



2006 Minerals Yearbook

AUSTRALIA

THE MINERAL INDUSTRY OF AUSTRALIA

By Pui-Kwan Tse

Owing to its large mineral resources, Australia was one of the world's leading mineral producing countries. The country ranked among the top 10 countries worldwide in the production of bauxite, coal, cobalt, copper, gem and near-gem diamond, gold, iron ore, lithium, manganese ore, niobium, and uranium. Reflecting an increase in world demand for mineral resources, the Australian economy grew at a rate of 2.9% during fiscal year 2005-06 (July 1, 2005, to June 30, 2006). Owing to anticipated higher prices of mineral commodities in the world markets, the Australian economy was expected to continue to expand during the next 2 years. In fiscal year 2005-06, Australian total mineral exploration spending, excluding petroleum, increased by 20.6% to \$930.5 million (A\$1,240.7 million). Total petroleum exploration (onshore and offshore) spending was \$946.5 million (A\$1,262.0 million). In 2006, total exploration (including petroleum exploration) spending was \$2,367 million (A\$3,156.5 million). The percentage of spending on gold exploration decreased to 32% of the total exploration expenditure because of increased spending on base metals, coal, iron ore, mineral sands, and uranium. The State of Western Australia remained the leading destination for exploration and accounted for 46% of the total exploration expenditure. As a result of the increased spending on exploration, significant mineral resources were discovered, including the Gullivers mineral sand deposit in the State of South Australia, the Saxon nickel deposit in the State of Tasmania, the Tekapo copper-gold deposit in Northern Territory, the Tandarra gold deposit in the State of Victoria, and the Rocklands copper deposit and the Swan copper-gold-uranium deposit in the State of Queensland (Australian Bureau of Statistics, 2007, p. 7, 61).

Minerals in the National Economy

Australia was one of leading mineral producing countries in the world. The mining sector contributed more than \$45 billion or about 8% of the country's gross domestic product. The mining sector employed 127,500 people who worked directly in mining and, in addition, about 200,000 people 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 during the next several years (Minerals Council of Australia, 2007, p. 2).

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.

During the past decade, Australia's total exploration expenditure was less than that of any other individual country in Africa or Latin America. In 2005-06, private companies invested more than \$930.5 million in mineral exploration in Australia, of which only 37% was for exploring for "new deposits" and 63% was for exploring existing deposits. As a result, the country's inventory of mineral resources was in decline. One cause of the decline in exploration in Australia relative to some other countries was that many startup mining companies had little income against which they could deduct exploration costs. To assist these startup companies, the Australian Government introduced a flow-through shares scheme for junior explorers. The flow-through shares scheme enables individual exploration companies to transfer tax deductions to individual investors. The Government also added a total of \$44.2 million (A\$58.9 million) to the Geoscience Australia budget during the next 4 years to provide geoscientific information for explorers (Geoscience Australia, 2007a).

In 2006, the Government introduced two pieces of legislation to amend the Aboriginal Land Rights (Northern Territory) Act and the Native Title Act. More than 60% of Australian mining operations have neighboring indigenous communities. The Native Title Act was established to facilitate the development of mutually beneficial land-use agreements between the mining operations and indigenous communities while protecting indigenous rights and interests. The Aboriginal Land Rights (Northern Territory) Amendment Act 2006 maintains the inalienability of land claims under the Aboriginal Land Rights (Northern Territory) Act as well as the traditional owner's right to withhold consent to exploration companies. The amended Act, however, sets new policy by delegating most Commonwealth ministerial powers related to mining to the Northern Territory government and provides measures to improve the accountability of royalty associations in receiving and distributing money (Minerals Council of Australia, 2007, p. 26-27).

Production

Australia continued to be one of the world's leading countries in the mined production of such commodities as bauxite, coal, cobalt, copper, gem and near-gem diamond, gold, iron ore, lithium, manganese ore, niobium, 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. Australia was one the leading exporting countries of alumina, coal, iron ore, and uranium in the world. About one-half of Australia's major energy fuel and mineral commodities reported production increases in 2006. Commodities that had significant increases in production were bauxite, chromium, cobalt, iron ore, kaolin, and manganese and mineral sands; those for which production decreased significantly were diamond, gold, lead, silver, and tin. Australia consumed about one-third

of the mineral commodities that it produced and exported the remainder (table 1).

Structure of the Mineral Industry

The Australian mineral industry was a free enterprise in which private companies were involved in exploration, mine development, mineral production, mineral processing, and marketing. A number of Australian mineral companies were affiliates or subsidiaries of European and United States companies and 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 was 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 was 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. The individual State and Territory government administered the mineral industries within their own borders, which included registering land titles; issuing exploration and development permits; conducting inspections and assuring compliance with health, safety, and environmental regulations; and levying royalties and taxes. The Commonwealth may restrict mineral exports for the good of the country and, therefore, had de facto control over most mineral production (Australia Bureau of Agricultural and Resources Economics, 2007d, p. 13-21).

Mineral Trade

Australia continued to rely heavily on the export of the majority of its mineral production to sustain the country's mineral industry development. In 2006, the value of Australia's total foreign trade was \$323.3 billion (A\$431.0 billion), of which the value of exports was \$157.0 billion (A\$209.4 billion) and the value of imports was \$166.2 billion (A\$221.6 billion). Mineral and metal exports accounted for 40.5% of the total exports. About 50%, or more than \$31.5 billion (A\$42 billion), was concentrated in the following commodity groups: iron ore, \$9.6 billion (A\$12.8 billion); oil and gas, \$9.1 billion (A\$12.1 billion); alumina and aluminum, \$7.5 billion (A\$10.1 billion); and coal, \$5.4 billion (A\$7.2 billion). Australia remained the premier exporter of alumina, coal, diamond (gem, near gem, and natural industrial), ilmenite, iron ore, mined lead, rutile, and zircon in the world (Australian Bureau of Statistics, 2007, p. 27-30).

Commodity Review

Metals

Aluminum.—Australia was the leading bauxite producing country in the world. Bauxite came from the Gove Mine in Northern Territory, the Weipa Mine in northern Queensland, and the Huntly, the Willowdale, and the Worsley Mines in Western

Australia. Australia was also the leading alumina producing country in the world. Bauxite from the Weipa Mine was shipped to alumina refineries at Gladstone, Queensland, and Sardinia, Italy. Western Australia's four alumina refineries—the Kwinana, the Pinjarra, the Wagerup, and the Worsley—produced about 12.7 million metric tons (Mt) of alumina in 2006. Australia's bauxite and alumina production was expected to increase to 67 Mt and 21 Mt, respectively, in 2009 from the 2006 level. Domestic consumption of alumina accounted for about 20% of the total production; China was the leading destination for exported Australian alumina. During the past 2 years, China expanded its alumina output capacity and, as a result, China's imports of alumina were expected to decrease in the next several years; China's bauxite imports were expected to increase, however, owing to a shortage of bauxite resources. Australia's exports of bauxite to China could increase in the future (Prospect, 2007a).

Owing to an increasing demand for alumina in recent years, Australian alumina producers planned to expand their refineries' output capacity. In 2003, Alcan Inc. of Canada proposed to invest \$2.3 billion to expand output capacity at its Gove refinery in Nhulunbuy, Northern Territory, to 3.8 million metric tons per year (Mt/yr) from 2.0 Mt/yr. Alcan submitted an environmental impact statement to the Northern Territory government. During the same period, an expansion feasibility study was undertaken. Construction of the refinery expansion began in late 2004 and was expected to be completed in 2007; the refinery was expected to be fully operational in 2008. The new design and technology (low-temperature digestion unit) was expected to improve the recovery efficiency of alumina by 10%. The Gove refinery was expected to produce 2.4 Mt of alumina in 2007. Raw material (bauxite) would be supplied from the Gove Mine, which had an average aluminum oxide content of 51% (Alcan Inc., 2007).

The Australian Environment Protection Agency recommended that the Western Australia government approve Alcoa World Alumina Australia's proposed expansion of its Wagerup alumina refinery, which was located south of Perth, and the Western Australia government approved the expansion in September 2006. The Wagerup expansion plan included a third production unit at the refinery and upgrading of the existing plant to improve efficiency and environmental compliance. The output capacity of alumina would increase to 4.7 Mt/yr from 2.6 Mt/yr. The construction of the third unit was underway in 2006 and was expected to be completed in 2008. Alcoa also upgraded the existing equipment with advanced technology and installed a new emissions control system in its Pinjarra refinery to add 660,000 metric tons per year (t/yr) of alumina production capacity. The renovation of the Pinjarra refinery was scheduled to be completed in 2006 (Alcoa Inc., 2006).

BHP Billiton Ltd. received environmental approval from the Western Australia government to expand its Worsley alumina refinery to 4.4 Mt/yr from 3.7 Mt/yr. The expansion investment was estimated to be \$90 million. A final investment decision depended on market conditions (Prospect, 2007b).

Rio Tinto Aluminium Ltd.'s (formerly Comalco Aluminium Ltd.) Yarwun alumina refinery operated at full capacity in 2006 and produced 1.2 Mt of alumina in 2006. Rio Tinto planned to

invest \$1.8 billion to expand the refinery's output capacity to 3.4 Mt/yr from 1.4 Mt/yr. Raw material would be supplied from its own bauxite mine at Weipa. The newly designed project, Yarwun 2, would reduce the refinery's air and greenhouse emissions. Flue gas desulfurization equipment would be installed on the Yarwun coal-fired boilers. As a result, total sulfur dioxide emissions would increase by only 10% despite the overall output capacity increase of 140%. The Yarwun 2 project was scheduled to be completed in 2011 (Rio Tinto Aluminium Ltd., 2007).

Aluminum Corporation of China Ltd. (Chalco) planned to develop the Aurukun bauxite resource project, which is located 10 kilometers (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 on the east coast of 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. Chalco had applied for a mineral development license (GHD Pty Ltd., 2007, p. 2-3).

Metallica Minerals Ltd.'s subsidiary, Cape Alumina Pty Ltd., had identified three bauxite deposits—Catfish 1, Catfish 2, and Wenlock—in Cape York Peninsula, Queensland. The bauxite mineralization thickness was between 5.5 meters (m) in Wenlock and 3 m in Catfish Creek, and it appeared to be a continuation of the bauxite resource on the nearby Alcan and Rio Tinto mining leases and Aurukun bauxite area. The pisolitic bauxite was from 0.25 m to 0.5 m below the surface, and the average aluminum oxide content was greater than 50%. Cape Alumina conducted a community consultation with an indigenous group in Western Cape York and negotiated for land access for exploration (Cape Alumina Pty Ltd., 2006).

Australia's primary aluminum production ranked fifth in the world after China, Russia, Canada, and the United States. Aluminum output was produced mainly from Alcan's Tomago smelter in the State of New South Wales, Alcoa's Point Henry and Portland smelters in Victoria, Hydro Aluminium Kurri Kurri Pty. Ltd.'s Kurri Kurri smelter in New South Wales, and Rio Tinto Aluminium Ltd.'s Bell Bay smelter in Tasmania and the Boyne Island smelter in Queensland (table 2).

Copper.—Australia's copper resources are found largely at Olympic Dam in South Australia and Mount Isa in Queensland. Other important copper resources are at the Northparks and CSA 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 fifth in the world behind Chile, the United States, Peru, and Indonesia. As a result of lower production from Ernest Henry and Olympic Dam, Australia's mined copper production declined in 2006 compared with that of 2005. Australia's mined copper production was expected to increase during the next 2 years because a number of new projects would be commissioned (Xstrata plc, 2007, p. 103).

In 2006, owing to a decline in output from the Olympic Dam and the Townsville refineries, production of refined copper decreased compared with that of 2005. Refined copper

production could increase in 2007 and 2008 if the expansion of the Townsville refinery is completed and the commencement of solvent-extraction and electrowinning production from the Brown's Oxide, Lady Annie, and Leichhardt operations materializes. In 2005, Australia consumed about 158,000 metric tons (t) of copper metal and exported most of its output to Asian countries (Australia Bureau of Agricultural and Resources Economics, 2007d).

Xstrata had two copper mine operations—Ernest Henry and Mount Isa in Queensland. Mount Isa is an underground mining complex and Ernest Henry is an open-cut mine. Most of the copper-gold concentrate from the Ernest Henry was trucked to Mount Isa for smelting. The copper anode from the Mount Isa smelter was refined at Xstrata's Townsville refinery. Xstrata also recovered copper by leaching about 2,500 t/yr of electrostatic precipitator dust from the Mount Isa copper smelter. Xstrata planned to expand the smelter's copper anode output capacity to 300,000 t/yr through technical renovation in 2007. Xstrata completed underground drillings at Ernest Henry and discovered an ore body at a depth of about 900 m that had copper and gold grades consistent with the mine's average grade of copper and gold at the surface (Xstrata plc, 2007, p. 77).

CopperCo Ltd.'s Lady Annie copper deposit is located 137 km northwest of Mount Isa, Queensland. The company completed a feasibility study and applied for a mining lease, which was expected to be granted in 2007. The copper oxide ore was located near the surface with copper resources of about 11.3 Mt at an average grade of 1.0% copper. The company planned to start mining in June 2007 and to process the ore through a solvent extraction and electrowinning process on site. Initial copper production was planned at 19,000 t in 2007 and would increase to 25,000 t in 2008 and 30,000 t in 2009, depending on further exploration. Drilling would continue at a depth of 100 m below the surface in 2007, and the company expected to find copper sulfide ore lying below 100 m (CopperCo. Ltd., 2007).

Compass Resources NL submitted a proposal for the development of an open cut mine at the Brown's deposit near Batchelor, Northern Territory, to the Northern Territory government. The Brown's Oxide project was designed to have a plant to produce 10,000 t/yr of copper, 1,000 t/yr of cobalt, and 750 t/yr of nickel through a heap-leaching process. Copper would be recovered using the resin-in-pulp metal scavenging process and then copper cathode would be produced using the solvent extraction and electrowinning process. The cobalt and nickel would be recovered by elution of the cobalt and nickel, and sodium carbonate would be added to the precipitate as cobalt-nickel carbonate. Copper production was scheduled in early 2008 (Compass Resources NL, 2007).

BHP Billiton Ltd. proposed to the South Australian government an expansion of its mining and processing operations at Olympic Dam to approximately 600,000 t/yr of copper from about 200,000 t/yr. BHP Billiton planned to prepare an environmental impact statement (EIS) on the expansion proposal and would present it to the public for comment. After the consultation, the company would submit the EIS to the State and Federal Governments for approval. A 300- to 400-megawatt powerplant would be built to support the proposed expansion (BHP Billiton Ltd., 2007d).

Gold.—Australia's gold mine output ranked third in the world after the Republic of South Africa and the United States. The country's gold resources occur and are mined in all States and in the Northern Territory, and much of the gold was produced from large open pit mines. The lower mined gold production in 2006 was attributed to bottlenecks at eastern seaboard ports, delayed project-approval procedures, and rising labor and input costs. 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 (Australian, The, 2007c).

Ballarat Goldfields NL completed the feasibility study to develop the \$90 million Ballarat East project, which is located in Ballarat, Victoria. Ballarat East had reserves of 14.6 Mt of ore at an average grade of 11 grams per metric ton (g/t) gold. According to the feasibility study, the underground mine and processing plant were designed to produce 7.78 t/yr [250,000 ounces per year (oz/yr)] of gold and were expected to begin operation in the second half of 2008 for 20 years. In October 2006, Lihir Gold Ltd. took over Ballarat Goldfields and received approval from the government of the State of Victoria to develop and operate the Ballarat East project (Lihir Gold Ltd., 2007).

Crescent Gold Ltd.'s Laverton gold project is located 250 km northeast of Kalgoorlie in Western Australia. In 2006, the company completed the construction of a production plant and was scheduled to put it into operation in February 2007. The low-grade ore stockpile contained 12.4 t (400,000 oz) of gold and the company planned to produce 2.8 t/yr of gold for 5 years. Crescent Gold continued to drill in the area and, as a result, the company reported indicated resources of about 20 Mt of ore at an average grade of 1.5 g/t gold and an inferred resource of 10.4 Mt at a grade 1.4 g/t gold at West Laverton (Crescent Gold Ltd., 2007).

AngloGold Ashanti Ltd. had two gold operations—Boddington and Sunrise Dam—in Western Australia. The Sunrise Dam Mine is located 220 km northeast of Kalgoorlie and 55 km south of Laverton. The mine comprised open pit and underground operations. In 2006, the Sunrise Dam Mine produced 14.5 t (465,000 oz) of gold. The company planned to expand the underground operation with the development of two declines totaling 9 km in length in the vicinity of previously defined reserves. The mineralization of the underground reserve was complex, varying in orientation, width, and grade. The company planned to make a decision on whether to proceed to full-scale underground mining in early 2007 to extend the life of the operation to 2012. The Boddington operation is located approximately 100 km southeast of Perth. The open pit operation closed in 2001. AngloGold Ashanti held a 33.33% share and Newmont Mining Corp. had a 66.67% share in the Boddington project. The government of the State of Western Australia approved the Boddington expansion plan. The company planned to produce from 10.0 t to 10.9 t (320,000 to 350,000 oz/yr) during the first 5 years. The construction of the underground mine was underway in 2006 and was expected to be completed in late 2008 or early 2009 (AngloGold Ashanti Ltd., 2007, p. 58-60).

Iron and Steel.—Australia's iron ore output ranked second (in terms of iron content) in the world after Brazil. 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. Since 2003, negotiated benchmark iron ore prices have more than doubled. High prices and 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. Australia's most significant iron ore mines are located in the Pilbara region of Western Australia, which accounts for 98% of the country's total iron ore production. Mines operated by Rio Tinto and BHP Billiton dominated the Pilbara area's output and accounted for about 94% of Australia's total production. In 2006, Australia's iron ore and pellet exports increased to 247 Mt, which was an increase of 3.4% compared with that of 2005. Australia's iron ore production was expected to increase to about 287 Mt in 2007 and to 310 Mt in 2008, and iron ore and pellets exports were expected to continue to rise in the near future owing to increased demand for iron ore in Asian countries (Australia Bureau of Agricultural and Resources Economics, 2007c, p. 5).

Hamersley Iron Pty. Ltd., which is a wholly owned subsidiary of Rio Tinto plc, operated eight iron ore mines—Brockman, Channar, Eastern Range, Marandoo, Mount Tom Price, Nammuldi, Paraburdoo, and Yandicoogina near Perth, Western Australia. The Channar Mine was a joint venture between Hamersley (60%) and a subsidiary of China Iron and Steel Industry and Trade Group Corp (40%), and the Eastern Range Mine was a joint venture between Hamersley (54%) and Shanghai Baosteel Group Corp. (46%). Other iron ore mines were fully owned by Hamersley. In 2003, Rio Tinto approved a \$685 million expansion of the iron ore handling capacity at Dampier Port to 116 Mt/yr from 74 Mt/yr in phase A, and then to 140 Mt/yr in phase B. The phase B expansion was scheduled to be completed by the end of 2007. Rio Tinto also approved \$860 million for the expansion of the iron ore handling capacity at Cape Lambert Port, of which Rio Tinto held a 53% share, to 80 Mt/yr from 55 Mt/yr. The port expansion was projected to be completed by the end of 2008 and would be fully operational in the first half of 2009. The \$290 million brownfield mines-expansion project, which would increase the total output capacity of the Marandoo, the Nammuldi, and the Mount Tom Price Mines (combined) by 15 Mt/yr, was scheduled to be completed in early 2007. In October 2005, Rio Tinto had approved \$520 million to expand the iron ore output capacity to 52 Mt/yr from 36 Mt/yr at the Yandicoogina Mine. That expansion was scheduled to be completed in the third quarter of 2007 (Rio Tinto plc, 2007, p. 13).

In April 2006, Rio Tinto approved \$1 billion for the development of Hope Downs iron ore project, which was a joint venture between Hancock Prospecting Pty Ltd. and Rio Tinto. The Hope Downs project is located 75 km northwest of Newman in Western Australia. The \$1 billion project included the development of the iron mine and a 58-km Lang Hancock railway between the mine and the Rio Tinto existing railway and port infrastructure. The Western Australia government approved and ratified the Hope Downs Joint Venture in 2006. The construction of phase 1, the Hope Downs 1 mining area and railway, began in 2006. The Hope Downs 1 had an iron ore reserve of 346 Mt at an average grade of 61.6% iron. The

joint-venture's assets included the Hope Downs 1, 2, and 3 deposits and the Hope Downs 4, 5, and 6 deposits (formerly the East Angelas 1, 2, and 3 deposits). Rio Tinto was to manage the development and operation of the project. The phase 1 construction was scheduled to be completed in 2008; the designed iron ore output was 22 Mt/yr (Rio Tinto plc, 2006).

Downer EDI Mining (formerly Roche Mining Pty Ltd.) and Fortescue Metals Group Ltd. formed the Pilbara Mining Alliance to undertake the mining activities at the Christmas Creek and Cloud Break deposits in East Pilbara, Western Australia. Fortescue held rights to 40,000 square kilometers of iron-ore-prospective ground, which is located next to the Hamersley's mining areas. Fortescue estimated that the deposits contained a total of 1.05 billion metric tons (Gt) of iron ore resources, which included 121 Mt of proven reserves and 932 Mt of probable reserves. The average grade was 59.1% iron, 4.30% silicon oxide, 2.35% aluminum oxide, and 0.05% phosphorus at Christmas Creek and 59.05% iron, 4.01% silicon oxide, 2.20% aluminum oxide, and 0.05% phosphorus at Cloud Break. The feasibility study for the first phase of production was 45 Mt/yr for the first 3 years. Downer was in charge of mine planning, engineering, and mining operation for the first 5 years. The construction of a railway to a new port facility at Anderson Point in Port Hedland was underway. China's Baosteel Trading Co. Ltd. [a subsidiary of Baoshan Iron and Steel Co. Ltd. (Baosteel)], signed an agreement to take up to 20 Mt/yr of Fortescue's iron ore output for 10 years. Under the terms of agreement, Baosteel would take up to 5 Mt/yr of Fortescue's initial 45-Mt/yr iron ore output and was committed to purchase up to an additional 15 Mt/yr from Fortescue's first expansion tonnages. Baosteel and Fortescue also signed a 50-50 joint-venture agreement to explore and potentially develop a magnetite deposit close to Fortescue's railway. Western Australia had abundant magnetite resources, which had iron content of only about one-half of Pilbara's hematite and must undergo beneficiation to be salable. Another Chinese iron and steel producer, Tangshan Iron and Steel Group, signed a 10-year offtake agreement to take up to 5 Mt/yr of Fortescue's initial 45-Mt/yr output and committed to purchase at least 15 Mt/yr of Fortescue's expanded output. Fortescue's marketing strategy was focused primarily on Chinese markets to take advantage of the huge demand there for iron ore. Fortescue would produce three ore blends—high-grade lump (~61% iron), high-grade fines (~60% iron), and rocket fines (~59% iron). The first shipment of Fortescue's iron ore was scheduled for the second quarter of 2008 and was targeted to produce 25 Mt in 2008. The first stage of the expansion of iron ore output capacity was either to upgrade the mining activities at Christmas Creek and Cloud Break or to develop new resources in the west in 2009 (Fortescue Metals Group Ltd., 2007, p. 6-11).

BHP Billiton had seven iron ore mining operations and port facilities in the Pilbara region of Western Australia. The port facilities of Nelson Point and Finucane Island are located within the town of Port Hedland. The Nelson Point facility handled iron ore from the Area C, the Jimbledar, the Newman (Satellite Ore Bodies 8, 23/25, and 29), the Whaleback, and the Yandi Mines; and the Finucane Island facility handled iron ore from the Area C, the Nimingarra, and the Yarrie Mines. These port

facilities could handle a total of 105 Mt/yr of iron ore shipments. In 2003, BHP Billiton set up a "rapid growth project (RGP)," which was a multiphase expansion project, to help handle the increased demand for iron ore in the world. The RGP would increase iron ore handling capacity to 165 Mt/yr through the development of four new port berths. The RGP 1 was completed in 2004 and the RGP 2 was completed in 2006; as a result, the ports handling capacity was increased to 118 Mt/yr. The RGP 3 commenced in 2006 and was scheduled to increase the ports handling capacity to 129 Mt/yr by late 2007. It would also increase the Area C iron ore mine output capacity by 20 Mt/yr to 42 Mt/yr. BHP Billiton approved \$1.85 billion funding for the RGP 4, which would focus on expanding the Newman iron ore operation. After completion of the first four phases of the RGP in 2010, BHP Billiton would have the capability to produce 155 Mt/yr of iron ore in Western Australia and would have increased port capacity to 155 Mt/yr. In the final stage, RGP 5, the construction of new lump rescreening plants at Nelson Port and Finucane Island would increase the total handling capacity to 165 Mt/yr (BHP Billiton Ltd., 2007b).

Australia's pig iron was produced from two integrated plants, BlueScope Steel Ltd.'s Port Kembla plant and OneSteel Ltd.'s Whyalla plant. In 2006, Australia produced about 7.9 Mt of crude steel from its integrated plants and electric arc plants. Mount Gibson Iron Ltd. planned to build a 500,000-t/yr ironmaking (direct-reduced iron) plant employing Midrex technology at Mingenew, Western Australia, and Ferrowest Ltd. also planned to build a 500,000-t/yr ironmaking plant at Yalgoo, which is located east of Geraldton, Western Australia. In 2006, Australia exported about 2.6 Mt of steel (Geoscience Australia, 2007b, p. 43).

Lead, Silver, and Zinc.—Australia's lead, silver, and zinc mines were predominantly based on zinc-rich ore bodies with zinc as the major component and lead and silver as byproducts. An exception was BHP Billiton's Cannington underground mine in Queensland where lead and silver were major components and zinc was a minor component. In 2006, Australian zinc mine production was similar to that of 2005. Zinc production from major mines was lower because of mine accidents at the Broken Hill Mine and the Cannington Mine; however, increased production was sourced from the commencement of operations at the Hellyer Mine in Tasmania and the restart of the Lennard Shelf Mine in Western Australia.

In 2003, Intec Ltd. acquired the Hellyer project from Western Metals Ltd. to process Hellyer tailings (from lead/zinc concentrate from the underground mine site in northwestern Tasmania) using the Intec process to recover base and precious metals from oxide and sulfide feedstocks. In 2006, Intec signed an agreement with Polymetals Mining Services Pty Ltd. for a 50-50 share to process the 10.9-Mt Hellyer tailing dam resources at an average grade of 2.8% zinc. The Intec process demonstrated that the zinc recovery rate was 65% from the tailings into concentrates, which contained 45% zinc, 9.5% lead, and 170 g/t of silver. Commercial production began in late 2006 (Intec Ltd., 2006).

Manganese.—Australian manganese was produced by three major companies—Groote Eylandt Mining Co. Pty. Ltd. (GEMCO), OM (Manganese) Ltd., and Pilbara Manganese

Pty. Ltd. In 2006, Australia produced 4.6 Mt of beneficiated manganese product and exported 4.2 Mt. In 2006, GEMCO signed an agreement with the Anindilyakwa Land Council to secure a continuous mining operation on Groote Eylandt. GEMCO committed to environmental regulations, which included rehabilitation of the site, employment of Anindilyakwa people, and provision of financial incentives to the Aboriginal community. The company planned to invest \$150 million to debottleneck the processing plant, which, in turn, would increase the processing capacity to 4.1 Mt/yr from 3.1 Mt/yr and reduce operating costs (Groote Eylandt Mining Co. Pty. Ltd., 2007).

OM Holdings Ltd.'s subsidiary, OM Manganese Ltd., commenced its Bootu Creek mining operation in November 2005. The processing plant was designed to process 600,000 t/yr of manganese ore containing 43% to 44% manganese. The beneficiated manganese product was transported by road to the Muckaty railway system and loaded onto trains for an 800-km haul to the port at Darwin. The company continued to explore in the area and discovered additional manganese resources, which led the company to consider expanding the mine output capacity to 1 Mt/yr (OM Holdings Ltd., 2007).

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 origin. In 2006, Western Australia remained Australia's only nickel-mining State. The top five nickel producers accounted for 85% of the total sales. BHP Billiton's Nickel West was Australia's leading nickel operation. Nickel West included Leinster and Mt. Keith, which are located between 645 km and 720 km northeast of Perth; each produced between 35,000 t and 40,000 t of nickel in concentrates. 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 third-party raw materials. Concentrates were shipped to the Kalgoorlie Smelter in Kalgoorlie to produce nickel matte, which contained about 68% nickel, 2% to 3% copper, and 1% cobalt. Nickel matte was railed to the Kwinana Refinery, which was located about 40 km south of Perth. The refinery had an output capacity of about 67,000 t/yr of nickel metal, which contained 99.8% nickel. The construction of Ravensthorpe nickel project was underway, which included an open-cut mine and a hydrometallurgical processing plant. The mine and processing plant, which were located near the town of Ravensthorpe, Western Australia, would produce 200,000 t/yr of a mixed nickel and cobalt hydroxide intermediate product containing up to 50,000 t of nickel and 1,400 t of cobalt. BHP Billiton invested \$556 million to expand its Yabulu Refinery at Townsville, Queensland. The Yabulu Refinery was a lateritic nickel and cobalt processing plant, which processed ores from Indonesia, New Caledonia, and the Philippines. The Yabulu expansion project would increase the nickel metal refining capacity to about 80,000 t/yr from 32,000 t/yr and the cobalt metal output capacity to 4,000 t/yr from 2,000 t/yr. The refinery would be able to process a mixed hydroxide precipitate or partially processed ore from the Ravensthorpe Mine. The two projects were scheduled to be completed in 2008 (BHP Billiton Ltd., 2007c).

Allegiance Mining NL commenced construction of its Avebury Mine, which is located in Zeehan, Tasmania, in 2006.

Allegiance Mining NL is a subsidiary of Allegiance Metals NL. The feasibility study indicated that the area contained 6.4 Mt of ore at an average grade of 1.2% nickel. The mine was designed to produce 900,000 t/yr of ore, which would convert to 8,500 t/yr of nickel in concentrates for 8 to 10 years. In 2005, Allegiance Mining signed an agreement with Jinchuan Nonferrous Metals Group Co. of China for the sale of all nickel concentrates produced from the Avebury Mine, and Jinchuan would provide a \$3.75 million (A\$5 million) subordinated loan to Allegiance Mining. The mine was scheduled to begin production in the fourth quarter of 2007. Allegiance Mining continued to explore the surrounding mine site area, and initial results indicated that more nickel resources were present in the Melba Flats area, which is located 20 km northeast of Avebury (Allegiance Mining NL, 2007).

In 2006, LionOre Australia Pty Ltd., a subsidiary of LionOre Mining International Ltd., completed the development of its Waterloo nickel mine, which is located 90 km north of Leonora, Western Australia. At yearend 2006, the mine had proven reserves of 265,000 t of ore at grades of 3.49% nickel and 0.26% copper. LionOre's nickel operations in Western Australia included the Kalgoorlie operation (the Black Swan open pit mine and the Silver Swan underground mine, which are located 53 km northeast of Kalgoorlie) and the Lake Johnston operation (the Emily Ann and the Maggie Hays underground mines, which are located 130 km west of Norseman). The Black Swan Mine Disseminated 2 expansion project was begun in 2005 to increase the design production capacity to 13,000 t/yr of nickel and to expand the open pit operation. By early 2007, the processing plant would be able to process 2.15 Mt/yr of ore. The Lake Johnston flotation plant processing capacity was upgraded to 1.5 Mt/yr from 500,000 t/yr in 2006. LionOre also had interests in the Honeymoon Well nickel project, which is located 60 km southeast of Wiluna, and was in the feasibility study stage. Norilsk Nickel Group of Russia reached an agreement to buy all LionOre Mining International Ltd.'s outstanding shares in early 2007 and to control all LionOre's operations in Australia (Norilsk Nickel Group, 2007).

Jubilee Mines NL announced the discovery of new zones of nickel sulfide at its Bannockburn project near Leonora in the East Goldfields, Western Australia, which is located about 100 km south of its Cosmos nickel operation. The new discoveries, named Skye and Stirling prospects, are located about 700 m south of the Sinclair deposit. The Skye prospect lies 400 m directly beneath the near-surface Stirling prospect. The discovery of these new zones indicated the presence of a significant body of high-grade nickel in close proximity to the company's existing mining operation. In 2006, nickel resources were produced from the company's Alec Mairs complex, Cosmos Deeps, and Tapinos deposits. The Cosmos Deeps ore body was completely mined out and the initial mining at the Alec Mairs complex and Tapinos deposits started in 2006. During the transition period, the average grade of 3.9% nickel was mined, which was significantly below the average grade of 5.55% nickel extracted in 2005. The output of nickel was expected to increase when thicker and higher grade ores are mined at Alec Mairs and Tapinos in 2008 (Jubilee Mines NL, 2007, p. 12-24).

Mincor Resources NL operated four nickel mines—Mariners, Miitel, Redross, and Wannaway—south of Kambalda, Western Australia. During 2006, Mincor invested \$18 million (A\$24 million) to develop the south Miitel ore body. The ore reserve at Miitel Mine was estimated to be 983,000 t at a grade of 2.5% nickel. Mincor earned 70% equity in the Carnilya Hill tenements project, which it had purchased from View Resources Ltd. Drilling by Mincor encountered promising intersections of nickel resources in the area and the company was beginning a prefeasibility study on the development of a nickel mine at Carnilya Hill. During 2006, Mincor discovered new nickel mineralizations below the Mariner Mine (Mincor Resources NL., 2007, p. 10-19).

Tantalum and Lithium.—Western Australia had two tantalum producers—Haddington Resources Ltd. and Sons of Gwalia Ltd. (SOG). Owing to debt problems, SOG went into voluntary administration in 2004, and since then, the demand for tantalite had continued to decline and the price of tantalite was low. SOG operated two mines—Greenbushes and Wodgina in Western Australia. In 2006, SOG reached agreements with two major customers—Cabot Corp. of the United States and HC Starck GmbH (a subsidiary of the Bayer Group of Germany)—for reduced sale volumes. SOG decided to place the Greenbushes tantalum underground operation on care and maintenance status; to continue producing spodumene concentrate in Greenbushes, which contained 4% to 7.5% lithium oxide; and to increase the production of tantalum at the Wodgina Mine. The Wodgina processing plant had a designed processing capacity of 2 Mt/yr, and the ore contained an average of 0.15% tantalum oxide (Resource Information Unit, 2007, p. 419).

In 2000, Haddington signed a license agreement with SOG to develop the Bald Hill tantalum deposit. The company had the exclusive right to mine and process tantalite ore from SOG tenements at the Bald Hill Mine until March 31, 2006. The Bald Hill Mine was originally developed on three small pits (North, South, and West). Successful exploration of the license area by the company identified pits at Boreline, Hills End, and Hillview. The processing plant was designed to treat 400,000 t/yr of ore containing about 450 parts per million of tantalum. SOG continued to purchase all production from Bald Hill at its contract price while the company went into voluntary administration. In 2005, the administrators of SOG informed Haddington that SOG was not in a position to receive concentrates from Bald Hill after September 30, 2005, and to terminate the contract. Haddington continued to process the remaining ore and to sell it on the international markets. The Bald Hill processing plant was closed at the end of December 2005 for maintenance. The company completed a review of its operating strategy for the Bald Hill project, the feasibility of mining and processing the known resources at the Creekside deposit; and the global tantalum market situations in March 2006 and decided to place the Bald Hill processing plant on care and maintenance status (Haddington Resources Ltd., 2007).

Industrial Minerals

Cement.—Australia has three major integrated cement companies—Adelaide Brighton Cement 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. Australia produced more than 8 Mt/yr of cement, mainly for domestic consumption. During the past several years, owing to strong domestic demand for cement, Australia imported from the Asian countries about 1 Mt of clinker and 325,000 t of cement in 2005. 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 was expected to increase by 1.25% per year and the import of cement was expected to increase in the near future (Department of Industry, Tourism, and Resources, 2006, p. 20-28).

Diamond.—Australia was one of the leading diamond producing countries in the world. Diamond production was mainly from the Argyle Mine in Western Australia. In 2005, Rio Tinto invested \$760 million to develop an underground block-caving operation; bringing the underground mine into full operation was expected to take 3 years. At full operation beginning in 2008, 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. The diamond output from the Argyle Mine was expected to decline as the open pit operation was winding down and the underground production was ramping up in the next 5 years (Rio Tinto plc, 2007, p. 27).

Phosphate Rock.—Australian phosphate rock production was mainly from the Phosphate Hill-Duchess Mine in Queensland and from the phosphate mine on Christmas Island. In 2006, Incitec Pivot Ltd. acquired Southern Cross Fertilizer Pty Ltd. (SCF) from BHP Billiton for \$165 million. SCF was an integrated operation that included a phosphate mine, a fertilizer plant at Phosphate Hill, and a sulfuric plant at Mt. Isa in Queensland. The SCF plant was the only producer of ammonium phosphate fertilizers in Australia. The fertilizer plant had an annual capacity of about 1 Mt of monoammonium phosphate and diammonium phosphate. The phosphate mine had a reserve of 85 Mt of ore, which was equivalent to a mine life of 30 years (Incitec Pivot Ltd., 2006).

Christmas Island is one of Australia's Indian Ocean Territories. The phosphate deposits on the island were mined by a private company from 1899, by the British Phosphate Commissioners (on behalf of the Australian and New Zealand Governments) from 1948, and by a Commonwealth-owned organization from 1981. The mine was closed by the Australian Federal Government, citing diminishing resources and industrial unrest. In September 1990, the Government granted local workers, operating as Christmas Island Phosphate, a lease for limited phosphate mining. In 1997, Phosphate Resources Ltd. signed a 21-year lease with the Government. The lease restricted the company to mine phosphate rock at previously mined areas, with the condition that no more primary rainforest be cleared. In 2006, the company was granted mining leases for more than 40 hectares (ha) at the island's airport extension. Phosphate Resources exported about 550,000 t of phosphate rock each year to countries in the Asia and the Pacific region. The company applied to the Federal Government for a mining lease for

another 200 ha of land to continue mining for an additional 10 to 12 years. The Federal Government denied the extension lease because the extension of the mine would have an unacceptable impact on the flora and fauna of the island. Phosphate Resources appealed the Government decision to the Federal court (Australian, The, 2007a).

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 about 97% of the country's total output. Queensland's coal was from the Bowen Basin, which extends south from Collinsville to Blackwater and Moura, and mines at Newlands, Blair Athol, and near Brisbane. New South Wales's coal was mined near the eastern and western edges of the large Sydney Gunnedah Basin. In 2006, Australia exported more than 236 Mt of coal to such countries and areas as the European Union, India, Japan, the Republic of Korea, and Taiwan. Domestic coal consumption was about 70 Mt, of which the power sector accounted for about 85%; followed by steel, 6.7%; cement, 1.3%, and other, 7% (Australia Bureau of Agricultural and Resources Economics, 2007c, p. 12).

Australian coal exports increased slightly to 236 Mt in 2006 from 230 Mt in 2005 as the result of constraints in the coal transport and handling infrastructure in New South Wales and Queensland. During the past several years, significant investment had been proposed to provide expansions in the transport and handling infrastructure in Australia. The infrastructure bottlenecks held back Australia's mineral exports, especially coal. Coal producers blamed state-owned rail operators for being too slow to react to booming demand and the operators replied that the mining companies were not prepared to pay for surplus capacity in anticipation of the boom. Under rail and port contracts, coal producers were charged on a take-or-pay basis. Coal producers in New South Wales and Queensland were discussing whether to take over the state-owned rail operations servicing the New South Wales and Queensland coal fields so as to operate similar to BHP Billiton and Rio Tinto, which own and operate their own rail and port operations in Western Australia. The Wambo Coal Rail Terminal was put into operation in 2006 and transported coal between the Wambo Mine, near Singleton, and Port Waratah in Newcastle, New South Wales. The capacity expansion of the Kooragang Island coal terminal in Newcastle by 13 Mt to 102 Mt was scheduled to be completed in 2007. The Sandgate Rail Grade Separation in the Hunter Valley was expected to be completed in 2007, and would increase the local rail capacity by 60 Mt to 165 Mt/yr. Expansions of port coal handling capacity at Gladstone Port and Hay Point were scheduled to be put into operation in 2007 (Australian, The, 2007b).

BHP Billiton Mitsubishi Alliance (BMA), a 50-50 joint venture between BHP Billiton and Mitsubishi Corp. of Japan, put its Poitrel coal mine into production in October 2006. The mine is located at Poitrel, which is about 35 km east southeast of

Moranbah and about 170 km southwest of Mackay, Queensland. The mine was designed to produce 3 Mt/yr of coking coal for steelmaking. BMA also owned and operated seven Bowen Basin coal mines—Blackwater, Broadmeadow, Goonyella Riverside, Gregory Crinum, Norwich Park, Perk Downs, and Saraji. The Broadmeadow and the Gregory Crinum Mines were underground mines and the others were open-cut mines. BMA owned and operated the Hay Point Coal Terminal, which was located south of Mackay on the Queensland coast. Coal exports by BMA accounted for more than one-quarter of Australia's annual coal exports (BHP Billiton Ltd., 2007a, p. 39).

Wilpinjong Pty Ltd., a subsidiary of Peabody Pacific Pty Ltd., which was the Australian subsidiary of Peabody Energy Corp. of the United States, commenced the construction of the Wilpinjong Coal Mine in February 2006 and was scheduled to complete the project in March 2007. The mine is located about 40 km northeast of Mudgee in central New South Wales. Thiess Pty Ltd. was the principal contractor for the mine construction and was designated as the mine operator for the first 5 years. The open-cut mine was designed to produce 13 Mt/yr of raw coal, and the coal dressing plant was designed to produce 6.3 Mt/yr of washed coal. About 3.5 Mt of coal would be delivered to the Macquarie Generation for power generation and the remainder would be exported. The mine would have a mine life of 20 years in six successive open-cut pits (Minfo, 2007).

Natural Gas and Petroleum.—Western Australia and Victoria accounted for most of Australia's oil and condensate and liquefied natural gas (LNG) production. The Carnarvon Basin in 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 in southeastern Australia was predominantly used to feed local refineries. In 2006, Australia's oil production increased slightly, when compared with that of 2005; however, it was lower than production in the early 2000s. During early 2006, a severe cyclone season in northwestern Australia and a decline in production from mature oilfields resulted in a decrease of oil production during that period. The growth was largely driven by the startup of a number of new projects in the second half of 2006, including the BassGas project, which is located off the Victorian coast; the Cliff Head project in the Perth Basin; and the Enfield project in the Carnarvon Basin, which is located off the coast of Western Australia. Australia was a net importer of oil and its refinery products. In 2006, Australia's net imports of crude oil and condensate was 71.64 million barrels (Mbbbl) (11,390 million liters) and petroleum products were 82.03 Mbbbl (13,042 million liters) (Australia Bureau of Agricultural and Resources Economics, 2007a, p. 82).

Australia has substantial natural gas resources. The country's main natural gas producing areas were the Carnarvon Basin, which is located off the coast of Western Australia; the Gippsland Basin, which is located off the coast of Victoria; and the onshore Cooper Basin, which is located in the northeast of South Australia. During the past decade, natural gas production in Australia has increased steadily. Australia consumed about 25 billion cubic meters per year of natural gas and exported its surplus. With the expected increase in production from the Casino and the Darwin fields, Australia's natural gas output

was expected to increase for the next several years. A fourth LNG train was put into operation in September 2004 that increased the LNG exporting capacity to 12 Mt/yr for the North West Shelf gasfield, which is located off Western Australia. A fifth LNG train was under construction; it had a 4.4-Mt/yr capacity and was expected to be ready for the first deliveries in 2008. The Bayu-Undan gas and condensate field in the Timor Sea, which is located about 500 km northwest of Darwin in the Northern Territory, commenced production in February 2006. The field is situated in the Joint Petroleum Development Area, which is an area of shared jurisdiction between East Timor and Australia established by the Timor Sea Treaty. A number of LNG agreements were signed between Australian oil and gas producers and Guangdong Province of China and Japan's Tokyo Electric Power Co. and Tokyo Gas Co. With such countries as China, Japan, and the Republic of Korea looking to secure sources of cleaner fuel for power generation, demand for Australian LNG exports was expected to increase. The Australian Government was committed to expanding the LNG sector in the next decade and to increase its share of LNG in the Asian market to 30% in 2020 from about 10% in 2004 (Department of Industry, Tourism, and Resources, 2005).

Uranium.—Australia was the second ranked uranium producer in the world following Canada. Australia's uranium production was mainly from three mines—the Beverley, the Olympic Dam, and the Ranger Mines. 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. The policies of governments in the States of Queensland, South Australia, and Western Australia and the legislation in New South Wales and Victoria prevent the development of uranium mines in those jurisdictions. In South Australia, under the recent government's "no new mine" policy, projects that had previously received approval for development could proceed; existing mines could also continue to operate. The Honeymoon project, therefore, which was approved in 2001, was allowed to proceed. Uranium mining is permitted only in the Northern Territory and South Australia. All Australia's uranium production was exported under long-term contracts to electric utilities in Belgium, Finland, France, Germany, Japan, the Republic of Korea, Spain, Sweden, the United Kingdom, and the United States. The Governments of Australia and China signed a Nuclear Transfer Agreement and a Nuclear Cooperation Agreement. These agreements established strict safeguards to regulate the conditions under which uranium is exported from Australia to China. In 2006, Australia uranium production was about 20% lower than that of 2005. The decrease in production was because of unscheduled plant maintenance at Olympic Dam and flooding at Ranger. In 2006, Australia exported 8,660 t of uranium oxide. BHP Billiton proposed to expand its uranium oxide output to 15,000 t from its current 4,400 t. The proposal was submitted to the Australian and South Australian governments for approval (Australia Bureau of Agricultural and Resources Economics, 2007b, p. 334).

Reserves and Resources

Australia ranked as one of the leading mineral resource nations. Its economic demonstrated resources of bauxite, coal, cobalt, copper, iron ore, lithium, lead, manganese, mineral sand, nickel, silver, tantalum, uranium, and zinc ranked in the top six worldwide (table 3).

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 region, the Australian economy is expected to continue to benefit from higher commodity export earnings. Expenditures on mineral and energy exploration in Australia is expected to increase owing to higher costs of labor and equipment and global demand for natural resources in the future. Production of commodities, such as bauxite, copper, iron ore, natural gas, nickel, and zinc, is expected to increase. Major projects, such as the Worsley alumina refinery project, BHP Billiton's Rapid Growth iron ore project, Hamersley Iron's Yandicoogina iron ore expansion, Fortescue Metals' iron ore project, Hope Down's iron ore project, BHP Billiton's Ravensthorpe nickel project, and Teck Cominco's lead and zinc expansion 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 exporting minerals can be transported from inland to the port terminals. Australia continues to be a major mineral and fuel exporting country to meet the global demand for natural resources in the future.

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TABLE 1
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

| Commodity | | 2002 | 2003 | 2004 | 2005 | 2006 |
|---|----------------------|--------------------|----------------------|----------------------|----------------------|--------------------|
| METALS | | | | | | |
| Aluminum: | | | | | | |
| Bauxite, gross weight | thousand metric tons | 54,135 | 55,602 | 43,993 | 59,959 | 62,307 |
| Alumina | do. | 16,382 | 16,529 | 16,525 | 17,704 | 18,312 |
| Metal, refined: | | | | | | |
| Primary | do. | 1,836 | 1,857 | 1,894 | 1,903 | 1,932 |
| Secondary ^c | | 127,000 | 127,000 | 127,000 | 127,000 | 130,000 |
| Antimony, Sb content of ores and concentrates^c | | | | | | |
| | | 1,200 | 900 | 120 | 120 | 1,600 |
| Cadmium: | | | | | | |
| Mine output, Cd content^c | | | | | | |
| | | 1,900 | 1,900 | 1,900 | 1,900 | 1,900 |
| Metal, smelter, refined | | | | | | |
| | | 370 | 350 | 469 | 429 | 460 |
| Chromium, chromite, gross weight | | | | | | |
| | | 132,665 | 163,012 ^r | 243,221 ^r | 241,756 ^r | 252,867 |
| Chromite content | | | | | | |
| | | 54,747 | 67,271 | 104,317 | 90,260 | 107,103 |
| Cobalt: | | | | | | |
| Co content in laterite ore, Ni concentrate, and Zn concentrate^c | | | | | | |
| | | 6,500 | 7,300 ^r | 7,000 | 7,200 ^r | 7,400 |
| Metal, refined | | | | | | |
| | | 3,500 ^c | 3,840 | 3,880 ^r | 3,150 ^r | 4,000 |
| Copper: | | | | | | |
| Mine output, Cu content | | | | | | |
| | thousand metric tons | 872 | 830 | 875 | 930 ^r | 879 |
| Metal: | | | | | | |
| Smelter, primary and secondary | | | | | | |
| | do. | 456 | 418 | 440 | 412 ^r | 377 |
| Refined, primary | | | | | | |
| | do. | 543 | 484 | 498 | 461 | 429 |
| Gold: | | | | | | |
| Mine output, Au content | | | | | | |
| | | 266 | 283 | 258 | 263 | 247 |
| Metal, refined: | | | | | | |
| Primary | | | | | | |
| | | 302 | 331 | 313 | 291 | 266 |
| Secondary | | | | | | |
| | | 47 | 80 | 58 | 50 | 112 |
| Iron and steel: | | | | | | |
| Iron ore: | | | | | | |
| Gross weight | | | | | | |
| | thousand metric tons | 187,200 | 213,000 | 243,000 | 261,796 ^r | 295,000 |
| Fe content | | | | | | |
| | do. | 113,548 | 116,355 | 143,980 | 162,527 ^r | 170,933 |
| Metal: | | | | | | |
| Pig iron | | | | | | |
| | do. | 6,106 | 6,116 | 5,735 | 6,203 ^r | 6,276 |
| Ferroalloys:^c | | | | | | |
| Ferromanganese | | | | | | |
| | | 115,000 | 115,000 | 115,000 | 120,000 ^r | 125,000 |
| Silicomanganese | | | | | | |
| | | 135,000 | 135,000 | 135,000 | 135,000 | 140,000 |
| Total | | | | | | |
| | | 250,000 | 250,000 | 250,000 | 255,000 ^r | 265,000 |
| Steel, crude | | | | | | |
| | thousand metric tons | 8,874 | 9,678 | 8,353 | 7,788 | 7,937 |
| Semimanufactured products | | | | | | |
| | | 6,457 | 7,458 | 6,671 | 6,920 | 7,000 ^c |
| Lead: | | | | | | |
| Mine output, Pb content | | | | | | |
| | thousand metric tons | 694 | 688 | 674 | 767 | 686 |
| Metal: | | | | | | |
| Bullion | | | | | | |
| | do. | 187 | 169 | 140 | 159 | 118 |
| Refined: | | | | | | |
| Primary | | | | | | |
| | do. | 268 | 270 | 232 | 230 | 233 |
| Secondary excluding remelt | | | | | | |
| | do. | 36 | 25 | 36 | 33 | 27 |
| Manganese ore, metallurgical: | | | | | | |
| Gross weight | | | | | | |
| | do. | 2,189 | 2,564 | 3,431 | 3,830 ^r | 4,567 |
| Mn content | | | | | | |
| | do. | 983 | 1,247 | 1,570 | 1,908 ^r | 2,192 |
| Nickel: | | | | | | |
| Mine output, Ni content | | | | | | |
| | do. | 188 | 191 | 187 | 189 | 185 |
| Matte | | | | | | |
| | do. | 98 | 108 | 107 | 115 | 95 |
| Metal, smelter, refined Ni and Ni content of oxide | | | | | | |
| | do. | 132 | 129 | 122 | 126 ^r | 114 |
| Platinum-group metals:^c | | | | | | |
| Palladium, Pd content | | | | | | |
| | kilograms | 800 | 820 | 800 | 550 ^r | 600 |
| Platinum, Pt content | | | | | | |
| | do. | 200 | 225 | 200 | 111 ^r | 122 |
| Total | | | | | | |
| | do. | 1,000 | 1,050 | 1,000 | 661 ^r | 722 |

See footnotes at end of table.

TABLE 1--Continued
 AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

| Commodity | 2002 | 2003 | 2004 | 2005 | 2006 |
|--|----------------------|------------------------|----------------------|------------------------|---------------------|
| METALS--Continued | | | | | |
| Silver: | | | | | |
| Mine output, Ag content | 2,077 | 1,868 | 2,224 | 2,417 | 1,727 |
| Metal, refined | 644 | 649 | 650 | 727 | 634 |
| Tin: | | | | | |
| Mine output, Sn content | 7,017 | 3,864 | 1,196 | 2,819 | 1,478 |
| Metal, refined: | | | | | |
| Primary | 791 | 597 | 467 | 594 | 572 |
| Secondary ^c | 400 | 400 | 400 | 400 | 400 |
| Tantalum, tantalite, Ta ₂ O ₅ equivalent | 985 | 973 | 985 ^r | 1,043 ^r | 584 |
| Titanium concentrates, gross weight: | | | | | |
| Ilmenite | 1,954 | 2,006 | 1,921 | 2,030 | 2,377 |
| Leucoxene | 39,000 | 57,000 | 44,000 | 46,000 | 131,000 |
| Rutile | 219,000 | 173,000 | 163,000 | 177,000 | 232,000 |
| Zinc: | | | | | |
| Mine output, Zn content | 1,469 | 1,479 | 1,334 | 1,367 | 1,362 |
| Metal, smelter: | | | | | |
| Primary | 567 | 553 | 470 | 457 | 463 |
| Secondary ^c | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| Zirconium concentrates, gross weight | 412 | 462 | 441 | 427 | 491 |
| INDUSTRIAL MINERALS | | | | | |
| Abrasives, natural: | | | | | |
| Beach pebble ^c | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Garnet | 10,846 ^r | 127,975 ^r | 125,404 ^r | 246,128 ^r | 270,895 |
| Barite ^c | 20,000 | 20,000 | 20,000 | 20,000 | 21,000 |
| Cement, hydraulic ^c | 7,550 | 8,000 | 8,000 | 8,475 ^{r,2} | 9,000 |
| Clays: ^c | | | | | |
| Bentonite and bentonitic clay | 113,000 ^r | 145,000 ^r | 265,000 ^r | 223,000 ^r | 220,000 |
| Brick clay and shale | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| Cement clay and shale | 500 | 500 | 500 | 500 | 500 |
| Damourite clay | 100 | 100 | 100 | 100 | 100 |
| Fire clay | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| Fuller's earth, attapulgite | 12,000 ^r | 11,000 ^r | 10,000 ^r | 9,800 ^r | 10,000 |
| Kaolin and ball clay | 230,000 | 280,000 ^r | 285,000 ^r | 230,000 ^r | 250,000 |
| Other | 1,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Diamond: | | | | | |
| Gem | 15,136 | 13,981 | 18,172 ^r | 25,730 ^r | 21,915 |
| Industrial | 18,500 | 17,087 | 6,008 ^r | 8,577 ^r | 7,305 |
| Total | 33,636 | 31,068 | 24,180 ^r | 34,307 ^r | 29,220 |
| Diatomite ^c | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Feldspar, including nepheline syenite ^c | 50,000 | 50,000 | 50,000 | 50,000 | 50,000 |
| Gemstones, other than diamond: | | | | | |
| Opal | 47 | 50 | 36 | 40 ^c | 50 |
| Sapphire | 1 | -- | -- | -- ^c | -- |
| Total | 48 | 50 | 36 | 40 ^c | 50 |
| Gypsum | 4,268 | 4,066 | 4,325 | 3,857 | 4,249 |
| Kyanite ^c | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Lime ^c | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 |
| Lithium, spodumene | 79,085 | 124,410 | 118,451 | 173,635 | 222,101 |
| Magnesite | 484,314 | 472,668 | 473,983 | 474,000 ^c | 446,000 |
| Nitrogen, N content of ammonia | 686,400 | 786,800 | 790,000 | 790,000 | 1,200,000 |
| Perlite, crude ^c | 5,000 | 5,000 | 5,000 | 6,000 ^r | 6,500 |
| Phosphate rock | 2,024,580 | 2,100,000 ^c | 2,200,000 | 2,080,000 ^r | 2,145,000 |
| Salt ³ | 9,961 | 10,256 | 11,088 | 12,444 | 11,424 |
| Stone and sand and gravel: | | | | | |
| Construction sand | 28,988 | 28,825 | 27,995 ^r | 30,438 ^r | 30,000 ^c |
| Crushed and broken stone | 68,369 | 75,649 | 75,262 ^r | 81,072 ^r | 80,000 ^c |
| Dimension stone | 143 | 147 | 266 ^r | 237 ^r | 240 ^c |
| Gravel | 12,155 | 12,718 | 18,850 | 20,000 ^c | 20,000 |
| Dolomite ^c | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |

See footnotes at end of table.

TABLE 1--Continued
 AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

| Commodity | 2002 | 2003 | 2004 | 2005 | 2006 | |
|---|----------------------------|---------|----------------------|----------------------|----------------------|----------------------|
| INDUSTRIAL MINERALS--Continued | | | | | | |
| Stone and sand and gravel--Continued: | | | | | | |
| Limestone | thousand metric tons | 18,333 | 17,076 | 18,360 ^r | 18,280 ^r | 18,200 ^c |
| Silica in the form of quartz, quartzite, glass sand | do. | 4,046 | 4,181 | 4,142 ^r | 5,169 ^r | 5,200 ^c |
| Sulfur, byproduct: | | | | | | |
| Metallurgy | do. | 899 | 863 ^r | 870 ^r | 880 ^r | 880 ^c |
| Petroleum ^c | do. | 60 | 60 | 60 | 60 | 58 |
| Total ^c | do. | 959 | 923 ^r | 930 ^r | 940 ^r | 938 |
| Talc, chlorite, pyrophyllite, steatite | | 165,980 | 123,080 | 150,923 ^r | 155,000 ^c | 130,000 ^c |
| MINERAL FUELS AND RELATED MATERIALS | | | | | | |
| Coal: | | | | | | |
| Bituminous and subbituminous | thousand metric tons | 274,850 | 280,700 | 298,000 | 303,000 | 309,000 |
| Lignite ^c | do. | 73,000 | 66,000 | 67,000 | 67,000 | 71,000 |
| Total ^c | do. | 421,000 | 347,000 ^r | 365,000 | 370,000 | 380,000 |
| Gas, natural, marketed | million cubic meters | 36,200 | 37,410 | 41,680 | 42,630 | 44,100 |
| Petroleum: | | | | | | |
| Crude | thousand 42-gallon barrels | 221,036 | 193,216 | 171,781 | 155,320 | 163,900 |
| Refinery products | do. | 293,878 | 273,518 | 280,242 | 255,863 | 229,748 |
| Uranium, mine output, U ₃ O ₈ content | | 3,536 | 8,912 | 10,600 | 11,218 | 8,970 |

^cEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. -- Zero.

¹Table includes data available through December 20, 2007.

²Reported figure.

³Does not include production from the Northern Territory and the State of Victoria.

TABLE 2
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(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 (Alcan Inc., 100%) | Gove Peninsula, 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 plc, 100%)] | Weipa, QLD | 17,000 |
| Do. | Willowdale open pit bauxite mine [Comalco Ltd., operator (Rio Tinto plc, 100%)] | 130 km south of Perth, WA | 8,600 |
| Do. | Worsley open pit bauxite mine [Worsley Alumina Pty. Ltd., manager [BHP Billiton Ltd., 86%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; Nissho Iwai Alumina Pty. Ltd., 4%]] | 50 km northeast of Collie, WA | 13,200 |
| Alumina refinery | Gladstone alumina refinery [Queensland Alumina Ltd., operator (Alcan Inc., 41.4%; Rio Tinto Aluminium Group, 38.6%; Rusal, 20%)] | Gladstone, QLD | 3,850 |
| Do. | Gove alumina refinery [Alcan Gove Pty Ltd. (Alcan Inc., 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 | 3,400 |
| 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 NW of Collie, WA | 3,700 |
| Do. | Yarwun alumina refinery (Rio Tinto Aluminium Ltd., 100%) | Gladstone, QLD | 1,400 |
| Metal smelter | Bell Bay aluminum smelter (Rio Tinto Aluminium Ltd., 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 Ltd., 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's 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%; Alcan Inc., 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 | 5 |
| 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. | 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. | Waurm 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 (Consolidated Minerals 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 2006

(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 Rockhamton, 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 |
| | 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. | Boundary Hill open pit coal mine (Anglo Coal Pty Ltd., 100%) | 130 km southwest of the Port of Gladstone, QLD | 4,000 |
| 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; 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 2006

(Thousand metric tons unless otherwise specified)

| Commodity | Facilities, major operating companies, and major equity owners | Location of main facilities ^{1,2} | Annual capacity ^c |
|-----------------|--|---|------------------------------|
| 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 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 to 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% at Narama; Iluka Resources Ltd., 50% at 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 2006

(Thousand metric tons unless otherwise specified)

| Commodity | Facilities, major operating companies, and major equity owners | Location of main facilities ^{1, 2} | Annual capacity ^c |
|------------------|--|---|------------------------------|
| 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%) | 15 km west of 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 | Preston Resources Ltd., 100% | Bulong open pit nickel-cobalt mine, 30 km east of Kalgoorlie, WA | 0.1 |
| Do. | 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. International AG, 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 |
| Refinery | Yabulu nickel-cobalt refinery (BHP Billiton Ltd., 100%) | Townsville, QLD | 2 |
| 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 Australia Pty. Ltd., 100%) | 10 km northwest of Cobar, NSW | 30 |
| Do. | Eloise underground copper mine (Barmenco Pty Ltd., 100%) | 60 km southeast of Cloncurry, QLD | 70 |
| Do. | Ernest Henry open pit 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 (Intec Ltd., 50%, and Polymetals Mining Services Pty Ltd., 50%) | 80 km south southwest of Burnie, TAS | 1 |
| Do. | Leichhardt copper mine (Matrix Metals Ltd., 100%) | 110 km northwest of Cloncurry, QLD | 10 |
| Do. | Mount Gordon open pit copper (SX-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 north 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%) | 195 km southeast of Mount Isa, 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. | 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 (Zinifex Ltd., 100%) | 35 km north of Queenstown, TAS | 2 |
| Do. | Selwyn underground copper-gold mine (Barrick Gold Corp., 100%) | 160 km southeast of Mount Isa, QLD | 17 |
| 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 Kembla, 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 Kembla, 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 2006

(Thousand metric tons unless otherwise specified)

| Commodity | | Facilities, major operating companies, and major equity owners | Location of main facilities ^{1,2} | Annual capacity ^c |
|-------------------|--|--|--|------------------------------|
| 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 Mining Lease (Kimberley Diamond Co. 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 (Australian 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 |
| Feldspar | | Triple Chance open pit feldspar mine (includes Lady Beryl, Bakers, and Spar Ridge) (Minerals Corp. 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. | 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 | 1,000 |
| 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) [Newmont Pajingo Pty. Ltd., operator (Newmont Gold Corp., 100%)] | 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 |
| 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 (Zinifex Ltd., 100%) | 35 km north of Queenstown, TAS | 1,000 |
| Do. | 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 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

| Commodity | Facilities, major operating companies, and major equity owners | Location of main facilities ^{1,2} | Annual capacity ^c |
|---------------------------|---|---|------------------------------|
| Gold, mine-- Continued | kilograms 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. Wiluna open pit/underground gold mine (Oxiana Ltd., 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. Newburn gold refinery [Australian Gold Refineries, 100% (State of WA agency)] | Newburn gold refinery, WA | 246,000 |
| Do. | do. Perth Refinery [Australian Gold Refineries, 100% (State of WA agency)] | Newburn, WA | 95,000 |
| 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. | do. Cockatoo Island open pit iron ore mine (BHP Billiton Ltd., 100%) | 130 km north northeast of Derby, WA | 1,500 |
| Do. | 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. | 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. | do. Jumblebar open pit iron ore mine {[BHP Iron Ore (Jumblebar), 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. | do. Koolyanobbing Central open pit iron ore mine (Portman Ltd., 100%) | 50 km north northeast of Southern Cross, WA | 6,000 |
| Do. | 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. | do. Mount Gould open pit iron ore mine (Unimin Australia Ltd., 100%) | 160 km west of Meekatharra, WA | 6,000 |
| Do. | do. Mount Newman (includes Mount Whaleback, Orebody 23-25, Orebody 29, and Orebody 30-35) open pit iron ore mine [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. | 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 |
| Do. | do. Savage River open pit iron ore mine (Stemcor Holding Ltd., 100%) | 100 km southwest of Burnie, TAS | 2,400 |
| Do. | do. Whyalla open pit iron ore mines (OneSteel Ltd., 100%) | 270 km northwest of Adelaide, SA | 2,600 |
| Do. | 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 |
| Steel | Hismelt (Operations) Pty Ltd. (Hismelt Corp., Pty Ltd., 100%) | Kwinana, WA | 800 |
| Do. | do. OneSteel Whyalla steelworks (OneSteel Ltd., 100%) | Whyalla, SA | 1,200 |
| Do. | do. Port Kembla steelworks (Blue Scope Steel Ltd., 100%) | Port Kembla, NSW | 5,000 |
| Do. | do. Smorgon Steel Group Ltd. | Laverton, Melbourne, VIC | 700 |
| Do. | do. | Waratch, NSW | 285 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

| Commodity | Facilities, major operating companies, and major equity owners | Location of main facilities ^{1,2} | Annual capacity ^c |
|--------------------|--|---|------------------------------|
| 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 (Zinifex 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 | Iluka Resources Ltd., 100% | Eneabba open pit heavy-mineral sands mine, 260 km north of Perth, WA | NA |
| Do. | Mineral Deposits Ltd., 100% | Hawks Nest heavy-mineral sands dredge, 50 km northeast of Newcastle, NSW | NA |
| Do. | Cable Sands (WA) Pty. Ltd., 100% | Jangardup heavy-mineral sands dredge, 50 km south of Nannup, WA | NA |
| Do. | Iluka Resources Ltd., 100% | North Capel open pit heavy-mineral sands mine, 7 km north of Capel, WA | NA |
| Do. | Stradbroke Rutile Pty. Ltd., 100% | North Stradbroke Island heavy-mineral sands dredge, 35 km east of Brisbane, QLD | NA |
| Do. | KMCC Western Australia Pty. Ltd., 50%, and Ticor Resources Pty. Ltd., 50% | Tiwest Joint Venture heavy-mineral sands dredge, 180 km north of Perth, WA | NA |
| Do. | Murray Basin Titanium Pty. Ltd., 100% | Wemen heavy-mineral sands dredge, 80 km southeast of Mildura, VIC | NA |
| Nickel: | | | |
| Mine, concentrate | Black Swan underground nickel mine (includes Silver Swan) (Norilsk Nickel Mining and Metallurgical Co., 100%) | 53 km northeast of Kalgoorlie, WA | 10 |
| 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 (Jubilee Mines NL, 100%) | 50 km north of Leinster, WA | 13 |
| Do. | Kambalda underground nickel mines (BHP Billiton Ltd., 100%) | 25 km north of Kambalda to 10 km south of Widgiemooltha, WA | 35 |
| Do. | Leinster open pit/underground nickel mines (BHP Billiton Ltd., 100%) | 10 km north of Leinster, WA | 44 |
| Do. | Miitel underground nickel mine (includes Redross and Mariners) (Mincor Resources NL, 100%) | 70 km south of Kambalda, WA | 10 |

See footnotes at end of table.

TABLE 2--Continued
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

| Commodity | | Facilities, major operating companies, and major equity owners | Location of main facilities ^{1,2} | Annual capacity ^e |
|---------------------|---------------------------|--|---|------------------------------|
| Nickel--Continued: | | | | |
| Mine, concentrate-- | | Mount Keith open pit nickel mine (includes Cliffs and Yakabindie) | 70 km south-southeast of Wiluna, WA | 40 |
| Continued | | (BHP Billiton Ltd., 100%) | | |
| 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%) | 100 km east-southeast of Karratha, WA | 4 |
| 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 | 32 |
| Opal | | Many small producers | Andamooka and Coober Pedy areas, SA; Lightning Ridge area, NSW | NA |
| Petroleum | thousand | Exxon Mobil Corp., 100% | Altona Refinery, VIC | 120 |
| | 42-gallon barrels per day | | | |
| Do. | do. | BP Amoco Refinery (Bulwer Island) Pty. Ltd., 100% | Bulwer Island Refinery, QLD | 69.3 |
| Do. | do. | Shell Refining (Australia) Pty. Ltd., 100% | Clyde Refinery, NSW | 85 |
| Do. | do. | do. | Geelong Refinery, VIC | 110 |
| Do. | do. | ChevronTexaco Corp., 100% | Kurnell Refinery, NSW | 114 |
| Do. | do. | BP Amoco Refinery (Kwinana) Pty. Ltd., 100% | Kwinana Refinery, WA | 138 |
| Do. | do. | Chevron Corp., 100% | Lytton Refinery, QLD | 106 |
| Do. | do. | Exxon Mobil Corp., 100% | Port Stanvac Refinery, 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 Salt Ltd., 100% | Dampier solar evaporation salt pans, 65 km north of Carnarvon, WA | 5,000 |
| Do. | do. | do. | Lake MacLeod solar salt and gypsum evaporation pans, 65 km north of Carnarvon, WA | 900 |
| Do. | do. | do. | Port Hedland solar salt fields, at Port Hedland, WA | 3,000 |
| Silica | | Itochu Corp., 50%, and Tochu Corp., 50% | Kemerton silica sands dredge, 25 km northeast of Bunbury, WA | 450 |
| Silver: | | | | |
| Mine, Ag content | kilograms | 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 (Zinifex 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 (Zinifex 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. | Newburn gold refinery [Australian Gold Refineries, 100% (State of WA agency)] | Newburn gold refinery, WA | 81,000 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2006

(Thousand metric tons unless otherwise specified)

| Commodity | | Facilities, major operating companies, and major equity owners | Location of main facilities ^{1, 2} | Annual capacity ^c |
|--|-----|--|--|------------------------------|
| Spodumene | | Greenbushes open pit/underground tantalite-spodumene mine [(Gwalia Consolidated Ltd., operator (Sons of Gwalia Ltd., 100%)] | 70 km southeast of Bunbury, WA | 220 |
| Talc | | Three Springs open pit talc mine (Rio Tinto Ltd., 100%) | 330 km north of Perth, WA | 200 |
| Tantalum, metric tons tantalite, Ta ₂ O ₅ | | Greenbushes open pit/underground tantalite-spodumene mine [(Gwalia Consolidated Ltd., operator (Sons of Gwalia Ltd., 100%)] | 70 km southeast of Bunbury, WA ³ | 270 |
| 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 [(Gwalia Consolidated Ltd., operator (Sons of Gwalia 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 [(Gwalia Consolidated Ltd., operator (Sons of Gwalia 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 [(Gwalia Consolidated Ltd., operator (Sons of Gwalia 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 |
| Uranium, U ₃ O 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 ₂ O 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 ³ | 8 |
| Zinc: | | | | |
| Mine, Zn content | | Broken Hill underground silver-zinc-lead mine (Perilya Ltd., 100%) | 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 (Zinifex 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 (Oxiana 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. | | 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 (Zinifex Ltd., 100%) | 5 km north of Queenstown, TAS | 100 |
| Smelter | | Port Pirie smelter (Nyrstar Corp., 100%) | 5 km north of Queenstown, TAS | 45 |
| Do. | | Hobart smelter (Zinifex Ltd., 100%) | Hobart, TAS | 320 |
| Refinery | | Sun Metals zinc refinery [Sun Metals Corp. Pty. Ltd., operator (Korea Zinc Co., 100%)] | Townsville, QLD | 170 |

^cEstimated; estimated data are rounded to no more than three significant digits. NA Not available.

¹Australian State and Territory abbreviations: NSW--New South Wales; NT--Northern Territory; QLD--Queensland; SA--South Australia; TAS--Tasmania; VIC--Victoria; WA--Western Australia.

²Abbreviation(s) used for unit(s) of measure in this table include the following: km--kilometer.

³Care and maintenance; expansion project development decision pending.

TABLE 3
AUSTRALIA: RESERVES OF MAJOR MINERAL COMMODITIES IN 2006

| Commodity | Reserves |
|---|----------------------------|
| Bauxite | 5,700 million metric tons |
| Cadmium, Cd content | 63 thousand metric tons |
| Coal: | |
| Black: | |
| In situ | 57 billion metric tons |
| Recoverable | 40 do. |
| Brown: | |
| In situ | 41 do. |
| Recoverable | 37 do. |
| Cobalt, Co content | 1,400 thousand metric tons |
| Copper, Cu content | 42 million metric tons |
| Diamond: | |
| Gem and near gem | 109 million carats |
| Industrial | 114 do. |
| Gold, Au content | 5,480 metric tons |
| Iron ore | 19 billion metric tons |
| Lead, Pb content | 24 million metric tons |
| Lithium, Li content | 170 thousand metric tons |
| Magnesite (MgCO ₃ content) | 344 million metric tons |
| Manganese ore | 139 do. |
| Mineral sands: | |
| Ilmenite | 218 do. |
| Rutile | 22 do. * |
| Zircon | 34 do. |
| Molybdenum, Mo content | 400 metric tons |
| Nickel, Ni content | 24 million metric tons |
| Niobium (columbium) and tantalum: | |
| Niobium (columbium), Nb content | 194 thousand metric tons* |
| Tantalum, Ta content | 52 do. |
| Petroleum, recoverable: | |
| Condensate | 300 billion liters |
| Crude | 158 do. |
| Liquefied petroleum gas | 214 do. |
| Natural gas | 2,590 billion cubic meters |
| Platinum-group metals (Pd, Pt) | 20 metric tons |
| Rare earths (REO plus Y ₂ O ₃) | 500 thousand metric tons |
| Silver, Ag content | 46 do. |
| Tin, Sn content | 247 do. |
| Tungsten, W content | 72 do. |
| Uranium, U content | 714 do. |
| Vanadium | 832 do. |
| Zinc | 41 million metric tons |

*Correction posted April 14, 2009.

Source: Geoscience Australia, 2007, Australia's identified mineral resources 2007: Canberra, Australia, Geoscience Australia, p. 3. (Modified to no more than three significant digits.)