Sunday, January 19, 2025

# HALLGARTEN + COMPANY

**Initiation of Coverage**

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# Energy Fuels:
## (NYSE: UUUU | TSX: EFR)
## Strategy: LONG

| **Key Metrics** | | | |
|---|---|---|---|
| Price (USD) | $5.21 | | |
| 12-Month Target Price (USD) | $11.50 | | |
| Upside to Target | 121% | | |
| 12mth high-low | $4.19 to $8.21 | | |
| Market Cap (USD mn) | $857.98 | | |
| **Shares Outstanding (mns)** | 164.7 | | |
| **Fully diluted** | 167.4 | | |
| | **FY23** | **FY24e** | **FY25e** |
| Consensus EPS | | ($0.09) | n/a |
| Hallgarten EPS (CAD) | | ($0.26) | $0.11 |
| Actual EPS (CAD) | 0.63 | | |
| P/E | 8.3 | n/a | 47.4 |

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# Energy Fuels

## White Mesa as the Epicentre of Change

- + Energy Fuels is a late starter in the race to Rare Earth Element (REE) production in North America but has dashed nearly to the front of the pack in two short years
- + Once seen almost exclusively as a Uranium story, the company has swiftly added two new silos to its business mix in the form of Rare Earths and those metals/minerals derived from Heavy Mineral Sands, such as Titanium, Zircon and Hafnium (a highly strategic metal in the nuclear energy space)
- + Several bargain acquisitions/deals have propelled Energy Fuels into the top tier of Heavy Mineral Sands (HMS) and Rare Earth developers
- + The Ranobe/Toliara project in Madagascar should propel UUUU/EFR into the top tier of mineral sands producers, while ensuring sizeable supplies of monazite sands that will be processed into high-purity separated Rare Earth oxides at the White Mesa Mill
- + Coming up fast though is the Donald JV (with Astron) in Australia which could be dispatching monazite product to UUUU as early as 2026
- + The return of monazite sands (from HMS) as a source of Rare Earths is a trend gaining momentum due to highly favorable distributions of both Light & Heavy Rare Earths, and the ability of companies like UUUU to manage associated radionuclides.
- + Evolving supply chains (some over great distances) have made the US relevant again in Rare Earths, with Energy Fuels (and its acquisitions) as key chess pieces
- + Unlike other Rare Earth developers, Energy Fuels is well-cashed up with $183mn in working capital as at the end of September 2024
- + The Uranium space is definitely out of the (post-Fukushima) swoon with very few companies positioned, as is Energy Fuels, to profit from the resurgence
- × The Rare Earth space has been bedeviled by weaker pricing over the last 12 months with many suspecting the hidden hand of China trying to suppress REE competition
- × Ilmenite prices have weakened since mid-2022 as has Premium Zircon, to a lesser extent
- × Spot Uranium prices have given back some of their gains made in 2023

**Divide & Multiply**

It's not often that a major mining company morphs from one element to a whole new silo in the relatively short space of just three years. Most just stick to their knitting and fail dismally at thinking laterally.

Ironically, it was the long drought in the uranium space post-Fukushima that spurred Energy Fuels to reassess its strengths and launch itself on a whole new path that, in retrospect, looks like a logical

extension of what it was doing pre-2020, but seemed iconoclastic when it headed down a path not previously taken by any industry participants. It is somewhat akin to RTZ's "A-Ha moment" when it realised it could exploit Scandium from its bauxite residues or Trafigura suddenly discovering it could produce Germanium from its Zinc refining streams at its Tennessee refineries (when the Chinese slapped on an export ban).

Not only was the move into Rare Earths a diversification, but it was a major disrupter of the truisms that constrained thinking in the REE space. The effects of Energy Fuels' intervention into monazite sands are still making tsunamis in the placid (well, becalmed) waters of the Lanthanide production (and development) complex. In our humble opinion, the eruption of monazite sands on the scene, as a realistic and practical source of sought-after Rare Earths, sounded the death knell for a swathe of wannabe REE projects pursuing complex mineralogies in outlandish locations. Some have not yet heard the tolling of the bell, but it is reflected in their lowly market capitalisations and inability to raise further funds. Mass dieback awaits the REE space as Energy Fuels is about to "eat their lunch"… to mix a few metaphors.

With their radioactive component, monazite sands have largely been shunned since the 1960s. Having said that Bastnaesite also has U/Th, though less than monazite, and has good distributions of the REEs that were in demand at the time (Ce, La, Eu). Today, monazite is back in vogue due to having superior distributions of Nd, Pr, Tb, Dy, and other Heavy Rare Earths, that now have stronger demand upside for EV and hybrid EV vehicles, advanced robotics, renewable energy systems, and military and defense tech.

Now though the point of intersection between the REE space and the Uranium space is Energy Fuels' White Mesa Mill in Utah that is the epicentre of change.

In this study, we shall look at the push by Energy Fuels into monazite sands and its collateral rise to becoming a major player in the Heavy Mineral Sands space, a sector of the mining industry even more obscure (yet massive) than Rare Earths once appeared to be. We shall also look at some of the changing dynamics, the pricing, Energy Fuels' deal-doing and other key factors.

**On Energy Fuels**

Energy Fuels is one of the exclusive group of uranium producers in the United States, but it is even more unique as a mineral processor as well. It has produced two-thirds of all uranium in the U.S. since 2017, it will likely be #2 or #3 in the U.S. in 2024 as the company focused on Rare Earths and ramps up its uranium mines while it believes it will reclaim its #1 position in US uranium in 2025 and extending its production lead further.

The company holds two licensed uranium processing facilities, including the only conventional uranium mill in the U.S. (White Mesa) and a low-cost ISR facility. Its uranium processing capacity at over 10mn lbs per annum gives it more licensed and operational uranium production capacity than any other U.S. miner.

Energy Fuels holds a uranium resource of greater than 81mn lbs in the M&I categories.

Additionally, it also holds a Vanadium resource of more than 31mn lbs in the M&I categories. Thus, Energy Fuels holds more in-ground vanadium resources than any other US producer, and the only conventional vanadium mill in the U.S. While Vanadium may be wallowing pricewise at the current time, the overwhelming attraction of Vanadium Redox Flow batteries for superior mass energy storage are not going away, nor are the core uses of Vanadium in high strength steel and advanced alloys.

It was the long stretch of lean years after the Fukushima event that led to Energy Fuels looking to harvest its strengths to enhance its value-added proposition. Firstly, this involved the processing of monazite sands for their uranium and Rare Earths content. This has evolved with greater rapidity in the last two years and the company now has three silos: the uranium processing and production business, REE extraction from monazite sands and now its major, and growing, position as a leading future producer of Heavy Minerals sands. The latter is the newest business line but links back particularly to the Rare Earth business and relies upon the company's existing licensed and operating facilities constructed initially solely for uranium processing. Thus, the company's silos are symbiotic.

**The Riddle of the Sands**

Firstly, we shall look at the dynamics of Heavy Mineral Sands (HMS), the company's newest activity and most different from its well-known strengths in Uranium. For those with an elementary grasp of HMS, these conjure up Titanium, but for the more nuanced, it also means Zircon and Hafnium and increasingly the full suite of both Light and Heavy Rare Earths (REEs) from a mineral called monazite. Hafnium is

most definitely a critical (and strategic) mineral without making reference to lists conjured up by bureaucrats. Its roles and uses are far beyond the humdrum.

Meanwhile, REEs were traditionally sourced from monazite sands. However, this source passed largely into the history books from mid-last century due to evolving demand for certain individual Rare Earth oxides that could be extracted from other sources (i.e., bastnaesite) and the fact that monazite has more Uranium and Thorium than other REE-bearing minerals. However, monazite is now making a comeback, with a vengeance. That is upsetting the business plans of a lot of REE wannabes who had not calculated on this source of Rare Earths making such a strong challenge, compromising the economics of plain vanilla REE projects with inferior distributions of the so-called "Magnet" REEs and Heavy REEs, while enhancing the economics of HMS projects where the monazite component was long seen as a throwaway, at worst, or to be stockpiled, at best.

**Heavy Mineral Sands – Origins & Occurrence**

Heavy mineral sands are a class of ore deposit that is an important source of Zirconium, Titanium, Thorium, Tungsten, and Rare-Earth elements, as well as the industrial minerals diamond, sapphire, garnet, and occasionally precious metals or gemstones.

Hitherto, the main minerals that have been exploited/sought-after have been ilmenite (Titanium), rutile (Titanium), leucoxene (Titanium), and zircon (Zirconium and Hafnium). For more details, see Appendix I.

Heavy mineral sands are placer deposits originally formed by wind and water, most usually in current or former beach environments by concentration due to the specific gravity of the mineral grains. Hard rock is eroded by rivers and wind, or if near the coast, also by waves, tides, and coastal currents. The sediments derived from these rocks are transported, deposited, and then reworked by the same processes. This reworking causes them to become sorted by density, size, and shape. This sorting can concentrate denser and heavier mineral grains such as ilmenite, leucoxene, and rutile (containing Titanium), monazite and xenotime (containing REEs), and Zircon (containing Zirconium and Hafnium), creating economic deposits.

Unsurprisingly mineral sands have their highest exploitable concentrations along coastlines (and former coastlines). The coasts of the Indian Ocean, and to a lesser extent the Atlantic Ocean, have been where most deposits of size have been exploited.

Heavy mineral deposits have several attractive advantages over other types of mineral deposits:

- Extraction is relatively simple, requiring only physical methods to separate out heavy minerals such as density, magnetic and electrical methods, rather than chemical methods that can introduce toxicity
- Remediation is also relatively simple because restoration methods are also physical

We would note that many HMS deposits often have a monazite component (some also having our most

favoured REE-mineralisation, Xenotime) and that product is being sourced mainly from Madagascar currently (RTZ), Australia (Iluka and Tronox), South Africa (RTZ and Tronox), Mozambique (Kenmare) and from new players, like Sheffield Resources (ASX:SFX), that have monazite within their mineral sand ore.

**Rare Earths – a Sleeper By-Product**

Rare Earth elements (REEs) have multiple applications, particularly in super magnets (with usage in the likes of electric vehicles (including hybrid EVs), advanced robotics, wind turbines, mobile phones etc.). It is notable that Plug-In Hybrid EVs (PHEVs) are seeing better consumer adoption in North America and Europe than pure EVs, and yet they need the same amount of REE magnets.

REEs also have applications in lasers and the defence industries (e.g. night-vision apparatus and precision-guided weapons).

In the last four years, the Rare Earths space has gone from mild buzzing to a full furore and back to a bust. Despite this, there has not been a massive burgeoning of projects, as in 2009-11, nor has there been much in the way of additions to the number of viable projects in the United States.

The (re)awakening in Rare Earths has been spurred by the invective related to the almost total dependence of the US economy (and its military) upon externally sourced Rare Earths, primarily from China.

The renewed interest of politicians and investors coincides with the on-going slide in China's own internal production (particularly in Heavy Rare Earths). This changes the dynamic from the one which has reigned for the last eight years, where China definitively had the whiphand. With Chinese supplies under a cloud and the West having added little capacity in recent years, the scenario is one of shortages and rationing, particularly for REEs most used in EVs, robots and 5G.

**On Monazite Sands**

In the first Rare Earths equities boom (2009-12), the overwhelming chatter of the REE promoters was related to bastnäsite, carbonatites, and even eudialyte. Monazite sands got some attention, but they were largely downplayed due to higher relative concentrations of Uranium and Thorium (which actually occur in most REE minerals).

While these previously vaunted mineralisations have fallen by the wayside due to inferior distributions of key REE oxides, increasingly the focus has been on lesser-known, lower-cost, and more valuable host mineralisations, with Ionic Adsorption Clays (with their strong distribution of Heavy REEs), monazite sands (with their strong weighting towards Light, Heavy and the so-called "Magnet" REEs), and recycling of urban waste and miscellaneous tailings all making a running.

Monazite is a primarily reddish-brown phosphate mineral that typically contains over 60% Rare Earth elements. It is often found in placer deposits with India, Madagascar, Brazil, Australia and South Africa

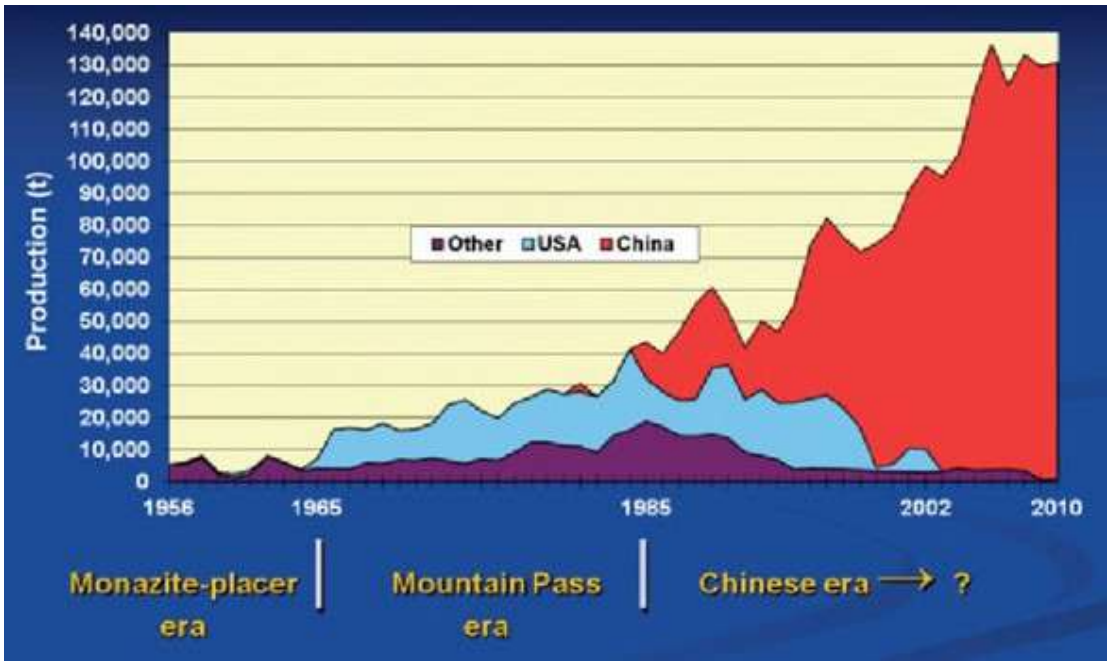
having large deposits of monazite sands (within larger HMS deposits). Deposits in India are particularly rich in monazite, but there is limited global supply from this source. Monazite is radioactive due to the presence of Thorium and, to a lesser extent, Uranium.

Generally, a "monazite concentrate" refers to a monazite-rich concentrate extracted from HMS, in which most of the Zircon and Titanium components have been removed and recovered in other products and concentrates. “Monazite concentrate” can be up to 80% to 90%+ monazite, which contains 50% - 60% Rare Earths, of which 20% - 22%+ are Neodymium (Nd) and Praseodymium (Pr), and about 1% - 2%+ are Dysprosium (Dy) and Terbium (Tb), the sought-after “magnet” Rare Earths.

**The Eras – Monazite as a Constant**

In fact, monazite was the only significant source of commercial Lanthanides from the first exploitation of Rare Earths through until the start of the so-called Mountain Pass era. Before the Mountain Pass era in Rare Earths, the Brazilian monazite sands (from HMS) dominated the supply picture from WW1 onwards.

Concern over the disposal of the radioactive daughter products in monazite, such as Thorium, resulted in bastnäsite displacing monazite in the production of lanthanides in the 1960s due to its much lower Thorium content. At that time, Europium (a red phosphor in color televisions) was a major market driver for Rare Earths, along with lanthanum and cerium. Today, these elements are not particularly valuable or in high demand.




Despite this radioactivity issue, India has been a constant producer of REEs from HMS over many decades, as well as being a producer of Thorium. According to the Indian Mineral Resources Handbook

of 2020, it occurs in concentrations of 0.4 – 4.3% of total HREEs in the beach and inland placer deposits of the country.

Resource estimates of monazite in the beach and inland placer deposits of India have been enhanced from 12.47 million tonnes in 2016 to 12.73 million tonnes in 2020.

Monazite ores can be transported internationally in Class 7 sealed shipping containers (of which more anon), but from HMS operations it is often sold as part of a mixed concentrate (sometimes as Class 7 material if concentrations are greater than about 2% monazite, sometimes not if concentrations are less than 2% monazite, and sometimes illegally into China or nearby by certain irresponsible entities around the world as non-Class 7 material despite concentrations being above 2% monazite).

**Energy Fuels – Start of a Trend?**

It is notable that Energy Fuels' White Mesa Mill in Utah is the US's only licensed refiner of uranium ores into natural uranium concentrates ($U_3O_8$), which makes it the only location in the USA to which monazite concentrates (typically containing about 40% - 60% Rare Earths, 0.20% - 0.30% uranium, and about 1%-7% Thorium) can be shipped, since Energy Fuels is licensed to receive and process naturally radioactive ores. In the environmental regulation-driven atmosphere of the USA, Energy Fuels stands out as the only US company that is licensed to produce $U_3O_8$, $V_2O_5$, and Rare Earths, and likely the only one for a long time, if not forever.

Energy Fuels is flipping conventional wisdom on its head, as the radioactive element of monazite sands is an opportunity and value driver for Energy Fuels, rather than a challenge (as it is for most other companies), as evidenced by its processing of monazite sands sourced from the operations of Chemours (NYSE:CC) in Georgia over the past four years, where they extract and purify the Rare Earths, along with uranium, from the ore.

Of the 50–60%% TREO typically found in U.S. monazite sand concentrates, NdPr comprises approximately 22% of the TREO, along with about 1% - 2% Dy and Tb, thus positioning Energy Fuels output as a feeder to the EV, hybrid EV, robotic, magnet, and defense industries in the US.

**The Chemours – Energy Fuels – Neo Performance Nexus**

The genesis of the shift by Energy Fuels into the REE space was an announcement in March 2021 that Neo Performance Materials (TSX: NEO) and Energy Fuels were teaming up to launch a Rare Earth production initiative "spanning European and North American critical material supply chains".

The plan was to produce REE products from monazite sands that were a byproduct of heavy mineral sands mined by Chemours in Georgia. Energy Fuels processed the monazite sands into a mixed REE carbonate in Utah for use as feed material for Neo's value-added separated Rare Earth production plant in Europe.

**The Deals with Chemours & Neo Performance**

The original sales agreement for the provision of natural monazite sands between Energy Fuels and Chemours was announced in mid-December of 2020. Under the deal Chemours was to supply Energy Fuels with a minimum quantity of 2,500 tons per annum of natural monazite ore produced in Georgia, and elsewhere in the southeast U.S. Neo's Silmet facility purchased and processed a minimum of 840 metric tonnes of Total Rare Earth Oxides (TREO) per year from Energy Fuels, which was in addition to Silmet's current production.

**Silmet – The End Product**

Starting in 2021, Energy Fuels processed Chemours' monazite sands into a mixed RE Carbonate and then shipped that production to Neo's REE separation facility, Silmet, in Sillamäe, Estonia until 2024. Neo then processed the RE Carbonate into separated Rare Earth oxides for use in permanent magnets and other REE-based advanced materials. Neo (which has been a long-term component of our Model Resources Portfolio) has long been seen as excessively dependent upon China and Russia for its inputs and so in recent years has been seeking to expand and diversify its sources of REE feedstock for Silmet.

Silmet, which has been separating REEs into commercial value-added products for more than 50 years, is the only operational REE separations facility in Europe. It was purchased over a decade ago from Triebacher, which had previously picked it up after the break-up of the Soviet Union and Estonia's independence. Under the USSR management it had been a key chess piece in the structure of the Eastern Bloc's critical metals supply-chain. Ironically, it is now a key component of the West's REE supply chain.

In April 2020, Neo and Energy Fuels first began working in a technical collaboration to establish a monazite processing and RE Carbonate production capacity at the White Mesa Mill plant. Then Energy Fuels successfully produced RE Carbonate at mill in October 2020 from monazite sands. This new REE supply chain constituted the first time in over twenty years that monazite ore from the U.S. was used as a feedstock to manufacture separated REE materials outside of China.

**White Mesa – Onshoring the End Product?**

While providing RE Carbonate to Neo, Energy Fuels also developed U.S. Rare Earth separation capabilities at its White Mesa Mill, as it worked to increase its monazite sand ore supplies, thereby fully integrate a REE supply chain. It turns out that the same processing technique Energy Fuels has used to produce high-purity uranium and vanadium oxides (solvent extraction) is also used to produce Rare Earth oxides. So, Energy Fuels set about to internally designing and developing its own Rare Earth separation capabilities. This came to fruition in the summer of 2024 when Energy Fuels successfully commissioned a Rare Earth separation circuit capable of producing about 1,000 tonnes of "on-spec" separated NdPr, which interestingly represents a larger capacity than Neo's Silmet facility.

Typical monazite ore has a higher value than other REE-bearing ores, as it contains 50% - 60%+ total rare

earth content, plus 0.20% - 0.30% recoverable natural uranium, which is the typical grade of uranium found in uranium mines that have historically fed the White Mesa Mill. This means that, in addition to extracting the high concentrations of Rare Earths from the monazite ore, the White Mesa Mill also extracts and monetizes the uranium content in this ore.

Energy Fuels was initially seeking to secure additional quantities of monazite ores with a goal of processing 15,000 tons, or more, per year in the future. For perspective, 15,000 tons of monazite per annum would represent approximately 2% of the White Mesa Mill's existing throughput capacity and less than 1% of its existing tailings capacity but contain Rare Earths equal to roughly 50% of total current U.S. demand. The company subsequently decided to shoot even higher and is now working to secure 40,000 to 60,000 tonnes of monazite per year.

In mid-August of 2024, Energy Fuels commissioned a 5,000 tpa TREO SX plant dedicated to NdPr separation in Utah (with a capacity to produce about 1,000 tpa of separated NdPr). Energy Fuels also expanded its previous plans in 2024, with the company now expecting to construct the capacity to produce up to 30,000 tpa TREO at the White Mesa Mill, including up to 6,000 tpa of NdPr and 300 tpa of Dy and Tb. It is noteworthy that the company does not plan to produce a mixed REE carbonate in the future, opting instead to go farther down the supply chain to more value-added products.

This is where “the rubber hits the road” with the vertical integration strategy as these new processing facilities will require roughly 50,000 tpa of monazite, which is intended to be sourced from the company’s newly acquired Toliara (Madagascar), Donald (Australia), and Bahia (Brazil) HMS projects, along with offtakes from other monazite suppliers (including Chemours). Energy Fuels plans to continue sourcing a portion of its monazite feedstock from Chemours and potentially others, while the future relationship with Neo is evolving. In the end, there are a number of current and emerging customers for Energy Fuels’ separated NdPr, Dy and Tb.

**The REE Space in the US – The Old is Made New Again**

From over 300 claimants to be potential Rare Earth producers in 2011, at the end of the last Rare Earths boom, the number of developers shrank to less than twenty survivors by 2019. Of those only five had properties in the United States. Mountain Pass in California (the sole producer, controlled by MP Materials), with the others being Halleck Creek (& La Paz) properties of American Rare Earths (ASX:ARR), Bear Lodge property (Rare Earth Elements - OTCQB:REEMF & General Atomics) and Bokan in Alaska (owned by UCore – TSX-v:UCU).

Meanwhile, USA Rare Earths, holder of the Round Top project with Texas Mineral Resources (OTC:TMRC) has gone from market darling to being almost totally sidelined. In any case we regard Round Top as a beryllium mine.

We would note though that the number of prospective properties in the US has not shrunk to an appreciable extent since 2011, but rather the attrition has been in Canada, Africa, Australia and elsewhere. Meanwhile, Mountain Pass (in the guise of Molycorp) died and was reborn in the guise of MP

Materials (NYSE:MP) and the others went through a long somnolence (from which Bokan and Bear Lodge have still not awoken).

**Pondering the Role in the Supply Chain**

One of the main fallacies of the First Rare Earth Boom (2009-12) was that all one needed was a mine and that this splendid creation (often in an outlandish location) could grow and prosper in isolation from the rest of the industrial-military complex that feeds upon Rare Earths. The errors of their ways took a long time to be corrected but this time around, almost all participants in Rare Earths know that it is all about the value chain and cost competitiveness.

The word "chain" is particularly appropriate when one looks at constructs such as the aforementioned Chemours/Energy Fuels/Neo Performance Materials mine-to-magnet flowchart, which got Energy Fuels off the ground. But this only shows that even the largest players cannot "do it all" and must rely upon the comfort of strangers to combine skillsets. This structure, originally, relied upon an end-processor that is in Estonia.

Then there were the plans (temporarily thwarted) of Vital Metals to send its output from Nechalacho in the NWT to Saskatoon and then on to Norway for end-processing, before ending up (we presume) in Europa's magnet making industry.

Then there is Ucore, which has planted its flag in the midstream with its development of a processing plant in Louisiana, which will require feed as long as its Bokan Mountain project remains on the drawing board. We recently wrote a note speaking of the technology issue as it pertains to REE processing.

Ergo, some supply chains are looking stretched or disjointed and are being driven by the *Zeitgeist* of resource security within major economic players and blocs. Lynas is a particularly novel example having gone from a mine project in Western Australia, to a processor in Malaysia, to being on the cusp of being a processor in Australia (after the government of Malaysia became discontented with Thorium and uranium being stored in their country), and with advanced plans to become a processor in the US.

Lynas has been engaged in the development at Seadrift, Texas, of a site for the co-location of Heavy REE and Light REE Earth separation and processing, as well as potential future growth opportunities such as downstream processing and recycling to create a circular mine to magnet supply chain. How, or if, the US development plan of Lynas play out could potentially mesh with the evolution of some onshore REE mines being pondered for the US, far more than with Lynas's mine back in Australia.

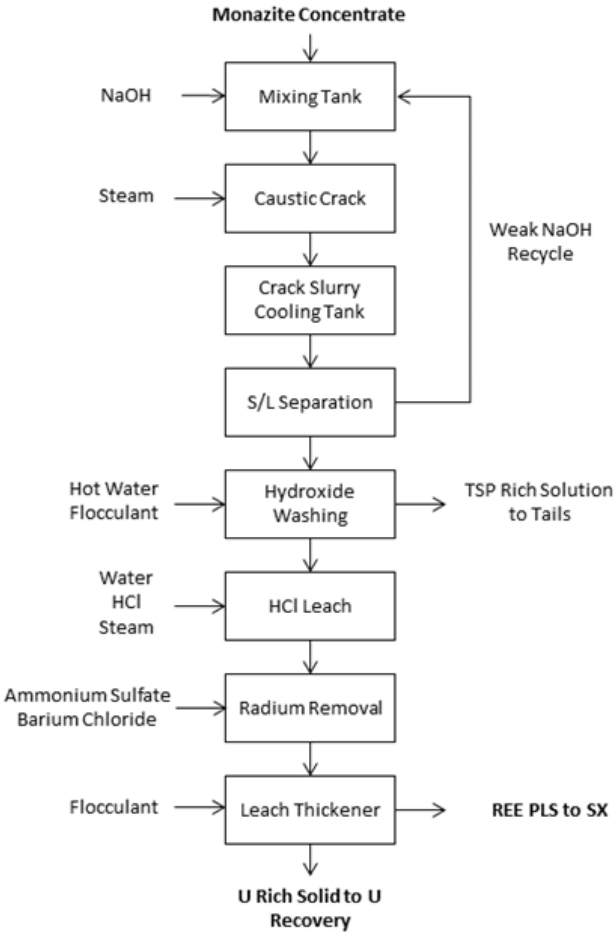
As Lynas has been a recipient of US DoD largesse and has made a big PR push in Washington and Texas, any retreat from the plan would go down poorly in high places.

**The Process at White Mesa**

The UUUU plans to extract REEs from monazite sands took the Rare Earth space by surprise. It should not have been such a revelation for, as we noted, monazite was the mainstay source of Rare Earths before the so-called Mountain Pass Era and has been the secondary non-hard rock source since the 1960s.

The processes are not rocket-science, as the expression goes, but it did take a leap of imagination by Energy Fuels' management to realise that its uranium processing facility could be applied to this process.

The first process is the Caustic Crack Process. This 2-step process, of which the first is a caustic crack followed by a Hydrochloric acid (HCl) leach. Then comes high-temperature caustic cracking with ~50% NaOH solution. A selective HCl leach is employed to leave radioactive materials in solid form.




The Pros for using this method are:

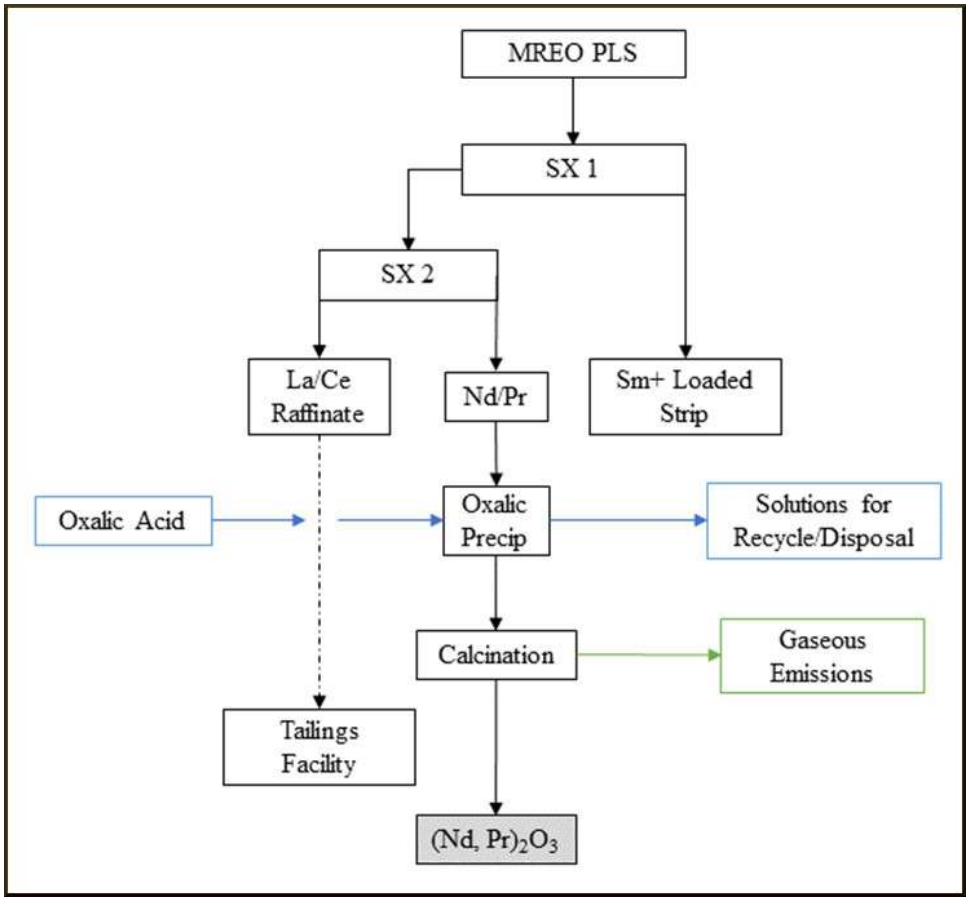
- ✓ Simplified impurities control
- ✓ Uranium and thorium stay in solid form

The Cons of the process are:

- ☒ Higher reagent prices
- ☒ Requires higher monazite grades to be economic

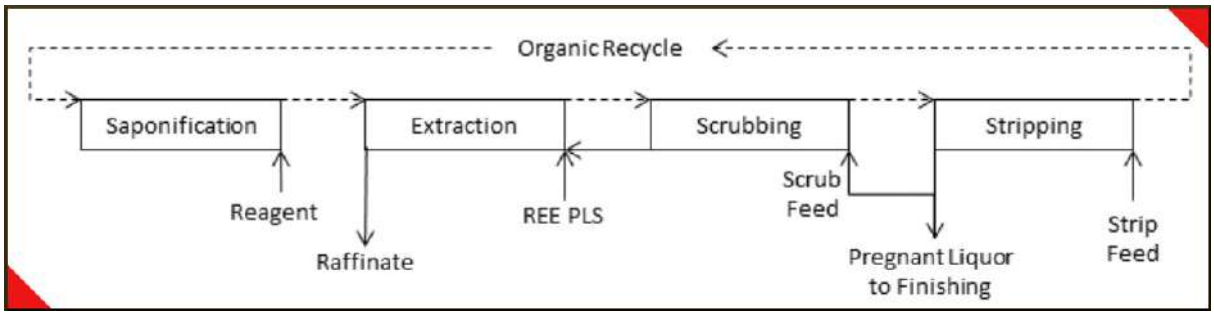
**Rare Earths Thru Solvent Extraction (SX)**

As the flowchart on the preceding chart shows the REE Pregnant Leach Solution (PLS) is sent off to the right to the Solvent Extraction (SX) circuit, which is shown below:

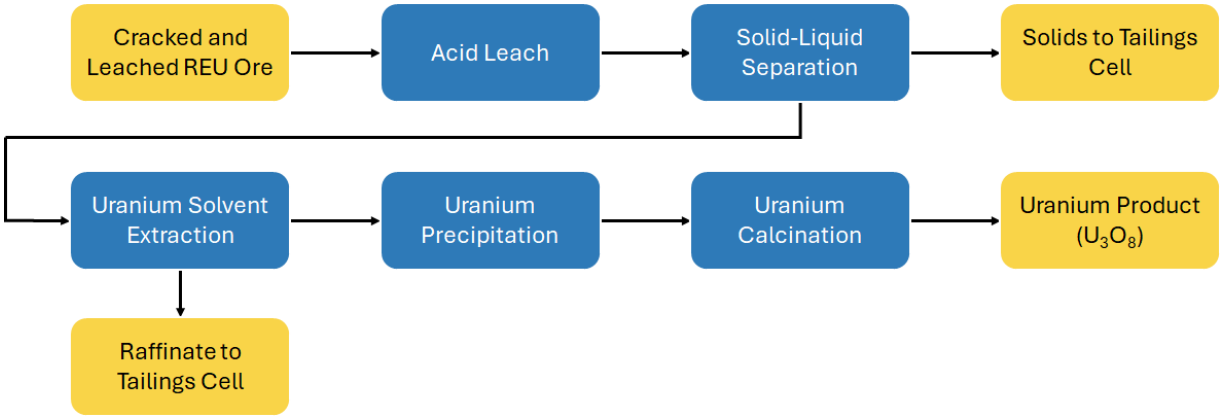



Solvent Extraction is utilized to separate Rare Earths to high purity individual elements (with purities exceeding 4N possible). Relatively small separation factors lead to many stages.

These individual solvent extraction circuits consist of four major parts: saponification, extraction, scrubbing, and stripping as shown in the process chart below.




Finally, there is the extraction of the radioactive element from the cracked and leached ore. This is shown in the flowchart that follows:




The Uranium leaves the caustic cracking process as a solid hydroxide. Then conventional solvent extraction is applied to purify and separate the uranium.

The company believes that there is potential to produce up to 400,000 lbs $U_3O_8$ per year from monazite.

**Production Thus Far**

In February of 2023 the company reported that it is was separating lanthanum (La) and cerium (Ce) from its commercial RE Carbonate stream utilizing existing White Mesa's infrastructure to produce an REE Carbonate product with higher concentrations of NdPr and heavy REEs.

The company made significant advancements in its REE processing in 2024. Between 2021 and 2023, it produced mixed REE carbonate (MREC), which it sold to Neo/Silmet. However, as mentioned earlier, in 2024, Energy Fuels installed and commissioned a dedicated solvent extraction (SX) circuit, nominally of 5,000 tons total Rare Earth oxides (TREO) per annum capacity (1,000 tpa separated NdPr), which has test produced about 38 tonnes of high-purity, on-spec separated NdPr.


This NdPr could be sold to Neo/Silmet, and samples are also now being qualified by other REE metal makers and magnet manufacturers around the world for use in EVs.

The company is also in advanced discussions with other REE metal-

makers, magnet-makers, and EV drivetrain manufacturers who are interested in purchasing the separated NdPr product, and potentially separated Dy (dysprosium) and Tb (terbium), in the future.

**The Three-Phase Plan**

Energy Fuels has a three-phase program to upgrade the REE circuit:

**Phase I:** In early 2023, construction began on the Phase 1 REE separation facilities (NdPr), including modifications and enhancements to the solvent extraction (SX) circuits at the Mill. "Phase 1" has the capacity to process approximately 8,000 to 10,000 metric tonnes of monazite concentrates per year from the Mill's process streams, producing roughly 4,000 to 5,000 metric tonnes TREO, containing roughly 800 to 1,000 metric tonnes of recoverable separated NdPr oxide per year (or oxalate, which is separated NdPr that has not been calcined or “baked”, a cheap, simple step). As the company was utilizing existing infrastructure at the Mill, this phase’s capital totaled only about $18mn. The phase became operational in early 2024, following successful construction and commissioning. This phase made Energy Fuels “first to the market” among US companies with commercial quantities of “on spec” separated NdPr available to EV/hybrid, renewable energy, and other companies for offtake.

**Phase II:** under this phase the company expects to expand its NdPr separation capabilities, with an expected capacity to process roughly 40,000 – 60,000 metric tonnes of monazite concentrates per year and expected recovery of roughly 20,000 to 30,000 metric tonnes of TREO, containing roughly 4,000 to 6,000 metric tonnes of NdPr oxide per year, or sufficient NdPr for three to six million EVs per annum. This second phase is also expected to add a dedicated monazite "crack-and-leach" circuit to the Mill's existing leach circuits. Currently, the Mill is utilizing its main uranium processing circuits to process monazite and extract the REEs and uranium. A dedicated leach circuit would allow the Mill to simultaneously process monazite in the new dedicated circuit and to process other mined uranium and uranium/vanadium ores in the main circuit. This phase is expected to be complete in 2027, subject to licensing, financing, and receipt of sufficient monazite feed.

**Phase 3:** the plan being to add heavy REE separation capabilities, including the production of Dy, Tb, and potentially other REE oxides and advanced materials. Management will also evaluate the potential to produce La and Ce products. Monazite concentrates naturally contain higher concentrations of heavy REEs, including Dy and Tb, versus other REE-bearing ores, like bastnaesite, mainly due to the presence of another REE-bearing phosphate mineral called "xenotime." Successful implementation of this phase will enable the production of separated Dy, Tb, and potentially other light and heavy REE products. The company also expects to have additional heavy REE feedstock stockpiled from the first two phases. During these earlier phases, the company expects to produce NdPr oxide (or oxalate) and a Samarium-plus (Sm+) heavy REE concentrate, which will be either sold or stockpiled as feed for Phase 3 REE separation. For reference, the monazite concentrates the Company has analyzed to date contain roughly 1% to 3% Dy and Tb, so 10,000 MT of monazite concentrate contains roughly 100 to 300 metric tonnes of Dy and Tb. The third phase is expected to be completed in 2027 or 2028, subject to licensing, financing, and receipt of sufficient feed.

I should be noted that, as permitting and design proceeds and evolves, phase 2 and 3 may be combined.

It is interesting to note that the proviso of "subject to feed" is repeated throughout the company's public disclosures. This of course was before the Base Resources acquisition (October 2024), the JV with Astron (June 2024) and closing on the Bahia deal (February 2023). We do not see any impediment to supplies going forward with these three projects feeding through monazite material.

**Base Resources – REEs as the Driver**

Energy Fuels' latest deal made the most splash. In late April of 2024 it was announced that Energy Fuels had agreed to acquire the ASX-listed Base Resources (ASX: BSE) creating "a global leader in critical minerals production with a focus on uranium, Rare Earth Elements and heavy mineral sands". The deal closed in early October 2024.

**The Base Resources Deal**

Energy Fuel made an offer worth AUD$375mn to acquire 100% of the issued shares of Base Resources in consideration for:

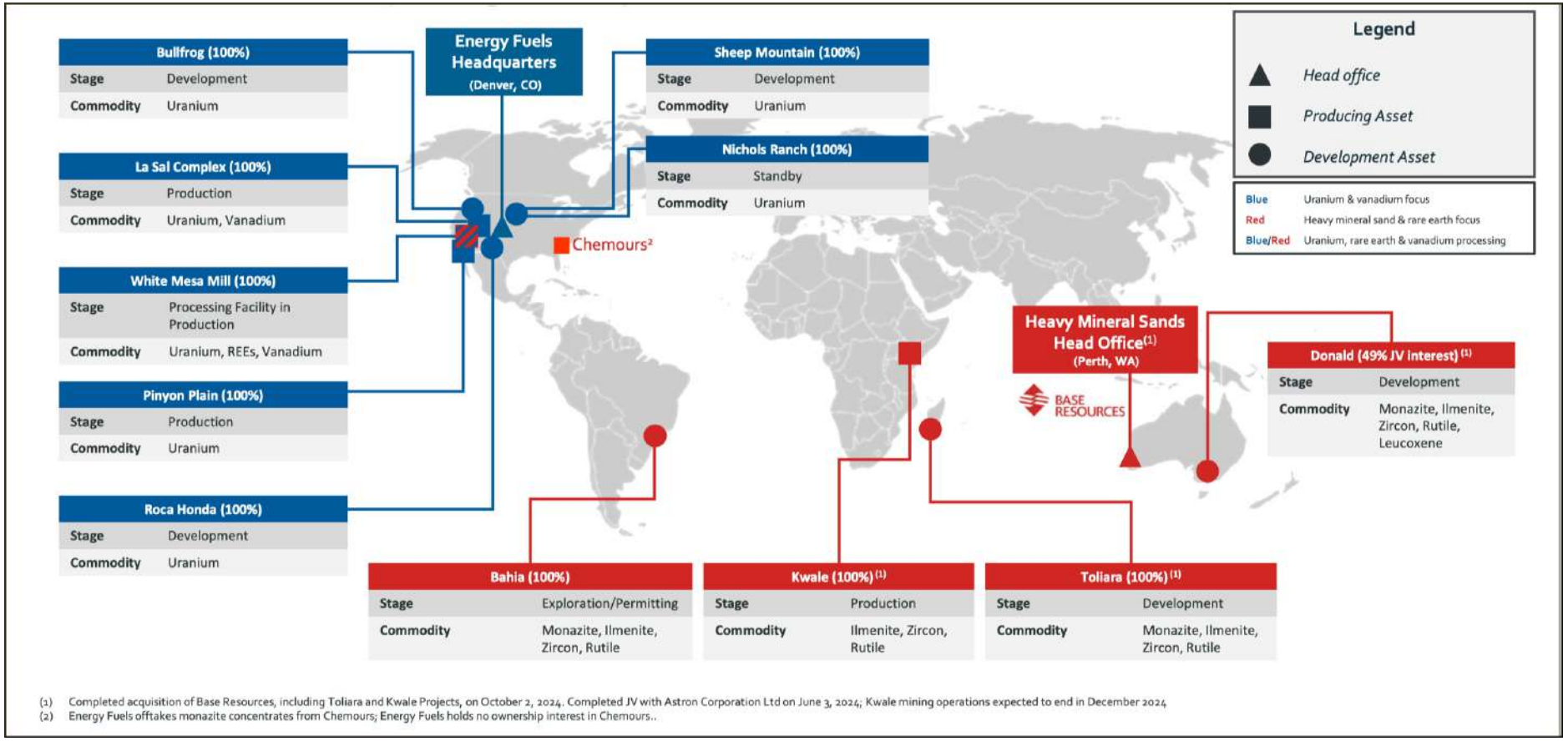
- 0.0260 Energy Fuels common shares
- AUD$0.065 in cash, payable by way of a special dividend by Base Resources to its shareholders

**The Logic**

Base Resources was not quite a sunset stock, but the gradual decline in production towards its late 2024 end of mine life at its Kwale HMS mine in Kenya meant that it stood on the cusp of being an ex-producer and yet also a developer via its 100%-owned advanced, Toliara heavy mineral sands project in Madagascar. Toliara is considered by many experts to be the largest undeveloped HMS project in the world. UUUU's management has called it "multi-generational" as, with additional drilling, the mine could be extended well beyond its current 38-year life to potentially over a century.

The Toliara HMS Project brought the added bonus of a long-life, high-value and low-cost monazite stream, produced as a byproduct of primary Titanium and zirconium production.

When developed, Toliara's monazite production is expected to be processed at White Mesa Mill into separated Rare Earth Element oxides (REO), at what is said to be a low capital and operating cost, as most mining costs will be attributed to the primary ilmenite, rutile, and zircon production.




(1) Completed acquisition of Base Resources, including Toliara and Kwale Projects, on October 2, 2024. Completed JV with Astron Corporation Ltd on June 3, 2024; Kwale mining operations expected to end in December 2024
(2) Energy Fuels offtakes monazite concentrates from Chemours; Energy Fuels holds no ownership interest in Chemours..

In the short-term UUUU should have a flow of material from the Donald JV, then the plan is to integrate Toliara when it reaches production, and then Brazil in the longer-term.

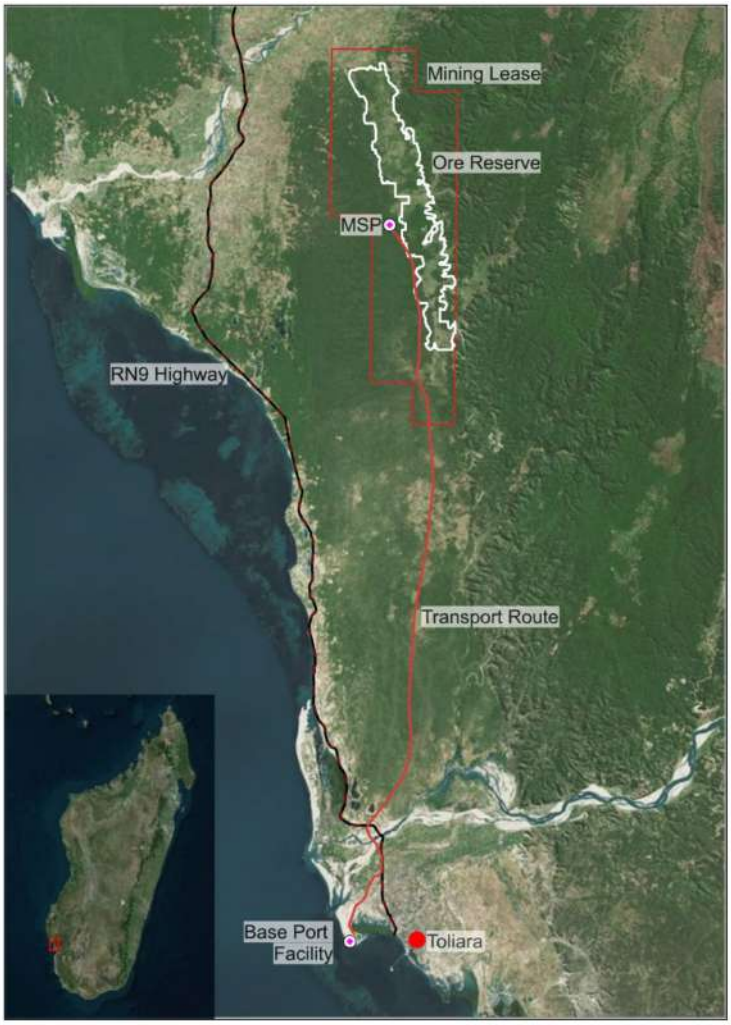
**Toliara (Ranobe) Project**

The Toliara project is sometimes also referred to as the Ranobe Deposit. This is an advanced-stage, large-scale Ilmenite, Zircon and monazite-rich deposit in southwest Madagascar.

The project is located about 45km north of the town of Toliara and will involve the construction of processing facilities at the mine site, a dedicated 55km haulage road, bridge across the Fihirana River and specialised port facilities.

The project was granted a mining licence (PDE 37242), which was re-issued on 23 October 2017, and has a term of 40 years from 21 March 2012. The government of Madagascar placed a suspension on the Project in 2018 as part of a review of the country's laws and regulations on mining. This halted all permitting and on-the-ground activities at Toliara.

However, following Energy Fuels' acquisition of Base Resources in October 2024, the government lifted the suspension in late November 2024 and entered into an MOU with Energy Fuels. This quick action demonstrates that the administration in Madagascar views the acquisition and linkage to US markets as a strong positive.




Base Resources acquired the project in January 2018 and completed a full suite of studies focused on realising value from the deposit's contained ilmenite, rutile and zircon. These mineral sands studies culminated in release of the Mineral Sands DFS in 2021. This was an updated definitive feasibility study on the Mineral Sands Project, with the study taking advantage of enlarged Mineral Resources and Ore Reserves estimates to enhance the project by increasing its scale.

**The Resource**

The latest DFS/MRE on Ranobe dates from 2021 and was an update on the DFS/MRE from 2019 incorporating available 2018/19 drilling program results. The new DFS/MRE almost doubled to 2,580mn tonnes at an average heavy mineral grade of 4.3%.

The Ranobe Ore Reserves estimate was increased to 904mn tonnes at an average HMS grade of 6.1% (i.e. a 45% increase in contained heavy mineral).

The 2018/19 drill program revealed further significant additional mineralisation at depth in the lower sandy unit, however, the mineralogy work required to include this geological domain in a Mineral Resources estimate has not yet been completed due to the suspension of on-ground activities.

| | | | | | | Mineral Assemblage as % of HM | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | Tonnes (Mt) | HM (Mt) | HM (%) | SL (%) | OS (%) | ILM (%) | RUT (%) | LEUC (%) | ZIR (%) | MON (%) | GARN (%) |
| 2021 Ranobe Mineral Resources (as at 27 September 2021) | | | | | | | | | | | |
| Measured | 597 | 36 | 6.1 | 4.3 | 0.2 | 74 | 1.0 | 1.0 | 5.9 | 1.9 | 2.2 |
| Indicated | 793 | 35 | 4.4 | 7.1 | 0.5 | 71 | 1.0 | 1.0 | 5.9 | 2.0 | 3.6 |
| Inferred | 1,190 | 39 | 3.3 | 9.7 | 0.6 | 69 | 1.0 | 1.0 | 5.8 | 2.0 | 4.3 |
| **Total** | **2,580** | **111** | **4.3** | **7.7** | **0.4** | **71** | **1.0** | **1.0** | **5.9** | **2.0** | **3.4** |

The current Ranobe estimated Mineral Resource is sufficient to support a 38-year mine life.

**The Monazite Angle**

In addition to its stand-alone, ilmenite, rutile (Titanium) and zircon (Zirconium) production capability, an estimated 2% of the Ranobe Mineral Resources' heavy mineral assemblage is composed of monazite.

The DFS was put together under the direction of Base Resources' management, and they had no foreseeable use for the monazite. Such that (as can be seen in the flow chart on page 23) the monazite is referred to as tails in the Mineral Sands DFS2 and was returned to the mining pit void together with all other tailings. Now, in a complete *volte face*, it is the monazite that drives the attractions of Ranobe for Energy Fuels. Indeed, in a bad pun, one might say that monazite is the tails that now wag the dog.

The attraction for Energy Fuels was that this essentially free source of monazite feed from the Toliara Mineral Sands Project would potentially be one of the world's most cost-competitive sources of REO minerals.

In Energy Fuels' opinion, the monazite can be recovered as a byproduct of Ilmenite and Zircon production at low incremental cost, thereby adding to Toliara's Ilmenite and Zircon capability at a cost of production that the company expects to be globally competitive and will position Energy Fuels to be a first-tier REE oxide producer.

A Monazite PFS was specifically put together by Base in late 2023. The study considered the concentration of the waste stream to produce monazite and demonstrated that the MSP's monazite waste stream might be easily separated from the other waste and upgraded to a monazite product with 90% purity. Adding production of a monazite concentrate resulted in a doubling of the NPV of the Toliara project, and Energy Fuels' capacity to process this monazite into separated REEs at the White Mesa Mill has the potential to extract even more value from the project.

The following key additional, or modified, infrastructure was identified with the modifications to the MSP being:

- Installing four Rare Earth roll (RER) magnets in the MSP to concentrate the monazite waste stream in a dry process
- Implement a pumping system to transfer the concentrated monazite from the MSP to the Monazite Concentrator Plant (MCP)

Then a new Monazite Concentrator Plant would be positioned adjacent to the HMC stockpile and separate from other structures for effective radiation management. The MCP will house wet and dry separation processes and monazite load out facility where the product will then be packed into plastic bag lined drums and subsequently loaded onto pallets and into dedicated containers.

The Toliara Rare Earths Concept Study was published in late-2023. The Concept Study identified four development options (in increasing order of cost and complexity):

**Option One:** Monazite Concentrate: Sell the existing monazite waste stream from the Mineral Sands Project mineral separation plant (MSP), which contains approximately 20% monazite. This totally defeats the purpose and would only find a natural buyer in China.

**Option Two:** Monazite Product: Construct a monazite concentrator plant to concentrate the MSP monazite waste stream and produce a product containing 90% monazite.

**Option Three:** Mixed Rare Earth Carbonate (MREC): Implement Option Two (Monazite Product) for the first five operating years then, following completion of studies, construct a refinery to produce an MREC product for the remainder of the mine life.

**Option Four:** Separated REOs: Implement Option Two (Monazite Product) for the first five operating years then, following completion of studies, construct a refinery and separation plant to produce REOs for the remainder of the mine life.

In further tweaking of the envisaged processing, a flowsheet developed for the Mineral Sands Project was further optimised to split dry and wet monazite separation between the MSP and new MCP respectively. An MCP location study was conducted, MSP to MCP pumping system designed and 3D engineering modelling performed.

**CapEx**

As can be seen by the breakdown of the CapEx of the Monazite extraction component on the following page, the "scavenging" of the otherwise throwaway monazite stream does not involve a challenging budget number by any measure.

Notably it is the export infrastructure to deal with the Class 7 containerisation and dispatch that makes up the largest component of the budget.

| Capital Cost Estimate (US$mn) | |
|---|---|
| Monazite Concentrator Plant | $13.1 |
| Construction Distributables | $5.1 |
| Engineering and Construction Management Costs | $5.5 |
| Export Facility Infrastructure (onshore) | $2.9 |
| Export Facility Infrastructure (offshore) | $19.1 |
| Owner's Costs (detail below) | $13.4 |
| Sub total | $59.2 |
| Contingency (20%) | $11.8 |
| Total Project Capital Costs | $71.0 |

| Owner's Costs Estimate (Included above) (US$m) | |
|---|---|
| Shipping Containers (600), steel drums and pallets | $4.2 |
| Plant Mobile Equipment | $3.1 |
| Integrated Management Team, Specialist Consultants | $3.5 |
| Fees, Taxes, Duties, Spares, Tools & First Fills | $1.2 |
| Other | $1.4 |
| Total Owner's Cost | $13.4 |

Assumptions employed in the modelling of the monazite values/revenues included:

- Monazite prices based on Adamas Intelligence forecast to 2035, then held flat for remainder of mine life
- Market monazite payability of 35% for the contained magnet REOs of Nd/Pr and Dy/Tb oxides only
- Inclusion of the new Mining Code's 5% royalty and upfront contribution to the "Mining Fund for Community and Social Investment" equal to 3% of initial capex

**Monazite on the Move**

For all options being considered for REE production from Monazite sands at Toliara, the finished product would be containerised for sale and export. Due to the level of naturally occurring radioactivity in

monazite (given its Uranium and Thorium content), appropriate safety protocols and management are required during processing and logistics, including specialised Class 7 Dangerous Goods (Class 7) cargo containers and transport.

Of the four options detailed on page 20, the Monazite Concentrate option was screened out due to the significant logistical complexity of transporting 263k tpa of Class 7 containerised product, with the same regulatory hurdles as Monazite Product. All remaining options were taken forward to the Pre-Feasibility Study (PFS) stage for further evaluation.

Energy Fuels will be shipping the monazite via containers from Toliara to White Mesa. The monazite might be in 1-2 tonne supersacks within the containers. As a uranium company, UUUU routinely ships Class-7 material, so the company does not see this as an issue. However, Class-7 material does have somewhat higher shipping costs.

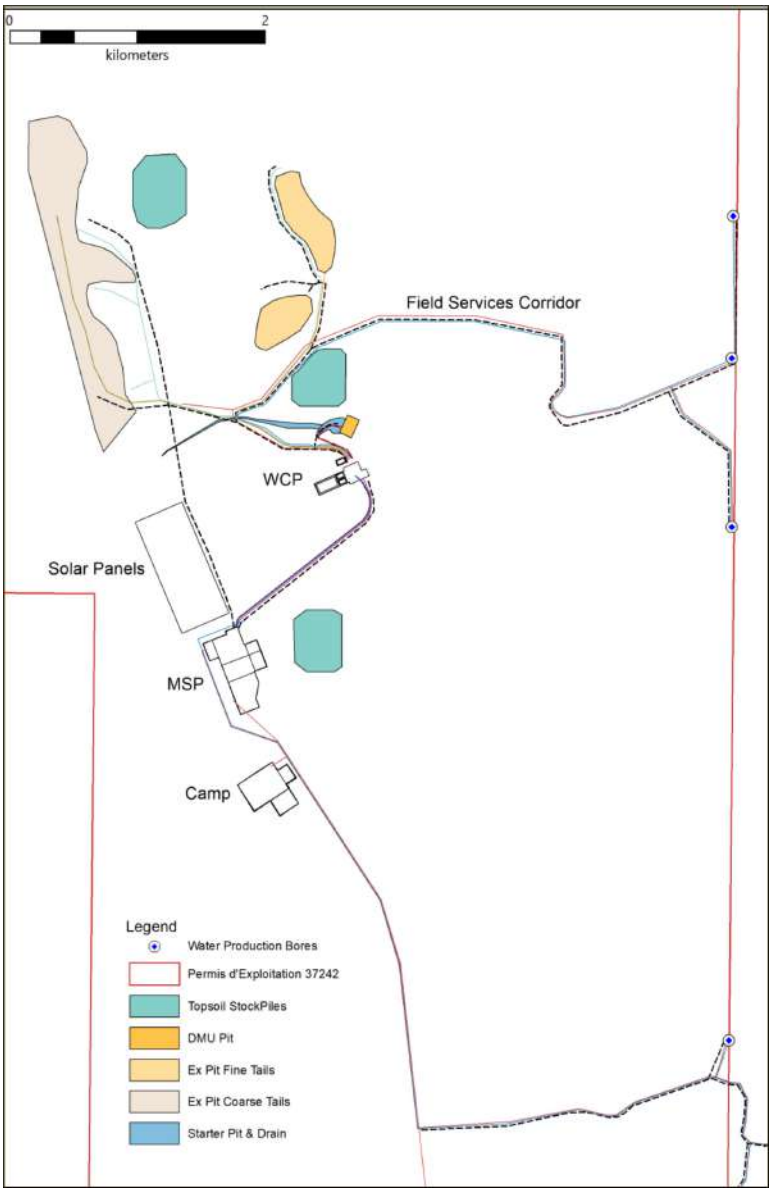
**The Mine Plan**

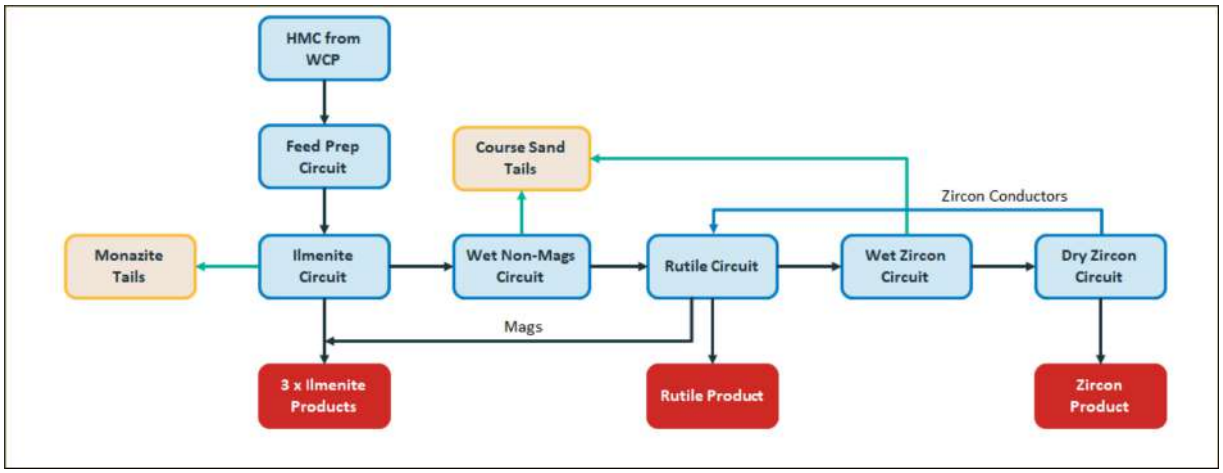
The mining rates of the Mineral Sands component in the DFS2 are proposed to be 13mn tpa in Stage 1, increasing to 25mn tpa following implementation of Stage 2 in operating Year 5.

The proposed site layout is shown on the right.

**Processing**

The flowchart on the following page shows the conventional nature of the HMS processing (with the original vision of the monazite being cast into the tailings from the whole process.






**OpEx**

Below can be seen the Monazite PFS's assumptions on annual costs of operations of this module. The actual production component is very humble indeed with the shipping element being the preponderant part of the cost per tonne.

Ranobe - Monazite PFS - OpEx

| | US$ p.a. | % of Total |
|---|---|---|
| Maintenance | 600,000 | 4% |
| Power | 592,000 | 4% |
| Labour | 170,000 | 1% |
| Miscellaneous | 120,000 | 1% |
| Consumables | 99,000 | 1% |
| Product transport and logistics | 12,300,000 | 89% |
| Total | 13,881,000 | 100% |

**The Economics**

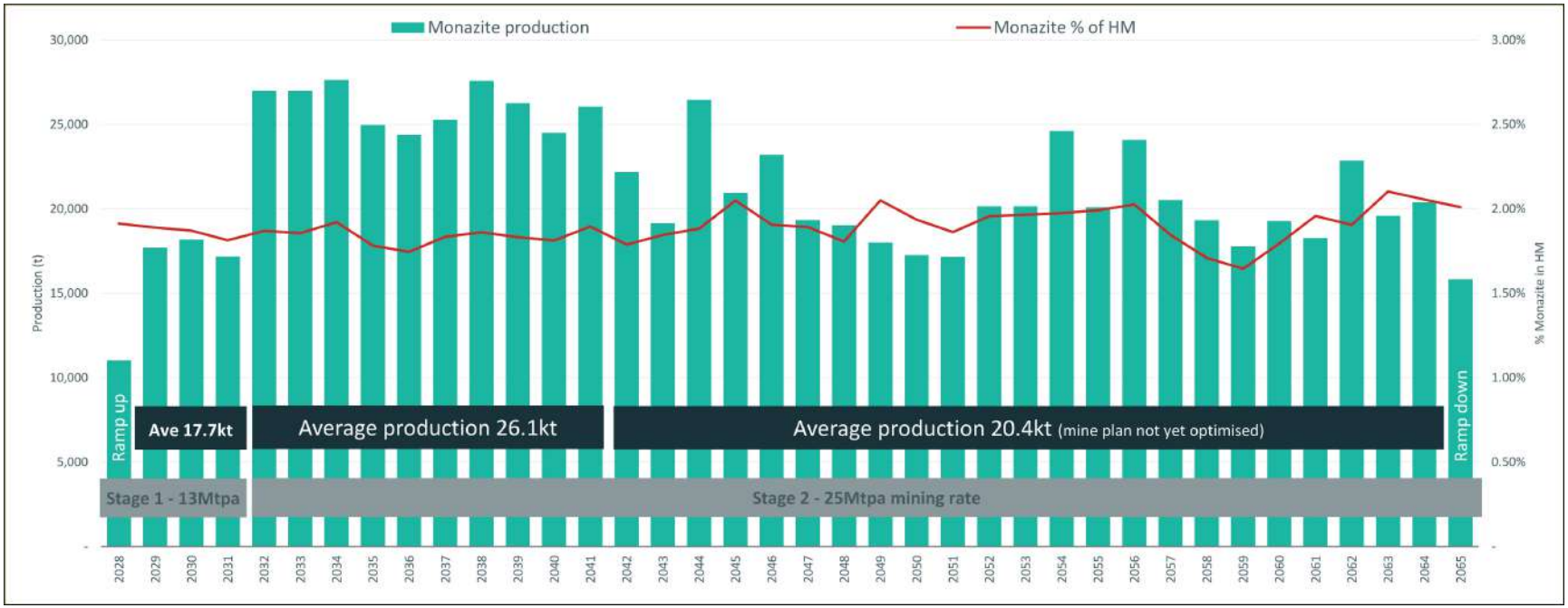
Below can be seen the principal metrics under three scenarios:

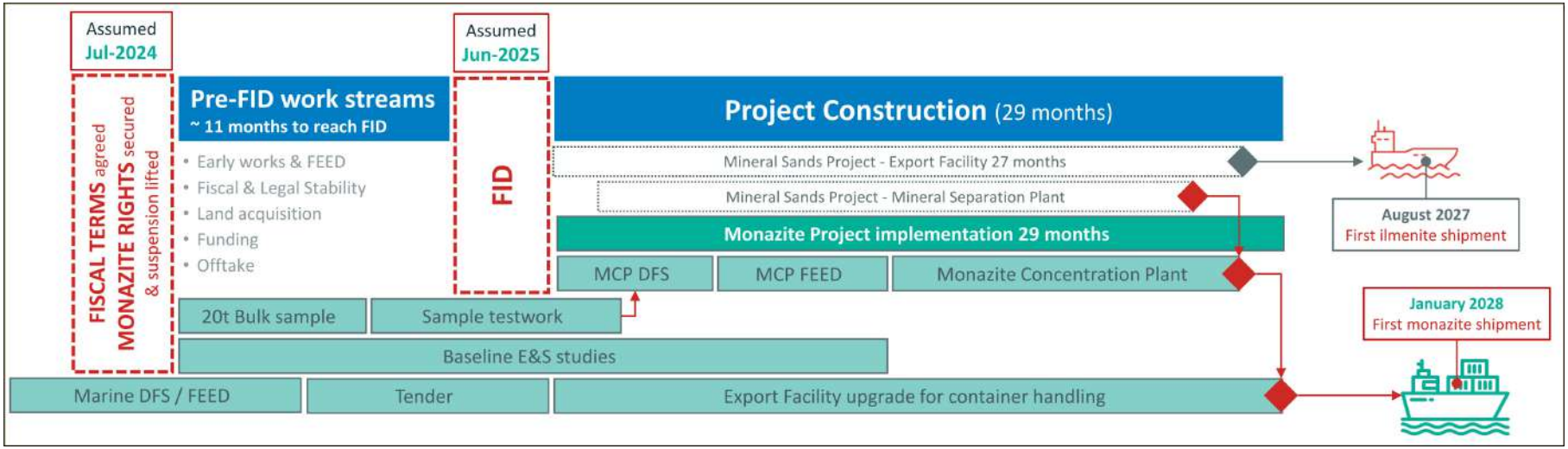
**Ranobe - Comparative of Studies**

| | Monazite PFS | DFS2 | Mineral Sand + Monazite |
|---|---|---|---|
| NPV10 (discount rate of 10%), post tax, real | US$999mn | US$1,008mn | US$2,006mn |
| NPV8 (discount rate of 8%) post tax, real | US$1,281mn | US$1,385mn | US$2,666mn |
| Internal Rate of Return (IRR) | 79% | 23.80% | 32.40% |
| Initial (Stage 1) capex | US$71mns | US$520mn | US$591mn |
| Construction period (Stage 1) Months 29 27 27 | 29mths | 27mths | 27mths |
| Stage 2 capex | | US$137mn | US$137mn |
| Construction period (Stage 2) | | 21 mths | 21 mths |
| Capital payback period (Stage 1 + 2) | One year | 4.5 yrs | 3.6 yrs |
| Life of mine (LOM) | 38 years | 38 years | 38 years |
| LOM operating costs + royalty (A) US$/t produced | US$1,089 | US$88 | US$112 |
| LOM revenue (B) US$/t produced | US$8,648 | US$306 | $477 |

**Production Metrics**

The graphic on the following page shows the projected annual output of monazite over a 37-year span.


Monazite production
Monazite % of HM
Production (t)
% Monazite in HM
Ramp up
Ave 17.7kt
Average production 26.1kt
Average production 20.4kt (mine plan not yet optimised)
Ramp down
Stage 1 - 13Mtpa
Stage 2 - 25Mtpa mining rate


Assumed Jul-2024
Assumed Jun-2025
FISCAL TERMS agreed
MONAZITE RIGHTS secured & suspension lifted
Pre-FID work streams
~ 11 months to reach FID
Early works & FEED
Fiscal & Legal Stability
Land acquisition
Funding
Offtake
FID
Project Construction (29 months)
Mineral Sands Project - Export Facility 27 months
Mineral Sands Project - Mineral Separation Plant
Monazite Project implementation 29 months
MCP DFS
MCP FEED
Monazite Concentration Plant
20t Bulk sample
Sample testwork
Baseline E&S studies
Marine DFS / FEED
Tender
Export Facility upgrade for container handling
August 2027
First ilmenite shipment
January 2028
First monazite shipment

An added kicker on the revenue side will be that monazite from Toliara will also provide material quantities of low-cost uranium production to the White Mesa Mill over the life of the project, while supplementing Energy Fuels' uranium production.

**The Strategy**

The strategy is that, once in production, the monazite sands from Toliara will provide a large portion of the raw materials needed for the REE oxide production facility at the White Mesa Mill.

The Mineral Sands Project (MSP) was designed to direct the monazite waste from the rutile and ilmenite processing streams to a designated reject bin, to be blended with sand tails from the wet concentrator plant (WCP) and then returned to the mined-out pit void.

The Monazite PFS considered the concentration of the waste stream to produce monazite and demonstrated that the MSP's monazite waste stream can be easily separated from the other waste and upgraded to a monazite product with 90% purity, with the following key additional or modified infrastructure identified.

The following modifications to the MSP will be required:

- Installing four Rare Earth roll (RER) magnets in the MSP to concentrate the monazite waste stream in a dry process
- Implement a pumping system to transfer the concentrated monazite from the MSP to the Monazite Concentrator Plant (MCP)

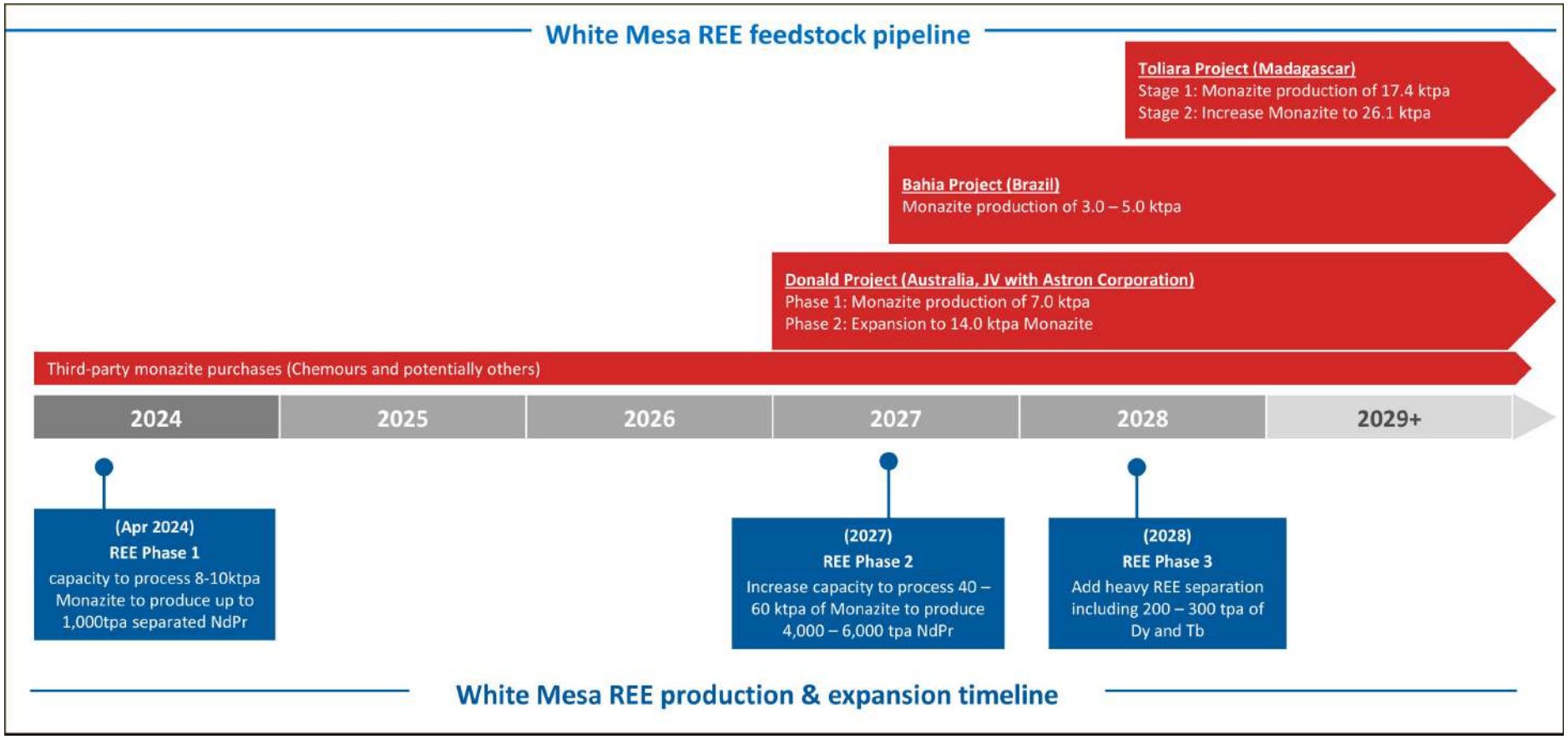
The new Monazite Concentrator Plant (MCP) will involve:

- Construction of a MCP positioned adjacent to the HMC stockpile and separate from other structures for effective radiation management.
- The MCP will house wet and dry separation processes and monazite load out facility where the product will then be packed into plastic bag lined drums and subsequently loaded onto pallets and into dedicated containers.

The required modifications to the export facility for container handling would be:

- Construction of a container laydown area
- Upgrading the jetty trestle structure and the loadout platform to support container truck operations and enable container transfer to vessels

The power infrastructure is envisioned to be hybrid thermal, solar photovoltaics (PV) and battery storage system power plant will require a slight enlargement. However, no additional infrastructure will be necessary minerals.


White Mesa REE feedstock pipeline
Toliara Project (Madagascar)
Stage 1: Monazite production of 17.4 ktpa
Stage 2: Increase Monazite to 26.1 ktpa
Bahia Project (Brazil)
Monazite production of 3.0 – 5.0 ktpa
Donald Project (Australia, JV with Astron Corporation)
Phase 1: Monazite production of 7.0 ktpa
Phase 2: Expansion to 14.0 ktpa Monazite
Third-party monazite purchases (Chemours and potentially others)
2024
2025
2026
2027
2028
2029+
(Apr 2024)
REE Phase 1
capacity to process 8-10ktpa Monazite to produce up to 1,000tpa separated NdPr
(2027)
REE Phase 2
Increase capacity to process 40 – 60 ktpa of Monazite to produce 4,000 – 6,000 tpa NdPr
(2028)
REE Phase 3
Add heavy REE separation including 200 – 300 tpa of Dy and Tb
White Mesa REE production & expansion timeline

**The JV with Astron**

Inked in June 2024, this transaction has the potential to be the supplier to White Mesa of monazite sands in the relative short-term. In June of 2024, Energy Fuels signed a definitive agreement with Astron (ASX: ATR) for development of the monazite-rich Donald Project in the northwest of the state of Victoria, Australia. Listed on the ASX since 1983, Astron Corporation is a mining and processing company, domiciled in Hong Kong.

Energy Fuels views this project as having the potential to supply approximately 7,000–14,000 tonnes per annum of monazite sand in a REE concentrate to the White Mesa Mill for processing into separated REE oxides.


**The Resource**

The Donald Project, consisting of the Donald and Jackson deposits, has a Mineral Resource of 5.8 billion tonnes of ore, at an average HMS grade of 3.2%. Within the Donald deposit area (MIN5532 and RL2002), there are Ore Reserves of 825mn tonnes of ore, with an average HMS grade of 4.5%. This equates to an approximate, *in-situ* ore body of 37mn tonnes of HMS, including 6.6mn tonnes of zircon, 10.5mn tonnes of ilmenite, 10.5mn tonnes of higher titanium content products of rutile and leucoxene, as well as a significant REE component of 724k tonnes.

Interestingly, the Rare Earths component here consists of both monazite and Xenotime ($YPFO_4$). The latter we are on record as praising as the most desirable Heavy Rare Earth mineralisation.

**The JV Deal**

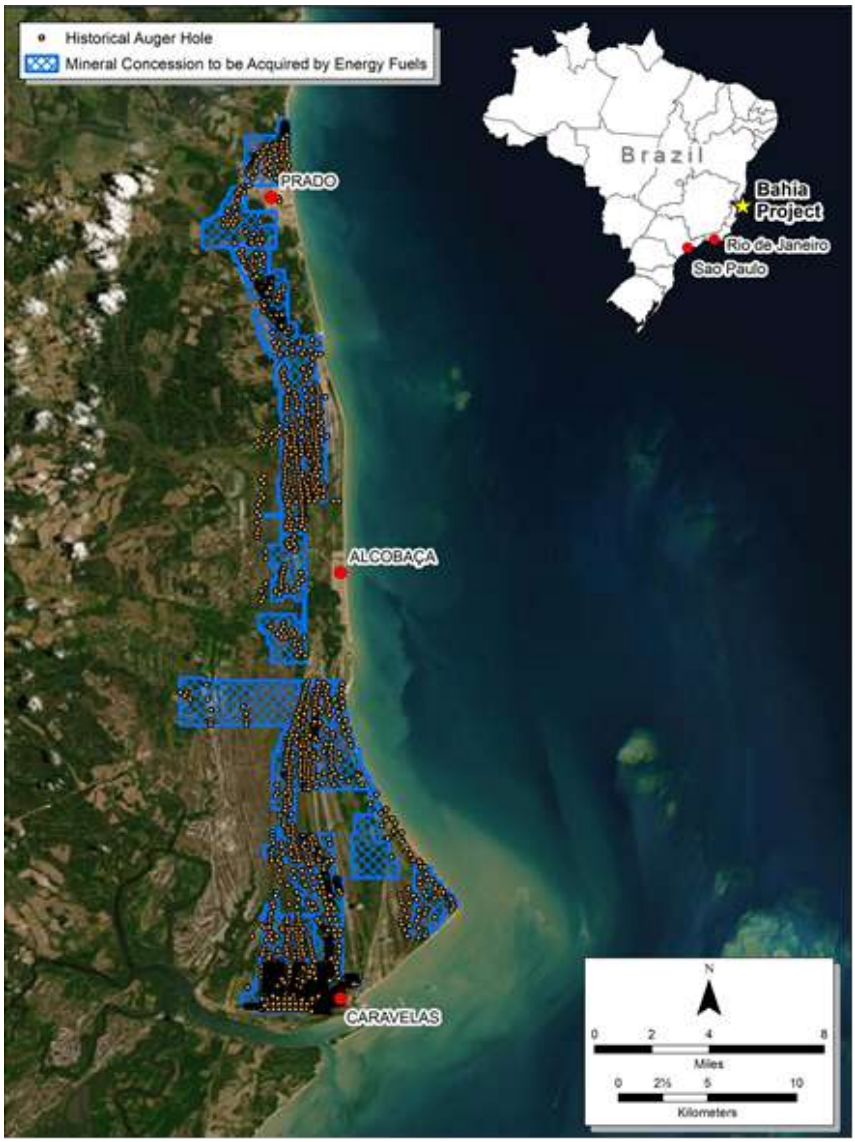
Under the joint venture, Energy Fuels has the right to invest AUD$183mn (approximately US$122mn) and issue $17.5 million in Energy Fuels shares to earn up to a 49% interest in the project.

Of these amounts, Energy Fuels issued $3.5mn in Energy Fuels shares in 2024 and committed to investing approximately $10.6mn in 2024/25, prior to making a final investment decision (FID) to proceed with the development of the first phase of the project (expected in mid-2025).

An affirmative FID by both JV partners would generally require commitments for satisfactory offtake and/or sales agreements for the REE oxides expected to be produced from REE concentrates at the Mill, as well as commitments for non-recourse and/or government-backed debt financing for the project.

**Production**

First production could be as early as late-2026 or more likely early-mid 2027. The REE concentrate production of approximately 7,000 to 8,000 tonnes per year from the first phase of the Donald Project would be processed at the White Mesa's REE oxide separation circuit, which currently has the capacity to process up to 10,000 tonnes of monazite sand per year, into up to 1,000 tonnes of NdPr oxide per year, along with a heavy mixed REE carbonate, without the need for any further capital expenditures at the Mill.




**Bahia**

In February 2023, UUUU announced that it had acquired seventeen mineral concessions (approximately 37,300 acres or 58.3 square miles) between the towns of Prado and Caravelas in the State of Bahia, Brazil totaling 15,089 hectares which hold significant quantities of heavy minerals, including monazite, to feed Energy Fuels' emerging REE supply chain.

It took until February of 2023 before government clearance came through for the transaction and it closed with UUUU paying the mineral owners the remaining US$21.9mn cash.

In UUUU's opinion the Bahia deposit has the potential to supply 3,000-10,000 tonnes per annum of natural monazite concentrate to the White Mesa Mill for processing into high-purity REE oxides and other materials.

By the company's calculation the 3,000 – 10,000 metric tonnes of monazite concentrate would contain ~1,500–5,000 metric tonnes of total REE oxides (TREO), including 300–1,000 metric tonnes of Neodymium-Praseodymium (NdPr) and significant commercial quantities of Dysprosium (Dy) and Terbium (Tb).

As a typical EV and hybrid EV utilizes roughly one to two kilograms of NdPr oxide in its drivetrain, the monazite concentrate from the Bahia project alone might be expected to supply enough NdPr oxide sufficient for 150,000 to one million EVs per year.

Additionally, the uranium contained in the monazite, which is expected to be comparable to typical Colorado Plateau uranium deposits, will also be recovered at the White Mesa Mill.

While Energy Fuels' primary interest in acquiring the Bahia Project is the monazite, the Bahia Project is also expected to produce large quantities of high-quality Titanium (ilmenite and rutile) and Zirconium (zircon) minerals.

**Medical Isotopes**

This is a developing value-added nuclear downstream business for UUUU but could be extremely significant.

The focus by Energy Fuels is on Targeted Alpha Therapy (TAT), an innovative technique that is viewed as holding great promise as an effective treatment, or even cure, for many cancers while causing less damage to healthy tissue compared to other treatments.

TAT is undergoing clinical trials around the world. Targeted Radiation Therapy (TRT, not TAT) is already in use commercially. However, current TRT treatments are not as targeted or selective as TAT, and hence more damaging and difficult for the patient.

The idea behind TAT is to deliver short half-life (12-24 hours), alpha-emitting elements to cancer cells. When the element decays, it emits an alpha particle, which is a powerful radioactive particle that doesn't travel far (2-5 cell widths) before it dissipates. The main alpha-emitting elements of interest are actinium (Ac)-225 and lead (Pb)-212. The first human trial of TAT in about 2017 cured a man in Germany of advanced Stage 4 prostate cancer (alive and cancer-free today).

The isotopes, Ac-225, Pb-212, and potentially others, are produced from two Radium isotopes that naturally occur in Energy Fuels' uranium and monazite process streams (Ra-224 and Ra-226). Ergo, Radium is in strong demand (and with strong pricing) currently, as there is no supplier of Radium

globally.

It´s worth noting that Russia and China desire to enter this space, but Western pharmaceutical companies are hesitant to do business with Russian and Chinese companies in light of the current global political dynamics. Moreover, they do not want to be reliant on medical supply chains from those countries.

Energy Fuels is undertaking R&D work on Radium recovery from its uranium/monazite process streams, which if successful, could result in a an entirely new biotech vertical for the company. The company is working towards recovering several radium samples in the coming months, which it shall sell to pharmaceutical companies to allow clinical trials on TAT to continue. It is noteworthy that trials may soon be forced to halt soon due to a lack of radium. While still early days, there is clearly an opportunity to add another synergistic business stream arising from the monazite inputs that could be, in a matter of a few years, on a par with the uranium, REE, and HMS verticals.

**Directors & Management**

**J. Birks Bovaird**, Chairman, his career has been focused on the provision and implementation of corporate financial consulting and strategic planning services. He was previously the Vice President of Corporate Finance for one of Canada's major accounting firms. He is Chairman of GTA Resources and Mining Inc. (TSX-V:GTA) as well as a member of the audit and compensation committees. He is an independent director of Noble Mineral Exploration Inc. (TSXV:NOB) where he is a member of the audit committee and chair of the compensation committee. He has previously been involved with numerous public resource companies, both as a member of management and as a director. He is a graduate of the Canadian Director Education Program.

**Mark Chalmers**, President and CEO, since February of 2018. From July 1, 2017 to January 31, 2018, he was President and Chief Operating Officer of Energy Fuels, and from July 1, 2016 to July 1, 2017, he was Chief Operating Officer of UUUU. From 2011 to 2015, he served as Executive General Manager of Production for Paladin Energy, a uranium producer with assets in Australia and Africa, including the Langer Heinrich and Kayelekera mines where, as head of operations, he oversaw sustained, significant increases in production while reducing operating costs. He possesses extensive experience in In-Situ recovery (ISR) uranium production, including management of the Beverley Uranium Mine owned by General Atomics, and the Highland mine owned by Cameco. He has consulted to several of the largest players in the uranium supply sector, including BHP Billiton, Rio Tinto, and Marubeni, and until recently served as the Chair of the Australian Uranium Council, a position he held for 10 years. He holds a Bachelor of Science in Mining Engineering from the University of Arizona

**Benjamin Eshleman III**, non-executive director, is also the President and CEO of Mesteña, LLC, a privately held energy company headquartered in Corpus Christi, Texas. As President and CEO, he is responsible for the oil, gas, and uranium leasing activities under 200,000 mineral acres located in South Texas. Mesteña built, operated, and mined several million pounds of uranium through its Alta Mesa plant in the mid-2000's.

**Dr. Ivy Estabrooke**, non-executive director, is also currently the Vice President of Operations and Corporate Affairs at IDbyDNA Inc., a commercial stage biotech company. From 2018 to 2020, she served as the Vice President of Corporate and Government Programs for PolarityTE, Inc. and, from 2014 to 2018, she served as the Executive Director of the Utah Science, Technology and Research Initiative. Other roles have included technical program manager to the U.S. Department of the Navy and science advisor to the Governor of Utah. She has led innovative research and development programs in both the public and private sectors delivering technology solutions for national security and public health challenges. She earned her doctorate in neuroscience at Georgetown University in 2005, received a master's degree in national resource strategy from the National Defense University in 2013 and a bachelor's degree in biological sciences from Smith College in 1998.

**Barbara Filas,** non-executive director, has significant experience in mining, waste management, environmental and social responsibility. She currently serves as the Nominations Chair and Chair of the Board of Governors for the National Mining Hall of Fame and Museum in Leadville, Colorado and is a part-time Professor of Practice at the Colorado School of Mines in Golden, Colorado. From 2003 to 2009, she served as the President and Chief Executive of Knight Piésold and Co., a leading global mining and environmental consulting firm, where she held various roles of increasing responsibility from 1989 to 2009. From 2011 to 2013, she served as the President of Geovic Mining, a listed company with an advanced cobalt, nickel and manganese exploration project in Cameroon, among other exploration ventures. From 2015 to 2016, she was a Director of Moroccan Minerals Ltd., a private company that explored for copper, gold, and silver prospects in Morocco and Serbia. Her operational background includes operating gold and coal mines and processing facilities; executive experience in consulting, public companies, and non-profits; and technical expertise in base and precious metals, coal, uranium and industrial metals in various engineering and environmental capacities. She is a graduate of the University of Arizona, and a Mining Engineer.

**Bruce D. Hansen,** non-executive director, is Chief Executive Officer and a director of General Moly Inc., a position he has held since 2007. Prior to that, he was Senior Vice-President, Operations Services and Development with Newmont Mining where he worked for ten years holding in senior roles, including CFO from 1999 to 2005. Prior to joining Newmont, he spent 12 years with Santa Fe Pacific Gold, where he held increasingly senior management roles including Senior Vice President of Corporate Development and Vice President Finance and Development. He holds an MBA from the University of New Mexico and a Bachelor of Science Degree in Mining Engineering from the Colorado School of Mines. He is also a director and serves on the Audit Committee of ASA Gold and Precious Metals Ltd. (NYSE).

**Jaqueline Herrera,** non-executive director, has over 23 years of experience in water treatment and process improvements in multiple industries including the oil refinery, petrochemical, chemical, mining & mineral processing and food and beverage industries. From 1998 to 2019 she worked for Nalco Water, an Ecolab Company and leader in water hygiene, treatment and process improvements and energy and air solutions, in increasingly senior management roles, including sales-operations, and global industry

development for the base metals and iron ore industries. In that role, she worked in the bauxite mining and alumina processing sectors in South America, the United States and the Caribbean then expanded her career into global base metals with a focus on the copper and molybdenum markets in various regions. Since 2019, she has been with the Ecolab Inc., where she currently leads the protein segment, responsible for corporate account business operations and sales in the United States and Canada. She holds a Bachelor of Science in both metallurgical engineering and industrial engineering from the Universidad Nacional Politécnica "Antonio José de Sucre" in Venezuela, a Master of Sciences in material science from the Universidad de Oriente, Venezuela, and a Master of Business Administration in operations from the University of Phoenix, Baton Rouge LA.

**Dennis Higgs,** non-executive director, has been involved in the financial and venture capital markets in Canada, the United States, and Europe for over thirty years. He founded his first junior exploration company in 1983 and took it public through an initial public offering in 1984. Since then, he has been involved in the founding, financing, initial public listing, and building of several companies, most notably Arizona Star Resource Corp. and the listing and financing of BioSource International Inc., both of which were the subject of take-over bids. Most recently, he was one of the founding Directors and subsequently Executive Chairman of Uranerz before it merged with Energy Fuels. He was Executive Chairman of Uranerz from 2006 until 2015. He is currently President and a director of Austin Gold Corp., a gold exploration company listed on the NYSE American Stock Exchange (NYSE: AUST). He holds a Bachelor of Commerce degree from the University of British Columbia.

**Robert Kirkwood,** non-executive director, is a principal of the Kirkwood Companies, including Kirkwood Oil and Gas LLC, Wesco Operating, Inc., and United Nuclear LLC. Mr. Kirkwood has been with the Kirkwood Companies for over 35 years and has been involved in all aspects of oil and gas exploration and operations. From 2000 to date, the Kirkwood Companies have grown from less than 500 barrels of oil per day to over 3,000 barrels of oil per day. The Kirkwood Companies have identified, evaluated, negotiated and closed over $110,000,000 of production acquisitions in the Rocky Mountain States. He is a graduate of the University of Wyoming, with a Bachelor of Science in Petroleum Engineering.

**Alex Morrison,** non-executive director, is a mining professional in the precious and base metals industries. He also has significant hands-on experience in financial reporting, capital raising, audit, and deal-making. He is currently a board member of Taseko Mines Ltd, Gold Resources Corporation, and Gold Standard Ventures. He previously served as a director for Pershing Gold and Detour Gold. From 2007 to 2010, he served as Vice President and Chief Financial Officer for Franco-Nevada, and from 2002 to 2007, he served for Newmont Mining as VP, Information Technology, VP, Operations Services, Group Executive, Operations Services, and Group Executive, Internal Audit. He also had 13 years of experience with PriceWaterhouseCoopers, where he provided business advisory, financial audit, and operational audit services to a diverse group of mining clients.

**Michael Stirzaker,** non-executive director, has over 40 years' commercial experience, mainly in mining finance and mining investment. He began his career in Sydney as a Chartered Accountant with KPMG, before moving into investment banking with the HSBC Group and then Kleinwort Benson in London.

From 1993 to 2007 he was part of the natural resource advisory and investment firm, RFC Group Limited, where he became Joint Managing Director. He has also been a shareholder and director of Tennant Metals Pty. Limited, a privately-owned physical metal trader and investor, was the finance director of Finders Resources Limited, an ASX listed company producing copper in Indonesia.

From 2010 until 2019, he was a partner with private equity mining fund manager, Pacific Road Capital Management and over the past five years he has acted as a non-executive director of several junior mining companies and is currently also a non-executive director of Southern Palladium Ltd. He was Chair of the Base Resources until its acquisition by Energy Fuels.

**Risks**

Some of the potential risks that may be faced are:

- ☒ Titanium/Zirconium prices moving lower
- ☒ Ongoing weak Rare Earth prices
- ☒ Chinese predatory pricing/manipulation in the REE market
- ☒ A return to weak Uranium pricing

Rare Earth prices are not likely to go lower than the levels they have been at in recent years, even the Chinese are not running a charity anymore. Prices have been ebullient for the last three months but there is no rationale for them to even vaguely test the highs of 2011-12. The Chinese have learnt their lesson from last boom and that lesson is that the best way to maintain control and discipline market players is by aggressive predatory pricing.

We might also note that, at least for now, the Chinese are the main buyers for monazite sands, and they hold the whip hand in dictating prices (particularly discounts to the going market rates for REE concentrates with certain mixes of REEs and radioactive elements). This fact catalyzed Energy Fuels to acquire its own HMS mines to control their own sources (and costs) for monazite feedstock. However, the Chinese are increasingly forced buyers of REE concentrates if they are to have any chance of remaining the dominant player in REEs now that they have lost their dominance in the production of Heavy Rare Earths. They would not want this repeated in the “Lights” such as Nd and Pr.

With the EV and hybrid “revolution” finally gaining traction outside of China, along with other major market drivers like robotics, electronics, and renewable energy, the potential for greater demand for REE magnets from the quarter is enhanced. We see no reason for REE demand to slacken and indeed there is the potential for it to finally start to meet some of the bullish projections of 10 years ago.

The issue for monazite sands is radioactivity. This has not stopped the evolution of projects such as that of Energy Fuels in the US. In fact, this is an advantage as they are able to monetize the Uranium (and potentially the Radium for medical isotopes).

**Conclusion**

Energy Fuels has clearly not been relying solely upon the turnaround in the uranium space to map out a way forward. Thinking laterally about their strengths in the separation of radioactive materials it was a natural progression to apply its technologies, skillsets and the White Mesa mill to the task of providing Rare Earths to the US government's desire to replace its China-dependency in this key group of minerals for the energy transition.

As Energy Fuels became more acquainted with the dynamics of the monazite space it also became more comfortable with the eventuality that a vertically integrated HMS through to Rare Earth oxides flowchart was the most desirable (and potentially profitable) format to pursue. To that end it has consummated deals for monazite sands in both Brazil and east Africa. REEs from monazite sands being a new (though actually old) by-product of HMS. In the process it has also positioned itself with an entirely new silo of the traditional HMS product suite of Titanium/Zircon/Hafnium.

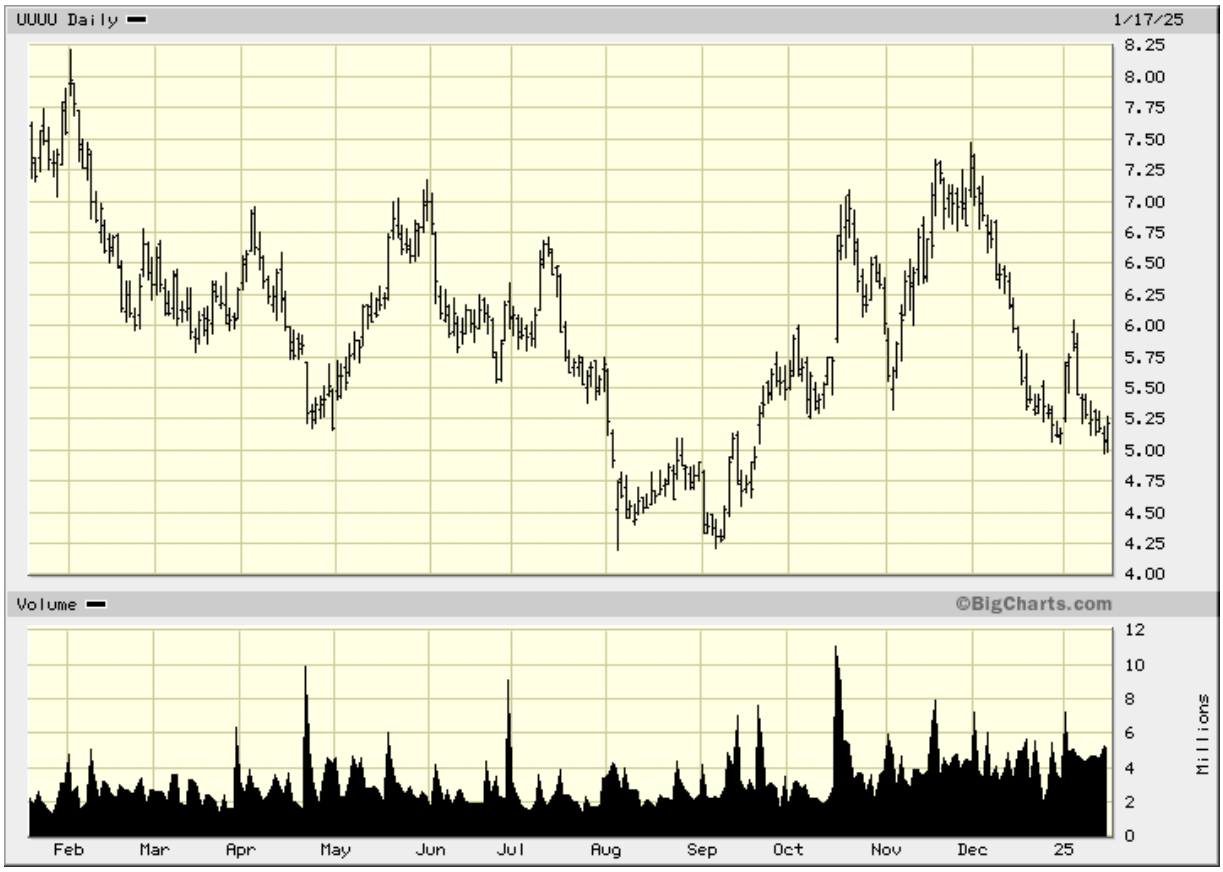
Heavy mineral sands are a sizeable mining sub-space that nevertheless is not on the radar of many mining players/investors. It is not inhabited by a large number of players, but most of those that are in public markets are in Australia (where it is well understood).

Titanium, Hafnium/Zircon and REEs are all undeniably strategic minerals. However, the vast bulk of Titanium is used for non-critical pigments and Zirconium for non-critical ceramics. Arguably, Titanium is thus strategic, but not critical, because there is no shortage of the chief source (i.e. HMS) and neither are the original sources under Chinese control. Indeed, it could be argued that Titanium is critical for the West, but that HMS are critical for China.

Energy Fuels' grasping the nettle of Rare Earth production from HMS has been a game-changer in the REE space. Long mired in bloated pharaonic projects in outlandish locations with challenging mineralisations, the onset of monazite sands (well, really a reboot of the pre-1960s situation) has indeed been a paradigm shift. The radioactive component of these sands is a bogeyman that has been grappled with and will be definitively buried.

While Energy Fuels may never become a uranium producer on the scale of Cameco or Kazatomprom (and it is unlikely any company in the US will be), it can become an international major in Rare Earths and HMS, akin to Lynas, Iluka, or Tronox, in the very short term.

We have a **LONG** rating on Energy Fuels with a twelve-month target price of CAD$11.50.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Volume
©BigCharts.com
12
10
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Millions
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25

# Appendix I: Titanium & Zircon

## Mundane or Strategic?

- + HMS are a key source of more than just the Titanium products widely associated with them, as key strategic minerals like Zircon/Hafnium and Rare Earth elements are also (sometimes) in the mix
- + The return to respectability (and doability) of monazite sands as a source of Rare Earths is a trend gaining momentum
- + The very stability and unsexiness of the Heavy Minerals Sands (HMS) space makes for a duller, more placid pace for investors
- + The pace of corporate actions, particularly M&A and strategic investment positioning would suggest a more dynamic space rather than a sleepy backwater
- + There is talk of Russia restricting exports of Titanium (presumably sponge) to the West in a tit-for-tat action in response to Western sanctions
- × The rising tide of resource nationalism does not seem to have impinged upon HMS as yet, mainly as Titanium is not perceived to have potential shortages
- × Ilmenite prices have weakened since mid-2022 as has Premium Zircon, to a lesser extent

**Critical & Strategic**

As noted earlier, Titanium and Hafnium/Zircon are all undeniably strategic minerals. However, the vast bulk of Titanium is used for non-critical pigments and Zirconium for non-critical ceramics. Arguably, Titanium is thus strategic, but not critical, because there is no shortage of the chief source (i.e. HMS) and neither are the original sources under Chinese control. Indeed, it could be argued that Titanium is critical for the West, but that HMS are critical for China.

**Applications**

As noted earlier, critical minerals from heavy mineral sands are important for a variety of uses. The primary commodities are Titanium, Zirconium, and Rare Earth elements.

**Titanium**

Heavy mineral sands have long been seen as the prime source of Titanium which can also be sourced from hard rock deposits, but these typically have a higher mining/extraction cost.

Pigments are by far the largest application for Titanium (~90% of global demand), with titanium metal and welding rod each representing about 5% of global demand.

For pigment applications titanium dioxide ($TiO_2$) is extracted from minerals including ilmenite and rutile

to produce titanium dioxide pigment with is used as an opacifier in paint, paper, inks and plastics. It has been estimated that Titanium dioxide is used in two-thirds of all pigments, and it is the most widely used white pigment because of its brightness and very high refractive index, in which it is surpassed only by a few other materials.

China is the largest producer and consumer of titanium dioxide pigments and is a net exporter.

Titanium in metal form (sponge) is notable for:

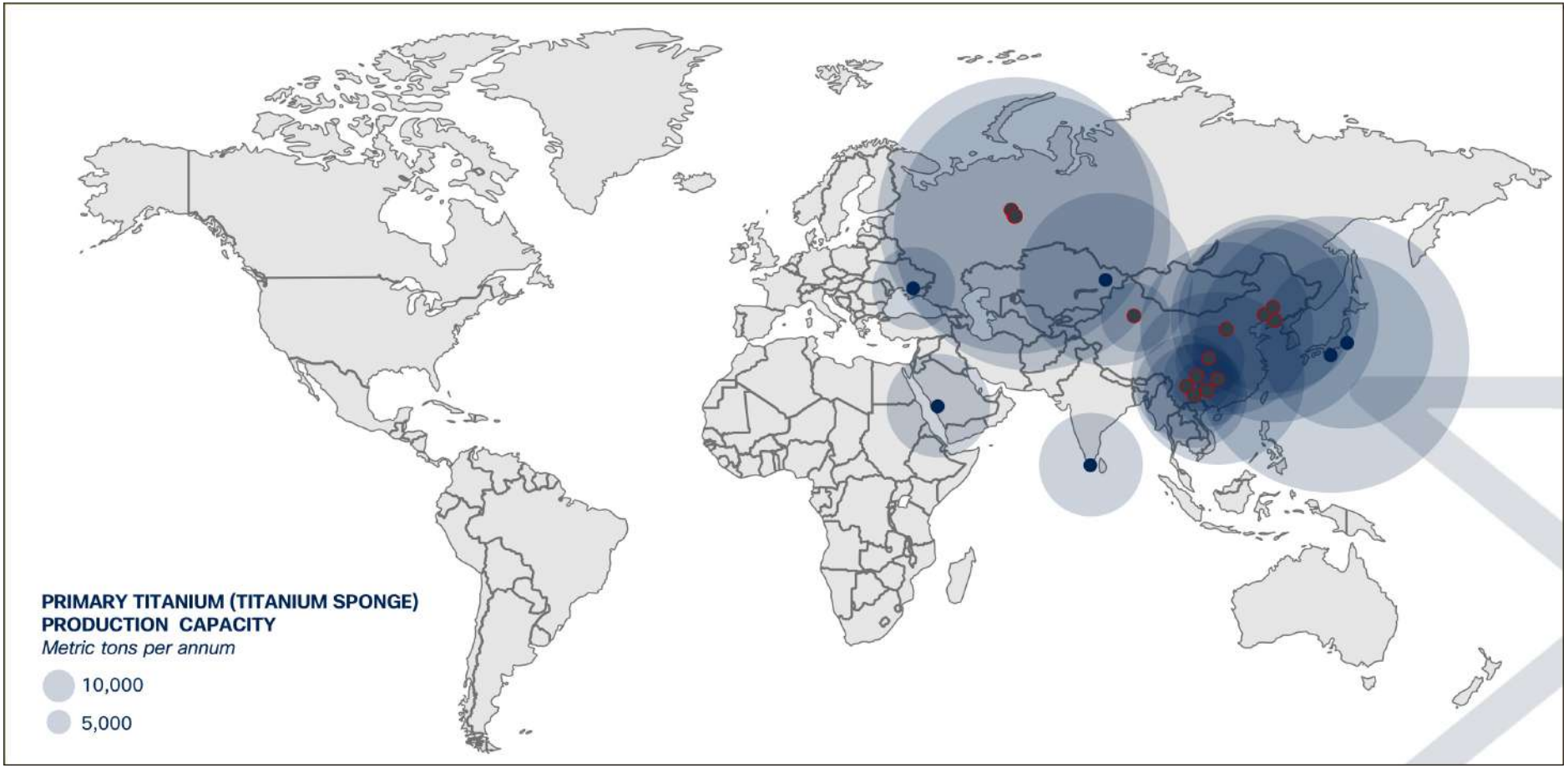
- Resistance to corrosion
- Fire and shock resistance
- Lightweight
- Low cost of maintenance
- Biocompatible
- Recyclable

Titanium sponge is the initial stage of the titanium metal value chain and is used as the base for Titanium alloys, billets, ingots etc. It is used for aircraft, shipbuilding, geothermal applications, and medical devices such as heart valves and artificial joints.

**USGS - Titanium Stats**

**World Sponge Metal Production and Sponge and Pigment Capacity:**

| | Sponge Production | | Capacity 2023 | |
|---|---|---|---|---|
| | 2022 | 2023 | Sponge | Pigment |
| United States | Withheld | Withheld | 500 | 1,360,000 |
| Canada | | | | 260,000 |
| Australia | | | | 108,000 |
| China | 180,000 | 220,000 | 260,000 | 5,500,000 |
| Germany | | | | 339,000 |
| India | 300 | 300 | 500 | 91,000 |
| Japan | 47,000 | 60,000 | 65,200 | 322,000 |
| Kazakhstan | | | 26,000 | - |
| Mexico | | | | 350,000 |
| Russia | 20,000 | 20,000 | 46,500 | 55,000 |
| Saudi Arabia | 9,700 | 12,000 | 15,600 | 200,000 |
| Ukraine | 1,000 | | | 122,000 |
| United Kingdom | | | | 315,000 |
| Other Countries | | | | 820,000 |
| World Total (rounded) | 270,000 | 330,000 | 410,000 | 9,800,000 |




*Source: IperionX*

As can be noted from the graphic on the preceding page, the Chinese have come to dominate sponge production, albeit that Chinese sponge has not yet been certified for use in aerospace applications.

According to Asian Metals, the United States, Europe and South Korea are the main export destinations for Chinese-produced Titanium sponge. Titanium production in the United States stopped in 2016 having gradually declined previously, and Titanium product manufacturers including TIMET are experiencing short supply of the material. As for the European market, it relies entirely on imported Titanium sponge.

Chinese Titanium sponge enterprises mainly focus on the production of industrial Titanium sponge.

**Zircon/Hafnium – Icing on the Cake**

These two minerals appear in some mineral sands formations and are present at most HMS projects. Reference should be made to our Hafnium Review of August 2020.

Zircon's primary usage is in ceramics where it is used as an opacifier.

Zirconium is resistant to both heat and corrosion. It is used for foundry and casting applications and as a corrosion-resistant material for construction in the chemical processing industry. It is also used to make superconducting magnets, with additional uses including surgical instruments, photographic flashbulbs and in making glass for televisions.

Hafnium is a small volume market, compared to Zircon, but an enormously strategic element. Its attraction is as a good absorber of neutrons and thus it is used to make control rods, such as those found in nuclear power stations and submarines. Hafnium has been alloyed with several metals including iron, Titanium and Niobium. It is also used for microprocessors/chips. It is combined with other elements to make compounds that can endure extreme temperatures. Hafnium oxide is used as an electrical insulator in microchips, while Hafnium catalysts have been used in polymerisation reactions.

The Minor Metals Trade Association has noted that, due to the strategic nature of the nuclear industry, the circle of extant Hafnium producers exist is very small. The two most notable being Wah Chang in USA (~40 mtpa) and Cezus in France (~30 mtpa), owned by Orano (formerly called Areva), the sometime largest producer of nuclear power stations in the world. Wah Chang, despite its name, is a division of Allegheny Technologies Incorporated. Until recently, Toshiba Westinghouse of the USA was also a producer of Hafnium but has now ceased.

It is interesting to muse if Energy Fuels might enter this space as the logic of doing so is very strong.

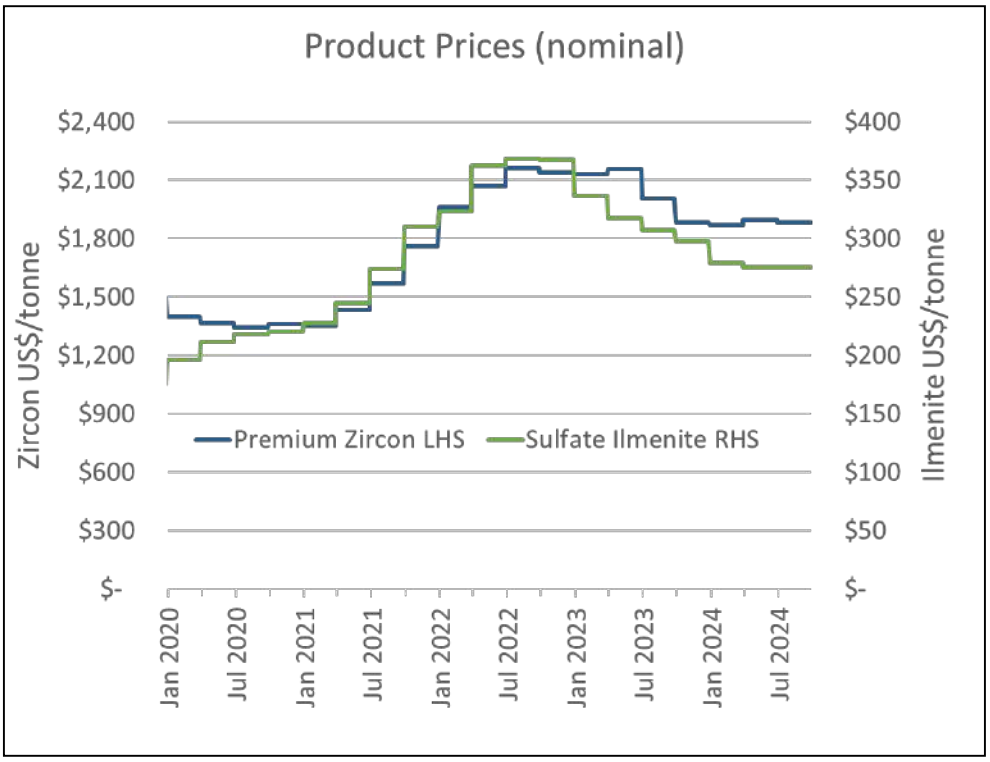
**Demand and Pricing**

The pigment market, the largest part of Titanium usage, shows a close correlation with broader economic growth, which as we know has been less than ebullient in recent years.

While much smaller, the titanium metal market demand for Titanium is expected to remain robust, particularly in the aerospace and defense sectors, where the need for high-strength, lightweight materials is critical. According to recent reports, the global titanium market is projected to grow at a compound annual growth rate (CAGR) of approximately 6.8% from 2020 to 2027, driven by the increasing demand for lightweight and durable materials. The global titanium metal market was valued at approximately US$26.07bn in 2023 and is anticipated to reach US$27.62bn in 2024 powered along by growth in civil aviation and defense expenditure.

Zircon demand has remained in a range of 1mn to 1.2mn tonnes over the past decade or more and the price is driven more by supply side developments than demand. The three largest producers (Iluka, Tronox, RTZ) account for ~55% of global supply, mostly from older mines that are in decline. The largest current zircon mine (20-25%) of global supply, Jacinth Ambrosia in South Australia and owned by Iluka, has only a few years of life left and is expected before 2030. Iluka has matched supply from this mine to demand for nearly a decade minimizing short-term oversupply and its closure later this decade will create an attractive mid-term market dynamic.

Currently there is no shortage of Titanium minerals, Zircon, or indeed of HMS so it is no surprise prices have tracked lowed similar to most other metals over the last 18 months as shown in the chart below, though the complex seems to have bottomed out.




*Source: TZMI*

## Mineral Sands Universe

| | Exchange | Ticker | Mkt Cap | Location | Project | Notes |
|---|---|---|---|---|---|---|
| **Producer** | | | | | | |
| Chemours | NYSE | CC | $2.813bn | USA | Trail Ridge | Provider of monazite to UUUU |
| Sheffield Resources | ASX | SFX | $59.221mn | Western Australia | Thunderbird | Thunderbird mine |
| PYX Resources | ASX/LSE | PYX | GBP £118.49mn | Indonesia | Mandiri | |
| Eramet | Euronext | ERA.PA | Euros 1.608bn | Senegal | Grande Côte | Diogo mine |
| Sierra Rutile | ASX | SRX | n/a | Sierra Leone | Pejebu/Ndendemoia | Taken over by Leonoil |
| Iluka Resources | ASX | ILU | $2.3bn | South Australia | Jacinth/Ambrosia | |
| | | | | Western Australia | Cataby | |
| Tronox | NYSE | TROX | $1.54bn | South Africa | Namakwa/Fairbreeze | |
| Mineral Commodities | ASX | MRC | $25.6m | South Africa | Tormin | |
| Rio Tinto | ASX/LSE | RIO | GBP£79.6bn | South Africa | Richards Bay | Force majeure |
| | | | | Mozambique | Fort Dauphin | |
| Savannah Resources | LSE | SAV | GBP £94.51mn | Mozambique | Mutamba | JV with RTZ |
| Kenmare Resources | LSE | KMR | GBP £281mn | Mozambique | Moma | Resource in Namibia |
| Energy Fuels | NYSE | UUUU | $1.046bn | Brazil | Bahia | Acquired Base Resources for AUD$375mn |
| (inc. Base Resources) | | | | Kenya | Kwale | Almost at EOM |
| | | | | Madagascar | Toliara | Under development |
| Strandline Resources | ASX | STA | **$138.94m** | Western Australia | Coburn | Debt crisis/halted since Oct 2023 |
| **Developer** | | | | | | |
| Astron Corporation | ASX | ATR | $125.3mn | Victoria, Aust | Donald | Pilot mode - JV with Energy Fuels |
| Sovereign Metals | ASX | SVM | $440.91mn | Malawi | Kasiya | |

**The Players**

The participants in the HMS space outside China are much fewer than many in mining would imagine. The table that follows shows the producers, developers and explorers. Base Resources, if it had stayed independent, would have been in the curious position of reverting from producer to developer.

Some of the explorers are inevitably not going to make it, so the pipeline is even thinner than it looks.

As can be noted, there are several companies that far transcend the HMS space, most notably Rio Tinto, Eramet and Energy Fuels, while two names, Tronox and Chemours are fundamentally regarded as chemical companies rather than miners by the US markets where they are listed.

Astron, with the Donald project in Victoria, Australia, has entered the orbit of Energy Fuels in recent months thru a JV on the project.

The fate of Strandline remains in the lap of the gods (or the hands of creditors). As at the end of September, the company claimed to have reached an in-principal agreement to an extension of the existing standstill and deferral arrangement with its financiers (NAIF, National Australia Bank and Nordic Bondholders). The existing standstill and deferral arrangement will remain in place until 30 November 2024. The near-term interest payment obligations and principal repayment obligations have been extended until that date. Management says it continues to work on a “holistic” recapitalization in the December quarter.

In a side deal, it shed its Tanzanian HMS assets to Shenghe in August for AUD$43mn.

**Iluka (ASX: ILU) – Similar but Different**

It’s worth mentioning in passing the Australian HMS giant, Iluka Resources, which is probably the closest comparative to what Energy Fuels are doing, but without Uranium as a prime pillar (or indeed any apparent component in the plan).

Since the 1990’s Iluka has strategically stockpiled, from its HMS production, the monazite stream from its Narngulu Mineral Separation Plant, at its operations at Eneabba, Western Australia. Iluka commissioned a concentrator plant at Eneabba to further process the stockpiled material. This separates the monazite (and additional zircon), producing a ~90% monazite concentrate material that provides a direct feed to Iluka’s Rare Earths refinery.

Beyond the Eneabba stockpile, Iluka holds additional mineral sands deposits that could serve as feed source for the refinery, including the Wimmera project in Victoria and the Balranald project in New South Wales.

**Whither the Chinese?**

The Chinese operate the largest Titanium processing industry in the world and also largest producer, and consumer, of Titanium dioxide in the world. It is also the largest ilmenite producer. The majority of

Chinese ilmenite supply is domestic (hard rock VTM). This can only be used for sulphate pigment and so China imports ilmenite to supplement domestic supplies for sulphate and to provide feedstock to make chloride slag for use in Chloride pigment production.

Despite this the Chinese have not been a major presence in acquiring outright Titanium mines and advanced projects in the main jurisdictions where the mineral is mined. They have instead stuck to a strategy that appears to be mainly JVs and strategic stakes in exchange for offtakes which keep them below the radar and out of the firing line of critics that attack any investment they might make in minerals that might be described as strategic.

We would not expect this to change. Indeed, it seems to be working as a strategy, making Titanium and the other metals one of the least controversial subjects of discussion when it comes to market dominance, despite China, in fact, having an overwhelming position in mid-stream and downstream processing in Titanium.

**Conclusion**

Interestingly, though while REEs from HMS are moving the dial in the REE space (and acting potentially as a major spoiler) they are a relative sideshow in the HMS space, though as the Base Resource deal shows, they may become a motor for some M&A action from unexpected quarters with previously unconsidered predators.

## Important disclosures

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