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Rare Earths: A Sophisticated New Resource Model for China?

Within the general pattern of China's natural resource procurement, attention must be paid to its strategy regarding rare earth elements (REEs), a category of metals used in a variety of technological applications, from lighter flints to high-temperature superconductivity. The term "rare earth," according to the US Geological Survey (USGS 2002, 2), "is a historical misnomer; persistence of the term reflects unfamiliarity rather than true rarity." Even the two least abundant REEs—thulium and lutetium—are approximately 200 times more common than gold.

Worldwide undiscovered sources of REEs are estimated to be much larger than expected demand (USGS 2009); however, REEs appear to be only occasionally concentrated in specific rich ore deposits and currently are derived from only a handful of sites. Historically, price patterns have been too low to support extensive exploration and development beyond these, though this may be changing.

The number of applications for REEs, alone or in alloys, is growing. High-strength REE magnets allow miniaturization of components used in computers, communications systems, and military gear. REE magnets control the guidance vanes on the sides of missiles. Liquid-crystal displays and color cathode-ray tubes employ europium as red phosphor. New energy-efficient fluorescent lamps also use REEs. Several REEs are essential constituents of both petroleum fluid cracking catalysts and automotive pollution control catalytic converters.

China Surpasses California

From 1965 through the mid-1980s, the dominant source of REEs for global consumption was Mountain Pass, in the upper Mojave Desert in California, which became commercially viable as demand rose for europium used in color televisions. After 1985 Chinese REE production began to increase rapidly, originating in two sources: the Bayan Obo deposit in Inner Mongolia and a collection of small and often unlicensed mines in tropical southern China. By 1999 more than 90 percent of REEs used in US industry came from China, as Mountain Pass was beset by environmental and regulatory problems associated with waste-water management and operated only intermittently (USGS 2002). China currently has the largest reserves of REEs and is both their largest producer and largest exporter (ResearchInChina 2008).

REE mining involves heavy leaching processes, with the need to take care of extremely toxic runoff. Monazite is the most commonly mined REE and usually contains elevated levels of thorium, which is accompanied by concentrations of highly radioactive materials, such as radium (USGS 2002). In China the customary mining process has been to pump powerful acid down bore holes, dissolving some of the rare earths, after which the slurry is dumped into artificial ponds with earthen dams that often leak into rivers.[1] China has not enjoyed the environmental and regulatory sensitivities, or the rigorous surveillance, of northern California.

From 2000 to 2006 the Chinese REE industry was characterized by what industry sources call "disorderly competition," "price chaos," and "a price war" among domestic firms (ResearchInChina 2006). According to China's National Development and Reform Commission, by 2008 the country's annual REE smelting and separating capacity exceeded 200,000 tons, more than double the world's annual demand (ResearchInChina 2008), even as China's government lowered its export quota on REEs each year from 2005 through 2008.[2] In August 2009 China's Ministry of Industry and Information Technology issued a draft policy to set an annual REE export quota of 35,000 tons, potentially ban exports of at least five types of REEs, strengthen controls on mining, and improve environmental practices.[3] The goal appears to be a comprehensive industrial policy for China's REE sector that stabilizes prices, consolidates the domestic industry, improves environmental management, and attracts investment in downstream applications, from processing ores to manufacturing magnets and high-performance electric motors—possibly providing an advantage to investors located in China who rely on REE inputs.

New Sources of Rare Earths

Concern about the availability of rare earths, combined with the prospect of higher prices, has sparked interest in alternative sources in an industry hitherto characterized by excess capacity and oversupply. Sumitomo and Toyota have begun to investigate supplier deposits in Kazakhstan and Vietnam.[4] An independent mining company, Avalon Rare Metals, is developing a new mine in northwest Canada.[5] Great Western Mining Group, an Ireland-based exploration company, may reopen a mine in South Africa.[6] The US Geological Survey identifies Kiruna, Sweden as a possible site for expansion (USGS 2002). Molycorp Minerals is trying to reopen its mine in Mountain Pass, California. As for US needs, the value of US imports of REEs totaled no more than $127 million in 2008 (USGS 2009), and the United States could revise its policies toward the Department of Defense's strategic REE stockpiles if the threat of withholding supplies appears likely.

Most advanced among potential new sites are two Australian operations, the Lynas Corporation and a smaller competitor, Arafura Resources, the combined production of which would equal a quarter of global output.[7] The two were poised to seriously threaten China's global dominance in the REE market, but with the international financial crisis of 2008–09, Lynas's bond issue and Arafura's initial public offering could not attract buyers. In spring 2009 the Chinese government provided favorable financing for the China Nonferrous Metal Mining Company (CNMC)[8] to acquire 51.7 percent of Lynas and for Jiangsu Eastern China Non-Ferrous Metals Investment Holding Company to acquire 25 percent of Arafura so that the companies could finish the construction of the Australian mines and processing facilities.[9] The latter arrangement has been approved by Australian regulators; but not the former. CNMC, the would-be acquirer of Lynas, agreed not to try to manage the daily operations of the company but would have four of the eight seats on its board.[10] This did not satisfy Australia's foreign investment review board, which demanded that CNMC take a smaller equity position with fewer board seats. CNMC declined, withdrawing its offer.[11]

How should national authorities react to the prospect of Chinese investment in offshore REE companies? The foreign acquisition analytics in this sector fit well within the broader framework of this book: Chinese investment in a small independent producer such as Arafura, the impact of which can do nothing except help expand supply and make the industry more competitive, should be encouraged; Chinese investment in a more major producer such as Lynas, which perhaps puts the Chinese owners—and Chinese government—in a position to control or constrain production, should be viewed with circumspection.

Lithium Supply

Apart from rare earths, there may also be concerns about control over supplies of lithium, which, among other things, is a crucial element in high-performance batteries. The lowest-cost commercial reserves are found in brine pools (USGS 2009). Nearly half the world's known reserves are located in Bolivia, along the central eastern slope of the Andes. As of 2009, Japanese, French, and Korean firms are negotiating to begin extraction.[12] In the United States lithium is recovered from brine pools in Nevada. Lithium has also been discovered in Australia, Russia, and Serbia. The US Geological Survey indicates that it is difficult to predict how concentrated the international industry will become as demand to make batteries for hybrid and electric vehicles grows (USGS 2009). Using a measure called the cumulative availability curve, Andres Yaksic and John E. Tilton (2009) suggest that lithium depletion per se is not likely to pose a serious problem for many decades. For its part, China is scheduled to become a significant producer of brine-source lithium carbonate in 2010–11 and is currently the leading producer of lithium metal in the world.

Notes

1. Keith Bradsher, "China Tightens Grip on Rare Minerals," *New York Times,* September 1, 2009.

2. Ibid.

3. Chuin-Wei Yap, "Will China Tighten "Rare Earth" Grip?" *Wall Street Journal,* September 3, 2009.

4. Ibid.

5. Bradsher, "China Tightens Grip."

6. Keith Bradsher, "Chinese Threat Reinvigorates Effort to Mine Rare Minerals," *New York Times,* September 26, 2009.

7. Bradsher, "China Tightens Grip."

8. CNMC is a state-owned enterprise involved in the investment, development, and management of foreign and domestic mines (Major Companies Database, 2009).

9. Ross Kelly, "Australia Delays Ruling on China Rare-Earth Investment," *Wall Street Journal*, September 4, 2009; Bradsher, "China Tightens Grip."

10. Bradsher, "China Tightens Grip."

11. Bradsher, "Chinese Threat."

12. Simon Romero, "In Bolivia, Untapped Bounty Meets Nationalism," *New York Times,* February 2, 2009.