

## NICKEL

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

**Domestic Production and Use:** The United States had only one active nickel mine—the underground Eagle Mine in Michigan. The new mine has been producing separate concentrates of chalcopyrite and pentlandite for export to smelters in Canada and overseas since April 2014. The principal nickel-consuming State was Pennsylvania, followed by Kentucky, Illinois, New York, and North Carolina. Approximately 45% of the primary nickel consumed went into stainless and alloy steel products, 36% into nonferrous alloys and superalloys, 7% into electroplating, and 12% into other uses.

<b>Salient Statistics—United States:</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016<sup>e</sup></b>
Production:					
Mine	—	—	4,300	27,200	25,000
Refinery, byproduct	W	W	W	W	W
Shipments of purchased scrap <sup>1</sup>	127,000	123,000	108,000	115,000	118,000
Imports:					
Primary	133,000	126,000	156,000	130,000	111,000
Secondary	22,300	26,300	39,000	27,100	31,100
Exports:					
Primary	9,130	10,600	10,400	9,580	10,300
Secondary	59,600	61,100	56,300	51,900	69,200
Consumption:					
Reported, primary metal	110,000	110,000	115,000	109,000	108,000
Reported, secondary	89,800	88,600	90,900	90,000	90,000
Apparent, primary metal	125,000	111,000	147,000	120,000	120,000
Total <sup>2</sup>	215,000	199,000	238,000	210,000	210,000
Price, average annual, London Metal Exchange (LME):					
Cash, dollars per metric ton	17,533	15,018	16,865	11,831	9,298
Cash, dollars per pound	7.953	6.812	7.650	5.367	4.218
Stocks:					
Consumer, yearend	16,800	18,400	23,400	19,200	19,500
Producer, yearend <sup>3</sup>	6,380	10,020	9,030	10,300	10,500
Net import reliance <sup>4</sup> as a percentage of apparent consumption					
	49	46	56	38	25

**Recycling:** In 2016, approximately 90,000 tons of nickel was recovered from purchased scrap. This represented about 43% of consumption for the year.

**Import Sources (2012–15):** Canada, 41%; Australia, 9%; Norway, 8%; Russia, 8%; and other, 34%.

<b>Tariff: Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–16</b>
Nickel ores and concentrates	2604.00.0040	Free.
Nickel oxides, chemical grade	2825.40.0000	Free.
Ferronickel	7202.60.0000	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 8,800 tons of nickel ingot contaminated by low-level radioactivity at Paducah, KY, plus 5,080 tons of contaminated shredded nickel scrap at Oak Ridge, TN. Ongoing decommissioning activities at former nuclear defense sites are expected to generate an additional 20,000 tons of nickel in scrap.

**Events, Trends, and Issues:** The U.S. steel industry produced approximately 1.5 million tons of austenitic (nickel-bearing) stainless steel in 2016—down by 17% from that in 2015. However, this was still 25% greater than the output of 1.18 million tons in 2009, the last year of the recession. Stainless steel has traditionally accounted for two-thirds of primary nickel use worldwide, with more than one-half of the steel going into the construction, food processing, and transportation sectors.

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In January, the LME cash mean for 99.8%-pure nickel was \$8,480 per ton, a 13-year low. Nickel prices increased during the second half of 2016 following the historic low levels of late 2015 and early 2016. By October, the price had risen to \$10,262 per ton. Decreased prices early in the year were largely attributed to an oversupply of nickel in the market, in particular, from the rampup of nickel refineries in Madagascar and Canada and the resolution of production problems at new ferronickel smelters in Brazil and New Caledonia. By mid-December, stocks in LME warehouses were more than 370,000 tons of nickel metal, more than four times the ending stocks of almost 91,000 tons at the end of 2011. The demand for nickel in uses other than stainless steel also decreased in 2016 owing to reduced U.S. oil and natural gas activities, although strong growth in the battery market compensated for this to some extent.

The Philippines, the world's leading producer of nickel ore, suspended one-half of its mining operations in September for failing to meet environmental standards, triggering a 2% increase in LME nickel prices, helping the recovery of global nickel prices. In response to the Indonesian ban in 2014 on direct shipping ore, companies from China, Indonesia, and Ukraine began building mining and smelting complexes on several islands in Indonesia. Some of these facilities began production in 2016.

**World Mine Production and Reserves:** Reserves data for Australia, China, New Caledonia,<sup>5</sup> the Philippines, and Russia were revised based on new information from company or Government reports.

	Mine production		Reserves <sup>6</sup>
	2015	2016 <sup>e</sup>	
United States	27,200	25,000	160,000
Australia	222,000	206,000	<sup>7</sup> 19,000,000
Brazil	160,000	142,000	10,000,000
Canada	235,000	255,000	2,900,000
China	92,900	90,000	2,500,000
Colombia	40,400	36,800	1,100,000
Cuba	56,400	56,000	5,500,000
Guatemala	52,400	58,600	1,800,000
Indonesia	130,000	168,500	4,500,000
Madagascar	45,500	48,000	1,600,000
New Caledonia	186,000	205,000	6,700,000
Philippines	554,000	500,000	4,800,000
Russia	269,000	256,000	7,600,000
South Africa	56,700	50,000	3,700,000
Other countries	157,000	150,000	6,500,000
World total (rounded)	2,280,000	2,250,000	78,000,000

**World Resources:** Identified land-based resources averaging 1% nickel or greater contain at least 130 million tons of nickel, with about 60% in laterites and 40% in sulfide deposits. Extensive nickel resources also are found in manganese crusts and nodules on the ocean floor. The decline in discovery of new sulfide deposits in traditional mining districts has led to exploration in more challenging locations such as east-central Africa and the subarctic.

**Substitutes:** Low-nickel, duplex, or ultrahigh-chromium stainless steels are being substituted for austenitic grades in construction. Nickel-free specialty steels are sometimes used in place of stainless steel in the power-generating and petrochemical industries. Titanium alloys can substitute for nickel metal or nickel-base alloys in corrosive chemical environments. Lithium-ion batteries may be used instead of nickel-metal hydride in certain applications.

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

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

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

<sup>3</sup>Estimated stocks of producers, agents, and dealers held in the United States only.

<sup>4</sup>Defined as imports – exports + adjustments for industry stock changes.

<sup>5</sup>One company in New Caledonia reported zero reserves owing to recent weakness of nickel prices, although the company continued to produce from that deposit.

<sup>6</sup>See [Appendix C](#) for resource and reserve definitions and information concerning data sources.

<sup>7</sup>For Australia, Joint Ore Reserves Committee-compliant reserves were about 6.4 million tons.