



MULTI-COMMODITY MINER EXPLORER  
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ASX : ALK  
OTCQX : ANLKY

# The Development of the Dubbo Zirconia Project

## A New Strategic Source of Critical Metals

### Toronto 10 – 11 May 2016



5th Annual Cleantech &  
Technology Metals Summit  
*invest* in the cleantech revolution

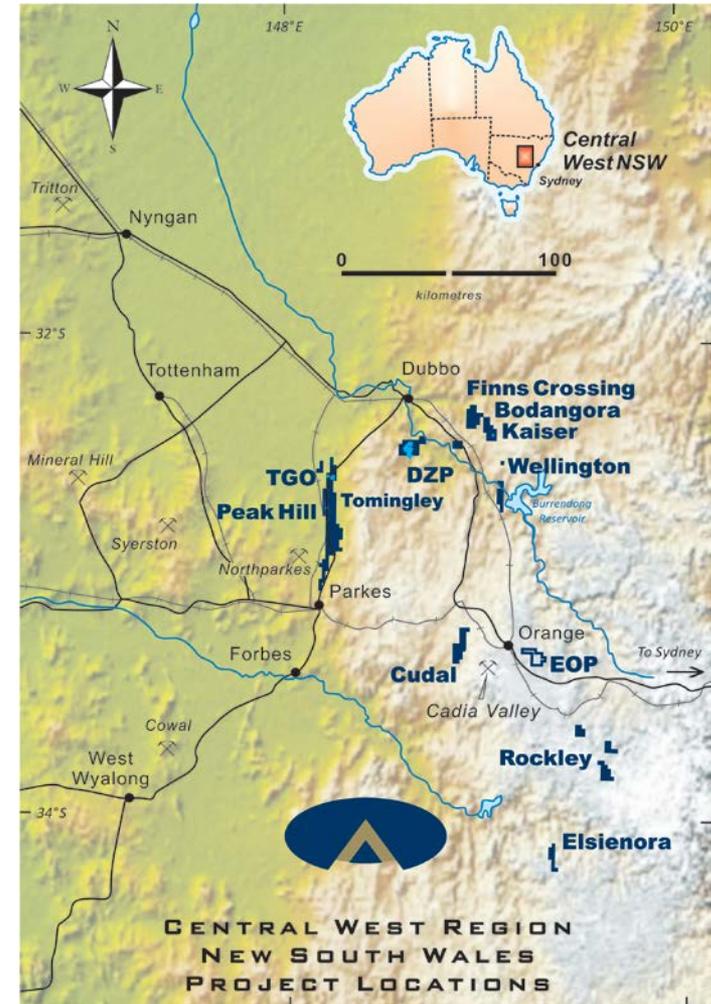




**ALKANE**  
RESOURCES LTD

- Listed on ASX since 1969, also listed on OTCQX (US)
- ~6,300 shareholders
- Multi commodity explorer, miner and developer focused on Central West of NSW, Australia
- Active in region for more than 20 years
- Developed Peak Hill Gold Mine in 1996, operated to 2005 being the end of mine life
- Tomingley Gold Operations (TGO) construction completed on time/budget; first gold production February 2014; providing cash flow to assist with DZP development
- World-class Dubbo Zirconia Project (DZP) front end engineering and design completed; project approval received; project at pre-construction stage; financing in progress
- Successful ongoing exploration program to provide a pipeline of development projects

# Corporate Profile





**ALKANE**  
RESOURCES LTD

# 1H FY2016 Snapshot

Indicative Shareholder Base as at 31 March 2016

## 1H FY2016 Financials

- Total income A\$56.2 million
- Profit before income tax A\$8.9 million
- Operating cash flow A\$19.1 million
- Total equity A\$178.1 million
- Market cap at 21 April ~A\$90 million
- Issued capital 414.2 million shares
- Cash and bullion A\$19.2 million

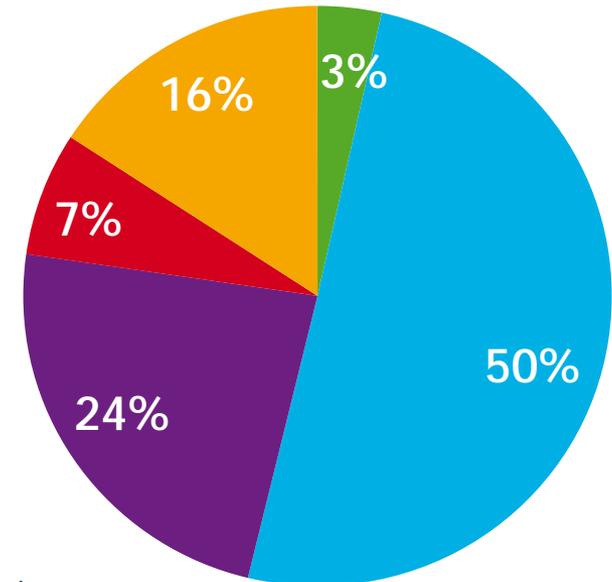
## Tomingley Gold Operations

- Production 35,136 ounces
- Gold revenue A\$55.4 million
- AISC<sup>(1)</sup> A\$1,270/oz (expected LOM average ~A\$1,000 - A\$1,100)
- Profit before income tax A\$12.9 million
- Capital A\$10.9 million (A\$9.4M deferred waste)

## Dubbo Zirconia Project

– ECI, process development, marketing, land acquisitions

- 1H FY16 total outflows A\$7.0 million (FY15 A\$15.8 million)
- Funded from TGO cash flows



- Hedge Funds
- Retail & others
- Directors & Management
- Foreign Institution
- Domestic Institutions

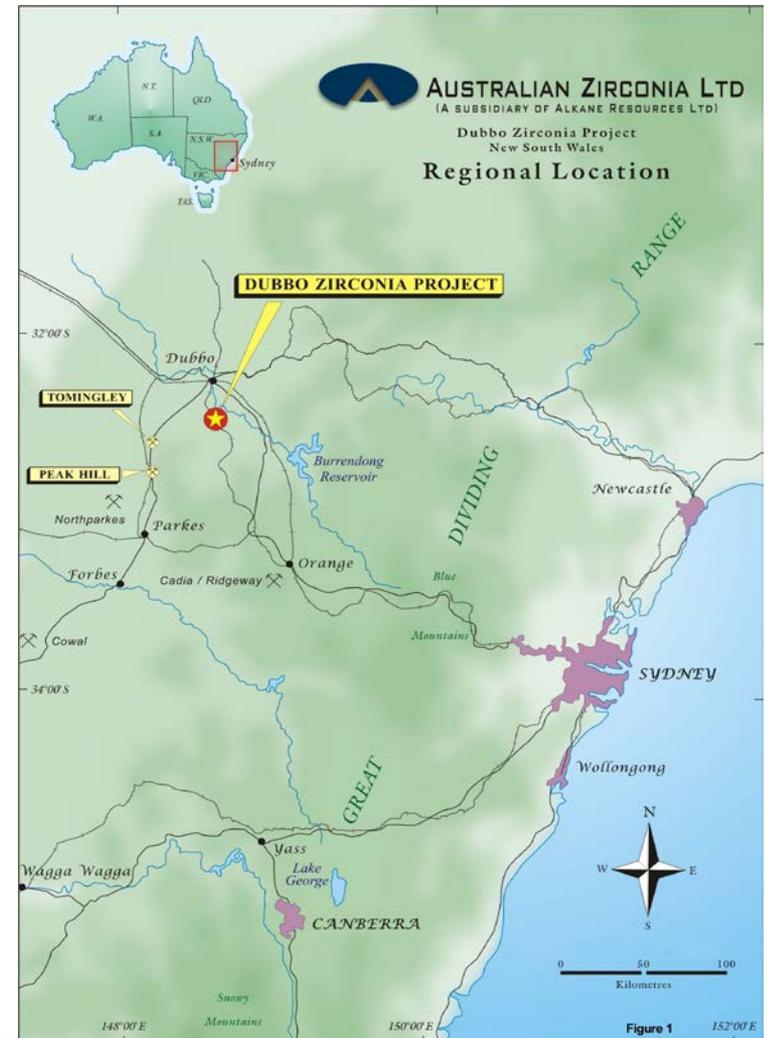
### Major Shareholders:

- ~22% Abbotsleigh (Gandel Metals)
- ~10% Fidelity Group

<sup>(1)</sup> Refer to ASX Quarterly Activities Report dated 20 April 2016 for definition

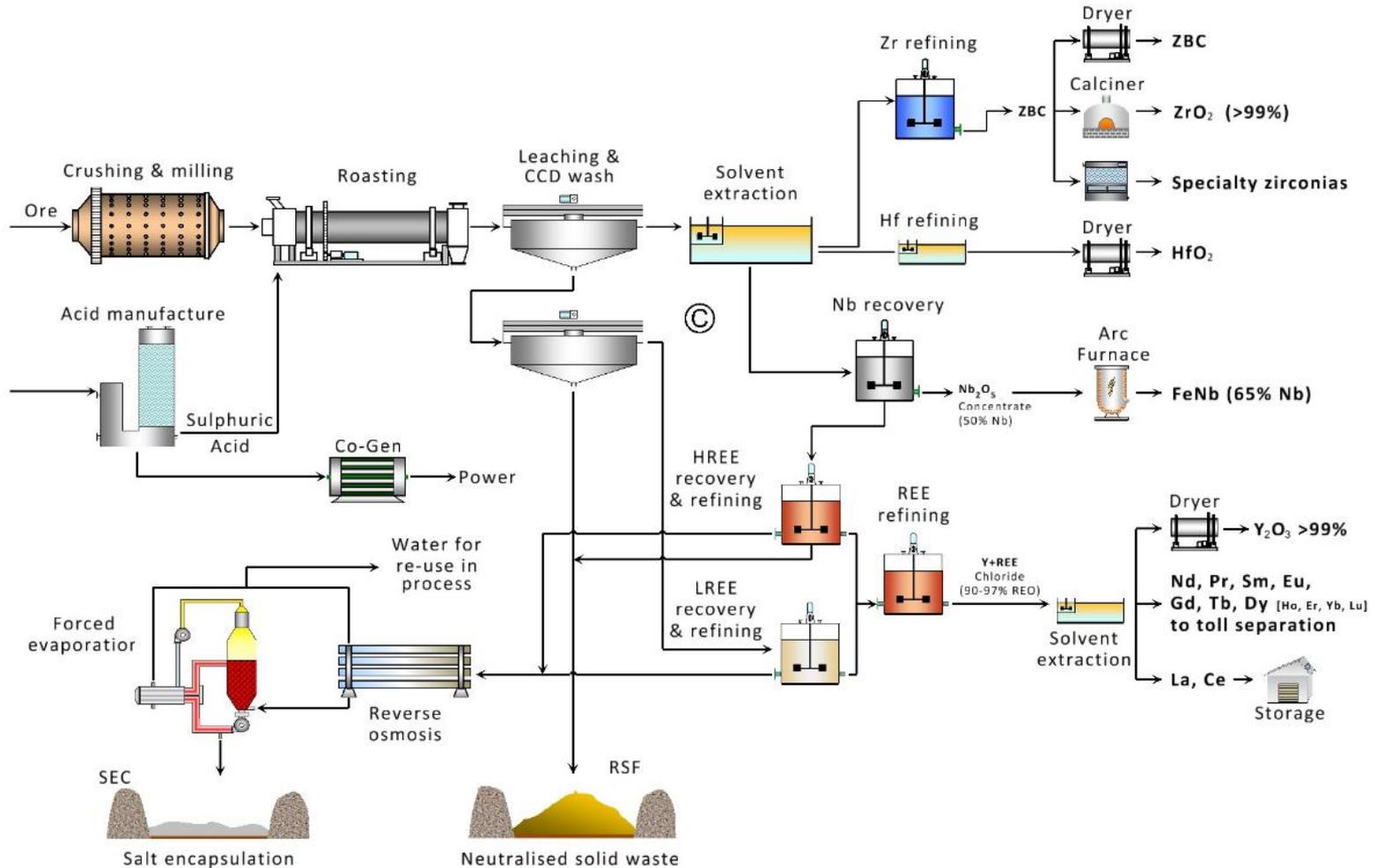
# Dubbo Zirconia Project

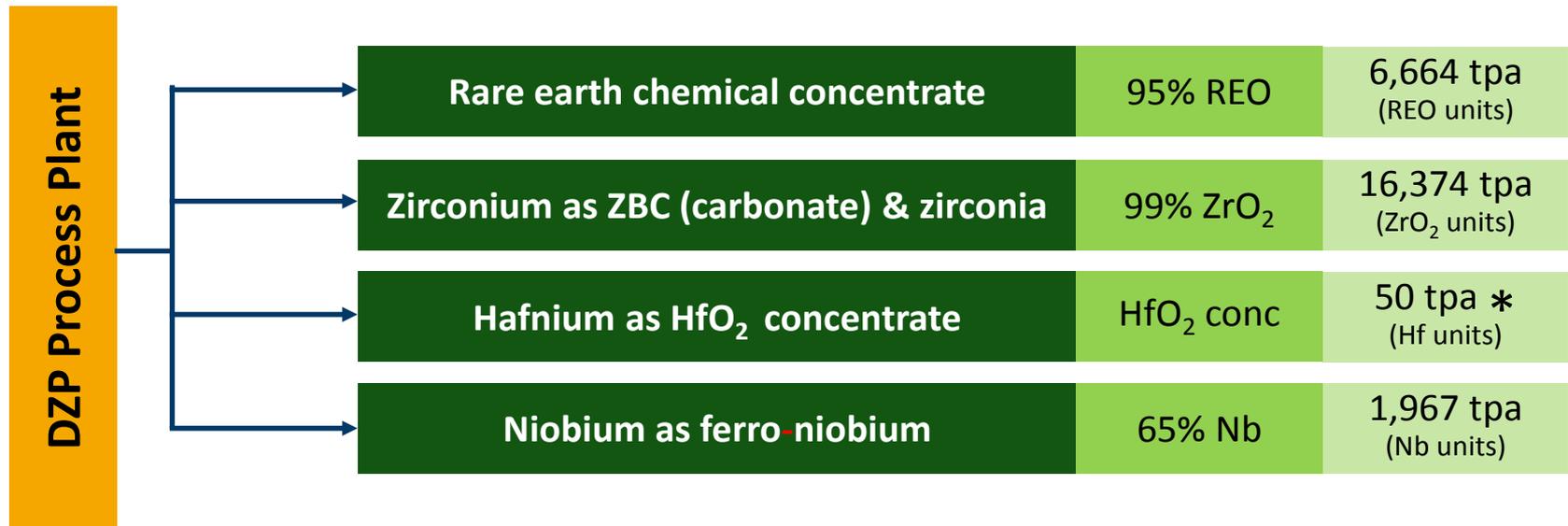
- Located 400km northwest of Sydney within a region that has substantial infrastructure – roads, rail, power, gas, light engineering, people (~100,000), being a large agricultural and mining area
- A very large polymetallic resource of the metals zirconium hafnium, niobium (tantalum), yttrium and rare earths
- Reserve supports 35 year mine life at 1 million tonne ore processing per annum with defined resource supporting an 80 year open pit operation
- Demonstrated flow sheet with pilot plant and products for market evaluation operated at ANSTO since 2008
- All State and Federal environment approvals completed by March 2016
- August 2015 Front End Engineering Design (FEED) study confirmed the robust technical and financial DFS of April 2013
- Finnish technology/engineering solutions company Outotec appointed for Early Contractor Involvement (ECI) in September 2015 to present a fixed price EPC
- Sumitomo Mitsui Banking Corporation financial advisors



Note: ASX announcements 16 November 2011, 11 April 2013, 30 October 2013, 27 August 2015 - the Company confirms that all material assumptions and technical parameters underpinning the estimated Mineral Resources and Ore Reserves, and production targets and the forecast financial information as disclosed continue to apply and have not materially changed.

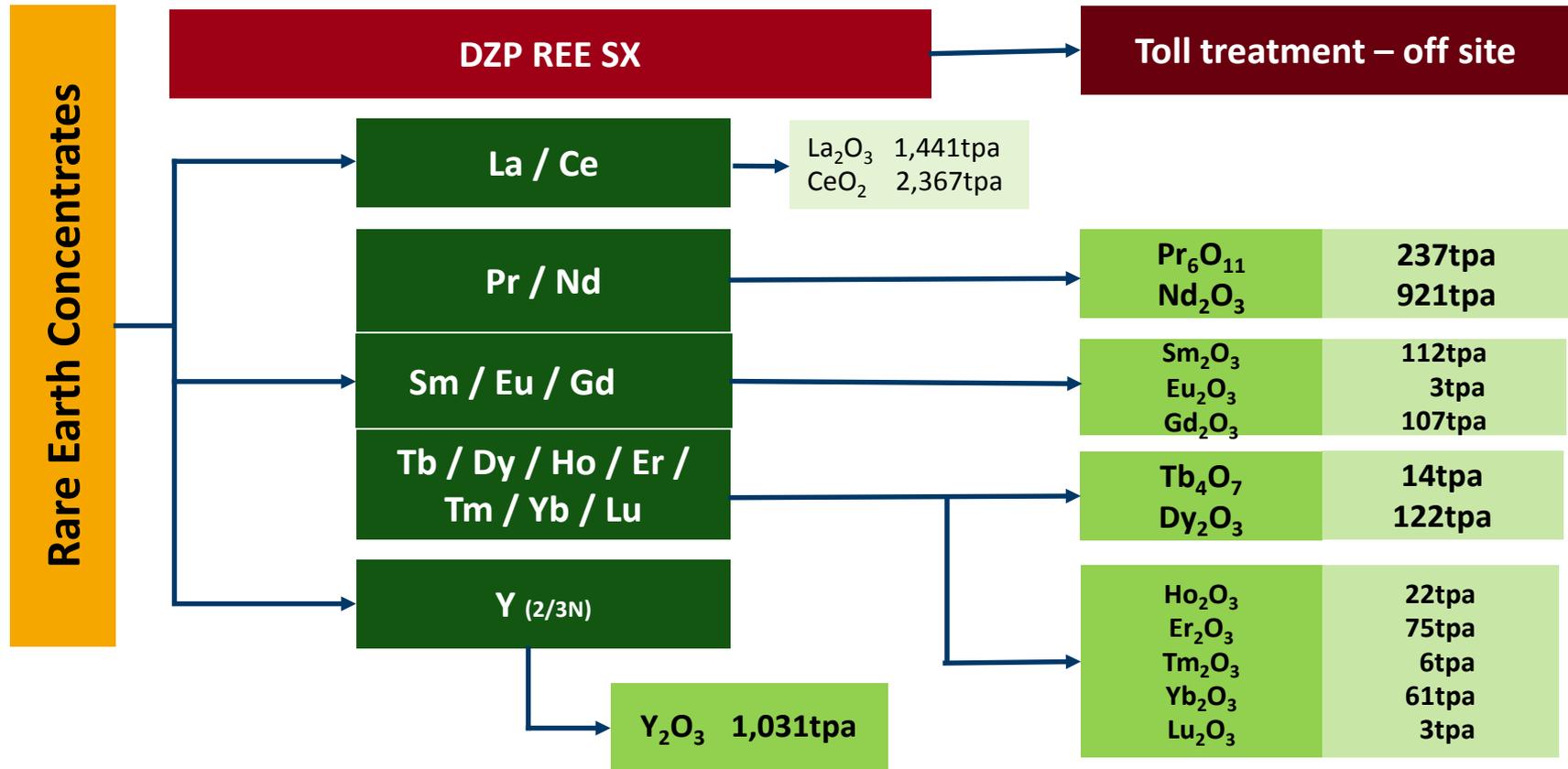
# Process Flowsheet





\* Start up output. 200tpa potential depending upon market demand

Tonnage based upon recoveries developed from mass balances of the demonstration pilot plant.  
Total output approximately 25,200 tpa of all products



Tonnage based upon recoveries developed from mass balances of the demonstration pilot plant, and preliminary solvent extraction stages on site at the DZP. Total saleable RE products from site ~1,030 tpa and off site ~ 1,675 tpa.

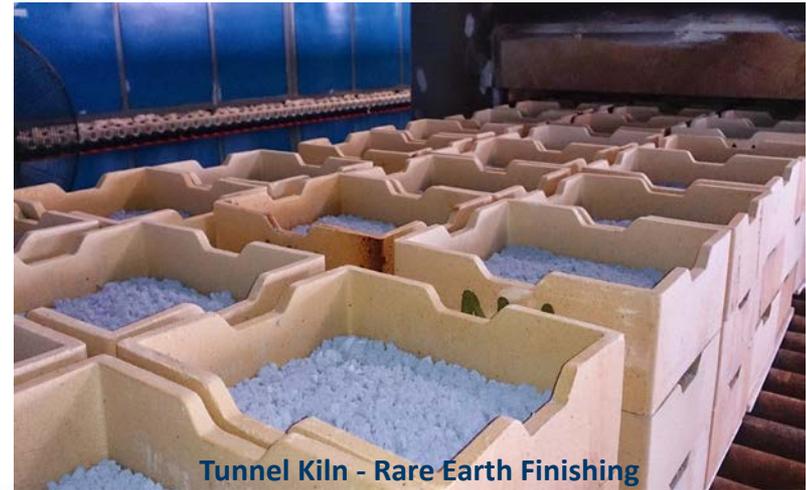
- **Joint venture with Treibacher Industrie AG to produce and market ferro-niobium**
- **Finalising a zirconium product and sales marketing agreement with European producer and trader (40 years in Zr) for world wide distribution**
- **Off-site rare earth processing LOI concluded with Vietnam Rare Earth (VRE) to enable production and marketing of separated rare earth products, and downstream value added metal alloy production**
- **Continued discussions with multiple end users for separated rare earth products, specifically aerospace and permanent magnet industries**
- **Discussions with organisations regarding supply of high purity Zr feed for reactor grade metal, and JV for hafnium metal production. The DZP will supply separate Zr and Hf feed and therefore production of either metal is not linked to the other as current**



- **Phu Ly** – 4,000tpa REO separation plant producing La, Ce, Nd, Pr, Dy and Tb
  - Selling certified products into Asia
- **Hai Phong** – 1,200tpa RE metal /alloy plant
  - Selling certified RE metals into Asian permanent magnet manufacturers
- **AZL – VRE Agreement**
  - Toll process DZP RE concentrate feed to produce separated rare earth products to certified standard
  - Establish a joint marketing company to expand VRE’s market base into Europe and North America using VRE existing feed
  - Replace existing feed progressively as DZP comes on stream
  - Expand product output to build on AZL’s customer base in aerospace and industrial groups in Europe and North America
  - Expand production facilities to increase market penetration
- **VRE Costs** – currently equal to or less than quoted for Chinese rare earth industry



Rare Earth Separation Plant



Tunnel Kiln - Rare Earth Finishing

# Cleantech and Technology Applications

- **ZIRCONIUM:** Auto catalysts for emissions minimization; thermal barrier coatings for turbines (jet and industrial); ceramics; special alloys/glass; paint drying; paper coating; jewelry
- **HAFNIUM:** turbine super alloys (jet and industrial); special ceramics; k-gates (computer chips). New applications such as radiative cooling
- **NIOBIUM:** special alloys (steel for tensile strength and lightness); other super alloys; superconductors; coinage
- **RARE EARTHS:** Permanent magnets for electric motors (wind turbines, marine, hybrid and electric cars); catalysts for emissions minimization; batteries; phosphors for energy efficient lighting; numerous electronic applications; photovoltaics; gasless refrigeration

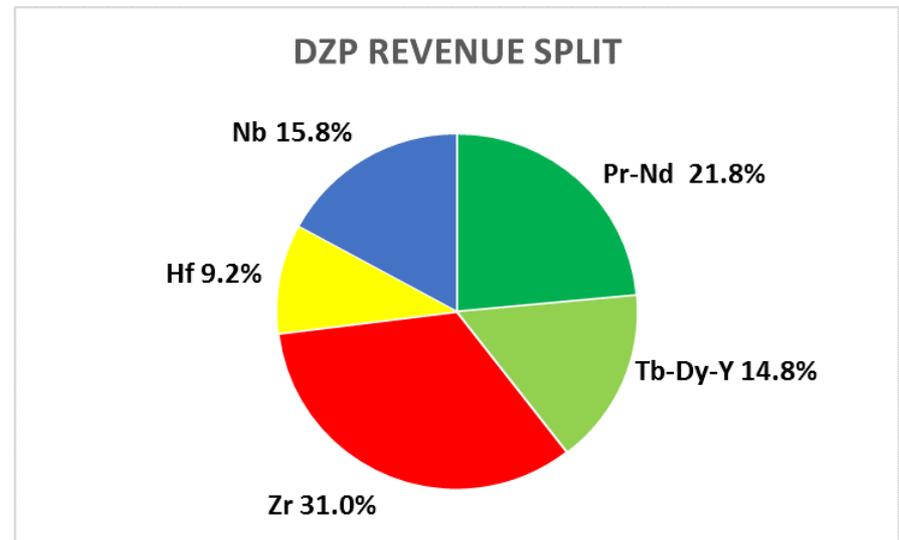


## Front End Engineering Design (FEED) completed August 2015 on 1Mtpa ore processed

<b>Capex</b>	US\$0.97B / US\$77M contingency
<b>Revenue</b>	US\$430 - \$470Mpa
<b>Opex</b>	US\$195Mpa
<b>EBITDA</b>	US\$235 - \$275Mpa
<b>20 year NPV</b>	US\$0.92B (8%) and 17.5% IRR

Revenue based upon Chinese domestic rare earth prices and current spot ranges for Zr and Nb, and a long term sustainable Hf price.

Rare earth revenues largely derived from Pr, Nd, Tb, Dy and Y (for production of RE magnets and special ceramics/alloys)



Operating costs to produce a kilogram of product range from US\$7.00 to US\$8.00/kg

Revenue averages US\$17.00/kg (REO US\$23/kg or US\$56/kg without La/Ce; Zr US\$8.26/kg; Hf US\$800/kg; Nb US\$40/kg)

Capital intensity ~ US\$35/kg of product

# Key Milestones to Development

Milestone	Timing*
<b><u>Project Resources</u></b>	
<ul style="list-style-type: none"> <li>Acquire remaining key project land parcels</li> <li>Secure remaining water resources</li> <li>Powerline easement option fees</li> </ul>	Q1/Q2 2016 Project funding Project funding
<b><u>Key Agreements</u></b>	
<ul style="list-style-type: none"> <li>Rare earth toll processing agreement</li> <li>Product offtake agreements (Zr, Hf and REEs)</li> <li>Zirconium marketing and sales agreement</li> <li>EPC construction contract(s)</li> </ul>	Q2 2016 Q2/Q3 2016 Q2 2016 In progress
<b><u>Engineering, Design &amp; Product Development</u></b>	
<ul style="list-style-type: none"> <li>Engineering and design at bankable level</li> <li>Engineering &amp; design improvements from ECI (CP to Funding)</li> <li>Pilot plant run to confirm Hf circuit and produce marketing samples</li> </ul>	Completed In progress H2 2016
<b><u>Construction and Production</u></b>	
<ul style="list-style-type: none"> <li>Financing</li> <li>Detailed design and Construction</li> <li>Production</li> </ul>	Staged H2 2016/2017 H2 2016/2018 H2 2018/2019

\* Estimates of times are based on a current assessment of the stage of negotiations and are indicative only and are subject to change

- **Internationally strategic with supply of several critical metals from non-Chinese sources**
- **Business case has robust revenues, even at current Chinese domestic RE and Zr prices**
- **Full spectrum of rare earth magnet materials – neodymium, praseodymium, dysprosium and terbium produced, as well as other “heavy” rare earths and yttrium which have developing advanced materials applications**
- **The DZP’s diversified output gives a very different revenue profile to Lynas’ Mt Weld and Molycorp’s Mt Pass pure rare earth operations, providing increased stability in variable markets**
- **Production of zirconium chemicals not related to zircon or the mineral sands industry. New high purity zirconium product can generate increased revenue**
- **Potential to be the world’s largest hafnium producer and supply long term stable production and pricing into the expanding aerospace and industrial gas turbine industries, not related to the production of reactor grade zirconium metal**
- **Current estimated operating cost structure very competitive @ US\$7 - \$8/kg of product produced, which places the project in the lowest quartile producer**



# Disclaimer

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This presentation contains certain forward looking statements and forecasts, including possible or assumed reserves and resources, production levels and rates, costs, prices, future performance or potential growth of Alkane Resources Ltd, industry growth or other trend projections. Such statements are not a guarantee of future performance and involve unknown risks and uncertainties, as well as other factors which are beyond the control of Alkane Resources Ltd. Actual results and developments may differ materially from those expressed or implied by these forward looking statements depending on a variety of factors. Nothing in this presentation should be construed as either an offer to sell or a solicitation of an offer to buy or sell securities.

This document has been prepared in accordance with the requirements of Australian securities laws, which may differ from the requirements of United States and other country securities laws. Unless otherwise indicated, all ore reserve and mineral resource estimates included or incorporated by reference in this document have been, and will be, prepared in accordance with the JORC classification system of the Australasian Institute of Mining, and Metallurgy and Australian Institute of Geosciences.

## **Competent Person**

Unless otherwise stated, the information in this presentation that relates to mineral exploration, mineral resources and ore reserves is based on information compiled by Mr D I Chalmers, FAusIMM, FAIG, (director of the Company) who has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which 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. Ian Chalmers consents to the inclusion in the presentation of the matters based on his information in the form and context in which it appears.



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# *Thank you*

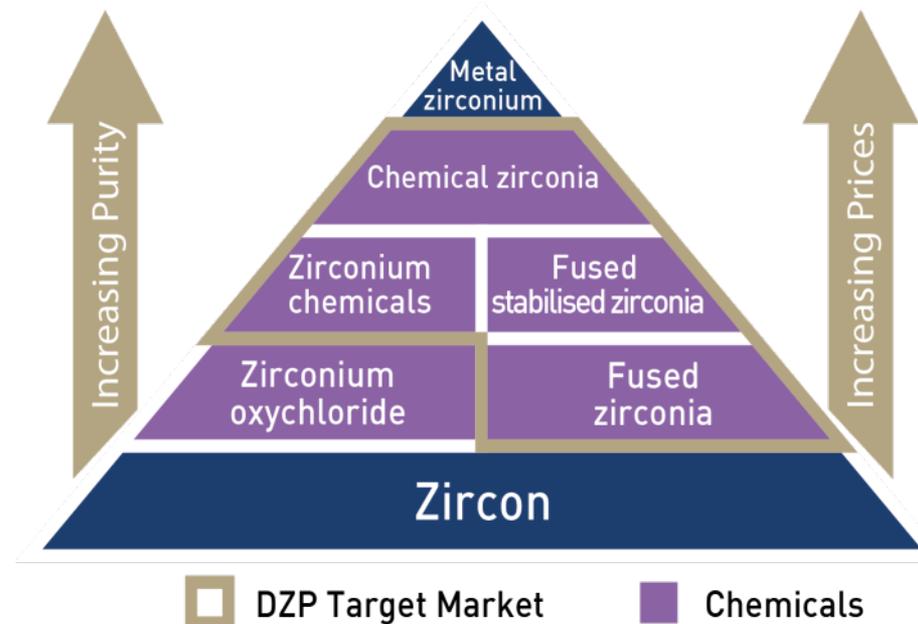
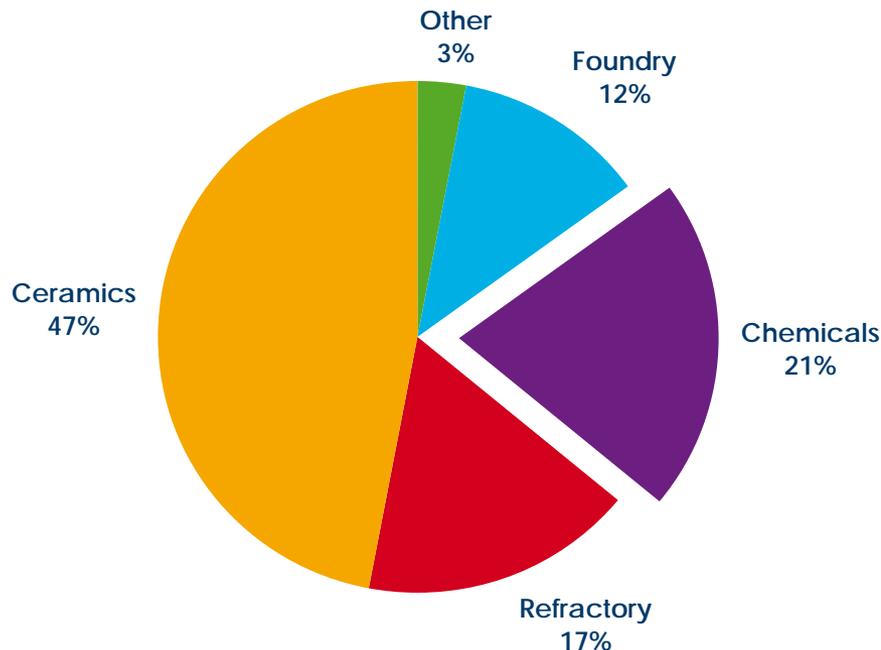
*Is Alkane the only “rare earth company” in the world today reporting a profit?*



Neodymium Mining the metals of the future.

## Zircon Demand by End Use

(2015 ~ 1 million tonnes)

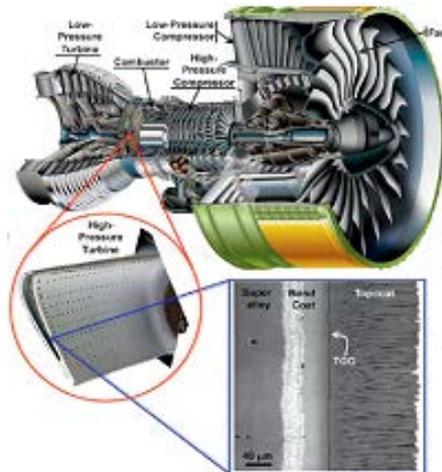


- Global market US\$2-3B
- 2015 producer zircon inventories still high
- Market expected to stabilise through 2016 - 2017
- CAGR anticipated at 5% - 7% pa after stabilisation

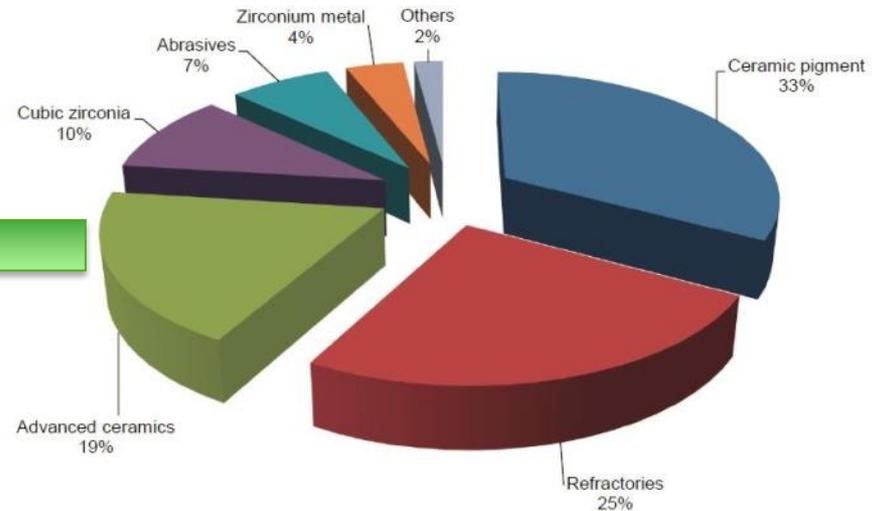
- China dominates downstream zirconium industry (85-90%)

# Zirconium Applications

## Auto exhaust catalysts – ceria stabilised zirconia



**Thermal barrier coatings – yttria stabilised zirconia for jet and industrial gas turbines, and many other applications**

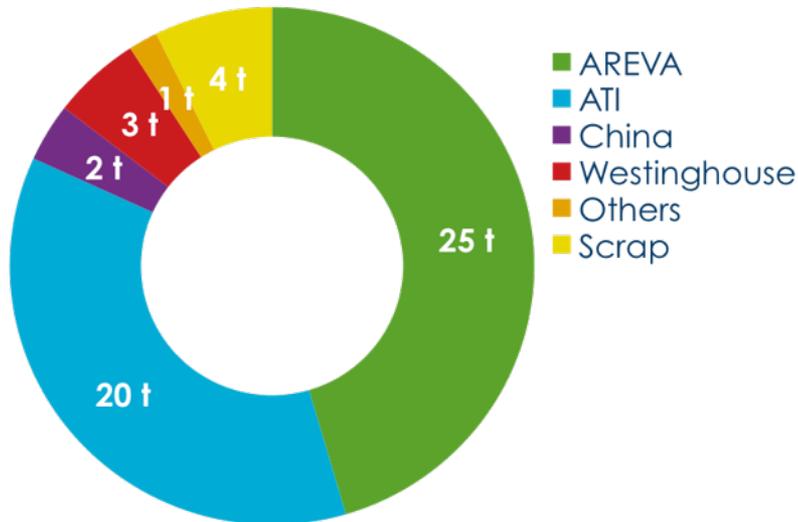


**Substantial growth in advanced ceramics and cubic zirconia (jewellery)**

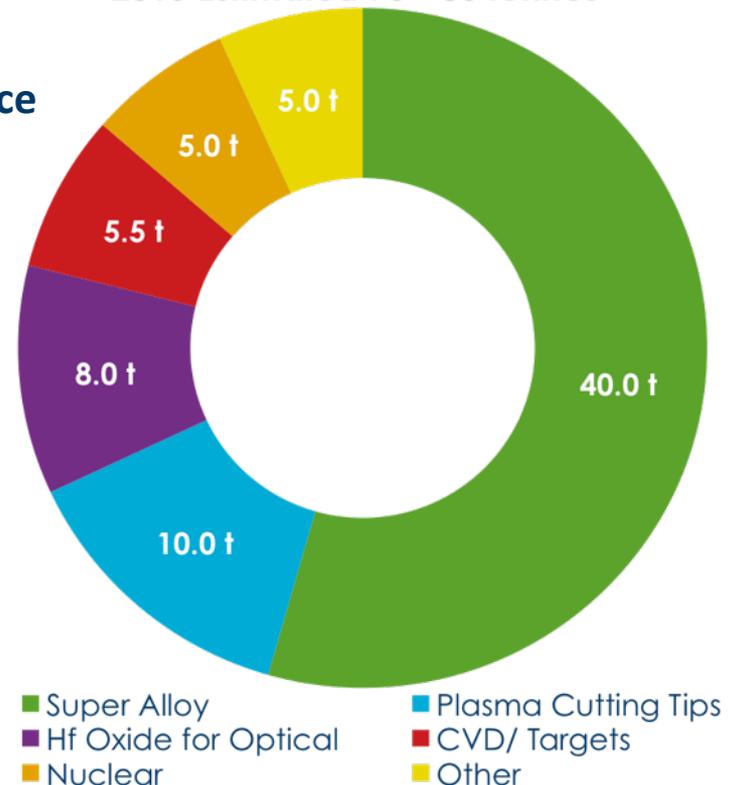
**Current world demand for zirconium chemicals / zirconia ~ 160,000tpa**

- Super Alloys - 73% of 2015 supply
- By-product from zirconium metal
  - Depends on nuclear industry
- Prices escalating through demand by aerospace industries 2014 into 2015

**Hafnium Supply**  
2015 Estimated 50 - 60 tonnes

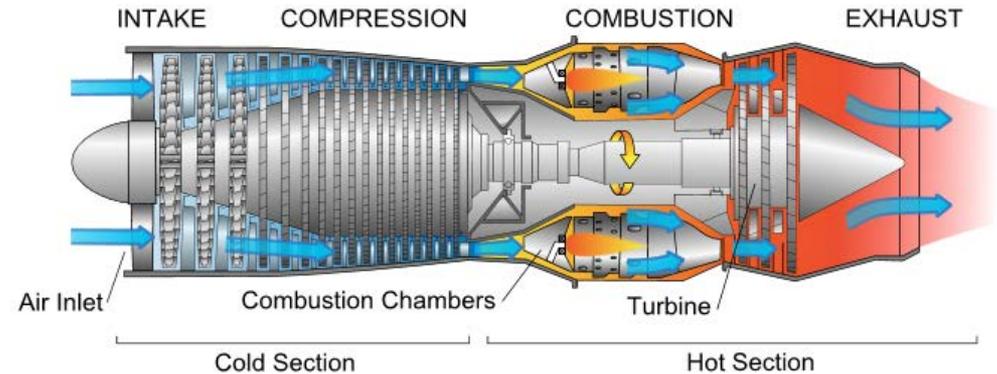
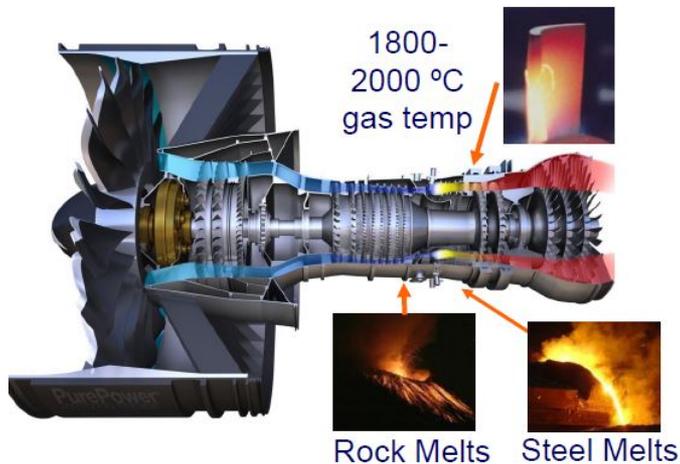


**Hafnium Demand**  
2015 Estimated 70 - 80 tonnes



# Hafnium Applications

**Jet Engine Turbine**



**Industrial Gas Turbine**

**Forecast International: gas turbine power generation market has entered a period of sustained growth:**

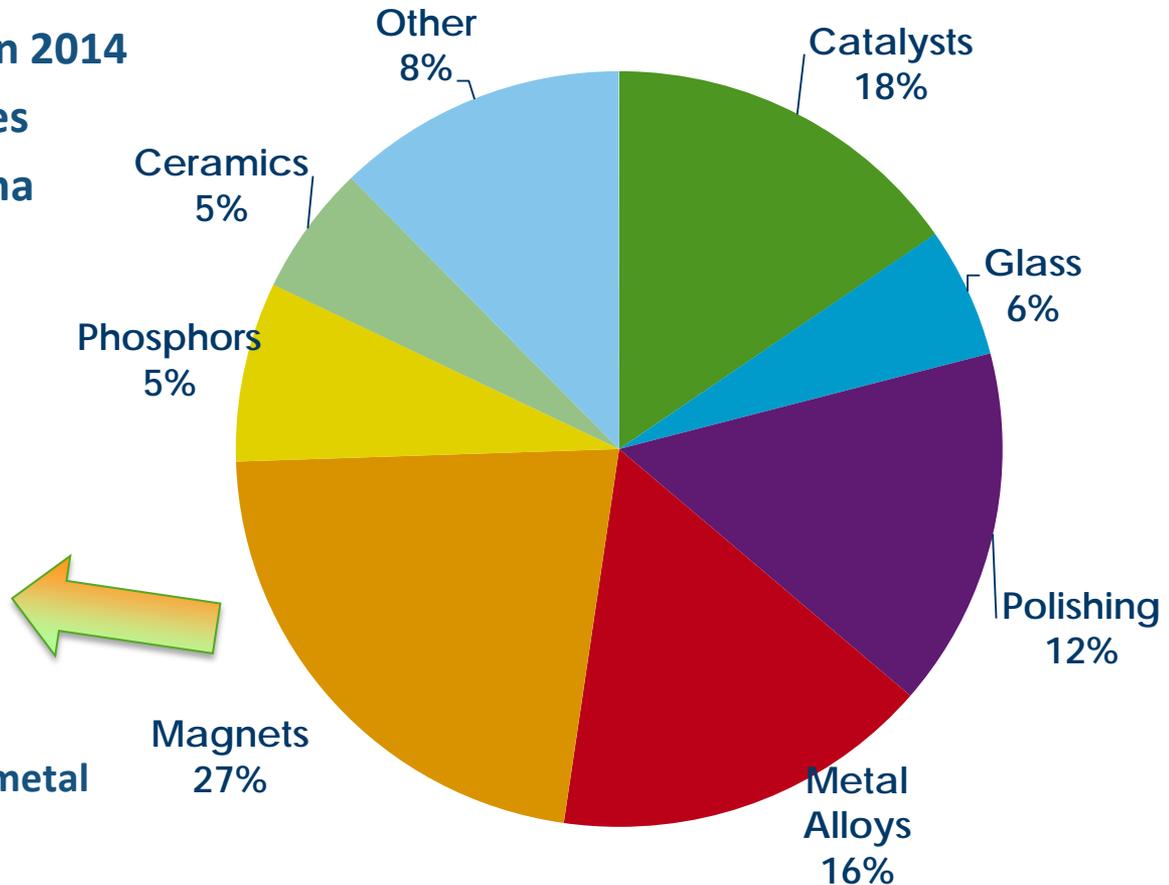
- 18,800 gas turbine engines for power generation in the 2014-2028 period. The value of this production is US\$341.7 billion.

**Addition of 1%-2% Hf to NiCo alloys raises operating temperature from 1,400°C to 2,000°C providing fuel efficiencies and emission minimisation.**

- US\$3-5B Global market
- 136,000t Annual consumption 2014
- 3-5% Annual growth estimates
- 85-90% REE produced by China

- Permanent magnet dominant consumer and growth ~ 8% pa
- Annual magnet market ~US\$20B
- Major use for Nd, Pr, Dy and Tb
- Growth in other REs for special metal alloys and ceramics

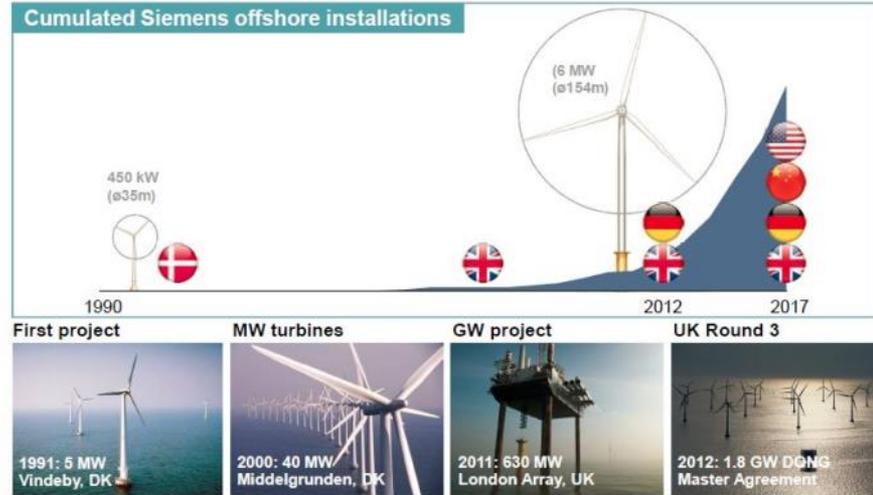
REE Demand 2016 by Application



# Rare Earth Applications – Permanent Magnets

## Permanent Magnets – major growth

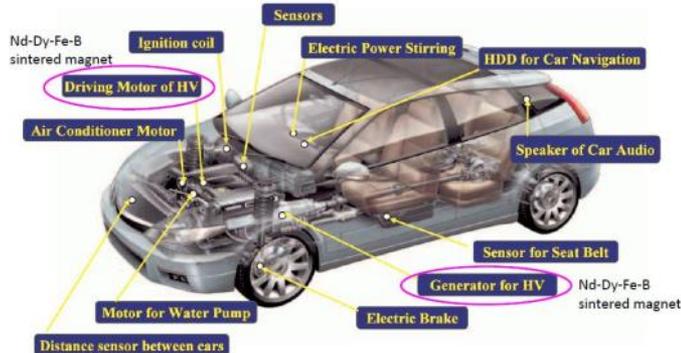
- Hybrid and electric cars
- Wind turbine
- Industrial gas turbines
- Marine electric motors



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## More than 100 magnet motors in one car

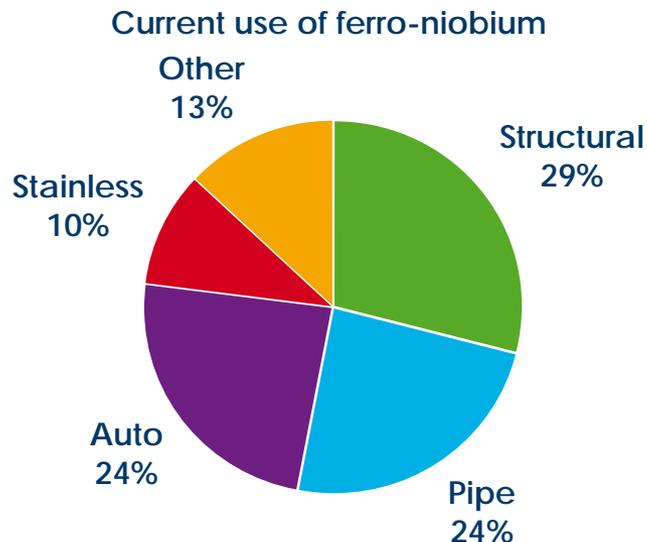
Ferrite magnet → Nd magnet → High-end ferrite magnet (added La, Co), SRM etc.



## Thyssen Krupp Maritim Permasyn marine propulsion systems



- 90% of Nb used in standard grade ferro-niobium for the production of high strength low alloy (HSLA) steels
- World production estimated at 60,000t Nb in 2014. CBMM in Brazil accounts for 85%
- Global market US\$3-4B. Price stability since 2008, including GFC
- CAGR anticipated at 5%. Demand expected to be driven by greater intensity of use in steels by BRIC producers



## Dubbo Zirconia Project – Mineral Resources

Toongi Deposit	Tonnage (Mt)	ZrO <sub>2</sub> (%)	HfO <sub>2</sub> (%)	Nb <sub>2</sub> O <sub>5</sub> (%)	Ta <sub>2</sub> O <sub>5</sub> (%)	Y <sub>2</sub> O <sub>3</sub> (%)	REO (%)
Measured	35.70	1.96	0.04	0.46	0.03	0.14	0.75
Inferred	37.50	1.96	0.04	0.46	0.03	0.14	0.75
<b>Total</b>	<b>73.20</b>	<b>1.96</b>	<b>0.04</b>	<b>0.46</b>	<b>0.03</b>	<b>0.14</b>	<b>0.75</b>

*These Mineral Resources are based upon information compiled by Mr Terry Ransted MAusIMM (Alkane Chief Geologist) who is a competent person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. Terry Ransted consents to the inclusion in the report of the matters based on his information in the form and context in which it appears. The full details of methodology were given in the 2004 Annual Report.*

## Dubbo Zirconia Project – Ore Reserves

Toongi Deposit	Tonnage (Mt)	ZrO <sub>2</sub> (%)	HfO <sub>2</sub> (%)	Nb <sub>2</sub> O <sub>5</sub> (%)	Ta <sub>2</sub> O <sub>5</sub> (%)	Y <sub>2</sub> O <sub>3</sub> (%)	REO (%)
Proved	8.07	1.91	0.04	0.46	0.03	0.14	0.75
Probable	27.86	1.93	0.04	0.46	0.03	0.14	0.74
<b>Total</b>	<b>35.93</b>	<b>1.93</b>	<b>0.04</b>	<b>0.46</b>	<b>0.03</b>	<b>0.14</b>	<b>0.74</b>

*These Ore Reserves are based upon information compiled by Mr Terry Ransted MAusIMM (Alkane Chief Geologist) who is a competent person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. The reserves were calculated at a 1.5% combined ZrO<sub>2</sub>+Nb<sub>2</sub>O<sub>5</sub>+Y<sub>2</sub>O<sub>3</sub>+REO cut off using costs and revenues defined in the notes in ASX Announcement of 16 November 2011. Terry Ransted consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.*

**Note: ASX announcements 16 November 2011, 11 April 2013, 30 October 2013 and 27 August 2015 - the Company confirms that all material assumptions and technical parameters underpinning the estimated Mineral Resources and Ore Reserves, and production targets and the forecast financial information as disclosed continue to apply and have not materially changed.**

# Resource & Reserves: Tomingley

TOMINGLEY GOLD OPERATIONS MINERAL RESOURCES (as at 30 June 2015)									
DEPOSIT	MEASURED		INDICATED		INFERRED		TOTAL		Total Gold (Koz)
	Tonnage (Kt)	Grade (g/t Au)	Tonnage (Kt)	Grade (g/t Au)	Tonnage (Kt)	Grade (g/t Au)	Tonnage (Kt)	Grade (g/t Au)	
Open Pittable Resources (cut off 0.50g/t Au)									
Wyoming One	2,171	1.7	442	1.5	735	1.1	3,348	1.5	167
Wyoming Three	206	1.7	122	1.7	2	1.1	330	1.7	18
Caloma	2,163	1.8	582	1.7	2,008	1.5	4,753	1.7	254
Caloma Two	-	-	1,085	2.4	704	1.3	1,789	2.0	112
Sub Total	4,540	1.8	2,231	2.0	3,450	1.4	10,220	1.7	551
Underground Resources (cut off 2.50g/t Au)									
Wyoming One	168	4.8	205	4.4	361	4.2	735	4.4	104
Wyoming Three	12	3.6	20	4.5	25	3.3	57	3.8	7
Caloma	0	3.1	4	2.9	81	3.2	84	3.2	9
Caloma Two	-	-	92	3.5	63	3.2	155	3.3	17
Sub Total	180	4.7	321	4.1	530	3.9	1,031	4.1	136
<b>TOTAL</b>	<b>4,720</b>	<b>1.9</b>	<b>2,552</b>	<b>2.3</b>	<b>3,979</b>	<b>1.7</b>	<b>11,251</b>	<b>1.9</b>	<b>687</b>

TOMINGLEY GOLD OPERATIONS OPEN PIT ORE RESERVES(as at 30 June 2015)							
DEPOSIT	PROVED		PROBABLE		TOTAL		Total Gold (Koz)
	Tonnage (Kt)	Grade (g/t Au)	Tonnage (Kt)	Grade (g/t Au)	Tonnage (Kt)	Grade (g/t Au)	
Wyoming One	1,665	1.6	202	1.3	1,867	1.5	94
Wyoming Three	173	1.6	5	1.4	178	1.5	9
Caloma	1,247	1.9	72	1.5	1,319	1.8	80
Caloma Cut Back	222	1.5	66	1.4	288	1.4	14
Caloma Two	-	-	243	3.5	243	3.5	27
Stockpiles	468	0.8	-	-	468	0.8	12
<b>TOTAL</b>	<b>3,775</b>	<b>1.6</b>	<b>588</b>	<b>2.2</b>	<b>4,363</b>	<b>1.6</b>	<b>235</b>

TOMINGLEY GOLD OPERATIONS UNDERGROUND ORE RESERVES(as at 10 December 2015)							
DEPOSIT	PROVED		PROBABLE		TOTAL		Total Gold (Koz)
	Tonnage (Kt)	Grade (g/t Au)	Tonnage (Kt)	Grade (g/t Au)	Tonnage (Kt)	Grade (g/t Au)	
Wyoming One(+Caloma)	224	4.0	300	3.4	514	3.7	62
<b>TOTAL</b>	<b>224</b>	<b>4.0</b>	<b>300</b>	<b>3.4</b>	<b>514</b>	<b>3.7</b>	<b>62</b>

Note: ASX announcements 21 September 2015 and 10 December 2015 - the Company confirms that all material assumptions and technical parameters underpinning the estimated Mineral Resources and Ore Reserves, and production targets and the forecast financial information as disclosed continue to apply and have not materially changed.