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IRON ORE

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Iron Ore

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U.S. iron ore production decreased 3% in 2006 compared with that of 2005; consumption also decreased by 3%. World iron ore production and consumption once again rose in 2006. China, by far the leading consumer, led gross tonnage production of iron ore, while Brazil was the leading producer of iron ore in terms of iron content (tables 1, 17). For the fourth consecutive year, world iron ore trade increased. Prices continued to rise, although not as much as in 2005.

The supply of iron ore—the basic raw material for producing iron and steel—is critical to the United States and all industrialized nations. Scrap, a supplement to iron ore in steelmaking, has become a major feed material, but owing to inadequate supply of high-quality scrap its use has limitations. Direct reduced iron (DRI), although used as an alternative to scrap, requires iron ore for its production.

Hematite (Fe_2O_3) and magnetite (Fe_3O_4), the primary commercial minerals of iron ore, are both iron oxides. Taconite, the principal iron ore mined in the United States, contains hematite and magnetite in varying proportions and is found in hard, fine-grained banded iron formations with low (20% to 30%) iron content. Almost 99% of domestic iron ore production is transformed into molten iron in a blast furnace by the iron and steel industry. Most molten iron goes directly to a basic oxygen furnace (BOF) where it is converted to steel by removing most of the remaining carbon. The remainder is poured into molds to produce pig iron.

In 2006, the United States consumed 58.2 million metric tons (Mt) of iron ore, a decrease of 1.9 Mt compared with that of 2005, and produced 37.9 Mt of pig iron. Pig iron production was up slightly from 2005, the lowest level since prior to the Second World War.

Raw steel production at 98.2 Mt increased by 3% compared with that of 2005. U.S. steel consumption increased to 126 Mt from 113 Mt in 2005. Domestically produced iron ore is supplemented with imported iron ore to produce pig iron, which is used along with imported pig iron, DRI, and scrap to produce raw steel. Integrated steel mills produce steel from iron ore; minimills produce steel from DRI and scrap. In 2006, the minimill sector of the steel industry produced 43% of the raw steel in the United States.

Substitutes for iron ore can help the highly cyclical steel industry avoid the shutdown of blast furnaces and associated layoff of production workers when demand for raw steel falls. Imports of pig iron and semifinished steel allow integrated steelmakers to increase shipments of steel mill products without increasing blast furnace production, thus avoiding the costly startup of less efficient blast furnaces held in reserve and the employment of additional skilled workers. In 2006, net U.S. imports of iron ore substitutes were 6.7 Mt, a 32% increase compared with their tonnage for 2005. This increase was mainly owing to an increase in net imports of 38% in semifinished steel products and 20% in DRI. The increase in imports was partially offset by a slight decrease in net imports of pig iron and a 10% increase in net exports of scrap steel. During the year, in spite of a 3% increase in raw steel production and a 6% rise in steel demand, iron ore consumption declined 3% from 2005 levels.

Legislation and Government Programs

Minnesota Steel Industries, LLC continued to make progress on the $1.6 billion integrated steelmaking project near Nashwauk, MN. The proposed complex was to consist of an iron ore mine, pelletizing plant, DRI plant, and facilities for making semifinished steel. Project economics benefited from additional leases on ore reserves, land exchanges to encompass the "permit-to-mine" area, a natural gas source with locked-in capacity at low transmission rates, and a change to slab rather than hot-rolled coil, as the final product. Further advantages of the project include transportation cost advantages to finishing plants in the Great Lakes region, the control of iron ore reserves for steelmaking, and the relatively low silica content of the ore. Minnesota Steel Industries entered into an agreement with Hylsa, S.A. de C.V. (Mexico) and Danieli & C. Officine Meccaniche S.p.A. (Italy) to construct a 1.86-million-metric-ton-per-year (Mt/yr) DRI facility and a 1.68-Mt/yr steel slab facility. Plant construction, valued at approximately $600 million, was anticipated to begin in 2007 (Minnesota Steel Industries, LLC, 2006a). Draft scoping studies were completed, and a draft environmental impact assessment was to be made available in early 2007 (Minnesota Steel Industries, LLC, 2006b; Pinkham, 2006).

Cleveland-Cliffs Inc signed an agreement with the State of Michigan, settling the company's responsibility for the cleanup of Deer Lake. The Michigan Department of Environmental Quality defined several possible sources of mercury contamination in the lake including atmospheric deposition, mercury wastes used to process ore at a former gold mine, and former Cliffs' laboratory testing procedures. Cliffs reportedly had spent more than $1 million on investigations and remedial programs at Deer Lake plus millions of dollars in easements, properties, and rights of way that were to be turned over to the State. Cliffs will be responsible for controlling mercury levels as well as monitoring and addressing sources of the lake's mercury (Eggleston, 2006).

The Minnesota legislature passed several items affecting the Taconite Production Tax. The tax rate for iron ore concentrates was increased by approximately 3.1%, movement of mining equipment purchased with Taconite Economic Development Fund monies was penalized if movement was outside of the taconite tax relief area, and a special distribution of taxes was

set up for St. Louis County in 2007. The Occupation Tax, a Minnesota tax in lieu of corporate franchise tax, had the alternative minimum tax clause repealed and redefined all sales, wherever originated, as Minnesota sales (Minnesota Department of Revenue, 2006, p. 6-7, 28).

Taconite iron ore processing facilities were required to meet the U.S. Environmental Protection Agency (EPA) Maximum Achievable Control Technology (MACT) standards by October 30, 2006. United States Steel Corporation had already added emissions control equipment at Minntac to comply with the taconite iron ore processing MACT. Keetac installed an air scrubber to meet MACT compliance standards (United States Steel Corporation, 2007, p. 24).

Production

The U.S. Geological Survey (USGS) develops U.S. iron ore production data through an annual "Iron Ore" survey, which provided the production listed in tables 1 through 4. This information is supplemented by employment data, mine inspection reports, and information from consumers. The American Iron Ore Association no longer provides data on ore shipments from loading docks on the Upper Great Lakes nor receipts at transfer docks and furnace yards nationwide. The steel plant data are compiled by the American Iron and Steel Institute (AISI).

In 2006, domestic iron ore production was 52.7 Mt a slight decrease from the 2005 production of 54.3 Mt. Michigan and Minnesota taconite mines accounted for almost all domestic iron ore production. Six of these mines operated on the Mesabi Range in northeastern Minnesota, and two, on the Marquette Range in Michigan's Upper Peninsula. Domestic iron ore supply (production minus exports) met 76% of domestic demand in 2006, 5% more than the average from 2002 through 2005.

Cliffs announced that its 2006 operating income had increased 3% compared with that of 2005 after having tripled compared with that of 2004. Cliffs' share of 2005 production from its North American operations, including Wabush operations in Canada, was 21.1 Mt, a decrease of 6% compared with that of 2005 (Cleveland-Cliffs Inc, 2007a, p. 2).

Michigan.—Michigan accounted for about 23% of U.S. usable iron ore output in 2006. Nearly all Michigan's output was pellet production. The Empire Mine produced 5.0 Mt of standard and flux pellets. The Tilden Mine produced 7.0 Mt of magnetite and hematite flux pellets, which was somewhat reduced from the previous year's output owing to unplanned repairs and an increase in production of lower productivity magnetite pellets (Cleveland-Cliffs Inc, 2007a, p. 56; Koch, 2007, p. 4-5, 8-9).

Minnesota.—Minnesota produced 77% of the usable iron ore in the United States in 2006; nearly all the output was pellet production. All production from the State came from open pits on the Mesabi Iron Range. Minnesota pellet production, grouped by operating company, is summarized as follows: (a) Hibbing Taconite Company produced 8.4 Mt of pellets; (b) Northshore Mining Company produced 5.2 Mt of standard pellets; (c) United Taconite Company, LLC [owned by Cliffs (70%) and China's Laiwu Steel Group (30%)] produced 4.4 Mt of pellets; (d) Mittal Steel USA produced 2.9 Mt—99% was flux pellets, and 1%, pellet chips; and (e) U.S. Steel produced 5.3 Mt of pellets from its Keewatin Taconite operations and 3.0 Mt of acid pellets and 11.8 Mt of flux pellets from its Minntac operations (Cleveland-Cliffs Inc, 2007b, p. 55; Koch, 2007, p. 9-10, 12, 14, 16-17, 21- 22, 24-27).

Two new facilities at Keewatin Taconite became operational early in 2006. Keewatin can now use coal and petroleum coke as an alternative fuel to natural gas, helping offset energy costs when natural gas prices are high. A wet scrubber system was installed at its taconite pelletizing plant to lower the dust content of air emissions. The original combined cost estimate for these systems was $38 million (Scipioni, 2005, 2006).

Mittal Steel USA loaded 24,500 metric tons (t) of pelletized iron ore from the Hibbing Taconite Mine at the Allouez dock in Superior, WI, for shipment to Algeria. The shipment aboard a 730-foot vessel, the maximum size capable of passing through the Welland Canal, was a test of loading capability at Superior and unloading capability at Annaba, Algeria, as well as the compatibility of the Hibbing Taconite ores with the Annaba blast furnace. By yearend, 340,000 t had been exported to Algeria, making that country the second leading export market for U.S. iron ore after Canada (DuluthNewsTribune.com, 2006).

Cliffs announced that the participants in the Mesabi Nugget project were unable to agree on terms for developing a DRI plant at Hoyt Lakes, MN, and the project was suspended. The proposed plant was to have produced 508,000 metric tons per year (t/yr) of high-quality nuggets, containing 95% to 96% iron, from Mesabi taconite ores at the site of the former LTV Steel Mining Co. Cliffs and Kobe Steel Ltd. (Japan), however, plan to construct a DRI plant based on Kobe's proprietary technology at Cliffs' Northshore facilities at Silver Bay, MN.

Cliffs also planned to restart idle pellet capacity at the Northshore facility to meet two new long-term supply agreements with AK Steel Corporation (OH) and Republic Engineered Products, Inc. (OH) (Skillings Mining Review, 2006b). The contracts replaced prior spot sales agreements. AK Steel agreed to purchase 0.9 Mt/yr to 1.4 Mt/yr of pellets for 7 years. Republic agreed to a 5-plus-year purchase contract estimated to be between 0.4 Mt/yr and 0.8 Mt/yr, which would meet a significant part of the steelmaker's pellet needs (Cleveland-Cliffs Inc, 2006a).

In December, Cliffs sold additional real property to Polymet Mining Corp., including rail equipment and facilities, railway track and rights, an administration building, and additional ancillary facilities. Cliffs' proceeds from the transaction were $1.0 million cash, 2 million shares of Polymet common stock, and $14 million in future cash payments (Cleveland-Cliffs Inc, 2007b, p. 59).

Utah.—Palladon Ventures Ltd. announced the first sale of iron ore from its Iron Mountain project near Cedar City, UT. The 500-t shipment from an existing 100,000-t stockpile, grading an average of 56% iron, was made to a cement industry customer. Palladon continued work on the project throughout 2006—demolishing existing structures, securing a contract mining company, converting existing drill data, designing a new concentrator, constructing interchange rail track, and refurbishing processing equipment (Palladon Ventures Ltd., 2006; Reed, 2007).

Consumption

U.S. iron ore consumption declined by 3% to 58.2 Mt from the 2005 figure of 60.1 Mt (table 1). Pig iron production at 37.9 Mt was 12% below the 10-year average of 43.2 Mt/yr for 1997 through 2006. Raw steel production using BOF technology decreased to 42 Mt—the lowest production level in more than 10 years and 15% below the average production for the past decade.

Consumption of iron ore, including agglomerates, reported to the AISI by integrated producers of iron and steel totaled 57.0 Mt, including 49 Mt of pellets; 7 Mt of sinter, briquettes, and other products; and 0.6 Mt of natural coarse ore (table 7). Of the ore consumed, 80% was domestic; 11%, from Canada; 8%, from Brazil; and 1%, from other countries. Other iron-bearing materials charged to blast furnaces included mill scale, slag scrap, and steel furnace slag.

The three consumption numbers used in this annual review are reported in tables 1, 7, and 8. The first consumption number (58.2 Mt in 2006), in table 1, is the sum of the ore consumed by input type reported by the AISI, the ore consumed in DRI production, and the ore consumed in nonsteel uses, as reported to the USGS (American Iron and Steel Institute, 2007, p. 81). The second consumption number (57.0 Mt in 2006), in table 7, is the ore consumed in U.S. iron and steel plants by type of ore reported by the AISI. The third consumption number is no longer being reported, but previous years' consumption are listed in table 8. This consumption figure was the ore consumed in U.S. iron and steel plants by ore type, as reported by the AISI, plus the ore consumed in DRI production (0.36 Mt in 2006) and nonsteel uses (0.90 Mt in 2006). Data on iron ore consumption in nonsteel end uses (table 8) were compiled from USGS surveys.

Cliffs reached an iron ore supply agreement with Mittal Steel, resolving a disputed purchase agreement related to Mittal's Weirton Plant in West Virginia. Under the new agreement, a minimum tonnage of iron ore pellets was decided for aggregate purchase between three of Mittal's facilities in Indiana, Ohio, and West Virginia. Cliffs' filing indicated that the purchase agreement extends through 2010. Mittal purchased 10.9 Mt of pellets from Cliffs in 2005 (Cleveland-Cliffs Inc, 2006e; Skillings Mining Review, 2006a).

Prices

International price negotiations in calendar year 2006 covered two separate contract years (CY)—April 1, 2006, through March 31, 2007, and April 1, 2007, through March 31, 2008. In CY 2006-07, Shanghai Baosteel Group Inc. headed 16 of China's leading steelmakers in negotiations with major iron ore suppliers—BHP Billiton Limited, Companhia Vale do Rio Doce (CVRD), and Rio Tinto plc (Bloomberg.com, 2006). The Australian Bureau of Agriculture and Resource Economics (ABARE), an Australian federal government entity, projected iron ore prices would increase by 12%, while ABARE's Chinese counterpart expected prices would remain the same or drop (Chambers, 2006). To counteract China's Commerce Ministry warning that measures might be taken if prices were deemed excessive; the head of the China's National Development and Reform Commission indicated that market and enterprise negotiations would decide the contract price (Blumenstein, 2006).

Although Japanese steelmakers in CY 2005-06 settled global iron ore benchmark prices with CVRD early and for a relatively high price, the Japanese appeared to take a wait-and-see attitude in 2006, letting Baosteel (China) lead negotiations (Ann and Yuan, 2006). Similarly, a POSCO (Republic of Korea) official reported they would likely base pricing for iron ore on results of Chinese negotiations (Yahoo! Asia News, 2006).

Price negotiations for CY 2006-07 continued past the normal April 1 conclusion date. Although Chinese imports of iron ore were at record levels in March 2006, the China Iron and Steel Association (CISA) reported that domestic ore production for 2006 was expected to increase by 100 Mt above that of 2005 owing to improved beneficiation techniques that make mining of lower grade ores more economic (Sun, 2006). A CISA official suggested that Indian iron ore producers and Chinese steelmakers begin negotiations aimed at establishing long-term price contracts for the sale of iron ore. India was selling ore to China on the spot market, where prices were considerably more volatile (India Daily, 2006).

By the end of May, all the major importers of iron ore had settled their CY 2006-07 contract prices, with the exception of the Chinese steel producers (AFX News Limited, 2006). In mid-May, several major ore producers reached agreement with their steelmaking customers, following CVRD (Rio de Janeiro, Brazil) coming to terms with ThyssenKrupp AG (Düsseldorf, Germany). Most agreements settled on a fine ore price increase of 19% and a 3% decrease in pellet price (The TEX Report, 2006). By the end of June, the three major exporters of iron ore had announced settling their CY 2006-07 contract prices with the Chinese steel producers—a price increase of 19% for lump and fine ore and a decrease of 3% for Brazilian blast furnace pellets (BHP Billiton Limited, 2006c; Companhia Vale do Rio Doce, 2006; Rio Tinto plc, 2006b).

According to an industry analyst, Chinese sources indicated an expected drop in iron ore prices of 5% for CY 2007-08. Meanwhile, a representative of CVRD—the world's leading iron ore producer—countered by suggesting prices could rise 40%. Most analysts indicated that a price increase of between 5% and 10% was more likely (newratings.com, 2006).

The first iron ore contract for the year beginning April 1, 2007, was agreed between Baosteel and CVRD on December 21, 2006. This agreement marked several milestones—the first time that Chinese steelmakers established the benchmark price, the earliest benchmark settlement in the past 11 years, and the fifth straight year of iron ore price increases. The price for lump and fines increased 9.5% above those of March 31, 2007. These prices represented an increase of 189% since 2002. Australia's BHP Billiton and Rio Tinto agreed to basically the same terms shortly thereafter. On December 28, CVRD announced what appeared to be a benchmark agreement with Italian steelmaker ILVA S.p.A. on a pellet price increase of 5.28% (Garside, 2007; Mining Journal, 2007).

Cliffs announced an increase in its 2006 iron ore prices. Average 2006 sales revenues for iron ore increased 10% compared with the 2005 average, with international pricing, producer price indices, price of hot rolled steel, and

transportation costs all affecting the final price (Cleveland-Cliffs Inc, 2006b).

Transportation

In May, a capesize bulk vessel carrying 155,000 t of iron ore sank off the East Coast of South Africa. The *Alexandros T* was en route from Brazil to China (Mining Engineering, 2006).

In October, Panamanians voted to enlarge the Panama Canal—doubling capacity to allow more traffic and larger ships. The expansion was expected to cost $5.25 billion, which would be paid by graduated toll increases (Panama Canal Authority, 2006).

Shipments of iron ore on the Great Lakes increased by 3% in 2006 compared with those of 2005 and also by 3% when compared with the average of shipments for the previous 5 years. Total dry-bulk shipments in 2006 on the Great Lakes were up by 2% compared with those of 2005 (Lake Carriers' Association, 2007).

The Soo Locks officially closed to vessel traffic on January 15 and reopened on March 25; ocean traffic on the St. Lawrence Seaway recommenced for the 2006 season on March 21 for the Welland Canal section and on March 23 for the Montreal-Lake Ontario locks. The last ocean-going vessel left the Port of Duluth on December 19 in time to transit the Welland Canal and Montreal-Lake Ontario locks before yearend (Duluth Seaway Port Authority, 2006, 2007).

Foreign Trade

In 2006, U.S. net imports (imports minus exports) of iron ore were 3.2 Mt, which represented 5.5% of domestic consumption. Exports decreased by 30%, while imports decreased by 12% compared with 2005 figures. Nearly all U.S. iron ore exports were pellets (8.1 Mt), and 92% of the exports were shipped via the Great Lakes to Canadian steel companies, while 4%, 3%, and 1% was shipped to Algeria, Mexico, and China, respectively. U.S. imports totaled 11.5 Mt, of which Brazil's share increased to 39%; Canada's share decreased to 54% (tables 1, 9-15).

World Industry Structure

Consumption.—Although global iron ore consumption is not measured directly, there are guides that indicate whether it rises or falls—imports of iron ore and production of crude steel, DRI, and pig iron. DRI and pig iron production tend to be more direct indicators of iron ore consumption than crude steel production because part of steel production comes from scrap-consuming minimills. Unless a country's ore production remains static, iron ore net imports are not a straightforward indicator of a change in iron ore consumption in countries that produce iron ore. Estimates of world consumption of iron ore increased as the result of a 9% increase in pig iron production compared with 2005 levels. Of the seven countries that had 4% or more of world pig iron production from 1997 through 2006, only the United States had negative growth over the average pig iron production during this period. All others had increases for this period, as follows: China, 150%; Ukraine, 40%; Russia, 31%; Brazil, 25%; Japan, 18%; and Germany, 14%. Of the four countries that had 7% or more of world pig iron production in 2006, all showed an increase in production from that of 2005—China, 20%; Russia, 7%; the United States, 2%; and Japan, 1%.

Increased interest in mine development has been sparked by a sustained strong demand for iron ore. The increased demand continued to be driven by Chinese economic growth. In spite of new iron ore production capacity, world supply of iron ore was expected to remain tight through 2007, partially owing to increased steel exports by China.

World crude steel production surpassed 1.2 billion metric tons (Gt) and rose by 9% from 2005 to 2006. Four countries accounted for 5% or more of world production in 2006. Of those countries, China produced almost 100 Mt more crude steel in 2006 than in 2005. The others (Japan, Russia, and the United States) combined produced 12 Mt more crude steel in 2006 than in 2005. Annual world crude steel production, excluding China, increased by almost 35 Mt. The four previously listed countries along with Germany and the Republic of Korea accounted for almost 69% of combined world crude steel production for 1997 through 2006. China's 2006 production was double the average for the 10-year period, while that of the United States increased by 2% (United Nations Conference on Trade and Development, 2007, p. 99-103).

Production.—World iron ore production of 1.80 Gt, gross weight, surpassed 2005 production by 17%. World production has been more than 1 Gt, gross weight, since it first exceeded that level in 1995. Australia's and Brazil's combined share of world production from 2002 through 2006 averaged 35%. In 2006, iron ore was produced in 45 countries, with production exceeding 1 Mt, gross weight, in 26 of those countries. World DRI production rose to 59.8 Mt, which was 5% more than that of 2005 (Midrex Technologies, Inc., 2007).

Trade.—World iron ore imports of 771 Mt rose by 7% compared with 2005 levels. Following large year-on-year increases in imports for the past 5 years (32% in 2001, 21% in 2002, 33% in 2003, 40% in 2004, and 32% in 2005), China posted another sharp rise to 326 Mt in 2006 from 275 Mt in 2005—a gain of more than 18%. Since 2001, four countries have accounted for more than 60% of world iron ore imports. Germany's share of imports in that period decreased to 6% from 8%, Japan's share decreased to 17% from 26%, and the Republic of Korea's share decreased to 6% from 9%. China's share more than doubled during this 6-year period to 42% from 19%. Australia's and Brazil's combined share of world iron ore exports increased slightly to 65% in 2006 compared with their share in 2005. Five countries represented more than 80% of world iron ore exports. In decreasing order of market share, Australia held 33%; Brazil, 33%; India, 10%; Canada, 4%; and South Africa, 4% (United Nations Conference on Trade and Development, 2007, p. 82-85).

Mergers and Acquisitions.—While Australia's Mount Gibson Iron Limited (MGI) prepared a takeover bid for Aztec Resource Limited, Chinese and Russian investors increased their holdings in MGI. By mid-November, Shanghai Merchant Holdings had a 10% interest in MGI and a 7% interest in Aztec, while Russian-based METALLOINVEST Management Company LLC owned

20% of MGI (Prior, 2006). By yearend, MGI controlled 90% of Aztec, and MGI's Tallering Peak Mine in Western Australia (WA) produced 1.8 Mt of iron ore in the second half of 2006. MGI sold its 73% interest in Asia Iron Holdings Limited (ultimate owner of the Extension Hill prospect in WA), but now owned the Koolan Island Development Project in WA (Mount Gibson Iron Limited, 2007).

At yearend, India's Tata Steel Limited and Brazil's Companhia Siderúrgica Nacional (CSN) were both attempting to buy Anglo-Dutch Corus Group plc. CSN claimed to be a better fit than Tata, warning that the Indian Government was considering imposing export controls on domestic iron ore (Metal Bulletin, 2006c). [Update: On February 1, 2007, Tata Steel announced that it had acquired Corus for $12 billion (Tata Steel, 2007).]

A bidding war for Dofasco Inc. (Canada) concluded with Dofasco's directors recommending that shareholders accept the Can$5.6 billion dollar offer from Luxembourg's Arcelor S.A. ThyssenKrupp lost its bid, despite a hostile takeover of Arcelor being launched by Mittal Steel Company N.V. (Mining Journal, 2006a). In August, Mittal announced that it had acquired 94% of Arcelor's share capital and voting rights (Mittal Steel Company N.V., 2006).

World Review

Australia.—Rio Tinto's production share of salable quantities of iron ore and pellets in 2006 were as follows (Australia, unless otherwise specified)—Channar (60% owned), 5.9 Mt; Corumba, Brazil, 2.0 Mt; Eastern Range, 8.2 Mt; Hamersley, 79.2 Mt; Iron Ore Company of Canada (59% owned), 9.4 Mt; and Robe River (53% owned), 28.1 Mt. Rio Tinto's share of total world mine production was 132.8 Mt, a 7% increase from that of 2005. In addition, Rio Tinto's share of pig iron production from Kwinana HIsmelt (60% owned), which commenced operation in September 2005, was 53,000 t, as the HIsmelt operation continued to ramp up production. Annual production in Western Australia's Pilbara region was impacted by heavy rains and a succession of cyclones in the first quarter. The production losses because of weather, however, were more than offset by expansion projects including the ongoing expansion at Yandicoogina and the commissioning of the Nammuldi Mine throughout the year (Rio Tinto plc, 2007b, p. 2, 10).

BHP Billiton's production share of salable quantities of iron ore (wet) for 2006 were as follows (Australia, unless otherwise specified)—Yandi Joint Venture (JV) (85% owned), 35.0 Mt; Mt. Newman JV (85% owned), 27.3 Mt; Area C JV (85% owned), 18.9 Mt; Samarco, Brazil, (50% owned), 7.7 Mt; Jimblebar (85% owned), 6.1 Mt; and Goldsworthy JV (85% owned), 4.1 Mt. BHP Billiton's share of total world mine production was 99.1 Mt, a 2% increase from that of 2005. Rapid Growth Project 3 (RGP3) tie-in activities negatively affected production, as did heavy rains and cyclones in the Pilbara (BHP Billiton Limited, 2007).

Rapid Growth Project 2 was completed in 2006, increasing the capacity of BHP Billiton's Western Australian Iron Ore operation by 8 Mt/yr at a cost of $575 million. RGP3, with a $1.5 billion capital expenditure budget, was 35% complete at yearend and was planned for completion by yearend 2007. RPG3 planned to increase capacity at Area C Mine by 20 Mt/yr, add sidings on the Newman railway, and construct port works at Nelson Point and Finucane Island (BHP Billiton Limited, 2006a, b).

Murchison Metals Limited started Stage 1 mining at the Jack Hills Mine in Western Australia at a rate of 1.5 Mt/yr in the last quarter of 2006, with production expected to increase to 2.0 Mt/yr in 2008. Murchison also began a definitive feasibility study for a 10 Mt/yr to 25 Mt/yr expansion. The ore would be transported on a new railway to a new port north of Geraldton. The project would cost $A1.7 billion (Murchison Metals Limited, 2006; Prospect, 2007).

Fortescue Metals Group Ltd. (FMG) announced that they had raised $A3.2 billion ($2.43 billion) for its iron ore project in Western Australia's Pilbara region. The investment included $1.65 billion in U.S.-denominated bonds, 315 million euros of European bonds, and $400 million from Leucadia National Corporation. In exchange for the $400 million, Leucadia received 9.99% of the company's capital shares and repayment of a $100 million note due in August 2019.

FMG's development project was well underway with port dredging started and several equipment and structure contracts signed or under negotiation. The project reportedly was on time and within budget—with the first ore expected on ship in the first quarter of 2008 and commissioning of the mine to begin in January 2008 (Fortescue Metals Group Ltd., 2006; 2007).

In May, Rio Tinto Iron Ore [a wholly owned subsidiary of Rio Tinto Limited (Australia)] received approval from the government of Western Australia and began construction of the $980 million Hope Downs project. Rio Tinto Iron Ore is the operating company for the 50-50 joint venture with Hancock Prospecting Pty Ltd (Australia). The project was planned to start production in 2008 with a capacity of 22 Mt/yr, eventually leading to a stage two production rate of 30 Mt/yr. It was expected that from negotiation of the agreement on Hope Downs to the first deliveries would take about 3 years (Rio Tinto plc, 2006a, p. 17; 2007a, p. 4, 8).

Midwest Corporation Limited shipped 744,000 t of hematite fines from the Port of Geraldton in Western Australia in 2006. Midwest planned to ramp up production to 2.0 Mt/yr at the Koolanooka/Blue Hills Direct Shipping Ore Project. The project will include a new dedicated iron ore shiploader and expanded train unloading capacity. Midwest was also planning to produce 4.5 Mt/yr of pellets or concentrate from magnetite ores as part of a joint venture with China's Sinosteel Corporation. This magnetite deposit has an indicated resource of 430 Mt (Metal Bulletin, 2006a; Midwest Corporation Limited, 2007).

Bolivia.—India's Jindal Steel and Power Limited was the sole remaining bidder for Bolivia's El Mutún prospect—a potential $2.3 billion mine concession for one of the world's leading iron ore deposits (Outlook India.com, 2006). Venezuelan officials had indicated that if problems arose in the bid negotiations, they would be willing to help Bolivia develop El Mutún and other natural resource projects (Harris, 2006). Meanwhile, Brazil's EBX Siderurgica Boliviana, threatened with expulsion from Bolivia, began dismantling its partially constructed pig iron furnaces near El Mutún. EBX, prohibited from participating in the auction of El Mutún, was unable to obtain environmental

and operating permits for the 800,000-t/yr, four-furnace pig iron project from the new Bolivian Government (Kinch, 2006).

In June, the Government awarded Jindal the contract. However, early in August, the Government suspended the June contract. A revised agreement was later signed between Jindal and the Government. The newly proposed contract required an initial investment of $2 billion, up from the $1.5 billion foreseen in the June contract (Mining Journal, 2006b). As of the end of 2006, no firm contract had been signed between the Government of Bolivia and Jindal.

Brazil.—CVRD announced 2006 production based on consolidated Brazilian generally accepted accounting practices (BR GAAP). CVRD's total iron ore production increased by 12.8% from 2005 to 2006, and CVRD's share of salable quantities of iron ore was as follows, in decreasing order of tonnage—Southeastern System, 96.6 Mt; Southern System, 84.3 Mt; Carajás, 81.8 Mt; Samarco, 6.9 Mt; and Urucum, 1.4 Mt. CVRD's 2006 pellet production was 33.2 Mt, a decrease of 8.8% from that of 2005. The breakdown of salable quantities of iron ore pellets was as follows, in decreasing order of pellet production—Samarco, 6.9 Mt; CVRD I and II, 6.0 Mt; Nibrasco, 4.6 Mt; São Luís, 4.1 Mt; Fábrica, 4.0 Mt; Kobrasco, 2.4 Mt; Hispanobras, 2.3 Mt; and others, 2.7 Mt. A large part of the reduction in pellet production in 2006 was the result of the shutdown of the São Luís plant from April to July caused by a slowdown in pellet demand, and the sale of CVRD's share of Gulf Industrial Investment Company, a Bahrain-based pellet producer (Companhia Vale do Rio Doce, 2007a, p. 2, 8).

Production capacity expansions by CVRD in 2006 included—expansion of Carajás capacity to 85 Mt/yr in the third quarter, opening of the Brucutu Mine in September with total production in 2006 of 7.7 Mt, and completion of expansion of the Tuberão port in the Southeastern System in December (Companhia Vale do Rio Doce, 2007b, p. 79-80).

Cliffs signed a share-purchase agreement with an affiliate of MMX Mineração e Metálicos S.A. to acquire 30% of a project in the State of Amapá for $133 million. The Amapá project was expected to produce 6.5 Mt/yr of iron ore concentrate. The deal was finalized in the first quarter of 2007 after Cliffs acquired 30% of MMX Amapá Mineração Ltda., the project owner. The Amapá project consists of a significant iron ore deposit, a 192-kilometer (km) railway connecting the mine and existing port, and 71 hectares (ha) on the Amazon River to be developed into a loading terminal (Cleveland-Cliffs Inc, 2006d; 2007a, p. 42).

MMX announced plans to invest $3.6 billion in iron-related projects during the next several years and to produce 37 Mt/yr of iron ore by 2011. MMX anticipated production from three mines, each with its own transport and shipping system. One mine opened near Corumbá in Mato Grosso do Sul State, another in Amapá State planned to begin shipments in 2007, and the third, Serra do Sapo Mine, the largest operation in terms of capacity, was planned for Minas Gerais State (Skillings Mining Review, 2006c).

Canada.—Iron Ore Company of Canada [owned jointly by Labrador Iron Ore Royalty Income Fund (15.1%), Mitsubishi Corporation (26.18%), and Rio Tinto Limited (58.72%)] produced 3.4 Mt of iron ore concentrates and 12.7 Mt of iron ore pellets. Québec Cartier Mining Company (owned by Dofasco Inc.—now part of the ArcelorMittal Group) produced 11.2 Mt of iron ore. Wabush Mines Ltd. [owned jointly by Cliffs (26.8%), Dofasco (28.6%), and Stelco Inc. (44.6%)] produced 4.2 Mt of iron ore pellets. Wabush Mine's lower production reflected pit dewatering difficulties (Cleveland-Cliffs Inc, 2006c).

An independent assessment of the iron ore reserves of Wabush Mines, managed and part-owned by Cliffs of the United States, confirmed the mine operator's reserve estimates. The report by Strathcona Mineral Services Ltd. of Toronto concluded that reserves at the Scully Mine were sufficient to operate the mine until 2013. Construction of a manganese reduction plant at an approximate capital cost of $40 million could extend mine life to 2021 (Skillings Mining Review, 2006d).

New Millennium Capital Corp. completed a prefeasibility study on its 80%-owned LabMag iron ore project with results indicating measured and indicated resources of 3.7 Gt, a possible production rate of 15 Mt/yr, and a total capital cost, including working capital, of $2.75 billion. The LabMag project area is located 220 km north of Labrador City, Newfoundland and Labrador, and extends about 30 km northwest-southeast with a width of up to about 4 km, covering a total area of approximately 64 square kilometers (6,400 ha). The magnetic taconite deposit was expected to have an overall 29.6% iron head grade and a weight recovery of 26.8% at 18% cutoff grade, producing a 70% concentrate with silica at 2.2% (Watts, Griffis and McOuat Limited, 2006, p. 1, 4, 10).

Baffinland Iron Mines Corporation (BIM) began exploration and metallurgical test work on the Mary River deposits in 2004 and continued through 2006. The Mary River project is situated in the northern part of Baffin Island in Nunavut Territory and is wholly owned by BIM. Total expenditures during the 2003-06 period reached almost Can$60 million. In May 2006, Aker Kvaerner Canada Inc. completed a scoping study for BIM which included a plan to ship high quality lump ore directly to Europe during the 34-year life of the mine. Ore would be produced at a rate of 10 Mt/yr, based on an indicated resource of 309 Mt at 66.1% Fe and an inferred resource of 28 Mt at 65.9% Fe. Capital costs were estimated to be Can$1.5 billion and life-of-mine operating costs at Can$18.73 per metric ton of ore processed. Payback on initial capital was 5.9 years. As a result of this study, Baffinland initiated a definitive feasibility study, under the management of Aker Kvaerner, which was scheduled for completion in December 2007 (Cooper, 2007).

Chile.—Admiralty Resources NL (Australia) completed a 1,800-metric-ton-per-hour iron ore processing plant at its 50%-owned Compañía Minera Santa Barbara (CMSB) at Vallenar, III Region Atacama. Admiralty later signed an agreement for the delivery of 940,000 t of iron ore from CMSB to Wuhan Iron & Steel (Group) Corporation in 2007 for an approximate value of $65 million on a cost and freight basis (Admiralty Resources NL, 2006, 2007).

Chile's Compañía Minera del Pacífico S.A. produced 7.7 Mt of pellets and iron ore and began construction of the project Hierro Atacama; Phase I of the project would produce 3 Mt/yr of pellet feed from installations at the Candelaria Mine. Concentrate would be transported through a pipeline to shipping facilities at a port north of Caldera (Compañía Minera del Pacífico S.A., 2007, p. 3).

China.—Since 2001, domestic production of iron ore has more than doubled; however, the iron ore content of the ores on average has been declining. Major mines account for about 20% of total iron ore production, while medium- to small-scale mines produce the bulk of the ore. There are about 48 major mines, while there are close to 8,000 total mines in the country—most of which produce ore of less than 30% iron content (United Nations Conference on Trade and Development, 2007, p. 33-35).

Gabon.—Government officials of Gabon granted a group headed by China National Machinery and Equipment Import and Export Corporation rights to large untapped iron ore reserves (about 1 Gt at 60% iron content) at Belinga. According to Government officials, the Chinese offer of financial guarantees and agreement to purchase all ore produced was better than the offer made by a consortium led by CVRD. The project would include construction of a mine, major rail links, a deepwater port, and a new hydroelectric dam. The total cost was estimated to be approximately $590 million (Agence France-Presse, 2006a, b).

India.—India continues to consider restrictions on iron ore exports. In 2005, India introduced a dual rail freight policy for iron ore, whereby companies transporting iron ore by rail to ports for export were charged double the rate for iron ore being transported to domestic blast furnace operations. In 2006, the Indian steel industry, led by Tata Steel, was pushing for a ban on iron ore exports. The ban on iron ore exports would be expected to have several consequences—make it easier for major steelmakers to obtain control of captive mines, allow steelmakers to reduce costs of iron ore by importing during periods of low prices, and increase large piles of environmentally unstable iron ore fines that are currently not being utilized because preference is given to readily usable lump (Rediff India Abroad, 2006).

Kudremukh Iron Ore Company Limited, which ceased mining operations at the end of 2005, ran out of iron ore in February and was producing pellets at a loss using concentrates supplied by India's National Mineral Development Corporation (Metal Bulletin, 2006f).

Iran.—An Iranian Government official announced plans to export 3 Mt of iron ore by the first quarter of 2007. The country expected to increase production by 20% by March 2008 with a long-term goal of producing 44 Mt/yr by 2010 (Metal Bulletin, 2006e).

Liberia.—In December 2006, the Government of Liberia renegotiated a 25-year deal with Mittal Steel, which resulted in an additional $100 million for the State and retention of key iron ore port and railway facilities for the State. Mittal's iron ore production will be increased by 15 Mt/yr once the mines are developed (Toweh, 2007).

Mauritania.—Sphere Investments Limited reported a major increase in iron ore resources at the Guelb el Aouj iron ore project in Mauritania. Sphere increased its resource estimate for the East Deposit by 56% to the current 701 Mt. The resource classification has also been upgraded from inferred to measured, indicated, and inferred according to the Australasian Joint Ore Reserves Committee (JORC) reserve classification system (Sphere Investments Limited, 2006).

Russia.—JSC Severstal, which had failed in an attempt to merge with Luxembourg's Arcelor Group, planned to increase output at its existing iron ore mines during the next 3 years. An investment of $300 to $400 million per year was planned to expand current pellet output of 9 Mt/yr by more than 2 Mt/yr at Karelsky Okatysh in Karelia, and add 1 Mt/yr to existing 4 Mt/yr concentrate capacity at Olenegorsk GOK in the Murmansk region (Metal Bulletin, 2006g).

South Africa.—Assmang Limited approved construction of the new 8.4-Mt/yr Khumani iron ore mine in the Northern Cape Province. The estimated capital expenditure for the first phase of the project was Rand 3.2 billion. The Khumani Mine would replace and expand capacity from the nearly depleted Beeshoek Mine (Assmang Limited, 2006, p. 3).

Sweden.—Luossavaara-Kiirunavaara Aktiebolag (LKAB) increased pellet production to 16.9 Mt from 16.5 Mt and decreased production of fines to 5.6 Mt from 6.8 Mt in 2005. A new pellet plant at Malmberget was commissioned at the end of 2006, and construction of a new concentrator and pelletizer was underway at Kiruna. The new plants at Kiruna were expected to be commissioned in 2008 for a total investment of more than $860 million, which included the adjacent rail terminal. Additional work on the harbor at Narvik (Norway) and other rail facilities was also begun in 2006 (Luossavaara-Kiirunavaara Aktiebolag, 2007, p. 25, 39).

Ukraine.—Mittal Steel, the world's leading steel producer, increased its holdings slightly to a 93.8% stake in Ukraine-based steel producer formerly known as Kryvorizhstal Mining and Metallurgy Kombinat JSC. Mittal acquired Kryvorizhstal in late 2005 for about $4.9 billion. The company, renamed OJSC Mittal Steel Kryviy Rih, produced 17.6 Mt of iron ore in 2006 (Mittal Steel Company N.V., 2007, p. 27).

Venezuela.—C.V.G. Ferrominera Orinoco, C.A. (FMO) resumed production at Puerto Ordaz, following a 1-month shutdown owing to technical problems at its 3.3-Mt/yr pelletizing plant. The shutdown, along with pellet shortages, caused Venezuela's hot briquette iron (HBI) producers to reduce operations to 70% of full capacity. HBI producers hoped to offset these shortages with pellet imports from Brazil or pellet production from a new plant envisaged to be built with Chinese collaboration (Metal Bulletin, 2006b; d).

Vietnam.—China's Kunming Iron & Steel Group Co. (KISCO) reported negotiations with the Government of Vietnam to open an iron ore mine in Vietnam. KISCO, indicated that, if successful, it would import 1.5 Mt/yr of iron ore or 15% of its ore requirements from the mine, located 60 km from the Yunnan border, by 2008. KISCO also considered building a 500,000-t/yr steel plant in Vietnam in a later project stage (McMahon, 2006).

Outlook

It appeared that U.S. production in 2007 would decrease slightly from that of 2006. Most U.S. iron ore production is sold directly to the domestic steel industry, although some domestic ore is shipped to Canada, while other ore is traded for Canadian ore subsequently shipped to China. This domestic dependence is not expected to change in the near future.

Information about steel industry trends is provided in the "Outlook" section in the Iron and Steel chapter of the 2006 USGS Minerals Yearbook, volume I, Metals and Minerals.

Growth of the U.S. iron ore industry within the next few years will be tied to the growth of the integrated steelworks along the Great Lakes and development of direct reduction processes planned for northern Minnesota and northern Michigan.

International imports of iron ore and production of iron ore and pig iron—three key indicators of iron ore consumption—indicate that the international iron ore industry will continue to be dependent on growing Chinese iron ore consumption. China's involvement in overseas projects through equity participation may offset the recent strong open market demand for iron ore. Price pressures caused by China's iron ore demand, and increasing Indian demand, may decrease as steelmakers continue to acquire equity in upstream iron ore producing facilities.

The environmental emphasis on "greening of" steelmaking processes with decreased energy consumption, reduced emissions, and the use of alternate fuels may become an important issue for the world's iron ore industry. Increased pressure by nongovernmental organizations (NGO) and Western government entities through tariffs and legislation may force a "greening" of the world steel industry and a shift in short-term trade patterns for iron ore. The American Iron and Steel Institute is sponsoring research projects to reduce, and possibly eliminate, carbon dioxide emissions from the steelmaking process.

Rio Tinto Limited continued the ramp up to nameplate capacity of 0.8 Mt/yr at the HIsmelt Kwinana Joint Venture plant in Western Australia. HIsmelt, a new technology developed by Rio Tinto, enables direct smelting of fine iron ore and coal into molten iron. Without coke ovens, sinter plants, or pelletizing plants, Rio Tinto claims to offer significant operational and environmental advantages over existing ironmaking techniques. Increased research and development projects at bench-scale and pilot-plant level indicate that in the longer term steelmaking and iron ore use will be entering a period of increased environmental awareness. Such projects as the already completed Mesabi Nugget pilot plant, the ongoing molten oxide electrolysis project, and hydrogen flash smelting are designed to drastically reduce carbon dioxide emissions.

The growth of DRI and improvements in steelmaking technology would allow the iron ore industry to supply the expanding minimill sector of the U.S. steel industry. Imported DRI already plays an important role for coastal U.S. steel producers since minimum specification steel alloy purity cannot be readily achieved with traditional scrap. Additional capacity for DRI plants is being planned for Michigan and Minnesota in the near term. Even in the event of strong global DRI growth during the next decade, DRI can replace only a small portion of the world's blast furnace production. The blast furnace is expected to remain the mainstay of the iron and steel industry during the midterm.

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TABLE 1
SALIENT IRON ORE STATISTICS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

		2002	2003	2004	2005	2006
United States, iron ore, usable, less than 5% manganese:[2]						
Production		51,600	48,600	54,700	54,300	52,700
Shipments:						
Quantity		51,500	46,100	54,900	53,200	52,700
Value[e]		1,340,000	1,490,000	2,080,000	2,370,000	2,840,000
Average value at mines	dollars per metric ton	26.04	32.30	37.92	44.50	53.88
Exports:						
Quantity		6,750	6,770	8,400	11,800	8,270
Value		249,000	248,000	334,000	584,000	636,000
Imports for consumption:						
Quantity		12,500	12,600	11,800	13,000	11,500
Value		313,000	328,000	371,000	532,000	611,000
Consumption, iron ore and agglomerates		59,700	61,600	64,500	60,100	58,200
Stocks, December 31:						
At mines, plants and loading docks[3]		4,090	4,910	3,930	2,040 [r]	1,380 [4]
At receiving docks[5]		1,820	1,630	(6)	(6)	(6)
At consuming plants		12,400	10,900	(6)	(6)	(6)
Total[7]		18,300	17,500	(6)	(6)	(6)
Additional stocks, December 31:						
Crude ore at mines and plants		410	688	496	915 [r]	1,140 [4]
Unagglomerated concentrates for pelletizing plants		878	1,560	1,820	1,870	1,260
World, production[8]		1,100,000	1,210,000 [r]	1,360,000	1,540,000 [r]	1,800,000 [e]

[e]Estimated. [r]Revised.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Direct-shipping ore, concentrates, agglomerates, and byproduct ore.

[3]Excludes byproduct ore.

[4]Crude ore stocks and unagglomerated concentrates for pelletizing plants removed. Marketable stocks only.

[5]Transfer and/or receiving docks of lower Great Lake ports.

[6]American Iron and Steel Institute no longer collects this data as of 2004.

[7]Sum of stocks at mines, consuming plants, and U.S. docks.

[8]Gross weight.

TABLE 2
EMPLOYMENT AT IRON ORE MINES AND BENEFICIATING PLANTS, QUANTITY AND TENOR OF ORE PRODUCED, AND AVERAGE OUTPUT PER WORKER HOUR IN THE UNITED STATES IN 2006, BY DISTRICT AND STATE[1]

			Production						
							Average quantity per worker hour (metric tons)		
District and State	Average number of employees	Worker hours (thousands)	Crude ore (thousand metric tons)	Usable ore (thousand metric tons)	Iron contained (in usable ore) (thousand metric tons)	Iron content natural (percent)	Crude ore	Usable ore	Iron contained
Lake Superior:									
Michigan[2]	1,220	2,560	32,500	11,900	7,210	60.4	12.69	4.66	2.82
Minnesota	3,230	6,260	137,000	40,800	26,100	63.9	21.85	6.52	4.16
Total or average	4,450	8,820	169,000	52,700	33,300	63.1	19.20	5.98	3.77
Other States[3]	20	39	9	9	5	54.0	0.24	0.24	0.13
Grand total or average	4,470	8,860	169,000	52,700	33,300	63.1	19.11	5.95	3.76

[1]Data are rounded to no more than three significant digits, except "Average per worker hour, crude ore" and "Average per worker hour, usable ore;" may not add to totals shown.

[2]Does not include professional or clerical workers at mines, pelletizing plants, maintenance shops, or research lab workers.

[3]Includes California and South Dakota.

TABLE 3
CRUDE IRON ORE MINED IN THE UNITED STATES IN 2006, BY DISTRICT, STATE, AND MINING METHOD[1, 2]

District and State	Number of mines	Open pit (thousand metric tons)	Underground (thousand metric tons)	Total (thousand metric tons)
Lake Superior:				
Michigan	2	32,500	--	32,500
Minnesota	6	137,000	--	137,000
Total	8	169,000	--	169,000
Other States	4	9	--	2
Grand total	12	169,000	--	169,000

-- Zero.

[1]Includes some byproduct ore. Excludes ore containing 5% or more managanese.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 4
USABLE IRON ORE PRODUCED IN THE UNITED STATES IN 2006, BY DISTRICT, STATE, AND TYPE OF PRODUCT[1, 2]

(Thousand metric tons)

District and State	Direct shipping ore	Concentrates	Sinter	Other agglomerates[3]	Total
Lake Superior:					
Michigan	1	--	--	11,900	11,900
Minnesota	--	66	68	40,700	40,800
Total	1	66	68	52,600	52,700
Other States[4]	--	9	--	--	9
Grand total	1	75	68	52,600	52,700

-- Zero.

[1]Excludes ore containing 5% or more manganese.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Data may include pellet chips, screenings, and sinter.

[4]Includes California and South Dakota.

TABLE 5
SHIPMENTS OF USABLE IRON ORE FROM MINES IN THE UNITED STATES IN 2006[1, 2]

	Gross weight of ore shipped (thousand metric tons)					Average iron content,	
District and State	Direct shipping ore	Concentrates	Sinter	Other agglomerates	Total	natural (percent)	Value (thousands)
Lake Superior:							
Michigan	1	--	--	12,300	12,300	60.4	W
Minnesota	--	62	31	40,300	40,400	63.9	W
Total reportable or average	1	62	31	52,600	52,700	63.1	$2,840,000
Other States[3]	--	9	--	--	9	54.0	409
Grand total or average	1	71	31	52,600	52,700	63.1	2,840,000

W Withheld to avoid disclosing company proprietary data. -- Zero.

[1]Includes byproduct ore. Excludes ore containing 5% or more manganese.

[2]Data are rounded to no more than three significant digits; may not add to totals shown.

[3]Includes California and South Dakota.

TABLE 6
IRON ORE-PRODUCING MINES IN THE UNITED STATES IN 2006

State and mine	County	Operator	Source of iron ore
California:			
Baxter Mine	San Bernardino	Hahm International Inc	Quarried ore.
Dredge 21	Yuba	Cal Sierra Development Inc.	Dredged sands.
Silverlake Mine	San Bernardino	Hahm International Inc	Quarried ore.
Michigan:			
Empire	Marquette	Cleveland-Cliffs Inc	Magnetite taconite ore.
Tilden	do.	do.	Hematite-magnetite taconite ore.
Minnesota:			
Hibbing Taconite	Saint Louis	do.	Magnetite taconite ore.
Keewatin Taconite	do.	United States Steel Corporation	Do.
Minntac	do.	do.	Do.
Minorca	do.	ArcelorMittal	Do.
Northshore	do.	Cleveland-Cliffs Inc	Do.
United Taconite	do.	do.	Do.
South Dakota, CF & I Pit	Lawrence	Pete Lien & Sons Inc.	Quarried ore.

TABLE 7
CONSUMPTION OF IRON ORE AT U.S. IRON AND STEEL PLANTS, BY TYPE OF PRODUCT[1]

(Thousand metric tons)

Type of product	2005	2006
Blast furnaces:		
Direct-shipping ore	34	36
Pellets	50,100	49,300
Sinter[2]	8,200	6,990
Total	58,300	56,400
Steelmaking furnaces:		
Direct-shipping ore	431	522
Sinter[2]	113	95
Total	544	617
Grand total	58,900	57,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes briquettes, nodules, and other.

Source: American Iron and Steel Institute.

TABLE 8
U.S. CONSUMPTION OF IRON ORE, BY END USE[1, 2]

(Thousand metric tons)

Year	Blast furnaces[3]	Steel furnaces[3]	Sintering plants[3, 4]	Miscellaneous[3, 5]	Subtotal integrated iron and steel plants[6]	Direct-reduced iron for steelmaking[7]	Nonsteel end uses[8]	Total
2002	52,900	301	5,620	1	58,800	705	828	60,300
2003	53,800	133	5,650	--	59,500	315	791	60,600
2004	NA	NA	NA	NA	NA	270	794	NA
2005	NA	NA	NA	NA	NA	330	928	NA
2006	NA	NA	NA	NA	NA	360	902	NA

NA Not available. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes agglomerates. Excludes ore containing 5% or more manganese.

[3]Data provided by American Iron and Steel Institute.

[4]Excludes dust, mill scale, and other revert iron-bearing materials.

[5]Sold to nonreporting companies or used for purposes not listed.

[6]Data provided by American Iron Ore Association.

[7]U.S. Geological Survey estimates based on production reports compiled by Midrex Corp.

[8]An estimate, which includes iron ore consumed in production of cement and iron ore shipped for use in manufacturing paint, ferrites, heavy media, cattle feed, refractory and weighing materials, and for use in lead smelting.

TABLE 9
U.S. EXPORTS OF IRON ORE, BY COUNTRY OF DESTINATION[1, 2]

(Thousand metric tons and thousand dollars)

Country	2005		2006	
	Quantity	Value	Quantity	Value
Algeria	--	--	340	14,900
Canada	11,200	555,000	7,610	604,000
China	282	16,500	100	5,440
Colombia	3	370	9	1,050
Mexico	30	2,610	214	10,600
Slovakia	237	6,630	--	--
United Kingdom	78	2,730	(3)	25
Other[4]	5 r	378 r	2	301
Total	11,800	584,000	8,270	636,000

rRevised. -- Zero.

[1]Data are rounded to no more than three significant digits; may not add to totals shown.

[2]Includes agglomerates.

[3]Less than ½ unit.

[4]"Other" represents 16 countries in 2005 and 14 countries in 2006.

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF IRON ORE, BY TYPE OF PRODUCT[1, 2]

Type of product	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2005 Unit value[3, 4] (dollars per metric ton)	2006 Quantity (thousand metric tons)	2006 Value (thousands)	2006 Unit value[3, 4] (dollars per metric ton)
Concentrates	89	$3,520	39.55	58	$3,380	58.03
Coarse ores	1	62	114.07	6	158	27.57
Fine ores	60	1,980	33.00	42	1,800	43.29
Pellets	11,600	578,000	49.70	8,070	624,000	77.39
Briquettes	7	352	47.41	23	1,050	45.07
Other agglomerates	2	144	89.70	77	5,260	67.90
Roasted pyrites	1	87	58.10	1	93	72.83
Total	11,800	584,000	49.55	8,270	636,000	76.86

[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes agglomerates.
[3]Unit values shown are calculated from unrounded data.
[4]Weighted average calculated from unrounded data by dividing total value by total tonnage.

Source: U.S. Census Bureau.

TABLE 11
U.S. IMPORTS OF IRON ORE, BY COUNTRY AND TYPE OF PRODUCT[1, 2]

Country and type of product	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2005 Unit value[3, 4] (dollars per metric ton)	2006 Quantity (thousand metric tons)	2006 Value (thousands)	2006 Unit value[3, 4] (dollars per metric ton)
Country:						
Australia	1	$11	18.00	8	$135	18.00
Bahamas, The	140	4,850	34.70	--	--	--
Brazil	4,180	178,000	42.65	4,530	228,000	50.29
Canada	7,510	299,000	39.88	6,240	359,000	57.44
Chile	270	10,700	39.56	283	14,000	49.35
Finland	9	383	41.03	9	331	36.78
Greece	49	963	19.69	15	386	25.73
Mexico	41	1,600	39.32	17	439	25.82
Peru	33	1,060	32.48	52	1,710	32.90
Russia	99	8,550	86.00	--	--	--
Sweden	133	6,710	50.42	(5)	6	35.29
Trinidad and Tobago	375	11,000	29.45	299	6,870	22.97
Venezuela	148	7,890	53.43	23	439	19.09
Other	11	309	27.05	1	58	58.00
Total	13,000	532,000	40.92	11,500	611,000	53.21
Type of product:						
Concentrates	1,250	36,400	29.06	2,380	96,400	40.54
Coarse ores	56	2,030	36.37	--	--	--
Fine ores	4,880	153,000	31.36	2,450	106,000	43.35
Pellets	6,730	337,000	50.12	6,620	407,000	61.49
Briquettes	--	--	--	--	--	--
Other agglomerates	74	2,820	38.24	17	440	25.28
Roasted pyrites	8	335	39.61	10	387	37.58
Total	13,000	532,000	40.92	11,500	611,000	53.21

See footnotes at end of table.

TABLE 11—Continued
U.S. IMPORTS OF IRON ORE, BY COUNTRY AND TYPE OF PRODUCT[1, 2]

-- Zero.
[1]Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.
[2]Includes agglomerates.
[3]Unit values shown are calculated from unrounded data.
[4]Weighted average calculated from unrounded data by dividing total value by total tonnage.
[5]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12
U.S. IMPORTS OF IRON ORE IN 2006, BY COUNTRY AND TYPE OF PRODUCT[1, 2]

(Thousand metric tons)

Country of origin	Concentrates	Coarse ores	Fine ores	Pellets	Briquettes and other agglomerates	Roasted pyrites	Total
Australia	--	--	8	--	--	--	8
Brazil	1,100	--	1,780	1,650	--	--	4,530
Canada	996	--	307	4,940	--	--	6,240
Chile	283	--	--	--	--	--	283
Finland	--	--	--	--	--	9	9
Greece	--	--	15	--	--	--	15
Mexico	--	--	--	--	17	--	17
Peru	--	--	52	--	--	1	52
Trinidad and Tobago	--	--	284	15	--	--	299
Venezuela	--	--	--	23	--	--	23
Other	(3)	--	--	--	--	(3)	1
Total	2,380	--	2,450	6,620	17	10	11,500

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes agglomerates.
[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 13
AVERAGE UNIT VALUE FOR SELECTED IMPORTS OF IRON ORE IN 2006[1]

Type of product	Country of origin	Average unit value[2] (dollars per metric ton, gross weight)
Concentrates	Brazil	40.47
Do.	Canada	38.09
Do.	Chile	49.38
Fine ores	Brazil	42.81
Do.	Canada	70.66
Do.	Trinidad and Tobago	20.80
Pellets	Brazil	64.93
Do.	Canada	60.53

[1]Includes agglomerates.
[2]Weighted averages of individual customs values.

Source: U.S. Census Bureau.

TABLE 14
U.S. IMPORTS OF IRON ORE, BY CUSTOMS DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	2005		2006	
Customs district	Quantity	Value	Quantity	Value
Baltimore, MD	3,440	156,000	3,930	221,000
Buffalo, NY	6	110	1	18
Charleston, SC	2	81	1	57
Chicago, IL	1,400	39,400	1,740	67,100
Cleveland, OH	3,080	123,000	3,040	164,000
Detroit, MI	258	13,900	131	7,460
Houston, TX	78	3,950	50	2,650
Mobile, AL	66	2,480	5	153
New Orleans, LA	4,610	191,000	2,550	147,000
Nogales, AZ	18	438	25	569
Philadelphia, PA	22	1,560	9	331
Other	11	411	(3)	22
Total	13,000	532,000	11,500	611,000

[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes agglomerates.
[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 15
U.S. IMPORTS OF PELLETS, BY COUNTRY[1]

(Thousand metric tons and thousand dollars)

	2005		2006	
Country	Quantity	Value	Quantity	Value
Brazil	1,900	106,000	1,650	107,000
Canada	4,730	223,000	4,940	299,000
Russia	99	8,550	--	--
Trinidad and Tobago	--	--	15	965
Venezuela	--	--	23	439
Total	6,730	337,000	6,620	407,000

-- Zero.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.

Source: U.S. Census Bureau.

TABLE 16
SELECTED PRICES FOR IRON ORE IN THE JAPANESE MARKET[1]

(Cents per dry long ton unit of iron unless otherwise specified)

Country and producer	Ore types	April 1-March 31	
		Fiscal year 2005	Fiscal year 2006
Australia:			
Hamersley Iron Proprietary Limited and Mount Newman Mining Company Proprietary Limited	Lump ore	78.77	93.74
Do.	Fines	61.72	73.45
Robe River Iron Associates	do.	49.20	58.55
BHP Billiton (Yandi)	do.	58.02	69.04
Brazil:			
Companhia Nipo-Brasileira de Pelotizacao (Nibrasco)	Pellet feed	112.04	108.68
Companhia Vale do Rio Doce (Carajás)	Fines	56.18	66.85
Companhia Vale do Rio Doce (Itabira)	do.	55.34	65.85
Mineraçoes Brasileiras Reunidas Societe Anonyme	Lump ore	59.65	88.82
Do.	Fines	57.32	68.21
Samarco Mineracâo Societe Anonyme	Pellet feed	47.52	56.55
Canada, Iron Ore Company of Canada (Carol Lake)	Concentrates	54.54	64.90
Chile:			
Minera del Pacifico Societe Anonyme (Huasco)	Pellets	110.32	107.11
Minera del Pacifico Societe Anonyme (El Romeral)	Fines	50.61	60.23
India:			
Minerals and Metals Trading Corporation (Bailadila)	Lump ore	77.60	92.34
Do.	Fines	60.20	71.64
Peru, Shougang Hierro Peru S.A.A.	Pellet feed	43.01	51.18
South Africa:			
Kumba Resources Limited (Iscor) cents per dry metric ton unit	Lump ore	64.79	77.10
Assmang Limited	do.	64.02	76.18
Do.	Fines	46.10	54.86

[1]Free on board shipping port basis.

Sources: Trust Fund Project on Iron Ore Information, The Iron Ore Market 2004-2006. The TEX Report, Iron Ore Manual 2006.

TABLE 17
IRON ORE: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

Country[5]	Gross weight[3]					Metal content[4]				
	2002	2003	2004	2005	2006[e]	2002	2003	2004	2005	2006[e]
Algeria	1,202	1,378	1,554	1,536 [r]	2,339 [6]	610	700	780 [e]	768 [r]	1,170
Australia	187,198 [r]	212,981 [r]	233,994 [r]	261,855 [r]	275,042 [6]	116,341 [r]	132,257 [r]	145,282 [r]	165,621 [r]	170,934 [6]
Austria[e]	1,900	2,119 [6]	1,882 [6]	2,000	2,000	575	703 [6]	602	640	600
Azerbaijan[e]	(7)	3 [6]	19 [6]	7 [6]	11 [6]	(7)	2	10	4	6
Bosnia and Herzegovina	212	127	300 [e]	3,300 [r, e]	3,300	106	63	125 [r, e]	1,400 [r]	1,400
Brazil	214,560	230,707 [r]	261,675 [r]	281,430 [r]	318,000 [p]	142,468	153,190 [r]	173,752 [r]	186,870 [r]	211,000 [p]
Bulgaria	373	466	83	-- [r]	--	119	127	27	-- [r]	--
Canada[8]	30,902	33,322	28,596	30,387 [r]	33,551 [p]	19,684	20,993	17,801 [r]	19,100 [r]	21,100
Chile	7,269	8,011	8,003	7,862 [r]	8,629 [6]	4,398	4,865	4,850	4,707 [r]	5,235 [6]
China[e, 9]	231,000	261,000	320,000	420,000	588,000	76,200	86,000	105,000	138,000	194,000
Colombia	688	625	508	608 [r]	644 [p]	378	344 [e]	280 [e]	334 [r, e]	334
Egypt	2,618	2,237	2,400 [e]	2,600 [e]	2,500	1,309	1,119	1,200 [e]	1,300 [e]	1,200
Germany[10]	419 [e]	429 [e]	412	362 [r]	360	59	60	58	51 [r]	50
Greece[e, 11]	1,500	1,500	1,500	1,500	1,500	575	575	575	575	575
Guatemala	35	2 [r]	3 [r]	11 [r]	7 [6]	23 [r]	2 [r]	2 [r]	7 [r]	5
India	86,400	99,100	120,600	140,000	160,000	55,300	63,400	77,200 [e]	90,000 [e]	102,000
Indonesia	379	245	90	22	20	216 [e]	140 [e]	51 [e]	12 [e]	11
Iran[12]	16,906	18,287	18,205	19,000 [e]	20,000	8,000	9,000	8,900	9,000 [e]	10,000
Kazakhstan	15,423	19,281	18,726	16,470	18,600	8,700	10,933	10,600	9,300 [e]	10,500
Kenya	1	1	1	(7) [r]	(7)	(7)	(7)	(7)	(7)	(7)
Korea, North[e]	4,100	4,430	4,580	5,000	5,000	1,150	1,260	1,300	1,400	1,400
Korea, Republic of	157 [r]	174 [r]	226 [r]	213 [r]	227 [6]	88 [r]	97 [r]	127 [r]	119 [r]	127 [6]
Macedonia[e]	10	10	10	10	10	6	6	6	6	6
Malaysia	404	597	664	950 [r]	1,000	259 [e]	382	424	606 [r]	639
Mauritania	9,553	10,377	10,674 [r]	10,752 [r]	11,155 [6]	6,200	6,890	6,900 [r]	7,000 [r]	7,250
Mexico[13]	9,941	11,265	11,483	11,700 [e]	11,000	5,965	6,759	6,890	7,012 [r]	6,590 [6]
Morocco	9	6	10	10 [e]	10	5	3 [e]	5 [e]	5	5 [e]
New Zealand[e, 14]	1,740 [6]	1,947 [5]	2,329 [6]	2,270 [r, 6]	2,300	520	580 [e]	690	654 [r]	680
Nigeria[e]	25 [6]	--	--	100 [r]	100	9 [6]	--	--	36 [r]	36
Norway	515	500	600	620	620	350	340	408	420	420
Pakistan	40	40	50	50	60	20	20	25	25	30
Peru	4,594	5,240 [r]	6,439	6,810 [r]	7,250	3,105	3,541 [r]	4,315 [r]	4,565	4,861 [6]
Portugal[e, 15]	14 [r]	14 [r]	14 [r]	14 [r]	14 [p]	10 [r]	10 [r]	10 [r]	10 [r]	10
Romania[e]	248 [r]	244 [r]	231 [r]	300	300	89 [6]	82 [6]	74 [6]	69 [r, 6]	70
Russia	84,236	91,760	96,980	96,764	102,000 [6]	49,000	53,000 [e]	56,200 [e]	56,100	59,100
Slovakia	326	287	305	300 [e]	250	114	100 [e]	107 [e]	90 [r, e]	89
South Africa[16]	36,484	38,086	39,322	39,542	41,326 [6]	23,350	24,000 [e]	24,800 [e]	25,000 [r, e]	26,100
Sweden[e]	20,300	21,500	22,300	23,300	23,300	13,400 [5]	14,100 [5]	14,700	15,300	15,000
Thailand	570	10	136	220	264 [6]	285	5 [e]	68 [e]	116	132 [6]
Tunisia	198	164	244	206	200	105	87 [e]	129	110 [e]	105
Turkey	3,433	3,429	3,857	4,000	4,000	1,830 [e]	1,830 [e]	2,060 [e]	2,150 [e]	2,150
Ukraine	58,900	62,498	65,550	68,570	74,000	32,300	34,300 [e]	36,000 [e]	37,700 [e]	40,700
United Kingdom[e]	(7) [r]	1	1	1	1	(7)	(7)	(7) [r]	(7)	(7)
United States	51,600 [r]	48,600 [r]	54,700 [r]	54,300 [r]	52,700 [6]	32,500 [r]	30,600 [r]	34,500 [r]	34,200 [r]	33,300 [6]
Venezuela[17]	16,684	17,954	19,196	20,000 [e]	23,000	11,092	11,936	12,669	13,000 [e]	15,200
Vietnam	430	540	650	700 [e]	710	236	300	360	385 [e]	390
Zimbabwe	272	367	283	377	200 [6]	136 [e]	180 [e]	154 [e]	200 [e]	90
Total	1,100,000 [r]	1,210,000 [r]	1,360,000 [r]	1,540,000 [r]	1,800,000	617,000 [r]	675,000 [r]	750,000 [r]	834,000 [r]	945,000

See footnotes at end of table.

TABLE 17—Continued
IRON ORE: WORLD PRODUCTION, BY COUNTRY[1, 2]

(Thousand metric tons)

[e]Estimated. [p]Preliminary. [r]Revised. -- Zero.

[1]Estimated data and world totals are rounded to no more than three significant digits; may not add to totals shown.

[2]Table includes data available through July 16, 2007.

[3]Insofar as availability of sources permit, gross weight in this table represent the nonduplicative sum of marketable direct-shipping iron ores and iron ore concentrates; iron agglomerates produced from imported iron ores have been excluded under the assumption that the ore from which such materials are produced has been credited as marketable ore in the country where it was mined.

[4]Data represent actual reported weight of contained metal or are calculated from reported metal content. Estimated figures are based on latest available iron content reported, except for the following countries for which grades are U.S. Geological Survey estimates: Azerbaijan, Kazakhstan, North Korea, and Ukraine.

[5]In addition to the countries listed, Cuba may also produce iron ore, but definitive information on output levels, if any, is not available.

[6]Reported figure.

[7]Less than ½ unit.

[8]Series represented gross weight and metal content of usable iron ore (including byproduct ore) actually produced, natural weight.

[9]China's gross weight iron ore production figures are significantly higher than that of other countries, because China reports crude ore production only with an average iron content of 33%, whereas other countries report production of usable ore.

[10]Iron ore is used domestically as an additive in cement and other construction materials but is of too low a grade to use in the steel industry.

[11]Nickeliferous iron ore.

[12]Data are for year beginning March 21 of that stated.

[13]Gross weight calculated from reported iron content based on grade of 60% iron.

[14]Concentrates from titaniferous magnetite beach sands.

[15]Includes manganiferous iron ore.

[16]Includes magnetite ore as follows, in thousand metric tons: 2002—2,557; 2003—2,307; 2004—2,893; 2005—2,957; and 2006—3,830.

[17]Official data reported by the Ministerio de la Industria Básica y Minería (formerly Ministerio de Energía y Minas), may differ from those published by Venezuela's only producer C.V.G. Ferrominera Orinoco CA.

TABLE 18
IRON ORE: WORLD PELLETIZING CAPACITY, BY CONTINENT AND COUNTRY IN 2006[1]

	Rated capacity, gross weight (million metric tons)
North America:	
Canada	27.5 [e]
Mexico	15.0 [e]
United States	55.8
Total	98.3
South America:	
Brazil	75.0 [e]
Chile	5.3
Peru	3.5
Venezuela	10.8 [e]
Total	94.6
Europe:	
Netherlands	4.4 [e]
Russia[2]	73.3 [e]
Slovakia	0.5 [e]
Sweden	16.9
Turkey	1.5
Total	96.6
Asia:	
Bahrain	4.0
China	45.0 [e]
India	13.0
Iran	10.5 [e]
Japan	4.0 [e]
Total	76.5
Oceania, Australia	4.2 [e]
Grand total	370.2

[e]Estimated.

[1]Data may not add to totals shown because of independent rounding.

[2]Includes Kazakhstan and Ukraine.

Sources: International Iron and Steel Institute; United Nations Commission on Trade and Development, Trust Fund on Iron Ore Information; U.S. Geological Survey.