

## NICKEL

(Data in metric tons of nickel content unless otherwise noted)

**Domestic Production and Use:** The United States did not have any active nickel mines in 2006. Limited amounts of byproduct nickel, though, were recovered from copper and palladium-platinum ores mined in the Western United States. On a monthly or annual basis, 161 facilities reported nickel consumption. The principal consuming State was Pennsylvania, followed by Kentucky, West Virginia, and Indiana. Approximately 48% of the primary nickel consumed went into stainless and alloy steel production, 36% into nonferrous alloys and superalloys, 11% into electroplating, and 5% into other uses. End uses were as follows: transportation, 29%; chemical industry, 14%; electrical equipment, 10%; construction, 9%; fabricated metal products, 8%; household appliances, 7%; machinery, 7%; petroleum industry, 7%; and other, 9%. Estimated value of apparent primary consumption was \$3.51 billion.

<b>Salient Statistics—United States:</b> <sup>1</sup>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006<sup>e</sup></b>
	W	W	W	W	W
Production, refinery byproduct					
Shipments of purchased scrap <sup>2</sup>	114,000	119,000	113,000	117,000	107,000
Imports: Primary	121,000	125,000	136,000	143,000	161,000
Secondary	9,110	11,500	18,800	15,500	20,900
Exports: Primary	6,520	6,330	8,000	7,630	15,200
Secondary	39,400	47,300	48,300	55,600	48,600
Consumption: Reported, primary	88,200	87,300	98,900	96,800	102,000
Reported, secondary	83,900	83,500	83,300	77,300	79,300
Apparent, primary	121,000	117,000	128,000	137,000	147,000
Total <sup>3</sup>	205,000	200,000	212,000	214,000	226,000
Price, average annual, London Metal Exchange:					
Cash, dollars per metric ton	6,772	9,629	13,823	14,738	23,871
Cash, dollars per pound	3.072	4.368	6.270	6.685	10.828
Stocks: Consumer, yearend	11,600	11,100	11,000	11,500	10,200
Producer, yearend <sup>4</sup>	6,150	8,040	6,580	4,380	4,100
Net import reliance <sup>5</sup> as a percentage of apparent consumption	52	50	55	56	60

**Recycling:** About 79,300 tons of nickel was recovered from purchased scrap in 2006. This represented about 35% of reported secondary plus apparent primary consumption for the year.

**Import Sources (2002-05):** Canada, 41%; Russia, 16%; Norway, 10%; Australia, 8%; and other, 25%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations</b>
		<b>12-31-06</b>
Nickel oxide, chemical grade	2825.40.0000	Free.
Ferronickel	7202.60.0000	Free.
Nickel oxide, metallurgical grade	7501.20.0000	Free.
Unwrought nickel, not alloyed	7502.10.0000	Free.

**Depletion Allowance:** 22% (Domestic), 14% (Foreign).

**Government Stockpile:** The U.S. Government sold the last of the nickel in the National Defense Stockpile in 1999. The U.S. Department of Energy is holding 9,400 tons of nickel ingot contaminated by low-level radioactivity plus 6,000 tons of contaminated shredded nickel scrap. Planned decommissioning activities at former nuclear defense sites are expected to generate an additional 20,000 tons of shredded scrap.

**Events, Trends, and Issues:** World nickel mine production was at an alltime high in 2006, but was barely keeping up with demand. Stainless steel accounts for two-thirds of global primary nickel use. U.S. production of austenitic (nickel-bearing) stainless steel reached a record high of 1.55 million tons in 2004, but slipped 10% to 1.41 million tons (revised) in 2005. Since 1950, stainless steel production in the Western World has been growing at an average rate of 6.0% per year. Demand for stainless steel in China has been particularly robust since 2000 and exceeded the combined output of Germany and Spain in 2006. Chinese and Australian companies have teamed up to explore for nickel in China. China imported nickel from Australia, Canada, Cuba, Russia, and Spain to help supply its growing stainless steel-producing industry. Brazil was expected to become a significant supplier of nickel by 2010. Nickel prices passed the 1989 high of \$16,920 per metric ton in mid-2005 and continued to climb to unprecedented levels in 2006. For the month of November 2006, the London Metal Exchange cash mean for 99.8%-pure nickel averaged \$32,100 per metric ton (\$14.56 per pound).

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Acquisitions and mergers have completely changed the structure of the global nickel industry since 2004. The two largest nickel producers in Canada were taken over by even larger foreign mining companies' intent on diversification. Regulatory authorities in Canada, the European Union, and the United States approved both takeovers after extensive antitrust investigations. Shortly afterwards, the largest nickel producer in the world—a Russian company—moved to acquire an Ohio-based company with important downstream nickel processing facilities. Some nickel consumers were concerned that global demand for the metal would outstrip supply before key, new mining projects could be completed. The larger of the two Canadian takeover targets has been constructing a laterite mining complex at Goro near the southeastern tip of New Caledonia. The New Caledonian nickel was to be recovered onsite using advanced pressure acid leach (PAL) technology. Australia's leading nickel producer was also developing a large laterite deposit near Ravensthorpe, Western Australia. Nickel and cobalt were to be leached from the ore and converted onsite to an intermediate hydroxide, which was to be shipped to Yabulu in Queensland for refining. Several other companies were considering employing some form of acid leach technology to recover nickel at greenfield sites in Cuba, Guatemala, Indonesia, Kazakhstan, and the Philippines. A new type of heap-leaching process was being used to recover nickel in Turkey. At least five automobile manufacturers planned to use nickel-metal hydride (NiMH) batteries to power their gasoline-electric hybrid vehicles for the 2008 and 2009 model years. Demand for gasoline-electric hybrid vehicles has been gradually building in the United States since their introduction in late 1999, and has accelerated dramatically with the sharp increases in gasoline prices in 2005-06. One leading manufacturer was expanding operations so that it could produce more than 1 million hybrid vehicles annually by 2010.

### World Mine Production, Reserves, and Reserve Base:

	Mine production		Reserves <sup>6</sup>	Reserve base <sup>6</sup>
	2005	2006 <sup>e</sup>		
United States	—	—	—	—
Australia	189,000	191,000	24,000,000	27,000,000
Botswana	28,000	28,000	490,000	920,000
Brazil	52,000	74,200	4,500,000	8,300,000
Canada	198,000	230,000	4,900,000	15,000,000
China	77,000	79,000	1,100,000	7,600,000
Colombia	89,000	90,000	830,000	1,100,000
Cuba	72,000	73,800	5,600,000	23,000,000
Dominican Republic	46,000	46,000	720,000	1,000,000
Greece	23,200	24,000	490,000	900,000
Indonesia	160,000	145,000	3,200,000	13,000,000
New Caledonia <sup>7</sup>	112,000	112,000	4,400,000	12,000,000
Philippines	26,600	42,000	940,000	5,200,000
Russia	315,000	320,000	6,600,000	9,200,000
South Africa	42,500	41,000	3,700,000	12,000,000
Venezuela	20,000	20,000	560,000	630,000
Zimbabwe	9,500	9,000	15,000	260,000
Other countries	25,000	25,000	2,100,000	5,900,000
World total (rounded)	1,490,000	1,550,000	64,000,000	140,000,000

**World Resources:** Identified land-based resources averaging 1% nickel or greater contain at least 130 million tons of nickel. About 60% is in laterites and 40% in sulfide deposits. In addition, extensive deep-sea resources of nickel are in manganese crusts and nodules covering large areas of the ocean floor, particularly in the Pacific Ocean.

**Substitutes:** With few exceptions, substitutes for nickel would result in increased cost or a tradeoff in performance of the product. Aluminum, coated steels, plain chromium steels, and plastics can replace stainless steel to a limited extent in many construction and transportation applications. Nickel-free specialty steels are sometimes used in place of stainless steel within the power generating, petrochemical, and petroleum industries. Titanium alloys or specialty plastics can substitute for nickel metal or nickel-base alloys in highly corrosive chemical environments. Recent cost savings in manufacturing lithium ion batteries allow them to compete against NiMH in certain applications.

<sup>e</sup>Estimated. W Withheld to avoid disclosing company proprietary data. — Zero.

<sup>1</sup>Changes in this section are due to revisions of 2002-04 ferrous scrap data.

<sup>2</sup>Scrap receipts – shipments by consumers + exports – imports + adjustments for consumer stock changes.

<sup>3</sup>Apparent primary consumption + reported secondary consumption.

<sup>4</sup>Stocks of producers, agents, and dealers held only in the United States.

<sup>5</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

<sup>6</sup>See Appendix C for definitions.

<sup>7</sup>Overseas territory of France.