

HALLGARTEN & COMPANY

Coverage Update

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Northern Minerals

(ASX:NTU, OTCBB:NOURF, FSE: NUN)

Strategy: Long

Key Metrics			
Price (AUD)	\$0.079		
12-Month Target Price (AUD)	\$0.38		
Upside to Target	381%		
12mth hi-low AUD	\$0.04 - \$0.105		
Market Cap (AUD mn)	\$158.63		
Shares Outstanding (mns)	2,008		
	FY18	FY19e	FY20e
Consensus EPS		n/a	n/a
Hallgarten EPS		(\$0.004)	\$0.002
Actual EPS	(\$0.01)		
P/E	n/a	n/a	40

Northern Minerals

Only Way is Up in the World of Post-Peak REEs in China

- + Northern Minerals joined the exclusive ranks of being a producer of Rare Earths in late 2018
- + Dysprosium is the top performing REE pricewise this year and vital to the EV revolution
- + Erbium is coming to be recognized as (part of) the secret sauce in 5G as EDF
- + China is past its peak in REE dominance and looking vulnerable
- + Planned debottlenecking should increase production substantially for very low capex
- + Exploration at the Iceman and Dazzler prospects has produced significantly higher intercepts than the currently mined area,
- + Higher grade Dazzler resource released in March augurs potential for expanded production in the future from mineralisation that is shallow and flat thus with lower mining costs
- + The company is now a potential target for a takeover by such as Lynas to diversify their exposure to the heavier elements in the Lanthanide suite of REE metals
- + Chinese entities might take advantage of low valuation to neutralize a potential competitor
- ✗ Financing remains a challenge in the REE space, but getting to production should dispel concerns about funding further incremental expansion
- ✗ The Australian government has tightened up criteria for its R&D scheme which had been a useful impetus for companies such as Northern Minerals and claimed back a tax rebate
- ✗ The threat of a Chinese takeover is a major negative to the creation of an independent REE producer universe

The Rare Earths Producers Club– Priceless

There are very few clubs where one needs to wait eight years to join and must spend AUD\$210m in dues to join. Then when one finally gets in finds that there are only two other members. Despite the high cost and the rarified company this is a club that ultimately will be well worth joining. After all the first member of the club spent several billion dollars to become a member and another founder member, since lapsed, spent many more billions and still could not remain within the hallowed halls of the Establishment.

In this research note we shall look at Northern Minerals transition from developer to producer, a status achieved in late 2018.

First Production

In mid-October 2018, Northern Minerals announced its first output of REE carbonate. This was the successful outcome of the process that commenced with the commissioning of the plant in June, with RE carbonate produced following load commissioning of the hydrometallurgical circuit.

Both the beneficiation and hydrometallurgical circuits having now been load commissioned and the focus for commissioning will now be to progress to steady continuous operation of these circuits.



The 72,000 tpa beneficiation plant should produce 573 tpa of TREO, of which some 49.4 tpa will be Dysprosium and 39.3 tpa will be Erbium.

The Evolving Strategy

In 2016 the company enunciated a three staged production plan, however since that time the plan has become more fluid with a gradualist modular approach rather than a series of quantum leaps. The Stage One envisaged the construction of a 72,000 tpa so-called pilot plant operation at the project (though a run-rate of 60,000 tpa is oft cited when factoring in weather/maintenance etc).

The first three-years operation envisage the utilization of both a beneficiation and hydrometallurgical process to produce 49,000kg Dysprosium, in 570,000kg TREO per annum contained in a mixed rare earth carbonate (REC). Construction of production facility moved ahead swiftly was completed mid-2018.

The operation as currently constructed involved a CapEx of AUD\$70mn.

Brown's Range Volumes

Ore	TREO (t)
60,000	573
72,000	670
86,000	800

The Production Facility

The initial production facility mirrors all the processing steps detailed in the Definitive Feasibility Study, however downsized to an operating budget capacity to initially process 60,000 tpa of ore at 1.19% TREO through the beneficiation plant, and 3,200tpa of Xenotime concentrate at 20% TREO through the hydrometallurgical process. Previous offsite testwork has shown that these two processes are capable of

delivering superior recoveries of 87% and 92% respectively.

Power is supplied by diesel generators and water sourced from the Gardiner Sandstone aquifer located 10km southwest of the pilot plant area. A tailings storage facility and evaporation pond have been constructed to manage the waste streams from both processes, however downsized from the DFS to suit the processing capacity of the initial plant.



A 1.2km unsealed air-strip and some roads were constructed, as a result of the work on setting up initial mine and plant. The plant is supported by a rostered fly-in, and fly-out workforce who have been accommodated through an expansion of the pre-existing existing 20-person exploration camp to 87 room capacity.

The Hydrometallurgical Plant

The initial plant specifications include a hydrometallurgical plant with capacity of 3,840 tpa. The hydrometallurgical plant will use sulphation bake method, followed by water leach, purification, precipitation to produce a mixed RE carbonate concentrate. The concentrate will then be washed, thickened, filtered and dried to produce a high-purity Dysprosium-rich mixed Rare Earth carbonate.

The chemical inputs used in the hydrometallurgical plant are expected to be:

- sulphuric acid
- Soda ash

Monday, June 10, 2019

- quick lime slaked to hydrated lime
- limestone
- ferric sulphate
- magnesium oxide
- caustic (sodium hydroxide).

The final RE carbonate product will be packed in bags in 20 tonne shipping containers and transported by road to the Port of Darwin for export.

Mining Operations

Mining operations began in the third quarter of 2017 and ended in November 2017 with material sourced from relatively shallow pits at the Wolverine and Gambit West deposits.

Below can be seen the pit at Gambit West as at December.



Source: Northern Minerals

The tonnage mined was slightly over 200,000 tonnes, higher than the target of 172,080t of mineralised material @ 1.19% TREO, containing 2,047,000kg TREO, which was the stockpiled to be fed into the plant. A 1.19% TREO grade is achieved as a result of higher grade ore near surface of the deposits being mined and should have minimal impact on the ore grade when the operation is developed at full scale.

It is estimated that of the TREO mined and processed through the plant thus far, 75% was from within the Probable Ore Reserve and 25% was from Inferred Mineral Resources, which is material that will be carried with the ore within the mine designs. The ore mined and processed in the initial phase represents a small portion of the DFS Ore Reserve, at 3,750,000t ore containing 26,375,000kg TREO, and the balance from the Mineral Resource Estimates.

Refining the Processing

As mentioned the Rare Earth content in the Browns Range ore is contained mostly in Xenotime, which, as a paramagnetic mineral allows the ore to be potentially beneficiated using magnetic separation. And as it is also a dense mineral that allows sorting by density. X-ray transmission (XRT) sensors are able to differentiate between the high-density Xenotime-rich ore and lower density gangue minerals.

In light of this, the technical team has been investigating the use of ore sorting on the five stockpiles at Browns Range to improve beneficiation and feed to the processing facility, which will in turn result in an increase in the amount of Rare Earth oxides that can be produced by the recently commissioned pilot plant.

Testing was undertaken and as these generated the hoped for results, Northern Minerals then appointed Nexus Bonum Pty Ltd to undertake a feasibility study for the, design, supply and installation of an ore sorting circuit ahead of the pilot plant at Browns Range

REO Contained in mixed REE carbonate	Annual Prod (kgs)
Lanthanum	5,800
Cerium	15,200
Praseodymium	2,800
Neodymium	10,600
Samarium	11,400
Europium	2,400
Gadolinium	34,800
Terbium	6,700
Dysprosium	49,400
Holmium	13,500
Erbium	39,300
Thulium	5,600
Ytterbium	33,100
Lutetium	4,500
Yttrium	337,600
	<u>572,700</u>

Test Results

Ore sorting tests were carried out on sample ore from each of the stockpiles on the ROM pad at Browns Range. Out of this testing the main findings were:

- Preliminary sorting tests on small bucket sized samples (3kg to 20kg) were screened into the two sortable fractions of 10-25mm and 25-75mm from each stockpile. The samples, which are not expected to be representative of the stockpiles, included high and medium grade material from each of the Wolverine and Gambit orebodies, as well as material from a mixed low grade stockpile.
- The preliminary sorting test results were all positive, showing that sorting using XRT will be able to upgrade all the stockpile material significantly.
- More comprehensive testwork has been undertaken on the Wolverine High Grade stockpile, where a bulk sample of approximately 100 tonnes was collected and crushed using the in-situ

mine site crusher. The crushed bulk sample was subsampled, and a 2.5 tonne sample was wet screened into four fractions: fines (<10mm); 10-25mm; 25-75mm and oversized (>75mm). The sortable fractions (10-25mm and 25-75mm) were split and sorted on Tomra and Steinert sorters using XRT technology.

- The comprehensive sorting tests of the two sortable fractions showed that both the Tomra and Steinert technology was able to successfully sort the Wolverine high-grade ore stockpile using XRT technology.

Approximately 80% of the value of the sortable fractions can be recovered in 20% of the mass, representing an upgrade factor of 4X; or, alternatively, 90% of value can be recovered in 40% of the mass, representing an upgrade factor of 2.25X.

When the upgraded sorted ore is added to the fine ore that cannot be sorted, which for Wolverine high-grade represents approximately 25% of the feed mass and has a higher grade than the other sized fractions, 90% of the value in the ore feed can be recovered in 42% of the mass giving an upgrade factor of 2.1. Most significantly by recovering 50% of the mass of the sortable fractions from a feed with a grade of 1.16% TREO and combining this with the unsorted fines fraction, a 2% TREO grade can be achieved for the ore feed to the mill.

The ore-sorter is proposed to be inserted at the frontend of the process as shown in the aerial shot of the plant site below:



Given this encouraging result for the Wolverine High Grade stockpile and the positive results from the preliminary sorting test results for the other stockpiles, it is planned to utilise ore sorting to target an increase in the head grade to the mill of 2% TREO. An increased mill head grade will provide an increase in TREO production at the current pilot plant design mill feed rate.

Comprehensive testwork to confirm the preliminary sorting tests and quantify the recovery and grades that can be achieved with the other stockpiles is ongoing. Bulk samples of approximately 100 tonnes have been collected and crushed using the in-situ mine site crusher for each stockpile and a 2.5 tonne sample of the Gambit Medium Grade stockpile has been sorted on a Steinert sorter using XRT technology with results are expected shortly.

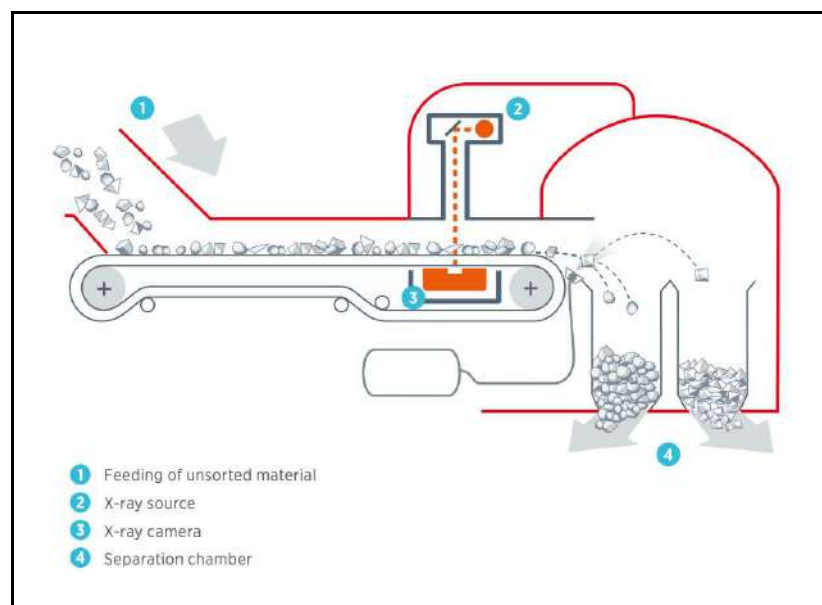
Similar tests are to be done on the Wolverine Medium Grade, Gambit West High Grade and Low Grade stockpiles which will allow the Company to refine the strategy prior to execution.

Infrastructure Kicker

While assistance from the Federal government is in retreat, the focus of the State government in Western Australia on value-added projects has been rising. In budget allocations in May of 2019, the State announced AUD\$51mn in funding for the upgrade of Duncan Road and Gordon Downs Road in the East Kimberley. This will provide improved access from Halls Creek and the Great Northern Highway to the community of Ringer Soak, several pastoral stations and ultimately Browns Range. The improved access to Browns Range should provide improved operational flexibility with potential flow-through to increased production.

Implementation & Debottlenecking?

After assessing various configurations the company, with Nexus Bonum, came up with what it viewed as the most efficient and cost-effective process design.



The decision was made to go with a dual-particle size range sorting with the ranges of 10-25mm and 25-75mm. The sub 10mm material is considered fines, which will be blended with the upgraded sorter product. Material greater than 75mm will be returned to the crushing circuit for reprocessing through the ore sorting circuit.

The ore sorting circuit will be integrated into the existing pilot plant, directly between the crushed ore stockpile and the mill feed hopper. The existing process plant has been built with a crushing capacity 216,000 tpa which is well in excess of the nameplate capacity of downstream beneficiation plant of 72,000 tpa and will be suitable for the ore sorting circuit.

The ore sorter circuit will divert the feed from the primary crusher ore stockpile conveyor over a screen and through the ore sorting circuit that establishes mill feed stockpiles of upgraded sorted ore, a separate fines stockpile, and optionally a blend stockpile of fines and upgraded sorted ore. Rejected, low grade ore is conveyed to the stockpile for processing at a later stage. The proposed location of the ore sorting circuit is shown in Figure 1 and the capital cost for the supply and installation of this circuit is estimated at AUD\$4mn.

Resource and Reserves

The 2015 Mineral Resource Estimate comprised six deposits; Wolverine, Gambit, Gambit West, Area 5, Cyclops and Banshee, with the total Mineral Resource estimated at 8.98mn tonnes @ 0.63% total rare earth oxides (TREO) comprising 56,664,000kg contained TREO using a cut-off grade of 0.15% TREO. Since then the higher grade Dazzler discovery has also had a resource estimate published (in March 2019).

Northern Minerals - Browns Range							
Category	Mt	TREO %	Dy2O3 kg/t	Y2O3 kg/t	Tb4O7 kg/t	HREO %	TREO kg
Indicated	4.69	0.70	0.59	3.95	0.09	87	32,862,000
Inferred	4.28	0.56	0.46	3.15	0.07	87	23,802,000
Total	8.98	0.63	0.53	3.56	0.08	87	56,664,000

The latest Ore Reserve (classified as 100% Probable) for the Project measures 3.75mn tonnes of ore containing 2.29mn kgs Dysprosium and 26.4mn kgs Total Rare Earth Oxide (TREO) and is shown below.

Browns Range - Reserve										
	Category	Tonnes	Dy2O3		Y2O3		Tb4O7		TREO	
			kg/t	kgs	kg/t	kgs	kg/t	kgs	kg/t	kg
Open Pit										
Wolverine	Probable	833,000	0.55	460,000	3.59	2,989,000	0.08	66,000	6.15	5,124,000
Gambit West	Probable	219,000	0.83	182,000	5.52	1,209,000	0.11	25,000	10.10	2,212,000
Gambit	Probable	37,000	0.68	25,000	4.74	176,000	0.09	3,000	8.05	298,000
Area 5	Probable	467,000	0.14	65,000	0.99	463,000	0.02	10,000	2.24	1,048,000
Underground										
Wolverine	Probable	2,104,000	0.70	1,483,000	4.71	9,908,000	0.10	221,000	8.00	16,833,000
Gambit West	Probable	90,000	0.88	79,000	5.78	521,000	0.11	10,000	9.54	860,000
Total	Probable	3,750,000	0.60	2,294,000	4.01	15,266,000	0.09	335,000	7.03	26,375,000

Bedazzled?

The most exciting thing in the exploration efforts in recent years has been the Iceman and Dazzler discoveries from the middle of 2018. These two prospects are located less than 15km to the south of the Browns Range processing plant. While the potential of the existing resource has only been scratched the new areas present an altogether much stronger target in terms of grade of TREO.

The most recent exploration program is the first to assess the unconformity between the Gardiner Sandstone and the underlying Browns Range Metamorphics. The campaign began with the use of a portable XRF to identify targets then thirteen holes for 1,242 metres were drilled with assay results from RC drilling at the Dazzler and Iceman prospects returning high grade results.

Some of the highlights of these drillholes were:

- 18m at 9.10% TREO (8,627ppm Dy₂O₃),
- 21m at 2.15% TREO and
- 11m at 4.83% TREO

The Dazzler target is located on the edge of a small scarp adjacent to a strong geochemical soil anomaly. The prospect was previously drilled in 2013, with seven RC drill holes completed. These holes were located at the base of the scarp slope and drilled directly into the Browns Range Metamorphics (BRM) unit. In March 2019, a Maiden Resource was released for Dazzler.

Dazzler - Resource Estimate							
Deposit Category	Tonnes (mns)	TREO kgs/t	Dy2O3 kgs/t	Y2O3 kgs/t	Tb4O7 kgs/t	HREO %	TREO (kgs)
Indicated	-	-	-	-	-	-	-
Inferred	0.14	2.23	2.08	12.79	0.27	93%	3,200,000
Total	0.14	2.23	2.08	12.79	0.27	93%	3,200,000

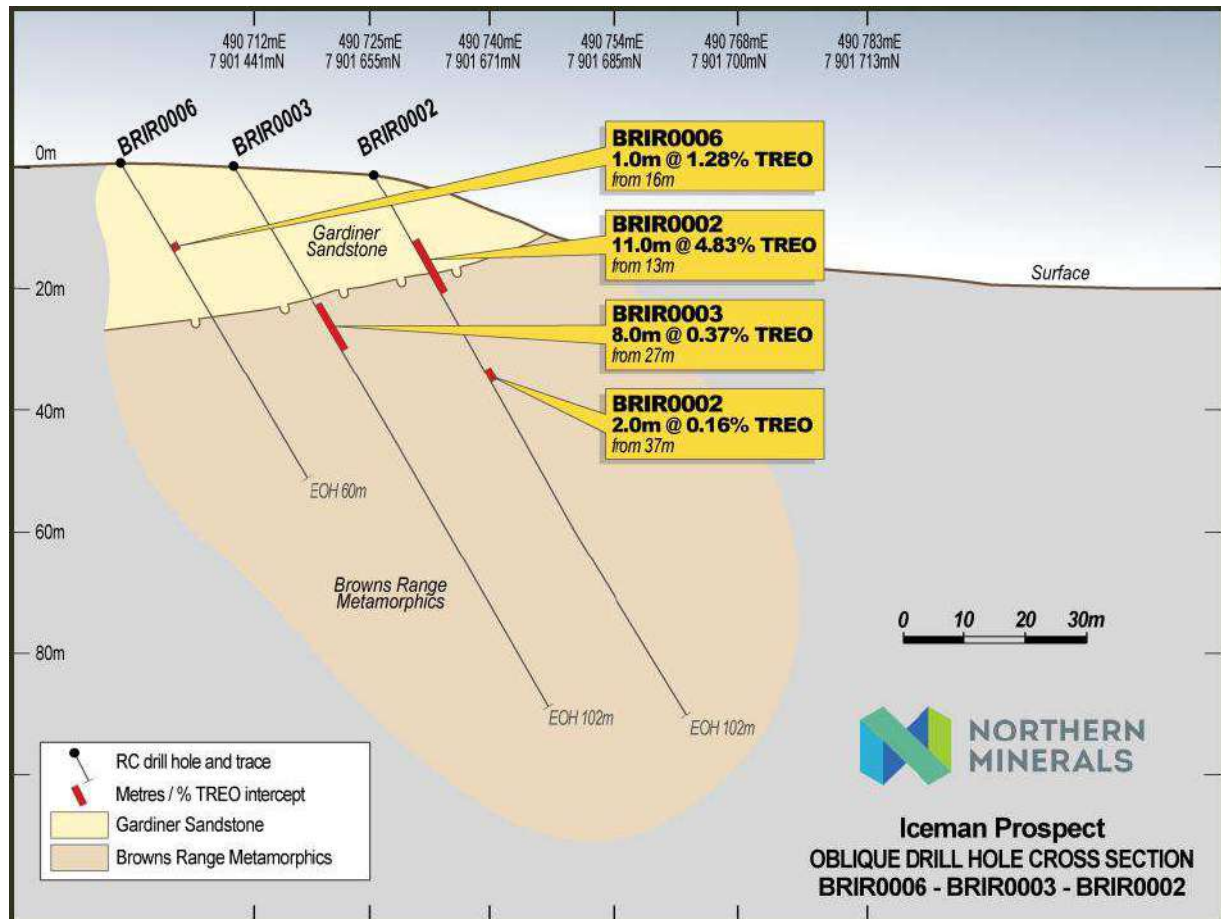
This resource was the result of a program in the second half of 2018 to assess the unconformity between the Gardiner Sandstone and the underlying Browns Range Metamorphics. Thirteen holes for 1,242 metres were drilled in that current program.

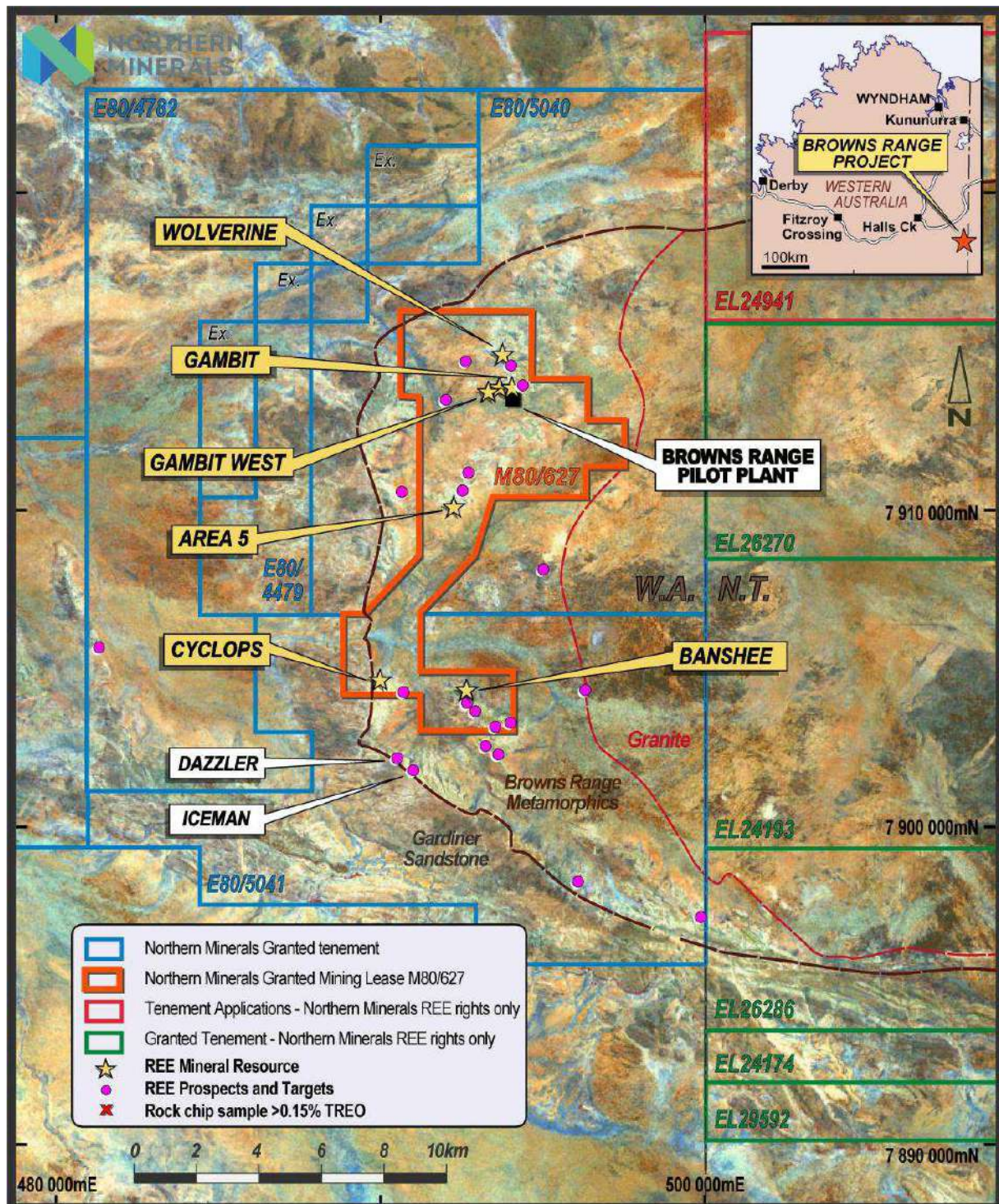


The Iceman prospect is located approximately 400m along strike to the southeast of Dazzler. This is the first drilling at the Iceman prospect and was targeted on the edge of a small scarp adjacent to a strong geochemical soil anomaly. Drilling from above the scarp firstly intersected the overlying Gardiner Sandstone unit before entering the lower Browns Range Metamorphics. Nine holes were drilled for 754 metres at Iceman.

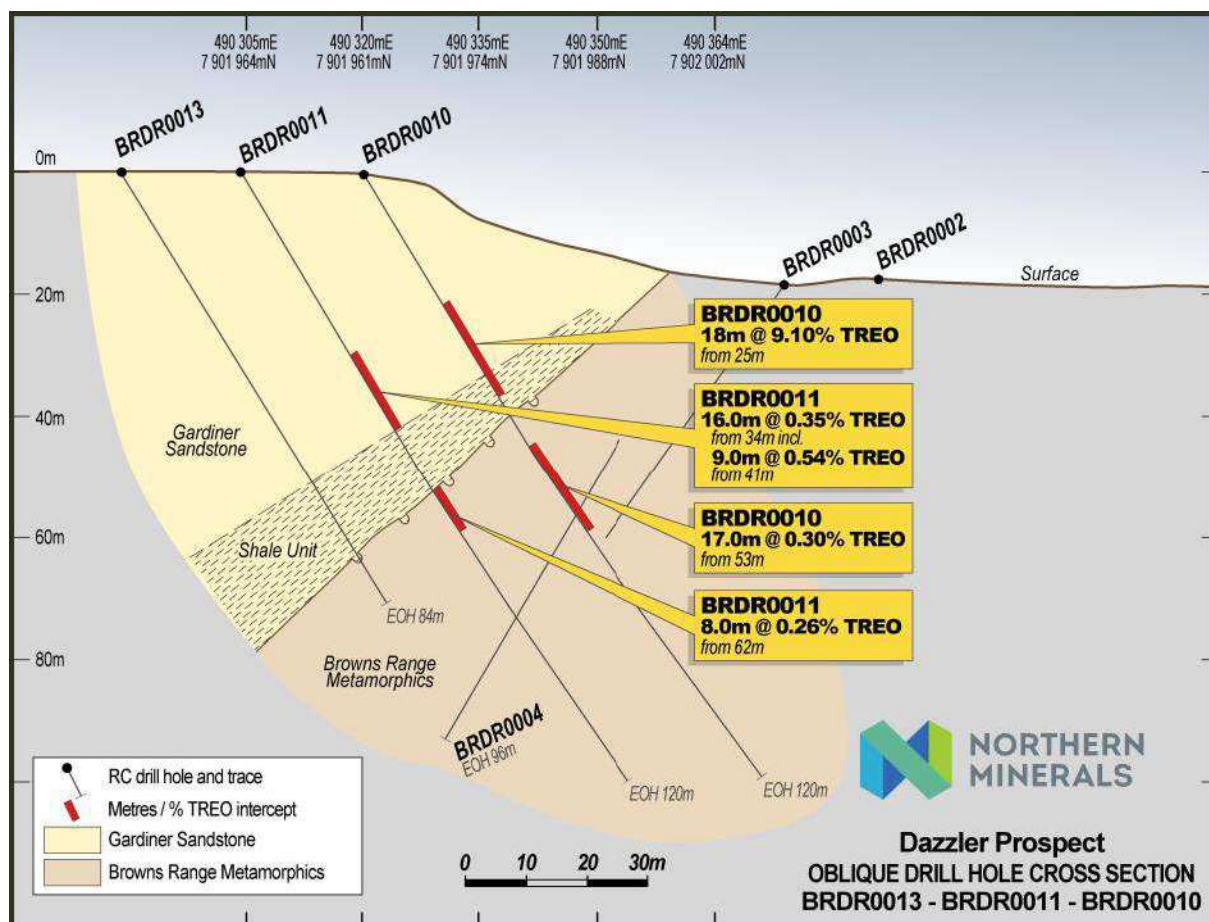
The grades at the new zones are significant, particularly in light of the fact that the existing Mineral Resource average grade is 0.63% TREO. Assay grades showed strong correlation against the preliminary pXRF results as can be seen from the table below:

Iceman- Dazzler: Selected Results							
Hole ID	Prospect	Width (m)	From (m)	To (m)	Dy2O3 (ppm)	Assay Grade TREO	Estimated intercept using pXRF
BRIR0002	Iceman	11	13	24	4545	4.83%	12m @ 4% TREO
BRIR0004	Iceman	7	26	33	1086	1.20%	7m @ 3% TREO
BRIR0007	Iceman	7	42	49	1694	1.73%	4m @ 1% TREO
BRD0010	Dazzler	18	25	43	8627	9.10%	19m @ 8% TREO
BRDR0014	Dazzler	21	24	45	1985	2.15%	21m at 2% TREO





Source: Northern Minerals



Follow up drilling is planned for later in the year.

Financing

At the end of May the company announced that it had completed all tranches of the AUD\$20mn placement that was announced in mid-March, following the receipt of the final \$5mn tranche. This consisted of the issuance of the 100,000,000 fully paid ordinary shares.

The other tranches to raise \$15mn and comprised of an issue of shares and convertible notes, is also nearing completion, with the final \$5mn tranche (in relation to the convertible note component of the subscription) due to be paid by 21 June 2019.

In a case of striking while the iron is hot, the company reacted to the REE price (and investor interest) surge by announcing in early June that it had entered into subscription agreements to raise a further AUD\$15 million (before costs) and AUD\$6.95mn via a 1 for 13 accelerated non-renounceable entitlement offer at A\$0.045 per share to raise a total of approximately AUD\$22mn (before costs).

The offer involves the issue of up to approximately 154,451,564 new fully paid ordinary shares.

The second part of the financing was a placement with the issue of 333,333,333 new shares at a price of AUD\$0.045 each to sophisticated investors in Australia and the British Virgin Islands. This issue is conditional on shareholder approval and subscription funds are due to be received in three equal tranches of AUD\$5mn on or before 31 August 2019, 30 September 2019 and 31 October. There will be a 12-month escrow on the placement shares.

Debt Situation

The debt profile of NTU consists of three elements. Firstly there is supplier financing from Sinosteel for the plant build. Then there is a line of convertible debt with Lind and there is two tranches of debt linked to R&D tax credits with a NY-fund called Brevet. This last debt piece will be discussed under R&D rebates.

In June of 2017 the company executed an agreement with an entity managed by The Lind Partners, a New York based fund the provision of up to AUD\$14mn in debt funding, with an initial amount of AUD\$6mn to be funded immediately after closing.

Major Debt Pieces Outstanding		
	End 3Q18	Jun-19
Brevet	\$22.5mn	0
Lind	\$6.9mn	0
Sinosteel	\$5.8mn	\$10.4mn
ATO		\$14.5mn
Cash on hand at end of June qtr	\$10.4mn	\$9.1mn
R&D Tax Receivables	\$19.5mn	0

That funding was provided as second-ranking secured convertible securities with a 30-month term. The funding agreement allowed for two AUD\$6mn tranches and two AUD\$1mn tranches based on specific events. The funding agreement included provisions for the conversion into ordinary shares, repayment in cash or early repayment at NTU's sole option.

Part of the funds raised from the recent financing transactions were used to fully repay all amounts owing to Innovative Structured Finance Co., LLC (Brevet) and Lind Asset Management X, LLC at the end of May 2019.

R&D Rebates – a Two-Edged Sword

A key component of getting Northern as far as it has managed during such a poor financing cycle was the imaginative use of tax offsets, from the Australian Federal government, that are applicable to R&D activities being undertaken at the Browns Range project.

The company also executed a US\$32mn R&D financing facility with Innovation Structured Finance (ISF, associated with Brevet Capital Management) based in New York. The facility provided Northern Minerals with accelerated access to the aforementioned tax credits.

Under the facility, the company and its tax advisor, Deloitte, estimated the level of tax offsets at the end of each quarter. ISF then provided funding up to 80% of the estimated tax offset, with the principal and accrued interest repayable out of actual tax offsets received at the end of the financial year. The facility was designed to have a term of two and a half years, aligning with the timeline for the initial plant project.

In May of last year, the Federal Treasurer (now Prime Minister) Scott Morrison announced that from July 1st, the government would introduce a \$4mn annual cap on cash rebates for companies with turnovers of less than \$20mn who were spending on R&D. This change has not been legislated and been withdrawn from parliament.

The ATO has now claimed back the amounts for the tax years of 2016/17 and 2017/18 of \$13,409,315.90.

To say that the ATO has been erratic on the subject of these rebates is an understatement. The ATO interpreted the pilot plant as production and then perceived the offtake announcement as commercial sales and has demanded the repayment of \$13.4m plus interest of the rebate.

Basket Value

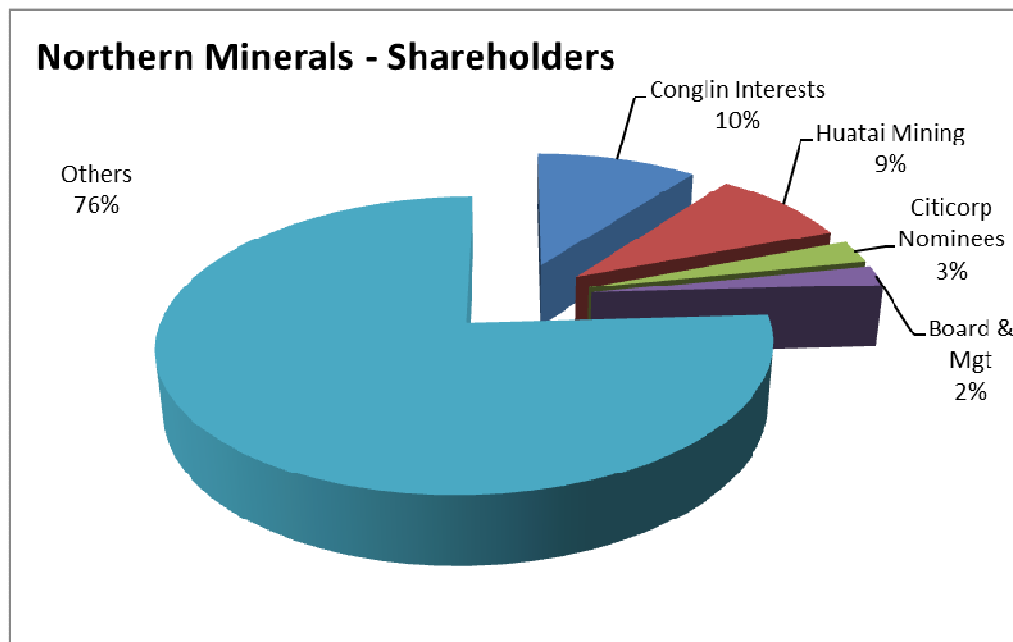
The table at the right shows the value of a typical kilo of output from Brown's Range at the reigning REE values at the end of May 2019.

The strong component of Dysprosium in revenues is obvious from this calculation.

NTU - REE Basket Value				
		Market Price	Browns Range RE Carbonate	
	REO	\$/kg	%REO	Basket Price \$/kg
Lanthanum Oxide	La ₂ O ₃	3.44	0.67	0.02
Cerium Oxide	CeO ₂	6.29	1.72	0.11
Praseodymium Oxide	Pr ₆ O ₁₁	51.72	0.26	0.13
Neodymium Oxide	Nd ₂ O ₃	42.75	1.38	0.59
Samarium Oxide	Sm ₂ O ₃	1.81	1.56	0.03
Europium Oxide	Eu ₂ O ₃	31.83	0.35	0.11
Gadolinium Oxide	Gd ₂ O ₃	25.39	3.78	0.96
Terbium Oxide	Tb ₄ O ₇	515.7	1.15	5.93
Dysprosium Oxide	Dy ₂ O ₃	269.1	8.43	22.68
Holmium Oxide	Ho ₂ O ₃	53.89	1.84	0.99
Erbium Oxide	Er ₂ O ₃	22.35	5.4	1.21
	Tm ₂ O ₃		0.75	0.00
Ytterbium Oxide	Yb ₂ O ₃	15.84	4.33	0.69
Lutetium Oxide	Lu ₂ O ₃	593.1	0.61	3.62
Yttrium Oxide	Y ₂ O ₃	2.63	67.76	1.78
			100.0	\$38.86

Shareholders

The current shareholder breakdown is shown in the pie-chart below.



Fins in the Water?

It would seem a great pity for Northern Minerals to be picked off just as it gets into production but like the phase where a chrysalis sheds its casing and becomes a butterfly NTU is as something of a vulnerable moment. Its price is depressed and not as responsive to the REE uptick as it should be and yet it is now a member of the very select band of listed REE producers, which consists of Lynas and Rainbow Rare Earths. To put things into perspective, Northern Minerals, now producing, has a market capitalization that is one sixth of that which Avalon Rare Metals had at its apogee when it had a project that would never be built and nothing else of consequence to its name.

So NTU in production is a different beast to the group of REE wannabes that it leaves behind. Not only does production bring credibility and cashflow but it passes into that more rarified state of being a potential takeover target. To our memory the only takeover ever in the Rare Earth space was Molycorp's acquisition of Neomaterials, which in any case was an acquisition into the downstream and not of a fellow miner.

There are only two types of acquirers that we can foresee for Northern Minerals, either a competitor buying them, where there is a universe of one, i.e. Lynas, or an end-user, such as a Rare Earth industrial consumer, which would be either Chinese or Japanese (or maybe Neoperformance Materials). We might also conjure with PE Funds taking a stake. The Japanese are still not psyched for such a leap. The Chinese are in a position to deal but the issue of whether that would be permitted in the current fevered international situation is a consideration. While the FIRB conceded the initial Chinese investment in NTU, would it allow a move to control?

Lynas moving on NTU looks like the easiest transaction. It has just escaped the clutches of Wesfarmers and has seen a massive rerating on the rebound from the failed bid and the Malaysian government having seen the light. Lynas could use its scrip and in the process diversify itself away from its weighting towards the lighter REEs and send a signal to the Malaysian politicians that other outcomes might be possible than having the LAMP projects being the perennial whipping boy. Such a transaction might be well viewed by the Japanese as rounding out Lynas's product range.

The EV Revolution and Rare Earths

From 2013 through 2017 Adamas Intelligence estimated that electric mobility and industrial applications were the greatest demand drivers of Dysprosium oxide (via use of Dy-containing NdFeB), followed by wind power, and vehicle accessory motors.

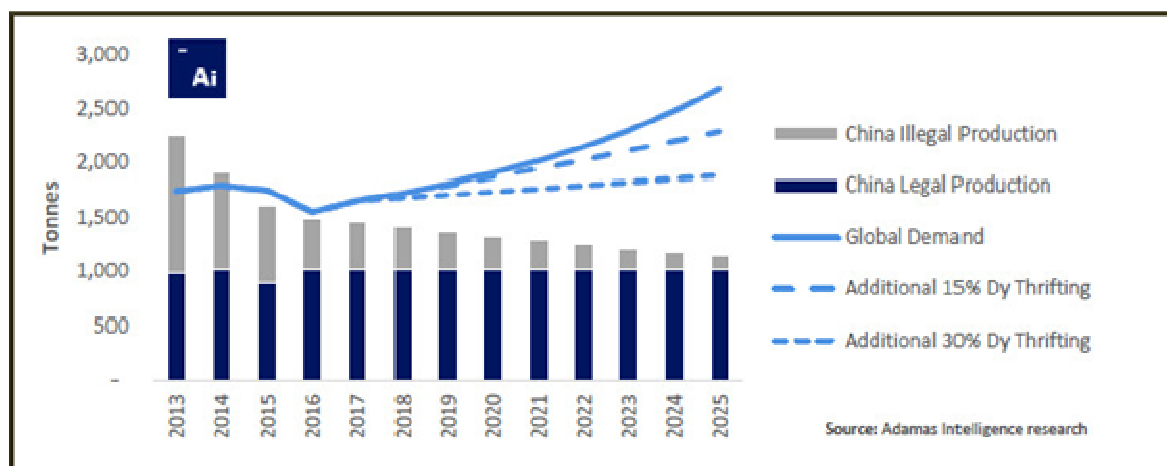
The three magnet metals that will harvest this whirlwind will be Neodymium, Praseodymium and Dysprosium. It is not a guaranteed that these will be available in the quantities required because Mother China is not an inexhaustible supply of these metals. Moreover, just as it is corralling all the Lithium and Cobalt it can get its hands on then why would it continue to be as wasteful as it has been hitherto of its Rare Earth advantage?



Source: Adamas Intelligence

The preceding chart shows a quite alarming decline in REE inventories which has occurred at a time when production is unchanged. Essentially China is selling down inventories to maintain sales. We sense that China's long dominance in the space is showing the signs of the massive overexploitation over the last 30 years and the ONLY remedy is to cut back exports and start stockpiling material before the

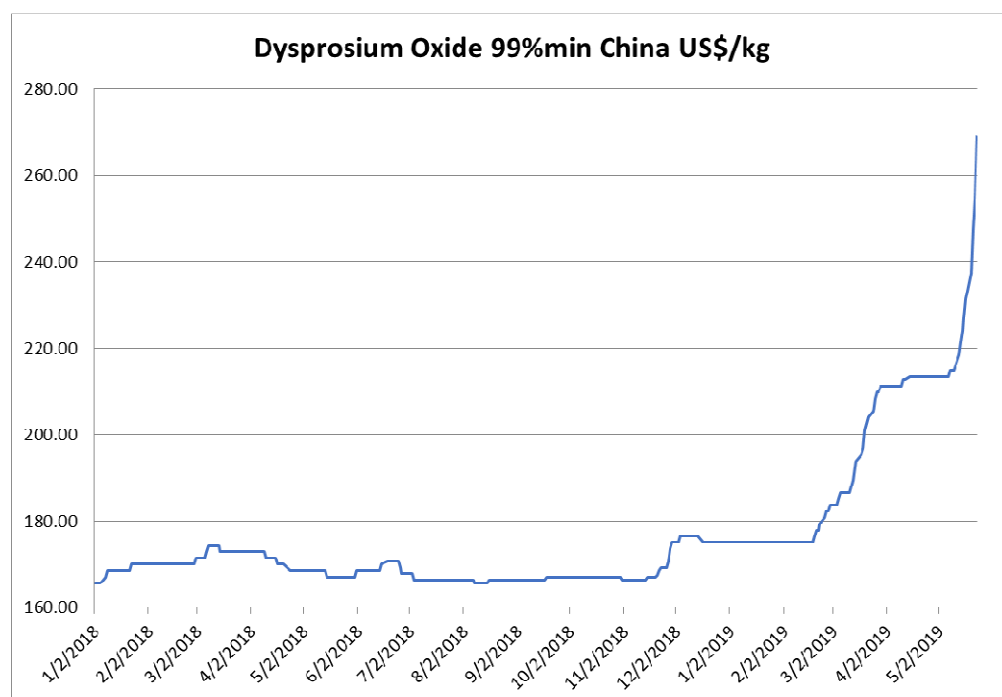
country becomes as vulnerable to outside forces in REEs as it is in Cobalt. This potentially sets the scene for a supply crunch outside China and no amount of WTO whining and appeals will stop the Chinese halting exports if it is deemed to be in the national interest.



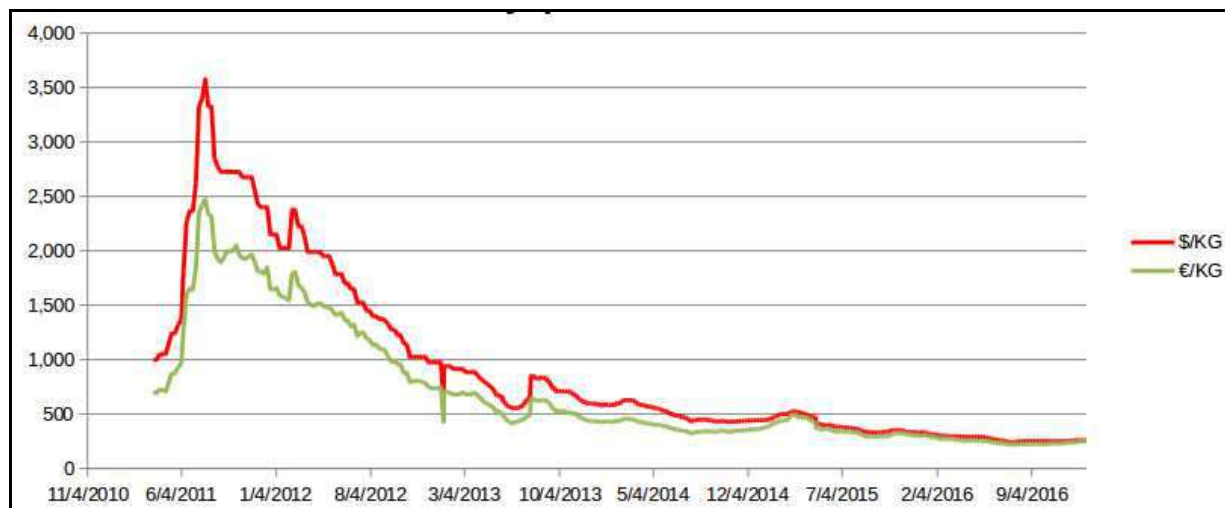
Source: Adamas Intelligence

Prices

Dysprosium did not have such a great 2018 having gone up and then come down, pretty much back to where it started the year. Then the first two months of 2019 were largely flat, moving up around 15% in the following two months and really start to motor higher in the last month. At current levels Dysprosium prices are 50% higher than their best levels of 2018.



The longer term price is shown here, with the massive fall from 2011 levels. The sheer ridiculousness of prices at that time is poignant.



Risks

The potential risks are:

- ✗ That REE prices return to the doldrums
- ✗ Ongoing tough financing conditions
- ✗ The company being taken out by a predator before it gets a chance to maximize its value
- ✗ The West continues to ignore the threat posed by one-country dominance and thus does nothing to foster non-Chinese production

REE prices are still captive to Chinese whims. There seems to be a perception that at least in the more strategic REEs (i.e. not Lanthanum and Cerium) that the Chinese would prefer to see higher prices but they do not want to trigger a rush of wannabes into the space that would threaten their dominance. The REE space has shrunk to a sufficiently small number of players that the Chinese can permit some price increases without triggering a rush of new entrants. Prices could rocket on a trade war induced ban on REE exports from China. This would be good, in helping financing and NTU's revenues. It would be bad in reactivating some of the "sleeping dogs" of the REE space.

Financing will be available if prices start to rise. Already sentiment in the space has improved due to the trade war jungle drums. This would be accentuated if the positive vibes start to expand. The company's main financing needs at this time are for the debottlenecking and to pay back the ATO.

Northern, unlike many others, already has an offtaker on board but if it is to expand production and service a nascent non-onshore (of China) REE industry it will need to gain more Western offtakers.

Conclusion

It has been a long wait between Lynas entering production back in 2013 and the onset of a second

producer in the form of Northern Minerals. Whether one can regard Rainbow Rare Earths as a serious producer remains an unknown.

Having reached this key inflection point the company now has new goals to aim for, foremost amongst these is to increase production through debottlenecking, further upgrading of the product, securing further offtakers and ultimately resource expansion. All of these tasks are in train currently with the production process improvements being relatively inexpensive and the fortuitous discovery of the Iceman/Dazzler zones jumpstarts resource expansion. Securing offtakers is the heavy lifting over the next six months for management.

Then there is the issue of the Rare Earth space itself. The glacial pace of additions of Western capacity offers no threat of oversupply while the brutal overexploitation of the in-country resources that the Chinese possess promises a declining output and ever thinner grades. In a nutshell, Bayan Obo is not forever. Other areas, such as the ionic clays have been ravaged and it is difficult to see how Chinese production can be sustained, in many cases, with loss-leading exports to the West. With China's mass adoption of the EV it has failed to be noticed that the only difficult-to-source input that China actually has a global dominance in is Rare Earths (for magnets in the motors). Will China continue to fritter away its REE advantage by selling to the West at knockdown prices? We suspect a crunch moment is nearing. Only producers in the West, like Northern, will be there to partially patch a gaping supply hole if the Chinese decide to pull the plug on "charity" sales of REEs to Western users. The trade war adds extra piquancy, and it happens to coincide with a period that we are calling "Post-Peak Chinese Rare Earths". The Chinese need to conserve their supplies and accumulate offshore sources of REEs for their own contracting supply.

Northern Minerals is finally in the right place at the right time with trade tensions and the EV boom coinciding with China moving towards the need to import REE feedstocks. We augmented yet again our Long position in Northern Minerals in the Model Mining Portfolio in late 2018 and we reiterate our 12-month target price for the holding is AUD\$0.38.

Monday, June 10, 2019



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