



## Arafura Resources Limited

*Evolution of a non-China NdPr Producer*

November  
2017

International Rare Earths Conference- Hong Kong

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Mr Hussey is a full-time employee of Arafura Resources.

# Programme

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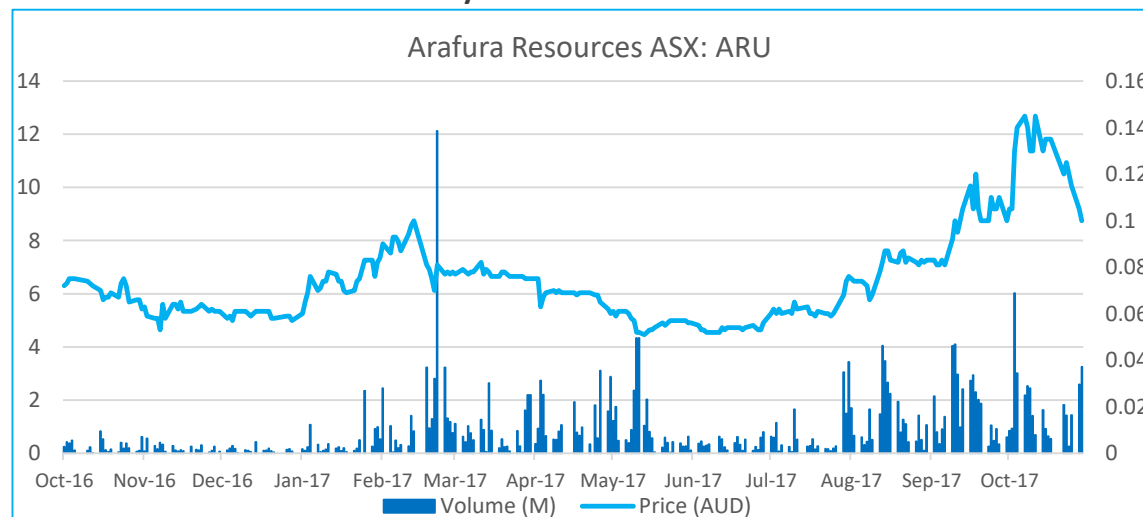
1. Investment Highlights & Project History
2. NdPr Market
3. Nolans Project
4. Project Timeline
5. Project Funding
6. Summary

# Investment Highlights & Capital Structure

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- ASX listed company developing the **Nolans Rare Earths Project** in the Northern Territory, **low geopolitical risk, 30+ year** mining and chemical processing operation
- Nolans is one of the **largest and richest deposits of Neodymium-Praseodymium (NdPr)** rare earths in the world and its forecast operating costs are in the **lowest quartile**
- NdPr is the critical raw material used in the production of **high-strength permanent magnets** used extensively in the **automotive, clean energy, electronics and healthcare sectors**
- Arafura has the capability of meeting **5-10% of global demand for NdPr**
- Nolans has been afforded **major project status** by the Northern Territory and Australian governments
- Nolans is in **advanced feasibility and environmental assessment**

ASX Code	ARU
Share Price (30-Oct-17)	A\$0.105
Issued Shares	575.8m
Market Cap	A\$60.5m
Cash (30-Sept-17) + Placement	A\$15.3m
Debt	Nil
Enterprise Value	A\$45.2m



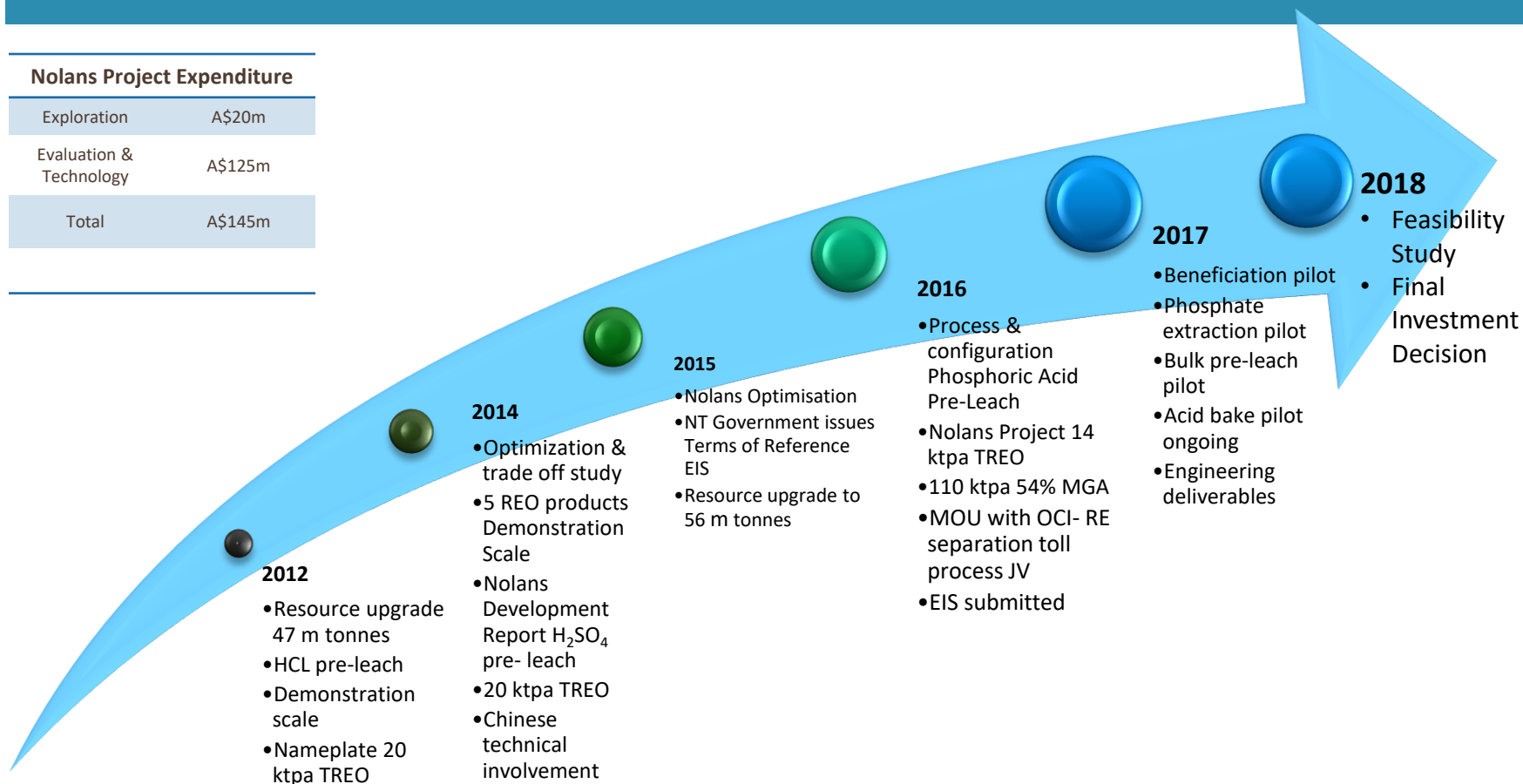
Top 5 Shareholders	
JP Morgan Nominees	20.47%
ECE Nolans Investment Co	19.05%
HSBC Custody Nominees	2.59%
Citicorp Nominees	2.31%
BNP Paribas Nominees	0.85%

# Project History

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## Nolans Project Expenditure

Exploration	A\$20m
Evaluation & Technology	A\$125m
Total	A\$145m



Nolans Project 2012		Nolans Development 2014		Nolans Optimization 2015	
CAPEX	A\$1,912m	CAPEX	A\$1,408m	CAPEX	A\$1,193m
OPEX	A\$20.55/kg TREO	OPEX	A\$15.67/kg TREO	OPEX	A\$14.51/kg TREO

H <sub>3</sub> PO <sub>4</sub> Pre-leach 2016	
CAPEX	US\$680m
OPEX	US\$6.23/kg TREO

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# The NdPr Market

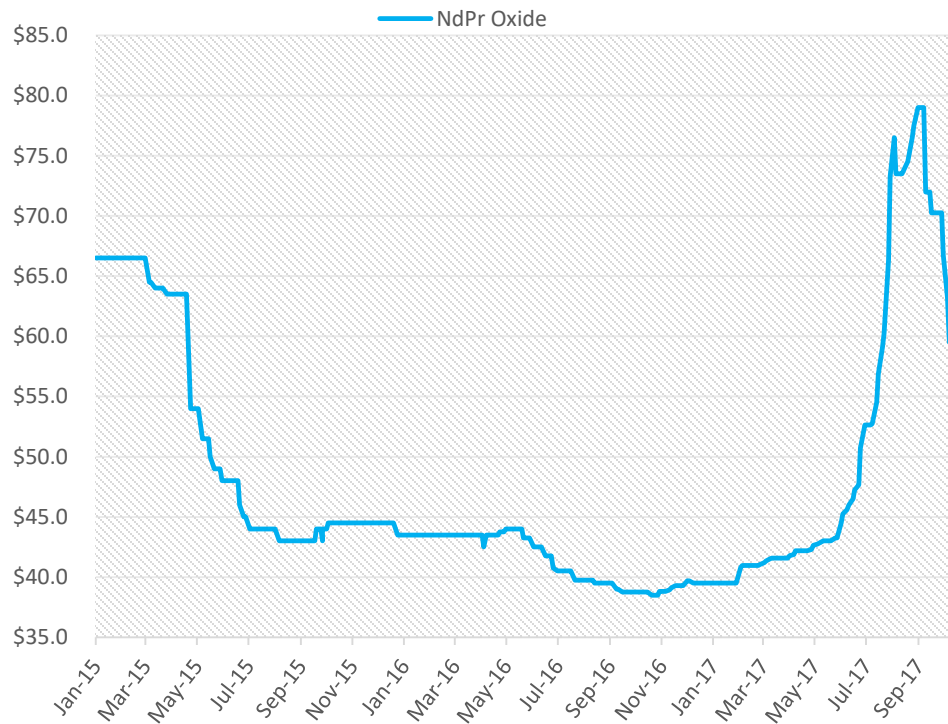
## Secure Supplier of NdPr to Permanent Magnets Used in Clean Energy

- **NdPr is a key component** in the manufacture of high-strength NdFeB permanent magnets used in electric vehicles (EVs), wind turbines, portable electronic devices, and many industrial applications
- EVs use approximately **1 kg NdPr per drivetrain**. Incremental to other existing applications
- NdPr accounts for 26.4% of Nolans rare earths composition by volume and **85% by value**
- China has generally controlled the production of NdPr but recently analysts are forecasting for **China to become a net importer**
- Structural changes are being implemented in China to **weed out illegal operators, close unsustainable operations**, and push bigger players to consolidate.

# NdPr Price – Supply & Environmental Reform

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**NdPr Oxide Pricing 2015-2017**



Source: Independent price reporting agency

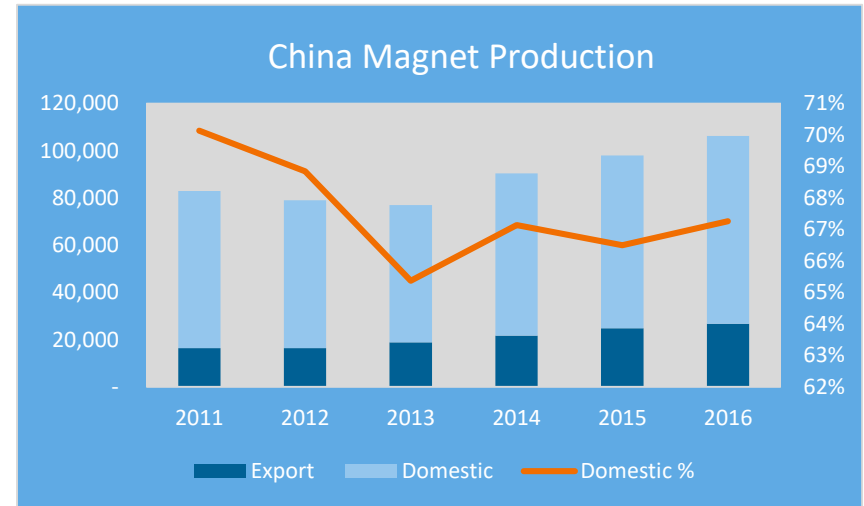
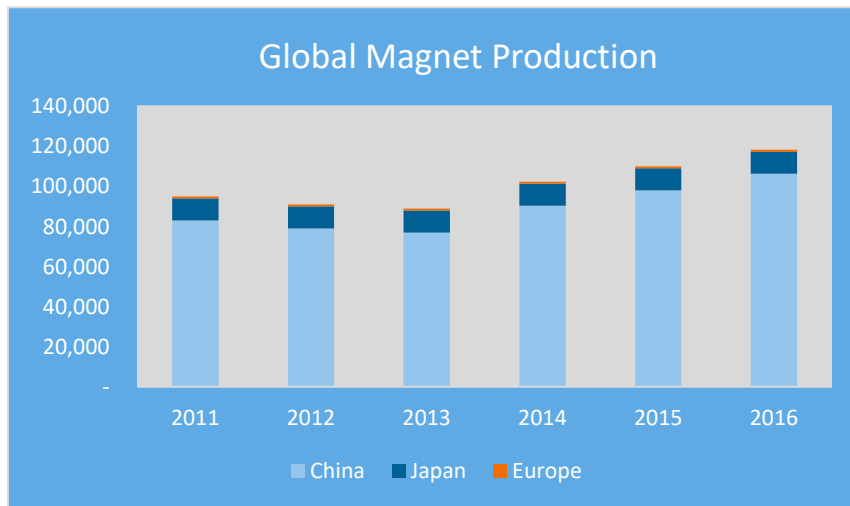
- Enforced closure of illegal and unsustainable mines and smelting
- China “big 6” consolidation creates a more sophisticated supply chain
- Improved chain of custody for NdPr supply
- China rehabilitation costs yet to be realised
- Supply initiatives have positively impacted NdPr price in 2017
- Emerging demand for NdFeB magnets may also impact demand- supply balance



# Emerging Demand Dynamic

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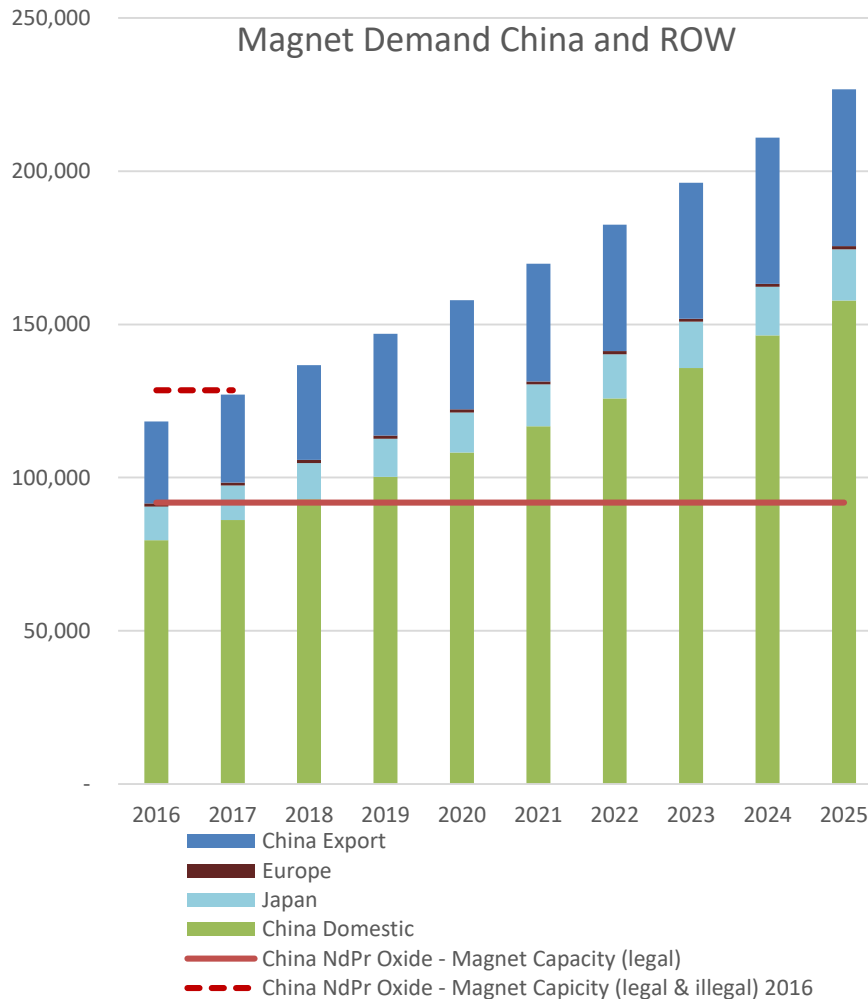
- Steady increases in global magnet production 2014 to 2016, NdPr price movement indicates **continued growth for 2017**, production growth dominated by China
- To maintain magnet production growth China will require **increased volumes of NdPr raw materials**, which conflicts with **contracting NdPr production**
- China's domestic magnet consumption is increasing** as it pursues clean energy objectives, if NdPr feedstock is not expanding China exports may be impacted
- Will illegally produced NdPr continue to keep supply and demand balanced?



Source: ACREI, Argus Metals and industry sources

# Demand Growth- China a net importer?

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Source: ACREI, Adamas Intelligence, corporate filings and presentations, IMCOA, rare earth end users, Roskill

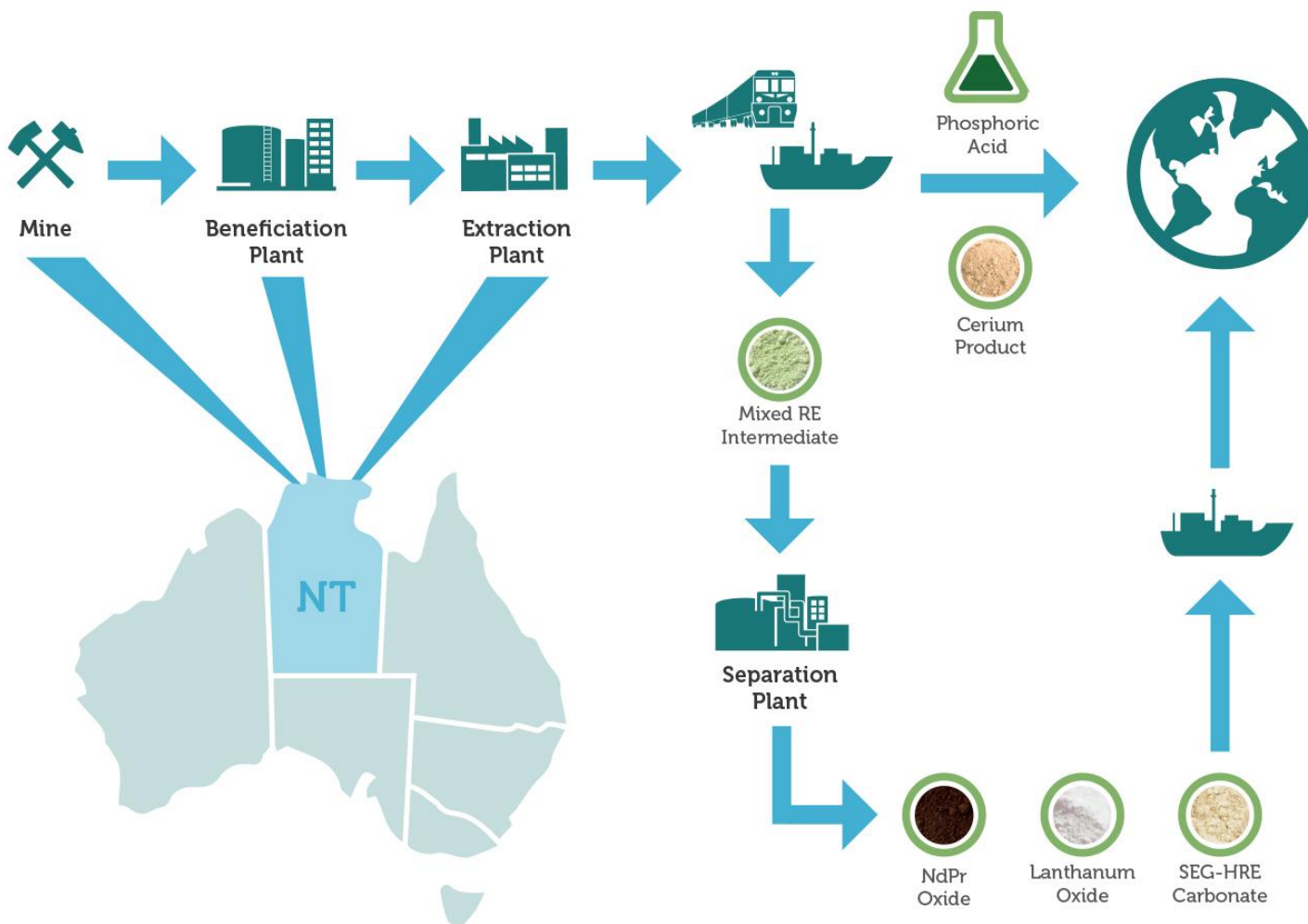
- China 2025 Strategy- integration and movement along the supply chain
- China pursuing global leadership in EV manufacture, as a priority
- Commercial Activity and expansion of non- China NdPr supply;
  - China RE producers are now looking to foreign assets to expand production (ASX:GGG; ASX:NTU)
  - China backed syndicate places winning bid to acquire Mountain Pass assets
  - Noble Resources acquires 14.5% of Mkango – Malawi focused RE development
  - Rainbow RE, Gakara project in Burundi- Thyssenkrupp mineral concentrate offtake
- Nolans to provide meaningful NdPr oxide production in the **lowest cost quartile, high** NdPr enrichment and advanced project development status

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# The Nolans Project

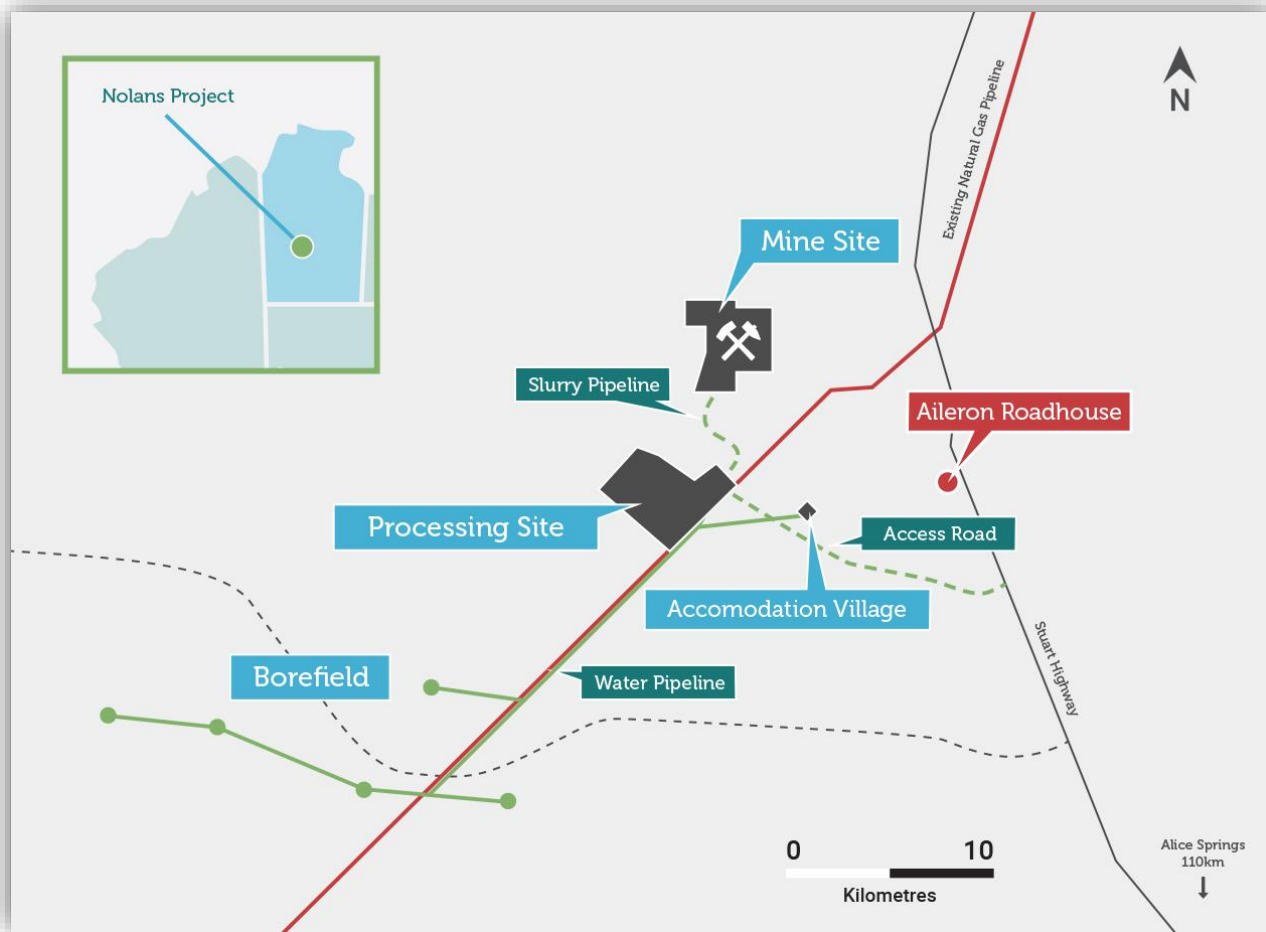
# Project Configuration

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# Close To Key Infrastructure

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- Stuart Hwy – **10 km east**
- Alice Springs railyard, airport and other services – **135 km south**
- Amadeus gas pipeline – **adjacent to processing site**
- Water supply – **30 km south**
- Tailings and process wastes **remain at site**

# Project Metrics

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- **Ultra competitive operating costs**  
US\$6.23/kg TREO or US\$24.38/kg NdPr oxide – lowest amongst peers
- Phosphoric acid recovered to **reduce commodity risk**
- **Flowsheet targets high NdPr**

*Refer Arafura ASX release 7 June 2017 for additional and qualifying information on the Mineral Resources that underpin the production target and provides the material assumptions on which the production target is based*

*The Company confirms that all material assumptions underpinning the forecast financial information derived from its 14,000 tpa TREO production target and the production target itself, continue to apply and have not materially changed since the 7 June 2017 ASX release*

*Based on 14,000 tpa TREO production processing Measured and Indicated Mineral Resources as per appendix A*

Mining & Processing		
ROM feed (tpa)		525,000
Mine life (years)		30+
Recovery (ROM to final product)	Total RE	76%
	NdPr	75%
	La	75%
	SEG-HRE	68%
Production		
TREO equivalent (tpa)		14,000
NdPr oxide (tpa)		3,600
La oxide (tpa)		2,660
SEG-HRE carbonate (tpa TREO equivalent)		660
Phosphoric Acid (tpa MGA)		110,000
Financial		
Capital cost (US\$m)		\$680
Operating cost (US\$m pa)		\$125
Operating cost (US\$/ kg TREO)		\$8.89
Operating cost (US\$/ kg TREO; less credit phos acid)		\$6.23
Operating cost (US\$/ kg NdPr; less credit phos acid)		\$24.38



# Pilot Scale Work Completed In 2017

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**PHASE 1**

**Beneficiation**



**Beneficiation Pilot Plant**



**PHASE 2**

**Phosphate Extraction**



**Phosphoric Acid Regeneration Circuit**



**PHASE 3**

**Bulk Pre-Leach**



**Bulk Pre-Leach Pilot Plant**

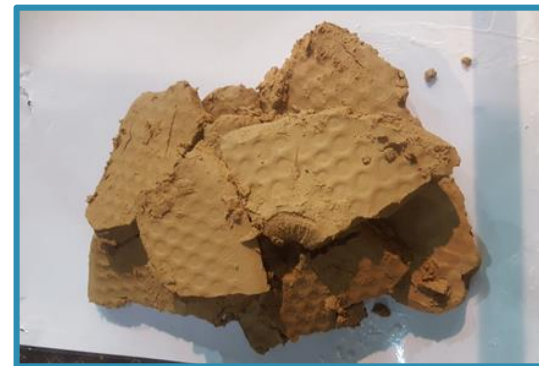
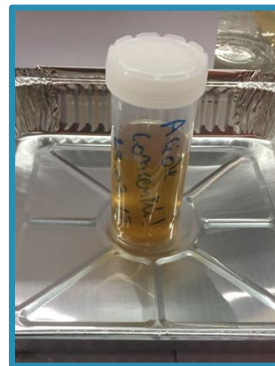


**High-Phosphate Concentrate**

TREO Grade	7.0%
TREO Recovery	>80%
NdPr Oxide Grade	1.8%
NdPr Oxide Recovery	>82%
P <sub>2</sub> O <sub>5</sub> Grade	29%
P <sub>2</sub> O <sub>5</sub> Recovery	>90%
Al <sub>2</sub> O <sub>3</sub> Grade	<3.2%
Fe <sub>2</sub> O <sub>3</sub> Grade	<1.9%
Mass Pull	55%



**Rare Earth & Phosphoric Acid Products**



**NdPr-Rich Pre-Leach Residue**

# Remaining Piloting Activities 2017-18

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## Acid Bake Phase 4 commenced



PLR and Acid Mixing



Baked Mixture Feeding



Acid Bake



Cooled Sulphated Product



Water Leach Liquor

## Phase 5,6,7 planning

RE Purification and Precipitation pilot  
**Phase 5**

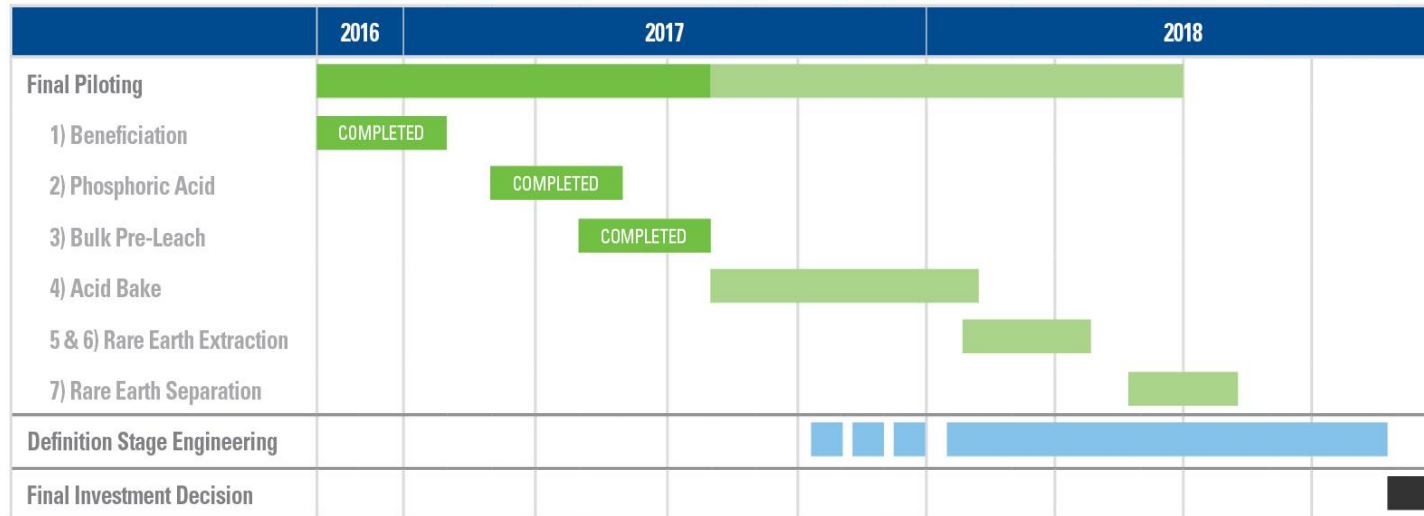
RE Dissolution and Crystallization pilot  
**Phase 6**

RE Separation pilot  
**Phase 7**



# Piloting & Final Feasibility

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## 2018 Targets

- Finalisation of piloting
- Environmental Approvals
- Advance offtake arrangements
- Completion of definition stage engineering and DFS
- Engage with strategic partners for capital equipment & project funding

# NdPr Project Funding

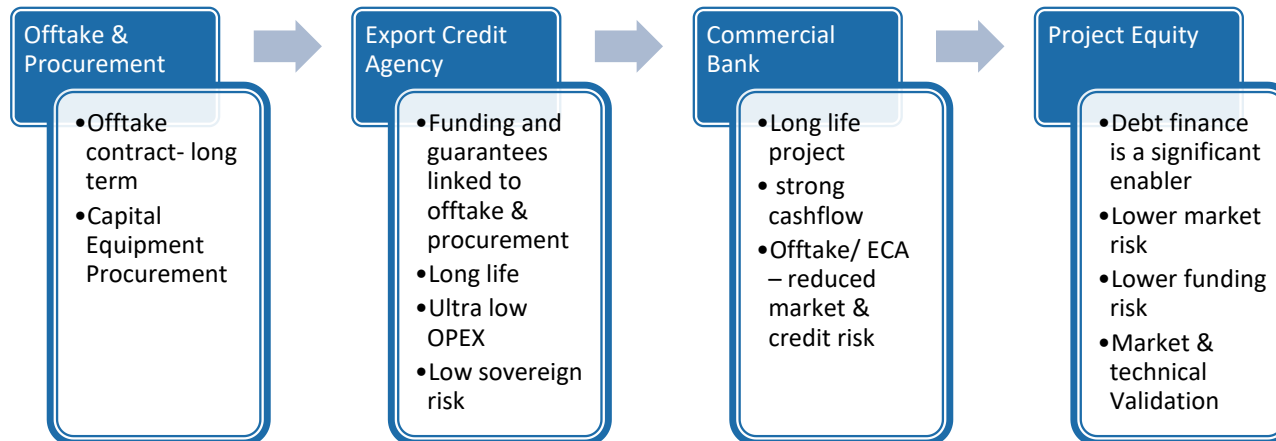
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- NdPr production requires downstream chemical processing, significant supporting infrastructure and compliant waste management
- New NdPr project capital intensity range- US\$30 -50M per kt REO. Drivers include; location, scale, OPEX, RE product produced and by products
- NdPr is not exchange traded, pricing risk will be assessed as high by banks
- Arafura actions to reduce funding requirement - BOOT, equipment financing, JV for toll RE separation, project level investment and leveraging the strategic significance NdPr

# Nolans Funding Strategy

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- Export Credit Agencies (ECA) will be key to providing government backed funding and guarantees, leveraged against the strategic link of NdFeB magnet production
- ECA funding linked to offtake arrangements, capital equipment supply and construction
- ECA linked project finance will be catalyst to attract equity at corporate and/ or project level



Attribute	Arafura
High growth and high value NdPr magnet focus	✓
NdPr production planned to coincide with projected supply gap	✓
Located in a jurisdiction with low geopolitical risk and with strategic support	✓
Long-life, low-risk resource with planned output that supports >30 years of production	✓
Close to vital transport, energy and water infrastructure	✓
Efficient, high recovery flowsheet proven from mine to market: final piloting phase commenced	✓
Regulatory approvals well advanced: environmental, water, Native Title	✓
Lowest production cost to remain competitive in a cyclical downturn	✓



### Contact:

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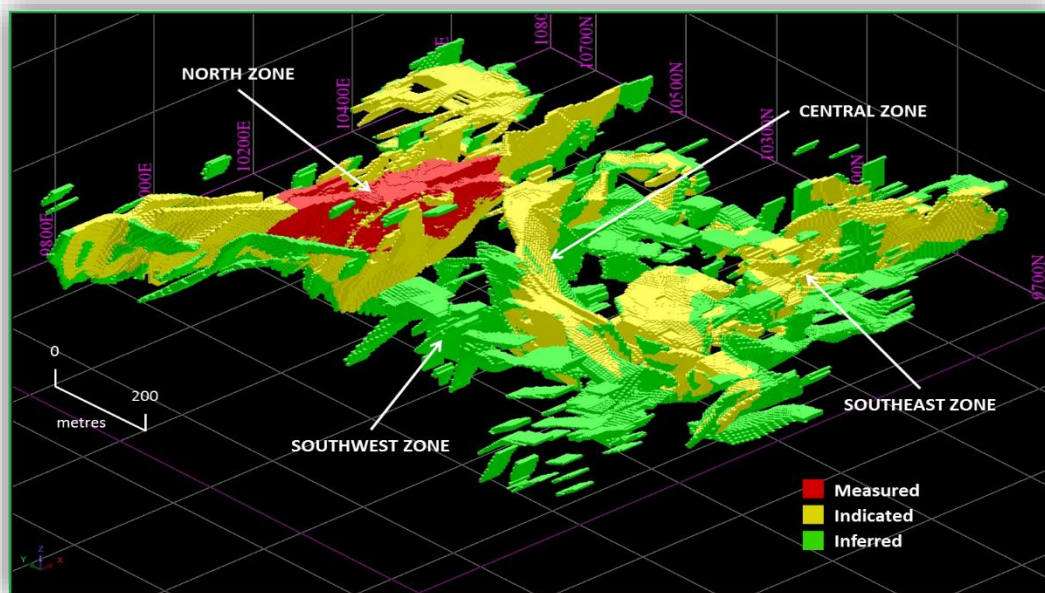
E: [arafura@arultd.com](mailto:arafura@arultd.com)

# Appendix A: Mineral Resources

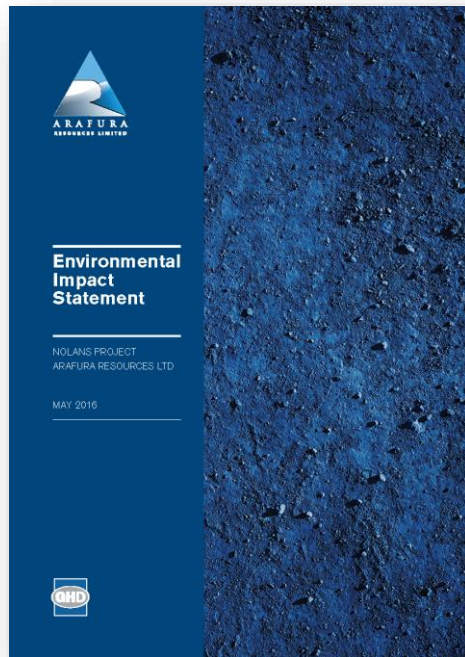
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RESOURCES	TONNES M	RARE EARTHS TREO %	PHOSPHATE P <sub>2</sub> O <sub>5</sub> %	NdPr Enrichment %
Measured	4.9	3.2	13	26.1
Indicated	30	2.7	12	26.4
Inferred	21	2.3	10	26.5
<b>TOTAL</b>	<b>56</b>	<b>2.6</b>	<b>11</b>	<b>26.4</b>

1% TREO cut-off grade. Numbers may not compute exactly due to rounding. "NdPr enrichment" is the proportion of TREO comprising Nd<sub>2</sub>O<sub>3</sub> and Pr<sub>6</sub>O<sub>11</sub>.



# Appendix B: Environmental Assessment In Progress



Draft EIS submitted May 2016



EIS Supplement submitted February 2017

Public and government review May-August 2016  
609 comments from 20 stakeholder groups



Proponent prepares and  
submits Supplement to EIS  
(timeframe under proponent's control)

Supplement circulated for  
government review and comment  
within 14 days

Assessment Report is prepared  
for EPA within 35 days of receiving  
Supplement

EPA provides Assessment  
Report to proponent and Environment  
Minister. Environment Minister  
provides the Assessment Report  
to Responsible Minister

Assessment complete\*

Arafura is currently  
at this stage in the  
EIS process

Remaining steps in Northern Territory  
Environmental Impact Assessment process

**No major risks identified**