

NICKEL

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

Domestic Production and Use: In 2022, the underground Eagle Mine in Michigan produced approximately 18,000 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 and was building a hydrometallurgical processing plant near the mine site. A nickel beneficiation project was to be built in North Dakota using \$115 million awarded from the Bipartisan Infrastructure Law. 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.

Salient Statistics—United States:	2018	2019	2020	2021	2022^e
Production:					
Mine	17,600	13,500	16,700	18,400	18,000
Refinery, byproduct	W	W	W	W	W
Imports:					
Ores and concentrates	3	4	95	18	—
Primary	144,000	119,000	105,000	108,000	130,000
Secondary	45,100	37,700	31,800	34,400	34,000
Exports:					
Ores and concentrates	18,000	14,300	13,400	14,900	18,000
Primary	9,780	12,800	11,300	11,600	11,000
Secondary	59,400	47,800	46,300	29,100	43,000
Consumption:					
Reported, primary	107,000	105,000	^e 85,000	^e 77,000	80,000
Reported, secondary, purchased scrap	123,000	111,000	^e 100,000	^e 100,000	96,000
Apparent, primary ¹	136,000	106,000	^e 94,000	^e 98,000	120,000
Apparent, total ²	259,000	217,000	^e 200,000	^e 200,000	220,000
Price, average annual, London Metal Exchange (LME), cash:					
Dollars per metric ton	13,114	13,903	13,772	18,476	25,000
Dollars per pound	5.948	6.306	6.25	8.38	11
Stocks, yearend:					
Consumer	16,300	13,400	^e 14,000	^e 14,000	14,000
LME U.S. warehouses	2,268	1,974	1,734	1,296	6
Net import reliance ^{3, 4} as a percentage of total apparent consumption	52	49	48	49	56

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 2022, as part of the Bipartisan Infrastructure Law, more than \$600 million was allocated to projects to recover nickel from spent lithium-ion batteries and for the synthesis of nickel-containing precursor and cathode active materials. In 2022, recycled nickel in all forms accounted for approximately 56% of apparent consumption.

Import Sources (2018–21): Primary nickel: Canada, 45%; Norway, 9%; Australia, 8%; Finland, 7%; and other, 31%. Nickel-containing scrap, including nickel content of stainless-steel scrap: Canada, 38%; Mexico, 26%; United Kingdom, 9%; and other, 27%.

Tariff:	Item	Number	Normal Trade Relations 12–31–22
	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:⁵ The U.S. Department of Energy is holding nickel ingot contaminated by low-level radioactivity at Paducah, KY, and shredded nickel scrap at Oak Ridge, TN. See the Lithium chapter for statistics on lithium-nickel-cobalt-aluminum oxide.

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Material	Inventory as of 9-30-22	FY 2022		FY 2023	
		Potential acquisitions	Potential disposals	Potential acquisitions	Potential disposals
Nickel alloys, gross weight	759	—	—	—	—

Events, Trends, and Issues: In 2022, the annual average LME nickel cash price was estimated to have increased by 35% compared with that in 2021 which was attributed to increasing use of nickel in electric vehicle batteries and continued strong demand for stainless steel. Nickel prices were particularly volatile early in the year. In March, after the onset of the conflict between Russia and Ukraine, prices surged, which disrupted nickel trading on the LME for approximately two weeks. Monthly average prices peaked in March, but began to decline through July, and stabilized for the remainder of the year.

Estimated global nickel mine production increased by about 20%, with almost all of the increased production attributed to Indonesia. The largest share of the increase was facilitated by the ongoing commissioning of integrated nickel pig iron and stainless-steel projects. In addition, several companies continued to develop projects to produce intermediate matte or mixed nickel-cobalt hydroxide that were intended to be used as feedstock to produce battery-grade nickel sulfate.

On February 24, 2022, a U.S. critical minerals list was published in the Federal Register (87 FR 10381). The changes in the 2022 list from the prior list published in 2018 (83 FR 23295) were the addition of nickel and zinc and the removal of helium, potash, rhenium, strontium, and uranium. The list is to be updated every 3 years and revised as necessary consistent with available data.

World Mine Production and Reserves: Reserves for Canada, China, New Caledonia, and the United States were revised based on company and Government reports.

	Mine production		Reserves⁶
	2021	2022^e	
United States	18,400	18,000	⁷ 370,000
Australia	151,000	160,000	⁸ 21,000,000
Brazil	76,000	83,000	16,000,000
Canada	134,000	130,000	2,200,000
China	109,000	110,000	2,100,000
Indonesia	1,040,000	1,600,000	21,000,000
New Caledonia ⁹	186,000	190,000	7,100,000
Philippines	387,000	330,000	4,800,000
Russia	205,000	220,000	7,500,000
Other countries	<u>429,000</u>	<u>440,000</u>	<u>20,000,000</u>
World total (rounded)	2,730,000	3,300,000	>100,000,000

World Resources:⁶ Identified land-based resources averaging approximately 0.5% nickel or greater contain at least 300 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.

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.

^eEstimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.

¹Defined as primary imports – primary exports ± adjustments for industry stock changes, excluding secondary consumer stocks.

²Defined as apparent primary consumption + reported secondary consumption.

³Defined as imports – exports ± adjustments for consumer stock changes.

⁴The calculation of net import reliance includes the nickel content of stainless steel and alloy scrap. Excluding scrap, net import reliance would be nearly 100%.

⁵See Appendix B for definitions.

⁶See Appendix C for resource and reserve definitions and information concerning data sources.

⁷Includes reserve data for three projects. An additional three domestic projects have defined resources but have not yet defined reserves.

⁸For Australia, Joint Ore Reserves Committee-compliant or equivalent reserves were 9.5 million tons.

⁹Overseas Territory of France.