

Critical Raw Materials Supply Chains – Europe’s and the UK’s Response – Forging the Links.

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“To solve global warming, we have to fully electrify the entire economy, including the transportation fleet. There are currently 1.3 billion cars on the planet. By mid-century, that will be close to 3 billion, just light duty cars. To make all of those electric vehicles, as opposed to internal combustible engine, you’ll need more than \$5 trillion worth of cobalt, nickel, lithium and copper. That’s incremental, in addition to all the demand for those materials, for just business as usual activities.” CEO Kurt House, KoBold.

This is just one of the many similar public statements from governments, business owners and investors drawing attention to the scale of the task ahead to transition societies and industries to a world where energy needs will depend less on fossil fuels and more on green energy and, as will be seen, is the focus of recent western government actions and policies. Cobalt, nickel, lithium and copper are in relatively abundant supply. But that is not the case with other minerals, such as rare earths. Without these particular “critical raw materials” there will be no large-scale development of the magnets that will power the EVs and wind turbines which are crucial to the success of green energy policies in the western world.

China has dominated the global mining production of REE, the processing of REE into RE metals and alloys, and the manufacture of permanent magnets for the last 20 or so years. Whilst China’s share of the world’s REE mining has declined in recent years, it still manufactures around 90% of all NdFeB metals and magnets. In 2018 China supplied the EU with 98.5% and the USA with 95.2% of their respective imports of RE metals and alloys.

The creation of resilient non-Chinese rare earth to magnet supply chains (NCSC) is now the focus of many western governments to reduce their reliance on Chinese imports.

What are “rare earth elements” and “permanent magnets”?

Rare earth elements (REE) are a group of 17 chemical elements that occur together in the periodic table. They are very difficult to mine because they are rarely found in economically extractable concentrations.

REE and metals and alloys that contain them are used in many everyday devices such as batteries, smart phones, catalytic converters, magnets, fluorescent lighting and much more. They also play an essential role in defence electronics in precision-guided weapons and communications equipment.

They are considered to be “critical raw materials” (CRM) because of their “critical” importance, in particular to the production of the magnets that power electric vehicles (EVs) and wind turbines.

A “permanent magnet” is an object made from material that is magnetized and creates its own persistent magnetic field – an everyday example is the simple “fridge” magnet. The strongest, lightest and most commercially available permanent magnet is the NdFeB magnet formed by neodymium (Nd) iron, and boron with praseodymium (Pr) and other REE. This is the magnet most commonly used in motors for hybrid vehicles, EVs and wind turbines.

The global demand for NdFeB magnets is projected to double this decade. The European Commission’s long-term outlook is, “In addition to rapidly rising demand driven by electric vehicles and energy storage, demand for rare earths critical for products like wind turbines could increase ten-fold by 2050”.

Western governments’ actions and initiatives.

A key objective of the establishment and maintenance of resilient CRM supply chains into the west is to ensure that the necessary components for the manufacture of the equipment and infrastructure that is crucial to achieving the transition to sources of greener energy, is increasingly independent of, and less reliant on, China.

Government support for the REE industry in general and NCSC in particular is essential if the private sector is to be able to economically produce the crucial components for the EV and wind turbine sectors. Support will need to come in many forms, including grants, tax allowances, debt financing and equity investment.

Over the last 12 months or so several western governments have announced initiatives and policies in relation to CRM which are necessary to transition to an energy system which is substantially less dependent on fossil fuels.

European Union

In September 2020 the European Commission released its Critical Raw Materials Action Plan focussing on “the most pressing need, which is to increase EU resilience in the rare earths and permanent magnets value chains, as these are vital to most EU industrial ecosystem”.

United Kingdom

The UK Government does not have a critical raw materials policy as such.

On 15 March 2021 in the course of his speech to the House of Commons, the Vice-Chair of the All-Party Parliamentary Group for CRM outlined the Group’s priorities in terms of government policy including “the development of a critical mineral midstream” i.e. the production of RE metals and alloys and the manufacture of RE permanent magnets in the UK.

The UK government’s objectives are ambitious; current policy identifies 2030 as the year when:

- offshore wind turbines will produce more than enough electricity to power every home in the country; and
- sales of cars with internal combustion engines will be banned.

US

In 2017 President Trump initiated a strategy to ensure secure and reliable supplies of CRM. In February this year, President Biden ordered reports within 100 days from a variety of government agencies, identifying the risks in the supply chains for CRM including REE and policy recommendations to address those risks.

Canada

In March 2021, Canada, a major resource economy, released its list of minerals considered critical for the sustainable success of Canada and “our allies”.

Australia

Another major resource economy, Australia, earlier this year released its 10-year “road map” to create more REE processing capacity as part of a broader push to make Australia one of the developed world’s linchpin suppliers of REE and other CRM.

International cooperation

The policies of EU, UK, US, Canada and Australia all acknowledge that the establishment of NCSC to meet their projected domestic REE processing and magnet manufacturing ambitions will require international cooperation and investment.

Examples of such cooperation include:

Europe

The European Raw Material Alliance (ERMA) is an alliance of organisations from the European public and private sectors covering the entire critical raw materials value chain. Its immediate objective is to increase the resilience of EU supply chains for rare earth magnets and motors, batteries, and fuel cells.

The EU’s Action Plan highlights the need to diversify sourcing of CRM from third countries requiring “strategic international partnerships and associated funding to secure a diversified supply of sustainable critical raw materials, including through undistorted trade and investment conditions, starting with pilot partnerships with Canada, interested countries in Africa and the EU’s neighbourhood”.

US - Canada

In June 2019, the US and Canadian governments agreed to develop resilient, integrated North American supply chains for CRM. A Critical Minerals Working Group has been established and Canada now participates in the US-led Energy Resource Governance Initiative.

US - Australia

In September 2019, the US and Australian governments agreed to develop a Critical Minerals Action Plan to “improve the security and supply of rare earths and other critical minerals in the United States and Australia; increase US-Australia connectivity throughout the supply chain of critical minerals; and leverage the interest of other like-minded partners to improve the health of the global critical minerals supply chain.”

US, Canada and Australia

The US, Canada and Australia have created the Critical Minerals Mapping Initiative to assist with the building of a diversified critical minerals industry.

US, UK, Canada, Australia and New Zealand - The “Five Eyes”

There have been several press reports concerning the possible expansion of the “Five Eyes” intelligence-sharing alliance into a strategic economic relationship that pools key strategic reserves such as CRM and develops NCSC amongst its members.

In its March 2021 Report, the Polar Research and Policy Initiative recommended the creation of a Five Eyes Critical Minerals Alliance with a particular focus on Greenland’s CRM deposits.

Conclusion

It is early days yet to assess the effectiveness of these policies in the development of NCSC to produce permanent magnets that will be price competitive with Chinese producers. There is considerable private sector activity around “the development of a critical mineral midstream” (with government support) but, as The Times’ editorial on 5 April warns, “[T]o reduce reliance on Beijing, the first step is to mine rare earths in new locations”, an issue we consider in the next article in this series.

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