

COBALT

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

Domestic Production and Use: In 2019, the nickel-copper Eagle Mine in Michigan produced cobalt-bearing nickel concentrate. In Missouri, a company built a flotation plant and produced nickel-copper-cobalt concentrate from historic mine tailings. Most U.S. cobalt supply comprised imports and secondary (scrap) materials. Approximately six companies in the United States produced cobalt chemicals. About 46% of the cobalt consumed in the United States was used in superalloys, mainly in aircraft gas turbine engines; 9% in cemented carbides for cutting and wear-resistant applications; 14% in various other metallic applications; and 31% in a variety of chemical applications. The total estimated value of cobalt consumed in 2019 was \$400 million.

Salient Statistics—United States:	2015	2016	2017	2018	2019^e
Production:					
Mine ^e	760	690	640	490	500
Secondary	2,750	2,750	2,750	2,740	2,700
Imports for consumption	11,400	12,800	11,900	11,800	13,600
Exports	3,830	4,160	5,710	6,960	4,000
Consumption:					
Reported (includes secondary)	8,830	9,010	9,240	9,270	9,300
Apparent (includes secondary) ¹	10,300	11,500	8,920	7,580	12,400
Price, average, dollars per pound:					
U.S. spot, cathode ²	13.44	12.01	26.97	37.43	17.00
London Metal Exchange (LME), cash	12.90	11.57	25.28	32.94	15.00
Stocks, yearend:					
Industry ³	1,070	969	1,020	1,040	1,000
LME, U.S. warehouse	165	195	160	130	110
Net import reliance ⁴ as a percentage of apparent consumption	73	76	69	64	78

Recycling: In 2019, cobalt contained in purchased scrap represented an estimated 29% of cobalt reported consumption.

Import Sources (2015–18): Cobalt contained in metal, oxide, and salts: Norway, 17%; Japan, 13%; China, 11%; Canada, 11%; and other, 48%.

Tariff: Item	Number	Normal Trade Relations 12–31–19
Cobalt ores and concentrates	2605.00.0000	Free.
Chemical compounds:		
Cobalt oxides and hydroxides	2822.00.0000	0.1% ad val.
Cobalt chlorides	2827.39.6000	4.2% ad val.
Cobalt sulfates	2833.29.1000	1.4% ad val.
Cobalt carbonates	2836.99.1000	4.2% ad val.
Cobalt acetates	2915.29.3000	4.2% ad val.
Unwrought cobalt, alloys	8105.20.3000	4.4% ad val.
Unwrought cobalt, other	8105.20.6000	Free.
Cobalt mattes and other intermediate products; cobalt powders		
Cobalt waste and scrap	8105.20.9000	Free.
Cobalt waste and scrap	8105.30.0000	Free.
Wrought cobalt and cobalt articles	8105.90.0000	3.7% ad val.

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

Government Stockpile:⁵ See the Lithium chapter for statistics on lithium-cobalt oxide and lithium-nickel-cobalt-aluminum oxide.

Material	Inventory As of 9–30–19	FY 2019		FY 2020	
		Potential Acquisitions	Potential Disposals	Potential Acquisitions	Potential Disposals
Cobalt	302	—	—	—	—
Cobalt alloys, gross weight	3	—	—	—	—

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Events, Trends, and Issues: Congo (Kinshasa) continued to be the world's leading source of mined cobalt, supplying approximately 70% of world cobalt mine production. With the exception of production in Morocco and artisanally mined cobalt in Congo (Kinshasa), most cobalt is mined as a byproduct of copper or nickel. China was the world's leading producer of refined cobalt, most of which it produced from partially refined cobalt imported from Congo (Kinshasa). China was the world's leading consumer of cobalt, with more than 80% of its consumption being used by the rechargeable battery industry.

During the first 7 months of 2019, cobalt prices generally trended downward, which analysts attributed to oversupply and consumer destocking and deferral of purchases. In early August, a Switzerland-based producer and marketer of commodities announced that, owing to low cobalt prices, it planned to place its world-leading cobalt mine on care-and-maintenance status by yearend 2019. Following the announcement, cobalt prices increased, then stabilized.

World Mine Production and Reserves: Reserves for multiple countries were revised based on industry reports.

	Mine production		Reserves ⁶
	2018	2019 ^e	
United States	490	500	55,000
Australia	4,880	5,100	⁷ 1,200,000
Canada	3,520	3,000	230,000
China	2,000	2,000	80,000
Congo (Kinshasa)	104,000	100,000	3,600,000
Cuba	3,500	3,500	500,000
Madagascar	3,300	3,300	120,000
Morocco	2,100	2,100	18,000
New Caledonia ⁸	2,100	1,600	—
Papua New Guinea	3,280	3,100	56,000
Philippines	4,600	4,600	260,000
Russia	6,100	6,100	250,000
South Africa	2,300	2,400	50,000
Other countries	5,540	5,700	570,000
World total (rounded)	148,000	140,000	7,000,000

World Resources: Identified cobalt resources of the United States are estimated to be about 1 million tons. Most of these resources are in Minnesota, but other important occurrences are in Alaska, California, Idaho, Michigan, Missouri, Montana, Oregon, and Pennsylvania. With the exception of resources in Idaho and Missouri, any future cobalt production from these deposits would be as a byproduct of another metal. Identified world terrestrial cobalt resources are about 25 million tons. The vast majority of these resources are in sediment-hosted stratiform copper deposits in Congo (Kinshasa) and Zambia; nickel-bearing laterite deposits in Australia and nearby island countries and Cuba; and magmatic nickel-copper sulfide deposits hosted in mafic and ultramafic rocks in Australia, Canada, Russia, and the United States. More than 120 million tons of cobalt resources have been identified in manganese nodules and crusts on the floor of the Atlantic, Indian, and Pacific Oceans.

Substitutes: Depending on the application, substitution for cobalt could result in a loss in product performance or an increase in cost. The cobalt contents of lithium-ion batteries, the leading global use for cobalt, are expected to be reduced rather than eliminated; nickel contents of lithium-ion batteries will increase as cobalt contents decrease. Potential substitutes in other applications include barium or strontium ferrites, neodymium-iron-boron, or nickel-iron alloys in magnets; cerium, iron, lead, manganese, or vanadium in paints; cobalt-iron-copper or iron-copper in diamond tools; copper-iron-manganese for curing unsaturated polyester resins; iron, iron-cobalt-nickel, nickel, cermets, or ceramics in cutting and wear-resistant materials; nickel-based alloys or ceramics in jet engines; nickel in petroleum catalysts; rhodium in hydroformylation catalysts; and titanium-based alloys in prosthetics.

^eEstimated. — Zero.

¹Defined as net import reliance + secondary production, as estimated from consumption of purchased scrap.

²As reported by Platts Metals Week. Cobalt cathode is refined cobalt metal produced by an electrolytic process.

³Stocks held by consumers and processors; excludes stocks held by trading companies and held for investment purposes.

⁴Defined as imports – exports + adjustments for Government and industry stock changes for refined cobalt.

⁵See Appendix B for definitions.

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

⁷For Australia, Joint Ore Reserves Committee-compliant reserves were 310,000 tons.

⁸Overseas territory of France. Although nickel-cobalt mining and processing continued, the leading producer reported zero reserves based on recent nickel prices.