16 SEPTEMBER 2014

AUSTRALIA (NT)

RARE EARTHS, URANIUM, PHOSPHORUS

FEASIBILITY STUDY

EXCHANGE: ASX:ARU

# ARAFURA RESOURCES LIMITED

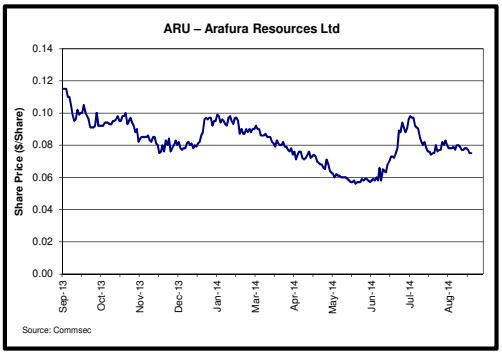
## The Nolans Development Report plots a clear path to production for ARU's advanced rare earths project.

**Share Price: A$0.073** | **Recommendation: Speculative Buy**

**ARU has released a detailed project summary for the Nolans Rare Earths Project which underlines the advanced status of this Project. It highlights the Project's strategic advantages and confirms that the Definitive Feasibility Study is well advanced with first production scheduled for 2019. Importantly, the Development Report is also a key marketing document in the drive for offtake agreements and project partners.**

## CAPITAL PROFILE

| | | |
|---|---|---|
| **Share price (A$)** | | **0.073** |
| 52 week range (A$/share) | 0.055 to | 0.120 |
| **Number of shares (m)** | | **441.3** |
| Options and warrants (m) | | 10.5 |
| Converting notes (m) | | 0.0 |
| Fully diluted (m) | | 451.7 |
| **Market capitalisation (undiluted) (A$m)** | | **32.2** |
| Debt (A$m) - Sep' 14F | | 0.0 |
| **Enterprise value (A$m)** | | **11.0** |
| Major shareholders: East China Min Expl & Devel Bureau (ECE, 24.9%), JP Morgan Nominees (23.5%) | | |
| Avg monthly volume (m) | | 6.2 |
| **Cash (A$m) - Sep '14F** | | **21.2** |
| Price/Cash (x) | | 3.8 |
| Price/Book (x) | | 0.6 |
| Listed company options: | | No |




## DIRECTORS

Ian Kowalick (Chairman)
Gavin Lockyer ( MD)
Chris Tonkin (Non Exec Dir)
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## INVESTMENT POINTS

- The Nolans Rare Earths Project is underpinned by a world-class rare earth ("RE") resource grading 2.6% rare earth oxides ("REO"). Measured and Indicated Resources support a minimum 25 year mine life (20ktpa REO output).
- ARU's recently released Nolans Development Report ("NDR") is a comprehensive document that highlights how advanced the Nolans Project is. The NDR provides a clear statement of the degree to which the ARU team (with Chinese technology input) have de-risked the path to production.
- A large proportion of the work on a Definitive Feasibility Study ("DFS") for the Nolans Project has now been completed. After further optimisation work with Chinese partners, the DFS is expected to be completed in 2H15.
- The Project could be in production in early 2019 if ARU secures additional offtake agreements and completes project funding – probably through bringing in a development partner - in the next 18-24 months. In that respect the NDR is very much a marketing document to achieve these goals.
- The NDR confirms that the neodymium ("Nd") content of the Project is "amongst the highest of any RE resource currently being considered for development anywhere in the world."
- The combined neodymium/praseodymium (NdPr) content of the ore means that NdPr oxide will generate 77% of projected revenue. This is of major strategic importance since NdPr Oxide demand is being driven by growth in RE magnets for the automotive and clean energy sectors.
- Demand growth for NdPr Oxide is expected to lead to supply shortages in the coming decade and price appreciation at a higher rate than other REOs.
- Assuming modest increases from current REO prices the NDR forecasts an after tax $NPV_{10}$ of A$2,045m, and IRR of 21.4%. Forecast opex is A$15.67/kg REO.
- The two non-Chinese REO producers (Molycorp and Lynas) are facing challenges in ramping up their projects and are currently not profitable, which is generating negative investor sentiment towards the sector. We expect their performance could improve significantly in the next two quarters which should lift investor sentiment towards the next generation producers such as ARU.

## COMPANY STATISTICS

| Year End June | Jun-14a | Sep-14F | 2014a | 2015F | 2016F |
|---|---|---|---|---|---|
| Exploration and evaluation (A$m) | 2.00 | 2.60 | 8.35 | 10.40 | 10.40 |
| Corporate (A$m) | 0.85 | 1.10 | 4.21 | 4.60 | 6.00 |
| Exploration/(Expl.+ Corporate) (%) | 70 | 70 | 66 | 69 | 63 |
| Funding duration at current burn (years) | | | 2.0 | 0.7 | 0.3 |
| Shares on issue (pr end) (m shares) | 441.3 | 441.3 | 441.3 | 441.3 | 466.3 |
| Drilling - RAB (m) * | 0 | 0 | 0 | 0 | 0 |
| Drilling - RC/Diamond (m) * | 0 | 0 | 1,250 | 0 | 0 |
| Land holding ('000 ha)* | 268 | 268 | 268 | 268 | 268 |
| Tenement costs ($k per year) | - | - | - | - | - |
| Capital raisings (A$m) | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 |
| Funding from JV partners (A$m) | 0 | 0 | 0 | 0 | 0 |
| Cash (A$m) | 24.5 | 21.2 | 24.5 | 10.5 | 4.4 |
| Cash backing (Ac/share) | 5.6 | 4.8 | 5.6 | 2.4 | 0.9 |
| Net asset backing (Ac/share) | 32.5 | 32.3 | 32.5 | 31.6 | 17.1 |

* All drilling metres are RCR estimates, includes drilling by JV partners.

## COMPANY COMMENT

**Overview:** ARU's flagship is the advanced Nolans Rare Earths Project (Northern Territory, Australia). The Nolans Bore deposit is 135km NNW of Alice Springs, and has Measured and Indicated JORC resources of 25.3mt @ 2.79% REO. This is equivalent to over 700,000t of contained rare earth oxides (REO). The current mine plan supports a mine life of 25 years at a production level of 20ktpa equivalent REO. The project is world scale, and strategically important with significant content of potentially critical REO's such as neodymium ("Nd") and praseodymium ("Pr"). Very few RE projects globally have reached the stage of the Nolans Project, advancing a DFS towards imminent completion.

**The Nolans Development Report ("NDR"):** ARU has recently released a very detailed Development Report which forms the backbone of the DFS. In this research report we have reviewed the NDR in the following pages and provide comment on some key aspects in the discussion below.

**Development Timetable:** ARU is developing a Project Execution Plan which is based on the DFS being completed in 2H15 (see page 3). Completion of an EIS and permitting, finalising offtake agreements and financing are projected to continue through to the second half of 2016, when construction is expected to start. Mining is scheduled to commence in mid-2018 and first RE production is expected in 2019.

**Production Forecasts:** The NDR (and DFS in progress) is based on an assumed open pit mining rate of approximately 800,000 tonnes per annum ("tpa") of ore delivered to the Concentrator at the Nolans Site. This mining rate will give a mine life of 25 years based on current Measured and Indicated Resources and optimised pit designs. After beneficiation, 300,000tpa of concentrate will be the feed by slurry pipeline to the RE Intermediate Plant also at the Nolans Site, which will produce a final cerium carbonate product (8,800tpa REO equivalent) and about 26,000tpa of mixed RE chloride intermediate products (42% REO) which will then be shipped to the RE Separation Plant whose output will be 11,200tpa of five high-quality separated REO products. In order to minimise capex and opex, the RE Separation Plant will be built in an existing chemical precinct, assumed to be on the USA Gulf Coast (final site selection in progress).

**Capex and Opex:** ARU initiated a trade-off study in late-2012 focusing on reducing capex and optimising opex. This relied heavily on input from Chinese RE experts introduced by major shareholder East China Mineral Exploration and Development Bureau ("ECE"). This resulted in a revised capex estimate of A$1,408m (formerly A$1.9bn) and, most crucially, projected total opex of A$15.67/kg REO (down from A$20.55/kg). To put that opex in perspective, the current price for the Nolans REO mix is US$27.86/kg.

**Product Pricing and Project Economics:** We have summarised the product pricing assumptions and Project economics from the NDR, including our own financial sensitivity analysis, on pages 13 to 16 of this report. ARU's pricing assumptions, taking into account projected higher demand and price growth rates for NdPr Oxide (which accounts for 77% of forecast revenue) gives a projected Nolans REO mix starting price of US$44/kg for 2019 (US$36.64/kg allowing for unseparated REO's), the first year of production. Assuming 2.7% price and cost inflation, and A$/US$ = 0.813 from 2017 on, ARU has derived a project NPV of A$2,045m (after tax, 10% discount rate) and an IRR of 21.4%. Our own analysis (based on 3%pa inflation and A$/US$ = 0.85 long term) indicates a base-case after tax NPV (10% discount rate) of A$2,004m assuming a long term REO average price (real) of US$42/kg (discounted to US$35/kg). The Project is marginal at the current price of US$28/kg.

**Addressing the Risks:** The NDR is very much aimed at summarising ARU's progress in de-risking the Nolans Project's path to production. Obviously this is of prime importance to existing and potential investors weighing up the prospects of ARU entering as a major RE producer in the next five years. The perceived project risk is reflected in the huge gap between the current enterprise value of ARU and the potential Project NPV. ARU's assessment of the risk profile in the NDR is shown on page 3, after planned additional risk mitigation. Not surprisingly, project funding for the A$1.4bn Project is seen as the most critical risk factor, with cost and schedule blowouts seen as a lesser risk, as is radioactivity. Product pricing is only seen as a moderate risk, underlining ARU's confidence that the strength in RE magnet demand will underpin price strength in its suite of REO products. Our view is that project funding risk can be addressed by bringing in a major partner (or partners) who can inject equity funds and underwrite a project financing. Our analysis (page 4) shows that this dramatically reduces the equity capital ARU will be required to raise to fund its share.

**Existing Listed RE Producers**: Investment confidence in the RE sector has been sapped by the recent financial and share market performance of the two listed non-Chinese RE producers – Molycorp (NYSE:MCP) and Lynas Corporation (ASX:LYC). Both of these companies are in the process of ramping up production, still cashflow-negative, and have needed major cash injections recently to bolster their capital reserves. Their share prices have been under severe pressure. The MCP share price (US$1.72/share.) is down about 70% since Jan '14; LYC (A$0.16/share.) is down about 48% over the same period. LYC's current product mix has a relatively high proportion of lower value Ce and La REOs. The average selling price quoted by LYC for 2Q14 was A$18.25/kg (US$17.00/kg) versus current Nolans mix quoted price of ~US$28/kg. This represents a significant point of difference, driven by the higher NdPr proportion in Nolans. That notwithstanding, there is no doubt investor sentiment towards the existing producers is negatively affecting ARU's share market rating. This situation will improve significantly if these two companies continue their ramp-up and achieve profitable production in the next two to three quarters.

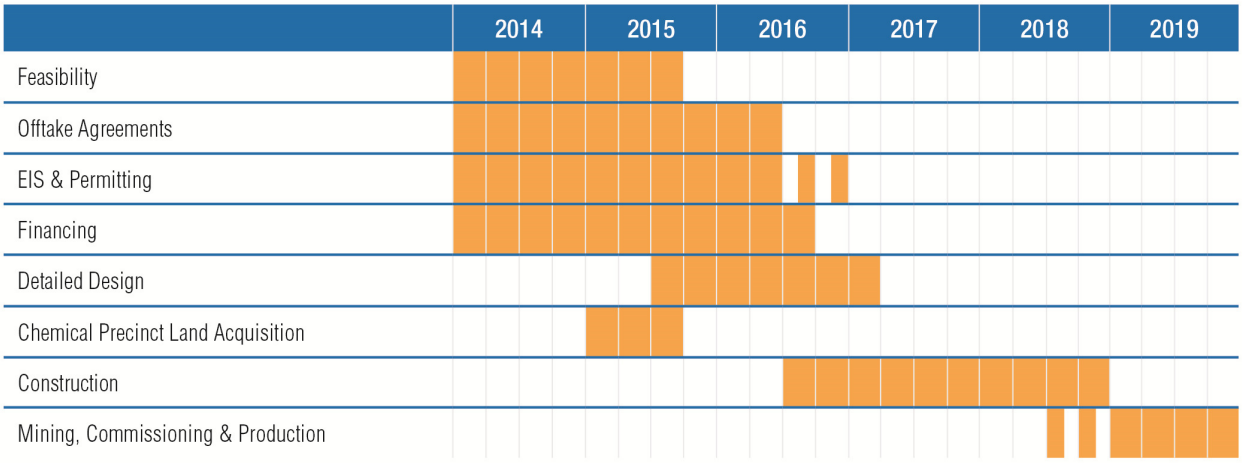
**Corporate**: ARU prudently raised A$40.7m in CY12, including an R&D tax refund of A$22.5m. As at 30 June 2014 cash was A$25.5m. With cessation of Australian REO demonstration plant testwork and optimisation work now in China, cash burn rate to progress the DFS has been drastically reduced to around A$3.5m/quarter, meaning that no further equity raising should be required until 2H15, when the DFS is scheduled to be complete.

**Key 'Big Brother' Partnerships:** ARU has a very supportive major Chinese shareholder in ECE that has already injected A$33m. ECE is playing an active role in project development by introducing Chinese expertise in REO processing technology (China is the world leader in REO technology). In Sep '13 ARU signed an MOU with Shanghai Exchange-listed Shenghe Resources, a Chinese RE producer that is an industry leader in RE production and technology development. It operates China's third-largest RE mine and a RE processing plant. Shenghe is providing key Chinese technical input to optimise and complete the Nolans Project DFS. ARU has also cemented key strategic relationships (based on offtake agreements of 3,000tpa REO each and project financing support) with two major downstream players - the giant German materials and technology group ThyssenKrupp, and more recently an MOU with an as yet un-named major South Korean multinational.

**Investment Comment:** The NDR underlines the huge amount of work ARU has undertaken in the past 5-6 years with its Chinese partners to optimise and progress the Nolans Project to the stage where many of the key elements of a DFS have been completed. The Report provides a clear statement of the degree to which the ARU team have de-risked the path to production, particularly through reductions in capex and opex, demonstrating that the Project is technically and economically viable with modest improvements in RE prices from current depressed levels. That notwithstanding, the sector is currently very much out of favour with investors. Considering ARU's current minimal enterprise value of A$11m, the risk of share price downside seems low but we see major upside if the integrity of development work reflected in the NDR leads to success in attracting a development partner and a potential path to project funding.

## PROJECT DEVELOPMENT TIMETABLE

**ARU is planning to be in production in the first half of 2019. The DFS should be completed in 2H15 after progressing the China-based RE extraction and separation optimisation program. In parallel with DFS completion will be establishment of offtake agreements, addressing environmental and operational permitting, and most crucially, progressing project funding discussions which will involve potential development partners.**




Estimates of times are indicative only and are subject to change. Arafura reserves the right to vary the timetable without notice

## PROJECT RISK ASSESSMENT

**ARU's project risk assessment matrix shows project funding of the A$1.4bn capex project as the greatest challenge to successfully progressing project commercialisation, hence the importance of attracting a "big brother" partner. Confidence in the firming price outlook for ARU's critically important NdPr product leads to product pricing being seen as only a moderate risk, "possible", rather than "likely". Radioactivity in waste (a problem that has beset Lynas Corp's RE separation plant in Malaysia) is seen as an unlikely risk factor due to the RE Intermediate Plant (where most of low level radionuclides are removed) being located at the minesite.**

| LIKELIHOOD | CONSEQUENCE 1 Insignificant | 2 Minor | 3 Moderate | 4 Major | 5 Critical |
|---|---|---|---|---|---|
| A Almost Certain | | | | | |
| B Likely | | | | | |
| C Possible | | | Product Price | | Project Funding |
| D Unlikely | | Study Funding<br>Native Title<br>Community | Marketing<br>Processing<br>Radioactivity<br>Environmental<br>OH&S | Cost and Schedule<br>Blowouts<br>Ramp-up | |
| E Rare | | Resource | Reagent Supplies | | |

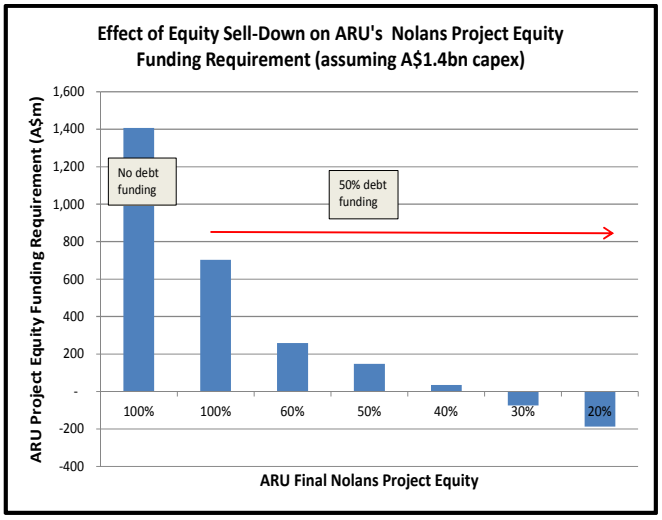
LOW MODERATE MANAGEMENT ATTENTION PRIORITY ACTION

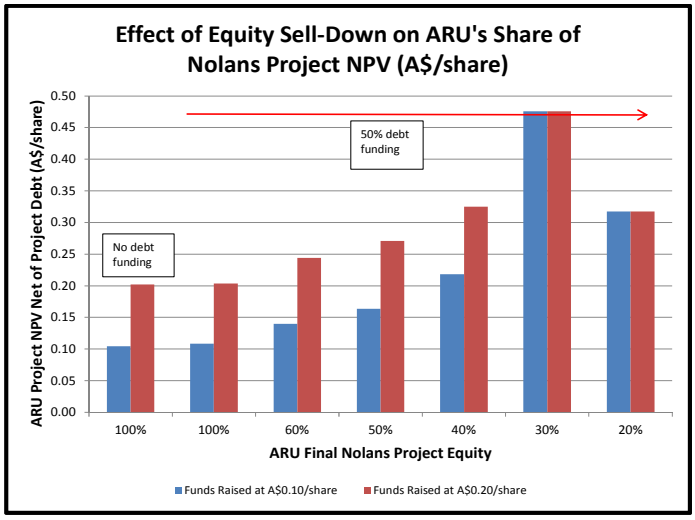
## RCR ANALYSIS – PROJECT FUNDING AND BRINGING IN A PROJECT PARTNER

### The table below reviews various funding scenarios based on the potential introduction of a project equity partner for an equity funding contribution equivalent to 20% of the Project NPV.

| ARU CAPITAL RAISING SCENARIOS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PROJECT FINANCE PROFILE:** | | 100% equity and no debt | Assumes 50% debt funding | | | | | |
| **ASSUMED ARU EQUITY SELL-DOWN:** | | | Assumes project equity sell-dpwn | | | | | |
| Base Case Project NPV [1] | A$m: | 2,045 | | | | | | |
| Total Project Capital[2] | A$m: | 1,408 | 1,408 | 1,408 | 1,408 | 1,408 | 1,408 | 1,408 |
| ARU Project Equity | Per cent: | 100% | 100% | 60% | 50% | 40% | 30% | 20% |
| Total ARU capital contribution: | A$m: | 1,408 | 1,408 | 845 | 704 | 563 | 422 | 282 |
| Project sell-down valuation[3] | % of NPV: | 20% | 20% | 20% | 20% | 20% | 20% | 20% |
| Incoming project partner(s) equity funding contrib. | A$m: | - | - | 164 | 205 | 245 | 286 | 327 |
| Debt Funding Component[4] | per cent | 0% | 50% | 50% | 50% | 50% | 50% | 50% |
| ARU Total equity funding | A$m: | 1,408 | 704 | 422 | 352 | 282 | 211 | 141 |
| less Project partner contrib. | A$m: | 0 | 0 | (164) | (205) | (245) | (286) | (327) |
| **Total ARU equity funding requirement** | **A$m:** | **1,408** | **704** | **259** | **148** | **36** | **(75)** | **(186)** |
| NPV of ARU Project Equity | A$m: | 2,045 | 2,045 | 1,227 | 1,023 | 818 | 614 | 409 |
| Less: ARU Component of Project Debt | A$m: | 0 | (704) | (422) | (352) | (282) | (211) | (141) |
| ARU net Project NPV | A$m: | 2,045 | 1,341 | 805 | 671 | 536 | 402 | 268 |
| Fully paid shares on issue (est. Jun '14) | m shares: | 441.3 | 441.3 | 441.3 | 441.3 | 441.3 | 441.3 | 441.3 |
| New equity issue @A$0.10/share[5] | m shares: | 14,080 | 7,040 | 2,588 | 1,475 | 362 | - | - |
| Total fully paid shares after project funding | m shares: | 14,521 | 7,481 | 3,029 | 1,916 | 803 | 441 | 441 |
| **ARU Project NPV Net of Project Debt (A$/share)** | **A$/share** | **0.14** | **0.18** | **0.27** | **0.35** | **0.67** | **0.91** | **0.61** |

**Notes to Table:**
1. ARU estimate of Nolans Project NPV (10% discount rate) from Nolans Development Report .
2. Total Nolans Project Capital Expenditure from Nolans Development Report.
3. We have assumed that an in-coming Nolans Project partner purchases its stake at a value equivalent to 20% of the project NPV.
4. We have assumed in the debt financing scenario that 50% of the Nolans Project capex is debt funded.
5. We have assumed a future equity issue at A$0.10/share.



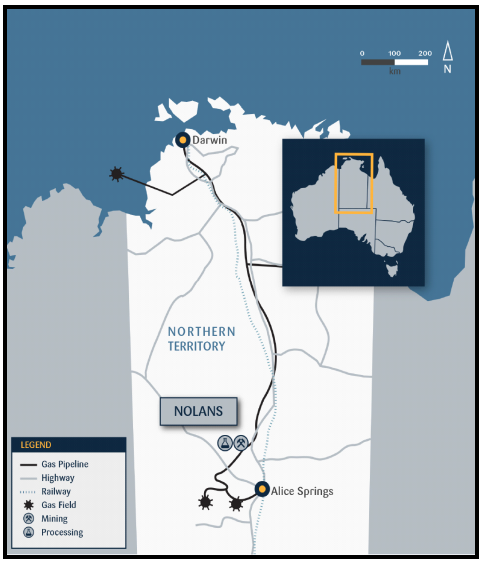



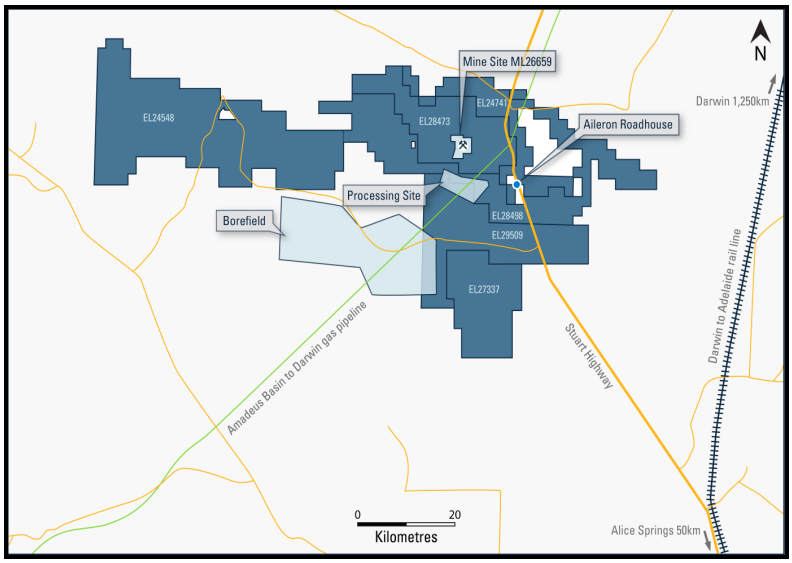

**ARU'S project funding requirement could be as little as A$130m with a 50% sell-down and A$38m with a 60% sell-down.**

**An equity sell-down potentially increases the value to ARU shareholders due to a reduction in the requirement for large discounted share issues.**

## PROJECT LOCATION AND SITE LOGISTICS

**The Nolans Site is located 135km NNW of Alice Springs in the Northern Territory. It is isolated from large communities but ideally positioned with respect to transport (road, rail) and energy (gas) infrastructure, and extensive groundwater resources. The Concentrator and RE Intermediate Plant will be located in the vicinity of the Mine Site, which is readily accessible from Darwin via a transnational highway and rail line. The RE Separation Plant will be located in an existing chemical precinct, with a Gulf Coast USA location being the front runner.**



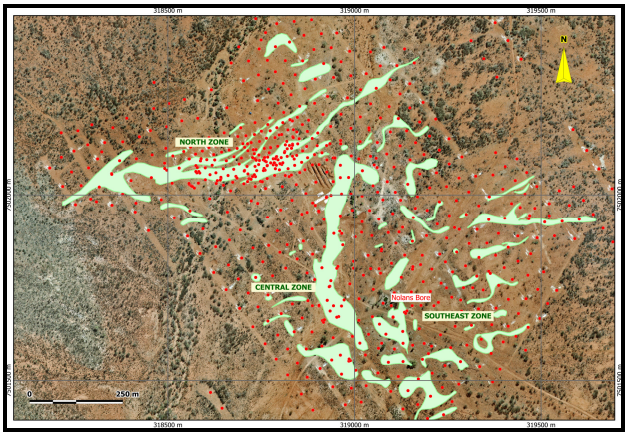



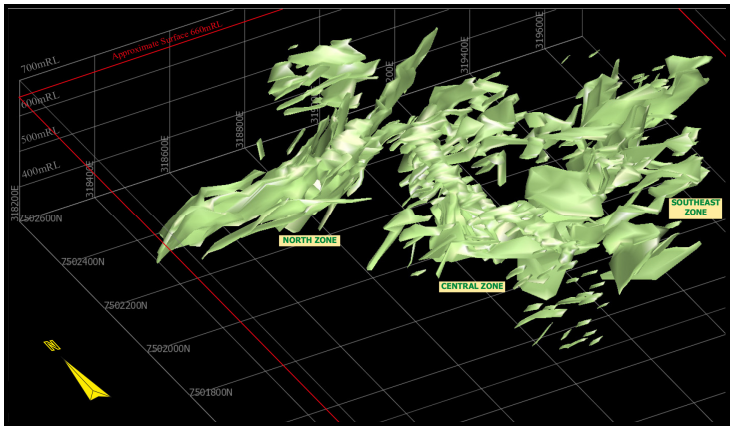

## THE NOLANS PROJECT RARE EARTHS RESOURCE

**ARU has conducted nearly 60,000m of RC and over 27,000m of diamond core drilling to establish the large scale resource at Nolans Bore. As such it sees resource risk as a low component of the overall project development risk.**

| Year | Costean | | RC Drilling | | Diamond Core Drilling | | | Wide Diameter Drilling | | Total Metres |
|---|---|---|---|---|---|---|---|---|---|---|
| | number | metres | number | metres | number from surface | number of tails | metres | number | metres | |
| 2000 | 6 | 890 | | | | | | | | 890 |
| 2001 | | | 12 | 856 | | | | | | 856 |
| 2004 | | | 20 | 1,525 | 5 | | 518 | | | 2,043 |
| 2005 | | | 58 | 7,532 | 1 | 11 | 1,042 | | | 8,574 |
| 2006 | | | 41 | 3,462 | 17 | | 1,322 | | | 4,784 |
| 2007 | 3 | 222 | 103 | 10,018 | 6 | 3 | 704 | | | 10,944 |
| 2008 | | | 85 | 7,815 | | | | | | 7,815 |
| 2009 | | | | | 7 | | 793 | | | 793 |
| 2010 | | | 9 | 992 | | | | 48 | 1,656 | 2,648 |
| 2011 | | | 208 | 27,761 | 56 | 126 | 22,681 | | | 50,442 |
| **TOTAL** | **9** | **1,112** | **536** | **59,961** | **92** | **140** | **27,060** | **48** | **1,656** | **89,789** |

**The Nolans Bore deposit outcrops in parts but is generally covered by a thin veneer of soil and alluvium. It is a hydrothermal stockwork vein-style RE deposit that remains open at depth. The left hand picture below shows drill hole positions (red dots) and distribution of the three zones of mineralisation at 60m below surface. The right hand graphic depicts an isometric view of the resource.**




**ARU has established a JORC compliant resource totaling 47mt averaging 2.6% REO (1.2mt contained REO). Within this total resource, Measured and Indicated Resources of 25.3mt @ 2.79% REO contain over 700kt of REO, plus over 3mt of phosphate and over 5kt of uranium, which may be considered as co-products at a later date.**

| Resources | Tonnes million | Rare Earths REO % | Tonnes REO | Phosphate $P_2O_5$ % | Tonnes $P_2O_5$ | Uranium $U_3O_8$ lb/t | Tonnes $U_3O_8$ |
|---|---|---|---|---|---|---|---|
| Measured | 4.3 | 3.3 | 144,000 | 13 | 572,000 | 0.57 | 1,120 |
| Indicated | 21 | 2.6 | 563,000 | 12 | 2,610,000 | 0.42 | 4,090 |
| Inferred | 22 | 2.4 | 511,000 | 10 | 2,220,000 | 0.37 | 3,610 |
| **TOTAL** | **47** | **2.6** | **1,217,000** | **11** | **5,410,000** | **0.41** | **8,830** |

1% REO cut-off grade. Numbers may not compute exactly due to rounding.

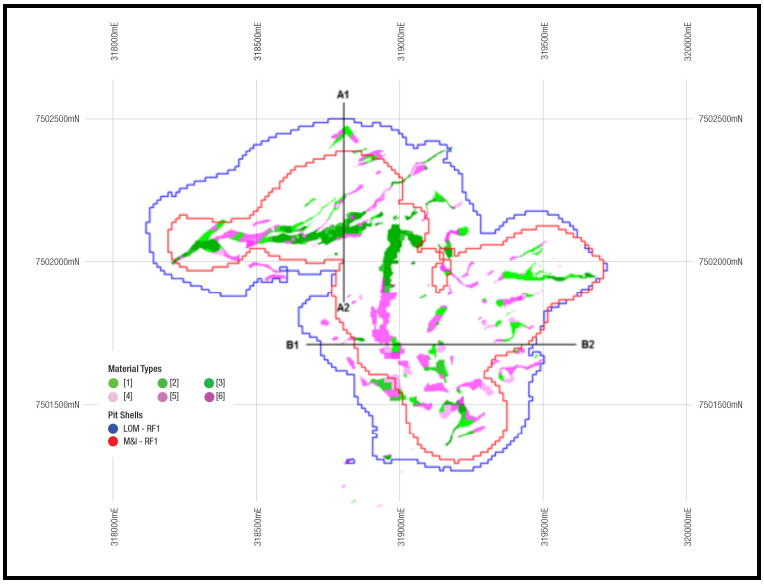
**The average in-situ composition of the Nolans Bore resource shows a predominance of light REO's, but of greatest significance are the next ranking magnet feed REOs Nd and Pr which are strategically important and likely to comprise the majority of the Project revenue.**

| Rare Earth Oxide REO | Average In-situ Composition | | | |
|---|---|---|---|---|
| | Measured Resources | Indicated Resources | Inferred Resources | Total Resources |
| Lanthanum as $La_2O_3$ | 19.3% | 19.0% | 19.2% | 19.1% |
| Cerium as $CeO_2$ | 48.7% | 48.7% | 48.7% | 48.7% |
| Praseodymium as $Pr_6O_{11}$ | 5.9% | 6.0% | 5.9% | 5.9% |
| Neodymium as $Nd_2O_3$ | 20.4% | 20.7% | 20.5% | 20.6% |
| Samarium as $Sm_2O_3$ | 2.3% | 2.3% | 2.3% | 2.3% |
| Europium as $Eu_2O_3$ | 0.39% | 0.39% | 0.39% | 0.39% |
| Gadolinium as $Gd_2O_3$ | 0.96% | 0.98% | 1.01% | 0.99% |
| Terbium as $Tb_4O_7$ | 0.07% | 0.08% | 0.09% | 0.08% |
| Dysprosium as $Dy_2O_3$ | 0.33% | 0.31% | 0.32% | 0.32% |
| Holmium as $Ho_2O_3$ | 0.05% | 0.04% | 0.04% | 0.04% |
| Erbium as $Er_2O_3$ | 0.08% | 0.09% | 0.10% | 0.09% |
| Thulium as $Tm_2O_3$ | 0.01% | 0.01% | 0.01% | 0.01% |
| Ytterbium as $Yb_2O_3$ | 0.06% | 0.05% | 0.06% | 0.06% |
| Lutetium as $Lu_2O_3$ | 0.01% | 0.01% | 0.01% | 0.01% |
| Yttrium as $Y_2O_3$ | 1.47% | 1.31% | 1.36% | 1.35% |

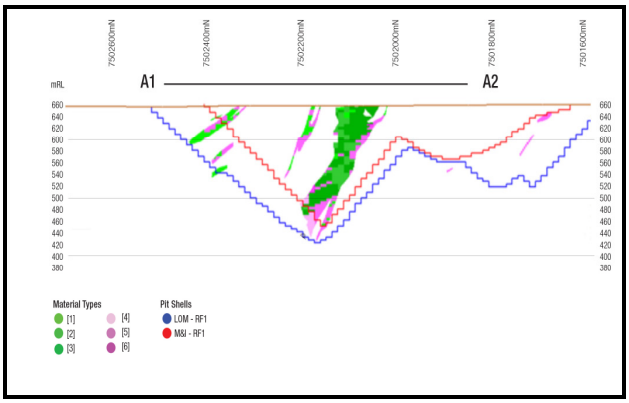
Numbers may not compute exactly due to rounding

## THE MINE PLAN

**ARU has developed an open pit mine plan based on Measured and Indicated Resources. Drill and blast will be required for ore and waste, and extraction will be using hydraulic excavator and trucks.**

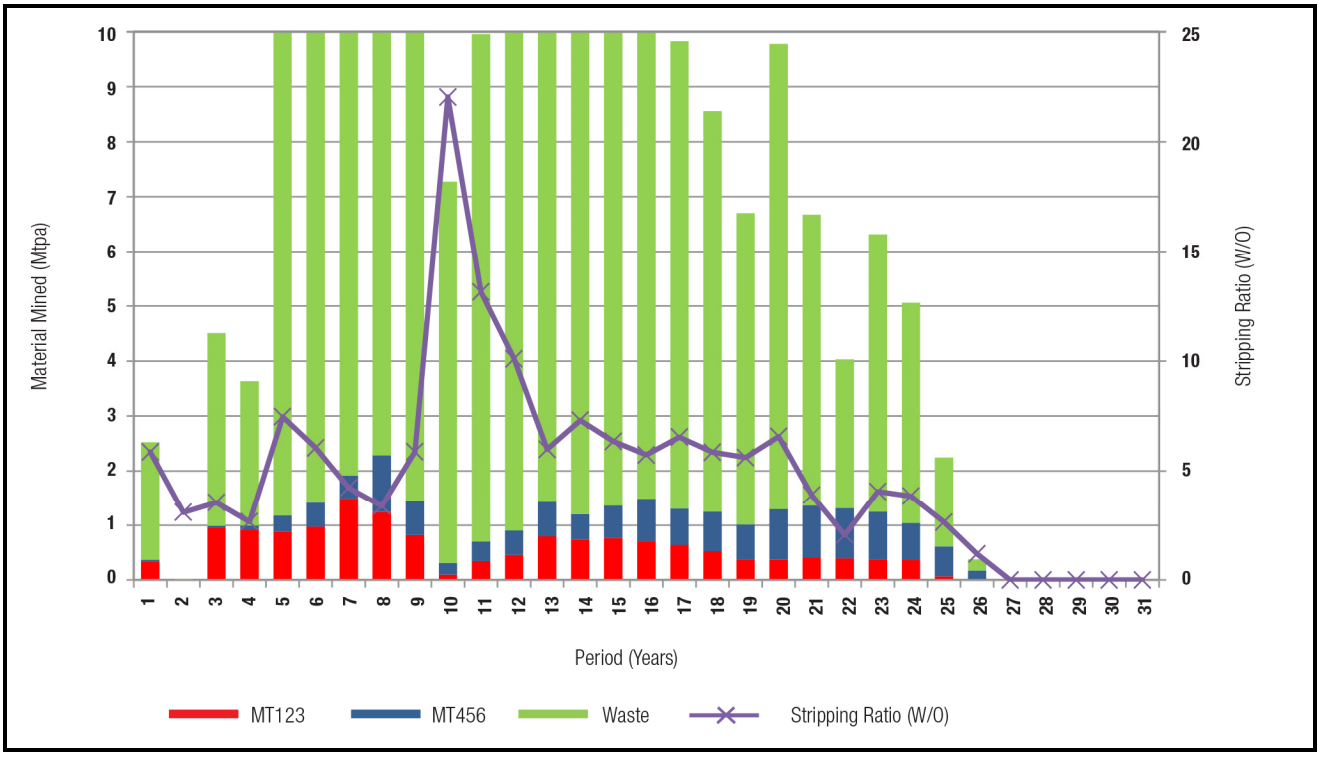



**Plan of pit shells based on M&I Resources (red line) and potential life of mine (LoM) (blue line)**




**Pit cross section (A1-A2) showing eventual pit depth of 220m (M&I Resources) to 260m (LoM).**

**The mine production schedule, based on M&I Resources only, selective mining strategies and an overall waste plus ore mining rate of up to 10mtpa, is shown below. The red and blue bars represent ore mined. The strip ratio (tonnes waste: tonnes ore) averages around 6 except for years 10-12 when a cut-back has been allowed for.**



## METALLURGICAL TESTWORK – PROCESSING TECHNLOGY

**Extensive RE extraction testwork has been undertaken by ARU since 2006. The development of this technology has been a crucial element for ARU, because all of the technology prior to this work was exclusively developed in China and export of this technology from China has been forbidden.**

| Date | Stage | Objectives/Outcomes | Reference |
|---|---|---|---|
| 2006-2009 | Preliminary laboratory testwork and small scale piloting | Preliminary extraction process development | ANSTO (2006a), (2006b), (2007), (2008a), (2008b), (2008c), (2009b) |
| 2009-2011 | Advanced laboratory testwork and small scale piloting | HCl pre-leach and acid bake flowsheet<br>Phosphoric acid and uranium by-products<br>Preliminary HCl regeneration testwork<br>Preliminary mixed RE carbonate intermediate<br>Enhanced mixed RE carbonate product<br>Completion of pilot testwork and reporting for RE extraction, from concentrate to RE carbonate intermediate (Figure 5.4) | ANSTO (2008d), (2008e), (2009a), (2009d), (2009e), (2009f), (2010a), (2010b), (2011c), (2011d), (2011e)<br>Bateman (2008b), (2008c), (2008d), (2009b), (2009c), (2010b)<br>CSIRO (2008) |
| 2011-2012 | Pilot and demonstration scale testing<br>Testwork review and options studies | Demonstration plant - HCl pre-leach, RE recovery, acid bake, impurity removal and RE carbonate precipitation - constructed and commissioned<br>HCl regeneration piloting and demonstration<br>Phosphate and uranium by-products<br>Two-stage impurity removal<br>Desktop studies for process options for 2012 Base Case | AMEC (2011), (2012a)<br>ANSTO (2012a), (2012b), (2012f)<br>Arafura (2011b), (2012f), (2012g), (2013b), (2013i), (2013k)<br>Bureau Veritas Amdel (2012d), (2012e), (2012f)<br>Murdoch University (2012a), (2012b)<br>SGS Minerals (2011a), (2011b), (2012b), (2012c), (2012d), (2012e), (2012g) |
| 2012-2014 | Trade-off study testing | Proof of concept testwork and process development for SAPL + acid bake + DSP<br>Phosphoric acid pre-leach<br>Direct acid bake (**Figure 5.5**)<br>Impurity removal and RE carbonate precipitation testwork to refine 2012 Base Case. | See **Table 5.5** |

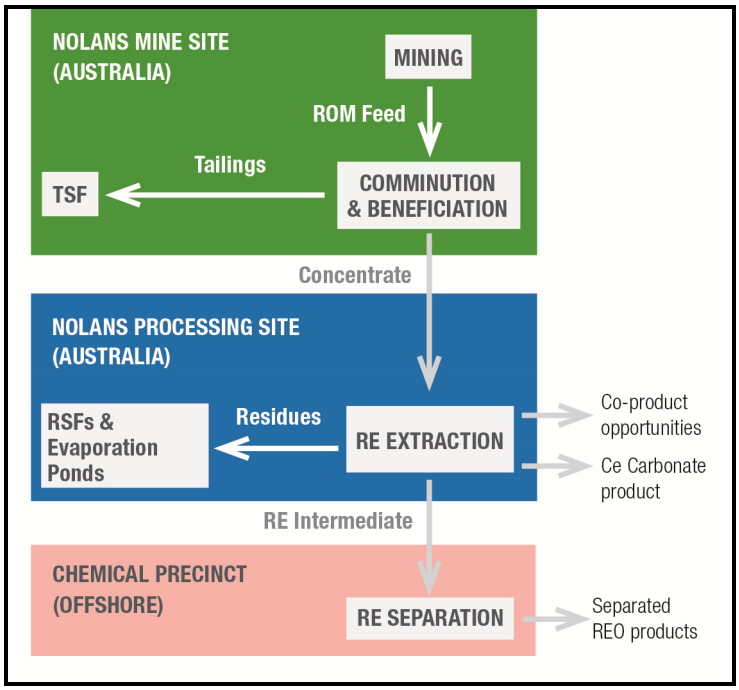
**The pilot RE separation testwork carried out at the Australian Nuclear Science and Technology Organisation (ANSTO) since 2009 has successfully demonstrated that five key REO products can be produced to customer specifications.**

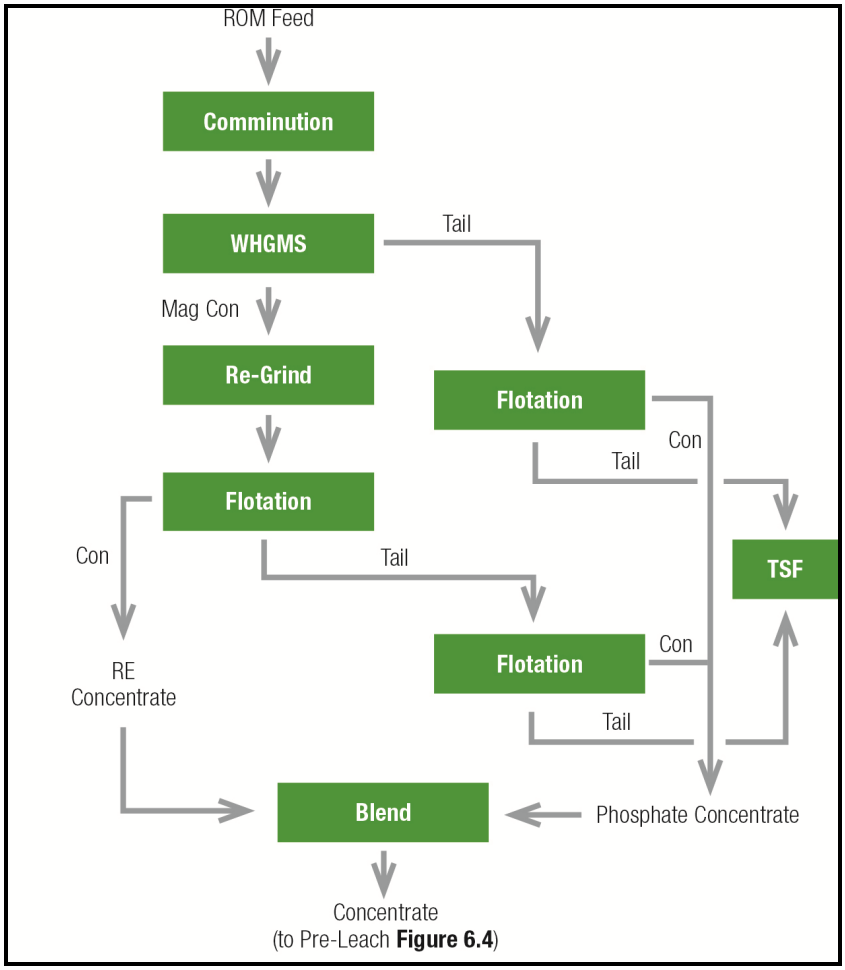
**The Project development testwork is now substantially complete with final optimization and validation work underway in China.**

| Date | Program | Reference |
|---|---|---|
| 2009 | RE products from RE carbonate intermediate | ANSTO (2009c) |
| 2011 | Separation of light, middle and heavy RE fractions | ANSTO (2011a) |
| | Separation of NdPr from Ce/La (SX and selective Ce precipitation) | ANSTO (2011b) |
| 2012 | REO piloting of middle and heavy RE fractions | ANSTO (2012c) |
| | REO piloting of NdPr fraction | ANSTO (2012d) |
| | REO piloting of Ce fraction | ANSTO (2012e) |
| 2013 | REO piloting of La fraction | ANSTO (2013) |

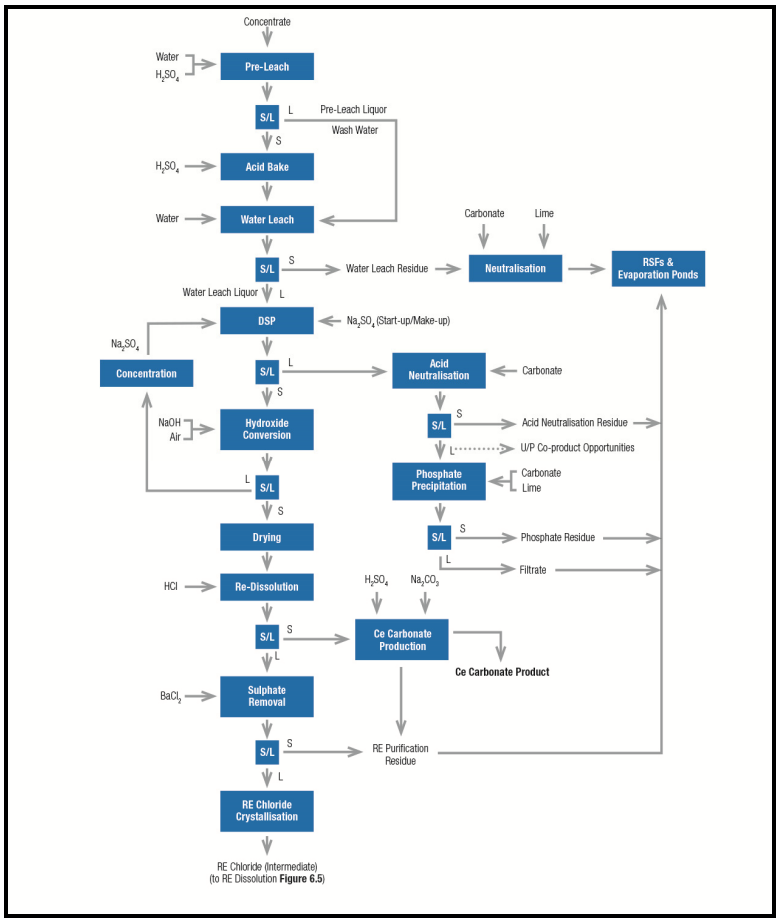
## PROCESSING FLOWSHEETS

**The proposed mineral processing flowsheet incorporates three separate plants – a Concentrator, an RE Intermediate Plant (both located at the Nolans Mine Site) and an RE Separation Plant to be located offshore in a chemical precinct.**




**The Concentrator's comminution and beneficiation flowsheet is relatively straight forward involving wet magnetic separation and flotation to produce a concentrate.**

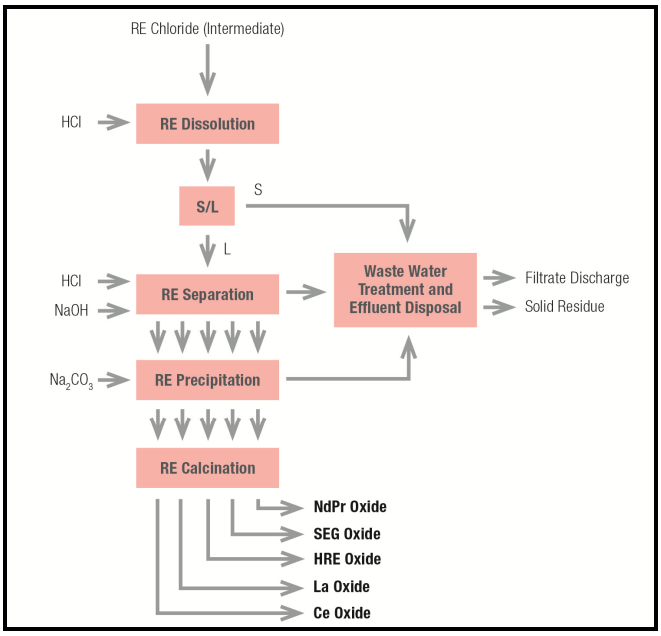



**The RE Intermediate Plant is a more complex chemical plant producing an intermediate mixed RE chloride product (which will be fed to the RE Separation Plant) and a cerium carbonate product. It involves a sulphuric acid pre-leach then a series of steps including acid bake, water leach, double sulphate precipitation (DSP), conversion to hydroxide, hydroxide dissolution and finally crystallisation to produce the RE chloride intermediate product (approx. 93% RE chloride).**

**The RE separation process removes final impurities from the RE intermediate feed and will produce five final REO products:**

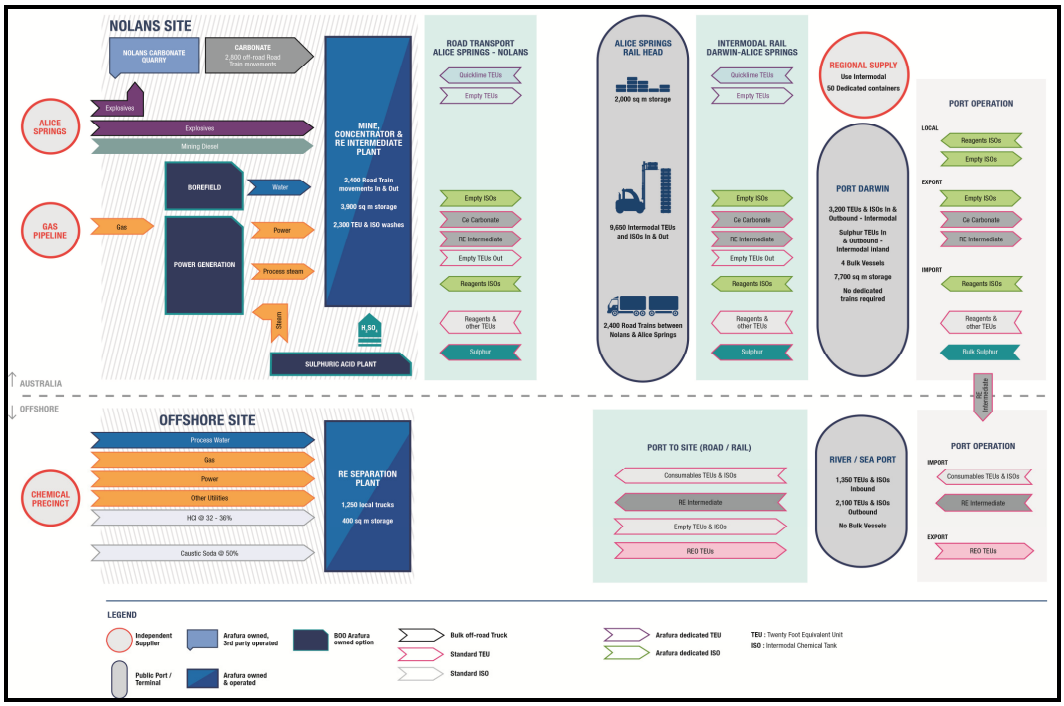
- **NdPr or Didymium Oxide**
- **SEG Oxide (Samarium, Europium and Gadolinium)**
- **HRE Oxide – a mixture of heavy REs and yttrium**
- **Lanthanum Oxide**
- **Cerium Oxide.**

**NdPr Oxide is the key product for revenue generation**

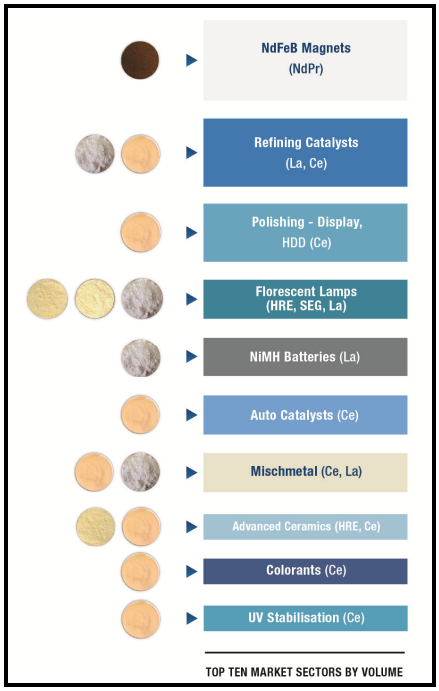


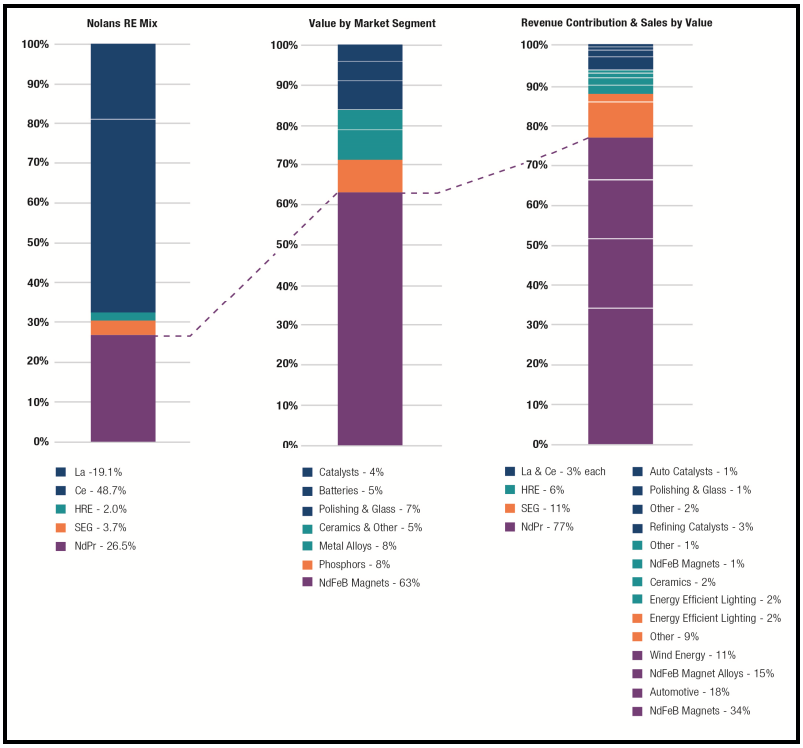
## PROJECT LOGISTICS

### The graphic below summarises key elements of the Project logistics.




## PRODUCT MARKETING



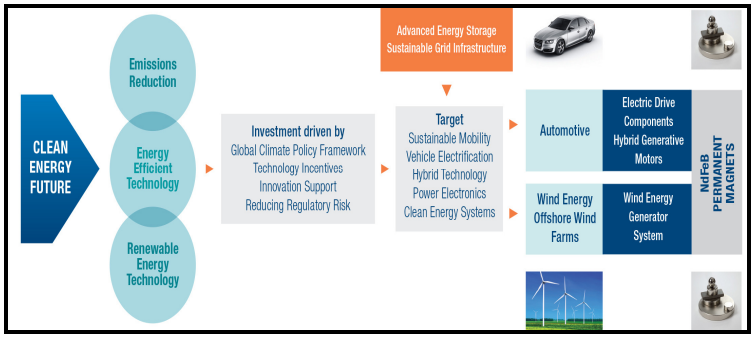

**The market sectors targeted for direct sale of Nolans RE products – the largest is for Neodymium-Iron-Boron (NdFeB) permanent magnets. Product samples have been quality-confirmed with potential customers.**

**The projected sales of Nolans RE products. The left hand bar shows the average in-situ composition. The middle bar shows the value of products by market segment, and the right hand bar shows projected revenue contribution and sales by value. Importantly ARU's NdPr product accounts for 77% of sales revenue but only 26.5% by weight in-situ.**

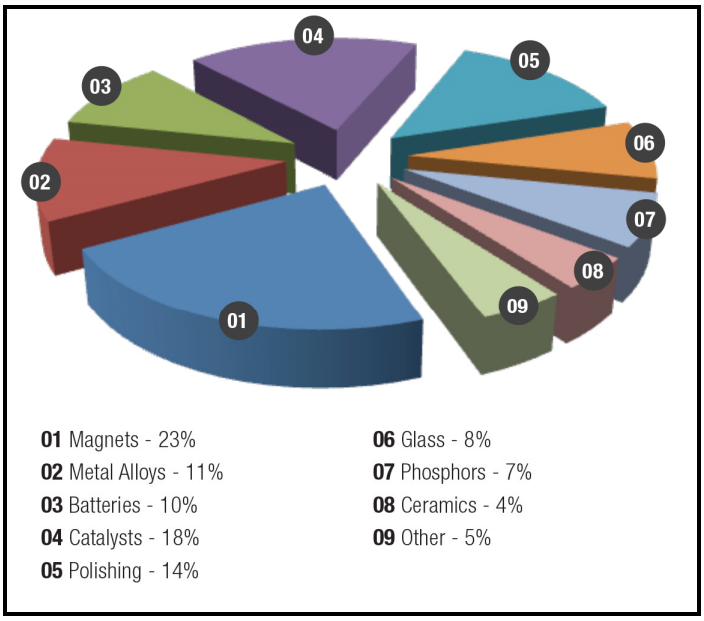
## RE MARKETS

| Arafura Product | Rare Earth Segment | Growth Platform | Target Region |
|---|---|---|---|
| NdPr Oxide | NdFeB Magnets | Automotive - Wind Energy | Europe, Japan, South Korea |
| SEG Oxide | Phosphors, Auto Catalysts, Optics | Energy Efficient Lighting - Emissions Reduction | Europe, Japan |
| HRE Oxide | Phosphors, Auto Catalysts, NdFeB Magnets | Energy Efficient Lighting - Emissions Reduction - Automotive | Europe, Japan |
| La Oxide | Refining Catalysts, Batteries, Optics | Energy Efficiency - Energy Storage - Electronics | North America, Japan, Europe |
| Ce Oxide | Polishing, Auto Catalysts | Electronics - Emissions Reduction | Japan, Europe, South Korea |

**Projected growth markets and main target regions for seeking offtake agreements. In Europe ARU has executed a Letter of Intent with ThyssenKrupp, while a MOU has been signed with a major South Korean multinational.**




**The most important market for Nolans products – NdFeB permanent magnets – is a strong growth market driven by development of automotive electric drive applications and clean energy technology.**



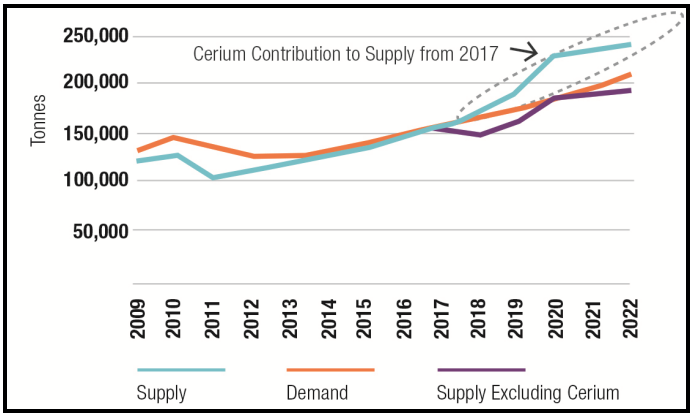

**01** Magnets - 23%
**02** Metal Alloys - 11%
**03** Batteries - 10%
**04** Catalysts - 18%
**05** Polishing - 14%
**06** Glass - 8%
**07** Phosphors - 7%
**08** Ceramics - 4%
**09** Other - 5%

**The overall RE market segments. The largest is the magnet sector predominantly utilising NdPr Oxide.**

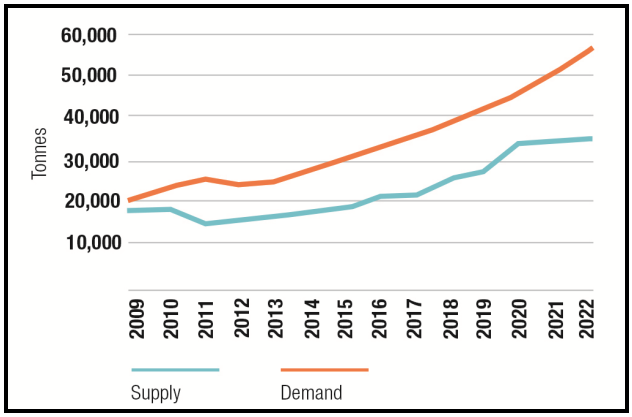
**ARU is projecting an average compound annual growth rate in REO demand of 6-7% pa. The magnets sector is projected to exhibit the strongest growth rate (10% pa).**

| REO Market | CAGR |
|---|---|
| Magnets | 10% |
| Batteries | 7% |
| Metal Alloys | 6% |
| Catalysts | 5% |
| Polishing | 5% |
| Ceramics | 5% |
| Phosphors | 4% |
| Glass | 3% |
| Other | 7% |
| **TOTAL** | **6-7%** |

## RE PRODUCT SUPPLY - DEMAND AND PRICING

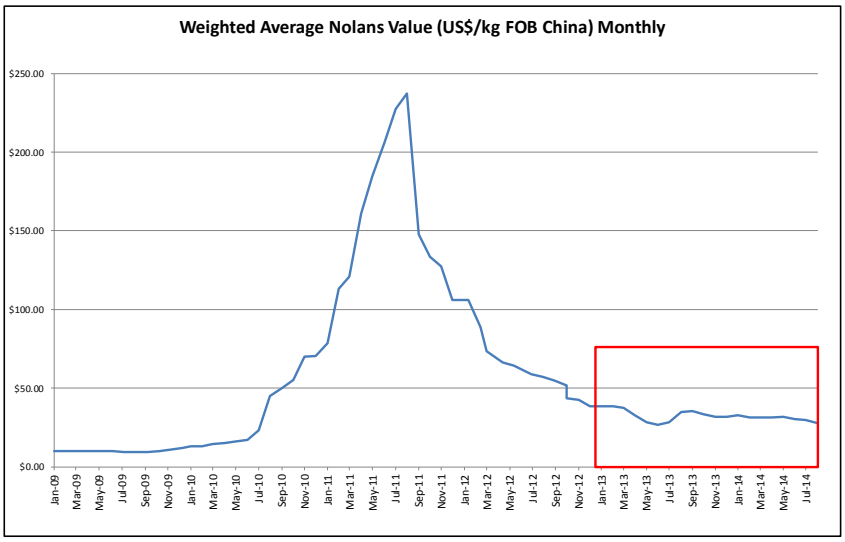



**The projected compound growth rate of 6-7% leads to an estimated total RE market demand of 180,000 tonnes per annum in 2020. The market is expected to be in surplus from 2017 due to increased cerium supply – but in deficit excluding cerium.**




**Of critical importance to ARU's product mix is a projected supply deficit in the key magnet feed neodymium.**

**The weighted average price of the overall Nolans mix of RE products has stabilised since late 2012 in the US$25-US$35 range after major price volatility caused by Chinese export bans a few years earlier. The current price for the Nolans mix of RE products is approximately US$28/kg.**





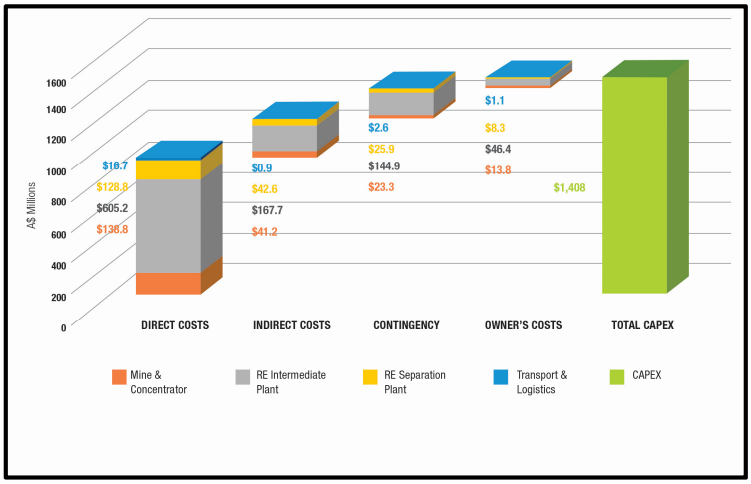
### ARU's PRICE FORECAST FOR NOLANS RE PRODUCS

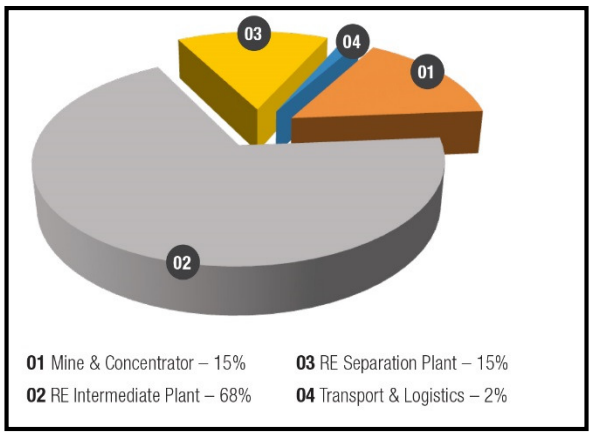
**In its financial modelling ARU has assumed that the weighted average price for the six RE products it intends to market is US$36.64/kg in 2019 - the assumed first year of production. This is based on:**

- **Base case 2014 Nolans mix price of US$33/kg = average for 2013.**
- **Assuming 7.6%pa real compound growth in the NdPr Oxide price through to 2023 due to a projected supply shortfall and growth in magnet demand.**
- **Assuming zero real compound growth for the other REO's, and a 50% discount in pricing for cerium carbonate due to oversupply.**

**The above assumptions generate a Nolans mix price estimate of US$44/kg in 2019. After discounting this for the REO components it will not separate and sell, the projected 2019 price is US$36.64/kg.**

## NOLANS PROJECT FINANCIAL EVALUATION




**The A$1,408m capital cost estimate comprises direct costs of A$889m, indirect costs (mainly EPCM and consultants) of A$252m, owner's costs of A$70m and contingency of A$197m.**

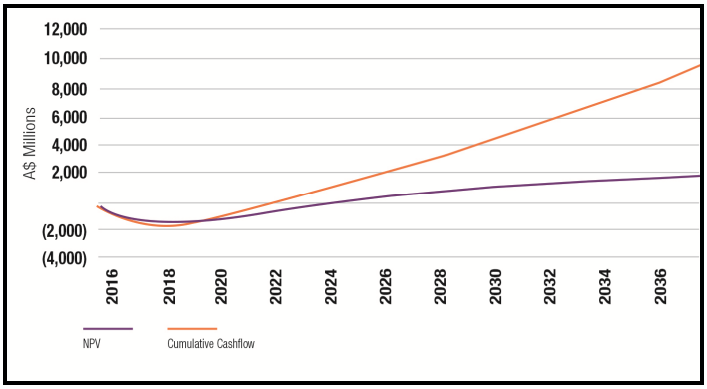
**The capex is dominated by the RE Intermediate Plant at the Nolans Mine Site, which is estimated at A$964m or 68% of total capex.**

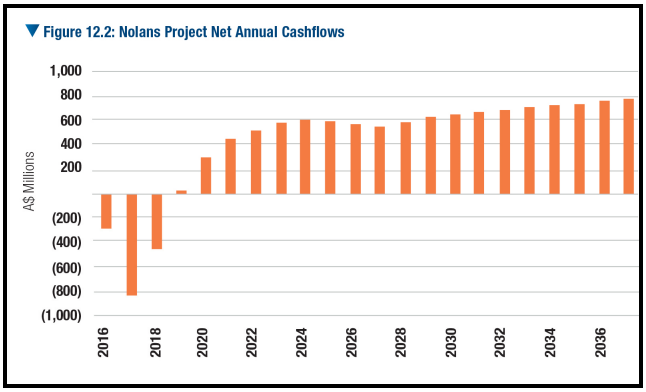
**The projected operating cost of A$15.67 per kg of REO product is dominated by costs associated with the production of intermediate REO products – this constitutes A$7.84/kg or approximately half of total operating costs. The next biggest component is the mining cost which equates to A$2.64 per kg REO product. This figure is derived from A$5.78 per total tonne mined (waste plus ore).**

| Plant | Australian cost component A$/kg REO | USA cost component US$/kg REO | Total A$/kg REO | Total US$/kg REO | Total A$m pa |
|---|---|---|---|---|---|
| Mine | 2.64 | - | 2.64 | 2.37 | 52.5 |
| Concentrator | 1.86 | - | 1.86 | 1.67 | 37.1 |
| RE Intermediate Plant | 4.75 | 2.77 | 7.84 | 7.03 | 156.1 |
| RE Separation Plant | - | 1.61 | 1.79 | 1.61 | 35.6 |
| Transport & Logistics | 1.44 | 0.09 | 1.54 | 1.38 | 30.7 |
| **TOTAL** | **10.69** | **4.47** | **15.67** | **14.06** | **312.0** |

Costs converted using A$1 = US$0.897

## Summary of ARU's Financial Evaluation of the Nolans Project




**Project Cumulative Net Cashflow after tax.**

**Net Annual Cashflow after tax.**

**Summary of the key data from ARU's financial evaluation. Total annual revenue is estimated at A$712m pa. The after tax NPV @10% discount rate is A$2,045m, and the after tax IRR is 21.4%. Estimated capital payback is within 5 years.**

## KEY ARU ASSUMPTIONS

**ARU's financial evaluation assumes a twenty year mine life with commissioning commencing in 2019.**

**Capital costs have been escalated at 3.2%pa during the construction period.**

**CPI escalation of 2.7% pa has been applied to sales revenue and operating costs.**

**A long term exchange rate of A$/US$ = 0.813 (after 2016).**

**Annual sustaining capital of 1.4% of total direct capital costs plus A$7.5m pa for tailings and residue storage.**

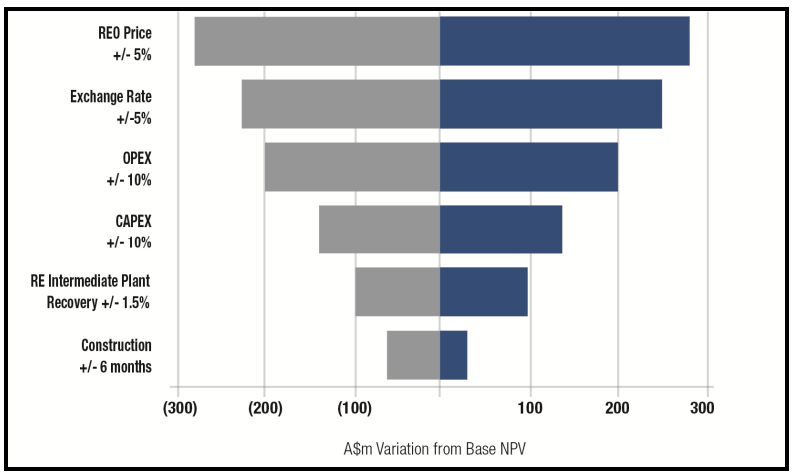
**Plant expansion capital of A$197m for tailings and residue storage facilities in years 7 to 10 of operations.**

| | US$m pa |
|---|---|
| Sales Revenue | |
| REO equivalent 20,000 tonnes (less royalty and selling expenses)[1] | 638 |
| **Total Revenue** | **638** |
| | **A$m pa** |
| **Total Revenue @ A$1 = US$0.897** | **712** |
| Operating Expenditure | |
| Mine & Concentrator | (90) |
| RE Intermediate Plant | (156) |
| RE Separation Plant | (35) |
| Transport & Logistics | (31) |
| Total Operating Expenditure[2] | (312) |
| Operating Cost (A$/kg REO) | 15.67 |
| **EBITDA** | **400** |
| Capital Expenditure (A$m) (excluding deferred capital) | 1,408 |
| **NPV @ 10% after tax and capital payback** (A$m)[3] | **2,045** |
| **IRR after tax and capital payback[3]** | **21.4%** |
| After tax payback period | Year 5 of operations |

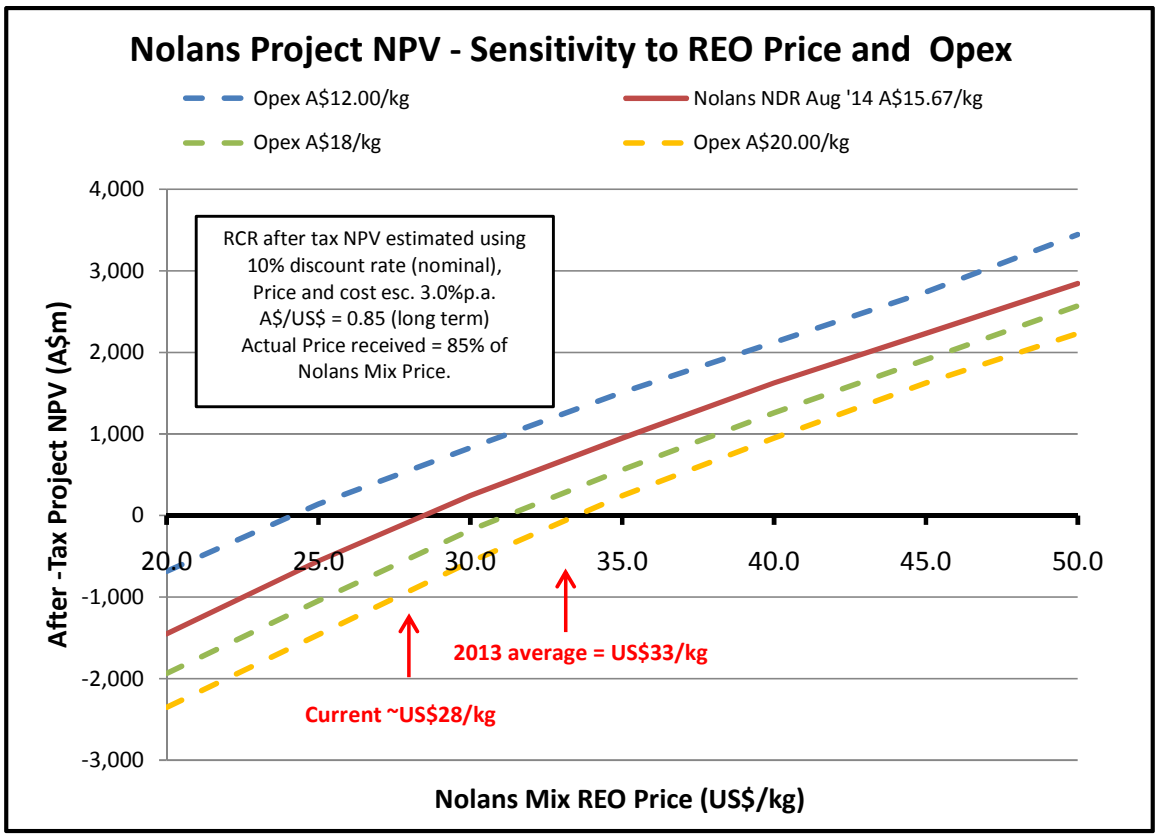
[1] Sales revenue based on the 2019 forecast price of US$36.64/kg (Section 10.8: PRICING).

[2] Operating expenditure based on Section 11.3 (OPERATING COST ESTIMATES) assuming annual production of 20,000 tonnes of REO based on an average of 900,000 tpa of ore feed.

[3] NPV and IRR analysis is based on the disclosed Project assumptions including allowance for construction, indexation, and the varying mining and feed rates associated with commissioning, ramp-up and grade variations.




**ARU's sensitivity analysis not surprisingly indicates that the NPV is most highly sensitive to REO prices and exchange rates. On the next line, sensitivity to opex is significantly higher than sensitivity to capex.**




**Our financial modelling of the Nolans Project based a long term forecast for A$/US$ = 0.85. We have assumed that the average price received for the six RE products is 85% of the weighted average total Nolans mix REO price (i.e. not all REO's in the mix will be separated and sold).**

### RCR Commentary

**Our modelling confirms that at current RE product prices the Nolans Project is marginal. If we factor in a reasonable probability that the weighted average price of the Nolans mix will appreciate to >US$35/kg in the next 1-2 years, led by appreciation in the key NdPr magnet-feed product (the dominant revenue generator for ARU), then the Project starts to look attractive. This is particularly so if ARU's market demand analysis rings true and the Nolans mix REO price moves towards ARU's projected target level of US$44/kg by 2019 (US$36.64/kg actual price received for the 6 REO products).**

**The sensitivity to changes in operating costs, one of the key risk variables for RE projects, is also shown. ARU has already made significant strides in reducing the projected operating costs from >US$20/kg (August 2012 estimate) to US$15.67/kg quoted in the NDR. The on-going optimisation work in China is aimed at generating further operating cost reductions.**

Acknowledgement of source material:

All of the graphics and tables in this report, except for page 1, page 4 and page 16 are sourced from ARU's Nolans Development Document.

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