

Australian  
VANADIUM  
LIMITED



E22

ENERGY

TRANSITION

SOLUTIONS



vsunenergy

# Future Facing Commodities Conference

APRIL 2023

# ASX CHAPTER 5 COMPLIANCE AND CAUTIONARY AND FORWARD-LOOKING STATEMENTS

The views expressed in this Presentation contain information derived from publicly available sources that have not been independently verified. No representation or warranty is made as to the accuracy, completeness or reliability of the information.

## ASX Listing Rules 5.19 and 5.23

### ASX Listing Rule 5.19

The information in this Presentation relating to production targets, or forecast financial information derived from a production target, is extracted from the announcement titled "Bankable Feasibility Study for the Australian Vanadium Project" released to the ASX on 6 April 2022 which is available on the Company's website [www.australianvanadium.com.au](http://www.australianvanadium.com.au).

The Company confirms that all material assumptions underpinning the production target, or the forecast financial information derived from a production target, in the original market announcement continue to apply and have not materially changed.

### ASX Listing Rule 5.23

The information in this Presentation relating to exploration results and mineral resource and ore reserve estimates for the Australian Vanadium Project is extracted from the announcement titled "Bankable Feasibility Study for the Australian Vanadium Project" released to the ASX on 6 April 2022 which is available on the Company's website [www.australianvanadium.com.au](http://www.australianvanadium.com.au).

The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement, and that all material assumptions and technical parameters underpinning the estimates in the original market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the competent person's findings are presented have not been materially modified from the original market announcement.

## Forward Looking Statements

This Presentation may contain certain forward-looking statements with respect to matters including but not limited to the financial condition, results of operations and business of AVL and certain of the plans and objectives of AVL with respect to these items. These forward-looking statements are not historical facts but rather are based on AVL's current expectations, estimates and projections about the industry in which AVL operates and its beliefs and assumptions.

Words such as "anticipates," "considers," "expects," "intends," "plans," "believes," "seeks," "estimates", "guidance" and similar expressions are intended to identify forward looking statements and should be considered an at-risk statement. Such statements are subject to certain risks and uncertainties, particularly those risks or uncertainties inherent in the industry in which AVL operates.

These statements are not guarantees of future performance and are subject to known and unknown risks, uncertainties, and other factors, some of which are beyond the control of AVL, are difficult to predict and could cause actual results to differ materially from those expressed or forecasted in the forward-looking statements. Such risks include, but are not limited to resource risk, metal price volatility, currency fluctuations, increased production costs and variances in ore grade or recovery rates from those assumed in mining plans, as well as political and operational risks in the countries and states in which we sell our product to, and government regulation and judicial outcomes. For more detailed discussion of such risks and other factors, see the Company's Annual Reports, as well as the Company's other filings.

AVL cautions shareholders and prospective shareholders not to place undue reliance on these forward-looking statements, which relate only to events as of the date on which the statements are made.

## AUSTRALIAN VANADIUM LIMITED

# Why Vanadium? Industrial, critical and battery metal

## Steel Alloy: Growth Market

### Industrial Metal

- Increased use of vanadium alloyed steels is a force multiplier in reducing carbon footprint
- 20 years of continuous demand growth, set to accelerate as higher specific V use continues to increase

## Quality of Life: Growth Market

### Critical Metal

- Vanadium contributes to sustaining and improving our quality of life. It is used extensively in **aerospace, defence and chemical catalysts**
- Over 75% of global vanadium supply currently sourced from China, Russia, and South Africa
- There is a case to diversify supply chains toward stable, ESG credentialled jurisdictions

## WHY VANADIUM?



## Energy Storage: Growth Market

### Battery Metal (Horizon 1 VRFBs)

- Vanadium redox flow batteries (VRFBs) are a mature and proven technology ideally positioned to meet demand for long duration storage.
- 2% of V market historically, expected to be >10% in 2023
- More VRFB capacity has been commissioned in the last 12 months than the entire prior 40 year history of VRFB technology combined

## Innovation: Future Upside

### Battery Metal (Horizon 2 Lithium-ion)

- Multiple advanced pre-commercialisation technologies showing significant economic and technical merits of **vanadium use in lithium-ion cathodes and anodes**
- Potential to improve Li-ion batteries including energy density, charge rate, cycling, and safety
- Vanadium use in solid state lithium metal batteries is another exciting application for vanadium under research



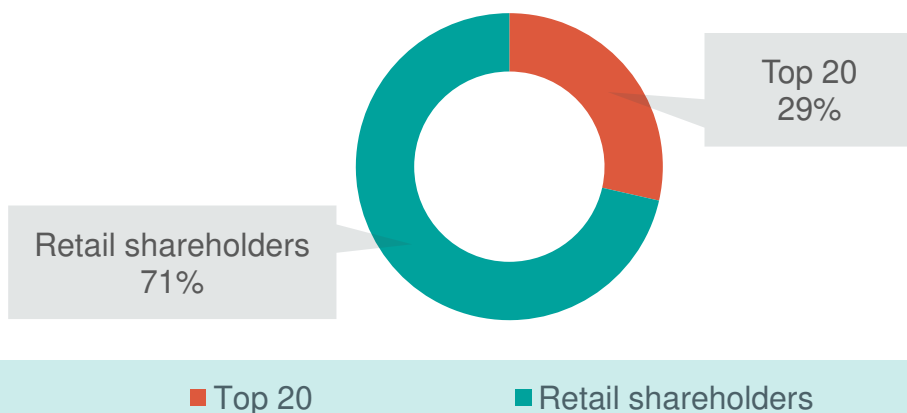
## CORPORATE OVERVIEW

## Australian Vanadium

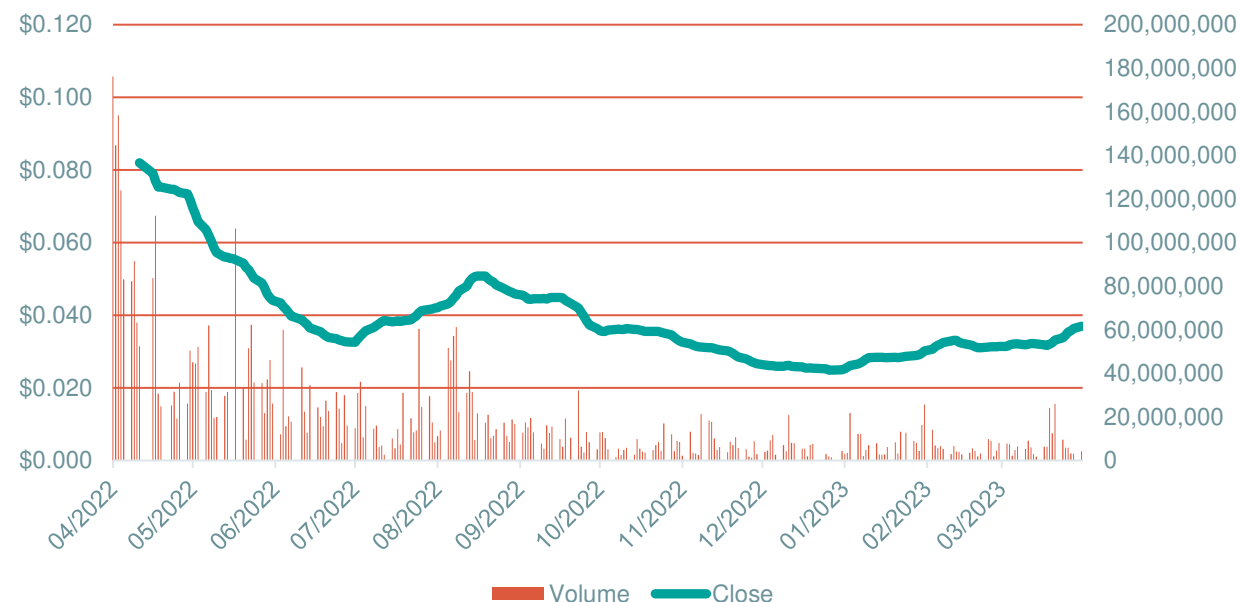
## KEY STATISTICS AS AT 03/04/2023

Ordinary Shares on Issue	4.36b
Share Price	A\$0.037
Average Daily Traded Volume	19M (~A\$1M)
Market Cap (Undiluted)	A\$161M
Shareholders	16,360
Cash at 03/04/2023	A\$22.4M

## SHAREHOLDER SPLIT



## AVL SHARE PRICE HISTORY (03/04/2023)



## TOP 5 SHAREHOLDERS

		%
1	Citicorp Nominees Pty Ltd (including RCF at 5.35%)	8.85%
2	BNP Paribas Nominees Pty Ltd ACF Clearstream	3.57%
3	Mr Leendert Hoeksema	2.66%
4	Kalemois Pty Ltd	1.51%
5	HSBC Custody Nominees (Australia) Ltd	1.41%







### Mining & CMB

- ✓ Proximity to Great Northern Highway (31km)
- ✓ Proximity to water
- ✓ BOO power generation station using LNG and renewables
- ✓ Close to airport (Meekatharra 40km)
- ✓ Historical and current mining region

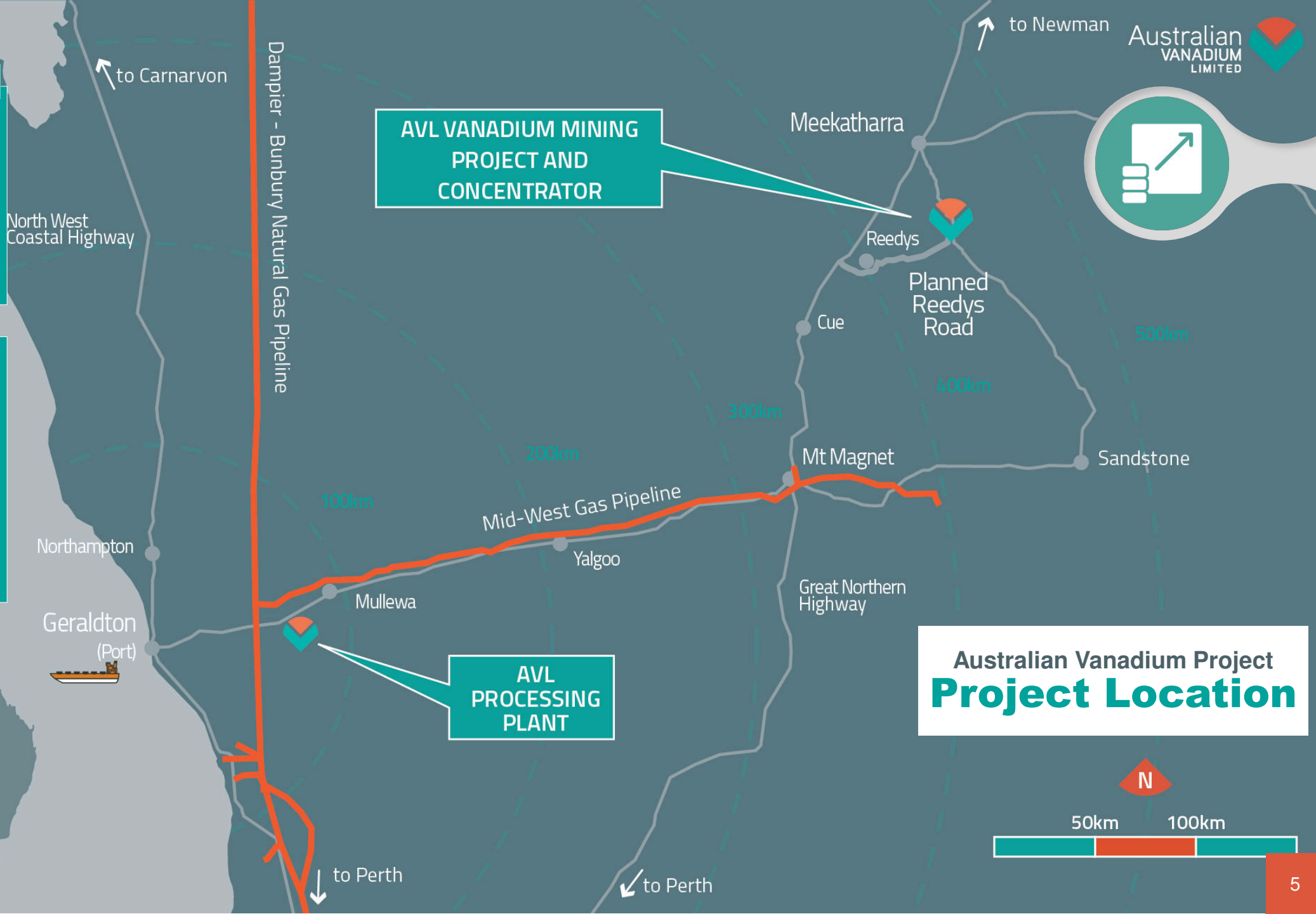
### Processing Plant

- ✓ Proximity to gas & water (25km)
- ✓ Proximity to Port of Geraldton (80km) for sale of FeTi
- ✓ Existing road and rail
- ✓ Local & regional workforce available
- ✓ Unique consumption opportunity for new regional green hydrogen use
- ✓ No assessment required

AVL VANADIUM MINING  
PROJECT AND  
CONCENTRATOR

AVL  
PROCESSING  
PLANT

Australian Vanadium Project  
**Project Location**



## AUSTRALIAN VANADIUM LIMITED

## Vanadium – consensus on demand growth



Vanadium demand to **double by 2032**, with more than 90% of this growth from Vanadium Redox Flow Batteries (VRFBs).



VRFBs will **fundamentally restructure** the vanadium supply chain.



Massive growth in batteries will **stress supply**.

‘Assuming even modest growth in vanadium consumption in energy storage applications, the industry will be **challenged to meet surging demand** in the coming decade.’  
**TTP Squared**



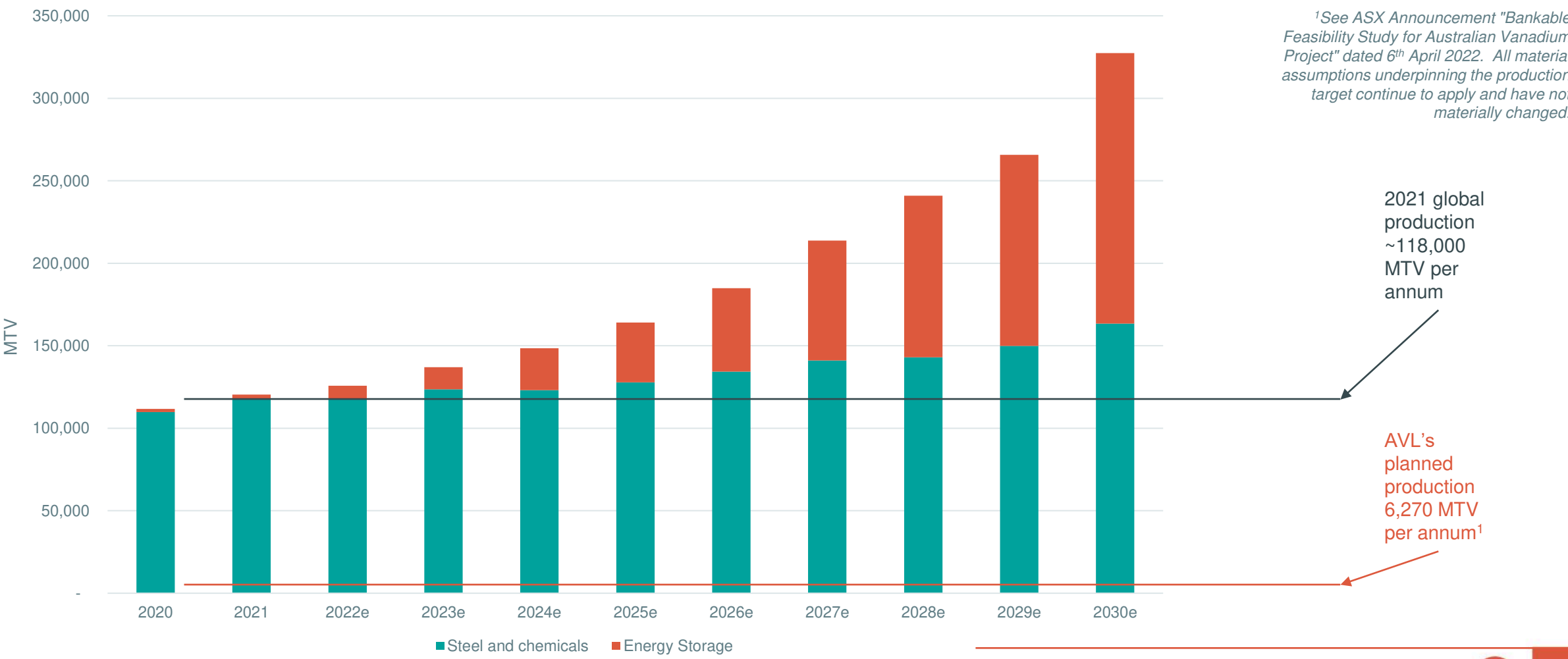
Currently, it is estimated that the VRFB market only accounts for 3%-5% of vanadium production but the continued shift to renewable energy solutions could trigger a surge in vanadium demand and account for **20% of vanadium consumption by 2030**.

Sources: Stockhead, TTP Squared, Project Blue, eResearch, Wood Mackenzie



VANADIUM MARKETS

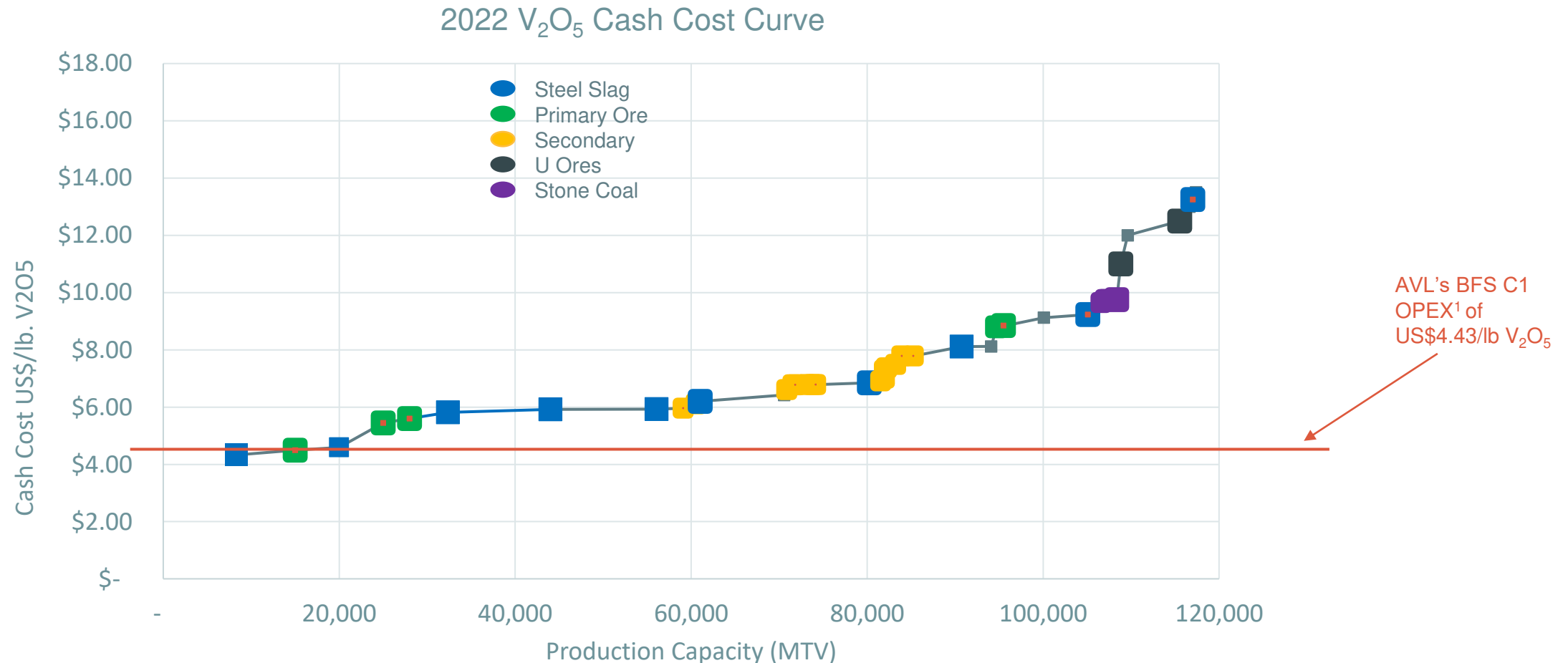
Industrial metal and battery metal demand growth



# Supply curve – AVL Project well positioned



“The cash cost of the last incremental units required to satiate demand in 2022 is above US\$12.00/lb V<sub>2</sub>O<sub>5</sub>” – TTP Squared



Source: TTP Squared, inc.

<sup>1</sup>See ASX Announcement "Bankable Feasibility Study for Australian Vanadium Project" dated 6<sup>th</sup> April 2022. All material assumptions underpinning continue to apply and have not materially changed.





# Why AVL?

## Track Record

- Track record in raising capital and securing significant government grants to fund and build value in the company.

## Asset & Scalability

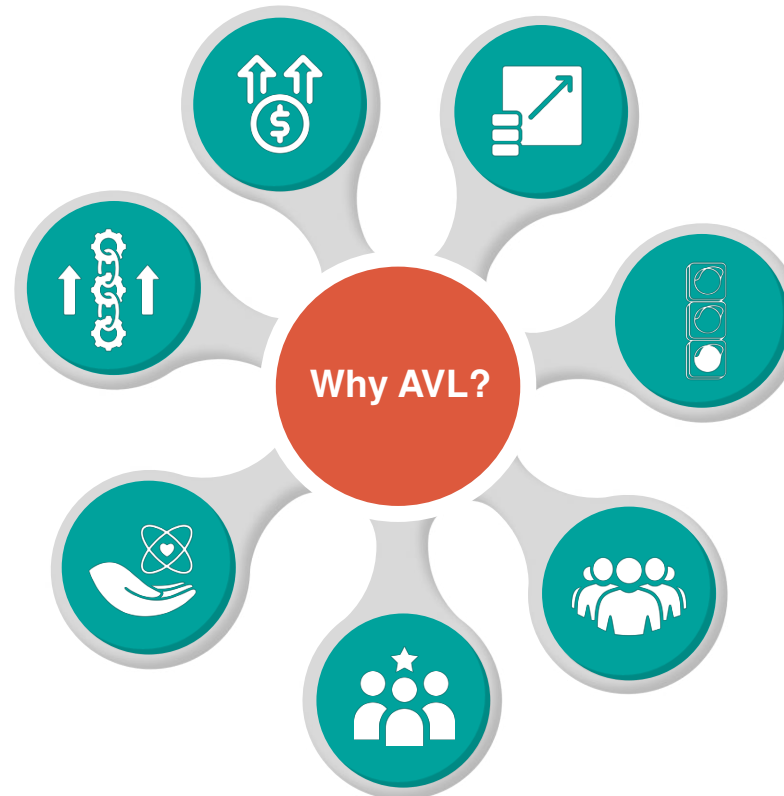
- **25+ years mine life, competitive C1 OPEX**
- **Hub Processing Configuration:** built for scalability
- **Scalable Infrastructure:** gas and logistics
- **Scalable Feed:** proximal to 1B tonnes similar ore types
- **Premium mining & processing jurisdiction:** Western Australia

## Vertical Integration

- Industry leading product quality, LoM
- True “Pit to Battery” integration optionality

## Ethically Sourced

- Distinctive ability to produce an ethical, low carbon product



## Green Lights

- A recent, comprehensive BFS, advanced approvals status
- Strong relationships: \$49M MMI-C Federal Government Grant (Multiple Grants, Major Project Status), Critical Minerals Office Austrade; State Government (Lead Agency Status)
- One of the most advanced undeveloped vanadium projects in the world
- Positioned with early mover advantage and supplier of choice status in the battery market.

## Collective Expertise

- Technical team in place from inception of asset development strategy
- Commodity experience in board, executive, and technical teams

## Quality of Board and AVL Team

- A future-proofed board with the right skillsets to finance, build, and operate the project and grow a globally relevant company in this commodity
- A team that can deliver with proven technical and commercial track record in vanadium, project development, operations



A TEAM THAT CAN DELIVER

# International vanadium expertise

## Track record in project execution and operations



### Board



**Cliff Lawrenson**  
Non-Executive  
Chair

Experienced Chair with extensive executive career in resources, energy, infrastructure and investment banking



**Vincent Algar**  
Managing  
Director

Mining, exploration, project development, mining services and management of publicly listed companies



**Daniel Harris**  
Non-Executive  
Director

Over 40 years of **vanadium experience** including executive leadership of global vanadium companies, and operations



**Miriam Stanborough**  
Non-Executive  
Director

Over 20 years of experience in mineral processing, research, operations, technology & innovation. Roles with Monadelphous, Iluka, Alcoa and WMC



**Peter Watson**  
Non-Executive  
Director

40 years of experience in senior technical, project and management roles, executive experience running ASX-listed companies

### Executive Team



**Graham Arvidson**  
Chief Executive  
Officer

Mineral sector experience spans **vanadium** and lithium project development and operations



**Todd Richardson**  
Chief Operating  
Officer

Over 20 years of **experience in the vanadium sector** and an expert in vanadium process design, commissioning and operations



**Louis Mostert**  
Chief Legal and  
Commercial  
Officer

20 years of experience in project contracting and finance, corporate advisory, mergers and acquisitions



**Liesl Strachan**  
Chief Financial  
Officer

More than 15 years of financial experience in the resources sector, both in Australia and the UK



**Samantha McGahan**  
Marketing Manager

Leads marketing of AVL and VSUN Energy. Fosters networks in vanadium and energy markets.





### Mining & CMB

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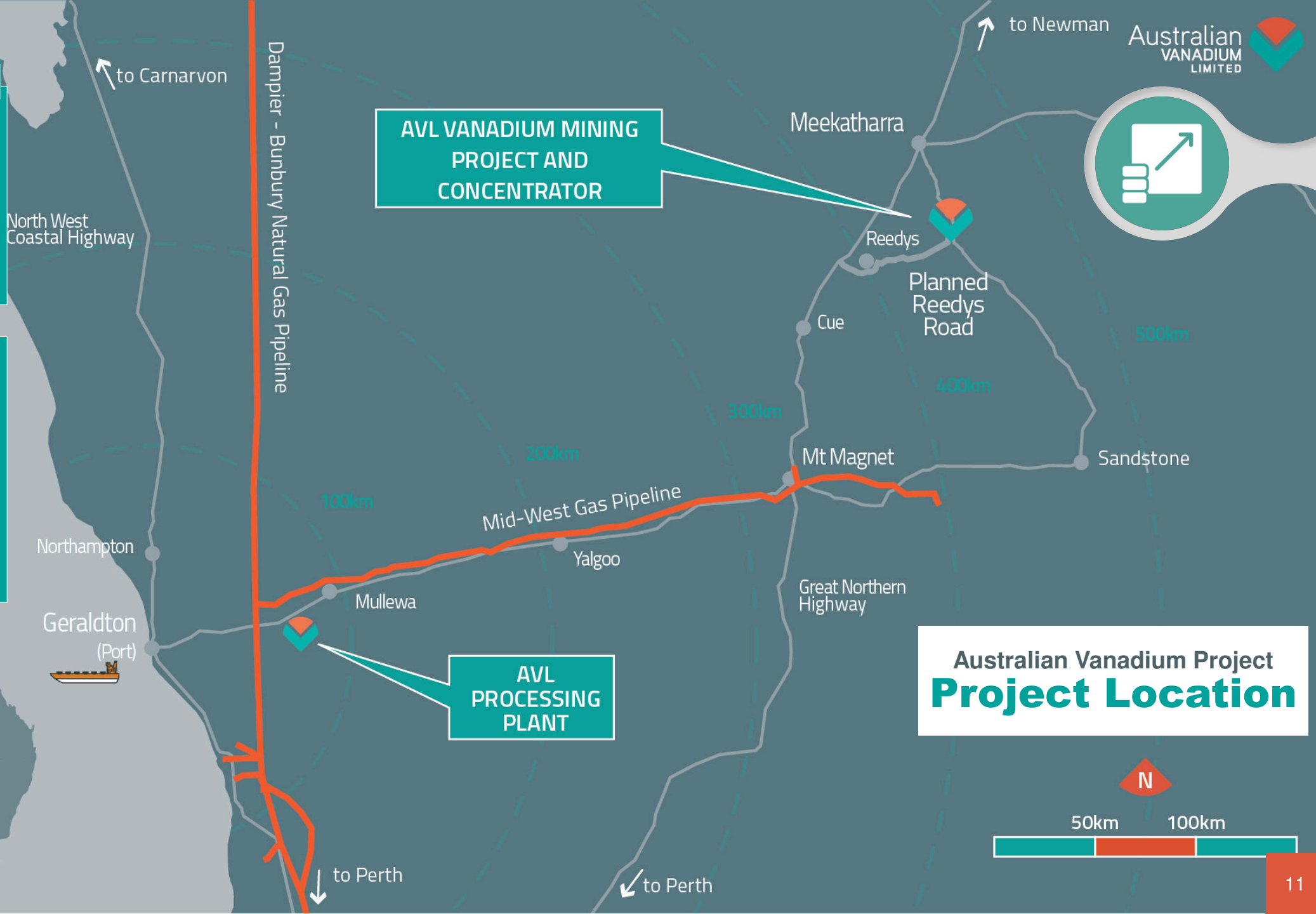
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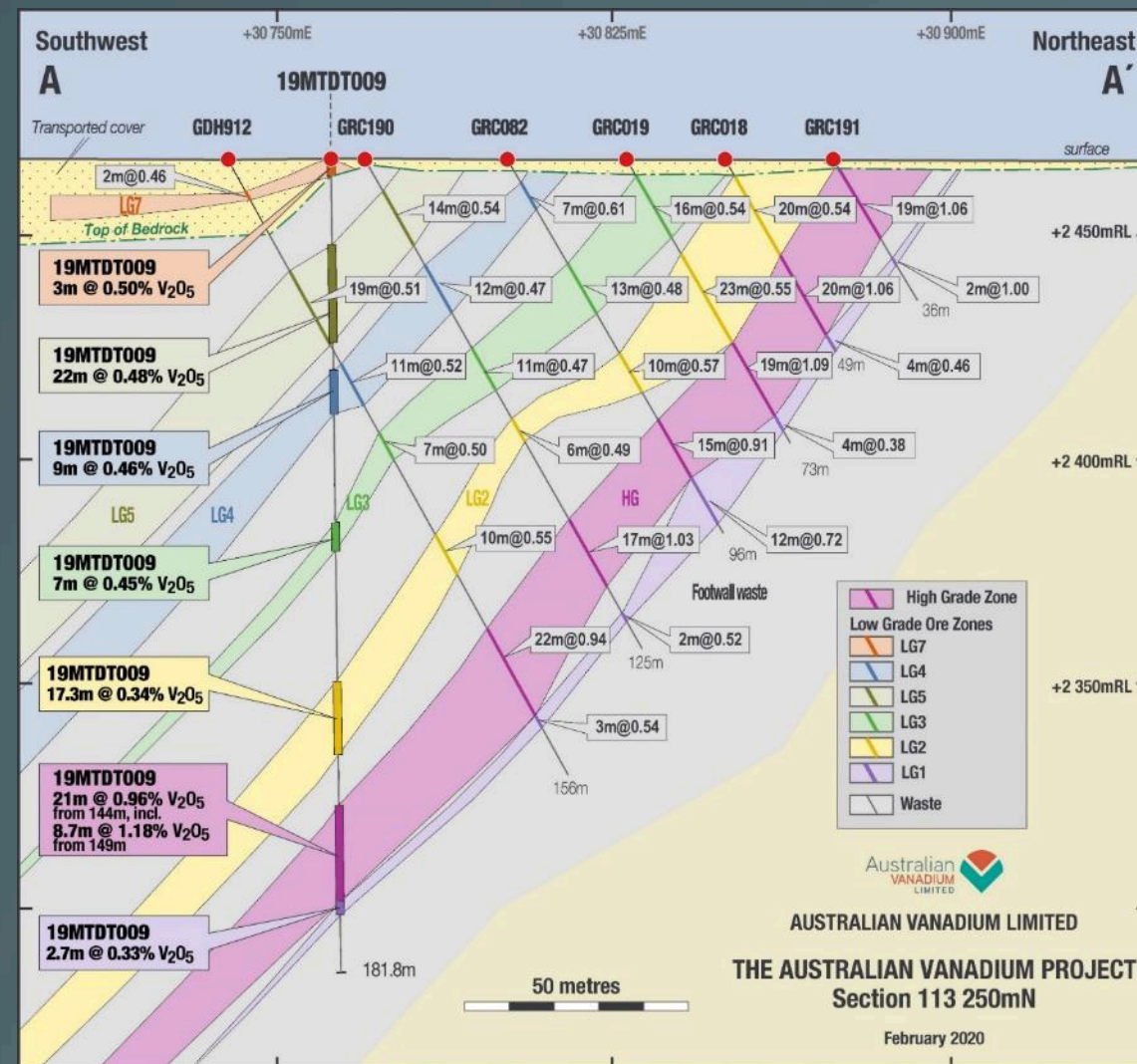
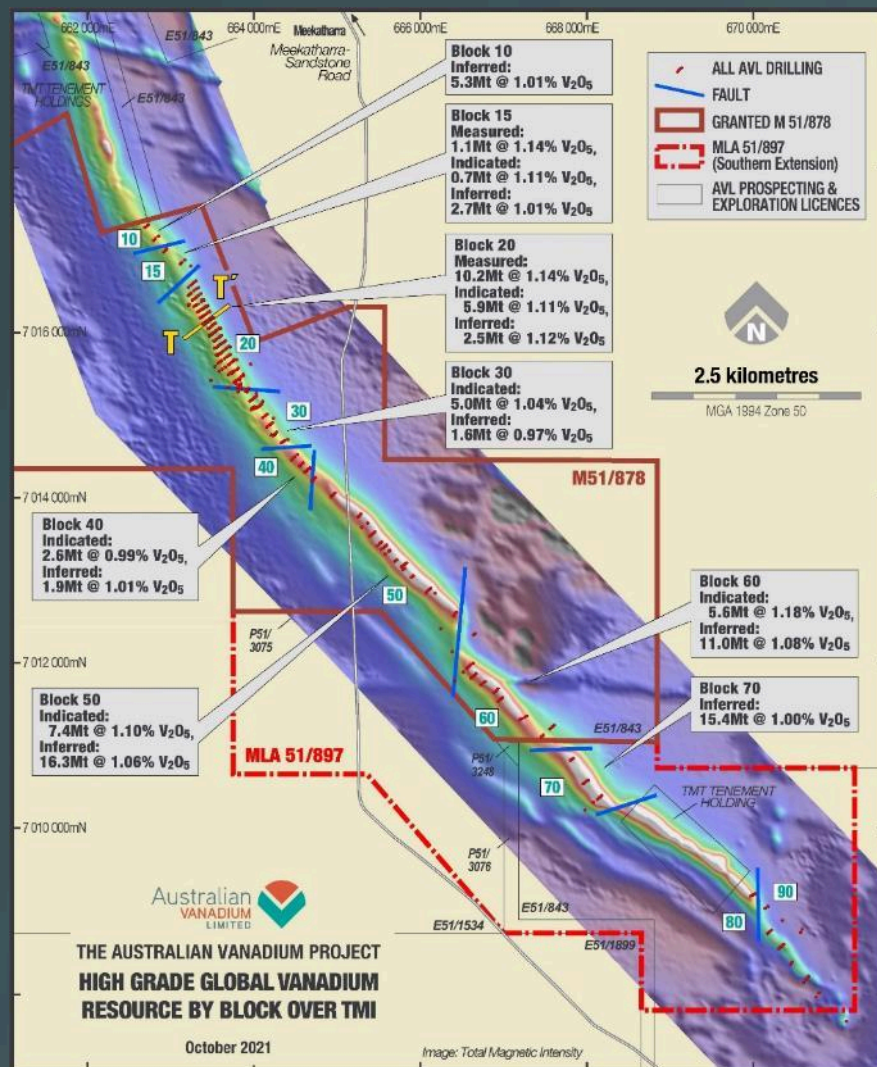
AVL VANADIUM MINING  
PROJECT AND  
CONCENTRATOR

AVL  
PROCESSING  
PLANT

Australian Vanadium Project  
**Project Location**







Resource Total Magnetic Intensity

Section

Note: Information within this slide as detailed in ASX Announcement "Bankable Feasibility Study for Australian Vanadium Project" dated 6<sup>th</sup> April 2022

# BFS – Robust Project Metrics



## RESOURCE

Total Resource

**239Mt @ 0.73% V<sub>2</sub>O<sub>5</sub>**

High-grade 95.6Mt @ 1.07 V<sub>2</sub>O<sub>5</sub>

Ore Reserve

**30.9Mt @ 1.09 V<sub>2</sub>O<sub>5</sub>**

Proved 10.5Mt @ 1.11% V<sub>2</sub>O<sub>5</sub>

Probable 20.4Mt @ V<sub>2</sub>O<sub>5</sub>

**25+ years**

mine life



## STRONG FINANCIAL OUTCOMES

Pre-Tax NPV<sub>7.5</sub>

**A\$833M**

IRR

**20.6%**

EBITDA Annual Average

**A\$175M**

EBITDA Project

**A\$4.4B**

NPAT Project

**A\$2.2B**



## OPEX, CAPEX, PRODUCTS

**C1 OPEX**

**US\$4.43/lb V<sub>2</sub>O<sub>5</sub>**

**PRE-PRODUCTION**

**CAPEX US\$435M**

**ANNUAL V PRODUCTION**

**11,200t V<sub>2</sub>O<sub>5</sub> (6,270 MTV)**

**LoM V<sub>2</sub>O<sub>5</sub> Grade 99.5%**

**FeTi Coproduct**

**900,000tpa**

Note: Information within this slide as detailed in ASX Announcement "Bankable Feasibility Study for Australian Vanadium Project" dated 6th April 2022. All material assumptions underpinning the production target and forecast financial information derived from a production target continue to apply and have not materially changed

Note: MTV = metric tonnes vanadium





Dampier - Bunbury Natural Gas Pipeline

North West Coastal Highway  
to Carnarvon

to Newman

**AVL MINING PROJECT  
AND CONCENTRATOR**

**Australian  
VANADIUM  
LIMITED**

**239Mt @ 0.73% V<sub>2</sub>O<sub>5</sub>  
ASX: 6/4/2022**

**AVL  
PROCESSING  
PLANT**

**STAGE 1**  
AVL concentrate

**STAGE 2**  
Regional concentrates

Murchison Technology Metals Project 5  
Barrambie Project 1  
Limestone Well Vanadium  
Ballanhoe Hills 500km

Cue 400km

200km

300km

Mid-West Gas Pipeline

Mt Magnet

Sandstone

3 Windimurra Project  
2 Canegrass Project  
Victory Bore  
Unaly Hill

Manindi West

4 Youanmi Project

Watsons Well

Lost Hill  
Buddadoo

Perenjori

Mingenew

Eneaba

Dongara

Northampton  
Oakajee  
Geraldton (Port)

**MID WEST REGION  
CONCENTRATE PROCESSING HUB**



- Other projects with published Resources
- 1 Neometals  
280.1Mt @ 0.82% V<sub>2</sub>O<sub>5</sub>  
ASX: 2018
  - 2 Canegrass Project (Viking Mines - Farm-In)  
79Mt @ 0.64%  
ASX: 2018
  - 3 Windimurra Project (Atlantic)  
209.7Mt @ 0.50% V<sub>2</sub>O<sub>5</sub>  
2019
  - 4 Youanmi Project (Venus Metals)  
134.73Mt @ 0.34% V<sub>2</sub>O<sub>5</sub>  
ASX: 2019
  - 5 Murchison Technology Metals Project (Technology Metals Australia)  
153.7 @ 0.80% V<sub>2</sub>O<sub>5</sub>  
ASX: 2022

The Vanadium Triangle

Vanadium Project Location

Gas/Water Pipeline

Major road

Major railway

N

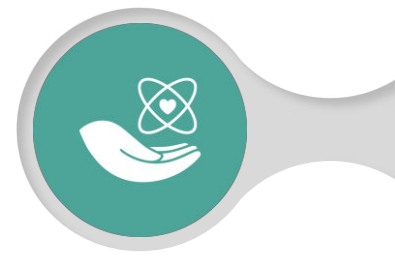
0km 100km

## ESG IN ACTION

# Strong ESG Focus

### Renewable energy strategy

- Ability to produce ethical, low carbon vanadium product, expecting to be 50% lower carbon intensity per unit of vanadium than existing co-production vanadium producers<sup>1</sup>
- Use of solar and/or wind generation
- Use of VRFBs for energy storage
- Collaboration with ATCO for use of green hydrogen into the natural gas supply at the processing plant through ATCO collaboration
- Exploring use of electric or green hydrogen fuelled vehicles onsite and for haulage



### Community relationships

- Workforce participation opportunities for Yugunga-Nya traditional owners
- Regional Engagement Manager based in Geraldton
- Sponsorship of awards and scholarships at Central Regional TAFE
- Mullewa community sponsorship
- Stephen Michael Foundation and Shooting Stars sponsorship



### Governance

- Developing ESG reporting structure aligned to the developing ISSB framework through application of SASB, TCFD, and GRI reporting structures
- Experienced and competent Board of Directors
- Long term engagement with Environmental Protection Agency
- Organisational culture

<sup>1</sup>Source: AVL internal benchmarking, public information from co-producers



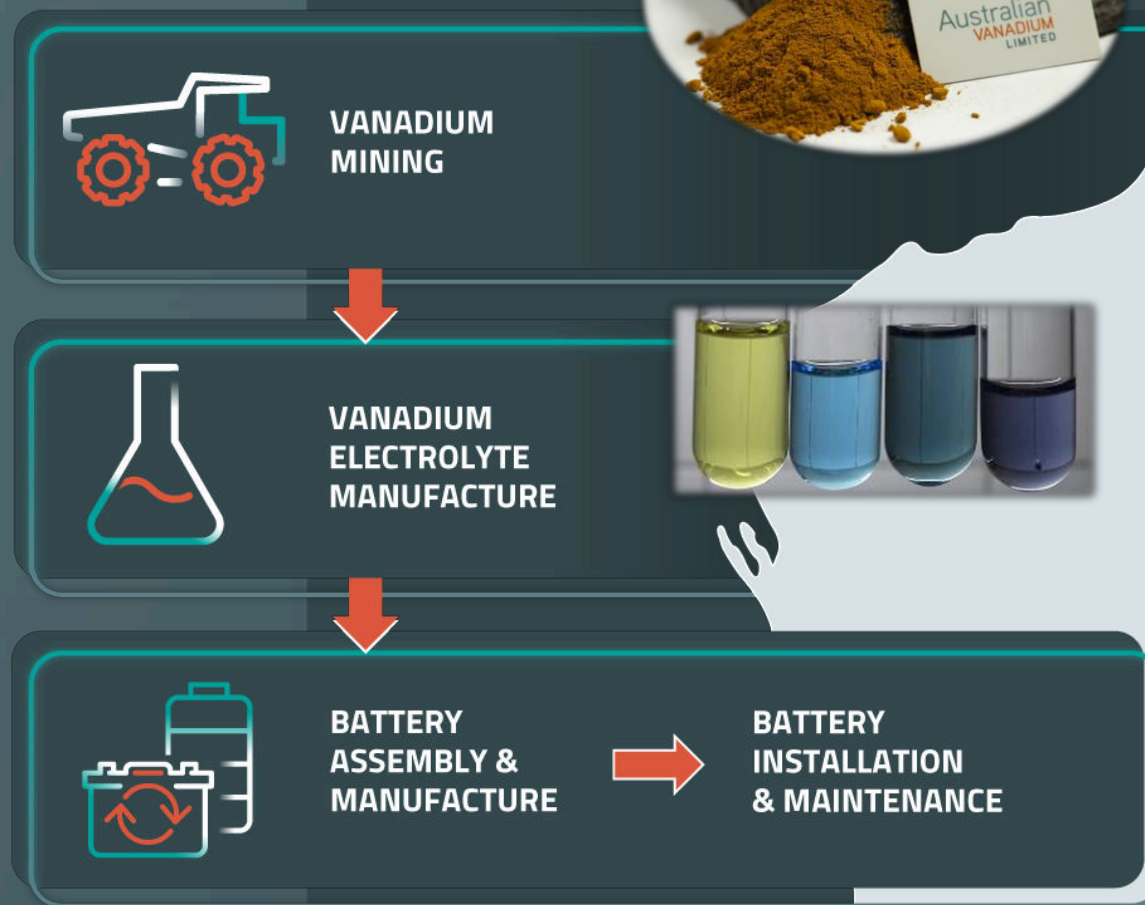
AUSTRALIAN VANADIUM PROJECT

# Vertical Integration

## *Pit to Battery*

Vertical integration optionality can give AVL the ability to produce the world's highest quality vanadium products tailored to our customers' needs from steel (low purity requirements) through to speciality chemicals (ultra high purity).

In addition to production, AVL will seek to participate economically in the vanadium value chain through partnerships and joint ventures

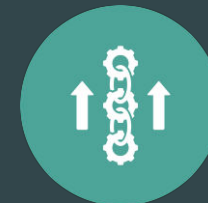




# AUSTRALIAN VANADIUM PROJECT Vanadium Electrolyte

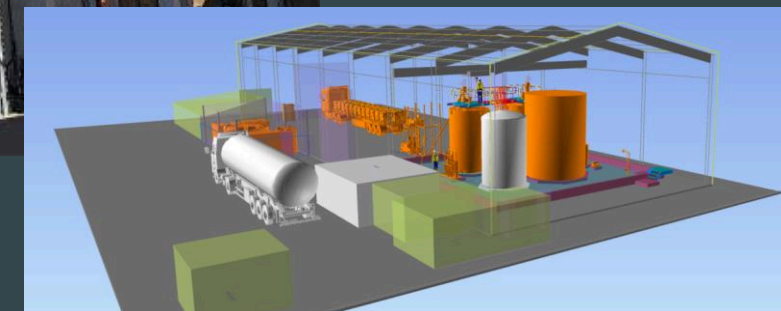
## Project Update

- 33MWh per annum electrolyte plant under development
- AVL to be an early mover in electrolyte manufacture in Australia
- Location secured in Perth, Western Australia
- Detailed design complete
- Long lead equipment ordered
- Utilises proven US Vanadium technology



*Left: U.S. Vanadium LLC electrolyte plant in Arkansas, USA*

*Below: Design for AVL electrolyte plant*



 **US VANADIUM**



**VANADIUM  
ELECTROLYTE  
MANUFACTURE**



# VRFB: Technical merit



Long duration



**Easy to scale**  
power and energy  
separately



Lifespan over  
20 years with little to  
**no degradation**  
**in performance**  
over time



**Non-flammable**  
making it one of the  
safest and most  
stable battery  
chemistries



Multiple daily cycles,  
with **100% depth of**  
**discharge** available



Vanadium electrolyte  
can be **reused**  
**indefinitely** or  
recycled for use in  
steel market





# VSUN Energy: Current Projects Overview



VSUN Energy is a 100% owned subsidiary of ASX-listed Australian Vanadium Limited (ASX: AVL)

## Current Projects

- **Water Corporation** – successful completion of trial of a 5kW/30kWh vanadium redox flow battery (VRFB) to power a chlorinator
- **IGO (ASX: IGO)** – installation of an 80kW/300kWh VRFB standalone power system (SPS) to provide power to a bore pump at the Nova Nickel Operation (pictured right, currently being tested in Perth)
- **Priest Bros Orchard**, Victoria – installation of a 20kW/80kWh VRFB
- Consultancy work for major mining clients underway
- Tender applications underway
- Well positioned to position in a significant future pipeline



AUSTRALIAN VANADIUM PROJECT

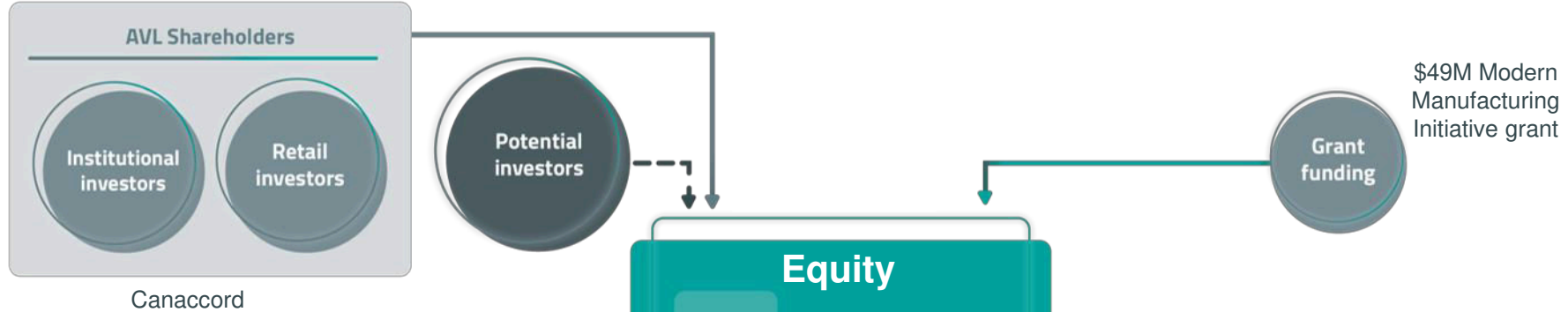
# Project Delivery Path



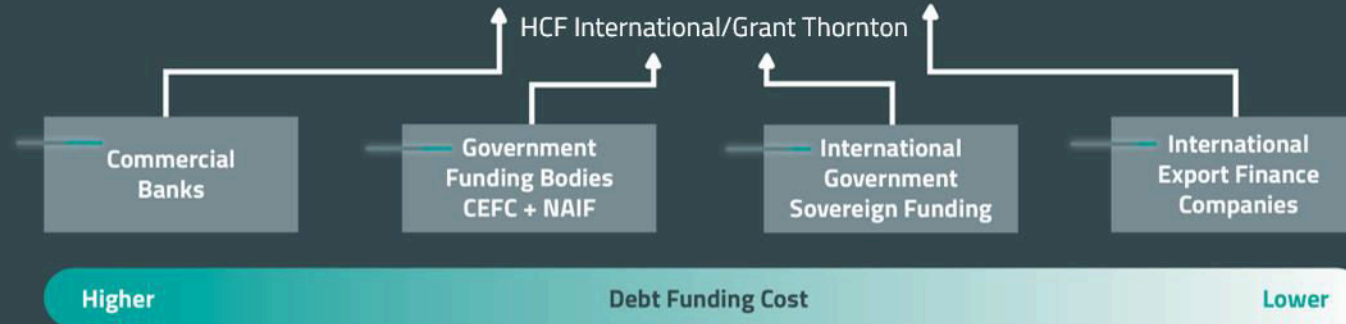
AUSTRALIAN VANADIUM PROJECT

# Funding model

EQUITY FUNDING



DEBT FUNDING





# In Summary

## Why Vanadium and why AVL?





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