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Copper

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In the United States, mine production of recoverable copper in 2007 declined by about 28,000 metric tons (t) to 1.17 million metric tons (Mt). Production increases, owing to startup or expansion of concentrate production at several mines in Arizona, were more than offset by reduced leach-electrowon production in Arizona and New Mexico and lower concentrate production in Utah. U.S. smelter production rose by about 116,000 t (23%) from that in 2006, in large part because of continual operation at the three operating smelters, all of which had experienced temporary closures during 2006. Downstream primary electrolytic refinery production rose by 89,000 t (13%) as increased availability of domestic anode overshadowed a decline in imported blister/anode. Total refinery production only rose by about 60,000 t owing to lower electrowon production. Electrowon production of refined copper from the leaching of copper ores, which declined for the sixth consecutive year, fell by 26,000 t and accounted for 43% of mine output and 38% of refined copper production. U.S. reported consumption of refined copper rose slightly despite lower apparent demand for semifabricates, primarily owing to increased domestic shipments and a sharp drop in imports of wire rod.

Global mine production of copper in 2007 rose by about 400,000 t. Because of continued production shortfalls in Chile, Indonesia, and Mexico, however, the growth in global mine production fell short of the growth in mine capacity, and mine capacity utilization declined for the sixth consecutive year. The United States accounted for about 8% of world copper mine production and fell to third ranked behind Peru, also with 8%, among copper-producing countries. Chile was the leading world mined copper producer and accounted for 36% of global mined copper production. Increases in global smelter and refinery production of 1.6% and 4.3%, respectively, were owing to increases in primary and secondary production. The United States rose to sixth place from ninth place, moving ahead of Canada, Germany, and Poland, in world smelter production and remained fourth in refinery output behind Chile, China, and Japan, in descending order of output.

According to data compiled by the International Copper Study Group (ICSG) (2008a, p. 19–20), global consumption of refined copper rose by about 700,000 t (4%) almost exclusively owing to apparent consumption growth in China. Apparent consumption in China, which had declined slightly during 2006 after having risen by more than 95% during the preceding 5 years, rose by about 950,000 t (26%). China accounted for an ever-increasing market share of almost 26% of global refined copper consumption, up from 21% in 2006. However, changes in unreported inventories held by industry and China's State Reserve Bureau may have distorted year-on-year measurement of apparent consumption growth.

Global production of refined copper exceeded consumption, and global inventories of refined copper rose by 300,000 t, up from an increase of 265,000 t in 2006 (International Copper Study Group, 2008a, p. 9). Total reported yearend inventories of 1.4 Mt represented only about 4 weeks of copper usage, well below the 2 Mt or almost 7 weeks of supply held at the end of 2002. Despite the inventory increase, copper prices continued their 5-year upward trend and the COMEX division of the New York Mercantile Exchange spot price reached a new record-high annual average value of $3.22 per pound of copper, ranging between $2.40 and $3.75 per pound during the year.

The principal mining States for copper, which in descending order of production were Arizona, Utah, New Mexico, Nevada, and Montana, accounted for 99% of domestic production; copper was also recovered at mines in Idaho and Missouri. Although copper was recovered at 27 mines that operated in the United States, 17 mines accounted for more than 99% of production. The remaining mines were either small leach operations or byproduct producers of copper in concentrates.

In 2007, copper recovered from refined or remelted scrap (about 83% from new scrap and 17% from old scrap) composed 30% of the total U.S. copper supply. The conversion of old scrap to alloys and refined copper rose slightly to 157,000 t of recoverable copper. Copper was consumed as refined copper and as direct melt scrap at about 30 brass mills, 16 wire-rod mills, and 500 chemical plants, foundries, and miscellaneous operations.

Legislation and Government Programs

In January, the U.S. Environmental Protection Agency (EPA) issued final national emission standards for hazardous air pollutants (NESHAP) for primary and secondary copper smelters. The EPA concluded that, for primary copper smelters that use continuous copper smelting, existing emission control devices and work practices represented the generally available control technology (GACT). The EPA developed GACT standards for smelters using batch-converting based on one operation that the agency determined was effectively controlling hazardous air pollutants. For secondary copper smelters, the proposed NESHAP was for new area sources, as there were no existing sources in this category (U.S. Environmental Protection Agency, 2007).

In April, the U.S. Mint adopted a final rule, after public review and comment of a December 2006 interim rule, that prohibited the exportation, melting, and treatment of 1- and 5-cent coins. The purpose was to ensure that sufficient quantities of these coins remained in circulation to meet the needs of the United States and was made necessary by the runup in

metal prices, which resulted in the metal values of these coins exceeding their respective face values. The regulations included several exceptions for small lot values, including coins, used for "legitimate" numismatic purposes, coins carried in the personal effects of an individual leaving the United States, and coins entrained in the recycling of other materials. In October, the U.S. Mint published an amendment to correct a deficiency in the timing of the April rule (U.S. Department of the Treasury, 2007a, b). The 5-cent coin contains 75% copper and 25% nickel, and the 1-cent coin contains 2.5% copper and 97.5% zinc.

The U.S. Department of Defense awarded funding to the Copper Development Association, Inc. for two studies to determine the antimicrobial effectiveness of copper. One study was to focus on the ability of copper metal to kill pathogens on touch surfaces in hospital facilities in New York, NY, and Charleston, SC, and the other was to focus on the effectiveness of copper components in heating, ventilation, and air-conditioning systems (HVAC) at several military installations. The studies were to be carried out under the aegis of the Telemedicine and Advanced Technology Research Center, a section of the U.S. Department of the Army Medical Research and Materiel Command, and were aimed at reducing the incidence of hospital-acquired infections and reducing the spread of harmful microbes through HVAC systems (Copper Development Association, Inc., 2007).

Production

Domestic mine production declined by about 28,000 t owing to lower output from mines in Utah and New Mexico, but the value of the production rose slightly to about $8.5 billion. Capacity utilization remained low owing to startup problems at some new mines and the preferential mining of high-molybdenum ore by at least one producer. Downstream copper smelter production rose by 23% from the extremely low level of 2006, a year in which all three of the operating smelters experienced temporary shutdowns. Refinery production rose by about 5%, despite a 26,000-t drop in electrowon production owing to increased anode availability. Four primary electrolytic refineries and 14 solvent extraction-electrowinning (SX-EW) facilities operated during 2007.

Company Reviews.—Asarco LLC (formerly ASARCO Incorporated) continued to operate under chapter 11 reorganization protection throughout 2007. In July, the U.S. Bankruptcy Court granted the seventh extension since 2005 to Asarco's exclusivity period, the period during which Asarco alone could file a reorganization plan, and in November, the court extended it yet again (Barry, 2007c). This extension followed a U.S. Bankruptcy Court approval of a new collective bargaining agreement between Asarco and its labor force that had been reached in January (Barry, 2007a). In November, the U.S. Bankruptcy Court rejected a bid by Grupo Mexico SA de SV (Mexico City, Mexico), the disputed owner of Asarco, to reassert control over Asarco, and at yearend, a variety of interests, including private equity groups, were seeking to acquire the remaining active operations of Asarco (Lerner, 2007).

Copper production from BHP Billiton's (Melbourne, Australia, and London, United Kingdom) residual Arizona leach operations at Miami and Pinto Valley continued to decline, falling to 7,300 t in 2007 from 7,700 t in 2006. In January, a "restart project" for resumption of sulfide mining was approved, and in October, the first concentrate was produced. By yearend, Pinto Valley had produced 5,200 t of recoverable copper in concentrate. Reserves were projected to support mining for 4 years (BHP Billiton, 2007, p. 2; 2008a, p. 30; 2008b, p. 9). Resolution Copper Co. [55% Rio Tinto plc (London) and 45% BHP Billiton] continued with development work and resource definition of the Resolution copper sulfide deposit located more than 2,100 meters below the surface and beneath BHP Billiton's shuttered Magma Mine, with the goal of producing a prefeasibility report by 2012 (Rio Tinto plc, 2008b).

Output at Constellation Copper Corp.'s (Denver, CO) Lisbon Valley Mine in Utah, which began production in November 2006, remained well below planned capacity throughout 2007. Despite several significant initiatives, leach recovery rates remained below expectation. At the end of November, Constellation announced that it would cease mining in early 2008 after extracting the remaining 800,000 t of exposed ore and convert to a leach-only operation. The company planned to continue to leach the approximately 18,000 t of recoverable copper inventory in the leach pile during a 1- to 3-year period (Constellation Copper Corp., 2007).

Mercator Minerals Ltd. (Kingman, AZ, and Vancouver, British Columbia, Canada) reportedly was on track for startup of its phase I 23,000-metric-ton-per-day (t/d) copper-molybdenum mill during the second quarter of 2008. By yearend, all major equipment had been purchased. SX-EW production rose in 2007 owing to benefits of the expansion project to 5,000 t from 4,300 t in 2006 (Mercator Minerals Ltd., 2008).

Mines Management, Inc. (Spokane, WA) was proceeding with development activities at its Montanore silver-copper project in northwestern Montana. By yearend, the company had completed testing of a new water treatment plant necessary for dewatering the Libby Adit [previously developed by Noranda Minerals Corp. (now owned by Xstrata plc)] in advance of further exploration and deposit delineation. The Montanore Project hosts one of the world's largest silver-copper deposits, with estimated resources containing more than 7 million kilograms of silver and nearly 900,000 t of copper. The project had already undergone extensive engineering and was designed with an initial production capacity of approximately 12,500 t/d of ore and an estimated annual production of about 250,000 kilograms of silver and 27,000 t of copper (Mines Management, Inc., 2008).

Nord Resources Corp. (Dragoon, AZ) continued working toward the reopening of its Johnson Camp Mine located in southern Arizona, which last produced in August 2003. In January 2008, the company reported harvesting its first electrowon cathodes from its residual leach operations and it projected production to reach 11,300 metric tons per year (t/yr) following restart of mining later in the year. Reserves estimates were more than doubled to 66.6 Mt of ore containing 170,000 t of recoverable copper based on a copper price of $1.50 per pound (Nord Resources Corp., 2007, 2008).

In March 2008, Copper Mesa Mining Corp. (formerly Ascendant Copper Corp.) a Canadian mineral exploration and development company with headquarters in Lakewood,

CO, acquired the assets of St. Geneviève Resources Ltd. (Montreal, Quebec, Canada), including two past producing mines in Arizona—Emerald Isle and Zonia. A prefeasibility study, targeted for completion during the first half of 2009, was in progress on the Zonia Mine copper project. The company expected to have all the necessary permit applications submitted to construct an open pit mine and an SX-EW processing complex that could produce an average of 9,000 t/yr of copper, with startup expected by the end of the second quarter of 2009. The company also intended to perform a detailed evaluation of the economics of returning the Emerald Isle copper mine to production. The property contained indicated resources of 2.1 Mt grading 0.625% copper and containing 12,500 t of copper (Copper Mesa Mining Corp., undated).

On March 19, Freeport McMoRan Copper & Gold Inc. (FCX) (New Orleans, LA), operator of the Grasberg Mine in Indonesia, reported that it had completed acquiring Phelps Dodge Corp. for $26 billion. Phelps Dodge shareholders received $88 in cash and 0.67 share of FCX's common stock per share of Phelps Dodge common stock or the equivalent of $128.68 per share. The administrative offices of the merged company remained in New Orleans while the operations headquarters moved to Phoenix, AZ. In 2007, FCX reported copper production (including preacquisition totals) of 1.47 Mt, excluding minority participant share of production, from its worldwide operations, compared with 1.41 Mt in 2006. U.S. production by FCX in 2007, including minority participation in the Morenci Mine, was 645,000 t of copper, up slightly from the 639,000 t produced in 2006. Production costs at FCX's U.S. mines continued their upward trend, rising to $0.98 per pound of copper during the fourth quarter of 2007 from $0.78 during the fourth quarter of 2006 and averaging $0.86 per pound for 2007 compared with $0.61 for 2006 (Freeport McMoRan Copper & Gold Inc., 2007, 2008, p. 23).

Production of recoverable copper at the Morenci Mine complex in Arizona of 358,000 t was down by about 3,000 t from that in 2006. During the third quarter, Morenci began production of copper and molybdenum concentrates from its recommissioned 49,000-t/d concentrator and correspondingly commissioned a new concentrate leach, direct electrowinning facility using proprietary medium-temperature pressure leaching. At yearend, the mill reportedly was operating at near capacity, while the concentrate leach operation continued to ramp up to full production capacity (Freeport McMoRan Copper & Gold Inc., 2008, p. 3).

Production FCX's Bagdad Mine in Arizona rose to 91,600 t of recoverable copper (concentrate and electrowon) from 74,000 t in 2006. At yearend, the high-temperature concentrate leach plant was closed, and plans were announced to convert it to a molybdenum leach facility by 2010 (Freeport McMoRan Copper & Gold Inc., 2008, p. 5, 23).

At the Sierrita copper-molybdenum mine in Arizona, copper production declined to 68,000 t of recoverable copper from 73,500 t in 2006. A new 18,000-t/yr copper sulfate plant started in early 2006 continued to operate below capacity. The Miami, AZ, open pit remained on care-and-maintenance status, and electrowon production from residual leach operations rose nominally to 9,000 t. At yearend, the mine had reported leach reserves of 102 Mt grading 0.39% copper and an expected recovery rate of 60.1% (Freeport McMoRan Copper & Gold Inc., 2008, p. 6, 13, 27).

In New Mexico, combined production at the Chino and Tyrone Mines fell to 109,000 t of recoverable copper from 113,000 t in 2006. Tyrone mined ore from a central pit that was processed through leaching and solvent extraction, while ore at Chino was both concentrated and leached (Freeport McMoRan Copper & Gold Inc., 2008, p. 7–8).

The Safford Mine-for-leach project in Arizona was essentially completed by yearend and nominal production was reported during the fourth quarter. Ramp up to full production capacity of about 110,000 t/yr of electrowon copper was expected during the first half of 2008. The operation consists of two open pits feeding a 103,000-t/d crushing facility, a heap leach, and an SX-EW plant. Both run-of-the-mine and crushed ore would be placed on the leach pads (Freeport McMoRan Copper & Gold Inc., 2008, p. 4).

In July, Northern Dynasty Minerals Ltd. (Vancouver) announced the formation of the Pebble Limited Partnership with a wholly owned subsidiary of Anglo American plc (London). Anglo would become a 50% partner in Northern Dynasty's Pebble copper-gold-molybdenum project in southwestern Alaska by making a staged cash investment of $1.425 billion. The Pebble project's key assets were its open pit minable Pebble West deposit containing a reported total resource (measured, indicated, and inferred) of more than 11 Mt of copper at a 0.3% copper-equivalent cutoff grade and its more recently discovered Pebble East deposit with an inferred underground resource of 22 Mt of copper at a copper-equivalent cutoff grade of 0.6% copper. The focus of the partnership's 2007 drill program was to upgrade the resource classification of the Pebble East inferred resource (Northern Dynasty Minerals Ltd., 2007a, b; 2008).

PolyMet Mining Corp. (Vancouver) announced in November that the Minnesota Department of Natural Resources and the U.S. Army Corps of Engineers were expected to complete their evaluation of operating plans for the NorthMet copper-nickel-precious metals project (mine and processing plant) in northeastern Minnesota in early 2008, clearing the way for publication of a draft environmental impact statement by the end of the first quarter. Production during the first 5 years was projected to average 33,000 t/yr of electrowon copper cathode, 7,000 t/yr of contained nickel, and 3,300 kilograms per year of precious metals. In September, PolyMet reported an expansion in proven and probable mineral reserves to 249.2 Mt grading 0.28% copper, 0.08% nickel, and 0.37 grams per metric ton (g/t) precious metals (gold, palladium, and platinum) (Polymet Mining Corp., 2007).

Quadra Mining, Ltd. (Vancouver) reported that its Robinson Mine in Nevada produced 59,800 t of copper in concentrate compared with 55,100 t produced in 2005. Despite higher operating costs, increased copper recoveries (the mill-head grade rose to 0.63% copper from 0.61% in 2006, and mill recovery rates rose to 67.4% from 65.4% in 2006), and higher byproduct credits, cash operating costs (net of byproduct credits) fell to $1.49 per pound of copper from $1.74 per pound of copper in 2006. By yearend, reported proven and probable reserves had declined to 104 Mt of ore grading 0.68% copper

and 0.23 g/t gold. Quadra was progressing on development of the Carlota copper project in Nevada, having spent $93.3 million by yearend on construction, equipment purchases, and other development costs, and reportedly was on schedule for startup during the second half of 2008. At capacity, Carlota was projected to produce 34,000 t/yr of electrowon copper (Quadra Mining, Ltd., 2008, p. 5–7).

At Rio Tinto's Bingham Canyon Mine in Utah, production of copper in concentrate declined by 20% to 212,200 t from 265,600 t in 2006 owing to a decline in average ore grade to 0.53% copper from 0.63% copper in 2006. Ore grades and recovery of byproduct gold and molybdenum also declined. Copper refinery production, however, rose to 266,000 t from 218,000 t in 2006 owing to increased anode availability; the Garfield, UT, smelter had been closed in September and October 2006 for maintenance (Rio Tinto plc, 2008a, p. 16–18). In December, Rio Tinto announced plans to invest $300 million to develop the Eagle nickel-copper mine near Marquette, MI. Slated to start production by yearend 2009, the mine was expected to yield 16,000 t/yr of nickel and 15,000 t/yr of copper during at least a 7-year period from a resource grading 3.6% nickel and 2.9% copper (Rio Tinto plc, 2007).

Consumption

U.S. reported consumption of refined copper rose nominally in 2007, breaking a downward trend that began in 2001. Consumption by wire-rod producers rose by about 37,000 t (2%) and accounted for the overall increase. An almost 3% increase in domestic shipments of wire rod was not indicative, however, of strong demand but rather resulted from a sharp drop in imports, which declined by about 131,000 t. According to data compiled by the American Bureau of Metal Statistics, Inc. (ABMS) (2008b), apparent consumption of wire rod declined by about 110,000 t, or 6%, for the second consecutive year and was at the lowest level in more than 10 years. The continued weak housing market and destocking along the supply chain owing to high copper inventory costs reportedly contributed to the decline in consumption.

Brass mill product shipments by domestic producers continued their downward trend, falling to 665,000 t in 2007 from 738,000 t in 2006 and from 770,000 t in 2005. While all market segments declined, the building-related product markets of alloy rod and copper tube were particularly hard hit, declining by 16% and 11% respectively. Industrial and electrical market segments of alloy strip and sheet, copper rod and bar, and flat rolled copper products declined by 8%, 3% and, 1%, respectively. In addition to weakness in the housing market, the copper tube market was affected by continued substitution by plastic in light of high copper prices. Copper tube shipments, which accounted for 32% of brass mill shipments in 2007, were down by 24% from 2005 levels (American Bureau of Metal Statistics, Inc., 2008a).

According to preliminary data from the Copper Development Association Inc. (2008, p. 18–21), the total supply of copper and copper-alloy products to the U.S. market by fabricators (brass mills, wire mills, foundries, and powder producers), which included net imports, declined by about 10% in 2007 from the revised shipments for 2006 and was down by 28% from its peak in 2000. Wire mill products accounted for about 49% of total shipments to the domestic market; brass mill products, 48%; and foundry and powder products, 3%. Consumption in the building construction sector, which remained the largest end use market, declined by 12%, and accounted for about 49% of shipments. The electric and electronic products (21% market share), industrial machinery and equipment (11% market share), transportation equipment (10% market share), and consumer and general products (9% market share) sectors declined by 6%, 9%, 14%, and 13%, respectively.

In response to high costs and lost market share, several brass mills announced actions to reduce costs and restructure their businesses. Revere Copper Products Inc. closed its New Bedford, MA, plant citing high energy costs. The plant produced copper and copper alloy plate and sheet (CRU International Ltd., 2007, p. 11). In November, Wolverine Tube, Inc. announced that it would discontinue its U.S. copper plumbing tube business and curtail its smooth industrial tube production by closing its Decatur, AL, and Boonesville, MS, plants. The company cited declining demand for plumbing tube and high raw material costs as the primary reason for closing (Wolverine Tube, Inc., 2007). In November, Olin Corp. sold its worldwide metals division for $400 million to a subsidiary of Global Brass & Copper Holdings Inc., a newly formed affiliate of private equity group KPS Capital Partners LP. Included in the transaction were Olin's East Alton, IL, Montpelier, OH, and Waterbury, CT, rolling mills; the Byron, OH, reroll mill; the Fineweld Tube operations in Cuba, MS; and the A.J. Oster metals service centers. Earlier in the year, Olin had closed its rerolling mill in New Haven, CT (Barry, 2007d). Mueller Industries Inc. closed its casting operations at its tube mill in Wynne, AR, and shifted production to its facility in Fulton, MS. The company also reportedly planned to begin producing plastic water tube at the Wynne facility (Barry, 2007b).

Prices and Stocks

Copper prices, which had soared to record-high-levels during 2006 (the COMEX spot price reaching an alltime high of more than $4.00 per pound in the second quarter), had finished 2006 on a downward trend owing to slumping demand and rising inventories. At yearend 2006, the COMEX price had fallen back to $2.85 per pound, and global commodity exchange inventories had risen to 253,000 t, an increase of almost 100,000 t from those at yearend 2005. The downward trend continued into the first 2 months of 2007, the COMEX price averaging $2.59 per pound of copper, and global commodity exchange inventories rising by about 20,000 t. Prices began to rise in March as commodity exchange inventories stabilized at about 270,000 t. During the second and third quarter of 2007, however, inventories retreated slowly to less than 200,000 t, and though subject to sharp fluctuations, the monthly average price ranged between $3.37 and $3.51 per pound. Prices fell slightly during the fourth quarter, averaging $3.02 per pound in December as inventories crept back to about 240,000 t. Volatility in the prices was attributable to overall low inventory levels and industry announcements, such as production shortfalls owing to technical

difficulties and labor unrest, that threatened to increase market tightness. The London Metal Exchange Ltd. (LME) price trend closely tracked that of the COMEX price, both averaging $3.20 per pound for the year.

Copper scrap prices generally followed the trend in refined copper prices. With higher refined prices, however, the discount of most grades of copper scrap to refined copper rose to near the record-high levels seen in 2006. According American Metal Market data, the discount for refiners No. 2 scrap from the COMEX price averaged 39 cents per pound for the year, below the record discount of 48 cents per pound in 2006. In January 2007, when the COMEX price averaged $2.58 per pound, the lowest monthly level of the year, the discount for refiners No. 2 scrap shrank to 14.3 cents per pound. In July, when the monthly average price peaked at $3.62 per pound, the discount rose to 63.6 cents per pound. Though following the same trend, the discount for No. 1 brass mill scrap remained much smaller, ranging from about 10 cents per pound in January to almost 18 cents per pound in August, averaging about 13 cents over the year.

Foreign Trade

Net refined copper imports in 2007 of 778,000 t were down by about 20% from those in 2006 and were at their lowest level since 2004. Chile was the leading source of unwrought copper products (40%) from 2004 through 2007, followed by Canada (33%) and Peru (13%). Refined copper accounted for 79% of unwrought copper imports during the same period. Exports of copper contained in concentrates totaled 134,000 t in 2007.

According to U.S. Census Bureau data compiled by the Copper and Brass Fabricators Council Inc. (2008, p. 1–9), in 2007, U.S. imports of copper and copper-alloy semifabricated products (excluding wire-rod mill products) were 279,000 t (down by 10% from those in 2006), exports were 141,000 t (down by 14%), and the resulting net imports decreased by 6% to 138,000 t. Canada and Mexico collectively accounted for 70% of semifabricated copper exports and 26% of imports.

ABMS (2008b) adjusted trade data indicate that imports of copper wire rod fell to 217,000 t from 355,000 t in 2006, exports declined nominally to 145,000 t from 149,000 t in 2006, and the resulting net imports declined to 72,000 t from 206,000 t in 2006. Canada remained the leading source of imports (57%), followed by Russia (22%), and Mexico (16%). In 2006, despite losing duty-free status under the Generalized System of Preferences effective July 1, 2005, which had waived the 3% ad valorem tariff, imports of wire rod from Russia had increased to 110,000 t from 102,000 t in 2005. In 2007, however, wire-rod imports from Russia fell to only 48,000 t owing to increased freight costs and a less favorable exchange rate.

Exports of copper scrap continued to trend upward with reduced domestic brass mill output and greater scrap availability owing to higher copper prices. Total scrap exports were 906,000 t, up from 803,000 t in 2006. China (including Hong Kong) was the destination for 73% of domestic scrap exports and, based on import data, accounted for 70% of reported global scrap imports of 7.5 Mt (International Copper Study Group, 2008a, p. 41–44).

World Review

World production of refined copper rose by about 4% to 18.0 Mt. World copper use, according to the ICSG (2008a, p. 19), rose by about 4% to 17.7 Mt. Consequently, the global market balance indicated a small production surplus for the second consecutive year and an increase in reported global inventories of about 300,000 t. Essentially all the stock rise was attributed to previously unreported stocks held in China, which were revealed after the year ended. Stocks on the more visible commodity exchanges declined by about 14,000 t from their already low level at yearend 2006. The low level of exchange inventories contributed to price volatility and a record-high average LME price of $3.23 per pound of copper.

World mine production of copper, which had risen only nominally in 2006, rose by about 380,000 t (2.5%). Production of copper in concentrates, which rose by about 180,000 t (1.4%) to 12.4 Mt, was insufficient to meet smelter demand and concentrate supplies remained tight through most of the year. According to CRU International Ltd. (2008, p. 91–96), spot treatment and refining charges during the third quarter of 2007 fell below 3 cents per pound, the lowest level in more than a decade and by yearend, global inventories of copper in concentrate had declined by more than 300,000 t. Tightness in the market might have been even more severe had Southern Copper Corp. in Peru not sold about 140,000 t of copper concentrate on the spot market, up from 78,000 t the year before, owing to production problems at its Ilo smelter. The shortage of concentrate limited primary smelter production growth to about 140,000 t. Secondary smelter output rose by about 80,000 t, and total smelter output rose by about 220,000 t to 14.3 Mt.

Consumption of refined copper rose by about 700,000 t, the largest annual increase since 2004, to reach a record-high 17.7 Mt. Asia, where apparent use had remained stagnant during 2006, was the only major consuming region to experience demand growth, led by China, where apparent consumption rose by a record 26% (950,000 t) to reach more than 4.5 Mt. Consumption in India rose by about 6%, while consumption in Japan and Taiwan declined by 2% and 6%, respectively, and consumption in the Republic of Korea remained essentially unchanged. In North America, consumption fell by about 5%. While consumption remained essentially unchanged in the United States, it decreased by 32% in Canada and by 12% in Mexico. A 26% reduction in exports of wire rod to the United States accounted for much of the weakness in Canadian consumption. In the European Union-15, apparent consumption decreased by about 5% (International Copper Study Group, 2008a, p. 19–20).

Consolidation of the global copper industry that was either set in motion or completed during 2006 led to a significant reordering of the position of major global copper producers. While Corporación Nacional del Cobré de Chile (Codelco) retained its position as the leading global mine producer, FCX (including Phelps Dodge's first quarter production) emerged as the second leading producer, and Xstrata plc (Zug, Switzerland) rose to fourth position, behind BHP Billiton. In 2007, the top

five copper-producing companies accounted for about 41% of global production, compared with 36% in 2006 (CRU International Ltd., 2008, p. 288).

Mine Production.—In 2007, world mine production capacity continued its strong upward growth and, according to ICSG (2008b, p. 16–92) estimates, increased by about 775,000 t (4.5%). Significant capacity growth took place in Chile (260,000 t), Zambia (100,000 t), Mexico (80,000 t), Brazil (70,000 t), China (70,000 t), Kazakhstan (65,000 t), and Congo (Kinshasa) (40,000 t). Capacity utilization rate fell for the third consecutive year to 86.3% in 2007 and was at its lowest level in more than 10 years. Mine production in 2007 continued to suffer from a number of problems, including lower head grades, poor ore quality, a global shortage of major equipment (including haulage trucks and tires), increased raw material and energy costs, and labor disruptions in part brought on by the higher copper prices (CRU International Ltd., 2008, p. 235). As well as lower than anticipated production, these and other factors led to an increase in average production costs for most producers. As an example, FCX reported that net cash costs for its North American operations rose to $0.86 per pound of copper in 2007, up from $0.61 per pound in 2006, owing to increased labor, maintenance, supply, utility, and development costs and despite a partial offset from increased byproduct molybdenum credits. Costs during the fourth quarter of 2007 rose to $0.98 per pound, up from $0.78 per pound during the fourth quarter of 2006. FCX's net cash cost for its South American operations rose to $1.02 per pound in 2007 from $0.91 per pound in 2006 (Freeport McMoRan Copper & Gold Inc., 2008, p. 10, 12). Codelco reported that its net cathode costs, including treatment and refining charges and byproduct credits, rose to 86.7 cents per pound of copper from 68.4 cents in 2006 in part owing to lower ore grades, higher supply costs, and a weaker U.S. dollar (Corporación Nacional del Cobré de Chile, 2008, p. 53).

Australia.—Production remained well below capacity, principally owing to continued production problems at the Olympic Dam Mine, where production decreased to 178,000 t, well below its capacity of about 240,000 t/yr, because of unplanned shutdowns of the mine's associated smelter, lower ore grades, and the buildup of underground inventories (BHP Billiton, 2008a, p. 2–3). Despite a 30,000-t/yr capacity increase completed at yearend 2006, production at Xstrata's Mount Isa Mine declined to 173,000 t from 194,000 t in 2006 owing to lower mill throughput and ore grades, which declined to 3.12% copper from 3.42% in 2006. Production at Xstrata's Ernest Henry Mine, however, rose to 95,800 t from 84,000 t in 2006 owing to higher ore grades and mill throughput (Xstrata plc, 2008b).

Chile.—Production rose by about 196,000 t to reach a record-high 5.56 Mt as production from the private sector more than offset a 93,000-t decline in production from state-owned Codelco mines. Total production from Codelco's mines, excluding its share of El Abra (operated by FCX), declined to 1.58 Mt in 2007 from 1.68 Mt in 2006, as all its divisions reported lower output. At Codelco Norte, production fell by 44,000 t to 896,000 t because of lower ore grades and lower ore production, in part the result of the breakdown of a bucket excavator and a fire at an electrical substation. Production at El Salvador decreased to 63,800 t from 80,600 t, production at Andina decreased to 218,000 t from 236,000 t, and production at El Teniente decreased to 405,000 t from 418,000 t (Corporación Nacional del Cobré de Chile, 2008, p. 50–55).

At the Escondida Mine, the world's leading copper mine, production rose by 220,000 t to 1.44 Mt of payable copper (1.20 Mt in concentrate and 238,000 t electrowon). Startup of the mine's sulfide leach plant in June 2006 and a strike in August 2006 had led to significantly lower production in 2006. At the Cerro Colorado Mine, electrowon production decreased to 99,000 t from 115,400 t in 2006, and production at the Spence Mine, which began operation in late 2006, rose to 129,000 t of electrowon cathode from only 4,000 t in 2006 (BHP Billiton, 2008a). At FCX's Candalaria, Ojos del Salado, and El Abra Mines, combined production decreased to 371,000 t from 413,000 t in 2006, principally owing to lower ore grades at the El Abra Mine (Freeport McMoRan Copper & Gold Inc., 2008, p. 17).

Congo (Kinshasa).—Although mine production rose by only about 10,000 t during 2007, mine developments during the year were expected to lead to a significant increase in production in 2008. Kamoto Copper Co. (Katanga Mining Ltd., 75%; Gécamines, 25%) completed Phase I of a four-phase refurbishment of its brownfield operations and produced its first electrowon copper cathode in December. During the next 4 years, production capacity was projected to rise to 150,000 t/yr of refined copper. In January 2008, Katanga formed a second joint venture with Gécamines (DRC copper and cobalt project) to acquire the adjacent resources of Nikanor plc's KOV open pit with expectations of combining the two operations. Katanga reported proven and probable reserves of 66 Mt of ore grading 3.5% copper and 0.48% cobalt (Katanga Mining Ltd., undated). Anvil Mining Ltd. (Montreal) began production at its Kinsvere open pit in June, producing 13,000 t of copper in concentrate by yearend. The project also called for installation of electric arc furnaces to treat the concentrate and a Stage II SX-EW facility with an anticipated capacity of 60,000 t/yr of copper (Anvil Mining Ltd., 2008).

The Frontier Mine, 95% owned by First Quantum Minerals Ltd. (Toronto), began production of copper concentrate in November. At capacity, the mine was expected to produce 75,000 t/yr of copper in concentrate (First Quantum Minerals Ltd., 2008a).

Indonesia.—Production at the Grasberg Mine declined to 522,000 t from 545,000 t in 2006 because of the mining of a relatively low-grade section of the open pit during the second half of the year, which partially offset higher ore grades and recoveries during the first half of the year. Net cash costs, including gold and silver credits, declined to $0.29 per pound of copper from $0.60 per pound in 2006 owing to increased gold and silver production and realized prices (Freeport McMoRan Copper & Gold Inc., 2008, p. 23, 77). Production at the Batu Hijau Mine rose to 220,000 t from 206,000 t in 2006, yet remained well below production in 2005 of 270,000 t as pit stability issues continued to limit access to higher grade sections of the mine and unplanned mill downtime reduced throughput during the fourth quarter of 2007. Ore grades, which averaged 0.69% in 2005, decreased to 0.55% in 2006 but recovered slightly to 0.6% in 2007 (Newmont Mining Corp., 2008, p. 26).

Peru.—Mine production in Peru rose by about 40,000 t, principally owing to startup of the Cerro Verde II sulfide concentrator at yearend 2006, which would process ore lying beneath the current oxidized zone and supplement the existing SX-EW production. Combined production of electrowon copper and recoverable copper in concentrate rose to 266,000 t in 2007 from 97,000 t in 2006 (Freeport McMoRan Inc., 2008, p. 24). The production increase was partially offset by production at the Antamina Mine, which decreased to 318,000 t from 370,000 t in 2006 owing to a 2-week shutdown of its SAG mill during the fourth quarter and the preferential mining of higher zinc-containing ores at the expense of copper grades (BHP Billiton, 2008a, p. 12; 2008b, p. 70). At the Tintaya Mine, combined concentrate and electrowon production rose by 4% to 120,000 t of copper (Xstrata plc, 2008a, p. 70).

Combined production from Southern Copper's Cuajone and Toquepala Mines was essentially unchanged at 326,000 t, although downstream smelter and refinery production fell by 26% and 35%, respectively, owing to startup problems associated with the modernization of the Ilo smelter completed in January (Southern Copper Corp., 2008, p. 8, 15).

Zambia.—Production at the Kansanshi copper-gold mine (80%-owned by First Quantum Minerals) rose to 164,000 t (93,000 t as SX-EW cathode and 70,600 t in concentrate) from 127,000 t (74,000 t as SX-EW and 53,000 t in concentrate) following doubling of the sulfide concentrate circuit to 8 million metric tons per year (Mt/yr) of ore and completion of a high-pressure leach facility to treat the increased concentrate in 2006. A third expansion of concentrate production was expected to be completed during the first half of 2008 (First Quantum Minerals, Ltd., 2008b).

Vedanta Resources plc (London) reported that production of copper for the fiscal year ending March 31, 2008, at its 51%-owned Konkola Copper Mines plc (KCM) was unchanged at 226,000 t. Refined copper (electrolytic plus electrowon) rose to 150,000 t from 142,000 t in fiscal year 2007, while the net production of copper in concentrate decreased to 76,000 t from 84,000 t in 2007. Electrowon production from the Nchanga tailings leach plant rose by 51% to 62,000 t. In addition to the tailings leach plant, KCM operated the Nchanga underground mine and open pit, the Konkola underground mine, the small Nampundwe underground pyrite mine, and the Nkana smelter and refinery (Vedanta Resources plc, 2008, p. 34–35).

Smelter and Refinery Production.—According to the ICSG (2008, p. 17–19), world smelter production capacity rose by about 400,000 t/yr to 16.6 Mt/yr, and refinery capacity rose by 850,000 t/yr to 22.5 Mt/yr. About 300,000 t/yr of the refinery capacity increase came from electowinning associated mine leach operations. China (350,000 t/yr), Japan (70,000 t/yr), and Peru (45,000 t/yr) accounted for most of the increase in smelter capacity. Electrolytic refinery capacity increases in China (430,000 t/yr), Japan (70,000 t/yr), Australia (30,000 t/yr), Austria (30,000 t/yr), and Russia (30,000, t/yr), were accompanied by electrowinning capacity increases in Chile (140,000 t/yr), Zambia (110,000 t/yr), and Mexico (70,000 t/yr). In China, Jiangxi Copper Corp. completed expansion of capacity at its Guixi smelter and refinery to 700,000 t/yr of copper from 400,000 t/yr. In Japan, Sumitomo Corp. completed the first phase of an expansion at its Toyo smelter and refinery in November 2006 that raised capacity to 410,000 t/yr of copper from 365,000 t/yr. In Peru, Southern Copper completed a modernization of its Ilo smelter that boosted capacity to 360,000 t/yr of copper from 315,000 t/yr and increased capacity at its associated refinery by 10,000 t/yr to match smelter capacity. In Russia, the second phase of expansion of the Kyshym electrolytic refinery expansion was completed during the second half of the year that was expected to increase capacity to 220,000 t/yr of copper in 2008 from 120,000 t/yr in 2006. In Zambia, replacement of the Mufulira (Mopani Copper Mines plc) electric furnace with an Isasmelt furnace in 2006 nominally increased capacity to 200,000 t/yr of copper.

Outlook

Although copper prices began to weaken in September, on average, copper prices during the first 9 months of 2008 remained at or near record-high levels. The LME price reached an alltime high of $4.08 per pound in April and averaged $3.61 per pound for the first 9 months of the year. Global commodity exchange inventories, which began the year at low levels, trended downward for the first 9 months of the year. Despite numerous announced expansions in mine capacity, estimated global copper mine production for the first 9 months of the year was slightly lower than that for the same period of 2007. Numerous factors, including labor unrest, lower ore grades, rapidly escalating production costs, technical problems, and utility and equipment shortages, contributed to lower than anticipated production. In October, concurrent with development of the global financial crisis, inventories began to rise and copper prices plummeted, the LME price falling below $1.70 per pound. Though it cautioned that the economic crisis could significantly alter projections, the ICSG forecast a small annual production surplus to develop by yearend that would expand to about 300,000 t in 2009 (International Copper Study Group, 2008c).

In the United States, a rise in mine production was owing to the startup of two major mining projects and expanded output at existing operations. In October 2008, however, the leading U.S. producer announced that the decrease in copper prices and rising production costs would lead to reevaluation of its planned global expansions. Owing to lower ore grades and increases in energy, labor, mining rates, and other input costs, the company's U.S. production costs had risen by 48% to $1.24 per pound of copper in the first 9 months of 2008 from those of the comparative period in 2007. Domestic consumption of refined copper continued to trend lower owing to weaker housing and automotive demand and brass mill closings.

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TABLE 1

SALIENT COPPER STATISTICS[1]

(Metric tons, unless otherwise specified)

		2003	2004	2005	2006	2007
United States:						
Mine production:						
Ore concentrated	thousand metric tons	114,000	139,000	154,000	163,000	138,000
Average yield of concentrated ore	percent	0.45 r	0.40 r	0.37 r	0.40 r	0.47
Recoverable copper:						
Arizona		741,000	723,000	690,000	712,000	731,000
New Mexico		87,800	122,000	131,000	113,000	108,000
Other States		287,000	312,000	319,000	372,000	329,000
Total		1,120,000	1,160,000	1,140,000	1,200,000	1,170,000
Total value	millions	$2,100	$3,420	$4,360	$8,310	$8,450
Smelter production:						
Primary and secondary		539,000	542,000	523,000	501,000	617,000
Byproduct sulfuric acid, sulfur content	thousand metric tons	590	600	575	576	720 e
Refinery production:						
Primary materials:						
Electrolytic from domestic ores		532,000	531,000	524,000	531,000	702,000
Electrolytic from foreign materials		130,000	140,000	130,000	144,000	62,100
Electrowon		591,000	584,000	554,000	530,000	504,000
Total		1,250,000	1,260,000	1,210,000	1,210,000	1,270,000
Secondary materials (scrap), electrolytic and fire refined		53,300	50,800	47,200	44,800	46,000
Grand total		1,310,000	1,310,000	1,260,000	1,250,000	1,310,000
Secondary copper produced:						
Recovered from new scrap		737,000	774,000	769,000	819,000	768,000
Recovered from old scrap		207,000	191,000	183,000	151,000 r	157,000
Total		944,000	965,000	953,000	969,000 r	925,000
Copper sulfate production		32,100	25,100	25,600	19,500	22,600
Exports, refined		93,300	118,000	39,500	106,000	51,100
Imports, refined		882,000	807,000	1,000,000	1,070,000	829,000
Stocks, December 31:						
Blister and in-process material		56,800	51,400	44,300	18,800	26,300
Refined copper:						
Refineries		12,100	10,400	8,190	28,100	21,800
Wire-rod mills		29,700	20,300	20,400	21,500	20,600
Brass mills		20,200	21,500	24,500	34,500	10,400
Other industry		4,240	3,230	5,750	5,750	5,750
New York Commodity Exchange (COMEX)		255,000	43,700	6,180	30,900	13,500
London Metal Exchange (LME), U.S. warehouses		335,000	35,000	800	75,600	60,600
Total		656,000	134,000	65,900	196,000	133,000
Consumption:						
Refined copper, reported		2,290,000	2,410,000	2,270,000	2,110,000	2,140,000
Apparent consumption, primary refined and old scrap[2]		2,430,000	2,550,000	2,400,000	2,190,000	2,270,000
Price:						
Producer, weighted average	cents per pound	85.25	133.94	173.49	314.75	328.00
COMEX, first position	do.	81.05	128.97	168.23	308.94	322.17
LME, Grade A cash	do.	80.68	129.96	166.84	304.85	322.83
World, production:						
Mine	thousand metric tons	13,800	14,700	15,000	15,100	15,400 e
Smelter	do.	12,600 r	12,900	13,500 r	14,100	14,300 e
Refinery	do.	15,300	15,900 r	16,600	17,300 r	18,000

[e]Estimated. [r]Revised. do. Ditto.

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

[2]In 2003, 2004, 2005, 2006, and 2007, apparent consumption is calculated using general imports of 687,000 metric tons (t), 704,000 t, 977,000 t, 1,070,000 t, and 832,000 t, respectively.

TABLE 2

LEADING COPPER-PRODUCING MINES IN THE UNITED STATES IN 2007, IN ORDER OF OUTPUT[1]

Rank	Mine	County and State	Operator	Source of copper	Capacity (thousand metric tons)
1	Morenci	Greenlee, AZ	Freeport-McMoRan Copper & Gold Inc.	Copper-molybdenum ore, concentrated and leached	400
2	Bingham Canyon	Salt Lake, UT	Kennecott Utah Copper Corp.	Copper-molybdenum ore, concentrated	280
3	Ray	Pinal, AZ	Asarco LLC	Copper ore, concentrated and leached	150
4	Bagdad	Yavapai, AZ	Freeport-McMoRan Copper & Gold Inc.	Copper-molybdenum ore, concentrated and leached	140
5	Chino	Grant, NM	do.	do.	110
6	Sierrita	Pima, AZ	do.	do.	90
7	Mission Complex	do.	Asarco LLC	Copper-molybdenum ore, concentrated	70
8	Robinson	White Pine, NV	Quadra Mining Ltd.	do.	60
9	Tyrone	Grant, NM	Freeport-McMoRan Copper & Gold Inc.	Copper ore, leached	50
10	Miami	Gila, AZ	do.	do.	50
11	Continental Pit	Silver Bow, MT	Montana Resources	Copper-molybdenum ore, concentrated	45
12	Silver Bell	Pima, AZ	Asarco LLC	Copper ore, leached	22
13	Pinto Valley	Gila, AZ	BHP Billiton	Copper ore, concentrated and leached	15
14	Phoenix	Lander, NV	Newmont Mining Corp.	Gold-copper ore, concentrated	10
15	Lisbon Valley	San Juan, UT	Constellation Copper Corp.	Copper ore, leached	10
16	Mineral Park	Mohave, AZ	Mercator Minerals Ltd.	do.	7
17	Miami	Gila, AZ	BHP Billiton	do.	5

do. Ditto.

[1]The mines on this list accounted for 99% of U.S. mine production in 2007.

TABLE 3

MINE PRODUCTION OF COPPER-BEARING ORES AND RECOVERABLE COPPER CONTENT OF ORES PRODUCED IN THE UNITED STATES, BY SOURCE AND TREATMENT PROCESS[1]

(Metric tons)

	2006		2007	
Source and treatment process	Gross weight[2]	Recoverable copper	Gross weight[2]	Recoverable copper
Mined copper ore:				
Concentrated	163,000,000	651,000 r	138,000,000	648,000
Leached	NA	530,000	NA	504,000
Total	NA	1,180,000 r	NA	1,150,000
Copper precipitates shipped, leached from tailings, dumps, and in-place material	NA	2,840	NA	3,440
Other copper-bearing ores[3]	5,000,000	12,900 r	5,270,000	13,500
Grand total	XX	1,200,000	XX	1,170,000

[r]Revised. NA Not available. XX Not applicable.

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

[2]In 2007, 20,800 kilograms of gold and 241 metric tons of silver were recovered from concentrated ore. The average value of gold and silver per metric ton of ore concentrated was $3.33.

[3]Includes gold ore, lead ore, silver ore, silver-copper ore, zinc ore, and ore shipped directly to smelter.

TABLE 4

CONSUMPTION OF COPPER AND BRASS MATERIALS IN THE UNITED STATES, BY ITEM[1]

(Metric tons)

Item	Brass mills	Wire-rod mills	Foundries, chemical plants, miscellaneous users	Smelters, refiners, ingot makers	Total
2006:					
Copper scrap	895,000 [2]	W	75,400 r	179,000	1,150,000
Refined copper[3]	490,000	1,570,000	46,500	4,530	2,110,000
Hardeners and master alloys	10,100	--	2,880	--	12,900
Brass ingots	--	--	85,000 r	--	85,000 r
Slab zinc	56,400	--	(4)	(4)	79,800
2007:					
Copper scrap	828,000 [2]	W	63,700	182,000	1,070,000
Refined copper[3]	476,000	1,610,000	46,100	4,520	2,140,000
Hardeners and master alloys	10,000	--	2,980	--	13,000
Brass ingots	--	--	78,800	--	78,800
Slab zinc	52,900	--	(4)	(4)	80,500

[r]Revised. W Withheld to avoid disclosing company proprietary data; included with "Brass mills." -- Zero.

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

[2]Includes item indicated by symbol W.

[3]Detailed information on consumption of refined copper can be found in table 5.

[4]Withheld to avoid disclosing company proprietary data; included in "Total."

TABLE 5

CONSUMPTION OF REFINED COPPER SHAPES IN THE UNITED STATES, BY CLASS OF CONSUMER[1]

(Metric tons)

Class of consumer	Cathodes	Ingots and ingot bars	Cakes and slabs	Wirebar, billets, other	Total
2006:					
Wire-rod mills	1,570,000	--	--	--	1,570,000
Brass mills	334,000	24,400	37,100	94,500	490,000
Chemical plants	--	--	--	1,010	1,010
Ingot makers	W	W	W	4,530 [2]	4,530
Foundries	4,360	6,440	--	10,600	21,400
Miscellaneous[3]	W	W	W	24,100 [2]	24,100
Total	1,910,000	30,800 r	37,100	135,000	2,110,000
2007:					
Wire-rod mills	1,610,000	--	--	733	1,610,000
Brass mills	317,000	24,200	42,700	92,600	476,000
Chemical plants	--	--	--	1,010	1,010
Ingot makers	W	W	W	4,520 [2]	4,520
Foundries	4,170	4,570	--	10,600	19,400
Miscellaneous[3]	W	W	W	25,700 [2]	25,700
Total	1,930,000	28,800	42,700	135,000	2,140,000

[r]Revised. W Withheld to avoid disclosing company proprietary data; included with "Wirebar, billets, other." -- Zero.

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

[2]Includes items indicated by symbol W.

[3]Includes consumers of copper powder and copper shot, iron and steel plants, and other manufacturers.

TABLE 6
COPPER RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES,
BY KIND OF SCRAP AND FORM OF RECOVERY[1]

(Metric tons)

	2006	2007
Kind of scrap:		
New scrap:		
Copper-base	772,000	723,000
Aluminum-base	46,700 r	45,000
Nickel-base	18	18
Total	819,000	768,000
Old scrap:		
Copper-base	128,000	127,000
Aluminum-base	22,400 r	29,900
Nickel-base	197 r	275
Zinc-base	38	13
Total	151,000 r	157,000
Grand total	969,000 r	925,000
Form of recovery:		
As unalloyed copper	45,500	47,400
In brass and bronze	846,000	796,000
In alloy iron and steel	792 r	890
In aluminum alloys	68,800 r	75,800
In other alloys	36	13
In chemical compounds	8,210	5,040
Total	969,000 r	925,000

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

TABLE 7
COPPER RECOVERED AS REFINED COPPER AND IN ALLOYS AND OTHER FORMS
FROM COPPER-BASE SCRAP PROCESSED IN THE UNITED STATES, BY TYPE OF OPERATION[1]

(Metric tons)

	From new scrap		From old scrap		Total	
Type of operation	2006	2007	2006	2007	2006	2007
Ingot makers	21,200 r	15,000	61,500 r	75,400	82,700 r	90,400
Refineries[2]	16,000	23,600	28,800	22,500	44,800	46,000
Brass and wire-rod mills	707,000	661,000	12,500	8,010	719,000	669,000
Foundries and manufacturers	22,800	18,100	22,000	21,100	44,800	39,200
Chemical plants	5,030	5,030	3,130	6	8,210 r	5,040
Total	772,000	723,000	128,000	127,000	900,000	850,000

[r]Revised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Electrolytically refined based on source of material at smelter level.

TABLE 8
PRODUCTION OF SECONDARY COPPER AND COPPER-ALLOY PRODUCTS
IN THE UNITED STATES, BY ITEM PRODUCED FROM SCRAP[1]

(Metric tons)

Item produced from scrap	2006	2007
Unalloyed copper products:		
Refined copper	44,800	46,000
Copper powder	134	1,240
Copper castings	612	114
Total	45,500	47,400
Alloyed copper products:		
Brass and bronze ingots:		
Tin bronzes	10,100	9,110
Leaded red brass and semired brass	69,400	65,300
High leaded tin bronze	10,100	10,400
Yellow brass	5,610	5,570
Manganese bronze	8,030	7,670
Aluminum bronze	5,960	6,680
Nickel silver	2,110	1,570
Silicon bronze and brass	5,780	5,740
Copper-base hardeners and master alloys	7,620	7,660
Miscellaneous	3,310	6,260
Total	128,000	126,000
Brass mill and wire-rod mill products	880,000	812,000
Brass and bronze castings	43,100	36,000
Brass powder	68	51
Copper in chemical products	8,210	5,040
Grand total	1,100,000	1,030,000

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

TABLE 9
COMPOSITION OF SECONDARY COPPER-ALLOY PRODUCTION IN THE UNITED STATES[1]

(Metric tons)

	Copper	Tin	Lead	Zinc	Nickel	Aluminum	Total
Brass and bronze ingot production:[2]							
2006	109,000	3,550 r	5,350 r	9,480 r	201 r	12	128,000
2007	104,000	4,280	6,380	10,700	155	12	126,000
Secondary metal content of brass mill products:							
2006	720,000	1,830	3,480	152,000	2,080	27	880,000
2007	669,000	1,490	3,140	137,000	1,530	28	812,000
Secondary metal content of brass and bronze castings:							
2006	38,100	1,480	1,210	2,110	105	42	43,100
2007	33,200	1,080	393	1,140	82	83	36,000

[r]Revised.
[1]Data are rounded to no more than three significant digits; may not add to totals shown.
[2]Includes approximately 96% from scrap and 4% from other than scrap in 2006 and 2007.

TABLE 10

CONSUMPTION AND YEAREND STOCKS OF COPPER-BASE SCRAP[1]

(Metric tons, gross weight)

Scrap type and processor	2006 Consumption	2006 Stocks	2007 Consumption	2007 Stocks
Unalloyed scrap:				
No. 1 wire and heavy:				
Smelters, refiners, and ingot makers	63,800 r	6,360 r	65,400	1,960
Brass and wire-rod mills	400,000	(2)	382,000	(2)
Foundries and miscellaneous manufacturers	22,400	(2)	19,300	(2)
No. 2 mixed heavy and light:				
Smelters, refiners, and ingot makers	28,400	1,500 r	28,400	1,210
Brass and wire-rod mills	13,600	(2)	13,700	(2)
Foundries and miscellaneous manufacturers	3,870 r	(2)	3,630	(2)
Total unalloyed scrap:				
Smelters, refiners, and ingot makers	92,200 r	7,860 r	93,800	3,180
Brass and wire-rod mills	413,000	34,900	396,000	15,500
Foundries and miscellaneous manufacturers	26,300	2,090	23,000	1,630
Alloyed scrap:				
Red brass:[3]				
Smelters, refiners, and ingot makers	20,100	1,300 r	26,600	1,720
Brass mills	12,400	(2)	11,200	(2)
Foundries and miscellaneous manufacturers	7,540	(2)	5,520	(2)
Leaded yellow brass:				
Smelters, refiners, and ingot makers	7,550 r	849 r	11,400	796
Brass mills	177,000	(2)	160,000	(2)
Foundries and miscellaneous manufacturers	880	(2)	980	(2)
Yellow and low brass, all plants	177,000	858 r	155,000	532
Cartridge cases and brass, all plants	94,100	(2)	90,700	(2)
Auto radiators:				
Smelters, refiners, and ingot makers	24,800	647 r	25,800	772
Foundries and miscellaneous manufacturers	6,370	(2)	60	(2)
Bronzes:				
Smelters, refiners, and ingot makers	10,300	651 r	12,900	847
Brass mills and miscellaneous manufacturers	19,200	(2)	16,500	(2)
Nickel-copper alloys, all plants	19,100	170 r	14,200	145
Low grade and residues; smelters, refiners, miscellaneous manufacturers	34,800	683	23,500	589
Other alloy scrap:[4]				
Smelters, refiners, and ingot makers	1,820	265	1,080	250
Brass mills and miscellaneous manufacturers	4,950	(2)	5,220	(2)
Total alloyed scrap:				
Smelters, refiners, and ingot makers	86,800	5,420 r	88,700	5,650
Brass mills	482,000	24,900	432,000	20,700
Foundries and miscellaneous manufacturers	49,100	2,370	40,700	2,070
Total scrap:				
Smelters, refiners, and ingot makers	179,000	13,300 r	182,000	8,820
Brass and wire-rod mills	895,000	59,800	828,000	36,200
Foundries and miscellaneous manufacturers	75,400 r	4,460 r	63,700	3,700

[r]Revised.

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

[2]Individual breakdown is not available; included in "Total unalloyed scrap," "Total alloyed scrap," and "Total scrap."

[3]Includes cocks and faucets, commercial bronze, composition turnings, gilding metal, railroad car boxes, and silicon bronze.

[4]Includes aluminum bronze, beryllium copper, and refinery brass.

TABLE 11

CONSUMPTION OF PURCHASED COPPER-BASE SCRAP[1, 2]

(Metric tons, gross weight)

Type of operation	From new scrap 2006	From new scrap 2007	From old scrap 2006	From old scrap 2007	Total 2006	Total 2007
Ingot makers	45,700 r	31,200	88,100 r	105,000	134,000	136,000
Smelters and refineries	16,500	23,600	28,700	22,600	45,200	46,300
Brass and wire-rod mills	882,000	819,000	13,100	8,260	895,000	828,000
Foundries and miscellaneous manufacturers	46,000 r	40,300	29,500 r	23,400	75,400 r	63,700
Total	991,000 r	914,000	159,000 r	159,000	1,150,000	1,070,000

[r]Revised.

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

[2]Consumption at brass and wire-rod mills assumed equal to receipts.

TABLE 12

FOUNDRIES AND MISCELLANEOUS MANUFACTURERS CONSUMPTION OF BRASS INGOT, REFINED COPPER AND COPPER SCRAP IN THE UNITED STATES[1]

(Metric tons)

Ingot type or material consumed	2006	2007
Tin bronzes	14,200	13,300
Leaded red brass and semired brass	53,900 r	48,900
Yellow, leaded, low brass[2]	7,260 r	7,220
Manganese bronze	3,980	3,940
Nickel silver[3]	803 r	748
Aluminum bronze	3,630	3,510
Hardeners and master alloys[4]	2,880	2,980
Lead free alloys[5]	1,250	1,210
Total brass ingot	87,900 r	81,800
Refined copper	46,500	46,100
Copper scrap	75,400	63,700

[r]Revised.

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

[2]Includes brass and silicon bronze.

[3]Includes brass, copper nickel, and nickel bronze.

[4]Includes special alloys.

[5]Includes copper-bismuth and copper-bismuth-selenium alloys.

TABLE 13

AVERAGE PRICES FOR COPPER SCRAP AND ALLOY-INGOT, BY TYPE

(Cents per pound)

Year	Brass mills No. 1 scrap	Refiners No. 2 scrap	Dealers' buying (New York) No. 2 scrap	Dealers' buying (New York) Red brass turnings and borings
2006	291.03	260.50	183.93	105.43
2007	311.87	282.89	221.86	137.47

Source: American Metal Market.

TABLE 14

U.S. EXPORTS OF UNMANUFACTURED COPPER (COPPER CONTENT), BY COUNTRY[1]

Country	Ore and concentrate[2]		Matte, ash and precipitates		Refined		Unalloyed copper scrap		Blister and anodes		Total	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2006	108,000	$642,000	95,600	$200,000	106,000	$237,000	399,000	$1,300,000 r	18,900	$83,800	727,000	$2,460,000
2007:												
Belgium	109	414	13	4	213	353	1,310	6,300	275	1,390	1,920	8,450
Canada	23,300	150,000	61,700	117,000	9,830	38,500	12,000	76,300	4,370	11,100	111,000	393,000
China	61,600	408,000	89	182	20,700	111,000	217,000	828,000	456	3,630	300,000	1,350,000
Germany	2,160	9,340	46	35	597	1,770	8,330	34,100	2,190	7,980	13,300	53,200
Hong Kong	--	--	--	--	103	195	9,810	35,500	2,440	19,200	12,300	54,800
India	--	--	38	302	9,320	17,700	14,000	9,760	216	1,690	23,500	29,400
Japan	18,700	134,000	63	233	--	--	8,990	59,200	565	2,220	28,400	196,000
Korea, Republic of	5,400	57,300	35	272	159	425	24,500	157,000	1,740	9,990	31,800	225,000
Malaysia	--	--	--	--	66	243	114	406	46	345	226	994
Mexico	19,200	90,900	--	--	6,020	39,700	389	2,030	35	284	25,700	133,000
Peru	--	--	--	--	18	66	--	--	5	48	23	114
Singapore	--	--	53	96	9	24	338	1,840	289	1,410	689	3,360
Spain	79	604	--	--	273	455	1,470	9,330	60	391	1,880	10,800
Taiwan	1	5	31	181	49	26	17,700	53,600	1,280	9,710	19,100	63,500
Thailand	3,500	20,800	--	--	71	130	1,070	6,150	224	1,260	4,860	28,300
United Kingdom	3	26	--	--	1,340	5,370	21	30	56	444	1,420	5,870
Other	213	1,450	104	515	2,340	5,400	11,900	45,900	1,480	8,890	16,000	62,100
Total	134,000	873,000	62,200	119,000	51,100	222,000	329,000	1,320,000	15,700	79,900	593,000	2,620,000

[r]Revised. -- Zero.

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

[2]Data for 2006 adjusted by the U.S. Geological Survey to reflect estimated copper content.

Source: U.S. Census Bureau.

TABLE 15

U.S. EXPORTS OF COPPER SEMIMANUFACTURES, BY COUNTRY[1]

Country	Pipes and tubing		Plates, sheets, foil, bars		Bare wire, including wire rod[2]		Wire and cable, stranded		Copper sulfate	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
2006	31,300	$237,000	31,800	$228,000	165,000	$1,120,000	33,900	$232,000	3,290 r	$5,740 r
2007:										
Australia	32	332	17	208	16	291	23	681	6	5
Brazil	57	454	53	654	126	1,250	60	1,960	--	--
Canada	8,240	76,100	21,100	174,000	39,400	297,000	6,840	55,800	2,470	5,790
China	66	627	573	6,720	2,740	11,100	1,180	6,600	177	342
Denmark	1	32	25	445	2	36	164	1,580	--	--
France	3	100	82	1,420	198	2,250	135	2,600	--	--
Germany	55	473	214	4,020	138	3,350	504	10,200	4	3
Hong Kong	19	213	104	2,840	221	1,680	668	7,560	--	--
Italy	4	55	13	185	57	382	22	261	--	--
Japan	91	587	137	2,310	43	832	165	2,190	52	79
Korea, Republic of	155	1,590	544	6,300	37	1,040	584	7,020	40	80
Malaysia	--	--	825	5,170	26	271	23	658	--	--
Mexico	16,800	136,000	5,600	43,600	117,000	926,000	8,680	72,200	44	66
Netherlands	63	768	40	864	16	231	24	636	35	42
Saudi Arabia	808	6,690	220	1,860	41	1,100	259	1,920	--	--
Singapore	307	1,450	193	1,310	72	972	172	2,560	13	11
Sweden	--	--	12	309	20	638	1	81	13	10
Taiwan	1	3	252	2,320	113	1,100	240	1,930	78	79
Thailand	2	16	221	2,360	157	1,210	25	367	--	--
United Kingdom	81	753	181	2,390	158	1,240	84	2,570	22	17
Other	1,040	9,870	1,100	13,000	1,970	19,800	7,260	55,500	1,820	1,960
Total	27,800	236,000	31,500	273,000	163,000	1,270,000	27,100	235,000	4,770	8,480

[r]Revised. -- Zero.

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

[2]Total exports of wire rod in 2006 were 144,000 metric tons (t) valued at $992 million, and in 2007, wire rod exports were 144,000 t valued at $1,140 million.

Source: U.S. Census Bureau.

TABLE 16

U.S. IMPORTS FOR CONSUMPTION OF UNMANUFACTURED COPPER (COPPER CONTENT), BY COUNTRY[1]

Country	Ore and concentrate		Matte, ash and precipitates		Blister and anode		Refined		Unalloyed scrap		Total	
	Quantity (metric tons)	Value[2] (thousands)	Quantity (metric tons)	Value[2] (thousands)	Quantity (metric tons)	Value[2] (thousands)	Quantity (metric tons)	Value[2] (thousands)	Quantity (metric tons)	Value[2] (thousands)	Quantity (metric tons)	Value[2] (thousands)
2006	192	$196	1,910	$7,780	171,000	$932,000	1,070,000	$6,670,000	24,900	$99,300	1,270,000	$7,700,000
2007:												
Belgium	--	--	13	112	--	--	--	--	--	--	13	112
Brazil	--	--	--	--	--	--	13,000	93,300	--	--	13,000	93,300
Canada	655	850	204	859	85,700	611,000	242,000	1,690,000	8,890	56,200	338,000	2,360,000
Chile	--	--	--	--	59,700	419,000	363,000	2,630,000	36,900	272,000	460,000	3,320,000
Costa Rica	--	--	--	--	1	4	--	--	1,050	1,000	1,050	1,010
Dominican Republic	--	--	--	--	--	--	--	--	603	550	603	550
Finland	--	--	--	--	866	8,650	5	41	--	--	871	8,690
Germany	--	--	--	--	(3)	10	10,600	79,900	146	93	10,700	80,000
Honduras	--	--	--	--	1	--	--	--	1,360	3,950	1,360	3,950
Japan	--	--	--	--	1	69	5,760	46,700	46	71	5,800	46,900
Mexico	(3)	8	32	89	7,140	83,600	50,200	332,000	6,200	11,400	63,600	427,000
Peru	174	150	--	--	--	--	140,000	998,000	--	--	140,000	998,000
Taiwan	--	--	968	5,130	--	--	5	26	--	--	974	5,160
United Kingdom	12	14	--	--	2	138	(3)	3	119	1,180	132	1,340
Other	--	9	447	2,000	21	161	4,450	35,800	2,980	10,200	7,900	48,200
Total	841	1,030	1,660	8,200	153,000	1,120,000	829,000	5,900,000	58,300	357,000	1,040,000	7,390,000

-- Zero.

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

[2]Cost, insurance, freight value at U.S. port.

[3]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 17

U.S. IMPORTS FOR CONSUMPTION OF COPPER SEMIMANUFACTURES, BY COUNTRY[1]

Country	Pipes and tubing		Plates, sheets, foil, bars		Bare wire, including wire rod[2]		Wire and cable, stranded		Copper sulfate	
	Quantity (metric tons)	Value[3] (thousands)	Quantity (metric tons)	Value[3] (thousands)	Quantity (metric tons)	Value[3] (thousands)	Quantity (metric tons)	Value[3] (thousands)	Quantity (metric tons)	Value[3] (thousands)
2006	1,040	$10,300	75,700	$574,000	360,000	$2,460,000	21,700	$109,000	53,600	$91,900
2007:										
Australia	--	--	--	--	4	40	1	15	--	--
Belgium	(4)	4	89	1,370	--	--	(4)	7	--	--
Brazil	--	--	1,250	10,200	10,600	72,700	--	--	--	--
Canada	27	238	41	420	126,000	894,000	460	4,280	9,550	10,700
Chile	27	230	11,300	86,500	--	--	--	--	3,100	6,310
China	143	1,370	2,190	18,000	725	6,570	2,680	11,000	6,810	16,800
Finland	24	222	2,650	26,700	846	7,900	1	14	--	--
France	29	646	2,350	19,300	233	4,460	32	728	1	4
Germany	659	6,460	16,700	145,000	1,070	9,690	489	6,030	564	1,200
Israel	--	--	6	84	--	--	2,410	23,700	--	--
Italy	(4)	8	125	1,250	2	101	296	1,410	6	41
Japan	8	178	3,710	37,400	339	4,170	(4)	26	34	424
Luxembourg	--	--	1,220	18,300	--	--	--	--	--	--
Mexico	244	2,220	4,490	40,500	33,900	235,000	655	4,110	31,300	70,100
Norway	--	--	--	--	(4)	3	(4)	62	--	--
Peru	--	--	6,090	45,900	1,600	12,300	118	722	691	1,400
Russia	--	--	18	142	48,400	358,000	38	264	616	1,400
Sweden	--	--	8,180	73,100	66	513	--	--	--	--
Taiwan	(4)	4	659	7,530	183	1,090	40	691	3,820	6,700
Turkey	--	--	--	--	4,270	34,500	10,400	88,800	--	--
United Kingdom	(4)	10	547	2,960	28	482	11	487	--	--
Other	29	436	4,010	35,100	356	2,650	1,420	10,700	491	811
Total	1,190	12,000	65,600	570,000	229,000	1,640,000	19,000	153,000	57,000	116,000

-- Zero.

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

[2]Total imports of wire rod in 2006 were 360,000 metric tons (t) valued at $2.37 billion, and in 2007, wire rod imports were 229,000 t valued at $1.55 billion.

[3]Cost, insurance, freight value at U.S. port.

[4]Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 18

U.S. EXPORTS OF COPPER SCRAP, BY COUNTRY[1]

	Unalloyed copper scrap				Copper-alloy scrap			
	2006		2007		2006		2007	
Country	Quantity (metric tons)	Value[r] (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value[r] (thousands)	Quantity (metric tons)	Value (thousands)
Belgium	1,380	$2,800	1,310	$6,300	12,700	$28,100	15,100	$31,800
Canada	71,700	92,600	12,000	76,300	38,800	71,700	37,100	139,000
China	247,000	812,000	217,000	828,000	257,000	627,000	403,000	958,000
Germany	15,200	50,700	8,330	34,100	15,400	60,800	7,770	32,400
Hong Kong	7,060	24,100	9,810	35,500	11,600	13,700	27,600	48,700
India	1,600	2,910	14,000	9,760	10,700	29,500	10,400	37,100
Japan	7,730	49,600	8,990	59,200	8,020	38,700	9,480	54,600
Korea, Republic of	20,700	115,000	24,500	157,000	13,000	67,200	13,700	71,600
Mexico	816 r	5,360	389	2,030	6,770	38,400	3,020	20,300
Taiwan	22,300	131,000	17,700	53,600	9,930	25,100	12,700	22,500
Other	3,460	13,000	14,900	63,600	20,400	53,500	37,600	94,200
Total	399,000	1,300,000	329,000	1,320,000	404,000	1,050,000	577,000	1,510,000

[r]Revised.

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

Source: U.S. Census Bureau.

TABLE 19

U.S. IMPORTS FOR CONSUMPTION OF COPPER SCRAP, BY COUNTRY[1]

	Unalloyed copper scrap		Copper-alloy scrap		
Country or territory	Quantity (metric tons)	Value[2] (thousands)	Gross weight (metric tons)	Copper content[3] (metric tons)	Value[2] (thousands)
2006	24,900	$99,300	92,600	66,700	$382,000
2007:					
Canada	8,890	56,200	32,000	23,000	152,000
Chile	36,900	272,000	484	348	3,410
Costa Rica	1,050	1,000	2,460	1,770	8,060
Dominican Republic	603	550	565	407	904
Guatemala	314	1,880	1,590	1,150	7,500
Honduras	1,360	3,950	695	500	2,170
Jamaica	454	595	373	268	759
Mexico	6,200	11,400	30,400	21,900	102,000
Nicaragua	699	2,000	363	262	615
United Kingdom	119	1,180	636	458	5,670
Other	1,710	5,920	5,190	3,740	25,100
Total	58,300	357,000	74,800	53,800	308,000

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

[2]Cost, insurance, freight value at U.S. port.

[3]Content is estimated by the U.S. Geological Survey to be 72% of gross weight.

Source: U.S. Census Bureau.

TABLE 20

COPPER: WORLD MINE PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	2003	2004	2005	2006	2007[e]
Argentina	199,020	177,143	187,317	180,144 r	180,200 p, 3
Armenia[e]	18,000	17,700	16,400 3	18,000 r	17,600
Australia:					
Concentrates	772,600	795,800	865,300	806,400	829,000
Leaching, electrowon	67,000	58,300	51,000	52,400 e	42,000
Total	839,600	854,100	916,300	858,800	871,000
Bolivia	182	596	32 r	218 r	565
Botswana[e]	27,400	22,500 3	26,100	24,000	24,000
Brazil	26,275	103,153	133,325	147,836 r	199,000 p
Bulgaria	91,700	79,600	94,000	110,000 r	110,000
Burma, leaching, electrowon	27,870	31,756	34,478	20,400 r	14,000
Canada, concentrates	557,082	562,795	595,383	603,295 r	589,115 p, 3
Chile:[4]					
Concentrates	3,251,100	3,776,200	3,735,900	3,669,000	3,724,900 p, 3
Leaching, electrowon	1,653,100	1,636,300	1,584,600	1,691,800	1,832,100 p, 3
Total	4,904,200	5,412,500	5,320,500	5,360,800	5,557,000 p, 3
China:[e]					
Concentrates	610,000	742,000	762,000	873,000	928,000
Leaching, electrowon	10,000	10,000	15,000	16,000	18,000
Total	620,000	752,000	777,000	889,000	946,000
Colombia	1,578	1,701	1,259	600 r, e	700
Congo (Kinshasa):[5]					
Concentrates[e]	30,300	31,800	44,200	81,000	95,000
Leaching, electrowon	29,513	41,546	49,538	51,000 r	47,000
Total	59,813	73,346	93,738	132,000 r	142,000
Cyprus, leaching, electrowon	2,552	1,240	--	--	300
Ecuador[e]	--	242	-- 3	--	--
Finland	14,900	15,500	15,000	13,000 r	13,600 3
Georgia[e]	12,000	12,000	10,000 r	9,000 r	11,000
India	28,500	29,500	26,900	27,400 r	34,700
Indonesia[5]	1,005,831	840,318	1,065,000	816,000	772,900 3
Iran:[e]					
Concentrates	130,000	140,000	150,000	208,000	241,000
Leaching, electrowon	12,000	11,000	10,000	9,000	8,000
Total	142,000	151,000	160,000	217,000	249,000
Kazakhstan[e]	485,000	462,100 r, 3	422,000	457,000	405,000
Korea, North[e]	12,000	12,000	12,000	12,000	12,000
Laos, leaching, electrowon	--	--	30,500 r	60,808 r	62,541 3
Macedonia	2,567 r	--	-- r	-- r	--
Mexico:					
Concentrates	279,254	327,432	336,376	245,053 r	236,000
Leaching, electrowon	76,399	78,108	92,675	89,076 r	122,000
Total	355,653	405,540	429,051	334,129 r	358,000
Mongolia	131,600	132,000	126,547	129,693	130,160 3
Morocco	4,900	4,400	4,400	4,400 e	6,300
Namibia	16,175	11,174	10,900	6,000 e	6,500
Pakistan	3,200	15,000	17,700	19,100	18,700
Papua New Guinea	202,300	173,370	192,978	194,355	169,184 3
Peru:					
Concentrates	691,380	868,574	844,368	874,602 r	1,018,163 3
Leaching, electrowon	171,198	167,000	165,530	173,871	172,118 3
Total	862,578	1,035,574	1,009,898	1,048,473 r	1,190,281 3

See footnotes at end of table.

TABLE 20—Continued

COPPER: WORLD MINE PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	2003	2004	2005	2006	2007[e]
Philippines	20,414	15,984	16,323	17,161 r	22,000
Poland	505,000 r	531,000	512,000 r	497,000 r	452,000
Portugal	77,581	95,743	89,541	78,600	90,200
Romania[6]	23,389	18,767	15,000	12,132 r	2,213 3
Russia[e]	675,000	675,000	700,000	725,000	740,000
Saudi Arabia	800 e	652 r	668 r	730 r	750
Serbia[e]	26,400 7	24,000 7	26,100 7	25,100 3	25,000
South Africa	89,500 r	87,000 r	88,600 r	89,500 r	97,000
Spain	643	1,448	7,900 r	6,600 r	6,300 p
Sweden	96,000	90,600	97,800	86,746 r	63,019 3
Tanzania, in concentrates and bullion	3,715	4,240	3,661 r	3,285 r	3,275 3
Turkey[e, 6]	58,000	49,000	54,000	46,000	49,000
United States:[5]					
Concentrates	525,000	576,000	586,000	651,000 r	665,000 3
Leaching, electrowon	591,000	584,000	554,000	546,000 r	504,000 3
Total	1,120,000	1,160,000	1,140,000	1,200,000	1,170,000 3
Uzbekistan[e]	80,000	110,000	110,000	100,000 r	95,000
Zambia:					
Concentrates	299,000 r	320,300 r	330,000 r, e	350,000	312,000
Leaching, electrowon	79,000 r, e	82,600	102,000 r	124,000 r, e	216,000
Total	378,000 r	402,900 r	432,000 r	474,000 r	528,000
Zimbabwe, concentrates	2,767	2,383	2,570 r	2,581 r	3,000
Grand total	13,800,000	14,700,000	15,000,000	15,100,000	15,400,000
Of which:					
Concentrates	11,100,000	12,000,000	12,300,000 r	12,200,000 r	12,400,000
Leaching, electrowon	2,720,000	2,700,000	2,690,000 r	2,830,000	3,040,000

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

[1]World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]Table represent copper content by analysis of concentrates produced (includes cement copper, if applicable), except where otherwise noted. Table includes data available through July 17, 2008.

[3]Reported figure.

[4]Reported by Comision Chilena del Cobre. Includes recoverable copper content of nonduplicative mine and metal products produced from domestic ores and concentrates and leach production for electrowinning.

[5]Recoverable content.

[6]Excludes copper content of pyrite.

[7]Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.

TABLE 21

COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY[1, 2]

(Metric tons, gross weight)

Country	2003	2004	2005	2006	2007[e]
Armenia, primary	7,500 [e]	7,500 [e]	9,881 [r]	8,791 [r]	6,954 [3]
Australia, primary	435,000	443,000	410,000	377,000	399,000 [3]
Austria, secondary	75,000	88,000	52,000 [r]	46,000 [r]	55,000
Belgium, secondary	117,500	107,000	99,200	114,600	115,000
Bolivia, primary	--	441	--	--	--
Botswana, primary[4]	25,292	21,195	26,704 [r]	24,255 [r]	19,996 [3]
Brazil, primary	173,378	208,020	199,043	220,000	211,000
Bulgaria:					
Primary	199,300 [r]	215,800 [r]	225,000 [r]	217,000 [r]	217,600 [3]
Secondary[e]	16,000	11,400 [r]	15,000 [r]	24,000 [r]	11,500
Total	215,300 [r]	227,200 [r]	240,000 [r]	241,000 [r]	229,000
Canada:					
Primary	430,116	446,209	441,325	484,700 [r]	470,700 [3]
Secondary	26,789	29,962	30,525 [r]	35,800 [r]	46,100 [3]
Total	456,905	476,171	471,850 [r]	520,500 [r]	516,800 [3]
Chile, primary	1,542,400	1,517,600	1,558,100	1,565,400	1,514,300 [p, 3]
China:[e]					
Primary	1,380,000	1,500,000	1,700,000	1,920,000 [r]	2,112,000 [3]
Secondary	350,000	440,000	540,000	700,000	800,000
Total	1,730,000	1,940,000	2,240,000	2,620,000 [r]	2,910,000
Congo (Kinshasa), primary, electrowon	8,000	20,000	10,000	10,000 [e]	10,000
Finland:					
Primary	176,400	168,600	170,000	190,235 [r]	144,705 [3]
Secondary[e]	2,000	2,000	2,000	2,000	2,000
Total	178,400	170,600	172,000	192,235 [r]	147,000
Germany:					
Primary	288,800	278,600	257,200	273,800	275,300 [3]
Secondary	306,600	262,600	251,400	266,300	265,600 [3]
Total	595,400	541,200	508,600	540,100	540,900 [3]
India:					
Primary	391,000	401,000	486,600	610,000 [e]	609,600 [3]
Secondary[e]	--	--	38,000	15,000	15,000
Total	391,000	401,000	524,600	625,000 [e]	624,600 [3]
Indonesia, primary	247,400	211,600	275,000 [e]	201,200	277,000
Iran, undifferentiated[5]	168,613	184,814	227,000	242,000 [r, e]	250,000
Japan:					
Primary	1,343,353	1,270,495	1,319,247	1,409,087	1,367,310 [3]
Secondary	172,724	194,927	198,516	219,203	245,208 [3]
Total	1,516,077	1,465,422	1,517,763	1,628,290	1,612,518 [3]
Kazakhstan, undifferentiated	431,930	445,200	426,000	426,000 [e]	409,000
Korea, North, primary and secondary[e]	15,000	15,000	15,000	15,000	15,000
Korea, Republic of:					
Primary	410,000	392,500	436,600	449,200	475,000 [3]
Secondary	50,000	50,000	49,900	34,800	40,000 [3]
Total	460,000	442,500	486,500	484,000	515,000 [3]
Mexico:					
Primary	220,100	271,000	301,200	260,200	222,200 [3]
Secondary[e]	5,000	5,000	5,000	5,000	5,000
Total	225,100	276,000	306,200	265,200	227,000
Namibia, primary[6]	26,036	24,704	23,300 [e]	22,000 [e]	21,000
Oman, primary[e]	18,000	25,000	25,000	25,000	25,000

See footnotes at end of table.

TABLE 21—Continued

COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY[1, 2]

(Metric tons, gross weight)

Country	2003	2004	2005	2006	2007[e]
Pakistan, primary	3,000	15,000	15,000	20,000 [e]	17,000
Peru, primary	376,100	377,800	381,600	381,300	296,100 [3]
Philippines, primary	227,900	217,300	201,300	239,600	219,900 [3]
Poland:					
Primary	500,000 [r]	542,000 [r]	527,000 [r]	445,000 [r]	519,000
Secondary[e]	24,100	33,000 [r]	30,000 [r]	80,000 [r]	40,000
Total	524,100 [r]	575,000 [r]	557,000 [r]	525,000 [r]	559,000
Romania:					
Primary	4,456 [r]	61	-- [r]	-- [r]	-- [3]
Secondary[e]	500	10 [r]	10 [r]	10 [r]	10
Total	4,956 [r]	71 [r]	10 [r]	10 [r]	10
Russia:[e]					
Primary	662,000 [r]	662,000	696,000 [r]	635,000 [r]	650,000
Secondary	180,000 [r]	257,000	262,000 [r]	312,000 [r]	290,000
Total	842,000 [r]	919,000	958,000	947,000 [r]	940,000
Serbia:[e]					
Primary	14,000 [7]	12,000 [7]	16,300 [7]	15,400 [r]	16,000
Secondary	3,600 [7]	1,100 [7]	6,000 [7]	5,000 [r]	5,000
Total	17,600 [7]	13,100 [7]	22,300 [7]	20,400 [r]	21,000
Slovakia, secondary	58,000	13,300	15,500	22,000 [e]	20,600
South Africa, primary[e]	112,025 [3]	89,300	105,000 [r]	99,000 [r]	112,000
Spain:					
Primary	276,300	210,200	278,600	263,100	249,400 [p]
Secondary[e]	14,000	14,100	5,600 [r]	600	6,700
Total	290,300	224,300	284,200 [r]	263,700	256,000
Sweden:[e]					
Primary	185,000	206,000	192,000	194,000 [r]	203,000
Secondary	30,000	30,000	30,000	30,000	30,000
Total	215,000	236,000	222,000	224,000 [r]	233,000
Thailand:[e]					
Primary	--	17,700 [3]	28,600	1,000	5,600 [3]
Secondary	--	1,900	2,000	100 [r]	500
Total	--	19,600	30,600	1,100 [r]	6,100 [3]
Turkey, undifferentiated[8]	30,400 [e]	34,700 [r]	27,600 [r]	30,000 [r, e]	30,000
United States, undifferentiated	539,000	542,000	523,000	501,000	617,000 [3]
Uzbekistan, undifferentiated[e]	75,000	94,000	105,000	95,000 [r]	92,000
Zambia, primary:					
Electrowon	50,000	60,000	50,000	50,000	50,000
Other	200,000	220,000	220,000	240,000	174,000
Total	250,000	280,000	270,000	290,000	224,000
Grand total:	12,600,000 [r]	12,900,000	13,500,000 [r]	14,100,000	14,300,000
Of which					
Primary:					
Electrowon	58,000	80,000	60,000	60,000	60,000
Other	9,870,000 [r]	9,970,000 [r]	10,500,000 [r]	10,800,000 [r]	10,800,000
Secondary	1,430,000 [r]	1,540,000 [r]	1,630,000 [r]	1,910,000 [r]	1,990,000
Undifferentiated	1,260,000 [r]	1,320,000 [r]	1,320,000 [r]	1,310,000 [r]	1,410,000

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

[1]World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

TABLE 21—Continued

COPPER: WORLD SMELTER PRODUCTION, BY COUNTRY[1, 2]

[2]This table includes total production of smelted copper metal, including low-grade cathode produced by electrowinning methods. The smelter feed may be derived from ore, concentrates, copper precipitate or matte (primary), and/or scrap (secondary). To the extent possible, primary and secondary output of each country is shown separately. In some cases, total smelter production is officially reported, but the distribution between primary and secondary has been estimated. Table includes data available through July 17, 2008.

[3]Reported figure.

[4]Copper content of nickel-copper matte exported to Norway for refining.

[5]Data are for year beginning March 21 of that stated. Secondary production is estimated to be about 5% of total.

[6]Includes 8,000 to 10,000 metric tons per year for 2003–06 produced from imported toll concentrates.

[7]Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.

[8]Secondary production is estimated to be about one-third of total.

TABLE 22

COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	2003	2004	2005	2006	2007
Argentina, secondary[e]	16,000	16,000	16,000	16,000	16,000
Australia, primary:					
Electrowon	67,400	58,300	50,900	52,400	42,000
Other	416,600	439,700	418,100	387,000	399,000
Total	484,000	498,000	469,000	439,400	441,000
Austria, secondary[e]	65,100	81,000	81,000	72,600 [r]	81,000
Belgium:[e]					
Primary[3]	208,000	223,000	252,900 [4]	238,000 [r]	228,500 [4]
Secondary	215,000	174,000	130,000	153,000 [r]	165,600 [4]
Total	423,000	397,000	382,900 [4]	391,000 [r]	394,100 [4]
Brazil, primary	173,378	208,020	199,043	219,700 [r]	220,000 [p]
Bulgaria:[e]					
Primary	43,000	52,300	60,500	65,500 [4]	65,000
Secondary	2,000	3,000	3,000	3,000	5,000
Total	45,000	55,300	63,500	68,500	70,000
Burma, electrowon	27,870 [r]	31,756 [r]	34,500	20,400 [r]	14,000
Canada:					
Primary	428,077	495,835	484,123	469,363 [r]	425,274 [p]
Secondary	26,789	31,100 [r]	31,100 [r, e]	31,100 [r, e]	28,179 [p]
Total	454,866	526,935 [r]	515,223 [r]	500,463 [r]	453,453 [p]
Chile, primary:					
Electrowon	1,653,100	1,636,300	1,584,600	1,691,800	1,832,100 [p]
Other	1,248,800	1,200,400	1,239,400	1,119,500	1,104,400 [p]
Total	2,901,900	2,836,700	2,824,000	2,811,300	2,936,500 [p]
China:[e]					
Primary					
Electrowon	10,000	10,000	15,000	20,000	20,000
Other	1,420,000	1,580,000	1,850,000	2,000,000	2,345,000 [4]
Secondary	430,000	620,000	750,000	1,000,000	1,135,000 [4]
Total	1,860,000	2,210,000	2,615,000 [4]	3,020,000	3,500,000
Cyprus, electrowon	2,552	1,240	--	1,000 [r]	2,900
Egypt, secondary[e]	4,000	4,000	4,000	-- [r]	--
Finland:[e]					
Primary	120,000	117,000	118,000	118,000	110,000
Secondary	15,000	16,000	16,000	16,000	10,000
Total	135,000	133,000	134,000	134,000	120,000
Germany:					
Primary	286,653	283,686	293,812 [r]	312,092 [r]	301,702
Secondary	310,925	368,956	344,446 [r]	350,246 [r]	363,815
Total	597,578	652,642	638,258 [r]	662,338 [r]	665,517
Hungary, secondary[e]	10,000	10,000 [r]	10,000 [r]	10,000 [r]	10,000
India:[e]					
Primary, electrolytic	375,000	399,000	477,000 [r, 4]	614,000 [r, 4]	713,600 [4]
Secondary	19,000	20,000	20,000	15,000	15,000
Total	394,000	419,000	497,000 [r]	629,000 [r]	729,000
Indonesia, primary	223,300	210,500	262,900	217,600	277,000
Iran:					
Primary:[5]					
Electrowon[e]	12,000	12,000	10,000	9,000 [r]	8,000
Other	95,637 [r]	102,000 [r]	123,100 [r]	140,000 [r, e]	145,000 [e]
Secondary	39,000	38,000	40,000	45,000 [e]	55,000 [e]
Total	146,637 [r]	152,000	173,100	194,000 [r, e]	208,000 [e]

See footnotes at end of table.

TABLE 22—Continued

COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	2003	2004	2005	2006	2007
Italy, secondary	26,700 [e]	34,000	32,200	36,400	28,600
Japan:					
Primary	1,251,728	1,188,491	1,227,528	1,342,350	1,369,814
Secondary	178,637	191,653	167,756	189,705	207,004
Total	1,430,365	1,380,144	1,395,284	1,532,055	1,576,818
Kazakhstan, primary	432,511 [r]	445,268 [r]	418,356 [r]	427,723 [r]	406,091
Korea, North, primary[e]	15,000	15,000	15,000	15,000	15,000
Korea, Republic of:					
Primary	464,970	450,952	481,566	541,492	536,467
Secondary	45,000	45,000	45,000	34,000	45,000
Total	509,970	495,952	526,566	575,492	581,467
Laos, electrowon	--	--	30,480	60,803	62,541
Mexico:					
Primary:					
Electrowon	76,399	78,108	92,675	89,076 [r]	122,000 [e]
Other	235,000	290,200	317,700	284,300 [r]	260,000 [e]
Secondary[e]	6,000	6,000	6,000	6,000	6,000
Total	317,399	374,308	416,375	379,376 [r]	388,000 [e]
Mongolia, electrowon	1,341	2,376	2,475	2,618	2,800 [e]
Norway, primary[6]	35,900	35,600	38,500	38,500 [e]	34,200
Oman, primary[e]	17,000	24,000	24,000	24,000	24,000
Peru, primary:					
Electrowon	171,198	167,000	165,530	173,871	172,118
Other	345,848	338,308	346,206 [r]	333,839	241,789
Total	517,046	505,308	511,736 [r]	507,710	413,907
Philippines, primary	171,152	174,628	172,000	181,000 [r]	180,000 [e]
Poland:					
Primary	500,400 [r]	520,000 [r]	530,000 [r]	476,100 [r]	493,200
Secondary	29,200 [r]	30,000 [r]	30,000 [r]	80,500 [r]	39,800
Total	529,600	550,000 [r]	560,000 [r]	556,600 [r]	533,000
Romania:					
Primary	14,739 [r]	22,526 [r]	18,739 [r]	18,583 [r]	15,584
Secondary[e]	2,000	2,000	2,000	3,000 [r]	3,000
Total	16,739 [r]	24,526 [r]	20,739 [r]	21,583 [r]	18,584
Russia:					
Primary	662,000 [r, e]	682,000 [r]	684,000 [r]	635,000 [r]	650,000
Secondary	180,000 [r]	237,000 [r]	249,000 [r]	312,000 [r]	289,000
Total	842,000 [r]	919,000	933,000	947,000 [r]	939,000
Serbia:					
Primary	9,000 [r, 7]	12,000 [r, 7]	25,300 [r, 7]	35,400 [r]	27,600
Secondary[e]	5,029 [r, 4, 7]	7,000 [7]	6,000 [r, 7]	6,000 [r]	4,000
Total	14,029 [r, 7]	19,000 [r, 7]	31,300 [r, 7]	41,400 [r]	31,600
South Africa, primary[6]	111,543 [r]	91,498 [r]	99,388 [r]	104,052 [r]	112,799
Spain:					
Primary	259,000	194,100	242,700	235,300	243,000 [p]
Secondary[e]	64,500 [r, 4]	64,300	66,000	64,000	65,000
Total	323,500 [r]	258,400	308,700	299,300	308,000
Sweden:[e]					
Primary	189,000	210,000	200,000	165,000 [r]	159,000
Secondary	25,000	25,000	22,000	64,000 [r]	55,000
Total	214,000	235,000	222,000	229,000 [r]	214,000
Taiwan, secondary[e]	4,000	4,000	4,000	4,500	4,500

See footnotes at end of table.

TABLE 22—Continued

COPPER: WORLD REFINERY PRODUCTION, BY COUNTRY[1, 2]

(Metric tons)

Country	2003	2004	2005	2006	2007
Thailand, primary	--	18,100 r	13,000 r	18,700 r	7,600
Turkey:[e]					
Primary	45,000 r	64,000 r	95,000 r	106,000 r	106,000
Secondary	5,000	5,000	5,000	5,000	5,000
Total	50,000 r	69,000 r	100,000 r	111,000 r	111,000
Ukraine, secondary	20	20	20	20	20
United States:					
Primary:					
Electrowon	591,000	584,000	554,000	530,000	504,000
Other	662,000	671,000	654,000	675,000	764,000
Secondary	53,300	50,800	47,200	44,800	46,000
Total	1,310,000	1,310,000	1,260,000	1,250,000	1,310,000
Uzbekistan, primary	75,000 e	93,770	103,870	92,300 r, e	89,655
Vietnam, primary	--	--	--	4,800	11,000
Zambia, primary:					
Electrowon[8]	109,000	124,000	155,000 r	178,000 r, e	250,000 e
Other	240,800	286,000	244,000 e	240,000 r, e	230,000 e
Total	349,800	410,000	399,000 r	418,000 r, e	480,000 e
Zimbabwe, primary[e]	7,200 [4]	7,000	7,000	7,000	7,000
Grand total	15,300,000	15,900,000 r	16,600,000	17,300,000 r	18,000,000
Of which:					
Primary:					
Electrowon	2,720,000	2,710,000	2,690,000	2,830,000 r	3,030,000
Other	10,800,000 r	11,100,000 r	11,700,000 r	11,900,000 r	12,300,000
Secondary	1,780,000 r	2,080,000 r	2,130,000 r	2,560,000 r	2,680,000

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

[1]World totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

[2]This table includes total production of refined copper whether produced by pyrometallurgical or electrolytic refining methods and whether derived from primary unrefined copper or from scrap. Copper cathode derived from electrowinning processing is also included. Table includes data available through July 17, 2008.

[3]Includes reprocessed leach cathode from Congo (Kinshasa).

[4]Reported figure.

[5]Data are for Iranian years beginning March 21 of that stated.

[6]May include secondary.

[7]Montenegro and Serbia formally declared independence in June 2006 from each other and dissolved their union.

[8]Electrowon covers only high-grade electrowon cathodes reported as "finished production leach cathodes."