

# DISRUPTING THE RARE EARTH SUPPLY CHAIN

January 2020

*+99.9% Neodymium (Nd) oxide*



**HXG**

**HEXAGON** 

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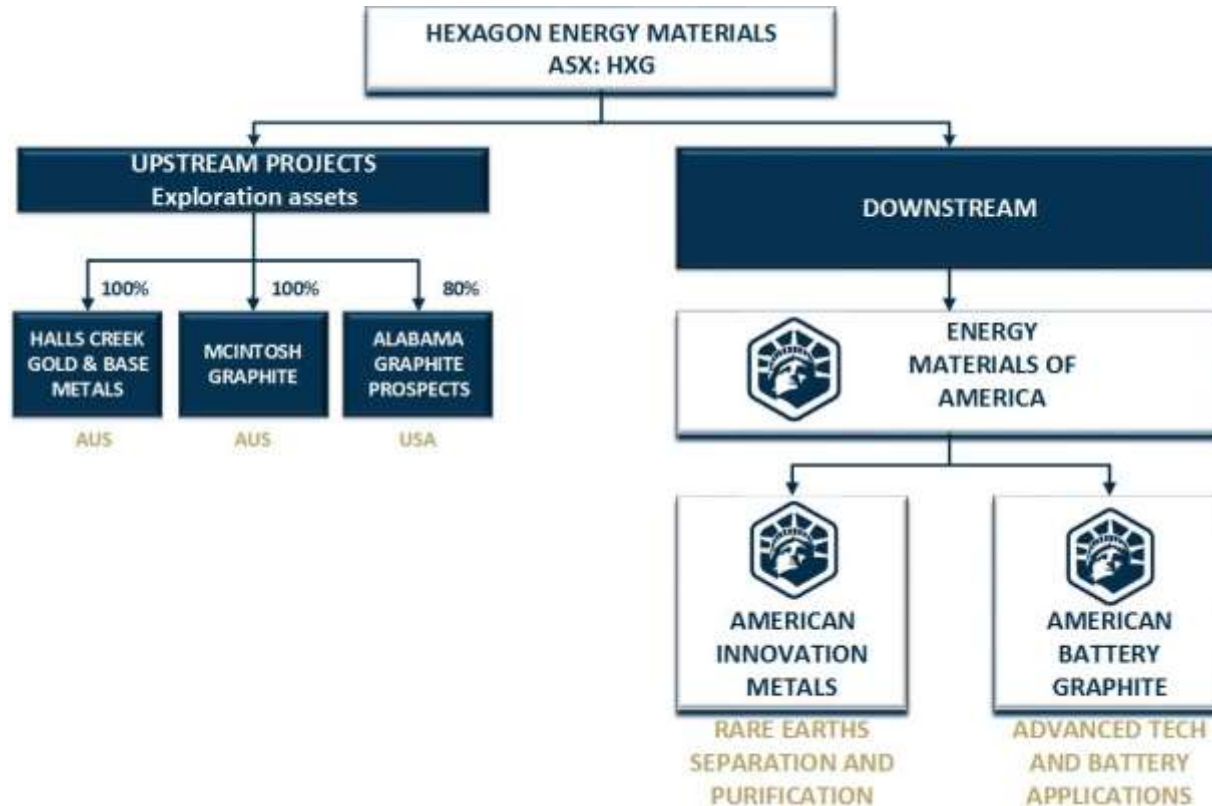
# HXG's Business Strategy

Hexagon is an energy-materials business initially focused on downstream processing of rare-earth elements (REEs):

- Disrupting & diversifying the global REEs supply-chain
- Lower OpEx & CapEx costs & faster down stream REEs processing
- Pathway to near-term sustainable cash generation
- Leveraging high-growth E-mobility & renewable energy sectors
- **North America; the right place, at the right time for 'energy materials'**

**Building a business on 'energy materials'** – which are essential to a renewable, sustainable, high-tech, low-carbon future

# Corporate Overview



ASX Code	HXG
Shares on Issue	291.8M
Options & Performance Rights	25.7M
Share Price (21 Jan 2020)	A\$0.06
Market Capitalisation	A\$18M
Debt	nil
Cash/Receivables (31/12/19)	A\$2.3M

## Strong Share Register

Tribeca Natural Resources Fund 12%  
Board & Management 9% \*

\*Fully-diluted basis



# An Experienced Team



Charles Whitfield  
Chairman

Formerly: Executive Director at lithium producer Galaxy Resources Ltd. Investment Banking – Citigroup & Deutsche Banks.

Mike Rosenstreich  
Managing Director

Formerly: Founding MD base / precious metals producer, Bass Metals. Banking – Rothschild. Mining and exploration, Homestake Gold & Dominion Mining.



Lianne Grove  
Commercial/ CFO

Extensive experience in project development. Formerly: Commercial management and financial control in Oil & Gas projects at AWE Ltd and Sea Trucks Group and mining experience at Rio Tinto.

Ty Dinwoodie  
CMO/US CEO

With extensive experience in both REEs and graphite, Mr. Dinwoodie previously served as President and Corporate Secretary of Alabama Graphite Corp.



Gareth Hatch  
Technical Advisor

Formerly: Founding Principal of Technology Metals Research and Director of Technology at Dexter Magnetic Technologies. Currently Chairman and CEO of Innovation Metals Corp.



# Downstream REEs Demand



Electric Vehicles  
(2kg REPM/EV)



Renewable Energy  
(3,000kg REPM /  
5 MW turbine)



Electronics  
(1-2g / device – currently 3  
billion devices)



Catalysts  
(Mainly Ce & La - linked  
to ICE fuels)



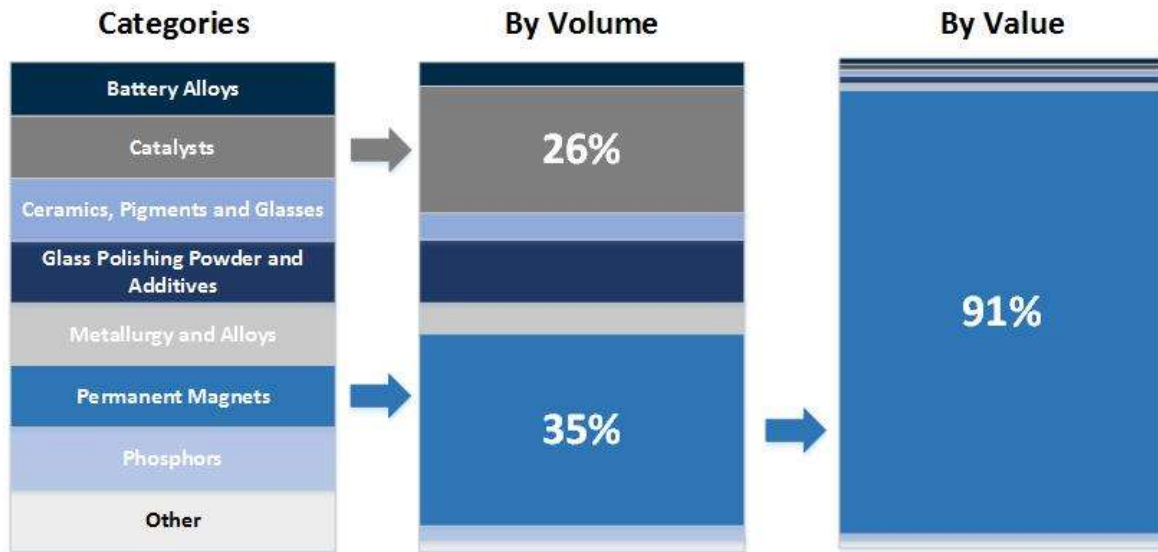
Defence & Aerospace  
(Topical, c.400-900kg / jet-  
fighter)

- Critical, non-substitutable inputs to high-tech, green-energy, e-mobility and defence applications
- REE Permanent Magnets (REPM) are the most significant and lucrative demand drivers for REE
- US government has prioritised REE/ REPM supply chain as a “strategic national priority”
- US Department of Defense has invited funding proposals for REE/ REPM technology projects – *demonstrates supply concerns*

# REE Value & Demand

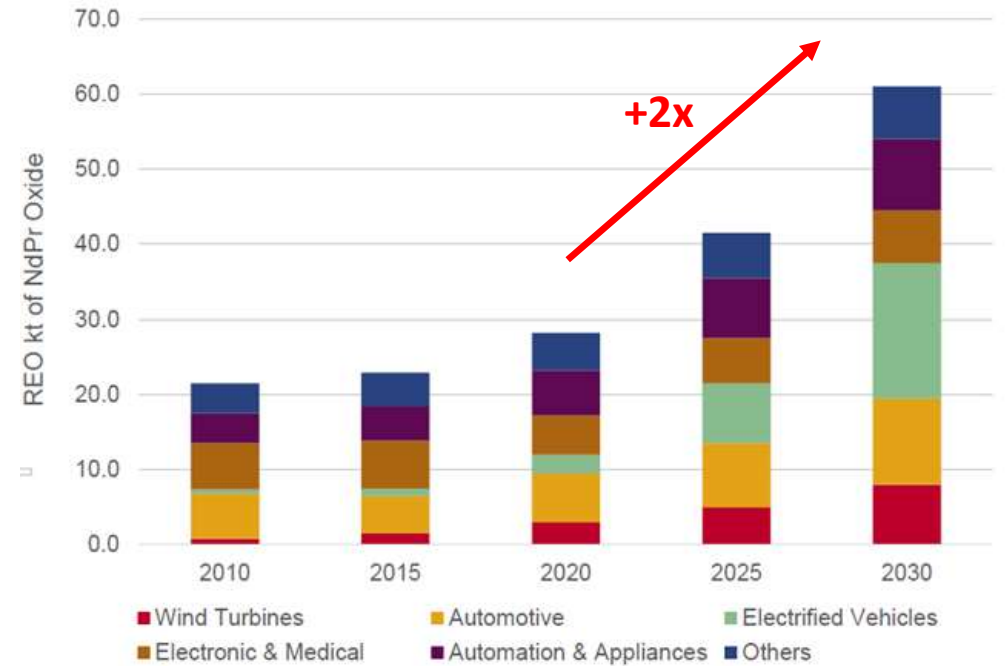
Light REE (LREE) rich deposits are more common than heavy REE (HREE) rich deposits

The REPM metals - Pr, Nd, Tb & Dy



Source: Adamas Intelligence

Global demand for fresh NdPr Oxide

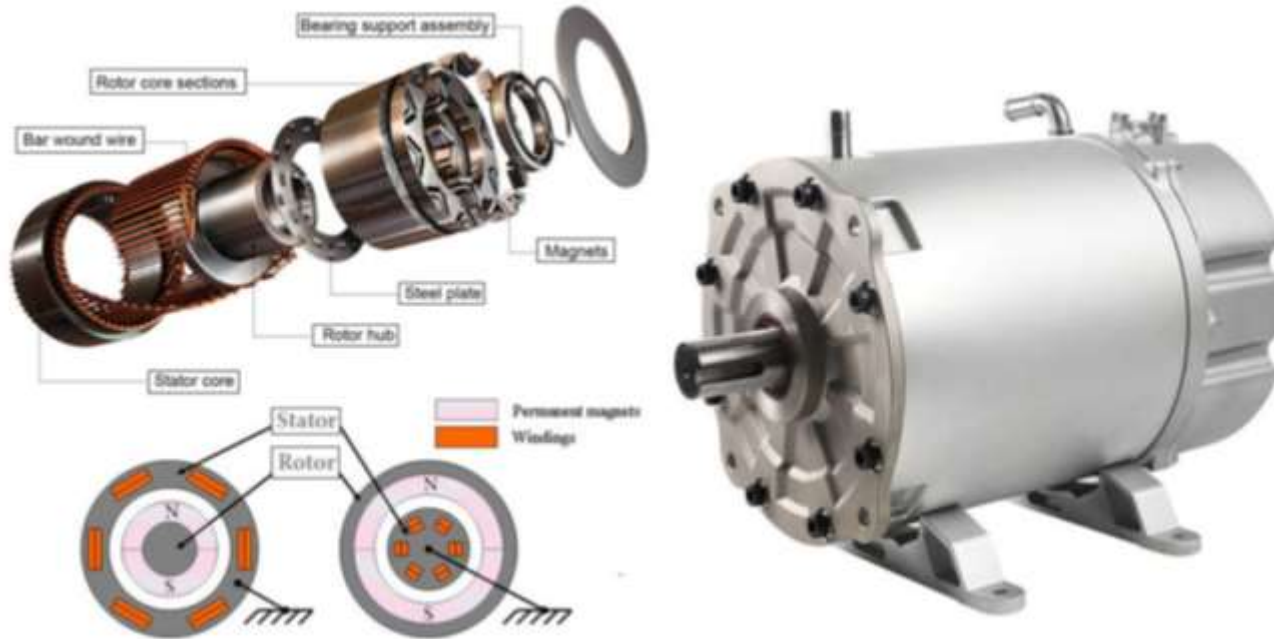


Source: Lynas

2x demand growth forecast for NdPr – the most common LREE magnet metals, for next 10 years

# Rare Earth Permanent Magnets (REPMs)

Permanent Magnet Synchronous Motor (PMSM)



PMSMs are:

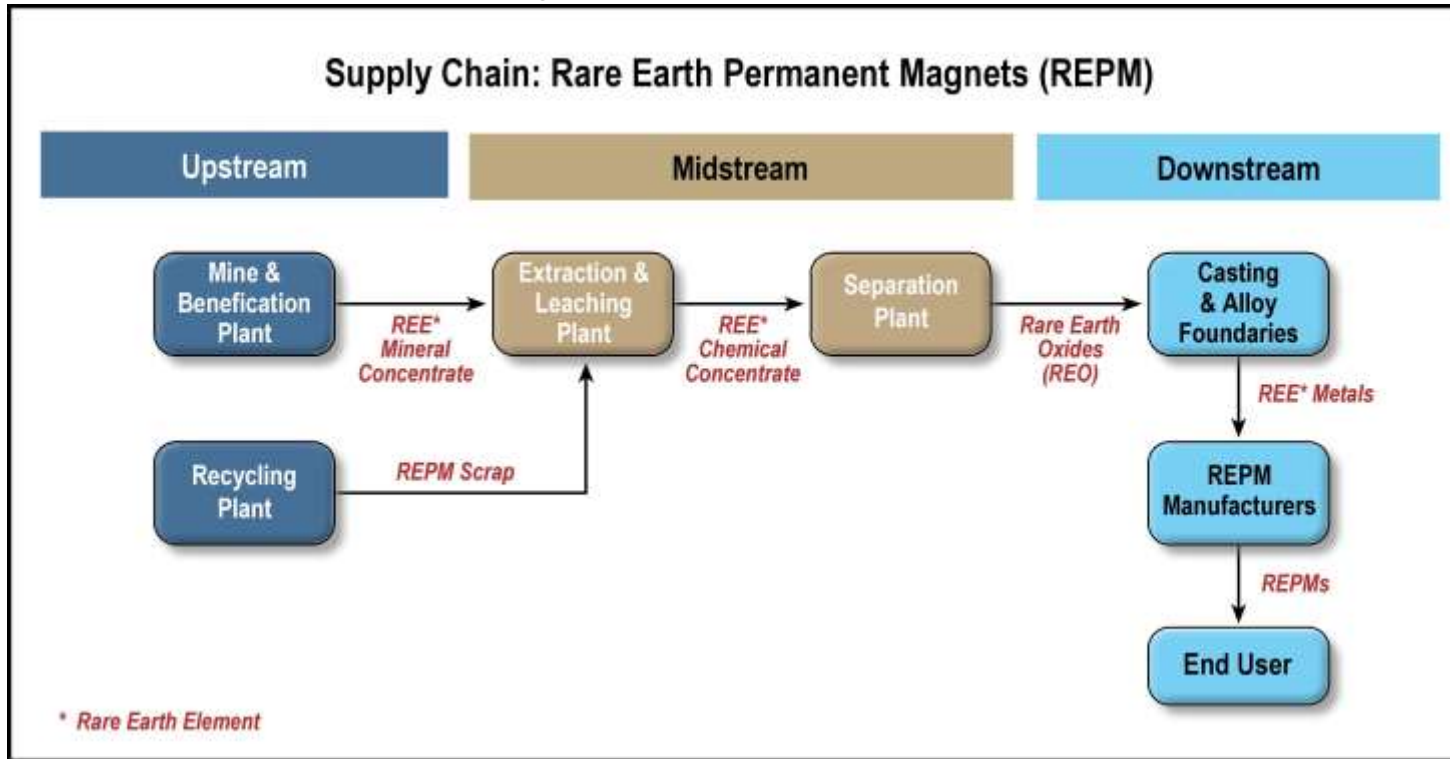
- The only electric motor with REPMs
- Used in +90% of all EVs made to date and increasing
- Up to 15% more efficient than induction electric motors, therefore they either:
  - ✓ EVs - Provide more power and range; or
  - ✓ Turbines - Generate more electricity





# REE Supply Chain – for REPMs

## Simplified REPM Supply Chain



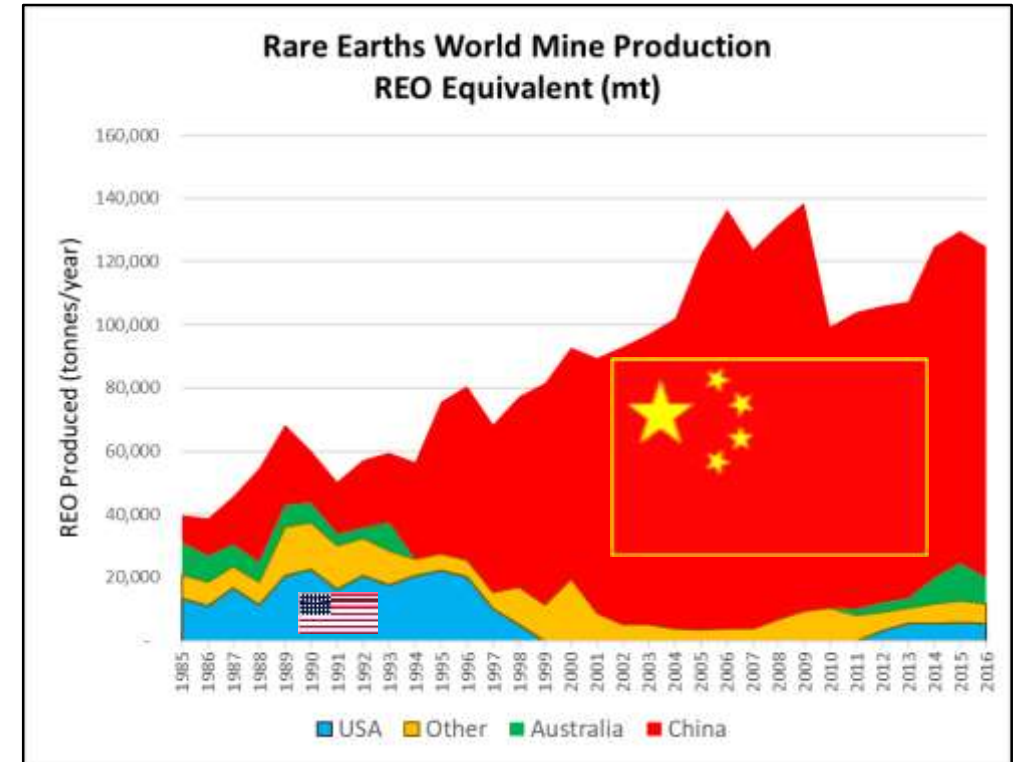
### Complex Processing

- REE are hard to separate – requires complex and expensive processing
- 100% of all REE separation is by conventional counter-current solvent extraction (SX)
- Separated products are converted into high-purity, high-value REE oxides (REOs)

Q. So what is the problem?

# A. China dominates the global REE market

- 70% of global REEs production
- 85% of global REOs production
- 95% of global REPM production
- Established, capital-**intensive** **conventional** SX REE separation plants
- **China has 'form' in REE price & supply manipulation**
- Makes China difficult to compete with



Data compiled by HXG - sourced from USGS & BAIINFO

Q. How can we diversify the REE supply chain?



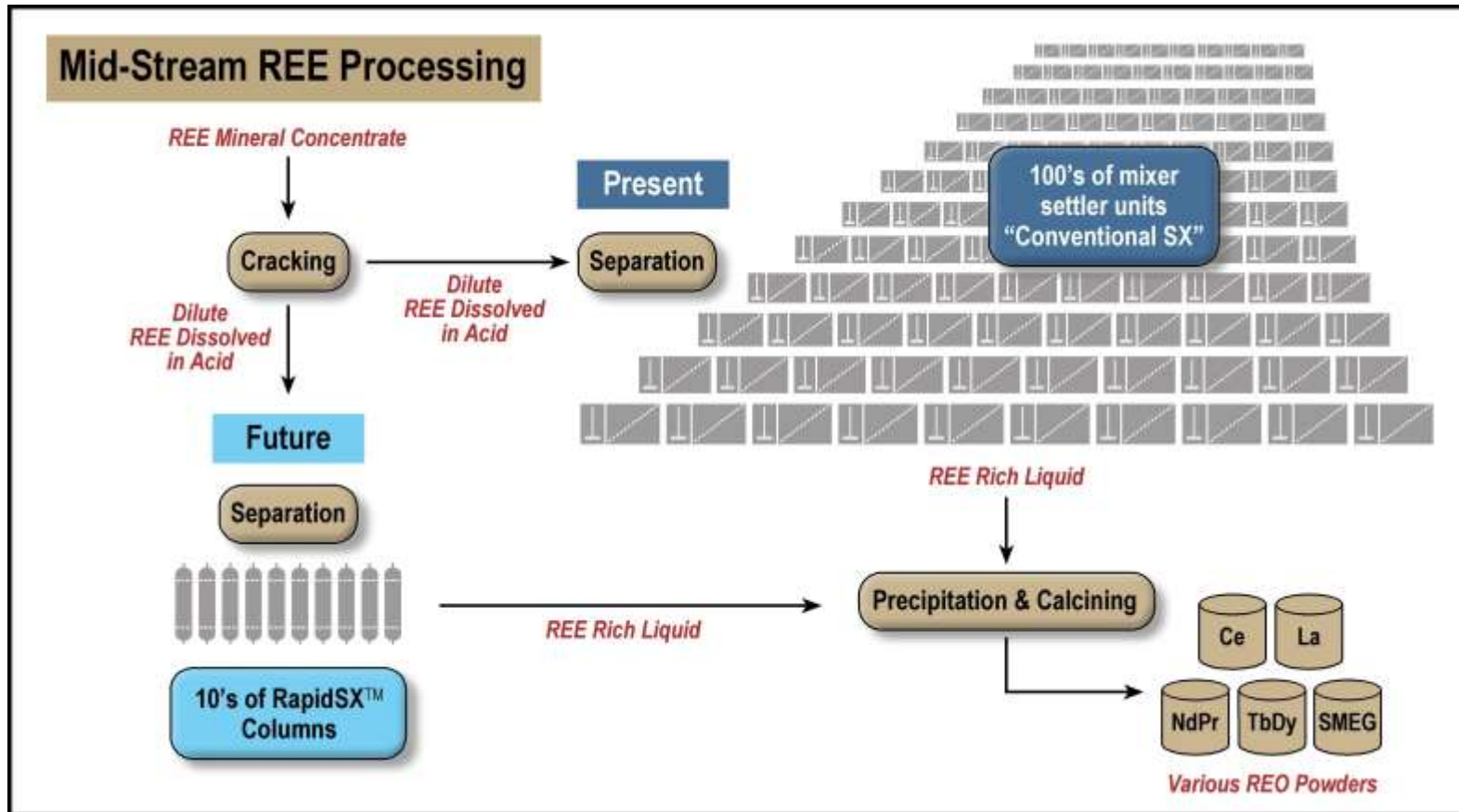


# A. RapidSX™

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



# Q. What choices do producers have?



Option 1 – “take a big hit”

Sells concentrates to China and loses c. 30-50% of the REE basket price value

Option 2 – “millions more debt/equity \$”

Spends 100's of millions of dollars on a conventional SX plant

OR

Option 3 – “no-brainer – RapidSX”

- Lower capital – less staging
- Lower OpEx
- Enhanced performance
- Cost competitive with China

**RapidSX™ – a disruptive force in REE, enabling producers to capture greater value**



# RapidSX™ - Proven Process

- Innovation Metals Corporation (IMC) successfully developed and piloted the **RapidSX™ process**
- **Same 'science' and chemistry as conventional SX** – but with modified media and liquid interaction to significantly accelerate the process
- Pilot testing facilitated by US\$1.8M funding from the US Department of Defense on LREE and HREE feedstocks
- **Successful piloting of RapidSX™ REE separation demonstrated fast and cost-effective production of REOs**



# AIM

# American Innovation Metals (AIM)

AIM is a jointly owned entity to commercialise the RapidSX™ technology



## Hexagon will acquire a 49% interest in RapidSX™ for REE separation through AIM

- Investment is US\$6.0M, comprising:
  - ✓ US\$2.0M to build a Commercial Demonstration Plant (CDP) within 12 months
  - ✓ US\$4.0M deferred payments, payable through Hexagon's share of future AIM cash flows
- Hexagon will contribute commercial and marketing skills, identify/secure feedstocks, generate RapidSX™ licencing opportunities, and sales/offtakes for REOs produced

# 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	Hours/Days	Several Weeks
CAPEX		
Equipment Cost	60-70% Saving	High
Separation Staging	90% Reduction	Very High
OPEX		
Metal Inventory/WIP	Low	High
Organic Volumes	Low	High
Labour	Low	High
Power Consumption	Low	High

## Increased Separation Kinetics

Reduced metal residence time

## Low CAPEX

Considerably reduced footprint

## Low OPEX

Significantly reduced separation times

<\$2/kg for LREOs and <\$12/kg for HREOs\*

## Commercially Available

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

## Scalable & Modular

Process lines are modular and scalable

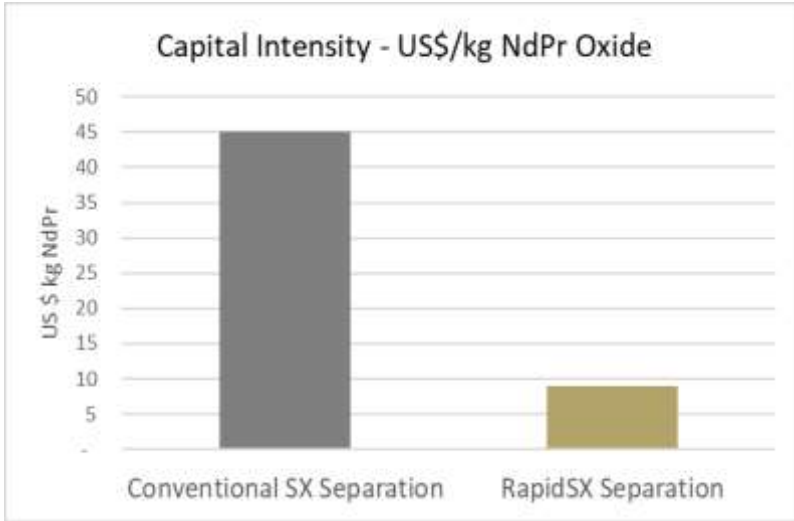
\* From Pilot Testwork



# RapidSX vs Conventional SX

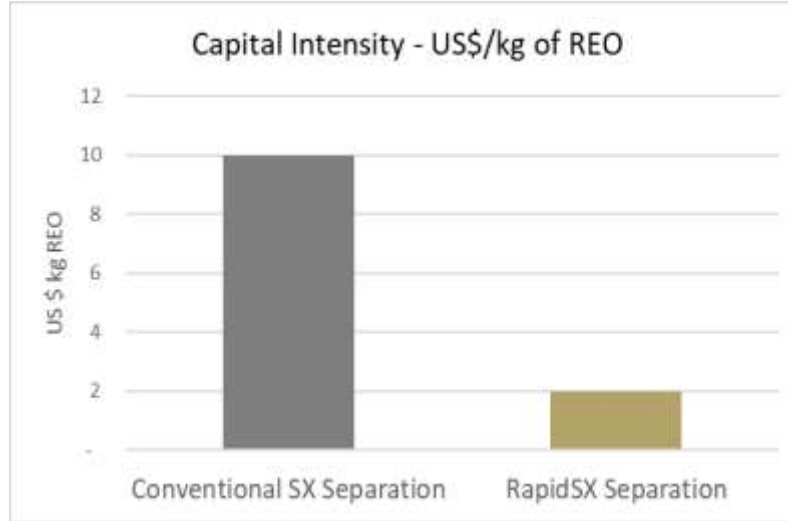
For a “typical\*” LREE feedstock type:

Capital Intensity – US\$/kg NdPr



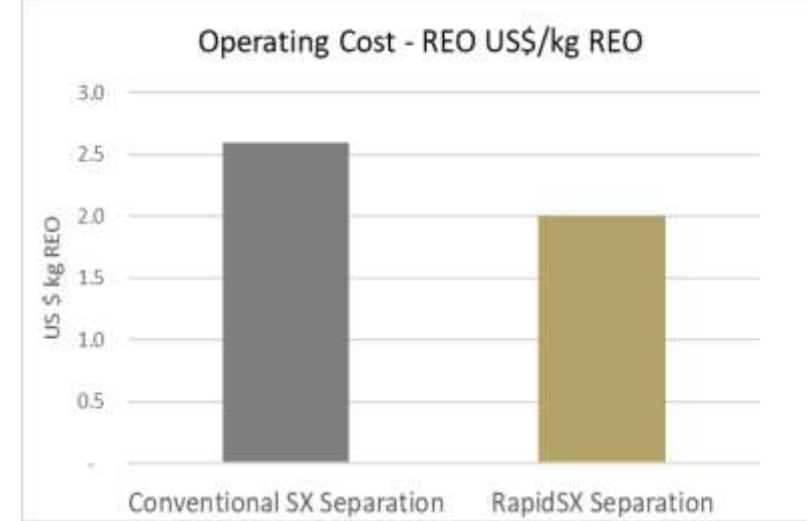
+60-70%  
CapEx Saving

Capital Intensity – US\$/kg REO



+60-80%  
CapEx Saving

Operating Costs – US\$/kg REO



+15-20%  
OpEx Saving

CapEx - **10's of millions \$ saved per project**

*Potentially greater savings for HREE deposits which require more processing*

OpEx – millions \$ saved per project/year



\*Based on compilation of public data from producing and advanced stage projects and IMC data.



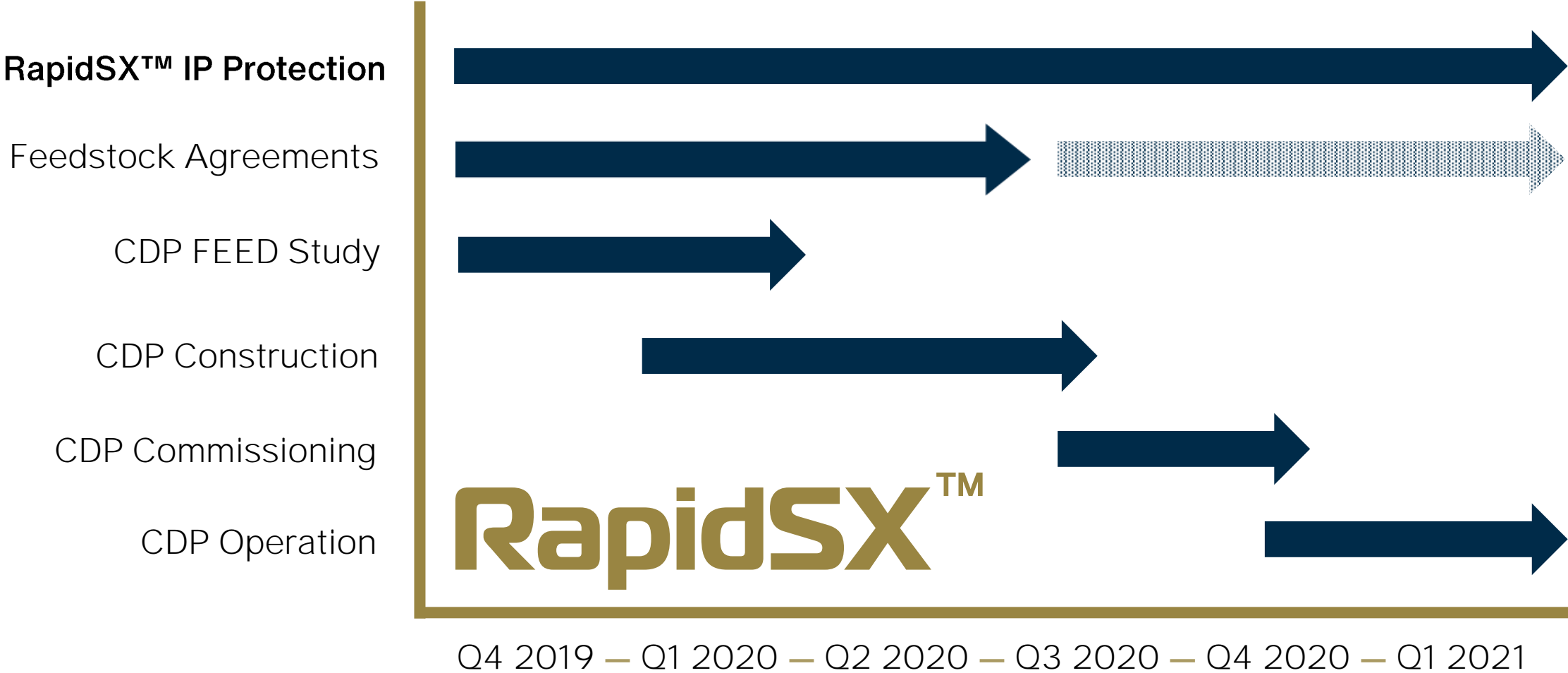


# AIM Business Strategy

## RapidSX™ commercialisation pathway:

- The value to Customers
  - ✓ Greater REE value capture: 30-50% of basket price by selling refined REOs not mineral concentrates
  - ✓ Enables on-site separation – lower CapEx and OpEx as well as operational control
- New Customers – access to CDP is a major de-risking step
  - ✓ CDP operational in Mississauga, Ontario by Q4 2020, Planned capacity of 6,000–8,500 kg/month of separated REOs
  - ✓ **Will provide clients operating data and samples for customer testing, at clients' cost**
  - ✓ After start-up CapEx – the CDP will be largely self funding
- Revenue
  - ✓ **RapidSX™ Technology Licencing Fees** – based on leverage to CapEx and OpEx savings
  - ✓ Fees – **combination of 'front-end' and ongoing Sales** – linked payments
  - ✓ Opportunity to build and operate separation plant to produce REOs for sale

# RapidSX™ CDP Timeline



# HXG – Next Steps

- Execute Technical Services Agreements with new customers
- Lodge patent applications
- Appoint FEED Study Engineers for Commercial Demonstration Plant
- Establish AIM JV entity
- Finalise funding HXG/EMA level
- Increased focus on investor communications

# Contact

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# Next-Generation Energy Materials Start Here

*Neodymium (Nd) metal*

[www.hxenergymaterials.com](http://www.hxenergymaterials.com)