:		
In situ	billion metric tons	56
Recoverable	do.	39
Brown:		
In situ	do.	44
Recoverable	do.	37
Cobalt, Co content	thousand metric tons	1,500
Copper, Cu content	million metric tons	78
Diamond:		
Gem and near gem	million carats	92
Industrial	do.	96
Gold, Au content	metric tons	6,260
Iron ore	billion metric tons	24
Lead, Pb content	million metric tons	27
Lithium, Li content	thousand metric tons	584
Magnesite ($MgCO_3$ content)	million metric tons	344
Manganese ore	do.	181
Mineral sands:		
Ilmenite	do.	212
Rutile	do.	23
Zircon	do.	39
Molybdenum, Mo content	thousand metric tons	225
Nickel, Ni content	million metric tons	26
Niobium (columbium) and tantalum:		
Niobium (columbium), Nb content	thousand metric tons	115
Tantalum, Ta content	do.	51
Petroleum, recoverable:		
Condensate	million barrels	2,750
Crude	do.	1,430
Liquefied petroleum gas	do.	1,470
Natural gas	billion cubic meters	4,650
Platinum-group metals (Pd, Pt)	metric tons	19
Rare earths (REO plus Y_2O_3)	thousand metric tons	1,650
Silver, Ag content	do.	61
Tin, Sn content	do.	145
Tungsten, W content	do.	111
Uranium, U content	do.	1,160
Vanadium	do.	1,750
Zinc	million metric tons	53

do. Ditto.
[1]Economic Demonstrated Resources.

Source: Geoscience Australia, 2009, Australia's identified mineral resources 2009: Canberra, Australia, Geoscience Australia, p. 5. (Data have been rounded to no more than three significant digits.)