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On Friday's Close

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Ionic Rare Earths (IXR) looks like a standout

The market continues to suffer from a disappointing gold price and copper has gone into retreat for the time being. Alternative energy stocks have been experiencing pullbacks after the recent buying surge. This sector, which can include rare earths, is still looking as the one most likely to move higher while more traditional metals are pausing. We continue to look for interesting stories in this sector.

Ionic Rare Earths is a standout in the sector

There is a whole swag of rare earth stocks out there with many exploration projects. The challenge is to find ones that have the most attractive suite of REEs, management that is competent and metallurgy that is simple. We know how long and how much it took for Lynas to get where it is today. It has been a similarly difficult road for Northern Minerals, taking more than 10 years and more than a hundred million dollars, surviving near death experiences on more than one occasion ... and NTU is still only at the pilot operating stage. So, is there a less tortuous path to rare earths production?

I have been charting Ionic Rare Earths (IXR) for some time, observing how it was somewhat ignored by punters during 2020, but I have never really looked closely at the geology or metallurgy until now. Last week the 121 Mining Investment Africa Conference availed me the opportunity to meet with the MD and get a good understanding of the merits of the company. In a word, it is a standout.

The Makuutu rare earths project

Makuutu is an ionic adsorption clay (IAC) rare earth element (REE) deposit located 120 km east of Kampala, in Uganda. The deposit has been mapped for a length of 37 km and drill tested over 26 km. Makuutu appears as a 12m thick clay zone overlain by only 3m of cover, enabling low cost bulk mining. Currently the indicated and Inferred Resource is 78.6 Mt at 840 ppm TREO (610 ppm without Cerium), which can be considered mid-range in terms of grade for an IAC. This announced tonnage is only a small proportion of the total orebody, meaning there is potential for a very long mine life. The current Exploration Target is 240-800 Mt at 450-900 ppm TREO.

Although the Makuutu Project is in Uganda, it is well positioned with regard to infrastructure. There is a 183 MW hydro power plant from which a 132 Kv power line runs through the project licence. Uganda has had a stable government with the same president since 1986, with the recent election confirming his position for another five years.

Ionic has earned a 51% interest in the project by spending US\$2.8m and will increase to 60% on the completion of the BFS. The mechanism exists by which ownership can increase to 100%.

Makuutu is an ionic clay deposit, meaning "special"

While the orebody size is impressive, the most notable feature is that Makuutu is an ionic clay deposit. Nature has already liberated the REE from the original geology, which is the first stage in the recovery process of any flowsheet. That has great implications for metallurgy, capital and operating costs.

What makes Makuutu very interesting is that it is a similar type of REE deposit to those that have been mined for many decades in southern China. These deposits are being depleted and there are very few known, similar deposits elsewhere in the world.

Metallurgy, not grade, is the key to rare earths

We frequently see the maxim "grade is king". Well, that doesn't really apply with rare earths. Metallurgy is far more important. Even though ion adsorption clays are lower grade than many hard rock deposits, the metallurgy is much simpler in the path from ore to concentrates and they have minimal or no radioactive materials such as thorium and uranium.

Ionic Adsorption Clay Flow Sheet

Ionic is considering using a two stage agglomerated heap leach, salt desorption process with rapid kinetics to release the REE from the clays. Each stage would be 14 days duration at pH levels of 3.5 and 2, respectively. Here, it needs to be carefully designed due to the potential for seasonal positive water balance and the occurrence of two short annual wet season rain events.

The rare earths will be precipitated as a mixed rare earth carbonate product (as opposed to a concentrate), which attracts both a higher payability rate, perhaps as high as 70-80% of the value of the REE contained therein. This contrasts with the playability of REE concentrates from hard rock mines, which is frequently as low as 35-40%. IXR expects to achieve a high basket price due to the dominant high value critical and heavy rare earths which make up over 70% of the product basket.

Expressed simply, salt desorption releases the rare earths into solution with no cracking required, giving a > 50% rare earth chemical precipitate with REE recovery rates of 40-80%, depending on the exact orebody.

Splits of value in the basket prices

Each rare earths project will produce a basket of products which result in mine specific values. As a generalisation the light rare earths come from hard rock deposits. The heavies are more associated with clay deposits, and xenotime (which is a hard rock mineral that Northern Minerals mines).

Two of the most sought after elements are Neodymium (Nd) and Praseodymium (Pr) for their use in permanent magnet motors. Prices of the oxides have basically double in the last six months from around US\$45/kg six months ago to > US\$70/kg today.

Another two elements needed for good performance of permanent magnet motors in higher temperature operating environments, such as wind turbines, are Terbium (Tb) and Dysprosium (Dy). These prices have been rising faster than NdPr prices, largely due to China being the only recognised source at the moment, and the recently implemented Export Control Law from December 1, 2020. Terbium oxide has jumped from US\$800/kg to US\$1,600/kg in western markets.

Makuutu expects to produce Tb and Dy, significantly boosting the value of its basket price. The table below shows how this works.

Basket of REE Products at Makuutu		
Element	% of Weight	% of Value
Dysprosium (Dy)	4.7%	32.5%
Terbium (Tb)	0.7%	16.3%
Neodymium (Nd)	19.2%	32.4%
Praseodymium (Pr)	4.3%	5.1%
Of Total	28.9%	86.3%

Scandium by-product

Scandium has popped its head up from time to time over the last few decades but so far it has been more of curiosity value and not taken seriously by many punters due to the limited market and supply. Still, companies love to promote it for the potential value. Not surprisingly IXR likes to talk about scandium, saying there are plenty of applications it could be used for if industry could get reliable supply at prices of US\$1,500/kg.

IXR has reported grades of 30 ppm scandium (Sc₂O₃) and negligible additional costs to recover it from the product stream. If it could recover 10-20 tpa of the scandium oxide (Sc₂O₃) it believes that scandium sales could contribute 20% of total revenue.

IXR has appointed John Carr as a scandium marketing advisor. John spent five years with Clean Teq working on a marketing strategy. Interestingly, IXR's MD, Tim Harrison, is a metallurgist who was Manager-Process development for Clean Teq's Sunrise nickel-cobalt-scandium project from conception to a development ready project. The team also includes Geoff Chapman, overseeing geology at Makuutu since acquisition back in August 2019, providing vast rare earth exploration and resource development experience as the size of the deposit comes to realisation.

Chinese have been the leaders in ionic clay deposits

One of the reasons for Chinese dominance of the rare earths market has been the availability of ionic clay deposits that can be easily mined and processed. They have been mining these for 50 years but the resources are being rapidly depleted. Ionic could be perfectly positioned to fill the gap in supply.

Experienced management is a plus

IXR's managing director is a metallurgist, which is most useful with a project like Makuutu. Relevant experience comes from five years with Clean Teq on the the sunrise project at Syerstone in NSW, with earlier positions at Olympic Dam with BHP/WMC, Fluor Daniel and Ivanhoe. Thus management has strong technical credentials.

Upcoming news flow

Forthcoming news flow is expected to include an updated resource in February, and an updated Scoping Study in March. Looking beyond that, in April the company will commence reconnaissance drilling at EL00147 (recently approved and immediately east of the previous drilling) to look for a further step change in IAC mineralisation at Makuutu.

At the moment the cash balance is a modest \$2m, so we should expect that there will be some sort of funding happening within a couple of months, though we do not know of any specific plan.

Is there fundamental value at \$100m?

The enthusiasm for rare earth stocks is more about the thematic of alternative energy and the need to diversify away from China's dominance of the sector. FOMO is driving investor preferences rather than fundamentals, so you don't have to spend too much time trying to estimate profits.

Most of the companies will never produce, but that won't stop punters from buying with their ears pinned back. It is all about getting set and going for a ride. Nevertheless, for those who want some comfort of the fundamentals, as uncertain as they may be, Ionic comes across as a standout due to the nature of the geology, the simplicity of the process flow sheet and the quality of the management.

Disclosure: Interests associated with the author own shares in Ionic Rare Earths.

More notes on hydrogen

Last week I commented that it was difficult to know what other hydrogen technologies are out being researched, that haven't made it to the public eye but we do have some colour of the level of activity. Since 2000, about 230 projects for hydrogen production have been commissioned that use electrical energy for a range of applications. The capex of water electrolyzers commissioned in 2017 and 2018 was US\$20-30m p.a., plus storage tanks associated pipework and support infrastructure.

Common technology includes alkaline and proton exchange membrane (PEM) methods. Solid oxide electrolyser cells are beginning to appear. It is thought that adaptation of these proven technologies will accelerate with economies of scale coming from mass manufacturing.