



19 June 2024

**Rainbow Rare Earths Limited**  
("Rainbow" or "the Company")  
LSE: RBW

**Pilot Plant Update**  
**Latest results support expectation that Phalaborwa will be one of the lowest cost magnet rare earth projects in development today**

- Primary pilot plant campaign in South Africa ran for an extended period allowing for key optimisation opportunities, with expected resultant benefits to capital and operating costs
- Separation pilot plant campaign in USA is ongoing - separation of Nd/Pr has now reached over 95% purity via an optimised first stage chromatography step, with the process expected to reach the targeted purity of 99.5%
- Piloting campaign to date supports our expectation that Phalaborwa will be a low-cost producer of separated rare earth oxides in comparison to the global peer group
- As part of the work to deliver the DFS in H1 2025, Rainbow plans to release an interim report in H2 2024 to update the economics of the Phalaborwa project reflecting the optimisations delivered from the pilot test work campaigns, footprinted against the Preliminary Economic Assessment ("PEA"), and to allow for commencement of project financing

**NEWS RELEASE**

Rainbow is pleased to announce an update with regards to the pilot plant operations for the Phalaborwa rare earths development project in South Africa.

The project's pilot plant incorporates the primary campaign, which processes the material to produce a mixed rare earth carbonate ("MREC"), based at the Johannesburg facilities of the Council for Mineral Technology ("Mintek"), a global leader in mineral processing, extractive metallurgy, and related fields. The final separation stage pilot plant refines the material further into separated rare earth oxides; this work is ongoing in Florida, USA.

**Primary pilot plant - Johannesburg, South Africa**

Excellent results have been achieved on the large scale, continuous pilot plant at Mintek, serving to confirm the basic process flowsheet originally set out in the PEA.

The primary pilot plant campaign was extended to run for 70 days in order to take advantage of key optimisation opportunities that became evident during the operation.

The key findings from the primary pilot plant campaign are:

- The overall recovery of rare earths was 66% versus 65% used in the PEA.
- A leach temperature of 30°C was employed compared to 40°C set out in the PEA, resulting in a 50% reduction in the expected heating energy requirement.
- The first-stage impurity leach readily controlled the impurities to the desired level. Approximately 23% of the recovered rare earths reported to the impurity leach solution.
- The subsequent rare earths leach has been reduced from three stages in the PEA to two stages.
- A continuous ion exchange ("CIX") pilot plant operation was conducted at Mintek to recover the rare earths in the impurity leach solution. This CIX pilot plant delivered excellent recovery, impurity rejection and rare earths upgrading with the resulting product being suitable for feed directly to the final continuous ion chromatography ("CIC") separation process.
- Solid:liquid separation tests conducted on samples from the primary pilot plant operation yielded excellent thickening and filtration results, which allows for the removal of six CCL (Counter Current Leach) thickeners out of 12 from the circuit.
- Very positive results were achieved in a materials of construction study where a variety of potential acid-proof steels and alloys have been tested in static conditions and in the continuous primary pilot plant operation. These have shown that lower cost alloys out-perform the high cost Hastelloy materials assumed for the construction of the plant in the PEA.

**Separation pilot plant - Lakeland, USA**

In parallel with the work at Mintek, test work is ongoing at K-Technologies, Inc. ("K-Tech") premises in Florida, USA, to deliver separated magnet rare earth oxides, with the initial focus on the separation and purification of neodymium and praseodymium ("Nd/Pr") via ion chromatography in three stages to an expected 99.5% oxide purity. This represents ca. 20% of the total processing footprint.

As previously announced on 5 February 2024, the initial first-stage ion chromatography step achieved good separation of Nd/Pr at ca. 68% purity, with good separation of the samarium/europium/gadolinium ("SEG") group of rare earths at a grade of ca. 63% and considerable upgrading of the concentration of the dysprosium and terbium ("Dy/Tb") from a combined feed grade of 0.9% to 14.6%.

The initial 68% Nd/Pr purity stream has been passed through a second ion chromatography stage, resulting in an upgraded solution of over 96% Nd/Pr purity.

Optimisation of the first stage ion chromatography step has been carried out in parallel, resulting in an excellent Nd/Pr grade of over 95% purity.

The separation test programme in Florida is taking longer than anticipated, primarily due to problems with the in-house analytical equipment at K-Tech's premises. This has resulted in the need for the material to be independently analysed by the Florida Institute of Phosphate Research ("FIPR"), which has required a long turnaround for each set of assays (two to three weeks versus the anticipated one to two days if doing this work in-house). This issue is being remediated, but there is benefit to the extra level of verification that these independent analyses provide to the rare earth separation work.

**Dave Dodd, Technical Director, commented:** "We are very pleased with the results of the completed primary pilot plant campaign that has produced a high grade MREC for the separation pilot plant in the USA. The significant results, including lower leach temperatures, the reduced number of stages in the main rare earth leach, reduced thickener requirements and lower cost materials of construction, are expected to deliver capital and operating cost benefits compared to the base case scenario for these processes set out in the PEA.

*The excellent performance of the pilot CIX plant at Mintek, coupled with the very good rare earth group separation and 95% Nd/Pr purity achieved by the optimised first pass of ion chromatography work in US, auger well for the finalisation of the CIX/CIC process and validate Rainbow's use of CIX/CIC as our chosen rare earth recovery method. Based on the recoveries to date, we also do not anticipate any material changes to the capital and operating costs for the back-end plant process."*

**George Bennett, CEO, commented:** "Whilst the pilot test work has taken longer to complete than originally planned, the positives of the additional time invested, in pursuing the optimisation opportunities identified on the primary pilot plant, cannot be underestimated from the point of view of confirming capital and operating costs for the Definitive Feasibility Study ("DFS") within the PEA guidelines.

*We feel these results go a long way to confirming that Phalaborwa will be one of the highest margin and lowest cost rare earth producers in the world, which gives the project excellent resilience versus pricing volatility, in contrast to the global peer group. These results confirm and vindicate the time invested in the process optimisation to the benefit of the project."*

#### Next steps

Work is continuing in both South Africa and the USA to finalise the pilot testing and optimisation opportunities resulting therefrom.

#### South Africa

- Initial acid baking of the rare earths precipitate, conducted in a standard muffle furnace, required a bake time of six to seven hours. Subsequent ongoing testing of a continuous infra-red furnace indicates excellent results which should reduce baking time to less than one hour.
- Optimisation work is being undertaken in relation to the two key reagents for the process: sulphuric acid consumption and lime addition for neutralisation.

#### USA

- Nd/Pr separation work via CIC is continuing, focused initially on delivering the expected 99.5% purity Nd/Pr oxide.
- Once the Nd/Pr separation is confirmed, CIC work focused on the Dy/Tb streams will progress as well as further work on the SEG group separation where Rainbow saw positive results in the first pass through the ion chromatography phase.

Following completion of the piloting testwork, as part of the work to deliver the DFS in H1 2025, Rainbow plans to release an interim report in H2 2024 to update the economics of the Phalaborwa project reflecting the optimisations delivered from the pilot test work campaigns, footprinted against the PEA. This is expected to demonstrate the resilience of the project economics in a variety of rare earth pricing scenarios and allow for the commencement of the financing process for the project.

#### For further information, please contact:

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#### Notes to Editors:

##### About Rainbow:

Rainbow Rare Earths aims to be a forerunner in the establishment of an independent and ethical supply chain of the rare earth elements that are driving the green energy transition. It is doing this successfully via the identification and development of secondary rare earth deposits that can be brought into production quicker and at a lower cost than traditional hard rock mining projects, with a focus on the permanent magnet rare earth elements neodymium and praseodymium, dysprosium and terbium.

The Company is focused on the development of the Phalaborwa Rare Earths Project in South Africa and the earlier stage Uberaba Project in Brazil. Both projects entail the recovery of rare earths from phosphogypsum stacks that occur as the by-product of phosphoric acid production, with the original source rock for both deposits being a hardrock carbonatite. Rainbow intends to use a continuous ion exchange / continuous ion chromatography separation technique, which simplifies the process of producing separated rare earth oxides (versus traditional solvent extraction), leading to cost and environmental benefits.

The Phalaborwa Preliminary Economic Assessment has confirmed strong base line economics for the project, which has a base case NPV10 of US\$627 million, an average EBITDA operating margin of 75% and a payback period of < two years.

More information is available at [www.rainbowrareearths.com](http://www.rainbowrareearths.com).

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