“The Rare Earths Industry: A Delicate Balancing Act”

by

Professor Dudley J Kingsnorth
Centre for Research in Energy and Minerals Economics
(Curtin University, Western Australia)
and
Industrial Minerals Company of Australia Pty Ltd

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Disclaimer
(“Forward Looking Statements”)
Disclosure

Dudley J. Kingsnorth, through the Industrial Minerals Company of Australia Pty Ltd (“IMCOA”) provides rare earths market and project development advice to Molycorp Minerals, LLC (owners of the Mountain Pass Project), Alkane Resources Ltd (owners of the Dubbo Zirconium Project), Rare Element Resources (owners of the Bear Lodge Project) and Northern Minerals Ltd (owners of the John Galt and the Browns Range Projects). He consults to other rare earths companies on an occasional basis. This advice is provided on a fee for service basis; with no success or promotional fees or obligations. There are Confidentiality Agreements in place with these companies, but this does not preclude comment on the public information available on these companies.

Dudley J. Kingsnorth is a Non-Executive Director of Northern Minerals Ltd. and IMCOA owns securities in Northern Minerals Ltd.
Summary of Presentation

- Background History
- The Rare Earths Industry Today
- China
- Future Demand and Supply
- The Issues of Balance
Rare Earths Market in 2008

- Demand is high in first half of the year as global economy is deemed healthy.
- Exaggerated demand in first half due to factory closures during Olympics.
- GFC commences in late 2008.
- IMCOA identifies HREE shortage in next decade.
- Global demand 124kt; China consumes 68kt (55%) and produces 125kt (97%).
- Rest-of World (“ROW”) demand 56kt; China export quota 56kt.
Rare Earths Market in 2009

- GFC has a big impact on demand.
- Global demand 85kt; China consumes 60kt (71%) and produces 120kt (96%).
- ROW demand 25kt; China export quota 50kt.
- Global supply exceeds demand by 40kt.
- Due to GFC China finances rare earth chemical concentrate stockpiles in Baotou.
- ROW recognises the importance of Mt Weld and Mountain Pass as an independent source of LREEs; but HREEs supply of concern.
Rare Earths Market in 2010

- Major recovery (temporary) from GFC.
- Global demand rebounds to 120kt; China consumes 71kt (59%) and produces 109kt (95%).
- China reduces export quotas by 40%.
- ROW demand 49kt; China export quota 30kt.
- China temporarily suspends shipments of rare earths to Japan.
- Global demand exceeds supply by 5kt.
- Huge increase in rare earths prices (most significantly FOB China basis) ±100-500%.
Rare Earths Market in 2011

- EU financial problems weaken global economy.
- Very high rare earths prices – +300-1,000% remain as ROW demand appears to exceed supply during the early months of the year.
- However, due to the resultant high prices & a weakening global economy annual demand falls back to 105kt; China consumes 70kt (67%) (static) and produces 98kt (94%).
- China export quotas remain at 30kt.
- ROW demand falls to 35kt (-30%).
Rare Earths Market in 2012

- Recovery in global demand to 123kt (+20%)
- High rare earths prices will remain for a while, but as Mountain Pass & Mt Weld come on-line:
  - Price of LREEs will fall.
  - Demand for LREEs will rise significantly
- China export quotas will remain at 30kt.
- China’s demand will increase to 80kt (64%) and ROW to 45kt.
- Funding for new projects will be difficult until Molycorp and Lynas projects are generating positive cash flows.
The Next Decade #1

- Between 2011 and 2016 ROW demand will grow from 35kt to 55kt while China’s demand will grow from 70kt to 105kt. Global demand will rise to 160kt.
- Between 2011 and 2016 ROW rare earths production will increase tenfold; from 6ktpa REO to 60ktpa REO.
- China’s export quotas will stabilise at 20-25kt.
- Forecast global demand in 2020 is 200-240kt.
- Forecast ROW demand in 2020 is 70-90ktpa REO; creating opportunities for ROW production to increase by 50% in latter part of decade by expansion or by greenfields projects.
The Next Decade #2

- China will not directly deny rare earths to the ROW; but it will take whatever measures are necessary to maximise ‘value add’ manufacturing (job retention and creation) in China.

- Ongoing high prices will increase substitution, re-cycling and reduce search for new applications.

- HREE production will be constrained so prices for Eu, Dy, Tb and Y will remain strong.

- Towards the end of the decade:
  - First of new projects will be on-stream and looking to expand.
  - *Next generation* projects could be in the early stages of start-up.
China has Adequate Rare Earths Resources to Meet its Own Needs

- Reserves of 30-50 million tonnes REO.
- Processing capacity of 200-250,000 tpa REO, of which 40-60% is idle for either environmental and/or economic reasons, but ‘available’ for purchase.
- The SOEs charged with consolidating the industry have all announced large capital investments.
- China’s priority is social harmony via the creation of employment through ‘value-adding’.
- The focus should be: ROW suppliers to meet ROW demand in 2020 – lots of opportunity.
- **But heavy rare earth reserves are finite (8-12 years?)**
Rare Earths Supply & Demand

Source: IMCOA and discussions with Rare Earths Industry Stakeholders
China: The Issues of Balance

- Export quotas – will they remain?
- Production quotas – HREE reserves limited.
- Export taxes (15-25%) – will they remain?
- Industry consolidation – too much could create oligopoly leading to excessive prices.
- Environmental – if legislation is enforced too strictly then industry supply could be inadequate.
ROW: The Issues of Balance

- Growth of ROW industry is LREE centric.
- Shortage of ROW HREEs is major barrier to growth in the magnet and phosphor sectors.
- Dependence on China for technology.
- New projects essential; but technology risk of new processes is high.
- Managing radioactive waste.
Global Supply/Demand Balance for some Individual Rare Earths in 2016

Forecast Supply and Demand for Selected Rare Earths in 2016

<table>
<thead>
<tr>
<th>Rare Earth Oxide</th>
<th>Demand @ 150-170,000tpa REO</th>
<th>Supply @ 180-210,000tpa REO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerium</td>
<td>60-70,000t REO</td>
<td>75-85,000t REO</td>
</tr>
<tr>
<td>Neodymium</td>
<td>25-30,000t REO</td>
<td>30-35,000t REO</td>
</tr>
<tr>
<td>Europium</td>
<td>625-725t REO</td>
<td>450-550t REO</td>
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<tr>
<td>Dysprosium</td>
<td>1,500-1800t REO</td>
<td>1,300-1,600 REO</td>
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<tr>
<td>Terbium</td>
<td>450-550t REO</td>
<td>300-400t REO</td>
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<tr>
<td>Yttrium</td>
<td>12-14,000t REO</td>
<td>9-11,000t REO</td>
</tr>
</tbody>
</table>
2016 ROW Rare Earths Producers

- Mountain Pass (Molycorp)
- Mt Weld (Lynas)
- Indian Rare Earths (IRE & Toyota Tsusho)
- Steenkampskraal (GWMG)
- Kazakhstan (SARECO & Sumitomo)
- Dubbo (Alkane)
- Dong Pao (Japanese Support)

Note: Dubbo is the only project with a significant portion (+25%) of ‘heavies’.
Any Questions?

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