

## THE MINERAL INDUSTRY OF

# INDIA

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India's worst drought in more than 15 years affected the country's gross domestic product (GDP) growth. Agriculture accounted for one-quarter of India's GDP and supported two-thirds of the population. A GDP growth of 3.1% was estimated for 2002. Industrial production was up by only 4%, and exports grew by 11%. The Government's countrywide road-building program spurred the cement industry, and low-interest rates contributed to the rapid growth of housing finance and construction (Far Eastern Economic Review, 2002a). Economic reforms included the relaxation of restrictions on foreign ownership and the privatization of industrial enterprises. Although the country was in debt, its foreign exchange reserves stood at \$62 billion.

The country produced 8 metallic minerals, 46 industrial minerals, and 4 mineral fuels in 2002. The mining industry was characterized by a large number of small-scale operating mines. State-owned companies controlled most of the coal and metal production. India was ranked second in world production of barite after China and third in chromite, coal, kyanite and sillimanite, and talc and pyrophyllite.

Australian Indian Resources of Australia had the prospecting rights to the Kolar field near Bangalore in southern India. The deposit is an 80-kilometer (km) stretch with 8.3 million metric tons (Mt) of gold- and zinc-bearing rock. The company also was looking for diamond in Wairagarh, nickel and platinum in Goa, and zinc in Nagpur; Nagpur and Wairagarh are in central India (Far Eastern Economic Review, 2002b).

The state Government allowed reconnaissance surveys to be conducted over 30,000 square kilometers (km<sup>2</sup>) in Karnataka, which included 18,000 km<sup>2</sup> for diamonds and 12,000 km<sup>2</sup> for gold. De Beers Consolidated Mines Ltd. and Rio Tinto Ltd. were given reconnaissance permits for diamond deposits, and a host of companies were given permits for gold and other base metals (Times of India Online, 2002§<sup>1</sup>).

### Government Policies and Programs

The major steel companies asked the Government to retain import duties on steel, which ranged from 25% to 35%, at the present levels for at least 2 more years and to increase the import duty on old ships to 25% from 5% to ground the ship breaking industry. They also wanted the excise duty on steel items, such as rod and bar and galvanized sheets, to be reduced to 8% from 16% to promote construction. They wanted imports for the steel industry to be exempt from the 4% additional customs duty and the import duty on hot-rolled coils to be reduced to 15% from 25% (Metal Bulletin, 2002j). Sponge iron producers appealed to increase the customs duty on steel melting scrap to 15% from 5%. The Government reduced the customs duty on copper, lead, and zinc to 25% from 35% and on aluminum and tin to 15% from 25%. Beginning in 2004, there would be two levels of duties for zinc—10% for raw materials and 20% for finished products.

The Government of Sindh set aside \$3.15 million in its budget for the next 12 months for feasibility studies and other work related to coal and other minerals. A total of five new projects was being considered. These included coal exploration, infrastructure construction related to mineral development, and an upgrade of a training institute in Khanote (Mining Journal, 2002i).

### Commodity Review

#### *Metals*

**Aluminum.**—Western India has large bauxite reserves of high-quality gibbsitic material in Kutch and Jamnagar in Gujarat and Western Ghats in Maharashtra. Their close proximity to the sea and port facilities and existing transport infrastructure makes their location suitable for export. The export of metallurgical-grade bauxite from India exceeded 2 Mt in 2002 and was expected to reach 4 Mt by 2004. Ashapura Minechem supplied 10% of noncaptive demand and had customers in Azerbaijan, Canada, Iran, Japan, Russia, and Ukraine (Metal Bulletin, 2002h).

Balaton Power Inc. of the United States agreed to acquire Continental Resources Ltd., also of the United States, which had a 51% interest in the Ganhamardan bauxite deposit in Orissa; Orissa Mining Corp. held the remaining 49%. The deposit was one of the world's largest known deposits of high-grade bauxite and the second largest bauxite deposit in India with measured reserves of 230 Mt at an average of 45.75% aluminum oxide and 2.23% silica. The low silica content made it ideal for low-cost production of alumina (Balaton Power Inc., 2002).

Indian Aluminium Co. Ltd. (Indal) approved the purchase of an additional 35% stake from Hydro Norsk of Norway in the \$1 billion development project planned by Utkal Alumina International Ltd. in Orissa; this purchase increased its interest to 55%. Hydro Norsk was left with a 10% stake, and Alcan of Canada still held a 35% stake. Alcan then purchased Hydro Norsk's 10% to become a

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<sup>1</sup>References that include a section mark (§) are found in the Internet References Cited section.

minority partner with 45%. Utkal had a planned production capacity of 1 million metric tons per year (Mt/yr) of alumina beginning in 2005 and increasing to 3 Mt/yr in 2008 (Mining Journal, 2002d).

Sterlite Industries Ltd. and Pechiney of France were looking into building an alumina refinery in Orissa. They might try to join with Larsen & Toubro Ltd., which had a lease in Orissa that had 200 Mt of bauxite. Larsen & Toubro would be the engineering contractor in the alumina refinery project (Metal Bulletin, 2002ad).

The Central Government decided to defer its sale of a 29.15% stake in National Aluminium Co. Ltd. (Nalco) because of low market prices for the company's shares. The Government held 87.15% of Nalco and intended to sell the 29.15% stake by April 2002. The plan called for the sale of 20% of the stake to foreign investors, 10% to domestic investors, and 2% to Nalco employees at a later date (Mining Journal, 2002h). Meanwhile, Nalco was to increase aluminum output to 250,000 metric tons (t) in 2002 and planned to export from 120,000 to 130,000 t of the total. Alumina production also would be raised to 1.5 Mt for 2002 with 800,000 t to 1 Mt for export. Nalco has vast bauxite reserves of 300 Mt, an expanded bauxite mining capacity of 4.8 Mt/yr, an alumina capacity of 1.6 Mt/yr, and a 345,000-metric-ton-per-year (t/yr) aluminum smelter after expansion. An ambitious expansion plan was initiated for setting up a fourth production line at Damanjodi alumina refinery with a capacity of 525,000 t/yr and a fourth potline at its Angul smelter with 115,000-t/yr capacity along with a corresponding increase in powerplant capacity (Metal Bulletin, 2002t). The Government turned down the expansion plan.

Bharat Aluminium Co. Ltd. (Balco) approved a \$1.02 billion expansion of its refinery and smelter complex at Korba in Chhattisgarh. The alumina refinery's production capacity would be raised to 830,000 t/yr from 200,000 t/yr, and smelter output would be increased to 334,000 t/yr from 100,000 t/yr. The company also approved an upgrade of the facility's powerplant to 810 megawatts (MW) from 270 MW. Sterlite Industries acquired a 51% interest in Balco in 2001 (Mining Journal, 2002a).

Hindustan Aluminium Co. Ltd. (Hindalco) made an offer to acquire 25.5% of the Indal shares; Hindalco already held a 74.5% stake, and this acquisition would make it a wholly owned subsidiary. The company also decided to merge with Birla Copper. After combining with Indal and Birla Copper, Hindalco would have an alumina capacity of 1.6 Mt/yr, an aluminum smelting capacity of 430,000 t/yr, and a copper capacity of 250,000 t/yr. Birla Copper's 100,000-t/yr expansion to 250,000 t/yr would be completed under Hindalco by June 2003 (Metal Bulletin, 2002f). The expansion of Indal's Hirakud aluminum smelter in Orissa to 57,200 t/yr from 30,000 t/yr was due for completion in March 2003.

Sterlite Industries signed a power deal with National Thermal Power to take control of a 270-MW captive powerplant located at its acquired Korba aluminum smelter. This would help boost its production at the smelter to 125,000 t/yr by 2003. Meanwhile, the company was to close its downstream processing unit at Bidhanbag near Kolkata, which produced extrusions, foils, and rolled products (Metal Bulletin, 2002ac).

**Chromium.**—The Government had fixed a ceiling of 400,000 t for chromite ore exports. Eligible material was restricted to that which was low-silica friable/fine chromite with chromium oxide not exceeding 52% and silica not exceeding 4% and chromite lumps that contained chromium oxide not exceeding 40%. No ceiling was imposed on concentrate exports, but these were stipulated as having a feed grade for producing concentrates of less than 33% Cr. Most of India's chromite exports went to Chinese producers of ferrochrome via Metals & Minerals Trading Corp. (Metal Bulletin, 2002i).

**Copper.**—Sterlite Industries might seek a listing on the London Stock Exchange to finance a proposed \$819 million expansion at Balco and its copper operations. Balco's capacity would be expanded from 100,000 t/yr to between 300,000 and 400,000 t/yr by 2005. The funds also would be used to increase Sterlite's copper smelting capacity from the current 150,000 t/yr to 300,000 t/yr and acquire copper mines in Australia and Latin America. Birla Copper was to expand production by 70,000 t/yr to 100,000 t/yr to up to 250,000 t/yr from April 2003. Sterlite had a 3-year option to acquire the remaining 49% of Balco (Mining Journal, 2002g).

Birla Group, Finolex Industries, Metdist/Phelps Dodge, and Sterlite Industries expressed interest in carrying out due diligence on the Swil copper smelter project for a 51% stake. The project would use a mixture of concentrates and secondary feed and have a smelting capacity of 70,000 t/yr and a refining capacity of 50,000 t/yr. Its cost had increased to \$238 million. The project was ready for trial runs in July and for commercial production in December (Metal Bulletin, 2002c).

Hindustan Copper Co. Ltd. (HCL) closed its smelter at Khetri in Rajasthan for maintenance for 6 to 8 weeks; the smelter had a production capacity of 45,000 t/yr. When the Government announced that it wanted to sell its 98.7% equity in HCL, Birla Copper, Finolex Industries, Metdist/Phelps Dodge, and Sterlite Industries had expressed an interest in the privatization of HCL and were prepared to carry out due diligence (Metal Bulletin, 2002d). Finolex Industries and Metdist/Phelps Dodge subsequently dropped out of contention, and Birla Copper and Sterlite Industries demanded more concessions and incentives from the Government.

**Iron and Steel.**—Sesa Goa Ltd., which was the largest private sector producer and exporter of iron ore in Goa, planned to expand into Karnataka and Orissa. The company had two big iron ore mines at Codli and Sonshi in Goa; the ore reserves would last 15 years. The acquisition of mines that had a combined capacity of 2 Mt/yr in Karnataka would increase production. Sesa Goa had a capacity of 1 Mt/yr in Orissa and planned to expand it to 2 Mt/yr (Metal Bulletin, 2002aa).

Sesa Goa started work to open a second mine at Jalahuri in Orissa that would be a small satellite operation to the main mine at Thakarani in Barbil district. Because of insufficient infrastructure, exporting iron ore from the Orissa operations was a major problem. The transport costs by rail and by truck to Paradip were high. The company hoped a new rail line would take a straight route to a new port planned at Damra, which would be located between Haldia and Paradip (Metal Bulletin, 2002ak).

Kudremukh Iron Ore Co. Ltd. (KIOCL) decided to give up the Ongole iron ore mining and beneficiation project in Andhra Pradesh on which it was to have spent \$62 million. The deposit had only about 45 Mt of ore, which would last only 10 years. The state

Government was keen to revive the project by putting up a hot-briquetted iron project with a capacity of 500,000 t/yr. The Ongole project was still not economically viable (Metal Bulletin, 2002q).

KIOCL urged the state Government of Karnataka to grant it a lease in the Ramandurg area in Bellary Hospet; the lease area had 270 Mt of good-quality iron ore deposits. Of this, 70 Mt each had been given to Jindal Steel and reserved for another steel plant, which was due to have been built in the area. KIOCL requested to be given the rights to the entire 270-Mt deposit, which would allow it to supply Jindal Steel and other steelmakers. Failing that, it asked for the 130-Mt area that had not been allocated (Metal Bulletin, 2002p).

The Government of Orissa agreed to grant iron ore leases to Bhushan Steel & Strips Ltd. as a captive source of raw materials for its proposed 1.2- to 1.5-Mt/yr hot-rolled coil steel plant to be set up in Jharsuguda district. The output of the plant would be consumed by its cold-milling units located in different places in India; consumption would increase to 1.2 to 1.3 Mt/yr when its new 400,000-t/yr cold-rolling plant started up at Khapoli. Bhushan Steel & Strips planned to start the first phase of the iron ore mining project in 2007 and to invest \$342 million in this phase. It might go into the second phase, which would cost \$383 million, to raise the production capacity to 2.8 Mt/yr. The company also would have a captive powerplant (Metal Bulletin, 2002b).

KIOCL, Mineral Sales Pvt Ltd., and National Mineral Development Corp. (NMDC), all of which were Indian iron ore exporters, signed memoranda of understanding with China National Metals and Minerals Import & Export Corp. to export more than 12 Mt/yr of iron ore to China. The exports would include high-grade fines with iron content of more than 65%, medium-grade fines with iron content that ranges between 62% and 65%, and low-grade fines with less than 62% iron content. KIOCL would export in the form of pellets (Metal Bulletin, 2002g). The company had a 4-Mt/yr pelletizing plant. KIOCL's vertical shaft furnace for pellets, which cost \$17.6 million, was in operation.

NMDC completed the development of its Nos. 10 and 11A iron ore deposits at Bailadila in Chhattisgarh at a cost of \$93 million. The two deposits will produce 2.4 Mt/yr of lump and 2 Mt/yr of fines when in full production in April 2003. NMDC planned to undertake the development of the 2- to 2.5-Mt/yr-capacity Daitari iron ore reserves in Orissa. At NMDC's mines, two deposits will produce 4.4 Mt/yr of iron ore, and the development of a third could supply a total of 6.4 Mt/yr. NMDC was the largest supplier of lump ore to domestic steel producers, such as Essar Steel and Vizag Steel (Metal Bulletin, 2002v).

Steel Authority of India Ltd. (SAIL) also was interested in exporting iron ore fines that contained from 59% to 62.5% iron to China and Eastern Europe. The company operated mines in Jharkhand and Orissa where it obtained iron ore of 62% to 65% iron. The company planned to increase iron ore mining to 13.7 Mt/yr to meet the requirements of its plants and exports (Metal Bulletin, 2002z).

NMDC's \$62 million 300,000-t/yr pig iron plant, which used the Russian Romelt technology at Nagamar in Chhattisgarh, was due to be completed by the end of 2004. The plant would be expanded to 1 Mt/yr if the technology proved successful. The technology would use iron ore tailings from the mining process that had 55% to 60% iron and could not be used in any conventional ironmaking. The Romelt process was expected to have production costs that were 10% to 15% lower than blast furnace (Metal Bulletin, 2002w).

Sathavahana Ispat at Hyderabad wanted to invest \$2.6 million to increase its current (2001) capacity of 100,000 t/yr of pig iron. The plant was closed for 60 days beginning in October for a furnace relining. Tata Metaliks Ltd., which was the foundry pig iron producer, expressed an interest in taking over Mideast Integrated Steels Ltd., which had been making slow progress in building a 500,000-t/yr blast furnace whose output would go for export and eventually feed a downstream steel plant. The project was at a standstill, although the blast furnace was almost completed. Tata Metaliks might find it worthwhile to revive Mideast because it is located near the raw materials sources (Metal Bulletin, 2002af).

India's three gas-based direct-reduction iron (DRI) producers had a total capacity of 3.7 Mt/yr. Of the 73 coal-based DRI units with nearly 7 Mt/yr of installed capacity, more than 50—particularly in Bihar, Orissa, and West Bengal—had capacities that ranged between 10,000 and 20,000 t/yr (Metal Bulletin, 2002x). In 2002, India produced 6.5 Mt of DRI and overtook Venezuela to become the world's largest DRI producer.

Usha Beltron Ltd. approved the construction of a 100,000-t/yr-capacity DRI plant and a 7.5-MW cogeneration powerplant and a railway siding at its Jamshedpur unit. It also planned to increase the capacity of value-added steel and wire rope products. The cost of the total project was estimated to be \$26 million (Yahoo India Finance, 2002§).

Ferrous scrap prices in India have surged to such an extent that local mills were increasingly looking to source cheaper alternative feed, such as DRI. In addition, re-rollable scrap, which had been coming from the Commonwealth of Independent States, was subject to extra duty in India. Meanwhile, locally generated material, such as ship scrap, was being sold at high price levels (Metal Bulletin, 2002l).

Tata Iron and Steel Co. Ltd. (TISCO) replaced its old blast furnaces with a larger one and planned to add 2 Mt/yr of steel capacity at a cost of \$518 million during the next 3 years to bring the total steel capacity to 5.5 Mt/yr. Paul Wurth of Luxembourg, with assistance from Larsen & Toubro, was granted a contract to build a 1-Mt/yr blast furnace. The furnace had a rated capacity of 2,750 metric tons per day, and the internal capacity was 1,587 cubic meters (Metal Bulletin, 2002aj).

Jindal Strips Ltd. decided to bid for SAIL's Salem Stainless Steel plant. The plant had a capacity of 186,000 t/yr of hot-rolled coils, 70,000 t/yr of cold-rolled products, and 3,600 t/yr of coin blanks. Salem Stainless Steel had a 7% market share. With 45% of the market, Jindal Strips was the largest stainless steel producer with a capacity of 400,000 t/yr to be expanded to 500,000 t/yr (Metal Bulletin, 2002o). The company installed a new electric arc furnace for the plant at Hisar in an expansion that cost \$31 million. Hot-rolling capacity would be raised to 300,000 t/yr as a result of the upgrade. The company planned to build a 1.8-Mt/yr stainless steel plant at a cost of more than \$414 million in Orissa. Jindal Strips also proposed to invest \$10 million to modernize SAIL's Durgapur plant in West Bengal as a source of slab for SAIL's Salem hot-rolling mill (Metal Bulletin, 2002n).

Tisco attempted to take over Indian Steel & Wire Products (ISWP), which is located near Tisco and supplied raw material. ISWP had a capacity of 200,000 t/yr of wire rod, 112,000 t/yr of bright wire, 24,000 t/yr of annealed and galvanized wire, and 4,000 t/yr of cast iron and steel rolls (Metal Bulletin, 2002ag).

Jindal Steel & Power Ltd commissioned its 250,000-t/yr mini blast furnace. Its rail and universal beam mill project was at an advanced stage and would be completed by March 2003. Also, its 2.5-Mt/yr coal washing plant was to be onstream in July 2002 (Metal Bulletin, 2002m).

Southern Iron & Steel Co. Ltd. started up its new rolling mill, which had a capacity of 300,000 t/yr; of that total, various qualities of mild steel made up 200,000 t/yr. It also had capacity to roll bearing-quality steel, free-cutting steel, spring steel flats, and stainless steel. The company had been producing pig iron and steel billets before (Metal Bulletin, 2002ab).

Bellary Steel and Alloys in the Hospet region of Karnataka restarted its 100,000-t/yr long products steel plant and started up a 500,000-t/yr long products plant. Southern India Steel started up a 200,000-t/yr long products plant. With 3 Mt/yr, Vizag Steel was still the most dominant producer with a market share of more than 45% in long products; it was likely to be privatized in 2003 (Metal Bulletin, 2002a).

Indian tinplate consumption stood at 300,000 t/yr, of which nearly one-half was imported. Tinplate Co. of India Ltd. entered a technical agreement with Arcelor of France to improve product quality and would expand its capacity from 90,000 to 120,000 t/yr at a cost of \$2 million to \$3 million. The company also was studying the feasibility of doubling production capacity to 250,000 t/yr through an overseas acquisition (Metal Bulletin, 2002ah). Together with Sail's Rourkela steel plant, India had a capacity of 200,000 t/yr of tinplate.

Maharashtra Seamless Ltd. would invest \$47 million to expand its production facilities; of this, \$5.2 million would be spent increasing existing capacity in seamless pipes to 18 centimeters (cm) in diameter to 200,000 t/yr from 100,000 t/yr, and \$41 million would be spent setting up a plant to produce seamless pipes up to 36 cm in diameter. The plant exported from 30,000 to 35,000 t/yr of pipes (Metal Bulletin, 2002r).

**Ferroalloys.**—Ferroalloy producers in Andhra Pradesh stopped operations following a steep hike in power tariffs in April. Andhra Ferroalloys, Facor, GMR Vasavi Industries, Jindal Steel, and VBC Ferroalloys all stopped production. They produced high-carbon ferrochrome; VBC Ferroalloys also produced ferrosilicon. Only Nava Bharat Ferroalloys' plant was operating because it had a captive power supply. If the state Government put a higher levy on captive power production, however, then it also might close (Metal Bulletin, 2002e). Subsequently, four of the five producers restarted production in November.

Tisco was interested in taking over a state-owned ferrochrome plant at Jajpur Road in Orissa. The plant had a production capacity of 15,000 t/yr of high-carbon ferrochrome and 5,000 t/yr of low-carbon ferrochrome. Tisco operated a plant at Baminipal in Orissa with a capacity of 50,000 t/yr of high-carbon ferrochrome (Metal Bulletin, 2002ai).

Marubeni Corp. of Japan was talking to Indian Charge Chrome Ltd. (ICCL) and its debtors about the possibility of taking a stake in the company. ICCL operated a 60,000-t/yr ferrochrome smelter, chrome ore mines, and a 108-MW captive powerplant. Marubeni had been the marketing representative for ICCL in East Asian countries, such as Japan, the Republic of Korea, and Taiwan, for the past 12 years (Metal Bulletin, 2002s).

**Lead.**—Indian Lead Co. Ltd. restarted production at its three shuttered secondary lead plants in May. The company was the largest secondary lead producer in India. Two of the three facilities were in Maharashtra, and one was in West Bengal and used locally available spent lead-acid batteries. In Maharashtra, a 25,000-t/yr plant was located at Thane near Mumbai, and a 40,000-t/yr unit, at Wada also near Mumbai. Indian demand for lead was 300,000 t/yr, most of which was met through imports (Metal Bulletin, 2002k).

**Manganese.**—Tisco and Sunflag Iron & Steel were interested in taking over Manganese Ore India Ltd.'s (MOIL) 51% stake offered by the Government, which held 81.57% of the equity in the company. Of the balance, 4.57% would be offered to company employees, and the Government would retain 26%. Jindal Strips also showed its interest. Some ferroalloys producers might join the consortium to prevent any single operator from taking over the company and gaining control of supplies of the raw material. MOIL was the largest producer of manganese ore in India with a 70% market share. The company could increase its exports of high-grade manganese ore to China if the Government would permit it to export low-phosphor manganese ore. MOIL had a workforce of 7,500, operated 10 mines in Madhya Pradesh and Maharashtra, and produced 700,000 t/yr of manganese ore. India had measured reserves of 40 Mt, indicated reserves of 49 Mt, and inferred reserves of 78 Mt (Metal Bulletin, 2002ae).

**Zinc.**—Hindustan Zinc Ltd. (HZL) reduced its work force by 1,600; this included 1,370 workers and 230 managers in its Agnigundala, Debari, Rajpur-Dariba, Vizag, and Zawar divisions. This represented 16% of the company's workforce (Mining Journal, 2002c).

Sterlite Industries was successful in its renewed bid for the 26% stake of HZL being sold by the Government, which received \$92 million from Sterlite in March. The company made an open offer for a further 20% and had a call option to buy a further 18.92% interest from the Government. HZL had six zinc-lead mines with a combined capacity of 3.5 Mt/yr and four zinc-lead smelters with a combined capacity of 169,000 t/yr of zinc and 43,000 t/yr of lead (Mining Journal, 2002j). HZL aimed to capture 50% of total zinc demand in India, which was around 327,000 t/yr.

Binani Industries put its zinc business into a separate company, Binani Zinc Ltd. The restructuring enabled Binani Zinc to expand its zinc refinery at Kerala to a capacity of 38,000 t/yr from 30,000 t/yr. It planned to add a further 100,000 t/yr of capacity later. The whole expansion was likely to cost \$93.2 million. Binani Zinc depended on imported zinc concentrates (Metal Bulletin, 2002y).

## *Industrial Minerals*

**Diamond.**—De Beers was granted permission by the State Government of Orissa to conduct an aerial survey over 10,000 km<sup>2</sup> of diamond deposits in the state. De Beers would undertake a reconnaissance survey over 5,000 km<sup>2</sup> in the first year and apply for a prospecting license over a patch of 25 km<sup>2</sup> that possibly contains diamond deposits. The State government would provide only a prospecting license if the company set up a diamond processing plant in the State (Rapaport News, 2002).

**Garnet.**—Transworld Garnet India Pvt. Ltd. (a 74% owned subsidiary of Western Garnet International Ltd. of the United States) was awarded the first mining lease on a multiheavy-mineral-sand deposit at Srikurman in Andhra Pradesh. The mining lease, which covered 95 hectares for a period of 30 years with renewal rights for another 30 years, consisted of garnet, ilmenite, rutile, sillimanite, and zircon. The company completed its drilling program and planned to have a detailed reserve analysis in May. It also planned to begin construction of a 400,000-t/yr processing plant in the third quarter of 2002. Commercial production was expected in the first half of 2003 (Canada NewsWire, 2002§).

**Spinel.**—White Circle Oxides Ltd. started up a 6,000-t/yr sintered magnesia-alumina spinel plant in April at Peddapuram in Andhra Pradesh. The company expected to operate the new plant at 60% to 70% of the design capacity in the first year of production. Spinel was used in only about 1% of Indian refractory producers, which included MPR Refractories Ltd., OCL India Ltd., and Tata Refractories Ltd. The company invested \$5.1 million in the development and production of its spinel in association with the Ministry of Science and Technology. The spinel plant's major power source would be natural gas. Alcoa ACC Industrial Chemicals Ltd., which was a joint venture of Alcoa Inc. (60%) and Associated Cement Companies Ltd. (40%), was India's leading spinel producer. It imported spinel from its European production site and further processed it in India. The other producer of sintered spinel from magnesia and alumina raw materials was Passary Minerals Ltd. at Rourkela in Orissa, which produced 5,000 t/yr of magnesia-alumina and magnesia-chrome spinel and expected to increase output to 10,000 t/yr (Industrial Minerals, 2002).

**Titanium.**—VV Minerals, which was India's newest ilmenite producer, produced ilmenite from beach sands at its mine near Kanyakumari on the southeastern coast of Tamil Nadu. The company had a production capacity of 130,000 t/yr of sulfate-grade ilmenite. The deposit had resources estimated to be more than 5 Mt of recoverable ilmenite (Mining Journal, 2002f).

Tisco was to conduct a \$3 million feasibility study for a titanium dioxide pigment plant in Tamil Nadu. If the project was viable, then the company was considering the construction of a \$307 million production facility. Tisco signed a memorandum of understanding with the state Government concerning electric, land, and water supplies for the project (Mining Journal, 2002k).

## *Mineral Fuels*

**Coal.**—India has vast coal reserves amenable only to underground mining on which most further production growth would have to rely. Underground production entailed higher capital outlays and lower productivity. At an annual growth rate of 3.5% of coal, the largest contribution to this incremental production would be from Coal India Ltd. (CIL) at 92%. CIL's projected total coal production would comprise 82.4% of coal from opencast mines and 17.6% of underground coal. A new policy was to increase the scope of private participation in coal mining and production efficiency. The Government might consider establishing a regulatory authority to control coal mining activities and to allocate mining blocks on the basis of the technical and financial capabilities of the bidders (Mining Journal, 2002e).

Under the 10th 5-year plan (April 2002-March 2007), CIL approved six new opencast coal projects that could provide an additional 57 Mt/yr. These projects would be undertaken by three CIL subsidiaries. The mines at Bhubaneswari, Garjanbahal, and Kulda, each with a capacity of 10 Mt/yr, would be developed by Mahanadi Coalfields Ltd., and the 4-Mt/yr Krishnashila operation, by Northern Coalfields Ltd. South Eastern Coalfields Ltd. would develop the two expansion projects by raising Gevra's capacity to 25 Mt/yr from 12 Mt/yr and Dipika's to 20 Mt/yr from 10 Mt/yr. During the current 5-year plan, CIL will invest \$1.29 billion to boost coal production to 350 Mt/yr from 270 Mt/yr (Mining Journal, 2002b).

Total reserves of lignite in India were large and estimated to be 34,600 Mt as of January 1, 2001. Lignite production capacity was expected to increase to 55.96 Mt/yr in 2007, and demand for lignite was forecast to be 57.78 Mt/yr, of which the power sector's requirement would be 49.33 Mt/yr. An investment of \$1.9 billion was proposed for the mining projects in Neyveli, and \$700,000 was required in Gujarat for undertaking the programmed additional lignite production (Mining Magazine, 2002).

**Natural Gas.**—Reliance Industries Ltd. discovered in excess of 198 billion cubic meters of natural gas in the deepwater block D6 in the Krishna Godavari Basin off Andhra Pradesh. Recoverable reserves were estimated to be 142 billion cubic meters. The company would deliver 40 million cubic meters per day to consumers in India in 3 to 4 years after development. This would account for 4% of the country's energy needs. Reliance had 177,000 km<sup>2</sup> of exploration area in 23 offshore and onshore blocks (Realtime News, 2002§).

Niko Resources Ltd. of Canada discovered natural gas in two of three exploratory wells on its 419-km<sup>2</sup> onshore block near Surat in Gujarat. The company planned to drill seven more wells on the block before April 2003. Niko held 100% interest in the Surat block. Under the terms of its production-sharing contract, Niko was required to drill 15 wells and shoot 250 km<sup>2</sup> of 3D seismic during 2 years. A second 2-year commitment, which was dependent on the results of the first phase, required the drilling of five wells and the shooting of an additional 50 km<sup>2</sup> of 3D seismic (Oil & Gas Journal, 2002a).

**Petroleum.**—Oil and Natural Gas Corp. planned to develop a major hydrocarbon discovery in the deepwater region in the next 2 years. The well drilled in August 1999 found oil and gas in 900 meters of water at the G-1 prospect in the Krishna-Godavari offshore region. Development of the well was expected to yield 1.5 million cubic meters per day of gas and 2,500 barrels per day of oil (Oil & Gas Journal, 2002b).

## Infrastructure

The completion of the Daitari-Keonjhar-Banspani railway, which linked the port of Paradeep with the rich reserves of chromite, coal, iron ore, and manganese ore in Orissa, in 2003 would help raise exports and reduce freight charges. The 155-km railway would reduce the distance to the port by 300 km. The existing railway, which was more than 661 km, linked the iron ore area of Banspani to Paradeep through the States of Orissa, Jharkhand, and West Bengal, but the new line would cut the distance by one-half and reduce freight costs (Metal Bulletin, 2002u).

Indian Oil Corp. was evaluating the possibility of independently implementing the \$106 million Chennai-Tiruchi-Madurai crude oil pipeline project that had been proposed by Petronet India. With experience gained from building and managing 6,500 km of pipelines, the company was confident that it could take on the new project on its own. Meanwhile, it dropped 15 pipeline projects because of slow growth in petroleum products consumption in the country; one was the proposed capacity expansion to 11.5 Mt/yr of the Kandla-Bhatinda products pipeline (Petroleum Economist, 2002).

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#### Oil and Natural Gas Corp.

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TABLE 1  
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES<sup>1,2</sup>

(Metric tons unless otherwise specified)

| Commodity <sup>3</sup>                                | 1998          | 1999                   | 2000                   | 2001                   | 2002                   |                      |
|---|---------------|------------------------|------------------------|------------------------|------------------------|----------------------|
| <b>METALS</b>   |               |                        |                        |                        |                        |                      |
| <b>Aluminum:</b>                                      |               |                        |                        |                        |                        |                      |
| Bauxite, gross weight                                 | thousand tons | 6,102 <sup>4</sup>     | 6,712 <sup>4</sup>     | 7,562 <sup>4</sup>     | 7,864 <sup>r,4</sup>   | 9,274 <sup>4</sup>   |
| Alumina, Al <sub>2</sub> O <sub>3</sub> equivalent    | do.           | 1,890                  | 2,080                  | 2,280                  | 2,400                  | 2,800                |
| Metal, primary  |               | 541,800 <sup>4</sup>   | 614,400 <sup>4</sup>   | 643,700 <sup>4</sup>   | 624,000 <sup>4</sup>   | 671,200 <sup>4</sup> |
| Cadmium metal   |               | 304 <sup>4</sup>       | 269 <sup>4</sup>       | 314 <sup>4</sup>       | 436 <sup>4</sup>       | 466 <sup>4</sup>     |
| Chromium, chromite, gross weight                      |               | 1,311,310 <sup>4</sup> | 1,472,766 <sup>4</sup> | 1,946,910 <sup>4</sup> | 1,677,924 <sup>4</sup> | 1,900,000            |
| Cobalt metal  |               | 120                    | 120                    | 206 <sup>4</sup>       | 250                    | 270                  |
| <b>Copper:</b>  |               |                        |                        |                        |                        |                      |
| Mine output, Cu content                               |               | 39,900 <sup>4</sup>    | 34,100 <sup>4</sup>    | 31,900 <sup>4</sup>    | 32,400 <sup>r,4</sup>  | 34,100 <sup>4</sup>  |
| Metal, primary:                                       |               |                        |                        |                        |                        |                      |
| Smelter   |               | 107,600 <sup>4</sup>   | 224,400 <sup>4</sup>   | 256,000 <sup>r,4</sup> | 293,000 <sup>r,4</sup> | 251,400 <sup>4</sup> |
| Refinery  |               |                        |                        |                        |                        |                      |
| Electrolytic, cathode                                 |               | 100,000                | 200,000                | 234,000 <sup>4</sup>   | 310,000 <sup>4</sup>   | 353,700 <sup>4</sup> |
| Fire refined  |               | 7,000                  | 8,000                  | 9,000                  | 18,000                 | 20,000               |
| Total   |               | 107,000                | 208,000                | 243,000                | 328,000                | 374,000              |
| Gold metal, smelter                                   | kilograms     | 2,383 <sup>4</sup>     | 2,500 <sup>4</sup>     | 6,200 <sup>4</sup>     | 3,700 <sup>r,4</sup>   | 3,800 <sup>4</sup>   |
| <b>Iron and steel:</b>                                |               |                        |                        |                        |                        |                      |
| <b>Iron ore and concentrate:</b>                      |               |                        |                        |                        |                        |                      |
| Gross weight  | thousand tons | 72,532 <sup>4</sup>    | 70,220 <sup>4</sup>    | 75,950 <sup>4</sup>    | 79,200 <sup>4</sup>    | 80,000               |
| Fe content  | do.           | 48,000                 | 44,940 <sup>4</sup>    | 48,600 <sup>4</sup>    | 50,700 <sup>4</sup>    | 51,200               |
| <b>Metal:</b>   |               |                        |                        |                        |                        |                      |
| Pig iron  | do.           | 20,194 <sup>4</sup>    | 20,139 <sup>4</sup>    | 21,321 <sup>4</sup>    | 21,900 <sup>4</sup>    | 22,000               |
| Direct-reduced iron                                   | do.           | 5,260 <sup>4</sup>     | 5,220 <sup>4</sup>     | 5,440 <sup>4</sup>     | 5,590 <sup>4</sup>     | 5,600                |
| <b>Ferrous alloys:</b>                                |               |                        |                        |                        |                        |                      |
| Ferrochromium, including charge chrome                |               | 345,125 <sup>4</sup>   | 312,140 <sup>4</sup>   | 376,693 <sup>4</sup>   | 266,395 <sup>4</sup>   | 311,927 <sup>4</sup> |
| Ferrochromiumsilicon                                  |               | 10,000                 | 10,000                 | 10,000                 | 10,000                 | 10,000               |
| Ferromanganese  |               | 165,000                | 160,000                | 160,000                | 165,000                | 165,000              |
| Ferrosilicon  |               | 55,000                 | 55,000                 | 60,000                 | 50,000                 | 52,000               |
| Silicomanganese                                       |               | 193,000                | 190,000                | 185,000                | 150,000                | 150,000              |
| Other   |               | 9,000                  | 9,000                  | 9,000                  | 9,000                  | 9,000                |
| Steel, crude  | thousand tons | 23,480 <sup>4</sup>    | 24,269 <sup>4</sup>    | 26,924 <sup>4</sup>    | 27,291 <sup>r,4</sup>  | 28,814 <sup>4</sup>  |
| Semimanufactures <sup>5</sup>                         | do.           | 12,000                 | 12,000                 | 12,000                 | 13,000                 | 13,500               |
| <b>Lead:</b>  |               |                        |                        |                        |                        |                      |
| Mine output, Pb content                               |               | 39,300 <sup>4</sup>    | 32,100 <sup>4</sup>    | 28,900 <sup>4</sup>    | 25,600 <sup>r,4</sup>  | 29,000 <sup>4</sup>  |
| Metal, refined:                                       |               |                        |                        |                        |                        |                      |
| Primary   |               | 70,000                 | 72,000                 | 70,000                 | 74,000                 | 53,000 <sup>4</sup>  |
| Secondary   |               | 25,000                 | 20,000                 | 26,000                 | 20,000                 | 20,000               |
| Total   |               | 95,000                 | 92,000                 | 96,000                 | 94,000                 | 73,000               |
| <b>Manganese:</b>                                     |               |                        |                        |                        |                        |                      |
| Ore and concentrate, gross weight                     | thousand tons | 1,557 <sup>4</sup>     | 1,500                  | 1,550                  | 1,600                  | 1,700                |
| Mn content  | do.           | 592                    | 570                    | 590                    | 600                    | 630                  |
| Rare-earth metals, monazite concentrate, gross weight |               | 5,000                  | 5,000                  | 5,000                  | 5,000                  | 5,000                |
| Selenium  | kilograms     | 11,500                 | 11,500                 | 11,500                 | 11,500                 | 11,500               |
| Silver, mine and smelter output                       | do.           | 52,310 <sup>4</sup>    | 54,000                 | 40,000                 | 49,500 <sup>r,4</sup>  | 52,100 <sup>4</sup>  |
| <b>Titanium concentrates, gross weight:</b>           |               |                        |                        |                        |                        |                      |
| Ilmenite  |               | 378,000                | 378,000                | 380,000                | 430,000                | 460,000              |
| Rutile  |               | 16,000                 | 16,000                 | 17,000                 | 19,000                 | 18,000               |
| <b>Zinc:</b>  |               |                        |                        |                        |                        |                      |
| <b>Mine output, concentrate:</b>                      |               |                        |                        |                        |                        |                      |
| Gross weight  |               | 261,467 <sup>4</sup>   | 265,000                | 264,000                | 270,000                | 241,800 <sup>4</sup> |
| Zn content  |               | 143,000                | 145,000                | 144,000                | 146,000                | 130,000              |
| <b>Metal:</b>   |               |                        |                        |                        |                        |                      |
| Primary   |               | 171,900 <sup>4</sup>   | 175,000                | 176,000                | 205,000                | 196,000              |
| Secondary   |               | 25,000                 | 25,000                 | 25,000                 | 25,000                 | 24,000               |
| Total   |               | 197,000                | 200,000                | 201,000                | 230,000                | 220,000              |
| Zirconium concentrate, zircon, gross weight           |               | 19,000                 | 19,000                 | 19,000                 | 19,000                 | 19,000               |

See footnotes at end of table.

TABLE 1--Continued  
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES<sup>1,2</sup>

(Metric tons unless otherwise specified)

| Commodity <sup>3</sup>                       | 1998                   | 1999                   | 2000                   | 2001                | 2002               |
|--|------------------------|------------------------|------------------------|---------------------|--------------------|
| <b>INDUSTRIAL MINERALS</b>                   |                        |                        |                        |                     |                    |
| Abrasives, natural, n.e.s.:                  |                        |                        |                        |                     |                    |
| Corundum, natural kilograms                  | 1,230 <sup>4</sup>     | 1,300                  | 1,250                  | 1,200               | 1,200              |
| Garnet                                       | 138,678 <sup>4</sup>   | 135,000                | 130,000                | 125,000             | 120,000            |
| Jasper                                       | 6,581 <sup>4</sup>     | 7,000                  | 7,500                  | 8,000               | 8,000              |
| Asbestos                                     | 18,751 <sup>4</sup>    | 20,000                 | 21,000                 | 21,000              | 18,000             |
| Barite                                       | 749,412 <sup>4</sup>   | 360,000                | 840,000                | 850,000             | 600,000            |
| Bromine, elemental                           | 1,500                  | 1,500                  | 1,500                  | 1,500               | 1,500              |
| Cement, hydraulic thousand tons              | 85,000                 | 90,000                 | 95,000                 | 100,000             | 100,000            |
| Chalk  | 114,109 <sup>4</sup>   | 115,000                | 110,000                | 110,000             | 110,000            |
| Clays:                                       |                        |                        |                        |                     |                    |
| Ball clay                                    | 381,479 <sup>4</sup>   | 380,000                | 375,000                | 370,000             | 400,000            |
| Diaspore                                     | 10,148 <sup>4</sup>    | 12,000                 | 13,000                 | 13,000              | 12,000             |
| Fireclay                                     | 331,729 <sup>4</sup>   | 340,000                | 345,000                | 350,000             | 355,000            |
| Kaolin:                                      |                        |                        |                        |                     |                    |
| Salable crude thousand tons                  | 540 <sup>4</sup>       | 520                    | 530                    | 540                 | 540                |
| Processed do.                                | 148 <sup>4</sup>       | 150                    | 160                    | 170                 | 170                |
| Total do.                                    | 688 <sup>4</sup>       | 670                    | 690                    | 710                 | 710                |
| Other do.                                    | 60 <sup>4</sup>        | 65                     | 70                     | 70                  | 70                 |
| Diamond:                                     |                        |                        |                        |                     |                    |
| Gem thousand carats                          | 12                     | 12                     | 16                     | 17                  | 17                 |
| Industrial do.                               | 22                     | 29                     | 41                     | 43                  | 45                 |
| Total do.                                    | 34                     | 41                     | 57                     | 60                  | 62                 |
| Feldspar                                     | 104,509 <sup>4</sup>   | 105,000                | 110,000                | 110,000             | 110,000            |
| Fluorspar:                                   |                        |                        |                        |                     |                    |
| Concentrates, metallurgical-grade            | 785 <sup>4</sup>       | 800                    | 850                    | 900                 | 1,000              |
| Other fluorspar materials, graded            | 5,507 <sup>4</sup>     | 5,600                  | 5,700                  | 5,800               | 5,700              |
| Gemstones excluding diamond:                 |                        |                        |                        |                     |                    |
| Agate, including chalcedony pebble           | 190 <sup>4</sup>       | 200                    | 250                    | 250                 | 200                |
| Garnet kilograms                             | 829 <sup>4</sup>       | 900                    | 850                    | 900                 | 700                |
| Graphite <sup>6</sup>                        | 143,333 <sup>4</sup>   | 145,000                | 140,000                | 140,000             | 130,000            |
| Gypsum                                       | 2,191,784 <sup>4</sup> | 2,200,000              | 2,210,000              | 2,250,000           | 2,300,000          |
| Kyanite and related materials:               |                        |                        |                        |                     |                    |
| Kyanite                                      | 5,169 <sup>4</sup>     | 5,000                  | 5,000                  | 5,500               | 6,000              |
| Sillimanite                                  | 11,936 <sup>4</sup>    | 12,000                 | 12,000                 | 13,000              | 14,000             |
| Lime   | 298,131 <sup>4</sup>   | 300,000                | 310,000                | 320,000             | 310,000            |
| Magnesite                                    | 355,033 <sup>4</sup>   | 360,000                | 365,000                | 370,000             | 380,000            |
| Mica:  |                        |                        |                        |                     |                    |
| Crude  | 1,489 <sup>4</sup>     | 1,500                  | 1,500                  | 1,300               | 1,500              |
| Scrap and waste                              | 966 <sup>4</sup>       | 1,000                  | 950                    | 1,100               | 2,000              |
| Total  | 2,455 <sup>4</sup>     | 2,500                  | 2,450                  | 2,400               | 3,500              |
| Nitrogen, N content of ammonia thousand tons | 10,240 <sup>4</sup>    | 10,376 <sup>4</sup>    | 10,148 <sup>4</sup>    | 10,081 <sup>4</sup> | 9,220 <sup>4</sup> |
| Phosphate rock, including apatite            | 1,730,334 <sup>4</sup> | 1,262,000 <sup>4</sup> | 1,136,000 <sup>4</sup> | 1,200,000           | 1,250,000          |
| Pigments, mineral, natural, ocher            | 351,704 <sup>4</sup>   | 380,000                | 336,000                | 355,000             | 360,000            |
| Pyrites, gross weight                        | 97,163 <sup>4</sup>    | 100,000                | 105,000                | 110,000             | 115,000            |
| Salt:  |                        |                        |                        |                     |                    |
| Rock salt thousand tons                      | 2 <sup>4</sup>         | 3                      | 3                      | 3                   | 3                  |
| Other do.                                    | 11,962 <sup>4</sup>    | 14,450 <sup>4</sup>    | 14,450 <sup>4</sup>    | 14,500              | 14,500             |
| Total do.                                    | 11,964 <sup>4</sup>    | 14,500                 | 14,500                 | 14,500              | 14,500             |
| Soda ash                                     | 1,500,000              | 1,500,000              | 1,500,000              | 1,500,000           | 1,500,000          |
| Stone, sand and gravel:                      |                        |                        |                        |                     |                    |
| Calcite                                      | 50,668 <sup>4</sup>    | 50,000                 | 50,500                 | 51,000              | 51,000             |
| Dolomite thousand tons                       | 2,800 <sup>4</sup>     | 2,700                  | 2,750                  | 2,800               | 2,900              |
| Limestone do.                                | 108,920 <sup>4</sup>   | 110,000                | 105,000                | 110,000             | 115,000            |
| Quartz and quartzite do.                     | 266 <sup>4</sup>       | 265                    | 260                    | 270                 | 250                |

See footnotes at end of table.

TABLE 1--Continued  
INDIA: ESTIMATED PRODUCTION OF MINERAL COMMODITIES<sup>1,2</sup>

(Metric tons unless otherwise specified)

| Commodity <sup>3</sup>                     | 1998                       | 1999                 | 2000                   | 2001                   | 2002                   |         |
|--|----------------------------|----------------------|------------------------|------------------------|------------------------|---------|
| <b>INDUSTRIAL MINERALS--Continued</b>      |                            |                      |                        |                        |                        |         |
| <b>Sand:</b>                               |                            |                      |                        |                        |                        |         |
| Calcareous                                 | thousand tons              | 230                  | 235                    | 240                    | 245                    | 250     |
| Silica                                     | do.                        | 1,265 <sup>4</sup>   | 1,300                  | 1,350                  | 1,400                  | 1,400   |
| Other                                      | do.                        | 2,879 <sup>4</sup>   | 2,900                  | 2,800                  | 2,900                  | 2,800   |
| Slate                                      |                            | 10,029 <sup>4</sup>  | 10,000                 | 10,500                 | 11,000                 | 10,000  |
| Sulfur, byproduct from fertilizer plants   |                            | 10,000               | 10,500                 | 11,000                 | 11,000                 | 11,500  |
| <b>Talc and related materials:</b>         |                            |                      |                        |                        |                        |         |
| Pyrophyllite                               |                            | 79,951 <sup>4</sup>  | 85,000                 | 85,000                 | 86,000                 | 85,000  |
| Steatite, soapstone                        |                            | 447,550 <sup>4</sup> | 450,000                | 460,000                | 460,000                | 465,000 |
| Vermiculite                                |                            | 4,080 <sup>4</sup>   | 4,000                  | 4,200                  | 4,300                  | 4,300   |
| Wollastonite                               |                            | 95,746 <sup>4</sup>  | 96,000                 | 100,000                | 100,000                | 105,000 |
| <b>MINERAL FUELS AND RELATED MATERIALS</b> |                            |                      |                        |                        |                        |         |
| <b>Coal:</b>                               |                            |                      |                        |                        |                        |         |
| Bituminous                                 | thousand tons              | 298,116 <sup>4</sup> | 290,400 <sup>r,4</sup> | 310,800 <sup>r,4</sup> | 320,500 <sup>r,4</sup> | 325,000 |
| Lignite                                    | do.                        | 23,164 <sup>4</sup>  | 24,000                 | 24,000                 | 23,000                 | 24,000  |
| Total                                      | do.                        | 321,280 <sup>4</sup> | 314,400 <sup>r,4</sup> | 334,800 <sup>r,4</sup> | 343,500 <sup>r,4</sup> | 349,000 |
| <b>Gas, natural:</b>                       |                            |                      |                        |                        |                        |         |
| Gross                                      | million cubic meters       | 25,000               | 31,400 <sup>4</sup>    | 30,000                 | 25,519 <sup>4</sup>    | 26,000  |
| Marketable                                 | do.                        | 23,500               | 29,500                 | 28,500                 | 24,000                 | 25,000  |
| <b>Petroleum:</b>                          |                            |                      |                        |                        |                        |         |
| Crude                                      | thousand 42-gallon barrels | 244,854 <sup>4</sup> | 241,119 <sup>4</sup>   | 238,068 <sup>4</sup>   | 239,292 <sup>4</sup>   | 240,000 |
| <b>Refinery products:</b>                  |                            |                      |                        |                        |                        |         |
| Liquefied petroleum gas                    | do.                        | 40,500               | 41,000                 | 41,500                 | 42,000                 | 43,000  |
| Gasoline                                   | do.                        | 39,500               | 40,000                 | 40,500                 | 41,000                 | 42,000  |
| Kerosene and jet fuel                      | do.                        | 58,000               | 58,500                 | 59,000                 | 58,000                 | 60,000  |
| Distillate fuel oil                        | do.                        | 167,000              | 168,000                | 169,000                | 170,000                | 172,000 |
| Residual fuel oil                          | do.                        | 70,000               | 69,000                 | 68,000                 | 67,000                 | 69,000  |
| Other                                      | do.                        | 90,000               | 91,000                 | 91,500                 | 92,000                 | 94,000  |
| Total                                      | do.                        | 465,000              | 468,000                | 470,000                | 470,000                | 480,000 |

<sup>r</sup>Revised.

<sup>1</sup>Table includes data available through August 5, 2003.

<sup>2</sup>Estimated data are rounded to no more than three significant digits; may not add to totals shown.

<sup>3</sup>In addition to commodities listed, other gemstones (aquamarine, emerald, ruby, and spinel) and uranium are produced, but output is not reported; available information is inadequate to make reliable estimates of output levels.

<sup>4</sup>Reported figure.

<sup>5</sup>Excludes production from steel miniplants.

<sup>6</sup>India's marketable production is 10% to 20% of mine production.

TABLE 2  
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2002

(Thousand metric tons unless otherwise specified)

| Commodity | Major operating companies and major equity owners  | Location of main facilities                        | Annual capacity <sup>c</sup> |
|-----------|--|--|------------------------------|
| Alumina   | Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]  | Belgaum Refinery, Karnataka                        | 280                          |
| Do.       | National Aluminium Co. Ltd. (Indian Government, 100%)  | Dhamanjodi Refinery, Orissa                        | 1,050                        |
| Do.       | Bharat Aluminium Co. Ltd. (Indian Government, 49%, and Sterlite Industries Ltd., 51%)  | Korba Refinery, Chhattisgarh                       | 200                          |
| Do.       | Utkal Alumina International Ltd. [Norsk Hydro A/S (Norway), 45%; Alcan Aluminium Ltd. (Canada), 35%; and Hindalco Industries Ltd., 20%]  | Koraput Refinery, Orissa                           | 1,000 <sup>1</sup>           |
| Do.       | Madras Aluminium Co. Ltd. [Alumix SpA (Italian Government), 27%; R. Prabhu and Associates, 24%; Tamil Nadu Industrial Investment Corp., 11%, and others, 38%]  | Mettur Refinery, Tamil Nadu                        | 60                           |
| Do.       | Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]  | Muri Refinery, Jharkhand                           | 88                           |
| Do.       | Hindalco Aluminium Co. Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; and financial institutions, 18%)   | Renukoot Refinery, Uttar Pradesh                   | 450                          |
| Aluminium | Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]  | Alupuram Smelter, Kerala                           | 20                           |
| Do.       | National Aluminium Co. Ltd. (Indian Government, 100%)  | Angul Smelter, Orissa                              | 230                          |
| Do.       | Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]  | Belgaum Smelter, Karnataka                         | 70                           |
| Do.       | do.  | Hirakud Smelter, Orissa                            | 30                           |
| Do.       | Bharat Aluminium Co. Ltd. (Indian Government, 49%, and Sterlite Industries Ltd., 51%)  | Korba Smelter, Chhattisgarh                        | 100                          |
| Do.       | Madras Aluminium Co. Ltd. [Alumix SpA (Italian Government), 27%; R. Prabhu and Associates, 24%; Tamil Nadu Industrial Investment Corp., 11%, and others, 38%]  | Mettur Smelter, Tamil Nadu                         | 25                           |
| Do.       | Hindalco Aluminium Co. Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; and financial institutions, 18%)   | Renukoot Smelter, Uttar Pradesh                    | 275                          |
| Bauxite   | Bharat Aluminium Co. Ltd. (Indian Government, 49%, and Sterlite Industries Ltd., 51%)  | Amarkantak Mine, Madhya Pradesh                    | 200                          |
| Do.       | Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]  | Kolhapur District mines, Maharashtra               | 600                          |
| Do.       | Gujarat Mineral Development Corp. (Gujarat State Government, 100%)   | Kutch and Saurashtra Mines, Gujarat                | 500                          |
| Do.       | Hindalco Aluminium Co. Ltd. (Birla Group, 33%; foreign investors, 26%; private Indian investors, 23%; and financial institutions, 18%)   | Lohardarga District mines, Jharkland               | 750                          |
| Do.       | Indian Aluminium Co. Ltd. [Indian interests, 60.4%, and Alcan Aluminium Ltd. (Canada), 39.6%]  | do.  | 200                          |
| Do.       | National Aluminium Co. Ltd. (Indian Government, 100%)  | Panchpatmali Hills, Koraput District mines, Orissa | 2,400                        |
| Do.       | Minerals & Minerals Ltd. (Indian Government, 100%)   | Richuguta, Palamau District mines, Jharkland       | 200                          |
| Barite    | Andhra Pradesh Mineral Development Corp. Ltd. (Andhra Pradesh State Government, 100%)  | Cuddapah District mines, Andhra Pradesh            | 350                          |
| Do.       | Associated Mineral Corp.   | do.  | 75                           |
| Do.       | Pragathi Minerals  | do.  | 50                           |
| Do.       | Shri C. M. Ram nath Reddy  | do.  | 75                           |
| Do.       | Vijaylaxmi Minerals Trading Co.  | do.  | 50                           |
| Cement    | Larsen and Taubro Ltd.   | Awarpur Plant, Maharashtra                         | 2,300                        |
| Do.       | Century Cement (Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%)   | Baikunth Plant, Madhya Pradesh                     | 1,120                        |
| Do.       | Coromandel Fertilizers Ltd. [Chevron Chemical Co. (United States), 23.55%; International Minerals and Chemical Co., 20.89%; Parry and Co., 10.64%; E.I.D. Parry (India) Ltd., 6.65%; and others, 38.27%] | Chilamkur Plant, Andhra Pradesh                    | 1,000                        |

See footnotes at end of table.

TABLE 2--Continued  
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2002

(Thousand metric tons unless otherwise specified)

| Commodity          | Major operating companies and major equity owners   | Location of main facilities  | Annual capacity <sup>c</sup>     |     |
|--------------------|---|--|----------------------------------|-----|
| Cement--Continued: | The Associated Cement Cos. Ltd. (Indian Government, 34.86%, and private shareholders, 65.14%)                         | Gagal Plant, Himachal Pradesh  | 1,830                            |     |
| Do.                | do.   | Wadi Plant, Karnataka  | 2,180                            |     |
| Do.                | do.   | Kymore Plant, Madhya Pradesh   | 1,500                            |     |
| Do.                | Raymond Cement Works (a division of Raymond Woolen Mills Ltd., J K Singhanian, principal shareholder)                 | Gopalnagar Plant, Madhya Pradesh   | 1,250                            |     |
| Do.                | Narmada Cement Co. Ltd. (Chowgule and Co. Ltd., 34%; Gujarat State Government, 17.33%; and others, 48.67%)            | Jafrabad Plant, Gujarat  | 1,000                            |     |
| Do.                | Rajashree Cement (a division of Indian Rayon and Industries Ltd., 100%)   | Khor Plant, Karnataka  | 1,020                            |     |
| Do.                | Mangalam Cement Ltd.  | Morak Plant, Rajasthan   | 1,000                            |     |
| Do.                | Mysore Cements Ltd. (Government institutions and banks, 41.13%; Corporate Trust Holdings, 21.70%; and others, 37.17%) | Narasingarh Plant, Madhya Pradesh  | 1,089                            |     |
| Do.                | Cement Corp. of India Ltd. (Indian Government, 100%)  | Nayagaon Plant, Madhya Pradesh   | 1,330                            |     |
| Do.                | J K Cement Works (a division of J K Synthetics Ltd., 100%)  | Nimbahera Plant, Rajasthan   | 1,462                            |     |
| Do.                | The India Cement Co. Ltd. (Indian Government, 26%; Life Insurance Corp. of India, 24%; and others, 50%)               | Sankarnagar Plant, Tamil Nadu  | 1,000                            |     |
| Do.                | Maihar Cement (Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%)                           | Satna Plant, Madhya Pradesh  | 1,800                            |     |
| Do.                | Shree Digvijay Cement Co. Ltd.  | Shreeniwas Plant, Maharashtra  | 1,060                            |     |
| Do.                | Lakshmi Cement (a division of Straw Products Ltd., J K Singhanian, principal shareholder)                             | Sirohi Plant, Rajasthan  | 1,400                            |     |
| Do.                | Manikgarh Cement (Century Textiles and Industries Ltd., a subsidiary of the Birla Group, 100%)                        | Tehsil Rajura Plant, Maharashtra   | 1,000                            |     |
| Do.                | Vasavadatta Cement (Kesoram Industries Ltd., 100%)  | Vasavadatta Plant, Karnataka   | 1,000                            |     |
| Do.                | Vikram Cement (Grasim Industries Ltd., a subsidiary of Birla Group, 100%)   | Vikram Plant, Madhya Pradesh   | 1,000                            |     |
| Do.                | Raasi Cement Ltd. (Andhra Pradesh Government, 50%, and Development Co. Ltd., 50%)                                     | Vishnupuram Plant, Andhra Pradesh  | 1,000                            |     |
| Chromite           | Ferro Alloys Corp. Ltd.   | Cuttack District, Orissa   | 120                              |     |
| Do.                | Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)   | do.  | 300                              |     |
| Do.                | Tata Iron and Steel Co. Ltd.  | do.  | 100                              |     |
| Do.                | Ferro Alloys Corp. Ltd.   | Dhenkanal District, Orissa   | 75                               |     |
| Do.                | Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)   | do.  | 200                              |     |
| Do.                | Mysore Minerals Ltd.  | Hassan District, Karnataka   | 125                              |     |
| Do.                | Ferro Alloys Corp. Ltd.   | Kendujhar District, Orissa   | 75                               |     |
| Do.                | Orissa Mining Corp. Ltd. (Orissa Industries Ltd., 100%)   | do.  | 100                              |     |
| Do.                | Ferro Alloys Corp. Ltd.   | Khammam District, Andhra Pradesh   | 100                              |     |
| Coal, bituminous   | million tons  | Bharat Coking Coal Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)               | Bihar and West Bengal            | 26  |
| Do.                | do.   | Central Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)               | Bihar                            | 27  |
| Do.                | do.   | Eastern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)               | Bihar and West Bengal            | 21  |
| Do.                | do.   | Mahanadi Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)              | Orissa                           | 21  |
| Do.                | do.   | North Eastern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)         | Assam                            | 640 |
| Do.                | do.   | Northern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)              | Madhya Pradesh and Uttar Pradesh | 24  |
| Do.                | do.   | Singareni Collieries Co. Ltd. (Andhra Pradesh State Government, 50%, and Indian Government, 50%) | Andhra Pradesh                   | 18  |
| Do.                | do.   | South Eastern Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)         | Madhya Pradesh                   | 36  |
| Do.                | do.   | Western Coalfields Ltd. (a subsidiary of Coal India Ltd., Indian Government, 100%)               | Madhya Pradesh and Maharashtra   | 18  |

See footnotes at end of table.

TABLE 2--Continued  
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2002

(Thousand metric tons unless otherwise specified)

| Commodity              | Major operating companies and major equity owners | Location of main facilities  | Annual capacity <sup>c</sup>  |        |
|------------------------|---|--|---|--------|
| Coal, lignite          | million tons                                      | Neyveli Lignite Corp. Ltd. (Indian Government, 100%)   | Tamil Nadu  | 17     |
| Copper                 |   | Indo-Gulf Fertilizers and Chemicals Corp.  | Birla Copper Complex smelter, Dahej, Gujarat                            | 150    |
| Do.                    |   | Hindustan Copper Co. Ltd. (Indian Government, 100%)  | Indian Copper Complex mines, Ghatsila District, Bihar                   | 31     |
| Do.                    |   | do.  | Indian Copper Complex smelter-refinery, Ghatsila District, Bihar        | 20     |
| Do.                    |   | do.  | Khetri Copper Complex mines, Khetrinagar Rajasthan                      | 15     |
| Do.                    |   | do.  | Khetri Copper Complex smelter-refinery, Khetrinagar District, Rajasthan | 45     |
| Do.                    |   | do.  | Malanjkhand Copper Complex mines, Balaghar District, Madhya Pradesh     | 22     |
| Do.                    |   | Sterlite Industries Ltd.   | Tuticorin Smelter, Tamil Nadu   | 150    |
| Ilmenite-rutile ore    |   | Kerala Minerals and Metals Ltd. (Kerala State Government, 100%)  | Chavara, Kerala   | 100    |
| Do.                    |   | Indian Rare Earths Ltd. (Indian Government, 100%)  | do.   | 200    |
| Do.                    |   | do.  | Ganjam, Orissa  | 220    |
| Do.                    |   | do.  | Manavalakurichi, Tamil Nadu   | 65     |
| Do.                    |   | VV Minerals Ltd.   | Kanyakumari, Tamil Nadu   | 130    |
| <b>Iron and steel:</b> |   |  |   |        |
| Crude steel            |   | Visvesvaraya Iron and Steel Ltd. (Karnataka State, 60%, and Steel Authority of India Ltd., Indian Government, 40%) | Bhadravati steel plant, Karnataka                                       | 180    |
| Do.                    |   | Steel Authority of India Ltd. (Indian Government, 100%)  | Bhilai steel plant, Madhya Pradesh                                      | 4,000  |
| Do.                    |   | do.  | Bokaro steel plant, Bihar   | 4,000  |
| Do.                    |   | Indian Iron and Steel Co. Ltd. (wholly owned subsidiary of Steel Authority of India Ltd., Indian Government, 100%) | Burnpur steel plant, West Bengal  | 1,500  |
| Do.                    |   | Steel Authority of India Ltd. (Indian Government, 100%)  | Durgapur steel plant, West Bengal                                       | 1,600  |
| Do.                    |   | Tata Iron and Steel Co. Ltd.   | Jamshedpur steel plant, Bihar   | 3,200  |
| Do.                    |   | Steel Authority of India Ltd. (Indian Government, 100%)  | Rourkela steel plant, Orissa  | 1,800  |
| Do.                    |   | Rashtriya Ispat Nigam Ltd.   | Visakhapatnam steel plant, Andhra Pradesh                               | 3,200  |
| Do.                    |   | Ministeel plants (privately owned)   | About 180 plants located throughout India                               | 4,700  |
| Iron ore               |   | National Mineral Development Corp. Ltd. (Indian Government, 100%)  | Bailadila, Madhya Pradesh   | 9,000  |
| Do.                    |   | Steel Authority of India Ltd. (Indian Government, 100%)  | Bastar and Durg District, Madhya Pradesh                                | 7,000  |
| Do.                    |   | Kudremukh Iron Ore Co. Ltd. (Indian Government, 100%)  | Kudremukh, Chikmagalur District, Karnataka                              | 10,300 |
| Do.                    |   | National Mineral Development Corp. Ltd. (Indian Government, 100%)  | Donimalai, Karnataka  | 9,000  |
| Do.                    |   | Chowgule and Co. Ltd.  | Goa   | 2,500  |
| Do.                    |   | Dempo Mining Corp. Ltd.  | do.   | 2,500  |
| Do.                    |   | V.M. Salgaocar & Bros. Pvt. Ltd.   | do.   | 2,500  |
| Do.                    |   | Sesa Goa Ltd.  | Codli and Sonshi, Goa   | NA     |
| Do.                    |   | Steel Authority of India Ltd. (Indian Government, 100%)  | Kendujhar District, Orissa  | 3,000  |
| Do.                    |   | Tata Iron and Steel Co. Ltd.   | do.   | 2,000  |
| Do.                    |   | Indian Iron and Steel Co. Ltd. (wholly owned subsidiary of Steel Authority of India Ltd., Indian Government, 100%) | Singhbhum District, Bihar   | 2,500  |
| Do.                    |   | Steel Authority of India Ltd. (Indian Government, 100%)  | do.   | 3,500  |
| Do.                    |   | Tata Iron and Steel Co. Ltd.   | do.   | 3,500  |
| Kyanite                |   | Associated Mining Co.  | Bhandara District, Maharashtra  | 10     |
| Do.                    |   | Maharashtra Mineral Corp. Ltd.   | do.   | 10     |
| Do.                    |   | Bihar State Mineral Development Corp. Ltd. (Bihar State Government, 100%)  | Singhbhum District, Bihar   | 10     |
| Do.                    |   | Hindustan Copper Ltd. (Indian Government, 100%)  | do.   | 22     |
| <b>Lead:</b>           |   |  |   |        |
| Ore                    |   | Hindustan Zinc Ltd. (Indian Government, 100%)  | Agnigundala Mine, Andhra Pradesh  | 72     |
| Do.                    |   | do.  | Sargipalli Mine, Orissa   | 150    |

See footnotes at end of table.

TABLE 2--Continued  
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2002

(Thousand metric tons unless otherwise specified)

| Commodity   | Major operating companies and major equity owners   | Location of main facilities   | Annual capacity <sup>c</sup> |
|---|---|---|------------------------------|
| Lead--Continued   |   |   |                              |
| Primary   | do.   | Chanderiya Smelter, Rajasthan   | 35                           |
| Do.   | do.   | Tundoo Smelter, Bihar   | 8                            |
| Do.   | do.   | Chanderiya Smelter, Rajasthan   | 35                           |
| Secondary   | Indian Lead Co.   | Thane Refinery, Mumbai, Maharashtra   | 25                           |
| Do.   | do.   | Wada, Mumbai, Maharashtra   | 40                           |
| Lead-zinc ore   | do.   | Rampura-Agucha Mine, Rajasthan  | 1,300                        |
| Do.   | do.   | Zawar mine group, Rajasthan   | 1,200                        |
| Magnesite   | Burn Standard Co. Ltd. (Indian Government, 100%)  | Salem, Tamil Nadu   | 150                          |
| Do.   | Dalmia Magnesite Corp.  | do.   | 150                          |
| Do.   | Tamil Nadu Magnesite Ltd. (Tamil Nadu State Government, 100%)   | do.   | 150                          |
| Manganese ore <sup>2</sup>  | Manganese Ore India Ltd. (Indian Government, 100%)  | Adilabad, Andhra Pradesh  | NA                           |
| Do.   | Falechand Marsingdas  | Andhra Pradesh  | NA                           |
| Do.   | Manganese Ore India Ltd. (Indian Government, 100%)  | Balaghat, Madhya Pradesh  | NA                           |
| Do.   | J.A. Trivedi Bros.  | do.   | NA                           |
| Do.   | Sandur Manganese and Iron Ores Ltd.   | Bellary, Karnataka  | NA                           |
| Do.   | Manganese Ore India Ltd. (Indian Government, 100%)  | Bhandara, Maharashtra   | NA                           |
| Do.   | Eastern Mining Co.  | North Kanara, Karnataka   | NA                           |
| Do.   | Mysore Minerals Ltd.  | do.   | NA                           |
| Do.   | Manganese Ore India Ltd. (Indian Government, 100%)  | Keonjhar, Orissa  | NA                           |
| Do.   | Mangilah, Rungta (Pvt.) Ltd.  | do.   | NA                           |
| Do.   | Orissa Mining Corp. Ltd.  | do.   | NA                           |
| Do.   | Rungta Mines (Pvt.) Ltd.  | do.   | NA                           |
| Do.   | Serajuddin & Co.  | do.   | NA                           |
| Do.   | S. Lall & Co.   | do.   | NA                           |
| Do.   | Tata Iron and Steel Co. Ltd.  | do.   | NA                           |
| Do.   | Orissa Mineral Development Co. Ltd.   | Koraput, Orissa   | NA                           |
| Do.   | Orissa Mining Corp. Ltd.  | do.   | NA                           |
| Do.   | Mysore Minerals Ltd.  | Shimoga, Karnataka  | NA                           |
| Do.   | Aryan Mining & Trading Corp.  | Sundargarh, Orissa  | NA                           |
| Do.   | Orissa Manganese & Minerals (Pvt.) Ltd.   | do.   | NA                           |
| Do.   | Tata Iron and Steel Co. Ltd.  | do.   | NA                           |
| Do.   | R.B.S. Shreeram Durga Prasad and Falechand Marsingdas   | Vizianagaram, Andhra Pradesh  | NA                           |
| Petroleum, refined products<br>thousand 42-gallon barrels per day | Cochin Refineries Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 55%, and private interests, 45%)            | Ambalamugal Refinery, Kerala  | 93,000                       |
| Do.   | do. Indian Oil Corp. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 91%, and private interests, 9%)               | Barauni Refinery, Bihar   | 66,000                       |
| Do.   | do. do.   | Digboi Refinery, Assam  | 12,000                       |
| Do.   | do. Bongaigaon Refinery and Petrochemicals Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 100%)              | Bongaigaon Refinery, Assam  | 27,000                       |
| Do.   | do. do.   | Guwahati Refinery, Assam  | 20,000                       |
| Do.   | do. do.   | Haldai Refinery, West Bengal  | 61,000                       |
| Do.   | do. do.   | Koyali Refinery, Gujarat  | 185,000                      |
| Do.   | do. Madras Refineries Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 52%, and private interests, 48%)        | Madras Refinery, Tamil Nadu   | 131,000                      |
| Do.   | do. Bharat Petroleum Corp. Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 67%, and private interests, 33%)   | Mahul Refinery, Mumbai, Maharashtra   | 135,000                      |
| Do.   | do. Industan Petroleum Corp. Ltd. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 51%, and private interests, 49%) | do.   | 110,000                      |
| Do.   | do. do.   | Visakhapatnam Refinery, Andhra Pradesh  | 90,000                       |
| Do.   | do. Indian Oil Corp. (a subsidiary of Oil and Natural Gas Corp., Indian Government, 91%, and private interests, 9%)               | Mathura Refinery, Uttar Pradesh   | 156,000                      |
| Do.   | do. do.   | Panipat Refinery, Uttar Pradesh   | 120,000                      |
| Phosphate rock <sup>3</sup>                                       | Rajasthan State Mineral Development Corp. Ltd. (Rajasthan State Government, 100%)   | Badgaon, Dakankotra, Kanpur, Kharbaria-ka-Guda, and Sallopat Mines, Rajasthan | NA                           |

See footnotes at end of table.

TABLE 2--Continued  
INDIA: STRUCTURE OF THE MINERAL INDUSTRY IN 2002

(Thousand metric tons unless otherwise specified)

| Commodity                               | Major operating companies and major equity owners                          | Location of main facilities                           | Annual capacity <sup>c</sup> |
|---|--|---|------------------------------|
| Phosphate rock <sup>3</sup> --Continued | Pyrites Phosphates and Chemicals Ltd.                                      | Durmala and Maldeota underground mines, Uttar Pradesh | NA                           |
| Do.                                     | Madhya Pradesh State Mining Corp. Ltd. (Pradesh State Government, 100%)    | Hirapur and Khatamba Mines, Madhya Pradesh            | NA                           |
| Do.                                     | Rajasthan State Mines and Minerals Ltd. (Rajasthan State Government, 100%) | Jhamarkotra Mine, Rajasthan                           | NA                           |
| Do.                                     | Hindustan Zinc Ltd. (Indian Government, 100%)                              | Maton Mine, Rajasthan                                 | NA                           |
| Zinc                                    | Binani Zinc Ltd.   | Binanipuram Smelter, Kerala                           | 38                           |
| Do.                                     | Hindustan Zinc Ltd. (Indian Government, 100%)                              | Chanderiya Smelter, Rajasthan                         | 70                           |
| Do.                                     | do.  | Debari Smelter, Rajasthan                             | 59                           |
| Do.                                     | do.  | Visakhapatnam (Vizag) Smelter, Andhra Pradesh         | 40                           |

<sup>c</sup>Estimated. NA Not available.

<sup>1</sup>Scheduled for startup in 2005.

<sup>2</sup>Capacity of clusters of surface mines varies extremely, depending on demand. Estimated total capacity is 1.5 million metric tons per year.

<sup>3</sup>Estimated total phosphate rock capacity is 800,000 metric tons per year.