ionic
rare earths

ASX: IXR | FSE: 6UH

# Sustainably Sourcing Magnet and Heavy Rare Earths for the New Economy

**JP Morgan Rare Earths Forum**

**18 November 2024**

# Cautionary Statement

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Information in this report that relates to previously reported Exploration Targets and Exploration Results has been crossed-referenced in this report to the date that it was originally reported to ASX. Ionic Rare Earths Limited confirms that it is not aware of any new information or data that materially affects information included in the relevant market announcements.

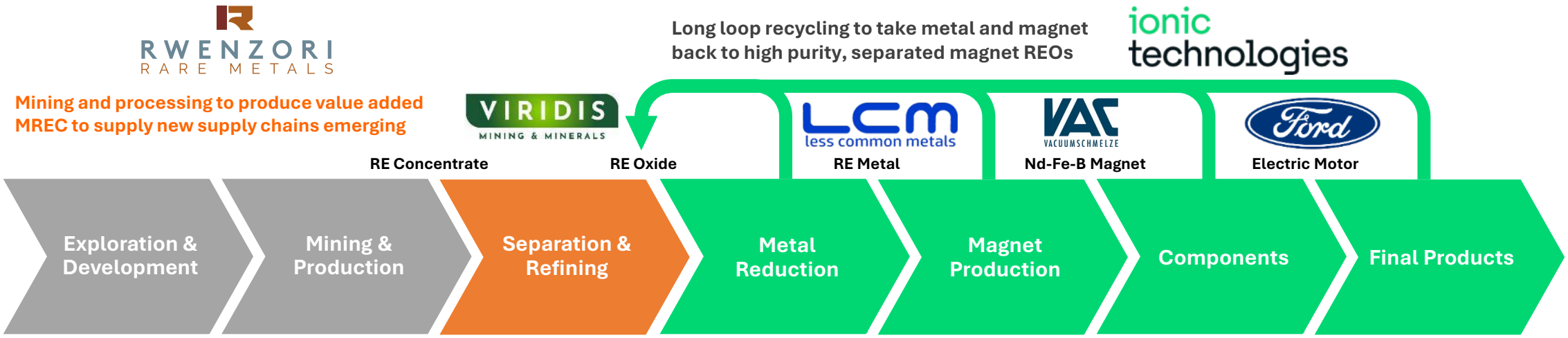
The information in this report that relates to Mineral Resources for the Makuutu Rare Earths deposit was first released to the ASX on 15 May 2024 and is available to view on www.asx.com.au. Ionic Rare Earths Limited confirms that it is not aware of any new information or data that materially affects information included in the relevant market announcement, and that all material assumptions and technical parameters underpinning the estimates in the announcement continue to apply and have not materially changed.

The information in this report that relates to Ore Reserves for the Makuutu Rare Earths deposit was first released to the ASX on 20 March 2023 and is available to view on www.asx.com.au. Ionic Rare Earths Limited confirms that it is not aware of any new information or data that materially affects information included in the relevant market announcement, and that all material assumptions and technical parameters underpinning the estimates in the announcement continue to apply and have not materially changed.

The information in this report that relates to Production Targets or forecast financial information derived from production the production target for the Makuutu Rare Earths deposit was first released to the ASX on 20 March 2023 and is available to view on www.asx.com.au. Ionic Rare Earths Limited confirms that all material assumptions and technical parameters underpinning the Production Targets or forecast financial estimates in the announcement continue to apply and have not materially changed.

# REE Supply Chain and IonicRE Integration

**IONICRE IS LEADING THE SECURE SUPPLY OF MAGNET RARE EARTHS, LEVERAGING OUR SUSTAINABLE TECHNOLOGY, PIONEERING MAGNET RECYCLING TO DRIVE THE NEXT GENERATION OF WIND TURBINES, ELECTRONIC VEHICLES, DEFENCE, AND ADVANCED MANUFACTURING**




## Makuutu Rare Earths Project (60% IonicRE → 94% IonicRE in H2 2024)

- March 2023 FS[1] indicated low capital, modular development IAC enables IonicRE to bring on highly sought-after, value added MREC basket of magnet and heavy REEs
- Mining Licence LML00334 Awarded[2], Environmental Permits issued[3]
- Demonstration Plant has produced MREC – offtake negotiations underway
- Expandable asset through free cash flow and growing market demand

## IonicRE/ VMM Refinery (50% IonicRE)

- 50/50 JV with Viridis Mining & Minerals Ltd (ASX: VMM) to develop refining and recycling footprint in Brazil[4]
- Leveraging Ionic Technologies IP to be an early mover and first step towards establishing greater presence in emerging Brazilian rare earth market
- Signed MOU[5] with CIT SENAI to accelerate NdFeB magnet capacity in Brazil via magnet recycling

## Magnet Recycling (100% IonicRE)

- November 2024 FS[4] indicates low capex development to recycle spent magnets and swarf to produce separated and refined 99.9%+ REOs
- Demonstration Plant operating – Magnet REO production now (Nd, Pr, Dy and Tb)
- Addressing domestic supply chain / sovereign capability need with global opportunities, focus on EU and US
- First to revenue, supply independent of mine permitting, lower capital and technical, and supply chain risk
- Several JVs and partnerships on the table



1. ASX 20th March 2023. 2. ASX 18th January 2024. 3. 27th October 2023. 4. ASX 3rd April 2024. 5. ASX 6th November 2024. ASX 18TH November 2024.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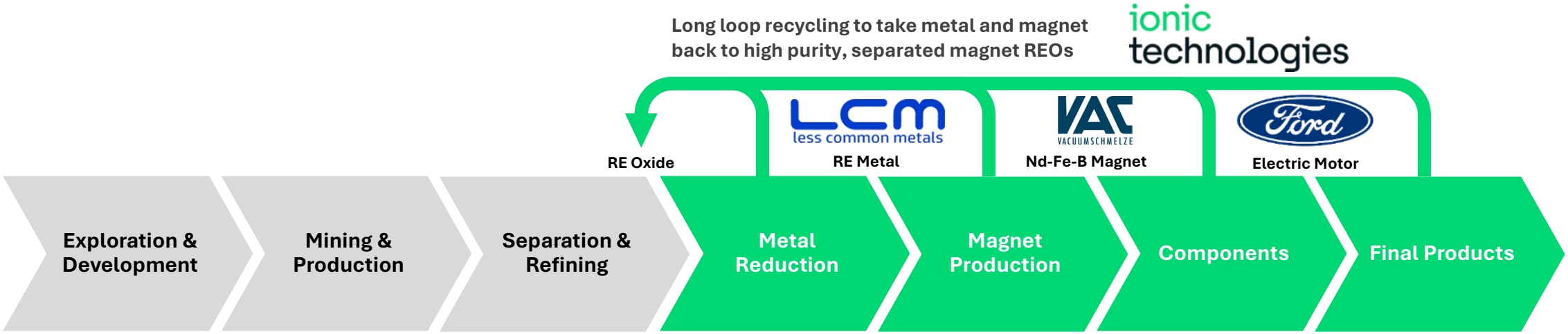
## Leading Magnet Recycling and the Circular Economy of Rare Earths

Belfast now first producer of recycled magnet REOs in Western world

# Recycling Supply Chain and IonicRE Integration an early leader

**IONICRE IS LEADING THE SECURE SUPPLY OF MAGNET RARE EARTHS, LEVERAGING OUR SUSTAINABLE TECHNOLOGY, PIONEERING MAGNET RECYCLING TO DRIVE THE NEXT GENERATION OF WIND TURBINES, ELECTRONIC VEHICLES, DEFENCE, AND ADVANCED MANUFACTURING VIA EXISTING CAPACITY IN THE RARE EARTH SUPPLY CHAIN**

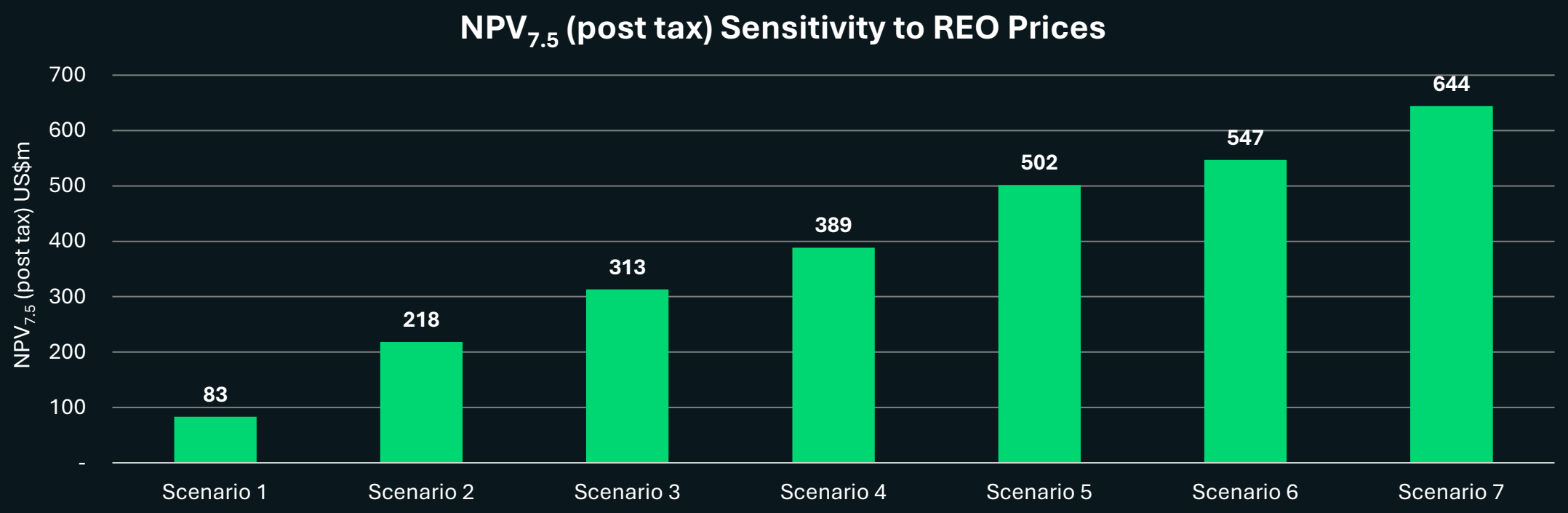



**Ionic Technologies Belfast Magnet Recycling Feasibility Study[1] designed for 1,200 tpa end-of-life (EOL) NdFeB magnet and swarf feedstock, producing 400 tpa separated magnet REOs**

- **$NPV_{7.5}$ (post-tax) = US$502 million**
- **IRR (post-tax) = 43.6%**
- **Net Revenue = US$2.12 billion**
- **EBITDA = US$1.78 billion**
- **CAPEX (Belfast) = US$108.7 million**
- **OPEX (Belfast) = US$27.68 / kg REO (ex-Magnet feedstock)**
- **Payback = 2.4 years**

1. ASX 18TH November 2024.

# REO Price Sensitivity




| REO Pricing | $NPV_{7.5}$ (post tax) | Average Project Life REO Prices (US$ / kg) | | | |
|---|---|---|---|---|---|
| Scenario | US$m | $Nd_2O_3$ | $Pr_6O_{11}$ | $Dy_2O_3$ | $Tb_4O_7$ |
| **Scenario 1 (REO spot)** | 83 | 61 | 61 | 248 | 842 |
| **Scenario 2** | 218 | 90 | 90 | 400 | 1,200 |
| **Scenario 3** | 313 | 120 | 120 | 400 | 1,500 |
| **Scenario 4** | 389 | 133 | 131 | 492 | 1,758 |
| **Scenario 5** | 502 | 160 | 159 | 618 | 1,958 |
| **Scenario 6** | 547 | 181 | 172 | 549 | 1,745 |
| **Scenario 7** | 644 | 212 | 201 | 615 | 1,955 |

# Ionic Technologies Process Flowsheet

Ionic Technologies has developed separation and refining technology that can be applied to the recycling and refining of individual magnet rare earths from used permanent (NdFeB) magnets.

Our hydrometallurgical process is able to deliver high purity separated magnet rare earth oxides no matter the quality and variability in composition of magnet feedstock.

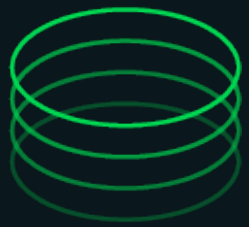
Magnet crushing / grinding

Digestion

Separate base metals (Fe, Mn, Al, Ni, Cu, B)

## Intake flexibility

Unlike other recycling processes, our technology can recycle any form of mixed waste magnets and production swarf regardless of type, age or coatings. We are not reliant on a single feedstock stream.



Nd, Pr, Dy, Tb solvent separation (15 stages)

Individual oxides precipitation

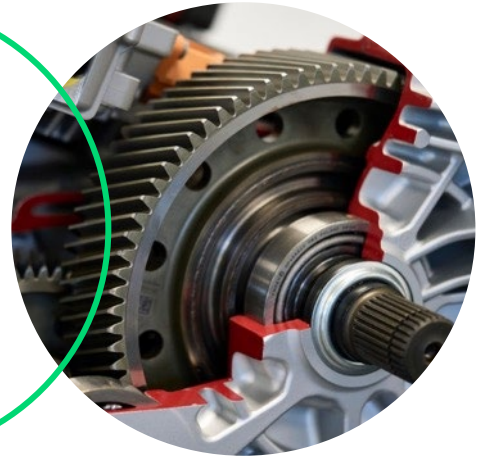
# Upcycling Neodymium Permanent (NdFeB) Magnets

## Commercialising recycling of End-of-Life (EOL) NdFeB magnets and swarf to high purity magnet REOs

Mixed grades of waste permanent magnets and swarf from existing metal, alloy and magnet manufacturing

Recycled separated high purity (>99.5%) grade magnet REOs

- ✓ $Nd_2O_3$
- ✓ $Pr_6O_{11}$
- ✓ $(NdPr)_2O_3$
- ✓ $Dy_2O_3$
- ✓ $Tb_4O_7$
- ✓ $Ho_2O_3$



High spec permanent magnets for net zero carbon technologies such as EV motors and off-shore wind turbines

# Policy Supporting Domestic Capability & Recycling

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UK refreshed the Critical Minerals Strategy in 2023 highlighting the Circular Critical Materials Supply Chains as a key area of focus

EU's Critical Raw Material Act (CRMA) 2023, a €300 billion initiative aimed at countering the Chinese Belt and Road Initiative implemented into law earlier this year

- The Act identifies a list of strategic raw materials crucial to Europe's green and digital ambitions and for defence and space applications
- In late 2023, the co-legislators reached a political agreement on the EU CRMA and increased the recycling component from 15% to 25%

USA highlighted recycling as art of its America's Supply Chains Executive order in 2021 as part of Federal Plan to ensure secure and reliable supplies of critical minerals

EU CRMA 2023 Regulation sets clear benchmarks for domestic capacities along the **strategic raw material supply chain** and to diversify EU supply by 2030:

At least **10%** of the EU's annual consumption for extraction

At least **40%** of the EU's annual consumption for processing

At least **25%** of the EU's annual consumption from recycling

Not more than **65%** of the EU annual consumption at any stage of processing from a single third country

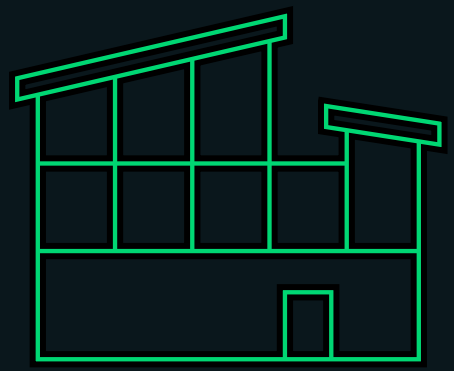
# Our Path to Commercialisation

## Rapid acceleration of our technology ready to scale globally

Scale Up Factor

20x

40x



| Lab scale | Pilot scale | Demonstration scale | Commercial scale |
|---|---|---|---|
| April 2022 | July 2022 | 2023 / 2024<br>Demonstration Plant @ 24/7 plant operations<br>Full program for next 18 months<br>Examining de-bottlenecking to scale up capacity now<br>FS Completed | Funding discussions underway<br>Planned Construction expected to be completed late 2026<br>FS to support scale out globally via JVs and commercial partnerships |

# Ionic Technologies TRL Status

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| | | |
|---|---|---|
| **TRL 1** | **Basic Research:** Initial s**cientific research has been conducted. Principles are qualitatively postulated and observed. Focus is on new discovery rather than applications.** | ✓ |
| **TRL 2** | **Applied Research:** Initial practical applications are identified. Potential of material or process to solve a problem, satisfy a need, or find application is confirmed. | ✓ |
| **TRL 3** | **Critical Function or Proof of Concept Established:** Applied research advances and early-stage development begins. Studies and laboratory measurements validate analytical predictions of separate elements of the technology. | ✓ |
| **TRL 4** | **Lab Testing/Validation of Alpha Prototype Component / Process:** Design, development and lab testing of components/processes. Results provide evidence that performance targets may be attainable based on projected or modeled systems. | ✓ |
| **TRL 5** | **Laboratory Testing of Integrated / Semi-Integrated System:** System Component and/or process validation is achieved in a relevant environment. | ✓ |
| **TRL 6** | **Prototype System Verified:** System/process prototype demonstration in an operational environment (beta prototype system level). | ✓ |
| **TRL 7** | **Integrated Pilot System Demonstrated:** System/process prototype demonstration in an operational environment (integrated pilot system level). | ✓ |
| **TRL 8** | **System Incorporated in Commercial Design:** Actual system/process completed and qualified through test and demonstration (pre-commercial demonstration). | **Ongoing** |
| **TRL 9** | **System Proven and Ready for Full Commercial Deployment:** Actual system proven through successful operations in operating environment, and ready for full commercial deployment. | |

# Peer Comparison

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| | Product | Location | Status | Demonstration Plant Feed Capacity (tpa) | Valuation |
|---|---|---|---|---|---|
| ionic technologies | Separated magnet REOs |  | Demonstration Plant, Feasibility Study Completed | 30 | A$44m / US$29m (ASX: IXR) |
| Cyclic Materials™ | Mixed magnet REOs |  | Demonstration Plant | 100 | Private<br>Series B Funding raised US$53m (09/2024)<br>Series A Funding raised US$27m (04/2023) |
| REEcycle | REOs (Formates) |  | Pilot Plant | N/A | Private<br>US$25m |
| Re ELEMENT | Separated magnet REOs |  | Pilot Plant | N/A | US$79m (NASDAQ: AREC) |

# Viridion – Brazilian Joint Venture – Refining and Recycling

- IonicRE and Viridis Mining and Minerals Ltd (ASX: VMM) announced 50/50 JV[1]
- Viridion JV aims to construct a refinery and magnet recycling facility in Brazil utilising Ionic Technologies' separation technology
- IonicRE will supply separation technology expertise to ensure successful commercial operation for the JV
- Magnet Recycling likely the first step in developing a domestic integrated supply chain in Brazil → MOU signed[2] with CIT Senai, FIEMG TO ESTABLISH to progress establishment of secure Brazilian Magnet supply chain
- Ongoing discussions with Brazilian government agencies for accelerated approvals process, leveraging access to government funding support
- JV cements IonicRE as an industry first leader on a path to REE production and supply
- Viridis' Colossus Rare Earth Project ("Colossus"), located in Poços de Caldas, Brazil, is potentially a major high grade IAC deposit
- Viridis agrees to supply mixed rare earth carbonate (MREC) processed from the Colossus Project on standard market terms; no offtake as yet

ionic rare earths — 50%

VIRIDIS MINING & MINERALS — 50%

JV Company

- Magnet and Heavy Rare Earth Refinery
- Magnet Recycling Facility
- Further integration into Brazilian RE footprint

1. ASX 3rd April 2024;
2. ASX 6th November 2024.

# Corporate Snapshot

**ASX: IXR | FSE: 6UH**

| Share Price | Market Capitalisation | Shares on Issue | Options / Rights | Cash Position | 12-months (min – max) |
|---|---|---|---|---|---|
| A$0.009 | A$44m | 4,869,762,647 | 508,007,690 | A$0.7m | A$0.005–A$0.029 |
| 15 November 2024 | 15 November 2024 | 15 November 2024 | Exercisable at 2.0 to 6.4 cents | 30 September 2024 | |

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