

AUSTRALIA

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Australia continued its position as one of the world's leading minerals-producing nations in 2001, and this position should hold well into the future owing to the largest economic demonstrated resources (EDRs) (mineral resources for which profitable extraction or production is possible at current prices) of lead, nickel, mineral sands, tantalum, uranium, and zinc. EDRs are approximately equal to reserves as defined by the U.S. Geological Survey's Circular 831 published in 1980. Additionally, Australia's level of EDRs is within the top six worldwide for 11 additional mineral commodities—bauxite, black coal, brown coal, cobalt, copper, gold, iron ore, lithium, manganese ore, rare-earth oxides, and gem and near-gem diamond. Australia's gross domestic product grew at an estimated rate of 4.1% in 2001 and increased to about \$465.9 billion owing to the country's resiliency in the face of the global economic downturn (Geoscience Australia, 2001, p. 7; U.S. Central Intelligence Agency, 2002¹; U.S. Energy Information Administration, 2002[§]).

The mineral industry represented about \$40 billion, or 8.6% of the Australian economy (Minerals Council of Australia, 2002[§]). In 2001, Australia was the world's leading producer of alumina, bauxite, chrysoprase, industrial diamond, ilmenite, lead, monazite, opal, rutile, sapphire, and zircon; second largest producer of iron ore and concentrate and mined zinc; third largest producer of cobalt, mined nickel, and gold; fourth largest producer of mined copper and refined nickel; fifth largest producer of aluminum metal; seventh largest producer of black coal; and eighth largest producer of refined copper. It was the premier exporter of alumina, coal, ilmenite, iron ore, refined lead, monazite, rutile, and zircon. The mineral wealth of Australia is so bountiful that Australia is virtually self-sufficient in most mineral commodities. The only significant mineral resource in which Australia is not self-sufficient is petroleum. Australia, nevertheless, produced more than 70% of its crude oil requirements domestically in 2001 (Resource Information Unit, 2002b, map). Australia also is endowed with abundant resources of other mineral fuels, which include coal, natural gas, liquefied petroleum gas, and uranium and continued to be one of the few market economy countries that was a net exporter of mineral fuels (Minerals Council of Australia, 2002[§]; U.S. Energy Information Administration, 2002[§]).

Government Policies and Programs

Australia is governed at a national level by the Commonwealth Parliament and at State and Territory levels by governments whose jurisdiction is restricted to that State or Territory. The powers of the Commonwealth Government are defined in the Australian Constitution, which is similar to the

¹References that include a section twist (§) are found in the Internet References Cited section.

U.S. Constitution, and any power not defined is given to or is the responsibility of the State or Territory. Thus, all matters that relate to mineral resources and their production are State and Territory issues. Except for the Australian Capital Territory (that is the capital city of Canberra and environs), all Australian States and Territories have identified mineral resources and established mineral industries.

In 1992, Australia's highest court recognized that the country's indigenous people have legally recognizable rights to land and that these rights were based in the traditional laws and customs of these aboriginal people. The 1992 recognition initially led to the Native Title Act of 1993 and, following lengthy parliamentary debates and extensive amendments, to the 1998 Native Title Act, which was in force throughout 2001.

The native title law, however, continued to be a concern for explorers and miners who have criticized the increasing costs that resulted from legislative and common law developments that arose from native title and other indigenous issues. In 2001, the mineral industry spent millions of dollars on these endeavors, which were expected to increase substantially as the backlog of mineral tenement applications are processed and the sector gives more compensatory payments to the traditional land owners (Mining Journal, 2001a; Minerals Council of Australia, undated d[§]).

In August, Australia's leading geoscience research and information agency, the Australian Geological Survey Organisation (probably better known as AGSO), officially became known as Geoscience Australia. The new name was designed to reflect the agency's broader role in identifying geoscience solutions for issues that affect Australian communities. Although Geoscience Australia will continue to promote resources exploration and investment in Australia, it will extend the application of its geoscience research to other areas, such as investigating the effectiveness of opportunities in urban development, transport, tourism, and the environment (Australian Journal of Mining, 2001c).

In November, the Australian Resources Research Centre (ARRC) [an initiative of the Federal Government's Commonwealth Scientific and Industrial Research Organization (CSIRO), Western Australia's Curtin University of Technology in Perth, and the Government of Western Australia] was opened at Technology Park, Kensington, Western Australia. The ARRC was developed in cooperation with Australia's mining and petroleum industries to provide reliable infrastructure for about 200 researchers from CSIRO and Curtin to Australia's science. The ARRC will initially focus on technologies that will increase the possibility of discovery of high-quality mineral deposits and make it possible to mine at affordable costs with emphasis on safety and the environment. Research for the oil and gas industry will focus on improving performance for oil and gas exploration while preparing Australia for the transition to new energy sources (Australian Journal of Mining, 2002a).

Environmental Issues

Australia is well endowed with nonrenewable energy resources, such as coal, natural gas, and petroleum. Coal and natural gas were major sources for export income, and petroleum supplied about 70% of domestic needs. Therefore, the local, State, and Federal Governments, as have the industries themselves, realized that the energy commodities must be developed and used in the most economic, environmental, and sustainable manner possible.

Production

In 2001, primary aluminum metal production in Australia increased by about 2%, to 1.8 million metric tons (Mt), primarily as a result of debottlenecking and minor efficiency improvements at some smelters. Increased production and a competitive exchange rate of the Australian dollar with the U.S. dollar and industry consolidation, enabled the Australian coal sector to boost its profitability in 2001. During the year, five large companies produced about 70% of the country's black coal. The consolidation also lowered production costs through the closure of less profitable mines, implementation of new management structures, and unifying adjacent mining operations. Australian black coal production increased by 7.8% to 265 Mt in 2001 from 246 Mt in 2000. Mined copper production was 873,000 metric tons (t) in 2001, which was an increase of 3.8% more than the 841,000 t in 2000. Primary refined copper production increased to 560,000 t, which was a 14.8% increase from the 488,000 t in 2000. Australian gold production in 2001 decreased by 3.8%, to 285,030 kilograms (kg) from 296,410 kg; this was the fourth successive year of decline. The lower production was largely a result of the decline in world gold prices that have resulted in the closure of a number of high-cost gold mines. Australian iron ore production in 2001 increased by 6.2% to 181.6 Mt from 171 Mt. Mined lead production was 714,000 t in 2001 compared with 678,000 t in 2000, an increase of 5%. Production of primary refined lead was 237,000 t in 2001, which was an increase of 6% from the 223,000 t in 2000. Australian production of mined nickel increased to 197,000 t in 2001, a 17.2% increase from 168,000 t in 2000. In 2001, mined zinc production was more than 1.5 Mt, or 7.2% higher than that of 2000, which was 1.4 Mt. In 2001, primary zinc production was 554,000 t, an increase of 11% more than the 493,000 t produced in 2000 (Resource Information Unit, 2002b, p. 21, 23-29, table 1).

Trade

Australia continued to rely heavily on the export of the majority of its mineral production. An estimated 78% of the 2001 mineral export value of about \$30 billion was concentrated in five commodity groups—oil and gas (25%), coal (18%), alumina-aluminum-bauxite (16%), iron ore (10%), and gold (9%). The mineral industry, which remained Australia's largest export earner, accounted for an estimated 60% of the total. An estimated 80% of Australia's mineral production was exported. Australia remained the premier exporter of alumina, bauxite, coal, diamond (gem, near gem, and natural industrial), ilmenite, iron ore and concentrate, refined lead, rutile, and zircon. The weaker exchange rate

between Australian dollars and U.S. dollars during the year may have assisted the marginal reduction. During the second semester of 2001, aluminum exports to Australia's major markets, Japan and Taiwan, decreased significantly owing to a decline in automobile production, manufacturing demand, and weakness in the information technology sectors. Aluminum exports to other countries, notably Italy and the United States, however, offset the decline. Australian exports of copper concentrates increased by 10% to about 1.27 Mt in fiscal year 2001-2. Exports of copper metal in fiscal year 2001-2 increased by 8% to 395,000 t. Zinc concentrates exports increased by 4% to 1.98 Mt in fiscal year 2001-2. Zinc metal exports increased by 11% in fiscal year 2001-2 to 500,000 t.

Gold exports decreased by about 2% in 2001 to 296 t primarily as a result of lower Australia production. Although production of iron ore in 2001 was a new record, iron ore exports declined by 2% to about 154.5 Mt (Resource Information Unit, 2002b, p. 10, 21, 24, 27).

Structure of the Mineral Industry

The Australian mineral industry included industrial minerals, base metals, ferrous metals, nonferrous metals, precious metals, fuel minerals, and gemstones. Australia was one of the world's principal producers and suppliers of concentrates, ores, and refined metals. It was estimated to rank third in the world in the value of its nonfuel mineral production and eighth in the value of its minerals when fuels were included.

The Australian mining industry was based on a system of free enterprise in which private companies were involved in exploration, mine development, production, mineral processing, and marketing. A number of companies in Australian mineral ventures were affiliates or subsidiaries of U.S. companies. Foreign companies controlled a large part of the mining, smelting, and refining sectors and a significant portion of the petroleum and natural gas sectors. Many of the mineral industries were fully integrated and produced concentrates and ores or other intermediate products (for example, alumina), and refined metal or other end products (for example, cut and polished gem diamond) within the country.

In 2001, Australia had 6 alumina refineries with another one under construction and 6 aluminum smelters; 3 principal copper smelters, and 3 principal refineries; 1 principal gold refinery; 4 principal lead-zinc smelters and/or refineries; 1 manganese ferroalloy plant; 1 nickel smelter and 2 nickel refineries; 3 principal crude steel plants; 1 primary tin smelter, 1 tin refinery, and 2 secondary tin refineries; 2 silver refineries; and 10 petroleum refineries.

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. Mineral ownership was divided between State ownership in State onshore areas and Commonwealth ownership in Territories and in offshore areas beyond Australia's 4.8-kilometer (km) (3-mile) territorial limit. The Commonwealth's responsibility in the Northern Territory for minerals except for uranium, however, was transferred to the Government of the Northern Territory. Thus, the individual States and Territories administered the mineral industries within their own borders, which included registering land titles; issuing exploration and

development permits; overseeing mining operations, which included administration of inspections; 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, has de facto control over most mineral production (table 2).

In 2001, eight major minerals and metals projects were commissioned at an estimated capital cost of \$230 million. This represented a significant reduction in the rate of project completions and in average project value compared with the previous 2 years. In 2000, 12 projects valued at about \$1.4 billion were completed, and in 1999, a record 35 projects valued at almost \$4 billion were commissioned. Among the major projects completed in 2001 were two new gold mines—Gympie Eldorado Gold Mines Pty. Ltd.'s Gympie underground mine in Queensland and Tri Origin Australia NL's Cobar Central open pit mine in New South Wales. Each was developed at a capital cost of about \$18.5 million (Resource Information Unit, 2002b, p. 14, 148, 180).

Commodity Review

Metals

Bauxite, Alumina, and Aluminum.—Australia again was the unchallenged leader for the 31st consecutive year in the production of bauxite, which was from the Northern Territory (Gove Mine), northern Queensland (Weipa Mine), and Western Australia (Huntly, Willowdale, and Worsley Mines). The country produced about 53.3 Mt in 2001, which represented 36% of world bauxite output. In terms of aluminum metal, Australia's production ranked fifth in the world with 8%. Bauxite deposits in the Mitchell Plateau and Cape Bougainville regions of Western Australia also are very large, but those were not yet economical to mine (Australian Journal of Mining, 2001a; Plunkert, 2002a, b; Minerals Council of Australia, undated a§).

Already having spent more than \$2 million on planning, privately owned Aldoga Aluminium Pty. Ltd. announced in January that it had secured sufficient power needed for its proposed \$1.5 billion aluminum smelter, which it would like to construct near Gladstone in Queensland, and that it had reached a preliminary technology agreement with Alcoa Inc. of the United States. The proposed facility would produce about 450,000 metric tons per year (t/yr) of aluminum. Initially, Aldoga had wanted to build the smelter in New South Wales but had failed to obtain a favorable power-supply agreement. Aldoga's Gladstone site, which is located 15 km southwest of Gladstone, however, had secured an 800-megawatt (MW) power block, which would underpin its energy requirements, and received support from the Commonwealth and Queensland Governments. Aldoga was optimistic that the plant would be operational by mid-2002 (Metal Bulletin, 2001e; Mining Journal, 2001k).

In March, VAW Kurri Kurri Pty. Ltd. announced its intention to spend about \$55 million during a 3-year period on technical improvements at its Kurri Kurri aluminum smelter in New South Wales's Hunter Valley. The upgrade was primarily to improve the technology of the existing potlines to reduce cost and emissions, and further raise product quality. In addition,

VAW Kurri Kurri was considering adding a fourth potline, which would increase installed capacity at the smelter from 150,000 t/yr to more than 250,000 t/yr. VAW Kurri Kurri had purchased the smelter from Capral Aluminium Ltd. in mid-2000. Capral had experienced difficulties in securing attractively priced power to expand the smelter, and the expansion under consideration would require a further 200 MW of energy (Metal Bulletin, 2001g; Mining Journal, 2001g).

In October, Comalco Ltd. (a wholly owned subsidiary of Rio Tinto Plc) announced that it would proceed with phase one of its alumina refinery at Gladstone. The Gladstone facility would decrease the company's alumina production deficiency and increase mine production at Rio Tinto's underutilized bauxite operations at Weipa, Queensland. Work on the first phase of the Central Queensland refinery, which was to have a capacity of 1.4 million metric tons per year (Mt/yr), was to start in early 2002; initial production was scheduled to begin in March 2005. The first phase, which was estimated to cost about \$750 million, was to treat 3 Mt/yr of bauxite to produce 1.4 Mt/yr of alumina by using the Bayer process. Subsequent expansion at the refinery may boost output to more than 4 Mt/yr of alumina. The Commonwealth and Queensland Governments provided support for the project, which was estimated to be about \$300 million. The project, which had been in planning for nearly 30 years, will be Australia's first new alumina refinery in 20 years when it comes onstream. As many as 1,500 people will be employed directly onsite during the construction phase of the refinery and more than 400 jobs directly associated with the refinery were expected to be created. The Gladstone area already had two other alumina facilities in the area—Queensland Alumina's 3.8-Mt/yr Gladstone alumina refinery and Boyne Smelters Ltd.'s 490,000 t/yr Boyne Island aluminum smelter (Australian Journal of Mining, 2001e; Metal Bulletin, 2001c; Mining Journal, 2001i; Rio Tinto Plc., 2001a).

The French-based aluminum group Pechiney exercised its option in October to buy an additional 15.5% interest in the 444,000-t/yr Tomago aluminum smelter in New South Wales from the Australian financial institution AMP Ltd. for \$220 million. The purchase raised Pechiney's holdings in the smelter to 51.55%, which made it the largest shareholder. Pechiney, which built and supplied the technology for the plant, was the operator. The other shareholders were Gove Aluminium Finance Ltd. (36.05%) and VAW Aluminium (12.4%); Gove Aluminium Finance was a subsidiary of CSR Ltd. in which AMP Ltd. had a 30% interest. The plant's principal source of alumina was the Gove bauxite and alumina complex in the Northern Territory (Metal Bulletin, 2001f; Mining Journal, 2001m).

Copper.—Although copper is widely distributed in Australia, the country's copper resources are largely at the Olympic Dam copper-uranium-gold-silver deposit in South Australia and at the Mount Isa copper-lead-zinc deposit in Queensland. Other important copper resources are at the Northparkes copper-gold and the CSA copper-lead-zinc deposits in New South Wales, the Ernest Henry, the Mammoth, and the Osborne copper deposits and copper-gold deposits at Selwyn in Queensland, the Golden Grove copper-zinc deposits and the Nifty copper deposit in Western Australia. In 2001, Australia's main copper mining centers were in the Mount Isa-Cloncurry region of Queensland and at Olympic Dam in South Australia. The

Mount Isa Mine, which also produced large tonnages of lead, zinc, and silver, was the largest copper producer in Australia and was one of the world's biggest underground mines. At Mount Isa, the copper ore bodies are separate from the lead-zinc-silver ore bodies, which enabled independent production of these distinct ore types. Relatively small amounts of copper also were recovered as a byproduct of silver-lead-zinc, nickel, and gold mining operations across Australia. Australia's economic copper resources were about 4% of the world's resources. In 2001, production ranked fourth in the world following Chile, the United States, and Indonesia (Edelstein, 2002; Minerals Council of Australia, undated b§).

In January 2001, Pasmenco Ltd. agreed to sell its 49% interest in the Ernest Henry copper-gold mine near Cloncurry, Queensland, to Aquila Resources Ltd. for \$45 million. In March, however, MIM Holdings Ltd., exercised its pre-emptive rights and had completed the purchase and resold the 49% interest to an investment company led by Westpac Banking Corp. by the end of April. MIM retained the option to repurchase the 49% (Resource Information Unit, 2002b, p. 75).

Although mining and crushing activities ceased in May 2000 at the Girilambone Mining Joint Venture mine (Straits Resources Ltd. and Nord Pacific Ltd., 50% each), copper production from its heap-leach system was to continue at a rate of about 200 metric tons per month until mid-2002 or for as long as positive cash flow could be maintained. By yearend 2001, the Girilambone Mine had produced 113,206 t of copper during its life (Resource Information Unit, 2002b, p. 76).

Following an expansion that was completed in 1999, the Olympic Dam copper operations in South Australia produced its one millionth metric ton of refined copper in February 2001. In mid-year, an optimization study to improve efficiency was completed, and a low-cost expansion program to achieve 235,000 t/yr of refined copper was initiated. Construction began in May 2001 and was expected to be completed by October 2002. The Olympic Dam copper operation included a fully integrated metallurgical complex with a grinding-concentrating circuit, a hydrometallurgical plant that incorporated a solvent extraction circuit, and a copper smelter and a copper refinery. Olympic Dam's copper production was sold to customers in Asia, Australia, and Europe under annual contracts based on the London Metal Exchange's cash settlement price (Resource Information Unit, 2002b, p. 89).

Gold.—Australia has about 8% of world economic gold resources and ranked third after the Republic of South Africa and the United States. In 2001, Australia was the world's third largest gold producer, again after South Africa and the United States, and accounted for about 12% of world output. Most of the gold mined in Australia in 2001 was from large open pit mines and was invisible to the naked eye (Amey, 2002; Minerals Council of Australia, undated c§).

In 2001, Australia was losing its gold assets with a sustained consolidation that was led by North American- and South African-based firms. Of the largest five gold mines in Australia in 2001, four had majority ownership by American, Canadian, or South African firms. The only Australian company represented in the top five was Delta Gold Ltd., which was to be merged with Goldfields Ltd.

On September 17, Delta Gold and Goldfields agreed to merge, which would create a 31,100-kilograms-per-year

company that will be headquartered in North Sydney, Australia. Although the merger was completed on December 13, its implementation date was to be effective on January 1, 2002, with the resulting merged company renamed AurionGold Ltd. AurionGold would share fifth place with Canada's Placer Gold Ltd. (AurionGold Ltd., 2002; Resource Information Unit, 2002b, p. 432). Gold production has decreased by more than 10% since 1997 to 285 t in 2001; this marked the fourth consecutive year of decline. In 2001, the five largest Australian gold mines were the Super Pit, which produced 19,170 kg during the year; the Granites, 14,939 kg; the Jundee-Nimary, 12,556 kg; the Saint Ives, 15,968 kg; and the Granny Smith, 10,798 kg (Gold Gazette, 2002a; Mining Journal, 2002b).

On December 11, the Mount Charlotte underground mine, which was owned by Kalgoorlie Consolidated Gold Mines Pty. Ltd. (a 50-50 joint venture between Normandy Mining Ltd. and Homestake Gold of Australia Ltd.) was officially closed after producing more than 3.8 million ounces (118,193 kg) of gold since its startup in 1962. A small workforce, however, was to remain onsite to remove remnant ore. The mine was to be used as a storage facility for drill samples as well as a communications and training center. Cessation of all mining activity and full closure of Mount Charlotte was expected by mid-2002 when the mine was to be capped (Gold Gazette, 2002b; Resource Information Unit, 2002b, p. 220).

Iron Ore and Steel.—Although iron ore resources occur in all six Australian States and the Northern Territory, almost 95% of the 32 billion metric tons (Gt) of the EDR is in Western Australia; this includes about 90% in the Hamersley region, which was a major world iron ore province. In 2001, Australia ranked fourth following China, Russia, and Ukraine in iron ore resources (Kirk, 2002; Minerals Council of Australia and Australian Geological Survey Organisation, undated§).

The major iron ore producers that operated in the Hamersley Province were BHP Billiton Ltd., Rio Tinto's wholly owned subsidiary Hamersley Iron Pty. Ltd., and Robe River Iron Associates [which was a 53% owned joint venture of Rio Tinto with a Japanese consortium that comprised Mitsui & Co. (Australia) Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; and Sumitomo Metal Australia Pty. Ltd., 3.5%]. Portman Ltd. and ABM Mining Ltd. were smaller iron ore miners that operated the Cockatoo and Koolyanobbing Mines in Western Australia and the Savage River Mine in Tasmania, respectively. Onesteel Ltd., which had been created when BHP divested some of its steel assets, operated the Whyalla Mines (formerly the Middleback Ranges Mines), which are about 50 km west of Whyalla in South Australia and included the Iron Baron, Iron Duchess, Iron Duke, Iron Knob, and Iron Prince Mines. The Iron Baron and Iron Knob Mines were almost depleted, however, after more than a century of mining (Mining Journal, 2001n; Resource Information Unit, 2002b, p. 301).

In midyear, Hamersley Iron and Robe River Iron agreed to merge their rail assets to form a 50-50 joint venture that would be known as the Pilbara Rail Co. and would operate and maintain their common rail lines. The Pilbara Rail joint venture replaced a previous plan that included the building of a new 340-km railway that was to link the West Angelas Mine, which was then owned by North Ltd., to Robe River Iron's ship-loading facilities at Cape Lambert on the coast of northern Western Australia. Hamersley Iron acquired the West Angelas

deposit from North in August 2000, thereby paving the way for the rail assets merger rather than to construct a new but redundant line for approximately \$255 million (Mining Journal, 2001n).

On December 20, Hamersley Iron reached agreement with Shanghai Baosteel Group Corporation, which was China's largest steel maker, to form an unincorporated iron ore joint-venture operation in Western Australia. Under the agreement, Hamersley Iron was to supply Baosteel with 200 Mt of products to average 10 Mt/yr of ore during the 20-year life of the joint venture. Hamersley Iron was to develop and operate a new mine, which was located 10 km east of Paraburdoo in the Pilbara region of Western Australia by about 2004 at an initial cost of \$63 million. Implementation of the project was subject to various approvals, which included those of the Foreign Investment Review Board and the Western Australia Government. The joint venture was to be held 54% by Hamersley Iron. The agreement was Baosteel's second with an overseas iron ore supplier (the first, which was concluded in October 2001, was with Brazil's Cia. Vale do Rio Doce and also was for 20 years) (Metal Bulletin, 2001a; Resource Information Unit, 2002b, p. 295; Rio Tinto Ltd., 2001c).

At yearend 2001, Portman was preparing plans to expand its 50% owned Cockatoo Island iron ore mine into a new stage of mining, following a study completed earlier in the year. The new operation was to recover an additional 4 Mt of iron ore from sections of the ore body that would extend below the level of the Timor Sea along strike and to the west of the present mine. The proposal required the construction of a sea wall to prevent flooding of the open pit. Portman management expected that the project would provide access for it and its partner, Henry Walker Eltin Ltd., to additional high-grade premium fines material for at least another 3 years (Metal Bulletin, 2001b).

On March 18 in London, United Kingdom, and March 19 in Melbourne, Australia, the directors of Melbourne-based BHP Ltd., which was founded in 1885 to mine lead, zinc, and silver at Broken Hill in New South Wales and later diversified into steel production and then into petroleum and other minerals, and London-based Billiton Plc., which was an international minerals company that focused on the commodities aluminum, base metals, coal, nickel, steel and ferroalloys, and titanium minerals, agreed to merge and establish a diversified global resources group, BHP Billiton. The merger was to be achieved through a dual-listed structure. BHP was to be run by a unified board and management team with headquarters in Melbourne and with a significant corporate management center in London. The existing primary listings on the Australian and London stock exchanges were to be maintained, as were the secondary listings on the Johannesburg, South Africa, and New York, New York, stock exchanges. The merger was completed in June 2001. The iron ore operations and the Worsley alumina plant in Western Australia, the steaming coal (New South Wales) and coking coal (Queensland) operations, the North-West Shelf LNG operations, the Bass Strait oil and gas fields, and the Australian ferroalloy operations composed 36% of the new global company's operating assets. BHP Steel Ltd. (a unit of BHP Ltd.) was not included in the merger but was intended to be spun off to BHP shareholders by yearend 2002 (BHP Ltd. and Billiton Plc., 2001, p. 1-5; Resource Information Unit, 2002b, p. 450-454).

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. It was based on a lead-silver ore body with zinc as a byproduct. The Cannington Mine, which was the largest single mine silver producer in 2001, contributed more than 4% of global silver production and was the second largest known silver deposit in the world. MIM's Mount Isa and Hilton George Fisher deposits at Mount Isa in Queensland ranked as the third and fifth largest known silver deposits respectively and together ranked fifth among individual producers in the world in 2001 (Mining Magazine, 2002a).

Lead was the first metal to be mined in Australia; it was first mined in 1841 at Glen Osmond, South Australia. Lead-silver ore was discovered and mined near Broken Hill, New South Wales in 1876. In 1883, the large lead-zinc-silver deposit at Broken Hill proper was discovered, which provided the basis for Australia's zinc mining industry through the present (Minerals Council of Australia, undated e§, h§, k§).

Australia ranked first in the world in lead and silver reserves and second after China in zinc reserves owing to the development of the large zinc-lead-silver deposits at the Cannington, the Century, and the McArthur River Mines. These positions are further supported by the reserves of the many other base-metal and silver-bearing gold deposits of lesser size in Australia (Hilliard, 2002; Plachy, 2002; Smith, 2002).

On September 19, the world's largest lead and zinc producer and third largest silver producer, Pasminco Ltd., appointed voluntary administrators. Trading of its shares on the Australian Stock Exchange was suspended, although its mines and smelters worldwide continued to operate. The company's adverse financial position resulted from a number of factors during the year, some of which were the result of its own decisions and some of which were beyond its control. The interplay of high debt, low metal prices, and long-term currency hedges were most detrimental (Pasminco Ltd., 2001; Resource Information Unit, 2002b, p. 600; Pasminco Ltd., 2002§)

Manganese.—Groote Eylandt Mining Co. Pty. Ltd. (GEMCO) mined about 15% of the world's manganese at its 2.4-Mt-capacity, 84-square-kilometer (km²) Groote Eylandt open pit operations on the northwestern portion of Groote Eylandt, which is located off the far northern coast of Australia in the west of the Gulf of Carpentaria, Northern Territory. The operations at Groote Eylandt used excavators and 145-t end-dump trucks for removal of overburden and ore mining. The onsite concentrator produced clean lump and fines ore products that were trucked to Milner Port Bay for shipment. GEMCO shipped about 25% per year of its concentrates to the ferromanganese plant operated by Tasmanian Electro Metallurgical Co. Pty. Ltd. (a BHP Billiton wholly owned subsidiary) at Bell Bay near Launceston, Tasmania. A smaller percentage was used in an electrolytic manganese dioxide plant at Newcastle, New South Wales, by Australian Manganese Co. Pty. Ltd. (a wholly owned subsidiary of BHP Billiton). The plant produced high-grade material used in long-life batteries. Other GEMCO customers were the makers of ferroalloys and steel in Australia, Canada, China, Europe, Japan, Mexico, Norway, the Republic of Korea, and the United States (Jones, 2002; Resource Information Unit, 2002b, p. 334).

Pilbara Manganese Pty. Ltd. owned and operated the 300,000-t/yr-capacity manganese mine at Woodie Woodie, which is located 400 km southeast of Port Hedland in Western Australia. The mine also included the adjacent Bells, Hanna, and Lewis open pits, although the Hanna pit was depleted near yearend, and rehabilitation work had begun. The ores from the various pits were blended to produce a consistent product. In 2001, the demand by manganese alloy producers in Asia and Europe was strong for Woodie Woodie's blended product, which had extremely low impurities of phosphorous and iron. By yearend, sufficient manganese resources had been identified at Woodie Woodie and the surrounding leases to extend the life of the mining operations to 10 years (Resource Information Unit, 2002b, p. 335).

Mineral Sands.—Mineral sands deposits are concentrations of ilmenite, rutile, and zircon, which occur along the coast of eastern Australia from central New South Wales to Cape York in Queensland. Large relic beach deposits are found as far inland as Ouyen in Victoria, in southwestern New South Wales, and in South Australia in more than 300,000 km² of the Murray Basin. In Western Australia, deposits are distributed from the southern tip of the State to Geraldton and are located at the coastline or as relic deposits up to 35 km inland. The eastern deposits generally have a total heavy-mineral content of 1% to 5%; ilmenite, rutile, and zircon each make up about one-third. In Western Australia, the deposits also have a total heavy-mineral content of about the same or slightly higher percentage, but the ilmenite portion of this content approaches about 70% (Minerals Council of Australia, undated f§). In 2001, Australia had a substantial portion of world mineral sands resources—about 32% for ilmenite, 45% for rutile, and up to 45% for zircon (Gambogi, 2002; Hedrick, 2002).

After completing a favorable prefeasibility study (PFS) at yearend 2000 on its Ginkgo minerals sands deposit in the Murray Basin of New South Wales, BeMaX Resources NL began a \$3.2 million bankable feasibility study (BFS). If the BFS confirmed the economic viability of the deposit and approved development by the New South Wales Government, both of which were expected in the first quarter of 2002, then BeMaX was to proceed with development of an estimated \$85 million project that was to produce about 124,000 t of ilmenite, 76,000 t of leucoxene, 53,000 t of rutile, and 32,000 t of zircon products. Heavy-mineral concentrate from Ginkgo typically contained about 65% ilmenite and leucoxene, 15% rutile, and 11% zircon; the remaining material was waste. Development was anticipated to begin in late 2002, to be completed by yearend 2003, and to ship the first product in early 2004 (Minerals Gazette, 2001b, 2002; Resource Information Unit, 2002b, p. 338).

In January 2001, the first production of mineral sands from the Murray Basin began when Murray Basin Titanium Pty. Ltd. (a 50-50 joint venture of Nissho Iwai Australia Ltd. and Sons of Gwalia Ltd.) made its first shipment from the Wemen Mine, which was located 80 km southeast of Mildura in Victoria. In the second quarter, the joint venture shipped 5,900 t of rutile and 1,300 t of zircon. At yearend 2001, the mine had reached about 70% of its design capacity of 30,000 t/yr of ilmenite, 30,000 t/yr of rutile, and 10,000 t/yr of zircon (Industrial Minerals, 2001a, b; Resource Information Unit, 2002b, p. 345).

In July, Iluka Resources Ltd. announced its intention to build

a zircon finishing plant at its Geraldton mineral processing complex in Western Australia. The new plant was expected to be commissioned in mid-2002 and to cost about \$11 million. The plant was to house the facilities to grade zircon minerals into products with specialized application for ceramic glazes, chemical processing, and refinery linings. The facility also was to remove any trace impurities. Feed for the plant was to originate from the nearby Eneabba open pit operation (Iluka Resources Ltd., 2001; Mining Journal, 2001f).

In midyear 2001, Doral Mineral Sands Pty. Ltd. of Perth, Western Australia, acquired the Dardanup mineral sands mine from Japan's ISK Minerals Pty. Ltd. with plans to start up a new \$16 million mining operation. A processing plant at Picton, which had been idle for about 8 years, was to be refurbished and reopened for use. Doral planned to mine 110,000 t/yr of ilmenite and rutile, 10,000 t/yr of leucoxene, and 10,000 t/yr of zircon minerals during a 9-year period. Full production was expected by September 2002 (Australian Journal of Mining, 2001b).

On October 26, 2001, BeMaX successfully concluded a native title agreement for the Ginkgo project with the Barkandji People. The agreement included provisions for the protection of the environment and local cultural heritage, training and employment opportunities for the Barkandji People, and consultation and compensation (Mining Journal, 2001c).

Nickel and Cobalt.—Australia ranked first in economic resources of cobalt and nickel. Australia's main nickel ores were primary sulfides of nickel, which occur as lodes within mafic and ultramafic (iron- and magnesium-rich) igneous rocks that have a volcanic origin, although most of the world's identified resources are contained in nickel-bearing laterite and nickeliferous limonite. These are secondary deposits that are derived from the weathering of nickel-bearing mafic and ultramafic rocks in tropical and subtropical climates (Kuck, 2002; Shedd, 2002; Minerals Council of Australia, undated g§).

At 197,000 t of nickel in 2001, Australia was the world's second largest nickel producer after Russia and ranked third in cobalt production following Congo (Kinhasa) and Zambia. Most of Australia's nickel-cobalt mines are in the Kalgoorlie and the Leonora regions of Western Australia (Kuck, 2002; Resource Information Unit, 2002b, map).

Effective December 27, OM Group Inc. (OMG) of Cleveland, Ohio, bought the Cawse lateritic nickel-cobalt mine in Western Australia from Centaur Mining & Exploration Ltd; the sale included the mineral rights plus the project's processing facilities. OMG was a major producer of metals-based chemical products, and the acquisition formed part of its strategy for vertical integration. This was the third and last sale of Centaur's assets since it went into receivership in March after having accumulated about \$346 million in debts, which included more than \$85 million in unserviceable foreign exchange and hedging losses. OMG expected the Cawse Mine to supply 8,000 t/yr of intermediate nickel hydroxide feedstock for its nickel refinery at Kokkola and 800 t/yr for its cobalt refinery at Harjavalta; both refineries were in Finland. The Cawse Mine probably had been one of the best performers of the three main Western Australia nickel laterite projects (the other two were Preston Resources Ltd.'s Bulong Mine and Anaconda Nickel Ltd.'s and Glencore Australia Pty. Ltd.'s Murrin Murrin Mine, which was a 60-40 joint venture) and in

which each was using variants of the pressure acid-leaching processing technology of limonitic nickel laterite ore (Metal Bulletin, 2002b; Mining Journal, 2002a, c; Resource Information Unit, 2002b, p. 29).

Platinum-Group Metals.—No Australian mines were primary producers of platinum-group metals (PGMs), although minor production continued in Western Australia's Eastern Goldfields at Kalgoorlie-Boulder and Kambalda as a byproduct of nickel operations. PGMs, which are mainly platinum and palladium, were recovered at the Port Kembla refinery-smelter complex from byproduct copper sulfide residues produced at the Kwinana nickel refinery. PGMs also were contained in nickel matte produced for export at the Kalgoorlie smelter.

Platinum Australia Ltd.'s PFS on its Panton mafic-ultramafic ore body in the Kimberley region of Western Australia, which was completed in July 2001, however, indicated that a 900,000-t/yr, 11-year platinum-gold operation could be financially and technically viable. The study proposed that mining would initially be open pit and then go underground, which would focus on the high-grade "A" reef, which had a grade of 5.4 grams per metric ton PGMs plus gold. Earlier, Perth-based Helix Resources NL was ready to commit to a \$4.8 million BFS for its Munni Munni PGM project, which also was located in Western Australia, in which Lonmin Plc. agreed to fund for a 50% interest (Metal Bulletin, 2001d; Mining Journal, 2001e; Resource Information Unit, 2002b, p. 382-384).

Tin.—Renison Bell Ltd.'s Renison Bell Mine in Tasmania and Marlborough Resources NL's Ardlethan Mine in central New South Wales were essentially Australia's only tin mines. Sons of Gwalia Ltd.'s Greenbushes Mine in Western Australia produced minor amounts of byproduct tin that was recovered along with the tantalum-bearing mineral tantalite. Australia supplied about 4% of world tin production in 2001; Renison Bell contributed the major portion (Carlin, 2002). The Ardlethan alluvial mine was at full production capacity at yearend following its commissioning in June and first production in August 2001 (Minerals Gazette, 2001c). Ardlethan and Renison Bell shipped their concentrate overseas for processing. Ardlethan's went to the Malaysian Smelting Corp. in Penang, Malaysia, and Renison Bell's was sold to Thailand Smelting and Refining Co. Ltd. for smelting at Phuket, Thailand (Australian Journal of Mining, 2002b; Metal Bulletin, 2002a; Resource Information Unit, 2002b, p. 397-399).

The Renison Bell deposit, which supported one of the world's largest underground tin mines, contains more than 85% of Australia's EDRs of tin (Carlin, 2002; Minerals Council of Australia, undated i§).

Tungsten.—Tasmania Mines Ltd. and Itochu Corp., with equal interests, produced a small quantity of low- and high-grade scheelite concentrates for the production of tungsten metal as well as a range of iron ore products from its Kara Mine, which is located 30 km south of Burnie, Tasmania, for use in coal washeries and cementmaking (Resource Information Unit, 2002b, p. 399).

Industrial Minerals

Diamond.—In 2001, Australia's diamond-producing mines were wholly owned by Australia's Rio Tinto Ltd., which was a

dual-listed company with the United Kingdom's Rio Tinto Plc. The mines were the Argyle open pit in the Ellendale diamond province of the western Kimberley region of Western Australia and the Merlin open pit in the Northern Trough in northeastern Northern Territory. Other operations had various activities ongoing; these included various drilling, sampling, trenching, tunneling, and/or washing of materials, but they were not producing any diamond. These included Cluff Resources Pacific NL's Bingara and Copeton diamond fields in New South Wales and Kimberley Diamond Co. NL's Ellendale Mining Lease in Western Australia, which includes the kimberlite pipes 4 and 9 (Australia's Paydirt, 2001/2002b, 2001/2002c; Resource Information Unit, 2002b, p. 97-103).

Argyle was the world's largest single producer of diamond. Mining from the AK-1 lamproite pipe at Argyle began in 1985. Diamond also was recovered from alluvial material in the nearby Limestone and Smoke Creeks where initial mining at Argyle had begun in 1983 and has continued through 2001. Total diamond production through yearend 2001 was 584.4 million carats, of which 541.1 million carats was from AK-1 pipe ore and 43.3 million carats was from alluvial material. The peak production year in which 42.8 million carats of diamond was recovered was 1994. The life of the open pit at Argyle was thought to extend to 2007, but since the AK-1 pipe continued at depth, underground mining possibly could extend the mine life to 2014. A \$1.3 million, 11-hole deep-drilling program and feasibility study was underway in 2001. A completed scoping study had positive results (Australia's Paydirt, 2001/2002a; Resource Information Unit, 2002b, p. 97-98).

Diamond produced at Argyle were sorted in Perth where they were prepared for international sale at Argyle's European sales office in Antwerp, Belgium. Argyle specialized in fancy diamonds, such as champaign, cognac, and the rare pink diamond (Resource Information Unit, 2002b, p. 428).

Ashton Mining NL's Merlin Mine, which was the country's second hardrock diamond mine, began surface mining in 1999. A decision regarding underground mining was expected prior to 2001. Following the December 2000 takeover, however, by Rio Tinto, no decision ensued. In early 2001, operations at the mine were suspended owing to adverse weather conditions that prevented fuel deliveries to the mine. Although operations began again in May, production for the remainder of the year was below target primarily owing to process constraints associated with the clayey nature of the ore (Resource Information Unit, 2002b, p. 106).

Although the Ellendale diamond field near Fitzroy Crossing in Western Australia was the first big diamond discovery in Australia, only near yearend 2001 was it considered to be the only immediate candidate to be the country's next diamond mine. In April, a prefeasibility study to assess the viability of establishing a diamond mining and processing operation at the Kimberley Diamond Co. NL's (KDC) wholly owned Ellendale Prospect was successfully completed. The study was based only on a limited 950,000-t secondary-enriched ore body perched on top of pipes 4 and 9 and did not include a primary ore body that had been delineated earlier. Accordingly, KDC was planning a 750,000-t/yr plant for processing the enriched surface material during about a 15-month period and then choosing to mine either the underlying leaner diamondiferous kimberlite or the alluvial materials in the vicinity (Mining Journal, 2001b; Resource Information Unit, 2002b, p. 103).

Diatomite.—Australian Diatomite Mining Pty. Ltd., which has been extracting high-grade diatomite at Barraba, New South Wales, since 1982, was acquired by Supersorb Minerals NL in 1999. The Barraba processing plant, which was located about 5 km from the mine, was centered around a coal-fired rotary kiln that dried and partially calcined the diatomite product for use in pet litter products. Near yearend 2000, a new fluidized-bed calciner was installed, which was commissioned in March 2001 at a cost of about \$460,000. The new plant did not reach design capacity, however, and was continually being modified throughout the year. Although the plant was still operating below design capacity at yearend, production rates had increased sufficiently to supply all ongoing orders as well as to replenish stocks (Resource Information Unit, 2002b, p. 113).

Garnet.—GMA Garnet Pty. Ltd. produced industrial-grade garnet at its Port Gregory open pit, which is located 100 km north of Geraldton, Western Australia. The processed garnet product was used domestically (40%) and exported through the Ports of Fremantle and Geraldton to Asia, the United States, and Western Europe for use as an abrasive in industrial cleaning and maintenance and as a high-pressure cutting agent (Resource Information Unit, 2002b, p. 116).

Gemstones.—Australia, which was the leading producer of precious opal in 2001, accounted for a large percentage of world production. About one-half of Australia's annual production was mined in South Australia's three major fields at Andamooka, Coober Pedy, and Mintabie, as well as many smaller fields that stretch from Andamooka to the Northern Territory border along the southwestern margin of the Great Artesian Basin. Most opal was hand mined by either open pits or underground drifts, and all grades from milky pinfire through crystal up to high-grade black were produced. Lambina, which was a newer field, increased its production at the expense of Coober Pedy, although Coober Pedy still produced, in terms of value, almost three times that of Lambina. Opal in New South Wales was mined at Lightning Ridge, which was the world's major source of the highly prized and valuable black opal. A small quantity of opal also was produced in western Queensland.

Australia also continued to be a leading producer of natural sapphire. Commercial sapphire production was mined from alluvial deposits in the Inverell-Glen Innes (New England) region of northern New South Wales and the Rubyvale-Anakie region of central Queensland. Australia supplied as much as 30%, by volume, of the world's rough sapphire output. Most of the uncut gems were exported to Thailand, which was the recognized world leader for cutting and marketing.

Jade was discovered in the form of nephrite, which is one of the two recognized jade minerals (the other being jadeite), near Cowell on the Eyre Peninsula, South Australia. These deposits were the world's largest identified resource of nephrite jade. Australia produced most of the world's chrysoprase, which is known as Australian jade outside of Australia.

Australia produced such other gemstones as agate, amethyst, chiastolite, emerald (aquamarine), garnet, rhodonite, topaz, tourmaline, turquoise, and zircon (Primary Industries and Resources South Australia, 2000, p. 19; Resource Information Unit, 2002b, p. 116-119).

Lithium and Tantalum.—Gwalia Consolidated Ltd. was the

world's largest producer of lithium minerals (spodumene), which were mined from the southern end of the Greenbushes Mine. In 2001, the Greenbushes Mine, which is located 300 km south of Perth, was the world's largest and highest grade spodumene resource. Gwalia Consolidated, which was also the world's largest producer of tantalum, supplied an estimated 25% of the world's annual tantalum requirements. Both commodities were extracted from two separate open pits that are spaced about 300 meters (m) apart within the Greenbushes pegmatite ore body, which is one of the largest zoned rare-metal pegmatites in the world. Additionally, Gwalia Consolidated produced tantalum from the Mount Cassiterite ore body at its Wodgina Mine, which is located 100 km south of Port Hedland (Resource Information Unit, 2002b, p. 394-395, 397).

Phosphate Rock.—Australia had two active phosphate rock operations in 2001. Christmas Island Phosphates Pty. Ltd. (a subsidiary of Western Australia's Phosphate Resources Ltd.) operated an open pit mine on Christmas Island, and WMC Fertilizers Ltd. (the wholly owned subsidiary of WMC Ltd.) operated the Phosphate Hill-Duchess open pit mine southeast of Mount Isa, Queensland. Phosphate has been mined on Christmas Island, which is an overseas dependent area of Australia and is located about 360 km south of Java, Indonesia, in the Indian Ocean, since 1897.

In 1997, the Federal Government awarded a 21-year mining lease to Christmas Island Phosphates, which had been mining phosphate on the island under contract since 1990. Production was marketed to fertilizer manufacturers in Australia and Southeast Asia (Resource Information Unit, 2002b, p. 378).

Mining began in 1999 at the Phosphate Hill-Duchess Mine with a planned maximum rate of 2.2 Mt/yr of phosphate rock for the production of fertilizer. In December 2001, WMC Fertilizers produced its one-millionth metric ton of fertilizer. The month also marked the first time that the plant reached its full capacity of 1 Mt/yr. About one-half of the production was sold domestically, and the remainder was exported to Southeast Asia and New Zealand (Australian Journal of Mining, 2002b).

Talc.—In September, following the construction of a new \$5.6 million processing mill which only had begun operations in April, WMC sold its Three Springs talc mine and plant to Luzenac Australia Pty. Ltd. (a wholly owned subsidiary of Rio Tinto) for \$27.8 million. The previous January, WMC had sold its 50% interest in the Mondo Minerals Oy joint venture in Finland to its partner, Swiss-based Omya AG, and, as a consequence, decided to withdraw from the talc business entirely. The Three Springs Mine had a capacity of 200,000 t/yr, and the new 400,000-t/yr-capacity plant was capable of producing 20 different products owing to its various milling and classifying techniques. Output from the mine was sold to customers worldwide for use in the paint, paper, plastic, and technical ceramics industries and was sold as lump or finely ground product (Australian Journal of Mining, 2001d; Industrial Minerals, 2001c; Mining Journal, 2001h; Resource Information Unit, 2002b, p. 391; Rio Tinto Plc., 2001b).

Mineral Fuels

Coal.—In 2001, Australia again was the world's largest exporter of coal, as it has been since 1984, thus marking its 17th consecutive year.

On June 1, Rio Tinto, with a 92% interest through its wholly owned subsidiary Pacific Coal Pty. Ltd., announced that the joint venture it led had approved development of the Hail Creek coking coal project, which is located 85 km west of Mackay in the northern Bowen Basin of central Queensland. The project was based on one of the largest coking coal deposits in the world; the total resources were estimated to be 1.2 Gt. Capital costs of \$217 million were to include development of the mine, a dragline, the coal washing plant, and the proposed 52-km Northern Bowen Basin rail link to the existing Goonyella rail line. Coal was to be transported a distance of 175 km by rail to be loaded onto ships at the Dalrymple Bay Coal Terminal at the Port of Hay Point south of Mackay. The first shipments were scheduled for the third quarter of 2003, with full production to be 5.5 Mt/yr of hard coking coal. Mine life was expected to exceed 20 years when underground resources were included. The other joint-venture owners were the Japanese companies Marubeni Coal Pty. Ltd. (5.33%) and Sumitomo Corp. (2.67%) (Minerals Gazette, 2001a; Mining Journal, 2001j; Rio Tinto Ltd., 2001a; Resource Information Unit, 2002b, p. 49).

In November, MIM was considering development of the Rolleston steaming coal resource at the southern end of the Bowen Basin in central Queensland. In October, MIM reported that it had a feasibility study underway to determine potential development of the resource, which was estimated to exceed 300 Mt of coal suitable for export to overseas power companies (Asian Journal of Mining, 2002).

In December, BHP Billiton announced approval for construction of the \$64.3 million Dendrobium metallurgical coal mine in the Illawarra region of New South Wales. Dendrobium would have the capacity to produce 5.2 Mt/yr of raw coal. Development was to begin immediately with first longwall scheduled to enter production by early 2005. The mine would produce approximately 2.6 Mt/yr of metallurgical coal to be used as a blend for domestic steel producers, which included BHP Steel Ltd.'s Port Kembla Steelworks, and for export markets and about 1 Mt/yr of byproduct steaming coal, all of which was for export markets. Full production of the mine was planned for 2006. The Dendrobium Mine was to replace the nearby Elouera longwall coking coal mine, which was expected to cease production following its reserves depletion in 2005. Dendrobium was to use existing infrastructure, which included rail transportation, the Elouera coal preparation plant, and mine surface facilities. BHP Billiton Illawarra Coal Pty. Ltd. (a wholly owned subsidiary) was to be the operator (Mining Journal, 2001i; Mining Magazine, 2002b).

On December 20, Rio Tinto's 73% owned subsidiary Coal & Allied Industries Ltd. reached agreement to sell its Ravensworth-Narama open pit steaming coal mining complex to Enx Resources Ltd. (a wholly owned subsidiary of Swiss-based Glencore International AG) for \$64 million. The Ravensworth-Narama complex, which was in New South Wales' Hunter Valley, included the Ravensworth East and Ravensworth West mining tenements and Coal & Allied's 50% interest in the Narama Mine. Coal & Allied had acquired these assets the previous January as part of its acquisition of the U.S.-based Peabody Group's Australian coal assets (Rio Tinto Ltd., 2001b).

At yearend, the Mount Arthur North Mine, which was scheduled to become the biggest open pit coal operation in the Southern Hemisphere, was on track to begin production in early

2002. The mine was to be operated by Coal Operations Australia Ltd. (COAL) (a wholly owned subsidiary of BHP Billiton). The Mount Arthur North resource also was to be the last of any significant surface mining resource to receive development consent in the Upper Hunter Valley of New South Wales. In December 2001, detailed design and engineering were about 45% complete and the major contract construction works, such as earthworks, mine predevelopment, and infrastructure, were progressing well. A portion of the initial production from Mount Arthur North was to supply steaming coal for 5 years to Macquarie Generation for local power station electricity generation. Capital cost for the mine was \$411 million. Because the project actually represented a high-value brownfield expansion of COAL's adjacent Bayswater open pit mine, the reserves of the two were to be mined as one large flexible operation. The operation was scheduled to reach 6.3 Mt/yr of salable coal from the Bayswater/Mount Arthur North complex in 2003 and its full salable production of 12.1 Mt/yr from Mount Arthur North by 2006. The full capacity of the combined operations was expected to be up to 14.5 Mt/yr (Asian Journal of Mining, 2001; BHP Billiton Ltd., 2001; Coal Age, 2001; Mining Magazine, 2001; Resource Information Unit, 2002b, p. 54).

Petroleum and Natural Gas.—In 2001, Western Australia and the adjacent Commonwealth offshore areas accounted for about 55% of Australia's total oil and condensate, and all the country's liquefied natural gas (LNG) production. A big part of why the State can do this, apart from having the appropriate geology, is because of its enormous size, onshore and offshore. Onshore Western Australia has a land area of more than 2.5 million square kilometers, which is nearly four times the size of Texas. Additionally, the State's offshore area encompasses an area nearly four times larger than Europe's North Sea and that is larger than North America's entire Gulf of Mexico. Although Western Australia attracted about 70% of the country's petroleum exploration expenditures during the most recent financial year ending June 30, 2001, only about 500 offshore exploration wells and just 395 onshore exploration wells have been drilled in Western Australia's petroleum exploration history (Department of Mineral and Petroleum Resources Western Australia, 2002, p. 1; Resource Information Unit, 2002a, p. 2).

In 2001, Australia produced about 72% of its crude oil requirements; this was a decrease from about 80% in 2000. Australia's expanding oil deficit was primarily a result of demand steadily outpacing supply. The Australian Government has estimated that the country was using its crude petroleum about three times faster than exploration projects were discovering new production fields. By 2010, Australia was expected to slide downward to only a 40% self-sufficiency (Oil & Gas Gazette, 2002a; U.S. Energy Information Administration, 2002§).

On April 2, Woodside Energy Ltd., which was operator of the North West Shelf Venture (NWSV), announced the go-ahead of the fourth LNG liquefaction train adjacent to existing facilities on the Burrup Peninsula in Western Australia. The NWSV consisted of the following sixequal participants: BHP Petroleum (North West Shelf) Pty. Ltd., BP Developments Australia Pty. Ltd., Chevron Australia Pty. Ltd., Japan Australia LNG (MIMI) Pty. Ltd., Shell Development (Australia) Pty.

Ltd., and Woodside. The new train was to have a capacity of 4.2 Mt/yr, which would make it the largest single LNG processor ever built, and was expected to cost about \$816 million. Construction began in September, and first production was scheduled for mid-2004. All production from the additional expansion was to be sold to Japan. Additionally, the NWSV agreed to construct a second trunk pipeline to its gas fields, which are located about 130 km offshore from Karratha. The 42-inch (1.1-m) trunkline was estimated to cost about \$408 million. The NWSV had eight purpose-built ships with a capacity of 125,000 cubic meters of LNG to carry the product from Australia to its Asian customers; a ninth LNG carrier had been ordered. The ship, which was to be built by the Republic of Korea's Daewoo Shipbuilding & Marine Engineering Co., was scheduled for delivery in early 2004 (Woodside Energy Ltd., 2001a; Oil & Gas Gazette, 2002b, c).

On October 25, the NWSV signed binding sales contracts with Tokyo Gas Co. Ltd. and Toho Gas Co. Ltd. for the supply of 1.37 Mt/yr of LNG from the new train for a period of 25 years. Deliveries were scheduled to begin in 2004; Tokyo Gas would receive 1.073 Mt/yr and Toho Gas would take the remaining 297,000 t/yr. The NWSV also has signed letters of intent with the following Japanese customers:

- Chubu Electric Power Co. Inc. for 600,000 t/yr beginning in 2009.
- Kyushu Electric Power Co. Inc. for 500,000 t/yr beginning in 2006.
- Osaka Gas Ltd. for 1 Mt/yr beginning in 2004.
- Shell Gas & Power Japan Ltd. for up to 3.7 Mt/yr between 2004 and 2009.
- Tohoku Electric Power Co. Inc. for 500,000 t/yr beginning in 2006 (Woodside Energy Ltd., 2001b).

In November, Hong Kong-based CNOOC Ltd. (a 70.6% owned subsidiary of China National Offshore Oil Corp.) announced that it had signed a Heads of Agreement with the NWSV on a new joint venture to develop North West Shelf gas in Australia pending the result of the Guangdong LNG supply bid. CNOOC agreed to coinvest in the development of Australia's North West Shelf project for the sale of LNG to China markets. Under the agreement, CNOOC was to invest with other participants in a venture that was to produce and process natural gas for LNG supply targeted to China (CNOOC Ltd., 2001).

Australia's natural gas reserves were among the largest in the Asia Pacific region. As of January 1, 2002, proven reserves were estimated to be 2.5 trillion cubic meters; this was an increase of slightly more than double the January 1, 2001, estimated reserves.

Australia has 10 crude oil refineries with a total crude oil distillation capacity of 846,250 barrels per day (bbl/d). The country's three largest facilities were BP Plc.'s Kwinana Refinery in Western Australia with a capacity of 158,500 bbl/d of crude oil, Chevron Texaco Corp.'s Kurnell Refinery in New South Wales with a capacity of 114,000 bbl/d of crude oil, and Exxon Mobile Corp.'s Altona Refinery in Victoria with a capacity of 130,000 bbl/d of crude oil (U.S. Energy Information Administration, 2002§).

The total number of petroleum exploration and development wells drilled during 2001 (214) was 13 more than that of 2000 (201). The number of onshore exploration wells drilled in 2001 (68) was 31 more than that of 2000 (37). During 2001, the

number of offshore exploration wells drilled increased to 59 compared with that of 2000 when 1 more well was drilled. The total number of exploration wells drilled in 2001 (127) increased by 31% from the number drilled in 2000 (97). The total number of development wells drilled (87) was 17 less than that of 2000 (104); 65 wells were drilled onshore, which was a decrease of 14 wells compared with that of 2000; and 22 wells were drilled offshore compared with 25 wells drilled in 2000. In 2001, the total meters drilled for exploration and development wells (533,241) was almost 12% more than that drilled in 2000 (478,035, revised). The 65,025 line kilometers of seismic survey activity during 2001 was better than 66% fewer than the 193,479 line kilometers (revised) recorded in 2000. During 2001, of the 14 offshore oil and gas discoveries, the most significant were oil at Audacious in the Bonaparte Basin off Western Australia, gas at Geographe and Thylacine in the Otway Basin offshore of Tasmania and Victoria, and gas at Blacktip in the southern part of the Bonaparte Basin. Onshore, of the 21 discoveries, 20 were gas. The Cooper/Eromanga Basin (Queensland and South Australia) accounted for 10 gas discoveries, the Otway Basin (Victoria) had 7 gas discoveries, the Bowen and Surat Basins (Queensland) had 2 gas discoveries, and the Gippsland Basin of New South Wales and Victoria had 1 gas discovery. The sole onshore oil discovery was made at Hovea in the Perth Basin of Western Australia (Geoscience Australia, 2002).

Uranium.—Australia had three active uranium mining operations in 2001—Energy Resources of Australia Ltd.'s (ERA) Ranger open pit mine in the Northern Territory, which was the oldest of the active mines; Heathgate Resources Pty. Ltd.'s Beverley in-situ-leach (ISL) operation in South Australia, which was the latest of the active uranium mines to come onstream; and WMC's Olympic Dam underground copper-silver-gold-uranium mine also in South Australia, which was one of the largest mines in the world. Because Australia has no significant national demand for uranium, virtually all production was exported. Uranium oxide or yellowcake, exports only were made under close supervision under stringent international and bilateral safeguards regulations to ensure that it will be used only for peaceful purposes (Minerals Council of Australia, undated j§).

The Beverley Mine, which was South Australia's second uranium mine, was officially opened on February 21, 2001, although it had begun production in 2000 after receiving all environmental approvals to proceed. The uranium was being extracted by the ISL mining process, which enabled the resource to be recovered without major impact on the environment. The Beverley Mine was expected to produce about 1,000 t/yr of yellowcake for about 15 years, although ongoing exploration on surrounding leases was expected to extend the mine life. After being trucked to Port Adelaide, the yellowcake was shipped to the United States under sales agreements with nuclear power utilities. Heathgate Resources was a subsidiary of General Atomics, which was a uranium miner, processor, and nuclear power station designer headquartered in the United States (Heathgate Resources Pty. Ltd., 2001; Resource Information Unit, 2002b, p. 400).

The Olympic Dam uranium operation included a fully integrated metallurgical complex with a grinding/concentrating circuit and a hydrometallurgical plant that incorporated a

solvent extraction circuit for the production of about 4,300 t/yr of yellowcake. The bulk of the uranium production was committed under long-term sales contracts with electricity generating facilities in Belgium, Canada, Finland, France, Japan, the Republic of Korea, Sweden, the United Kingdom, and the United States. In October 2001, a fire in the uranium solvent extraction area of the processing plant resulted in decreased levels of production (Resource Information Unit, 2002b, p. 89).

First production of yellowcake from the Ranger Mine was in August 1981, and the life of the mine was anticipated to end in 2007, with processing of Ranger ore expected to be completed during 2010. All ERA's yellowcake sales were to energy companies in France, Germany, Japan, the Republic of Korea, Spain, Sweden, the United Kingdom, and the United States (Resource Information Unit, 2002b, p. 404; Uranium Information Center, 2002§).

Near yearend 2001, the Toronto, Canada-based Southern Cross Resources Inc.'s Honeymoon Project cleared its last Government regulatory barriers when it received its mining lease on November 21 and an export permit on November 24, this enabling mining to proceed and providing the means to ship the product to the company's customers overseas. In February, the Government had tentatively approved Southern Cross' environmental impact statement (EIS) subject to provisions relating to the Honeymoon aquifer and the company's monitoring programs. In November, the EIS was given full clearance. Upon becoming commercially operational, the Honeymoon Mine will be South Australia's second ISL uranium mine, the State's third uranium mine, and Australia's fourth active uranium mine. Honeymoon was expected to be in commercial production by the fourth quarter of 2002 at a nominal rate of 1,000 t/yr of yellowcake, although the operation would be viable producing at a rate of only 500 t/yr (Mining Journal, 2001d; MESA Journal, 2002; Resource Information Unit, 2002b, p. 401).

Reserves

Australia ranked as one of the leading mineral-resource nations. It had the largest EDRs of lead, mineral sands, nickel, tantalum, uranium, and zinc in the world. Its EDRs also ranked in the top six worldwide for bauxite, black and brown coal, cobalt, copper, gem and near gem diamond, gold, iron ore, lithium, manganese ore, rare-earth oxides, and silver (table 3; Geoscience Australia, 2001, p. 7).

Infrastructure

The transportation infrastructure of Australia was well developed. Of the 913,000 km of roads, 353,331 km was paved, which included 1,363 km of expressways, and 559,669 km were unpaved. Inland waterways, of which 8,368 km was usable mainly by small shallow-draft craft, were of little importance to the transportation industry. The public sector railway system consisted of 33,819 km of track, of which 15,422 km was standard (1.435-m) gauge, 14,506 km was narrow (1.067-m) gauge, 3,719 km was broad (1.600-m) gauge, and 172 km was dual gauge. Australia had 2,540 km of electrified rail. A few hundred kilometers of rail were privately owned; most of this served the iron ore industry in Western

Australia. Of the 421 airports, 282 were principal with permanent-surface runways. International shipping ports included Adelaide, Brisbane, Cairns, Darwin, Devonport (Tasmania), Esperance, Fremantle, Geelong, Hobart (Tasmania), Launceston (Tasmania), Mackay, Melbourne, Sydney, and Townsville. The merchant marine fleet included 7 petroleum-oil-lubricant tankers; 4 chemical tankers; 4 LNG tankers; 38 bulk, roll-on/off, cargo-container freighters; and 2 passenger vessels. Pipelines included 5,600 km for natural gas, 2,500 km for crude oil, and 500 km for refined petroleum products (U.S. Central Intelligence Agency, 2002§).

Electric generating capacity was 37.9 gigawatts, of which 89.3% was thermal (mostly coal) and 10.7% was hydroelectric power (U.S. Energy Information Administration, 2001§).

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Australian Bureau of Statistics, Belconnen:
Mineral Production, Australia, fiscal year.
Production Statistics, Preliminary, monthly.

TABLE 1
AUSTRALIA: PRODUCTION OF MINERAL COMMODITIES 1/

(Metric tons unless otherwise specified)

| Commodity | | 1997 | 1998 | 1999 | 2000 | 2001 |
|----------------------------------------------------------------|---------------|----------|----------|------------|------------|------------|
| METALS | | | | | | |
| Aluminum: | | | | | | |
| Bauxite, gross weight | thousand tons | 44,465 | 44,553 | 48,416 | 53,802 | 53,285 |
| Alumina | do. | 13,385 | 13,853 | 14,532 | 15,680 | 16,271 |
| Metal, refined: | | | | | | |
| Primary | do. | 1,495 | 1,627 | 1,718 | 1,769 | 1,798 |
| Secondary | | 101,100 | 104,000 | 108,400 | 110,000 e/ | 110,000 e/ |
| Antimony, Sb content of ores and concentrates | | | | | | |
| | | 1,900 e/ | 1,800 e/ | 1,679 | 1,511 | 1,380 |
| Cadmium: | | | | | | |
| Mine output, Cd content e/ | | 1,900 | 1,900 | 1,900 | 1,900 | 1,900 |
| Metal, smelter, refined | | 632 | 585 | 462 | 552 | 500 e/ |
| Chromium, chromite, gross weight | | | | | | |
| | | -- | 80,000 | 70,000 | 90,000 | 11,800 |
| Cobalt: | | | | | | |
| Co content in laterite ore, Ni concentrate, and Zn concentrate | | 1,600 | 4,000 | 7,000 | 5,100 | 6,100 |
| Metal, refined | | 617 | 1,395 | 1,700 | 2,610 r/ | 3,470 |
| Columbium-tantalum concentrate, gross weight | | | | | | |
| | | 1,010 | 1,150 | 1,230 | 1,600 | 2,220 |
| Copper: | | | | | | |
| Mine output, Cu content | thousand tons | 549 r/ | 619 r/ | 741 r/ | 841 r/ | 873 |
| Metal: | | | | | | |
| Smelter, primary | do. | 216 r/ | 211 r/ | 332 r/ | 394 r/ | 455 |
| Refined: | | | | | | |
| Primary | do. | 276 r/ | 279 r/ | 412 | 488 | 558 |
| Secondary e/ | do. | 21 | 22 | 25 r/ | 25 r/ | 25 |
| Gold: | | | | | | |
| Mine output, Au content | kilograms | 314,500 | 310,070 | 300,000 r/ | 296,410 | 285,030 |
| Metal, refined: | | | | | | |
| Primary | do. | 332,700 | 282,000 | 376,000 | 349,000 | 304,770 |
| Secondary | do. | 900 | 127,000 | 66,000 | 7,640 | 68,310 |
| Iron and steel: | | | | | | |
| Iron ore: | | | | | | |
| Gross weight | thousand tons | 157,766 | 155,731 | 151,558 | 171,508 r/ | 181,435 |
| Fe content | do. | 97,901 | 99,418 | 93,807 | 106,563 r/ | 112,592 |
| Metal: | | | | | | |
| Pig iron | do. | 7,884 | 7,724 | 7,468 | 7,000 e/ | 7,000 e/ |
| Ferrous alloys: e/ | | | | | | |
| Ferromanganese | | 95,000 | 110,000 | 98,000 | 115,000 | 115,000 |
| Silicomanganese | | 95,000 | 105,000 | 116,000 | 135,000 | 135,000 |
| Total | | 190,000 | 215,000 | 214,000 | 250,000 | 250,000 |
| Steel, crude | thousand tons | 8,769 | 8,886 | 8,481 | 7,297 r/ | 7,076 |
| Semimanufactures e/ | | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 |
| Lead: | | | | | | |
| Mine output, Pb content | thousand tons | 531 | 619 | 681 | 739 r/ | 760 |
| Metal: | | | | | | |
| Primary: | | | | | | |
| Bullion | do. | 178 | 164 | 162 | 139 | 195 |
| Refined | do. | 204 | 173 | 239 | 223 | 237 |
| Total | do. | 382 | 337 | 401 | 362 | 432 |
| Secondary excluding remelt | do. | 34 | 33 | 33 | 28 | 30 e/ |
| Manganese ore, metallurgical: | | | | | | |
| Gross weight | do. | 2,136 | 1,500 | 1,900 | 1,613 | 2,069 |
| Mn content | do. | 1,024 | 729 | 929 | 787 | 948 |
| Nickel: | | | | | | |
| Mine output, Ni content | do. | 123 | 144 | 127 | 166 r/ | 205 |
| Metal, smelter, refined Ni and Ni content of oxide | do. | 74 | 81 | 83 | 112 | 128 |
| Platinum-group metals: | | | | | | |
| Palladium, Pd content | kilograms | 400 e/ | 800 e/ | 816 | 812 r/ | 828 |
| Platinum, Pt content | do. | 300 e/ | 150 e/ | 90 | 171 r/ | 174 |
| Total | do. | 700 e/ | 950 e/ | 906 | 983 r/ | 1,002 |
| Silver: | | | | | | |
| Mine output, Ag content | | 1,106 | 1,474 | 1,720 | 2,060 | 1,970 |
| Metal, refined | | 280 | 319 | 472 | 538 | 576 |

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

| Commodity | 1997 | 1998 | 1999 | 2000 | 2001 |
|---------------------------------------------------------|-----------|-----------|-----------|-------------|-----------|
| METALS--Continued | | | | | |
| Tin: | | | | | |
| Mine output, Sn content | 10,168 | 10,174 | 10,011 | 9,146 | 9,802 |
| Metal, refined: | | | | | |
| Primary | 605 | 655 | 585 | 733 r/ | 1,094 |
| Secondary e/ | 300 | 300 | 300 | 300 | 400 |
| Titanium concentrates, gross weight: | | | | | |
| Ilmenite thousand tons | 2,233 | 2,425 | 1,989 | 2,156 | 2,017 |
| Leucoxene | 32,000 | 31,000 | 31,000 | 27,000 | 30,000 |
| Rutile | 214,000 | 243,000 | 190,000 | 237,000 | 206,000 |
| Zinc: | | | | | |
| Mine output, Zn content thousand tons | 1,035 | 1,066 | 1,163 | 1,410 | 1,519 |
| Metal, smelter: | | | | | |
| Primary do. | 307 | 311 | 344 | 493 | 556 |
| Secondary e/ | 11,000 | 9,000 | 4,500 | 4,500 | 394 |
| Zirconium concentrates, gross weight thousand tons | 416 | 369 | 359 | 373 | 394 |
| INDUSTRIAL MINERALS | | | | | |
| Abrasives, natural: e/ | | | | | |
| Beach pebble | 2,000 | 2,000 | 2,000 | 2,000 | 2,000 |
| Garnet | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| Barite e/ | 15,000 | 13,000 | 18,000 | 20,000 | 20,000 |
| Cement, hydraulic e/ thousand tons | 6,450 | 6,850 | 7,450 | 7,500 | 7,500 |
| Clays: e/ | | | | | |
| Bentonite and bentonitic clay | 73,100 | 104,000 | 180,000 | 180,000 | 180,000 |
| Brick clay and shale thousand tons | 8,000 | 8,000 | 8,000 | 8,000 | 8,000 |
| Cement clay and shale do. | 500 | 500 | 500 | 500 | 500 |
| Damourite clay | 100 | 100 | 100 | 100 | 100 |
| Fire clay | 25,000 | 25,000 | 25,000 | 25,000 | 25,000 |
| Fuller's earth, attapulgite | 28,262 2/ | 15,670 2/ | 5,639 2/ | 5,600 | 5,600 |
| Kaolin and ball clay | 220,000 | 180,000 | 200,000 | 200,000 | 200,000 |
| Other thousand tons | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Diamond: | | | | | |
| Gem thousand carats | 18,079 | 18,379 | 16,381 | 14,656 | 14,397 |
| Industrial do. | 22,096 | 22,464 | 13,403 | 11,992 | 11,779 |
| Total do. | 40,175 | 40,843 | 29,784 | 26,648 | 26,176 |
| Diatomite e/ | 11,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Feldspar including nepheline syenite e/ | 68,800 | 65,500 | 49,600 | 50,000 | 50,000 |
| Gemstones, other than diamond: e/ | | | | | |
| Opal value, thousands | \$110,000 | \$126,000 | \$150,000 | \$152,000 | \$140,000 |
| Sapphire do. | \$60,000 | \$40,000 | \$50,000 | \$40,000 | \$40,000 |
| Other do. | \$12,000 | \$14,000 | \$15,000 | \$16,000 | \$15,000 |
| Total do. | \$182,000 | \$180,000 | \$215,000 | \$208,000 | \$195,000 |
| Gypsum e/ thousand tons | 1,800 | 1,900 | 2,500 | 3,800 | 4,000 |
| Kyanite e/ | 800 | 800 | 1,000 | 1,000 | 1,000 |
| Lime e/ | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 | 1,500,000 |
| Magnesite | 245,192 | 360,115 | 280,505 | 349,783 | 605,314 |
| Nitrogen, N content of ammonia | 432,400 | 430,500 | 430,900 | 575,500 | 762,200 |
| Perlite, crude e/ | 5,000 | 5,000 | 5,000 | 5,000 | 5,000 |
| Phosphate rock e/ thousand tons | 500 | 800 | 1,200 | 2,108 r/ 2/ | 1,917 |
| Salt do. | 8,801 | 9,033 | 10,022 | 8,798 | 9,536 |
| Sillimanite e/ 3/ | 100 | 100 | 300 | 300 | 300 |
| Spodumene, concentrate | 88,399 | 63,190 | 75,824 | 81,891 r/ | 63,443 |
| Stone and sand and gravel: e/ | | | | | |
| Construction sand thousand tons | 30,000 | 31,000 r/ | 33,000 r/ | 33,000 r/ | 35,000 |
| Gravel do. | 15,000 | 15,000 | 15,000 | 15,000 | 15,000 |
| Dolomite do. | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| Limestone, for cement do. | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| Limestone, for other uses do. | 6,000 | 6,000 | 6,000 | 6,000 | 6,000 |
| Silica in the form of quartz, quartzite, glass sand do. | 2,500 | 2,500 | 2,500 | 2,500 | 2,500 |
| Other: | | | | | |
| Crushed and broken stone do. | 65,000 | 70,000 r/ | 75,000 r/ | 80,000 r/ | 80,000 |
| Dimension stone do. | 100 | 100 | 110 r/ | 120 r/ | 120 |
| Unspecified do. | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |

See footnotes at end of table.

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

(Metric tons unless otherwise specified)

| Commodity | 1997 | 1998 | 1999 | 2000 | 2001 |
|------------------------------------------------|---------|------------|------------|------------|-----------|
| Sulfur, byproduct: | | | | | |
| Metallurgy do. | 474 | 507 | 441 | 654 | 700 |
| Petroleum e/ do. | 35 | 35 | 34 | 35 | 35 |
| Total e/ do. | 509 | 542 | 475 | 689 | 735 |
| Talc, chlorite, pyrophyllite, steatite e/ | 185,000 | 200,000 | 190,000 | 260,000 | 270,000 |
| MINERAL FUELS AND RELATED MATERIALS | | | | | |
| Coal: | | | | | |
| Bituminous and subbituminous thousand tons | 216,490 | 219,500 r/ | 238,200 r/ | 245,500 r/ | 264,680 |
| Lignite do. | 60,100 | 63,900 | 66,000 | 67,000 r/ | 70,000 |
| Total do. | 276,590 | 283,400 r/ | 304,200 r/ | 312,500 r/ | 334,680 |
| Coke, metallurgical e/ do. | 325 | 325 | 325 | 325 | 300 |
| Fuel briquets e/ do. | 750 | 750 | 750 | 750 | 800 |
| Gas, natural, marketed million cubic meters | 29,950 | 30,364 | 30,743 | 30,794 | 30,000 e/ |
| Natural gas liquids thousand 42-gallon barrels | 25,896 | 26,116 | 47,097 | 47,260 | 47,000 e/ |
| Peat e/ | 20,000 | 20,000 | 20,000 | 20,000 | 20,000 |
| Petroleum: | | | | | |
| Crude thousand 42-gallon barrels | 206,965 | 225,935 | 226,665 | 263,500 r/ | 231,000 |
| Refinery products: | | | | | |
| Gasoline: | | | | | |
| Aviation do. | 900 | 1,072 | 1,069 | 975 | 868 |
| Motor do. | 116,220 | 115,159 | 120,991 | 113,228 | 112,767 |
| Jet fuel do. | 34,082 | 33,277 | 33,610 | 35,585 | 362,138 |
| Kerosene do. | 534 | 510 | 704 | 147 | 245 |
| Distillate fuel oil do. | 84,847 | 82,947 | 84,833 | 80,222 | 84,862 |
| Residual fuel oil do. | 11,324 | 10,362 | 10,190 | 12,442 | 12,132 |
| Lubricants do. | 5,321 | 4,386 | 4,038 | 4,284 | 3,950 |
| Liquefied petroleum gas do. | 10,332 | 9,456 | 4,642 | 10,536 | 11,145 |
| Bitumen do. | 4,342 | 4,053 | 4,000 | 4,328 | 4,610 |
| Unspecified do. | 6,512 | 5,976 | 6,932 | 7,574 | 4,654 |
| Total 4/ do. | 274,414 | 267,198 | 271,009 | 269,321 | 597,371 |
| Uranium, mine output, U content | 5,489 | 4,901 | 5,992 | 7,588 | 7,680 |

e/ Estimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. r/ Revised. -- Zero.

1/ Includes data available through October 12, 2002.

2/ Reported figure.

3/ In addition, about 7,000 metric tons per year of sillimanite clay, also known as kaolinized sillimanite that contains 40% to 48% aluminum oxide is produced.

4/ Excludes refinery fuel and losses.

TABLE 2
AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------|
| Alumina | Queensland Alumina Ltd., operator [Rio Tinto Ltd., 30.3%; Kaiser Aluminum and Chemical Corp. (Australia) Ltd., 28.3%; Alcan South Pacific Pty. Ltd., 21.4%; and Pechiney Australia Pty. Ltd., 20%] | Gladstone alumina refinery, QLD | 3,800 |
| Do. | Alcan Northern Territory Pty. Ltd., 70%; and Alcan South Pacific Pty. Ltd., 30% | Gove alumina refinery, NT | 1,900 |
| Do. | Alcoa World Alumina Australia, 100% | Kwinana alumina refinery, WA | 2,100 |
| Do. | do. | Pinjarra alumina refinery, WA | 3,400 |
| Do. | Alcoa World Alumina Australia, 60%; and Western mining Corp., 40% | Wagerup alumina refinery near Waroona, WA | 2,200 |
| Do. | Worsley Alumina Pty. Ltd., manager [Billiton Aluminium Australia Pty. Ltd., 86%; Billiton Plc, 30%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; and Nissho Iwai Alumina Pty. Ltd., 4%] | Worsley alumina refinery, 20 km NW of Collie, WA | 3,200 |
| Aluminum | Comalco Aluminium (Bell Bay) Ltd., 100% | Bell Bay aluminum smelter, TAS | 142 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|--------------------|
| Aluminum--Continued: | Boyne Smelters Ltd., operator (Rio Tinto Ltd., 64%; Sumitomo Light Metal Industries Ltd., 17%; Ryowa Development Pty. Ltd., 12%, Kobe Steel Ltd., 5%; and Sumitomo Chemical Co. Ltd., 2%) | Boyne Island aluminum smelter, QLD | 490 |
| Do. | VAW Kurri Kurri Pty. Ltd., 100% | Kurri Kurri aluminum smelter, NSW | 150 |
| Do. | Alcoa of Australia, 100% | Point Henry aluminum smelter, VIC | 185 |
| Do. | Alcoa of Australia, 45% and manager; China International Trust Investment Co. (a Chinese Government agency), 2.5%; Marubeni Australia Pty. Ltd., 22.5%; and Eastern Aluminum Ltd., 10% | Portland aluminum smelter, VIC | 345 |
| Do. | Tomago Aluminium Co. Pty. Ltd., operator (Gove Aluminium Finance Ltd., 36%; Pechiney Australia Pty. Ltd., 36%; Australian Mutual Provident Society, 16%; and VAW Australia Pty. Ltd., 12%) | Tomago aluminum smelter, NSW | 444 |
| Antimony | New England Antimony Mines NL, 100% | Hillgrove underground antimony-gold mine, 25 km E of Armidale, NSW | 4 |
| Bauxite | Alcan Inc., 100% | Gove open pit bauxite mine, Gove Peninsula, NT | 7,000 |
| Do. | Alcoa World Alumina Australia, 100% | Huntly open pit bauxite mine, 80 km S of Perth, WA | 20,000 |
| Do. | Comalco Ltd., operator (Rio Tinto Plc, 100%) | Weipa-Andoom open pit bauxite mine, Weipa, QLD | 12,000 |
| Do. | do. | Willowdale open pit bauxite mine, 130 km S of Perth, WA | 8,600 |
| Do. | Worsley Alumina Pty. Ltd., manager [BHP Billiton Ltd., 86%; Kobe Alumina Associates (Australia) Pty. Ltd., 10%; and Nissho Iwai Alumina Pty. Ltd., 4%] | Worsley open pit bauxite mine, 50 km NE of Collie, WA | 11,000 |
| Bentonite | Arumpo Bentonite Pty. Ltd., 100% | Arumpo open pit bentonite mine, 95 km NE of Mildura, NSW | 10 |
| Do. | Unimin Australia Ltd., 100% | Cressfield open pit bentonite mine, 20 km N of Scone, NSW | 12 |
| Do. | do. | Miles open pit bentonite mine, 350 km W of Brisbane, QLD | 100 |
| Cement | Blue Circle Southern Cement Ltd., 100% | Berrima Cement Plant, NSW | 1,200 |
| Do. | Adelaide Brighton Cement Ltd., 100% | Birkenhead Cement Plant, SA | 1,000 |
| Do. | Queensland Cement Ltd., 100% | Darra Cement Plant, QLD | 700 |
| Do. | Adelaide Brighton Cement Ltd., 100% | Geelong Cement Plant, VIC | 800 |
| Do. | Goliath Cement Holdings Ltd., 100% | Railton Cement Plant, TAS | 1,000 |
| Do. | Cockburn Cement Ltd., 100% | South Coogee Cement Plant, WA | 1,000 |
| Chromite | Sylvania Resources Ltd., 100% | Coobina open pit chromite mine, 56 km ESE of Newman, WA | 100 |
| Coal, black | Powercoal Pty. Ltd., 100% | Angus Place longwall coal mine, 16 km NW of Lithgow, NSW | 2,200 |
| Do. | BHP Steel (AIS) Pty. Ltd., 100% | Appin longwall coal mine, 40 NW of Wollongong, NSW | 3,300 |
| Do. | Powercoal Pty. Ltd., 100% | Awaba underground coal mine, 30 km SW of Newcastle, NSW | 2,000 |
| Do. | Oakbridge Pty. Ltd., 95%; and Sumitomo Corp., 5% | Baal Bone longwall coal mine, 24 km NW of Lithgow, NSW | 3,500 |
| Do. | BHP Billiton Hunter Valley Energy Coal, 100% | Bayswater open pit coal mine, 33 km NW of Singleton, 13 km SSW of Muswellbrok, NSW | 5,500 |
| Do. | Coal and Allied Industries Ltd., 40% and manager (Wesfarmers Bengalla Ltd., 40%; MCDA Bengalla Investment Pty. Ltd., 10%; and Taipower Bengalla Pty. Ltd., 10%) | Bengalla open pit coal mine, 5 km W of Muswellbrook, NSW | 5,000 |
| Do. | Berrima Coal Pty. Ltd., 100% | Berrima underground coal mine, 60 km NE of Goulburn, NSW | 2,000 |
| Do. | BHP Billiton Mitsubishi Alliance, manager. (BHP Billiton Ltd., 50%; and Mitsubishi Development Pty. Ltd., 50%) | Blackwater open pit coal mine (includes South Blackwater), 195 km W of Rockhamton, QLD | 13,500 |
| Do. | Xstrata Coal Australia Pty. Ltd., manager (Oakbridge Pty. Ltd., 87.5%; and Nippon Steel Australia Pty. Ltd., 12.5%) | Bulga open pit/longwall coal mine, 16 km SW of Singleton, NSW | 11,000 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------|
| Coal, black--Continued: | Pacific Coal Pty. Ltd., 57.195% and manager [Leichhardt Coal Pty. Ltd., 31.419%; EPDC (Australia) Pty. Ltd., 7.9723%; and Japan Coal Development Co. Ltd., 3.416%] | Blair Athol open pit coal mine, 110 km NW of Emerald, 25 km NW of Clermont, QLD | 11,000 |
| Do. | Bloomfield Collieries Pty. Ltd., 100% | Bloomfield open pit coal mine, 20 km NW of Newcastle, 5 km SE of Maitland, NSW | 1,300 |
| Do. | Anglo Coal Holdings Australia Ltd., 100% | Boundary Hill open pit coal mine (includes Callide), 115 km to 140 km W of Gladstone, QLD | 7,250 |
| Do. | RAG Australia Pty. Ltd., manager (Burton Coal Pty. Ltd., 95%; and Thiess Pty. Ltd., 5%) | Burton open pit coal mine, 150 km SW of Mackay, QLD | 5,800 |
| Do. | Camberwell Coal Pty. Ltd., manager [Toyota Tsusho Mining (Australia) Pty. Ltd., 90%; and Dia Coal Mining (Australia) Pty. Ltd., 10%] | Camberwell open pit coal mine, 10 km NW of Singleton, NSW | 4,000 |
| Do. | LakeCoal Pty. Ltd., 80%, manager; and Catherine Hill Resources Pty. Ltd., 20% | Chain Valley underground coal mine, 48 km S of Newcastle, NSW | 3,000 |
| Do. | Centennial Coal Co. Ltd., 85%, manager; and SK Australia Pty. Ltd., 15% | Clarence underground coal mine, 10 km E of Lithgow, NSW | 2,200 |
| Do. | Roche Mining Pty. Ltd., operator (Millmerran Power Partners, 100%) | Commodore open pit coal mine, 80 km S of Toowoomba, QLD | 3,600 |
| Do. | Xstrata Coal Australia Pty. Ltd., 50%; Centennial Coal Co. Ltd., 45%; and Tokyo Boeki Ltd., 5% | Cook underground coal mine, near Blackwater, QLD | 1,000 |
| Do. | Powercoal Pty. Ltd., 100%, manager | Cooranbong underground coal mine, 35 km SW of Newcastle, NSW | 1,600 |
| Do. | Australian Premium Coals Pty. Ltd., manager (Macarthur Coal Ltd., 45%; QCR No. 2 Pty. Ltd., 20%; CPB Coals Pty. Ltd., 10%; Citic Australia Coal Ltd., 5%; Marubeni Coal Pty. Ltd., 7.5%; Nissho Iwai Australia Ltd., 7.5%; Kawasho Group, 3%; and Nittetsu Shoji, 2%) | Coppabella open pit coal mine, 150 km SW of Mackay, QLD | 4,700 |
| Do. | BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%; and Mitsubishi Development Pty. Ltd., 50%) | Crinum longwall coal mine, 45 km NE of Emerald, QLD | 4,000 |
| Do. | Cumnock No. 1 Colliery Pty. Ltd., 100% | Cumnock No. 1 open pit/longwall coal, 28 km NW of Singleton, NSW | 2,750 |
| Do. | Curragh Queensland Mining Ltd., 100% | Curragh open pit coal mine, 70 km E of Emerald, QLD | 5,000 |
| Do. | Anglo Coal Holdings Australia Ltd., 93%; and Ssangyong Resources Ltd., 7% | Dartbrook longwall coal mine, 70 km N of Singleton, NSW | 3,750 |
| Do. | BHP Billiton Ltd., 100% | Dendrobium longwall coal mine, 15 km SW of Wollongong, NSW | 5,200 |
| Do. | Anglo Coal Holdings Australia Ltd., 88.2% and manager; Mitsui Coal Development Australia Pty. Ltd., 3.8%; Mitsui Mining (Australia) Pty. Ltd., 3%; Daesung Australia Pty. Ltd., 2.5%; and Hyundai (Australia) Pty. Ltd., 2.5% | Drayton open pit coal mine, 35 km NW of Singleton, NSW | 5,000 |
| Do. | Ebenezer Mining Co., 100% | Ebenezer open pit coal mine, 40 km SW of Brisbane, QLD | 1,500 |
| Do. | BHP Steel (AIS) Pty. Ltd. | Elouera longwall coal mine, 15 km SW of Wollongong, NSW | 2,000 |
| Do. | Idemitsu Kosan Co. Ltd., 85%; EPDC (Australia) Pty. Ltd., 10%; and LG International (Australia) Pty. Ltd., 5% | Ensham-Yongala open pit coal mine, 40 km NE of Emerald, QLD | 5,500 |
| Do. | Griffin Coal Mining Co. Pty. Ltd., 100% | Ewington II open pit coal mine, 8 km E of Collie, WA | 1,000 |
| Do. | CAML Resources Pty. Ltd., 63%; Itochu Corp., 20.6%; and Bowen Basin Investments Pty. Ltd., 16.4% | Foxleigh open pit coal mine, Bowen Basin, QLD | 2,300 |
| Do. | Anglo Coal Holdings Australia Ltd., 100% of German Creek and 75.04% of German Creek East; and Marubeni Coal Pty. Ltd., 24.96% of German Creek East | German Creek and German Creek East open pit/longwall coal mines, 275 km WNW of Rockhampton, QLD | 6,000 |
| Do. | Console Energy Inc., 50% and Namoi Hunter Pty. Ltd., 50% | Glennies Creek longwall coal mine, 12 km N of Singleton, NSW | 2,500 |
| Do. | BHP Billiton Ltd., 80% at Riverside and 50% at Goonyella; Mitsubishi Corp., 50% at Goonyella; and BHP Mitsui Coal Pty. Ltd., 20% at Riverside | Goonyella-Riverside open pit coal mines, 140 km SW of Mackay, QLD | 11,000 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Coal, black--Continued: | BHP Billiton Mitsubishi Alliance, manager (BHP Billiton Ltd., 50%; and Mitsubishi Development Pty. Ltd., 50%) | Gregory open pit coal mine, 60 km N of Emerald, QLD | 5,500 |
| Do. | Coal and Allied Industries Ltd., 100% and manager | Hunter Valley Operations (includes Carrington, Chestnut, Howick, Hunter Valley No. 1, Lemington, and Riverview open pit coal mines), 10 km W to 25 km N of Singleton, NSW | 15,000 |
| Do. | New Hope Corp. Ltd., 100% | Jeebropilly open pit coal mine, 35 km SW of Brisbane, QLD | 1,500 |
| Do. | Queensland Coal Mine Management Pty. Ltd., 70%; Winnin Pty. Ltd., 15%; and Marubeni Coal Pty. Ltd., 15% | Jellinbah East open pit coal mine, 90 km E of Emerald, QLD | 3,000 |
| Do. | Pacific Coal Pty. Ltd., 80%; and Kestrel Coal Investment Pty. Ltd., 20% | Kestrel longwall coal mine, 40 km NNE of Emerald, QLD | 3,300 |
| Do. | Xstrata Coal Australia Pty. Ltd., 67%; and Mitsui Matushima Australia Pty. Ltd., 32.5% | Liddell open pit coal mine, 25 km NW of Singleton, NSW | 4,000 |
| Do. | Burratorang Valley Coal Pty. Ltd., 100% | Metropolitan longwall coal mine, 30 km N of Wollongong, NSW | 1,400 |
| Do. | LakeCoal Pty. Ltd., 80%; and Catherine Hill Resources Pty. Ltd., 20% | Moonee longwall coal mine, 37 km S of Newcastle, NSW | 1,200 |
| Do. | Anglo Coal Holdings Australia Ltd., 88%; Nippon Steel Australia Pty. Ltd., 5%; Tomem Coal Resources Pty. Ltd., 3.75%; and private interests, 3.25% | Moranbah North longwall coal mine, 150 km SW of Mackay, QLD | 5,700 |
| Do. | Hunter Valley Coal Corp., 100% | Mount Owen open pit coal mine, 20 km NW of Singleton, near Ravensworth, NSW | 8,000 |
| Do. | Coal and Allied Industries Ltd., 80%; and Pohang Steel Australia Pty. Ltd., 20% | Mount Thorley open pit coal mine, 14 km SW of Singleton, NSW | 6,500 |
| Do. | Mitsui & Co. (Australia) Ltd., 100% | Moura open pit coal mine, 185 km W of Gladstone, QLD | 4,400 |
| Do. | The Griffin Coal Mining Co. Pty. Ltd., 100% | Muja open pit coal mine, 18 km SE of Collie, WA | 2,000 |
| Do. | Powercoal Pty. Ltd., 100% | Munmorah underground coal mine, 55 km S of Newcastle, NSW | 7,000 |
| Do. | Muswellbrook Coal Co., 100% | Muswellbrook No. 2 open pit coal mine, 4 km NE of Muswellbrook, Hunter Valley NSW | 1,700 |
| Do. | Powercoal Pty. Ltd., 100% | Myuna underground coal mine, 35 km S of Newcastle, NSW | 1,500 |
| Do. | Nardell Coal Corp., 100% | Nardell underground coal mine, 18 km NW of Singleton, NSW | 1,200 |
| Do. | MIM Holdings Ltd., manager (Collinsville Coal Co. Pty. Ltd., 75%; and Itochu Coal Resources Australia Pty. Ltd., 25%) | Newlands-Collinsville-Abbot Point open pit/longwall coal mine, 130 km west of Mackay, QLD | 7,000 |
| Do. | Powercoal Pty. Ltd., 100% and manager | Newstan longwall coal mine, 30 km SW of Newcastle, NSW | 2,700 |
| Do. | Rag Coal International AG, 40%; and Thiess Pty. Ltd., 40% | North Goonyella longwall coal mine, 180 km W of Mackay, QLD | 3,000 |
| Do. | BHP Billiton Ltd., 50%; and Mitsubishi Corp., 50% | Norwich Park open pit coal mine, 85 km NNE of Emerald, QLD | 4,000 |
| Do. | Oaky Creek Coal Pty. Ltd., 75%; Sumitomo Coal Australia Pty. Ltd., 15%; and Itochu Coal Resources Australia Pty. Ltd., 10%, of Oaky Creek; Namoi Highwall Pty. Ltd., 50%, and Sumitomo Coal Australia Pty. Ltd., 50%, of Alliance | Oaky Creek longwall and Alliance open pit coal mines, 300 km WNW of Rockhampton, QLD | 9,500 |
| Do. | BHP Billiton Ltd., 50%; and Mitsubishi Development Pty. Ltd., 50% | Peak Downs open pit coal mine, 145 km N of Emerald, QLD | 7,500 |
| Do. | Wesfarmers Premier Coal Ltd., 100% | Premier open pit coal mine, 10 km SE of Collie, WA | 4,000 |
| Do. | Xstrata Coal Australia Pty. Ltd., 100% of Ravensworth and 50% at Narama; and Iluka Resources Ltd., 50% at Narama | Ravensworth-Narama open pit coal mine (includes Ravensworth East), at Lemington, 20 km NW of Singleton, NSW | 6,200 |
| Do. | Bloomfield Colliers Pty. Ltd., 100% | Rixs Creek open pit coal mine, 5 km NW of Singleton, NSW | 2,000 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------|
| Coal, black--Continued: | BHP Billiton Ltd., 50%; and Mitsubishi Development Pty. Ltd., 50% | Saraji open pit coal mine, 125 km N of Emerald, QLD | 5,000 |
| Do. | BHP Mitsui Coal Pty. Ltd., 100% | South Walker Creek open pit-underground coal mine, 90 km SW of Mackay, 20 km W of Nebo, QLD | 3,500 |
| Do. | Southland Coal Pty. Ltd., 90%; and Thiess Pty. Ltd., 10% | Southland longwall coal mine, 40 km W of Newcastle, NSW | 2,000 |
| Do. | G.C. Springvale Pty. Ltd., 50%; and Samsung Development (Australia) Pty. Ltd., 50% | Springvale longwall coal mine, 16 km NW of Lithgow, NSW | 2,000 |
| Do. | Austral Coal Ltd., 100% | Tahmoor longwall coal mine (includes Tahmoor North and Bargo), near Picton, about 70 km SW of Sydney, NSW | 2,000 |
| Do. | Pacific Coal Pty. Ltd., 100% | Tarong-Meandu open pit coal mine, 85 km N of Toowoomba, QLD | 5,500 |
| Do. | BHP Steel (AIS) Pty. Ltd., 100% | Tower longwall coal mine, 32 km NW of Wollongong, NSW | 2,000 |
| Do. | Ulan Coal Mines Ltd., 10%; and Mitsubishi Development Pty. Ltd., 10% | Ulan open pit-longwall coal mine, 45 km NW of Mudgee, NSW | 12,000 |
| Do. | Xstrata Coal Australia Pty. Ltd., 95%; and United Mine Workers, 5% | United Collieries underground coal mine, 15 km W of Singleton, NSW | 1,600 |
| Do. | Wambo Coal Pty. Ltd., 100% | Wambo longwall coal mine, 15 km W of Singleton, NSW | 3,100 |
| Do. | Coal and Allied Industries, Ltd., 55.574%; Mitsubishi Coal Development Pty. Ltd., 28.898%; Nippon Steel Australia Pty. Ltd., 9.528%; and Mitsubishi Corp., 6% | Warkworth open pit coal mine, 11 km SW of Singleton, NSW | 6,400 |
| Do. | BHP Steel (AIS) Pty. Ltd., 100% | West Cliff longwall coal mine, 43 km NW of Wollongong, NSW | 3,000 |
| Do. | Oceanic Coal Australia Ltd., 70%; Marubeni Coal Pty. Ltd., 17%; Ocal Macquarie Pty. Ltd., 10%; and Kokan Kogyo (Australia) Pty. Ltd., 3% | West Wallsend longwall coal mine, 25 km SW of Newcastle, NSW | 3,000 |
| Do. | Powercoal Pty. Ltd., 100% | Wyee longwall coal mine, 40 km S of Newcastle, NSW | 1,200 |
| Coal, brown | Alcoa World Alumina Australia, 100% | Anglesea open pit lignite mine, 97 km SW of Melbourne, near Geelong, VIC | 1,200 |
| Do. | Hazelwood Power, 100% | Hazelwood open pit lignite mine at Morwell, 150 km SE of Melbourne, VIC | 19,500 |
| Do. | Loy Yang Power Ltd., 100% | Loy Yang open pit lignite mine at Traralgon, 165 km E of Melbourne, VIC | 32,000 |
| Do. | Auspower Pty. Ltd., 73.6%; Powergen Plc., 18.4%; and Deutsche Asset Management, 8% | Yallourn open pit lignite mine, 140 km SE of Melbourne, VIC | 18,500 |
| Cobalt | Preston Resources Ltd., 100% | Bulong open pit nickel-cobalt mine, 30 km E of Kalgoorlie, WA | 0.1 |
| Do. | OM Group Inc., 100% | Cawse open pit nickel-cobalt mine, 50 km NW of Kalgoorlie, WA | 0.2 |
| Do. | Anaconda Nickel Ltd., 60%, manager; and Glencore Australia Pty. Ltd. International AG, 40% | Murrin Murrin open pit nickel-cobalt mine, 60 km E of Leonora, WA | 0.1 |
| Do. | Australian Nickel Mines NL, 100% | Radio Hill underground nickel-cobalt mine, 100 km ESE of Karratha, WA | 0.2 |
| Do. | QNI Pty. Ltd., 100% | Yabulu nickel-cobalt refinery, Townsville, QLD | 2.0 |
| Copper | Newcrest Mining Ltd., 100% | Cadia Hill open pit gold-copper mine, 21 km SSW of Orange, NSW | 25 |
| Do. | Glencore Australia Pty. Ltd., 100% | Cobar underground copper mine, 10 km NW of Cobar, NSW | 30 |
| Do. | Amalg Resources NL, 100% | Eloise underground copper mine, 60 km SE of Cloncurry, QLD | 70 |
| Do. | MIM Holdings Ltd., 51%; and Westpac Banking Corp., 49% | Ernest Henry open pit copper-gold mine, 35 km NE of Cloncurry, QLD | 105 |
| Do. | Murchison Zinc Co. Pty. Ltd., 100% | Golden Grove underground zinc-copper mine (includes Gossan Hill and Scuddles), 225 km E of Geraldton, WA | 6 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ | |
|--------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------|
| Copper--Continued: | Western Metals Ltd., 100% | Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS | 1 | |
| Do. | Thalanga Copper Mines Pty. Ltd., 70%; and BML Holdings Pty. Ltd., 30% | Highway-Reward open pit and underground copper mine, 37 km S of Charters Towers, QLD | 185 | |
| Do. | Copper Refineries Pty. Ltd., operator (MIM Holdings Ltd., 100%) | MIM copper refinery, Townsville, QLD | 270 | |
| Do. | MIM Holdings Ltd., 100% | MIM copper smelter, QLD | 250 | |
| Do. | Matrix Metals Ltd., 100% | Mount pithbert open pit mine (includes Mount Watson), 90 km NW of Cloncurry, QLD | 8 | |
| Do. | Western Metals Ltd., 100% | Mount Gordon open pit copper mine (includes Esperanza and Mammoth), 125 kilometers N of Mount Isa QLD | 46 | |
| Do. | MIM Holdings Ltd., 100% | Mount Isa underground copper-lead-zinc-silver mine (also includes Enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD | 275 | |
| Do. | Copper Mines of Tasmania Pty. Ltd., 100% | Mount Lyell underground copper-gold mine, 2 km NE of Queenstown, TAS | 35 | |
| Do. | Straits (Nifty) Pty. Ltd., 100% | Nifty open pit copper mine, 200 km SE of Marble Bar, WA | 22 | |
| Do. | Rio Tinto Ltd., 80%; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; and SC Mineral Resources Pty. Ltd., 6.7% | Northparkes open pit/underground copper-gold mine, 27 km N of Parkes, NSW | 55 | |
| Do. | WMC Olympic Dam Operations Pty. Ltd., 100% | Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs. 80 km N of Woomera, SA | 220 | |
| Do. | do. | Olympic Dam copper refinery, SA | 220 | |
| Do. | do. | Olympic Dam copper smelter, SA | 70 | |
| Do. | Placer Dome Asia Pacific Ltd., 100% | Osborne underground copper-gold mine, 195 km SE of Mount Isa, QLD | 50 | |
| Do. | Peak Gold Mines Pty. Ltd., 100% | Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW | 2.5 | |
| Do. | Furukawa Co. Ltd., 52.5%; Nittetsu Mining Co., 20%; Nissho Iwai Corp., 17.5%; and Itochu Corp., 10% | Port Kembla copper refinery, NSW | 120 | |
| Do. | do. | Port Kembla copper smelter, NSW | 120 | |
| Do. | Newcrest Mining Ltd., 100% | Ridgeway underground gold-copper mine, 25 km S of Orange, NSW | 30 | |
| Do. | Pasminco Ltd., 100% | Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS | 1 | |
| Do. | Selwyn Mines Ltd., 100% | Selwyn underground copper-gold mine, 150 km SE of Mount Isa, QLD | 17 | |
| Diamond | thousand carats | Rio Tinto Ltd., 100% | Argyle Mine (AK-1 lamproite pipe and alluvial diamond mines), 120 km SW of Kununurra, WA | 26,000 |
| Do. | do. | do. | Merlin open pit diamond mine, 80 km S of Borroloola, NT | 55 |
| Diatomite | Australian Diatomite Mining Pty. Ltd., 100% | Barraba open pit diatomite mine, 85 km km NNW of Tamworth, NSW | 25 | |
| Dolomite | OneSteel Ltd., 100% | Arrossan metallurgical dolomite quarry, Northern York Peninsula, SA | 650 | |
| Feldspar | Minerals Corp. Ltd., 100% | Triple Chance open pit feldspar mine (includes Lady Beryl, Bakers, and Spar Ridge), 42 km SW of Broken Hill, NSW | 15 | |
| Garnet | GMA Garnet Pty. Ltd., 100% | Port Gregory open pit industrial garnet mine, 100 km N of Geraldton, WA | 200 | |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ |
|------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Gas, condensate | thousand 42-gallon barrels per day | 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] | North West Shelf gas operations, 130 km offshore from Dampier, WA | 60 |
| Gas, natural | million cubic meters per day | do. | North West Shelf gas operations, 130 km offshore from Dampier, WA | 20 |
| Gas, liquefied natural | million tons | do. | Three-train liquefaction plant, Burrup Peninsula, WA | 8 |
| Gold | kilograms | Gold Fields Ltd. (South Africa), 100% | Agnew open pit-underground gold mine, 23 km W of Leinster, WA | 5,600 |
| Do. | do. | New Hampton Goldfields Ltd., 100% | Big Bell Consolidated open pit/underground gold mine (includes Big Bell, Black Swan, Cuddingwarra, Great Fingall, Golden Crown, and Tuckabianna): Big Bell, 30 km WNW of Cue; Cuddingwarra, 10 km WNW of Cue; Golden Crown, 7 km S of Cue, WA | 7,000 |
| Do. | do. | Worsley Alumina Pty. Ltd., operator (Newmont Mining Corp., 44.45%; AngloGold Ltd., 33.33%; and Newcrest Mining Ltd., 22.22%) | Boddington open pit/underground gold mine (includes Wandoo and Hedges), 150 km SE of Perth, WA 3/ | 12,000 |
| Do. | do. | Normandy Yandal Operations Ltd., 100% | Bronzewing underground gold mine (includes Mount McClure), 65 km NE of Leinster, WA | 9,000 |
| Do. | do. | Newcrest Mining Ltd., 100% | Cadia Hill open pit gold-copper mine, 21 km SSW of Orange, NSW | 11,000 |
| Do. | do. | MIM Holdings Ltd., 51%; and Westpac Banking Corp., 49% | Ernest Henry open pit copper-gold mine, 35 km NE of Cloncurry, QLD | 3,000 |
| Do. | do. | Kalgoorlie Consolidated Gold Mines Pty. Ltd., 100% | Gidji Roaster gold smelter, Kalgoorlie, WA | 24,250 |
| Do. | do. | Normandy NFM Ltd., 100% | Granites-Dead Bullock Soak open pit/underground gold mine, 550 km NW of Alice Springs, in the Tanami Desert, NT | 7,000 |
| Do. | do. | Placer Dome Asia Pacific Ltd., manager (Placer Dome Inc., 60%; and Delta Gold Ltd., 40%) | Granny Smith open pit gold mine (includes Sunrise and Wallaby), 20 km S of Laverton, WA | 16,000 |
| Do. | do. | AuironGold Ltd., 100% | Henty underground gold-silver mine, 30 km N of Queenstown, TAS | 3,700 |
| Do. | do. | Thalanga Copper Mines Pty. Ltd., 70%; and BML Holdings Pty. Ltd., 30% | Highway-Reward open pit and underground copper mine, 37 km S of Charters Towers, QLD | 1,000 |
| Do. | do. | New England Antimony Mines NL, 100% | Hillgrove underground antimony-gold mine, 25 km E of Armidale, NSW | 1,000 |
| Do. | do. | Newmont Yandal Operations Ltd., 100% | Jundee-Nimary open pit/underground gold mine, 45 km NE of Wiluna, WA | 12,000 |
| Do. | do. | AuironGold Ltd., 100% | Kanowna Belle underground gold mine, 18 km NE of Kalgoorlie, WA | 7,000 |
| Do. | do. | Barrack Gold Corp., 100% | Lawlers underground gold mine, 30 km SW of Leinster, WA | 3,000 |
| Do. | do. | Sons of Gwalia Ltd., 100% | Marvel Loch Operations open pit-underground gold mines approximately 30 km SE of Southern Cross, WA | 10,000 |
| Do. | do. | Saint Barbara Mines Ltd., 100% | Meekatharra open pit mine-underground gold mine, 20 km S of Meekatharra, WA | 4,000 |
| Do. | do. | Copper Mines of Tasmania Pty. Ltd., 100% | Mount Lyell underground copper-gold mine, 2 km NE of Queenstown, TAS | 1,000 |
| Do. | do. | Harmony Gold Mining Co. Ltd., 100% | Mount Magnet open pit/underground gold mine (includes Hill 50 and Star), 2 km from Mount Magnet, WA | 8,500 |
| Do. | do. | Australian Gold Refineries, 100% (State of WA agency) | Newburn gold refinery, WA | 246,000 |
| Do. | do. | Croesus Mining NL, 100% | Norseman underground gold mine at Norseman, WA | 3,700 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ |
|----------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Gold--Continued: kilograms | Rio Tinto Ltd., 80%; Sumitomo Metal Mining Oceania Pty. Ltd., 13.3%; and SC Mineral Resources Pty. Ltd., 6.7% | Northparkes open pit/underground copper-gold mine, 27 km N of Parkes, NSW | 155,000 |
| Do. | do. WMC Olympic Dam Operations Pty. Ltd., 100% | Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs. 80 km N of Woomera, SA | 1,500 |
| Do. | do. Placer Dome Asia Pacific Ltd., 100% | Osborne underground copper-gold mine, 195 km SE of Mount Isa, QLD | 1,500 |
| Do. | do. MIM Holdings Ltd., 100% | Pacific precious metals refinery, NSW | 1,900 |
| Do. | do. Paddington Gold Pty. Ltd., 100% | Paddington open pit gold-silver mine, 35 km NW of Kalgoorlie, WA | 2,800 |
| Do. | do. Newmont Pajingo Pty. Ltd., 100% | Pajingo underground gold mine (includes Vera-Nancy), 60 km SSE of Charters Towers, QLD | 6,400 |
| Do. | do. Peak Gold Mines Pty. Ltd., 100% | Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW | 350,000 |
| Do. | do. Alkane Exploration Ltd., 100% | Peak Hill open pit gold mine, 50 km N of Parkes, NSW | 700,000 |
| Do. | do. Australian Gold Refineries, 100% (State of WA agency) | Perth Refinery (Newburn), WA | 95,000 |
| Do. | do. Homestake Mining Co., 100% | Plutonic open pit/underground gold mine, (includes Freshwater), 180 km NE of Meekatharra, WA | 8,000 |
| Do. | do. Carpentaria Gold Pty. Ltd., 50.1%; and Haoma Mining NL, 49.9% | Ravenswood open pit mine (includes Nolans, Sarsfield, and Mount Wright), 100 km S of Townsville, QLD | 3,000 |
| Do. | do. Newcrest Mining Ltd., 100% | Ridgeway underground gold-copper mine, 25 km S of Orange, NSW | 10,800 |
| Do. | do. Pasminco Ltd., 100% | Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS | 1,000 |
| Do. | do. Gold Fields Ltd., 100% | Saint Ives open pit/underground gold mine, 75 km SSE of Kalgoorlie, WA | 15,000 |
| Do. | do. Selwyn Mines Ltd., 100% | Selwyn underground copper-gold mine, 150 km SE of Mount Isa, QLD | 700 |
| Do. | do. Sons of Gwalia Ltd., 100% | Sons of Gwalia open pit/underground gold mine (includes Red October, Harlech, McGraths, Kailis, and Anchor), 5 km W of Leonora, WA | 6,000 |
| Do. | do. MPI Gold Pty. Ltd., 50%; and Pittston Mineral Ventures of Australia Pty. Ltd., 50% | Stawell underground gold mine, 240 km W of Melbourne, VIC | 3,000 |
| Do. | do. AngloGold Ltd., 100% | Sunrise Dam open pit mine gold (includes Cleo), 55 km S of Laverton, WA | 8,000 |
| Do. | do. Kalgoorlie Consolidated Gold Mines Pty. Ltd., manager (Barrick Gold Corp., 50%; and Newmont Mining Ltd., 50%) | Super Pit open pit gold mine (includes Fimiston), SE corner of the Kalgoorlie-Boulder Township, WA | 20,000 |
| Do. | do. Otter Gold Mines Ltd., 60%; and AngloGold Ltd., 40% | Tanami open pit gold mine (includes Central Desert Joint Venture), 650 km NW of Alice Springs, NT | 2,800 |
| Do. | do. PacMin Mining Corp., 100% | Tarmoola open pit gold mine, 29 km NW of Leonora, WA | 6,500 |
| Do. | do. AngloGold Ltd., 100% | Union Reefs open pit gold mine, 12 km N of Pine Creek, NT | 3,000 |
| Do. | do. Wiluna Mines Ltd., 100% | Wiluna open pit/underground gold mine, 7 km S of Wiluna, WA | 3,300 |
| 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 evaporation ponds, 65 km N of Carnarvon, WA | 900 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Iron ore | Hamersley Iron Pty. Ltd., 60%; and China Iron and Steel Industry & Trade Group Corp. (a Chinese Government agency), 40% | Channar open pit iron ore mine, 70 km S of Tom Price, WA | 11,000 |
| Do. | BHP Billiton Ltd., 100% | Cockatoo Island open pit iron ore mine, 130 km NNE of Derby, WA | 1,050 |
| Do. | Hamersley Iron Pty. Ltd., 100% | Hamersley Operations (includes Brockman No. 2, Marandoo, Mount Tom Price, Nammuldi, Paraburdoo, and Yandicoogina open pit iron ore mines), 30 km to 85 km NE, NW, and S of Tom Price, WA | 60,000 |
| Do. | BHP Minerals Pty. Ltd., 100% | Jimblebar open pit iron ore mine, 40 km E of Newman, WA | 6,000 |
| Do. | Portman Iron Ore Ltd., 100% | Koolyanobbing Central open pit iron ore mine, 50 km NNE of Southern Cross, WA | 3,000 |
| Do. | BHP Iron Ore Pty. Ltd., 85%, manager; CI Minerals Australia Pty. Ltd., 8%; and Mitsui Iron Ore Corp. Pty. Ltd., 7% | Mount Goldsworthy open pit iron ore mine (includes Yarrrie), 180 km E of Port Hedland, WA | 8,000 |
| Do. | Imdex Ltd., 100% | Mount Gould open pit iron ore mine, 160 km W of Meekatharra, WA | 6,000 |
| Do. | BHP Iron Ore Pty. Ltd.; 85% Mitsui Itochu Iron Pty. Ltd., 10%; and CI Minerals Australia Pty. Ltd., 5% | Mount Newman (includes Mount Whaleback, Orebody 23-25, Orebody 29, and Orebody 30-35) open pit iron ore mines, within 13 km of Newman, WA | 25,000 |
| Do. | Robe River Iron Associates, manager (Rio Tinto Ltd., 53%; Mitsui Iron Ore Development Pty. Ltd., 33%; Nippon Steel Australia Pty. Ltd., 10.5%; and Sumitomo Metal Australia Pty. Ltd., 3.5%) | Pannawonica (includes Mesa J) open pit iron ore mine, 130 km SSW of Dampier WA | 31,000 |
| Do. | ABM Mining Ltd., 100% | Savage River open pit iron ore mine (includes Long Plains), 100 km SW of Burnie, TAS | 2,400 |
| Do. | OneSteel Ltd., 100% | Whyalla open pit iron ore mines, 270 km NW of Adelaide, SA | 2,600 |
| Do. | BHP Minerals Pty. Ltd., 55%; Pilbara Iron Pty. Ltd., 30%; CI Minerals Australia Pty. Ltd., 8%; and Mitsui Iron Ore Corp. Pty. Ltd., 7% | Yandi open pit iron ore mine, 92 km N of Newman, WA | 35,000 |
| Kaolin | Osterfield Pty. Ltd., 100% | Axedale Clays open pit kaolin mine, 18 km E of Bendigo, VIC | 50 |
| Do. | Queensland Kaolin Pty. Ltd., 96.6%; and private interests, 3.4% | Skardon River open pit kaolin mine, 85 km N of Weipa, QLD | 150 |
| Lead | Perilya Ltd., 100% | Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW | 90 |
| Do. | BHP Minerals Ltd., 100% | Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD | 265 |
| Do. | Pasminco Century Mine Ltd., 100% | Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD | 70 |
| Do. | Pasminco Ltd., 100% | Cockle Creek lead smelter, NSW | 35 |
| Do. | do. | Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW | 45 |
| Do. | Western Metals Ltd., 100% | Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS | 44 |
| Do. | do. | MIM lead smelter, QLD | 160 |
| Do. | MIM Holdings Ltd., 100% | Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD | 150 |
| Do. | do. | Mount Isa Smelter, QLD | 240 |
| Do. | Peak Gold Mines Pty. Ltd., 100% | Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW | 5 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ |
|------------------|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------|
| Lead--Continued: | Pasminco Ltd., 100% | Port Pirie lead smelter, SA | 250 |
| Do. | do. | Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS | 23 |
| Magnesite | Australian Magnesium Corp. Ltd., 100% | Kunwarara open pit magnesite mine (includes Marlborough), 70 km NW of Rockhampton, QLD | 3,000 |
| Manganese | Groote Eylandt Mining Co. Pty. Ltd., 100% | Groote Eylandt open pit manganese mine at Groote Eylandt, NT | 2,400 |
| Do. | Pilbara Manganese Pty. Ltd., 100% | Woodie Woodie open pit manganese mine (includes Bells and East Pilbara leases), 400 SE of Port Hedland, WA | 350 |
| Manganese alloys | Tasmanian Electro Metallurgical Co. Pty. Ltd., 100% | Bell Bay Smelter near Launceston, TAS | 260 |
| Mineral sands | Iluka Resources Ltd., 100% | Eneabba open pit heavy-mineral sands mine, 260 km N of Perth, WA | NA |
| Do. | Mineral Deposits Ltd., 100% | Hawks Nest heavy-mineral sands dredge, 50 km NE of Newcastle, NSW | NA |
| Do. | Cable Sands (WA) Pty. Ltd., 100% | Jangardup heavy-mineral sands dredge, 50 km S of Nannup, WA | NA |
| Do. | Iluka Resources Ltd., 100% | North Capel open pit heavy-mineral sands mine, 7 km N of Capel, WA | NA |
| Do. | Stradbroke Rutile Pty. Ltd., 100% | North Stradbroke Island heavy-mineral sands dredge, 35 km E 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 N of Perth, WA | NA |
| Do. | Murray Basin Titanium Pty. Ltd., 100% | Wemen heavy-mineral sands dredge, 80 km SE of Mildura, VIC | NA |
| Nickel | Outokumpu Exploration Ventures Pty. Ltd., 100% | Black Swan underground nickel mine (includes Silver Swan), 53 km NE of Kalgoorlie, WA | 22 |
| Do. | Preston Resources Ltd., 100% | Bulong open pit nickel-cobalt mine, 30 km E of Kalgoorlie, WA | 9 |
| Do. | OM Group Inc., 100% | Cawse open pit nickel-cobalt mine, 50 km NW of Kalgoorlie, WA | 9 |
| Do. | Jubilee Mines NL, 100% | Cosmos open pit nickel mine, 50 km N of Leinster, WA | 80 |
| Do. | WMC Ltd., 100% | Kalgoorlie nickel smelter, Kalgoorlie, WA | 100 |
| Do. | do. | Kambalda underground nickel mines, 25 km N of Kambalda to 10 km S of Widgiemooltha, WA | 35 |
| Do. | do. | Kwinana nickel refinery, Kwinana, WA | 67 |
| Do. | do. | Leinster open pit-underground nickel mines, 10 km N of Leinster, WA | 44 |
| Do. | Mincor Resources NL, 76%; Clough Mining Pty. Ltd., 12%; and Donegal Resources Pty. Ltd., 12% | Miitel underground nickel mine (includes Redross and Mariners), 70 km S of Kambalda, WA | 10 |
| Do. | WMC Ltd., 100% | Mount Keith open pit nickel mine (includes Cliffs and Yakabindie), 70 km SSE of Wiluna, WA | 50 |
| Do. | Anaconda Nickel Ltd., 60%; and Glencore International AG, 40% | Murrin Murrin nickel refinery, Murrin Murrin, WA | 45 |
| Do. | do. | Murrin Murrin open pit nickel-cobalt mine, 60 km E of Leonora, WA | 100 |
| Do. | Australian Nickel Mines NL, 100% | Radio Hill underground nickel-cobalt mine, 100 km ESE of Karratha, WA | 4 |
| Do. | QNI Pty. Ltd., 100% | Yabalu nickel-cobalt refinery, Townsville, QLD | 30 |
| Opal | Many small producers | Andamooka and Coober Pedy areas, SA; Lightning Ridge area, NSW | NA |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ |
|-----------|---------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Petroleum | thousand | Mobile Refining Australia Pty. Ltd., 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 |
| Do. | do. | Shell Refining (Australia) Pty. Ltd., 100% | Clyde Refinery, NSW | 85 |
| Do. | do. | do. | Geelong Refinery, VIC | 110 |
| Do. | do. | Caltex Refineries (NSW) Ltd., 100% | Kurnell Refinery, NSW | 114 |
| Do. | do. | BP Amoco Refinery (Kwinana) Pty. Ltd., 100% | Kwinana Refinery, WA | 138 |
| Do. | do. | Caltex Refineries (QLD) Ltd., 100% | Lytton Refinery, QLD | 106 |
| Do. | do. | Mobile Refining Australia Pty. Ltd., 100% | Port Stanvac Refinery, SA | 69 |
| Phosphate | | WMC Fertilizers Ltd., 100% | Phosphate Hill-Duchess open pit phosphate mine, 140 km NW of Mount Isa, QLD | 2,200 |
| Salt | | Dampier Salt Ltd., 100% | Dampier solar evaporation salt pans, 65 km N of Carnarvon, WA | 5,000 |
| Do. | | do. | Lake MacLeod solar salt and gypsum evaporation pans, 65 km N of Carnarvon, WA | 900 |
| 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 NE of Bunbury, WA | 450 |
| Silver | kilograms | Perilya Ltd., 100% | Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW | 81,200 |
| Do. | do. | BHP Minerals Ltd., 100% | Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD | 700,000 |
| Do. | do. | Pasminco Century Mine Ltd., 100% | Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD | 3,000 |
| Do. | do. | Pasminco Ltd., 100% | Cockle Creek silver smelter, NSW | 85,000 |
| Do. | do. | do. | Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW | 35,000 |
| Do. | do. | Western Metals Ltd., 100% | Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS | 60,000 |
| Do. | do. | AuironGold Ltd., 100% | Henty underground gold-silver mine, 30 km N of Queenstown, TAS | 1,100 |
| Do. | do. | Thalanga Copper Mines Pty. Ltd., 70%; and BML Holdings Pty. Ltd., 30% | Highway-Reward open pit and underground copper mine, 37 km S of Charters Towers, QLD | 1,000 |
| Do. | do. | MIM Holdings Ltd., 100% | Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD | 375,000 |
| Do. | do. | Australian Gold Refineries, 100% (State of WA agency) | Newburn silver refinery, WA | 81,000 |
| Do. | do. | WMC Olympic Dam Operations Pty. Ltd., 100% | Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs. 80 km N of Woomera, SA | 12,900 |
| Do. | do. | Paddington Gold Pty. Ltd., 100% | Paddington open pit gold-silver mine, 35 km NW of Kalgoorlie, WA | 500 |
| Do. | do. | Peak Gold Mines Pty. Ltd., 100% | Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW | 6,000 |
| Do. | do. | Pasminco Ltd., 100% | Port Pirie silver smelter, SA | 450,000 |
| Do. | do. | do. | Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS | 35,000 |
| Spodumene | do. | Gwalia Consolidated Ltd., 100% | Greenbushes open pit/underground tantalite-spodumene mine, 70 km SE of Bunbury, WA | 100 |
| Steel | | BHP Steel Pty. Ltd., 100% | Newcastle steelworks, NSW | 1,800 |
| Do. | | do. | Port Kembla steelworks, NSW | 4,000 |
| Do. | | do. | Sydney (Rooty Hill) minimill, NSW | 250 |
| Do. | | do. | Whyalla steelworks, SA | 1,200 |

See footnotes at end of table.

TABLE 2--Continued
 AUSTRALIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2001

(Thousand metric tons unless otherwise specified)

| Commodity | | Major operating companies and major equity owners | Location of main facilities 1/ 2/ | Annual capacity e/ |
|-------------------------------------------|--------------|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Talc | | Luzenac Australia Pty. Ltd., 100% | Three Springs open pit talc mine, 330 km N of Perth, WA | 200 |
| Tantalite, Ta ₂ O ₅ | pounds | Gwalia Consolidated Ltd., 100% | Greenbushes open pit/underground tantalite-spodumene mine, 70 km SE of Bunbury, WA | 600,000 |
| Do. | do. | do. | Wodgina open pit tantalite mine, 100 km S of Port Hedland, WA | 500,000 |
| Tin, banch (in situ) | | Telminex NL, 100% | Ardlethan alluvial tin mine, 90 km NW of Wagga Wagga, NSW | 500,000 |
| | cubic meters | | | |
| Do. | | Gwalia Consolidated Ltd., 100% | Greenbushes Smelter, WA | 1 |
| Do. | | Renison Bell Ltd., 100% | Renison Bell underground tin mine, 136 km S of Burnie, TAS | 13 |
| Uranium, U ₃ O ₈ | tons | Heathgate Resources Pty. Ltd., 100% | Beverley in situ leach uranium operation, 300 km NE of Port Augusta, SA | 900 |
| Do. | do. | WMC Olympic Dam Operations Pty. Ltd., 100% | Olympic Dam underground copper-silver-gold-uranium mine at Roxby Downs, 80 km N of Woomera, SA | 1,500 |
| Do. | do. | Energy Resources of Australia Ltd., 100% | Ranger open pit uranium mine, 230 km E of Darwin, NT | 4,500 |
| Vanadium, V ₂ O ₅ | do. | Xstrata Windimurra Pty. Ltd., 100% | Windimurra open pit mine vanadium, 100 km ESE of Mount Magnet, WA | 8 |
| Zinc | | Perilya Ltd., 100% | Broken Hill underground silver-zinc-lead mine at Broken Hill, NSW | 360 |
| Do. | | BHP Minerals Ltd., 100% | Cannington underground silver-lead-zinc mine, 200 km SE of Mount Isa, QLD | 100 |
| Do. | | Pasminco Century Mine Ltd., 100% | Century open pit zinc-silver-lead mine, 250 km NW of Mount Isa, QLD | 500 |
| Do. | | Pasminco Ltd., 100% | Cockle Creek zinc smelter, NSW | 90 |
| Do. | | do. | Elura underground zinc-silver-lead mine, 40 km NW of Cobar, NSW | 125 |
| Do. | | Murchison Zinc Co. Pty. Ltd., 100% | Golden Grove underground zinc-copper mine (includes Gossan Hill and Scuddles), 225 km E of Geraldton, WA | 150 |
| Do. | | Western Metals Ltd., 100% | Hellyer underground zinc-lead-copper-silver mine, 80 km SSW of Burnie, TAS | 130 |
| Do. | | MIM Holdings Ltd., 100% | Mount Isa underground copper-lead-zinc-silver mine (also includes enterprise, George Fisher, and Hilton mines) at Mount Isa, QLD | 175 |
| Do. | | Peak Gold Mines Pty. Ltd., 100% | Peak underground gold-zinc-lead-copper-silver underground mine (includes New Cobar, New Occidental, and Perseverance), 8 km S of Cobar, NSW | 8 |
| Do. | | Pasminco Ltd., 100% | Port Pirie zinc smelter, SA | 40 |
| Do. | | do. | Ridson zinc refinery, Hobart, TAS | 230 |
| Do. | | do. | Rosebery underground zinc-lead-silver-copper-gold mine, 35 km N of Queenstown, TAS | 100 |
| Do. | | Sun Metals Corp. Pty. Ltd., 100% | Sun Metals zinc refinery, Stuart, QLD | 170 |

e/ Estimated. NA Not available.

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

2/ Bearing abbreviations: N north; NNE north-northeast; NE northeast; E east; SE southeast; SSE south-southeast; S south; SSW south-southwest; SW southwest; WSW west-southwest; W west; WNW west-northwest; NW Northwest; NNW north-northwest.

3/ Care and maintenance; expansion project development decision pending.

TABLE 3
AUSTRALIA: RESERVES OF MAJOR MINERAL COMMODITIES IN 2001

| Commodity | Reserves |
|-------------------------------------------------------|----------|
| Bauxite | 4,400 |
| Black coal: | |
| In situ | 62.6 |
| Recoverable | 42.6 |
| Brown coal: | |
| In situ | 42.0 |
| Recoverable | 37.7 |
| Cadmium | 109 |
| Cobalt | 1,290 |
| Columbium (niobium) | 29 |
| Copper | 24.1 |
| Diamond: | |
| Gem and near gem | 92.6 |
| Industrial | 96.1 |
| Gold | 4,960 |
| Iron ore | 13.6 |
| Lead | 14.6 |
| Lithium | 157 |
| Magnesite (MgCO ₃) | 267 |
| Manganese ore | 128 |
| Mineral sands: | |
| Ilmenite | 196 |
| Rutile | 22 |
| Zircon | 28 |
| Nickel | 20 |
| Petroleum, recoverable: | |
| Condensate | 282 |
| Crude | 227 |
| Liquefied petroleum gas | 262 |
| Natural gas | 2,220 |
| Platinum-group metals (Pd, Pt) | 22.6 |
| Rare earths (REO plus Y ₂ O ₃) | 0.9 |
| Silver | 32.1 |
| Tantalum | 29 |
| Tin | 107 |
| Tungsten | 7.0 |
| Uranium, recoverable | 654 |
| Vanadium | 188 |
| Zinc | 33 |

MgCO₃ Magnesium oxide. REO Rare-earth oxides. Pd Palladium. Pt Platinum. Y₂O₃ Yttrium oxide.

Source: Geoscience Australia, 2001, Australia's Identified Mineral Resources 2001: Canberra, Geoscience Australia, p. 9. (Modified to no more than three significant digits).