

**Notes from Metal Events Ltd's 11<sup>th</sup> International Rare Earths Conference  
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Key challenges for the rare earths industry identified by speakers – where is the market? Can the existing market be relied on as a long-term stable and reliable supplier? Do new supply chains outside China need to be developed? Will new mine projects be developed outside China?

China still rules the roost at the head of an increasingly Asian REE hub – undeniably the heart of the rare earths industry. Current low-price scenario was seen by many attendees as suiting ROW end-users despite concerns about quality issues and origin of material (is it illegal – see below?). There was much discussion about the need to build supply chains that are independent of China. But can this be achieved and how?

Discussion about the uneven playing field between China and ROW – government subsidies, no taxation, etc.,

**Issues for RE industry – Illegal Mining - 40% of supply in China is from “grey” sources – end-users need to question origin of material – environmental issues – resource sterility – when will government tackle these issues?**

Illegal mining of rare earths in China remains a major issue. Dudley Kingsnorth, Professor Curtin University, spoke about the difficulties of knowing how much “grey” production there is. He said the China Society of Rare Earths suggests 200 companies are involved in illegal mining/processing activities.

Estimated that 40% of Nd and Pr required to meet domestic demand is from illegal production – and these numbers were agreed with by Chinese participants. The Chinese government is not being successful in eliminating this. This “grey” production is destroying the longer term viability of the rare earths business in China – may be a temporary stop gap to meet supply requirements in China and at lower prices, but in longer term is negative, Kingsnorth stressed. It is causing environmental problems and resource sterility.

Kingsnorth said China should increase production quotas to 150-160,000 tpy REO and continue closing illegal operations.

Illegal mining, however, is providing cheap material to magnet makers and also it was suggested by participants that China's RE producers are able to mitigate their losses by cutting their own production and meeting any supply gap with this “grey” material.

Is there a battle between central and local governments over dealing with illegal mining? Local governments possibly not keen to clamp down as they continue to earn tax revenue and ensure that there are no major job losses at a time of economic decline.

Meanwhile, central government has a long-term strategy and is trying to find the right point to stop illegal production, SMM's Yettie Yi said. Further price declines will see illegal and legal production decrease in China. Inventories will be consumed. If the price falls too low then the government will support the Big 6 (legal production). There will be a step-by-step approach to eradicating illegal production, but it will be slow. Yi said that changes will be seen in 2016-2017 and by 2018 illegal production should be more or less stopped.

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Han Yu of JL Mag also questioned where PrNd supply is coming from to meet magnet demand in China, with demand of 45,480 tonnes in 2014, but 20,995 tonnes from PrNd production and 9,310 from Nd recycling. So was the rest from stockpiles and/or illegal production? Again with Dy, supply does not meet demand so where is the additional material coming from?

Han said it is important to create a clean industry and supply of REE for the magnet sector. JL Mag is working on a green supply chain for a sustainable future. "It's important to the automotive industry that the RE supply chain is clean," he said. Industry otherwise faces the possibility that REE will be worked out of automotive magnets.

Kingsnorth said ROW needs to develop independent supply chains outside China – a refrain which was taken up by a number of other speakers (see below). There needs to be support to develop REE projects outside China and work needs to continue to develop REE environmental standards. Similarly, China needs to develop occupational health standards too. "This would help reduce illegal mining," Kingsnorth said.

Amanda Lacaze, CEO of Lynas Corp, also voiced concerns about the REE supply chain. She blamed a lack of global innovation in the rare earths sector on the lack of industry profitability and much of that problem stems from illegal mining in China (and freely available low-priced REE both within China and to ROW).

Lacaze took to the podium to promote the idea that end-users ask for certificates of origin to verify the source of the REE they buy. "The market is dysfunctional and requires a demand-side solution. End-users will and are buying illegal production. The solution is to stop buying it and ask for a certificate of origin," she said. "The remedy is to stop buying illegally produced rare earth products... Customers should be demanding traceability."

Other delegates privately voiced concerns that certificates of origin would not make any difference but would likely add to the administrative burden of ROW processors and end-users rather than affecting Chinese companies. They said that the EU has shown no interest in introducing such a scheme.

### **Situation in China – formation of the "Big 6"**

Kingsnorth said that China's resources taxes are not in place yet. Prices have fallen this year as export taxes were removed. At the moment the industry is not subject to any taxes. He said the resources tax is proving difficult to put in place. "The Chinese REE industry lost \$500m last year so it's very difficult to tax them," he said. There is also a lag between the time when the ore is mined and when the concentrates hit the market of around 6-9 months. "So how do you decide the value of the REE? Where is the pricing point? This is all still being discussed."

Talking about the distribution of the production quotas across the Big 6, SMM's Yettie Yi said it is complicated because it depends on the subsidiaries in each state-owned group. It's not a straight division between the six.

RE integration in Jiangsu, Guangdong, Sichuan, Hunan will not be completed until 2018. Jiangxi and Guangxi are also behind on consolidation and these two provinces are seeing the most illegal mining.

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Generally amongst conference participants there didn't seem to be any feeling that production quotas will be increased for 2015.

### **Supply chain management**

Lynas's Lacaze said the industry needs to improve end-user confidence in using rare earths. "There are worries still over [future] security of supply and the predictability of pricing," she said, noting that Lynas has a 10 year contract with Solvay which gives Solvay guaranteed offtake and guarantees Lynas sales. "There is no uncertainty in this supply chain," she said. Lynas is also trying to limit price volatility and has provided a fixed price. "It's good for the customer and good for Lynas," she said. She described current pricing methodology as the "rare earth casino" and said the industry should look at ways to contract with customers that benefit both the supplier and the end-user, whether it is fixed, float, floor or ceiling contract pricing.

Dierk Paskert of Resource Allianz in Germany said it is important to secure industry value chains (in accordance with anti-trust law). He said the automotive sector will be more and more reliant on rare earths so it is necessary to develop the supply chain.

He said China is the elephant in the room both on the supply (90% of world) and demand (60% of world) sides. "Western companies don't seem bothered about this [dominance]. They are just enjoying the low prices, but this is a very short-term view," he said. China will remain a low-cost producer of REE for the foreseeable future and new environmental standards being introduced will only have an effect on capex and opex in the long term.

Paskert said there is still the potential for the Chinese government to give further subsidies to producers. [It could be argued that the lack of taxation at the moment is indeed a subsidy.] And there is also the potential for China to restrict supplies to ROW again. As a result, downstream operations are moving increasingly to China (and its environs) in order to secure supply.

He said volatility has killed the market and co-operation in the value chain will pave the way for financing opportunities. "The focus should not just be on one particular region. China will be vital, but we need others too. But the dependencies along the value chain need to be reduced," Paskert said, adding that end-products need to be priced competitively but a fair margin distribution is needed along the mine-to-magnet value chain.

Solvay's Alain Rollat in his presentation said that by 2020 he believes some heavy REO separation capacity will be required outside China and it will be need to located where the processing chemicals are available at low-cost. He said it wouldn't be an expansion of existing capacity in France.

### **Magnets, magnets – and growth in EV/HEV automotive**

Han Yu of JL Mag spoke about market developments in China. The hard drive (VCM) market has been decreasing since 2011 and the HDD share is also falling. In addition the amount of rare earths used in the magnets has been falling. The consumer electronic market (smart phones) is a mature market now.

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The air-conditioning market is very changeable. In 2014 there were sales of 112.21m units but this will decrease this and next year, but should start to recover by 2017. In terms of NdFeB consumption it was 2,817 tonnes in 2014, is estimated to be 2,454 tonnes in 2015, with growth back in 2017 to a forecast 2,480 tonnes.

Growth is slowing in China's automotive sector too, but there are some new policies to stimulate the market, for instance, lower taxes, so the market can expect a bit of a pick-up in H2 2015. However, the industry has seen production stoppages this year and it is not growing as expected.

Wind power installation development is seeing healthy growth.

Continuing to see a reduction in Dy usage in magnets. Will be down to 0.4% by 2018 and Dy free by 2020. In the automotive sector there is a big effort to eliminate heavy REE. Again there will be a significant fall in Dy used in wind power. In 2010 the Dy average was 2.5%, but forecast to be 0.7% content by 2019.

EV/HEV applications – seeing big growth. Bringing a new market to REE magnets. Dy consumption will increase, but he warned this is because magnet usage is growing, but the amount of Dy used in each magnet is falling.

Greg Kroll of Magnequench spoke on magnets in ROW. Prices for solid state drives are falling and will take over from HDD in 2016. Optical disk drives could decline by 15% CAGR (compound annual growth rate) to 2019. Also falls in printers and office automation, with possible CAGR of 9% in the next 5 years.

Good news for REE in magnets. In the EU – residential circulation pumps – expect to see CAGR of 14% by 2019. Electric motors in automotive applications should be up 5% CAGR to 2019. Seeing demand for magnets in window lift motors, seat motors, trunk motors, safety sensors (airbag, ABS, proximity) and adaptive lights.

EV growth is being spearheaded by India and China. Today automotive sector accounts for 40% of bonded NdFeB magnet demand.

Kroll said one of the issues for rare earths is that once the supply chain realises that there is no cost differential between Nd and NdPr it will look elsewhere for different materials. "Customers will switch back and forth depending on prices." Replacement with cerium is happening. "But there is a trade-off. Not just in magnetic properties. Just adding cerium isn't the solution. You need to be able to add cerium but maintain other key characteristics."

**REE replacement continues in catalysts:** Roskill Information Services' s David Merriman said the major FCC catalyst manufacturers have or are in the process of developing catalysts with lower REE content. Grace has gone to zero, while BASF has gone from 3.3% content to 2.8%. Lower prices though have seen some return to using REE. Expect to see 3.4% year-on-year growth of REO in REE containing catalysts to meet environmental requirements (particularly good news for REE in wake of VW emissions scandal).

Tightening of emissions controls in China, Russia and Mexico should see increased requirement for auto-catalysts and emissions control systems. Will see 5% year-on-year growth to 2020 of REO in auto-catalysts – from 9,250 tonnes in 2014 to 12,500 tonnes in 2020.

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Growth of HEVs – largest consumer of NiMH batteries and many HEV producers are switching to Li ion technologies too as have consumer electronics sector already. Cars with NiMH batteries will be cheaper versions. Expect REE consumption growth of 6.5% in years to 2020 in batteries to 13,500 tonnes of REO.

One attendee pointed out that there are 100 applications in the car that use REE.

#### **Lynas – surviving ROW miner**

Lynas is on track. Phase 1 capacity was targeted at 600 tonnes per quarter and in the last quarter the company achieved 968 tonnes per quarter REO. “We are on target,” Lynas’s Amanda Lacaze said, pointing to improved sales volumes and values.

Operating costs have fallen from A\$21/kg to A\$19.40/kg. “We have fewer people now and are more productive and more efficient.” Both lenders have renegotiated showing support for the business and in the last two quarters we have been cash-flow positive, she said.

“We can confidently present ourselves to the market as a sustainable and reliable supplier of quality products,” she said.