The Case for a Five Eyes Critical Minerals Alliance

Focus on Greenland

Dwayne Ryan Menezes

Polar Research & Policy Initiative

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Cover Image:
Qeqqata Municipality in Greenland

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ISBN: 978-1-8384420-0-2

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London SW6 1BH
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www.polarconnection.org

March 2021

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Introduction

In August 2019, when it surfaced that the incumbent President of the United States sought to purchase Greenland from Denmark, the world, unsurprisingly, greeted the story with derision and incredulity. The idea that one country – no matter how large or powerful – could simply make an offer to purchase another – no matter how unfamiliar or remote – seemed anachronistic at best, prompting the Danish Prime Minister Mette Frederiksen to dismiss the proposal as "absurd" and assert, "Greenland is not Danish. Greenland is Greenlandic". The very notion that Greenland was a mere appendage of Denmark that the latter could sell was highly problematic, leading Greenland's Premier Kim Kielsen to state, "Greenland is not for sale".

Yet, by causing the world to sit up and take notice of this large Arctic island, Donald Trump may have unwittingly lifted the veil on Greenland's – and indeed the Arctic's – geostrategic importance to the US and its allies more widely than ever before. The renewed emphasis on Greenland in US foreign, defence and security policy is much more explicable when viewed against the backdrop of Greenland's vast resource potential and increasing US-China great power competition. The relative abundance of several critical minerals, including rare earth elements, in Greenland offers the US and its allies the opportunity to reduce their dependence on China for resources essential to their defence and security, renewable energy and high-tech sector needs and, thus, to enhance their resource security and strategic competitiveness.

What makes the case of Greenland particularly interesting is that, despite the media hullaballoo about China's growing footprint in the Arctic, the three countries most prolific in Greenland's mining sector are the UK, Australia and Canada, three of the closest allies of the US and its partners within the Five Eyes alliance. By casting a spotlight on this oft-overlooked reality, this report prompts the question: Would greater and more concerted Five Eyes cooperation in, and with, Greenland be a more appropriate and effective strategy to address some of the more legitimate concerns and achieve some of the more reasonable objectives that may have fuelled the proposed US acquisition of Greenland, especially in relation to enhancing regional security, and building more diverse and resilient supply chains of critical minerals?

What this report will explore, by focusing on the British, Australian and Canadian commercial presence in Greenland instead of the more familiar US military presence therein, is why Greenland should matter just as much to the UK and to the Fives Eyes Alliance as a whole. It shall make the case for a Five Eyes Critical Minerals Alliance that can contribute to building greater resource security for the UK and its allies through enhanced cooperation in, and with, Greenland. It shall consider the existing approaches of the UK, EU, US, Canada, Australia and New Zealand to securing access to critical minerals and demonstrate why concerted Five Eyes cooperation is vital to the allies' defence and security, climate ambitions and industrial strategy. It shall explore also the importance of a UK-Greenland bilateral trade agreement not simply to the UK's post-Brexit trade policy and resource security, but also to such Five Eyes cooperation.

Look North: Greenland's Vast Resource Potential

Changing Arctic sea ice conditions have opened up the possibility of increased navigation along the Northern sea routes, dramatically reducing the time it takes to ship goods between Asia, Europe and North America, while presenting new opportunities for Greenland's waterways and port infrastructure. Likewise, the growing practicality and popularity of using polar air routes that result in substantial time and fuel savings on flights between North America, Europe and Asia have opened up new opportunities for Greenland's airways and airport infrastructure. What makes Greenland so strategic though is not just where it sits geographically, but also what it holds resource-wise. In 2008, the US Geological Survey (USGS) estimated that the three major basins off the coast of Greenland could yield up to 52 billion barrels of oil

equivalent. Furthermore, a 2015-study found that Greenland could produce enough hydropower to meet its own needs and export the surplus to Nunavut, or Newfoundland and Labrador, and perhaps even further through an undersea cable.[1] Greenland's fish-rich waters also make it one of the world's largest exporters of cold-water prawns, cod, haddock, halibut and snow crab. Mineral-rich Greenland, moreover, holds large reserves of copper, zinc, lead, iron ore, nickel, titanium, cobalt, gold, precious gemstones, platinum-group metals, rare earth elements and other minerals.

Growing Chinese Interest in Greenland

Greenland's – as also the wider Arctic's – vast resource potential has not escaped China's attention. In 2018, China outlined its ambitions to build a Polar Silk Road (as an extension of its Belt and Road Initiative) by developing Arctic shipping routes; vessels belonging to China's COSCO Shipping have plied the Northern Sea Route since 2013. China, furthermore, has actively pursued investment opportunities in Greenland's airport, port and research infrastructure, as well as mining and energy sectors. In 2016, it was reported that the Hong Kong-based company General Nice sought to take over the abandoned naval base Grønnedal, but the Danish Prime Minister Lars Løkke Rasmussen personally intervened to prevent it from doing so.[2] More recently, a Chinese construction firm China Communications Construction Company bid for Greenland's airport projects, but withdrew after Denmark stepped in to finance the projects, reportedly in the face of mounting US concern over China's role with respect to Greenland's future air facilities.[3]

When it comes to mining, Chinese firms, such as Shenghe Resources Holding Co Ltd, China Non-Ferrous Metal Industry's Foreign Engineering and Construction Co Ltd (NFC) and China National Nuclear Corporation (CNNC), have interests in Greenland, much to the consternation of the US. Greenland sits on some of the world's largest deposits of rare earth elements that are critically important to the US, but for which the US is still heavily dependent on China, a dependence that China could weaponise in the US-China trade war. In the energy sector, two Chinese oil majors – China National Petroleum Corporation (CNPC) and China National Offshore Oil Corporation (CNOOC) – have expressed interest in bidding for Greenland's onshore oil and gas blocks in 2021. China also serves as one of the largest markets for Greenland's fish exports. A 2017-study noted that Greenland attracted the highest levels of Chinese foreign direct investment as a percentage of GDP of all Arctic countries.[4]

The Forgotten Giants: The British, Canadian and Australian Economic Footprint in Greenland

While China undoubtedly has a growing footprint in Greenland, the preoccupation with China has resulted in the US overlooking the importance of other players, including its closest allies, in the region. Despite the media hullabaloo about China, it is the UK that, with the exception of Denmark, might still command the greatest economic footprint in Greenland, followed by Canada and Australia. The UK, Canada and Australia, furthermore, have a long and rich history of resource exploration and development in Greenland.

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1 B. Pehora, "Greenland to Nunavut electricity exports? It just might be possible", *Nunatsiaq News*, 14 January 2016. https://nunatsiaq.com/stories/article/65674greenland_to_nunavut_hydro_exports_it_just_might_be_possible/

2 M. Breum, "Did Denmark's prime minister stop a Chinese firm from buying an abandoned military base in Greenland?", *Arctic Today*, 23 December 2016. https://www.arctictoday.com/did-denmarks-prime-minister-stop-a-chinese-firm-from-buying-an-abandoned-military-base-in-greenland/

3 M. Shi, M. Lanteigne, "A Cold Arena? Greenland as a Focus of Arctic Competition", *The Diplomat*, 10 June 2019. https://thediplomat.com/2019/06/a-cold-arena-greenland-as-a-focus-of-arctic-competition/

4 M. Rosen, C. Thuringer, *Unconstrained Foreign Direct Investment: An Emerging Challenge to Arctic Security* (CNA Analysis & Solutions, 2017). https://www.cna.org/cna_files/pdf/COP-2017-U-015944-1Rev.pdf

Geologists, prospectors and explorationists from the UK and the wider English-speaking world have been instrumental in surveying and mapping the geology, as well as energy and mineral resources, of Greenland for the better part of two centuries.

In recent years, Greenland has rapidly re-emerged in the British and Canadian public imagination as a large, resource-rich island that forms a strategically important part of the UK's and Canada's northern maritime neighbourhood, endowed with a favourable geography and developed into a vibrant, stable and attractive jurisdiction for investment, especially in mining. Although Greenland is less prominent in Australian public discourse, which focuses more on Australia's interests in Antarctica and the Southern Ocean and, thus, Australia's southern maritime neighbourhood, Greenland enjoys a growing – even if niche – profile within Australia's large mining industry. As of February 2021, there were 41 companies enlisted as having mineral exploitation, exploration and prospecting licenses in Greenland, 27 of which were headquartered in, listed in or substantially connected to the UK, Canada and Australia.

The UK, Canada and Australia have remained relevant to Greenland over recent decades as home to some of the world's leading clusters of energy and mining expertise, foremost centres of global energy and mining finance, and biggest and most visible energy and mining companies. In the case of the UK, energy firms, such as BP, Royal Dutch Shell and Cairn Energy, have been a key feature of Greenland's oil and gas exploration landscape. While BP and Shell were part of a consortium of companies that was granted a prospecting licence under the KANUMAS (Kalaallit Nunaat Marine Seismic) Project as early as 1989, Cairn Energy had emerged as the biggest explorer in Greenland by 2011, though its USD 1.2 billion, 8-well drilling campaign proved unsuccessful. The UK's largest mining firms as well, Glencore, BHP, Rio Tinto and Anglo American, have been involved in Greenland at various points. For instance, Rio Tinto was already prospecting in Kangerluarsuk, Isua and Washington Land in the 1990s, and another UK-based firm London Mining acquired its Isua iron ore project from Rio Tinto in 2005. In 2013, London Mining was awarded a 30-year license to develop the Isua iron ore project, described then as "the largest commercial project to date in Greenland", though financial problems led to the transfer of its Greenlandic subsidiary to the Hong Kong-based General Nice Development.[5] Likewise, when BHP Billiton took over Canadian diamond producer Dia Met Minerals Ltd in 2001, it acquired a majority interest in a joint venture engaged in diamond exploration in western Greenland.[6] Incidentally, BHP and Rio Tinto are both Anglo-Australian, while Glencore is Anglo-Swiss, and Anglo American has strong ties to both the UK and South Africa.

Although no mineral resources were mined in Greenland for a few years since the closure of its southern gold mine in 2013, the mining sector has grown steadily since then and now has two active mines.

- In 2017, LNS Greenland, the sister company of Greenland Ruby and both part of the Norwegian family-owned LNS Group, commenced the production of rubies – positioned as the world's only conflict-free rubies – at its Aappaluttoq mine.
- In 2019, the TSXV-listed Canadian firm Hudson Resources started production at its White Mountain Anorthosite mine, which it reports is the largest anorthosite occurrence, surpassed only by the moon.

As of February 2021, there were 41 companies enlisted as holding mineral exploitation, exploration and prospecting licenses in Greenland. Of these, 13 were listed as having their addresses in the UK; 8, in Greenland; six, in Denmark; four, in Canada; four, in Australia; three, in the Czech Republic; and one each,

5 "Greenland awards London Mining huge iron ore project", *BBC News*, 24 October 2013. https://www.bbc.co.uk/news/world-europe-24658756

6 "Greenland drilling uncovers kimberlite dyke", *The Northern Miner*, 15 October 2001. https://www.northernminer.com/news/greenland-drilling-uncovers-kimberlite-dyke/1000109121/

in India, South Africa and Ireland.[7] On closer inspection, it became apparent that, seven of the 8 companies with addresses in Greenland were subsidiaries of firms overseas – three, in Canada; and one each, in Australia, Norway, France and Hong Kong. Furthermore, the South African firm was a member company of an international group headquartered in London; 51% of the Irish firm was owned by a British firm; one of the Canadian firms achieved a dual listing on the Alternative Investment Market (AIM) of the London Stock Exchange (LSE) in 2020; and one of the British firms was acquired by an Australian firm in 2020. Moreover, one of the six Danish firms appeared to hold equity in the other five, with the majority stake in most held by a firm in the British Virgin Islands.

In reality, thus, of the 41 license holders in Greenland's mining sector, at least 27 firms were largely or entirely British, Canadian and Australian:

- **UK:** 16 firms were headquartered in, listed in, or substantially connected to, the UK, even if they operated in Greenland through local subsidiaries.
- **Canada:** 7 firms were headquartered in, listed in, or substantially connected to, Canada, even if they operated in Greenland through local subsidiaries.
- **Australia:** 6 firms were headquartered in, listed in, or substantially connected to, Australia, even if they operated in Greenland through local subsidiaries.
- Two of the firms above were connected to either both the UK and Canada or both the UK and Australia, so they have been counted only once in the total number of British, Canadian and Australian mining firms operating in Greenland, bringing the total number to 27, rather than 29.
- This number does not include the Danish firms that were connected to the British Virgin Islands.

The UK, Canada and Australia, moreover, are not just where many of the mining companies scoping out opportunities in Greenland originate, but often where they choose to fundraise or seek expertise. In the case of the UK, listing on the LSE (and its AIM) has proven especially popular. In the case of Canada and Australia, the Government of Greenland regularly hosts Greenland Day events in both countries – at, or following, mining conferences, such as the PDAC (Prospective & Developments Association of Canada) Convention in Toronto and the Australian Nickel Conference in Perth – to promote Greenland's resource potential and attract investment. The table below provides a list of the 27 British, Canadian and Australian firms currently holding mining licenses in Greenland, noting where they are headquartered and, if relevant, listed.

[7] Greenland Mineral License and Safety Authority, List of Licensees and Partners as of February 2021.

British, Canadian and Australian Licence Holders in the Mining Sector in Greenland			
	Company	**Listed Address***	**Notes**
UK	Anglo American Exploration Overseas Holdings Limited	UK	LSE- and JSE-listed, London-headquartered
UK/SA	De Beers Marine (Pty) Ltd	South Africa	Cape Town-based, part of London-headquartered De Beers Group, itself 85% owned by Anglo-American
UK	Bluejay Mining Plc	UK	AIM- and FSE-listed, OTCQB-traded, London-headquartered
UK	Bluejay Mining Ltd	UK	
UK	Disko Exploration Ltd.	UK	100% owned by Bluejay Mining Plc
UK	Dundas Titanium A/S	UK	
UK	Bright Star Resources Limited	UK	London-headquartered private limited companies that are subsidiaries of, or connected to Executive Chairman of, AIM-listed Alba Mineral Resources
UK	Obsidian Mining Ltd	UK	
UK	White Eagle Resources Limited	UK	
UK	White Fox Resources Limited	UK	
UK	Stallion Resources Limited	UK	
UK	Challenge Holdings Ltd	UK	London-headquartered private limited company
UK	FBC Mining (BA) Ltd	UK	London-headquartered private limited company
UK/AU	Longland Resources Limited	UK	Bristol-headquartered private limited company acquired by ASX-listed Conico in 2020
IE/UK	Resource 500 FeVTi Ltd	Ireland	51% owned by London-headquartered Gofer Mining plc
CA/UK	Nalunaq A/S	Greenland	Owned by Toronto-headquartered TSXV- and AIM-listed AEX Gold Inc.
CA	Greenland Resources Inc.	Canada	Toronto-headquartered private limited company
CA	Copenhagen Minerals Inc.	Canada	100% owned by Greenland Resources Inc., but may be acquired by CSE-listed Cryptologic Corp. in 2021
CA	Hudson Resources Inc.	Canada	TSXV-listed, OTCQX-traded, Vancouver-headquartered
CA	Hudson Greenland A/S	Greenland	31% owned by Hudson Resources Inc.
CA	North American Nickel Inc.	Canada	TSXV-listed, Toronto-headquartered
CA	Skaergaard Mining A/S	Greenland	Owned by CSE-listed Vancouver-headquartered Major Precious Metals Corp.
AU	Greenfields Exploration Ltd	Australia	Perth-headquartered private limited company
AU	Greenland Minerals A/S	Greenland	Subsidiary of ASX-listed, Perth-headquartered Greenland Minerals Ltd
AU	Ironbark Zinc A/S	Australia	Subsidiary of ASX-listed, Perth-headquartered Ironbark Zinc Limited
AU	Rimbal Pty Ltd	Australia	Perth-based private limited company
AU	Tanbreez Mining Greenland A/S	Australia	Subsidiary of Perth-based Rimbal Pty Ltd

** Address of the company, as provided in the List of Licensees and Partners as of February 2021*

Given the extent to which the ownership, funding and project activities of mining firms – especially British, Canadian and Australian, but also American, Irish and South African – may be intertwined through ownership structures, exchange listings and pathways of cooperation, one might ask whether these national distinctions are or remain clear cut in practice. What complicates matters a little is that it is often the case that a firm registered or headquartered in one country may choose to list in another country or may get acquired a firm listed in another country. As apparent in the table above, many of the firms, or their parent companies, may also hold multiple listings – on exchanges such as the London Stock Exchange (LSE) and its Alternative Investment Market (AIM), Toronto Stock Exchange Venture Exchange (TSXV), Australian Securities Exchange (ASX), Frankfurt Stock Exchange (FSE) and Johannesburg Stock Exchange (JSE) –

and trade in over-the-counter (OTC) markets, such as OTCQB and OTCQX, allowing them to access wider and more diverse pools of international capital.

Furthermore, as the firms currently producing in Greenland expand, and those prospecting or exploring eventually commence production, Greenland – owing to its resource potential and relative geographical proximity – is well-placed to become one of North America's and Europe's leading import sources for a number of metals and minerals. Many of these firms may rely on British, Canadian, Australian and American expertise and mining finance, as is already the case, and may also look to use or to develop processing operations in the UK, Canada, Australia and the US. Such pathways of future cooperation may also make national distinctions less relevant, meaningful and valuable, in comparison with international alliances, when it comes to conceiving strategies to build secure, stable, sustainable, reliable and resilient supply chains of critical minerals.

The following examples reveal some of the ways in which UK companies and exchanges are involved in Greenland's mining sector, and how connected they are with companies and exchanges beyond, especially in Canada, Australia and South Africa.

- The AIM- and FSE-listed British firm Bluejay Mining is developing three projects in Greenland: the Dundas Ilmenite Project, which is the world's highest-grade mineral sand ilmenite (the key ore in titanium) project; the Disko-Nuussuaq Project, a magmatic massive sulphide nickel-copper-platinum-cobalt project believed to host mineralisation similar to the world's largest nickel/copper sulphide mine in Siberia; and the Kangerluarsuk Zinc-Lead-Silver Project. In 2019, it also signed an agreement with Rio Tinto Iron and Titanium Canada, a member of the LSE- and ASX-listed Anglo-Australian mining giant Rio Tinto Group, for further analysis of the ilmenite from the Dundas project.

- The LSE- and JSE-listed British mining giant Anglo-American – the world's largest platinum producer – is one of the largest mining firms that holds licenses in Greenland, where it is undertaking polymetallic (copper-nickel-platinum group elements) exploration, as it is in Finland and Canada. Anglo-American had also taken over the London-headquartered global diamond giant De Beers Group in 2011, of which an associated Cape Town-based South African company - De Beers Marine (Pty) Ltd - has since obtained an exploration license for diamond exploration in Greenland.

- Another LSE- and JSE-listed British-Swiss mining giant Glencore is a significant shareholder at the ASX-listed Australian firm Ironbark Zinc and an offtaker for its Citronen project. Ironbark Zinc is developing the Citronen Zinc-Lead Project, which represents one of the world's largest undeveloped zinc-lead deposits with a resource of more than 13 billion pounds in contained zinc and lead metal.

- In July 2020, the TSXV-listed Canadian firm AEX Gold, which has revived the Nalunaq Gold Project and which currently holds the largest gold license portfolio in Greenland, achieved a dual listing on the AIM, the sub-market of the LSE for small and medium size growth companies, after raising GBP 42.5 million through a placing and direct subscriptions.

This also brings us to what resources the British, Canadian and Australian firms currently holding licences in Greenland are targeting. As evident in the table below, there is a substantial focus on base metals (copper, lead, zinc), light metals (such as ilmenite, titanium and magnesium), precious metals (such as gold, silver and the platinum group metals), iron and ferro-alloy metals (such as iron, nickel, cobalt, molybdenum, chromium and niobium), industrial minerals (such as graphite, feldspar and anorthosite), specialty metals (such as rare earth elements, zirconium, niobium, tantalum and uranium) and gemstones (rubies, pink

sapphires and diamonds). These are all metals and minerals that the UK and its partners use and import quite considerably and that are vital to their defence and security, climate and energy policy, business growth and industrial strategy. When it comes to rare earths in particular, the two firms that appear to be of greatest interest to the US and the EU are both Australian – Greenland Minerals and Tanbreez.

- The ASX-listed Australian firm Greenland Minerals, which holds a 100% interest in the Kvanefjeld multi-element Rare Earths Project, is developing the world's second-biggest rare-earth operation and fifth-biggest uranium mine (uranium as a by-product).

- The privately-owned Australian firm Tanbreez holds licenses to the Kringlerne project not far from Kvanefjeld and is believed to sit on substantial reserves of rare earths as well, including the world's biggest deposit of dysprosium.

What Resources are British, Canadian and Australian Licensees in Greenland Exploring?	
License Holder	**Minerals**
Anglo American Exploration Overseas Holdings Limited	Disko-Nuussuaq - Nickel, Copper, Platinum Group Metals
	Svartenuk Halvø – Nickel, Copper, Platinum Group Metals
De Beers Group	Diamonds
Bluejay Mining Plc and through its subsidiaries **Dundas Titanium A/S** **Disko Exploration Ltd**	Disko-Nuussuaq Project – Nickel, Copper, Platinum Group Metals, Cobalt
	Kangerluarsuk Project – Zinc, Lead, Silver
	Thunderstone – Potential for Gold, Nickel, Copper, PGE, Lead, Zinc, Uranium
	Dundas Ilmenite Project – Ilmenite, Titanium
Greenland Resources Inc through **Copenhagen Minerals**	Malmbjerg Project - Molybdenum
	Storø Project - Gold
Greenfields Exploration Ltd	Frontier Project – Copper, Nickel, Tungsten
Greenland Minerals A/S	Kvanefjeld Project – Rare Earth Elements, Uranium, Zinc, Fluorspar
Hudson Resources Inc. and **Hudson Greenland A/S**	White Mountain (Qaqortorsuaq) Project - Anorthosite
	Sarfartoq Project – Rare Earth Elements, Niobium, Tantalum
Ironbark Zinc A/S	Citronen Fjord Project – Zinc, Lead
Longland Resources Ltd	Ryberg Project – Copper, Palladium, Gold, Nickel, Cobalt, Platinum
Nalunaq A/S	Nalunaq and Tartoq – Gold
North American Nickel Inc.	Maniitsoq Project – Nickel, Copper, Cobalt
Resource 500 FeVTi Ltd	Isortoq – Vanadium, Titanium
Rimbal Pty Ltd and **Tanbreez Mining Greenland A/S**	Kringlerne Project – Rare Earth Elements, Niobium, Tantalum, Zirconium, Hafnium, Tungsten, Arfvedsonite, Feldspar
Skaergaard Mining A/S	Skaergaard Project – Gold, Palladium, Platinum, Titanium, Vanadium, Copper
Stallion Resources Ltd	Motzfeldt – Rare Earth Elements, Niobium, Tantalum
Alba Mineral Resources through its subsidiaries **Obsidian Mining Ltd** **White Eagle Resources Ltd** **White Fox Resources Ltd**	Amitsoq Graphite Project – Graphite
	Thule Black Sands Project – High-grade Ilmenite
	Melville Bay Iron Project – Iron Ore, Haematite, Magnetite
	Inglefield Land – Cobalt, Copper, Gold, Vanadium, Nickel, Zinc, Molybdenum

Source: Company websites and communication. Also, https://govmin.gl/exploration-prospecting/start-exploring/exploration-and-advanced-projects/

It should be noted that the UK's economic footprint in Greenland extends beyond mining. As of October 2020, while there were at least 12 British companies holding 28 mining licenses in Greenland, there were also four UK entities holding licenses for oil and gas exploration in Greenland, at least one UK firm exploring water and ice export opportunities from Greenland and, albeit not trade, a substantial UK research community engaged with research projects in Greenland. In addition, the UK is one of the leading

sources of incoming tourists in Greenland, and a number of UK travel companies – including cruise companies – include Greenland in their itineraries. Furthermore, the UK is one of the largest markets for Greenland's fish and fish products and accounts for more than 10% of Greenland's total exports. There is a substantial value chain that has developed around Greenlandic seafood in the UK, one that includes UK importers, processors, manufacturers, traders, distributors, wholesalers, retailers and foodservice channels (such as fish and chips shops, pubs and restaurants). Given the UK's vast footprint in Greenland, it is as much in the interest of its Five Eyes and European partners, as it is in its own interest, to encourage a pivoting of UK foreign, defence, security and trade policy towards Greenland and the cultivation of a new UK-Greenland Special Relationship. The same holds true for Canada, Australia, New Zealand and the US, with their economic footprint too extending beyond mining to trade, investment or cooperation in energy, water, tourism, fisheries, research, and defence and security.[8]

Rare Earth Elements: Critically Important to the Five Eyes and Europe

With respect to few mineral commodities are the Five Eyes and European needs as critical, and Greenland's strengths as obvious, as in rare earths, a group of 17 elements (yttrium, scandium and the 15 lanthanides) that are not necessarily rare in their occurrence, but so widely dispersed that they are rarely found in large concentrations. The *Scientific American* notes that rare earth elements make their way into consumer electronics (such as Apple AirPods and iPhones), green technologies (such as General Electric wind turbines and Tesla electric cars), medical tools (such as Philips Healthcare scanners) and military hardware (such as F-35 jet fighters).[9] Some of their uses in the defence, renewable energy and technology sectors in the UK and the US, as well as in other Five Eyes and European partners, have been outlined below:

Defence: Rare earths are critically important to the defence sector, being used in:

- Guidance and control systems (such as smart bombs, Tomahawk cruise missiles, Joint Direct Attack Munitions, Joint Air-to-Ground fin actuators and Predator unmanned aircraft);
- Defence electronic warfare (such as jamming devices, electromagnetic railguns, Ni Metal Hydride batteries, Area Denial System and Long-Range Acoustic Device);
- Targeting and weapon systems (laser targeting, air-based lasers, Laser Avenger, SaberShot Photonic Dispenser, Future Combat Systems vehicles with laser weapon);
- Electric motors (such as CHPS Future Combat, integrated starter generators, hub mounted electric traction drive, Zumwalt DDG 1000 and Joint Strike Fighter electric aircraft);
- Communication (satellite communications, sonar transducers, radar technology, enhanced X Ray radiation detection and Multipurpose Integrated Chemical Agent Alarm); and
- Optical equipment and speakers (such as night-vision goggles).[10]

When it comes to the amount of rare earths needed, according to a 2013 US Congressional Research Service report, a single F-35 Lightning II Joint Strike Fighter jet needs about 920 lb (418 kg); a DDG-51 Aegis destroyer needs around 5,200 lb (2,359 kg); while a single SSN-774 Virginia-class submarine requires 9,200 lb (4,180 kg).[11] Significant restrictions to the supply of rare earths, thus, can severely affect British and American defence and aerospace firms, such as BAE Systems, Rolls-Royce Holdings, Lockheed Martin, Northrup Grumman, Raytheon and Boeing.

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8 See D. Menezes, H. Nicol (eds.), *The North American Arctic: Themes in Regional Security* (London: UCL Press, 2019).

9 J. Hsu, "Don't panic about rare earth elements", *Scientific American*, 31 May 2019. https://www.scientificamerican.com/article/dont-panic-about-rare-earth-elements/

10 V.B. Grasso, *Rare Earth Elements in National Defense: Background, Oversight Issues, and Options for Congress*, Congressional Research Service, 23 December 2013, pp.10-13. https://fas.org/sgp/crs/natsec/R41744.pdf

11 https://fas.org/sgp/crs/natsec/R41744.pdf

Renewable Energy: In June 2019, the UK Government became the first major global economy to set a net zero greenhouse gas emissions target for 2050, a 100% reduction compared with the previous target of an 80% cut in emissions from 1990 levels. It aims to achieve these targets by continuing to push for a shift to renewable wind, wave, tidal and solar energy, and also by decarbonising transport and other sectors. According to PwC's *Low Carbon Energy Index*, within the G20, the UK has the highest average decarbonisation rate in the twenty-first century.[12] This green, clean energy revolution, however, is predicated on the availability and use of rare earths, such as neodymium for wind turbines and tellurium for solar panels, and other critical minerals. Lithium, likewise, is a vital resource for lithium-ion batteries used by car manufacturers such as Tesla, Ford, BMW, Nissan and Renault. According to the World Bank, achieving the ambition of a low carbon future would translate as a rapid increase in the demand of certain metals and minerals, with the shift to electric storage batteries alone, under a 2°C rather than business as usual scenario, translating as demand for certain metals and minerals rising by more than 1000% by 2050.[13]

- The wind turbine market is projected to result in roughly 30% of the global growth in the use of rare earth magnets, with wind turbines believed to use roughly 600 kg of rare-earth metals each.[14]
- Rare earth magnets also find their way into the motors of more than 90% of hybrid and electric vehicles, as well as into their braking systems, power folding side mirrors, power seats, drivetrains, compressors and pumps. Hybrid electric cars use 10-15 kg of lanthanum in their batteries.
- A 2020-study commissioned by the European Commission noted that the demand for rare earths used in permanent magnets could increase 10 times by 2050, while the EU would require up to 18 times more lithium and five times more cobalt in 2030, and around 60 times more lithium and 15 times more cobalt in 2050, for electric vehicle batteries and energy storage.[15]
- According to a report commissioned by the Dutch Ministry of Infrastructure, meeting the greenhouse gas emission reduction targets under the Paris Agreement through renewable energy production requires that global production of several rare earth minerals used in solar panels and wind turbines has to grow at least twelvefold by 2050.[16]

Tech Industry: Rare earths are used in loudspeakers, computer hard drives, camera and telescope lenses, studio lighting and cinema projection, catalytic converters in cars, aircraft engines, aerospace components, vibration motors, lasers, microwave filters, LED screens, glass polishing, nuclear-reactor control rods, nuclear batteries, superconductors, visors, electrical components, fibre optics, and X-ray and MRI scanning systems. Lanthanum constitutes up to 50% of digital camera lenses.[17]

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[13] World Bank, *The Growing Role of Minerals and Metals for a Low Carbon Future* (2017). https://elibrary.worldbank.org/doi/abs/10.1596/28312

[14] S. Ritter, "A whole new world for rare earths", *C&EN: Chemical & Engineering News*, 28 August 2017. https://cen.acs.org/articles/95/i34/whole-new-world-rare-earths.html

[15] European Commission, *Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability* (hereafter, *2020 List of Raw Materials*), Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, 3 September 2020. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0474&from=EN

[16] P. van Exeter, S. Bosch, B. Schipper, B. Sprecher, R. Kleijn, *Metal Demand for Renewable Electricity Generation in The Netherlands: Navigating a complex supply chain* (2018). https://www.metabolic.nl/publication/metal-demand-for-renewable-electricity-generation-in-the-netherlands/

[17] "What are 'rare earths' used for?", *BBC News*, 13 March 2012. https://www.bbc.co.uk/news/world-17357863

China's Dominance in Global Rare Earths Supply: Security Implications

Despite the critical importance of rare earths to their defence and security, energy and technology sectors, the UK and its Five Eyes and European partners are greatly dependent on China for the supply and processing of rare earths and other critical minerals. It is in the context of China's dominance in rare earths that the real power it wields and the potential threat it poses may be best understood. According to the US Geological Survey (USGS), the global production of rare earths grew from 220,000 MT in 2019 to 240,000 MT in 2020, representing a significant rise of 9.1%.[18] In 2020, China was the leading producer by far, accounting for 140,000 MT or 58.33% of global production, followed by the US (38,000 MT or 15.83%), Myanmar (30,000 MT or 12.5%) and Australia (17,000 MT or 7.1%) – thereafter, Madagascar, India, Russia, Thailand, Vietnam, Brazil and Burundi (collectively accounting for 7.6%).[19]

Likewise, with respect to rare earth reserves, at least as identified by USGS (and not accounting for Greenland's estimates of its reserves), China is firmly in the lead. Of the estimated 120 million MT of rare earth reserves in the world, China holds 44 million MT (36.7%), with Brazil (21 million MT or 17.5%), Vietnam (22 million MT or 18.3%), Russia (12 million MT or 10%), India (6.9 million MT or 5.8%) and Australia (4.1 million MT or 3.4%) following suit. The US holds 1.5 million MT or 1.25% of the world's rare earth reserves.[20] As around 95% of the world's processing of raw ore also takes place in China, China is simultaneously the world's biggest reserve, producer, consumer, processor, importer and exporter of rare earths. The EU depends on China for 98% of its total supply of rare earth elements. This dominance is even more dramatic in related industries, with China reigning supreme as the world's largest producer and exporter of rare earth permanent magnets, accounting for 90.5% of the global total output in 2018.[21]

Furthermore, China has repeatedly demonstrated its willingness to deploy economic levers for geopolitical gain, with rare earths arguably the sharpest weapon in its arsenal. In September 2010, China halted the export of critical rare earth minerals to Japan in retaliation for its detention of a Chinese fishing trawler captain near some disputed East China Sea islands, causing the prices of rare-earth minerals to soar.[22] In July 2020, China threatened to impose new sanctions on US defence contractor Lockheed Martin, which would cut off its supply of rare earth elements, in retaliation for the US approval of an arms deal for Taiwan relating to air defence missiles made by the company.[23] Then, there are also the risks of China restricting the use of domestic rare earth production for domestic manufacturing industries, which would disrupt global production in all of the sectors that depend on rare earths,[24] and, conversely, of China defending its monopoly by flooding the global market with rare earths to lower their prices considerably when necessary, thus drowning out new entrants.[25]

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18 USGS, *Mineral Commodity Summaries 2021* (Reston, Virginia: USGS, 2021), p.133. https://pubs.usgs.gov/periodicals/mcs2021/mcs2021.pdf

19 USGS, *Mineral Commodity Summaries 2021* (Reston, Virginia: USGS, 2021), p.133.

20 USGS, *Mineral Commodity Summaries 2021* (Reston, Virginia: USGS, 2021), p.133.

21 *Global and China Rare Earth Permanent Magnet Industry Report, 2018-2023* (March 2019): https://www.reportlinker.com/p05389598/Global-and-China-Rare-Earth-Permanent-Magnet-Industry-Report.html?utm_source=PRN

22 K. Bradsher, "Amid Tensions, China blocks vital resource to Japan", *New York Times*, 22 September 2010. https://www.nytimes.com/2010/09/23/business/global/23rare.html

23 "China threatens to starve US of key defence materials", *The Times*, 16 July 2020. https://www.thetimes.co.uk/article/china-threatens-to-starve-us-of-key-defence-materials-j38rms7rn

24 J. Smyth, "Industry needs a rare earths supply chain outside China", *Financial Times*, 28 July 2020. https://www.ft.com/content/fc368da6-1c86-454b-91ed-cb2727507661

25 J. Smyth, US-China: Washington revives plans for its rare earths industry", *Financial Times*, 14 September 2020. https://www.ft.com/content/5104d84d-a78f-4648-b695-bd7e14c135d6

Rare earth elements have also emerged as China's weapons on standby in the US-China trade war: "Will rare earths become a counter weapon for China to hit back against the pressure the United States has put on for no reason at all?", asked China's *People's Daily* in May 2019. "The answer is no mystery.", it replied unabashedly, adding later, "We advise the U.S. side not to underestimate the Chinese side's ability to safeguard its development rights and interests. Don't say we didn't warn you!"[26] By reducing its exports of rare earths, China could seriously disadvantage American, British, Canadian, Australian and European firms. In November 2020, an analyst at a consultancy backed by the Chinese government disclosed that US weapons makers could be among the first companies targeted by export restrictions imposed by China.[27]

In February 2021, the *Financial Times* reported that China's Ministry of Industry and Information Technology proposed draft controls on the production and export of 17 rare earth minerals in China, with government officials asking industry executives how severely companies in the US and Europe would be affected if China restricted rare earth exports during a bilateral dispute. Reportedly, Beijing also sought to understand if the US would have trouble making F-35 jets and how quickly the US could secure alternative sources of rare earths and increase its own production capacity.[28] While China's proposed guidelines would require rare earth producers to follow export control laws that regulate shipments of materials that "help safeguard state security", with China's State Council and Central Military Commission having the final say on whether the list should include rare earths, not everyone is on board. Concern has been raised in some quarters that such export controls are a "double-edged sword" that might motivate China's rivals to accelerate their own production capacities and undermine China's dominance of the industry, and Chinese rare earth miners themselves are troubled about the enhanced power that such regulations would give China's Ministry of Industry and Information Technology to control their output.[29]

Approaches to Securing Access to Critical Minerals: The Case of the UK and the EU

In the face of the increasing demand for rare earths and China's peerless leadership in the space, a 2019-report by the UK Parliament's Parliamentary Office of Science and Technology (POST) included rare earth elements (REE), along with cobalt and helium, in its list of "critical materials" on the basis of "their economic or national security importance, or high risk of supply disruption". In spite of being "vital commodities for UK manufacturing, including for the aerospace, automotive, chemical and energy sectors", the report pointed out, these sectors "rely on materials typically extracted and processed abroad."[30]

Almost a decade earlier, in 2010, the UK Department of Food, Environment and Agricultural Affairs (Defra) noted that "it is likely that the UK will face long term supply availability issues, with significant implications for the development of aspects of a low carbon economy including key applications such as electric vehicles and wind turbines where REE materials are used for high efficiency, permanent magnets."[31] In its 2012 *Resource Security Action Plan*, Defra identified metals, electric equipment and domestic appliances, electronics and ICT, chemicals, rubber plastics and glass, construction material and other final consumer

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26 Wu Yuehe, "United States, don't underestimate China's ability to strike back", *People's Daily*, 31 May 2019.

27 S. Yu, D. Sevastopulo, "China targets rare earth export curbs to hobble US defence industry", *Financial Times*, 16 February 2021. https://www.ft.com/content/d3ed83f4-19bc-4d16-b510-415749c032c1

28 "China targets rare earth export curbs to hobble US defence industry", *Financial Times*, 16 February 2021.

29 "China targets rare earth export curbs to hobble US defence industry", *Financial Times*, 16 February 2021.

30 Houses of Parliament Parliamentary Office of Science & Technology (POST), Research Briefing: Access to Critical Minerals, *Postnote*, No. 609, September 2019, p.1. https://post.parliament.uk/research-briefings/post-pn-0609/

31 AEA Technology plc for Department for Environment, Food and Rural Affairs (Defra), *Review of the Future Resource Risks faced by UK Business and an Assessment of Future Viability: Executive Summary* (London: DEFRA, 2010), p.6.

goods as sectors in which rare earths were used.[32] Although the UK Government has recognised repeatedly the need to address supply chain security when it comes to critical minerals, the single greatest challenge remains that it has neither a dedicated critical minerals strategy, nor a government department mandated to coordinate the development and realisation of strategy in this regard, as POST also indicated.[33] Although Defra did outline, in 2018, its plans to revitalise its 2012 *Resource Security Action Plan*, including by improving government oversight of raw materials critical to the UK economy, there have been no major structural changes or policy developments of relevance since.[34] One might argue that the UK may have pursued its objectives through the European Union, of which it remained a member for most of this period.

Indeed, the EU has had a more concerted approach, with the European Commission publishing a List of Critical Raw Materials every three years since 2011, using economic importance and supply risk as the key determinants of criticality. Its 2020 list enlisted separately both heavy and light rare earth elements, as well as cobalt, indium, magnesium, natural graphite, niobium, platinum group metals, scandium, tantalum, lithium and titanium.[35] There is no doubt that the EU understands the gravity of the situation. After all, the EU has a 75-100% import reliance for most metals and 100% import reliance for rare earth elements: it depends on China for 98% of its heavy rare-earth element supply and 99% of its light rare-earth element supply.[36] The 2020 list also indicated that China provides 38% of the EU's supply of baryte, 49% of its supply of bismuth, 93% of its supply of magnesium; 47% of its supply of natural graphite; 66% of its supply of scandium; 45% of its supply of titanium; 69% of its supply of tungsten; and 39% of its supply of vanadium.[37] Likewise, the EU depends on Turkey for 62% of its antimony supply and 98% of its borates supply; Russia for 40% of its palladium supply; South Africa for 71% of its platinum; and the Democratic Republic of Congo for 68% of its cobalt and 36% of its tantalum.[38]

On 3 September 2020, the EU announced the creation of a European Raw Materials Alliance (ERMA), as part of its Action Plan on Critical Raw Materials and in line with its commitment to the goals of the European Green Deal. Managed by EIT RawMaterials, ERMA is an inclusive network that "contributes to ensuring reliable, secure and sustainable access to raw materials as key enablers for a globally competitive, green and digital Europe", and aims to "make Europe economically more resilient by diversifying its supply chains", among other things.[39] On 23 February 2021, in her opening speech at the European Industry Days 2021, Ursula von der Leyen, President of the European Commission, stressed the importance of ERMA in the context of the EU's over-dependence on China for rare earth elements:

> "Green and digital technologies currently depend on a number of scarce raw materials. We import lithium for electric cars, platinum to produce clean hydrogen, silicon metal for solar panels. 98% of the rare earth elements we need come from a single supplier: China. This is not sustainable. So we must diversify our supply chains. And at the same time, we must invest in circular technologies that re-use resources instead of constantly extracting them. This is the goal of our Action Plan on Critical Raw Materials. This is why we have proposed to create a European Raw Materials Alliance."[40]

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32 Department for Business, Innovation and Skills (BIS) and Department for Environment, Food and Rural Affairs (Defra), *Resource Security Action Plan: Making the most of valuable materials* (London: Defra, 2012), p.19. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69511/pb13719-resource-security-action-plan.pdf

33 POST, Research Briefing: Access to Critical Minerals, *Postnote*, No. 609, September 2019, p.1.

34 POST, Research Briefing: Access to Critical Minerals, *Postnote*, No. 609, September 2019, p.3. /

35 European Commission, *2020 List of Raw Materials*, 3 September 2020. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0474&from=EN

36 European Commission, *2020 List of Raw Materials* (2020).

37 European Commission, *2020 List of Raw Materials* (2020).

38 European Commission, *2020 List of Raw Materials* (2020).

39 European Raw Materials Alliance. https://erma.eu

40 European Commission, "Opening speech by President Von der Leyen at the EU Industry Days 2021", 23 February 2021. https://ec.europa.eu/commission/presscorner/detail/en/speech_21_745

While the EU's approach to securing access to critical materials is to be commended, it must be pointed out that most of these developments occurred after the UK left the EU on 31 January 2020. Irrespective of whether or not it was a member of the EU, and certainly from June 2016 once it was clear that it would be exiting the EU, the UK should have had a robust strategy in place to secure its critical minerals supply. What is encouraging, however, is the panoply of related developments that have unfolded across the UK over the past decade.

In 2011, the British Geological Survey and the Camborne School of Mines at the University of Exeter came together to form the Critical Metals Alliance to address concerns in the UK and Europe about the security of supply of critical minerals.[41] Over the next few years, the Natural Environment Research Council (NERC) and Engineering and Physical Science Research Council (EPSRC) supported an interdisciplinary research programme on Security and Supply of Mineral Resources (SoS MinErals) focusing "on the science needed to sustain the security of supply of the strategic elements that underpin current and future green energy technologies", with one project SoS RARE aiming to investigate, among other things, new processes to lower the environmental impact of rare-earth element extraction and recovery.[42]

In 2017, the University of Birmingham launched the Birmingham Centre for Strategic Elements and Critical Materials (BCSECM), which received funding from EPSRC to launch the Critical Elements and Materials (CrEAM) network in 2018, with the key aim to create a UK Elements Strategy for the UK Government. Over recent years, the Office of National Statistics, Defra and BEIS have been developing a National Materials Datahub to map resource stocks and flows in the UK and provide both public and private sectors access to reliable data about the availability of material resources. March 2020 witnessed the launch of the All-Party Parliamentary Group (APPG) on Critical Minerals in the UK Parliament and the Critical Minerals Association (CMA), an industry association which serves as the APPG's secretariat. In February 2021, CMA hosted a 'Breakfast Chat' that looked at the UK Government's *The Ten Point Plan for a Green Industrial Revolution* – announced in November 2020 – and explored the role of critical minerals in its delivery.[43]

The progress made in battery development, for which critical minerals are crucial, is particularly significant. In 2013, the UK Government joined forces with the automotive industry to set up the Advanced Propulsion Centre UK (APC) at the University of Warwick to provide "funding, support and insight to help the UK automotive industry transition towards a net-zero future."[44] In 2017, the UK Government, through its Industrial Strategy Challenge Fund, launched the Faraday Battery Challenge to reinforce the UK's leadership in battery technology development. The Faraday Battery Challenge has supported the creation of the Faraday Institution in Didcot in 2017 as the UK's flagship battery research programme "to accelerate the fundamental research needed for future battery development", provided funding for businesses leading collaborative research and development projects and feasibility studies into battery technologies, and, with the APC as its delivery partner, supported the establishment of the UK Battery Industrial Centre (UKBIC) – the first facility of its kind – in Coventry in 2021 to enable companies to develop manufacturing capabilities for battery technologies, scale up and export overseas quickly.[45]

In January 2021, the consortium (which includes Cornish Lithium) behind the Faraday Battery Challenge-funded project Li4UK revealed it had produced lithium carbonate – an essential ingredient for lithium-ion

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41 University of Exeter, "University and Geological Survey join together in a critical alliance", 14 December 2011. https://www.exeter.ac.uk/sustainability/newsandevents/newsarchive/2011/title_171989_en.html

42 British Geological Survey. https://www2.bgs.ac.uk/sosminerals/about.html

43 Critical Minerals Association (CMA). https://www.criticalmineral.org

44 Advanced Propulsion Centre. https://www.apcuk.co.uk

45 UKRI, *Faraday Battery Challenge: funded projects to date*, September 2019. https://faraday.ac.uk/wp-content/uploads/2019/10/FaradayBatteryChallenge_FundedProjects_Sep2019.pdf

battery cells used in electric vehicle battery technologies – from sources in Cornwall and Scotland.[46] A couple of months prior, in November 2020, the UK's innovation agency Innovate UK awarded funding from its Automotive Transformation Fund to the ASX-listed Talga Resources for feasibility studies into the scaling up for its silicon-rich battery anode and the setting up of the UK's first anode refinery – for production of Talga's lithium-ion battery anode product.[47] Furthermore, in July 2020, the British company Britishvolt signed an MoU with the Welsh Government to deliver the UK's first battery gigafactory in Bro Tathan in the Vale of Glamorgan, but by December, once it became clear the site would not be ready for construction to commence in the summer of 2021, Britishvolt acquired a site in Blyth, Northumberland, for the project instead.[48] In February 2021, Coventry City Council and Coventry Airport unveiled their plan to build the UK's second battery gigafactory in Coventry.[49] Later that month, the National Research Council Canada (NRC), The Faraday Institution, The British High Commission in Canada and KTN (UK) hosted the first ever UK-Canada Summit on Solid State Batteries to strengthen UK-Canada collaboration on battery and energy storage technologies.

Needless to say, the UK also sits on several critical mineral resources, and, partly as a result of rising metal prices in 2020 and 2021 and despite the uncertainties caused by Brexit and the Covid-19 pandemic, is experiencing a mining revival. As of February 2021, there were at least 16 companies engaged in mineral exploration or mine development in the UK. Among the resources being explored were lithium by Cornish Lithium and British Lithium in Cornwall; tungsten and tin at Tungsten West's Drakelands Mine in Devon and Strategic Minerals' Redmoor Project in Cornwall; copper and/or tin at Cornish Metals' United Downs Project and South Crofty Project and Cornish Tin's Great Wheal Vor Project in Cornwall; zinc, lead, gold and silver at Anglesea Mining's Parys Mountain Project in Anglesey in Wales; gold by Scotgold Resources, Koza, GreenOreGold, Erris Gold Resources and Western Gold Resources in Scotland and by Galantas Gold, Dalradian Gold, and Conroy Gold and Natural Resources in Northern Ireland; and polyhalite at Anglo American's Woodsmith Project in North Yorkshire.[50]

It may be worth noting that the European Academies' Science Advisory Council (EASAC) acknowledged that recycling solely could not satiate increasing demand for a material: among the potential solutions it explored were opening new mines, expanding mines already in operation, and investing in innovations in mining in hitherto inaccessible areas.[51] However, while EASAC also put forward deep sea mining as an option, it failed to mention Greenland as a potential solution, despite it being the country nearest to the UK with the largest deposits of rare earths.[52] Close and concerted critical minerals collaboration between the UK and Greenland could connect producers, processors, manufacturers, end users, investors, technical experts and logistical services; secure access to critical minerals (including rare earth elements) for the UK; secure access to finance, expertise, processing and markets for Greenland; and lead to the development of integrated, secure, stable, sustainable, reliable and resilient North Atlantic supply chains of critical minerals that could also benefit the UK's Five Eyes and European partners.

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46 "First UK production of Lithium battery ingredient", *Cornish Stuff*, 18 January 2021. https://cornishstuff.com/2021/01/18/first-uk-production-of-lithium-battery-ingredient/

47 "Talga Resources' anode feasibility studies backed by UK government", *Stockhead*, 5 November 2020. https://stockhead.com.au/resources/talga-resources-anode-feasibility-studies-backed-by-uk-government/

48 J. Jolly, "Car battery firm scraps plan to build UK's first gigafactory in Wales", *The Guardian*, 11 December 2020. https://www.theguardian.com/business/2020/dec/11/car-battery-firm-scraps-plan-to-build-uks-first-gigafactory-in-wales

49 A. Nedelea, "UK may get second battery gigafactory to replace Coventry Airport", *InsideEVs*, 17 February 2021. https://insideevs.com/news/488735/uk-second-gigafactory-coventry-airport/

50 R. Long, "The great British mining revival is needed now more than ever", *Proactive Investors*, 23 February 2021. https://www.proactiveinvestors.co.uk/companies/news/942037/the-great-british-mining-revival-is-needed-now-more-than-ever-942037.html

51 European Academies Science Advisory Council, *Priorities for critical materials for a circular economy* (2016).

52 European Academies Science Advisory Council, *Priorities for critical materials for a circular economy* (2016).

Apart from the British companies active in Greenland, the UK-based companies potentially most relevant to UK-Greenland critical minerals collaboration include Less Common Metals and Pensana Rare Earths. In November 2020, Innovate UK awarded funding to Cheshire-based Less Common Metals – the only rare earth magnet alloy producer outside China and Japan, which is moving into metal production as well – to conduct a feasibility study into establishing a fully integrated supply chain for rare earth permanent magnet production in the UK.[53] The demand for such rare-earth magnets has soared due to their use in electric vehicles and offshore wind turbines, and Greenland could emerge as a reliable supplier of needed rare earths. In December 2020, LSE- and ASX-listed Pensana Rare Earths announced that it would build the UK's first rare earths processing plant at Saltend Chemicals Park in Hull to process rare earths from its project in Angola. The plant would be one of two major producers of rare earth oxides outside China, the other being the Australian Lynas Corporation, and would aid the creation of "the world's first fully sustainable magnet metal supply chain".[54] In January 2021, the company submitted its planning application for the facility, and in February, it delisted from the ASX and rebranded itself as Pensana to indicate a widening of its remit.[55] The possibility of Pensana's Yorkshire plant serving as a multi-use facility in the future presents opportunities for both, Pensana and mining companies in Greenland.

Whether as a world-leading centre of expertise in mining, or as the leading centre of global mining finance, or even as a potential hub for processing of raw materials from Greenland, the UK would be well-suited to support rare earth production in, and export from, Greenland, while creating a more secure strategic minerals supply chain for itself, as well as for its Five Eyes and European partners, that is not dependent on China. The UK is already home to the highest number of mining firms holding licenses in Greenland, including some focusing on rare earths. It is crucial that the UK Government entrusts a government department with a clear mandate for strategy concerning critical minerals; develops a critical materials strategy to address supply chain security; prepares a mining-related major projects inventory, critical minerals prospectus and overview of British mining assets at home and overseas; compiles a list of UK industry actors present or interested in Greenland; explores support measures to incentivise investment (outward/inward, as relevant) in production and processing of critical minerals; and seeks closer cooperation with the Government of Greenland relating to mineral exploration and development. In the short term, the UK would do well to prioritise a bilateral trade agreement with Greenland to ensure tariff-free, quota-free preferential access for mineral resources from Greenland upon their importation into the UK, as had been the case before the end of the Brexit transition period on 31 December 2020.

Approaches to Securing Access to Critical Minerals: The Case of the US

With the US overshadowing the UK when it comes to the imports of rare earths, it provides a useful case study to observe more clearly the challenges posed by China's near monopoly of rare earths for the US, the UK and their allies. In 2019, the estimated value of US imports of rare-earth compounds and metals was USD 170 million MT, a 6.25% rise from the USD 160 million worth of rare-earth compounds and metals it imported in 2018.[56] In 2020, the estimated value of US imports of the same fell to USD 110 million, largely due to the decline in consumption of nonfuel mineral commodities in the context of the Covid-19 pandemic.[57] Economic shocks aside, the figures still flag the considerable reliance on rare earths across

[53] E. Saklatvala, "LCM to assess potential for UK RE magnet supply chain", *Argus Media*, 10 November 2020. https://www.argusmedia.com/en/news/2158412-lcm-to-assess-potential-for-uk-re-magnet-supply-chain

[54] "First rare earth plant in UK proposed for Hull", *BBC News*, 7 December 2020. https://www.bbc.co.uk/news/uk-england-humber-55223571

[55] D. Laister, "UK focus for Humber-investing Pensana as it delists in Sydney and rebrands", *BusinessLive*, 9 February 2021. https://www.business-live.co.uk/manufacturing/uk-focus-humber-investing-pensana-19799023

[56] USGS, *Mineral Commodity Summaries 2020* (Reston, Virginia: USGS, 2020), p.132.

[57] USGS, *Mineral Commodity Summaries 2021* (Reston, Virginia: USGS, 2021), pp.5, 132.

various sectors in the US: judging by their end use, the US Geological Survey estimated that, in 2020, 75% of rare earths made their way to catalysts; 6%, ceramics and glass; 5%, polishing; 4%, metallurgical applications and alloys; and 10%, other uses.[58] Despite the extent to which the US depends on rare earths for its economic and national security, it relies on China for 80% of its imports of rare-earth compounds and metals. Its next largest import sources – Estonia (5%), Japan (4%) and Malaysia (4%) – also derive their rare-earth compounds and metals from mineral concentrates and chemical intermediaries produced mostly in China and Australia.[59] It is precisely on account of such dependence that China could deploy rare earths as a powerful weapon in the US-China trade war, as discussed earlier in this report.

While rare earths are mined domestically in the US, most notably at the Mountain Pass mine in California, this mine – for decades, the world's leading source of rare earths – has had a chequered recent history, being moved into care and maintenance in 2015 before being revived in 2018. Although MP Materials, which purchased the mine in 2017, affirms a mission to "restore the full rare earth supply chain to the United States of America" and has received backing from the Pentagon, it has not succeeded in challenging China's dominance yet.[60] This US-led consortium, paradoxically, includes China's Shenghe Resources Holding Co Ltd that holds a non-voting 9.9% minority interest, while the firm sends more than 50,000 tonnes of its rare-earth concentrates to China for final processing and also depends entirely on Chinese customers for its annual revenue.[61] Its offtake agreement with Shenghe Resources commits all of its rare earths concentrate to Shenghe until the repayment of the Shenghe Offtake Advance (USD 78 million), estimated to be in 2024.[62] Nevertheless, as the only active rare earths mine in the US and "the largest rare earths producer in the Western Hemisphere" reportedly producing "approximately 15% of global rare earth content", MP Materials remains strategically important to the US.[63]

In November 2020, MP Materials completed its business combination with Fortress Value Acquisition Corp. (FVAC), a special purpose acquisition company sponsored by an affiliate of Fortress Investment Group LLC, and the combined company – MP Materials Corp. – began trading on the NYSE, with the value of its shares more than doubling since. MP Materials raised USD 545 million from the transaction (with FVAC) that will fund its Stage II optimisation plan – that is, "to become a fully integrated provider of separated rare earth oxides, with a focus on Neodymium-Praseodymium, one of the most crucial inputs for magnetics, by 2022."[64] On 18 November 2020, MP Materials announced that it had been awarded a Defense Production Act Title III technology investment agreement to establish domestic processing for light REE, which would see the US Department of Defense contribute USD 9.6 million towards its Stage II optimisation efforts.[65] MP Materials also has a comprehensive plan (Stage III) to become a downstream

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58 USGS, *Mineral Commodity Summaries 2021* (Reston, Virginia: USGS, 2021), p.132.

59 USGS, *Mineral Commodity Summaries 2021* (Reston, Virginia: USGS, 2021), p.132.

60 MP Materials: https://mpmaterials.com/about/

61 E. Scheyder, "U.S. rare earths miner MP Materials to go public in $1.47 billion deal", *Reuters*, 15 July 2020. https://uk.reuters.com/article/us-mp-materials-ipo/u-s-rare-earths-miner-mp-materials-to-go-public-in-1-47-billion-deal-idUKKCN24G1WT

62 F. Kozak, "MP Materials: It is Rare Earths Déjà Vu All Over Again", *Investor Intel*, 16 February 2021. https://investorintel.com/markets/technology-metals/technology-metals-intel/mp-materials-it-is-rare-earths-deja-vu-all-over-again/

63 MP Materials, Press Release: "MP Materials Announces Timing of Q4 and Fiscal Year 2020 Financial Results Release, Conference Call and Webcast", 8 February 2021. https://investors.mpmaterials.com/investor-news/news-details/2021/MP-Materials-Announces-Timing-of-Q4-and-Fiscal-Year-2020-Financial-Results-Release-Conference-Call-and-Webcast/default.aspx

64 MP Materials, Press Release: "MP Materials Completes Business Combination and Will Begin Trading on the NYSE under 'MP'", 17 November 2020. https://s25.q4cdn.com/570172628/files/doc_news/2020/11/MP-Materials-Closing-Release-FINAL.pdf

65 MP Materials, Press Release: "MP Materials Awarded Technology Investment Agreement with the Department of Defence", 18 November 2020. https://s25.q4cdn.com/570172628/files/doc_news/2020/11/MP-Materials-DOD-PR-11.18.20-FINAL.pdf

magnet producer by around 2025.[66] The provision of funding by the Pentagon is of interest and signals the importance the federal government places on securing the country's critical minerals supply chains by reducing import reliance on China and expanding domestic production and processing capacity in the US.

The 2015 bankruptcy of Molycorp, which owned Mountain Pass prior to MP Materials taking over, had triggered serious questions about the security and stability of the US supply of critical minerals. In December 2017, President Trump signed Executive Order 13817 – *A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Materials* – that directed the Federal Government to "reduce the Nation's vulnerability to disruptions in the supply of critical minerals, which constitutes a strategic vulnerability for the security and prosperity of the United States". It also required the US Secretary of the Interior to identify critical minerals, which it defined as: "(i) a non-fuel mineral or mineral material essential to the economic and national security of the United States, (ii) the supply chain of which is vulnerable to disruption, and (iii) that serves an essential function in the manufacturing of a product, the absence of which would have significant consequences for our economy or our national security."[67]

On 21 December 2017, following the EO, the Interior Secretary Ryan Zinke signed a secretarial order 3359 – *Critical Minerals Independence and Security* – directing the steps to be taken to produce "the first nationwide geological and topographical survey of the United States in modern history".[68] Prepared in coordination with the US Secretary of Defense and in consultation with other executive departments and agencies, the Secretary of the Interior submitted a list of 35 mineral commodities – including rare earth elements, platinum-group metals, scandium, tantalum, tellurium, titanium, vanadium and zirconium – to the Federal Register in May 2018.[69] In 2020, the US imported more than half of its total annual consumption for 46 nonfuel mineral commodities, with critical minerals accounting for 14 of the 17 mineral commodities with 100% net import reliance – rare earth elements included here – and another 14 with net import reliance of more than 50%.[70]

The Pentagon reiterated its concerns in its report *Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States* (September 2018) to the President.[71] The risk posed by China to the supply of materials and technologies deemed strategic and critical to US national security, it noted, posed challenges for key allies as well. It drew attention to available mechanisms, such as Reciprocal Defense Procurement (RDP) agreements, Security of Supply Arrangements (SOSAs) and the National Technology and Industrial Base, through which it could foster collaboration with, and secure US access to suppliers in, allied and partner countries. It noted the importance of Canada, the UK and Australia as allies with which the US could cooperate through the National Technology and Industrial Base, the framework for integrating their defence industrial base activities. In May 2019, the Pentagon also sent a report to the White House asking for federal funds to boost the domestic production of rare earth elements to reduce US dependence on China.[72]

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66 F. Kozak, "MP Materials: It is Rare Earths Déjà Vu All Over Again", *Investor Intel*, 16 February 2021.

67 E.O. 13817 of 20 December 2017: *A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Materials.*

68 Department of the Interior, Press Release: "Secretary Zinke Signs Order to Begin Process of Creating First Ever National Survey of Critical Minerals", 21 December 2017. https://www.doi.gov/pressreleases/secretary-zinke-signs-order-begin-process-creating-first-ever-national-survey-critical

69 Final List of Critical Minerals 2018: A Notice by the Interior Department on 18/05/2018. 83 FR 23295. Also, E.O. 13953 of 30 September 2020 (*Addressing the Threat to the Domestic Supply Chain from Reliance on Critical Minerals from Foreign Adversaries and Supporting the Domestic Mining and Processing Industries*).

70 USGS, *Mineral Commodity Summaries 2020* (Reston, Virginia: USGS, 2020), p.6.

71 US Department of Defense (DOD), *Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States* (September 2018).

72 P. Stewart, A. Shalal, "Pentagon seeks funds to reduce U.S. reliance on China's rare earth metals", *Reuters*, 29 May 2019. https://www.reuters.com/article/us-china-usa-rareearth-pentagon-idUSKCN1SZ2C6

In June 2019, the Department of Commerce published its report *A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Materials*, prepared in coordination with the heads of various federal agencies, which presented 6 Calls to Action, 24 goals and 61 recommendations that the Federal Government would take to realise the objectives in Executive Order 13817. The third Call to Action focused on how "increasing trade and cooperation with allies and partners can help reduce our Nation's reliance on sources of critical minerals that could be disrupted", and referred to the various DOD mechanisms mentioned above, as well as USGS's MoUs with partner countries' geological surveys, Department of Energy (DOE)'s discussions with the EU and Japan in a trilateral R&D critical materials group, and Environmental Protection Agency (EPA)-hosted meetings, including a G7 Alliance on Resource Efficiency workshop in March 2016.[73] The White House Office of Science and Technology Policy's National Science and Technology Council (NSTC) Subcommittee on Critical Minerals, as the federal interagency body coordinating critical minerals issues since 2011, has been responsible for coordinating the implementation of the interagency Federal Strategy.

In April 2020, the US Department of Energy (DOE) published a White Paper about the Critical Minerals Supply Chain, outlining its role and approach in alignment with Executive Order 13817. Within DOE, the Office of Energy Efficiency and Renewable Energy (EERE) set up the Critical Materials Institute, which "carries out early-stage applied research to diversify supply, develop substitutes, and drive reuse and recycling of materials critical to clean energy technologies", and has also invested in the recovery of critical materials. Likewise, the DOE Office of Fossil Energy (FE) has funded the National Energy Technology Laboratory *Feasibility of Recovering Rare Earth Elements/Critical Minerals Sustainability Program*, while the Office of Science has invested in fundamental research.[74] The white paper also drew attention to the Calls of Action in the Federal Strategy most relevant to DOE and mentioned its Critical Minerals Rare Earths Supply Chain Roundtable and Workshop at the Colorado School of Mines in 2019 at which representatives from Canada, Australia and Japan were present. In September 2020, DOE announced USD 122 million in funding for research and development under the FE funding opportunity announcement (FOA) *Carbon Ore, Rare Earth, and Critical Minerals (CORE-CM) Initiative for U.S. Basins.*[75] Four months later, in January 2021, FE announced USD 28.35 million in funding for the FOA *Advanced Processing of Rare Earth Elements and Critical Minerals for Industrial and Manufacturing Applications.*[76] In January 2021, DOE awarded more than USD 50 million in funding to 15 critical material extraction, separation and processing projects.[77]

The Defense Production Act Title III program, through which MP Materials had been awarded funding, is one of three active authorities in the Defense Production Act (DPA), signed into law in 1950 and last renewed in 2018.[78] The Title III program grants the President the authority to provide tailored economic

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[73] US Department of Commerce, *A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Materials* (June 2019), pp.27-30. https://www.commerce.gov/data-and-reports/reports/2019/06/federal-strategy-ensure-secure-and-reliable-supplies-critical-minerals

[74] US Department of Energy (DOE), *Critical Minerals Rare Earths Supply Chain: A Situational White Paper* (April 2020), pp.2-3. https://www.energy.gov/sites/prod/files/2020/04/f73/Critical%20Materials%20Supply%20Chain%20White%20Paper%20April%202020.pdf

[75] DOE, "US Department of Energy announces $122 million for regional initiative to produce rare earth elements and critical minerals", 22 September 2020. https://www.energy.gov/articles/department-energy-announces-122-million-regional-initiative-produce-rare-earth-elements-and

[76] DOE, "US Department of Energy to invest $28.35 million in advanced processing of rare earth elements and critical minerals for industrial and manufacturing applications", 20 January 2020. https://www.energy.gov/fe/articles/us-department-energy-invest-2835m-advanced-processing-rare-earth-elements-and-critical

[77] DOE, "Department of Energy selects 50 projects to advance critical material innovations", 20 January 2021. https://www.energy.gov/eere/articles/department-energy-selects-15-projects-advance-critical-material-innovations

[78] DOD Office of Industrial Policy, "Defense Production Act Title III Overview". https://www.businessdefense.gov/DPA-Title-III/Overview/

incentives to create, maintain, protect, expand or restore domestic industrial base capabilities for national defence, which would include ensuring the timely availability of essential domestic industrial resources. These incentives could include loans, loan guarantees, direct purchases and purchase commitments, and the authority to procure and install equipment in private industrial facilities.[79] Title III of the Act also establishes a Defense Production Act Fund to support projects. On 22 July 2019, Trump issued five Presidential Determinations (PDs) for the Pentagon, authorising the use of Defense Production Act Title III authorities to strengthen or expand the domestic production capability for light rare earth elements, heavy rare earth elements, rare earth metals and alloys, neodymium iron boron (NdFeB) rare earth sintered material permanent magnets, and samarium cobalt rare earth permanent magnets respectively, all deemed to be essential for national defence.[80] In December 2019, the DPA Title III program announced two funding opportunities – for separation and processing capabilities of light and heavy REEs and for a supply chain study and inventory demonstration for NdFeB sintered materials and/or permanent magnets.

In April 2020, the Pentagon awarded Phase 1 funding to two companies to develop rare earths separation facilities in California and Texas respectively: MP Materials, which owns and operates Mountain Pass and in which a Chinese firm had a minority stake, and Lynas Corporation, an Australian company that has partnered with Texas-based processing company Blue Line Corporation to construct a heavy REE separation facility in the US. The largest REE mining and processing company outside China, Lynas has a mining facility at Mount Weld in Australia and a processing plant at Kuantan in Malaysia. Shortly after the award was announced, six US Senators – Ted Cruz (R-TX), Mike Enzi (R-WY), Tom Cotton (R-AR), Cory Gardner (R-CO), John Barrasso (R-WY) and Martha McSally (R-AZ) – wrote to the Department of Defense protesting that it "must take care that no link in the chain passes through a country that presents risk of supply disruption"; that priority should be given to projects that extract and process rare earths from US sources and at US facilities; and that "it is important that the federal government does not pick winners and losers within the industry."[81] Subsequently, the Pentagon reversed its decision and put the Phase 1 contracts on hold pending additional research.[82] In July 2020, after a legal and program review found that the grants were awarded fairly and in the best interest of the US, the Pentagon recommenced funding the two projects and formally issued their contracts to MP Materials and Lynas.[83]

In July 2020, Lynas secured US government funding to develop a USD 36 million processing plant in Hondo, Texas, that would focus on the commercial separation of heavy REE; and it plans to source its REE from its Mount Weld mine in Australia before shipping it to Texas for final processing.[84] The geopolitical context in which the Pentagon approved the funding is worth noting: that same month, China had been threatening to impose new sanctions on US defence contractor Lockheed Martin, essentially cutting off its supply of rare earth elements, in retaliation for the US approval of an arms deal for Taiwan relating to air defence missiles made by the company.[85] In July 2020, the Pentagon also announced funding

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79 Congressional Research Service overview 2018 of the Act

80 DOD Office of Industrial Policy, "Defense Production Act Title III Presidential Determinations to Strengthen the Domestic Industrial Base and Supply Chain for Rare Earth Elements", 23 July 2019. https://www.businessdefense.gov/News/News-Display/Article/1913110/defense-production-act-title-iii-presidential-determinations-to-strengthen-the/

81 Letter from Senators T. Cruz, M. Enzi, T. Cotton, C. Gardner, J. Barrosso, M. McSally to the Hon Mark Esper, Secretary of Defense, 24 April 2020. https://www.cruz.senate.gov/files/documents/Letters/2020.04.24%20-%20Letter_DOD_Esper_Rare_Earths%20-%20FVS.pdf

82 E. Scheyder, "Exclusive: Pentagon halts rare earths funding program pending 'further research'", *Reuters*, 22 May 2020. https://www.reuters.com/article/us-usa-rareearths-exclusive-idUSKBN22Y1VC

83 E. Scheyder, "Pentagon resumes rare earths funding program after review", *Reuters*, 21 July 2020. https://www.reuters.com/article/us-usa-rareearths-idUSKCN24M2Z4.

84 J. Smyth, "Pentagon backs Lynas to break China's rare earths stranglehold", *Financial Times*, 27 July 2020. https://www.ft.com/content/595215bc-bfa9-4cc4-9f5d-587fb3945779

85 "China threatens to starve US of key defence materials", *The Times*, 16 July 2020.

of USD 28.8 million for a Texas-based firm Urban Mining Company to assist in developing a domestic source for NdFeB rare earth permanent magnets.[86] The firm – reportedly "the first commercial recycler of NdFeB magnets" – has developed and patented a 'Magnet-to-Magnet' process to reprocess scrap magnets and develop them into new, high-performance rare earth permanents, while mitigating supply/price risk.[87] In November 2020, the Pentagon made three further awards under DPA Title III authorities: USD 9.6 million to MP Materials to develop processing and separation capabilities, and USD 2.3 million to TDA Magnetics and USD 0.86 million to Urban Mining Company for rare earth element magnet supply chain studies and inventory demonstrations.[88] In February 2021, the Pentagon awarded Lynas a second award: USD 30.4 million to finance the construction of a plant in Hondo for processing light REE.[89] It is expected to produce a quarter of the world's supply of rare earth oxides.

These awards of funding reflected the myriad legislative and executive developments, including various Senate and House bills, over the same period to bolster domestic production of rare earths and critical minerals. In May 2020, Senator Ted Cruz (R-TX) introduced a Senate bill – the ORE (Onshoring Rare Earths) Act – that would establish a grant program of USD 50 million each fiscal year 2021 through 2024 and award grants of up to USD 10 million to finance pilot projects for critical minerals development in the US. The bill would also offer generous tax incentives to encourage investment, including the permanent expensing of property (and nonresidential real property) used in the extraction of certain critical minerals and metals within the US, and allowing a new tax deduction for 200% of the cost of purchasing or acquiring such critical minerals and metals extracted from deposits in the US.[90] July 2020 saw the Critical Materials Caucus established in the US House of Representatives, with Congressmen Eric Swalwell (D-CA) and Guy Reschenthaler (R-PA) as co-chairs. In September 2020, Congressmen Lance Gooden (R-TX) and Vicente Gonzalez (D-TX) introduced a House bill – the RARE (Reclaiming American Rare Earths) Act – meant to serve as the House companion to Cruz's similar Senate bill.[91] These bills complemented others that stressed US mineral resource security, such as the American Mineral Security Act introduced by Senator Lisa Murkowski (R-AK) in May 2019 and the American Critical Mineral Exploration and Innovation Act introduced by Rep. Michael Waltz (R-FL) in May 2020.

In May 2020, the Pentagon proposed legislation – for inclusion in the annual defence policy bill being drafted by Congress at the time – that would raise spending caps under the DPA to allow it to spend up to USD 1.75 billion on REE in munitions and missiles and up to USD 350 million for microelectronics, and to eliminate caps where hypersonic weapons are concerned.[92] The existing legislation did not permit the Pentagon to invest more than US 50 million in DPA funds without additional congressional notification,

https://www.thetimes.co.uk/article/china-threatens-to-starve-us-of-key-defence-materials-j38rms7rn

86 DOD, 24 July 2020: https://www.defense.gov/Newsroom/Releases/Release/Article/2287490/dod-announces-773-million-in-defense-production-act-title-iii-covid-19-actions/

87 Ellen MacArthur Foundation, "Urban Mining Company: Finding rare earth elements above ground, not underground". https://www.ellenmacarthurfoundation.org/case-studies/finding-rare-earth-elements-above-ground-not-underground

88 DOD, "DOD announces rare earth element awards to strengthen domestic industrial base, 17 November 2020. https://www.defense.gov/Newsroom/Releases/Release/Article/2418542/dod-announces-rare-earth-element-awards-to-strengthen-domestic-industrial-base/

89 E. Barrett, "U.S. takes another step to break China's stranglehold on rare earth metals", *Fortune*, 2 February 2021. https://fortune.com/2021/02/02/us-dod-rare-earth-metals-contract-lynas-china-hondo-texas/

90 https://www.congress.gov/bill/116th-congress/senate-bill/3694/text?r=2&s=1

91 Congress.gov: https://www.congress.gov/bill/116th-congress/house-bill/8143/text?r=1&s=1

92 J. Gould, "Pentagon legislation aims to end dependence on China for rare earth minerals", *DefenseNews*, 18 May 2020. https://www.defensenews.com/congress/2020/05/18/pentagon-legislation-aims-to-end-dependence-on-china-for-rare-earth-minerals/

but the proposed legislation would raise this cap to USD 350 million to invest in various projects.[93] The US House of Representatives and Senate passed their versions of the bill in July 2020, with the final versions agreed by the House and Senate in December 2020. Although it was vetoed by Trump, the House and Senate voted to override it over December 2020 and January 2021. The USD 740 billion legislation – the National Defense Authorisation Act 2021 – authorised fiscal year 2021 appropriations and set forth policies for the Department of Defense's programs and activities. Covering the supply of strategic and critical materials, Section 848 laid out the order of preference in which the Secretary of Defense should acquire such – first, from within the US; second, from within the national technology and industrial base (US, Canada, UK and Australia); and then, from other sources – while stressing the need to eliminate dependence on "potentially vulnerable sources of supply" by 2035 and to provide incentives to develop robust domestic processing and manufacturing capabilities.[94]

The Pentagon also took other measures to secure supply chains, including stockpiling; implementing Defense Federal Acquisition Regulations Supplement (DFARS) rules that prohibit acquisition of rare earth element magnets and tungsten from North Korea, China, Russia and Iran;[95] HREE-focused engineering studies with the Industrial Base Analysis and Sustainment program; industry partnerships to boost NeFeB magnet production; and Small Business Innovation and Research and Rapid Innovation Funds to expedite REE processing technology development.[96] In February 2020, the TSXV-listed, OTCQX-traded Nova Scotian firm Ucore Rare Metals executed a binding agreement with the Toronto-headquartered Innovation Metals Corporation (IMC) to test the processing of mixed REE concentrates into separated REE oxides using the RapidSX™ REE separation technology that IMC developed with USD 1.8 million of funding from the US Army Research Laboratory.[97] Ucore owns 100% of the Bokan-Dotson Ridge Heavy REE Project in southeast Alaska for which the Alaska Legislature had authorised USD 145 million in bonds through the Alaska Industrial Development and Export Authority (AIDEA), and is looking to build a REE separation and purification facility – the Alaska Strategic Metals Complex – in Ketchikan. Ucore acquired 100% of IMC through a binding Share Purchase Agreement in April 2020 and shipped more than 1.5 tonnes of REE feedstock material to IMC's RapidSX™ Commercialisation and Development Facility in Kingston, Ontario, in October 2020. In September 2020, the Defense Logistics Agency increased the scope of its Rare Earth Salts Rapid Innovation Fund (RIF) to expand the REE separation- and refining-focused Nebraska-based company Rare Earth Salts' production at its facility in Beatrice, Nebraska.

In September 2020, Trump signed Executive Order 13953 – *Addressing the Threat to the Domestic Supply Chain from Reliance on Critical Minerals from Foreign Adversaries and Supporting the Domestic Mining and Processing Industries* – and declared a national emergency to deal with the "unusual and extraordinary threat" posed by the US's "undue reliance on critical minerals, in processed or unprocessed form, from foreign adversaries".[98] The EO directed the Secretary of the Interior, in consultation with the heads of other federal agencies, to investigate this dependence and recommend executive actions, including the imposition of tariffs or quotas,

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93 "Pentagon legislation aims to end dependence on China for rare earth minerals", *DefenseNews*, 18 May 2020.

94 H.R. 6395 (116th): National Defense Authorization Act for Fiscal Year 2021. https://www.govtrack.us/congress/bills/116/hr6395/text

95 Defense Federal Acquisition Regulation Supplement: Restriction on the Acquisition of Certain Magnets and Tungsten (DFARS Case 2018-D054). https://www.federalregister.gov/documents/2019/04/30/2019-08485/defense-federal-acquisition-regulation-supplement-restriction-on-the-acquisition-of-certain-magnets

96 "DOD announces rare earth element awards to strengthen domestic industrial base, 17 November 2020.

97 Press Release: "Ucore announces Technical Service Agreement with Innovation Metals Corp. for RapidSX™ Rare Earth Element Separation Technology Testing", *Newsfile*, 14 February 2020. https://www.newsfilecorp.com/release/52447/%20Ucore-Announces-Technical-Services-Agreement-with-Innovation-Metals-Corp.-for-RapidSXTM-Rare-Earth-%20Element-Separation-Technology-Testing

98 Executive Order 13953 of 30 September 2020: *Addressing the Threat to the Domestic Supply Chain from Reliance on Critical Minerals from Foreign Adversaries and Supporting the Domestic Mining and Processing Industries*.

to ensure an uninterrupted supply of critical minerals for the US. It also required the Interior Secretary, in consultation with the Defense Secretary, to consider whether a program could be established "to provide grants to procure or install production equipment for the production and processing of critical minerals in the United States" and tasked the Energy Secretary with developing guidance "clarifying the extent to which projects that support domestic supply chains for minerals are eligible for loan guarantees pursuant to Title XVII of the Energy Policy Act of 2005... and for funding awards and loans pursuant to the Advanced Technology Vehicles Manufacturing incentive program established by section 136 of the Energy Independence and Security Act of 2007".[99] In December 2020, Trump signed a USD 2.3 trillion spending bill that codified his executive orders on rare earths and included more than USD 800 million to fund rare earths and strategic minerals research.[100]

On 24 February 2021, Trump's successor, President Joe Biden, signed his Executive Order 14017 on *America's Supply Chains*, stressing that the US "needs resilient, diverse and secure supply chains", and that "close cooperation on resilient supply chains with allies and partners who share our values will foster collective economic and national security and strengthen the capacity to respond to international disasters and emergencies."[101] The EO also required the Secretaries of Commerce, Energy and Defense to submit to the President, through the Assistant to the President for National Security Affairs (APNSA) and Assistant to the President for Economic Policy (APEP), reports identifying risks in the supply chains of semiconductor manufacturing and advanced packaging, high-capacity batteries (including electric-vehicle batteries), and critical minerals and other identified strategic materials (including rare earth elements) respectively. It directed the Defense, Energy and Transportation Secretaries to supply reports on supply chains for the defence, energy sector and transportation industrial bases respectively, and for the APNSA and APEP to submit a review of actions and recommendations concerning, among other things, "diplomatic, economic, security, trade policy, informational, and other actions that can successfully engage allies and partners to strengthen supply chains jointly or in coordination".[102]

USA Rare Earth, LLC is another firm focusing on domestic production in the US. The New York-based company is developing the Round Top Heavy Rare Earth and Critical Minerals Project in Hudspeth County, West Texas, in partnership with Texas Mineral Resources Corporation. It states it has 16 of the 17 rare earth elements and 13 of the 35 critical minerals, as listed by the Department of the Interior, and seeks to commence operation by 2023.[103] In April 2020, it purchased the neodymium-iron-boron (NdFeB) permanent magnet manufacturing plant formerly owned and operated by Hitachi Metals America in North Carolina; and in June 2020, it opened a rare earth and critical minerals mineral processing facility in Wheat Ridge, Colorado.[104] In July 2020, it announced its collaboration with the Canadian firm Geomega Resources to integrate material recycling into the magnet production process.[105] According to *Reuters*, USA Rare Earth plans to go public in the US through an initial public offering (IPO) or via a special purpose acquisition

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99 Executive Order 13953 of 30 September 2020.

100 E. Scheyder, "Miners praise U.S. spending bill that funds rare earths production", *Reuters*, 30 December 2020. https://www.reuters.com/article/us-usa-mining-congress-idUSKBN29424R

101 Executive Order 14017 of 24 February 2021: *America's Supply Chains*. https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/24/executive-order-on-americas-supply-chains/

102 Executive Order on America's Supply Chains of 24 February 2021.

103 USA Rare Earth LLC, Press Release: "USA Rare Earth Applauds President Biden's Executive Order to Secure America's Critical Supply Chains for Rare Earth Elements and Electric Vehicle Batteries", *GlobeNewswire*, 24 February 2021. https://www.globenewswire.com/news-release/2021/02/24/2181964/0/en/USA-Rare-Earth-Applauds-President-Biden-s-Executive-Order-to-Secure-America-s-Critical-Supply-Chains-for-Rare-Earth-Elements-and-Electric-Vehicle-Batteries.html

104 USA Rare Earth LLC, Press Release: "USA Rare Earth commends bipartisan bill introduced in the U.S. House of Representatives to encourage domestic rare earth production", *Associated Press*, 1 September 2020.

105 "USA Rare Earth commends bipartisan bill", *Associated Press*, 1 September 2020.

company (SPAC) that could value the firm at more than USD 1 billion.[106] The US also has other REE projects at Bear Lodge, Wyoming, being developed by OTCQB-traded Rare Element Resources Ltd. (RER); and Elk Creek, Nebraska, being developed by TSX-listed, OTCQX-traded NioCorp.[107] In January 2021, DOE awarded more than USD 50 million in funding to 15 critical material extraction, separation and processing projects, with Rare Element Resources, Inc., RER's wholly-owned US subsidiary, and General Atomics, an affiliate of its largest shareholder, awarded almost USD 22 million in funding for a REE separation and processing demonstration project.[108]

In 2019, the Pentagon stated that it would look to allies such as Australia and Canada to develop rare earth reserves around the world, and the US entered into agreements with Australia and Canada – as shall be seen later. As of August 2019, the Pentagon was already in talks with Australia about developing a new processing facility for rare earth elements in the US.[109] Central to its plans, as seen, was the Australian firm Lynas. In October 2020, the US Government invested USD 25 million, from the USD 60 billion US International Development Finance Corporation (DFC), in a London-based British firm TechMet that specialises in rare earth production and is developing a nickel and cobalt project in northeastern Brazil.[110] Although not related to rare earths, in November 2020, the ASX-listed Australian firm Ironbark Zinc, which is developing the Citronen Zinc-Lead Project in northern Greenland that represents one of the world's largest undeveloped zinc-lead resources, reported that it had secured a non-binding letter of interest from the US Export-Import (EXIM) Bank, considering financing of up to USD 216.125 million, with a maximum loan term of 8.5 years – a key milestone in securing EXIM as a finance provider for the project.[111]

Approaches to Securing Access to Critical Minerals: The Case of Canada

Canada has also expressed concern about dependence on China for certain critical minerals. After federal, provincial and territorial ministers made the case for a pan-Canadian plan to bolster Canada's global leadership in mining in August 2017, the federal, provincial and territorial governments, in collaboration with stakeholders, developed a Canadian Minerals and Metals Plan (CMMP) that was released in March 2019. The most significant initiative on mining since the Whitehorse Mining Initiative in 1994, CMMP focused on six Strategic Directions to drive industry and competitiveness. The vision set out is to be pursued by a series of Action Plans, the first of which was released in a preliminary form at the PDAC convention in Toronto in March 2020 and a final version at the virtual Energy and Mines Ministers' Conference in September 2020. The Action Plan noted that, "as the world was shifting to a low carbon and digitalized economy that requires increased mineral and metal products", Canada is "primed to respond to increased demand for both traditional and emerging commodities needed for flagship clean technology applications", such as batteries for electric vehicles.[112] Canada has also invested heavily in its critical minerals

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106 E. Scheyder, "Exclusive: USA Rare Earth to explore public offering at value above $1 billion", *Reuters*, 2 February 2021. https://www.reuters.com/article/us-usa-rareearths-exclusive-idUSKBN2A22ZW

107 Congressional Research Service, *An Overview of Rare Earth Elements and Related Issues for Congress*, November 2020, pp.1-6. https://crsreports.congress.gov/product/pdf/R/R46618

108 "Department of Energy selects 50 projects to advance critical material innovations", 20 January 2021.

109 F. Mir, "Pentagon explores rare earths production with Australia to cut reliance on China", *S&P Global*, 28 August 2019. https://www.spglobal.com/marketintelligence/en/news-insights/trending/LTRovEftBEjtxV7jVoazlQ2.

110 H. Sanderson, "TechMet wins US backing for Brazilian mining project", *Financial Times*, 4 October 2020. https://www.ft.com/content/e004e34d-6d8f-4ba1-ad45-687787a6606b

111 E. Davies, "Ironbark Zinc progress towards Citrönen final investment decision with letter of interest from Export-Import Bank of the United States", *Proactive Investors*, 2 November 2020. https://www.proactiveinvestors.com.au/companies/news/932864/ironbark-zinc-progresses-towards-citrnen-final-investment-decision-with-letter-of-interest-from-export-import-bank-of-the-united-states-932864.html

112 *The Canadian Minerals and Metals Plan – Action Plan 2020: Introducing the pan-Canadian initiatives* (March 2020). https://www.minescanada.ca/sites/default/files/cmmp-actionplan2020_rev52_feb_29_2020-a_en.pdf

research: CAD 16 million (2015-2021) in the Rare Earth Elements R&D Program, CAD 9 million (2015-2021) in the Chromite R&D Program; and more in "mining value from waste".[113]

In June 2019, the US Federal Strategy included Canada as a key ally with which the US should consider enhanced international trade and cooperation to develop critical minerals production and build secure and resilient supply chains of critical minerals. Canada, like Australia, is a mining powerhouse, and it is also a key supplier of 13 of the 35 minerals deemed critical by the US. Canada is the world's leading producer of potash; second largest producer of uranium and niobium; third largest producer of palladium; fourth largest producer of aluminium, indium and platinum; and a leading supplier of cobalt, nickel and graphite.[114] Furthermore, half of the world's publicly listed mining companies have Canada as their home, and 1,290 Canadian mining and exploration companies held CAD 263.2 billion worth of Canadian mining assets in 2019. 927 of these companies held assets in Canada, valued at CAD 85.6 billion; 234 held assets in the US, valued at CAD 36.1 billion; 70 held assets in Europe, valued at CAD 9 billion; and 36 had assets in Oceania, valued at CAD 3.8 billion.[115] As of 2020, there were also 120 major mining projects planned or in construction in Canada, representing around CAD 83 billion in potential investment over the 10 following years: gold, copper, nickel, zinc and other metal mines accounted for more than two thirds of the value.[116]

In June 2019, US President Donald Trump and Canadian Prime Minister Justin Trudeau agreed to develop reliable, integrated North American supply chains for critical minerals, with the 1st bilateral Critical Minerals Working Group meeting held in Washington, DC, in October 2019. This was followed by the Geological Survey of Canada joining forces with Geoscience Australia and US Geological Survey in the trinational Critical Minerals Mapping Initiative (CMMI), which held its first meeting in Ottawa in December 2019.[117] That same month, Canada and the US also signed an international MoU confirming Canada's participation in the US-led Energy Resource Governance Initiative (ERGI), which includes Australia, Botswana, Peru, Argentina, Brazil, Democratic Republic of the Congo, Namibia, Philippines and Zambia. On 9 January 2020, Canada and the US announced the finalisation of the *Canada-US Joint Action Plan on Critical Minerals Collaboration*, covering various areas of cooperation, including securing critical minerals supply chains for strategic industries and defence, improving sharing of mineral resource information, enhancing private sector engagement, collaborating in multilateral fora, engaging in supply chain modelling and increasing support for industry.[118] On 17 June 2020, the two countries reaffirmed their collaboration at the 2nd Bilateral Critical Minerals Working Group meeting.[119]

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113 *Critical Minerals in Canada: Securing North American and Global Supply Chains*, Presentation by Hilary Morgan, Director, International Affairs and Trade, Lands and Minerals Sector, Natural Resources Canada, at the Pacific NorthWest Economic Region Annual Summit 2019, 23 July 2019. http://www.pnwer.org/uploads/2/3/2/9/23295822/pnwer_2019_summit_mining_hilary_morgan.pdf

114 Natural Resources Canada, *Critical Minerals in Canada*, 2020. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/Critical%20Minerals_EN_2020_accessible.pdf

115 National Resources Canada, "Canadian Mining Assets", January 2021. https://www.nrcan.gc.ca/maps-tools-and-publications/publications/minerals-mining-publications/canadian-mining-assets/19323

116 *Natural Resources: Major Projects planned or under construction – 2020 to 2030*, Energy and Mines Ministers' Conference, September 2020. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/emmc/pdf/2020%20MPI%20Final%20-%20Sep30%20-%20For%20Access%20-%20EN.pdf

117 US Geological Survey, "Critical Cooperation: How Australia, Canada and the United States are working together to support critical mineral discovery", 16 October 2020. https://www.usgs.gov/news/critical-cooperation-how-australia-canada-and-united-states-are-working-together-support

118 Natural Resources Canada, "Canada and US finalise Joint Action Plan on Critical Minerals Collaboration", 9 January 2020. https://www.canada.ca/en/natural-resources-canada/news/2020/01/canada-and-us-finalize-joint-action-plan-on-critical-minerals-collaboration.html

119 Natural Resources Canada, "Canada and the United States advance collaboration on critical minerals", 17 June 2020. https://www.canada.ca/en/natural-resources-canada/news/2020/06/canada-and-the-united-states-advance-collaboration-on-critical-minerals.html

Canada-US minerals collaboration has not always been smooth sailing. In August 2020, the month after the US-Canada-Mexico agreement took effect, Trump reimposed 10% tariffs on Canadian aluminium producers, accusing them of flooding the US market and decrying them as a national security threat, which led to Canada responding with retaliatory tariffs on US aluminium products.[120] Although the US dropped its tariffs in September, it introduced new import thresholds, a move Canada deemed "unilateral".[121] By and large, bilateral collaboration on critical minerals was strengthened in 2020; and in February 2021, Trudeau said that there was scope for closer Canada-US collaboration on electric vehicles manufacturing and critical minerals supply.[122] On 22 February 2021, Canada's Minister for Natural Resources, Seamus O'Regan, announced that a federal-provincial-territorial task team had been established to develop a Canadian critical minerals inventory, which in turn would be used to build an integrated, all-Canadian critical minerals and battery value chain.[123] Canada has also seen the establishment of various networks and industry associations to promote critical minerals supply chains, such as the Canadian Rare Earth Element Network (CREEN) set up in 2013 and the Canadian Critical Minerals and Materials Alliance (CM2MA) launched in January 2021, with the latter calling on Canada to have its own critical minerals strategy.

In May 2020, Abacus Data found that 88% of the Canadians it polled for the Mining Association of Canada sought to see Canada increase its role as a producer of critical minerals for world markets; 86% wished to see increased international investment in Canada's critical minerals; and 83% hoped to see greater domestic production of critical minerals that would allow Canada to compete with China.[124] When it comes to investment in developing Canada's critical minerals, the Government of Saskatchewan announced, in August 2020, CAD 31 million in funding to create Canada's first rare earth processing plant in Saskatchewan. The facility is to be owned and operated by Saskatchewan Research Council (SRC), help establish a REE supply chain in Saskatchewan, and become fully operational in late 2022.[125] In September 2020, Cheetah Resources, a subsidiary of ASX-listed, Sydney-headquartered Australian firm Vital Metals, signed a binding term sheet with SRC about building and operating a rare earth extraction plant – that produces a mixed rare earth carbonate product – alongside SRC's facility, harnessing the complementarity of their technologies.[126] Vital expects to commence rare earths production at its Nechalacho project in the Northwest Territories in the second quarter of 2021,[127] and its plan is to upgrade the ores using an ore

[120] J. Mason, J. Gordon, "Trump reimposes tariffs on raw Canadian aluminium, Canada promises retaliation", *Reuters*, 6 August 2020. https://www.reuters.com/article/us-usa-trade-canada-aluminum-idUSKCN2523A3

[121] "US backs off Canadian aluminium imports", *BBC News*, 15 September 2020. https://www.bbc.co.uk/news/business-54168420

[122] S. Scherer, "Canada's Trudeau says scope for closer U.S.-Canada integration on EVs, critical mineral supply", *Reuters*, 4 February 2021. https://www.reuters.com/article/canada-politics-trudeau-usa/canadas-trudeau-says-scope-for-closer-u-s-canada-integration-on-evs-critical-mineral-supply-idUSL8N2KA7EY?edition-redirect=uk

[123] "Task team developing Canadian critical minerals inventory", *Mining Weekly*, 23 February 2021. https://www.miningweekly.com/article/task-team-developing-canadian-critical-minerals-inventory-2021-02-23

[124] "Poll shows Canadians support critical mineral development", *Mining Journal*, 13 May 2020. https://www.mining-journal.com/energy-minerals-news/news/1386866/poll-shows-canadian-support-for-critical-mineral-development

[125] Saskatchewan Research Council, Press Release: "Saskatchewan to create Canada's first rare earth processing facility at SRC", *PR Newswire*, 28 August 2020. https://www.prnewswire.com/news-releases/saskatchewan-to-create-canadas-first-rare-earth-processing-facility-at-src-301120108.html

[126] B. Cameron, "Vital Metals (ASX:VML) subsidiary signs rare earth plant agreement", *The Market Herald*, 22 September 2020. https://themarketherald.com.au/vital-metals-asxvml-subsidiary-signs-rare-earth-plant-agreement-2020-09-22/

[127] E. Kelly, "Vital Metals (ASX: VML) prepares for production at Nechalacho", *The Market Herald*, 26 February 2021. https://themarketherald.com.au/vital-metals-asxvml-prepares-for-production-at-nechalacho-2021-02-26/

sorting machine before upgrading the intermediary product at the REE plant in Saskatchewan and then shipping it to a Norway-based firm REEtac with which it has a definitive offtake agreement.[128]

Likewise, in October 2020, TSXV-listed, Vancouver-based Canadian firm Search Minerals, which owns 100% of the properties (including Foxtrot and Deep Fox) within the Port Hope Simpson-St Lewis Critical Rare Earth Elements (CREE) District in South East Labrador, signed a MoU with SRC, noting, "The ability to demonstrate the separation of rare earths, from our concentrate produced in SE Labrador, will position Search as a potential supplier in the Canadian and North American rare earth supply chain."[129] In November 2020, Search Minerals, which has patented Direct Extraction Process technology, also entered into a technical collaboration agreement with USA Rare Earth, which is developing the Round Top project in Texas and an integrated mine-to-magnet strategy, to help develop their respective mineral resources and support a North American rare earth supply chain.[130] As in the case above, US-Canada collaboration is also evident in the private sector. In July 2019, Vancouver-based Canadian firm Medallion Resources, which developed a process to achieve low-cost, near-term REE production by exploiting minerals sand monazite, said it was looking at sites across North America to develop an extraction plant for rare earths. It was eyeing the region between Saskatchewan and Texas for its plant, but following a study concluded in October 2020, reports point to sites in US states with access to the Gulf Coast as more likely to be selected.[131]

In 2019, the Government of Québec also initiated a strategic review of the development of critical and strategic minerals, resulting in the *Québec Plan for the Development of Critical and Strategic Minerals 2020-2025*.[132] The Plan drew attention to 44 critical and strategic minerals projects and deposits in the province, focusing on graphite; nickel, copper, cobalt and platinum group elements; niobium; titanium and vanadium; lithium; rare earth elements; zinc and copper; and noting Québec's strengths as the world's largest producer of titanium in the form of ilmenite and second largest producer of niobium. The TSXV-listed Geomega Resources states it is building "the world's first sustainable rare earths recycling facility" in Québec and is also developing its 100%-owned Montviel REE/Niobium project in Québec. Other REE projects in Canada include TSXV-and FSE-listed, OTCQB-traded, Vancouver-headquartered Defense Metals Corporation's Wicheeda Rare Earth Elements Property located near Prince George, British Columbia; and TSX-listed, OTCQB-traded Toronto-headquartered Avalon Advanced Materials' Separation Rapids Lithium Project in Kenora, Ontario, and Nechalacho REE Project at Thor Lake, NWT. A TSXV-listed, OTCQX-traded Nova Scotian firm Ucore is also developing the Bokan Mountain Heavy Rare Earth Elements (HREE) Project on Prince of Wales Island in southeast Alaska.

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128 S. Lasley, "Vital REE Mining in Northwest Territories", *North of 60 Mining News*, 19 February 2021. https://www.miningnewsnorth.com/story/2021/02/19/news/vital-ree-mining-in-northwest-territories/6703.html

129 Search Minerals, Press Release: "Search Minerals and Saskatchewan Research Council enter into Memorandum of Understanding", *GlobeNewswire*, 29 October 2020. http://www.globenewswire.com/news-release/2020/10/29/2117372/0/en/Search-Minerals-and-Saskatchewan-Research-Council-Enter-Into-Memorandum-of-Understanding.html

130 "Search and USA Rare Earth join to advance critical minerals development". *MINING.com*, 10 November 2020. https://www.mining.com/search-and-usa-rare-earth-join-to-advance-critical-minerals-development/

131 Medallion Resources, Press Release: "Medallion completes siting study for North American Rare-Earth Element Production Facility", 14 October 2020. https://medallionresources.com/2020/10/medallion-completes-siting-study-for-north-american-rare-earth-element-production-facility/

132 Government of Québec, *Critical and Strategic Minerals* (2020). https://cdn-contenu.quebec.ca/cdn-contenu/ressources-naturelles/Documents/PL_critical_strategic_minerals.pdf?1604003187

Approaches to Securing Access to Critical Minerals: The Case of Australia

In February 2018, following the US President Donald Trump's meeting with Australian Prime Minister Malcolm Turnbull in Washington, DC, the US and Australia agreed "to work together on strategic minerals exploration, extraction, processing and research, and development of rare earths and high performance metals".[133] In December 2018, Australian Minister for Resources and North Australia Matt Canavan and US Secretary of the Interior Ryan Zinke signed a Letter of Intent committing Geoscience Australia and the US Geological Survey to collaborate on critical minerals.[134] They also signed a Letter of Intent, establishing a cooperative work program for Australia and the US, and noting that the US would consider Australia an alternative source of critical minerals.[135] In February 2019, the Australian Government published its first *National Resources Statement* in two decades, pledging to prioritise the development of critical minerals, finalise the MoU between Geoscience Australia and the US Geological Survey, and promote opportunities for investment in Australia's critical minerals sector.[136] It also issued *Australia's Critical Minerals Strategy* in March 2019, outlining actions to promote investment, provide incentives for innovation, and connect projects with infrastructure development, and identifying 24 critical minerals in which Australia had moderate to high geological potential and which it could supply to key trading partners.[137] It cast a spotlight on Austrade initiatives to attract investment, such as the *Australian Critical Minerals Prospectus* that Austrade developed, with support from Geoscience Australia, to promote Australia's supply potential, and the investor roadshow in North America – including representation at the PDAC Convention in Toronto in March 2019 – that facilitated connections between Australian companies and US investors.[138]

In September 2019, US President Trump and Australian Prime Minister Scott Morrison agreed to develop a US-Australia 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."[139] The Australian Government also published a report identifying 15 rare earth and critical minerals projects it aimed to highlight as part of joint Australia-US efforts and that required AUD 5.7 billion to develop.[140] In October 2019, Austrade released its report *Critical Minerals Supply Chain in the United States: Mapping the Landscape for Australian Suppliers* to help Australian producers identify end users in the US and facilitate commercial offtake and investment agreements with them.[141] It noted, for instance, how, "following the issuing of an interim rule amending the *Defense Federal*

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133 The White House, Press Release: "The White House: Trump-Turnbull meeting strengthens the alliance", 23 February 2018. https://au.usembassy.gov/white-house-statement-trump-turnbull-meeting-strengthens-alliance/

134 Australian Government, *Australia's Critical Minerals Strategy 2019*, March 2019. https://www.industry.gov.au/sites/default/files/2019-03/australias-critical-minerals-strategy-2019.pdf

135 Australian Government (Austrade), *Critical Minerals Supply Chain in the United States: Mapping the Landscape for Australian Suppliers*, October 2019, p.7. https://apo.org.au/sites/default/files/resource-files/2019-10/apo-nid261496.pdf

136 Australian Government, *National Resources Statement*, February 2019. https://www.industry.gov.au/sites/default/files/2019-02/national-resources-statement.pdf

137 Australian Government, *Australia's Critical Minerals Strategy 2019*, March 2019.

138 Australian Government, *Australia's Critical Minerals Strategy 2019*, March 2019.

139 Prime Minister of Australia, "Outcomes from White House meetings", 20 September 2019. https://www.pm.gov.au/media/outcomes-white-house-meetings

140 Australian Government (Office of the Chief Economist), *Outlook for Selected Critical Minerals: Australia 2019*, September 2019. https://www.industry.gov.au/sites/default/files/2019-10/outlook-for-select-critical-minerals-in-australia-2019-report.pdf. Also, J. Smyth, "Australia's 15 projects aim to break China rare earths dominance", *Financial Times*, 3 September 2019. https://www.ft.com/content/fc43a3c6-ce0f-11e9-99a4-b5ded7a7fe3f

141 Australian Government (Austrade), *Critical Minerals Supply Chain in the United States: Mapping the Landscape for Australian Suppliers*, October 2019.

Acquisition Regulation Supplement to implement a section of the National Defense Authorization Act for Fiscal Year 2019, the US Department of Defense is prohibited from purchasing devices that contain certain magnets or tungsten from North Korea, China, Russia and Iran", opening a window of opportunity for Australian companies.[142] Resource-rich Australia, furthermore, is the largest producer of lithium; among the top five producers of antimony, manganese, rare earths, ilmenite and rutile; and has the world's largest nickel reserves and second-largest cobalt reserves.[143]

Recognising Australia's ability to become an "international powerhouse" with regard to the supply of critical minerals, the Australian Government introduced a number of initiatives to support the development of critical minerals projects and related infrastructure.[144] On 14 November 2019, the Australian Government announced that it would offer projects aiming to develop capabilities to extract and process critical minerals in Australia state-backed concessional loans through both, Export Finance Australia (EFA) including the Defence Export Facility, and, as a result of changes that will allow access to dual funding, the Northern Australia Infrastructure Facility (NAIF), maximising their access to government support.[145] The government also committed AUD 4.5 million to support critical minerals research by Commonwealth scientific agencies. In November, the Australian Minister for Resources and Northern Australia led an Australian delegation to the US for high-level talks with the US Secretary of Commerce Wilbur Ross, US Secretary of the Interior David Bernhardt, Director of the White House National Economic Council Larry Kudlow, other officials and business leaders, promoting Australia as a "secure and reliable international supplier" of many critical minerals, including rare earth elements, that the US needs.[146] Australia and the US advanced their discussions about the US-Australia Action Plan and, on 19 November 2019, formalised their partnership with a project agreement signed by Geoscience Australia and the US Geological Survey, building on the Letter of Intent signed earlier.[147] In December 2019, the Critical Minerals Mapping Initiative (CMMI) – a research collaboration between Geological Survey of Canada, Geoscience Australia and US Geological Survey to pool mineral resource information, develop scientific consensus, identify new sources of supply and promoting critical minerals discovery – held its inaugural meeting in Ottawa, Canada.[148]

In January 2020, the Australian Government opened a Critical Minerals Facilitation Office (CMFO) in Canberra to lead a whole-of-government effort to develop Australia's critical minerals sector; secure investment, financing and market access for critical minerals projects; and support international

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142 Australian Government (Austrade), *Critical Minerals Supply Chain in the United States: Mapping the Landscape for Australian Suppliers*, October 2019, p.6.

143 Minister Canavan's Office, Press Release: "US talks to strengthen trade in critical minerals", Ministers for the Department of Industry, Science, Energy and Resources, 15 November 2019. https://www.minister.industry.gov.au/ministers/canavan/media-releases/us-talks-strengthen-trade-critical-minerals

144 M. Canavan, S. Birmingham, L. Reynolds, Press Release: "New financing measures to help build critical minerals sector", *Australian Government Export Finance Australia*, 14 November 2019. https://www.exportfinance.gov.au/resources-news/news-events/government-news/2019/november/new-financing-measures-to-help-build-critical-minerals-sector/

145 M. Canavan, S. Birmingham, L. Reynolds, Press Release: "New financing measures to help build critical minerals sector", *Australian Government Export Finance Australia*, 14 November 2019.

146 Minister Canavan's Office, Press Release: "US talks to strengthen trade in critical minerals", Ministers for the Department of Industry, Science, Energy and Resources, 15 November 2019.

147 Minister Canavan's Office, Press Release: "Australia, US partnership on critical minerals formalised", Ministers for the Department of Industry, Science, Energy and Resources, 19 November 2019. https://www.minister.industry.gov.au/ministers/canavan/media-releases/australia-us-partnership-critical-minerals-formalised

148 US Geological Survey, "Critical Cooperation: How Australia, Canada and the United States are working together to support critical mineral discovery", 16 October 2020.

cooperation to help diversify critical minerals supply chains.[149] CMFO connects projects with sources of government finance, such as EFA, NAIF and Clean Energy Finance Corporation, and non-government finance. Austrade is to work with CMFO to promote investment in the sector.[150] Through the AUD 4.5 million Critical Minerals R&D program, CMFO is also leveraging Australia's national science capability to support downstream activities through partnerships with the Australian Nuclear Science and Technology Organisation (ANSTO), Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Geoscience Australia.[151] It is also leading a National Critical Minerals Roadmap with state and territory governments and supporting initiatives such as the Future Batteries Industry Cooperative Research Centre that is driving an entire batteries value chain approach to support a batteries industry in Australia.[152] In February 2020, CMFO led the Australian delegation to Washington, DC, to make progress on the US-Australia Action Plan on Critical Minerals, with Department of Foreign Affairs and Trade, Defence, Austrade, Export Finance Australia, Geoscience Australia and CSIRO represented in the delegation.[153] The delegation met with a range of stakeholders in the US, including US government funding mechanisms such as US EXIM Bank and US International Development Finance Corporation, and shared their respective critical minerals strategies with their Canadian counterparts at a roundtable in Ottawa, Canada.[154]

In March 2020, at the PDAC Convention in Toronto, Geoscience Australia, on behalf of the Australian Government, signed a bilateral agreement with the Geological Survey of Canada to collaborate on understanding their respective geological resource potential and undertake critical minerals research.[155] In 2019, the Australian Government joined the US-led Energy Resource Governance Initiative (ERGI) to promote sound mining sector governance and resilient energy mineral supply chains, alongside Argentina, Brazil, Canada, Democratic Republic of the Congo, Namibia, Peru, Philippines and Zambia.[156] The Australian Government's new *Modern Manufacturing Strategy* identified Resources Technology and Critical Minerals Processing as one of six priority areas.[157] Australia also secured partnerships with Japan, US, India and the EU, with discussions underway for bilateral arrangements with the UK and Korea.[158] In November 2020, Australia was welcomed as a member of the EU, US and Japan Trilateral on Raw Materials, along with Canada.[159] These measures, as Jessica Robinson – the former head of CMFO – observed, signalled Australia's interest to move up in the value chain from exploration and extraction to processing, separation, refining and niche manufacturing capabilities.[160] Australia's national science agency CSIRO also strengthened its US collaboration on lithium-ion recycling by joining the DOE-funded ReCell Center's Industrial Advisory Council.[161]

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149 M. Canavan, S. Birmingham, L. Reynolds, Press Release: "New financing measures to help build critical minerals sector", *Australian Government Export Finance Australia*, 14 November 2019. /

150 J. Robinson, "Rare earths and critical minerals provide significant opportunities for Australia", *Resourceful*, No. 22, (CSIRO, December 2020). https://www.csiro.au/en/Research/MRF/Areas/Resourceful-magazine/Issue-22/Rare-earths-and-critical-minerals-provide-significant-opportunities-for-australia

151 "Rare earths and critical minerals provide significant opportunities for Australia", *Resourceful* (CSIRO, 2020).

152 "Rare earths and critical minerals provide significant opportunities for Australia", *Resourceful* (CSIRO, 2020).

153 K. Pitt, "Australia-US strengthen critical minerals cooperation", 2 March 2020. https://www.minister.industry.gov.au/ministers/pitt/media-releases/australia-us-strengthen-critical-minerals-cooperation

154 J. Robinson, "Update from Jessica Robinson, Critical Minerals Facilitation Office: March 2020", Australian Government Department of Industry, Science, Energy and Resources, 23 March 2020. https://www.industry.gov.au/news/update-from-jessica-robinson-critical-minerals-facilitation-office-march-2020

155 "Update from Jessica Robinson, Critical Minerals Facilitation Office: March 2020", 23 March 2020.

156 "Update from Jessica Robinson, Critical Minerals Facilitation Office: March 2020", 23 March 2020.

157 "Rare earths and critical minerals provide significant opportunities for Australia", *Resourceful* (CSIRO, 2020).

158 "Rare earths and critical minerals provide significant opportunities for Australia", *Resourceful* (CSIRO, 2020).

159 "Rare earths and critical minerals provide significant opportunities for Australia", *Resourceful* (CSIRO, 2020).

160 "Rare earths and critical minerals provide significant opportunities for Australia", *Resourceful* (CSIRO, 2020).

161 Prime Minister of Australia, "Outcomes from White House meetings", 20 September 2019.

Approaches to Securing Access to Critical Minerals: The Case of New Zealand

Although companies from New Zealand do not appear to have been as active as their British, Canadian, American and Australian counterparts in critical minerals projects in the wider North, New Zealand has an increasingly outward-looking mining sector and growing technical expertise in critical minerals research, and would be a strategic partner in any Five Eyes Critical Minerals Alliance. In 2017, minerals and petroleum contributed NZD 2.4 billion to New Zealand's GDP, with mineral exports valued at NZD 873 million.[162] In November 2019, New Zealand issued its 2019-2029 Minerals and Petroleum Strategy that laid out the link between the importance of the minerals and energy sector and commitments to transition to a low emissions economy:

> "As countries transition to low emissions economies, where low emissions technologies like electric vehicles and solar panels become more prevalent, the demand for clean-tech minerals such as cobalt and lithium is projected to increase dramatically. There may be opportunities for New Zealand to meet this domestic and global demand for clean-tech minerals... As the energy system transforms, we also need to make sure we have the minerals (such as rare earth elements) necessary to produce the technology we need to power the future."[163]

The 2019 strategy also pointed out that while New Zealand does not have a list of critical minerals yet, it was committed to developing such a list.

In recent years, New Zealand's Ministry of Business, Innovation and Employment (MBIE) commissioned GNS Science – which leads New Zealand's largest minerals research programme – to undertake regional studies to evaluate the potential prospectivity of clean-tech minerals.[164] Its 2018 and 2019 studies indicated lithium potential in the central North Island and the Hohonu Range on the West Coast of the South Island, Nickel and Cobalt potential in Nelson-Tasman-Marlborough and Southland regions, and rare earth elements potential on the West Coast.[165] MBIE also funded the New Zealand Institute of Minerals to Materials Research (NZIMMR), established in Greymouth in 2018, that is spearheading the research to support the government's goal of encouraging a REE-based industry in New Zealand.[166] On 26 February 2021, GNS New Zealand participated in a Critical Minerals Forum organised by the Geological Survey of Canada, Geoscience Australia and the US Geological Survey.[167] In the private sector, a New Zealand chemical engineering company, Fenix NZ Ltd, which specialises in minerals processing and metal recovery by implementing the design, development, construction and installation of hydrometallurgical circuits, played a key role in the development of USA Rare Earth's rare earth and critical minerals mineral processing facility in Wheat Ridge, Colorado, alongside its US partners, USA Rare Earth, Inventure Renewables and Resource Development Inc.[168,169]

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https://www.pm.gov.au/media/outcomes-white-house-meetings

162 NZ Government, *Responsibly Delivering Value: A Minerals and Petroleum Resource Strategy for Aotearoa New Zealand: 2019-2029* (November 2019). https://www.mbie.govt.nz/assets/nzpm-resource-strategy-multi-agency.pdf

163 NZ Government, *A Minerals and Petroleum Resource Strategy for Aotearoa New Zealand: 2019-2029* (November 2019).

164 GNS Science, "Minerals". https://www.gns.cri.nz/Home/Our-Science/Energy-Futures/Minerals

165 NZ Government, *A Minerals and Petroleum Resource Strategy for Aotearoa New Zealand: 2019-2029* (November 2019).

166 NZIMMR, "Rare Earth Elements". https://www.nzimmr.co.nz/rare-earth-elements/

167 Australian Institute of Geoscientists, "Critical Minerals Forum: Geoscience to support critical minerals discovery", 26 February 2021. https://www.aig.org.au/events/critical-minerals-forum-geoscience-to-support-critical-mineral-discovery/

168 USA Rare Earth LLC, Management Presentation: "Critical Materials in the USA: Round Top Rare Earth / Lithium Project, Texas", January 2020. https://www.coreconsultantsgroup.com/wp-content/uploads/2020/05/USA-Rare-Earth-Management-Presentation-v008.4-January-2020-3.pdf.

169 USA Rare Earth LLC, Press Release: "USA Rare Earth Successfully Completes Phase I Rare Earth Separation and Processing Test Work", *GlobeNewswire*, 26 May 2020. https://www.globenewswire.com/news-

The Five Eyes Critical Minerals Alliance (FVEY CMA) and Enhanced Partnership with Greenland

It is precisely as the Five Eyes (FVEY) allies – the UK, the US, Canada, Australia and New Zealand – and their European partners look to reduce their dependence on China for critical minerals, including rare earths, that Greenland grows so strategically important. When it comes to rare earths alone, Greenland is reported to hold 38.5 million tons of rare earth oxides, and is believed to have enough rare earths to meet at least a quarter of global demand in the future.[170]

- The ASX-listed Australian firm Greenland Minerals, which holds a 100% interest in the Kvanefjeld multi-element rare earths project, sits on a rare earths resource of 1 billion tonnes in three zones in the Ilimaussaq complex – Kvanefjeld, Sørensen and Zone 3. It is developing the world's second-biggest rare earth operation and fifth-biggest uranium mine: 11.1 million MT of rare earth oxide and 593 million pounds of uranium.
- The privately-owned Australian firm Tanbreez holds licenses to the Kringlerne project not far from Kvanefjeld and is believed to sit on substantial reserves of rare earths as well, including the world's biggest deposit of dysprosium: Tanbreez's JORC reserves stand at 29 million tonnes of contained REE in some 4.7 billion tonnes. It has had fewer obstacles to overcome, with respect to opposition from local communities and environmental groups, than Greenland Minerals as it does not contain radioactive elements such as uranium and thorium.
- The TSXV-listed Canadian firm Hudson Resources also owns the Sarfartoq carbonatite exploration project, believed to be rich in neodymium and a high-grade niobium/tantalum.

Greenland's vast critical minerals reserves and the sheer number of British, Canadian and Australian companies operating in Greenland make it a new frontier for FVEY, as well as FVEY-EU-EEA cooperation. While the FVEY intelligence alliance can trace its origins to the Atlantic Charter in 1941 and the 1943 British-U.S. (BRUSA) Communication Intelligence Agreement, later formalised as the United Kingdom – United States of America (UKUSA) Agreement in 1946, it has evolved over the years – not least through the inclusion of Canada in 1948 and Australia and New Zealand in 1956, as well as cooperation with third party partners, such as Norway, Denmark, Sweden, Belgium, the Netherlands, France, Germany, Spain, Singapore and South Korea. The principal proposals, thus, are, first, to extend the framework of the FVEY alliance, from joint cooperation in signals, geospatial, defence, security and human intelligence, to more comprehensive political, scientific and economic cooperation on critical minerals, including resource intelligence, technical collaboration, major project financing and supply chain integration for minerals and materials critically important to national and economic security. Second, the FVEY allies should explore avenues to strengthen critical minerals collaboration among themselves, and to build an enhanced partnership with Greenland, to develop integrated, secure, stable, sustainable, resilient and reliable critical minerals supply chains, thus enhancing resource security and autonomy and reducing dependence on China.

Although the scope for FVEY and FVEY-Greenland cooperation in this regard is limitless, the following 10 'First Steps' provide a roadmap and lay the foundation to realise the vision in the near-term future:

1. The UK, US, Canada, Australia and New Zealand should develop their respective Critical Mineral Strategies (Australia and the US have already) and a collective strategy (as the EU has), and appoint agencies/facilitation offices to serve as central focal points and to lead engagement and activities.

release/2020/05/26/2038432/0/en/USA-Rare-Earth-Successfully-Completes-Phase-I-Rare-Earth-Separation-and-Processing-Test-Work.html

[170] F. Harvey, "The rare earth riches buried under Greenland's vast ice sheet", *The Guardian*, 31 July 2012. https://www.theguardian.com/environment/2012/jul/31/rare-earth-greenland

2. The UK, US, Canada, Australia and New Zealand should develop bilateral frameworks of cooperation, such as the Canada-US and Australia-US Joint Action Plans, on Critical Minerals Collaboration as a whole or on topics such as permanent magnets, batteries and electric vehicles.
3. The UK, US, Canada, Australia and New Zealand should design a new multilateral framework of cooperation – the Five Eyes (FVEY) Critical Minerals Alliance, akin to the EU's European Raw Material Alliance, and that provides an inclusive network for dialogue with industry and academia.
4. The UK and New Zealand should join the US-led Energy Resource Governance Initiative (ERGI), which already includes the US, Canada and Australia, as well as Botswana, Peru, Argentina, Brazil, Democratic Republic of the Congo, Namibia, Philippines and Zambia.
5. The British Geological Survey and GNS Science should sign MoUs with the US Geological Survey, Geological Survey of Canada and Geoscience Australia to strengthen international geoscience collaboration on critical minerals and join the Critical Minerals Mapping Initiative (CMMI).
6. The Five Eyes should develop a *Critical Minerals Prospectus and Major Projects Inventory*, building on the *Australian Critical Mineral Prospectus* and Canada's *Major Projects Inventory* and *Canadian Mining Assets* bulletin, to provide data about their capabilities, major projects, and overseas mining assets.
7. The Five Eyes should build on Australia's Major Projects Facilitation Agency to develop their own, or a FVEY, Major Projects Agency that serves as a single entry point for major project proponents seeking tailored information or support with navigating regulatory approvals.
8. The Five Eyes should bring together government and non-government financing mechanisms, including UK Export Finance, US EXIM Bank, Export Development Canada, Export Finance Australia and NZ Export Credit Office, to cooperate on critical minerals project financing.
9. The National Technology and Industrial Base, the framework to integrate and leverage defence industrial capabilities in the US, UK, Canada and Australia, should include New Zealand and be strengthened (even replicated) to develop integrated, secure, reliable critical minerals supply chains.
10. The Five Eyes should enter into an enhanced partnership with Greenland for critical minerals, strengthening geoscience and technical collaboration, financing major projects of strategic interest, developing processing capabilities, and integrating producers in Greenland in FVEY supply chains.

The Relevance of the UK-Greenland Trade Agreement

The UK must take all of the above considerations into account when negotiating its bilateral trade agreement with Greenland. Greenland is of critical importance to the UK's current and future defence and security needs, industrial strategy, business growth, climate policy, energy security, mineral resource security, food security, international trade and foreign relations. The Arctic island nation is also of great importance to the UK's closest allies, whether Five Eyes or European, in many of these areas. Given the UK's geographic location within Greenland's wider maritime neighbourhood, and its status as the country with arguably the most extensive economic footprint in Greenland (followed by its allies, Canada and Australia), the UK is in a unique position to serve as a strategic gateway – even a bridge – between Greenland and the UK's Five Eyes and European allies, especially when it comes to critical minerals collaboration and supply. In the light of the sheer number of British companies holding licenses in Greenland's minerals sector, and the UK's relevance as a leading centre of mining finance, expertise and potentially also processing and logistical capabilities for mining companies in Greenland no matter where they originate, the UK and Greenland should build an enhanced partnership that covers both technical collaboration and the development of integrated North Atlantic supply chains that can be widened further, through cooperation with Five Eyes and European partners, to form integrated FVEY or FVEY-EU-EEA supply chains.

As it is the UK-Greenland trade agreement that will form the bedrock of any such Enhanced Partnership, it is as much in the interest of the UK's Five Eyes and European partners, as it is in the interest of the UK,

for the UK to strengthen its relationship with Greenland through a trade agreement that, among other things, secures access to Greenland's vast mineral reserves. When it comes to ensuring the security and stability of the UK's and its allies' critical minerals availability and supply chains, it is vital that the UK retains access to Greenland's resources under conditions no less favourable than the access offered to any other state, supports the development of a favourable investment climate for UK businesses in Greenland and Greenlandic businesses in the UK, facilitates the use of processing and logistical facilities in the UK by mining companies in Greenland, and allows for mineral resources to be exported from Greenland to the UK on a tariff-free, quota-free preferential basis (as it had been under the EU-OCT arrangement). While the UK was still a member of the EU, UK-Greenland trade fell within the scope of the EU's arrangement with the Overseas Countries and Territories (OCTs) constitutionally linked to the UK, Netherlands, Denmark and France. To appreciate more fully why replicating the provisions of the EU-OCT arrangement in any UK-Greenland trade agreement is so vital, it would be useful to understand the wider context of UK-Greenland trade prior to the end of the Brexit transition period on 31 December 2020.

Over the past 50 years, Greenland's formal relationship with the UK has been determined, to a large extent, by its relationship with Denmark and the EU. In 1982, three years after implementing Home Rule from Denmark, Greenland held a referendum on its membership of the European Economic Community (EEC), with 53% of the voters voting against continued membership. Another three years later, in 1985, the Greenland Treaty formalised Greenland's withdrawal from the EEC, making it the first country to leave the EU by referendum. Nevertheless, while no longer a member of the EEC, Greenland was still an autonomous constituent realm within the Kingdom of Denmark, enabling it to become an Overseas Country and Territory (OCT) to the EEC in 1985. Consequently, along with other OCTs including the 14 British Overseas Territories, Greenland retained some integration with the EU's Single Market via various association agreements, and benefited from tariff-free, quota-free preferential access to the EU, including the UK. On 23 June 2016, the UK held a referendum on its membership of the EU, with a majority of 51.9% voting in favour of the UK leaving the EU. On 31 January 2020, the UK formally left the EU, though it entered a transition period until 31 December 2020 during which it remained within the EU's Single Market and Customs Union. The UK's withdrawal from the EU has had serious implications for Greenland-UK trade: in the absence of a UK-Greenland trade agreement that replicates the principles and provisions in the EU-OCT arrangement that underpinned UK-Greenland trade, there is a real risk of significant trade disruption, as UK and Greenlandic seafood companies have already started to see.

It translates as the automatic application of UK Global Tariffs to products being imported from Greenland into the UK, whether finished products, semi-finished products or raw materials. The imposition of new tariffs on products originating in Greenland adversely impacts not just Greenlandic producers and exporters, but also British importers, processors and consumers, and, in the case of critical materials, has profound implications on national security. In the case of fish and fish products, the imposition of new tariffs – despite any temporary arrangements that the UK may have introduced since on certain product codes, with the best of intentions – has resulted already in adverse effects on the UK's food security, as well as the entire seafood value chain: importers, processors, distributors, wholesalers, traders, retailers, foodservice channels (such as fish and chips shops, pubs and restaurants) and consumers. Although Greenland's exports to the UK currently consist almost entirely of fish and fish products, the sheer number of UK mining firms holding licenses in Greenland, and the growing demand within the UK (and its allies) for mineral resources available in abundance in Greenland, indicate that mining is simply too big and important an emerging sector for bilateral trade and cooperation to be left out of any UK-Greenland trade agreement. As discussed, critical minerals is the one area where the UK could play a key role as a strategic gateway between Greenland and the UK's Five Eyes and European allies and partners.

As the firms in Greenland currently producing expand and those prospecting or exploring eventually commence production, Greenland is well-placed to become one of the UK's leading import sources for a number of critical minerals, including rare earth elements. Furthermore, many of these firms will rely on UK expertise and mining finance, as is already the case, and potentially also look to use or to develop processing and logistical operations in the UK, or to connect with rare earth permanent magnet producers and a range of end users in the UK. As seen, in December 2020, Pensana announced that it is looking to develop the UK's first rare earths processing plant in Hull, a site chosen also for the city's excellent port and infrastructure. If successful, Pensana states, the plant will be one of two major producers of rare earth oxides outside China.[171] Although the plant is being set up to process materials from Pensana's mine in Angola, the management recognises the potential for it to be used as multi-use facility in the future. Likewise, Cheshire-based Less Common Metals – the only rare earth magnet alloy producer outside China and Japan – is exploring the possibility of establishing a fully integrated supply chain for rare earth permanent magnet production in the UK. On all counts, it is as much in the interest of the UK as that of Greenland to ensure that these mineral resources can be imported into the UK on a tariff-free, quota-free basis, as was the case under the EU-OCT arrangement. The emerging linkages are crucial to the development of integrated North Atlantic, Five Eyes and possibly also FVEY-EU-EEA supply chains.

The following table illustrates how certain mineral resources from Greenland are affected by the new tariffs on third countries upon their importation into the UK.

Import of Mineral Resources from Greenland in the UK: Impact of New Tariffs			
HS Code	**Product Category**	**Current Tariffs (OCTs)**	**UK Global Tariffs**
2523210000	Portland cement: white cement, whether or not artificially coloured	0.00%	1.70%
2817000000	Zinc oxide; zinc peroxide	0.00%	5.50%
28053010	Rare-earth metals, scandium or yttrium, intermixtures or interalloys	0.00%	5.50%
28053020	Rare-earth metals, cerium, lanthanum, praseodymium, neodymium, samarium, of a purity by weight of 95% or more	0.00%	2.70%
28053030	Rare-earth metals, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, yttrium, of a purity by weight of 95% or more	0.00%	2.70%
2805304000	Scandium, of a purity by weight of 95% or more	0.00%	2.70%
2846	Compounds, inorganic or organic, of rare-earth metals, of yttrium or of scandium or of mixtures of these metals	0.00%	3.20%
2823	Titanium oxides	0.00%	5.50%
7801100000	Unwrought lead: Refined lead	0.00%	2.50%
7901	Unwrought zinc	0.00%	2.50%
7901110000	Zinc, not alloyed, containing by weight 99.99% or more of zinc	0.00%	2.50%
790112	Zinc, not alloyed, containing by weight less than 99.99% of zinc	0.00%	2.50%
7901200000	Zinc alloys	0.00%	2.50%
810820	Unwrought titanium; powders	0.00%	5.00%

Thus, the bilateral trade agreement between the UK and Greenland, two island countries located at the edge of Europe and both incidentally the first to leave the EU, is the easiest deal the UK Government could ever make and yet a deal that would be crucial to the UK's current and future defence and security, as well as food, energy, trade, industrial, climate and foreign policy. It will also have an impact on the UK's allies and partners overseas in many of the policy areas listed above. Beyond that, as this report has

[171] "First rare earth plant in UK proposed for Hull", *BBC News*, 7 December 2020.

demonstrated, the bilateral trade agreement is the bedrock for a new UK-Greenland Special Relationship, which in turn would serve as the cornerstone of the proposed Five Eyes Critical Minerals Alliance and its Enhanced Partnership with Greenland. Such an alliance would enable the UK, the US, Canada, Australia and New Zealand to embark on closer geoscience, resource intelligence, technical and financing collaboration in, with and beyond Greenland, and to benefit from integrated, secure, stable, sustainable, resilient and reliable supply chains for minerals critical to their national and economic security.

This report builds on, but substantially expands and updates, an in-depth briefing produced by the author for The Centre for Historical Analysis and Conflict Research (CHACR) – 'The British Army's Think Tank' – in October 2020.[172]

[172] D. Menezes, *Greenland: Security, Trade, Competition* (Camberley, Surrey: The Centre for Historical Analysis and Conflict Research, October 2020). https://chacr.org.uk/2020/10/26/greenland-security-trade-competition/

About the Author

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In addition, Dr Menezes is a Director of High North Advisers, a London-based investment advisory firm focusing on Arctic and Nordic projects; Vice-President of *Arctic Today*, the world's foremost media outlet covering news stories from across the circumpolar Arctic region; and a Member of the Advisory Board of *JONAA – Journal of the North Atlantic & Arctic*, a photo-journalistic media platform dedicated to High North affairs. He is also the Co-Chair of Arctic Encounter London, an Anglo-American conference focusing on trade and security in the Arctic; and author or editor of numerous publications about the Arctic, including the recent volume *The North American Arctic: Themes in Regional Security* (London: UCL Press, 2019).

Dr Menezes read History at the London School of Economics and Political Science (LSE) and the University of Cambridge, graduating from the latter with a PhD in History. He then held honorary, associate or visiting research fellowships at research centres at the Universities of Cambridge, Oxford and London. At present, he serves as Associate Fellow at the Institute of Commonwealth Studies, University of London and Honorary Fellow at the UCL Institute for Risk and Disaster Reduction, University College London. He is also a Fellow of the Royal Historical Society, Royal Geographical Society and Royal Society of Arts.

Over the past decade, Dr Menezes has also served as Consultant to the Commonwealth Secretary-General, Principal Consultant to a European Parliament Intergroup, Research Associate to a UN Special Rapporteur and Head of the Secretariat of the Yemen All-Party Parliamentary Group in the UK Parliament. He is also the Founder and Director of Human Security Centre, Co-Founder and Advisory Board Member of Think-Film Impact Production, and the Associate Producer of four award-winning films, including the Oscar-shortlisted, Emmy-nominated Canadian documentary *My Enemy, My Brother* (2015, 2017).