

CONFIDENTIAL

Hexagon Resources Limited
US Downstream Rare-Earth Elements Investment Opportunity
October 2019

Next-Generation Energy Materials Start Here.



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Rare-Earth Elements



- Rare-earth elements (REEs) comprise a relatively abundant group of 17 elements, including the 15 lanthanide elements on the periodic table, plus two other related elements, scandium and yttrium
- The unique magnetic, electric, optical, and chemical properties of REEs have made them an integral part of modern life
- REEs are critical, non-substitutable inputs required in countless high-tech, green-energy, transportation and defence applications
- REE permanent magnets are the most significant and lucrative demand driver for the REE downstream, consuming various REEs, most notably, praseodymium, neodymium, samarium, terbium and dysprosium
- A study by the US Department of Commerce's Bureau of Industry and Security reported that 66% of respondents, the majority of whom are vendors to US Department of Defense (DoD), indicated they imported REE materials
- After China, Australia is the largest upstream producer of mixed REE chemical concentrates globally. The US has just one producing REE mine — the Mountain Pass Mine in California — however, the mined REE mineral concentrates are shipped to China for processing into mixed REE chemical concentrates and subsequent separation into REE oxides (REOs)

Background: Neodymium-based permanent magnets – the strongest type of magnet commercially available

Rare-Earth Elements

REE separation to produce REOs – the key technical challenge

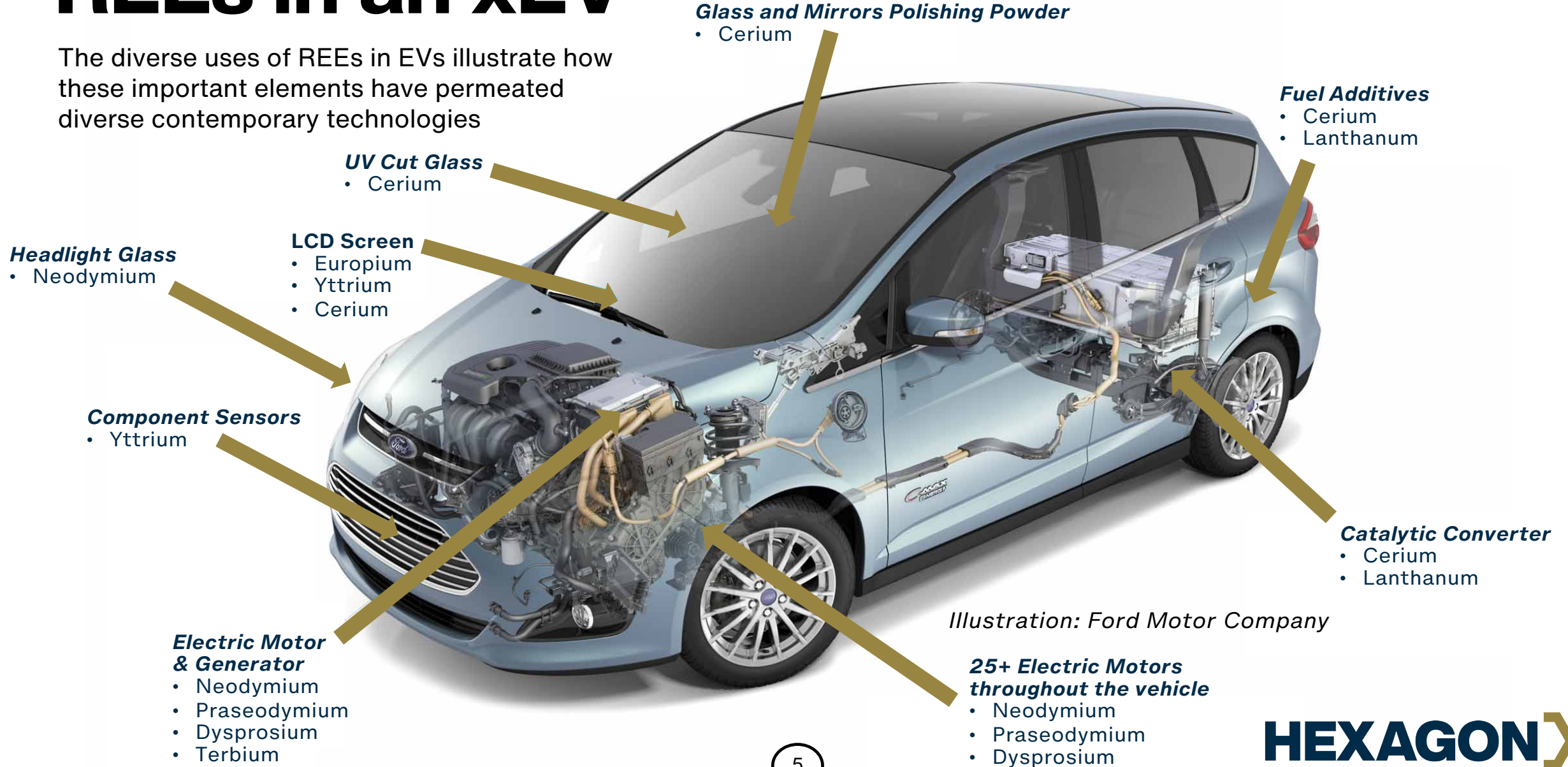
- China dominates downstream REE separation, producing ~85% of global REO output
- Solvent extraction (SX) is the dominant, industry-standard commercial processing method for REE separation
- Highly capital-intensive due to technical challenges of REE separation and the hundreds of mixer-settler stages required for conventional SX
- REEs are divided into light REEs (LREEs) and heavy REEs (HREEs), with HREEs being more valuable, but LREEs being used in greater quantities

LREEs	21 Sc Scandium 44.955908	57 La Lanthanum 138.90547	58 Ce Cerium 140.116	59 Pr Praseodymium 140.90766	60 Nd Neodymium 144.242	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	REO Indicative Pricing* Nd ₂ O ₃ \$45/kg Pr ₆ O ₁₁ \$54/kg Tb ₄ O ₇ \$546/kg Dy ₂ O ₃ \$263/kg
	39 Y Yttrium 88.90584	65 Tb Terbium 158.92535	66 Dy Dysprosium 162.500	67 Ho Holmium 164.93033	68 Er Erbium 167.259	69 Tm Thulium 168.93422	70 Yb Ytterbium 173.045	71 Lu Lutetium 174.9668	

* Indicative prices in US\$, source: BAI INFO October 2019

REEs in an xEV

The diverse uses of REEs in EVs illustrate how these important elements have permeated diverse contemporary technologies

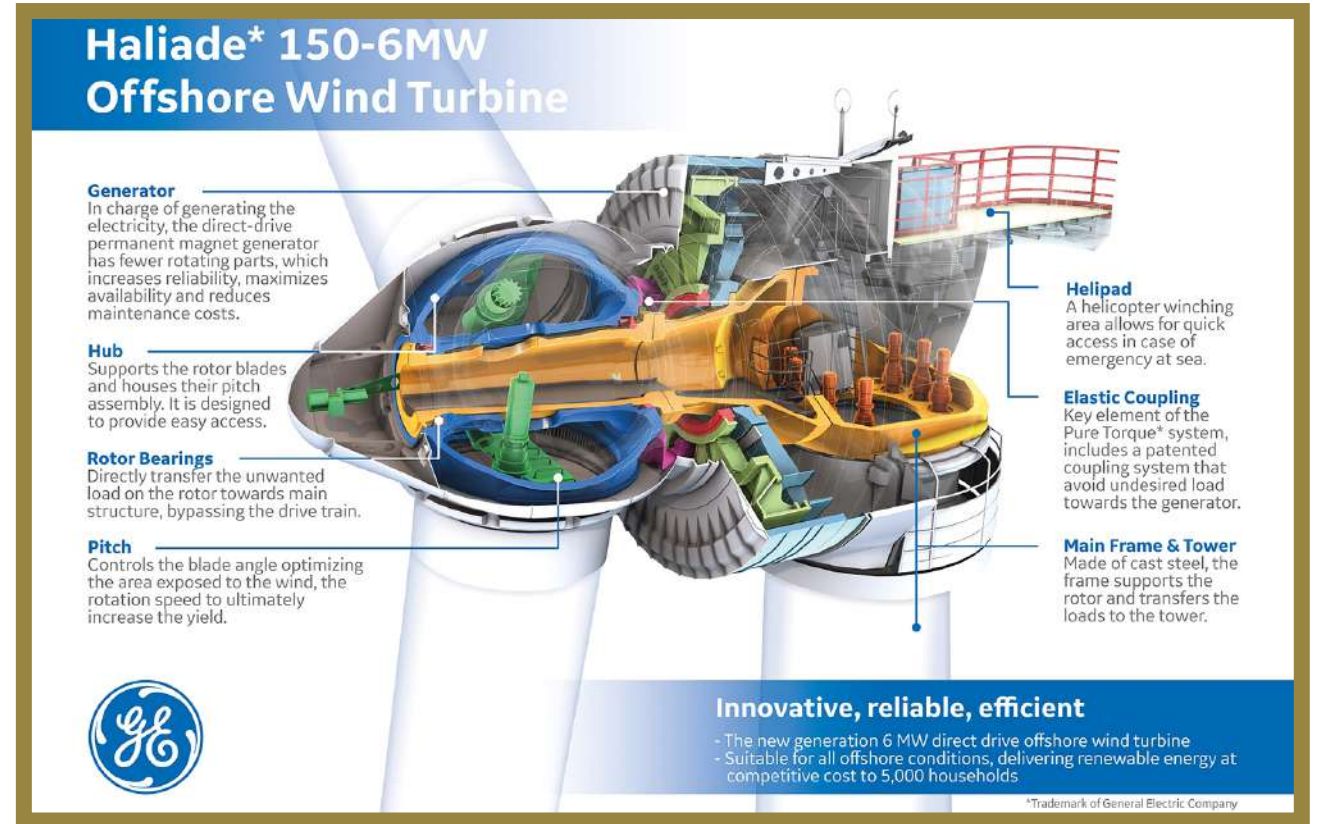


REE Permanent Magnets

REE permanent magnets are essential non-substitutable components in many electric motor, generator and sensor applications, for defence, aerospace, medical, and numerous industrial and high-tech applications

The most efficient motors require REE permanent magnets to convert electrical energy into mechanical motion. Similarly, high-efficiency turbines and generators require these magnets to convert mechanical motion into electrical energy

Permanent magnets are critical in maximising the efficiencies and capabilities of electricity in modern technologies



Above: a cutaway image of GE's Haliade 150-6MW Offshore Wind Turbine, utilising hundreds of kgs of REE magnets

Image: GE Renewable Energy, 2019

Critical Applications for REEs

America's manufacturing and defence industrial base requires a growing number of widely used specialised materials, including REEs and REE permanent magnets



Defence &
Aerospace



Renewable
Energy



Electronics



Fluid-Cracking
Catalysts



Electric
Transportation

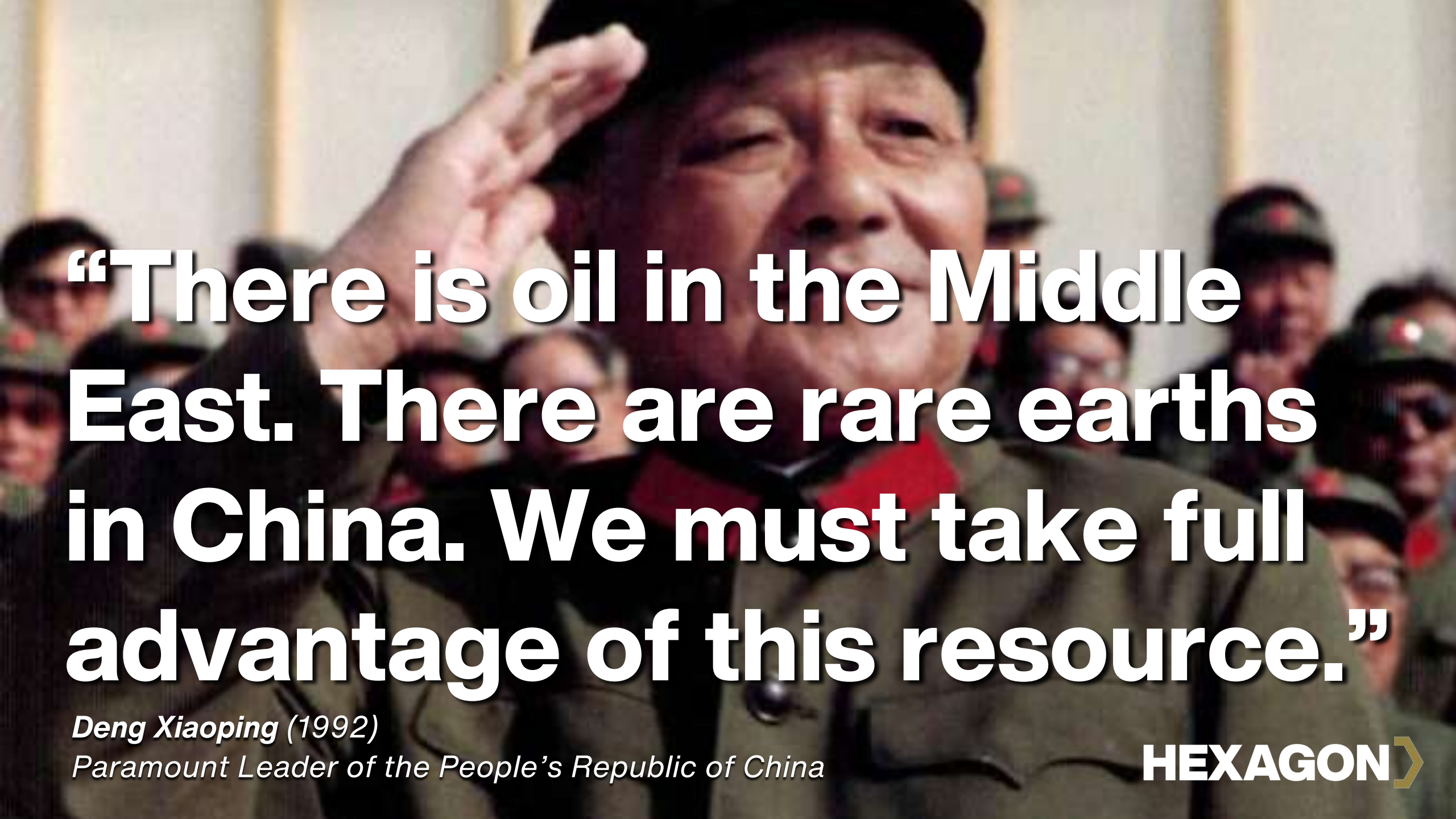
REEs in Green Energy

REE	Magnets	Batteries	Phosphors	US DoD
Lanthanum		●	●	●
Cerium		●	●	●
Praseodymium	●	●		●
Neodymium	●	●		●
Samarium	●			●
Europium			●	●
Terbium	●		●	●
Dysprosium	●			●
Gadolinium	●			●
Yttrium			●	●

The Problem

Praseodymium (Pr) metal



A photograph of Deng Xiaoping, the former leader of China, wearing a dark military uniform with a red scarf. He is gesturing with his right hand raised, palm facing forward. In the background, several other people in military uniforms are visible, though they are out of focus.

“There is oil in the Middle East. There are rare earths in China. We must take full advantage of this resource.”

Deng Xiaoping (1992)

Paramount Leader of the People's Republic of China

HEXAGON 



China's Dominance

China controls 85% of global REE production without enforcing adequate environmental safeguards

A rare-earth processing plant pollutes the air and produces hazardous waste in Baotou, Inner Mongolia, China

Illegal and undocumented REE mining and production in China is a serious, ongoing issue

China's Dominance

China's domination of the REE market illustrates the dangerous interaction between Chinese economic aggression guided by its strategic industrial policies — and vulnerabilities and gaps in America's manufacturing and defence industrial base

China has strategically controlled the global market with REEs at subsidised prices, driven out competitors, and inhibited new market entrants. When China feels the need to flex its soft-power muscles by embargoing REEs, it does not hesitate (*e.g. China's maritime dispute with Japan in 2010*)

As part of the increasingly global manufacturing and defence industrial base, imports of strategic and critical materials, such as REEs, have increased, causing a trade-off between supply dependency and lower costs



**“Don’t underestimate
the Chinese capacity to
counter-attack. Don’t
say we didn’t warn you”**


The Chinese Communist Party (May 19, 2019)

Published in the People’s Daily, the official newspaper of the Chinese Communist Party

The above quote was in response to China’s use of REEs as bargaining leverage in the ongoing US-China trade dispute

Those familiar with Chinese diplomatic language know the weight of the statement, specifically the rare Chinese phrase of “don’t say I didn’t warn you” which was used before China went to war with India (1962) and Vietnam (1979)

“Military equipment firms in the United States will likely have their supply of rare earths restricted”

A U.S. Air Force B-2 Spirit Stealth Bomber is shown in flight, viewed from a low angle, flying towards the right. The aircraft is dark and sleek, with its wings and tail visible. The background is a bright, cloudy sky.

The Chinese Communist Party (June 17, 2019)

Published in the Global Times, an official newspaper of the Chinese Communist Party

A U.S. Air Force B-2 Spirit Stealth Bomber in flight. The B-2 Spirit is manufactured by Northrop Grumman, with an average cost of more than \$2.1B per aircraft

Photo: U.S. Air Force

100% US Reliance

A matter of US Economic,
Industrial and National Security:
the US must reduce its REE
downstream reliance on China

The US was once largely self-
sufficient in REEs, but over the
past quarter century, China has
emerged as the dominant global
leader in REE production

REEs are a focal point in the
escalating trade war between
the US and China



Markets

How China Overpowered the U.S. to Win the Battle for Rare Earths

Bloomberg News
June 10, 2019, 7:17 PM EDT Updated on June 11, 2019, 2:50 AM EDT

- ▶ Six state companies at heart of key government-run industry
- ▶ Crucial sector shaping as the new battleground in trade war



The government has prepared steps to use its stranglehold on critical rare earth minerals to hurt the U.S. economy

1,609 views | Aug 21, 2019, 06:00am

Marco Rubio Knows America's Future Depends On Rare Elements

 James Conca Contributor
Energy
I write about nuclear, energy and the environment



How China Could Shut Down America's Defenses

Advanced U.S. weapons are almost entirely reliant on rare-earth materials from China—and they could be a casualty of the trade war.

BY KEITH JOHNSON, LARA SELIGMAN | JUNE 11, 2019, 5:10 PM

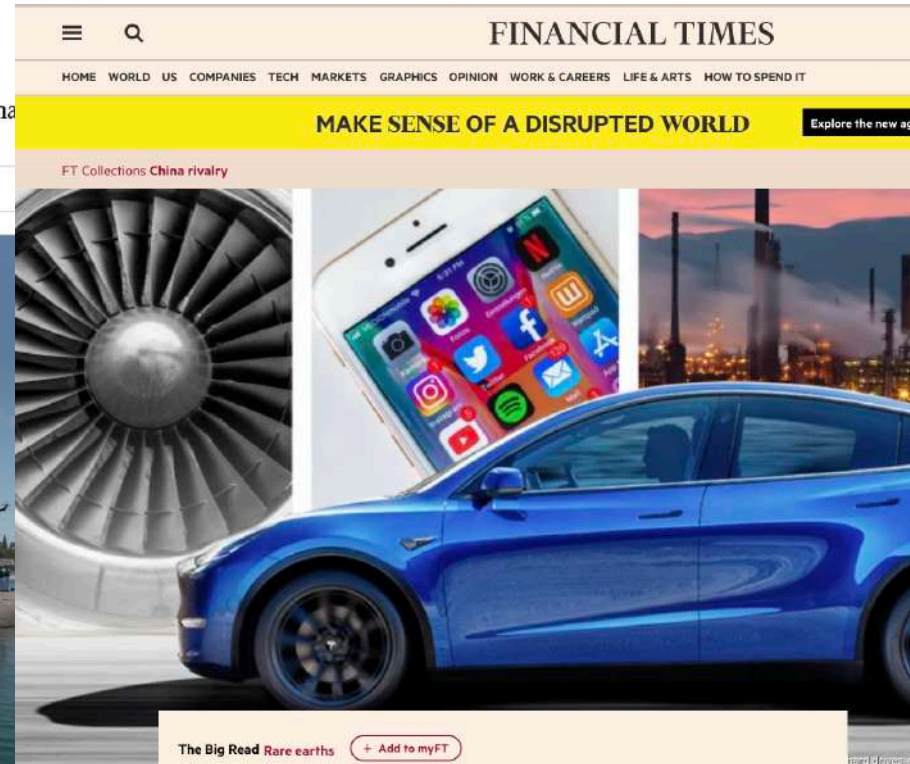


The Virginia-class fast-attack submarine USS Hawaii prepared to moor at the historic submarine piers at Joint Base. Each Virginia-class submarine uses nearly five tons of rare-earth materials. U.S. NAVY PHOTO BY CHIEF MASS COMMUNICA

President Donald Trump often argued that China has much more than the United States in a trade war, but critics say his administration has failed to

Is threat of withholding rare-earth metals a key weapon in China's trade war with U.S.?

Published: May 29, 2019 1:51 p.m. ET



The Big Read **Rare earths** + Add to myFT

Rare earths: Beijing threatens a new front in the trade war

China believes its near-monopoly on rare earths, the key ingredients for many high-tech products, could spur rival producers

HEXAGON

Lucy Hornby in Beijing and Henry Sanderson in London JUNE 3 2019

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The Solution



Samarium (Sm) metal

RapidSX™ Rare-Earth Separation

RapidSX™



Innovation Metals Corp (IMC)

- Private Canadian company, founded to develop cost-effective separation processes for critical minerals (*REEs, Lithium, Cobalt, Nickel*)
- World-renowned technical research and development expertise; partners and clients include public/private companies and government agencies
- IMC successfully developed and piloted the RapidSX™ approach — a *proven, enhanced* SX technology offering major REE separation efficiencies, with significantly *reduced CAPEX & OPEX*
- The RapidSX™ technology was piloted with *US\$1.8M funding* from the *US DoD*, via the *US Army Research Laboratory*
- Successful piloting of RapidSX™ REE separation for demonstrated *highly efficient* and *cost-effective* production of REOs
- RapidSX™ Pilot Plant demonstrated a production capacity of *1 – 2 tonnes of REOs per month* (*depending on the REE feed*)
- RapidSX™ Pilot Plant results indicated average separation costs for a suite of high-value, in-demand REOs of *<\$2/kg for LREOs* and *<\$12/kg for HREOs*



RapidSX™ Rare-Earth Separation

RapidSX™



**INNOVATION
METALS**



IMC to Participate in US Department of Defense Rare-Earth Project and Launches Lab-Scale Solvent Extraction Pilot Plant Program

June 5th, 2014

TORONTO, June 5, 2014 – Innovation Metals Corp. (IMC or the Company) today announced its participation in a new \$1.2M rare-earth supply-chain development program, led by Technology Metals Research, LLC (TMR) and funded by the US Army Research Laboratory (ARL), part of the US Department of Defense (DOD).

IMC joins a dozen other participants in the program, which will enable the Company to construct and to operate a 120-stage, lab-scale rare-earth-element (REE) pilot plant. The plant will be used to test solvent-extraction (SX) process-flow diagrams, for the extraction and separation of REEs, focused on the much sought-after heavy REEs.

"The United States and Canada are well endowed with critical- and heavy-rich REE deposits," said Gareth Hatch, President of IMC, co-founder of TMR and the Principal Investigator for the 12-month program. "What is missing from mine-development projects is the ability to extract and to separate heavy REEs here in North America, once the ores have been initially processed. IMC is in the process of 're-shoring' the knowledge and expertise required for the production of separated heavy REEs, and will use the new SX test apparatus to provide baseline comparative data to the overall ARL program."

Once constructed, the pilot plant will be run by experienced personnel at a third-party process-engineering facility in Canada. The Company will initially use heavy REE-rich concentrates that are commercially available from non-Chinese sources. IMC will also collaborate with future heavy REE producers that are able to provide similar concentrates for testing.

IMC Announces Successful Testing of Proprietary Low-Cost Rapid Solvent Extraction Process

February 18th, 2016

TORONTO, February 18, 2016 – Innovation Metals Corp. ("IMC" or "the Company") is pleased to report on the successful testing of its proprietary rapid solvent-extraction ("RapidSX") process, for the low-cost separation of rare-earth elements ("REEs") and other technology metals.

"The patent-pending RapidSX™ approach reduces the number of SX separation stages by over 90%," said Patrick Wong, CEO of IMC, "leading to a significant reduction in plant footprint and associated capital expenditures. The process also leads to dramatic reductions in operating costs and time to process completion, when compared to conventional SX."

In June 2014, IMC joined the first phase of a REE supply-chain development program, led by Technology Metals Research, LLC ("TMR") with US\$1.2M in funding from the US Army Research Laboratory ("ARL"), part of the US Department of Defense. This first phase enabled the Company to operate a 130-stage, lab-scale conventional REE SX separation pilot plant in 2014 and 2015. Results from this work will be presented at the IMPC meeting in September 2016, to be held in Quebec.

In 2015, IMC began work to improve the conventional SX process, through its participation in a \$1.7M second phase of the TMR / ARL development program. The Company evaluated a number of avenues before focusing on its current RapidSX approach.

"The RapidSX process utilizes the time-proven chemistry of SX, in a set of proprietary columns filled with a simple contact medium," commented Gareth Hatch, President of IMC, co-founder of TMR and the Principal Investigator for the ARL-funded program. "The process avoids the need for expensive resins or other separation approaches unproven at scale."



The RapidSX™ technology is now ready for commercialisation

The RapidSX™ REE separation Pilot Plant in Mississauga, Ontario, Canada

Photo: G&W, 2019

American Innovation Metals (AIM)



Hexagon Resources Limited
(ASX:HXG)

IMC and Hexagon's wholly owned US-based subsidiary, Energy Materials of America, LLC plan to form a joint venture — **American Innovation Metals Inc. (AIM)** — to commercialise the RapidSX™ downstream REE separation technology




American Innovation Metals (AIM)

AIM is a de-risked downstream REE separation business, with RapidSX™ technology ready for commercialisation



Hexagon has a binding Investment Agreement to acquire 49% of the RapidSX™ technology for REE separation through AIM

- *Investment is US\$2M to build out a Commercial Demonstration Plant within 12 months, plus US\$4M deferred payments, payable through Hexagon's share of future AIM cash flows. Investment is subject to Hexagon shareholder approval expected 22 Nov. 2019*
- *Hexagon will contribute commercial and marketing skills, identify/secure feedstocks, generate RapidSX™ licencing opportunities, and sales/offtakes for REOs produced*
- AIM intends to play a role in the rebalancing of REE supply and demand between China and US
- Potential to expand AIM beyond USA — to Australia, Europe, Japan, South America, South Korea, and India — through licensing
- The feedstocks are mixed REE chemical concentrates; the RapidSX™ technology is source-agnostic
(not reliant on the REE source; multiple LREE and HREE feedstocks)
- There is little upstream risk, as REE feedstocks are readily available



AIM's value is in the demonstrated ability of the RapidSX™ technology to separate REE concentrates into high-purity REOs

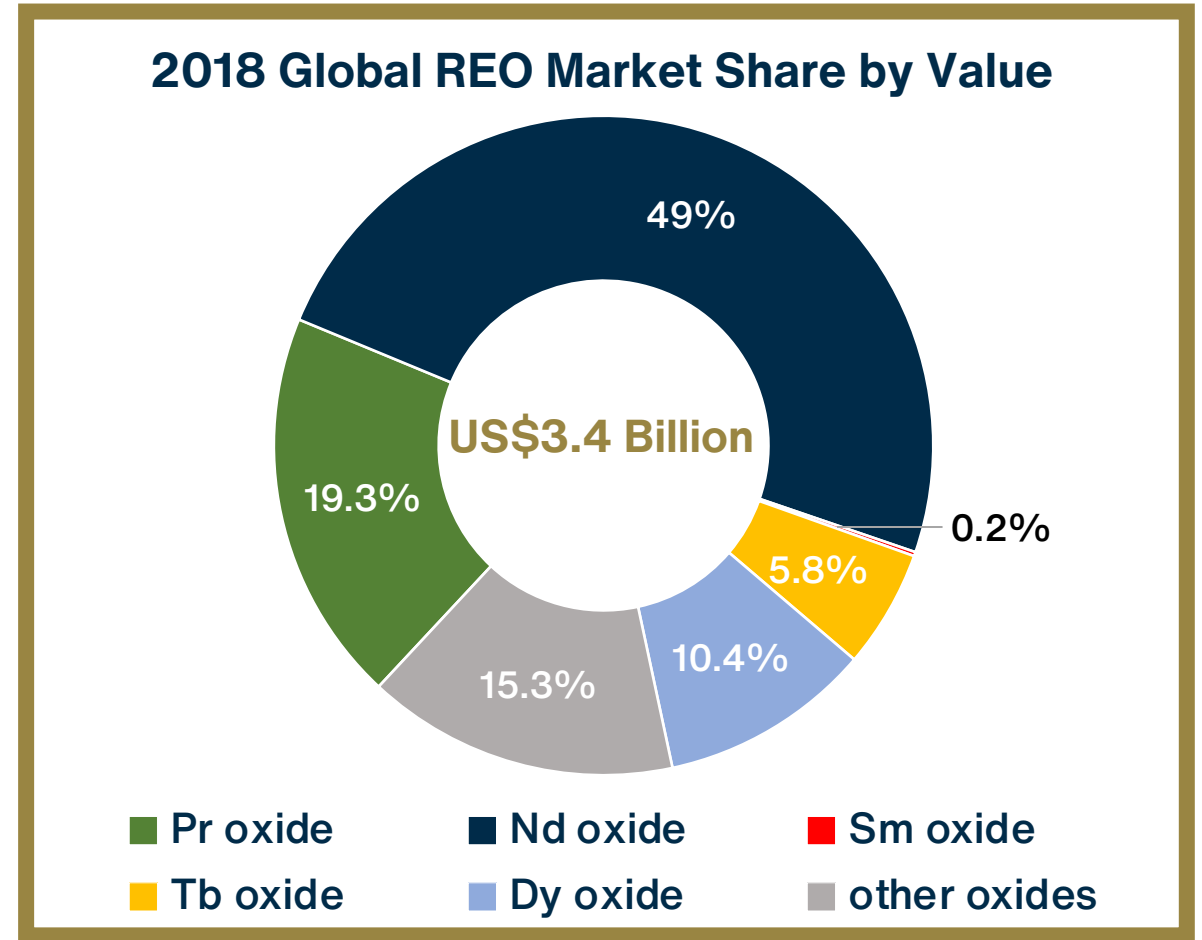
REOs (clockwise from top center) praseodymium, cerium, lanthanum, neodymium, samarium, and gadolinium

Photo: United States Geological Survey (USGS)

REO Global Market Value

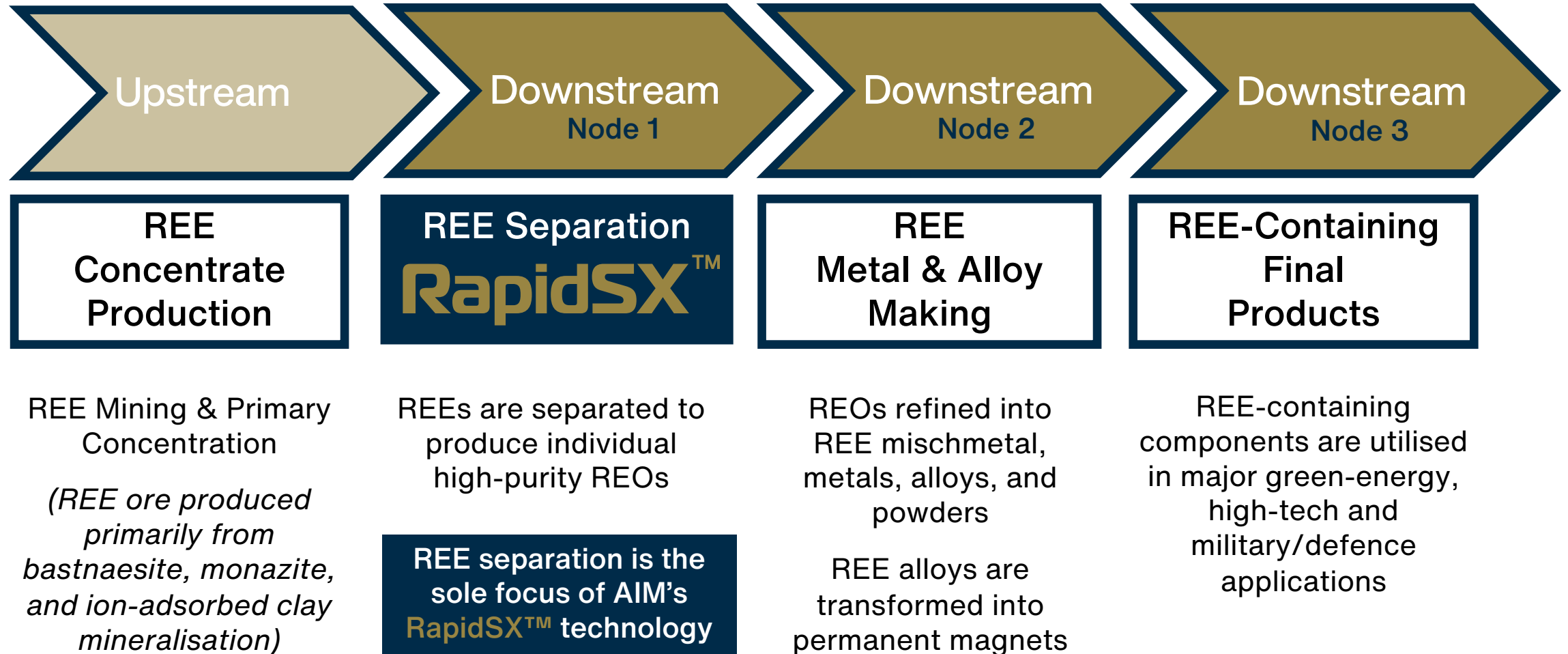
In 2018, the total global REO market was worth **~US\$3.4 billion**

- Requiring REOs, **REE permanent magnets are the most significant and lucrative demand driver** for the REE downstream, constituting ~60 to 70% of the value of the global REO market
- REE permanent magnets consume various REOs, including oxides of praseodymium, neodymium, samarium, terbium, and dysprosium, which for all uses represented an estimated of 35% REO demand by volume in 2018
- By 2025, magnets are forecast to exceed 39% of REO total demand by volume and 42% by 2030



Source: Adamas Intelligence, 2019

REE Supply Chain



REE Supply Chain Outputs

REE Mining/
Concentration

↑ UPSTREAM

- REE Ores
- REE Mineral Concentrates
- Mixed REE Chemical Concentrates



REE
Separation

↓ DOWNSTREAM

- Separated REE Oxides (REOs)
- Separated REE Chem Compounds



REE Metal &
Alloy Making

↓ DOWNSTREAM

- REE Metals
- REE Alloys



REE
Magnets &
Components

↓ DOWNSTREAM

- REE Permanent Magnets
- REE Components/Applications



Constraint is in the Downstream

REE Mining/
Concentration

There is no shortage of REE upstream concentrate production/feedstock suppliers outside of China (USA, Australia, South America)

UPSTREAM

REE
Separation

REE separation is the supply-chain constraint. Commercialising the RapidSX™ technology will address non-Chinese REE separation deficiency



DOWNSTREAM

REE Metal &
Alloy Making

REE
Magnets &
Components

**REE
separation
capacity is
needed to
support and
grow the REE
downstream**

REE downstream clients are now demanding non-Chinese metals and alloys for their downstream REE products

Under-served Downstream Consumers

A selection of REE Metal & Alloy and REE Magnet Makers — outside of China



RapidSX™ vs Conventional SX

RapidSX™		Conventional Solvent Extraction
Performance & Efficiency		
Commercial Purity	Yes	Yes
REE Recovery Rates	High	High
Processing Time	Rapid	Slow
Time to Equilibrium	Days	Several Weeks
CAPEX		
Equipment Cost	Low	High
Separation Staging	90% Reduction	Very High
OPEX		
Metal Inventory/WIP	Low	High
Organic Volumes	Low	High
Labour	Low	High
Power Consumption	Low	High



The RapidSX™ technology dramatically reduces the number of REE separation stages in the SX chemical circuits by up to 90% compared with conventional SX systems, leading to a significant reduction in plant footprint and associated CAPEX

The RapidSX™ technology significantly reduces OPEX and time to process completion, reducing processing times — *from several weeks to just days* — for each REE separation completed



RapidSX™ vs Conventional SX

Why the RapidSX™ technology is superior to conventional SX

Increased Separation Kinetics

Reduced time to achieve desired transfer of metal(s) of interest, from one liquid phase to the other

Low CAPEX

Due to considerably reduced size, number of separation stages and resulting physical plant footprint, compared to conventional SX approaches

Low OPEX

Due to significantly reduced separation times (days compared to weeks), reduced reagent and power consumption, reduced manpower requirements, and reduced in-process metal inventories

Agnostic

Robust process capable of taking LREE-rich, HREE-rich and even blends of mixed REE feedstocks

Commercially Available

All construction materials, equipment and chemistry are readily available with no 'black-box' technology

Scalable & Modular

Process lines are modular and scalable

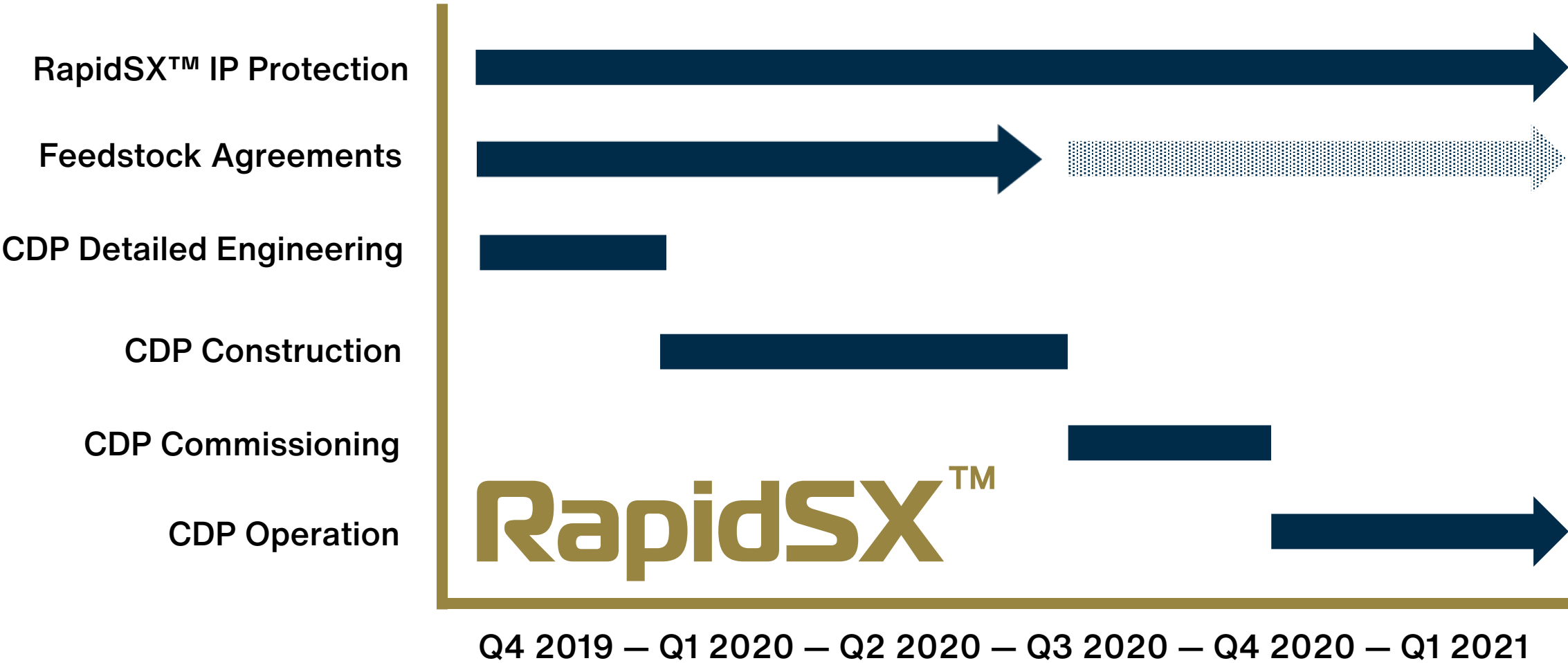
American Innovation Metals (AIM)

RapidSX™ commercialisation steps:

- Construct a RapidSX™ REE separation Commercial Demonstration Plant (CDP) for US\$1.5M (~6 months build time and ~3 months commissioning; ~9 months total)
- Planned production capacity of 6,000–8,500 kg/mo REO (70–90 tpa)
- Procure mixed REE chemical concentrates
- Provide and/or sell separated REOs to potential customers
- Testwork for existing and emerging mixed REE concentrate producers at client's cost
- Conservative assumption of generating fees from executing RapidSX™ Technology Licencing Agreements
- Progressively go to commercial scale through incremental addition of full-scale separation lines
- Modular and scalable, the RapidSX™ technology is capable of entering into a significantly under-served US market without the risks of oversupply



RapidSX™ CDP Timeline



RapidSX™

US Defense Production Act, Title III

The **US Defense Production Act (DPA Title III)** is the President's primary authority to ensure the timely availability of private-sector resources for national defence

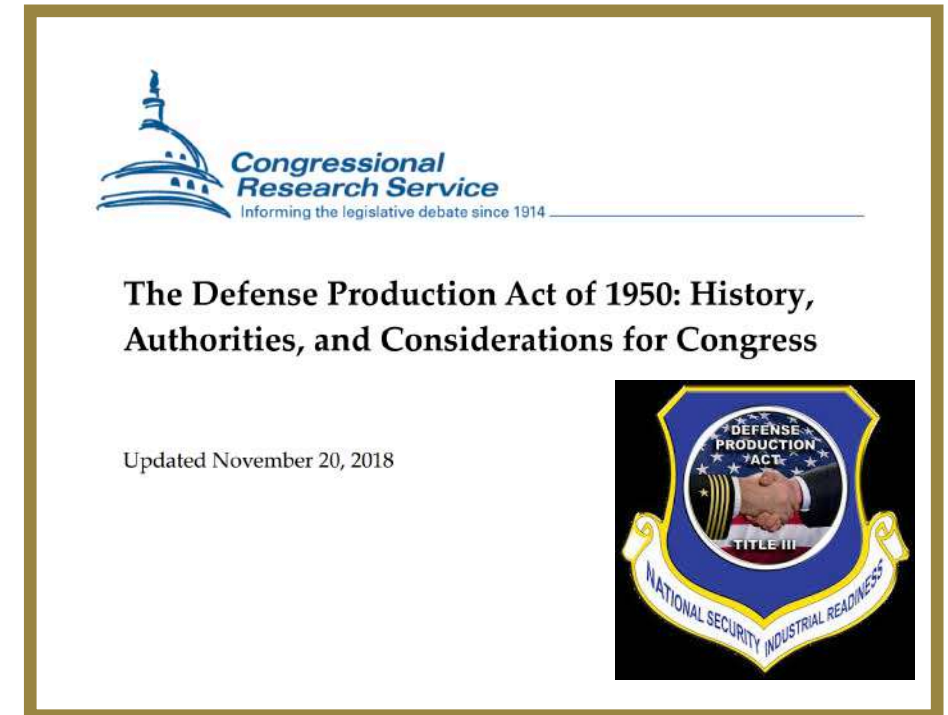
DPA Title III provides unique economic authorities to mitigate industrial-base shortfalls and expand US production capabilities to promote national defence

Objectives include:

- Expanding and sustaining production capacity
- Ensuring US Government access to technology and resources
- Ensuring long-term commercial viability

DPA Title III requires the President to make one or more Determinations in order to authorise the US government to invest directly into privately owned manufacturing capabilities

In July 2019, President Trump issued five Presidential Determinations pertaining to US downstream REE production



*The US Industrial Base is a critical element of the economic and military power of the USA.
The 2019 budget for the US DoD is >\$693B*

US Defense Production Act, Title III

The five Presidential Determinations proclaimed **domestic REE processing capabilities** are essential to national defence and addressed:

- **HREE Separation ***
- **LREE Separation ***
- REE Metals & Alloys
- NdFeB Magnets
- SmCo Magnets

* *The RapidSX™ technology is a proven, low-cost solution to both HREE & LREE separation*

Presidential Documents

Presidential Determination No. 2019-18 of July 22, 2019

Presidential Determination Pursuant to Section 303 of the Defense Production Act of 1950, as Amended

Memorandum for the Secretary of Defense

By the authority vested in me as President by the Constitution and the laws of the United States of America, including section 303 of the Defense Production Act of 1950, as amended (the "Act") (50 U.S.C. 4533), I hereby determine, pursuant to section 303(a)(5) of the Act, that the domestic production capability for Rare Earth Metals and Alloys is essential to the national defense.

Without Presidential action under section 303 of the Act, United States industry cannot reasonably be expected to provide the production capability for Rare Earth Metals and Alloys adequately and in a timely manner. Further, purchases, purchase commitments, or other action pursuant to section 303 of the Act are the most cost-effective, expedient, and practical alternative method for meeting the need for this critical capability.

You are authorized and directed to publish this memorandum in the *Federal Register*.



THE ECONOMY

Trump Issues Order to Spur Production of Rare-Earth Magnets

Trump invoked the 69-year-old Defense Production Act to remedy what he called "a shortfall" in production of the super-strong magnets made with rare-earth minerals neodymium and samarium.

Bloomberg | Jul 23, 2019



President Donald Trump on Monday ordered the U.S. Defense Department to spur the production of a slew of rare-earth magnets used in consumer electronics, military hardware and medical research, amid concerns China will restrict exports of the products.

US Defense Production Act, Title III

DPA Title III actions stimulate private investment in production resources by reducing the risks associated with the capital expenditures required to establish the needed US production capacity. The program executes projects ranging from process improvement to production plant construction

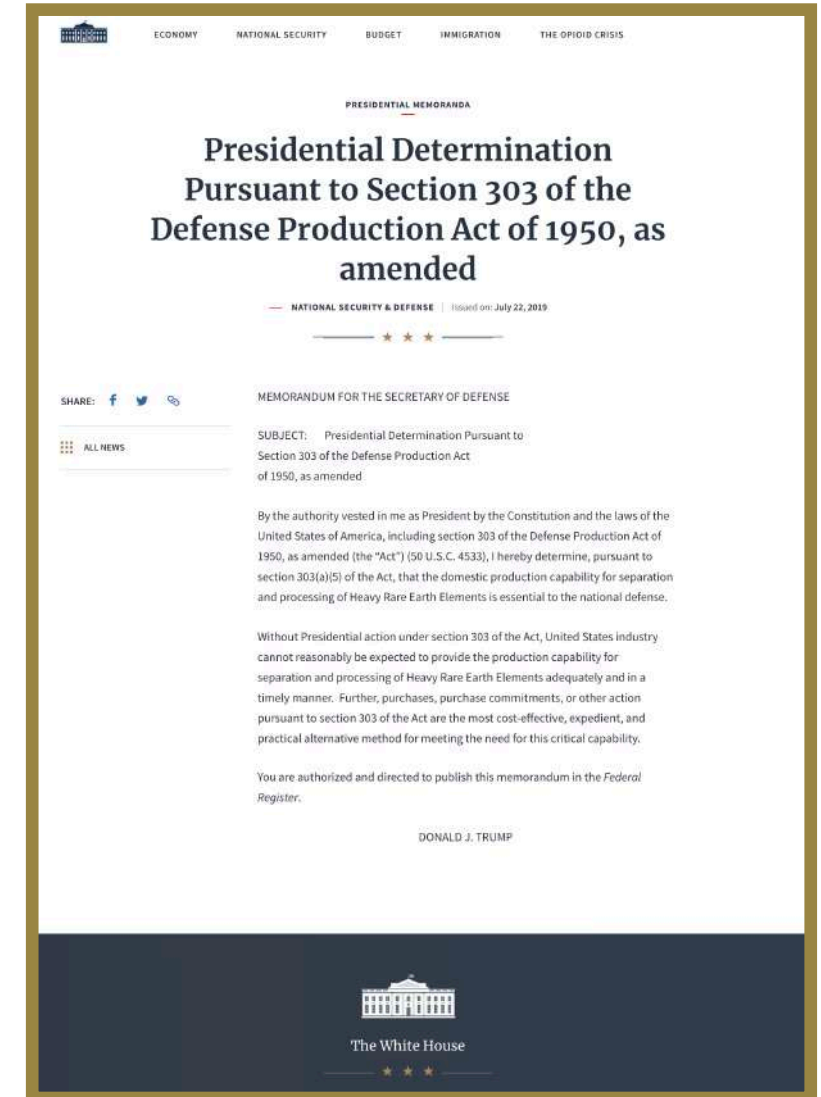
*“I hereby determine, pursuant to section 303(a)(5) of the Act, that the **domestic production capability** for **separation and processing** of **Heavy Rare Earth Elements** is **essential to the national defense**.”*

*“I hereby determine, pursuant to section 303(a)(5) of the Act, that the **domestic production capability** for **separation and processing** of **Light Rare Earth Elements** is **essential to the national defense**.”*

*“I hereby determine, pursuant to section 303(a)(5) of the Act, that the **domestic production capability** for **Neodymium Iron Boron Rare Earth Sintered Material** and **Permanent Magnets** is **essential to the national defense**.”*

*“I hereby determine, pursuant to section 303(a)(5) of the Act, that the **domestic production capability** for **Samarium Cobalt Rare Earth Permanent Magnets** is **essential to the national defense**.”*

Donald J. Trump
President of the United States of America
July 22, 2019



US Defense Production Act, Title III

In June 2019, the Defense Production Act Title III Office published a Request for Information (RFI) for “**Light and/or Heavy Rare Earth Element Separation and Processing Production Capability**”

“Specifically, the DPA Title III Program Office is interested in input regarding the feasibility and desirability of government support for development of domestic LREE and HREE refining, separation, and processing capacity”

Typically, an RFI leads to a Request for Proposals (RFP) for funding grants to finance efforts ranging from process improvement to production-plant construction

The contracting office was the US Air Force’s Air Force Research Laboratory (AFRL) in conjunction with Northrop Grumman

On July 12, 2019, the US DoD announced a \$5-billion grant program for the “Expansion of Domestic Production Capability and Capacity” through the DPA Title III and the AFRL

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U.S. AIR FORCE

Defense Production Act (DPA) Title III Light and/or Heavy Rare Earth Element Separation and Processing Production Capability
Solicitation Number: FA8650-19-S-5024
Agency: Department of the Air Force
Office: Air Force Materiel Command
Location: AFRL/PZL - WPAFB

Notice Details Packages Interested Vendors List

Original Synopsis
Jun 27, 2019
2:33 pm

[Return To Opportunities List](#)

Solicitation Number: FA8650-19-S-5024 Notice Type: Presolicitation

Synopsis:
Added: Jun 27, 2019 2:33 pm
Request for Information

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Defense Production Act Title III Program Technology Market Research for "Light and/or Heavy Rare Earth and Processing production Capability"

Type: Other (Draft RFPs/RFIs, Responses to Q) Posted Date: June 27, 2019

[LREE and HREE RFI.pdf](#) (130.26 Kb)
Description: RFI FA8650-19-S-5024 Defense P Title III Program Technology Market Research for Rare Earth Element Separation and Processing Capability

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FA8650-19-S-5024

Defense Production Act (DPA) Title III Program Technology Market Research

Light and/or Heavy Rare Earth Element Separation and Processing Production Capability

CONTRACTING OFFICE ADDRESS

Department of the Air Force, Air Force Research Laboratory (AFRL) – Wright Research Site, Manufacturing Technology Section, AFRL/RXKMT, Area B, Bldg 45, 2130 8th Street, Wright-Patterson AFB, OH, 45433-7541.

ADDITIONAL GENERAL INFORMATION

This is a Request for Information (RFI) only as defined in FAR 15.201(c) to obtain information about U.S. national security and critical infrastructure protection and restoration industrial base shortcomings, risks, and opportunities which may be addressed by investments made under provisions in Title III of the Defense Production Act. Of particular interest are the technical, manufacturing, business concerns and market barriers to establishing a viable business for the technologies of interest. This RFI is not a request for competitive proposals; therefore, responses to this notice are not considered offers and cannot be accepted by the Government to form a binding contract. Companies that respond will not be paid for the information submitted except as an allowable cost under other contracts as provided in FAR 31.205-18, "Bid and Proposal Costs." The government will be utilizing non-government personnel under this RFI. The role of these non-government personnel is to function as technical advisors to the Government reviewers. These non-Government personnel will have access to the information submitted in response to the RFI and will provide technical expertise and/or advice as required. All non-government personnel have Non-Disclosure Agreements on file with the Government. Contractors employing these individuals and supporting each project are identified below.

Contractor Support Company

Northrop Grumman Technology Services,
Global Logistics and Modernization (GLM)
4065 Col. Glenn Highway
Beavercreek, OH 45431

US Defense Production Act, Title III

IMC submitted a response to the RFI from the Defense Production Act Title III Office. In addition to answering the specific questions requested in the RFI, IMC proposed the commercialisation of the RapidSX™ technology

The DPA Title III program authorises the Federal Government to procure and install equipment within plants, factories, and other industrial facilities which are owned by private entities

During 2014 to 2016, IMC's Chairman and CEO, Dr. Gareth Hatch, served as Principal Investigator (PI) on a US\$2.9M DoD-funded development program for REEs, with US\$1.8M specifically awarded to IMC for work leading to the development of the RapidSX™ REE separation technology



Response to RFI FA8650-19-S-5024 on Light and / or Heavy Rare Earth Element Separation and Processing Production Capability

Submitted by Innovation Metals Corp.

A small business per NAICS Codes 325180 and 541715

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Submitted to:

Air Force Research Laboratory (AFRL/RXKMT)

Attn: Sarah Thompson

2130 Eighth Street, Building 45

Wright-Patterson AFB, OH 45433-7541

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US Senate & Congressional Support

Rubio Introduces Bill to Combat China's Rare Earth Monopoly, Boost U.S. Advanced Manufacturing

JUL 11 2019

Washington, D.C. — Today, U.S. Senator Marco Rubio (R-FL) will introduce the [RE-Coop 21st Century Manufacturing Act](#). The legislation would establish a privately funded, operated, and managed Rare Earth Refinery Cooperative responsible for coordinating the establishment of a fully integrated domestic rare earth value chain to serve U.S. national security interests and restore American competitiveness of critical advanced manufacturing industries.

“As the Chinese government and Communist Party aggressively subsidize and invest in their own economy at our expense, we must shift our policies to restore the competitiveness of critical American industries for the 21st century,” **Rubio said**. “Beijing’s mercantilist tactics have contributed to a market failure for the development of rare earth resources, both in the United States and around the world. Continued U.S. dependence on China for the mining and processing of rare earths and the manufacture of those metals into useful products is untenable — it threatens our national security, limits our economic productivity, and robs working-class Americans of future opportunities for dignified work.

“The *RE-Coop 21st Century Manufacturing Act* is a crucial ingredient for the resurgence of America’s advanced manufacturing sector by allowing domestic industries to regain competitiveness and break China’s control over the global rare earth value chain,” **Rubio continued**. “We can’t beat China by playing their game, which is why this bill harnesses the American cooperative model as a time-tested way to correct for failed markets without relying on heavy-handed federal intervention. We are in a geopolitical competition that will determine the future prosperity of our nation, and it is long overdue for the U.S. government to act like it in every phase of our work for the American people.”

TIPTON INTRODUCES BILL TO REDUCE AMERICA’S RELIANCE ON RARE EARTH MINERALS FROM CHINA

September 19, 2019 | Press Release

WASHINGTON, D.C. — Today, Representative Scott Tipton (CO-03) introduced a bill to make the United States more competitive with China when it comes to the processing of rare earth minerals. Tipton’s bill, the *Rare Earth Cooperative 21st Century Manufacturing Act* (H.R. 4410), would establish a federal cooperative that would allow for companies to process rare earth minerals they rely on for manufacturing. China is currently the world leader in the rare earth mineral processing market and has used its position as leverage during the U.S.-China trade negotiations.

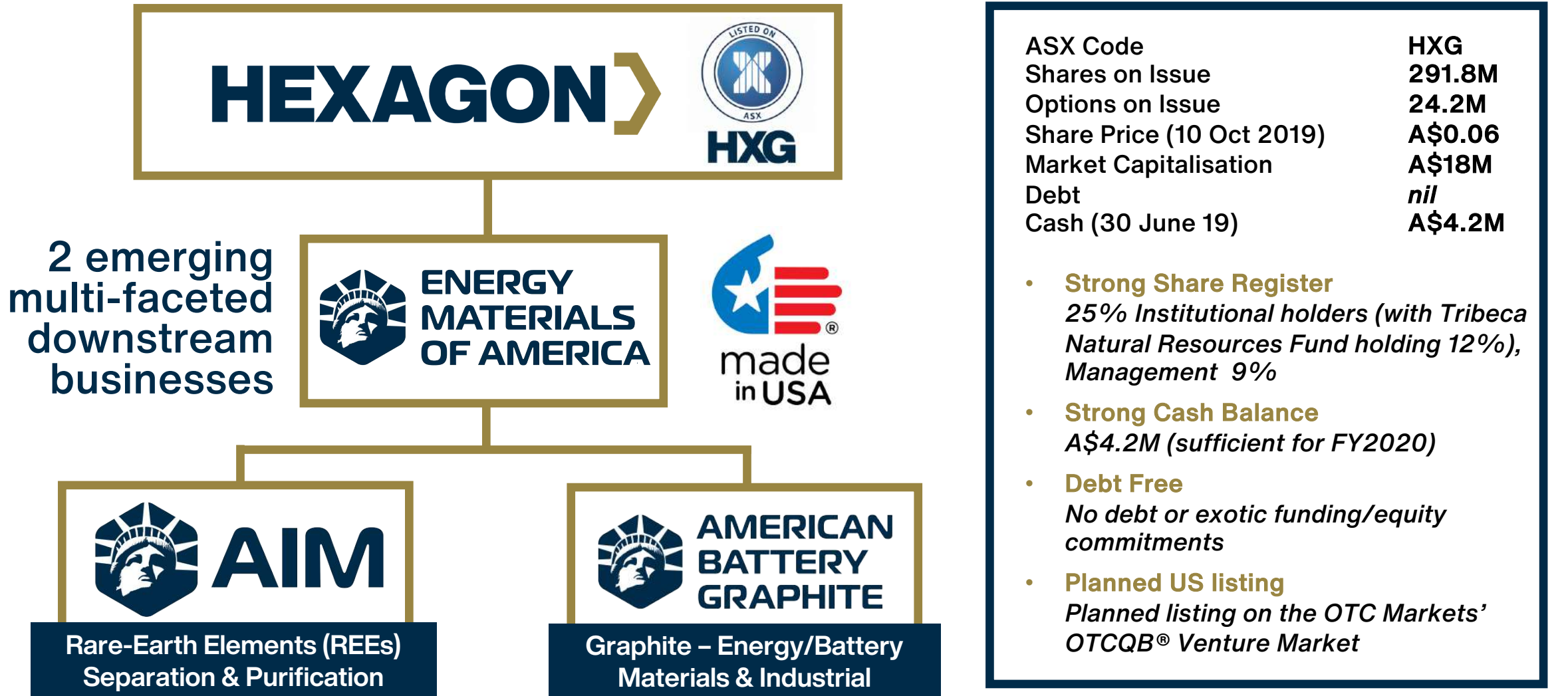
“From cell phones to medical equipment to solar panels, rare earth minerals are found in just about every piece of modern technology used by millions of Americans every day,” **said Tipton**. “China continues to manipulate American companies by practicing unfair trade tactics which has increased the United States’ economic and national security vulnerability, especially when it come to its reliance on rare earth minerals from China. This bill will help reverse that trend by empowering American companies to be more competitive with China, allowing them to responsibly extract and process the rare-earth minerals they rely on to manufacture their products. I look forward to continue advocating for the responsible development of energy resources and encourage my colleagues to act quickly to end this delicate situation.”

U.S. Senator Marco Rubio **introduced an identical Senate version** of the bill in July 2019.

“I thank Congressman Tipton for his leadership in the House on this important issue. As the Chinese government and Communist Party aggressively subsidize and invest in their own economy at our expense, we must shift our policies to restore the competitiveness of critical American industries for the 21st century. The *RE-Coop 21st Century Manufacturing Act* is a crucial ingredient for the resurgence of America’s advanced manufacturing sector by allowing domestic industries to regain competitiveness and break China’s control over the global rare earth value chain,” **Rubio said**. “We can’t beat China by playing their

***Rare Earth Cooperative 21st Century Manufacturing Act* Bill introduced by Sen. Marco Rubio (R-FL) and Rep. Scott Tipton (R-CO)**

Hexagon Overview



Energy Materials of America

Hexagon's US business vehicle



ENERGY MATERIALS OF AMERICA

Energy Materials of America, LLC (EMA) is the holding entity for Hexagon's two US-based energy-materials businesses:

- **Strong management and technical teams** — comprising US-based, UK and Australian executives with significant graphite, REE and technical-materials marketing experience
- EMA is a potential funding vehicle for Hexagon's US businesses
- Plan to list EMA on **NASDAQ/NYSE** as an independent US business

Energy Materials of America

Made-in-USA
Premium Energy Materials



DOWNSTREAM RARE-EARTH ELEMENTS

- Proven RapidSX™ REE separation & purification technology
- “Best-in-class” cost and performance efficiencies
- Successfully piloted; produced commercial-grade REOs with 99.5-99.97% purities
- US\$1.8M initial development funded by US Department of Defense’s Army Research Laboratory

RapidSX™

DOWNSTREAM GRAPHITE

Battery Graphite

- Comprehensive, go-to-market ‘Made-in-USA’ battery-graphite materials business, driven by leading ends users (*natural-flake, synthetic and blended battery-graphite products*)
- Suite of Tier-1 performance anode & cathode battery materials
- Utilising commercially available feedstocks, transformed via proven commercial technologies already approved/understood by end users
- Not reliant on upstream development activities

Energy & Industrial Graphite

- Diverse suite of specialised products

HEXAGON

Contact

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Neodymium (Nd) metal



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