

Rare earths to secure our energy future

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(Picture credit: EMA)

Reflecting on SIEW 2011's theme--"Securing our Energy Future"—Mr Yaron Vorona, Director of the Technology & Rare Earth Metals Centre at the Institute for the Analysis of Global Security (IAGS TREM Centre), highlighted critical linkages between energy security and access to rare earths. Just as oil-importing nations are dependent upon a few politically-volatile countries, he said energy insecurity is engendered by the control of the vast majority of the world's rare earth reserves by just a few countries.

Mr Vorona added that the relationship between energy security and access to rare earths has become increasingly intertwined over the past few decades due to the move towards cleaner technologies (since rare earths have become a ubiquitous component in a wide range of products from cars to solar panels and from magnets to common batteries). There is also China's rise since the 1980s as the prime producer of rare metals and the consequent geopolitical power that this has conferred on the country.

## **A history of rare earth development**

According to Mr Clint Cox, President of The Anchor House, no one paid much attention to the industry until the Sino-Japanese fishing boat dispute last September. The events that followed quickly shaped the current rare earth industry trends. All end users were caught off guard by China's sudden rare earth export quota cuts of 72 percent in the second-half of 2010.

Although China has since revised its decision to 35 percent, it was clear that rare earth elements are no longer simply an economic commodity but have evolved into a political tool. This was why Japan was spending over ¥1 billion to pursue rare earth resources outside of China, including looking at ways to efficiently recycle the precious elements.

The US, similarly, has labelled rare earth elements a matter of national security given their importance in defence applications. "Things got different really fast," said Mr Cox, adding that the demand and price spikes for rare earth elements over the past year were unprecedented in the entire history of rare earth mining and development.

## **China's edge**

Mr Cox believed that competition, rather than cooperation, was likely to be the mainstay of the rare earth industry. China possesses a unique edge in the heavy rare earth markets, which is evidenced by the fact that even Mountain Pass in California and Mount Weld in Australia--despite their size and mining potential--would not have a significant impact on industries that depend on a steady supply of rare earth elements.

Market-wise, Mr Cox explained the complexities involved in starting a business in the rare earth industry and said the creation of a market outside of China would never be feasible given the country's ability to flood the world market with cheap materials, like it did in the mid-1980s. He added that China is offering key rare earth programmes to students in Chinese universities so that they will be "plugged in" and committed to protecting China's capital in rare earths. As such, China's dominance in this field is likely to continue until rare earth elements can be found and mined economically in a different geopolitical setting.

## **Rare earths as a political resource**

Mr Vorona said that until very recently, China's dominance of rare earths was only a relatively obscure supply risk in the global manufacturing value chain. However, its control over rare earths suddenly became a significant political resource last year when China decided to use export restrictions on rare earths to gain political leverage with other nations.

Mr Vorona believes that though China's restriction of rare earth exports was ostensibly to "protect the environment", the true purpose of such export restrictions may actually be to enhance China's political and economic power. This has led several developed nations to designate several rare earths and other minerals as "critical".

A number of solutions to these rare earth import security issues were identified by Mr Varona, such as stepped-up investment in research and development to reduce dependencies upon rare earths in manufacturing, the exploration for rare earth reserves outside of politically-volatile regions, and the practice of diplomacy to gain access to rare earths. An example is General Electrics' growing investment in LED lights over fluorescent lamps due to the lower rare earth requirements in the former.

However, Mr Cox warned that with the advent of new "unconventional" fossil fuels such as tar sands, each barrel of oil now requires more fluid cracking catalysts to process, driving up the demand for rare earth elements even further.

## **Rare earth, energy and e-mobility**

Referring to the relationship between rare earth and e-mobility, Mr Joost Geginat, Partner, Roland Berger Strategy Consultants, said that by 2020, vehicles with electrified powertrains (from mild hybrid to full electric) will account for 8-10 percent of global sales (more than 7 million units), but only if battery prices fall. He added that raw materials and processing alone account for 40 percent of battery cell costs and thus holds the greatest potential for future cost reductions.

Mr Geginat expected material prices to fall by 10-15 percent in the medium term due to decreasing cathode material costs and intense competition, commoditisation of anode materials, and increasing competition with regards to electrolyte. Thus, battery costs are expected to fall to US\$250/kWh by 2020 and the global li-ion battery market will grow to US\$9 billion by 2015, 80 percent of which will be controlled by five suppliers.

Chinese firms will be small in average and together account for 8 percent of the market. Summing up, Mr Geginat said he expects the li-lon battery value chain to change dramatically during this decade, with cell costs decreasing rapidly, and consolidation of the value chain and improved technology.