

## ABx Group Open Day Presentation

ABx Group (ASX: ABX) (“ABx” or “the Company”) is pleased to provide a copy of the Company’s latest presentation to be delivered at the ABx Group Open Day event, held at its 83%-owned subsidiary ALCORE’s Technology Centre on the NSW Central Coast.

The presentation will be delivered by Managing Director and CEO Dr Mark Cooksey and provides a more in-depth discussion of the ALCORE process, which recently produced its highest ever fluorine recoveries from ‘excess bath’ (an aluminium smelter waste)<sup>1</sup>.

In addition, the presentation also provides further information on ABx Group’s other activities including its rare earth elements (REE) exploration work, with the Company recently upgrading its Mineral Resource Estimate to 89 million tonnes at the Deep Leads – Rubble Mound and Wind Break deposits<sup>2</sup>.

A recorded copy of the ABx Group Open Day presentation delivery will be made available following the event on the Company’s website.

This announcement is approved for release by Mark Cooksey, Managing Director and CEO.

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### About ABx Group Limited

ABx Group (ABX) is a uniquely positioned, Australian company delivering materials for a cleaner future. The two current areas of focus are:

- Creation of an ionic adsorption clay rare earth project in northern Tasmania
- Establishment of a plant to produce hydrogen fluoride and aluminium fluoride from recycled industrial waste, via its 83%-owned subsidiary, Alcore

There is also a legacy business:

- Mining and enhancing the value of bauxite resources for cement, aluminium and fertilisers.

We only operate where welcomed and we apply best practices to restore any disturbed land to a better condition than we found it.

<sup>1</sup> ASX Announcement, 4 June 2024

<sup>2</sup> ASX Announcement, 2 May 2024



(ASX:ABX)



# Open Day Presentation

5 June 2024

# Disclaimer

This presentation has been prepared by ABx Group Limited ACN 139 494 885 (“ABx” or the “Company”). It should not be considered as an offer or invitation to subscribe for or purchase any securities in the Company or as an inducement to make an offer or invitation with respect to those securities. No agreement to subscribe for securities in the Company will be entered into on the basis of this presentation.

This presentation contains forecasts and forward looking information. Such forecasts and information are not a guarantee of future performance, involving unknown risks and uncertainties. Actual results and developments will almost certainly differ materially from those expressed or implied. ABx has not audited or investigated the accuracy or completeness of the information, statements and opinions contained in this presentation. Accordingly, to the maximum extent permitted by applicable laws, ABx makes no representation and can give no assurance, guarantee or warranty, express or other implied, as to, and take no responsibility and assume no liability for, the authenticity, validity, accuracy, suitability or completeness of, or any errors in or omission, from any information, statement or opinion contained in this presentation.

You should not act or refrain from acting in reliance on this presentation material. This overview of ABx does not purport to be all inclusive or to contain all information which its recipients may require in order to make an informed assessment of the Company’s prospects. You should conduct your own investigation and perform your own analysis in order to make an informed assessment of the company’s prospects. You should also conduct your own investigation and perform your own analysis in order to satisfy yourself as to the accuracy and completeness of the information, statements and opinions contained in this presentation and making any investment decision.

Prices for aluminium fluoride (AlF<sub>3</sub>) were sourced from Asian Metals, China Customs and verified by comparison with prices from Bloomberg. The price actually achieved will depend upon market conditions at the time of sale.

## Competent Person Statement

The information in this report that relate to Exploration Information and Mineral Resources are based on information compiled by Ian Levy who is a member of The Australasian Institute of Mining and Metallurgy and the Australian Institute of Geoscientists. Mr Levy is a qualified geologist and a director of ABx Group Limited.

Mr Levy 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 a Competent Person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. Mr Levy has consented in writing to the inclusion in this report of the Exploration Information in the form and context in which it appears.

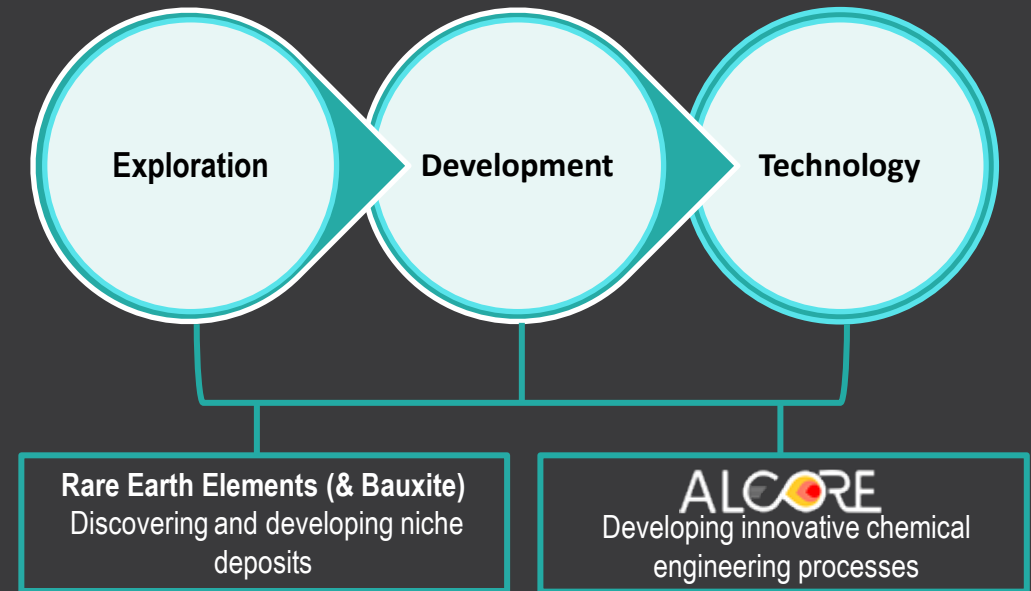


## Delivering materials for a cleaner future

- Creation of an ionic adsorption clay rare earth project in northern Tasmania
- Establishment of a plant to produce hydrogen fluoride and aluminium fluoride from recycled industrial waste, to replace imports (ALCORE)

## Legacy business

- Mining and enhancing bauxite resources for cement, aluminium and fertiliser production



# Board of Directors (Alcore)

Hon Paul Lennon AO (Chair)



- Premier of Tasmania 2004-2008
- Deputy Premier and Minister for Infrastructure, Energy & Resources 1998-2004
- Principal Paramul Pty Ltd 2009-

Ian Levy (Director)



- 30 years of senior management and geological experience with multiple commodities, including at WMC and Pancontinental Mining
- Previously CEO of Allegiance Mining and Director of Gloucester Coal
- Member of JORC for 11 years (4 years as Vice Chairman) and Federal President, Australian Institute of Geoscientists

Dr Mark Cooksey (Managing Director and CEO)



- More than 20 years with Rio Tinto and CSIRO
- Worked closely with aluminium and other metal industries
- Significant experience in commercialising new technologies and processes
- PhD in Chemical & Materials Engineering

Joycelyn Morton (Non-Executive Director)



- Over 30 years' experience as an executive and director with Australian and international listed companies, including Argo Investments, ASC and Snowy Hydro
- Chair of the Audit, Risk and Compliance Committee for multiple boards
- Fellow and Life Member of CPA Australia, and former National President

Rex Adams (Non-Executive Director)



- Founding director of Blue Ocean Equities
- Executive Director of Southern Cross Equities
- Over 17 years in the mining industry & 26 years in finance in Senior Resources Analyst & Research Manager roles

# ESG

- ABx Group has commenced disclosing environmental, social, and governance (ESG) metrics, using the internationally accepted Stakeholder Capitalism Metrics developed by the World Economic Forum
- ABx Group has subscribed to Socialsuite’s reporting platform to assist with monitoring and disclosing progress<sup>1</sup>
- It is intended to Announcment a baseline ESG disclosure report during the December quarter

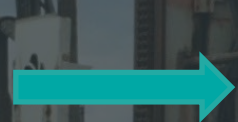


<sup>1</sup> ABX ASX Announcement, 12 October 2023





# Businesses



Reprocessing aluminium smelter waste



Ionic adsorption clay rare earths



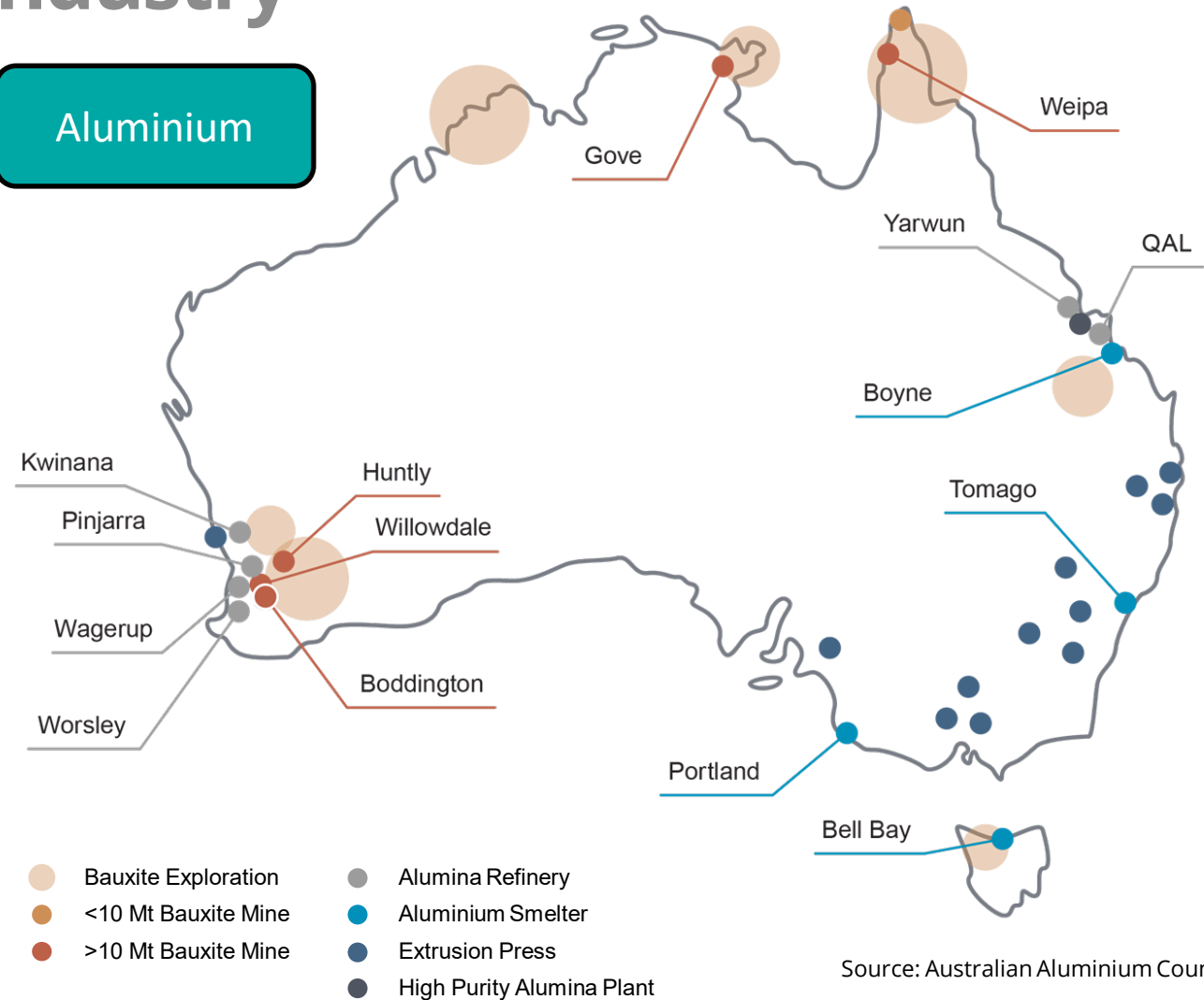
Bauxite operations

# Australian aluminium industry



• Australia is one of the very few nations that supplies aluminium across the whole supply chain from mining to fabrication.

Material	Australia rank
Bauxite	#1
Alumina	#2
Aluminium	#7



Source: Australian Aluminium Council



# Government industry policy

Australian government has recognised aluminium as a Strategic Material



1. **Deliver internationally competitive supplies of clean energy;**



2. Use of  
a. **Production Tax Credits** and a  
b. **Transformational Infrastructure and Technology Fund** to enable Australia to be sufficiently competitive to be able to attract global decarbonisation investment;



3. **Prioritise the Australian aluminium value chain** within industry development policies;

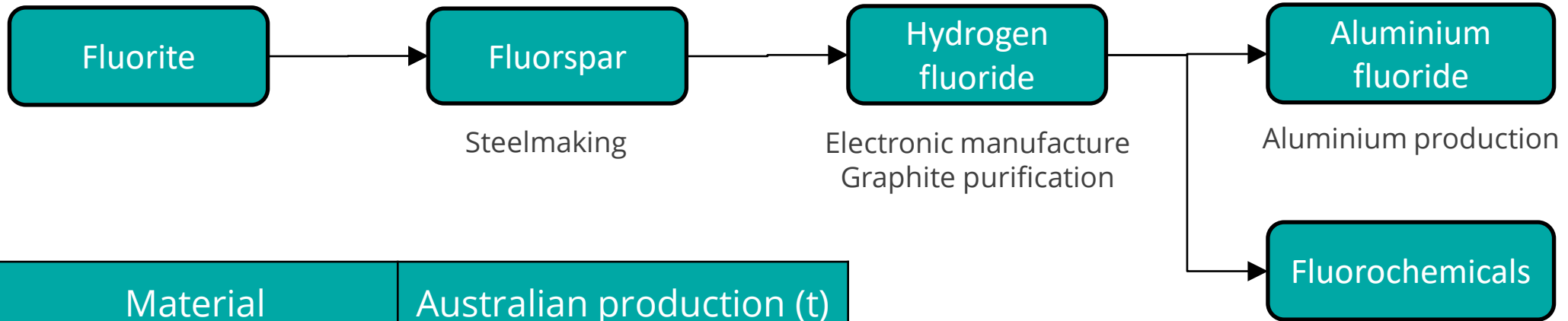


4. **Environmental approval processes** across the supply chain that appropriately balance the environmental rigour and protection with timelines that reflect commercial needs; and



5. Development of **long-term strategic partnerships** with likeminded countries.

# Fluorine value chain



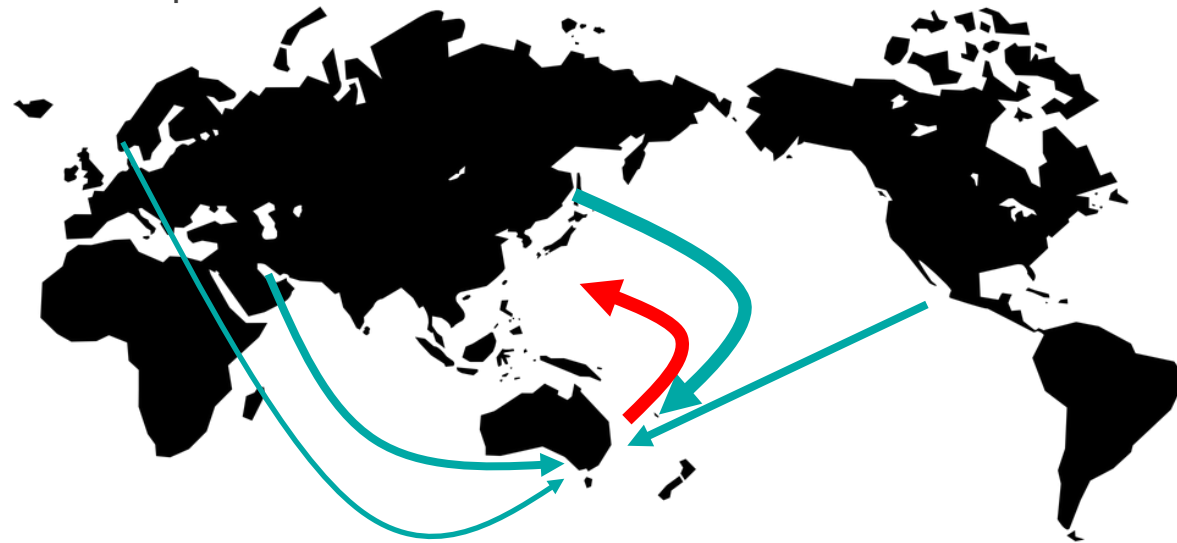
Material	Australian production (t)
Fluorite	0
Fluorspar	0
Hydrogen fluoride	0
Aluminium fluoride	0
Fluorochemicals	0?

- Fluorine added to Australia's Critical Minerals list in 2023
- Fluorspar (calcium fluoride) is defined as a critical mineral by USA, Europe, Japan, Canada...

# Aluminium fluoride and aluminium smelter bath

Aluminium fluoride ( $\text{AlF}_3$ ): essential for aluminium smelting

- 1.2 million tonnes produced globally per year worth US\$1.5 billion (US\$1,000-1,800 per tonne)
- 50% produced in China, mainly for Chinese smelters
- Australia is the largest aluminium producer without local aluminium fluoride production, and imports mostly from China
- Traditionally produced from high-cost fluorspar and alumina trihydrate
- Product specification is not onerous



→ Aluminium fluoride      → Excess bath

Current imports/exports

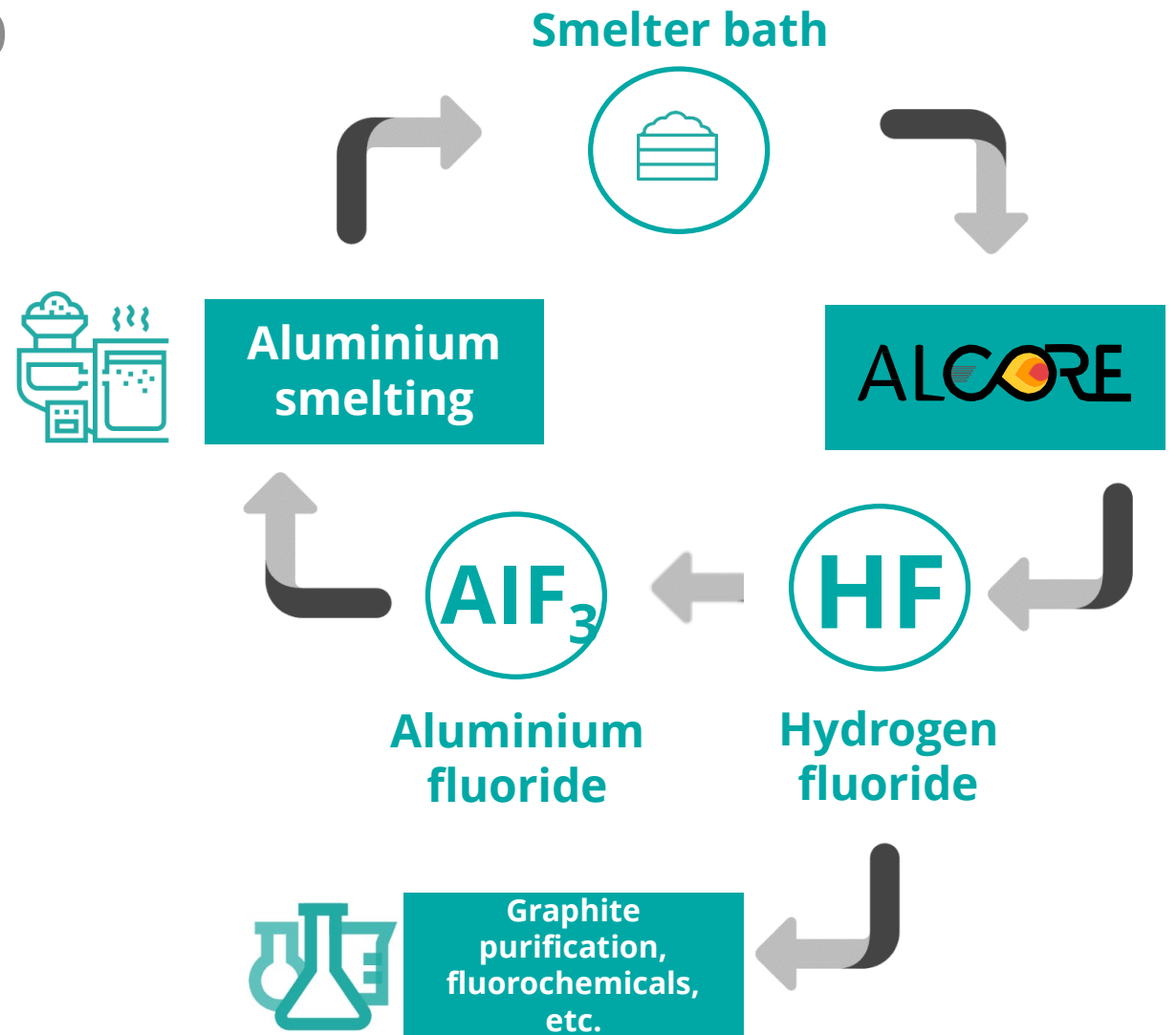
- Most aluminium smelters produce aluminium smelter bath, containing about 50% fluorine
- Only attractive market for smelter bath is new smelter construction; none in Australia
- Global market for smelter bath has moved into oversupply; it is increasingly becoming a waste
- Smelter bath is a low-cost source of fluorine



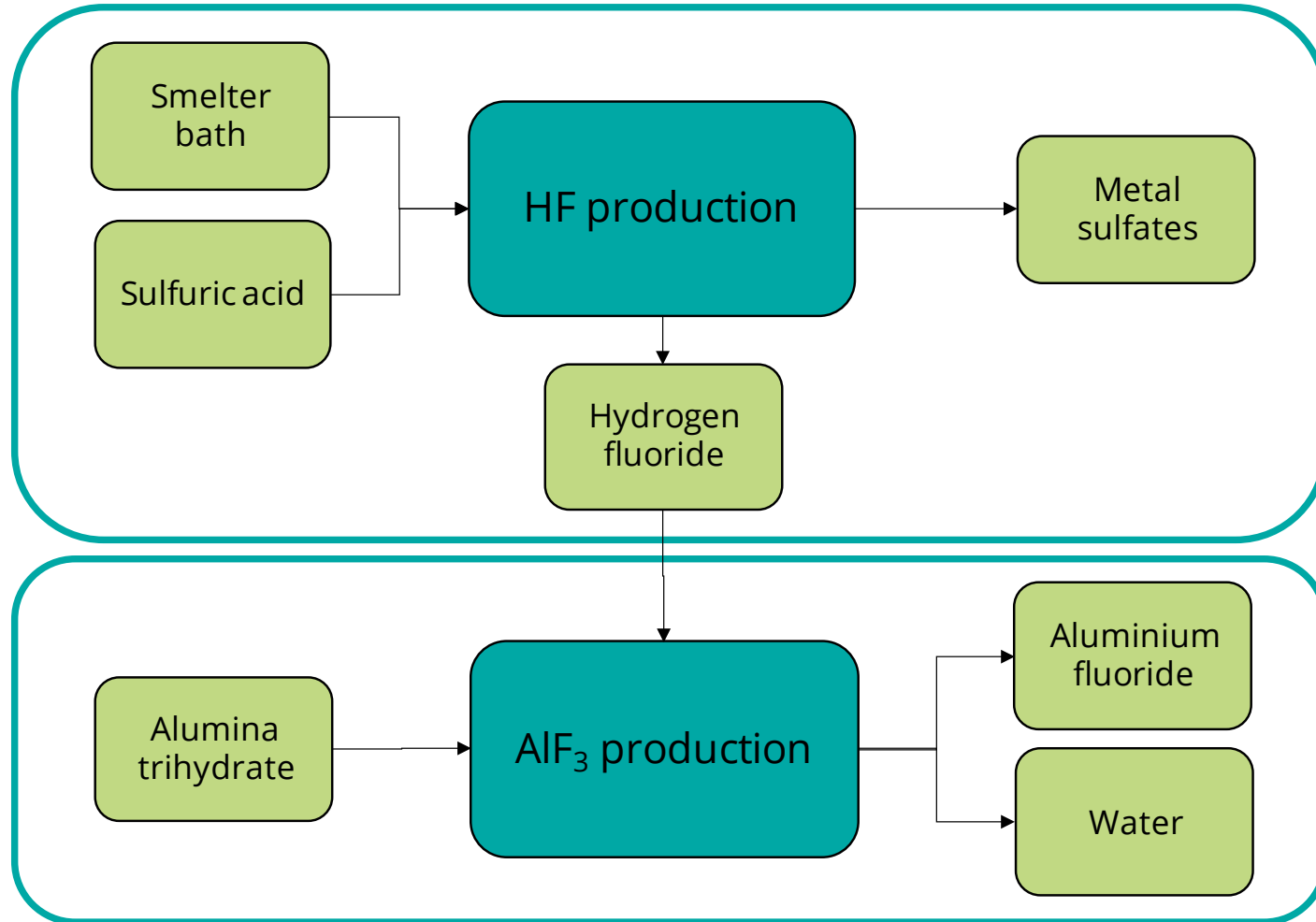
# Closing the fluorine loop

- We have developed a process to produce hydrogen fluoride from aluminium smelter bath
- Via 83%-owned subsidiary, ALCORE
- Hydrogen fluoride can be converted to aluminium fluoride using an existing commercial process
- Hydrogen fluoride has many other applications

Exemplary demonstration  
of circular economy



# Process flowsheet



Developed by Alcore

Existing commercial process

Overall energy consumption: ~1 kWh/kg AlF<sub>3</sub>

# Customer and supplier engagement

## Aluminium smelters

Intensive engagement with Australian and international smelters:

- Commercial discussions on purchase of aluminium fluoride, and supply of bath and alumina trihydrate
- Endorsement for grant applications
- Assessment of aluminium fluoride product quality
- Supply of bath and alumina trihydrate for testing

## Other customers

- Engagement with customers for metal sulfates
- Assessment of metal sulfate product quality



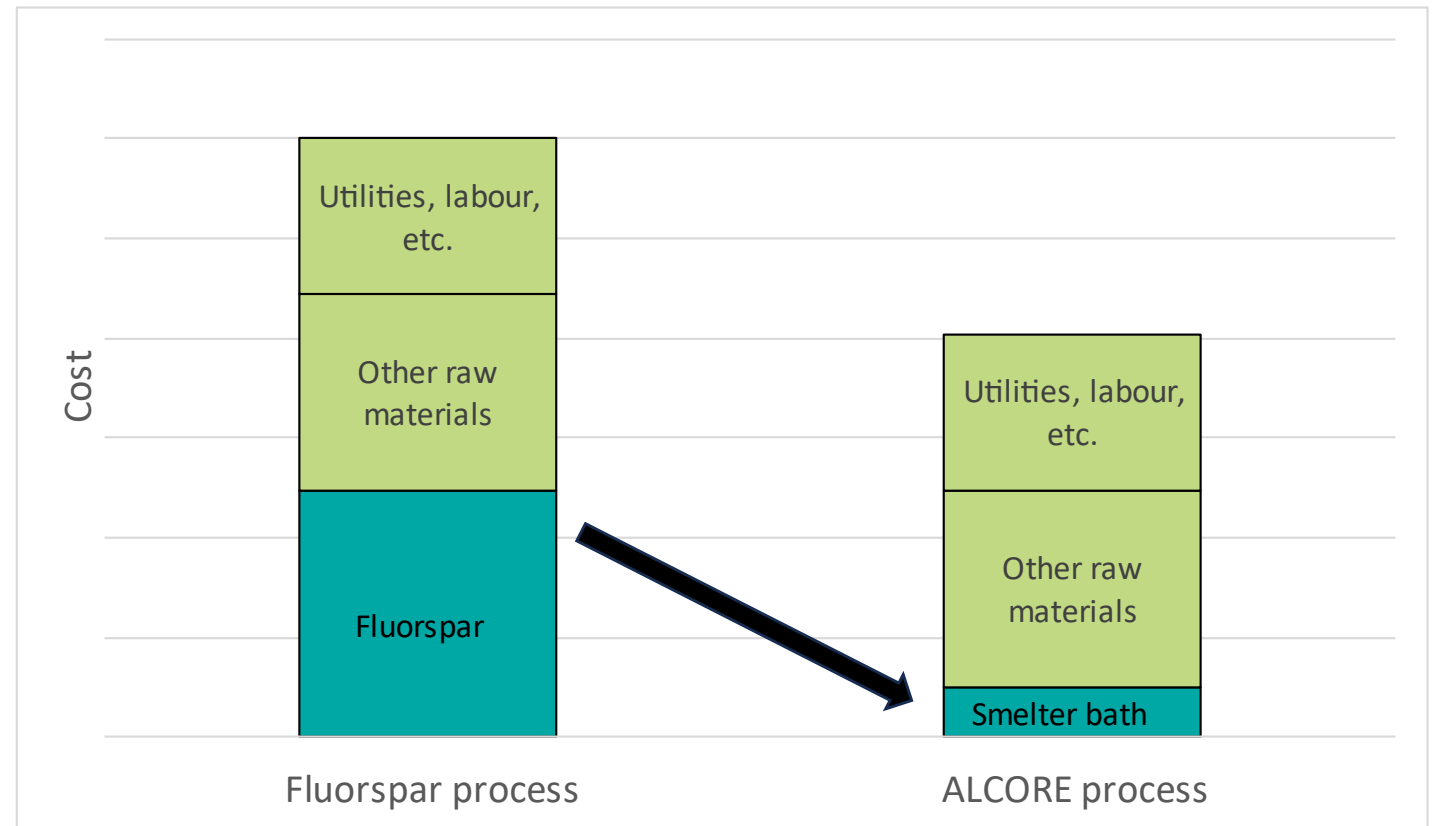


# The economic advantage of replacing fluorspar

A rare opportunity that is financially, strategically and environmentally attractive

- Chart shows illustrative operating costs for producing aluminium fluoride
- ALCORE process produces same aluminium fluoride product using a much lower cost feed material
- Aluminium smelter bath is also a good quality material

Potential for significant profit margin



# ALCORE Process economics

A rare opportunity that is financially, strategically and environmentally attractive

Scenario	AlF <sub>3</sub> price (US\$/t)	FX rate USD:AUD	AlF <sub>3</sub> price (A\$/t)	Estimated operating cost (A\$/t AlF <sub>3</sub> )	Estimated operating margin* (A\$/t AlF <sub>3</sub> )	Estimated EBITDA* (A\$m)
Baseline	\$1,220	0.75	\$1,630	\$1,250	\$730	\$15m
Optimistic	\$1,400	0.70	\$2,000	\$930	\$1,450	\$29m

\*Includes revenue from co-products

- Based on long term aluminium fluoride prices and exchange rates, and estimated costs
- For 20,000 t/y aluminium fluoride (80% of Australian demand)

# ALCORE Team

- High calibre chemical engineers, with extensive experience in development and commercialisation of novel processes
- Significant industrial experience in aluminium and fluorine industries

Dr Mark Cooksey (Managing Director)



- More than 20 years with Rio Tinto (aluminium smelting) and CSIRO
- Significant experience in developing and commercialising new processes in minerals and metals industry
- PhD in Chemical & Materials Engineering
- Joined Alcore in 2020

Dr Xiao Liang (Principal Engineer)



- Over 15 years in chemical process innovation and intensification, including conceptual design, fundamental research, and process scale-up
- PhD in Chemical Engineering
- Joined Alcore in 2021

Vishva Patel (Process Engineer)



- 5 years experience as design engineer with SRF Limited (India); a specialty chemicals company, including with hydrogen fluoride
- Masters in Chemical Process Engineering
- Joined Alcore in 2023



# ALCORE Process scale-up

- Rigorous scale-up to reduce technical risk
- First aluminium fluoride plant planned for Bell Bay, Tasmania, near existing hydro-powered aluminium smelter. Planned production 20,000 t/y
- High potential for plants in other major aluminium smelting regions
- Potential expansion into other markets, including fluorine chemicals



← \$7.5m grant awarded<sup>1</sup> and \$5.7m instalments received<sup>2</sup> →

<sup>1</sup>ABX ASX Announcement, 29 April 2022

<sup>2</sup>ABX ASX Announcement, 28 June 2023

# Technical Progress and Update

Laboratory Research Update

Pilot Batch Reactor (MKII) Progress

Continuous Pilot Plant Design

2022

2023

2024

# Laboratory Equipment and Experiments

## Objectives

- Enhance fundamental understandings of bath reactions with sulfuric acid
- Maximise bath fluorine conversion using available lab equipment

### Step 1 - Laboratory Rotary kiln (LRK)



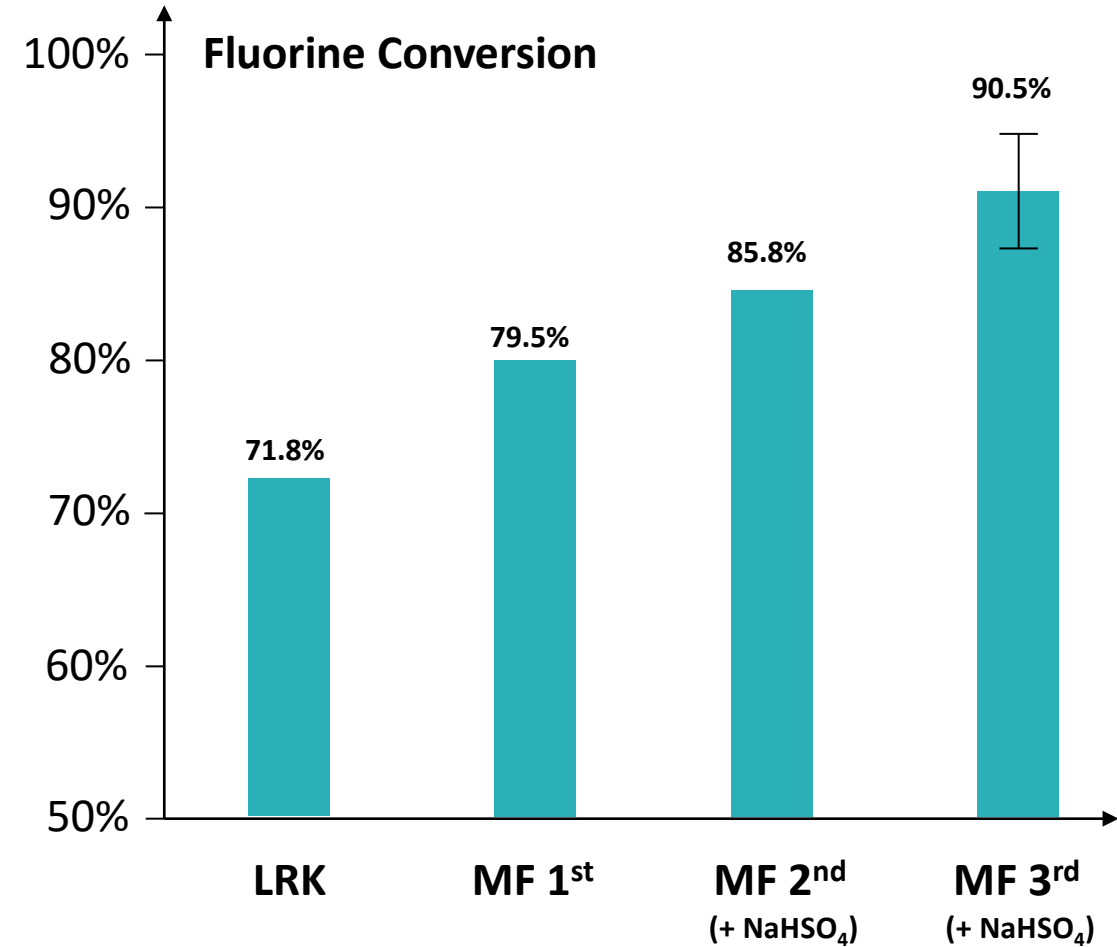
### Step 2 - Ring Mill & Muffle Furnace





# Laboratory Scale Achievements

Equip.	Number of Exp.	Outcomes
Rotary Kiln (LRK)	30	<ul style="list-style-type: none"> <li>Tested various feed for reaction mechanistic study;</li> <li>Identified workable process conditions;</li> <li>Investigated material transformation during process;</li> <li>Evaluated significance of mixing.</li> </ul>
Muffle Furnace (MF)	120	<ul style="list-style-type: none"> <li>Examined fundamental effects of key process parameters;</li> <li>Uncovered critical factors for achieving high fluorine conversion;</li> <li>Produced consistent solid residues for further product development</li> </ul>



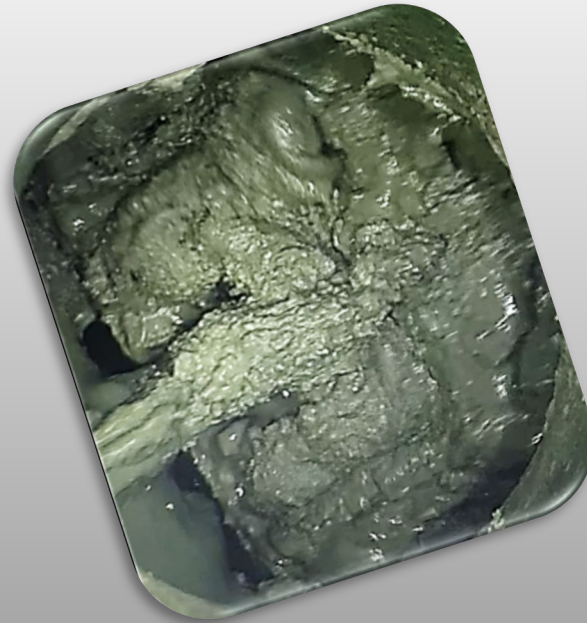
# Process Material Transformation



Tapped Bath (as received)



Ground Bath



Regime of sludge with increasing viscosity

Regime of solid with decreasing hardness

0%

50%

70%

100%

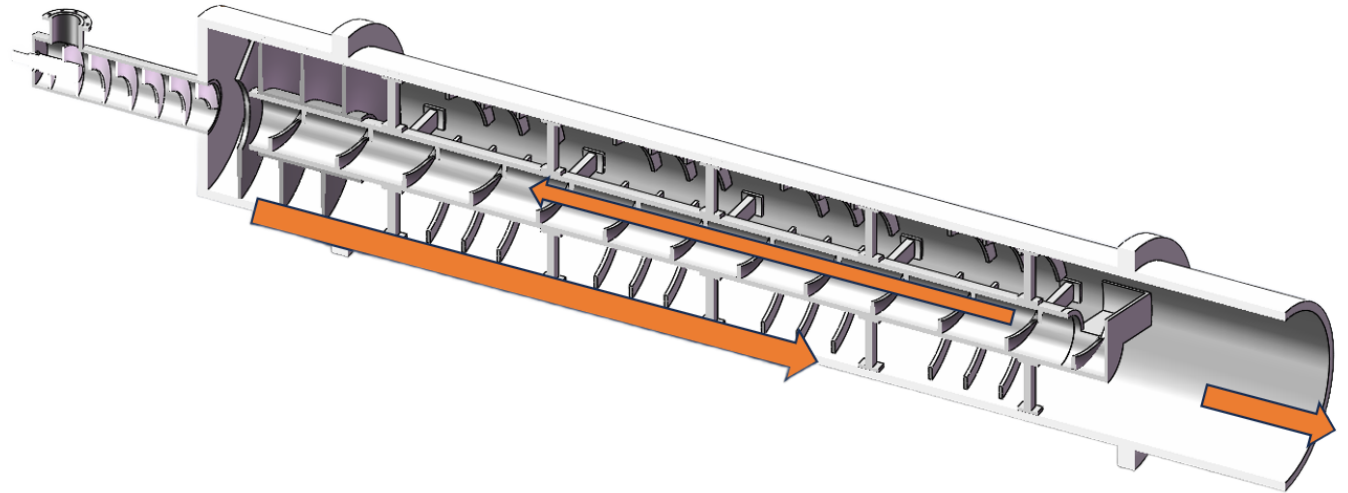
Tapped Bath Fluorine Conversion (%)

# Process Reactor Configuration

## Double Shaft Kneader (1<sup>st</sup> Stage) and Rotary Kiln with Internal Slug Return (2<sup>nd</sup> Stage)



Double Shaft Kneader



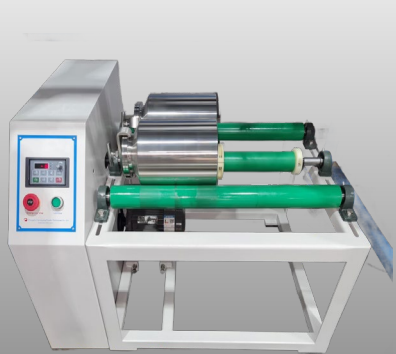
Rotary Kiln Internal Design



# Pilot Batch Reactor Overview

## Operation Mass Balance

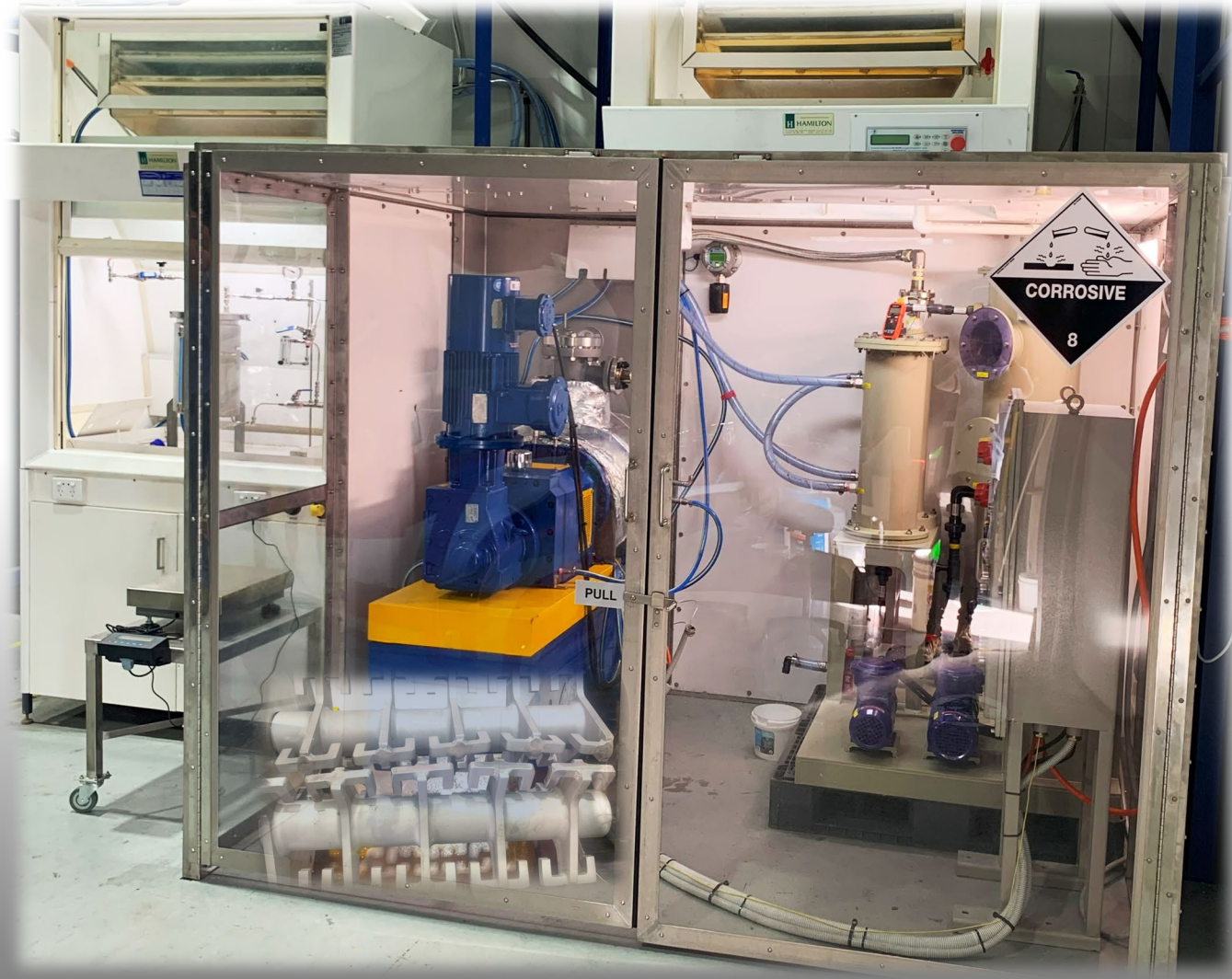
- 4 kg Crushed Bath
- 6 kg H<sub>2</sub>SO<sub>4</sub>
- 2.3 kg HF
- 7.7 kg Solid Products
- 50% Filling Rate



Ball Mill



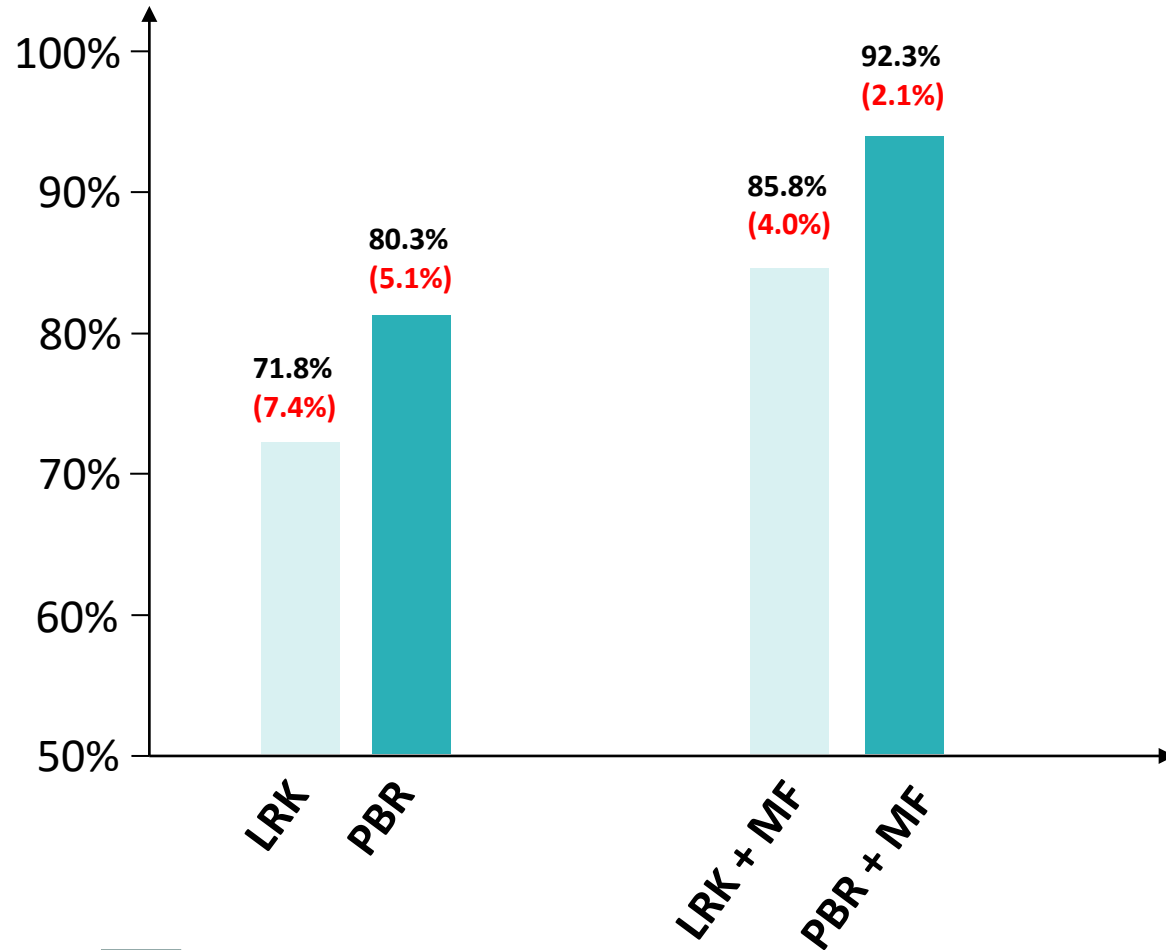
Ultrasound assisted screener





# Pilot Batch Reactor Progress

## Fluorine Conversion



## Commercial Fluorspar Process

- Typical fluorine content in solid product is **0.6 – 3%**
- Process benchmark is **< 1%** fluorine in solid product, equivalent to **< 2%** CaF<sub>2</sub> or **> 96%** conversion

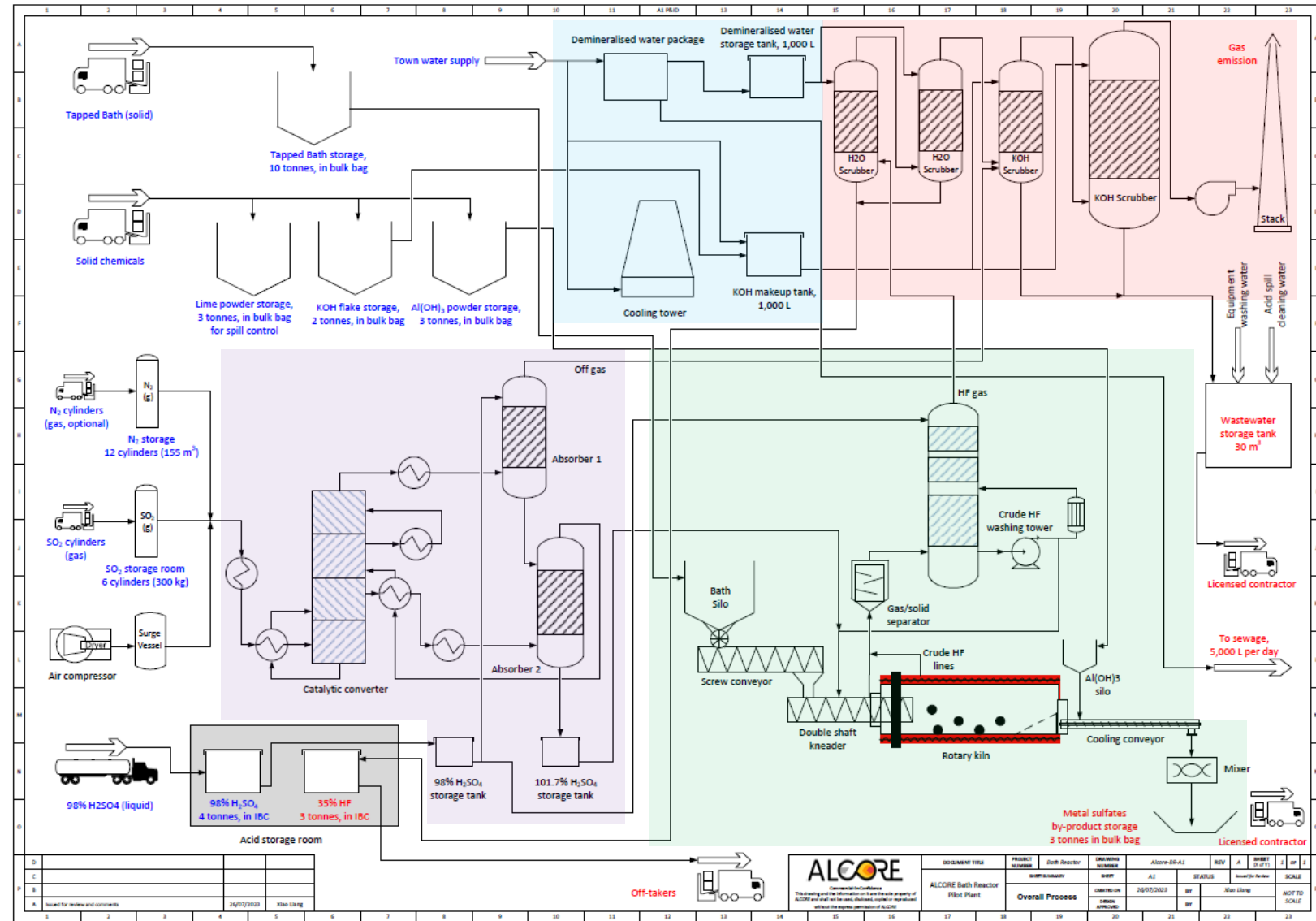
# Continuous Pilot Plant Overview

## Main Objectives

- Demonstrate continuous operation
- Validate HF Spec. for  $AlF_3$  production
- Optimise process conditions
- Develop optimal scale up parameters

## Consists of

- Oleum production module
- Bath reaction module
- Gas scrubbing module
- Utilities
- Material and waste storage



# Future Technical Plan

Laboratory Research Update

Pilot Batch Reactor (MKII) Progress

Continuous Pilot Plant Design

**Metal Sulfate Product Development**

**Continuous Pilot Plant Construction**

2022

2023

2024

2025

# Businesses



Reprocessing aluminium smelter waste



Ionic adsorption clay rare earths

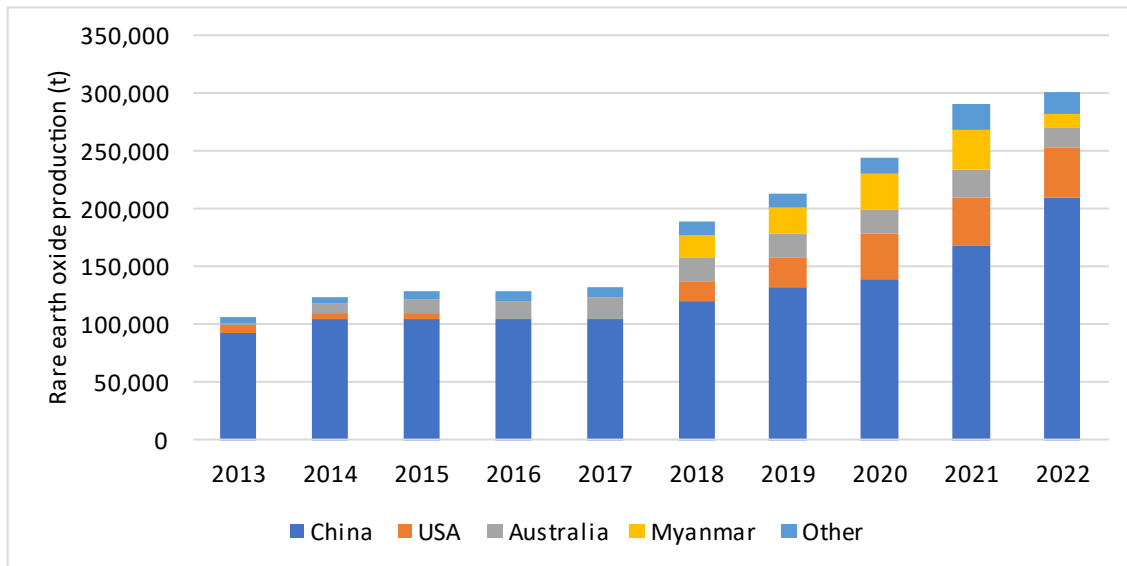


Bauxite operations

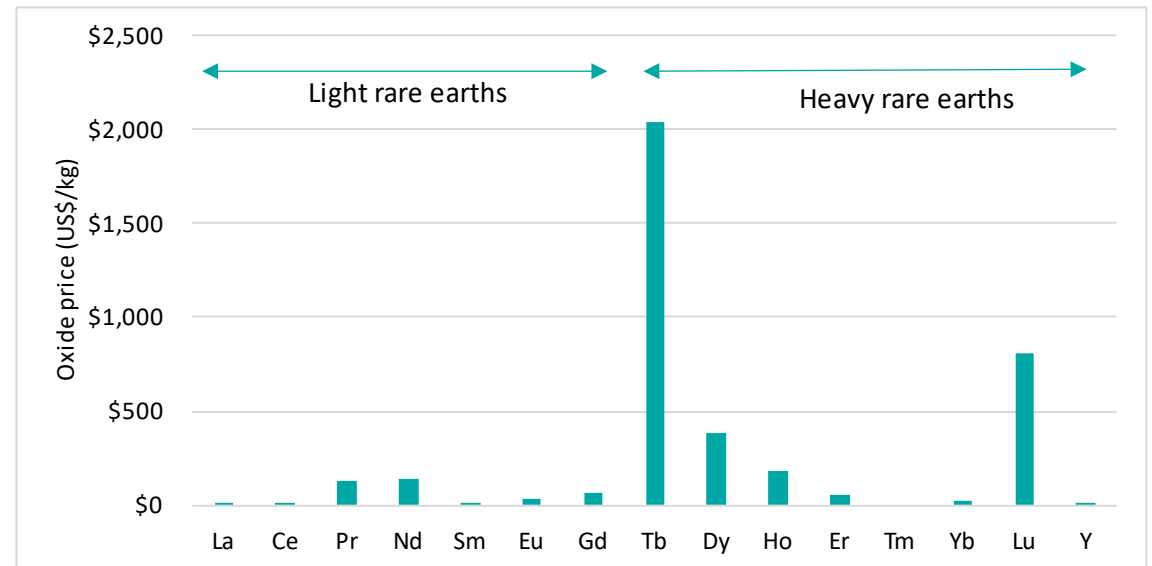


# Rare earths market

- 15+ rare earth elements (REEs) used in wide variety of applications, with demand growing rapidly
- China dominates rare earths markets, especially heavy rare earths such as Tb and Dy
- Prices of different rare earths vary significantly because:
  - Proportions of supply do not match proportions of demand
  - Rare earths difficult to substitute



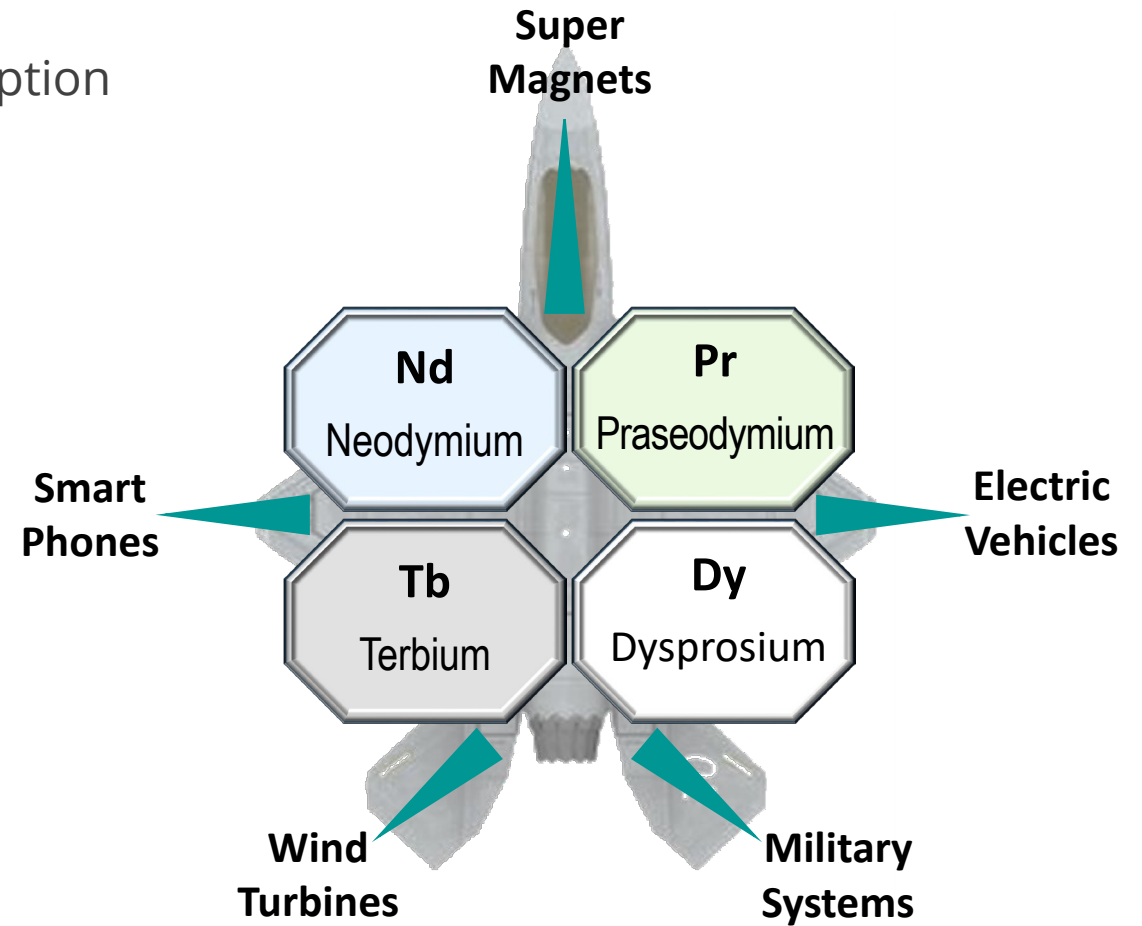
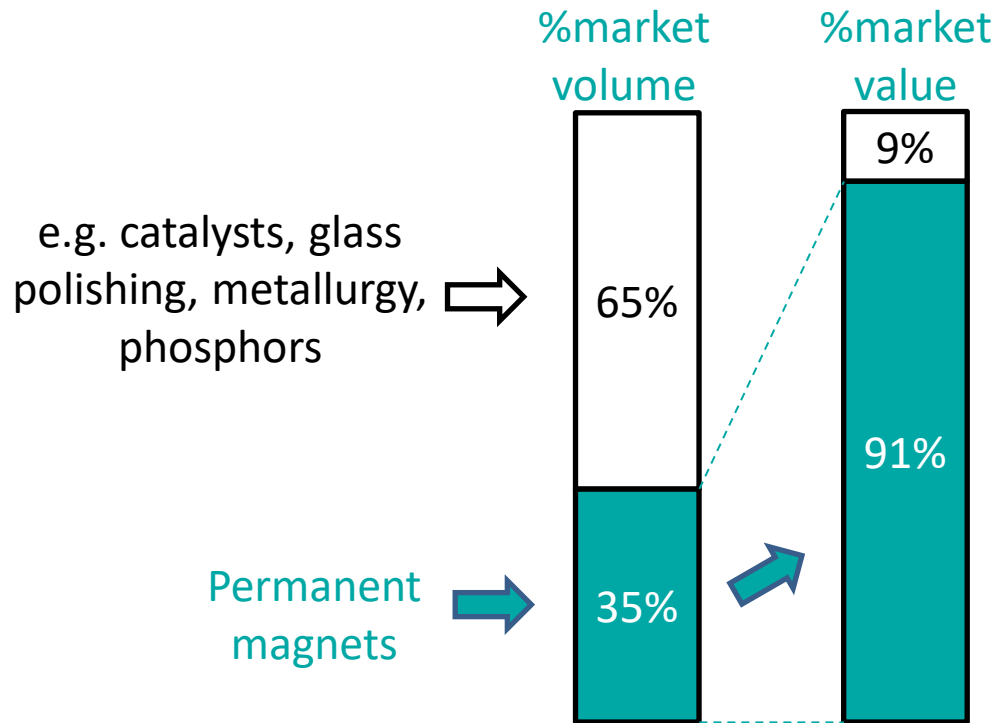
Source: USGS (excludes unregulated production in China)



Source: Adamas 2022 prices, in: Iluka Resources, Macquarie Australia Conference, 3-4 May 2023

# Permanent magnet rare earths

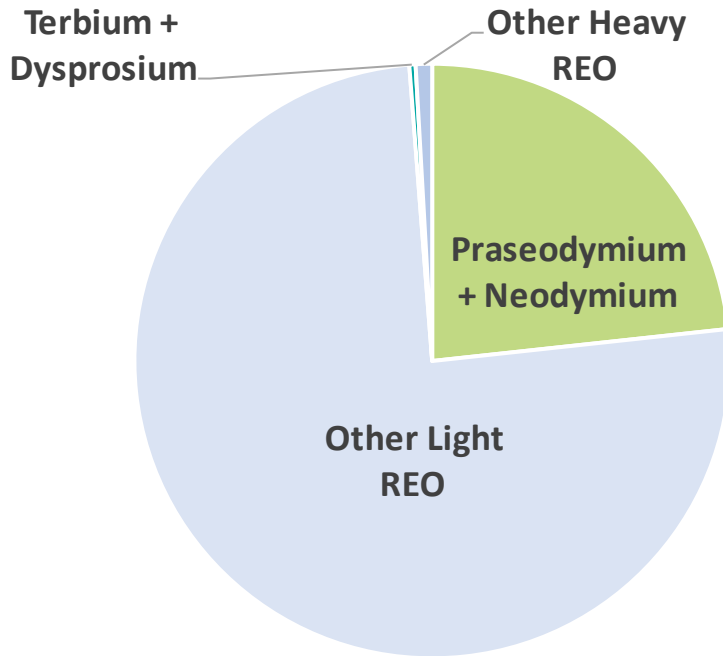
- Essential for electric vehicles and wind turbines
- Represent over 90% of value of rare earths consumption
- Forecast to grow at 7% per year to 2040



Source: Rare Earth Industry Association (<https://www.global-reia.org/about-rare-earth/>)

# Ionic adsorption clay (IAC) rare earth deposits

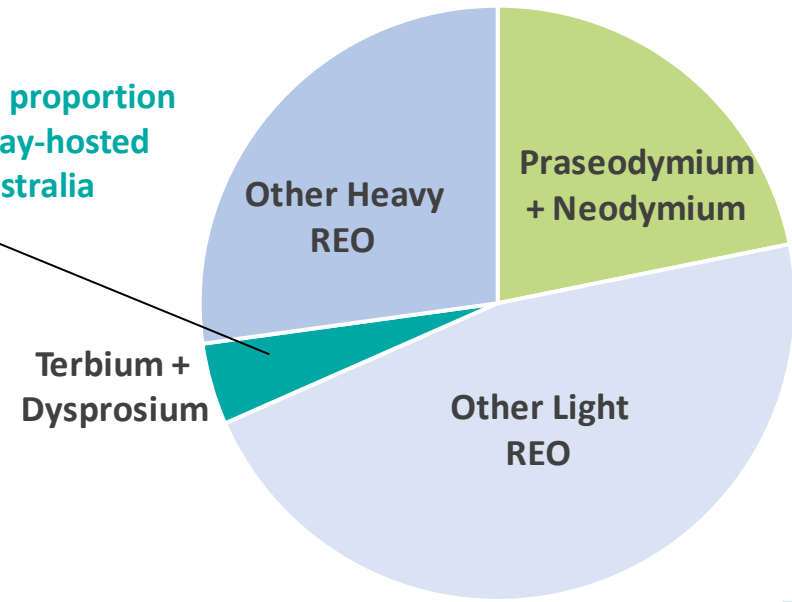
- Contain much higher proportion of higher value, heavy rare earths
- Historically only mined in southern China



Hard rock: Mount Weld (Lynas)

Source: D.J. Packey and D. Kingsnorth, Resources Policy, 48(2016) 112-116

ABx has the highest proportion of Dy+Tb of any clay-hosted resource in Australia



Ionic Adsorption Clay **ABx** Group

Source: ABX ASX Announcement, 20 November 2023

# Requirements for an ionic clay rare earth project

## Mineral Resource

- Size
- Grade
- Mineralogy
- Strip ratio

## Jurisdiction

- Regulatory approval
- Community support
- Government support
- Supply chain security

## Infrastructure

- Transport
- Water
- Energy

## Company Resources

- People
- Partnerships
- Finance
- Intellectual property



# ABx rare earth discoveries in Tasmania

ABx is first company to discover rare earths in Tasmania

- Four discoveries spanning 100 km<sup>2</sup> (1)
- Newly granted tenements add over 450 km<sup>2</sup> (2)

Highest proportion of DyTb of any clay-hosted resource in Australia<sup>3</sup>

Highest ionic component reported in Australia, comparable to operations in China<sup>4,5</sup>

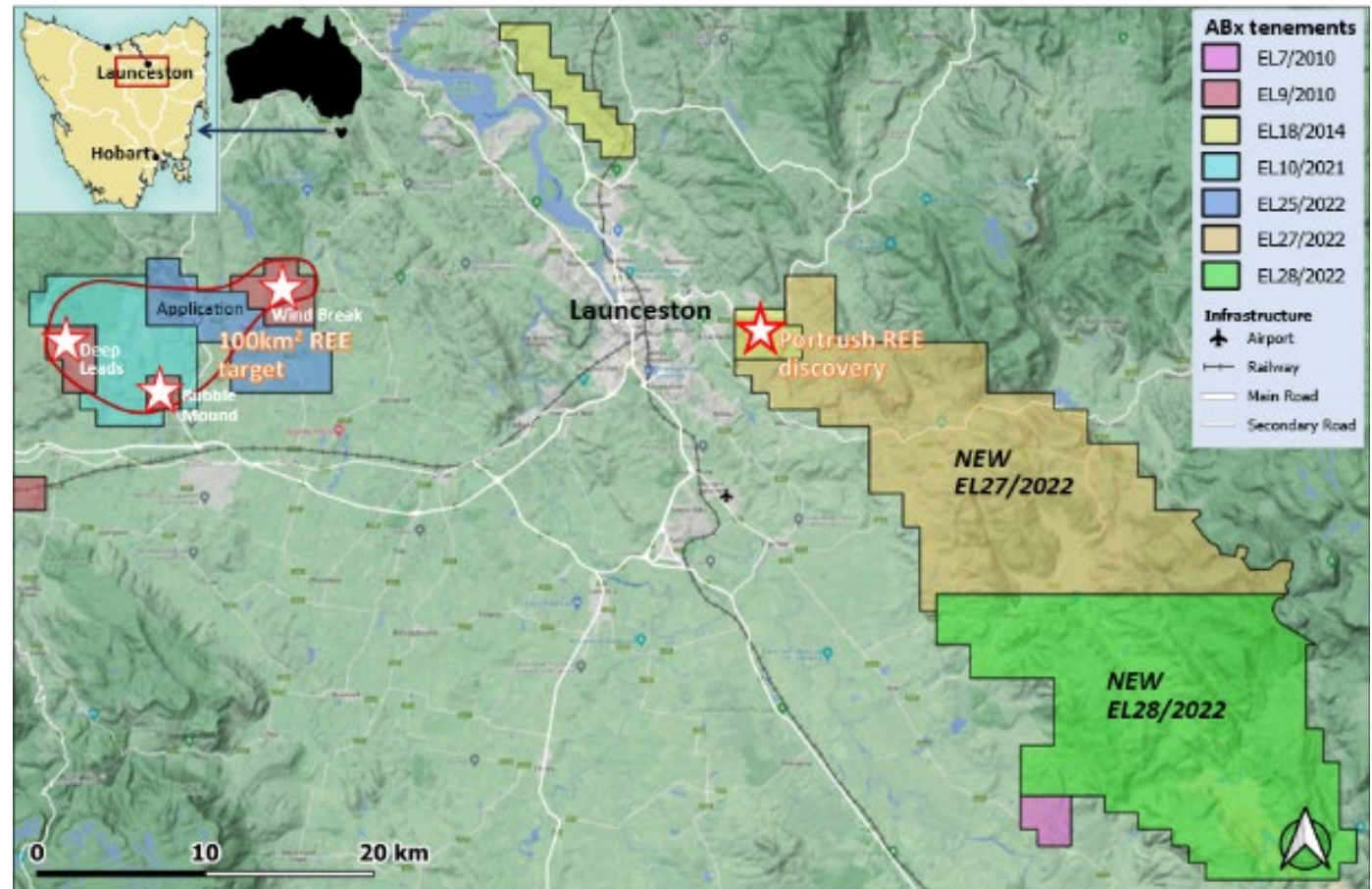
<sup>1</sup> ABX ASX Announcement, 16 March 2022

<sup>2</sup> ABX ASX Announcement, 26 September 2023

<sup>3</sup> ABX ASX Announcement, 2 May 2024

<sup>4</sup> ABX ASX Announcement, 31 May 2022

<sup>5</sup> ABX ASX Announcement, 2 February 2023



Source: ABX ASX Announcement, 22 January 2024

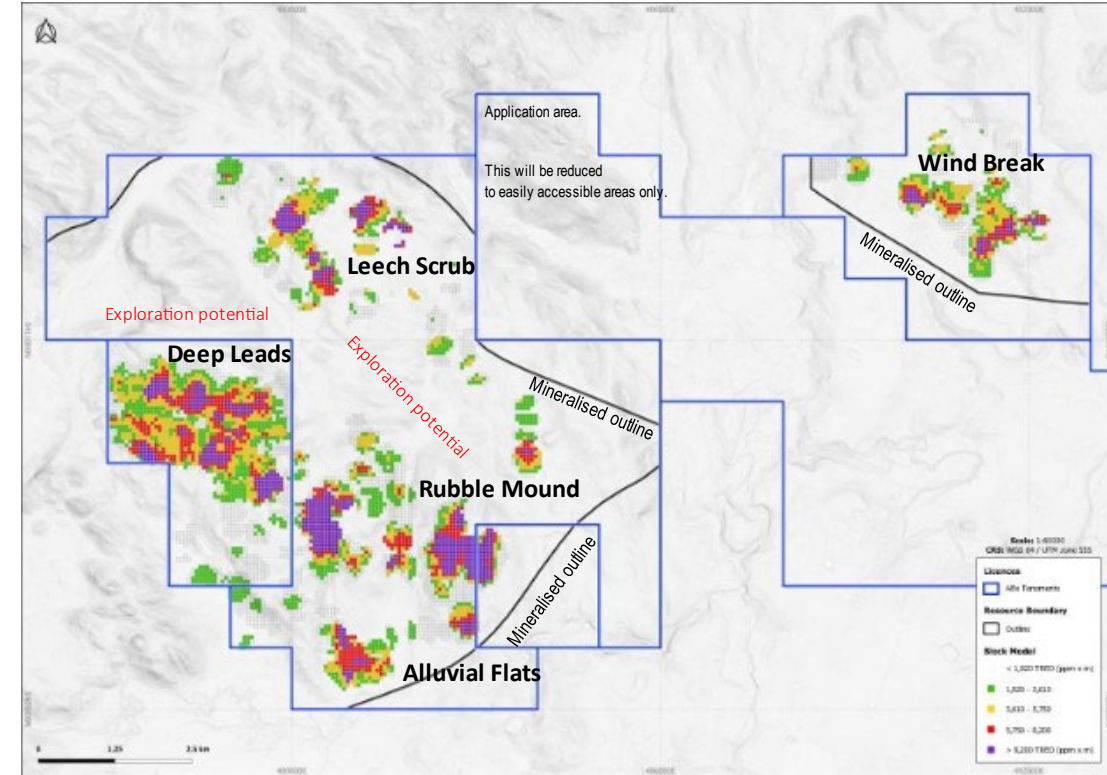
# Rare Earths Resource Estimate

- Upgrade to 89 Mt announced May 2024<sup>1</sup>
- Over 10-fold increase in 12 months

Size	Cut-off (ppm TREO-CeO <sub>2</sub> )	Mean TREO (ppm)	Mean TREO-CeO <sub>2</sub> (ppm)	DyTb <sup>3</sup> (%TREO)
89 Mt <sup>2</sup>	350	844	652	4.3%

Holes drilled	Metres drilled (m)	Metres assayed (m)	From (m)	To (m)
1,077	9,742	3,843	4.2	12.0

Resource based on only 29% of identified mineralised outline<sup>1</sup>



Source: ABX ASX Announcement, 2 May 2024

<sup>1</sup>ABX ASX Announcement, 2 May 2024

<sup>2</sup>41 Mt inferred, 42 Mt indicated and 6 Mt measured

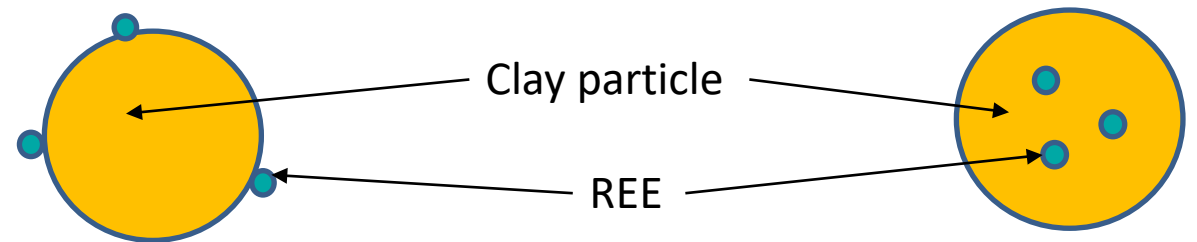
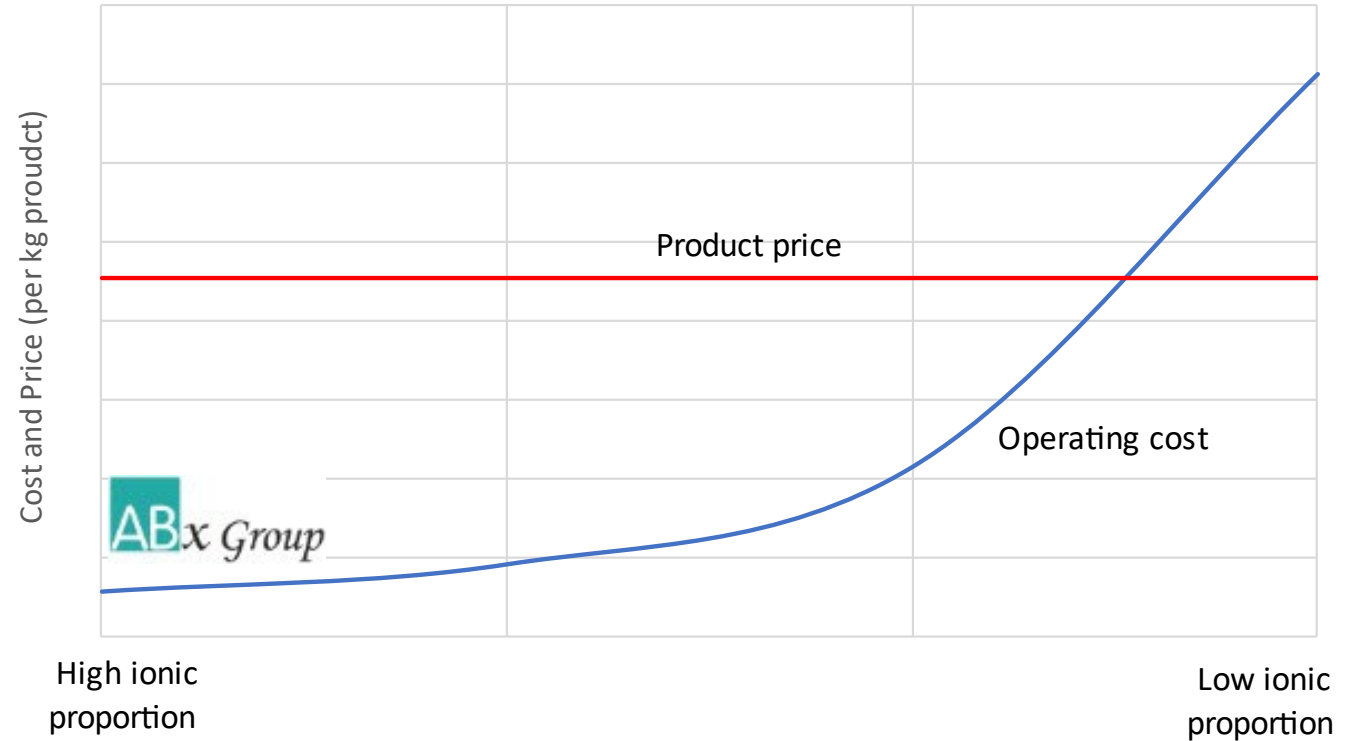
<sup>3</sup>DyTb = Dy<sub>2</sub>O<sub>3</sub> + Tb<sub>4</sub>O<sub>7</sub>

# Not all clays are created equal

## Ionic proportion is king

- Chart shows illustrative relationship between ionic proportion and operating cost
- For low ionic proportion, reagent costs alone can be higher than product price

- Position on cost curve heavily dependent on proportion of resource that is ionic
- Industry processing experts indicate that low-cost processing can only be achieved for resources with high ionic proportion





# Infrastructure

## Transport

- <20 km to major highway
- <100 km to deepwater Bell Bay port

## Labour

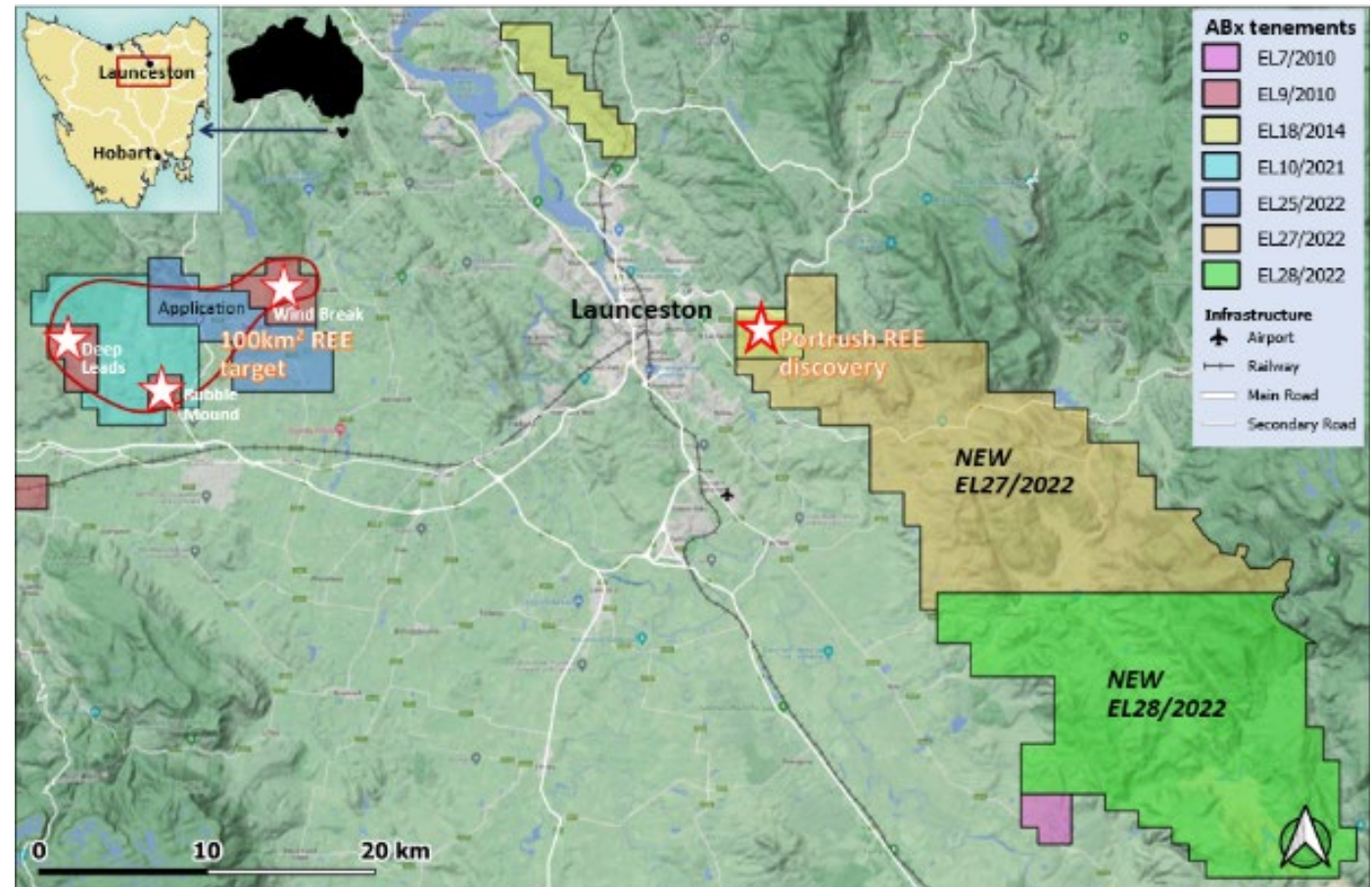
- <50 km to Launceston (pop 65,000)

## Water

- High availability in Tasmania

## Energy

- Close to major transmission lines



Source: ABX ASX Announcement, 22 January 2024



# Jurisdiction

## Australia

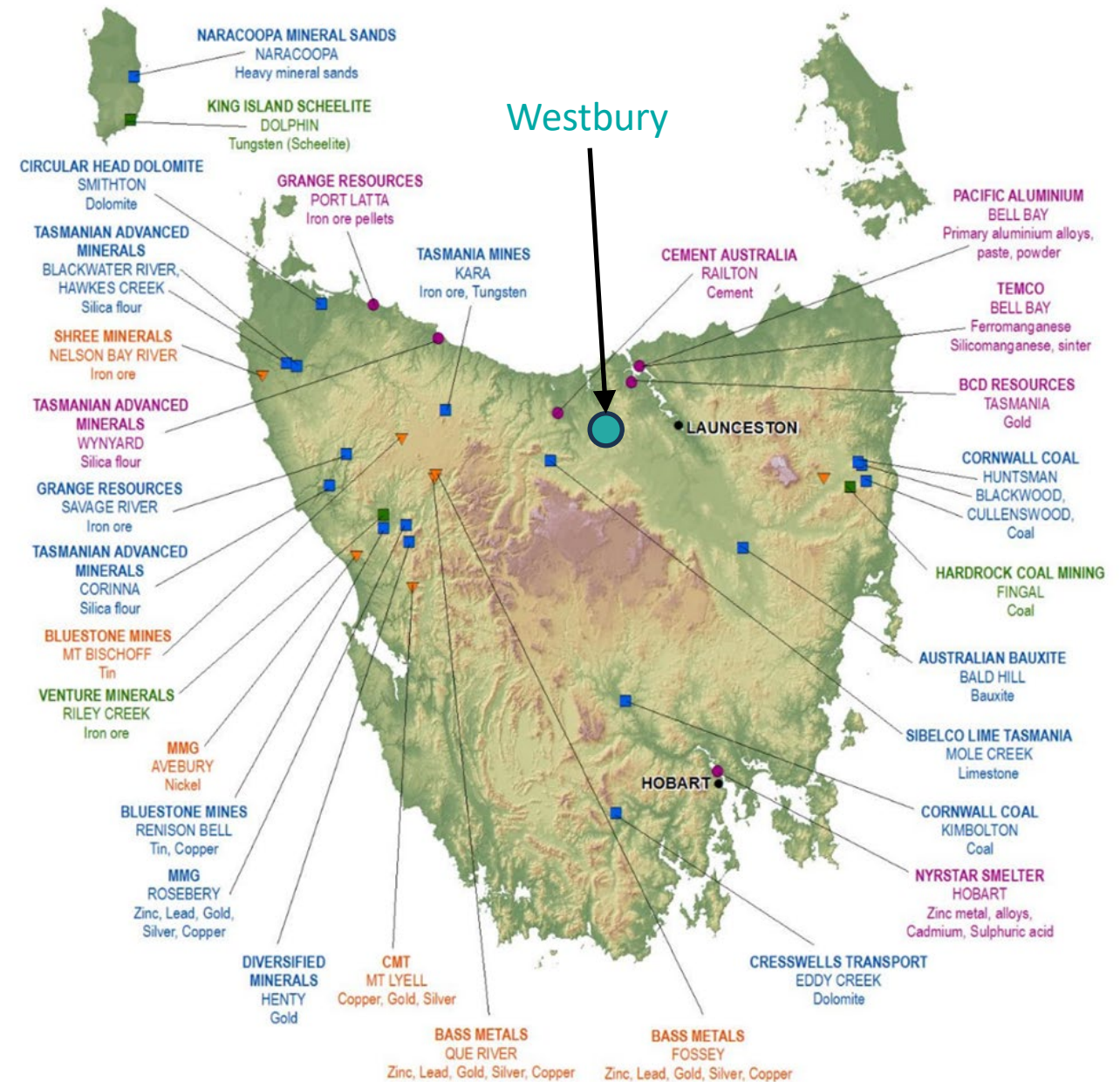
- NATO partner
- Major mining jurisdiction

## Tasmania

- Extensive mining history: tin, copper, zinc, lead, gold
- Supportive regulatory environment

## Westbury region

- Mostly commercial forest plantations



# Resources

## People

- High calibre geologists and engineers, with experience in resource development, process development, and production
- ABx active in Tasmania since 2010
  - Excellent reputation with landholders, regulators and government
  - Mined bauxite 2015 to 2020, now fully rehabilitated
  - Mine lease application in progress for second bauxite mine

Ian Levy (geology)



- 30 years of senior management and geological experience with multiple commodities, including at WMC
- Previously CEO of Allegiance Mining and Director of Gloucester Coal
- Member of JORC for 11 years (4 years as Vice Chairman) and Federal President, Australian Institute of Geoscientists

Dr Mark Cooksey (chemical engineering)



- More than 20 years with Rio Tinto and CSIRO
- Significant experience in developing and commercialising new processes in minerals and metals industry
- PhD in Chemical & Materials Engineering

Dr Daniel Jewell (chemical engineering)



- 15 years in senior technical roles including at the University of Cambridge, CSIRO, and in industry
- Strong focus on extractive scale-up technologies for metal production for titanium, magnesium, & lithium
- PhD in Chemical Engineering

# ABx ticks all the boxes for an ionic clay rare earth project

Highest proportion of DyTb of any clay-hosted resource in Australia

Highest ionic proportion reported in Australia, comparable to operations in China

Mineral Resource



Jurisdiction



Infrastructure



Company Resources





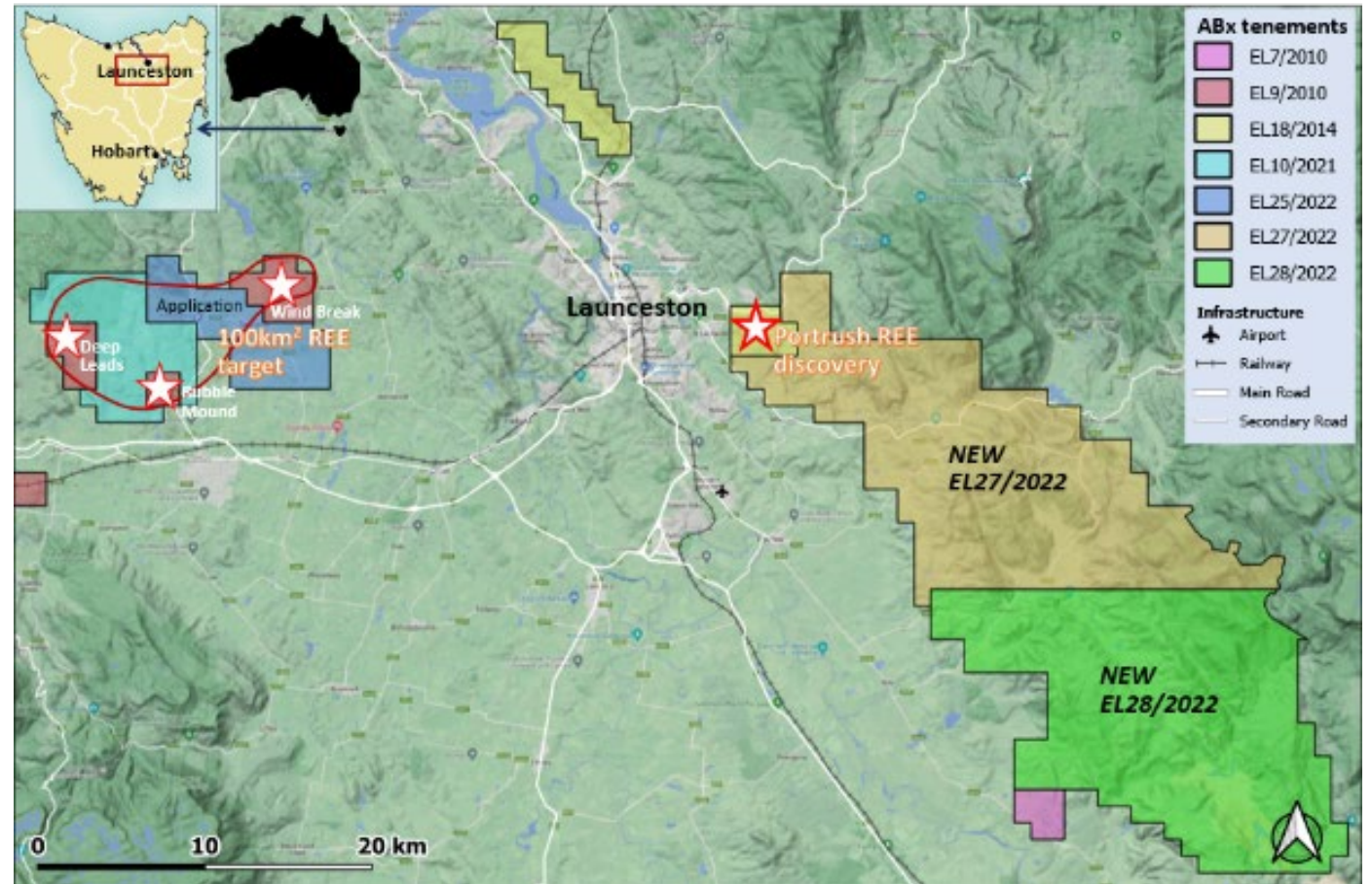
# ABx rare earths strategy

## Strategy

- Rapidly develop low-cost production of mixed rare earth carbonate (MREC)
- Sell MREC to third party refinery
- We operate only where welcomed

## Plan

- Laboratory and pilot plant studies
- Estimate CAPEX and OPEX
- Customer engagement
- Exploration technology
- Exploration campaigns



Source: ABX ASX Announcement, 22 January 2024



**ABx Group Limited**

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