**RAINBOW RARE EARTHS** 



## DRIVING DECARBONISATION:

# UNLOCKING SECONDARY SOURCES OF RARE EARTHS

3 APRIL 2023





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## **RAINBOW RARE EARTHS** UNIQUE INVESTMENT OPPORTUNITY

### PHALABORWA BASE CASE<sup>1</sup>



Rainbow Rare Earths Limited Corporate Presentation - 3 April 2023 3

All figures based on base case using US\$110/kg Nd; US\$112.50/kg Pr; US\$340/kg Dy; US\$1,875/kg Tb

RAINBOW

## STRONG LEADERSHIP TEAM WITH TRACK RECORD THROUGH PROJECT DEVELOPMENT TO PRODUCTION



- CEO George Bennett established MDM Engineering which delivered multiple processing plants and feasibility studies under his tenure
- Technical Director Dave Dodd worked alongside George at MDM Engineering after a long career delivering multiple mine developments
  - At MDM, George and Dave delivered two RE studies, being Lofdal in Namibia and Ngualla in Tanzania
- Technical team strengthened to include Chris Le Roux and Roux Wildenboer; extensive experience in RE processing and project development
- Chairman Adonis Pouroulis, is a mining entrepreneur; extensive experience across Africa and a long-term strategic vision for growth
- CFO Pete Gardner is a Chartered Accountant with +15 years in the mining sector (development and producing assets)

1. As at 29 March 2023







## **RARE EARTH ELEMENTS** ESSENTIAL FOR GLOBAL DECARBONISATION

## **CRITICAL BUILDING BLOCKS TO REACH NET ZERO**

- Rare earths (RE) are a group of 17 elements
- Neodymium and Praseodymium (together NdPr),
  Dysprosium (Dy) and Terbium (Tb) are economically
  important and account for 95% of global consumption<sup>1</sup>
- Used for permanent magnets (c. 30% RE elements by mass), which are essential components for:
- -Wind turbines
- -Electric vehicles (EVs)
- -Defence industry
- RE permanent magnets' competitive advantage is their very high strength to weight ratio
- Demand forecast to grow strongly accelerated by evolving global emissions legislation and government policy including commitments from COP27



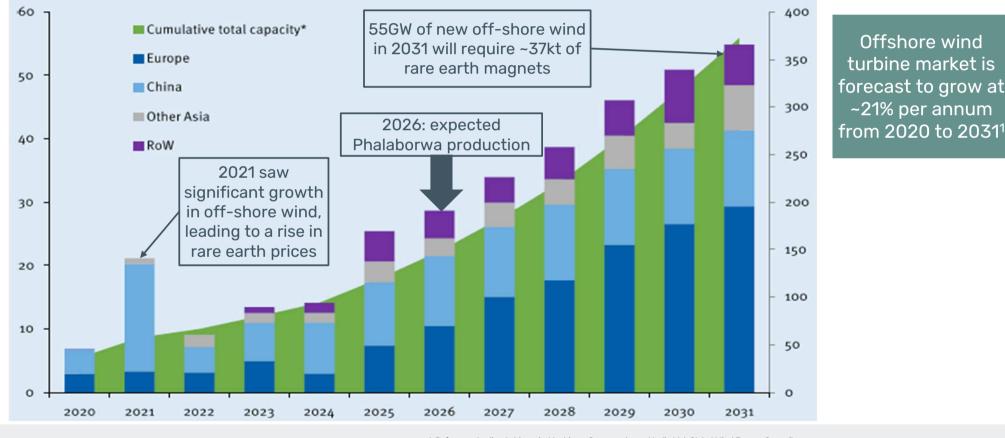
1. By value; in 2021. Sources: Argus Media Ltd





## ACCELERATING GLOBAL DEMAND FOR RARE EARTHS A 3MW OFFSHORE WIND TURBINE REQUIRES ~2T OF PERMANENT MAGNETS<sup>1</sup>

## **OFFSHORE WIND POWER CAPACITY ADDITIONS (GW)**



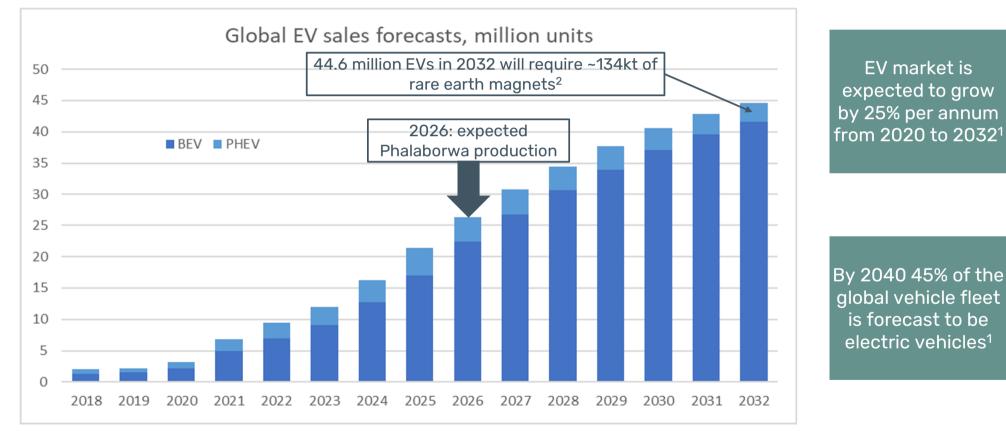
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1. Reference to direct drive wind turbines. Sources: Argus Media Ltd, Global Wind Energy Council



## ACCELERATING GLOBAL DEMAND FOR RARE EARTHS THE AVERAGE HYBRID OR EV USES 2-5KG OF RARE EARTH MAGNETS<sup>1</sup>

## **RISING GLOBAL EV SALES FORECASTS (MILLION UNITS)**



1. Sources: Argus Media Ltd

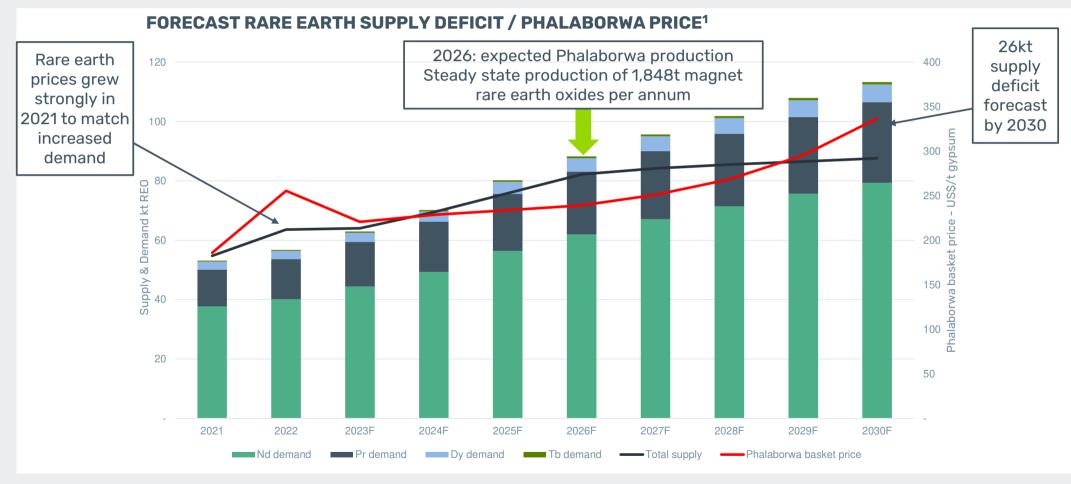
2. Assumed 3kg of RE magnets per vehicle - the average PHEV or BEV uses 2-5kg of RE magnets

RAINRO

## LONG TERM SUPPLY DEFICIT EXPECTED FOR RARE EARTHS



MAGNET RE SUPPLY WILL NEED TO GROW BY 8% PER ANNUM TO MATCH DEMAND



Sources: Argus Media Ltd

## **CREATING A RESPONSIBLE, WESTERN, INDEPENDENT SUPPLY CHAIN** URGENCY MOUNTING TO MEET GROWING DEMAND





**Deng Xiaoping, credited as** the father of modern-day China, 199

- Rare earths production, separation and refinery is dominated by China - 90% market share of refining market<sup>1</sup>
- With projected demand escalation and supply chain concerns, REEs have been designated as critical metals by many Western governments promoting a drive toward raw materials security
- REEs are critical in defence industry American F-35 fighter jet contains c. 420kg rare earths

## SUPPLY DEFICIT IS LIKELY DUE TO TRADITIONAL RARE **EARTHS MINING CHALLENGES:**

- Many development projects have complex challenges to overcome including low grades, high levels of radioactivity and environmental complications
- High capex associated with complex processing
- Long lead time for mines to be brought into operation

The top billionaires are now chasing the critical magnet rare earths - Part 1 of 2



🔍 Save 🏓 Share

Rinehart revs up in rare earths, gains lead in Warrego

Hancock grabbed a big stake in Arafura Rare Earths on Monday amid a flurry of corporate activity that shows how serious Mrs Rinehart is about evnanding her private company's footprint in green minerals as well as





## **PHALABORWA: EXCITING, NEAR-TERM GROWTH OPPORTUNITY** DELIVERY OF SEPARATED MAGNET RARE EARTH OXIDES ON SINGLE SITE FROM HISTORIC GYPSUM STACKS



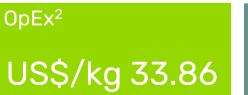


**Rainbow is earning a 70% interest in Phalaborwa** Remaining 30% will be held by Bosveld Phosphates (Pty) Limited

The Mineral and Petroleum Resources Development Act, 2002 in South Africa does not apply to the Phalaborwa project, so a mining right is not required to extract the minerals from the gypsum stacks. Accordingly, there are no black economic empowerment requirements

## THE RESOURCE SITS AT SURFACE THEREBY ELIMINATING TRADITIONAL MINING RISK

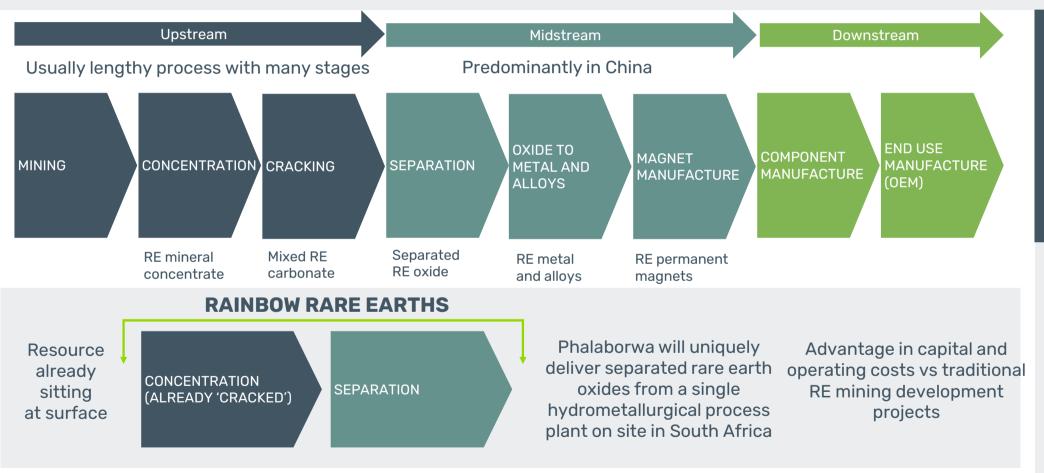
- Project is largely permitted and positioned in an established mining town, with:
- -associated skilled labour availability
- supporting industry (i.e., local production of sulphuric acid, a key reagent in the processing circuit)
- -existing infrastructure
- Low capital intensity: capex of **US\$295.5 MILLION** significantly below that of a traditional hard rock rare earth mining project
- Low levels of radioactive elements: typical rare earth projects require complex processing to remove these



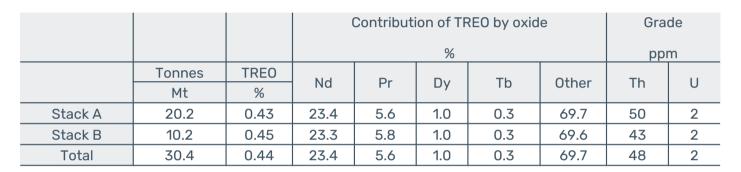
Highest basket price of any project ex China<sup>3</sup> US\$/kg 175.89<sup>4</sup>

1. Resource information provided on slide 12; 2. Operating cost per kg product; 3. Berenberg Metals and Mining Analyst – November 2022; 4. Numbers based on 2022 YTD average rare earth prices at time of publication of PEA in October 2022

## RAINBOW'S POSITION IN THE RARE EARTH MAGNET SUPPLY CHAIN UNDERLINES PHALABORWA'S UNIQUE ADVANTAGE



## **UPDATED JORC COMPLIANT MINERAL RESOURCE ESTIMATE (MRE)** PHALABORWA, SOUTH AFRICA



			Contribution of TREO by oxide				Grade		
			%					ppm	
	Tonnes	TREO	Mid	D.*	DV	Th	Other	Th	
	Mt	%	Nd	Pr	Dy	Tb	Other	Th	U
Measured	7.3	0.47	23.5	5.9	1.0	0.3	69.3	47	2
Indicated	16.1	0.44	23.5	5.6	1.0	0.3	69.6	49	2
Inferred	7.0	0.42	23.1	5.5	1.0	0.3	70.1	45	2
Total	30.4	0.44	23.4	5.6	1.0	0.3	69.7	48	2
October 2022	30.7	0.43	23.4	5.7	1.0	0.3	69.6	48	2
PEA resource									
Variance %	(0.3)	0.01	0.0	(0.1)	0.0	0.0	0.1	0	0

### **UPDATED 20 MARCH 2023**

- Overall size of MRE confirmed at 30.4 Mt comprising 0.44% TREO
- High value magnet rare earths Nd and PR represent 29% of TREO, with economic quantities of Dy and Tb
- Company will undertake additional drilling to upgrade MRE further as part of the

RAINROW

 Management expects that more accurate density measurements below the water table of the gypsum stacks will provide opportunity to increase total resource tonnage

DFS

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1. The MRE is reported at a 0.2% TREO cut-off grade. 2. Rainbow Rare Earths is earning a 70% interest in the Phalaborwa project.

3. The MRE has been estimated by independent consultant Malcolm Titley of Maja Mining Limited. 4. Mineral resources are not mineral reserves and do not have demonstrated economic viability.

## **K-TECH PATENTED SEPARATION TECHNOLOGY** CONTINUOUS ION EXCHANGE (CIX) AND CONTINUOUS ION CHROMATOGRAPHY (CIC)



### RAINBOW HAS ACCESS TO K-TECH'S CIX AND CIC TECHNOLOGY FOR RECOVERY OF SEPARATED RARE EARTH OXIDES

- Replaces traditional solvent extraction (SX) technology, which uses toxic and flammable solvents and diluents
- Safer and more environmentally responsible
- Reduced capital and operating costs due to simplified flowsheet and single processing plant
- CIX and CIC are proven technologies used in other industries at capacities up to 700m<sup>3</sup> per hour (larger than required at Phalaborwa) including food, biotech, mining and chemical industries globally
- Fast, efficient, and precise extraction of trace quantities of target materials from high volume streams
- Safe, simple to run, and can operate at a range of temperatures



An example of a commercial scale CIX unit built by K-Tech



**Rare Earth Project Comparison** 

## PHALBAORWA EST. EBITDA MARGIN OF 75% BASED ON CONSERVATIVE PRICING MUCH HIGHER GRADE THAN TYPICAL IONIC CLAY RARE EARTH PROJECTS WITH LOW LEVELS OF RADIOACTIVITY

Project	Style	Owner	TREO <sup>3</sup> %	NdPr <sup>4</sup> ppm	In-situ REO US\$/t¹	U⁵ ppm	Th <sup>6</sup> ppm
Phalaborwa	Gypsum stacks	Rainbow Rare Earths	0.44%	1,277	182	2	47
La Paz <sup>2</sup>	Ionic Clay	American rare Earths	0.047%	80	14	1	7
Round Top <sup>2</sup>	Ionic Clay	US Rare Earths/TMRC	0.063%	39	35	45	179
Makuutu <sup>2</sup>	Ionic Clay	Ionic Rare Earths	0.08%	232	45	10	30
Mount Weld <sup>2</sup>	Hard rock	Lynas Rare Earths	7.90%	18,833	2,348	30	750
Ngualla <sup>2</sup>	Hard rock	Peak Resources	4.80%	10,210	1,180	18	61
Yangibana <sup>2</sup>	Hard rock	Hastings Tech. Metals	1.17%	4,000	1,010	300	600
Bear Lodge <sup>2</sup>	Hard rock	Rare Element Resources	3.08%	7,059	893	113	472
Nolan's Bore <sup>2</sup>	Hard rock	Arafura Resources	2.60%	6,859	824	191	2,700
Nechalacho <sup>2</sup>	Hard rock	Vital Metals	1.46%	3,690	794	28	139
Longonjo <sup>2</sup>	Hard rock	Pensana plc	1.43%	3,170	415	29	967
Songwe Hill <sup>2</sup>	Hard rock	Mkango Resources	1.41%	2,880	403	15	386
Norra Karr <sup>2</sup>	Hard rock	Leading Edge Materials	0.50%	701	228	8	16

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Value of magnet rare earth metals/t ore based on US\$110/kg Nd; US\$112.50/kg Pr, US\$340/kg Dy, US\$1,875/kg Tb 1. 2. Based on public disclosure from owner

4.  $Nd_2O_3$  and  $Pr_6O_{11}$ 5.  $U_3O_8$ 6.  $ThO_2$ 

3. TREO includes  $Y_2O_3$ 



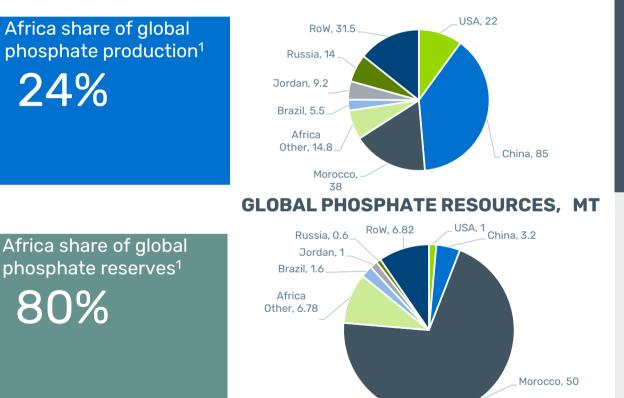
## GLOBAL OPPORTUNITY TO RECOVER RARE EARTHS FROM PHOSPHORIC ACID PRODUCTION

LEVERAGING IP AND PORTFOLIO FOR LONG TERM GROWTH

## STRATEGIC FOCUS ON RECOVERING RARE EARTH OXIDES FROM SECONDARY SOURCES TO SUPPORT GLOBAL DECARBONISATION

- IP and expertise in recovering rare earths from phosphogypsum unlocking additional opportunities:
- Signed master agreement with OCP Moroccan world-leading producer of phosphate products – and UM6P University on rare earths extraction from phosphogypsum
- MoU with major chemicals company in South Africa to extract rare earths from nitro phosphate process stream
- -Investigating further global opportunities

## **GLOBAL PHOSPHATE PRODUCTION, MT**



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1. Berenberg Metals and Mining Analyst – November 2022

## **RESPONSIBLE PRODUCTION OF RARE EARTHS** INTEGRATING STRONG ENVIRONMENTAL AND SOCIAL PRACTICES IN PHALABORWA'S DEVELOPMENT



### FOUNDED ON THE PRINCIPLES OF CIRCULARITY; RECOVERING RARE EARTHS FROM SECONDARY SOURCE

## BROWNFIELD

- Phalaborwa is on an industrial site with legacy environmental issues
- Majority of environmental permits are in place and only require updating

## REHABILITATION

- Rainbow will clean up legacy issues:
- Neutralising acidic solution
- Redepositing benign gypsum on lined stacks in accordance with IFC standards / Equator Principles

## RECYCLING

- All process water needs will be met by neutralised water in ponds
- Certain key reagents<sup>1</sup> recovered from upfront leach process for use downstream
- Sulphuric acid from nearby plant waste stream

## 🕮 RENEWABLE

 Exploring renewable energy options at Phalaborwa, including solar

# CREATING SOCIAL VALUE



- Different social context from a greenfield project in a remote location
- Transparent payment of taxes
- Commitment to prioritise local supply chain

PEOPLE

## ABLE

• Focus on Zero harm

**m**m

- Phalaborwa expected to provide c. 275-300 direct jobs
- Commitment to prioritise local employment

## CLOSED-LOOP

- No water abstraction required for processing
- Any water discharged to the environment will be done so in line with regulations

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## REUSE

î2

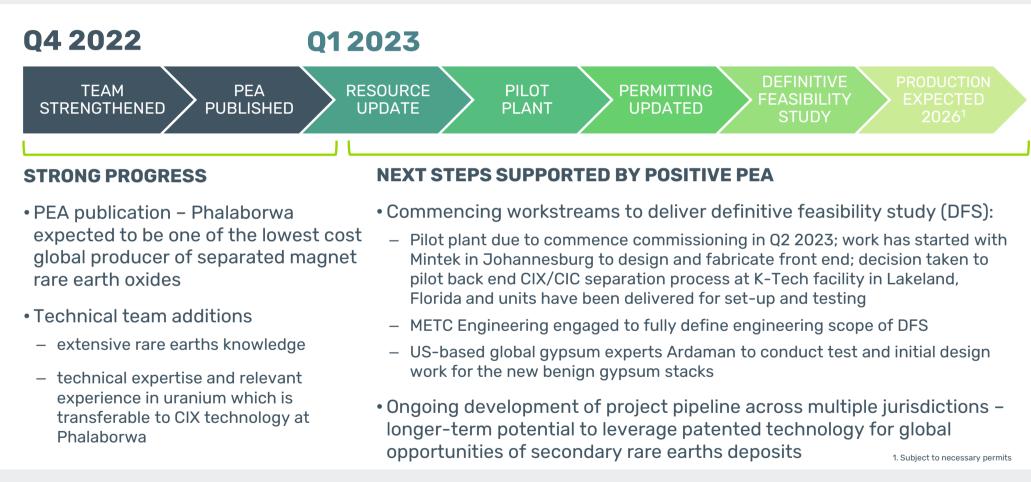
- Existing infrastructure can be repurposed and reused
- Potential for use of reclaimed, clean phosphogypsum in building and industrial sectors

**Responsible production** 

## STRONG PROGRESS TO DATE

DE-RISKS PHALABORWA PROJECT; UNLOCKS VALUE





Progress and next steps

## WHY RAINBOW? DRIVING VALUE FROM STRATEGIC SECONDARY SOURCES OF RARE EARTHS





 Based on the long-term price forecasts received from Argus, with the first year of production assumed to occur in 2026 and prices assumed to remain constant from 2031 to the end of the project life
 EBITDA operating margin

## RAINBOW RARE EARTHS

RAINBOW

# THANK YOU

Contact us:

INVESTOR RELATIONS Cathy Malins Tel: +44 7876 796 629 Email: cathym@rainbowrareearths.com www.rainbowrareearths.com

## EXPERIENCED BOARD AND EXECUTIVE MANAGEMENT





### NON-EXECUTIVE DIRECTOR International affairs specialist

SHAWN MCCORMICK

ADONIS POUROULIS

NON-EXECUTIVE CHAIRMAN

precious/base metals, coal and oil and gas.

 Over 25 years of political and extractive industries sector experience having served in The White House as Director for African Affairs on the National Security Council (Washington)

• Mining engineer: an entrepreneur whose expertise lies in the discovery, exploration

Founder of Rainbow and Petra Diamonds (LSE:PDL): Founder and Director of Chariot

and development of natural resources across Africa including diamonds,

Oil & Gas (AIM:CHAR) and Founder of Pella Resources Limited

• Previously Political Affairs Director of BP (London) and VP of TNK-BP (Moscow)



## ALEXANDER LOWRIE

#### NON-EXECUTIVE DIRECTOR

- Investment banker with 13 years' experience and previous director roles at Deutsche Bank and RBS
- Co-founder of Telemark Capital LLP
- Significant market experience: IPOs and primary and secondary equity offerings



#### **J PETER PHAM** NON-EXECUTIVE DIRECTOR

- Scholar and practitioner of International Affairs: >20 years of experience in Africa
- First-ever United States Special Envoy for the Sahel Region until 2021 with the personal rank of Ambassador; previously as US Special Envoy for Great Lakes Region
- Distinguished Fellow at the Atlantic Council
- Member of the Board of the Smithsonian National Museum of African Art in Washington, DC, as well as Non-Executive Director of Africell Global Holdings

#### **ATUL BALI** NON-EXECUTIVE DIRECTOR

- Corporate CEO and board member with extensive experience in tech, government contracting and regulated industries; Chartered Accountant
- Currently advisor to several high-growth technology companies, Chairman of the Football Pools and non-executive director of Everi Holdings Inc (NYSE:EVRI)
- Previously held divisional CEO or President positions with IGT (NYSE), Aristocrat (ASX), and Real Networks (NASDAQ), as well as a venture capital firm





#### PETER GARDNER CHIEF FINANCIAL OFFICER

• Qualified Chartered Accountant; +15 years' experience in mining industry leading finance teams across Africa/developing nations

process plants and feasibility studies. Sold after 8 years to Foster Wheeler for US\$120 million

• Former CFO of Amara Mining plc (up to acquisition by Perseus Mining Ltd), Chaarat Gold, Piran Resources and Alexander Mining



#### DAVE DODD TECHNICAL DIRECTOR

- 45 years of extractive metallurgy experience
- Metallurgical Project Consultant
- BSc (Hons) Chemical Engineering (1974)
- Fellow of Southern Africa Institute of Mining & Metallurgy

#### PROJECT MANAGER - PHALABORWA

- Mechanical Engineer
- 20 years' experience in project management delivering multidisciplinary mining and infrastructure projects in remote and logistically challenging geographical regions
- Successful completion of multiple feasibility studies across Africa
- Proven track record of increasing project value by reducing capital and operating costs during project life cycle from study to execution

#### CHRISTOPHER ATWOOD

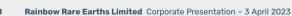
**PROJECT MANAGER - GAKARA** • 25 years' experience in mining and extractive industries.

- Track record of driving expansion and minimising costs
- Associated with startup ventures in remote locations.
- Led operations up to 35Mtpa successfully











## **KEY SHAREHOLDER INFORMATION**



### **BOARD SHAREHOLDINGS AND MAJOR SHAREHOLDERS (>3%)**

Shareholder	Holding
Adonis Pouroulis	14.5%
George Bennett	6.8%
Robert Kampf	5.5%
Praesidium Capital Management	4.0%
TechMet Ireland Ltd	3.5%
UBS AG Zurich	2.9%
Shawn McCormick	1.8%
Alexander Lowrie	1.2%
Atul Bali	0.7%
J Peter Pham	0.05%
Total Board shareholding	25.0%

### **INFORMATION AS AT 29 MARCH 2023**

Ticker	Market	Market cap	Share price	Shares in issue	Brokers
RBW.L	LSE	£50.0m	9.25p	526m	BERENBERG

### SHARE PRICE (GBP)





## **PHALABORWA PRELIMINARY ECONOMIC ASSESSMENT** EXPECTED TO BE ONE OF THE LOWEST COST PRODUCER OF SEPARATED MAGNET RARE EARTH OXIDES

### STRONG ECONOMIC RETURNS FROM PEA

- October 2022 PEA demonstrated the low-cost nature of the Phalaborwa development
- Base case model delivers robust economic returns with significant upside seen using YTD magnet rare earth prices
- US\$255m/annum revenue from sale of 1,848t/annum separated magnet rare earth during production for base case price assumptions – rises to US\$325m/annum using 2022 YTD average prices<sup>2</sup>
- Average operating costs of US\$33.86/kg separated magnet rare earth oxides expected to be one of the lowest of all Western rare earth projects
- US\$192m/annum EBITDA during steady state production for base case price assumptions – rises to US\$262m/annum using 2022 YTD average prices<sup>2</sup>
- Capex of US\$295.5 million below that of a traditional hard rock rare earth mining project



The base case uses US\$110/kg Nd; US\$112.50/kg Pr; US\$340/kg Dy; US\$1,875/kg Tb.

3. Net present value using a 10% forward discount rate.

4. EBITDA operating margin.

1.

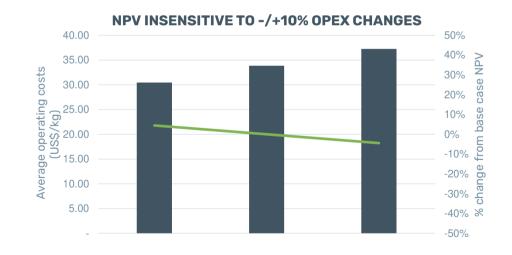
Appendice

Prices derived from weekly data collated by Rainbow from price reporting agencies up to 23 September 2022: US\$146.36/kg Nd; US\$140.25/kg Pr; US\$403.70/kg Dy; US\$2,117.56/kg Tb. Whilst prices have been updated, no other assumptions have been updated since 20 March 2023.

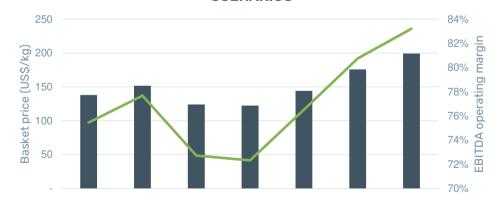
## STRONG RETURNS WITH LOW SENSITIVITY TO COSTS IN ANY FORESEEABLE PRICING ENVIRONMENT

- Sensitivity analyses demonstrate robust EBITDA operating margins in all pricing sensitivity scenarios
- Strong supply / demand fundamentals support long-term increase in magnet rare earths prices
- Long-term forecast prices provide an NPV of c.US\$1 billion, with a 2.4-year payback

- Minimal impact on NPV due to changes in operating costs; beneficial in inflationary environment
- Opex, capex and forex analyses demonstrate strong NPVs in all scenarios:
- opex +10%: -US\$28m (-4%)
- capex +10%: -US\$17m (-3%)
- FX US\$1:ZAR17.5: +US\$25m (+4%)



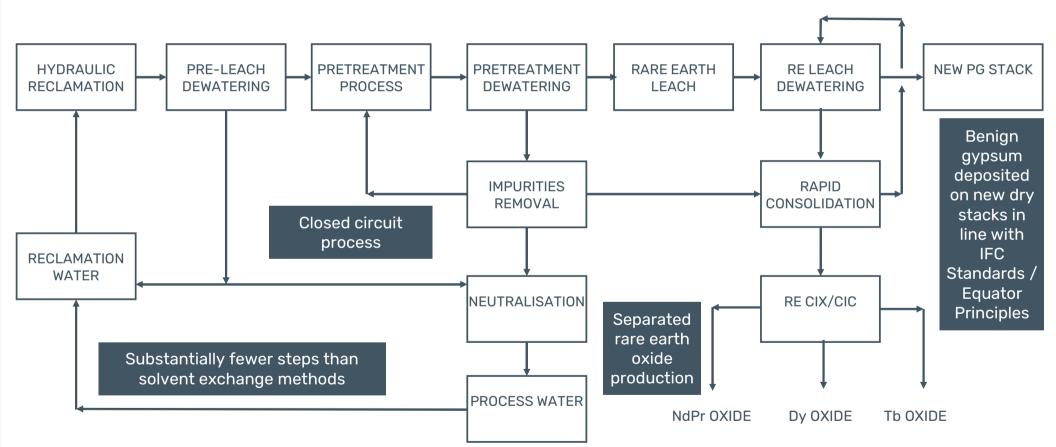
### ROBUST EBITDA OPERATING MARGIN IN ALL PRICING SCENARIOS





## PHALABORWA BLOCK FLOW DIAGRAM UNIQUE PROCESS DEVELOPED BY RAINBOW AND K-TECH





Appendices

## **GAKARA: HIGH-GRADE RARE EARTH MINERAL CONCENTRATE** FROM LARGE MINERALISED SYSTEM IN BURUNDI

- 39km<sup>2</sup> mining permit hosting large scale mineralised system
- Exploration target provides opportunity for 262,000 375,000t of high-grade vein hosted mineralisation grading 7.0% - 12.0% TREO plus 252,000 - 342,000t of breccia hosted mineralisation grading 1.0% - 1.5% TREO
- Trial mining and processing since 2017 has demonstrated amenability for simple, low-cost gravity separation from ore
- Trial mining has progressed from small-scale manual focused operations pre 2020 to bulk mechanical waste mining and selective mechanical ore mining to deliver an average mine feed grading 13.5% TREO between September 2020 and March 2021
- High value rare earth concentrate (52-58% TREO) with low levels of radioactive elements weighted towards magnet rare earths: NdPr represent ~90% of value (19.5% of mass)
- Expanded mining fleet and de-bottle necking of process plant in 2020-21 delivered growing production profile until operation placed on care and maintenance in June 2021 at request of Burundi Government
- We continue to engage with the Government to renegotiate terms of the Mining Convention and to restart operations





LATEST OPERATIONS

