

A rare opportunity

The Mid West region north of Perth could become critical to the world's clean energy transition if local miner Iluka Resources approves its Eneabba rare earths refinery project

By Stephen Bell



Iluka Resources' Tom O'Leary



Iluka could put the tiny Mid West mining town of Eneabba on the global green energy map early in 2022 if the Perth-based company's board approves the development of Australia's first rare earths refinery.

A positive final investment decision (FID) on the downstream plant would signal WA's transition into a globally significant rare earths processing hub, producing several critical minerals needed for the green energy transition.

The FID would be a special moment for Iluka, which has been producing the less glamorous mineral sands products ilmenite, rutile and zircon for many years — both in Australia and offshore.

And, if Iluka does make a positive call on building the refinery, it will be down in part to a lucky break three decades ago.

Back in the early 1990s, Iluka was generating a lot of monazite — a waste product of the company's mineral sands mines. But rather than mixing the mineral back into the waste tailings as part of mine rehabilitation, a bright spark at Iluka suggested that the monazite might one day be valuable and should be saved.

So a decision was made to store the monazite in a mining void at Iluka's Eneabba mineral sands operations, about three hours north of Perth.

Three decades later, Iluka still hasn't identified the person who made the call to save the

monazite for future generations.

But whoever he or she is, they have done Iluka and WA industry a big favour. Once a nearly worthless by-product, the monazite today is hot property — mostly because of its high concentrations of rare earth elements.

In August, Iluka reported a spot price of US\$7100 (\$7700) per tonne of monazite concentrate, the form of the mineral that Iluka aims to produce from its \$35 million Eneabba Phase 2 project, now in construction.

At that spot price, Iluka estimates the net present value of Eneabba Phase Two as \$770m — not bad for a product once considered mining waste.

But the Perth company is scheming to add even more value to the monazite via Eneabba Phase 3 — the refinery. Also known as a finishing plant, it would see WA become a global player in supplying the rare earth oxides essential for making the permanent magnets inside electric motors that power EVs and wind turbines.

Rare earths are also necessary in the manufacture of catalytic converters for vehicle emission control of hybrid and petrol-fuelled cars, in modern rechargeable batteries, and as an alloying agent to create high-strength metals in aircraft engines.

Iluka CEO Tom O'Leary recently told an

American-Australian Association critical minerals panel that the \$20m feasibility study into the refinery was progressing alongside discussions with the Federal Government.

"Just to emphasise the impact on the supply chain, Eneabba Phase 3 is not about producing a concentrate or a carbonate that can only go to China for further refining into rare earth oxides," he said.

"This is a fully integrated refinery to produce the key magnet metal rare earth oxides."

Third parties welcome

O'Leary said Iluka is working closely with the Federal Government on "risk sharing" arrangements for Phase 3, which will be capable of processing third-party rare earth concentrates proposed by several Australian junior companies.

"This would see Eneabba and Australia become a key global hub for the secure production of refined rare earths," he said.

Another company, Lynas Rare Earths, is also building a downstream plant at Kalgoorlie. However, this so-called cracking and leaching plant will produce an intermediate product requiring refining in Malaysia to produce the rare earth oxides.

Phase 1 of Iluka's Eneabba rare earths venture began last year and produces a mixed



Iluka Resources Eneabba Pit

concentrate grading about 20 per cent monazite.

Phase 2 will be capable of producing 22,000 tonnes per annum of 90 per cent monazite concentrate, suitable as a direct feed for rare earth refineries, from mid-2022.

The monazite stockpile is sufficient to underpin an eight-year life for Phase 2. However, this estimate excludes ongoing replenishment from Iluka's Jacinth-Ambrosia (South Australia) and Cataby (Mid West) mines, which would contribute a further two years of life.

Depending on the results of the Phase 3 study, and ongoing talks with Federal credit agencies, Iluka may choose to retain part or all of the Phase 2 products for feeding the refinery.

The finished production would include oxides of neodymium, praseodymium, terbium and dysprosium — the magnet rare earths used in emissions-free electric motors.

Victorian mine needed?

The relatively short life of Iluka's Eneabba operation has some stockbroking analysts concerned.

Credit Suisse, for instance, believes that building a rare earth metals refinery only makes sense if the company adds products from its undeveloped Wimmera mineral sands project in Victoria.

The bank's long-standing commodities analyst Matthew Hope says Iluka's mooted refinery will need to incorporate Wimmera to make a worthwhile return on investment.

"We believe Iluka's refinery plan could provide a lucrative multi-generation business, provided Wimmera mineralisation in Victoria can be exploited at about 30 million tonnes per annum," Hope said in a research note.

The known resources at Wimmera are "vast", according to Hope, and Iluka has three deposits in the field, located in the Victorian Murray Basin.

However, development of Wimmera is hindered by a tiny grain size, uranium and thorium contamination of the zircon, and the rutile grains being too fine for chlorinators.

"Wimmera is the key for value, but zircon contamination needs a solution," he said.

Iluka, meanwhile, said it is focused on finding a processing solution to remove impurities from the zircon at Wimmera, which currently make the deposit unsuitable for the key ceramics market.

The company planned to commission a zircon refining pilot plant at Wimmera before the end of 2021.

"The processing of Wimmera's rare earth minerals through a potential Eneabba refinery would simplify the Wimmera development," Iluka said.

Mastering the process

Hope, meanwhile, said Iluka will need to master the "long and difficult process" of separating the rare earth oxides from the raw refinery feed, should Eneabba proceed with the project.

"The know-how cannot be acquired," he said, adding that Sydney-based Lynas has the only rare earth refinery outside China.

"Lynas uses over 1000 SX (solvent extraction) steps at its Malaysian plant and it took six years to reach 90 per cent of nameplate capacity," Hope said.

"An Iluka refinery would have even greater complexity as it wants to separate more elements, including Terbium and Dysprosium."

Credit Suisse assumes a five-year ramp-up, with recovery rising from 50 per cent to 90 per cent.

WA Works understands that Iluka is looking to address the technical risks of Phase 3 by consulting with companies such as Caresta, which has deep experience in building and troubleshooting rare earth processing facilities.

Solving the separation of rare earths might allow Iluka to later expand the refinery towards 18,000 tonnes per annum total rare earth oxides, fed by a large Wimmera mine of more than 32 million tonnes per annum, Hope estimates. ●