

LEVERAGED ENTRY INTO THE NDPR SPACE

Arafura Resources Limited (ARU) is at an advanced stage with its Nolan's REO project located within the NT, with DFS now completed, project effectively at the starting blocks pending the expected spike in the NdPr Price. Given the strategic intent of the likes of Wesfarmers Limited with its heavy weight balance sheet on the junior EV space, we feel the market is starting to ready itself for the impact of the burgeoning EV industry has on demand for products such as NdPr, lithium, graphite and cobalt to name a few. ARU is projecting annual production of NdPr of 4,357tpa, 2/3 of LYC's current production, ranking the company number 2 outside China.

- **When the NdPr dam bursts, and users scramble for supply, ARU is in the box seat.** Industry experts such as Roskill and Adamus are forecasting very significant price increases over the next 10-15 years reflecting the demand brought on by increasing production of EV vehicles. Whilst the NdPr price seems determined to track lower in the short term, supply shortfall will inevitably drive the price sharply higher in the medium term. With LYC currently the only non-Chinese producer of end product in meaningful volume, and the long lead time to development and capital intensive nature of developing a fully integrated processing facility, companies with advanced projects such as ARU's 100% owned Nolans is well placed to benefit.
- **The high value funding requirement likely to be resolved.** The Nolans project has a development cost over just over \$A1bn, which looks problematic given the current ARU market capitalisation of only \$39m. However, the recent interest of WES into LYC highlights the interest the market has on the EV space, and we feel the size and quality of ARU's project should see a funding solution.
- **Market thematics point to significant price rises.** There is a clear deficit looming in the NdPr market, meaning it's not if a price rise is to happen but when. There are very few companies in a position to bring on any meaningful production in time to meet the EV driven exploding demand. ARU represents a unique opportunity for a low cost entry into a credentialed project with long mine life, meaningful NdPr production on a global scale and low AISC.

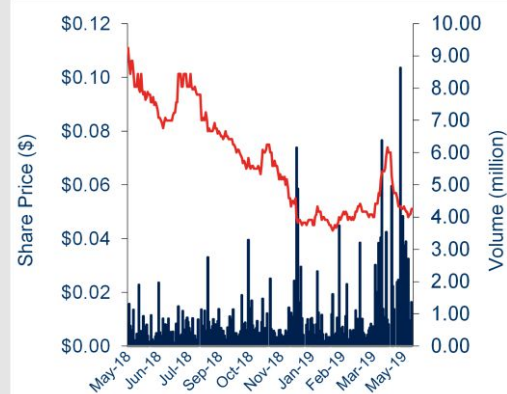
Year End June 30	2018A	2019F	2020F	2021F	2022F	2023F
Price rcvd ROE (US\$/kg)	0.00	0.00	0.00	0.00	0.00	0.00
AISC (US\$/kg)	NA	NA	NA	NA	NA	NA
Reported NPAT (\$m)	(5.1)	(7.7)	(6.1)	(26.2)	(62.6)	(91.0)
Recurrent NPAT (\$m)	(5.1)	(7.7)	(6.1)	(26.2)	(62.6)	(91.0)
Recurrent EPS (cents)	(0.7)	(0.8)	(0.5)	(0.4)	(1.0)	(1.4)
EPS Growth (%)	na	na	na	na	na	na
PER (x)	(7.8)	(6.2)	(10.4)	(12.8)	(5.3)	(3.7)
EBITDA (\$m)	(5.0)	(7.7)	(6.2)	(3.0)	(3.1)	(3.1)
EV/EBITDA (x)	(5.1)	(4.9)	(9.5)	(148.4)	(148.1)	(147.8)
Free Cashflow	(4.6)	(6.2)	2.4	148.2	(4.9)	(91.7)
FCFPS (cents)	(0.6)	(0.7)	0.2	2.3	(0.1)	(1.4)
PFCF (x)	(8.7)	(7.8)	26.0	2.3	(67.6)	(3.6)
DPS (cents)	0.0	0.0	0.0	0.0	0.0	0.0
Yield (%)	0.0	0.0	0.0	0.0	0.0	0.0
Franking (%)	0.0	0.0	0.0	0.0	0.0	0.0

13 May 2019			
12mth Rating		Speculative Buy	
Price	A\$	0.05	
Target Price	A\$	0.08	
12mth Total	%	51.3	
RIC: ARU.AX		BBG: ARU AU	
Shares o/s	m	781.4	
Free Float	%	100.0	
Market Cap.	A\$m	39.9	
Net Debt (Cash)	A\$m	-5.9	
Net Debt/Equity	%	na	
3mth Av. D. T'over	A\$m	0.075	
52wk High/Low	A\$	0.11/0.04	
2yr adj. beta		0.78	
Valuation:			
Methodology		DCF	
Value per share	A\$	0.08	

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Disclosure: Patersons Securities Limited provided services to Arafura Resources Limited (ARU) within the past two years and received fees for these services.

12 Month Share Price Performance



Performance %	1mth	3mth	12mth
Absolute	(29.2)	4.1	(54.0)
Rel. S&P/ASX 300	(30.1)	0.3	(56.9)

COMPANY OVERVIEW AND INVESTMENT THESIS

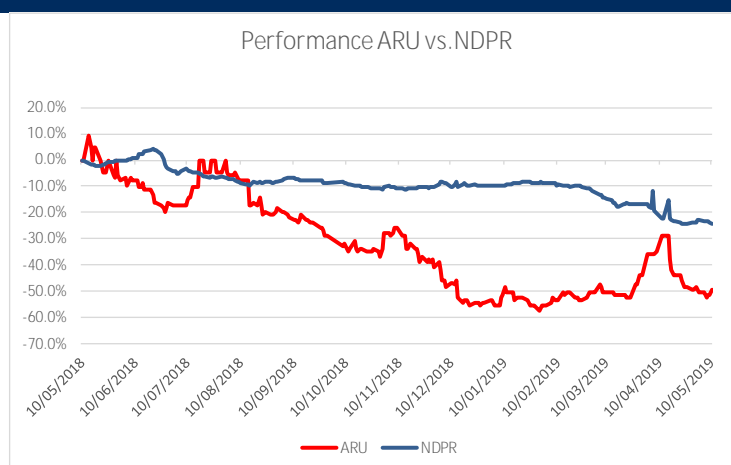
Arafura Resources Limited (ARU) is an ASX-listed REO developer focussed on advancing its 100% owned Nolans REO Project, located in the Northern Territory, Australia, with a 23 mine life base on the current ore reserves. The company was listed in 2003 with four project locations covering 12,000km² in the NT, with a gold and rare earth focus, with Nolans was always the main game. Over the ensuing 16 years, the company has taken the resource from 4mt at 4% REO to 56mt at 2.6% REO, with a finalised and robust DFS over the project

The project has a recently completed DFS which sees annual NdPr production of 4,357tpa, at a low cost of US\$25.94/kg after P₂O₅ credits (c8% revenue). Production is targeted for 2022, with the company actively seeking offtake partners and funding. The project does have a large capital expenditure requirement of over \$A1bn, but given the level of interest globally in securing non-Chinese reliable offtake to feed into the expected increasing demand relating to the burgeoning EV market, we feel this minnow has the potential to grow very quickly.

We initiate coverage of ARU with a Speculative Buy rating and a \$0.08/share valuation. Key ARU investment considerations include:

- **Globally strategic asset.** Nolans is forecast to produce 4,357tpa NdPr, ranking the project number 2 in the Non-Chinese global production of NdPr, and representing c. 7% of total world production.
- **Significant valuation and project economics.** We derive a post-tax NPV₁₀ on the Nolans project of \$473m, on what we feel is a conservative REO pricing deck. Conversely ARU generate a NPV₁₀ of A\$729m on a more positive pricing deck based on a company requested report by industry expert Roskill.
- **High capital intensity, but global concerns on surety of supply on NdPr production may solve the funding dilemma.** Nolans is undoubtedly a capital intensive project, with project capital estimated at a\$1,006m (including contingency of \$110.4m). We feel the lack of non-Chinese opportunities to secure supply should see end users, and magnet producers likely to help fund this project to give surety of supply.
- **Safe Jurisdiction.** All aspects of the project are domiciled in Australia significantly reducing the company risk. The fact that the company plans permanently dispose of all wastes in a permanent residue storage facility at the project site further de-risks the project with respect to any environmental returns.
- **Highly leveraged to the REO market.** ARU feasibility sees a US\$5/kg increase in the NdPr oxide price increasing NPV₁₀ by A\$130m, or 17%. We would expect when the REO demand bubble bursts, the price is likely to overreact on the upside, which should see excellent valuation uplift opportunities for ARU.
- **Advanced stage project.** ARU not only completed the DFS earlier this year, but also has key environmental permits in place. The company already has two non-binding offtake agreements signed, with negotiations for additional agreements ongoing, and engagement with financing partners already commenced.

Figure 1: Leveraged to performance of NdPr price



Source: Asian Metals, IRESS

VALUATION

Our ARU valuation is based on a NPV₁₀ discounted cash flow analysis of the 100% owned Nolans REO Project, risk weighted to 80%. Our valuation is further diluted to account for a potential equity raising to fund 50% of the projects start-up capital requirement of \$A1, 006m.

Figure 2: ARU Valuation

Valuation	A\$m	A\$/sh
Nolans , risked at 80%	473.1	0.61
Exploration	0.0	0.00
Sub Total	473.1	0.61
Investments	0.0	0.00
Cash + receivables and inventory	9.4	0.01
Total Borrowings + creditors	(3.5)	(0.00)
Corporate/Other	(21.9)	(0.03)
Equity component of any capital raising	666.7	0.85
NPV ₁₀	1 123.7	\$0.08
Price Target		\$0.08

Source: Patersons Securities Limited

Figure 3 shows the NdPr price and A\$/US\$ used to derive our valuation. Our starting point for our price forecasts are the spot NdPr prices as derived from Asian Metals. We then apply conservative inflation assumptions to 2022, there after we apply inflation of 10%pa through to 2030 to reflect expectations of the increasing demand from the ramp up in the EV industry. We previously had applied a 7%pa inflation rate over the period from 2022-2030, but given the NdPr price has fallen 33% since it recent peak of \$US49/kg on the 13 March 2018, we have increased our inflation expectations to lift the future pricing deck to what we see as more realistic levels.

Figure 3: REO Price and A\$/US\$ Forecasts

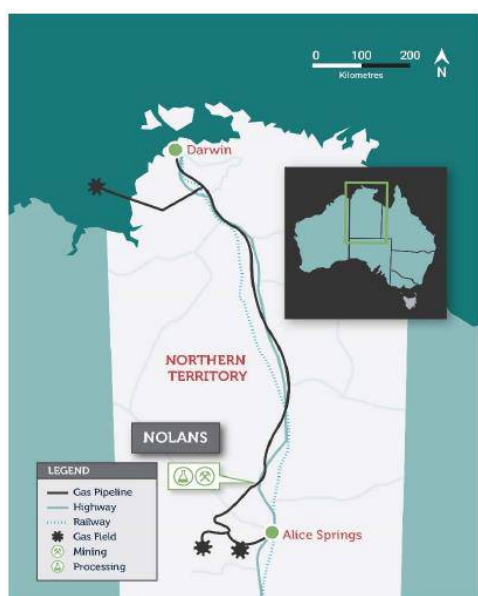
Assumptions	2018a	2019E	2020E	2021E	2022E	2023E
A\$:US\$	0.77	0.72	0.72	0.72	0.73	0.72
NdPr (\$US/Kg)	43.39	36.29	33.59	36.03	38.64	42.62

Source: Patersons Securities Limited

NOLAN'S RARE EARTH PROJECT

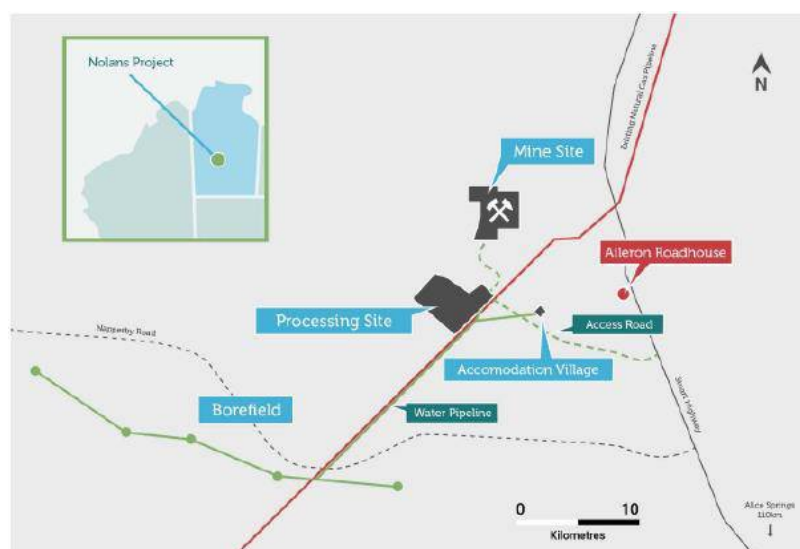
The Nolan's Project is located 135km north of Alice Springs in the Northern Territory. The Amadeus natural gas pipeline is adjacent to the project site, with water supply 30km to the site and sufficient area on site to dispose of tailings and process waste on site. The asset is particularly significant as both mine and processing facility are planned to be located on site, with environmental approvals already in place. DFS was recently completed (Feb 7 2019) with annual NdPr production of 4,357tpa (LYC currently producing c. 6,500tpa) at a LOM cost of US\$25.94/kg NdPr. Whilst the project does generate other REO, over 85% of the revenue is derived from NdPr, with a US\$5/kg increase in NdPr price increasing the NPV by A\$130m according to ARU. Commissioning of the \$1bn project is forecast to occur in 2022, with a supply shortfall due to the ramp up of EV vehicles expected to be impacting price by this time. For conservatism we have delayed start-up of the project through to mid-2023CY.

Figure 4: Nolans Project Location



Source: Arafura Resources Limited

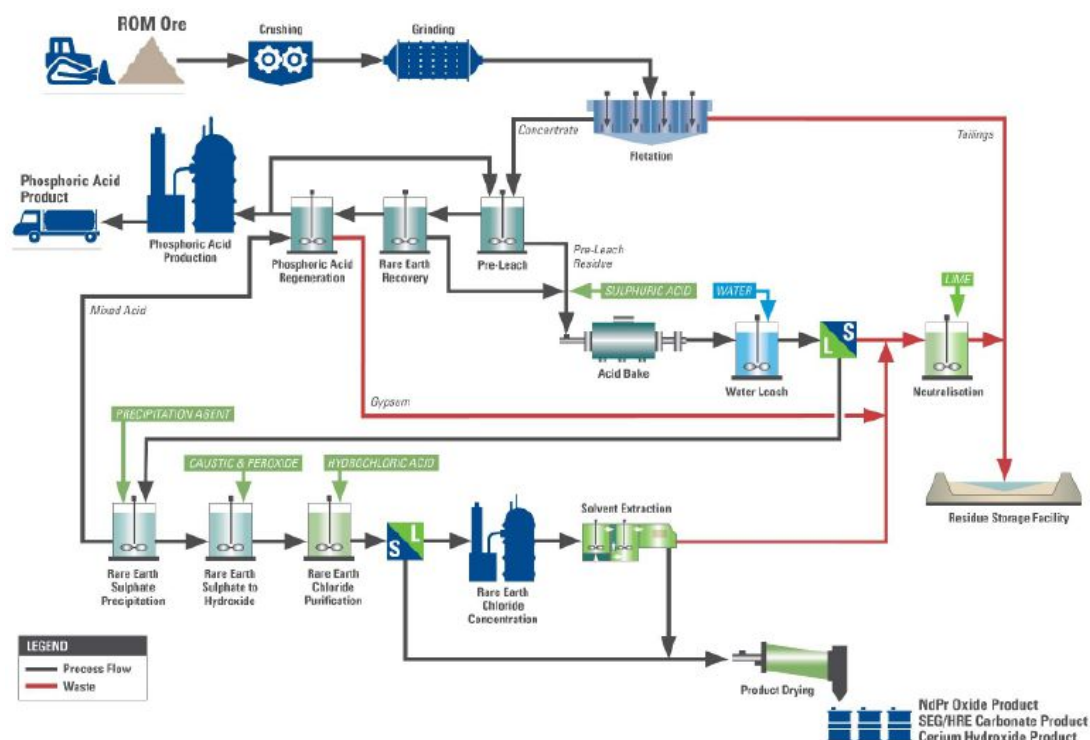
Figure 5: Location of the Nolans Project relative to key infrastructure requirements



Source: Arafura Resources Limited

The processing route proposed is similar to that of LYC, producing an NdPr Oxide product, SEG/HRE Carbonate product and a Cerium Hydroxide Product. The company also intends to sell its P₂O₅ production, which is estimated to add circa 8% to annual revenue. Whilst capital intensive, producing separate end use products opens the markets for product sales, with production of a concentrate which we believe may be planned by Hastings, and is also the planned route for pricing the Monazite produced as a bi-product from a number of Mineral Sands projects beholden to Chinese processors who are ultimately likely to dictate pricing. To that end, ARU are focussed on China, Japan, South Korea and Europe as potential customers for their NdPr Oxide.

Figure 6: Process Flowsheet



Source: Arafura Resources Limited

Figure 7: Offtake Progress

Customer / Target Region		Amount (tonnes p.a.)	Offtake Status	Proportion of Revenue
JingCi Material Science Co.		900	Mou	96%
China		3,457	In progress	
Japan				
South Korea				
Europe				
SEG-HRE Carbonate – targeting contracts with rare earth processors				
China		606 (TREO equivalent)	In progress	1%
Japan				
Cerium Hydroxide – targeting contracts with rare earth processors				
Baotou Xinyuan Rare Earth Hi-tech		8,383 (TREO equivalent)	Mou	3%

Proportion of revenue for rare earth products only

Arafura Resources Limited

DFS sees both TREO production and NdPr oxide production c. 2/3 that of LYC's current production levels, so potentially quite meaningful with respect to world production, and highly significant with reference to non-Chinese REO production. Unlike the well documented issues with the LYC LAMP plant, the Nolans DFS includes fully costed permanent disposal of mine and process plant waste residues at Nolans. Whilst the DFS has low Opex of US\$25.94/kg NdPr, the Capital cost of the project is high at over \$A1bn, with capital payback based on the ARU price deck is five years. **On an incentive price basis, the Project requires an NdPr oxide prices of US\$75.50/kg to achieve an IRR of 15% or US\$59/kg to achieve an IRR of 10%. The project is well placed at the cost curve at US\$25.94/kg NdPr oxide.**

Figure 8: DFS Financials and KPIs

Mining & Processing		
Mine Life (years)	23	
Concentrate (tpa)	293,000	
Production		
TREO equivalent (tpa)	13,343	
NdPr Oxide (tpa)	4,357	
Cerium Hydroxide (tpa TREO basis)	8,383	
SEG-HRE Carbonate (tpa TREO basis)	603	
Phosphoric Acid (tpa 54% P ₂ O ₅ MGA)	135,808	
Financial	US\$	A\$
Capital Cost (\$m)	726	1,006
Rare Earth Sales Revenue (\$m pa)	379	539
Phosphoric Acid Sales Revenue (\$m pa)	35	50
Mining Costs (\$m pa)	(30)	(43)
Processing Costs (\$m pa)	(103)	(148)
General & Administration Costs (\$m pa)	(15)	(21)
EBITDA (\$m pa)	266	377
KPI Analysis	US\$	A\$
Operating Cost \$/kg NdPr	34.07	48.40
Operating Cost \$/kg NdPr with MGA credit	25.94	36.85
NPV ₁₅ after tax (\$m)	497	729
IRR after tax (%)	17.43%	
After tax payback	Year 5	
IRR 15% @ US\$/kg NdPr	76	
IRR 10% @ US\$/kg NdPr	59	

Source: Arafura Mining Limited

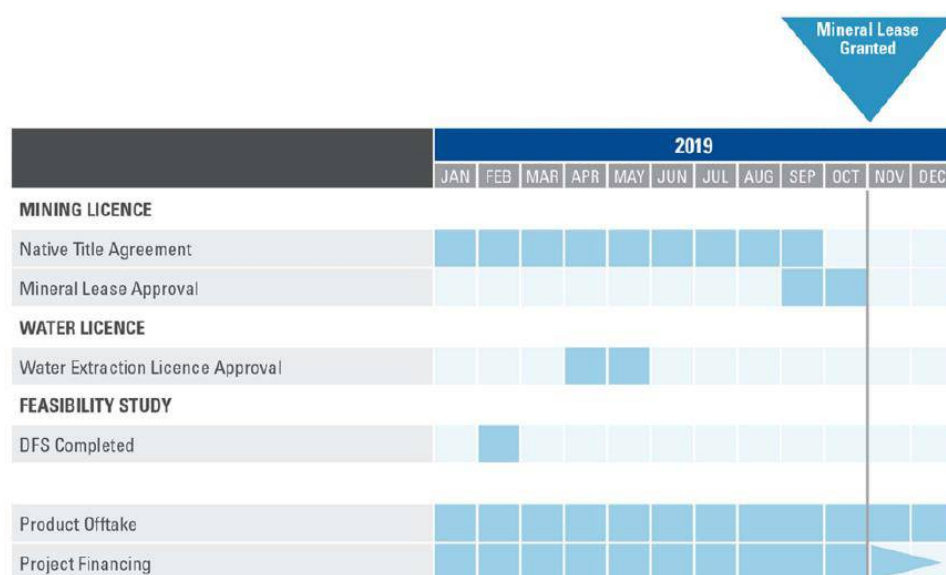
Figure 9: Overall Project Capital Cost Estimate Summary by Area

Table 5 Overall Project Capital Cost Estimate Summary by Area	
Description	A\$M
Mining Infrastructure	20.9
Pre-Production Mining	19.1
Beneficiation Plant	42.3
Extraction Plant	284.4
Separation Plant	48.1
Reagents & Services	147.9
Non-Process Infrastructure	173.2
Total Direct Cost	736.0
Temporary Construction Facilities	15.0
Travel & Accommodation	11.3
Detailed Engineering & PCM	64.9
Spares & First Fills	23.3
Mobile Fleet	5.6
Owner's Costs	36.7
Import duties	2.8
Total Indirect Cost	159.6
Contingency	110.4
Escalation	Excl.
Total	1,006.1

Source: Arafura Mining Limited

The project has significant catalysts in the current year, including the expected granting of a Mining Lease, and finalisation of Offtake and Project Financing.

Figure 10: Project Timeline - 2019



Source: Arafura Resources Limited

The Nolans Project boasts a significant reserve and resource, which remains open. However, given the current reserve allows for a mine life of over 20 years, we see no urgency in looking to expand the reserve at this stage. Resource is just under 3X the reserve size, with very little variance in REO grade as compared to the reserve.

Figure 11: Nolans Reserve and Resource position

RESOURCES	TONNES (m)	RARE EARTHS TREO %	PHOSPHATE P ₂ O ₅ %	NdPr Enrichment %
Measured	4.9	3.2	13	26.1
Indicated	30	2.7	12	26.4
Inferred	21	2.3	10	26.5
TOTAL	56	2.6	11	26.4
RESERVES	TONNES (m)	RARE EARTHS TREO %	PHOSPHATE P ₂ O ₅ %	NdPr Enrichment %
Proved	4.3	3.1	13	26.1
Probable	14.9	2.9	13	26.5
TOTAL	19.2	3.0	13	26.4

Source: Arafura Resources limited

Figure 12: Operational Summary

Year		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
US\$/A\$		0.76	0.72	0.73	0.73	0.73	0.73	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
NdPr Oxide	(US\$/t)	43,388	36,069	33,143	35,551	38,135	42,054	46,375	51,140	56,395	62,189	68,580	75,626	83,397	83,606	83,815	84,025	84,235	84,446	84,657	84,869	85,081	85,294	85,508	85,722	85,936	86,151	86,367	86,583	86,799
Nolans																														
PRODUCTION																														
Open Cut																														
Ore Milled	(k t)							826	826	826	826	826	826	826	826	826	826	826	826	826	826	826	826	826	826	826	826	826	826	826
TREO Grade	(%)							3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Contained TlO	(k t)							23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54	23.54
NdPr	(t)							4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357	4,357
Cash Cost	(\$US/kg NdPr)							28.8	29.1	29.4	29.7	30.0	30.3	30.6	30.9	31.2	31.5	31.8	32.1	32.5	32.8	33.1	33.9	34.2	34.6	34.9	35.3	35.6	36.0	36.4
AISC	(\$US/kg NdPr)							32.1	32.1	32.0	31.9	31.8	31.7	31.4	31.8	32.1	32.4	32.7	33.0	33.4	33.7	34.0	34.9	35.3	35.7	36.1	36.5	37.0	37.4	37.9
NdPr Price Received	(\$US/kg)							56.7	61.4	66.5	72.2	78.4	85.2	92.6	93.5	94.5	95.5	96.7	97.6	98.6	99.8	100.9	102.1	103.3	103.5	103.7	103.9	104.1	104.2	104.4
PROFIT AND LOSS																														
Revenue - REO	(A\$ M)		0.00	0.00	0.00	0.00	0.00	342.85	371.42	402.68	436.91	474.38	515.44	560.44	566.08	571.88	577.86	585.00	590.37	596.92	603.66	610.61	609.32	616.61	617.71	618.82	619.93	621.04	622.15	623.27
Revenue - Phosphoric Acid	(A\$ M)		0.00	0.00	0.00	0.00	0.00	27.43	29.71	32.21	34.95	37.95	41.24	44.84	45.29	45.75	46.23	46.80	47.23	47.75	48.29	48.85	48.75	49.33	49.42	49.51	49.59	49.68	49.77	49.86
Operating Costs - Mining	(A\$ M)		0.00	0.00	0.00	0.00	0.00	39.22	39.61	40.01	40.41	40.82	41.23	41.64	42.06	42.48	42.91	43.34	43.77	44.21	44.65	45.10	45.56	46.01	46.47	46.94	47.41	47.89	48.37	48.85
Operating Costs - Processing	(A\$ M)		0.00	0.00	0.00	0.00	0.00	174.20	175.95	177.72	179.50	181.30	183.12	184.96	186.82	188.69	190.59	192.50	194.43	196.39	198.36	200.35	202.36	204.39	206.44	208.51	210.61	212.72	214.86	217.01
Royalty	(A\$ M)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tax Provision	(A\$ M)		0.00	0.00	0.00	0.00	0.00	0.00	21.68	52.65	63.08	74.56	87.20	101.10	102.25	103.44	104.68	106.29	107.32	108.72	110.18	111.70	110.55	112.16	111.76	111.36	110.95	110.53	110.11	109.68
Nolans Capital	(A\$ M)		0.0	0.0	366.7	366.7	366.7	4.0	4.1	4.1	4.1	4.2	4.2	4.3	4.3	4.3	4.4	4.4	4.5	4.5	4.6	4.6	4.7	4.7	4.8	4.8	4.9	4.9	5.0	5.0
Processing Capital	(A\$ M)		0.0	0.0	0.0	0.0	0.0	4.0	4.1	4.1	4.1	4.2	4.2	4.3	4.3	4.3	4.4	4.4	4.5	4.5	4.6	4.6	4.7	4.7	4.8	4.8	4.9	4.9	5.0	5.0
Net Cash Flow	(A\$ M)		0.00	0.00	-366.67	-366.67	-366.67	148.83	155.78	156.33	180.59	207.29	236.69	269.04	271.63	274.32	277.13	280.80	283.12	286.30	289.62	293.07	290.28	293.95	292.93	291.90	290.84	289.77	288.69	287.58

Source: Patersons Securities Limited

PROJECT FUNDING STRATEGY

ARU are looking to secure A\$1,146m in new capital to execute the project. Given the current Market Capitalisation of c.\$40m, this does look challenging. However, looking to a combination of some offtake funding, and lease arrangement on high value specialist capital equipment, Government-backed direct loans and guarantees, strategic link to NdFeB, or a partial sell-down on the project. ARU publically states their funding strategy is linked with offtake, targeting NdPr users not aligned with the China 2025 strategy. The company plans to leverage the offtake to secure debt funding in conjunction with loan guarantees from ECE's and are also in discussion for ECA assistance with loans tied to capital equipment procurement. We believe equity will be sourced through some strategic investment but also on the back of ECA/ Debt funding. In our base case assumption, we are assuming a debt/equity split of 50/50. **Given the low market capitalisation and significance of this project to global production, we are surprised the WES didn't show some interest here ahead of LYC.**

KEY RISK AND SENSITIVITY PARAMETERS

Planning a \$1bn capital project in a company capitalised at c\$40m is inherently risky, but, if successful, the upside potential is commensurately high.

1. **Funding risk.** We discussed previously that we identify funding as the key risk for the project, with a significant market capitalisation uplift required to allow any meaningful equity raising. We feel concerns on surety of supply by end users (such as car manufacturers) may see investment in ARU in meaningful levels. ARU has the potential to become the second largest NdPr producer outside China, behind LYC. Given the support by LYC of the Japanese, we see a potential similar funding arrangement for ARU.
2. **Permitting risk.** ARU already has the key environment approvals granted, and has the Mining Licence, Water Extraction Licence Approval and Native Title Agreement tabled for approval in the current year in its timeline. The Company applied to the Northern Territory Department of Primary Industry and Resources (DPIR) for its primary ML over the Nolans mine site area in 2008 and for its ancillary MLs over other elements of the Project in 2015. Prior to granting the MLs DPIR requires the completion of a mining agreement between Arafura, the Native Title holders and the Central Land Council (CLC). The mining agreement negotiation is a standard practice; however, timeframes can vary between projects. Arafura provided a draft mining agreement to the counterparties in October 2018 and expects to complete negotiations in the coming months. In the unlikely event the parties are unable to reach agreement the Company can seek a legal determination from the National Native Title Tribunal.
3. **Project execution risk.** Given the capital intensive nature of the project particularly relative to the current company market capitalisation we see this as a significant risk, especially considering the issues and time taken for LYC to fully commission their combined Australian/Malaysian operations. We further assess the project execution risk when looking to the sensitivity parameters in the next section.
4. **Country risk.** We perceive the Country risk as low given the operation is solely based in Australia. However the looming election does post some further risk, depending on taxation/royalty/permitting policies dictated by the incoming Government. However, given the environment approvals are already in place, we do not see the Country risk as significant.

BOARD AND REMUNERATION

Aggregate Directors fee pool limited currently stands at \$A1m pa, which we think is in keeping with sector average, with the Chairman's base fee \$151,200, and NED base fees \$78,400. Looking to the key executive's remuneration, MD had total remuneration in FY18 of \$423k, with other key executives paid c. \$300k-\$350k. Whilst high when compared with other companies of equivalent market capitalisation, we feel more than reasonable given the stage the company is currently at, with a likely escalation in market capitalisation as development progresses.

Mark Southey - Non-Executive Chairman. Mark Southey has previously held senior executive positions with Honeywell and ABB, and more recently was part of the global executive leadership team within WorleyParsons, where he held the position of Group Managing Director for the Minerals, Metals and Chemical Sector.

Gavin Lockyer - Managing Director. Gavin Lockyer has held leadership and Management positions in a range of disciplines including Accounting, Financial and Investment Banking, Major Resource Development and Operations, and Global Treasuries.

Chris Tonkin - Non-Executive Director. Chris Tonkin has over 35 years' experience as a senior business executive with a broad industry background in business generation, management and strategy development. Chris Tonkin is also the Chairman of Lakes Oil NL.

Quansheng Zhang - Non-Executive Director. Quansheng Zhang holds a Doctoral degree in Engineering and a Masters degree in Geophysical Prospecting. He is based in Nanjing and is GM of the Hong Kong East China Non-Ferrous Mineral Resources Co Ltd (HKECE). Quansheng has over 30 years of mineral prospecting and exploration experience and expertise in mineral resource surveys and geophysics.

Richard Brescianini - GM Exploration and Development. Richard has over 30 years' experience in the minerals industry having worked with BHP Minerals throughout Australia and North America, thereafter he led the NT Government's Geological Survey from 2003 to 2007 after which he joined Arafura.

Peter Sherrington - CFO and Company Secretary. Peter has more than 20 years' experience in professional and corporate roles in Perth. He joined Arafura in 2008 as Commercial Manager and was appointed CFO in July 2013.

Lloyd Kaiser - GM Sales and Marketing. Lloyd has more than 10 years' experience in the sales and marketing of industrial minerals prior to joining ARU, he held several senior positions in account management, business development and marketing across a diverse range of commodities and chemicals.

Brian Fowler - GM NT and Sustainability. Brian has worked for over 40 years in private sector mineral companies developing a range of commodities including rare earths, base metals and gold. Brian is a member of the NT Mining Board, Management Board of the NT Minerals Council of Australia, and a member of Work Health and Safety Advisory council of the Northern Territory.

Stewart Watkins - GM Projects. Stewart has 25 years' experience in many facets of the mining industry including operations, engineering consulting, project development and management.

NDPR MARKET DYNAMICS

The NdPr price has softened over the last 14 months as per the graph below, but we view this very much as a short term phenomena, with supply demand dynamics pointing to strengthening prices over the medium term. Approximately 2kg of NdPr is required for an EV vs. 1kg in a conventional vehicle with the cost unlikely to drive any substitution even at several multiples of the current price. The expansion of the EV market is the key driver for increasing demand for NdPr over a prolonged period. Whilst the Chinese market is relatively opaque and drives over 85% of total current NdPr production, industry expert Roskill have provided ARU with an in depth study into the market which we summarize in the following section. In a nutshell outside the Chinese illegal production, there is unlikely to be sufficient new supply source to meet the longer term demand driven by the transition to EV. Chinese illegal production and other undocumented production from China is thought to historically have comprised c.50% of total NdPr production. A push to clean up and better monitor production in China has seen the contribution from these sources fall to c.25% of total production. Environmentally cleaner production is inherently more expensive to produce, which is yet another price driver. Add to this new potential producers such as ARU and PEK require an NdPr Oxide price above US\$70/kg to justify the capital development. We are assuming 10% CAGR for 10 years from 2022 in our base case assumption. The area of risk to this argument is the processing of monazite concentrate produced as a bi-product of the mineral sands industry. This product has a limited market due to the high levels of thorium, but we understand China is already processing this material and stockpiling the thorium with the view to identifying an end use for the thorium. We have not seen any detailed analysis on the percentage of NdPr oxide derived from processing monazite except to say it appears significant. Both Iluka and also new mineral sands entrant are looking to monetize their monazite waste, which may result in unexpected additional supply at some pricing point.

Figure 13: NdPr Prices

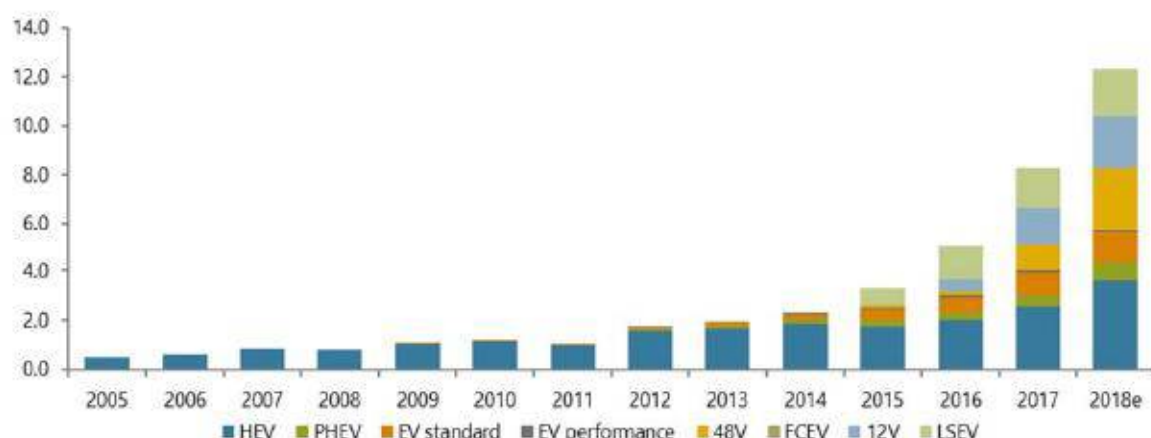


Source: Asian Metals, Patersons Securities Limited

THE NdFeB MAGNET MARKET

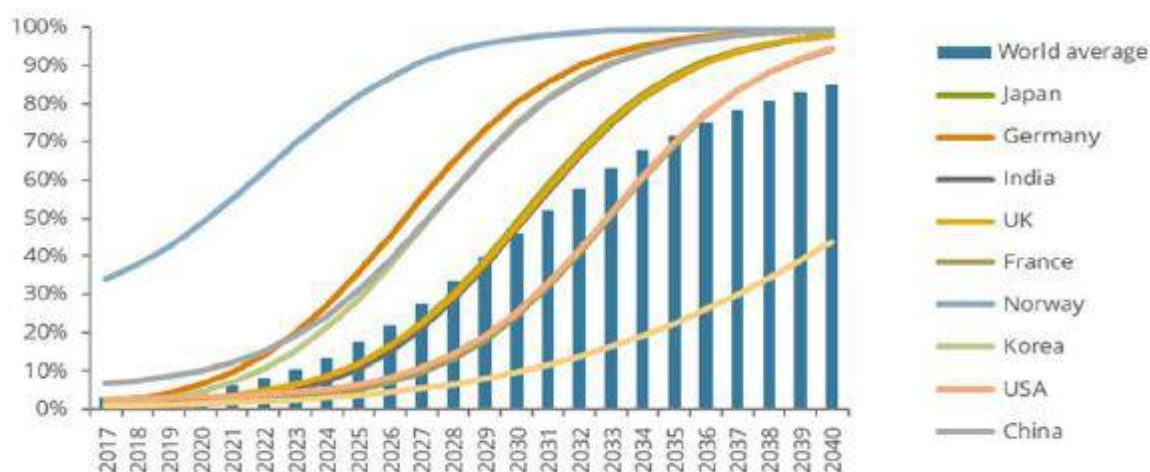
Industry expert, Roskill, forecast underlying demand for NdFeB magnets across all applications to grow by 6% p.a. over the period to 2030. China continues to dominate the global supply chain, accounting for c.80% of NdPr for global NdFeB magnet production. The market is forecasting China to become a net importer of NdPr by the early 2020's, as production continues to decline (Environmental concerns have seen China move to clean up its REO production facilities, moving mainly to 6 Government Owned Production Super Hubs and limited illegal production), and demand stimulated by the growing EV vehicle industry amongst others continues to grow.

Figure 14: Electric vehicle sales by type 2005-2018 (m units)



Source: Roskill

Figure 15: Outlook for electrification by region 2017-2040



Source: Roskill

Figure 16: Announced national/local targets

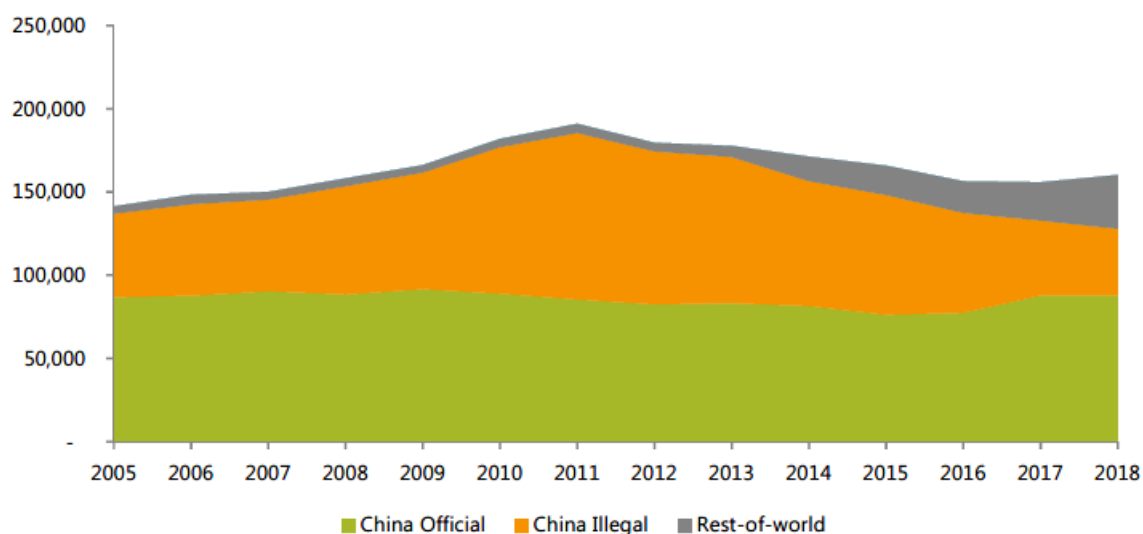
Country	Term	Scope	Likelihood ↴
China	n/a	Ban of ICE	High ↴
Denmark	2050	CO ₂ Targets	Medium ↴
France	2040	Ban of ICE; Paris by 2030	Medium ↴
Germany	2030	Ban of ICE	Medium ↴
India	2030	Ban of ICE	Low ↴
Netherlands	2030	Ban of ICE	High ↴
Norway	2025	Ban of ICE	High ↴
South Korea	2020	EV target - 250,000 (30% market share 2017-2020)	High ↴
Spain	2020	Ban of ICE in Madrid centre (car models pre-2000)	High ↴
Sweden	2030	Ban of ICE	High ↴
UK	2040	Ban of ICE; Scotland by 2032	High ↴
California	2027-2030	Ban of ICE	High ↴

Source: Roskill

FORECAST REO SUPPLY

Global REO production increased between 2005 and 2011, reaching a peak of 192kt REO due to spikes in prices. At this time, illegal production in China accounted for c. 52% annual supply. Production has progressively fallen since then, reaching a low of 160kt in 2017, driven by falling Chinese production. China has driven a clean-up in its production in its drive to limit pollution, with Chinese production estimated to have fallen by 5.4% pa over the period 2011-2017. China announced a crack-down on illegal production, and transferred the bulk of official production into six state owned enterprises. The chart below shows the absolute dominance the Chinese have had on REO production. With China progressively upgrading its processing capability to convert its REO into magnets to extract maximum value, it's understandable that users outside China have concerns as to the surety of supply in a period of escalating demand, hence the interest in producers outside China such as ARU, LYC and PEK. The increase in non-China REO over the period was driven by LYC (c.18kt production in FY18), with additional production also from India, Russia and Brazil.

Figure 17: Global REO Production 2005-2018



Source: Roskill

Figure 18: Production of Rare Earths by Region 2010 - 2018

	2010	2011	2012	2013	2014	2015	2016	2017	2018*
Africa	-	-	-	-	-	-	-	0.01	0.7
Asia (excl. China)	0.5	0.5	0.5	0.5	0.5	0.6	2.1	2.0	2.0
Australia	-	-	-	1.1	7.2	10.5	13.8	17.3	19.1
China	176.9	185.4	174.4	171.0	156.5	148.2	137.4	132.8	127.9
Europe	1.5	1.4	2.1	1.4	2.1	2.3	2.5	2.8	2.8
North America	3.0	3.7	2.5	3.6	4.8	4.0	-	-	5.2
South America	-	-	-	-	0.1	0.1	0.6	1.0	2.5
Total	181.9	191.0	179.5	177.7	171.2	165.7	156.4	155.8	160.2

Source: Roskill

Figure 19: Production of Rare Earths by Elements 2010-2018

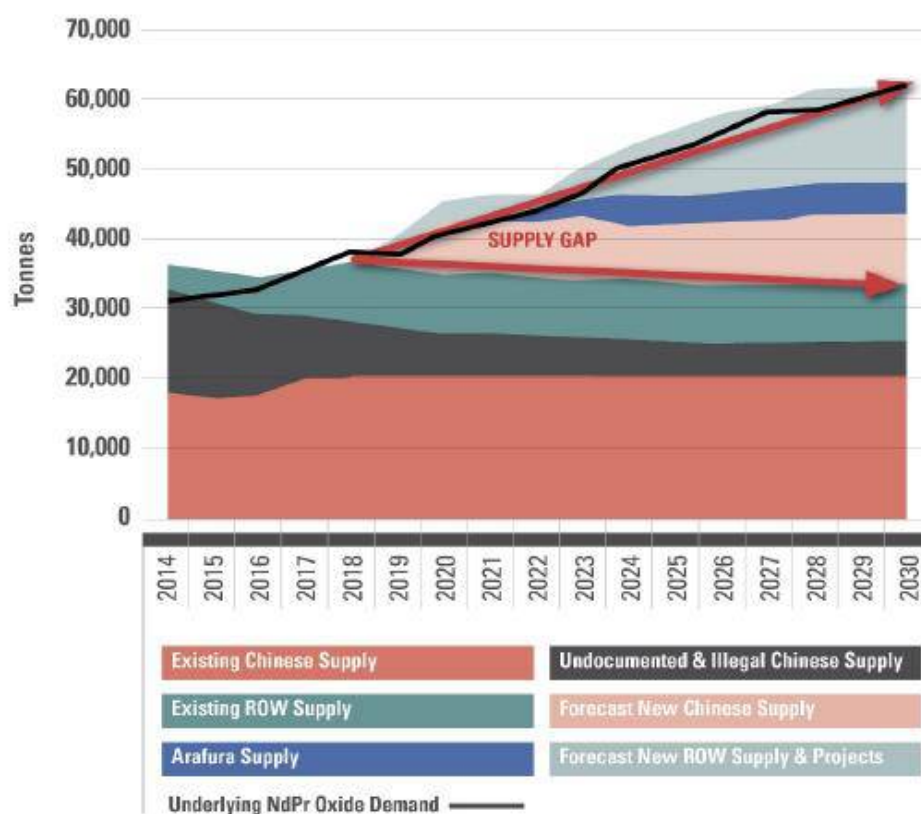
	Production of oxides						
	La	Ce	Pr	Nd	Dy	Y	Others
2010	44,600	59,800	9,000	30,200	2,800	22,800	12,900
2011	46,400	63,300	9,400	31,900	3,000	24,300	13,700
2012	43,500	60,400	9,200	31,800	2,900	22,400	12,800
2013	43,300	60,100	9,100	31,600	2,800	21,700	12,500
2014	41,900	60,300	9,000	30,700	2,500	18,700	11,200
2015	40,600	58,100	8,700	29,600	2,300	18,100	10,800
2016	38,000	56,200	8,600	29,300	2,100	15,700	9,700
2017	38,300	58,300	9,000	30,600	1,800	13,300	8,700
2018*	40,100	60,800	9,300	31,500	1,700	12,600	8,600

Source: Roskill

Whilst Pr and Nd only typically comprises 20-25% of global REO production, in mines which produce Nd and Pr, their revenue contribution is typically between 80 and 90%. Roskill estimates global mine capacity of NdPr at 77ktpa, or 87% higher than current production levels. Assuming compound growth at 10% per annum, which is the typical industry expectation for the increase in demand due to the increase in production of EV vehicles, and assuming no depletion of reserves, this is unlikely to prove sufficient to meet c.10-12 year's growth in demand. Add to this we assume this mine capacity includes the Chinese illegal Mining has historically contributed over 50% of total production. This production is currently limited due to environmental concerns, but some pricing point may be seen as sufficient to effect a clean-up of the processing of this material potentially increasing the acceptable supply from this source. Similarly, MP Materials (a consortium comprised of Shenghe Resources, QTT Financial and JHL capital) owns the Mountain Pass Operation in USA which is currently on care and maintenance. Currently under redevelopment, its processing capacity is rated at 19ktpa REO, which could lift overall REO by c. 11%. However, mineral concentrates are currently shipped to China for further processing. The final risk to the supply constraint argument for REO comes from the mineral sands market, with REO production from monazite typically produced as a by-product from mineral sands operations currently stands at c. 30% of total world REO production, with significant capacity from existing producers such as Iluka, and a lot of the emerging development companies.

Roskill forecasts rare earth supply to increase by 4.1%pa between 2018 and 2030 reaching 260.4ktpa REO in 2030. Production of neodymium and praseodymium oxides are forecast to show growth of 4.2% pa and 4.5% pa respectively, with supply of NdPr oxide forecast to total 61.8ktpa by 2030. China is forecast to account for 80% of global REO production in 2018, falling to 60% in 2030 as additional rest of world supply is constructed and commissioned. Chinese illegal production is forecast to remain around 40ktpa REO between 2018 and 2020, falling to 26ktpa by 2030. Australian rare earth production is forecast to total 19.1kt REO in 2018, comprised of output from Lynas Corporation and Northern Minerals only. The development and commissioning of multiple rare earth projects in Australia, particularly projects with higher NdPr oxide output, is forecast to increase Australian production capacity by 46.0ktpa REO to total 64.6kt REO by 2025. According to a recent report from Adamas Intelligence (13 March 2019), China for the first time became a net-importer of several rare earth oxides (or oxide equivalents) in 2018. The report quoted that total global primary rare earth oxide production increased by 20.8% last year as China raised domestic mining, smelting and separation quotas for the first time in five years. During the same period, Adamas estimates that illegal production in China fell by 50%, creating a vacuum that was filled by record-high imports from Myanmar and the US (shipments of historic stockpiles from Mountain Pass). This resulted in China becoming a net-importer rare earth oxides (or concentrates) in 2018. With an ongoing crackdown by the authorities on illegal rare earth production (and imports) in China, concentrate imports from Myanmar therefore became a vital source of magnets' rare earth for China's magnet and alloy manufacturers. For 2019, if imports from Myanmar are further curtailed or stopped and China's production quotas are not sufficiently increased to compensate, the potential for supply disruptions will affect the supply of high grade rare earth magnet production.

Supply from Australian operations is forecast to reach 58.8kt REO by 2030, with much of the expected supply growth occurring between 2020 and 2025. The commissioning of multiple rare earth projects is expected to transform Australia into a major production and processing center, accounting for 22.6% of global production in 2030. Whilst Northern Minerals has commissioned a pilot scale plant, this is focused on heavy rare earths. Arafura, Alkane and Hastings are currently operating the most advanced projects. Hastings Yangibana project, located in Western Australia has relatively high NdPr content of 41%, and has signed four non-binding off-take agreements for the project from Chinese processors, with total offtake capacity 11ktpa. However the company will be producing a mixed rare earth carbonate, with separation into TREO oxides by a third party. Capacity for NdPr oxide production is estimates to total 3,200tpa over the first 5 years of operation. Alkane Resources are developing the Dubbo Zirconia project in NSW. NdPr production is estimated at 1.15ktpa. The project is at the funding stage with a capex estimate of \$1.3bn. The project is predominantly a hafnium and zirconium project, with REO as a bi-product. Both projects have an initial startup expectation of 2020 stated by Roskill, but reading recent reports, we feel both are likely to commence well beyond 2020. Hastings currently are quoting production to commence 2Q 2021, and Alkane are still pursuing funding. Australian listed Peak Resources have completed the DFS for their Ngualla project in Tanzania, which is currently awaiting granting of its SML. The separation plant (Teesside, UK) is scheduled to produce 2,420 tpa NdPr oxide. **Assuming all these projects are ultimately commissioned, they are unlikely to meet the forecast demand requirement of almost 20kt NdPr oxide from new production sources (ref fig below):**

Figure 20: NdPr Oxide supply & Demand

Source: Roskill

Figure 21: Forecast global total rare earth and individual oxide supply

	Total rare earth oxides		Individual oxides			
	Production	% Change	La oxide	Ce oxide	Pr oxide	Nd oxide
2018	160,000	-	40,100	60,500	8,800	28,200
2019	176,900	10.6%	44,600	67,400	9,700	31,200
2020	196,300	11.0%	49,900	73,300	10,800	34,800
2021	198,000	0.9%	50,600	72,500	11,000	35,500
2022	198,900	0.5%	50,000	73,500	11,000	35,700
2023	215,300	8.2%	53,200	81,200	11,800	38,700
2024	225,900	4.9%	55,000	86,600	12,400	41,000
2025	233,400	3.3%	56,800	89,200	12,900	42,700
2026	244,100	4.6%	59,900	93,800	13,500	44,600
2027	250,200	2.5%	61,600	96,000	13,800	45,700
2028	259,300	3.6%	64,000	99,500	14,300	47,400
2029	260,400	0.4%	64,200	99,800	14,300	47,600
2030	260,400	0.0%	64,400	100,200	14,300	47,500

Source: Roskill

FORECAST REO PRICING

Industry experts such as Roskill and Adamus have been forecasting significant increases in the NdPr price from as early as 2020, with CAGR projections of the order of 7-12%, as seen in the price projections given in the chart below supplied by Roskill. We tend to feel that pricing response is likely to occur significantly later, as projected EV growth inevitably experiences some delays. However, historically (see both the mineral sands and rare earths market as prime examples), pricing tends to **overreact on both the upside and downside scenarios**. We feel this is likely to be the case with the NdPr market, and whilst we are forecasting 10% CAGR in NdPr Oxide price from 2022, we feel there is risk that the growth commence **later** than 2022, but the growth is **higher** than our expectations. We use the current NdPr price as our starting point, and given then current weakness, this results in a substantially **lower** price in our forecast than those given by Roskill as shown below.

Figure 22: Forecast average FOB price of light rare earth oxides, 2019-2030

	2019	2020	2021	2022	2023	2024
LREO						
La ₂ O ₃ (99%)	2.37	2.37	2.30	2.52	2.48	2.07
CeO ₂ (99%)	2.11	2.13	2.20	2.32	2.31	2.17
Pr ₂ O ₃ (99%)	92.71	88.09	88.93	104.81	123.96	109.40
Nd ₂ O ₃ (99%)	63.29	70.05	72.44	83.07	84.96	84.62
(Nd _{0.75} Pr _{0.25}) ₂ O ₃ (99%)	67.58	68.55	69.93	81.36	90.52	84.15
	2025	2026	2027	2028	2029	2030
LREO						
La ₂ O ₃ (99%)	2.15	2.29	2.35	2.40	2.64	2.76
CeO ₂ (99%)	2.26	2.27	2.34	2.42	2.53	2.62
Pr ₂ O ₃ (99%)	107.94	116.99	120.97	122.44	121.73	127.71
Nd ₂ O ₃ (99%)	88.79	91.98	97.17	97.73	96.35	101.37
(Nd _{0.75} Pr _{0.25}) ₂ O ₃ (99%)	85.26	90.52	94.55	95.41	94.48	99.25

Source: Roskill

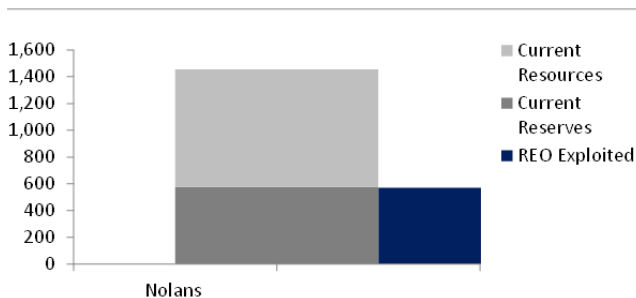
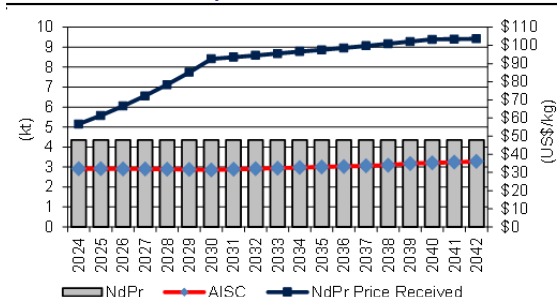
Figure 23: Comparison between Patersons and Roskill's NdPr forecasts

Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
NdPr Oxide (Patersons)	36.29	33.59	36.03	38.64	42.62	46.99	51.82	57.15	63.02	69.50	76.64	84.51
NdPr Oxide (Roskill)	63.29	70.05	72.44	83.07	84.96	84.62	88.79	91.98	97.17	97.73	96.35	101.37

Source: Patersons Securities Limited, Roskill

Arafura Resources Ltd

Valuation	A\$m	\$0.05 A\$/sh
Nolans, risked at 80%	454.0	0.58
Exploration	0.0	0.00
Sub Total	454.0	0.58
Investments	0.0	0.00
Cash + receivables and inventory	9.4	0.01
Total Borrowings + creditors	(3.5)	(0.00)
Corporate/Other	(21.9)	(0.03)
Equity component of any capital raising	666.7	0.85
NPV₁₀	1104.6	\$0.08
Price Target		\$0.08

REO exploited as a subset of reserves/resources (k t)**NdPr Production Summary****Reserves & Resources**

Reserves	Mt	Grade (%)	REO (kt)
Nolans	19.2	3.0	576
Resources	Mt	Grade (%)	REO (kt)
Nolans	56.0	2.6	1,456
Total	56.0	2.6	1,456

Directors

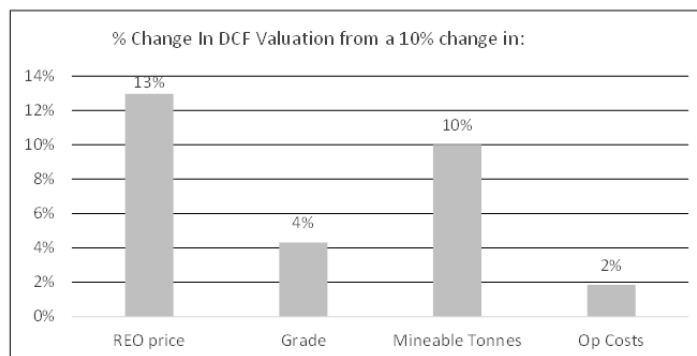
Name	Position
Mark Southey	Non-Executive Chairman
Gavin Lockyer	Managing Director
Quansheng Zhang	Non Executive Director
Chris Tonkin	Non Executive Director

Substantial ShareSpeculative Buyers

Substantial ShareSpeculative Buyers	Shares (m)	%
JP Morgan Nominees	170.1	18.0%
ECE Nolans Investment Co	132.3	14.0%

Year End June 30

Assumptions	2018A	2019E	2020E	2021E	2022E	2023E
A\$:US\$	0.77	0.72	0.72	0.72	0.73	0.72
NdPr (\$US/Kg)	43.39	36.07	33.14	35.55	38.14	42.05



Production Summary	2018A	2019E	2020E	2021E	2022E	2023E
Production (kg)						
Neodymium/Praseodymium	0	0	0	0	0	0
Total REO Production (t)	0	0	0	0	0	0
Total REO Sales (t)	0	0	0	0	0	0

Summary

Cash Cost inc. Admin (A\$/kg)	NA	NA	NA	NA	NA	NA
Sustaining All In Costs (A\$/kg)	NA	NA	NA	NA	NA	NA
Nolans REO suite (A\$/kg)	NA	NA	NA	NA	NA	NA
Margin (US\$/kg)	NA	NA	NA	NA	NA	NA

Profit & Loss (A\$m)	2018A	2019E	2020E	2021E	2022E	2023E
Sales Revenue	0.2	0.1	0.0	0.0	0.0	0.0
Other Income	0.7	0.5	0.0	0.0	0.0	0.0
Operating Costs	0.0	0.0	0.0	0.0	0.0	0.0
Exploration Exp.	0.0	4.0	3.5	0.4	0.4	0.4
Corporate/Admin/Other	6.0	4.4	2.7	2.7	2.7	2.7
EBITDA	(5.0)	(7.7)	(6.2)	(3.0)	(3.1)	(3.1)
Depn & Amort	0.1	0.1	0.0	0.0	0.0	0.0
EBIT	(5.1)	(7.8)	(6.2)	(3.0)	(3.1)	(3.1)
Interest	0.0	(0.1)	(0.1)	23.1	59.6	88.0
Operating Profit	(5.1)	(7.7)	(6.1)	(26.2)	(62.6)	(91.0)
Tax expense	0.0	0.0	0.0	0.0	0.0	0.0
FX Adjustment	0.0	0.0	0.0	0.0	0.0	0.0
Abnormals	0.0	0.0	0.0	0.0	0.0	0.0
NPAT	(5.1)	(7.7)	(6.1)	(26.2)	(62.6)	(91.0)
Normalised NPAT	(5.1)	(7.7)	(6.1)	(26.2)	(62.6)	(91.0)

Cash Flow (A\$m)	2018A	2019E	2020E	2021E	2022E	2023E
Operating Cashflow	(3.5)	(4.3)	(2.6)	(25.8)	(62.3)	(90.7)
- Capex (+ asset sales)	(0.4)	(3.2)	0.0	(366.7)	(366.7)	(366.7)
- Exploration	(4.8)	(11.3)	(10.0)	(1.0)	(1.0)	(1.0)
Free Cashflow	-8.7	-18.9	-12.6	-393.5	-429.9	-458.3
- Dividends (ords & pref)	0.0	0.0	0.0	0.0	0.0	0.0
+ Equity raised	3.2	8.3	15.0	270.8	212.5	183.3
+ Debt drawdown (repaid)	0.0	0.0	0.0	270.8	212.5	183.3
+ Other	1.0	4.4	0.0	0.0	0.0	0.0
Net Change in Cash	-4.6	-6.2	2.4	148.2	-4.9	-91.7
Cash at End Period	7.9	1.7	4.1	152.3	147.4	55.7
Net Cash/(LT Debt)	7.5	1.7	4.1	(118.5)	(336.0)	(611.0)

Balance Sheet (A\$m)	2018A	2019	2020	2021	2022	2023
Cash	7.9	1.7	4	152	147	56
Total Assets	102	102	104	619	981	1,256
Total Debt	0.3	0.0	0.0	270.8	483.3	666.7
Total Liabilities	2.5	4.3	4.3	275.1	487.6	671.0
ShareSpeculative Buyers Funds	99	97	100	344	493	585

Recommendation History



Date	Type	Target Price	Share Price	Recommendation	Return
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Stock recommendations: Investment ratings are a function of Patersons expectation of total return (forecast price appreciation plus dividend yield) within the next 12 months. The investment ratings are Buy (expected total return of 10% or more), Hold (-10% to +10% total return) and Sell (> 10% negative total return). In addition we have a Speculative Buy rating covering higher risk stocks that may not be of investment grade due to low market capitalisation, high debt levels, or significant risks in the business model. Investment ratings are determined at the time of initiation of coverage, or a change in target price. At other times the expected total return may fall outside of these ranges because of price movements and/or volatility. Such interim deviations from specified ranges will be permitted but will become subject to review by Research Management. This Document is not to be passed on to any third party without our prior written consent.



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Patersons Securities Limited Disclosure of Interest

Patersons Securities and its respective officers and associates may have an interest in the securities or derivatives of any entities referred to in this material

Patersons Securities does, and seeks to do, business with companies that are the subjects of its research reports.

Patersons Securities Corporate Relationship Disclosure

ARU	Patersons Securities have acted for Arafura Resources (ARU) within the past two years and have received fees for these services.
AKM	Patersons Securities have acted for Aspire Nmining Limited (AKM) within the past two years and have received fees for these services.
AXL	Patersons Securities have acted for Axesstoday Limited (AXL) within the past two years and have received fees for these services.
BOE	Patersons Securities have acted for Boss Resources Limited (BOE) within the past two years and have received fees for these services.
BRB	Patersons Securities have acted for Breaker Resources NL (BRB) within the past two years and have received fees for these services.
BSX	Patersons Securities have acted for Blackstone Minerals Limited (BSX) within the past two years and have received fees for these services.
BUX	Patersons Securities have acted for Buxton Resources Limited (BUX) within the past two years and have received fees for these services.
CSS	Patersons Securities have acted for Clean Seas Seafood Limited (CSS) within the past two years and have received fees for these services.
GLL	Patersons Securities have acted for Galilee Energy Limited (GLL) within the past two years and have received fees for these services.
IBG	Patersons Securities have acted for Ironbark Zinc Limited (IBG) within the past two years and have received fees for these services.
NUS	Patersons Securities have acted for Nusantara Resources (NUS) within the past two years and have received fees for these services.
PEX	Patersons Securities have acted for Peel Mining Limited (PEX) within the past two years and have received fees for these services.
RCL	Patersons Securities have acted for ReadCloud Limited (RCL) within the past two years and have received fees for these services.
STN	Patersons Securities have acted for Saturn Metals Limited (STN) within the past two years and have received fees for these services.
SYA	Patersons Securities have acted for Sayona Mining Limited (SYA) within the past two years and have received fees for these services.
VMY	Patersons Securities have acted for Vimy Resources Limited (VMY) within the past two years and have received fees for these services.
WKT	Patersons Securities have acted for Walkabout Resources Ltd (WKT) within the past two years and have received fees for these services.
XTE	Patersons Securities have acted for Xtek Limited (XTE) within the past two years and have received fees for these services.

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