

# Understanding the Rare Earth Materials Crisis

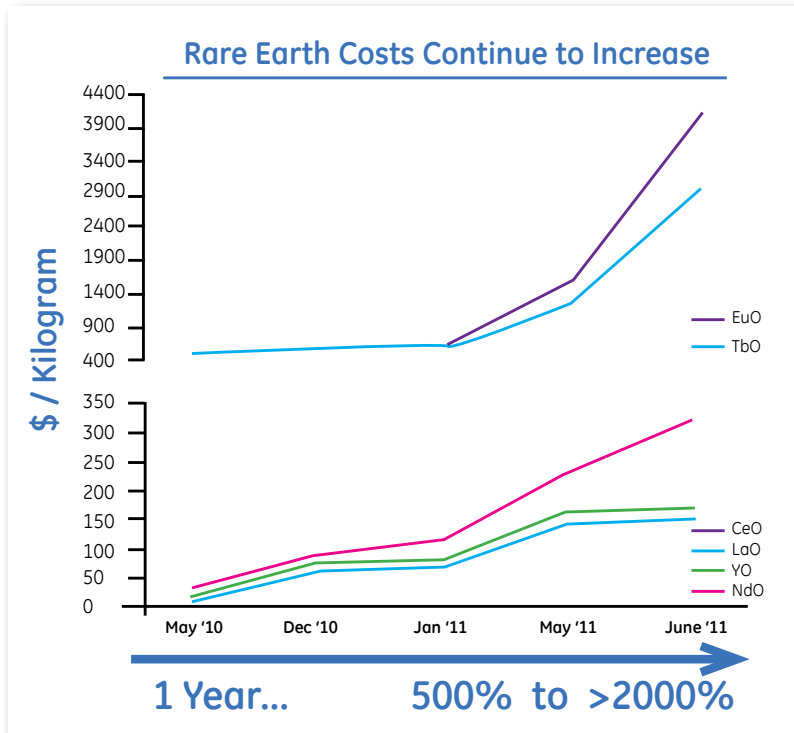




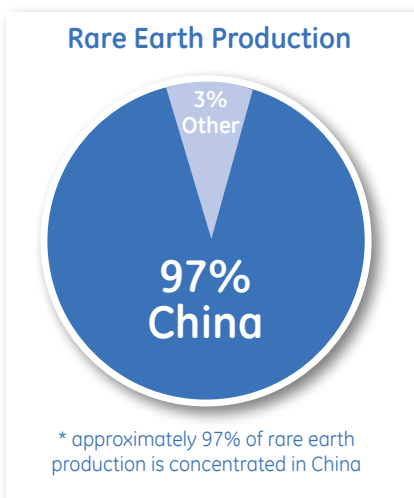
# Understanding the Rare Earth Materials Crisis

## Background: Rare Earth Materials

The lighting industry is going through unprecedented change. Global energy standards are causing the phase-out of less efficient products. Solid state LED technology, with its rapid improvements in efficiencies, continues to penetrate traditional lighting applications. Integrated electronics are bringing along controls with lighting solutions networked throughout building and living spaces. Low barriers to entry with LED products have led to thousands of entrants into the marketplace.



As dynamic as this is, a somewhat more recent development has created a never-before inflationary environment with core materials. Rare earths, a group of 17 elements widely used in lighting technologies, are undergoing extreme cost increases due to unprecedented market forces. In less than 12 months, costs of some rare earth oxide materials used in lighting products have experienced increases ranging from 500 percent to more than 2,000 percent, and they continue to climb.



## Where are Rare Earths Found Today?

Rare earth materials are mined principally in China, although they are found throughout the world. They are needed in concentrated deposits in order to make their mining economically viable. Concentrations in the lower single-digit percentages can be considered attractive, but they are nonetheless expensive to mine, and environmental concerns impact mining activities. In the past, there were numerous mines that produced rare earth materials outside of China, but today approximately 97% of all production is concentrated in China.



These circumstances have raised the interest of speculators, however, and rare earth material buyers are building inventories. China also has continued to impose quotas on its exports of rare earths each year, which tends to promote production of materials elsewhere in the world.

### Role of Rare Earths in Lighting

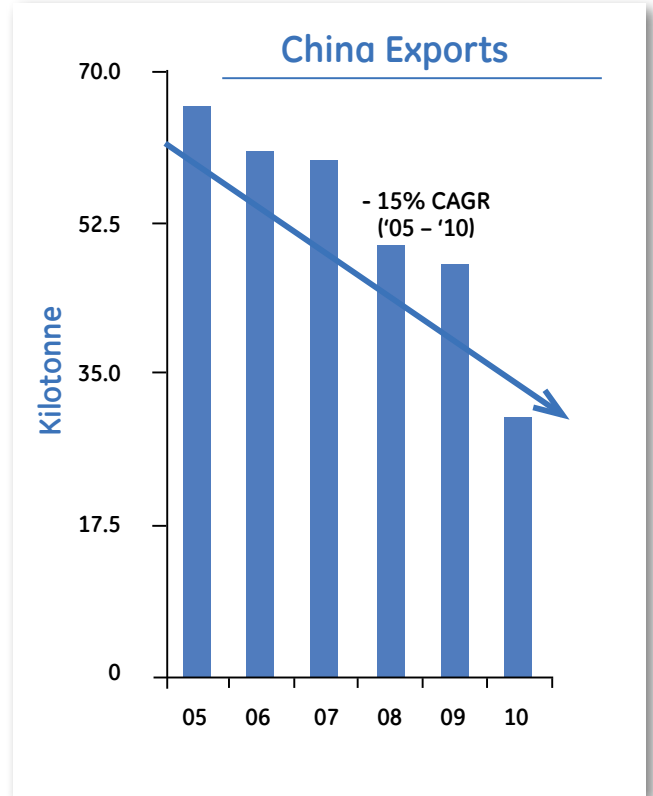
Rare earth materials have very unique properties and are used in hundreds of products, such as hard drives, fuel cells, wind turbines, polishing powders and catalytic converters. However, they also are essential components for some lighting products. Rare earth oxides of lanthanum, cerium, terbium, yttrium and europium are used for the creation of white light from the UV radiation generated within fluorescent lamps. Today, no viable substitutes exist for rare earth materials in like-for-like products, including lamps.

### The Impact on Pricing

A variety of factors continue to inflate the cost of these materials as the realization of their intrinsic value increases. Demand for rare earths continues to grow in line with growth in green technologies. The rate of cost increase for these raw materials vital to fluorescent, and some incandescent and halogen products, is astronomical. For perspective, if the rate of inflation on the rare earth element europium oxide were applied to a \$2.00 cup of coffee, the new cost would be \$24.55.

### What is the Global Response?

The increased demand and changes in China have spawned renewed interest in rare earth mining around the world, but new mines and separation facilities, which extract rare earth minerals into usable ores and metals, warrant huge investment. The cost is in the hundreds of millions of dollars, and the timeline to operationalize a new mine is seven to ten years. Furthermore, differences in the makeup of ores with rare earths result in mines producing higher concentrations of some of the rare earths, but not all. The Mountain Pass and Mount Weld mines in California and Australia, respectively, are expected to be operational in 2012, but these mines will produce mainly a group of rare earths called “light” rare earths. Unfortunately, only half of the rare earths needed for fluorescent lighting products are considered “light” rare earths. The others are considered “heavy” and will not be produced in viable quantities outside of China for many years.





## What Can be Done?

The picture for rare earths remains difficult. Demand for some rare earths will outpace supply for some time. Globally, many actions are underway to help manage this situation. Governments are working with China to ensure balanced and fair trade policies. The U.S. government also has a marked focus on rare earths with a number of bills and actions aimed at securing a domestic materials supply chain. Researchers in private and public industries are pursuing the development of alternative solutions. Companies and industries, collectively, are working abatement through manufacturing waste reduction, as well as developing recycling methods for end-of-life products.

## Summary

The GE Lighting global business has invoked teams across the company to help effectively manage this unprecedented supply chain crisis. Our technology team is working closely

with GE's Global Research Center to develop and procure lower rare earth content phosphor and qualify an expanded base of suppliers. The business continues to work to secure an ample supply of materials to help minimize cost impacts on customers. And, our European and U.S. industry representatives and government teams are active within industry groups.

Until supplies of these materials stabilize with new sources and technologies, our business will have to work hard to navigate through this unprecedented inflationary environment and use our growing portfolio of products and solutions even more creatively to lead the lighting revolution.

For more information, go to [www.gelighting.com/rareearths](http://www.gelighting.com/rareearths).