

ALKANE RESOURCES LTD  
AUSTRALIAN ZIRCONIA LIMITED

# Dubbo Zirconia Project

NSW Australia

*A new source of zirconium materials and other  
critical metals and oxides*



*Alister MacDonald -Technical Ceramic Marketing Services*

*Ian Chalmers – Alkane Resources Ltd*

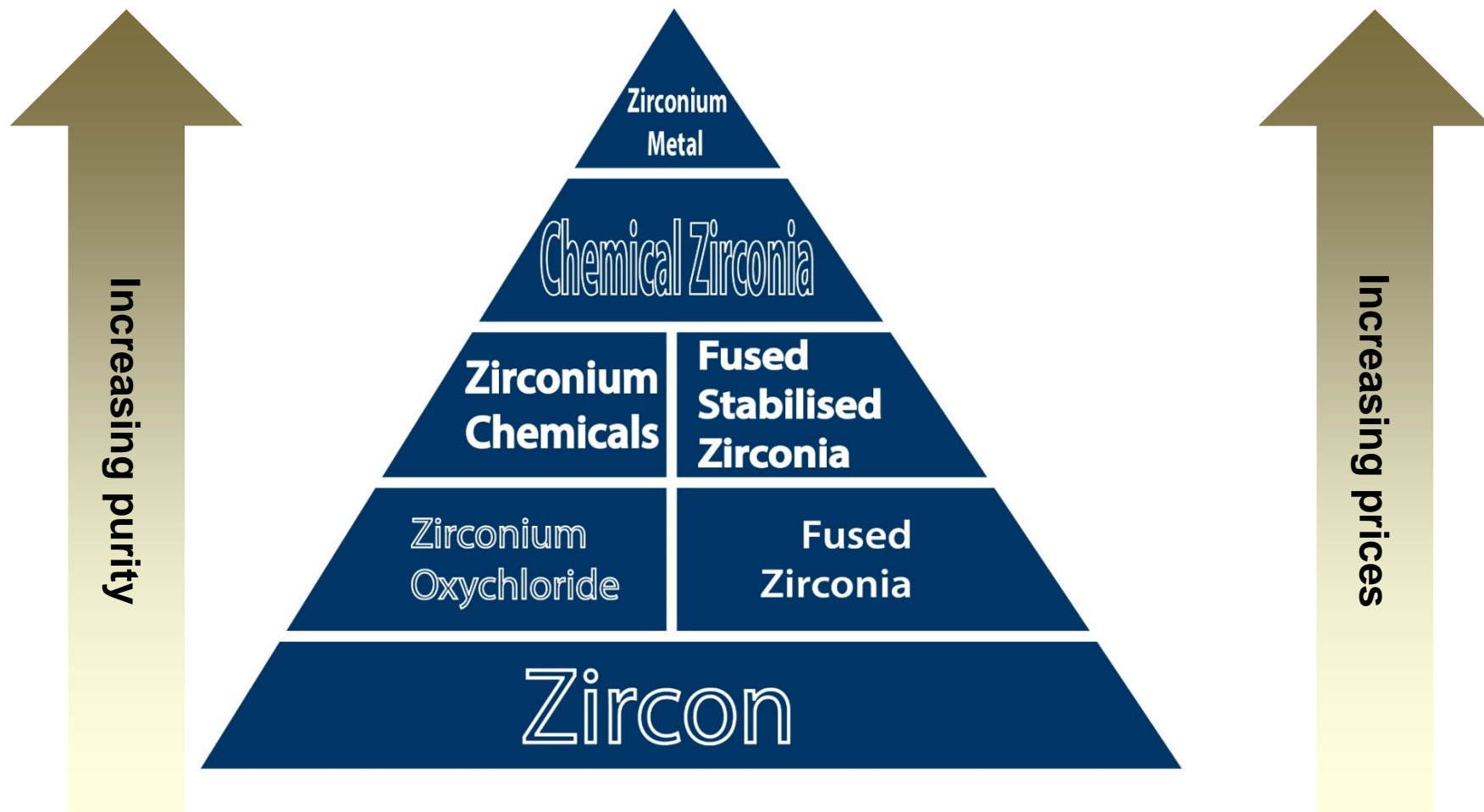


MULTI-COMMODITY MINER EXPLORER  
[www.alkane.com.au](http://www.alkane.com.au)



- Listed on ASX since 1969, also listed on OTCQX (US)
- Market cap ~\$120M
- ~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 Project (TGP) a new gold mine commenced production February 2014
- World-class Dubbo Zirconia Project (DZP) feasibility completed; development approval and financing in progress

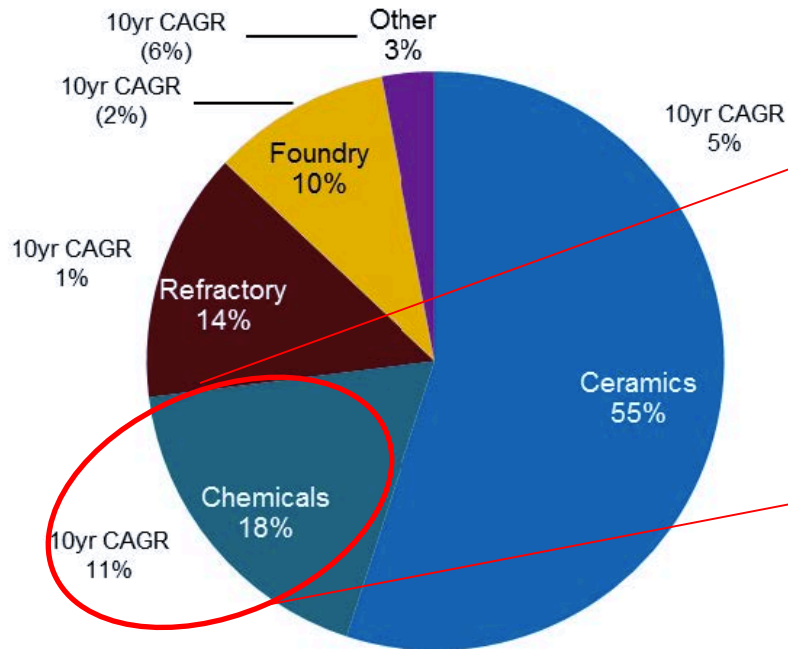




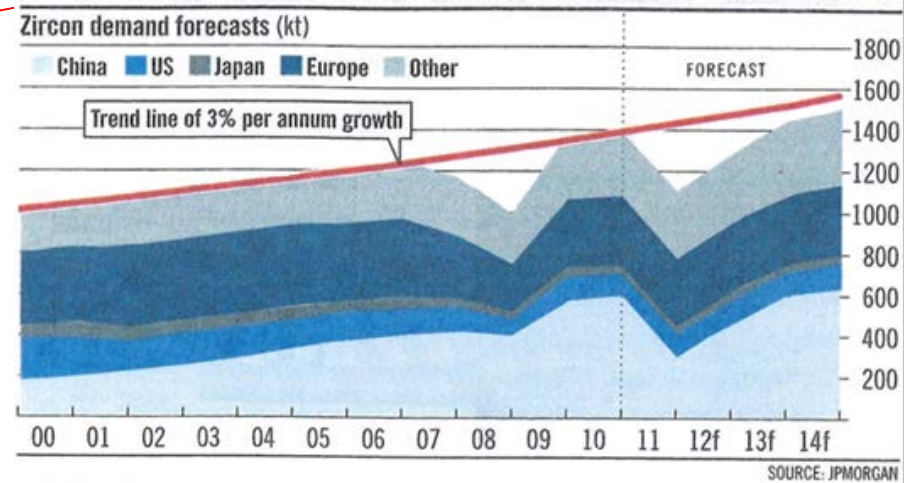
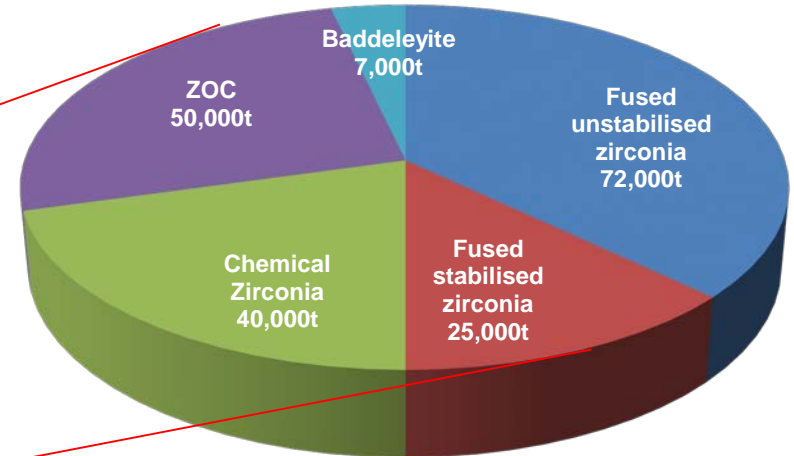
**Global Market 'Value': US\$2-3 B**



**Zircon Demand by End Use  
(2011 – 1.4mt)**



**Zirconium Chemicals Output  
(2011 – 194,000t ZrO<sub>2</sub> basis)**



- 2013 consumer zircon inventories running down
- Market expected to move back into under supply 2015 - 2016

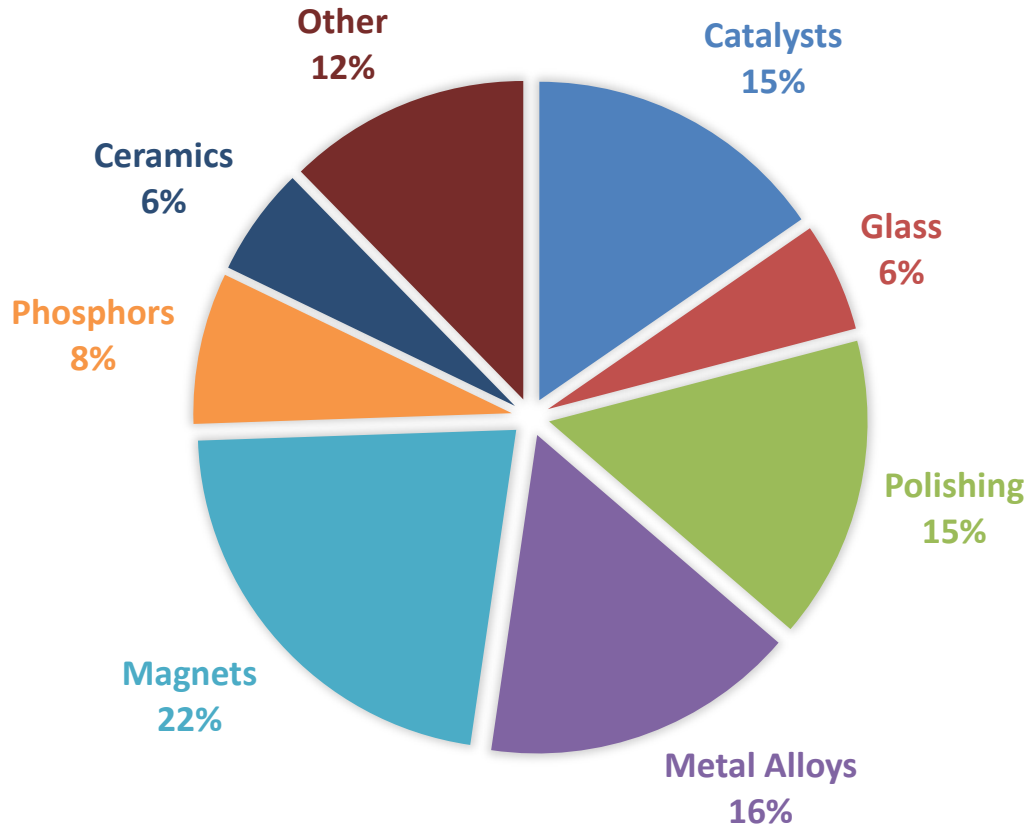
## Estimated Zirconium Demand to 2020

<i>Zirconium materials (100% ZrO<sub>2</sub> basis)</i>	<i>2011 tpa</i>	<i>2012 tpa</i>	<i>2015f tpa</i>	<i>2020f tpa</i>	<i>2020f tpa</i>
Growth rate %/year			<b>7%</b>	<b>5%</b>	<b>7%</b>
Baddeleyite	7,000	6,000	8,000	8,000	8,000
Fused unstabilised zirconia	72,000	48,000	59,000	71,000	82,000
Fused stabilised zirconia	25,000	17,000	21,000	25,000	29,000
Chemical zirconia	40,000	27,000	33,000	40,000	46,000
Zirconium chemicals	50,000	43,000	53,000	64,000	74,000
<b>Total</b>	<b>194,000</b>	<b>141,000</b>	<b>174,000</b>	<b>208,000</b>	<b>239,000</b>
Zircon required (65% ZrO <sub>2</sub> )	300,000	217,000	268,000	320,000	368,000

**21-25% of all zircon demand by 2020 consumed by zirconia / chemicals industries**  
 (48-72% increase from 2012)

- **Availability of premium zircon for fused zirconia**
  - will require ~160-180,000t
  - low Al<sub>2</sub>O<sub>3</sub> with minimal particle size < 45 micron
  - availability of zircon with <300 ppm U+Th
- **Consolidation of Chinese fused and zirconium chemical industry**
  - production is about 75% of total world market
  - imports >95% of the zircon required
- **Environmental and OH&S cost pressures**
- **Treatment of high U+Th residues for zirconium chemicals production**

## FORECAST REE DEMAND 2016



- Global market estimated at US\$3-5B of ~110,000 t
- China produces about 90% of world supply and consumed about 65%, with Japan 15% and the US 14%
- The REE industry is “imbalanced” with potential oversupply of light rare earths (Ce & La) and undersupply of heavy rare earths and neodymium
- Nd, Tb and Dy are considered to be in critical supply through to at least 2020. Pr, Y and Eu may also be critical
- Substantial inventories built up in 2011 and 2012. Currently being run down. Market expects to stabilise during 2014

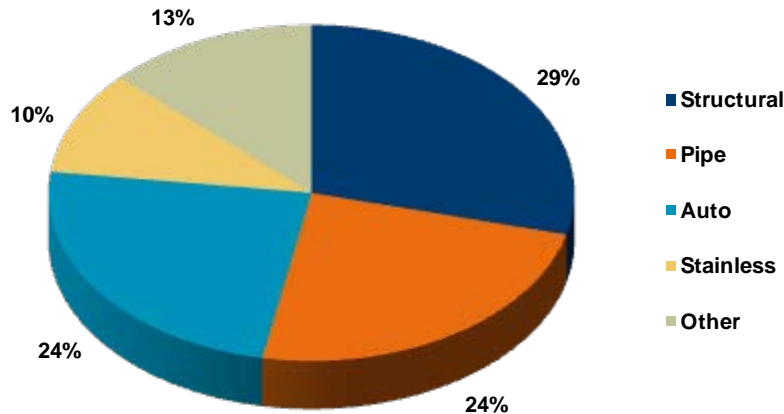
## Forecast Global Rare Earths Demand in 2017 (t REO ±20%)

Rare Earth Oxide	Demand		Supply/Production	
	REO Tonnes	Per Cent	REO Tonnes	Per Cent
Lanthanum	40,800	28.1%	47,800	27.4%
Cerium	51,295	35.4%	75,500	43.2%
Praseodymium	8,400	5.8%	8,500	4.8%
Neodymium	28,925	19.9%	27,400	15.6%
Samarium	1,400	1%	3,175	1.8%
Europium	375	0.3%	450	0.2%
Gadolinium	2,125	1.5%	2,000	1.2%
Terbium	475	0.3%	250	0.2%
Dysprosium	900	0.6%	1,000	0.6%
Erbium	1,065	0.7%	525	0.3%
Yttrium	8,975	6.2%	7,250	4.1%
Ho-Tm-Yb-Lu	265	0.2%	1,150	0.6%
<b>Total</b>	<b>145,000</b>	<b>100.0%</b>	<b>175,000</b>	<b>100.0%</b>



- **Demand in 2020: 200-240,000 tpa REO**
- **Demand trends:**
  - Greater availability of non- Chinese products
  - Greater total supply chain management
  - Higher consumption of HREEs if available
- **Supply in 2020: 240-280,000 tpa REO**
- **Supply trends:**
  - Limited scope for pure LREE projects outside China
  - Significant opportunity for HREE projects as availability of HREEs will remain an issue
  - Ongoing consolidation of industry worldwide

## Main traded product is ferro-niobium



### Autos



### ØRESUND Bridge



- 90% of Nb used in standard grade ferro-niobium for the production of high strength low alloy (HSLA) steels
- Nb HSLA steels are primarily consumed in structural and piping, but the auto industry is becoming an increasing consumer
- World production estimated at 80,000t Nb in 2012. CBMM in Brazil accounts for 85%
- Global market US\$3-4B
- CAGR 10% Demand expected to be driven by greater usage in steels of BRIC producers

- Very large polymetallic resource\* (homogenous ore body) of the metals zirconium (hafnium), niobium (tantalum), yttrium and rare earths
- Important and strategic metal mix - 25% of rare earth output is in “heavy” group
- Reserve\* supports 35 year mine life at 1Mtpa processing with defined resource potentially supporting a significantly longer operation
- ~A\$1B project cost (as per DFS released in April 2013) – 95% in processing plant, acid plant and infrastructure
- Demonstrated flow sheet with pilot plant at ANSTO (Lucas Heights) in operation since May 2008 providing products for market evaluation
- Robust technical and financial feasibility completed
- Value enhancement of core DZP products both on and off site
- EIS was lodged in June 2013, and went to public exhibition in September 2013; mid 2014 project approval
- Strong market interest in products with several MoUs executed
- Establishing long term strategic relationships with offtake partners in Japan and Europe
- Growing and diverse markets
- ECA funding discussions ongoing – progressing positively



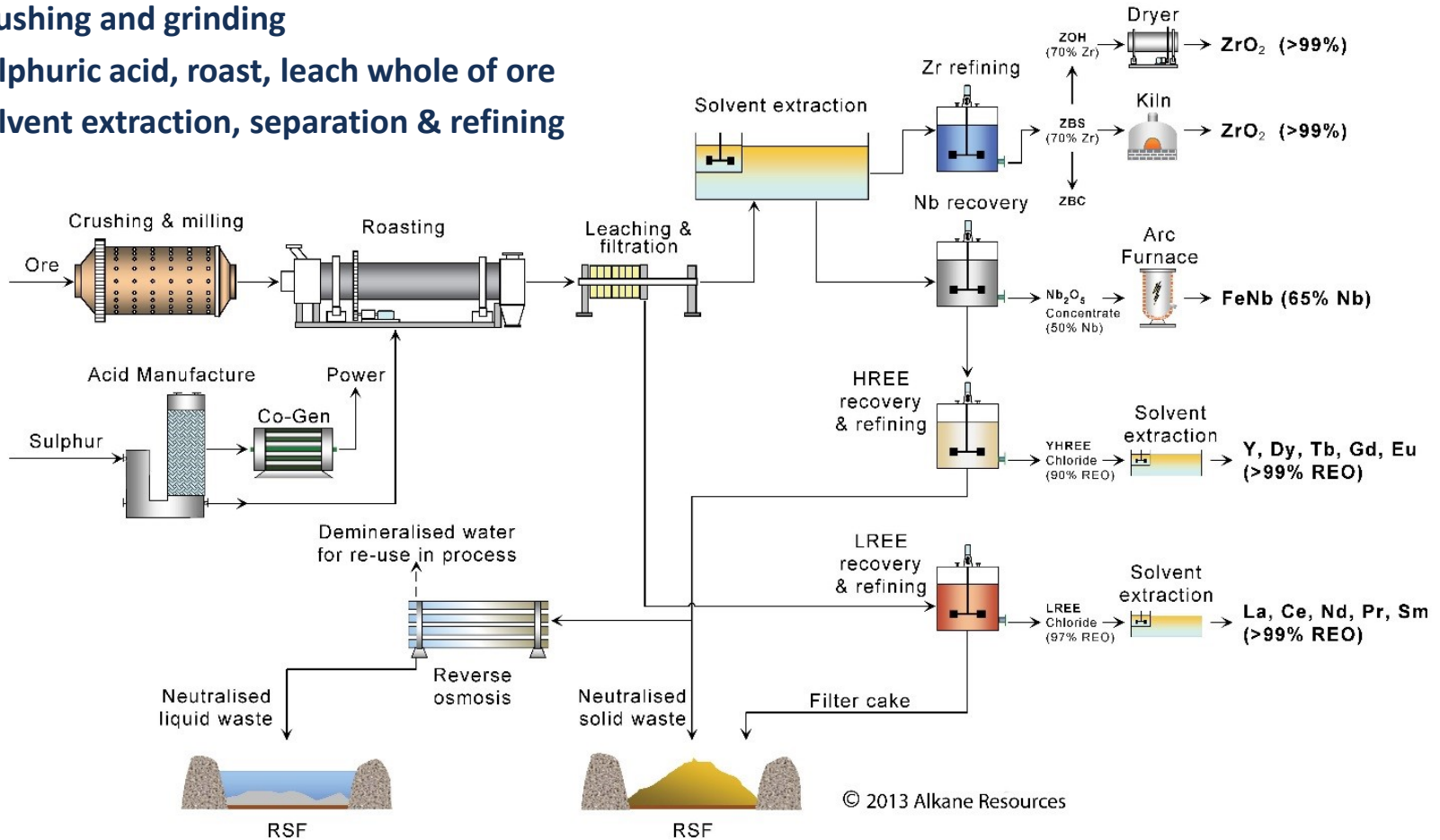
Zirconium Heavy REs	eudialyte armstrongite	$ZrSiO_4 \pm Ca, Y,$ HREE, $H_2O + ?U$	$< 2\mu m - 50\mu m$
Niobium/ Tantalum	natroniobite	$NaNbO_3 + Ta + ?Th$ also $NbFeSiO_4$	$< 30\mu m$
Rare Earths	calcian basnaesite	$Ca(REE)(CO_3)F$	$< 100\mu m$
	rare ancylite	$Sr(REE)(CO_3)H_2O$	

The deposit does not contain zircon; pyrochlore; columbite; monazite or xenotime

Key to process is all ore minerals are readily soluble in sulphuric acid

Commercial flow sheet developed over several years, including trials at mini-pilot plant scale. Full scale at demonstration pilot plant scale at ANSTO over last 5 years

- Simple open cut mining operation
- Crushing and grinding
- Sulphuric acid, roast, leach whole of ore
- Solvent extraction, separation & refining







DPP Filtration, PLS, SX, Zr and Nb recovery



Y and HREE refining and recovery



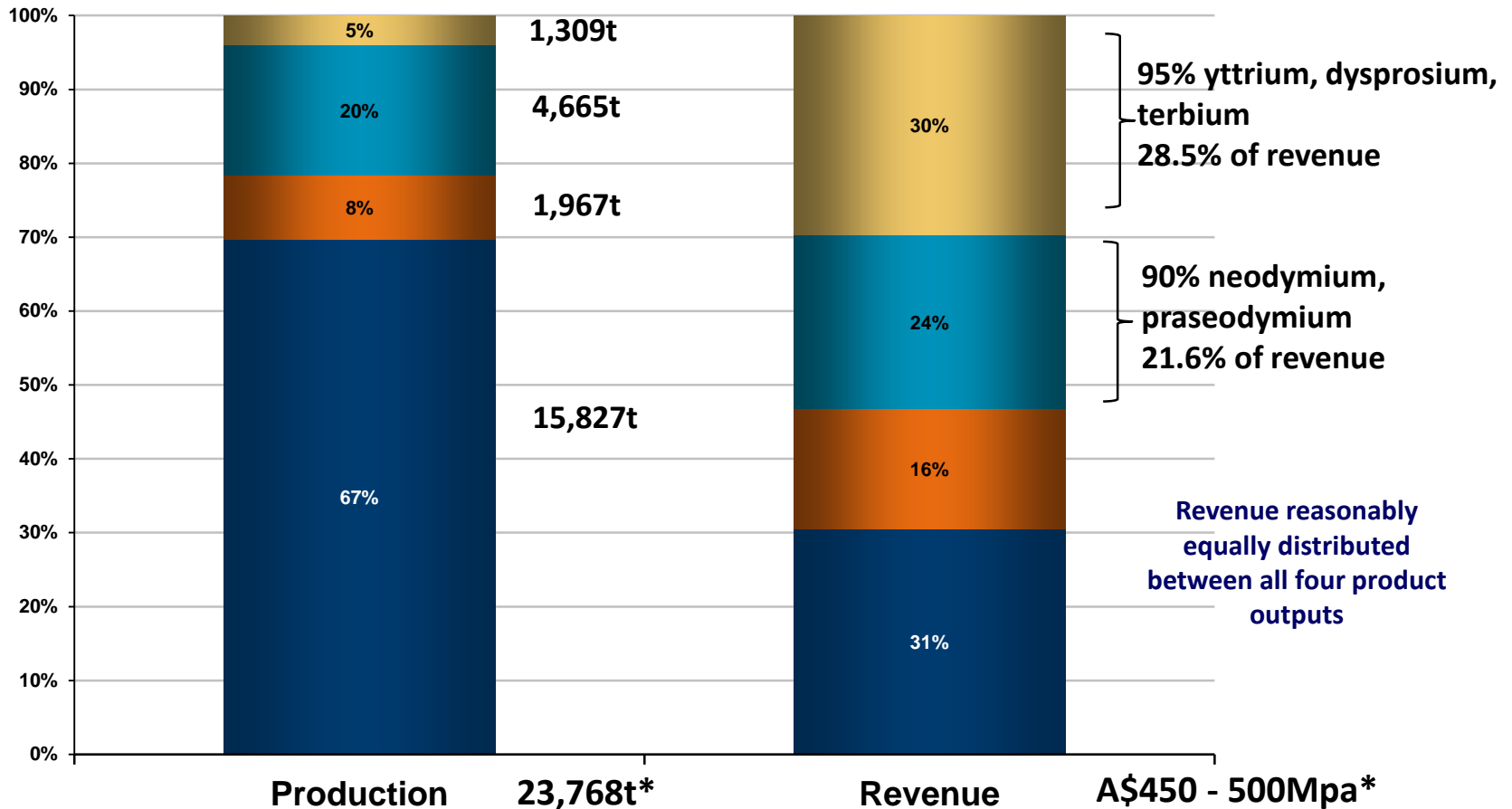
Zirconium refining and precipitation



Reverse osmosis and water recycle



# DZP Estimated Product Output @ 1Mtpa



■ ZrO2  
 ■ Nb metal  
 ■ LREO concentrate  
 ■ HREO concentrate

Revenue\* based on DFS long term product prices and A\$:US\$0.85. OPEX est A\$200M – A\$220Mpa

\*ASX announcement 11 April 2013 - the Company confirms that all material assumptions and technical parameters underpinning the estimated production targets and the forecast financial information as disclosed continue to apply and have not materially changed.

## Multiples end uses for DZP products

### ➤ *Zirconium Materials:*

- Electronics, ceramics, glass, refractories, chemicals, metal, catalysts

### ➤ *Rare Earth Materials:*

- Electronics, magnets, ceramics, glass, metal alloys, phosphors, catalysts

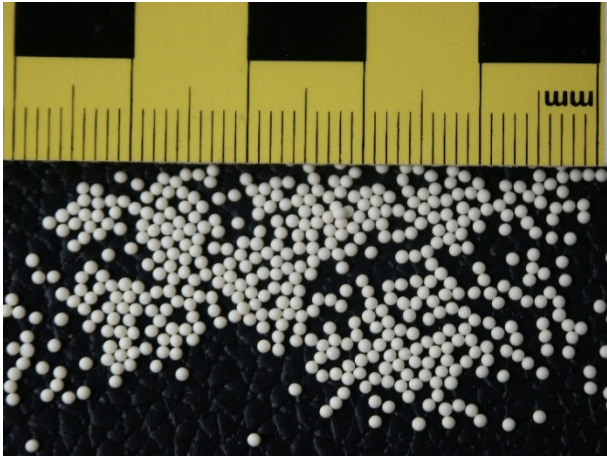
### ➤ *Niobium Materials:*

- Special steels, alloys, capacitors, glass, jewellery, coinage, superconducting magnets

The DZP can provide a long term supply of zirconium chemicals independent of the zircon supply chain, and critical rare earths not reliant on China



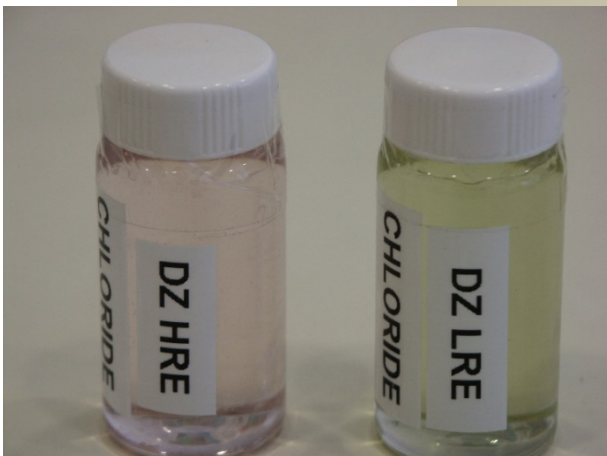
## Agreements to secure 100% of output



DZP yttria stabilised zirconia microspheres

### Zirconium (Zr)

- Leading chemical company to develop applications and markets in Asia for zirconia produced by DZP
- MoU with European manufacturer /trading company to market DZP products in Europe and North America
- Ceramic colours laboratory developed in Perth produce test products for ceramic tile industry



DZP high purity REE chemical concentrate

### Niobium (Nb)

- JV with European Treibacher Industrie AG to produce and market ferro-niobium
- Test work for tantalum recovery

### Light rare earths Heavy rare earths

- MoU with Japan's Shin-Etsu Chemical for toll treatment for separation and sale

- **Government Assistance Programs/ECA style funding**
  - **Lead Coordinator: Sumitomo Mitsui Banking Corporation (SMBC)**
  - **Attractive Project:**
    - ✓ long life low cost strategic source of critical metals
    - ✓ long term off-take agreements with international companies
  
- **Commercial Bank Debt**
  - **Financial Advisors: Credit Suisse & SMBC**
  - **Attractive Project:**
    - ✓ strong operating cash flows
    - ✓ diversified revenue stream
    - ✓ new markets will add to project value
  
- **Sale of Project Level (AZL) Minority Interest(s) (~15%)**
  - **Sale Advisors: Credit Suisse & SMBC**
    - ✓ Strategic interest(s) in long term supply of critical metals
    - ✓ Introduction of cornerstone investor(s)
  
- **Equity Capital Raising (Alkane)**
  - **Advisors Credit Suisse & Petra Capital**

# DZP Major Milestones

Major Milestones	2013	2014	2015	2016
Environmental Impact Statement	Q1, Q2			
Project Approval Process		Q3, Q4		
Project Financing Program	Q1, Q2	Q3, Q4	Q1, Q2, Q3, Q4	
Engineering Contract		Q3, Q4	Q1	
Front End Engineering Design (FEED)		Q1, Q2, Q3, Q4		
CONSTRUCTION			Q3, Q4, Q1, Q2, Q3, Q4	Q1
PRODUCTION				Q1, Q2, Q3, Q4

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



## Disclaimer

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 2004 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.





## 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 2004 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 2004 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 and 11 April 2013 - 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.