

04 April 2022

IONICRE FINALISES ACQUISITION OF SEREN TECHNOLOGIES

- **Due diligence successfully completed**
- **The acquisition of SerenTech delivers IonicRE:**
 - **an immediate rare earth separation and refining capability to target high purity rare earth products**
 - **demonstrated capability to recycle NdFeB magnets via extraction of the individual REE content to produce high purity (99.9%) rare earth oxide (REO) products**
- **Seren Technologies also enhances IonicRE end to end rare earth vertical integration and supply plans**
- **Potential for rare earth element (REE) separation with high separation factors confirmed indicating potential for reduced number of stages in separation of heavy REEs**
- **Near term opportunities for optimisation on the magnet recycling flowsheet identified and demonstrated by recent test work**
- **New piloting program to commence for integrated magnet recycling flowsheet ahead of planned demonstration plant later in 2022**
- **Preliminary discussions with magnet recycling initiatives in Europe and the US commencing**
- **Key executive appointments made**

Ionic Rare Earths Limited (**IonicRE** or the **Company**) (ASX: IXR) is pleased to advise that it has successfully completed due diligence on the acquisition of 100% of Seren Technologies Limited (**SerenTech**). As announced on 8 December 2021, IonicRE entered into a binding term sheet for the acquisition of SerenTech, a UK private company with unique and leading-edge rare earth separation and refining technology.

Following the comprehensive due diligence, a Share Purchase agreement (SPA) has been executed with completion pending regulatory approval from the UK Investment Security Unit (ISU).

SerenTech is commercialising technology using ionic liquids for separation and refining of rare earth elements (REE), which includes the full cohort of the proposed basket from Makuutu, consisting of the lanthanides series, Lanthanum (La), to Lutetium (Lu), plus Scandium (Sc) and Yttrium (Y).

The acquisition of SerenTech, which will be based in Belfast, UK, greatly complements IonicRE's strategy of becoming a vertically integrated participant in the formation of new magnet and heavy rare earth supply chains emerging across Europe and North America.

IonicRE Managing Director Tim Harrison commented:

"The due diligence process has confirmed the potential for the technology to be very value accretive for IonicRE in its ability to help unlock the downstream value of the Makuutu basket plus also move swiftly on magnet recycling potential across Europe, the UK and the US."

"Preliminary test work has confirmed high separation factors at more moderate pH conditions compared to alternative options for REE separation, along with recent enhancements in the magnet recycling flowsheet which will potentially further improve the commercial attractiveness of the technology. A new pilot plant program is planned to commence in Q2 2022 which will feed into the next phase of validation prior to a potential demonstration plant later in 2022."

"Additionally, the Company plans to initiate a new engineering study on the magnet recycling project to revise the prior 2018 study up to 2022 basis to confirm expected operational and capital cost estimates to feed into commercialisation plans."

"The team at SerenTech has identified a number of potential opportunities to move rapidly in the scale up from demonstration to commercial development of the technology for magnet recycling, which will now be explored with key supply chain stakeholders. Initial discussions with potential industry participants have identified significant interest to take advantage of SerenTech's hydrometallurgical magnet recycling technology for the extraction and refining of magnet rare earths for use in new high specification magnets".

"Finally, the acquisition of SerenTech provides IonicRE with an inhouse test work capability to execute new test work programs which is expected to complement the development of IonicRE's refinery flowsheet. The IonicRE team has been engaging with the SerenTech team to map out next steps to help validation of key process chemistry and design criteria inputs for the Refinery Scoping Study."

SerenTech Overview

The acquisition of SerenTech delivers IonicRE an immediate rare earth separation and refining capability to target high purity rare earth products. Most attractive is the demonstrated capability to recycle NdFeB magnets via extraction of the individual REE content to produce high purity (99.9%) rare earth oxide (REO) products, which we expect will provide a step change to magnet recycling appeal globally.

SerenTech has demonstrated capability to separate magnet rare earths Neodymium (Nd), Praseodymium (Pr), Dysprosium (Dy) and Terbium (Tb) for modest capital requirements. This presents an opportunity for targeted deployment in key markets in the US, Europe, and Asia where existing inventories of magnets exist and where the current recycling technology fails to be able to achieve similar REE extraction results, thus providing a step change advantage and the ability to take an early mover position in new NdPr supply.

SerenTech has an exclusive “patent and know-how” licence from Queens University Belfast (QUB) allowing it to develop and commercialise the technology. Additionally, SerenTech has also developed know-how in this area and lodged a further four (4) global patents, providing a pipeline of opportunities in which to deploy the technology.

The application of SerenTech patented technology has achieved separated and refined products to high purity with REO grades above 99.9% demonstrated at pilot scale in two key applications;

- Mining ore concentrate: the pilot scale plant has processed concentrate received from supply chain stake holders and achieved separation of REEs; and
- Permanent magnet (Neodymium-Iron-Boron, NdFeB) recycling: the pilot scale plant has processed spent permanent magnets received from supply chain stake holders and achieved extraction of recycled rare earth oxides at purity 99.9% plus.

This technology has the potential to be applied to other critical raw materials.

Opportunities have been identified for near term demonstration and deployment of the technology to help bridge the shortfall in magnet REE's (Nd, Pr, Dy and Tb) supplied to western markets where demand is expected to grow by up to 20% compounded annually. Shanghai Metals Market (SMM) recently forecast the recycling of NdFeB scrap is likely to be the largest growth of NdPr supply from 2021 to 2025¹.

IonicRE's due diligence has identified a positive net benefit potential in providing inhouse REE separation and refining capability which has included a commercial, finance, legal, intellectual property, and technical review. IonicRE Managing Director, Tim Harrison, recently completed a visit to SerenTech at QUB, and affiliate Queens University Ionic Liquids Laboratory (QUILL), to discuss recent technical advances with the team and discuss strategies for commercialisation over the next 18 months.

Previous Engineering Studies

SerenTech initiated a techno-economic study in 2018 with Process Design Centre in the Netherlands to define the overall economics for the commercial development of a magnet recycling plant, treating 600 tonnes per annum (tpa) of spent magnets and swarf produced in magnet production to hydrometallurgically extract, separate and refine the contained magnet REE content (Nd, Pr, Dy and

¹ <https://news.metal.com/newscontent/101669714/Scrap-Recycling-Likely-to-be-the-New-Growth-Engine-of-PrNd-Market-in-2021-2025/>

Tb) to produce approximately 200 tpa of individual REOs (Nd_2O_3 , Pr_6O_{11} , Dy_2O_3 and Tb_4O_7) to 99.9% plus purity.

The capital estimates for the 600 tpa magnet recycling plant indicated a potential CAPEX of US\$13 million (including contingency) with OPEX estimates of approximately US\$35 to US\$40 per kg of separated and refined REO product, excluding magnet costs.

IonicRE is planning to complete an update of the CAPEX and OPEX to capture potential improvements in the flowsheet and also to revise the basis of estimate up to current 2022 pricing to assist with the facilitation of discussions underway on potential commercialisation in 2023.



Figure 1: SerenTech magnet recycling plant conceptual design.

Seren Technologies Leadership Team Appointments

To drive the ongoing development of SerenTech towards commercialisation, IonicRE has appointed Mr. Andrew Holmes as General Manager – SerenTech. Andrew has 40 years in the global commercialisation of environmental technologies and products and for the past four years has been the sales and marketing director of SerenTech.

Professor Peter Nockemann has been appointed as Technical Advisor – SerenTech. As a co-founder and director of SerenTech, Peter has been instrumental in knowledge-transfer and refinement of the technology to recycle REEs, and a world expert in ionic liquids with numerous published papers on ionic liquid applications. Peter is presently Professor in Inorganic and Materials Chemistry, Director of Research at QUB. Peter will also join a newly formed Technical Steering Committee which will provide oversight and guidance on the development and commercialisation of the technology.

Dr Fergal Coleman has been appointed Technology Lead – SerenTech. Fergal has led the team in optimisation and validation of the technology since 2020, overseeing the completion of test work and studies for the separation of REEs from mineral concentrates, mixed rare earth carbonates, and the recycling of permanent magnets.

The leadership team will be well supported by the remainder of the SerenTech team of chemists and engineers who will transition across to progress the technology to development, plus support IonicRE in the ongoing refinery test work program to support the process design.

About Seren Technologies Limited

Seren Technologies Limited (SerenTech) is a UK private company with unique and leading-edge rare earth separation and refining technology. Since its founding in 2015, SerenTech has developed processes for the separation and recovery of REEs from mining ore concentrates and waste permanent magnets with the potential to provide a step change in efficient, non-hazardous, and economically viable processing with minimal environmental footprint compared to current practices. SerenTech has developed a toolkit of separation techniques and solvent systems incorporating both conventional organophosphorus extractants and ionic liquids (ILs) that can be combined to and applied to different mixed rare earth feeds.

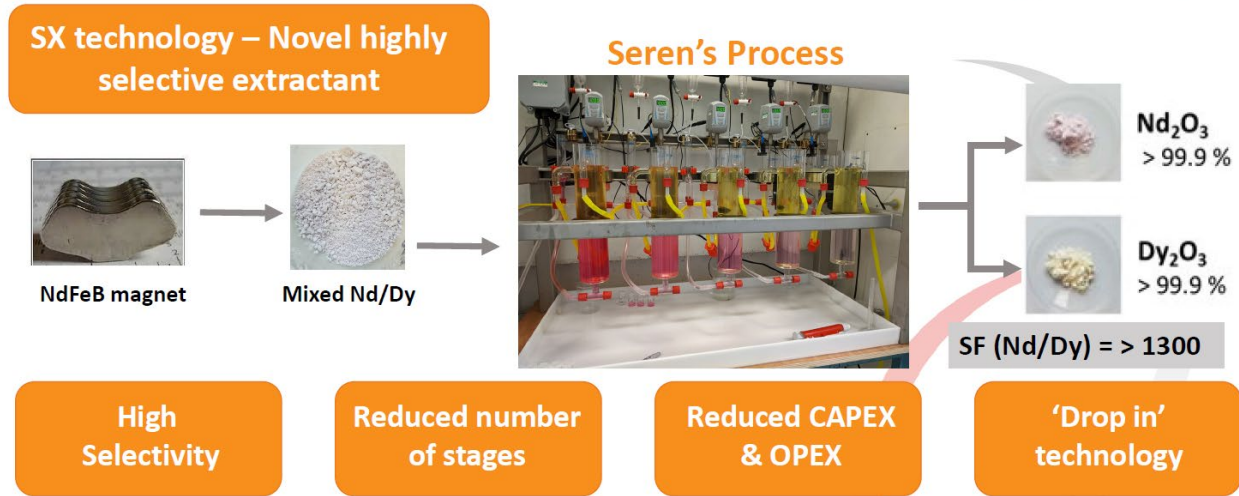
SerenTech's process uses an alternative and more environmentally benign extractant, an optimised ligand, for rare earth metal extraction, separation, and processing.

The technology developed by SerenTech has several advantages compared to existing or alternative options with respect to the industrial processing of rare earths:

- The ionic liquid is fully recyclable to the extent the ligand can be considered a capital rather than operational cost.
- Greatly reduced acid consumption, with optimum pH levels between 2 and 4 throughout the whole process.
- High separation factors for individual REE separation and refining capability.
- There are no toxic waste products, and
- Potential to tune the ligands to focus on pairings or groupings of rare earths, giving greater flexibility in approaching the separation of rare earths from mining feed sources.

Impressively, work to date has demonstrated capability for REEs to achieve near complete extraction from lower quality spent magnets and waste (swarf) to near complete recovery to high value rare earth oxide (REO) product quality exceeding 99.9% REO.

This presents a potential opportunity to provide a first mover advantage post acquisition to IonicRE in the industrial elemental extraction of REEs from spent magnets and waste, enabling near term magnet REO production capability to satisfy growing demand and lagging new supply chains.



Seren's Process – can be applied to the entire lanthanide series

Figure 2: Magnet recycling potential of ionic liquids technology developed by SerenTech.

The technology developed by SerenTech provides considerable benefits over alternative magnet recycling technology presently being marketed and operated, including hydrogen decrepitation, which simply breaks down spent magnets and swarf to be recast as magnets of the similar or lesser quality. The advantage of the technology developed by SerenTech is to provide potential for magnets REEs to be extracted from lower quality and variable grade magnets, to then be recycled into newer higher content REE containing permanent magnets, used in higher value applications.



Figure 3: Mixer Settler pilot plant located at Queens University Ionic Liquids Laboratory (QUILL) at QUB.

Acquisition Terms

The Company has entered into a binding Share Purchase Agreement to acquire 100% of SerenTech from Seren AG, Professor Peter Nockemann and Professor Martin Atkins (**Sellers**) pursuant to the following key terms:

- Subject to the satisfaction or waiver of the conditions set out below, upon completion IonicRE will:
 - (a) pay US\$1,000,000 in cash to the Sellers (or their nominees);
 - (b) issue to the Sellers (or their nominees) 48 million fully paid ordinary shares (**Shares**). The Shares must remain in escrow for a period of 12 months from the issue date of the Shares (*the issue of these Shares will be met through the Company's existing LR 7.1 15% capacity*);
 - (c) pay the Sellers 25% of any licence fee received by IonicRE from a third party to use the technology for magnet recycling or rare earth separation technology (**Milestone 1 Payment**), to a maximum of US\$1,500,000.
 - (d) Upon reaching commercial production for a magnet recycling plant or rare earth separation and refining plant developed using the technology and designed for a scale exceeding 100 tonne per annum Rare Earth Oxide equivalent production capacity or greater (**Milestone 2**) pay the Sellers US\$1,500,000 less the total Milestone 1 Payments paid to the Sellers (**Milestone 2 Payment**).

Completion of the proposed acquisition will be subject to the satisfaction or waiver of the following conditions within the time periods indicated below:

- obtaining any regulatory consents or approvals, (including any approval from the ASX or waiver of any relevant ASX Listing Rules) within 60 days of execution of the Binding Sale Agreement or Exclusive Option Agreement.
 - (a) ASX have confirmed that shareholder approval for the purposes of Listing Rule 11.1.2 and re-compliance with Chapters 1 and 2 of the Listing Rules will not be required for the proposed acquisition.
 - (b) The proposed transaction has required a submission under the National Security and Investment Act 2021 as SerenTech constitutes a “qualifying entity” for the purposes of SI 2021 No. 1264. More specifically Seren conducts activities which fall within the defined sector of Advanced Materials. A ruling is expected in mid-April.

Authorised for release by the Board.

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