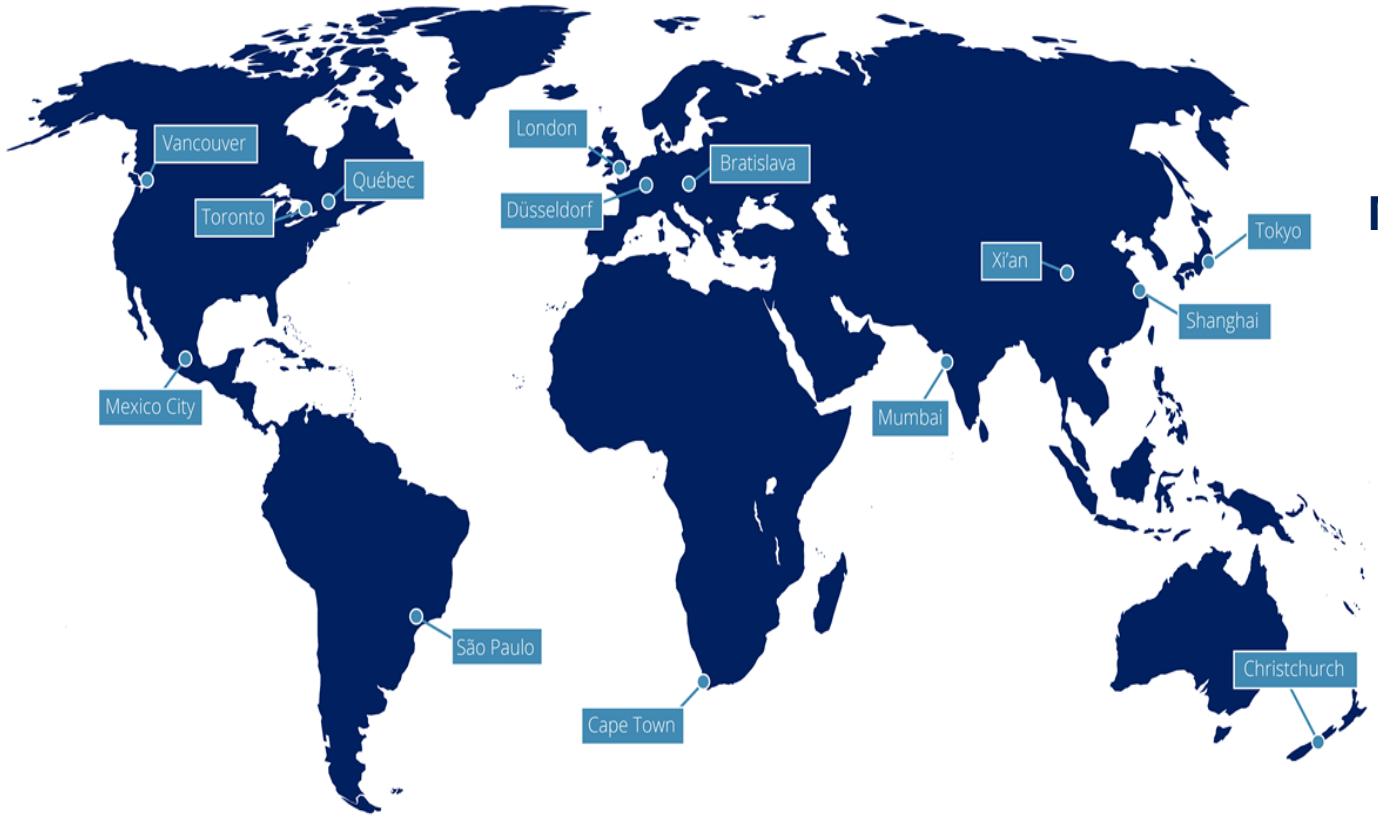
V SEMINÁRIO BRASILEIRO DE

TERRAS RARAS

# Terras-Raras - Visão Geral do Mercado Global, Desafios e Oportunidades

**12-14.abr.2021**

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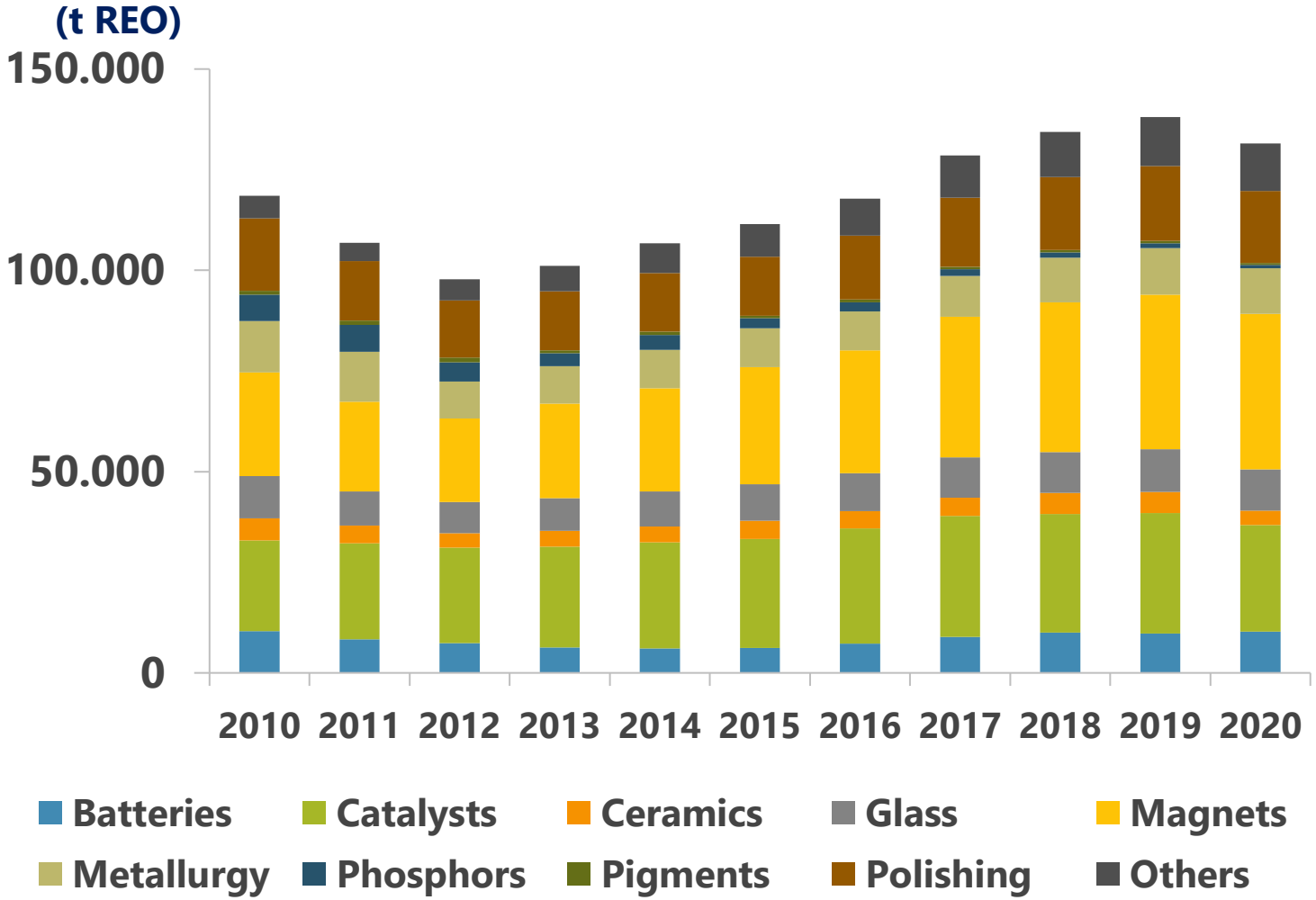
While Roskill Information Services Ltd. has made every reasonable effort to ensure the veracity of the information presented it cannot expressly guarantee the accuracy and reliability of the estimates, forecasts and conclusions contained herein.  Accordingly, the statements in the presentation should be used for general guidance only.

# Demand overview

*After a difficult start, 2020 was a positive year for some REE end-use markets*




Source: Thomson Reuters, Roskill

- **Rare earth demand fell to 131.4kt REO in 2020, a y-on-y reduction of 4.8%, the first reduction since 2012**
- **Rare earth demand from magnet application increased to 38.6kt REO**
- **Magnet use still dominated by 3C applications, though demand structure is rapidly changing**
- **Covid-19 related disruption to FCC catalyst demand and auto-catalyst demand impacted La and Ce significantly in 2020**
- **Disruption to supply chains also saw reduced demand for Y from ceramic applications in 2020**

REE: Rare earths elements – REO: Rare earths oxide - 3C: computing, communication & consumers – FCC: fluid catalytic cracking



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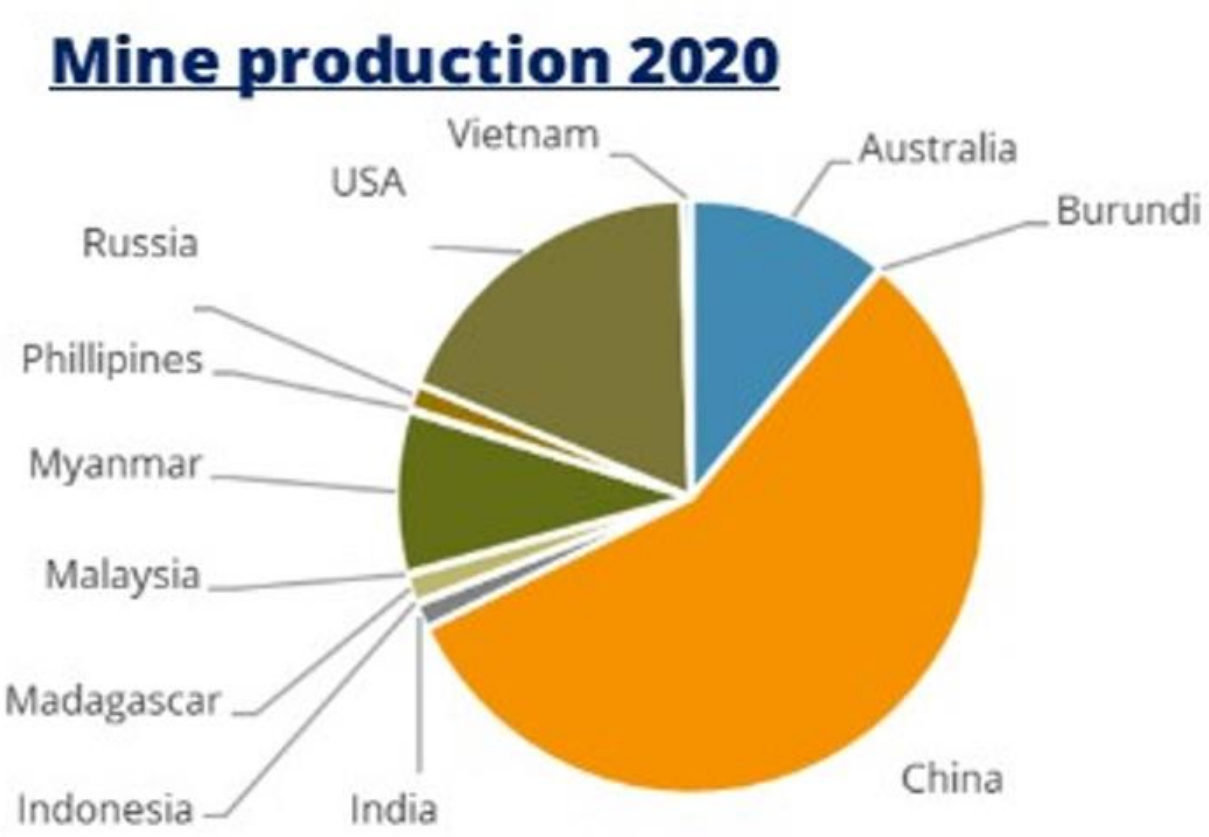
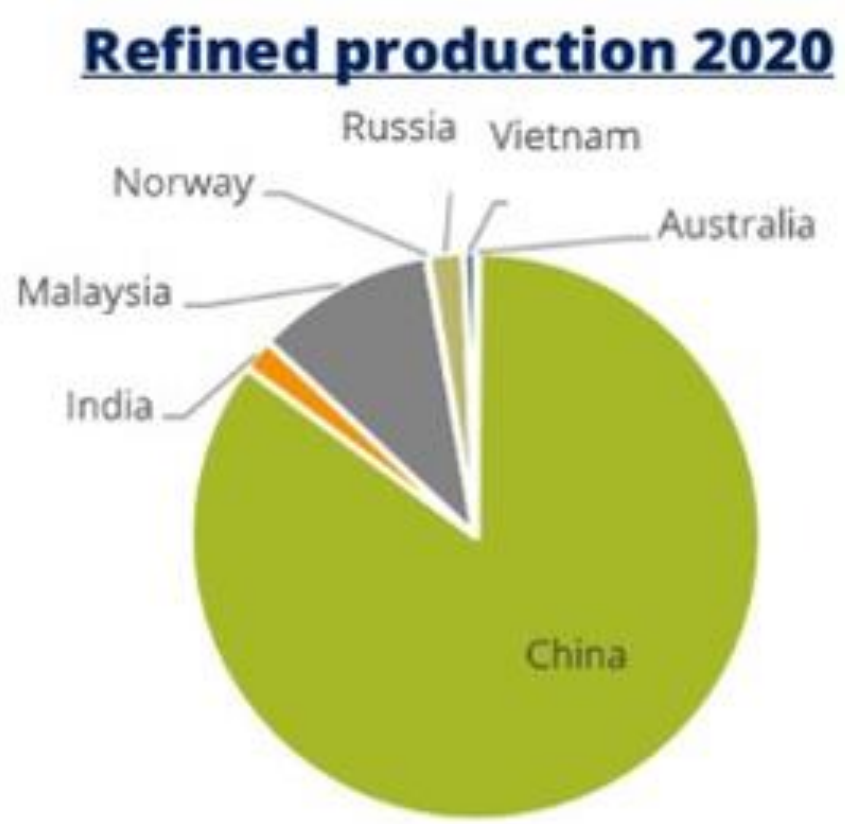
# Supply – shares – China dominating



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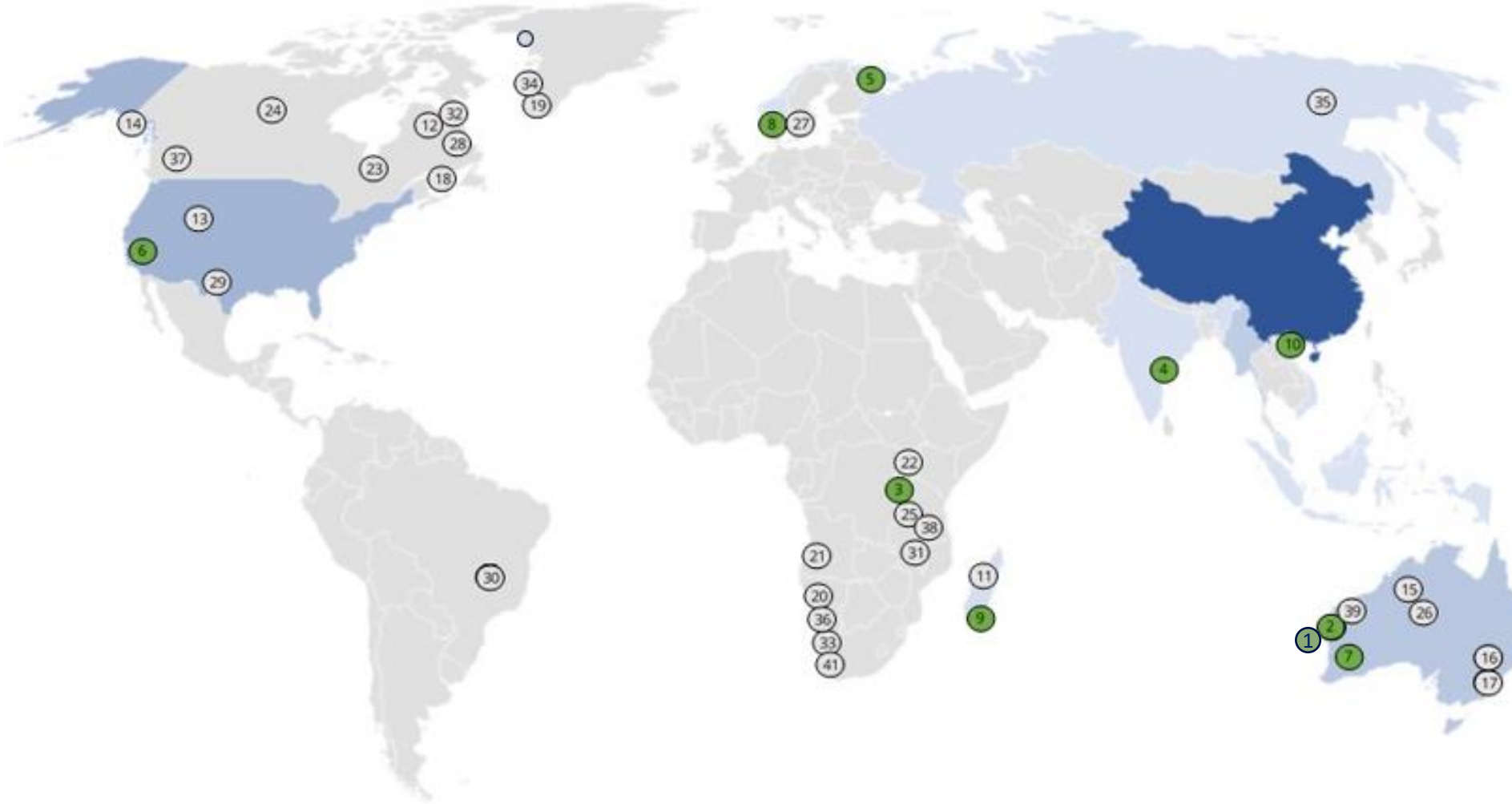
# Supply – Some Non-Chinese Mines Operations and Projects (2020)



## Non-Chinese Rare Earths

Operating mines (1)

1. Browns Range
2. Eneabba
3. Gakara
4. IREL HMS operations
5. Lovozersky
6. Mountain Pass
7. Mt. Weld
8. Posgrunn
9. QIT Madagascar
10. Yen Phu

Rare Earth projects (1)

11. Ambato
12. Ashram
13. Bear Lodge
14. Bokan Mountain
15. Cummins Range
16. Dubbo
17. Fingerboards
18. Foxtrot
19. Kvanefjeld
20. Lofdal
21. Longonjo
22. Makuutu
23. Montviel
24. Nechalacho
25. Ngualla
26. Nolans
27. Norra Karr
28. Red Wine
29. Round Top
30. Serra Verde
31. Songwe Hill
32. Strange Lake
33. Steenkampskraal
34. Tanbreez
35. Tomtor
36. Warmbad
37. Wicheeda
38. Wigu Hill
39. Yangibana
40. Yen Phu
41. Zandkopsdrift



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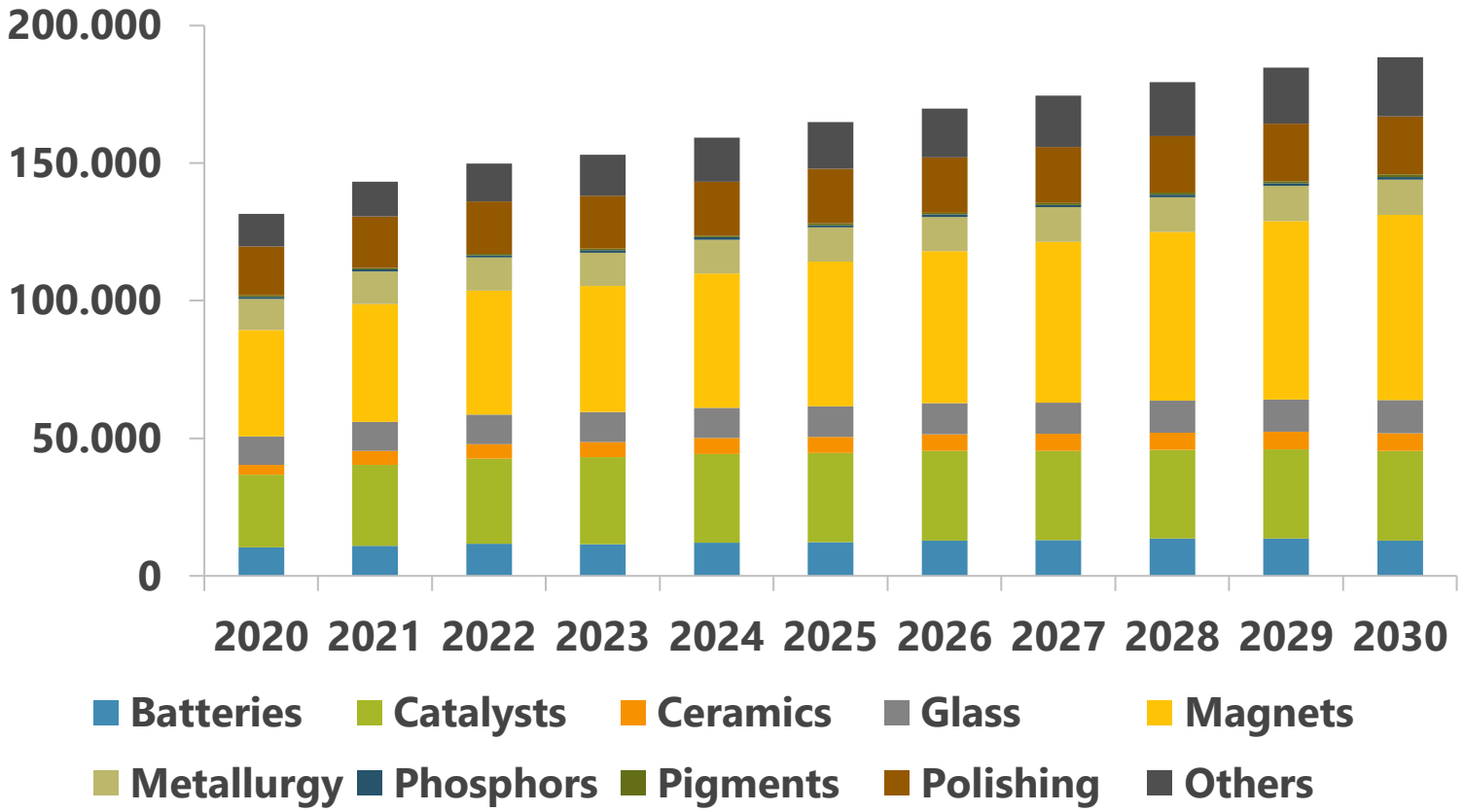
# Demand outlook

*Rare earths industry transition underway to meet magnet requirements*

**Forecast demand by end-use application (t REO)**




- **Rare earth demand is forecast to reach in excess of 188kt REO by 2030**
- **Magnet demand is forecast to form 36% of demand by 2030 (29% in 2020)**
- **Other rare earth applications expected to show growth, though overshadowed by magnet demand**
- **Refocussing of REE industry onto magnet materials, though the existing projects are not all suited to this new distribution**
- **Nd, Pr and Dy targeted by new projects (monazite and ion adsorption clays)**
- **Though brings with it further challenges when considering ESG criteria**

ESG: Environmental, Social and Governance

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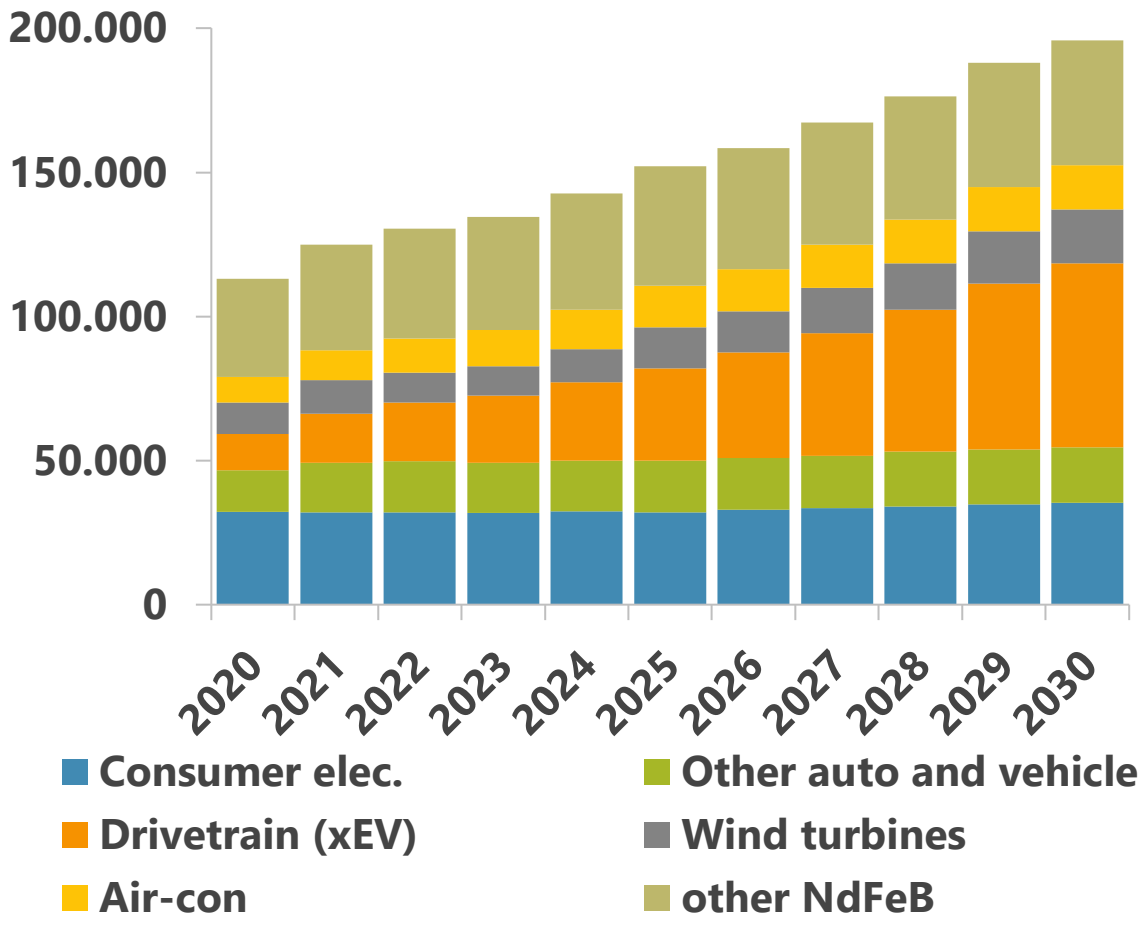
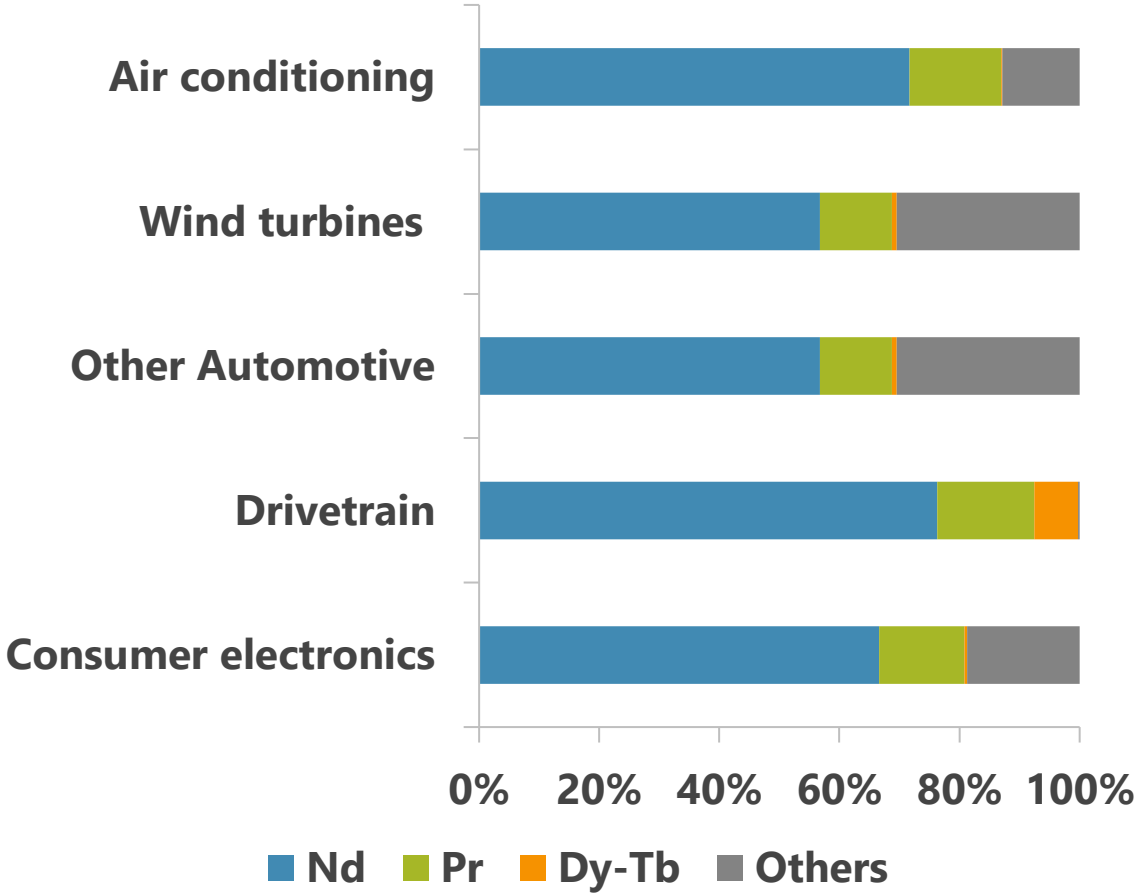
# Magnet demand outlook

*EV drive trains and wind turbines to spearhead demand growth*

**NdFeB demand by end-use application (t NdFeB)**




**Distribution of REE demand in magnet applications (% REO demand)**

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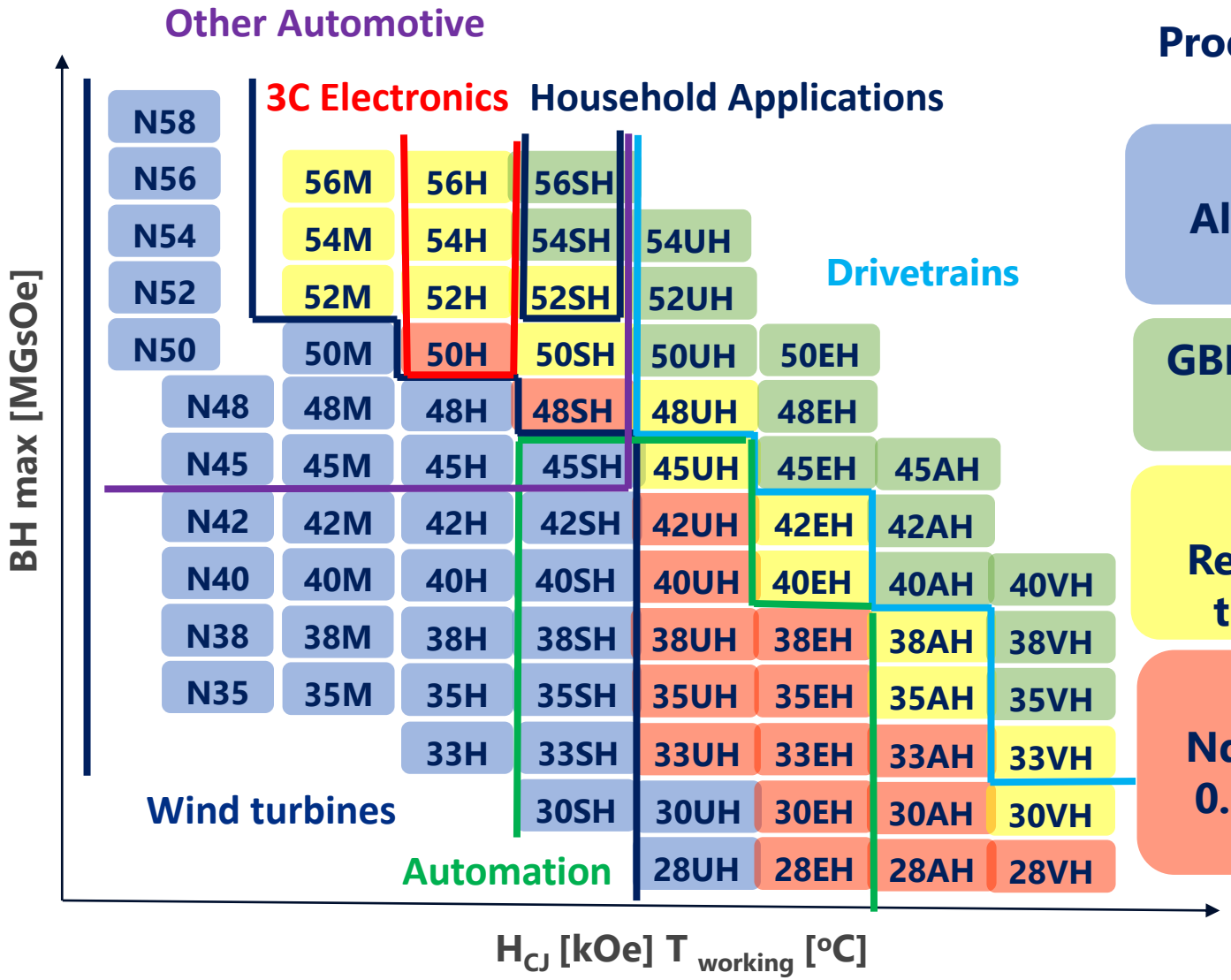
# NdFeB magnet demand – not all magnets are created equal




**Production process and Rare Earths element:**

**Dy free grade**
**All Nd + Pr demand, some Ce and Gd for cost saving**

**GBD (grain boundary diffusion)+ Fine grain tech**
**Similar HREE content to other GBD alloys**

**GBD process**
**Reduced Dy content <1.0% Dy in alloy overall, though higher content on outer boundaries**

**Oxygen controlled process**
**Nd + Pr + Gd consumption, Dy content roughly 0.8-1.2%, though can be significantly higher in specific applications**

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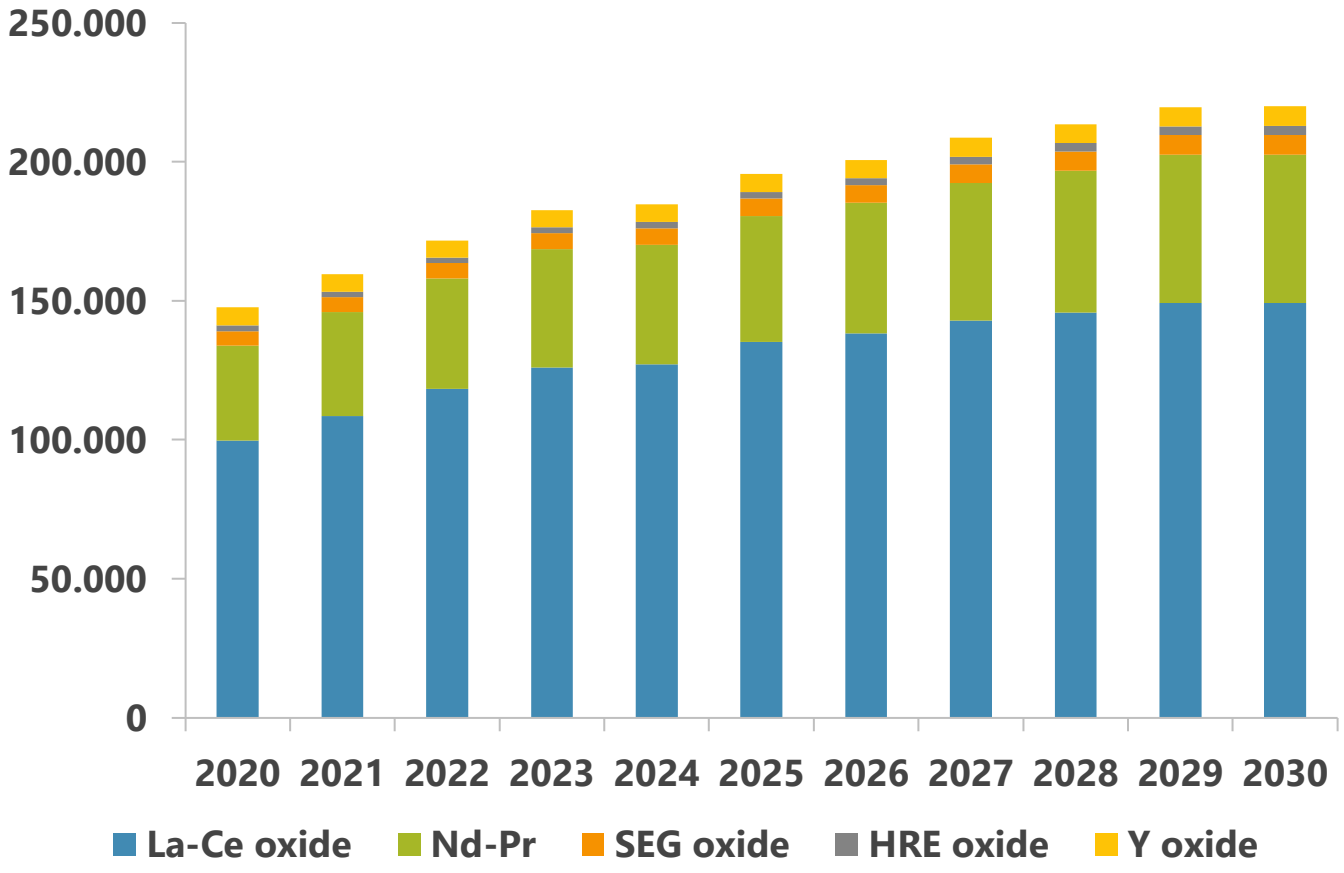
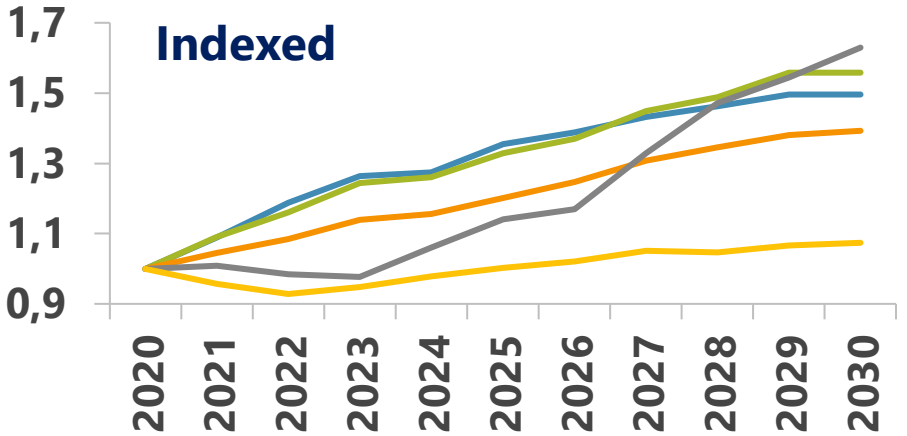
Source: JL Mag presentation – Metal Events webinar – Sept 2020

# Supply outlook

*Forecast showed targeting of Nd-Pr and HREE production*

**Forecast REO supply by element groups, 2020-2030 (t REO)**




- **La & Ce will continue to dominate supply outlook as LREE production is expanded from bastnaesite/monazite type projects**
- **Recycling only way to avoid over-production of other REEs**
- **Nd-Pr and HREE oxide production to experience targeted production**
- **Magnet products to form an increasing proportion of mixed product value**

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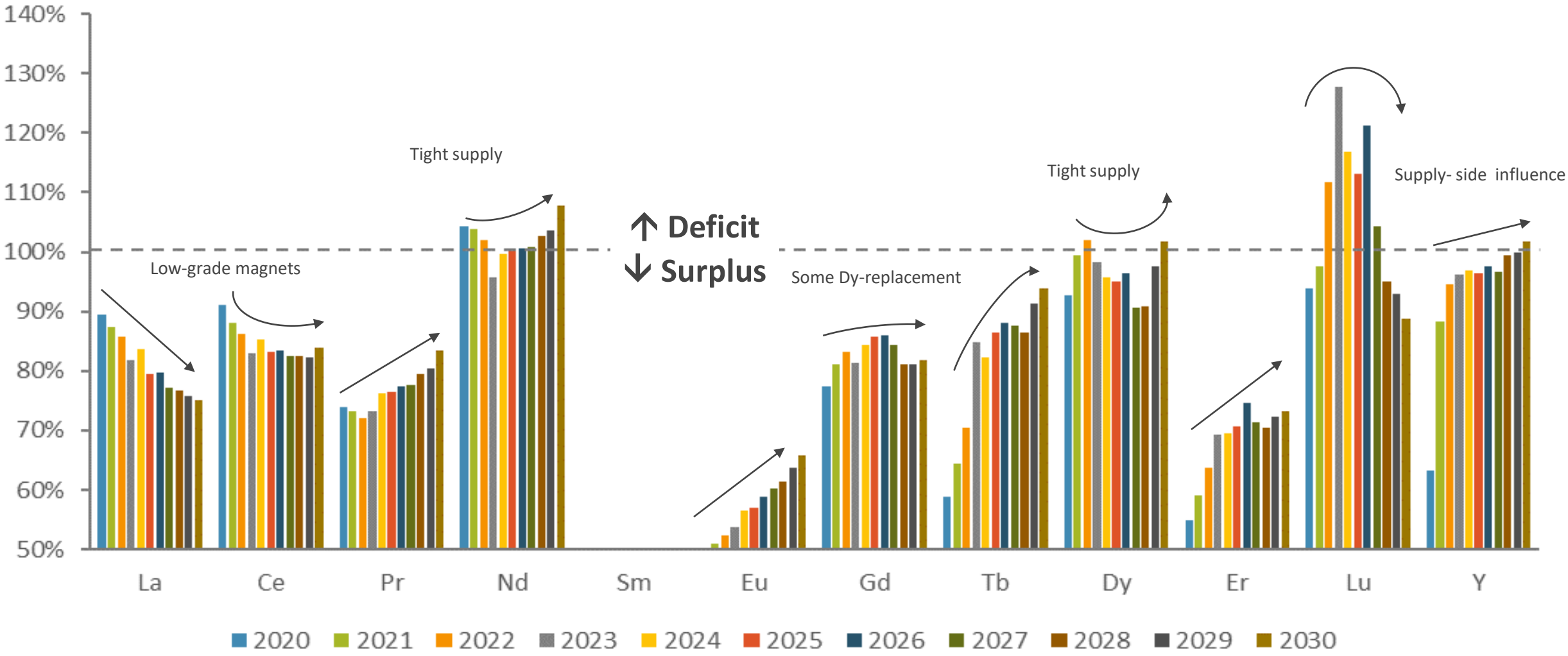
# Market Balance outlook

## *Nd & Dy demand to remain tight, with strong growth and limited supply*

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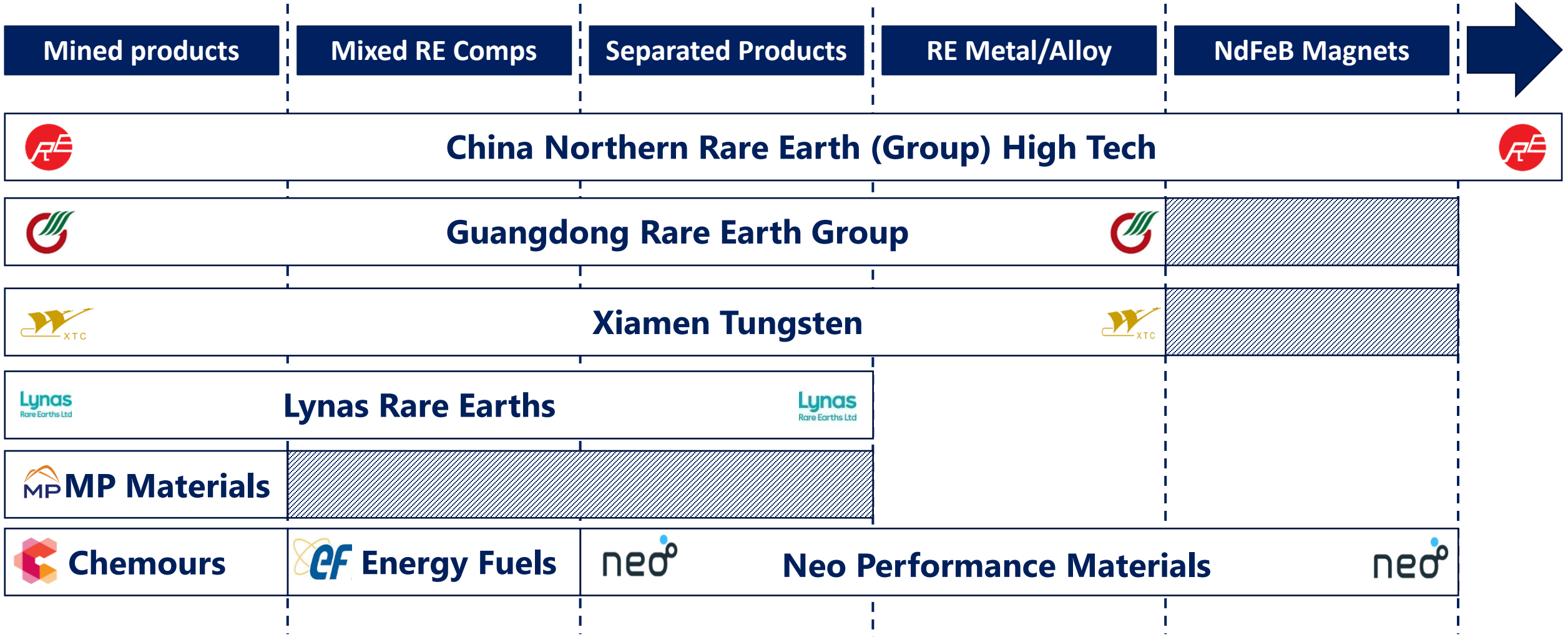
# Industry integration

*Multi-company supply chains initiate industry, though can limit growth & competitiveness*

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# Supply must be incentivized

*Future supply needs to be incentivized via pricing and secure off-takers*

**Pricing must be carefully balanced to attract investment and provide sufficient IRR% for investors though not create surging supply (i.e. lithium market)**

**Downstream industry must support long-term upstream supply to justify investments. Investment in intermediate stages (metal, alloy, compounds, polishing powder, magnets). New revenue for Ce/La also beneficial.**

**Legislation to develop regional and domestic supply chains needs to be sustained outside of China, though must be longer-term solutions.**



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# Environmental, Social and Governance

***Will ESG legislation in Europe and North America be a cliff edge moment?***

## ESG

### Environmental

Combating climate change
GHG emissions
Energy efficiency
Water usage & management
Protecting biodiversity
Environmental management & stewardship
Waste disposal

### Social

Equal opportunity
Freedom of association
Human rights
Community relations
Employee engagement
Labour standards
Health & safety
Child labour

### Governance

Company values & ethics
Compliance
Equal opportunity
Board & executive compensation
Transparency & accountability
Board independence
Shareholder democracy


IRMA
Initiative for Responsible Mining Assurance

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# Como a Roskill poderia lhes ajudar



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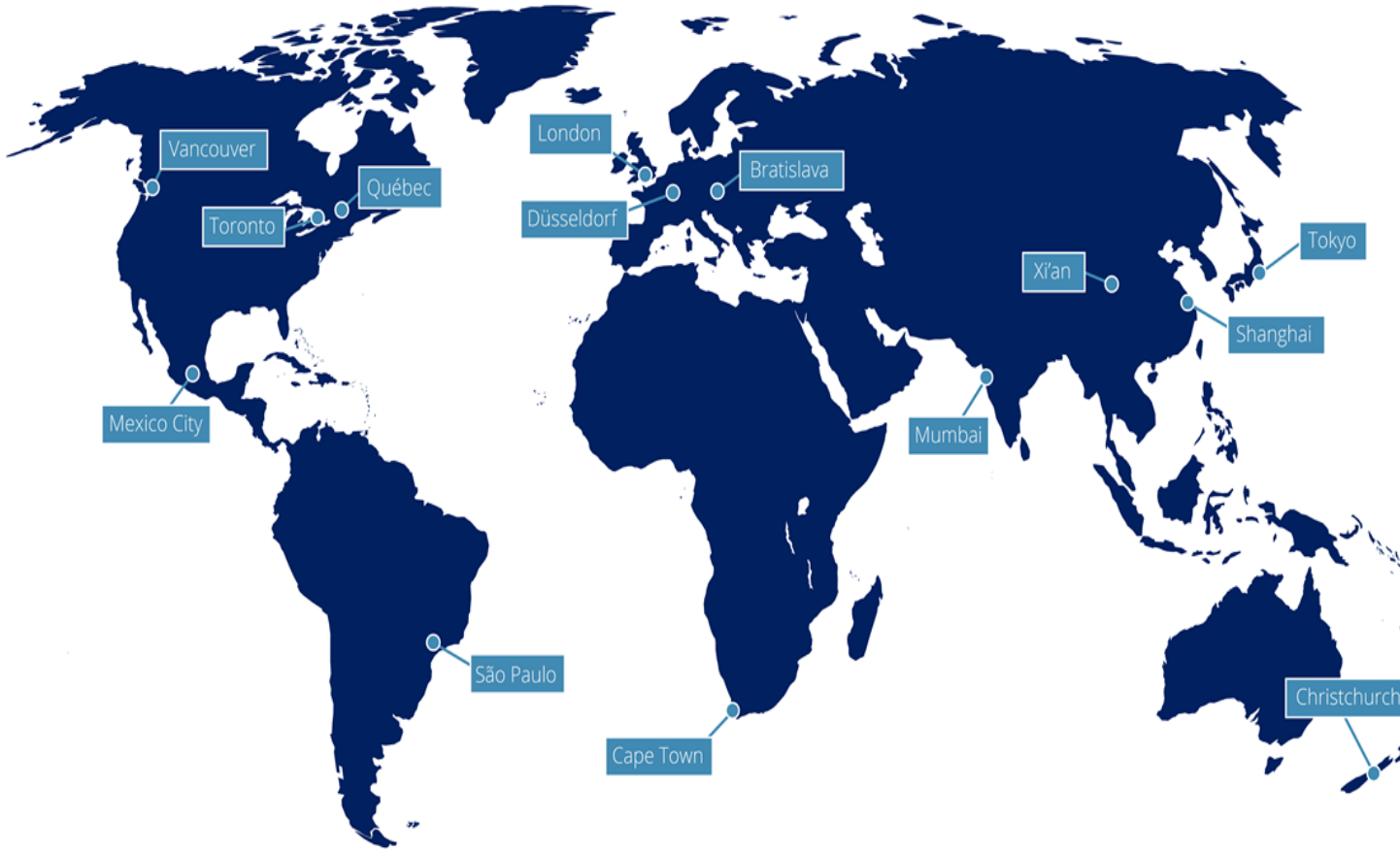
- **Roskill has been serving customers**
  - **in more than 100 countries**
  - **for more than 90 years**

- **We deliver:**
  - **independent data and analysis**
  - **from local research,**
  - **made by locals and by a dedicated and experienced team in London**
  - **with knowledge along the value chain**

- **Specialists in "technology materials", industrial minerals and steel alloys**

- **Specialists on market and cost competitiveness**

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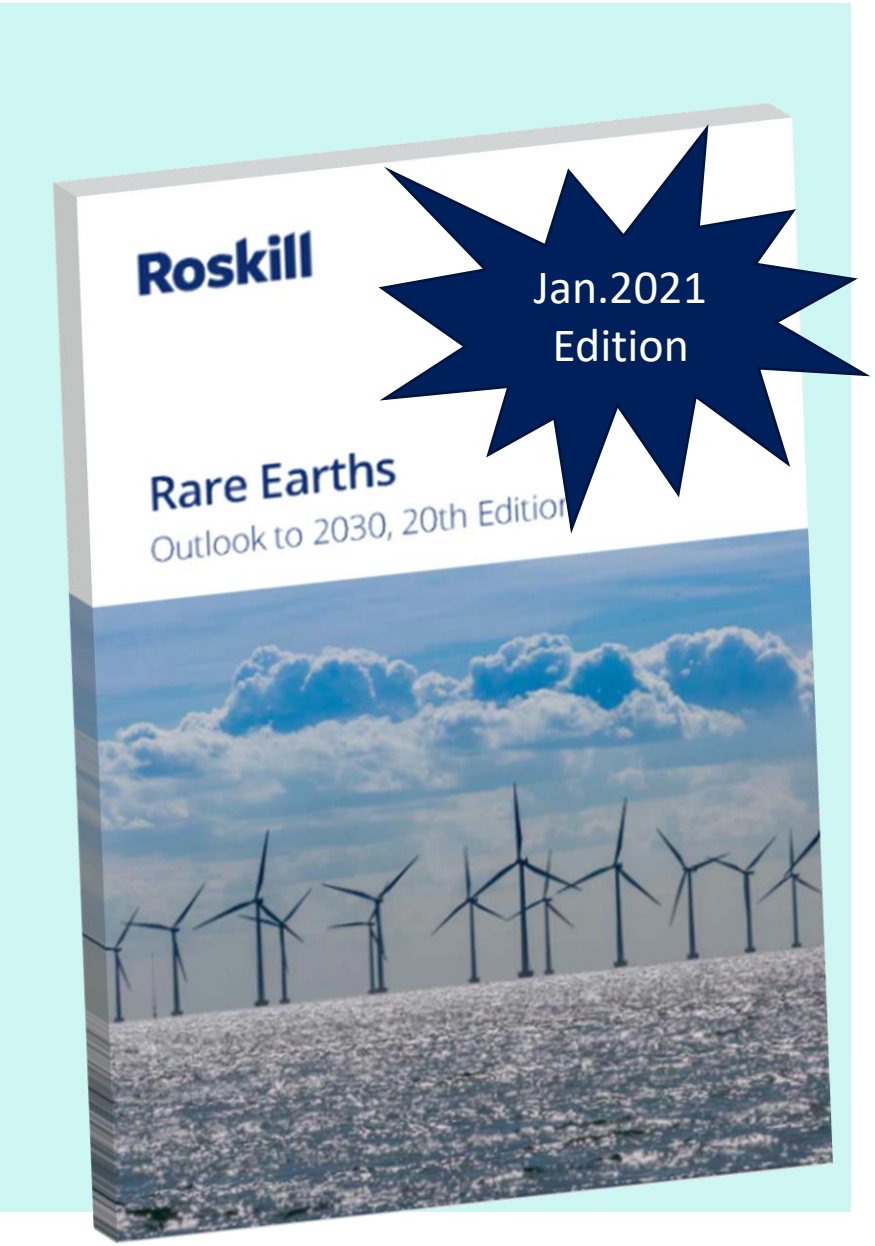
# Publications

- Roskill has a range of research reports aligned to:
  - EV raw materials, Copper & technology metals
  - Industrial minerals & chemicals and steel alloys
- Analysis of production, consumption, costs, trade & prices
- Detailed information on processing & end-uses
- Ten-year forecasts for supply, demand & prices
- Country profiles and Companies profiles
- Quarterly updates
- Responses for market questions

**89 pages with 53 companies profiles: assets, resources and reserves, mines and plants data**




https://roskill.com/market-report/rare-earths/

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# Publications

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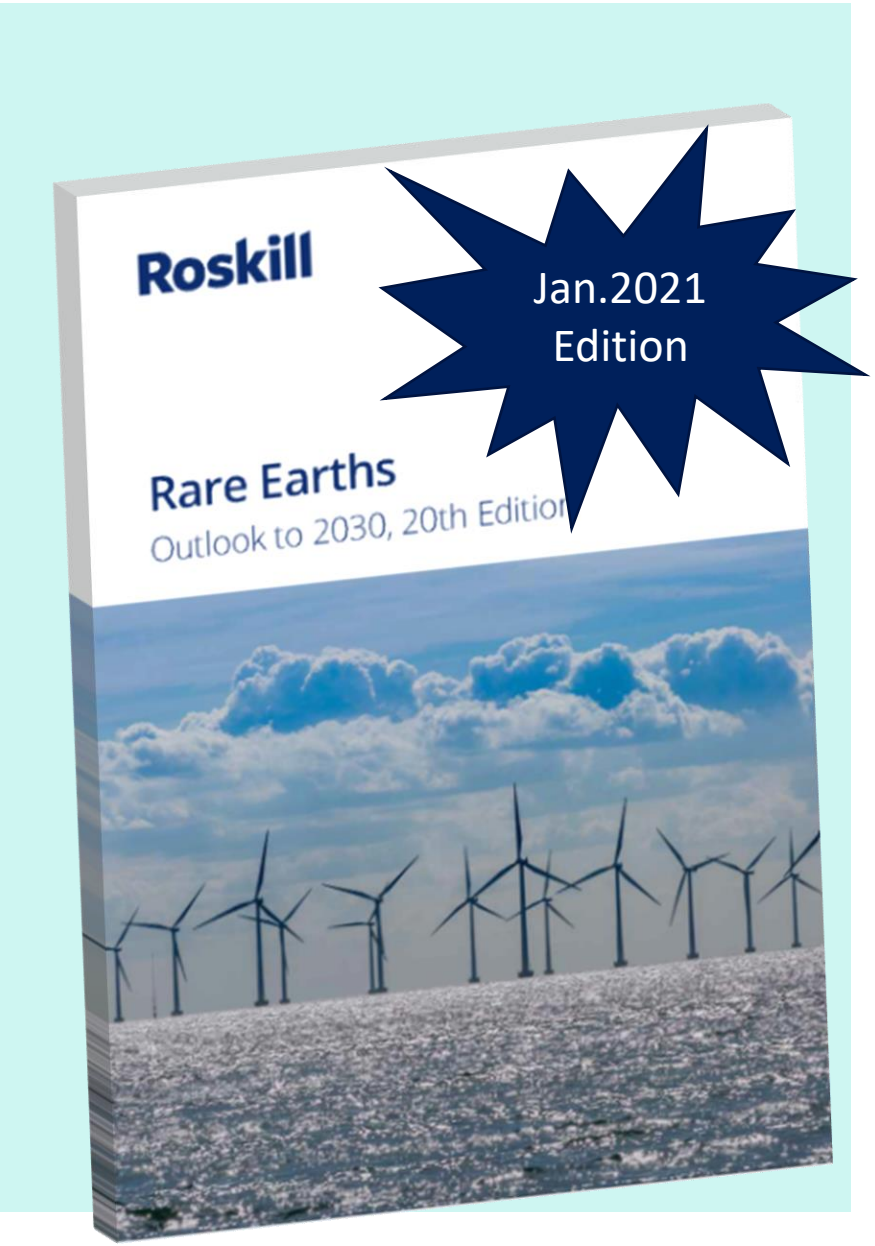


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# Consulting

- Cost studies
- Custom Market Analysis
- Due Diligence
- Feasibility Study Input & Financing Support
- Go-to-market Services
- Strategic Advisory Services
- Socio-economic Impact Assessments

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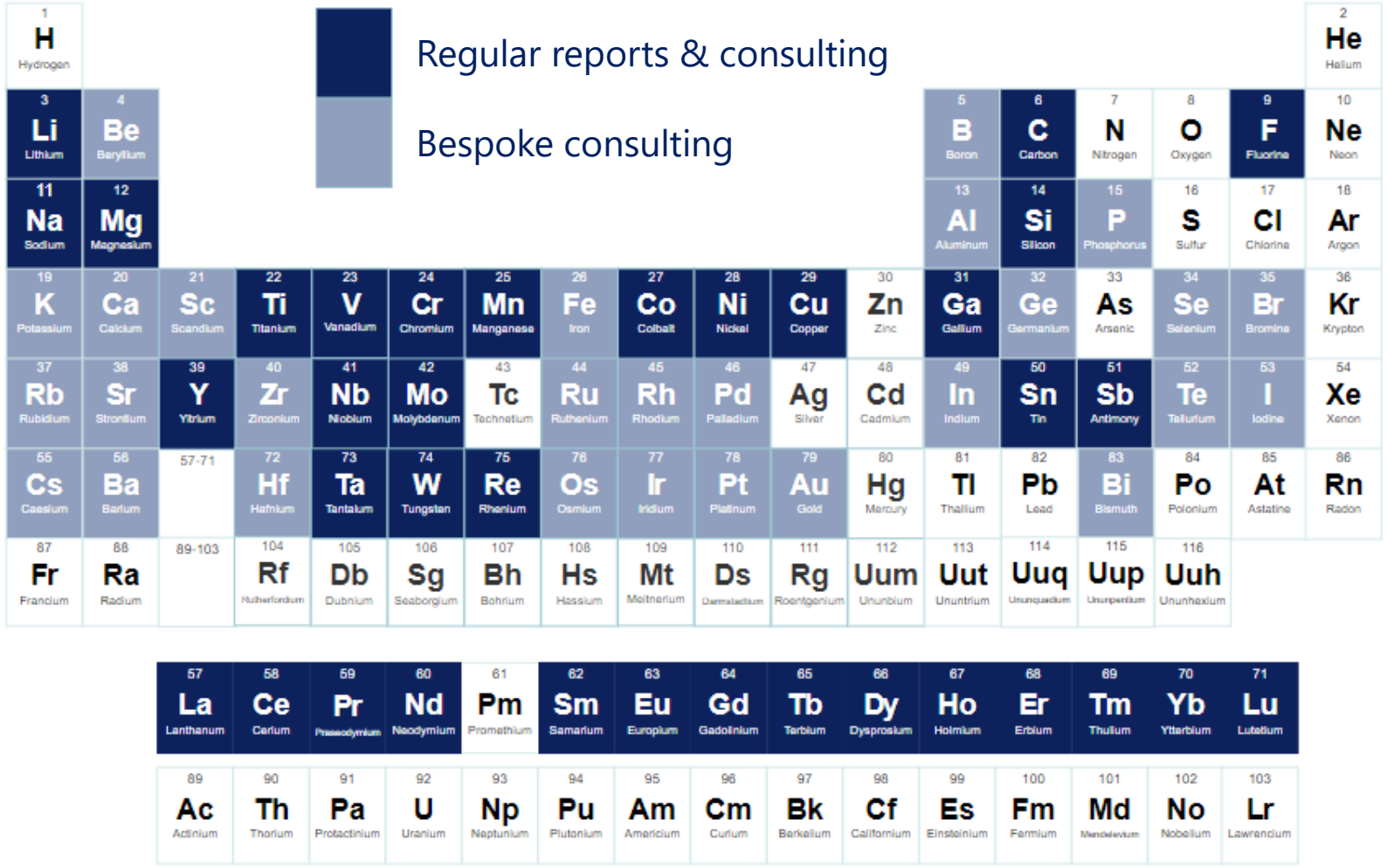
# Our commodity coverage…

*Comprehensive coverage of critical materials*

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# Events

On the road...
## TOKYO
Battery and electric vehicle raw materials insights

6 October 2021
Palace Hotel, Tokyo

The Roskill team will bring their highly successful On the Road... event back to Tokyo for a third time and would like you to join us. Again, the event will take place in the Palace Hotel in Marunouchi, Tokyo, adjacent to the Emperor's Palace gardens. Roskill's senior leadership will provide insights and analytical overviews of the electric vehicles' revolution, the evolution of lithium-ion anode and cathode technologies and the latest trends in steel and steel-making raw materials. This year's event will also focus on the impacts of COVID-19 on commodities markets globally and examine the impacts of the rapidly growing sustainability agenda.

https://roskill.com/event/on-the-road-tokyo-2021/

On the road...
## LONDON
Battery and electric vehicle raw materials insights

12 October 2021
New Armouries Suite, The Tower of London

Roskill returns to the Tower.

On Tuesday 12th October 2021 during LME week, Roskill will be hosting a series of presentations, seminars and panel discussions at the Tower of London.

Held in the stunning location of the New Armouries Suite we will focus on the "very latest" outlook for raw materials in the electric vehicle revolution.

https://roskill.com/event/on-the-road-london-2021/

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# Weekly News – with Roskill's View

free

## Rare earths: New rare earths production initiative to strengthen non-Chinese supply chain

Posted 31st March 2021 in Industry news.
By Ross Embleton and David Merriman

The supply agreement between Neo Performance Materials (Neo) and Energy Fuels (EF), announced on 1 March 2021, outlined details of a new rare earths production initiative between the USA and Europe. EF will process monazite sands, derived from Chemours' Starke project in Northeast Florida, at their White Mesa facility in Utah. The process involves

**Roskill View**

Whilst Neo does operate several facilities within China, t… …ilities are largely independent, reliant upon domestic Chines… …mports derived from imported mineral concentrates. This provides a… …s it's able to serve both customers within China and those targeti… …g a r… …earth… …pply c…in that does not undergo any stage of the value chain within China.

Environmental, social and governance (ESG) factors are important when assessing supply chain security and Roskill believes the rare earth industry is delicately positioned for future ESG conformance. An example of this was reported by Roskill on 25 March, outlining that all IAC mining operations suspended production in late February, following recent crackdowns on the environmental and social impacts of operations. Due to China's control over mined and refined rare earth output, sourcing supply chains that exclude Chinese operations may reduce the risk of encountering disruptions relating to ESG constraints, though few alternatives meeting both ESG criteria in China and the required volumes of production required to meet demand are currently available.

In summary, the supply initiative between Neo and EF is designed to primarily serve European, North American and Asian customers, for various end-use applications. Whilst Neo has existing capacity to undertake LREE separation in the EU at Silmet, there is opportunity for both Neo and EF to develop separation capacity for heavy rare earth (HREE) residues, particularly with a greater portion of monazite expected to be processed. This may present a

https://roskill.com/news/

https://roskill.com/news/rare-earths-new-rare-earths-production-initiative-to-strengthen-non-chinese-supply-chain/

# Roskill Algumas referências (publicadas por clientes)




















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