

Creating an Australian Green Fuelled Vanadium Industry

Midwest Major Projects Update
Conference

September 2021

ASX: AVL

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Competent Person References

Competent Person Statement – Mineral Resource Estimation The information in this presentation that relates to Mineral Resources is based on and fairly represents information compiled by Mr Lauritz Barnes, (Consultant with Trepanier Pty Ltd) and Mr Brian Davis (Consultant with Geologica Pty Ltd). Mr Barnes and Mr Davis are members of the Australasian Institute of Mining and Metallurgy and Mr Davis is a member of the Australian Institute of Geoscientists and both have sufficient experience of relevance to the styles of mineralisation and types of deposits under consideration, and to the activities undertaken to qualify as Competent Persons as defined in the 2012 Edition of the Joint Ore Reserves Committee (JORC) Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. Specifically, Mr Barnes is the Competent Person for the estimation and Mr Davis is the Competent Person for the database, geological model and site visits. Mr Barnes and Mr Davis consent to the inclusion in this presentation of the matters based on their information in the form and context in which they appear.

Competent Person Statement – Metallurgical Results The information in this presentation that relates to Metallurgical Results is based on information compiled by independent consulting metallurgist, Brian McNab (CP. B.Sc Extractive Metallurgy). Mr McNab is a member of the Australasian Institute of Mining and Metallurgy. Mr McNab is employed by Wood Mining and Metals. Mr McNab has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which is undertaken, 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 McNab consents to the inclusion in the presentation of the matters based on the information made available to him, in the form and context in which it appears.

Competent Person Statement – Ore Reserves The technical information in this presentation that relates to the Ore Reserve estimate for the Project is based on information compiled by Mr Ross Cheyne, an independent consultant to AVL. Mr Cheyne is a Fellow of the Australasian Institute of Mining and Metallurgy. He is an employee and Director of Orelogy Mine Consulting Pty Ltd. Mr Cheyne has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken 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 Cheyne consents to the inclusion in the announcement of the matters related to the Ore Reserve estimate in the form and context

in which it appears.

The information is extracted from the announcement entitled "Total Vanadium Resource at The Australian Vanadium Project Rises to 208 Million Tonnes" released to the ASX on 4th March 2020 and "Technical and Financial PFS Update" released to the ASX on 22nd December 2020 which are available on the Company's website at australianvanadium.com.au.

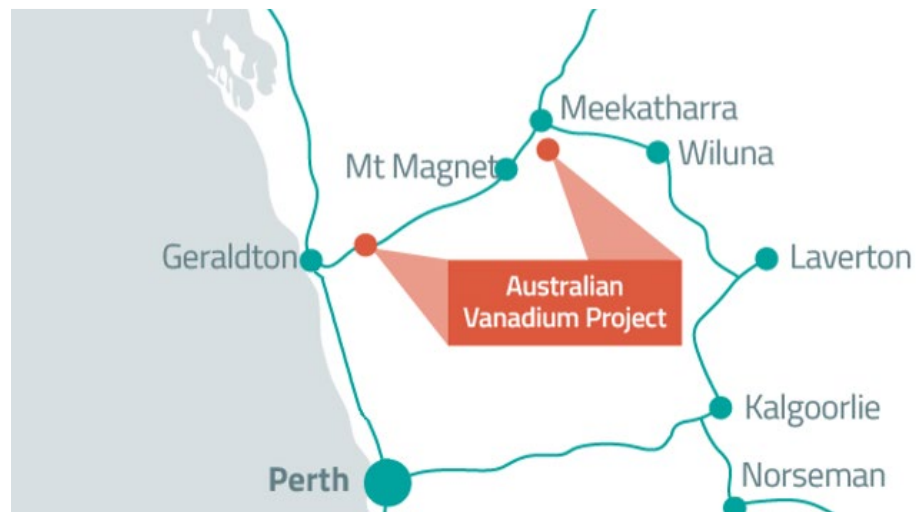
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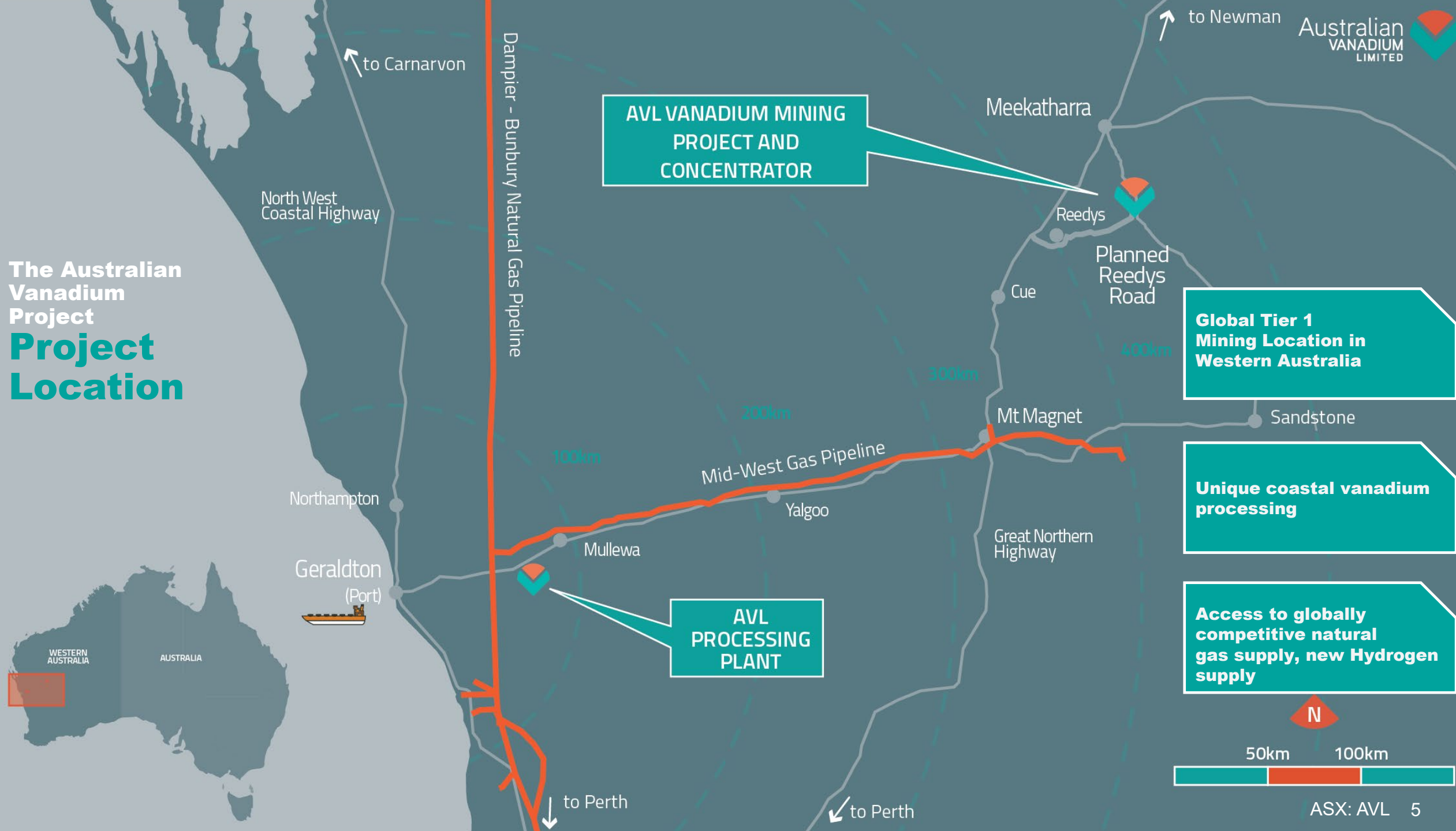
Overview

Australian Vanadium Limited
(ASX: AVL) is an emerging
vanadium producer developing
**The Australian Vanadium
Project** in Western Australia



- ✔ Strong technical and commercial team with global vanadium experience
- ✔ High quality vanadium deposit with strong financials
- ✔ 25+ year mine life
- ✔ Completing BFS
- ✔ Australian Government Major Project Status
- ✔ Western Australian Government Lead Agency Status
- ✔ Critical and battery mineral
- ✔ Downstream processing to final high-purity products in WA
- ✔ A green hydrogen market enabler through collaboration with ATCO
- ✔ Vanadium use in re-enforcement steel a major positive impact on CO₂ emission reduction
- ✔ Vertically integrated downstream processing, manufacturing and installation of **vanadium redox flow batteries** - a vanadium supply growth market

The Australian Vanadium Project Project Location



Vanadium Markets



PRIMARY Steel

Accounts for 90% of current global vanadium consumption.
Total global vanadium consumption in 2020 was 109,000 MTV



EMERGING Energy Storage

Accounts for 2% of current global vanadium consumption, with significant potential for growth



ADDITIONAL Ti, Chemical and Other

8% of vanadium consumption, with significant potential for growth (super alloys, 3D printing, etc)



Vanadium electrolyte in
**vanadium redox flow
batteries (VRFBs)**



Vanadium can also be used in
the cathode of **Li-ion
batteries**



Critical mineral

- Vanadium's use in alloyed steel for aerospace makes it a critical mineral
- There is no acceptable substitute for vanadium in aerospace titanium alloys
- Alloys containing vanadium are used in virtually every jet aircraft – from jet engine components to high-speed airframes
- Vanadium alloys have the best strength to weight ratio of any engineered material



Battery mineral

- Vanadium is used in vanadium electrolyte solution in vanadium redox flow batteries
- Vanadium also plays a role in the lithium-ion battery market – through its use in the cathodes of lithium-ion batteries
- Vanadium has the ability to conduct electricity, but also act as an insulator and inhibit heat transfer

Did you know?

- Esther Sans Takeuchi invented and refined the lithium/silver vanadium oxide battery which is used in most of today's implantable cardioverter defibrillators and helps patients avoid excess operations to replace batteries
- The VRFB was invented at the University of New South Wales by Emeritus Professor Maria Skyllas-Kazacos and her team, using technology first invented by NASA in the 1970s

Why use the VRFB for energy storage?



An **energy battery**, able to store large amounts of energy for later use



Easy to scale by adding modules or introducing larger electrolyte tanks



Lifespan of over 20 years with **no cycle-life degradation in performance** over time



The VRFB is **non-flammable**, making it safer than other batteries on the market



Can charge and discharge **simultaneously**, with **100% depth of discharge available**



The vanadium electrolyte in a VRFB can **reused indefinitely** or used steel market



The Australian Vanadium Project



TOTAL RESOURCE

208 Mt @ 0.74% V_2O_5
32.1 Mt Reserve @ 1.05% V_2O_5

HIGH-GRADE ZONE

87.9 Mt @ 1.06% V_2O_5
Proved 9.8Mt | Probable 22.4 Mt

QUALITY RESOURCE AND RESERVE



INITIAL MINE LIFE

25 years

V_2O_5 PRODUCTION

24.3 Mlbs per annum

LONG MINE LIFE



OPEX

US\$3.66/lb V_2O_5

CAPEX

US\$399M[#]

LOW OPEX AND CAPEX



PRE-TAX NPV₈

A\$909 million

IRR

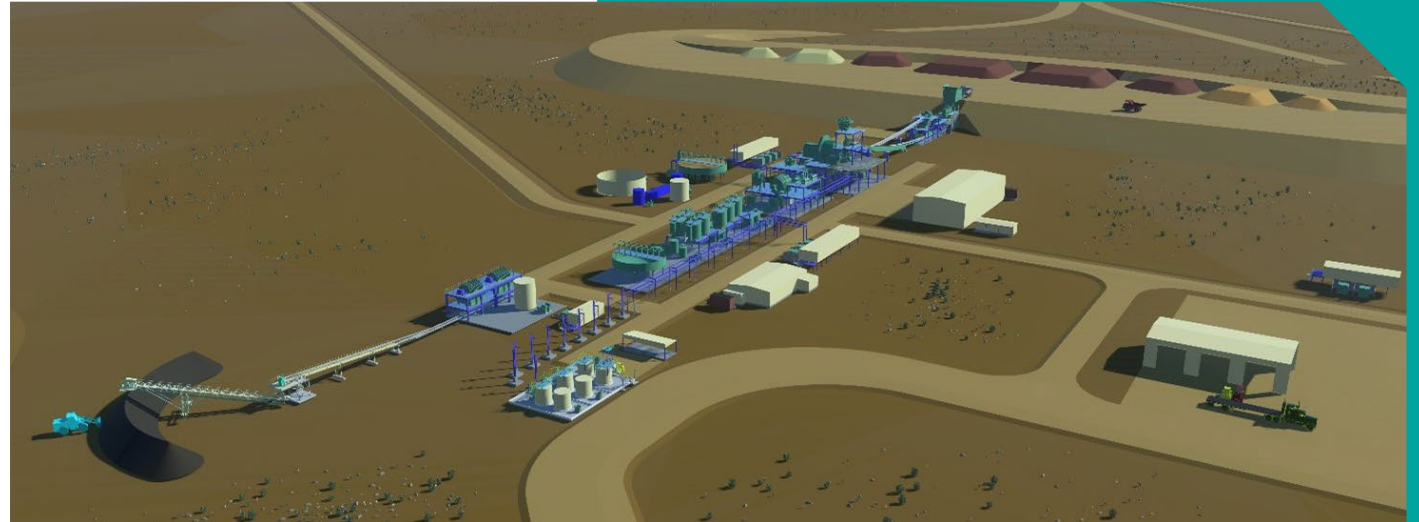
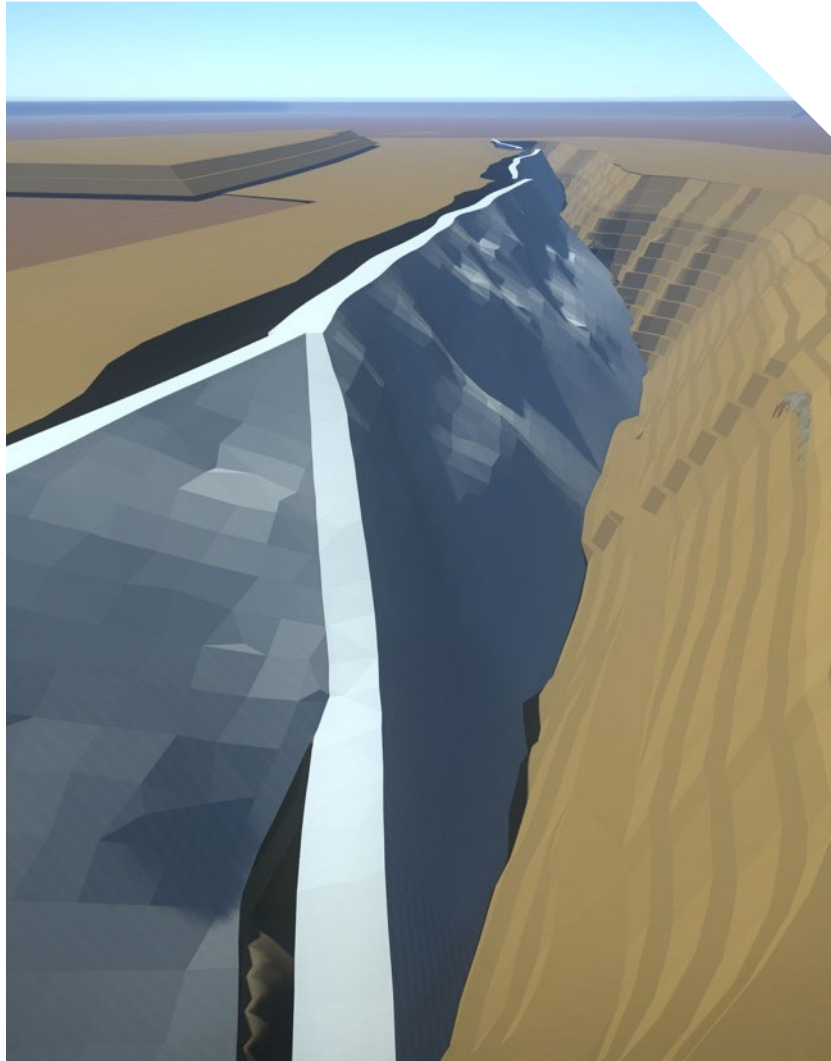
17.5%

FINANCIALLY ROBUST OUTCOMES

* See ASX announcement dated 22nd December 2020 'Technical and Financial PFS Update'

[#] Plant and associated infrastructure only US\$253M

Pit, Beneficiation Plant and Processing Plant

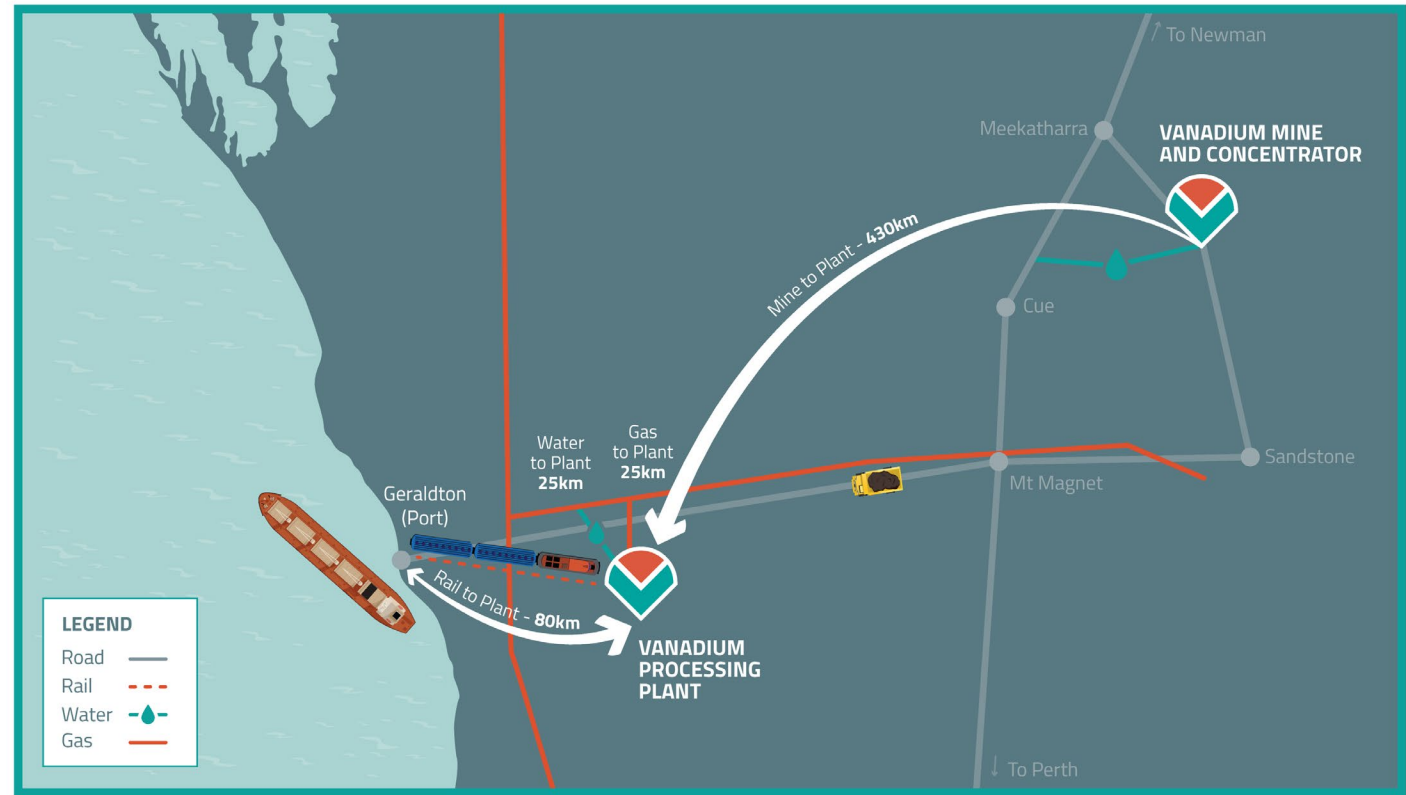


Innovative Proposed Project Layout

Coastal Processing

Processing plant location near coast offers significant opportunities:

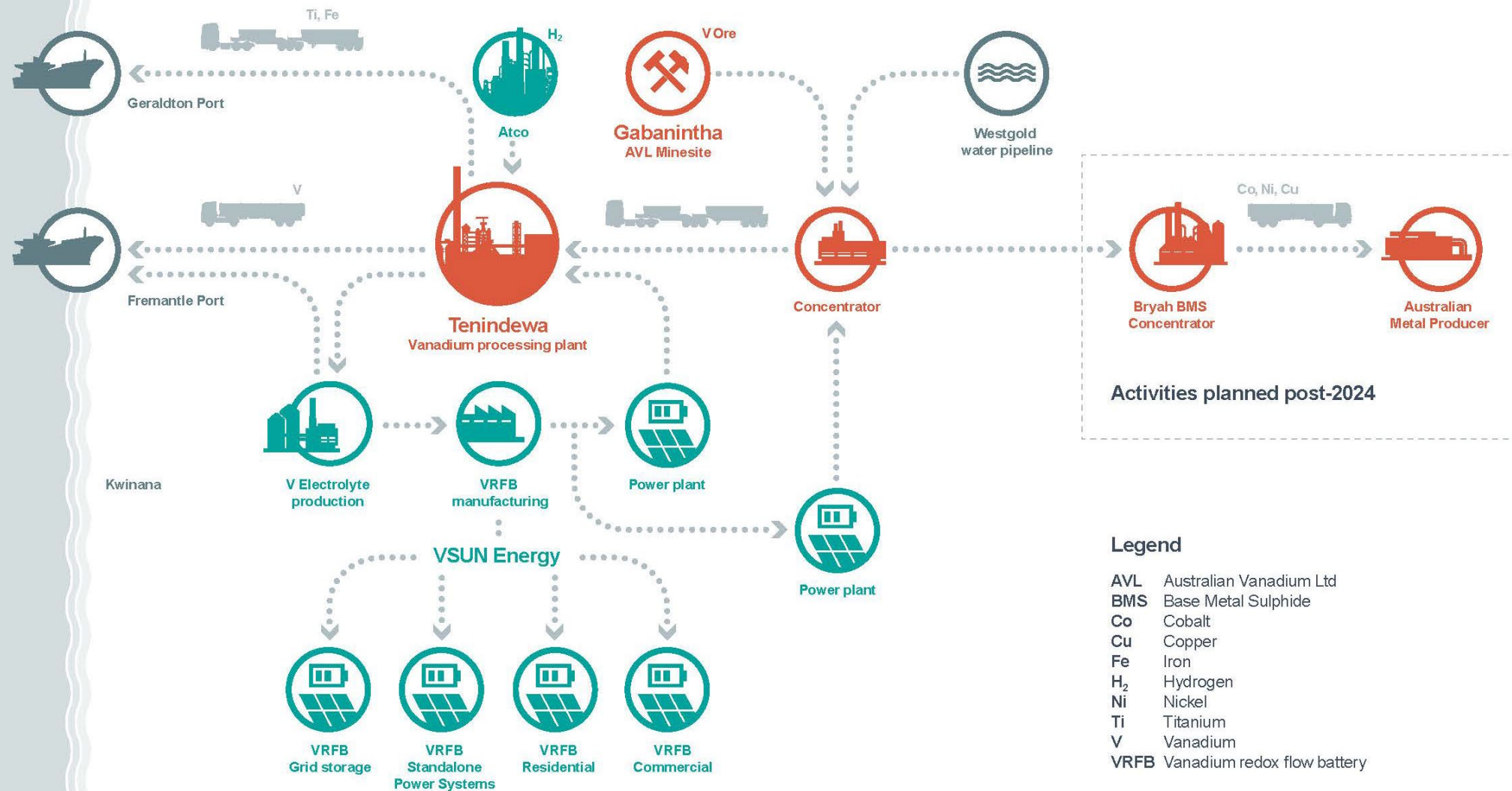
- ▶ Proximity to gas pipeline infrastructure and associated low domestic gas prices.
- ▶ Unique consumption opportunity for new regional green hydrogen production.
- ▶ Ability to sell iron-titanium coproduct (up to 1Mtpa) through Geraldton Port.
- ▶ Opportunity for lowest quartile Opex over life.
- ▶ Existing road, rail, water and gas infrastructure.
- ▶ Available local workforce.
- ▶ Reduced Capex and water use at Project minesite.
- ▶ Strong government support.



Startup Capex Reduction Opportunity

Coastal processing location allows option of two stage project delivery, improving attractiveness for Project investors.

Creating an Australian Green Fuelled Vanadium Battery Industry



Hydrogen and renewable energy strategy

Hydrogen strategy

ATCO

AVL is investigating the following uses for hydrogen:

- Use of green hydrogen in ore reduction process.
- Introducing green hydrogen into the natural gas feed for the processing plant – collaborating with ATCO Australia on design.
- Powering minesite or haulage vehicles.

AVL is planning to offtake the green hydrogen manufactured from the 10MW electrolyser at ATCO's Clean Energy Innovation Park, which is co-located with the 180MW Warradarge Wind Farm.

VRFBs can also be used in an integrated design with hydrogen electrolyzers.

Renewable energy strategy

AVL is investigating the following uses for renewable energy:

- Use of solar and/or wind at the minesite and processing plant.
- Installation of VRFBs at both sites for energy storage and EV charging.
- Powering minesite or haulage vehicles.



Did you know?

The addition of vanadium to steel rebar results in an annual global carbon emission reduction for the construction industry equivalent to planting 260,000,000 trees.



Broader State Economic Impact Analysis

- ▶ Approximately **\$304 million** in royalties to the Western Australian Government for vanadium and FeTi coproduct sales.
- ▶ Total revenues of **\$9 billion** over the Project's current life.



Employment Opportunities

- ▶ During construction **500 jobs** will be provided, 250 jobs at each of the two sites.
- ▶ Once construction is complete there will be approximately **240 jobs in total**, 120 jobs at each site, with a further headcount in the corporate office based in Perth.
- ▶ Using a mining industry standard **job multiplier of 4**, the estimated jobs for the entire project is about 3,000. A job multiplier measures the amount of direct and indirect jobs created in the region as a result of the primary operation.



Mid-West region of Western Australia

Meekatharra

- ▶ AVL aims to ensure that the community of Meekatharra is offered job opportunities on site where appropriate.
- ▶ The company provides support for the town through volunteer work and expenditure into the businesses in town.
- ▶ During the exploration stage, AVL has been providing economic benefit to Meekatharra, with the company spending over A\$350,000 on services from local businesses in the 2018/19 financial year and A\$200,000 in the 2019/20 financial year.

Geraldton

- ▶ With the processing plant located near to Geraldton, there will be significant positive economic impact on this area and the ability for the workforce to be located in the growing and vibrant city.

Recent News



- ▶ **AVL awarded \$3.69M manufacturing grant**
- ▶ **Building Australia's first commercial vanadium electrolyte plant**
- ▶ **US vanadium supply agreement**
- ▶ **World leading vanadium recovery**
- ▶ **V_2O_5 ↑ US\$9/lb**



Current Key Objectives

Offtake Agreements

Complete secured offtake for 100% of vanadium products and FeTi coproducts – **MOUs in place and under negotiation.**

Finance

Maintain strong financial position through to construction
Prequalification with financiers for Project equity and debt and/or joint venture partnerships advancing

Environmental Approval

Environmental approval for mine and concentrate facility submitted
Processing plant site approval application well underway

Feasibility Studies

Completion of engineering and BFS level costing – all related design and costing to $\pm 15\%$

Social Licence

Continue increase in regional community engagement
Continue to analyse economically viable ways to increase sustainability
Strong focus on ESG

Government Support

Maintain strong Federal and State Government recognition and support
Critical and battery metal focus

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VSUN Energy



A Renewable Energy Company

- VSUN Energy was launched by AVL to target the long duration energy storage market for the vanadium redox flow batteries (VRFBs).
- VSUN Energy supplies VRFBs for all market segments including utility, commercial and industrial, mining, agriculture, standalone power systems and residential.
- Batteries are currently sourced from overseas, with plans for some manufacture to be undertaken in Australia.
- Vertically integrated strategy from AVL's minesite to high-purity vanadium pentoxide, vanadium electrolyte manufacture and manufacture or partial manufacture of batteries in Australia.



Why use the VRFB for energy storage?



An **energy battery**, able to store large amounts of energy for later use



Easy to scale by adding modules or introducing larger electrolyte tanks



Lifespan of over 20 years with **no cycle-life degradation in performance** over time



The VRFB is **non-flammable**, making it safer than other batteries on the market



Can charge and discharge **simultaneously**, with **100% depth of discharge available**



The vanadium electrolyte in a VRFB can **reused indefinitely** or used steel market



Manufacturing in Australia

- VSUN Energy has procured a 5kW/30kWh VRFB from China.
- Electrical testwork is underway, with feedback being provided to the manufacturer.
- Local manufacturer CADDIS Group has undertaken design work, with one of the prospective designs pictured.
- Manufacture of the systems in WA, alongside local production of vanadium electrolyte is one of VSUN Energy's forward plans.



Utilities	smooth delivery of renewable energy into the grid
Commercial & Industrial	maximize use of renewable energy
Agricultural	reduce diesel power reliance, cost and emissions
Mining	reduce infrastructure & diesel costs with renewable energy
Remote	reduce trucking diesel & secure uninterrupted energy
Electric Vehicle Charging	charge electric vehicles from a renewable energy source
Telecommunications Power	power remote towers anywhere with solar + storage
UPS Battery Back Up	secure the supply of energy if the grid is unavailable
Domestic Renewable Energy	when the sun goes down, use excess energy generated by solar panels during the day

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