Iluka Resources is building Australia's first fully integrated rare earths refinery

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Iluka Resources Limited (ASX: ILU) ("Iluka") is an Australian critical metals producer, specializing in mineral sand mining and processing. Iluka is the world's largest producer of zircon, a major producer of high grade titanium feedstocks rutile and synthetic rutile, and is set to become a significant global supplier of refined rare earths from 2025.

Iluka Resources looks to join exclusive club of rare earths producers

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Iluka Resources Limited, (ASX: ILU) an Australian mineral sands company, is poised to add rare earth elements to its portfolio of products. The company's main products are zircon, titanium, plus iron and carbon materials from its processing plants in Australia. It also has recently announced the de-merger of its Sierra Leone company, Sierra Rutile Holdings Limited, to end up with two ASX listed companies.

The plan announced by Iluka is to start concentrating monazite and xenotime in the second half of this year from its mineral sands operation in Western Australia. Cracking and leaching will begin next year followed by separation to produce rare earth oxides in 2024 at Eneabba, Western Australia, which is a 3 hour's drive north of Perth. According to public company information, the planned output is 17,500 tons per year of Total Rare Earth Oxides (TREO). They note the plant will have a full capacity of 23,000 TPY of TREO with all circuits fully utilized. It is reasonable to assume that they are looking for additional monazite to fill their plant as the capacity is more than they can produce themselves.

Based on the feed rate of 17,500 TPY TREO Iluka expects to produce 4,000 TPY of Nd/Pr plus 500 TPY of Dy/Tb. Typically, Dy:Tb ratio varies from 2:1 to 5:1. At today's pricing of $135/kg USD for Nd/Pr oxide, Dy oxide at $362/kg USD, and Tb4O7 at $2.056/kg USD, Iluka's annual revenue could be in the range of US$1 billion.

The projected capital costs are AU$170-200 million for the cracking and leaching, and AU$320-390 million for the separation and finishing. Additional costs include plant and infrastructure AU$110-140 million plus indirect costs, contingency, commissioning and miscellaneous costs of AU$400-470 million for a total of AU$1-1.2 billion. According to the company, there will be support from the Australian government in the form of a loan from the government's Critical Minerals Facility fund and a risk-sharing agreement that would include non-recourse debt, royalty payments to Iluka, and flexibility in repayment schedules. This is what is necessary to get these projects off the ground – government support and vision to see that risk sharing is very important.

Raising this amount of capital in the markets today is a

challenge and also very dilutive as their current market cap is AU$3.8 billion. An advantage Iluka has over many other planned entrants into the rare earth space is their existing cash flow from current operations, as it will take time to generate revenues from this operation after construction begins this year and until the first output is expected to be seen in 2025.

Source: Iluka Company presentation, April 4, 2022

Based on using their existing stockpile at Eneabba, Iluka could produce 12,400 TPY TREO with an operating cost of AU$13/kg or about US$10/kg which is competitive with Chinese costs. I am assuming they put no value on the feed material as it is in a stockpile. They have not included any transfer costs from other sources in their expanded production estimates with other sources of feed. The stockpile feed would produce 2,700 TPY of Nd/Pr or about half of the capacity of 5,500 TPY of Nd/Pr. This stockpile would be exhausted in 9 years, so they are actively looking for other sources to fill the plant.

One question that is not clear is whether they will take a Molycorp plant design approach or the Lynas approach. Molycorp originally designed a single train 20,000 TPY TREO capacity. Lynas built four 5,500 TPY TREO trains so that if supply or demand changed, or there was a problem in one train, they did not lose all their production. This came to light over the COVID era when demand dropped. This is a major consideration of any new plant design as economies of scale are limited or offset by potential operational problems.

Overall this may well be one of the players to cross the finish line in the race for more production of rare earths outside China.

The Post-COP26 World Looks To Australia For Future Non-Chinese Rare Earths Production

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To achieve U.N. climate change management goals the world needs to shift rapidly to clean energy, and that means we need to build or secure, reliable sources of rare earths. While the USA and Canada have made some progress in this direction, Australia will also be needed to play a key role.

When looking at a chart of rare earths reserves by country, China shows the largest reserves followed by Vietnam, Brazil, Russia, India, and Australia, in that order. The USA is ranked 8th and Canada is outside of the top ten. Given Australia's stellar track record as a reliable supplier of raw materials, it should not be surprising to know that the West is looking towards Australia to step up production of rare earths, especially those needed to support the surging cleantech sectors of electric vehicles, wind energy, and solar energy.

ClearWorld.us says it well, stating:

"Renewable energy development relies upon sufficient quantities of rare earth minerals, specifically neodymium, terbium, indium, dysprosium, and praseodymium. These are used in the production of solar panels and wind turbines. **If the world is to meet the greenhouse gas emissions targets sought in the Paris Climate Agreement the availability of these minerals must increase by 12 times by 2050**."

(Emphasis by the author.)

Rare earths are key elements in the cleantech revolution

Australian listed rare earths companies:

Producers

Lynas Rare Earths Limited (ASX: LYC) ("Lynas")

Lynas is the second largest neodymium and praseodymium ("NdPr") producer in the world. Lynas owns the Mt Weld rare earth mine, which is one of the world's highest grade rare earths' mines, and the Mt Weld ORE Concentration Plant, both located in Western Australia. Lynas also owns the Lynas Advanced Materials Plant (LAMP), which is an integrated manufacturing facility, separating and processing rare earths' materials in Malaysia. The Lynas 2025 growth strategy encompasses plans to build the Kalgoorlie Rare Earths Processing Facility (cracking and leaching) in Australia and an LRE/HRE separation and specialty materials facility in the USA. Lynas trades on a market cap of A$7.3 billion.

Iluka Resources Ltd. (ASX: ILU) ("Iluka")

Iluka is a relatively new (April 2020) producer of rare earths at their Eneabba Project in Western Australia. Iluka intends to ramp to selling 50,000 tpa of a 20% monazite-zircon ore concentrate for further processing offshore. Iluka has an offtake agreement for 50,000 tpa. Iluka is working on developing a Phase 2 of the Eneabba Project which involves investigating techniques to beneficiate and purify the monazite to an 80% concentrate for sale further down the value chain. Iluka is mostly known for being an Australian heavy mineral sands, zirconium and titanium, producer. Iluka trades on a market cap

of A$3.5 billion.

Vital Metals Limited (ASX: VML) (“Vital”)

Vital recently began mining ore at its Nechalacho’ Mine in Canada’s Northwest Territories (NWT), with commencement of ore processing at Vital’s, under construction, Saskatoon cracking and leaching facility expected to begin in 2022. The Nechalacho Mine is a high grade, light rare earth (bastnaesite) project with a world-class resource of 94.7Mt at 1.46% REO (measured, indicated and inferred). Nechalacho’s North T Zone, which is being mined by Vital, hosts a high-grade resource of 101,000 tonnes at 9.01% LREO (2.2% NdPr). Vital has a non-binding MOU with Ucore Rare Metals Inc. for the supply to it of a mixed rare rare earth carbonate, beginning H1 2024. Vital Metals trades on a market cap of A$250 million.

Explorer/Developers (in alphabetical order):

Arafura Resources Limited (ASX: ARU) (“Arafura”)

Arafura 100% own the Nolan’s Bore rare earth project 135kms from Alice Springs in the Northern Territory, Australia. Arafura states: “The Project is underpinned by low-risk Mineral Resources that have the potential to supply a significant proportion of the world’s NdPr demand. It is a globally significant and strategic NdPr project which, once developed, will become a major supplier of these critical minerals to the high-performance NdFeB permanent magnet market.”

The deposit contains a JORC 2012-compliant Mineral Resources of 56 million tonnes at an average grade of 2.6% total rare earth oxides (TREO). 26.4% of the total rare earths contained are NdPr. The Project is supported by Export Finance Australia (EFA), and the Northern Australia Infrastructure Facility (NAIF), via non-binding letters of support for a proposed senior

debt facility of up to A$200 million and A$100 million respectively. Arafura is looking to raise further funds to get the project started. Arafura recently stated: “The momentum with offtake discussion has enabled engagement to expand to include the options for strategic investment as part of the Nolan’s project funding.” Market cap is A$379 million.

Australian Rare Earths Limited (ASX: AR3) (“AREL”)

AREL is progressing in the exploration of a significant deposit of valuable ‘clay-hosted’ rare earth elements, located at their Koppamurra Project spread over ~4,000km² of tenements in South Australia and Victoria. Past exploration of the Koppamurra region has shown it contains mineralization containing the rare earth elements neodymium, praseodymium, dysprosium and terbium. The Koppamurra Project is an ‘ionic clay’ rare earth opportunity with a 2021 JORC Inferred Mineral Resource of 39.9Mt @ 725ppm TREO. AREL trades on a market cap of A$98 million.

Australian Strategic Materials Ltd. (ASX: ASM) (“ASM”)

ASM owns the Dubbo Rare Earths Project in NSW, Australia. The Dubbo Project is a 100% owned ‘construction ready’ poly-metallic and rare earths project with potential to become a key global supplier of specialty metals and rare earths. ASM’s goal is a “mine to metal” strategy to extract, refine and manufacture high-purity metals and alloys, supplying directly to global technology manufacturers. Market cap is A$1.92 billion.

Northern Minerals Limited (ASX: NTU)

Northern Minerals own the Browns Range heavy rare earth minerals project in Western Australia. Northern Minerals has built a pilot plant to test a number of deposits and prospects that contain high-value dysprosium and other Heavy Rare Earths (HREs) such as yttrium, hosted in xenotime mineralization.

The Company states: “Northern Minerals is positioned to become the world’s first significant producer of dysprosium outside of China. Accounting for 60% of the Browns Range Project’s (the Project) revenue, dysprosium is the key value driver of the Project and is at the core of Northern Minerals’ marketing strategy. With a high value, high purity, dysprosium rich product, the Company is set to become a long term and reliable supplier of dysprosium and other critical heavy rare earths to world markets.” Market cap is A$339 million.

Peak Resources Limited (ASX: PEK)

Peak Resources 75% owns the Ngualla Tanzania rare earth project, which the Company states is one of the world’s, largest and highest grade, undeveloped rare earth projects. The Ngualla Project has ore reserves of 18.5 million tonnes at 4.8% REO; 22% of the total mineral resource is NdPr, with an expected 26 year life of mine. The Project is currently at the funding stage having completed a BFS in 2017. The BFS summary details are here. About 90% of the Project’s revenues will be coming from NdPr. Peak Resources state: “Operating cost of US$ 34.20/kg NdPr* Oxide, demonstrating potential to be the world’s lowest-cost fully integrated rare earth development project.” Market cap is A$135 million.

Closing remarks

With rare earths demand set to grow strongly this decade as the world moves towards cleaner energy and technology, investors would be wise to take a second look at the rare earths sector.

Australian critical minerals projects were recently in the news after the Government announced that they would receive an A$2 billion boost (via a loan facility), to support the sector. This bodes well for the Australian rare earths junior miners to join Lynas as producers. Stay tuned as this sector looks set to shine

this decade.