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IRON ORE

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IRON ORE

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U.S. iron ore production decreased slightly in 2005 compared with that of 2004; consumption decreased by 7%. World iron ore production and consumption again rose in 2005. Brazil was the leading producer of iron ore in terms of iron content, while China led gross tonnage production and was by far the leading consumer (tables 1, 16). World iron ore trade increased for the third consecutive year and prices continued to rise, although not as dramatically as in 2004.

The supply of iron ore—the basic raw material from which iron and steel are made—is critical to the United States and all industrialized nations. Scrap can be considered to be a supplement to iron ore in the steelmaking process but is limited as a major feed material owing to inadequate supply of high-quality scrap. Direct reduced iron (DRI), which is used as an alternative to scrap, requires iron ore for its production.

Hematite (Fe_2O_3) and magnetite (Fe_3O_4), both iron oxides, are the primary commercial minerals of iron ore. Taconite, which contains hematite and magnetite in varying proportions, is the principal iron ore mined in the United States. It 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. The molten iron can go directly to a basic oxygen furnace (BOF) where it is converted to steel by removing most of the remaining carbon or be used in molds to produce pig iron.

In 2005, the United States consumed 60.1 million metric tons (Mt) of iron ore, a decrease of 4.4 Mt compared with that of 2004, and produced 37.2 Mt of pig iron. Pig iron production was at the lowest level since just prior to the Second World War.

Raw steel production at 95 Mt decreased by 5% compared with that of 2004. U.S. steel consumption decreased to 109 Mt from 117 Mt in 2004. 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. This raw steel is used along with imported raw steel to produce steel mill products. Integrated steel mills produce steel from iron ore; minimills produce steel from DRI and scrap. In 2005, the minimill sector of the steel industry produced 55% of the raw steel in the United States.

Imports of pig iron and semifinished steel allow integrated steelmakers to increase steel shipments without increasing blast furnace production, thus avoiding major production increases, which require restarting blast furnaces and employing additional skilled workers. Iron ore substitutes can be used to help the highly cyclical steel industry avoid the shutdown of blast furnaces and layoffs of production workers when demand for steel falls. In 2005, net U.S. imports of iron ore substitutes were 5.1 Mt, an almost 40% decrease compared with their tonnage for 2004, owing mainly to an increase in net exports of 28% for scrap and decreases in net imports of 8% in semifinished steel products, 6% in pig iron, and 11% in DRI. During the year, a 5% decrease in raw steel production coupled with a 7% fall in steel demand resulted in iron ore consumption falling 7% from 2004 levels.

Legislation and Government Programs

The Governor of Minnesota reaffirmed his administration's commitment to such Iron Range economic development projects as Minnesota Steel Industries, LLC's (MSI) steelmaking project in Nashwauk and the Mesabi Nugget project at Silver Bay. Local press reported that $49 million, or most of the seed money for these projects, had been removed from the 21st Century Minerals Fund to help resolve State deficit problems (Hanna, 2005§[1]).

Progress continued on this MSI project to develop a taconite mine, pelletizing plant, and DRI plant at a steelmaking complex on the Mesabi Iron Range. MSI realigned the concept from a hot-rolled coil product to steel slab, an intermediary product, and submitted an environmental assessment worksheet; also completed was a final scoping decision document. MSI tentatively planned to issue a final environmental impact statement in 2006 for the $1.6 billion project, which was to produce 2.5 million metric tons per year (Mt/yr) of slab steel (Leonard, 2005§; Minnesota Steel Industries, LLC, 2005§).

The Minnesota Pollution Control Agency (PCA) citizen's board decided in favor of Cleveland-Cliffs Inc (Cliffs) and United States Steel Corporation (U.S. Steel) on two separate issues. The PCA decided to allow Cliffs' Northshore plant at Silver Bay, MN, to increase taconite pellet capacity by 1.4 Mt/yr. The planned $29 million project would include the restart of two fine crushers, several concentrator lines, and one furnace. The PCA also declared U.S. Steel's environmental impact assessment adequate for the Minntac Mine's tailing disposal basin near Mountain Iron, MN. This will allow U.S. Steel, in conjunction with agency staff, to develop a permit for a water management plan to handle the 250,000 gallons per minute needed for processing iron ore. The current water management system has become increasingly congested with solids, making it difficult to process and recycle all of the water (Skillings Mining Review, 2005b).

The Minnesota legislature published a bill that defined commercial production of direct reduced ore for purposes of the State's taconite production tax as greater than 50,800 metric tons per year (t/yr) (50,000 long tons per year). A subsequent, supplemental legislative bulletin further defined commercial and noncommercial production of direct reduced ore and set forth weighting factors for the occupation tax. Effective for taxes payable in 2006, the production tax, although not imposed on

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

noncommercial production of direct reduced ore, is required on taconite or iron sulfides consumed in the production of noncommercial direct reduced ore. Effective January 1, 2007, the weighting of the occupancy tax will be 75% sales, 12.5% property, and 12.5% payroll factors (Minnesota Department of Revenue, 2005a§, b§).

Production

The U.S. Geological Survey (USGS) develops U.S. iron ore production data through an annual "Iron Ore" survey, which provided 100% of 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 dock and steel plant data are compiled by the American Iron and Steel Institute (AISI).

Domestic iron ore production at 54.3 Mt in 2005 decreased slightly from 2004 production of 54.7 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 the Upper Peninsula of northwestern Michigan. Domestic iron ore supply (production minus exports) met 71% of domestic demand in 2005, about the same as the average from 2002 through 2004.

Ispat Inland Mining Company (a subsidiary of Mittal Steel Corporation) announced plans to open at least two new iron ore pits near Biwabik and McKinley in northern Minnesota. Without development of the new pits, Ispat's reserves were expected to be exhausted in 8 years. If the new pits are approved, mining could begin as early as January 2007 (WCCO-TV, 2005§).

Additional demand for iron ore pellets was expected when U.S. Steel finishes rebuilding its renamed No. 14 blast furnace at the company's steelworks in Gary, IN. The rebuild, planned to raise the blast furnace capacity by 30% and increase availability to 97.5%, was expected to be completed in the first quarter of 2006 (United States Steel Corporation, 2005§, 2006§).

Cliffs announced that its 2005 operating income had tripled compared with that of 2004. Cliffs' share of 2005 production from its North American operations, including Wabush operations in Canada, was 23.3 Mt, an increase of 2% compared with that of 2004 (Cleveland-Cliffs Inc, 2006b§). Operating income increased despite higher operating costs. Fuel costs were substantially higher than projected in an industry that is very fuel-intensive. Minnesota iron ore mines, which had consumed more than 24 million gallons (91 million liters) of diesel fuel in 2003, were seriously affected by prices as high as 55 cents per gallon greater than projected for 2005. Overall production costs were also affected by a worldwide shortage of heavy-equipment tires, which are made by only three manufacturers. Tire shortages were exacerbated by recent expansions in the world mining industry and increased demand for large tires by China (Bloomquist, 2005a§, b§).

Michigan.—Michigan accounted for less than one-quarter of U.S. usable iron ore output in 2005. Nearly all of Michigan's output was pellet production. The Empire Mine produced 4.9 Mt of standard and flux pellets, and the Tilden Mine produced 8.0 Mt of magnetite and hematite flux pellets (Koch, 2006, p. 5, 8).

Wisconsin Electric Power Company, which supplies energy to the Empire and Tilden operations, unilaterally changed its method of billing energy charges. Cliffs disputed the change in billing methodology and submitted the matter to the American Arbitration Association. Cliffs placed funds covering what it considered excess charges into an escrow account until the arbitration was complete (Cleveland-Cliffs Inc, 2006a§).

Minnesota.—Minnesota produced more than three-quarters of the usable iron ore in the United States in 2005; nearly all of 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 8.6 Mt of pellets; (b) Northshore Mining Company produced 5.0 Mt of standard pellets; (c) United Taconite Company, LLC [owned by Cliffs (70%) and China's Laiwu Steel Group (30%)] produced 5.0 Mt of pellets; (d) Mittal Steel USA produced 2.8 Mt—99% was flux pellets, and 1%, pellet chips; and (e) U.S. Steel produced 5.4 Mt of pellets from its Keewatin Taconite operations and 15.3 Mt of pellets from its Minntac operations (Koch, 2006, p. 9-20; Cleveland-Cliffs Inc, 2006b§).

Keewatin Taconite began construction of facilities to allow for the use of coal and petroleum coke as an alternative fuel to its current natural gas system and to add a wet scrubber system at its taconite pelletizing plant. The alternative fuel system was designed to offset high natural gas prices, while the scrubber was to remove dust from air emissions. These systems became operational early in 2006 and had an original combined cost estimate of $38 million (Scipioni, 2005, 2006).

The Mesabi Nugget Project, which involves the construction of an iron nugget plant at the site of the former LTV Steel Mining Co. property at Hoyt Lakes, MN, was on schedule. The Mesabi Nugget plant was designed to produce 500,000 t/yr of high-quality, 95% to 96% iron-containing pellets from Mesabi taconite ores. Concentrate feed for the plant would initially come from Cliffs' Northshore Mine near Babbitt. Iron Range lawmakers, the Governor's office, and Minnesota Pollution Control Agency officials were expediting the permitting process for the Mesabi Nugget plant (Mesabi Daily News, 2005§).

Cliffs planned to obtain a 23% share of the Mesabi Nugget project by investing $50 million in the project; the investment was approved by Cliffs in the second week of 2006 and included $21 million for the construction and operation of the plant to produce high-quality iron nuggets, $25 million to expand iron ore concentrate production at the Northshore Mine, and $4 million to construct rail facilities that would allow concentrate to be transport to the nugget plant from the Northshore Mine (Mining Engineering, 2006).

PolyMet Mining Corp. closed on the sale of idle iron ore concentrating and auxiliary facilities at Hoyt Lakes. Cliffs acquired the facilities as part of the bankruptcy settlement from the former LTV Steel. Cliffs was expected to receive $3.4 million in cash and 6.2 million common shares of Polymet stock from the sale of the former LTV Steel plant (PolyMet Mining Corp., 2005a, b; Cleveland-Cliffs Inc, 2005a§).

Other States.—Strong demand for iron ore spurred interest in iron ore projects in other States. Palladon Ventures Ltd. completed a preliminary scoping study on the Comstock/Mountain Lion Iron Project in Iron County, UT. An update of existing feasibility studies to provide current costs was performed. The study evaluated 10 scenarios for development and concluded that the property value exceeded the $10 million purchase consideration (Palladon Ventures Ltd., 2005c§). Palladon completed the purchase of an idled mine from Geneva Steel Company, and posted a $1.3 million reclamation bond for the property. Palladon began bulk sampling the exposed ore benches to determine the most effective method of beneficiation and to use in negotiations with potential customers. Palladon announced a contract to sell 1.0 Mt of direct shipping ore to a Chinese purchaser, beginning in September, but by yearend, this iron ore had not yet been shipped (Palladon Ventures Ltd., 2005a§, b§).

Tennessee Minerals, LLC announced that 15 Mt of calcined iron ore fines grading greater than 65% iron would be available from its stockpile at Copperhill, TN. Tennessee Minerals rehabilitated a 43-mile [69-kilometer (km)] rail line to provide access to the 53-acre (21-hectare) site and shipped eight trainloads of calcine to Newport News, VA, for eventual transport to China (Tennessee Minerals, LLC, 2005§; Southeast Industrial Development Association, 2006§).

Consumption

U.S. iron ore consumption fell by 7% to 60.1 Mt from a 2004 figure of 64.5 Mt (table 1). Pig iron production at 37.2 Mt was 16% below the 10-year average of 44.4 Mt/yr for 1996 through 2005. Raw steel production using BOF technology fell to 43 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 58.9 Mt, including 50 Mt of pellets; 8 Mt of sinter, briquettes, and other products; and 0.5 Mt of natural coarse ore (table 6). Of the ore consumed, 78% was domestic; 13%, from Canada; 7%, from Brazil; and 2%, 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, 6, and 7. The first consumption number (60.1 Mt in 2005), 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, 2006, p. 81). The second consumption number (58.9 Mt in 2005), in table 6, 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 are listed in table 7. 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 (0.33 Mt in 2005) and nonsteel uses (0.93 Mt in 2005). Data on iron ore consumption in nonsteel end uses (table 7) were compiled from USGS surveys.

Price

By the end of February, indications were that world prices for iron ore would increase significantly in the contract year (April 1, 2005, through March 31, 2006). Several price agreements had already been reached between leading iron ore exporters and major steelmakers that contained price increases greater than 70%. Companhia Vale do Rio Doce (CVRD) first negotiated significant price increases with their Asian customers and then signed similar contracts with Arcelor Group in Europe whereby deliveries for the contract year for Carajás and Southern System iron ore fines, free on board (f.o.b.) their respective ports, were increased by 71.5% relative to those of 2004 (Samor and Glader, 2005; Companhia Vale do Rio Doce, 2005§). Rio Tinto plc subsequently concluded its negotiations with Nippon Steel Corporation for the contract year. The price for lump ore, fine ore, and Yandi ore were all increased by 71.5% on a cents per dry metric ton unit basis (Rio Tinto plc, 2005§). Other major steelmakers quickly, but reluctantly, signed similar agreements that contained significant price increases with CVRD and Rio Tinto, while BHP Billiton Limited (BHPB) requested yet higher increases than either Rio Tinto or CVRD (Bell, 2005§).

BHPB held out for several weeks for a $7.50 to $10 per ton rate premium, but finally settled annual contracts for iron ore at the same rate as both CVRD and Rio Tinto. Resistance from the China Iron & Steel Association, formed in mid-2003 by Chinese steel producers, helped hold BHPB prices to the Japanese and European established benchmark levels (Jones, 2005b; Mining Journal, 2005a).

Iron ore contract price increases, on a percentage basis, were similar in the European and Asian markets. In spite of iron ore prices having declined in real terms through 2002, the price of Carajás fines, an ore grade produced by CVRD and sold to Europe, when denominated in U.S. dollars, reached 65.00 cents per 1% iron per ton, a 71.5% increase compared with the previous contract year, which had been the highest price in the past 9 years (United Nations Conference on Trade and Development, 2006, p. 84).

U.S. prices as indicated by Cliffs also increased relative to 2004 realized prices. The estimated effect of international pellet pricing was anticipated to increase revenues by almost 18% per ton (table 15). An additional $1.56 per ton would be realized based on known contractual base pricing, lag year adjustments, and capped pricing, while the effect of additional price adjustment factors was not fully known (Cleveland-Cliffs Inc, 2005b§).

According to CRU International Ltd., lower prices for iron ore exported from India to China were linked to a reduction in Chinese steel prices. Although a slight reduction in growth was seen, Chinese steel production increased by 41% compared with that of the past year (CRU Monitor, 2005).

The rise in Chinese imports in 2005, continued tight supply, and increased world spot prices for iron ore (almost 50% higher per ton than the price in 2005-06 annual contracts) suggested that benchmark iron ore prices would rise again in 2006. Counterbalancing these upward market forces were short-term overcapacity in Chinese steelmaking and falling Chinese steel product prices. An additional factor in the pricing mix was

BHPB's continued interest in having iron ore prices reflect a transport premium for the cost to the purchaser of iron ore delivered at the steel plant. In spite of steelmakers having started to reduce the price of their products to recover sales volume, one major iron ore company pushed for a 40% increase in prices. By October, preliminary negotiations of iron ore prices had begun at a steel seminar held in Qingdao, China (Clarke, 2005a; China Press, 2005§; Tan, 2005§; Wilson, 2005§).

Transportation

Shipments of iron ore on the Great Lakes dropped by 7% in 2005 compared with those of 2004 and 4% compared with the average of shipments for the previous 5 years. Total dry-bulk shipments in 2005 on the Great Lakes were down by more than 12% compared with the average for the same 5-year period (Lake Carriers' Association, 2006).

The Soo locks officially closed to vessel traffic at midnight on January 15 and reopened on March 25; ocean traffic on the St. Lawrence Seaway recommenced for the 2005 season on March 23 for the Welland Canal section and on March 25 for the Montreal-Lake Ontario section; and the last ocean-going vessel left the Port of Duluth on December 19 in time for the closing of the Welland Canal and Montreal-Lake Ontario locks before yearend (Duluth Seaway Port Authority, 2005§). A milestone was reached as the Soo locks at Sault Ste. Marie, MI, celebrated its 150th anniversary. The first lock on the St. Mary's River was completed in 1855 by Fairbanks Scale Company (Flesher, 2005§).

The Port of New Orleans, a major iron ore importing port, sustained considerable damage from hurricane Katrina. Six wharves were heavily damaged, six were moderately damaged, and eight were in working order after electricity and power became available (Burgert, 2005).

Foreign Trade

U.S. net imports of iron ore in 2005 were 1.2 Mt, which represented 2.0% of domestic consumption. Exports increased by 40%, while imports increased by 11% compared with 2004 figures. Nearly all U.S. iron ore exports (11.6 Mt) were pellets, and 95% of the exports were shipped via the Great Lakes to Canadian steel companies, while 2% was shipped to each of China and Slovakia. U.S. imports totaled 13.0 Mt, of which Brazil's share decreased to 32%; Canada's share increased to 58% (tables 1, 8-14).

World Industry Structure

Consumption.—Although global iron ore consumption is not measured directly, there are indicators that show whether it rose or fell—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. Iron ore imports are not a straightforward indicator of a change in iron ore consumption in any country that produces iron ore unless the country's ore production remains static. Estimates of world consumption of iron ore increased as the result of a 9% increase in pig iron production compared with 2004 levels. Of the six countries that had 4% or more of world pig iron production from 1996 through 2005, only the United States had negative growth in pig iron production over this period. All others had increases over this period, as follows: China, 207%; Brazil, 41%; Russia, 31%; Japan, 11%; and Germany, 4%. Of the five countries that had 4% or more of world pig iron production in 2005, three showed a decrease in production—the United States, 14%; Russia, 4%; and Brazil, 2%. Japan's production had a very slight increase, while China increased production of pig iron by 28%.

World crude steel production surpassed 1.1 billion metric tons (Gt) and rose by 7% from 2004 to 2005. Four countries accounted for 5% or more of world production in 2005. Of those countries, China produced almost 77 Mt more crude steel in 2005 than in 2004. The others (Japan, Russia, and the United States) combined produced 6 Mt more crude steel in 2004 than in 2005. The world crude steel production, excluding China, decreased by more than 5.7 Mt. The four previously listed countries along with Germany and the Republic of Korea accounted for almost 59% of combined world crude steel production for 1996 through 2005. China's production rose by 245% during that period, while that of the United States fell by 2% (United Nations Conference on Trade and Development, 2006, p. 92-96).

Demand.—Continued strong iron ore demand has led to increased interest in mine development. This 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 2006, partially owing to increased steel exports by China. World DRI production rose to 56.1 Mt, which was 3% more than that of 2004 (Midrex Technologies, Inc., 2006§).

Production.—World iron ore production of 1.53 Gt, gross weight, surpassed 2004 production by 13%. 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 2001 through 2005 averaged 36%. In 2005, iron ore was produced in 45 countries, with production exceeding 1 Mt, gross weight, in 25 of those countries.

Australian miners Rio Tinto Limited and BHPB announced plans to invest an additional $1.35 billion and $1.3 billion, respectively, in iron ore projects. Brazil's CVRD followed suit with an announcement to invest a further $759 million to expand its Itiberitos operations (Mining Journal, 2005d).

Trade.—World iron ore imports of 713 Mt rose by 9% compared with 2004 levels. Following large year-on-year increases in imports for the past 5 years (27% in 2000, 32% in 2001, 21% in 2002, 33% in 2003, and 40% in 2004), China posted another sharp rise to 275 Mt in 2005 from 208 Mt in 2004—a gain of more than 32%. Since 2001, four countries have accounted for more than 60% of world iron ore imports. Germany's share of imports in that period fell to 5% from 8%, Japan's share fell to 19% from 26%, and the Republic of Korea's share fell to 6% from 9%. China's share rose during this 5-year period to 39% from 19%.

Australia's and Brazil's combined share of world iron ore exports fell slightly to 65% in 2005 from 66% in 2004. Five

countries represented more than 80% of world iron ore exports. In decreasing order of market share, Australia held 33%; Brazil, 31%; India, 11%; Canada, 4%; and South Africa, 4% (United Nations Conference on Trade and Development, 2006, p. 76-79).

World Review

Australia.—BHPB's share of total world mine production was 97.5 Mt, a 9% increase from that of 2004. BHPB's share of saleable quantities of iron ore (wet) from its mines was as follows: Yandi JV (85% owned), 34.4 Mt; Mt. Newman JV (85% owned), 25.4 Mt; Area C Joint Venture (JV) (85% owned), 18.5 Mt; Samarco, Brazil, (50% owned), 7.5 Mt; Jimblebar, 6.0 Mt; and Goldsworthy JV (85% owned), 5.7 Mt (BHP Billiton Limited, 2006§).

Rio Tinto Limited's share of total world mine production was 124.5 Mt, a 15% increase from that of 2004. Rio Tinto's share of saleable quantities of iron ore plus pellets from its mines was as follows: Hamersley, 74.4 Mt; Robe River (53% owned), 27.8 Mt; Iron Ore Company of Canada (59% owned), 9.2 Mt; Eastern Range, 6.6 Mt; Channar (60% owned), 5.2 Mt; and Corumba, Brazil, 1.4 Mt (Rio Tinto plc, 2006§).

At yearend, Grange Resources Limited was finalizing a bankable feasibility study on its Southdown Project in Western Australia. This magnetite iron ore project, located approximately 90 km northeast of Albany, envisioned ore shipments from the Port of Albany to a yet-to-be-constructed pelletizing plant at Kemaman in Malaysia. A scoping study indicated operating costs in the range of US$32 per ton f.o.b. pelletizing plant and project costs for the mine and pelletizing plant of about US$640 million. Recent resource estimates indicated an increase to 458 Mt grading 37% magnetite. A draft environmental scoping study was submitted by Grange in November (MineBox, 2005b§; Grange Resources Limited, 2006§).

Cliffs gained control of Portman Limited, the third ranked iron ore producer in Australia. Portman operated two iron ore mines—the Koolyanobbing Mine near Southern Cross in Western Australia and the Cockatoo Island Mine off the northern coast of Western Australia, of which it had a 50% ownership (Cleveland-Cliffs Inc, 2005c§; Portman Limited, 2005§). Reed Resources Ltd. signed a joint-venture agreement with Portman for drilling on the Mt. Finnerty iron ore deposit, 65 km east of Portman's Koolyanobbing operations. By signing the agreement, Portman would earn 80% ownership of the project if it spent $A300,000 over the following 3 years to determine the project's ore reserves (Metal Bulletin, 2005c).

Ivanhoe Mines Ltd. (Singapore) announced the sale of its Savage River Mine—a complex consisting of iron ore mining, pelletizing, and shipping facilities in Tasmania. The purchaser, Stemcor Holdings Limited (United Kingdom), agreed to pay Ivanhoe US$21.5 million plus annual payments for the next 5 years based on a formula related to the Nibrasco/Japan Steel Mills pellet price for the 1.8 Mt/yr sales of pellets (Ivanhoe Mines Ltd., 2005§).

In early 2005, China Metallurgical Construction Group (CMCG) announced that it was not prepared to finance Fortescue Metals Group's (FMG) Christmas Creek iron ore project, a part of the Pilbara iron ore joint-venture project, in Western Australia. FMG claimed that CMCG was now requiring an equity interest to become involved in the financing. Subsequent to CMCG's decision, FMG requested Citigroup to open negotiations through a tender for the Pilbara iron ore joint-venture project (Clarke, 2005b; Mining Journal, 2005b).

FMG upgraded its resource estimates, with 77% conversion to reserve category under the Joint Ore Reserves Committee (JORC) classification system, to probable ore reserves of 619 Mt at Christmas Creek and 447 Mt at Cloud Break in the Pilbara's Chichester Ranges. These probable ore reserves were further segregated to 359 Mt of high-grade ore with an average grade of 60.4% and 707 Mt of lower-grade ore with an average grade of 57.7%. Additional infill drilling was planned to further upgrade the reserve estimates (Fortescue Metals Group Ltd, 2005§).

Kumba Resources Limited sold its share of the Hope Downs project to Hancock Prospecting Pty Ltd. Hancock purchased Kumba's 50% share of the project for $A231.4 million with a discount for early payment. Subsequently, Hancock announced that Rio Tinto would take a 50% stake in and manage the $A2 billion project. Rio Tinto's participation in the project drastically reduced rail requirements. An initial 30-km spur was proposed to connect the planned 25- to 30-Mt/yr mine to existing infrastructure and allow access to Hope Down's 1 Gt of high-grade iron ore reserves (Kumba Resources Limited, 2005§; Phaceas, 2005§).

Mount Gibson Iron Limited agreed with Shougang Holding (Hong Kong) Limited to develop the Extension Hill magnetite deposit in the Mid West region of Western Australia. A feasibility study for the 5-Mt/yr mine, concentrator, slurry pipeline, and associated port infrastructure was to be completed early in 2006. If the study was positive, Asia Iron Holdings Limited (a 63%-owned subsidiary of Mount Gibson) would allocate $A15 million towards development of Extension Hill. Shougang would provide $A120 million in equity to earn a 50% interest in the newly formed Extension Hill Pty Ltd (Mount Gibson Iron Limited, 2005§). The Extension Hill project was expected to cost $A750 million, including a $A340 million, 270-km iron ore slurry pipeline to the Port of Geraldton and two pellet plants to be built at Longtan (near Nanjing) in China (Metal Bulletin, 2005b).

BHPB approved the Rapid Growth Project 3 (RGP3) to increase capacity by 20 Mt/yr to 42 Mt/yr at the Area C iron ore operations. BHPB's board approved the $1.3 billion investment for an 85% share in the project. RGP3 includes development of a new pit, new mine crushing and screening facilities, increased port and rail facilities, and sustaining capital to upgrade aging port and rail infrastructure. The current Rapid Growth Project 2 (RGP2) is on schedule and initial production was planned for the second half of 2006. New RGP3 work began immediately with initial production planned for the fourth quarter of 2007 (BHP Billiton Limited, 2005§).

Bolivia.—Bolivia planned to submit the El Mutún iron ore deposit near Puerto Suarez to international auction in March. The site, close to the Brazilian border, has proven reserves of 175 Mt averaging 67% iron content and an estimated reserve of 40 Gt of primary ore (Kinch, 2005). The bidding process, already behind schedule, was further delayed by the election of a new President at the end of 2005. The bids were to be delayed a further 60 days from the earlier December 21 deadline following statements by the President-elect that the property

would be nationalized, if the bidding process was not postponed for the 2-month period. Five companies bought bidding rules—Brazil's EBX Group, China's Luneng Shandong Group, European steel giant Mittal Steel, Argentina's Siderar Sociedad Anonima Industrial y Comercial, and India's Jindal Steel and Power Limited (Beltrán, 2005§).

Brazil.—CVRD announced 2005 production based on consolidated Brazilian generally accepted accounting practices (BGAAP). Consolidated BGAAP production figures include the total production of all the companies in which CVRD had more than 50% of the voting capital and effective control with production proportional to CVRD's stake in the companies and exclude production volumes of companies in which CVRD had minority interests. CVRD's total iron ore production increased by 10.3% from 2004 to 2005, and CVRD's share of salable quantities of iron ore was as follows: Southern System, 109.9 Mt; Carajás, 72.5 Mt; Caemi, 50.4 Mt; Samarco, 6.6 Mt; and Urucum, 1.1 Mt. CVRD's 2005 pellet production was 36.4 Mt, an increase of 3.0% from that of 2004, and the breakdown of salable quantities of iron ore pellets was as follows: Samarco, 6.9 Mt; São Luís, 6.2 Mt; CVRD I and II, 5.9 Mt; Fábrica, 4.3 Mt; Nibrasco, 4.6 Mt; Kobrasco, 2.4 Mt; Hispanobras, 2.1 Mt; and others, 4.0 Mt (Companhia Vale do Rio Doce, 2006§).

Improved performance by CVRD in 2005 was for the most part the result of new projects—Fábrica Nova, Carajás expansion, and Capão Xavier—and in spite of a maintenance stoppage at the São Luís pellet plant during the first part of the year. The Fábrica Nova Mine, which began operations in the second quarter of 2005, produced 7.8 Mt, and Capão Xavier produced 11.3 Mt, 7.1 Mt more than in 2004. The Capão Xavier Mine started operations in July 2004, so 2005 was its first year of operation at full capacity (Companhia Vale do Rio Doce, 2006§).

Companhia Siderúrgica Nacional (CSN) signed a contract with CVRD to supply 54.7 Mt of iron ore over the next 10¼ years from the Casa de Pedra Mine. The contract, worth US$2 billion, gave CSN the incentive to spend an additional US$520 million to expand the mine capacity to 40 Mt/yr from 15 Mt/yr and to make the necessary additions to port facilities at Septiba (Mining Journal, 2005c; Smith, 2005§).

Brazil's Administrative Council for Economic Defense (CADE) approved CVRD's acquisitions of five iron ore producers—Belém–Administrações e Participações Ltda., Caemi Mineração e Metalurgica S.A., Ferteco Mineração S.A., Mineração Socoimex Ltda., and Samitri S.A. After 5 years of investigation, CADE placed an important caveat on maintaining the acquisition of Ferteco—CVRD must relinquish its right of first refusal on CSN's surplus iron ore produced at the Casa de Pedra Mine (Metal Bulletin, 2005a).

Canada.—Québec Cartier Mining Company (QCM) (a Canadian iron ore and pellet producer partially-owned by Dofasco Inc.) settled a 6-week strike after having an initial contract offer rejected by the United Steelworkers union. Union members accepted a 6-year contract following prolonged negotiations. Later that year, Dofasco completed the acquisition of QCM by purchasing all preferred shares held by Caemi and Investissment Québec (Dofasco Inc., 2005§, Koch, 2006, p. 14-15).

In November, Arcelor S.A. (Luxembourg) launched an unsolicited bid worth US$3.7 billion to obtain majority ownership of Dofasco, which owned 28.6% of Wabush Mines and 100% of QCM (Markham and others, 2005). Germany's ThyssenKrupp AG raised its takeover bid for Dofasco to Can$4.9 billion in an effort to match the hostile bid from Arcelor. Dofasco's board preferred the takeover offer from ThyssenKrupp because the German steelmaker planned to maintain the Dofasco name and management; place all North American operations, including a stainless steel mill in Mexico, under Dofasco control; and continue some form of profit-sharing for the largely nonunion workforce (Austen, 2006§).

Chile.—Admiralty Resources NL (Australia) purchased a 50% interest in Compañía Minera Santa Barbara, which had nine properties with inferred iron ore mineral resources totaling 41 Mt. In December, a measured and probable ore reserve of 32.5 Mt at an average grade of 12.2%, equivalent to 6 Mt at an ore grade of 60% iron, was established for the first of these properties—the Japonesa Mine (Admiralty Resources NL, 2005§; MineBox, 2005a§).

Chile's Compañía Minera del Pacífico S.A. (CMP) (a subsidiary of Compañía de Aceros del Pacífico) planned to spend US$160 million to expand its exports. CMP produced 7 Mt/yr of pellets and iron ore and was in the final stages of approval for a 3-Mt/yr pellet plant to process magnetite-rich tailings from Phelps Dodge Corporation's Candelaria copper mine (Harris, 2005).

China.—China announced plans to institute an iron ore import license system in 2005. The new system appeared to be designed to curb speculative trading of iron ore, reduce market access to smaller, less efficient steel producers, and better organize the country's shipping requirements (Australian Investment Review, 2005§).

According to China Daily, two Chinese companies and the State Development & Investment Corporation signed a joint venture agreement to build a 50-Mt/yr coal terminal. The 36-meter-deep terminal, to be located at Caofeidian in Heibei Province, would also handle iron ore and crude oil (McCloskey's Coal News, 2005§). China's Qingdao Port in Shandong Province handled more than 24 Mt of iron ore imports in the first half of 2005. In 2004, Quindao surpassed Rotterdam (Netherlands) as the world's leading importer of iron ore (Yahoo! Asia News, 2005§).

India.—India introduced a dual rail freight policy for iron ore. 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 (Hindu Business Line, The, 2005§).

Companies from Australia and the Republic of Korea and Chinese government entities were all actively pursuing mine development opportunities in India. In 1995, Rio Tinto entered into a joint-venture agreement with Orissa Mining Corporation to develop two mines—Gandhamardan and Malangtuli—with much of the ore planned for export. In 2005, after 40 companies expressed interest in developing steel plants in Orissa State, the Government of India decided to renegotiate the original Orissa Mining joint venture. POSCO, in association with BHPB, proposed developing a steel plant near Paradip along with mining and support infrastructure. A Chinese delegation met with the Orissa Mining and government representatives from the States of Jharkhand and Karnataka to discuss raw material sourcing, as well as mining and steelmaking opportunities within India (Saha, 2005§; Telegraph (Calcutta), The, 2005§).

Kudremukh Iron Ore Company Limited (KIOCL) (a Government-owned enterprise and one of the world's 15 leading iron ore miners) ceased mining at its Kudremukh leasehold. KIOCL, which exported 100% of its iron ore, was first granted a mining lease in the Western Ghats area of Karnataka State in 1969. In 1987, the mine was designated part of the Kudremukh National Forest, and in 2002, KIOCL was informed that mine production would have to stop by 2005 (Rosenquist, 2006).

Indonesia.—Aretae Ltd. (Singapore) received one mining license and was expecting to get a another for two deposits that have estimated reserves of between 10 and 12 Mt of iron ore with 63.5% to 68% iron content (Metal Bulletin Daily, 2005). PT Krakatau Steel signed a memorandum of understanding with Chinese investors to develop a US$1 billion iron ore project in Kalimantan Province. The mine was to produce 2.5 Mt/yr of iron ore, with plant construction beginning in early 2006 (Indonesia Investment Coordinating Board, 2005§).

Korea, North.—Reports indicated that China would invest US$480 million to explore North Korea's Musan iron ore deposit. Musan had resources of 7 Gt, with some ore containing 66% iron. Plans were to develop reserves sufficient to support a 7-Mt/yr steel plant. In November, Tonghua Iron & Steel (Group) Co. Ltd. (a mid-sized state-owned steelmaker based in Tonghua City, Jilin Province, in northeastern China) expected to sign a US$867 million, 50-year exploration-rights deal with the Musan iron ore mine (Skillings Mining Review, 2005a; Asia Times Online, 2005§).

Liberia.—In December 2004, Rio Tinto and Mittal Steel submitted expressions of interest in the western Liberia. Liminco (a Liberian state entity) held the concession for unexploited deposits at Buluton, Mount Beeton, Mount Bele, Mount Mlenton, and Tokadeh (Jones, 2005a). Mittal Steel subsequently entered into a mining development agreement with the Government of Liberia for access to 1 Gt of iron ore reserves in the western part of the country. Initial cost estimates for development of mines and rail, community, and port infrastructure were approximately $900 million (Mittal Steel Corporation, 2005§).

Philippines.—In Camarines Norte, a US$20 million mine site project to pulverize iron ore into iron sands for shipment to China was expected to be completed in April (Kirk, 2005).

Russia.—Fears that exports of Russian and Kazakh iron ore to Chinese steelmakers would impact supplies prompted Russia's Magnitogorsk Iron & Steel Works Open Joint Stock Company (MMK) to consider expanding its captive iron ore mines to increase production from the 10% of supply now provided. Metal Bulletin reported that MMK was proceeding with two strategies to increase iron ore shipments. The first was to acquire an existing mine—with the Sokolovsko-Sarbaisky Mine only 300 km from the steel plant a strong candidate. The second was to explore for and develop iron ore deposits in Chelyabinsk Oblast and other regions (Rivituso, 2005).

South Africa.—Kumba Resources approved the 10-Mt/yr Sishen Expansion Project, which would expand production to 38 Mt/yr from 28 Mt/yr by 2009 at the Sishen iron ore mine in Northern Cape Province. The expansion decision followed agreement with the government-run Transnet to expand rail and port capacity and revise rail tariffs to a rand base rather than a U.S. dollar base (Mining Journal, 2005e).

A second ship loader became operational at the Saldhana Port in March, boosting the port's export capacity to 32 Mt/yr. A second rail car tippler, although expected to be available later in 2005 would not come online until 2006. Saldanha's tippling capacity could reach 50 Mt/yr within 6 months of commissioning of the new tipple (Metal Bulletin, 2005d; Freight & Trading Weekly, 2006§).

Sweden.—Luossavaara-Kiirunavaara Aktiebolag (LKAB) increased pellet production to 16.5 Mt from 16.0 Mt in 2004 and increased production of fines to 6.8 Mt from 6.2 Mt in 2004. LKAB planned to invest US$762 million, the largest investment in the company's 115-year history, to build a sixth pelletizing plant. The investment would not only include the pelletizing plant, but also a concentrator, haulage and terminal facilities, and several environmental upgrade projects. The new plants, to be built adjacent to existing plants at Kiruna, were expected to provide an additional 120 permanent jobs, have a capacity of 5 Mt/yr of pellets, and be operational in early 2008. With this expansion, Kiruna would produce pellets exclusively, while Malmberget operations would remain capable of producing iron ore fines (Luossavaara-Kiirunavaara Aktiebolag, 2006, p. 37; 2005§).

Ukraine.—Mittal Steel, the world's leading steel producer, acquired a 93% stake in Ukraine-based steel producer Kryvorizhstal Mining and Metallurgy Kombinat JSC for about US$4.8 billion. In an annulled privatization agreement, KryvorishStal had been purchased in 2004 by Investment Metallurgical Union at one-sixth the price later paid by Mittal. In 2004, KryvorizhStal produced 7.0 Mt of crude steel, 6.0 Mt of rolled steel products, and 15.5 Mt of iron ore (Mining Journal, 2005f; Ritchie, 2005b).

The purchase of KryvorizhStal was just one step in Mittal's overall goal of becoming more than 80% self-sufficient in iron ore by 2010. It was anticipated that Mittal would add more than 28 Mt/yr of iron ore production capacity upon completion of all current projects (Ritchie, 2005a).

Current Research and Technology

Rio Tinto Limited announced the hot commissioning 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, it claims to offer significant operational and environmental advantages over existing iron-making techniques. It is flexible in terms of the qualities of iron ore—including high phosphorus ores—and coal (noncoking) that it uses to produce premium quality iron. The plant moved into a rampup phase and was expected to reach full production of 0.8 Mt/yr during the next 3 years. The iron produced will be sold as pig iron (Rio Tinto Limited, 2005§).

Outlook

Minnesota legislative changes are expected to dramatically affect the structure of the U.S. iron industry in coming years with a conversion of ore to DRI and then to steel products—all within the State of Minnesota. The Nashwauk steel project is tentatively scheduled for slab caster plant commissioning as

early as 2009, while the Mesabi Nugget project is expected to begin commercial production in 2008.

It appears that U.S. production in 2006 is on track to remain about the same as that of 2005. 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 2005 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, although some deposits are also being considered as a source of export concentrate.

The growth of DRI 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 steel alloy purities can not be readily achieved with scrap. Domestically produced DRI could become competitive further inland where cheaper power is available. 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.

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. Increased participation by China in overseas joint ventures, robust imports of iron ore, and continued high levels of domestic production of low-grade ores in China imply that iron ore consumption will remain strong, although a larger portion of the supply is expected to be satisfied by iron ore from China's equity portion of joint ventures.

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TABLE 1
SALIENT IRON ORE STATISTICS[1]

(Thousand metric tons and thousand dollars unless otherwise specified)

	2001	2002	2003	2004	2005
United States, iron ore, usable, less than 5% manganese:[2]					
Production	46,200	51,600	48,600	54,700	54,300
Shipments:					
Quantity	50,600	51,500	46,100	54,900	53,200
Value[e]	1,210,000	1,340,000	1,490,000	2,080,000	2,370,000
Average value at mines dollars per metric ton	23.87	26.04	32.30	37.92	44.50
Exports:					
Quantity	5,610	6,750	6,770	8,400	11,800
Value	229,000	249,000	248,000	334,000	584,000
Imports for consumption:					
Quantity	10,700	12,500	12,600	11,800	13,000
Value	293,000	313,000	328,000	371,000	532,000
Consumption, iron ore and agglomerates	65,700	59,700	61,600	64,500	60,100
Stocks, December 31:					
At mines, plants and loading docks[3]	3,800	4,090	4,910	3,930	2,870 [4]
At receiving docks[5]	1,960	1,820	1,630	(6)	(6)
At consuming plants	12,300	12,400	10,900	(6)	(6)
Total[7]	18,000	18,300	17,500	(6)	(6)
Additional stocks, December 31:					
Crude ore at mines and plants	NA	NA	NA	NA	1,170 [4]
Unagglomerated concentrates for pelletizing plants	NA	NA	NA	NA	1,870
World, production[8]	1,050,000 [r]	1,100,000 [r]	1,220,000 [r]	1,360,000 [r]	1,530,000 [e]

[e]Estimated. [r]Revised. NA Not available.

[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 2005, 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]	1,160	2,570	37,900	12,900	7,790	60.2	14.79	5.04	3.04
Minnesota	3,170	6,540	138,000	41,400	26,400	63.8	21.07	6.33	4.04
Total or average	4,330	9,100	176,000	54,300	34,200	63.0	19.30	5.97	3.76
Other States[3]	19	38	9	9	5	54.0	0.25	0.25	0.13
Grand total or average	4,450	9,140	176,000	54,300	34,200	63.0	19.22	5.94	3.74

[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 2005, 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	37,900	--	37,900
Minnesota	6	138,000	--	138,000
Total	8	176,000	--	176,000
Other States	4	9	--	9
Grand total	12	176,000	--	176,000

-- 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 2005, BY DISTRICT, STATE, AND TYPE OF PRODUCT[1, 2]

(Thousand metric tons)

District and State	Direct shipping ore	Concentrates	Agglomerates[3]	Total
Lake Superior:				
Michigan	30	--	12,900	12,900
Minnesota	--	63	41,300	41,400
Total	30	63	54,200	54,300
Other States[4]	--	9	--	9
Grand total	30	72	54,200	54,300

-- 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 2005[1, 2]

	Gross weight of ore shipped (thousand metric tons)				Average iron content,	
District and State	Direct shipping ore	Concentrates	Agglomerates	Total	natural (percent)	Value (thousands)
Lake Superior:						
Michigan	33	--	12,600	12,600	60.2	W
Minnesota	--	63	40,500	40,600	63.8	W
Total reportable or average	33	63	53,100	53,200	63.0	$2,370,000
Other States[3]	--	10	--	10	54.0	368
Grand total or average	33	73	53,100	53,200	63.0	2,370,000 [e]

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

(Thousand metric tons)

Type of product	2004	2005
Blast furnaces:		
Direct-shipping ore	26	34
Pellets	55,000	50,100
Sinter[2]	7,900	8,200
Total	62,900	58,300
Steelmaking furnaces:		
Direct-shipping ore	450	431
Sinter[2]	147	113
Total	597	544
Grand total	63,500	58,900

[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 7
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
2001	57,300	35	4,560	--	61,900	180 [r]	756	64,400
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

[r]Revised. 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 8

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

(Thousand metric tons and thousand dollars)

	2004		2005	
Country	Quantity	Value	Quantity	Value
Canada	7,820	311,000	11,200	555,000
China	297	13,600	282	16,500
Slovakia	188	6,130	237	6,630
Other	88	3,640	116	6,090
Total	8,400	334,000	11,800	584,000

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

Source: U.S. Census Bureau.

TABLE 9

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

	2004			2005		
Type of product	Quantity (thousand metric tons)	Value (thousands)	Unit value[3, 4] (dollars per metric ton)	Quantity (thousand metric tons)	Value (thousands)	Unit value[3, 4] (dollars per metric ton)
Concentrates	24	$695	29.36	89	$3,520	39.55
Coarse ores	8	186	23.89	1	62	114.07
Fine ores	255	8,520	33.36	60	1,980	33.00
Pellets	8,100	325,000	40.06	11,600	578,000	49.70
Briquettes	3	114	41.63	7	352	47.41
Other agglomerates	2	172	75.97	2	144	89.70
Roasted pyrites	1	100	71.55	1	87	58.10
Total	8,400	334,000	39.82	11,800	584,000	49.55

[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 10
U.S. IMPORTS OF IRON ORE, BY COUNTRY AND TYPE OF PRODUCT[1, 2]

Country and type of product	2004 Quantity (thousand metric tons)	2004 Value (thousands)	2004 Unit value[3, 4] (dollars per metric ton)	2005 Quantity (thousand metric tons)	2005 Value (thousands)	2005 Unit value[3, 4] (dollars per metric ton)
Country:						
Australia	(5)	$24	54.15	1	$11	18.00
Bahamas, The	--	--	--	140	4,850	34.70
Brazil	5,020	140,000	27.97	4,180	178,000	42.65
Canada	5,830	190,000	32.53	7,510	299,000	39.88
Chile	244	6,380	26.15	270	10,700	39.56
Finland	76	6,190	81.18	9	383	41.03
Greece	--	--	--	49	963	19.69
Mexico	49	1,220	24.81	41	1,600	39.32
Peru	56	1,030 r	18.58 r	33	1,060	32.48
Russia	--	--	--	99	8,550	86.00
South Africa	104	4,100	39.29	--	--	--
Sweden	111	4,520	40.87	133	6,710	50.42
Trinidad and Tobago	--	--	--	375	11,000	29.45
Venezuela	262	17,000	64.72	148	7,890	53.43
Other	5	191 r	42.30 r	11	309	27.05
Total	11,800	371,000	31.53	13,000	532,000	40.92
Type of product:						
Concentrates	1,060	24,700	23.38	1,250	36,400	29.06
Coarse ores	68	2,600	38.10	56	2,030	36.37
Fine ores	3,230	74,700	23.14	4,880	153,000	31.36
Pellets	7,270	256,000	35.20	6,730	337,000	50.12
Briquettes	56	10,500	188.39	--	--	--
Other agglomerates	75	2,070	27.48	74	2,820	38.24
Roasted pyrites	9	373	43.84	8	335	39.61
Total	11,800	371,000	31.53	13,000	532,000	40.92

rRevised. -- 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 11
U.S. IMPORTS OF IRON ORE IN 2005, 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	--	--	1	--	--	--	1
Brazil	212	--	2,070	1,900	--	--	4,180
Canada	703	--	2,020	4,730	50	--	7,510
Chile	270	--	--	--	--	--	270
Finland	--	3	--	--	--	6	9
Mexico	--	--	23	--	18	--	41
Peru	(3)	--	31	--	--	2	33
Sweden	67	35	31	--	--	--	133
Venezuela	--	14	134	--	--	--	148
Other	(3)	4	564	99	6	(3)	674
Total	1,250	56	4,880	6,730	74	8	13,000

-- 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 12
AVERAGE UNIT VALUE FOR SELECTED IMPORTS OF IRON ORE IN 2005[1]

Type of product	Country of origin	Average unit value[2] (dollars per metric ton, gross weight)
Concentrates	Brazil	30.62
Do.	Canada	22.41
Do.	Chile	39.56
Fine ores	Brazil	31.68
Do.	Canada	29.22
Pellets	Brazil	55.96
Do.	Canada	47.02

[1]Includes agglomerates.

[2]Weighted averages of individual customs values.

Source: U.S. Census Bureau.

TABLE 13
U.S. IMPORTS OF IRON ORE, BY CUSTOMS DISTRICT[1, 2]

(Thousand metric tons and thousand dollars)

	2004		2005	
Customs district	Quantity	Value	Quantity	Value
Baltimore, MD	3,580	115,000	3,440	156,000
Buffalo, NY	9	148	6	110
Charleston, SC	1	55	2	81
Chicago, IL	1,450	31,300	1,400	39,400
Cleveland, OH	2,440	78,000	3,080	123,000
Detroit, MI	174	6,570	258	13,900
Houston, TX	57	1,590	78	3,950
Mobile, AL	84	2,900	66	2,480
New Orleans, LA	3,900	132,000	4,610	191,000
Nogales, AZ	(3)	10	18	438
Philadelphia, PA	58	2,900	22	1,560
Other	9 r	330 r	11	411
Total	11,800	371,000	13,000	532,000

rRevised.
[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 14
U.S. IMPORTS OF PELLETS, BY COUNTRY[1]

(Thousand metric tons and thousand dollars)

	2004		2005	
Country	Quantity	Value	Quantity	Value
Brazil	2,720	93,100	1,900	106,000
Canada	4,480	157,000	4,730	223,000
Finland	65	5,740	--	--
Russia	--	--	99	8,550
Total	7,270	256,000	6,730	337,000

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

Source: U.S. Census Bureau.

TABLE 15

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 2004	Fiscal year 2005
Australia:			
Hamersley Iron Proprietary Limited and Mount Newman Mining Company Proprietary Limited	Lump ore	45.93	78.77
Do.	Fines	35.99	61.72
Robe River Iron Associates	do.	28.69	49.20
BHP Billiton (Yandi)	do.	33.83	58.02
Brazil:			
Companhia Nipo-Brasileira de Pelotizacao (Nibrasco)	Pellet feed	60.02	112.04
Companhia Vale do Rio Doce (Carajás)	Fines	32.76	56.18
Companhia Vale do Rio Doce (Itabira)	do.	32.27	55.34
Mineraçoes Brasileiras Reunidas Societe Anonyme	Lump ore	34.78	59.65
Do.	Fines	33.42	57.32
Samarco Mineracâo Societe Anonyme	Pellet feed	27.71 r	47.52
Canada, Iron Ore Company of Canada (Carol Lake)	Concentrates	31.80	54.54
Chile:			
Minera del Pacifico Societe Anonyme (Huasco)	Pellets	59.10	110.32
Minera del Pacifico Societe Anonyme (El Romeral)	Fines	29.51	50.61
India:			
Minerals and Metals Trading Corporation (Bailadila)	Lump ore	45.25	77.60
Do.	Fines	35.10	60.20
Peru, Shougang Hierro Peru S.A.A.	Pellet feed	25.08	43.01
South Africa			
Kumba Resources Limited (Iscor) cents per dry metric ton unit	Lump ore	37.78	64.79
Do. do.	Fines	27.82 r	NA

rRevised. NA Not available.

[1]Free on board shipping port basis.

Sources: Trust Fund Project on Iron Ore Information, The Iron Ore Market 2004-2006. The TEX Report Ltd., Iron Ore Manual 2005.

TABLE 16
IRON ORE: WORLD PRODUCTION, BY COUNTRY[1]

(Thousand metric tons)

Country[4]	Gross weight[2]					Metal content[3]				
	2001	2002	2003	2004	2005[e]	2001	2002	2003	2004	2005[e]
Algeria	1,291	1,202	1,378	1,554 [r]	1,579	650	610	700	780 [r, e]	790
Australia	181,553	187,219 [r]	212,881 [r]	234,002 [r]	261,706 [5]	112,592	116,355 [r]	132,195 [r]	145,287 [r]	162,527 [5]
Austria[e]	1,800	1,900	2,119 [5]	1,882 [r, 5]	2,000	575	575	703 [5]	602 [r]	640
Azerbaijan[e]	NA	(6)	3 [5]	19 [r, 5]	7 [5]	NA	(6)	2	10 [r]	4
Bosnia and Herzegovina	264	212	127	300 [r, e]	3,000	132	106	63	150 [r, e]	1,500
Brazil	201,430	214,560	234,478 [r]	262,029 [r]	280,000 [p]	133,713	142,468	155,693	174,300 [r]	185,000 [p]
Bulgaria	464	373	466	83 [r]	80	148	119	127	27 [r]	26
Canada[7]	27,119	30,902	33,322	28,596 [r]	30,125 [p]	17,274	19,684	20,993	18,016 [r]	18,980 [p]
Chile	8,834	7,269	8,011	8,003 [r]	8,000	5,437	4,398	4,865	4,850 [r]	4,800
China[e, 8]	220,000	231,000	261,000	320,000 [r]	420,000	72,600	76,200	86,000	105,000 [r]	138,000
Colombia	637	688	625	508 [r]	499 [5]	350	378	344 [e]	280 [r, e]	275
Egypt	2,600	2,618 [r]	2,237 [r]	2,400 [r, e]	2,600	1,300	1,309 [r, e]	1,119 [r, e]	1,200 [r, e]	1,300
Germany[9]	407 [e]	419 [e]	429 [e]	412	410	57 [r]	59 [r]	60 [r]	58 [r]	57
Greece[e, 10]	1,500	1,500	1,500	1,500	1,500	575	575	575	575	575
Guatemala	15 [e]	35	2 [r]	3 [r]	11 [5]	10	23	2 [r]	2 [r]	7
India	79,200	86,400	99,100	120,600	140,000 [5]	50,700	55,300	63,400	77,200 [e]	90,000
Indonesia	469	379	245	90	22 [5]	258 [e]	216 [e]	140 [e]	51 [e]	12
Iran[11]	13,978 [r]	16,906 [r]	18,287 [r]	18,205 [r]	19,000	6,400 [r]	8,000 [r]	9,000 [r]	8,900 [r]	9,000
Japan	1	-- [r]	-- [r]	-- [r]	--	(6)	-- [r]	-- [r]	-- [r]	--
Kazakhstan	14,140	15,423	19,281 [r]	18,726 [r]	16,470 [5]	8,000	8,700	10,933	10,600 [r]	9,300
Kenya	1	1	1	1	1	(6)	(6)	(6)	(6)	(6)
Korea, North[e]	4,200	4,100	4,430	4,580	5,000	1,200	1,150	1,260	1,300	1,400
Korea, Republic of	195	365	289 [r]	328 [r]	305 [5]	109	164	125 [r]	138 [r]	131 [5]
Macedonia[e]	10 [r]	10 [r]	10 [r]	10 [r]	10	6 [r]	6 [r]	6 [r]	6 [r]	6
Malaysia	376	404	597	664 [r]	650	241 [e]	259 [e]	382	424 [r]	416
Mauritania	10,302	9,553	10,377 [r]	11,000 [r]	11,000	6,700	6,200	6,890 [r]	7,200 [r]	7,200
Mexico[12]	8,783	9,941 [r]	11,265 [r]	11,483 [r]	11,700	5,270	5,965	6,759	6,890	7,028 [5]
Morocco	8	9	6 [r]	10 [r]	10	4	5	3 [r, e]	5 [r, e]	5
New Zealand[13]	1,636 [5]	1,740 [5]	1,947 [5]	2,329 [r, 5]	2,300	480	520	580 [e]	690 [r]	690
Nigeria	25	25	-- [e]	-- [e]	--	9	9	-- [e]	-- [e]	--
Norway	500	515	500	600	620	340 [e]	350	340	408	420
Peru	4,564	4,594	5,229 [r]	6,439	6,895 [5]	3,087	3,105	3,542	4,247 [r]	4,565 [5]
Portugal[14]	15 [5]	15	15 [5]	12	12	5	5	5	4	4
Romania[e]	292	341	304	305 [r]	300	76	89 [5]	82 [5]	74 [5]	70 [5]
Russia	82,500	84,236	91,760	96,980	96,764 [5]	48,000 [e]	49,000	53,000 [e]	56,200 [e]	56,100
Slovakia	435	326	287 [r]	305 [r]	300	152	114	100 [r, e]	107 [r, e]	105
South Africa[15]	34,757	36,484	38,086	39,322 [r]	39,542 [5]	22,240	23,350	24,000 [e]	24,800 [e]	24,900
Sweden	19,486 [5]	20,300	21,500	22,300	23,300	12,811 [5]	13,400 [5]	14,100	14,700	15,300
Thailand	(6)	570	10	136	220 [5]	(6)	285	5 [e]	68 [r, e]	116 [5]
Tunisia	204	198	164	244	206 [5]	109 [e]	105	87 [e]	129	110
Turkey	3,932	3,433	3,429	3,857	4,000 [5]	2,100 [e]	1,830 [r, e]	1,830 [r, e]	2,060 [r, e]	2,150
Uganda	1	--	--	--	--	1	--	--	--	--
Ukraine	54,650	58,900	62,498	65,550	68,570 [5]	30,000 [e]	32,300	34,300 [e]	36,000 [e]	37,700
United Kingdom	1 [5]	1 [5]	1	1	1	1	(6)	(6)	(6)	(6)
United States	46,192	51,570	48,554	54,724	54,329 [5]	29,263	32,499	30,590	34,460	34,202 [5]
Venezuela[16]	16,902	16,684	17,954	19,196 [r]	20,000	10,817	11,092 [r]	11,936 [r]	12,669 [r]	13,000
Vietnam	400 [r]	430 [r]	540 [r]	650 [r]	700	220 [r]	236 [r]	300 [r]	360 [r]	385
Zimbabwe	361	272	367	283 [r]	377 [5]	180 [r, e]	136 [r, e]	180 [r, e]	154 [r, e]	200
Total	1,046,430 [r]	1,104,022 [r]	1,215,610 [r]	1,360,221 [r]	1,534,121	584,192 [r]	617,249 [r]	677,315 [r]	750,981 [r]	828,996

See footnotes at end of table.

TABLE 16—Continued
IRON ORE: WORLD PRODUCTION, BY COUNTRY[1]

[e]Estimated. [p]Preliminary. [r]Revised. NA Not available. -- Zero.

[1]Table includes data available through July 16, 2006.

[2]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.

[3]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.

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

[5]Reported figure.

[6]Less than ½ unit.

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

[8]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.

[9]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.

[10]Nickeliferous iron ore.

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

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

[13]Concentrates from titaniferous magnetite beach sands.

[14]Includes manganiferous iron ore.

[15]Includes magnetite ore as follows, in thousand metric tons: 2001—2,552; 2002—2,557; 2003—2,307; 2004—2,893; and 2005—2,900.

[16]Offical 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 17
IRON ORE: WORLD PELLETIZING CAPACITY,
BY CONTINENT AND COUNTRY IN 2005[1]

	Rated capacity, gross weight (million metric tons)
North America:	
Canada	27.5 e
Mexico	12.0 e
United States	55.6
Total	95.1
South America:	
Brazil	53.0 e
Chile	5.2
Peru	3.5 e
Venezuela	10.5 e
Total	72.2
Europe:	
Netherlands	4.6 e
Russia[2]	65.0 e
Slovakia	0.5 e
Sweden	16.5
Turkey	1.5 e
Total	88.1
Asia:	
Bahrain	4.0
China	47.0 e
India	12.8
Iran	9.0 e
Japan	4.0 e
Total	76.8
Oceania, Australia	6.0 e
Grand total	338.2

eEstimated.
[1]Data may not add to totals shown because of independent rounding.
[2]Includes Kazakhstan and Ukraine.

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

TABLE 18
IRON ORE-PRODUCING MINES IN THE UNITED STATES IN 2005

State and mine	County	Operator	Source of iron ore
California, Dredge 21	Yuba	Cal Sierra Development Inc.	Dredged sands.
Michigan:			
Empire	Marquette	Cleveland-Cliffs Inc	Magnetite taconite ore.
Tilden	do.	do.	Hematite-magnetite taconite ore.
Minnesota:			
Hibbing Taconite	St. Louis	do.	Magnetite taconite ore.
Keewatin Taconite	do.	United States Steel Corporation	Do.
Minntac	do.	do.	Do.
Minorca	do.	Mittal Steel Corporation	Do.
Northshore	do.	Cleveland-Cliffs Inc	Do.
United Taconite	do.	do.	Do.