COBALT

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

<u>Domestic Production and Use</u>: A nickel-copper mine in Michigan began production and shipped cobalt-bearing nickel concentrate in late 2014. Most U.S. supply comprised imports and secondary (scrap) materials. The sole U.S. producer of extra-fine cobalt powder, in Pennsylvania, used cemented carbide scrap as feed. Seven companies were known to produce cobalt compounds. About 47% 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; 17% in various other metallic applications; and 27% in a variety of chemical applications. The total estimated value of cobalt consumed in 2014 was \$275 million.

Salient Statistics—United States:	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	2014 ^e
Production:					
Mine					NA
Secondary	2,000	2,210	2,160	2,160	2,200
Imports for consumption	11,100	10,600	11,100	10,500	11,700
Exports	2,640	3,390	3,760	3,850	4,800
Shipments from Government stockpile excesses ¹	-8				_
Consumption:					
Reported (includes secondary)	8,130	9,180	8,660	8,090	8,200
Apparent ² (includes secondary)	10,300	9,230	9,520	8,670	9,200
Price, average, dollars per pound:					
Spot, cathode ³	20.85	17.99	14.07	12.89	14.40
London Metal Exchange (LME), cash	XX	16.01	13.06	12.26	14.00
Stocks, yearend:					
Industry	880	1,040	970	1,070	1,040
LME, U.S. warehouse	23	43	51	41	10
Net import reliance⁴ as a percentage of					
apparent consumption	81	76	77	75	76

Recycling: In 2014, cobalt contained in purchased scrap represented an estimated 27% of cobalt reported consumption.

Import Sources (2010–13): Cobalt contained in metal, oxide, and salts: China, 21%; Norway, 11%; Russia, 10%; Finland, 9%; and other, 49%.

Tariff: Item	Number	Normal Trade Relations ⁵ 12–31–14
Cobalt ores and concentrates Chemical compounds:	2605.00.0000	Free.
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:

Stockpile Status—9-30-14⁶

Diamond Diam

Diamondo

		Disposai Pian	Disposais
Material	Inventory	FY 2014	FY 2014
Cobalt	301		_

COBALT

Events, Trends, and Issues: In recent years, global production of refined cobalt has been higher than consumption, resulting in a market surplus and downward pressure on prices. This trend is expected to continue in the near-term as production from new projects and expansions to existing operations add to supply of mined and refined cobalt. China was the world's leading producer of refined cobalt and the leading supplier of cobalt imports to the United States. Much of China's production was from ore and partially refined cobalt imported from Congo (Kinshasa). In recent years, China has been drawing down significant stocks of cobalt feed that had accumulated from 2009 through 2011.

During the first 6 months of 2014, world availability of refined cobalt (as measured by production) was 10% higher than that of the same period in 2013. China showed a large increase in production of refined cobalt; significant increases in production in Finland, Japan, and Madagascar also contributed to supply. Worldwide cobalt inventories in London Metal Exchange (LME) warehouses decreased to 491 tons at the end of October 2014 from 560 tons at yearend 2013.

<u>World Mine Production and Reserves</u>: Reserves for Australia, Brazil, Canada, the United States, and "Other countries" were revised based on company or Government reports.

	Mine	production	Reserves ⁷
	<u>2013</u>	2014 ^e	
United States		NA	37,000
Australia	6,400	6,500	81,100,000
Brazil	3,000	3,000	85,000
Canada	6,920	7,000	250,000
China	7,200	7,200	80,000
Congo (Kinshasa)	54,000	56,000	3,400,000
Cuba	4,200	4,200	500,000
New Caledonia ⁹	3,190	2,800	200,000
Philippines	3,000	3,700	270,000
Russia	6,300	6,300	250,000
South Africa	3,000	3,000	32,000
Zambia	5,200	3,100	270,000
Other countries	8,000	9,500	<u>750,000</u>
World total (rounded)	110,000	112,000	7,200,000

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.

<u>Substitutes</u>: In some applications, substitution for cobalt would result in a loss in product performance. Potential substitutes 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; iron-phosphorous, manganese, nickel-cobalt-aluminum, or nickel-cobalt-manganese in lithium-ion batteries; nickel-based alloys or ceramics in jet engines; nickel in petroleum catalysts; and rhodium in hydroformylation catalysts.

^eEstimated. NA Not available. XX Not applicable. — Zero.

¹Negative numbers are the result of inventory adjustments.

²The sum of U.S. net import reliance and secondary production, as estimated from consumption of purchased scrap.

³As reported by Platts Metals Daily (formerly Platts Metals Week).

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

⁵Tariffs for certain countries and items may be eliminated under special trade agreements.

⁶See Appendix B for definitions.

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

⁸For Australia, Joint Ore Reserves Committee (JORC)-compliant reserves were about 390,000 tons.

⁹Overseas territory of France.