

RARE EARTHS¹

[Data in metric tons of rare-earth oxide (REO) equivalent content unless otherwise noted]

Domestic Production and Use: Rare earths were not mined domestically in 2016. Bastnaesite, a rare-earth fluorocarbonate mineral, was previously mined as a primary product at Mountain Pass, CA, which was put on care and maintenance in the fourth quarter of 2015. The estimated value of rare-earth compounds and metals imported by the United States in 2016 was \$120 million, a decrease from \$160 million imported in 2015. The estimated distribution of rare earths by end use was as follows: catalysts, 55%; metallurgical applications and alloys, 15%; ceramics and glass, 10%; polishing, 10%; and other, 10%.

Salient Statistics—United States:	2012	2013	2014	2015	2016^e
Production, bastnaesite concentrates	3,000	5,500	5,400	5,900	—
Imports: ²					
Compounds:					
Cerium compounds	1,390	1,110	1,440	1,560	1,900
Other rare-earth compounds	3,400	7,330	9,110	7,640	10,000
Metals:					
Ferrocerium, alloys	276	313	378	356	290
Rare-earth metals, scandium, and yttrium	240	393	348	383	470
Exports: ²					
Compounds:					
Cerium compounds	996	734	608	441	310
Other rare-earth compounds	1,830	5,570	3,800	4,530	350
Metals:					
Ferrocerium, alloys	960	1,420	1,640	1,220	220
Rare-earth metals, scandium, and yttrium	2,080	1,050	140	57	131
Consumption, estimated	15,000	15,000	17,000	17,000	16,000
Price, dollars per kilogram, yearend: ³					
Cerium oxide, 99.5% minimum	10–12	5–6	4–5	2	2
Dysprosium oxide, 99.5% minimum	600–630	440–490	320–360	215–240	183–186
Europium oxide, 99.9% minimum	1,500–1,600	950–1,000	680–730	90–110	62–70
Lanthanum oxide, 99.5% minimum	9–11	6	5	2	2
Mischmetal, 65% cerium, 35% lanthanum	14–16	9–10	9–10	5–6	5–6
Neodymium oxide, 99.5% minimum	75–80	65–70	56–60	39–42	38–40
Terbium oxide, 99.99% minimum	1,200–1,300	800–850	590–640	410–470	410–425
Employment, mine and mill, annual average	275	380	391	351	—
Net import reliance ⁴ as a percentage of estimated consumption	80	63	68	65	100

Recycling: Limited quantities, from batteries, permanent magnets, and fluorescent lamps.

Import Sources (2012–15): Rare-earth compounds and metals: China, 72%; Estonia, 7%; France, 5%; Japan, 5%; and other, 11%. Imports of compounds and metal from Estonia, France, and Japan were derived from mineral concentrates produced in China and elsewhere.

Tariff:	Item	Number	Normal Trade Relations
			<u>12–31–16</u>
	Rare-earth metals, scandium and yttrium whether or not intermixed or interalloyed	2805.30.000	5.0% ad val.
	Cerium compounds		
	Oxides	2846.10.0010	5.5% ad val.
	Other	2846.10.0050	5.5% ad val.
	Other rare-earth compounds		
	Lanthanum oxides	2846.90.2005	Free.
	Other oxides	2846.90.2040	Free.
	Lanthanum carbonates	2846.90.8070	3.7% ad val.
	Other carbonates	2846.90.8075	3.7% ad val.
	Other rare-earth compounds	2846.90.8090	3.7% ad val.
	Ferrocerium and other pyrophoric alloys	3606.90.3000	5.9% ad val.

Depletion Allowance: Monazite, 22% on thorium content and 14% on rare-earth content (Domestic), 14% (Foreign); bastnaesite and xenotime, 14% (Domestic and foreign).

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Government Stockpile: The Defense Logistics Agency's Annual Materials Plan for fiscal year 2016 included a ceiling acquisition of 0.5 tons of dysprosium metal and 10 tons of yttrium oxide. In fiscal year 2016, the Defense Logistics Agency acquired 8.8 tons of yttrium oxide.

Events, Trends, and Issues: The suspension of U.S. mining in 2015 resulted in a significant decline in exports of rare-earth compounds in 2016. U.S. imports of rare-earth compounds and metals increased by 6% compared with those in 2015.

In 2016, excess global supply caused prices for many rare-earth compounds and metals to decline, and China continued to dominate the global supply. In China, the rare-earth mining production quota for 2016 was set at 105,000 tons, unchanged from 2015. China's rare-earths industry continued its consolidation into six major industrial entities. Through September 2016, China had exported 35,200 tons of rare-earth materials, a 50% increase compared with exports for the same period in 2015. Production of rare-earth oxide equivalent in Malaysia, derived from concentrates mined in Australia, was 6,290 tons through June 2016, a 37% increase compared with the same period in 2015.

Exploration efforts to develop rare-earth projects continued in 2016. Exploration and development assessments in the United States included Bear Lodge, WY; Bokan Mountain, AK; Diamond Creek, ID; Elk Creek, NE; La Paz, AZ; Lemhi Pass, ID-MT; Pea Ridge, MO; Round Top, TX; and Thor, NV. Additional projects were underway in Australia, Brazil, Canada, China, Finland, Greenland, India, Kyrgyzstan, Madagascar, Malawi, Mozambique, Namibia, South Africa, Sweden, Tanzania, Turkey, and Vietnam.

World Mine Production and Reserves: The reserves estimates for Canada, China, India, Malawi, Russia, South Africa, Vietnam, and the United States have been added or revised based on new information from Government and industry sources.

	Mine production ^e		Reserves ⁵
	2015	2016	
United States	5,900	—	1,400,000
Australia	12,000	14,000	⁶ 3,400,000
Brazil	880	1,100	22,000,000
Canada	—	—	830,000
China	⁷ 105,000	⁷ 105,000	44,000,000
Greenland	—	—	1,500,000
India	1,700	1,700	6,900,000
Malaysia	500	300	30,000
Malawi	—	—	136,000
Russia	2,800	3,000	18,000,000
South Africa	—	—	860,000
Thailand ⁸	760	800	NA
Vietnam ⁸	250	300	22,000,000
World total (rounded)	130,000	126,000	120,000,000

World Resources: Rare earths are relatively abundant in the Earth's crust, but discovered minable concentrations are less common than for most other ores. U.S. and world resources are contained primarily in bastnäsite and monazite. Bastnäsite deposits in China and the United States constitute the largest percentage of the world's rare-earth economic resources, and monazite deposits constitute the second largest segment.

Substitutes: Substitutes are available for many applications but generally are less effective.

^eEstimated. NA Not available. — Zero.

¹Data include lanthanides and yttrium but exclude most scandium. See also Scandium and Yttrium.

²REO equivalent or content of various materials were estimated. Source: U.S. Census Bureau.

³Price range from Argus Media group - Metal-Pages Ltd.

⁴Defined as estimated consumption – production. Insufficient data were available to determine stock changes and unattributed imports and exports of rare-earth materials.

⁵See [Appendix C](#) for resource and reserve definitions and information concerning data sources.

⁶For Australia, Joint Ore Reserves Committee-compliant reserves were about 2.1 million tons.

⁷Production quota does not include undocumented production.

⁸Production estimate based on Chinese imports.