COBALT

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

Domestic Production and Use: In 2018, a nickel-copper mine in Michigan produced cobalt-bearing nickel concentrate. Most U.S. cobalt supply comprised imports and secondary (scrap) materials. Six companies were known to produce cobalt chemicals. About 46% of the cobalt consumed in the United States was used in superalloys, mainly in aircraft gas turbine engines; 8% in cemented carbides for cutting and wear-resistant applications; 15% in various other metallic applications; and 31% in a variety of chemical applications. The total estimated value of cobalt consumed in 2018 was $700 million.

Salient Statistics—United States:	2014	2015	2016	2017	2018[e]
Production:					
Mine[e]	120	760	690	640	500
Secondary	2,200	2,750	2,750	2,750	2,800
Imports for consumption	11,300	11,400	12,800	11,900	12,000
Exports	4,500	3,830	4,160	5,730	7,700
Consumption:					
Reported (includes secondary)	8,650	8,830	9,010	9,240	9,500
Apparent (includes secondary)[1]	8,710	10,300	11,500	8,910	7,200
Price, average, dollars per pound:					
U.S. spot, cathode[2]	14.48	13.44	12.01	26.97	38.00
London Metal Exchange (LME), cash	14.00	12.90	11.57	25.28	33.00
Stocks, yearend:					
Industry[3]	1,410	1,320	1,220	1,270	1,200
LME, U.S. warehouse	9	165	195	160	130
Net import reliance[4] as a percentage of apparent consumption	75	73	76	69	61

Recycling: In 2018, cobalt contained in purchased scrap represented an estimated 29% of cobalt reported consumption.

Import Sources (2014–17): Cobalt contained in metal, oxide, and salts: Norway, 18%; China, 12%; Japan, 12%; Finland, 9%; and other, 49%.

Tariff: Item	Number	Normal Trade Relations 12–31–18
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	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.

		FY2018		FY 2019	
Material	Inventory As of 9–30–18	Potential Acquisitions	Potential Disposals[6]	Potential Acquisitions	Potential Disposals[6]
Cobalt	302	—	—	—	—
Cobalt alloys, gross weight	3	—	—	—	—

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Events, Trends, and Issues: In May 2018, the U.S. Department of the Interior, in coordination with other executive branch agencies, published a list of 35 critical minerals (83 FR 23295), including cobalt. This list was developed to serve as an initial focus, pursuant to Executive Order 13817, ‘‘A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals” (82 FR 60835).

Congo (Kinshasa) continued to be the world’s leading source of mined cobalt, supplying more than 60% 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 and has been a leading supplier of cobalt imports to the United States. Most of China’s production was 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. In 2018, average annual cobalt prices were higher than those of 2017, owing to strong demand from consumers in the rechargeable battery and aerospace industries and to limited availability of cobalt metal.

World Mine Production and Reserves: Reserves were revised based on Government or industry reports.

	Mine production		Reserves[7]
	2017	2018[e]	
United States	640	500	38,000
Australia	5,030	4,700	[8]1,200,000
Canada	3,870	3,800	250,000
China	3,100	3,100	80,000
Congo (Kinshasa)	73,000	90,000	3,400,000
Cuba	5,000	4,900	500,000
Madagascar	3,500	3,500	140,000
Morocco	2,200	2,300	17,000
Papua New Guinea	3,310	3,200	56,000
Philippines	4,600	4,600	280,000
Russia	5,900	5,900	250,000
South Africa	2,300	2,200	24,000
Other countries	7,650	7,000	640,000
World total (rounded)	120,000	140,000	6,900,000

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.

[e]Estimated. — Zero.

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

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

[3]Stocks held by consumers, processors, and trading companies.

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

[5]See Appendix B for definitions.

[6]Disposals are defined as any barter, rotation, sale, or upgrade of National Defense Stockpile stock.

[7]See Appendix C for resource and reserve definitions and information concerning data sources.

[8]For Australia, Joint Ore Reserves Committee-compliant reserves were about 390,000 tons.