



2008 Minerals Yearbook

IRON ORE

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U.S. iron ore production increased slightly in 2008 compared with that of 2007; consumption decreased by 5%. World iron ore production and consumption once again rose in 2008. China, by far the leading consumer, led gross tonnage production of iron ore with relatively low-grade ore. Brazil was the leading producer of iron ore in terms of iron content (tables 1, 17). For the fifth consecutive year, world iron ore trade increased. Prices continued to rise at a much greater rate than in 2007.

The supply of iron ore—the basic raw material for producing iron and steel—is critical to the economy of the United States, as it is to that of all industrialized nations. Scrap, a supplement to iron ore in steelmaking, is also an extremely important feed material, but owing to lack of supply of high-quality scrap, its use has limitations. Direct reduced iron (DRI), although 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 ore minerals of iron. Taconite, the primary 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 all domestic iron ore production is transformed into molten iron in a blast furnace by the iron and steel industry. Most molten iron then goes directly to a basic oxygen furnace (BOF) for conversion to steel by removing most of the residual carbon. The remainder is poured into molds to produce pig iron.

In 2008, the United States consumed 51.9 million metric tons (Mt) of iron ore, a decrease of 2.9 Mt compared with the revised consumption for 2007, and produced 33.7 Mt of pig iron. Pig iron production decreased 7% from that of 2007 and was at the lowest level since before World War II.

Raw steel production, at 91.9 Mt, decreased 6% compared with that of 2007. U.S. steel consumption decreased to 102 Mt from 116 Mt in 2007. 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 2008, the minimill sector of the steel industry produced 58% of the raw steel in the United States.

Imports of pig iron and semifinished steel allow integrated steelmakers to increase steel mill product production 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 2008, net U.S. exports (exports minus imports) of iron ore substitutes were 5.8 Mt, while in 2007 the United States was a net importer of 0.2 Mt. This increase in exports was mainly owing to an increase in net exports of 41% in scrap steel, counterbalanced somewhat by an increase of 13% in net imports (imports minus exports) of semifinished steel products. The net imports of DRI remained

constant at 2.3 Mt. During the year, along with the 6% decrease in raw steel production and a 12% drop in steel demand, iron ore consumption declined 5% from revised 2007 levels.

Legislation and Government Programs

The many changes to the Taconite Production Tax passed by the Minnesota legislature in 2008 followed a year during which no changes were passed. The 2008 changes did not affect the production tax rate but simply their distribution. Adjusted for inflation, the tax rate for concentrates produced in 2008 increased to \$2.316 from \$2.258 per taxable long ton (Minnesota Department of Revenue, 2008, p. 6, 7, 20; 2009, p. 20).

Production

The U.S. Geological Survey (USGS) develops U.S. iron ore production data through an annual “Iron Ore” survey, which is sent to iron ore mines, and those mines provided the production statistics listed in tables 1 through 5. This information is supplemented by employment data, information from consumers, and mine inspection reports. The American Iron Ore Association became a supplier-oriented organization, now known as the Iron Mining Association of Minnesota, and no longer provides data on ore shipments from loading docks on the Upper Great Lakes nor receipts at transfer docks and furnace yards nationwide. Steel plant data continues to be compiled by the American Iron and Steel Institute (AISI).

In 2008, domestic iron ore production was 53.6 Mt, a slight increase from the 2007 production of 52.5 Mt. Michigan and Minnesota taconite mines accounted for almost all domestic iron ore production—six 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 82% of domestic demand in 2008, 7% more than the average from 2004 through 2007.

Cleveland-Cliffs Inc (Cleveland, OH) officially changed its name to Cliffs Natural Resources Inc. to better represent its goal of becoming a more diversified resource company. Cliffs announced 2008 production for its North American operations (35.8 Mt) as follows (United States, unless otherwise specified): Empire, 4.7 Mt; Hibbing Taconite, 8.3 Mt; Northshore, 5.6 Mt; Tilden, 7.7 Mt; United Taconite, 5.2 Mt; and Wabush (Canada), 4.3 Mt. Cliffs’ share of that production was 23.3 Mt. Cliffs’ North American production share for the year increased 5% compared with that of 2007, and overall iron ore sales revenue increased to \$2.37 billion, an increase of 36% compared with that of 2007 (Cliffs Natural Resources Inc., 2009, p. 58, 59).

Cliffs announced three new supply agreements for the sale of a minimum tonnage of almost 5.0 Mt of iron ore pellets

between 2008 and 2013. The agreed price was defined as the annual “Eastern Canada Pellet Price” at the time of settlement. In spite of these additional sales, Cliffs had to idle three pellet lines—one at United Taconite and two at its Northshore Mining facilities—representing about 300,000 metric tons (t) of monthly pellet production capacity (Cleveland-Cliffs Inc., 2008b; TEX Report, The, 2008).

Cliffs acquired 70% controlling interest in Renewafuel LLC (Rosemount, MN), a company that produces a low-emissions biofuel. The fuel cubes are made of renewable materials and are comparable in cost to Western coals, but with far lower emissions of sulfur dioxide, particulate matter, and acidic gases. Cliffs successfully tested the fuel cubes at its Empire Mine near Marquette, MI, and planned to use the cubes to fuel its pelletizing furnaces at several of its other operations in Michigan and Minnesota (American Metal Market, 2008).

In late March, ArcelorMittal (Luxembourg) confirmed that the court-appointed divestiture trustee had entered into an agreement to sell the company’s Sparrows Point steel mill in Maryland to Russia’s OAO Severstal. The sale was required to comply with an antitrust ruling related to the merger in 2006 between Mittal Steel and Arcelor SA. The agreed sale price was \$810 million net of debt (ArcelorMittal, 2008a).

The Tilden Mine increased production by sending additional iron ore to the Empire processing plant, and Hibbing Taconite’s production increase resulted from restart of an additional furnace line at the end of the first quarter (Cleveland-Cliffs Inc., 2008c, p. 2, 3).

Michigan.—Michigan accounted for about 23% of U.S. usable iron ore output in 2008. Nearly all of Michigan’s output was pellet production. The Empire Mine production was standard and flux pellets. The Tilden Mine produced magnetite and hematite flux pellets. Empire Mine production was shown as decreasing by 0.4 Mt compared with that of the previous year, while Tilden Mine showed a corresponding increase because Empire test processed 0.4 Mt of Tilden ore during the year (Cliffs Natural Resources Inc., 2009, p. 59; Koch, 2009, p. 12–14).

Minnesota.—Minnesota produced 77% of the usable iron ore in the United States in 2008; 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, was summarized as follows: Hibbing Taconite Company produced pellets; Northshore Mining Company produced 5.6 Mt of standard pellets, including a small amount of sinter material; United Taconite Company, LLC [owned by Cliffs (70%) and China’s Laiwu Steel Group (30%) for the first half of the year and fully owned by Cliffs for the second half of the year] produced pellets; ArcelorMittal Minnaca Mine Inc. (Chicago, IL) produced 2.8 Mt (97% flux pellets and 3% pellet chips); and United States Steel Corp. (Pittsburgh, PA) produced 5.1 dry Mt of pellets from its Keewatin Taconite operations and 2.2 Mt of acid pellets and 12.5 Mt of flux pellets from its Minntac operations (Cliffs Natural Resources Inc., 2009, p. 59; Koch, 2009, p. 8–9, 14, 16–24).

United States Steel announced plans to invest \$300 million in its Keetac facility in Keewatin, MN. The capital investment would expand existing annual iron ore pellet production by

3.7 Mt to 9.8 Mt. The project to improve and modernize a pellet production line that had been idle since 1980 would be completed within 36 months of receiving environmental approvals. The expansion would create 75 new jobs and install energy-efficient technologies and new emission controls that would exceed current environmental standards (United States Steel Corp., 2008).

Cliffs acquired United Mining Co. Ltd.’s interest in the United Taconite Mine and pelletizing plant near Eveleth, MN. United Mining, a subsidiary of Laiwu Steel Group, Ltd. (Laiwu City, China), sold its 30% control in the joint venture to give Cliffs full ownership of the operation. The purchase price included \$100 million in cash, more than 1.5 million shares of Cliffs’ stock, and 1.2 Mt of iron ore pellets during the following 15 months. United Taconite reported proven reserves of 133 Mt at the end of 2007 (Cleveland-Cliffs Inc., 2008a).

Steel Dynamics, Inc. (Fort Wayne, IN) continued construction on the \$265-million Mesabi Nugget project in Hoyt Lakes, MN. Infrastructure installed in 2008 to support the 500,000-metric-ton-per-year-capacity iron-making plant included natural gas lines, electrical powerlines, and rail spurs for delivery of raw materials and shipment of iron nuggets. The main plant facility, which was almost complete, has a 180-foot-diameter gas-fired rotary-hearth furnace (RHF) that, through a chemical reduction process, was expected to yield millions of 96% to 98% iron nuggets. The feed material—iron ore concentrate, coal, and binding agents—was to be mixed and dried to form marble-sized “dry balls” in ancillary facilities. These balls were then to be melted in the RHF to form the iron nuggets (Rutherford, 2008; Steel Dynamics, Inc., 2009, p. 18, 19).

Essar Steel Minnesota, LLC (Hibbing, MN) [a subsidiary of Essar Global Ltd. (Mumbai, India)], held a groundbreaking ceremony for the steelmaking facilities planned at Nashwauk, MN. The \$1.6-billion project planned to include the mining facilities of the former Butler Mine and new DRI, steel-making, and slab-casting facilities (Essar Global Ltd., 2008).

Magnetation, Inc. (Nashwauk, MN) began construction of its Mesabi Chief plant near Keewatin, MN, with plans to produce iron concentrate from existing tailings. The plant was expected to produce low-cost iron concentrates at a rate of 150,000 metric tons per year (t/yr) from lean ore stockpiles of hematite and natural ore tailings. Offtake agreements with Steel Dynamics’ Mesabi Nugget plant were agreed upon (Redmon, 2009; Magnetation, Inc., 2010).

Utah.—Palladon Ventures Ltd. (Salt Lake City, UT) announced the signing of a 5-year contract with China Kingdom International Minerals & Metals Co., Ltd. to supply 2 million metric tons per year (Mt/yr) of run-of-mine iron ore. Pricing was fixed through March 2009 and would adjust for future annual periods based on the world benchmark iron ore price. Palladon anticipated shipments to begin in the third quarter of 2008. Palladon was finalizing plans for operation startup at Iron Mountain in Utah (Palladon Ventures Ltd., 2008a; Skillings Mining Review, 2008h). At yearend, Palladon announced that storage barns at the Southern California port were full, but that they were unable to ship iron ore owing to the weakening price for ore and hesitancy on the part of other businesses. Stockpiles

were filled to 150,000 t of capacity (Palladon Ventures Ltd., 2008b).

Consumption

U.S. iron ore consumption declined by 5% to 51.9 Mt from the revised 2007 figure of 54.7 Mt (table 1). Pig iron production at, 33.7 Mt, was 10% below the 5-year average of 37.5 Mt/yr for 2004 through 2008. Raw steel production using BOF technology decreased by 5% to 39 Mt—the lowest production level in more than a decade.

Consumption of iron ore, including agglomerates, reported to the AISI by producers of iron and steel totaled 50.7 Mt, including 43.8 Mt of pellets; 6.5 Mt of sinter, briquettes, and other products; and 0.5 Mt of natural coarse ore (table 7). Of the ore consumed, 82% was domestic; 11%, from Canada; 5%, 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, 7, and 8. The first consumption number (51.9 Mt in 2008), 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, 2009, p. 81). The second consumption number (50.7 Mt in 2008), 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 an estimate of DRI and other miscellaneous uses, which include 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 are listed in table 8. This consumption figure was the ore consumed in DRI production (0.39 Mt in 2008) and nonsteel uses (0.73 Mt in 2008). Data on iron ore consumption in nonsteel end uses (table 8) were compiled from USGS surveys and information provided by Midrex Technologies, Inc. (2009, p. 7).

Prices

In January, difficulties associated with the closing of Brazil's Itaguaí iron ore port, the typhoon season in Australia, and threats of increased iron ore export taxes by India complicated talks to establish 2008–09 contract prices. Rio Tinto plc (London, United Kingdom) pushed strongly for a large increase in price to improve profitability and assist in fending off a hostile bid from rival BHP Billiton Ltd. (Melbourne, Australia). Rio Tinto took advantage of a clause in its long-term contracts to make customers pay existing spot prices for 10% of their contracted iron ore supplies. Negotiations were strongly affected by a greater than 75% premium for spot iron ore over the existing contract rate (Matthews, 2008c; Skillings Mining Review, 2008e).

In February, Companhia Vale do Rio Doce (Vale) (Rio de Janeiro, Brazil) agreed with Baosteel Group Corp., China's leading steel producer, to a 65% increase compared with the 2007 contract year price for Southern System fines. POSCO

(Republic of Korea) and Japanese steelmakers—Kobe Steel, Ltd., JFE Steel Corp., Nippon Steel Corp., and others—agreed to the same price increment (Skillings Mining Review, 2008i). Rio Tinto and BHP Billiton continued to negotiate a price premium for the lower transport cost into the Asian market, compared with the transport cost of Brazilian iron ore (Barta and Moffett, 2008).

In March, Vale and Italian steelmaker ILVA S.p.A. agreed on a blast furnace pellet price increase of 86.67%. The new Vale price was 220.2 U.S. cents per dry metric ton unit, free on board Tubarao. This represented the first settlement price for pellets in the 2008 annual contract negotiations (Metal Bulletin, 2008h). Australian iron ore giants—BHP Billiton and Rio Tinto—continued to hold out for significantly higher contract prices in spite of boycotts enforced by the China Iron & Steel Association and other Chinese trade entities. Chinese iron ore importers reportedly could have their import licenses suspended for purchasing BHP Billiton or Rio Tinto iron ore on the spot market (Koch, 2008).

The April 1 deadline passed without resolution of the price negotiations between Australian producers and Asian buyers. The chairman of the China Metallurgical Mines Association (CMMA) indicated that China would not be able to accept a transportation premium that would raise the benchmark price already accepted by Vale. BHP Billiton and Rio Tinto were holding out for higher contract prices in view of the strongly increased spot-over-contract price margins. Vale had already settled for a 65% increase for Southern System fines and a 71% increase for their Carajás fines (Li, 2008b; Wilson, 2008b).

In May, amidst rising stockpiles of iron ore, Chinese steelmakers continued negotiations with BHP Billiton and Rio Tinto. The chairman of the CMMA indicated that China was considering a freight differential, but wanted the transportation premium to be limited to a percentage of the spot market price for iron ore. An official with the China Iron & Steel Association indicated that BHP Billiton and Rio Tinto might invoke a contract clause that would base ore prices on spot market values, if the contract price negotiations were not settled by June 30 (Skillings Mining Review, 2008a, c, d).

In June, Australian miners BHP Billiton and Rio Tinto negotiated an average 85% increase in iron ore price with Chinese steelmakers. This included the first transportation premium when compared with Brazilian iron ore prices, which were increased by 65% to 71% earlier in 2008. Some analysts indicated this may end the benchmark system of iron ore pricing and lead to a system of indexed iron ore prices (Matthews, 2008b; Ritchie and others, 2008).

In conjunction with the June 2008 establishment of a transportation premium by Australian miners, Credit Suisse and Deutsche Bank created over-the-counter financial instruments that had already assisted in the trade of almost 2 Mt of iron ore. These cash-settled trades were based on reference indices of spot iron ore contracts published by Metal Bulletin and Steel Business Briefing. One steelmaker doubted the ability of a reference index system to handle a variety of iron ore grades, while a trader indicated that such a system would enable hedging of risk and would better reflect market conditions (Metal Bulletin, 2008e).

In September, Vale attempted to renegotiate its iron ore contracts with Chinese steelmakers. Vale was making an effort to receive a premium for higher quality ore after an advantage for shorter transport of ore was given to the Australian miners (Metal Bulletin, 2008g). In the midst of these discussions, spot iron ore prices continued to plummet from a high of about \$200 per metric ton in late 2007 to around \$110 per metric ton in September 2008. The spot iron ore price was not expected to increase, with Chinese steelmakers indicating that cutbacks could continue through the end of the year (Li, 2008a). Following indications in early October that falling spot prices reflected “seasonal pessimism” related to the coming negotiating season, prices for 63.5% iron content fines continued to fall to about \$60 per metric ton by the end of the month (Marais, 2008c; Metal Bulletin, 2008d).

With planned near-term reductions in steel plant production estimated to be 20% of the 2007 production levels, analysts anticipated a decrease in iron ore price of as much as 40% in the 2009–10 contract year beginning April 1, 2009. In an effort to avoid a huge decrease in prices, major iron ore producers started to reduce production. Vale began by mothballing 30 Mt of capacity (or 10% of its iron ore annual production capacity) and agreed not to pursue a 12% price increase to the current contract agreement (Bowen, 2008; Marais, 2008d; Matthews, 2008a).

China’s iron ore purchasers opened annual price negotiations asking for major reductions in the iron ore price and a realignment of the contract year with the calendar year. Some analysts considered that steel producers had their strongest bargaining position in annual contract negotiations since at least 2002. Reductions of 40% in contract price were mentioned as reasonable (Wilson, 2008a).

Transportation

The Soo Locks closed on January 15, officially ending the Lake Superior shipping season. Iron ore tonnages for the 2007 shipping season were lower compared with those of 2006 owing to scheduled outages at two blast furnaces—one at Sault Ste. Marie in Ontario, Canada, and the other at Dearborn, MI (Eggleston, 2008).

Uncertainties about iron ore demand from China through the end of the year caused ocean-freight rates to drop significantly. From its peak in June, the Baltic Dry Index had dropped by 70% through September. The reported reduction in iron ore shipments from Australia, Brazil, and India indicated low demand for iron ore in the Chinese steel markets, which affected transport rates (Marais, 2008b).

Foreign Trade

In 2008, U.S. net exports of iron ore were 1.9 Mt, which represented 4% of domestic apparent consumption. Exports increased by 20%, while imports decreased slightly compared with 2007 figures. Nearly all U.S. iron ore exports were pellets (10.8 Mt), and 81% of the exports were shipped via the Great Lakes to Canadian steel companies, while 5% was shipped to the Slovak Republic, 3% to Mexico, 2% each to Belgium and France, and the rest to 26 other countries. U.S. imports totaled 9.2 Mt, of which Brazil’s share decreased to 28% from 34% the

previous year and Canada’s share increased to 64% from 59% in 2007 (tables 1, 9–15).

World Industry Structure

Consumption.—Although global iron ore consumption is not measured directly, imports of iron ore and production of crude steel, DRI, and pig iron act as guides to indicate whether consumption rises or falls. DRI and pig iron production tend to be more direct indicators of iron ore consumption than crude steel production because, to a varying degree, part of steel production comes from scrap-consuming minimills in each country. Iron ore net imports cannot be used as a straightforward indicator of a change in iron ore consumption in countries that produce iron ore unless a country’s ore production remains static. World consumption of iron ore was estimated to have decreased as the result of slight decrease in pig iron production compared with 2007 levels. Of the nine countries that had 3% or more of world pig iron production in 2008, four of the countries showed negative growth, including the United States, comparing 2008 production with each country’s average pig iron production from 2004 through 2008. The growth rates for these countries were as follows: China, 120%; Republic of Korea, 9%; India, 5%; Brazil and Japan, 2%; Germany, -3%; Russia and Ukraine, -4%; and the United States, -10%. Of the five leading producing countries of pig iron in 2008, only the Republic of Korea showed an increase in production (5%) from that of 2007—decreases for the other countries were as follows: Japan and China, 1%; Russia, 6%; Ukraine, 7%; and the United States, 13%.

Interest in mine development waned toward the end of 2008 owing to the global economic downturn, as producers waited to see if consumption would continue to be driven by Chinese economic growth. With new iron ore production capacity, world supply of iron ore was expected to be adequate through 2009 unless mine shutdowns were able to bring supply back in line with the new demand scenario.

World crude steel production continued to surpass 1.3 billion metric tons (Gt), but fell slightly from 2007 to 2008. Seven countries produced more than 40 Mt of crude steel and accounted for almost two-thirds of world production in 2008. Of those countries, China produced about 10 Mt more crude steel in 2008 than in 2007. The others (Germany, India, Japan, Republic of Korea, Russia, and the United States) combined produced 11 Mt less crude steel in 2008 than in 2007. Annual world crude steel production, excluding China, decreased by almost 30 Mt in 2008. Between 1999 and 2008, China, Germany, India, Japan, Republic of Korea, Russia, and the United States accounted for more than 65% of combined world crude steel production. China’s 2008 production was 75% greater than its average for the 10-year period, while that of the United States decreased by more than 4% (United Nations Conference on Trade and Development, 2009, p. 118–120).

Production.—World iron ore production of 2.2 Gt, gross weight, surpassed 2007 production by 9%. Annual world production has exceeded 1 Gt, gross weight, since it first reached that level in 1995. Australia’s and Brazil’s combined share of world production by gross weight from 2004 through 2008 averaged 33%. In 2008, iron ore was produced in 44

countries, with production exceeding 1 Mt, gross weight, in 28 of those countries. World DRI production rose to 68.5 Mt, which was slightly more than that of 2007 (Midrex Technologies, Inc., 2009).

Trade.—World iron ore imports of 907 Mt rose by 8% compared with 2007 levels. Following large year-on-year increases in imports for the past 6 years (21% in 2002, 33% in 2003, 40% in 2004, 32% in 2005, 19% in 2006, and 17% in 2007), China posted another sharp rise to 440 Mt in 2008 from 383 Mt in 2007—a gain of almost 15%. Since 2000, four countries have accounted for more than two-thirds of world iron ore imports. Germany's share of imports in that period decreased to 5% from 10%, Japan's share decreased to 16% from 26%, and the Republic of Korea's share decreased to 6% from 8%. China's share more than tripled during this 9-year period to 49% from 14%. Australia's and Brazil's combined share of world iron ore exports increased slightly to 67% in 2008 compared with their share in 2007. Five countries represented more than 85% of world iron ore exports. In decreasing order of market share, Australia held 35%; Brazil, 32%; India, 12%; South Africa, 4%; and Canada, 3% (United Nations Conference on Trade and Development, 2009, p. 99–103).

Mergers and Acquisitions.—In February, BHP Billiton submitted a formal bid of 3.4 of its shares for each share of Rio Tinto. The \$147.4 billion bid was rejected within hours by Rio Tinto, in spite of being a 45% increase over Rio Tinto's value before the original share offer in November. This latest bid came days after the Chinese state-owned Aluminum Corp. of China and Alcoa Inc. bought 12% of Rio Tinto's shares (Ho, Ritchie, and Foster, 2008).

Later in February, Rio Tinto sold its stakes in two U.S. mines—Greens Creek polymetallic mine (AK) and Cortez gold mine (NV). Rio Tinto's share of Greens Creek Mine was sold for \$1.7 billion—a 180% premium over analysts' assessments, indicating that some of Rio Tinto's assets may well have been undervalued (Edwards, 2008; Rio Tinto plc, 2008b).

BHP Billiton reported that it was confident it would receive approval from European Union regulators for the \$160 billion takeover of Rio Tinto (Hinde, 2008). However, in late November, BHP Billiton announced that with the recent drop in commodity prices and a worsening world economic situation, it would no longer pursue its 18-month takeover attempt of Rio Tinto. Thus, a merger that would have linked the world's leading and third-leading mining companies and would have placed more than 70% of the world's seaborne iron ore trade in control of only two companies, came to an abrupt end (BHP Billiton Ltd., 2008a; Matthews, Cimilluca, and Barta, 2008).

World Review

Australia.—BHP Billiton announced full-year production figures for 2007. BHP Billiton's share of salable quantities of iron ore (wet) were as follows (Australia, unless otherwise specified)—Area C Joint Venture (JV) (85% owned), 33.7 Mt; Goldsworthy JV (85% owned), 1.2 Mt; Jimblebar (85% owned), 5.2 Mt; Mt. Newman JV (85% owned), 28.5 Mt; Samarco (Brazil) (50% owned), 9.3 Mt; and Yandi JV (85% owned), 39.7 Mt. BHP Billiton's share of total world mine production was

117.5 Mt, a 14% increase from that of 2007 (BHP Billiton Ltd., 2009a, p.4).

Engineering, procurement, and construction work continued on Rapid Growth Project 4 (RGP4), with initial production from the 26 Mt/yr-ore system expansion expected in the first half of 2010. In November 2008, BHP Billiton approved the commencement of RGP5, which was an expansion of an additional 50 Mt/yr of ore system capacity. RGP5 was expected to have initial production from expanded facilities in the second half of 2011. By yearend 2008, engineering and construction on RGP4 was greater than 95% and 70% complete, respectively, and work had begun on RGP5 (BHP Billiton Ltd., 2009b, p. 3).

Rio Tinto announced full-year production figures for 2008. Rio Tinto's share of salable quantities of iron ore plus pellets were as follows (Australia, unless otherwise specified)—Channar (60% owned), 6.2 Mt; Corumbá (Brazil), 2.0 Mt; Eastern Range, 8.2 Mt; Hamersley, 95.6 Mt; Hope Downs (50% owned), 5.7 Mt; Iron Ore Company of Canada (IOC) (58.7% owned), 9.3 Mt; and Robe River (53% owned), 26.6 Mt. Rio Tinto's share of total world mine production was 153.4 Mt, a 6% increase from that of 2007 (Rio Tinto plc, 2009a, p. 110).

In January, Rio Tinto completed the expansion of its port at Dampier, Western Australia. The \$1.4 billion project raised Dampier's production capacity to 140 Mt/yr from 74 Mt/yr, with the installation of two new ship loaders and a wharf extension that allows four vessels to berth at one time (Metal Bulletin, 2008f). In November, Rio Tinto announced an estimated 10% reduction in iron ore shipments from its Australian operations for 2008 (Rio Tinto plc, 2008c).

In November, Rio Tinto suspended operations at the Channar and Brockman 2 Mines owing to the weakened global iron ore market. In late December, Rio Tinto carried out a planned shutdown of the company's mine and rail operations across the Pilbara region for 2 weeks (Rio Tinto plc, 2009b, p. 2).

In May, East Perth-based Fortescue Metals Group Ltd. (FMG) loaded the first shipment from its Pilbara iron ore project through new port facilities in Western Australia. FMG planned to ship 55 Mt/yr from its iron ore project to Chinese steel mills. The project reportedly has estimated reserves of 1.0 Gt of iron ore (Dixon, 2008).

In February, China-based Sinosteel Corp. was initially unsuccessful in its bid to take over Midwest Corp. Ltd. (West Perth, Western Australia) with its five iron ore development and exploration projects in Western Australia (Midwest Corp. Ltd., 2008), but in July finally did acquire controlling interest of Midwest. Midwest produced about 1 Mt/yr of direct shipping ore from its Koolanooka Mine. In a joint venture with Sinosteel, Midwest expected to start up its Weld Range Mine in early 2011 and ramp up to 15 Mt/yr at full production. Also in joint venture with Sinosteel, Midwest anticipated the development of the Koolanooka magnetite project, which was expected to produce 6 Mt/yr of iron ore (Li, 2008c).

Cape Lambert Iron Ore Ltd. (Leederville, Western Australia) signed a memorandum of understanding with China Metallurgical Group Corp. for the sale of the Cape Lambert iron ore project in the Pilbara Region for A\$400 million. The Cape Lambert project had an estimated resource of 1.6 Gt of iron ore (Cape Lambert Iron Ore Ltd., 2008).

Mount Gibson Iron Ltd. (West Perth, Western Australia) reported that three Chinese customers had defaulted on long-term iron ore contracts. Two other buyers agreed to purchase this material but at a much reduced price. As part of the uptake agreements, APAC Resources Ltd. (a financial company based in Hong Kong) and Shougang Concord International Enterprises Co. Ltd. (China) would become part owners of Mount Gibson with a holding of between 29% and 41%, depending on the final placement of the rights issue the two companies were underwriting (Kelly, 2008).

Bolivia.—Jindal Steel & Power Limited (New Delhi, India) acquired development rights for El Mutún iron ore reserves in Bolivia, South America. Jindal planned to invest \$2.1 billion during the 2009–12 period for mining and construction of an integrated 1.7-Mt steel plant, a 6-Mt sponge iron plant, 10-Mt iron ore pellet plant, and a 450-megawatt powerplant (Jindal Steel & Power Limited, 2008, p. 12).

Brazil.—CVRD announced 2008 production based on consolidated Brazilian generally accepted accounting practices (BR GAAP). CVRD's total iron ore production decreased by 0.5% from 2007 to 2008—the first reduction in annual ore production since 1999. CVRD's share of salable quantities of iron ore was as follows, in decreasing order of tonnage—Southeastern System, 115.4 Mt; Carajás, 96.5 Mt; Southern System, 80.5 Mt; Samarco, 8.3 Mt; and Urucum, 1.0 Mt. CVRD's 2008 pellet production was 44.8 Mt, essentially unchanged from that of 2007. The breakdown of salable quantities of iron ore pellets was as follows, in decreasing order of pellet production—Nibrasco, 8.8 Mt; Samarco, 8.6 Mt; São Luís, 7.0 Mt; Tubarão I and II, 6.1 Mt; Kobrasco, 4.9 Mt; Fábrica, 4.2 Mt; Itabasco, 3.3 Mt; and Hispanobras, 1.9 Mt. Of this pellet production, 30.6 Mt was blast furnace pellets and 14.2 Mt was direct reduction pellets. A large part of pellet production in 2008 was shut down during the fourth quarter owing to reduced global demand and a desire to avoid excessive inventory buildup (Companhia Vale do Rio Doce, 2009, p. 1, 2, 10).

In November, BHP Billiton announced a reduction in pellet production from its Samarco joint venture in Brazil. Samarco planned to shut down two of its three pellet plants from the end of November through mid-January 2009, reducing annual production capacity to about 7.6 Mt from 21.6 Mt (BHP Billiton Ltd., 2008b).

ArcelorMittal planned to invest more than \$1 billion in Brazilian iron ore and port assets. London Mining plc (London, United Kingdom) sold its Brazilian iron ore mine in Minas Gerais State to ArcelorMittal for \$809.9 million. The mine, purchased by London Mining in 2007 for \$89 million and put into production for an additional capital expenditure of \$30 million, was producing 1.4 Mt/yr of iron ore. Investments by ArcelorMittal were expected to bring the mine and sinter feed plant production up to 3.2 Mt/yr by 2009. ArcelorMittal also purchased 80% of Brazilian port facilities owned by Adriana Resources Inc. (Canada) for \$40.5 million, which would allow the company to further expand mine facilities (Metal Bulletin, 2008a).

Canada.—IOC [owned jointly by Labrador Iron Ore Royalty Income Fund (15.1%), Mitsubishi Corporation (26.18%), and

Rio Tinto (58.72%)] produced 3.2 Mt of iron ore concentrates and 12.6 Mt of iron ore pellets. ArcelorMittal Mines Canada (formerly Québec Cartier Mining Company) produced 13.8 Mt of iron ore concentrates. Wabush Mines Ltd. [owned jointly by ArcelorMittal (28.6%), Cliffs (26.8%), and U.S. Steel Canada (44.6%)] produced 4.3 Mt of iron ore pellets. In early March, Cliffs and U.S. Steel withdrew from the proposed sale of Wabush Mines to ArcelorMittal. Later in March, ArcelorMittal brought suit for damages related to the sale. In November, the suit was dismissed (Koch, 2009, p. 10, 25; Rio Tinto plc, 2009a, p. 70; United States Steel Corp., 2009, p. 39).

In March, Rio Tinto approved plans to invest \$475 million to expand capacity at its partially owned IOC facilities to 22 Mt/yr of concentrates. This announcement was followed by approval of additional capital expenditures of \$193 million to expand the magnetite plant capacity to 22.8 Mt/yr and \$75 million for a feasibility study for the expansion of IOC to an annual capacity of 26 Mt of iron ore concentrates. This last expenditure included funds for the purchase of some items requiring long-lead times. IOC placed its \$800 million expansion program in Western Labrador on hold until demand for steel improved (Rio Tinto plc, 2008a, p. 3; Skillings Mining Review, 2008f; Skillings Mining Review, 2009).

Tata Steel Ltd. (Mumbai, India) entered into an agreement to acquire about 20% in New Millennium Capital Corp. (Calgary, Alberta), owner of 80% of the LabMag iron ore project in Newfoundland and Labrador and of 100% of the KéMag iron ore project in Quebec. The New Millennium asset base reportedly includes 9.1 Gt of iron ore resources, part of which was 100 Mt of direct shipping ore in the Quebec project (Skillings Mining Review, 2008g).

China.—In October, China announced discovery of a massive iron ore deposit with greater than 1 Gt of iron ore resources. Chinese geologists indicated the ore block, with a grade of between 26.0% and 31.7% iron, was located between 1,020 meters and 2,200 meters below the surface. The deposit is located near Jining City in Shandong Province (Metal Bulletin, 2008c).

China continued to report new project developments in advance of the upcoming 2009 iron ore price negotiations. The chairman of the Metallurgical Mines Association of China reported 17 projects, each with an annual production capacity of greater than 2 Mt, were planned during the 2009 to 2012 period. The additional combined annual production capacity for these new projects would be greater than 120 Mt of iron ore (Skillings Mining Review, 2008b).

Iran.—Chador Malu Mining and Industrial Co. (Tehran) started commercial production at its new Ardakan pellet plant. Construction of the 3.4-Mt/yr capacity plant north of Yazd began in 2004. Iron ore concentrates for the plant were being supplied by the Chador Malu Mine, which reportedly had reserves of 320 Mt of ore (Metal Bulletin, 2008b).

Mauritania.—ArcelorMittal announced the signing of a memorandum of understanding with Mauritania's Société Nationale Industrielle et Minière to jointly explore, evaluate, and eventually develop the El Agareb iron ore deposit in the northern third of Mauritania. El Agareb was estimated to contain greater than 1 Gt of high-grade magnetite resources.

Preliminary plans called for the development of a 25-Mt/yr mine (ArcelorMittal, 2008b).

Mexico.—ArcelorMittal Lázaro Cárdenas S.A. de C.V. (a fully owned subsidiary of ArcelorMittal) operated three iron ore mines—Peña Colorado, Las Truchas, and El Volcan. El Volcan Mine in northwest Sonora commenced operations in 2008. Ore at El Volcan is crushed and preconcentrated, transported by truck 120 kilometers to the main concentrating facilities, and then railed to the port of Guaymas for shipment to the Lázaro Cárdenas steel plant (ArcelorMittal, 2009, p. 53).

New Zealand.—The Government under New Zealand's Overseas Investment Act 2005 declined the application by Cheung Kong Infrastructure (Hong Kong) for consent to acquire the Taharoa Iron Sands operations from BlueScope Steel Ltd. (Melbourne, Australia) (BlueScope Steel Ltd., 2008).

Sweden.—Luossavaara-Kiirunavaara Aktiebolag (LKAB) (Luleå) increased pellet production to 19.9 Mt from 18.8 Mt in 2007. This pellet production was a major part of the 23.8 Mt of total production, a decrease in total production from 24.7 Mt in 2007. The new concentrating and pelletizing plants at Kiruna were inaugurated, and it was decided to construct new main levels at the Kiruna and Malmberget Mines. LKAB announced Kiruna's proven ore reserves to be 602 Mt at 48.5% iron content, and probable ore reserves of an additional 82 Mt at 46.7% iron content. The company reported Malmberget's proven ore reserves to be 304 Mt at 44.1% iron content, and probable ore reserves of 32 Mt at 44.9% iron content (Luossavaara-Kiirunavaara Aktiebolag, 2009, p. 34, 36, 42).

Ukraine.—Ferroexpo plc (Baar, Switzerland) planned to open its iron ore assets in Ukraine to joint-venture ownership, with a number of resource companies performing due diligence studies in anticipation of a possible investment in operations. Ferroexpo's goal was to sell about 50% of the 3 Gt of 32% iron content resources held in the Yeristovskoye and Belanovskoye deposits. The Yeristovskoye Mine project was the most advanced, with first production planned for 2010 and full production of 28 Mt/yr by 2014. The prefeasibility study for the Belanovskoye deposit was in progress, with production planned to begin in 2015 (Marais, 2008a).

Outlook

It appeared that U.S. production in 2009 would decrease drastically from that of 2008, and indications were that an economic downturn would continue to negatively affect steel and iron ore production into 2010. Most U.S. iron ore production is sold directly to the domestic steel industry, although a large amount of domestic ore is shipped to Canada and small amounts may be exported to other countries. Neither the domestic dependence nor the pattern of exports to Canada is expected to change in the near future, although the countries to which small amounts are exported each year would be expected to change.

Trends in the steel industry are provided in the "Outlook" section in the Iron and Steel chapter of the 2008 USGS Minerals Yearbook, Volume I, Metals and Minerals. The development of projects, using new and existing direct reduction technology being developed in northern Minnesota, can be expected to affect growth of the U.S. iron ore industry within the next few

years, as developments such as Steel Dynamics' Mesabi Nugget project and Essar Steel's Minnesota Iron project come onstream.

International imports of iron ore and production of iron ore and pig iron—key indicators of iron ore consumption—point toward continued dependence by the international iron ore industry on growing Chinese iron ore consumption. China's increasing involvement in overseas projects in Australia and on the African continent through equity participation may well affect the balance of supply and demand for iron ore. Downward price pressures would be anticipated as China acquires its own sources of supply.

With the economic downturn, which started in late 2008 and was expected to continue well into 2009, those companies that had taken advantage of lowering operating costs by investing a portion of their profits in modernization over the previous few years should then be better able to weather the recession. Those iron ore mines producing the most marketable products at the lowest cash operating costs could expect to outperform their higher cost competitors. Steel companies with upstream iron ore-producing facilities would be expected to fair best if the difficult economic times prove to be short term, while those iron ore companies that had focused on reducing costs of mining, pelletizing and other processing, loading, and transport would fare better should the economic downturn prove to be of longer duration.

Producers of iron ore for sale in the domestic and global markets could expect to be affected in a different manner than those that produce for their own downstream facilities. Existing iron ore contracts and terms were expected to become increasingly important as annual contract negotiations between steel producers and iron ore producers could expect to be hard fought. The continued existence of the annual price contract, as it is now structured, remains uncertain. Amidst continual contract squabbles and inability to come to terms, shorter term price contracts, a move toward an iron ore price index, transport and quality premiums, and increased selling on the spot market are alternatives being discussed in an effort to develop a more equitable and stable price-setting structure.

New developments and growth of DRI technology would allow the iron ore industry to become a major supplier to both the integrated steel plants, as well as, an expanding minimill sector of the U.S. steel industry. Coastal U.S. steel producers already rely on imported DRI to supply a quality raw-material input to help meet minimum steel alloy purity specifications, which cannot be obtained using only traditional scrap. But 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. Although no new "greenfield" pig iron facilities have been built in the United States in the past 30 years, and owing in part to the continued slow growth in the DRI market, the blast furnace, despite being considered aging technology, is expected to remain the mainstay of the iron and steel industry in the immediate future.

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TABLE 1
SALIENT IRON ORE STATISTICS¹

(Thousand metric tons and thousand dollars unless otherwise specified)

	2004	2005	2006	2007	2008	
United States, iron ore, usable, less than 5% manganese: ²						
Production	54,700	54,300	52,700	52,500	53,600	
Shipments:						
Quantity	54,900	53,200	52,700	50,900	53,500	
Value	2,080,000	2,370,000	2,840,000	3,040,000	3,770,000	
Average value at mines	dollars per metric ton	37.92	44.50	53.88	59.64	70.43
Exports:						
Quantity	8,400	11,800	8,270	9,310 ^r	11,100	
Value	334,000	584,000	636,000	718,000 ^r	1,240,000	
Imports for consumption:						
Quantity	11,800	13,000	11,500	9,400	9,250	
Value	371,000	532,000	611,000	543,000	918,000	
Consumption, iron ore and agglomerates	64,500	60,100	58,200	54,700 ^r	51,900	
Stocks, December 31:						
At mines, plants and loading docks ³	3,930	2,040	1,650 ⁴	2,090 ⁴	4,070 ⁴	
At receiving docks ⁵	(6)	(6)	(6)	(6)	(6)	
At consuming plants	(6)	(6)	(6)	(6)	(6)	
Total ⁷	(6)	(6)	(6)	(6)	(6)	
Additional stocks, December 31:						
Crude ore at mines and plants	496	915	1,140 ⁴	749 ⁴	947 ⁴	
Unagglomerated concentrates for pelletizing plants	1,820	1,870	1,260	1,550	1,320	
World, production ⁸	1,360,000 ^r	1,550,000 ^r	1,840,000 ^r	2,040,000 ^r	2,220,000	

^rRevised.

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

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

³Excludes byproduct ore.

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

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

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

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

⁸Gross 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 2008, BY DISTRICT AND STATE¹

District and State	Average number of employees	Worker hours (thousands)	Production				Average quantity per worker hour (metric tons)		
			Crude ore (thousand metric tons)	Usable ore (thousand metric tons)	Iron contained in usable ore (thousand metric tons)	Iron content (percent)	Crude ore	Usable ore	Iron contained
Lake Superior:									
Michigan ²	1,360	3,130	33,400	12,400	7,530	60.6	10.66	3.97	2.40
Minnesota	3,330	6,970	140,000	41,100	26,200	63.8	20.03	5.90	3.76
Total or average	4,700	10,100	173,000	53,500	33,800	63.1	17.13	5.30	3.34
Other States ³	74	159	17	17	9	54.0	0.11	0.11	0.06
Grand total or average	4,770	10,300	173,000	53,600	33,800	63.0	16.86	5.22	3.29

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

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

³Includes California and South Dakota.

TABLE 3
CRUDE IRON ORE MINED IN THE UNITED STATES IN 2008, 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	33,400	--	33,400
Minnesota	6	140,000	--	140,000
Total	8	173,000	--	173,000
Other States	4	17	--	17
Grand total	12	173,000	--	173,000

-- Zero.

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

²Data 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 2008, 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	9	--	--	12,400	12,400
Minnesota	--	45	88	41,000	41,100
Total	9	45	88	53,400	53,500
Other States ⁴	--	17	--	--	17
Grand total	9	62	88	53,400	53,600

-- Zero.

¹Excludes ore containing 5% or more manganese.

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

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

⁴Includes California and South Dakota.

TABLE 5
SHIPMENTS OF USABLE IRON ORE FROM MINES IN THE UNITED STATES IN 2008^{1,2}

District and State	Gross weight of ore shipped (thousand metric tons)					Average iron content, natural (percent)	Value (thousands)
	Direct shipping ore	Concentrates	Sinter	Other agglomerates	Total		
Lake Superior:							
Michigan	9	--	--	12,400 ³	12,400 ³	60.6	W
Minnesota	--	45	61	41,000	41,100	63.8	W
Total reportable or average	9	45	61	53,400	53,500	63.1	\$3,770,000
Other States ⁴	--	17	--	--	17	54.0	829
Grand total or average	9	61	61	53,400	53,500	63.0	3,770,000

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

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

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

³Source reported to Securities and Exchange Commission.

⁴Includes California and South Dakota.

TABLE 6
IRON ORE-PRODUCING MINES IN THE UNITED STATES IN 2008

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.

Do., do. Ditto.

TABLE 7
CONSUMPTION OF IRON ORE AT U.S. IRON
AND STEEL PLANTS, BY TYPE OF PRODUCT¹

(Thousand metric tons)

Type of product	2007	2008
Blast furnaces:		
Direct-shipping ore	--	--
Pellets	46,300 ¹	43,800
Sinter ²	6,830 ¹	6,380
Total	53,100 ¹	50,200
Steelmaking furnaces:		
Direct-shipping ore	499	465
Sinter ²	86	118
Total	585	583
Grand total	53,700 ¹	50,700

¹Revised. -- Zero.

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

²Includes briquettes, nodules, and other.

Source: American Iron and Steel Institute.

TABLE 8
U.S. CONSUMPTION OF IRON ORE FOR
DIRECT-REDUCED IRON AND NONSTEEL END USES^{1,2}

(Thousand metric tons)

Year	Direct-reduced		Total
	iron for steelmaking ³	Nonsteel end uses ⁴	
2004	270	794	1,060
2005	330	928	1,260
2006	360	867	1,230
2007	375	699 ^r	1,070
2008	390	734	1,120

^rRevised.

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

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

³U.S. Geological Survey estimates based on production reports compiled by Midrex Corp.

⁴An 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	2007		2008	
	Quantity	Value	Quantity	Value
Algeria	570	\$25,100	80	\$7,690
Belgium	--	58	218	20,900
Canada	7,350	597,000	9,060	1,020,000
China	1,130	78,000	91	7,210
Colombia	7	1,060	12	946
Czech Republic	--	--	83	7,930
France	--	--	210	20,100
Germany	--	--	156	14,900
Japan	7	214	--	--
Malaysia	--	--	25	499
Mexico	148	13,500	328	43,200
Peru	5	134	(3)	20
Poland	--	--	103	9,890
Romania	87	3,820	129	12,400
Serbia	--	--	51	7,850
Slovakia	--	--	505	61,700
Spain	--	--	103	9,770
Trinidad and Tobago	3	294	5	367
Other ⁴	6 ^r	501 ^r	13	1,530
Total	9,310	719,000	11,200	1,250,000

^rRevised. -- Zero.

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

²Includes agglomerates.

³Less than ½ unit.

⁴Includes all countries with less than 5,000 metric tons of exports from the United States. This represents 17 countries in 2007 and 13 countries in 2008.

Source: U.S. Census Bureau.

TABLE 10
U.S. EXPORTS OF IRON ORE, BY TYPE OF PRODUCT^{1,2}

Type of product	2007			2008		
	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	51	\$4,670	92.25	142	\$13,000	91.24
Coarse ores	6	449	78.85	45	1,160	25.63
Fine ores	51	2,380	46.87	158	13,200	91.91
Pellets	9,170	709,000	77.28	10,800	1,220,000	112.64
Briquettes	1	85	65.59	(⁵)	4	79.15
Other agglomerates	22	2,270	105.29	19	1,100	13.37
Roasted pyrites	11	986	92.16	1	102	90.66
Total	9,310	719,000	77.26	11,200	1,250,000	111.59

¹Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

²Includes agglomerates.

³Unit values shown are calculated from unrounded data.

⁴Weighted average calculated from unrounded data by dividing total value by total tonnage.

⁵Less than ½ unit.

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	2007			2008		
	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)
Country:						
Bosnia-Herzegovina	--	--	--	23	\$1,570	68.43
Brazil	3,210	\$183,000	57.13	2,620	216,000	82.45
Canada	5,520	326,000	59.08	5,900	645,000	109.35
Chile	279	15,700	56.17	215	16,800	78.25
China	--	--	--	14	266	19.00
Finland	8	385	46.87	6	233	38.83
Mexico	35	1,630	46.49	52	4,290	82.56
Norway	8	365	45.63	--	--	--
Peru	140	4,160	29.78	59	3,100	52.59
Russia	--	--	--	127	16,000	126.06
Sweden	141	8,960	63.33	88	4,540	51.59
Switzerland	--	--	--	70	5,410	77.29
Venezuela	58	2,580	44.94	68	4,210	61.85
Other ⁵	(6)	35	257.22	4	185	98.92
Total	9,400	543,000	57.81	9,250	918,000	99.26
Type of product:						
Concentrates	1,280	57,500	44.91	1,250	92,200	73.79
Coarse ores	176	10,800	61.57	48	1,970	41.10
Fine ores	1,790	83,900	46.79	1,980	149,000	75.59
Pellets	6,050	387,000	63.90	5,960	674,000	113.03
Briquettes	--	--	--	1	97	97.00
Other agglomerates	87	3,930	45.04	--	--	--
Roasted pyrites	10	511	47.65	12	537	44.75
Total	9,400	543,000	57.81	9,250	918,000	99.26

-- Zero.

¹Data are rounded to no more than three significant digits, except unit value; may not add to totals shown.

²Includes agglomerates.

³Unit values shown are calculated from unrounded data.

⁴Weighted average calculated from unrounded data by dividing total value by total tonnage.

⁵Includes all countries with less than 5,000 metric tons of imports to the United States. This represents three countries in 2007 and four countries in 2008.

⁶Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 12
U.S. IMPORTS OF IRON ORE IN 2008, 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
Bosnia-Herzegovina	--	--	--	23	--	--	23
Brazil	385	--	1,620	616	--	--	2,620
Canada	469	--	194	5,240	--	--	5,900
Chile	215	--	--	--	--	--	215
China	--	--	14	--	--	(3)	14
Finland	--	--	--	--	--	6	6
Mexico	52	--	--	--	--	--	52
Peru	--	--	36	18	--	5	59
Russia	127	--	--	--	--	--	127
Sweden	--	48	41	--	--	--	89
Switzerland	--	--	70	--	--	--	70
Venezuela	--	--	--	68	--	--	68
Other ⁴	--	(3)	2	--	1	1	4
Total	1,250	48	1,980	5,960	1	12	9,250

-- Zero.

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

²Includes agglomerates.

³Less than ½ unit.

⁴Includes all countries with less than 5,000 metric tons of imports to the United States. This represents four countries.

Source: U.S. Census Bureau.

TABLE 13
AVERAGE UNIT VALUE FOR SELECTED IMPORTS OF IRON ORE IN 2008¹

Type of product	Country of origin	Average unit value ² (dollars per metric ton, gross weight)
Concentrates	Brazil	70.10
Do.	Canada	59.81
Do.	Chile	78.25
Fine ores	Brazil	76.30
Do.	Canada	79.22
Do.	Peru	59.11
Pellets	Brazil	106.50
Do.	Canada	114.91
Do. Ditto.		

¹Includes agglomerates.

²Weighted 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)

Customs district	2007		2008	
	Quantity	Value	Quantity	Value
Baltimore, MD	3,130	\$191,000	3,590	\$338,000
Charleston, SC	--	170	28	647
Chicago, IL	1,330	59,600	1,160	81,600
Cleveland, OH	3,120	178,000	3,160	384,000
Houston, TX	65	4,490	51	5,870
Minneapolis, MN	--	--	103	9,660
Mobile, AL	33	528	74	4,570
New Orleans, LA	1,610	102,000	1,020	91,400
Nogales, AZ	16	403	--	--
Norfolk, VA	--	--	10	649
Ogdensburg, NY	--	--	12	223
Philadelphia, PA	8	385	6	249
Port Arthur, TX	71	4,030	--	--
Providence, RI	8	365	--	--
Tampa, FL	13	1,520	24	1,490
Other ³	4	165	3	75
Total	9,400	543,000	9,250	918,000

-- Zero.

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

²Includes agglomerates.

³Includes all customs districts with less than 5,000 metric tons of imports into the United States. This represents seven customs districts in 2007 and three customs districts in 2008.

Source: U.S. Census Bureau.

TABLE 15
U.S. IMPORTS OF PELLETS, BY COUNTRY¹

(Thousand metric tons and thousand dollars)

Country	2007		2008	
	Quantity	Value	Quantity	Value
Bosnia-Herzegovina	--	--	23	\$1,570
Brazil	1,260	\$85,700	616	65,600
Canada	4,680	295,000	5,240	602,000
Mexico	19	1,220	--	--
Peru	9	404	18	736
Sweden	24	1,870	--	--
Venezuela	58	2,590	68	4,210
Total	6,050	387,000	5,960	674,000

-- Zero.

¹Data 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 MARKET¹

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

Country and producer	Ore types	April 1–March 31	
		Fiscal year 2007	Fiscal year 2008
Australia:			
Hamersley Iron Proprietary Limited and Mount Newman Mining Company			
Proprietary Limited ²	Lump ore	102.64	201.69
Do ²	Fines	80.42	144.66
Robe River Iron Associates ²	do.	64.10	115.30
BHP Billiton (Yandi) ²	do.	80.42	144.66
Brazil:			
Companhia Nipo-Brasileira de Pelotizacao (Nibrasco) ²	Pellets ³	114.42	213.59
Companhia Vale do Rio Doce (Carajás) ²	Fines	73.20	125.17
Companhia Vale do Rio Doce (Itabira)	do.	72.11	118.98 ²
Minerações Brasileiras Reunidas Societe Anonyme	Lump ore	97.26	181.78
Do.	Fines	74.69	NA
Samarco Mineracão Societe Anonyme	Pellets ³	112.66 ^r	213.59 ⁴
Canada, Iron Ore Company of Canada (Carol Lake)	Concentrates	71.06	NA
Chile:			
Minera del Pacifico Societe Anonyme (Huasco)	Pellets	104.99	NA
Minera del Pacifico Societe Anonyme (El Romeral)	Fines	56.76	NA
India:			
Minerals and Metals Trading Corporation (Bailadila)	Lump ore	101.11	198.68
Do.	Fines	78.45	141.12
Peru, Shougang Hierro Peru S.A.A.	Pellet feed	56.04	NA
South Africa:			
Kumba Resources Limited (Iscor)	Lump ore	84.42 ²	NA
Assmang Limited	do.	83.42 ²	NA
Do.	Fines	60.07 ²	NA

^rRevised. Do., do. Ditto. NA Not available.

¹Free on board shipping port basis.

²Cents per dry metric ton unit.

³Ore types in 2007 was listed as pellet feed.

⁴Blast furnace grade pellets.

Source: Trust Fund Project on Iron Ore Information, The Iron Ore Market 2008–2010.

TABLE 17
IRON ORE: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons)

Country ⁵	Gross weight ³					Metal content ⁴				
	2004	2005	2006	2007	2008 ^c	2004	2005	2006	2007	2008 ^c
Algeria	1,554	1,579	2,340	1,982	2,077 ⁶	780 ^e	800 ^e	1,180	1,000 ^e	1,050 ⁶
Australia	234,000 ^r	262,000 ^r	275,000 ^r	299,000 ^r	342,000 ⁶	145,000 ^r	163,000 ^r	171,000 ^r	194,000 ^r	209,000 ⁶
Austria ^c	1,889 ^r	2,048 ^r	2,092 ^r	2,153 ^r	2,100	627 ^{r,e}	679 ^{r,e}	694 ^{r,e}	714 ^{r,e}	690
Azerbaijan	19	7	11	17	17	10 ^e	4 ^e	6 ^e	9 ^e	9
Bosnia and Herzegovina	281	3,177	3,440	2,944 ^r	2,950	140 ^r	1,500	1,450 ^r	1,240 ^r	1,240
Brazil	261,696	281,462	317,800	354,674	355,000 ^p	173,752	186,891 ^r	211,020 ^r	233,700 ^r	236,000 ^p
Bulgaria	83	--	--	--	--	27	--	--	--	--
Canada ⁷	28,596	30,387	33,543	32,744 ^r	31,273 ^{p,6}	17,801	19,333	21,341	20,800 ^r	19,700
Chile	8,003	7,862	8,628	8,818	9,316 ⁶	4,850	4,707	5,235	5,379 ^r	5,670 ⁶
China ^{e,8}	320,000	420,000	601,000	707,000	824,000	105,000	138,000	198,000	233,000	270,000
Colombia	587	608	644	624	600	316 ^r	325 ^{r,e}	351 ^r	350 ^r	300
Egypt ^c	2,287 ^{r,6}	1,590 ^r	1,600 ^r	2,185 ^r	1,811 ⁶	1,200	800 ^r	800 ^r	1,100 ^r	910
Germany ⁹	412	362	412	422 ^r	422	43 ^r	38	44	44 ^r	45
Greece ^{e,10}	1,500	1,500	1,500	1,500	1,500	575	575	575	575	575
Guatemala	3	11	7	-- ^r	--	2	8	5	-- ^r	--
India	120,600 ⁶	152,000 ^r	181,000 ^r	202,000 ^r	220,000	77,200 ⁶	97,500 ^r	117,000 ^r	129,000 ^r	142,000
Indonesia	90	32	88 ^r	61 ^r	65	51 ^e	18	50 ^r	35 ^r	37
Iran ¹¹	18,205	19,000 ^e	26,244	31,538	32,000	8,900	9,000 ^e	13,000 ^e	15,000 ^e	15,000
Kazakhstan	20,403	19,471	22,263	23,834	22,700	11,600	11,100	12,700	13,600	13,000
Kenya	1	(12)	(12) ^e	(12) ^e	(12)	(12)	(12)	(12) ^e	(12) ^e	(12)
Korea, North ^c	4,580	5,000	5,040	5,130	5,000	1,300	1,400	1,400	1,400	1,400
Korea, Republic of	226	213	227	291	300	127	119	155	163 ^r	168
Macedonia ^c	10	10	10	-- ^r	-- ⁶	6	6	6	-- ^r	-- ⁶
Malaysia	664	950	667	802 ^r	800	378 ^r	541 ^r	380 ^r	457 ^r	456
Mauritania	10,505 ^r	11,133 ^r	10,658	11,817 ^r	10,950 ⁶	6,900	7,240 ^r	7,250 ^r	7,700 ^r	7,118 ⁶
Mexico ¹³	11,483	11,687	10,983	10,916 ^r	11,688 ^{p,6}	6,890	7,012	6,590	6,550 ^r	7,013 ^{p,6}
Mongolia	33	168	180	265	1,387 ⁶	21	109	116	170	888 ⁶
Morocco ^c	10 ⁶	10	10	10	10	5	5	5	5	5
New Zealand ¹⁴	2,329	2,270	2,146	1,723 ^r	1,800	1,320 ^{r,e}	1,260 ^{r,e}	1,220 ^{r,e}	982 ^{r,e}	1,030
Nigeria ^c	--	60	88 ^{r,6}	58 ^{r,6}	62 ^{p,6}	--	22	32 ^r	21 ^{r,6}	23
Norway	600	620	620	620 ^e	620	408	420	420	400 ^e	400
Pakistan ¹⁵	50	50	130 ^r	207	250	25	25	65 ^r	104	125
Peru	6,439	6,810	7,250	7,740	7,825 ⁶	4,315	4,565	4,861	5,185	5,244 ⁶
Portugal ^{e,16}	14	14	14	14	--	10	10	10	10	--
Romania	275	265	123 ^r	45 ^r	40	74	69	40 ^r	11 ^r	10
Russia	96,980	96,764	102,000	105,000	99,900 ⁶	56,200 ^e	56,100 ^e	59,100 ^e	60,800 ^e	57,800
Slovakia	653 ^r	534 ^r	583 ^r	570 ^r	392	222 ^r	182 ^r	198 ^r	194 ^r	133
South Africa ¹⁷	39,322	39,542	41,326	42,082 ^r	48,983 ^{p,6}	24,800 ^e	25,000 ^e	26,100 ^e	26,600 ^e	31,000
Sweden ^c	22,300	23,300	23,300	24,700	23,800	14,700	15,300	15,000	16,000	15,400
Thailand	136	231	264	1,555	1,550	68 ^e	116	132 ^e	892	890
Tunisia	256	206	214	180 ^r	200	134 ^e	108 ^e	112 ^e	94 ^r	104
Turkey	4,120 ^r	4,598	3,785 ^r	4,849 ^r	4,700	2,200 ^r	2,450	2,000 ^{r,e}	2,600 ^r	2,500
Ukraine	65,550	68,570	74,000	77,900	72,700	36,000 ^e	37,700 ^e	40,700 ^e	42,800 ^e	39,900
United Kingdom ^c	1	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)	(12)
United States	54,700	54,300	52,700	52,500	53,600 ⁶	34,500	34,200	33,300	33,100	33,800 ⁶
Venezuela ^e	19,196 ⁶	21,200 ^r	22,100 ^r	20,700 ^r	20,700	12,669 ⁶	14,000 ^r	14,500 ^r	13,600 ^e	13,600

See footnotes at end of table.

TABLE 17—Continued
 IRON ORE: WORLD PRODUCTION, BY COUNTRY^{1,2}

(Thousand metric tons)

Country ⁵	Gross weight ³					Metal content ⁴				
	2004	2005	2006	2007	2008 ^c	2004	2005	2006	2007	2008 ^c
Vietnam	990 ^e	1,009	1,020	1,060 ^e	1,000	495 ^e	505	510	530 ^e	530
Zimbabwe ^e	283	377	104	100 ^e	50	154 ^e	200 ^e	52 ^e	50 ^e	25
Total	1,360,000 ^f	1,550,000 ^f	1,840,000 ^f	2,040,000 ^f	2,220,000	752,000 ^f	843,000 ^f	969,000 ^f	1,070,000 ^f	1,130,000

^eEstimated. ^pPreliminary. ^rRevised. -- Zero.

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

²Table includes data available through July 8, 2009.

³Insofar 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.

⁴Data 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.

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

⁶Reported figure.

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

⁸China'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.

⁹Iron 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.

¹⁰Nickeliferous iron ore.

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

¹²Less than ½ unit.

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

¹⁴Concentrates from titaniferous magnetite beach sands.

¹⁵Pakistan iron ore is based on a July-to-July fiscal year and 50% of production is used from each reported year.

¹⁶Includes manganiferous iron ore.

¹⁷Includes magnetite ore as follows, in thousand metric tons: 2004—2,893; 2005—2,957; 2006—3,830; 2007—3,781; and 2008—3,987.

TABLE 18
 IRON ORE: WORLD PELLETIZING CAPACITY,
 BY CONTINENT AND COUNTRY IN 2008¹

	Rated capacity, gross weight (million metric tons)
North America:	
Canada	27.5
Mexico	15.0 ^e
United States	56.6
Total	99.1
South America:	
Brazil	56.0 ^e
Chile	5.7
Peru	3.5
Venezuela	11.8 ^e
Total	77.0
Europe and Central Eurasia:	
Kazakhstan	8.4 ^e
Netherlands	4.4 ^e
Russia	31.4 ^e
Slovakia	0.4
Sweden	21.0
Turkey	1.5
Ukraine	33.5 ^e
Total	100.6
Asia:	
Bahrain	4.0
China	45.0 ^e
India	18.3 ^e
Iran	12.3 ^e
Japan	3.0
Total	82.6
Oceania, Australia	4.3
Grand total	363.6

^eEstimated.

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

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

