

# Breaking the Barriers The Lynas Story

Diggers and Dealers Mining Forum

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2 August 2016



**SAFE FOR PEOPLE  
SAFE FOR THE ENVIRONMENT  
SECURE FOR CUSTOMERS**



**Lynas**  
CORPORATION LTD

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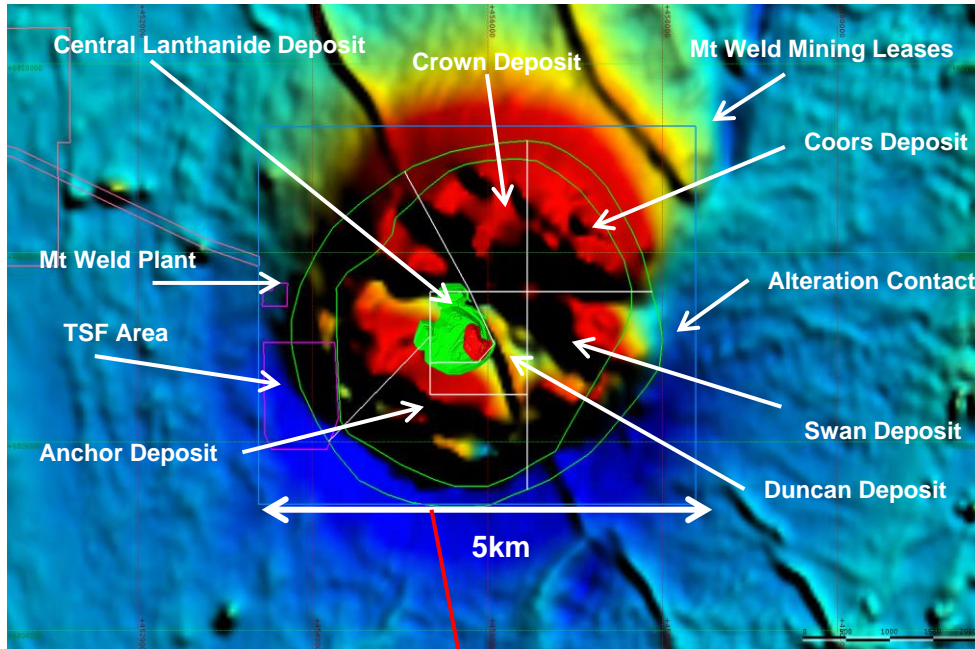
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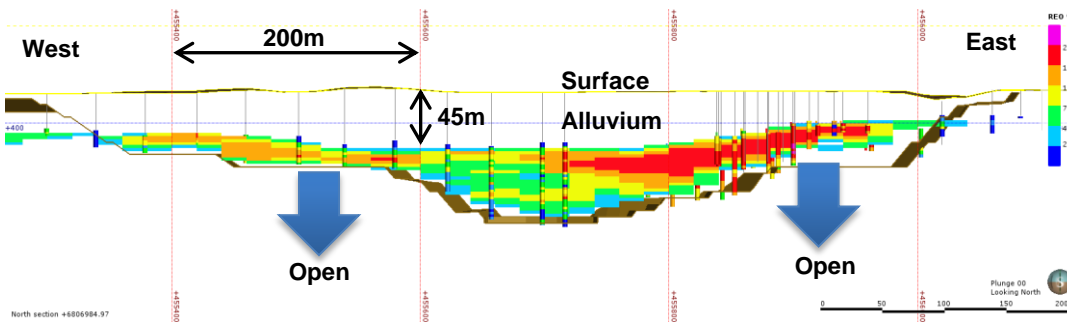
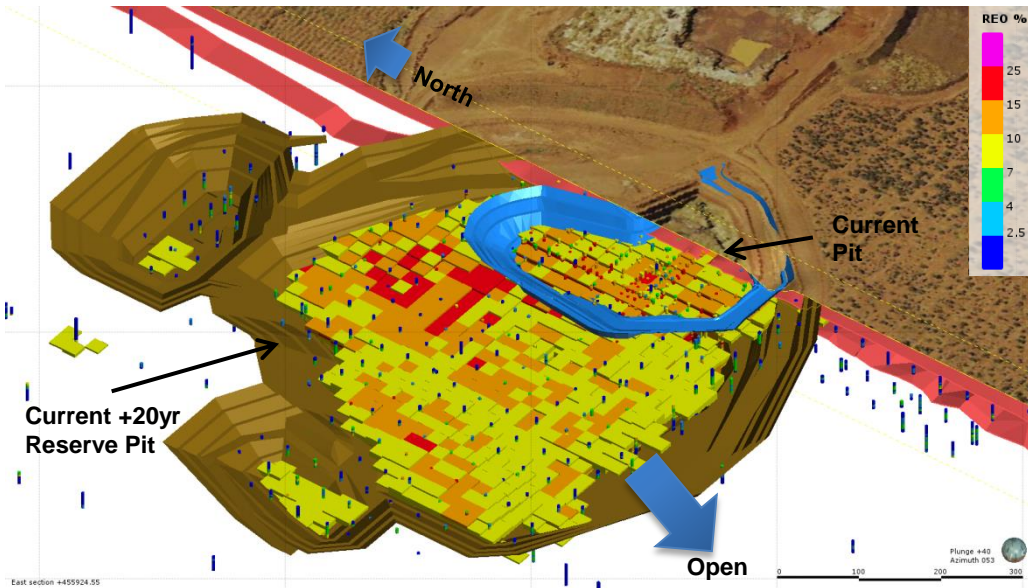
# The Mount Weld Carbonatite Intrusion World Class REE and Rare Metals Deposit



- Central Lanthanide Deposit, the highest grade operating Rare Earths mine in the world with a current operating LOM JORC reserve of 20+ years
- Duncan Deposit, the largest high grade Dysprosium resource in the world
- Crown and Coors Deposits, the highest grade undeveloped Niobium resource in the world
- All deposits currently limited by drilling extent
- All deposits close to Mt Weld processing infrastructure <5km



# CLD Deposit – Current Reserve 20+yrs



- Carbonatite contains 3 ore types that are flat lying and laterally continuous
- Reserve ore zone lies between 25m to 110m depth and is amendable to open pit mining with a simple ore blending strategy
- Ore zone averages 30m in vertical thickness with low strip ratio 1:4
- Mineralisation limited to drilling - most of historic drilling ended within mineralisation
- Resource open at depth and towards the south-west



# Beneficiation Challenges

*Just a simple "Bulk Float" ??*



Froth Paddles

The Boiler

- Very fine grain – 50% less than 7 microns
- Requires very clean water – all water is Reverse Osmosis (RO) treated including recycled water
- Challenging materials handling – 5 types of positive displacement pumps have been used
- Flotation requires heating of the slurry – 40% of total diesel consumption used for heating
- Only 4% increase in REO grade per cleaner flotation stage - 4 stages required



Positive Displacement Pumping Rev 1  
For a 15tph Concentrator



Positive Displacement Pumping Rev 5



# Beneficiation Challenges

## *Water management*

### Historical Situation

- Tailings Storage Facility – full of stable solid suspension (22% solids) and free water on top
- Very fine tailings (50% <7 microns), dispersants added in flotation
- Originally, no suitable tailings thickener - testwork only achieved underflow densities of 22% solids
- Recycling of untreated water would adversely affect flotation performance
- Solutions were required to maintain production rates

Before



### The Journey

- Searched the world for solutions, collaborated with many parties
- Similar situation to mature fine tailings in the oil sands industry in Alberta but on a much smaller scale. Mt Weld 0.16km<sup>2</sup> versus 77km<sup>2</sup> (2013)
- Cloudy water was originally unsuitable for recycling without further solutions, due to very fine solids, silica and organics

After  
ETD Tailings



### The Solutions have been Implemented

- Found 3 viable solutions for tailings consolidation – high compression thickener operating at feed dilution (1% solids); screw press filter and ETD (Rheomax)
- Clarifier technologies to treat free water prior to evaporation
- Membrane Ultra Filtration ahead of RO treatment and then reuse of water in the flotation plant.

After  
Ultra Filtration

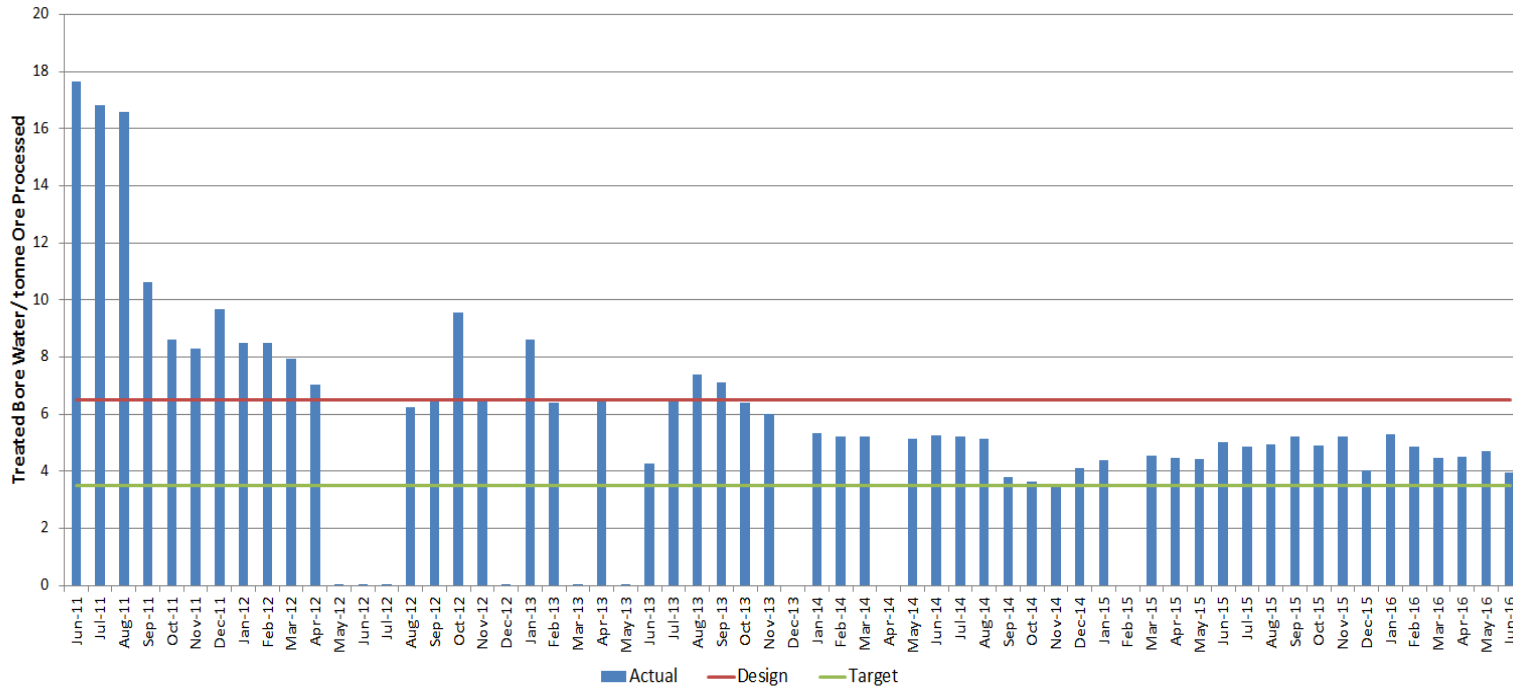


# Mt Weld Production Improvement

## Water usage



Treated Bore Water per tonne of Ore Processed



Progressive Reduction in water consumption





# Cracking the Separation barrier



**4 rotary kilns (60m long)**

**928 metres of  
kilns and tunnel  
furnaces**



**8 tunnel furnaces (88m long)**

**44 High Speed Centrifuges**



**46 Plate & Frame Pressure Filters**



**1,000 Solvent Extraction Stages**

**Quality specs as low as  
<50ppm for some  
impurities**





# Cracking the Separation Barrier

- Cracking is the first stage of the LAMP process.
- Challenges were similar to lateritic nickel processes.
- Mt Weld Rare Earths concentrate is mixed with 98% sulphuric acid resulting in vigorous exothermic reaction. The mixture is abrasive, corrosive, and creates pumping challenges.
- No off the shelf solutions
- Limited success with Supavac pneumatic positive displacement pumps.
- Embarked on an in-house development program with mixer (Supabob) and pump (Supamir).
- Originally, valve replacement was required every few days
- Each of the four kilns has its own mixer and pump system
- Each 24" Supamir now runs for 6 weeks between major maintenance



Original mixer and pump were not robust

Supavac worked but did not last



3<sup>rd</sup> generation 24" Supamir concentrate/acid pump

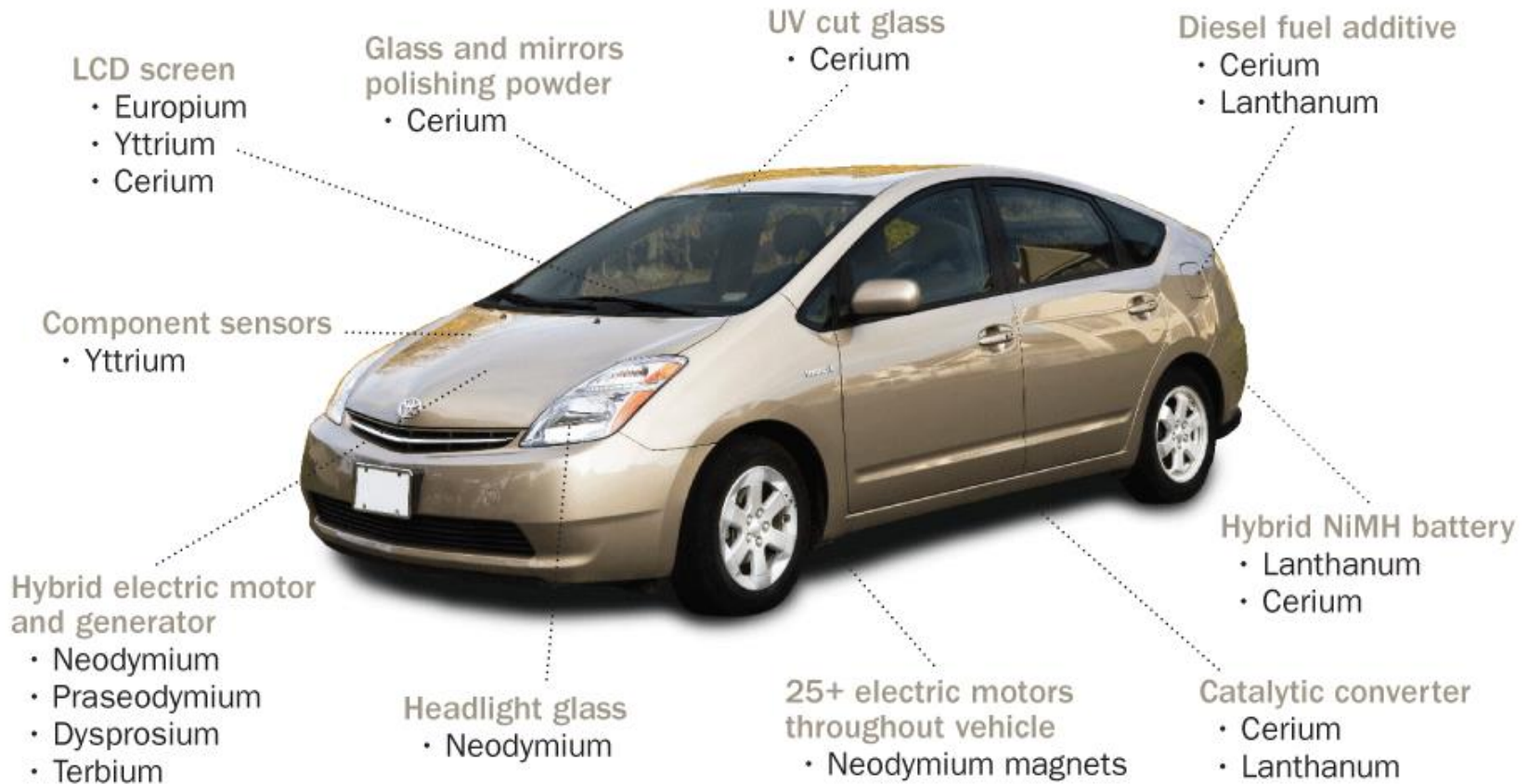


# The Rare Earth market offers specific challenges



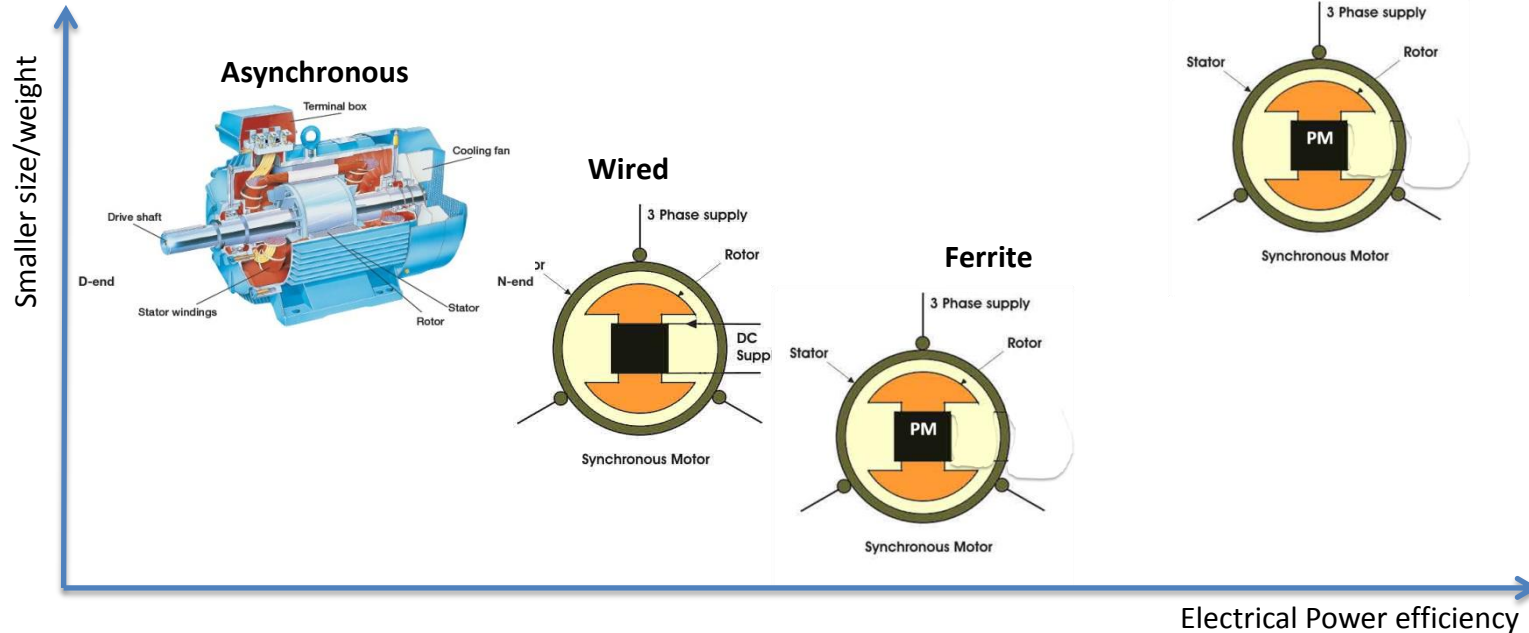
- Rare Earths are essential inputs to many important future facing technologies:
  - To reduce car gas emissions
  - In new green applications such as electrical and hybrid cars, and renewable energies such as wind turbines
- China has over 90% of Rare Earths production and is vertically integrated in all sections of the supply chain
- Japan is the most significant outside China market for Rare Earths
- Market dynamics continue to be affected by memories of the 2011 bubble

# Essential inputs to the Auto Industry





# Rare Earths Magnets are the best choice for small/medium motors



NdFeB

- **NdFeB benefits are fully leveraged with e-cars**
  - Weight reduction = Reduced fuel consumption (standard cars)
  - Better efficiency = smaller batteries (e-cars)

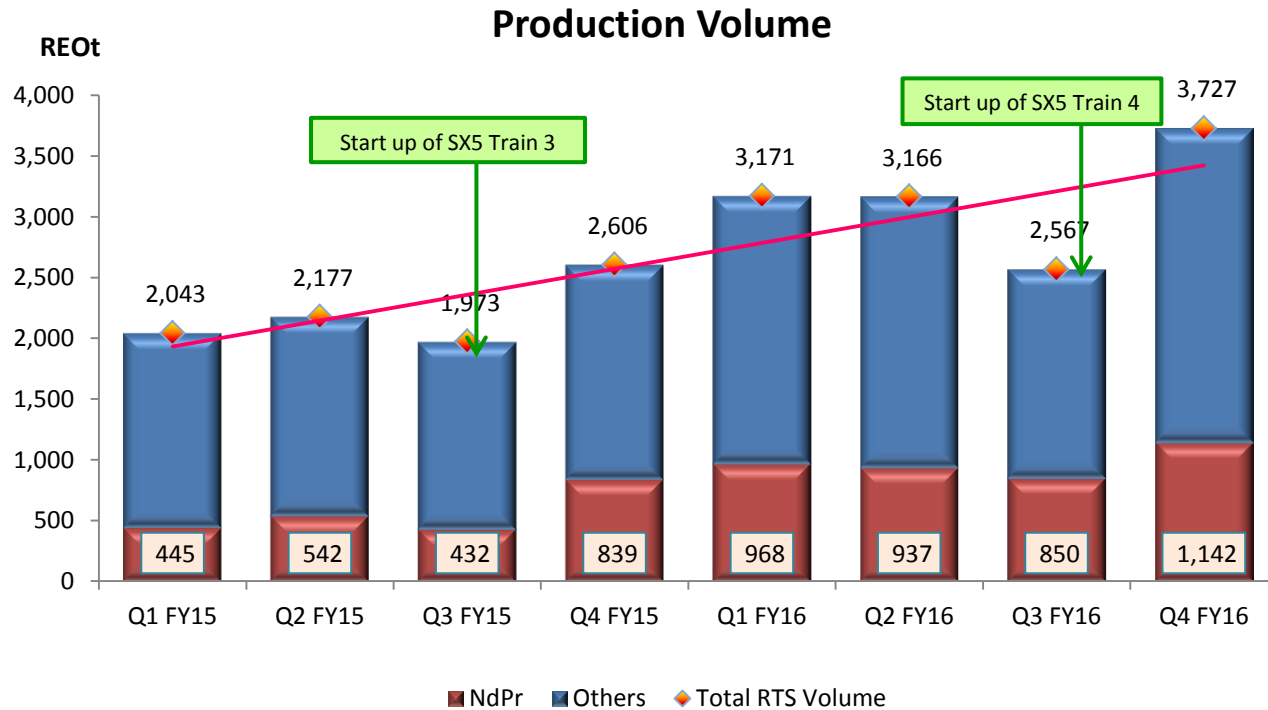


# Breaking into the Market



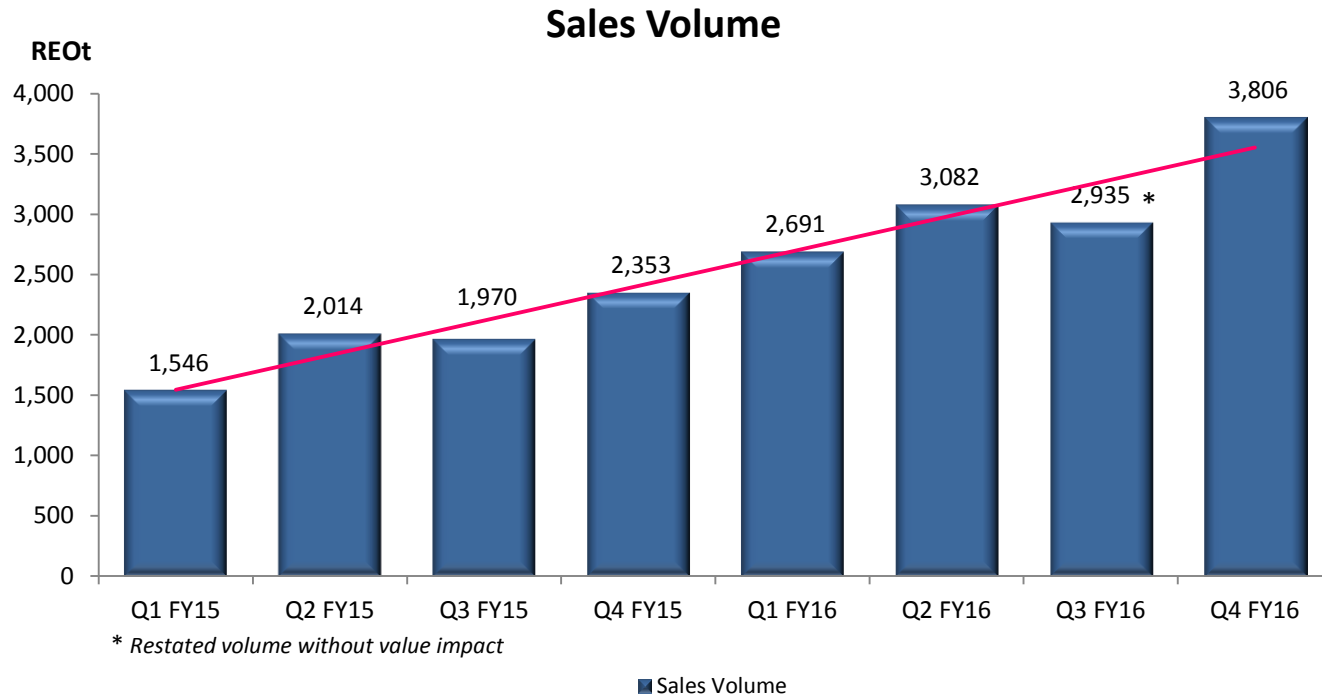
- Build position as credible, reliable non-Chinese source of Rare Earths from mine to customer
- Environmentally assured and traceable supply source – from mine to customer
- Establish strong commercial relationships with customers in Japan:
  - JARE is our senior secured lender
  - Sojitz is our commercial trading partner
  - Engage with Japanese magnet makers
- Establish strong commercial relationships with end users in all geographies
- Establish strong commercial relationships with selected customers in China who value Lynas' quality, reliability and environmental provenance from mine to customer

# Lynas Today



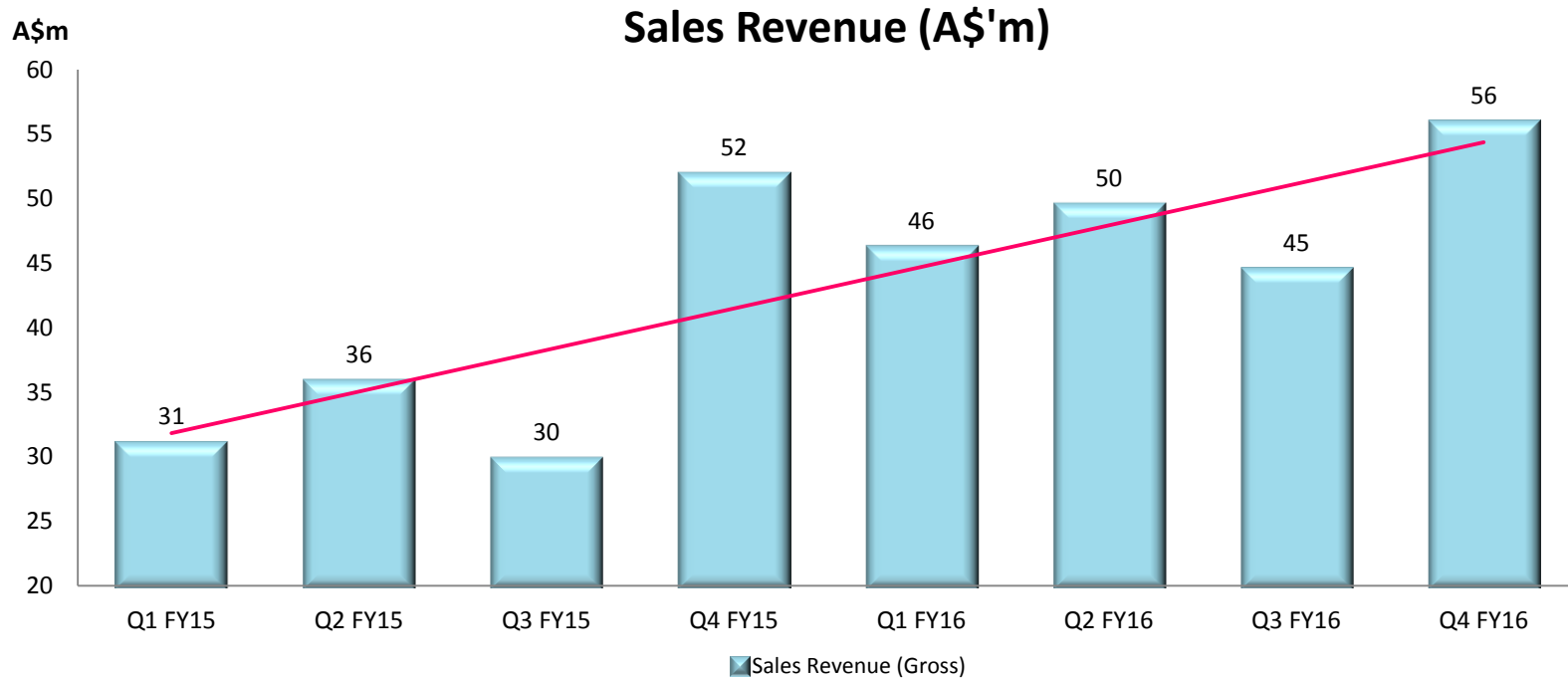
- **100% of capacity commissioned and operating**
- **NdPr production at 90% of nameplate capacity**
- **Minor debottlenecking before growing to 100%**





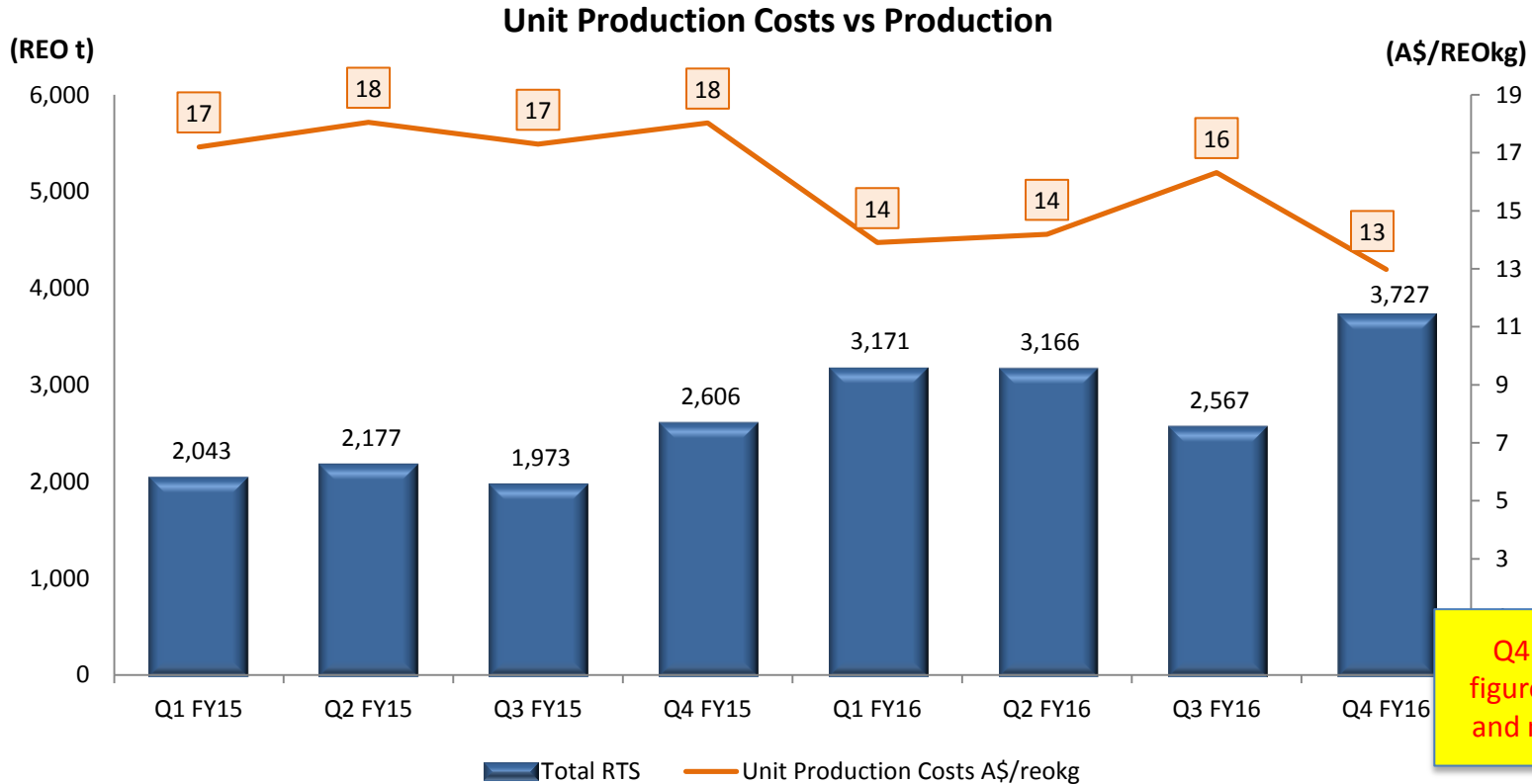
**Sales volume has kept pace with production volume reflecting**

- Increasing demand
- Strong customer relationships



**Revenue growth has been driven by increased volume compensating for the sustained low market prices**

# Lynas Today



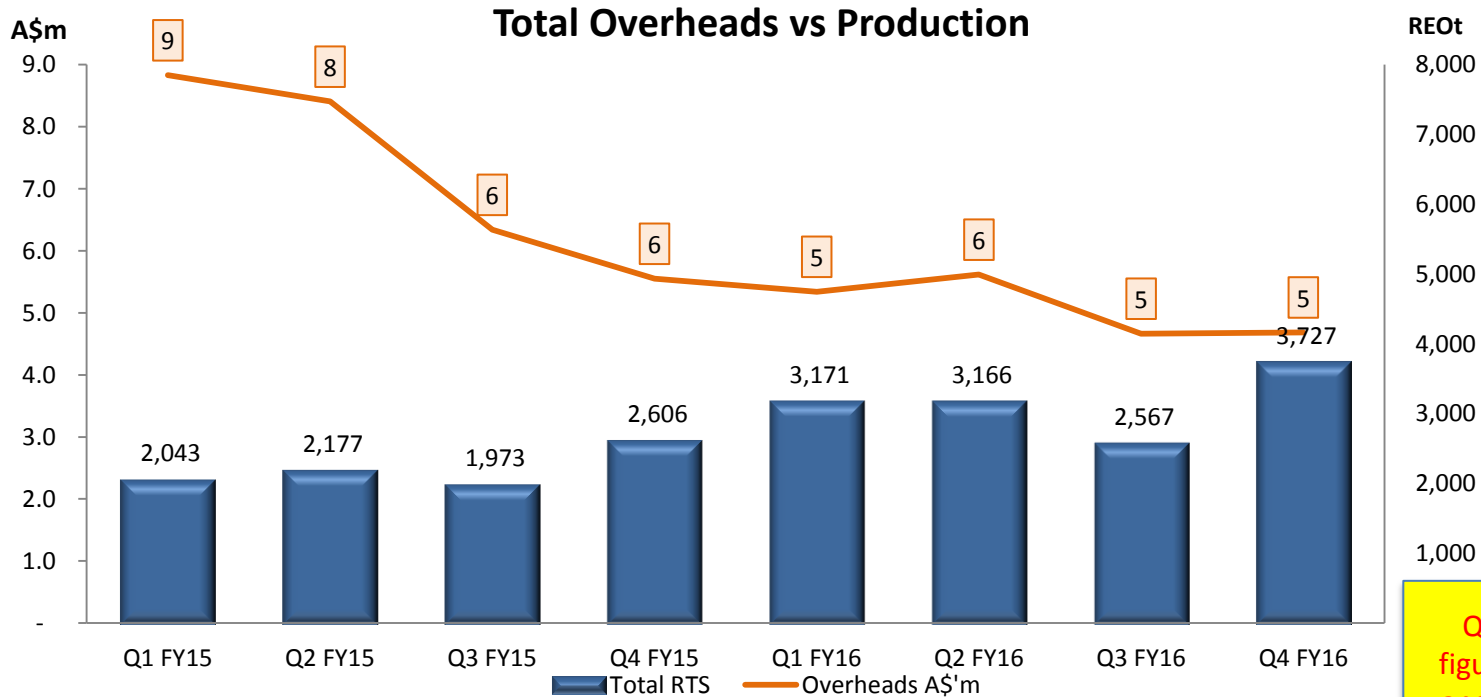
Q4FY16 June figure unaudited and may change

**Costs improved by throughput growth , purchasing improvements and usage efficiencies**





# Lynas Today



Q4FY16 June figure unaudited and may change

**Savings in Overheads have been sustained as production has increased**



# Lynas has kept its promises to the communities and regulators in WA and Malaysia



- Lynas has been operating safely for over 3 years
  - Lynas operations comply with all regulatory requirements in WA and Malaysia
  - Lynas has industry-leading systems at both sites
    - Water management at Mt. Weld
    - Waste gas emission at LAMP
    - Water management system at LAMP
  - There has been no increase in background radiation at independently measured sites 1km, 5km, 10km or 20km from the plant in Malaysia
  - We have had no adverse impact on residents of Kuantan or the surrounding villages
  - Lynas has clear evidence and independent certifications that its operations and emissions are safe and, in Malaysia, Lynas provides online real time operational readings directly to authorities which are accessible to the public
  - The IAEA (International Atomic Energy Authority) rates the Lynas operations as “intrinsically low risk”
- Lynas is actively engaged in community support programs at both locations

# Lynas is no longer a start up



- **100% of capacity is commissioned and operating**
- **Experienced and disciplined management team**
- **Capable and ready for future challenges**
- **Well positioned to leverage increases in market demand and price**
- **Strong stable operating foundations allow Lynas to consider “what next?”**



# And the moral of our story



A great resource is not a free pass to making a lot of money

**BUT**

**If you have a great resource and a big dose of determination, creativity and discipline, then you will make money from your great resource!**



# Competent Person's Statement



## COMPETENT PERSON'S STATEMENTS— MINERAL RESOURCES

The Mineral Resources and Ore Reserves Statement in this Presentation is based on, and fairly represents, information compiled by Mr. Brendan Shand who is a consultant geologist to Lynas Corporation. Mr. Shand is a Member of The Australian Institute of Geoscientists and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity that he is undertaking, to qualify as Competent Person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. Mr. Shand consents to the inclusion in the document of the information in the form and context in which it appears.

## COMPETENT PERSON'S STATEMENTS— ORE RESERVES

The information in this Presentation which relates to the Central Lanthanide Deposit Ore Reserve estimate accurately reflects information prepared by Competent Persons (as defined by the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves). The information in this document relating to the Central Lanthanide Deposit Ore Reserves at the Mt Weld Rare Earths Project is based on information resulting from Feasibility-level updated Ore Reserve works carried out by Auralia Mining Consulting Pty Ltd. Mr. Daniel Tuffin completed the Ore Reserve estimate. Mr Daniel Tuffin is a Member and Chartered Professional (Mining) of the Australasian Institute of Mining and Metallurgy and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity that he is undertaking to qualify him as a Competent Person as defined in accordance with the 2012 Edition of the Australasian Joint Ore Reserves Committee (JORC). Mr Tuffin consents to the inclusion in the document of the information in the form and context in which it appears.

