## NICKEL

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

<u>Domestic Production and Use:</u> The United States did not have any active nickel mines in 2004. 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, 124 facilities reported nickel consumption. The principal consuming State was Pennsylvania, followed by Kentucky, West Virginia, and Indiana. Approximately 41% of the primary nickel consumed went into nonferrous alloy and superalloy production, 41% into stainless and alloy steels, 16% into electroplating, and 2% into other uses. Ultimate end uses were as follows: transportation, 32%; chemical industry, 14%; electrical equipment, 11%; construction, 9%; fabricated metal products, 8%; household appliances, 7%; machinery, 6%; petroleum industry, 6%; and other, 7%. Estimated value of apparent primary consumption was \$1.74 billion.

Salient Statistics—United States:	<u>2000</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	2004 <sup>e</sup>
Production, mine		_	_		
Shipments of purchased scrap <sup>1</sup>	123,000	141,000	137,000	129,000	129,000
Imports: Primary	156,000	136,000	121,000	125,000	133,000
Secondary	10,700	8,760	9,110	11,500	19,300
Exports: Primary	8,150	8,450	6,520	6,330	7,910
Secondary	49,900	48,600	39,400	47,300	48,000
Consumption: Reported, primary	115,000	98,800	87,400	86,400	92,300
Reported, secondary	84,000	102,000	106,000	93,400	100,000
Apparent, primary	147,000	129,000	121,000	118,000	126,000
Total <sup>2</sup>	231,000	230,000	227,000	211,000	226,000
Price, average annual, London Metal Exchange:					
Cash, dollars per metric ton	8,638	5,945	6,772	9,629	13,843
Cash, dollars per pound	3.918	2.696	3.072	4.368	6.279
Stocks: Consumer, yearend	14,400	14,300	13,700	8,890	8,500
Producer, yearend <sup>3</sup>	12,300	12,600	6,150	7,250	7,100
Employment, yearend, number, mine	1	_	_	_	_
Net import reliance⁴ as a percentage of					
apparent consumption	56	46	46	48	49

**Recycling:** About 100,000 tons of nickel was recovered from purchased scrap in 2004. This represented about 44% of total reported secondary plus apparent primary consumption for the year.

Import Sources (2000-03): Canada, 40%; Russia, 14%; Norway, 11%; Australia, 10%; and other, 25%.

Tariff: Item	Number	Normal Trade Relations 12-31-04		
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).

<u>Government Stockpile</u>: 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 9,700 tons of nickel ingot contaminated by low-level radioactivity plus 3,600 tons of contaminated shredded nickel scrap. Planned decommissioning activities at former nuclear defense sites are expected to generate an additional 23,000 tons of shredded scrap.

**Events, Trends, and Issues:** Stainless steel accounts for two-thirds of the primary nickel used in the world. U.S. production of austenitic (nickel-bearing) stainless steel reached a record high of 1.56 million tons in 2004—13% more than the previous record of 1.37 million tons (revised) set in 2003. U.S. stainless producers continued to struggle against significant import penetration but were helped when demand for specialty steel began to recover in North America during the second half of 2004. World nickel mine production was at an alltime high in 2004. 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 is now on a par with that of Japan.

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Nickel prices were at their highest level since 1989. For the week ending December 3, 2004, the London Metal Exchange cash price for 99.8% pure nickel averaged \$13,895 per metric ton (\$6.30 per pound). Twelve months earlier, the cash price was \$12,578 per ton (\$5.71 per pound). High prices have encouraged substitution of duplex or ferritic stainless for some applications where austenitic was being used. For example, type 201 (3.5% to 5.5% nickel) was being substituted for type 304 (8.0% to 10.5% nickel). Some nickel consumers were concerned that global demand for the metal would outstrip supply before several new mining projects could be completed. In mid-2002, a major Canadian-based producer began developing the huge Voisey's Bay sulfide deposit in northeastern Labrador. The same company also resumed construction of the Goro laterite mining complex at the southeastern tip of New Caledonia. The New Caledonian nickel was to be recovered onsite using advanced pressure acid leach (PAL) technology. In Australia, three greenfield PAL projects built in 1998 and 1999 continued to ramp up production. A second generation of Australian PAL projects was in varying stages of development. Competitors were considering employing some form of acid leach technology to recover nickel at greenfield sites in Cuba, Indonesia, and the Philippines. At least four automobile manufacturers were using nickel-metal hydride (NiMH) batteries to power their gasoline-electric hybrid vehicles for the 2006 and 2007 model years. Demand for gasoline-electric hybrid vehicles has been gradually building up in the United States since their introduction in late 1999 and has accelerated with rising gasoline prices. Seven commercial models were being offered in North America—six of Japanese design. In November 2003, a leading NiMH battery manufacturer began producing battery modules at a new facility in Springboro, OH. Modules were being manufactured for a variety of applications in addition to the transportation market, including stationary backup or uninterruptible power supply systems for telecommunications.

<u>World Mine Production, Reserves, and Reserve Base</u>: Estimates of reserves for Canada, the Dominican Republic, and Venezuela were revised based on new information from the mining industry.

	Mine <sub> </sub> <u>2003</u>	Mine production 2003 2004 <sup>e</sup>		Reserve base <sup>5</sup>	
United States	_	_	_	_	
Australia	210,000	210,000	22,000,000	27,000,000	
Botswana	32,740	37,100	490,000	920,000	
Brazil	45,000	45,000	4,500,000	8,300,000	
Canada	162,756	180,000	4,800,000	15,000,000	
China	60,000	62,000	1,100,000	7,600,000	
Colombia	70,844	72,500	830,000	1,100,000	
Cuba	74,018	75,000	5,600,000	23,000,000	
Dominican Republic	45,400	47,000	720,000	1,000,000	
Greece	21,410	22,100	490,000	900,000	
Indonesia	143,000	144,000	3,200,000	13,000,000	
New Caledonia	111,895	122,000	4,400,000	12,000,000	
Philippines	21,150	20,000	940,000	5,200,000	
Russia	315,000	315,000	6,600,000	9,200,000	
South Africa	40,842	40,700	3,700,000	12,000,000	
Venezuela	20,700	22,000	560,000	630,000	
Zimbabwe	9,517	9,300	15,000	260,000	
Other countries	14,000	14,000	1,300,000	<u>5,100,000</u>	
World total (rounded)	1,400,000	1,400,000	62,000,000	140,000,000	

<u>World Resources</u>: 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.

<u>Substitutes</u>: With few exceptions, substitutes for nickel would result in increased cost or tradeoff in the economy or performance of the product. Aluminum, coated 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 superalloys in highly corrosive chemical environments.

<sup>&</sup>lt;sup>e</sup>Estimated. — Zero.

<sup>&</sup>lt;sup>1</sup>Scrap receipts – shipments by consumers + exports – imports + adjustments for consumer stock changes.

<sup>&</sup>lt;sup>2</sup>Apparent primary consumption + reported secondary consumption.

<sup>&</sup>lt;sup>3</sup>Stocks of producers, agents, and dealers held only in the United States.

<sup>&</sup>lt;sup>4</sup>Defined as imports – exports + adjustments for Government and industry stock changes.

<sup>&</sup>lt;sup>5</sup>See Appendix C for definitions.