RARE EARTHS[1]

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

Domestic Production and Use: In 2011, rare earths were not mined in the United States; however, rare-earth concentrates previously produced at Mountain Pass, CA, were processed into lanthanum concentrate and didymium (75% neodymium, 25% praseodymium) products. Rare-earth concentrates, intermediate compounds, and individual oxides were available from stocks. The United States continued to be a major consumer, exporter, and importer of rare-earth products in 2011. The estimated value of refined rare earths imported by the United States in 2011 was $696 million, an increase from $161 million imported in 2010. Based on reported data through August 2011, the estimated 2011 distribution of rare earths by end use, in decreasing order, was as follows: catalysts, 47%; metallurgical applications and alloys, 13%; alloys, 11%; glass polishing and ceramics, 10%; permanent magnets, 9%; ceramics, 5%; rare-earth phosphors for computer monitors, lighting, radar, televisions, and x-ray-intensifying film, 5%.

Salient Statistics—United States:	2007	2008	2009	2010	2011[e]
Production, bastnäsite concentrates	—	—	—	—	—
Exports:[2]					
Cerium compounds	1,470	1,380	840	1,350	1,400
Rare-earth metals, alloys	1,470	1,390	4,920	1,380	3,400
Other rare-earth compounds	1,300	663	455	1,690	3,300
Ferrocerium, alloys	3,210	4,490	2,970	3,460	2,500
Thorium ore (monazite or various thorium materials)	—	—	18	1	30
Imports:[2]					
Cerium compounds	2,680	2,080	1,500	1,770	1,300
Ferrocerium, alloys	123	125	102	131	130
Mixed rare-earth chlorides	1,610	1,310	411	956	330
Mixed REOs	2,570	2,400	4,750	5,480	2,300
Rare-earth oxides, compounds	9,900	8,820	5,130	3,980	3,700
Rare-earth metals, alloy	784	679	226	525	420
Thorium ore (monazite or various thorium materials)	—	—	—	26	—
Consumption, apparent (excludes thorium ore) [3]	10,200	7,410	W	W	W
Price, dollars per kilogram, yearend:					
Bastnäsite concentrate, REO basis[e]	6.61	8.82	5.73	6.87	NA
Monazite concentrate, REO basis[e]	0.87	0.87	0.87	0.87	2.70
Mischmetal, metal basis, metric ton quantity[4]	7–8	8–9	8–9	45–55	86–110
Stocks, producer and processor, yearend	W	W	W	W	W
Employment, mine and mill, number at yearend	70	100	110	220	350
Net import reliance[5] as a percentage of apparent consumption	100	100	100	100	100

Recycling: Small quantities, mostly permanent magnet scrap.

Import Sources (2007–10): Rare-earth metals, compounds, etc.: China, 79%; France, 6%; Estonia, 4%: Japan, 3%; and other, 8%.

Tariff: Item	Number	Normal Trade Relations 12-31-11
Thorium ores and concentrates (monazite)	2612.20.0000	Free.
Rare-earth metals, scandium and yttrium whether or not intermixed or interalloyed	2805.30.0000	5.0% ad val.
Cerium compounds	2846.10.0000	5.5% ad val.
Mixtures of REOs (except cerium oxide)	2846.90.2010	Free.
Mixtures of rare-earth chlorides (except cerium chloride)	2846.90.2050	Free.
Rare-earth compounds, individual REOs (excludes cerium compounds)	2846.90.8000	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); bastnäsite and xenotime, 14% (Domestic and foreign).

Government Stockpile: None.

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RARE EARTHS

Events, Trends, and Issues: Based on apparent consumption derived from 8 months of trade data, domestic consumption of rare earths and imports in 2011 declined significantly compared with that of 2010. All seven rare-earth import categories decreased when compared with those of 2010. Owing to declining supply, prices for most rare-earth products increased significantly in the third and fourth quarters of 2011. Consumption generally decreased for cerium compounds used in automotive catalytic converters and in glass additives and glass-polishing compounds; rare-earth chlorides used in the production of fluid-cracking catalysts for oil refining; rare-earth compounds used in automotive catalytic converters and many other applications; and rare-earth metals and their alloys used in armaments and base-metal alloys. Consumption was more stable in lighter flints, permanent magnets, pyrophoric alloys, and superalloys, but decreased for yttrium compounds used in color televisions and flat-panel displays, electronic thermometers, fiber optics, lasers, and oxygen sensors and for phosphors used for color televisions, electronic thermometers, fluorescent lighting, pigments, superconductors, x-ray-intensifying screens, and other applications. Demand remained stable for rare earths in many applications, especially automotive catalytic converters, permanent magnets, and rechargeable batteries for electric and hybrid vehicles.

The rare-earth separation plant at Mountain Pass, CA, resumed operation in 2007 and continued to operate throughout 2011. Bastnäsite concentrates and other rare-earth intermediates and refined products continued to be sold from mine stocks at Mountain Pass. The company commenced with Project Phoenix in 2011 to reopen mining operations and to build new processing facilities at Mountain Pass. Exploration efforts to develop rare earths projects continued to surge in 2011, and investment and interest increased dramatically. Economic assessments continued in North America at Bear Lodge in Wyoming; Diamond Creek in Idaho; Elk Creek in Nebraska; Hoidas Lake in Saskatchewan, Canada; Kipawa in Quebec, Canada; Lemhi Pass in Idaho-Montana; and Nechalacho (Thor Lake) in Northwest Territories, Canada. Economic assessments in other locations around the world include Dubbo Zirconia in New South Wales, Australia; Kangankunde in Malawi; Mount Weld in Western Australia, Australia; Nolans Project in Northern Territory, Australia, and Steenkampskraal in Western Cape, South Africa.

World Mine Production and Reserves:

	Mine production[e]		Reserves[6]
	2010	2011	
United States	—	—	13,000,000
Australia	—	—	1,600,000
Brazil	550	550	48,000
China	130,000	130,000	55,000,000
Commonwealth of Independent States	NA	NA	19,000,000
India	2,800	3,000	3,100,000
Malaysia	30	30	30,000
Other countries	NA	NA	22,000,000
World total (rounded)	133,000	130,000	110,000,000

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, while monazite deposits in Australia, Brazil, China, India, Malaysia, South Africa, Sri Lanka, Thailand, and the United States constitute the second largest segment. Apatite, cheralite, eudialyte, loparite, phosphorites, rare-earth-bearing (ion adsorption) clays, secondary monazite, spent uranium solutions, and xenotime make up most of the remaining resources. Undiscovered resources are thought to be very large relative to expected demand. A very large resource enriched in heavy rare-earth elements is inferred for phosphorites of the Florida Phosphate District.

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

[e]Estimated. NA Not available. W Withheld to avoid disclosing company proprietary data. — Zero.
[1]Data include lanthanides and yttrium but exclude most scandium. See also Scandium and Yttrium.
[2]REO equivalent or contents of various materials were estimated. Data from U.S. Census Bureau.
[3]Defined as production + imports – exports + adjustments for industry stock changes; for 2010 and 2011, excludes producer stock changes (proprietary), and there were no producer stock changes in 2007.
[4]Price range from Elements—Rare Earths, Specialty Metals and Applied Technology and Web-based High Tech Materials, Longmont, CO, and Hefa Rare Earth Canada Co. Ltd., Richmond, British Columbia, Canada.
[5]Defined as imports – exports + adjustments for Government and industry stock changes. For 2010 and 2011, excludes producer stock changes (proprietary).
[6]See Appendix C for resource/reserve definitions and information concerning data sources.