

## NICKEL

(Data in metric tons, nickel content, unless otherwise specified)

**Domestic Production and Use:** In 2023, the underground Eagle Mine in Michigan produced approximately 17,000 tons of nickel in concentrate, which was exported to smelters in Canada and overseas. Nickel in crystalline sulfate was produced as a byproduct of smelting and refining platinum-group-metal ores mined in Montana. In Missouri, a company produced nickel-copper-cobalt concentrate from historic mine tailings. In the United States, the leading uses for primary nickel are alloys and steels, electroplating, and other uses including catalysts and chemicals. Stainless and alloy steel and nickel-containing alloys typically account for more than 85% of domestic consumption.

<b>Salient Statistics—United States:</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023<sup>e</sup></b>
Production:					
Mine	13,500	16,700	18,400	17,500	17,000
Refinery, byproduct	W	W	W	W	W
Imports:					
Ores and concentrates	4	95	18	(1)	1
Primary	119,000	105,000	108,000	127,000	120,000
Secondary	37,700	31,800	34,400	37,300	39,000
Exports:					
Ores and concentrates	14,300	13,400	14,900	15,200	10,000
Primary	12,800	11,300	11,600	11,100	11,000
Secondary	47,800	46,300	29,200	44,300	58,000
Consumption:					
Reported, primary <sup>e</sup>	120,000	97,000	92,000	100,000	100,000
Reported, secondary, purchased scrap	111,000	<sup>e</sup> 110,000	<sup>e</sup> 100,000	<sup>e</sup> 97,000	80,000
Apparent, primary <sup>2</sup>	106,000	<sup>e</sup> 94,000	<sup>e</sup> 97,000	<sup>e</sup> 110,000	110,000
Apparent, total <sup>3</sup>	217,000	<sup>e</sup> 210,000	<sup>e</sup> 200,000	<sup>e</sup> 210,000	190,000
Price, average annual, London Metal Exchange (LME), cash:					
Dollars per metric ton	13,903	13,772	18,476	25,815	22,000
Dollars per pound	6.31	6.25	8.38	11.71	9.80
Stocks, yearend:					
Consumer	13,400	<sup>e</sup> 14,000	<sup>e</sup> 14,000	<sup>e</sup> 29,000	29,000
LME U.S. warehouses	1,974	1,734	1,296	6	1,500
Net import reliance <sup>4, 5</sup> as a percentage of total apparent consumption	49	<sup>e</sup> 46	<sup>e</sup> 49	<sup>e</sup> 54	<sup>e</sup> 57

**Recycling:** Most secondary nickel was in the form of nickel content of stainless-steel scrap. Nickel in alloyed form was recovered from the processing of nickel-containing waste. Most recycled nickel was used to produce new alloys and stainless steel. In 2023, recycled nickel in all forms accounted for approximately 57% of apparent consumption.

**Import Sources (2019–22):** Primary nickel: Canada, 46%; Norway, 9%; Finland, 7%; Russia, 7%; and other, 31%. Nickel-containing scrap, including nickel content of stainless-steel scrap: Canada, 40%; Mexico, 26%; United Kingdom, 9%; Russia, 5%, and other, 20%.

<b>Tariff:</b>	<b>Item</b>	<b>Number</b>	<b>Normal Trade Relations 12–31–23</b>
	Nickel ores and concentrates, nickel content	2604.00.0040	Free.
	Ferronickel	7202.60.0000	Free.
	Unwrought nickel, not alloyed	7502.10.0000	Free.
	Nickel waste and scrap	7503.00.0000	Free.

**Depletion Allowance:** 22% (domestic), 14% (foreign).

**Government Stockpile:**<sup>6</sup> The U.S. Department of Energy is holding approximately 9,700 tons of radiologically contaminated nickel at Paducah, KY.

**Events, Trends, and Issues:** In 2023, the annual average LME nickel cash price was estimated to have decreased by 15% compared with that in 2022. The leading cause was an increasing surplus of nickel from Indonesia in the form of intermediate matte and mixed nickel-cobalt hydroxide (also called MHP by industry) that are used to produce battery-grade nickel sulfate, primarily in China, coupled with decreasing demand for stainless steel. The surplus first emerged in 2022, but the excess material was primarily in the form of Class II nickel pig iron, which is used

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predominately in the production of stainless steel in China and Indonesia. Any negative effect on price was counterbalanced by increased demand for nickel sulfate in lithium-ion battery precursors and concerns about continued availability of Class I metal from Russia after the conflict with Ukraine. By early 2023, however, the surplus had cascaded into an excess of nickel sulfate causing numerous companies in China to convert nickel sulfate to Class I metal, which was expected to add more than 150,000 tons of Class I metal capacity by yearend 2024.

In January, the LME released a report from an independent auditor that reviewed events that led to a 270% increase in nickel price and subsequent suspension of nickel trading on the exchange in March 2022. Contributing factors were found to include the existence of large, exposed, short positions; lack of transparency in over-the-counter trades, which were not subject to typical risk controls; a lack of liquidity and diversity of participants willing to take opposite positions; insufficient price volatility controls; and the use of LME nickel prices to hedge sales of Class II nickel, which is not approved for delivery on the exchange. In response to this report, the LME developed an action plan to reduce the likelihood of recurrent events that included mechanisms such as permanent daily price limits, mandatory reporting of over-the-counter positions, enhanced monitoring of member liquidity, off-warrant stock reporting, and releasing guidance for more efficiently listing new Class I metal brands.

In September, the U.S. Department of Defense awarded \$20.6 million for further exploration and mineral resource definition at a nickel-copper-cobalt project in Minnesota under the Defense Production Act Title III authorities using funds from the Additional Ukraine Supplemental Appropriations Act.

**World Mine Production and Reserves:** Reserves for Australia, China, Indonesia, Russia, the United States, and “Other countries” were revised based on company and Government reports.

	Mine production		Reserves <sup>7</sup>
	2022	2023 <sup>e</sup>	
United States	17,500	17,000	<sup>8</sup> 340,000
Australia	155,000	160,000	<sup>9</sup> 24,000,000
Brazil	88,500	89,000	16,000,000
Canada	143,000	180,000	2,200,000
China	<sup>e</sup> 114,000	110,000	4,200,000
Indonesia	1,580,000	1,800,000	55,000,000
New Caledonia <sup>10</sup>	200,000	230,000	7,100,000
Philippines	<sup>e</sup> 345,000	400,000	4,800,000
Russia	222,000	200,000	8,300,000
Other countries	404,000	380,000	>9,100,000
World total (rounded)	3,270,000	3,600,000	>130,000,000

**World Resources:**<sup>7</sup> Globally, nickel resources have been estimated to contain more than 350 million tons of nickel, with 54% in laterites and 35% in magmatic sulfide deposits. Hydrothermal systems such as iron-nickel alloy, sedimentary-hosted polymetallic, and volcanogenic massive sulfide deposits, as well as seafloor manganese crusts and nodules contain 10%, and miscellaneous resources such as tailings, 1%.

**Substitutes:** Low-nickel, duplex, or ultrahigh-chromium stainless steels have been 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.

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

<sup>1</sup>Less than ½ unit.

<sup>2</sup>Defined as primary imports – primary exports ± adjustments for industry stock changes, excluding secondary consumer stocks.

<sup>3</sup>Defined as apparent primary consumption + reported secondary consumption.

<sup>4</sup>Defined as imports – exports ± adjustments for consumer stock changes.

<sup>5</sup>Includes the nickel content of stainless steel and alloy scrap. Excluding scrap, net import reliance would be nearly 100%.

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

<sup>7</sup>See Appendix C for resource and reserve definitions and information concerning data sources.

<sup>8</sup>Includes reserve data for three projects. An additional three domestic projects have defined resources but have not yet defined reserves.

<sup>9</sup>For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 8.6 million tons.

<sup>10</sup>Overseas territory of France.