



ASX Announcement

19 March 2024

BOOST FOR LCM & FORD COLLABORATION AS IONIC TECHNOLOGIES PRODUCES HIGH PURITY TERBIUM OXIDE

- **Ionic Technologies delivers boost for collaboration with Ford and Less Common Metals, following successful separation of high purity terbium oxide (Tb_4O_7) at Belfast Pilot Plant;**
- **Production demonstrates advanced capability, and capacity to meet growing global demand for HREEs, with around 2.8 kg of Tb_4O_7 of greater than 99.5% purity produced from early production batches;**
- **The production of maiden high purity Tb_4O_7 samples are another first in the magnet recycling industry by Ionic Technologies;**
- **Ionic Technologies' Demonstration Plant is expected to commence separated magnet REO production on a continuous basis before the end of the month; and**
- **Ionic Technologies continuing potential supply chain collaborations with rare earth metal, alloy, and magnet manufacturers and global Original Equipment Manufacturers (OEMs).**

Ionic Rare Earths Limited ("IonicRE" or "the Company") (ASX: IXR) has delivered a boost for its collaboration with leading global automaker Ford Technologies (Ford) and UK-based specialist alloy manufacturer Less Common Metals (LCM), following the successful separation and first production of high purity terbium oxide (Tb_4O_7) at wholly owned subsidiary Ionic Technologies' Belfast plant.

The production of the maiden terbium (Tb) samples are another first in the magnet recycling industry, highlighting IonicRE's ability to develop a Western supply chain for this key magnet rare earth oxide (REO). The achievement follows IonicRE's successful magnet REO production from Demonstration Plant in 2023, and significant progress with its wind turbine magnet recycling program, as announced to the ASX on 14 March 2024.

Approximately 2.8 kg of high purity (>99.5%) Tb_4O_7 has been produced. IonicRE's Demonstration Plant is expected to commence separated magnet REO production on a continuous basis before the end of the month.



Ionic Rare Earths' Executive Chairman, Mr Brett Lynch, commented on another successful achievement towards the development of a Western supply chain for energy transition industries:

"This is another significant milestone for IonicRE, solidifying IonicRE as a leader in this sector as we look to build a secure and sustainable Western supply chain for the wind power and other key clean energy industries."

"The capability to produce these elements to high purity, from waste materials generated in the Rare Earth Permanent Magnet supply chain, represents a win for the industry and an opportunity to disrupt how Western markets access heavy REOs, especially dysprosium and terbium of which more than 98% of global supply originates from Chinese producers."

"Given the global demand for secure and traceable heavy REOs, at high purity, we are pleased to demonstrate our capability to separate and purify Tb and Dy with our technology. Dy and Tb remain in consistently high demand, as we are witnessing first hand from the reverse enquiry from the supply chain looking at alternative supply of these elements."

He added: "Heavy REOs are utilised for the production of the highest specification of permanent magnets, and their criticality is plain to see. Demand for Dy and Tb is already outstripping supply from traditional sources with this expected to increase significantly by the end of the decade."

"The recycling capability for these elements, in addition to the excellent progress at Ionic Rare Earths' Makuutu Rare Earths Project in Uganda, show that Ionic Rare Earths and Ionic Technologies are working towards providing resilience, to supply chains as part of a new economy in these strategic raw materials for global decarbonisation."

A first mover in magnet recycling to high purity REOs

Ionic Technologies is a global first mover in the recycling of Neodymium-Iron-Boron (NdFeB) permanent magnets to high purity separated magnet REOs – enabling the creation of sustainable, traceable, and sovereign rare earth supply chains.

During 2023, Ionic Technologies with strong support from the UK Government, constructed a magnet recycling Demonstration Plant and produced initial quantities of high purity (> 99.5%) neodymium (Nd) and dysprosium (Dy) REOs (ASX: 19 June 2023).

Additionally, to expand capacity for existing partners, Ionic Technologies is expediting heavy rare earth element (HREE) separation capability to complete Dy and Tb separation utilising the mixer-settler pilot plant equipment. This complex separation of HREEs provides supply chain partners with high purity (99.5% or above) heavy REOs to be used in developing grain boundary diffused (GBD) sintered NdFeB permanent magnet production.

Development work has enabled process conditions to be optimised for the production of high purity Dy and Tb oxides, to operate in parallel to the Demonstration plant. Multiple batches of iron-dysprosium-terbium (Fe-Dy-Tb) alloy manufacturing wastes (swarf), with varying composition comprising of high HREE content, has been sourced from our partners and processed. Initial batches operated through the pilot plant have been separated, with approximately 2.8 kg of high purity (>99.5%) Tb₄O₇ already generated.

Terbium market and importance in magnet production

Terbium, element 65, is classified as a HREE which in excess of 98% of global supply coming from China. Its primary market is for the use in NdFeB permanent magnets for high temperature applications, fluorescent lamp phosphors and defence applications.

The two main rare earths used in NdFeB magnets are Nd and Pr (praseodymium), which can be either added independently or as a mixed NdPr product called didymium. With the exception of lower grade magnets, Nd usually accounts for over two-thirds of the rare earth content in NdFeB magnets.

Up to 30% of the rare earth content in NdFeB magnets can be substituted with other rare earths to meet varying specifications. The key substitutes are Dy and Tb, that allow the magnet to operate at higher temperatures, such as required for electric vehicles (EVs) and direct drive wind turbines.

The relatively low abundance of Dy, and even more so Tb, has underpinned a move to reduce the loading of these elements, however both Dy and Tb remain important in traction motor applications. Wind turbines for example have significantly reduced the use of Dy and Tb, however market intelligence indicates that Tb is the preferred element in Chinese NdFeB producers as it provides for enhanced performance, while Japanese producers have focussed on Dy. Given a substantially lower abundance of Tb in recent times, market intelligence suggests an increased substitution of Tb with Dy.

Terbium is the highest value and most heavily sought after of the magnet rare earths. Recent pricing of magnet HREEs has seen significant reductions over the past 24 months, with Tb₄O₇ trading for approximately US\$780 per kg, and Dy₂O₃ trading for approximately US\$250 per kg. Recent highs of both HREEs were last seen in February 2022, with prices trading at approximately US\$2,400 per kg Tb₄O₇, and US\$490 per kg Dy₂O₃ at that time.

Demonstration Plant Background

In September 2022, the UK Government's Innovate UK Automotive Transformation Fund Scale up Readiness Validation ("SuRV") program, coordinated by the Advanced Propulsion Centre (APC), awarded a £1.72 million grant (A\$2.90 million) to Ionic Technologies to build a demonstration magnet recycling plant to produce separated magnet REOs, a first for the UK, as a scale up of successful previous pilot campaigns using the Company's patented technology.

In September 2023, Ionic Technologies announced it had successfully secured additional funding for two Innovate UK CLIMATES grants totalling £2 million (A\$3.90 million). The successful grant funding submissions centred on two CLIMATES projects:

1. in partnership with LCM and Ford, Ionic Technologies will develop a traceable, circular supply chain of rare earths for application in EV motors within the UK; and
2. in partnership with the British Geological Survey, Ionic Technologies has commenced a feasibility study for a commercial magnet recycling plant in Belfast, UK.

Both projects are progressing and have formally kicked off successfully with InnovateUK.

ionic rare earths

This production of high purity Tb_4O_7 forms part of the work stream with LCM and Ford, which is now progressing well and represents a model the Company expects to see replicated through other relationships under development.



Figure 1: Dysprosium (Dy) and terbium (Tb) alloy feed material (left), and subsequent streams prior to separation to recover high purity (> 99.5%) Dy_2O_3 and Tb_4O_7 products.



Figure 2: Operating Dy/Tb Separation on the Ionic Technologies Pilot Plant Mixer Settler Circuit at Ionic Technologies' facility in Belfast, UK.

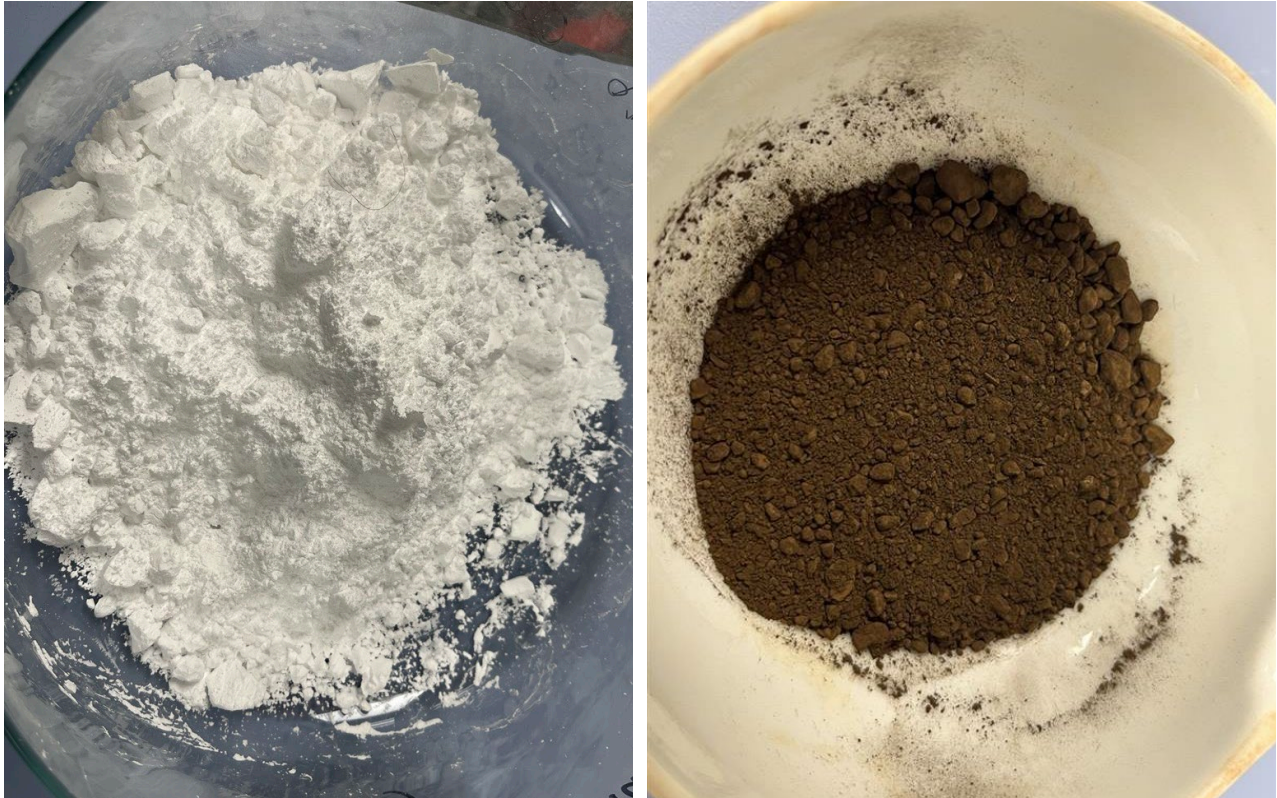


Figure 3: Terbium oxalate (left) prior to calcination and 99.5% purity Tb₄O₇ (right).

Technology Overview

Since its founding in 2015, as a spinout from Queens University Belfast (QUB), Ionic Technologies has developed processes for the separation and recovery of REEs from mining ore concentrates and waste permanent magnets.

The technology developed is a step up in efficient, non-hazardous, and economically viable processing with minimal environmental footprint.

The Company's proprietary technology provides a universal method for the recovery of high purity grade rare earth elements from lower quality and variable grade magnets, to be used in the manufacture of modern high-performance and high specification NdFeB permanent magnets required to support substantial growth in both EV and wind turbine deployment.

Mr Lynch added: *"IonicRE is 'walking the talk' by demonstrating our ability to produce these strategic REOs at our facility in Belfast, located in close proximity to wind power generation, deployment and decommissioning facilities.*

"The growth ahead for this clean energy industry is enormous, and we are moving as fast as we can to commercialise this technology to enable the circular economy to support it. Our technology is capable of being scaled globally to meet the enormous demand for circular economy value addition to support climate-friendly energy sources such as wind energy."

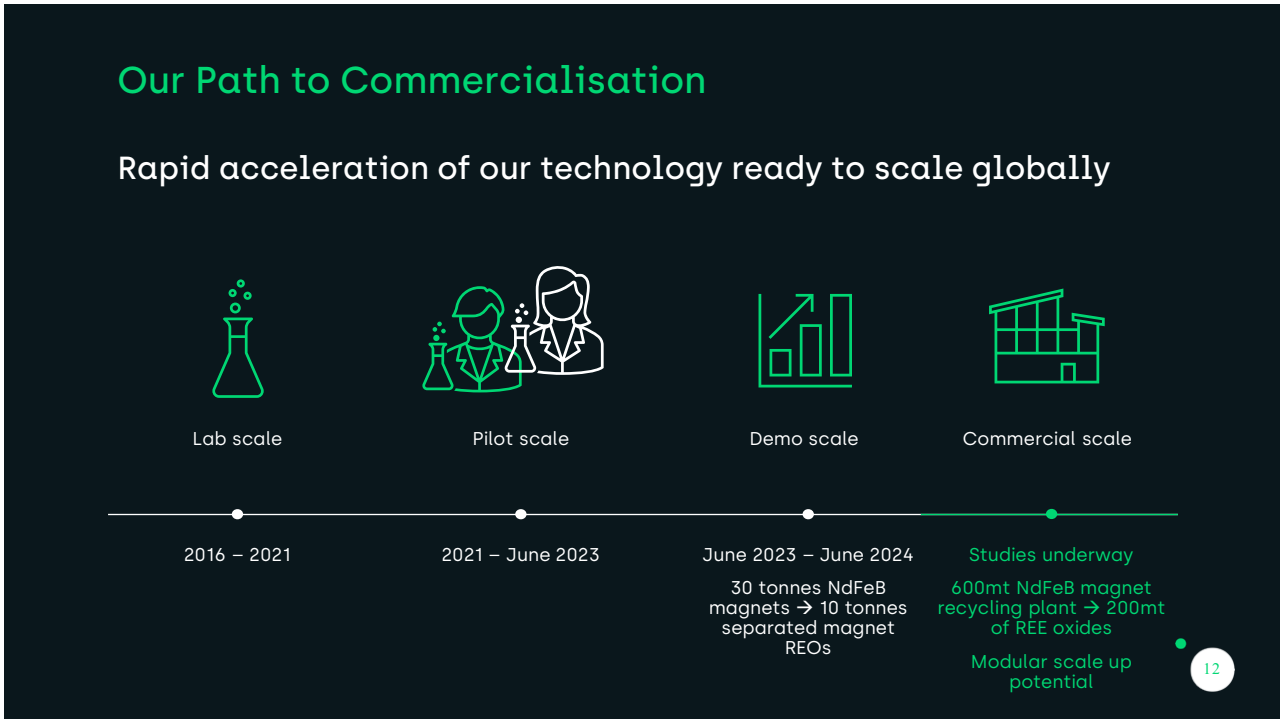


Figure 4: Ionic Technologies path to production.

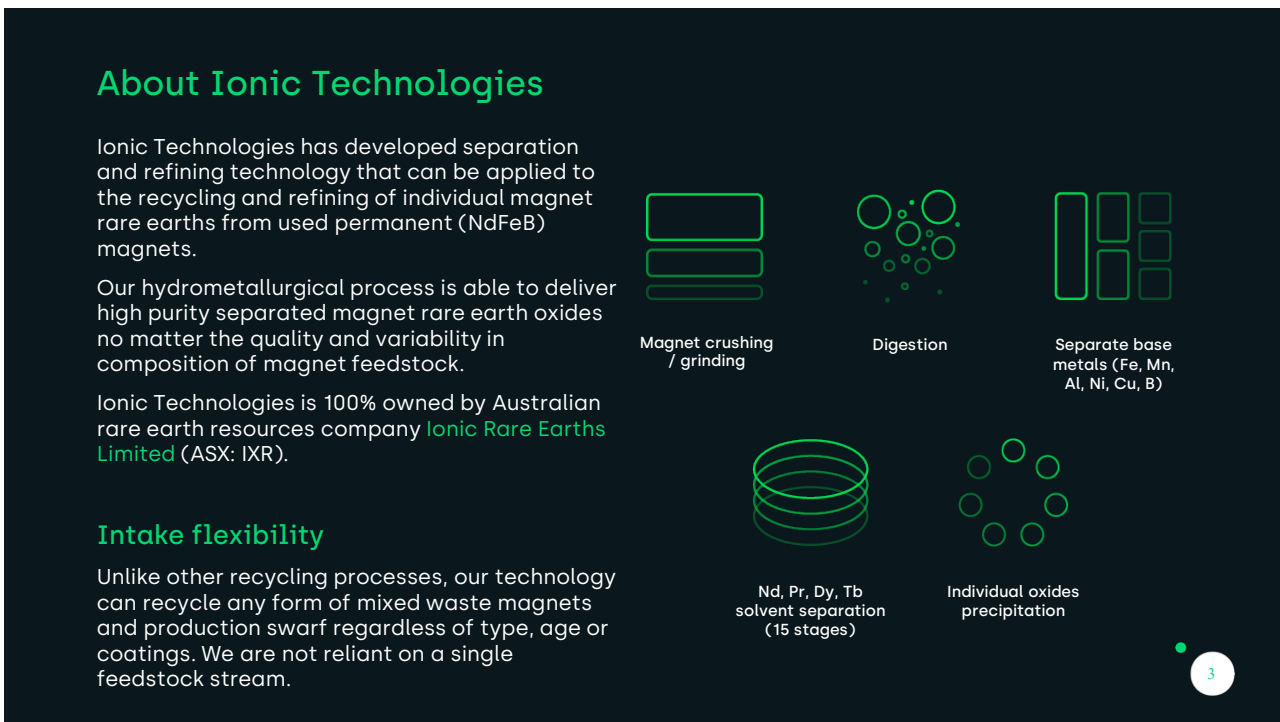


Figure 5: Ionic Technologies technology overview.

For more information about IonicRE and its operations, please visit www.ionicre.com.

Authorised for release by the Board.

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About Ionic Rare Earths Ltd

Ionic Rare Earths Limited (ASX: IXR or IonicRE) is set to become a miner, refiner and recycler of sustainable and traceable magnet and heavy rare earths needed to develop net-zero carbon technologies.

The Makuutu Rare Earths Project in Uganda, 60% owned by IonicRE, moving to 94% ownership in Q2 2024, is well-supported by existing tier-one infrastructure and is on track to become a long-life, low Capex, scalable and sustainable supplier of high-value magnet and heavy rare earths oxides (REO). In March 2023, IonicRE announced a positive stage 1 Definitive Feasibility Study (DFS) for the first of six (6) tenements to progress to a mining licence which was awarded in January 2024. The Makuutu Stage 1 DFS defined a 35-year life initial project producing a 71% rich magnet and heavy rare earth carbonate (MREC) product basket and the potential for significant potential and scale up through additional tenements.

Ionic Technologies International Limited (“Ionic Technologies”), a 100% owned UK subsidiary acquired in 2022, has developed processes for the separation and recovery of rare earth elements (REE) from mining ore concentrates and recycled permanent magnets. Ionic Technologies is focusing on the commercialisation of the technology to achieve near complete extraction from end of life / spent magnets and waste (swarf) to high value, separated and traceable magnet rare earth products with grades exceeding 99.9% rare earth oxide (REO). In June 2023, Ionic Technologies announced initial production of high purity magnet REOs from its newly commissioned Demonstration Plant. This technology and operating Demonstration Plant provides first mover advantage in the industrial elemental extraction of REEs from recycling, enabling near term magnet REO production capability to support demand for early-stage alternative supply chains. In September 2023, Ionic Technologies announced with the support of the UK government, collaboration partnerships to build a domestic UK supply chain, from recycled REOs to metals, alloys and magnets and supplying UK based electric vehicles (EV) manufacturing, with potential to replicate across other key markets.

As part of an integrated strategy to create downstream supply chain value, IonicRE is also evaluating the development of its own magnet and heavy rare earth refinery, or hub, to separate the unique and high value magnet and heavy rare earths dominant Makuutu basket into the full spectrum of REOs plus scandium.

This integrated strategy completes the circular economy of sustainable and traceable magnet and heavy rare earth products needed to supply applications critical to EVs, offshore wind turbines, communication, and key defence initiatives.

IonicRE is a Participant of the UN Global Compact and adheres to its principles-based approach to responsible business.

Forward Looking Statements

This announcement has been prepared by Ionic Rare Earths Limited and may include forward-looking statements. Forward-looking statements are only predictions and are subject to risks, uncertainties and assumptions which are outside the control of Ionic Rare Earths Limited. Actual values, results or events may be materially different to those expressed or implied in this document. Given these uncertainties, recipients are cautioned not to place reliance on forward looking statements. Any forward-looking statements in this document speak only at the date of issue of this document. Subject to any continuing obligations under applicable law and the ASX Listing Rules, Ionic Rare Earths Limited does not undertake any obligation to update or revise any information or any of the forward-looking statements in this document or any changes in events, conditions, or circumstances on which any such forward looking statement is based.