



# RARE EARTH ELEMENTS: THE NEXT OIL

*Elliot Brennan & Bert Edström*

*Rare earth elements (REE) are increasingly becoming a critical strategic resource. The 17 elements can be found in most high-tech gadgets from advanced military technology to mobile phones. China currently holds claim to 95 percent of the world's production. Recent Chinese export reductions have forced high-tech firms to relocate to China and forced other governments, particularly in the developed world, to pour money into their exploration and production. This month Japan's Trade Minister met with his Chinese counterpart, at the top of the agenda was REEs. Rare earths are fast becoming "the next oil."*

Deng Xiaoping, the former leader of the Communist Party of China, recognized the importance of rare earth elements (REEs) almost two decades ago. "The Middle East has oil and China has rare earth," he said in 1992. His foresight was impressive. Today, REEs are used in most high-tech products predominantly in the form of heavy-duty batteries and magnets. They are pivotal in defense technology—lasers, radars and electromagnetic weaponry—as well as green technology. It is therefore not surprising that China's near monopoly of their production has industry and government worried. Several governments have begun fast-tracking new policy to increase production. Backroom debates over whether to stockpile the strategic resource have begun, most notably by the U.S. Department of Defense.

Earlier this year the U.S. Geological Survey (USGS) updated its global reserve-estimate data of rare earth elements as it narrowed its definition of recoverable minerals. The result saw reserve estimates in China rise from 36 megatons (Mt) to 55Mt—exactly half of the world's reserves. U.S. estimates remain at 15Mt; the Commonwealth of Independent States (Russia and former Soviet republics) are reported to have reserves of 19Mt; while estimates of Australia's reserves declined from 5.4 to 1.6Mt. Yet the untapped reserves of the resource mean little; it is the production that counts. And it is China that is a clear leader supplying 95 percent of world production.

Driving the new policy initiative is the upsurge of global demand for REEs. According to the USGS demand is increasing 10 percent annually. Demand is similarly rising in China—the country's consumption of the resource has quadrupled since 2000. The growing domestic demand has been cited as the reason for sharp declines in export quotas, cut by 37 percent in 2010 and a 35 percent cut in the first half of 2011.

China's near monopoly on production, and its subsequent

reductions in exports, have seen prices of REEs increase tenfold on last year's per kilo prices. Just as worrying has been China's predatory pricing which has run other REE mines and companies out of business, or at least into the red. The curbing of exports has similarly forced high-tech manufactures to relocate to China to ensure adequate supply, thereby harming the growth of high-tech industry in many other countries such as Japan, South Korea and Europe. In doing so China appears to be creating a high-tech industry almost overnight.

## In Rare Abundance

The name, rare earth element, is a misnomer. The elements are far more abundant than many precious minerals. Yet their dispersion means they are rarely found in economically viable quantities. There are 17 REEs—15 lanthanides, and scandium and yttrium. The 15 lanthanide elements occupy atomic numbers 57–71 on the periodic table. The similarity of their chemical properties, demonstrated by their close proximity on the table, makes them very difficult to separate. Their extraction is capital- and skill- intensive.

End uses for REEs are varied. Figures cited by the USGS noted that in the U.S. in 2009 the distribution of rare earths for end use was largely for chemical catalysts (22 percent), petroleum refining catalysts (21 percent), automotive catalytic converters (14 percent) and approximately 40 percent was for battery alloys, ceramics and magnets (sectors which are growing 4–10 percent annually). The extent to which REEs are used in defense technology is such that without their production modern warfare—fighter jets, drones, and most computer controlled equipment—would not be possible. A sovereign monopoly of such a resource is therefore a serious concern for any nation.

The next generation of warfare, in which the U.S. gov-



ernment continues to invest significantly, is heavily dependent on REEs. Electromagnetic weapons minimize human casualties and are therefore considered better weapons for military interventions and vessel defense. Such technology is emerging as the future of defense; as such, REEs will be crucial to this future. It is therefore not surprising that the U.S. is scrambling to implement new policy to secure the resources.

## Policy & Diplomacy

It was this state of urgency to secure reserves that saw the U.S. propose the 2011 RESTART (Rare Earths Supply-Chain Technology and Resources Transformation) Act. The measure would promote greater research and innovation within the REE sector. Also included in the Act is the proposal to start a national stockpile of REEs within the U.S. Department of Defense to supply the defense and technology industry in the event of future shortages.

Yet the U.S. is not the only country boosting exploration and production. Economic assessments to determine the viability of mining have recently taken place in numerous locations across the USA, Canada, Australia and Malawi amongst others. Sweden has also returned to the fray, beginning a significant exploration and production program.

In May, China expanded the definition of REEs to include iron alloys containing more than 10 percent of REEs. These will now be subject to the same export quota. This expansion of the quota was to curb the export of the elements under different guises such as in alloys. The practice, according to sources, had become very common in order to avoid the quota.

In 2010, China temporarily halted shipments of REEs to Japan following a diplomatic crisis. China's move scared the Japanese, whose industry is vitally dependent on REEs. In February of this year a trade official announced that Japan would try to reduce its dependency on Chinese REEs by cutting consumption by 10,000 tons annually over the coming years.

Almost half a billion U.S. dollars would be paid in subsidies to support the initiative. In July, Japan reported the discovery of

significant deposits of REEs in the mud of its sea bed. While the finding is important, given the difficulty of recovering the elements, it does not change the playing field in the short-term.

Japan's Trade Minister Yukio Edano recently met his Chinese counterpart Chen Deming. Edano was the first minister in the recently inaugurated Noda cabinet to meet Chinese leaders. On the top of Edano's agenda was a request to China to ensure a stable supply of REEs and address their price differences in the country and abroad (Japan Times, Oct. 15, 2011). It has also been revealed that Japan has initiated REEs trade talks with Myanmar. In its attempts to diversify its supply chain, Japan plans to jointly, with Myanmar, develop REEs and other natural resources (Japan Times, Sep. 26, 2011).

## Towards a Sustainable Future

REEs have become an economic and diplomatic power for China to wield. Just as oil is used as a coercive instrument of foreign policy in other parts of the world, similarly China will try to use REEs to its advantage. Indeed, they have played their cards well, now it is time for other governments and industry around the world to try and catch up. This in itself may prove a long process.

While substitutes are available for most applications of REEs, they are usually less efficient and undesirable. In our modern day race for more efficient high-tech devices and the greater government spending in high-tech weaponry, REEs look set to become "the new oil." It will be increasingly important for governments to secure national reserves of rare earth elements to support local high-tech industries and prevent future conflicts over the resource.

*Elliot Brennan is Assistant Editor & Bert Edstöm a Senior Research Fellow at the Institute for Security and Development Policy. The opinions expressed in this Policy Brief are those of the authors and do not necessarily reflect the views of the Institute for Security and Development Policy or its sponsors.*

### ABOUT ISDP

*The Institute for Security and Development Policy is a Stockholm-based independent and non-profit research and policy institute. The Institute is dedicated to expanding understanding of international affairs, particularly the interrelationship between the issue areas of conflict, security and development. The Institute's primary areas of geographic focus are Asia and Europe's neighborhood.*

WEBSITE: [WWW.ISDP.EU](http://WWW.ISDP.EU)