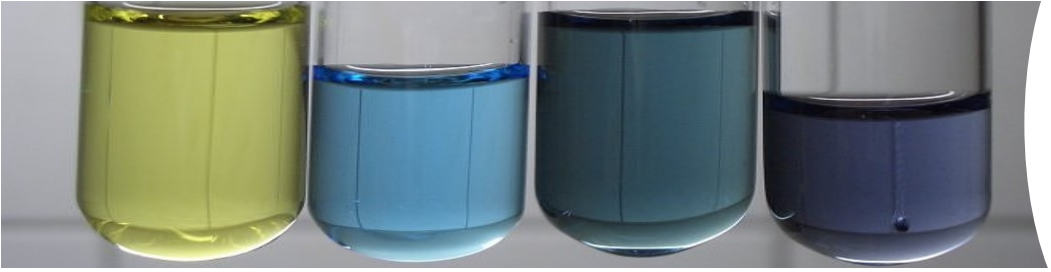

**ASX ANNOUNCEMENT** **9 May 2025**

# PROJECT LUMINA PROGRESS CONFIRMS IMPROVED COMPETITIVENESS

## KEY POINTS

- **The Company's wholly owned subsidiary, VSUN Energy Pty Ltd (VSUN Energy), continues to progress Project Lumina, the development of a scalable, turnkey, utility-scale battery energy storage system (BESS) using vanadium flow battery (VFB) technology, for use in Australian energy markets.**
- **Work supports an improved levelised cost of storage (LCOS) of A$214/MWh (± 30%) for an 8-hour duration Project Lumina VFB BESS. Such an LCOS remains competitive with the LCOS of a similar capacity lithium-ion BESS products currently in the market.**
- **VSUN Energy continues to develop a range of opportunities for the deployment of utility scale VFB BESS solutions across five states.**

Australian Vanadium Limited (ASX: AVL, the Company or AVL) is pleased to announce significant progress with Project Lumina.[1] Early contractor involvement activities conducted with GenusPlus Group[2] (Genus) and Sedgman, a CIMIC Group company (Sedgman) and Austrian VFB manufacturer Cellcube Energy Storage GmbH (CellCube)[3] have advanced design and costing for Project Lumina's VFB BESS product.

Continued work on Project Lumina confirms an LCOS of A$214/MWh (± 30%) for an 8-hour duration VFB BESS, which is a significant improvement from an initial estimate of an LCOS of A$251/MWh (± 30%). Such an LCOS would be competitive with the LCOS of similar capacity lithium-ion BESS products currently in the market.

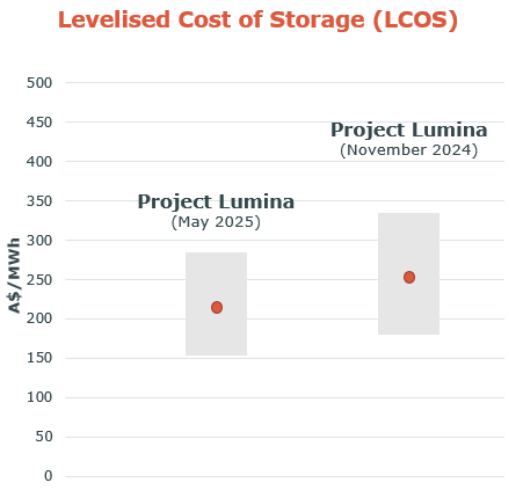


*Figure 1 – Project Lumina LCOS range (8-hour storage duration)*

[1] See ASX announcement dated 6 November 2024 '*Realising AVL's Utility-Scale Vanadium Flow Battery Strategy*'

[2] Through its wholly owned subsidiary, KEC Power Pty Ltd

[3] See ASX announcement dated 9 December 2024 '*Key Appointments to Support Vanadium Flow Battery Development*'

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AVL's Chief Executive Officer, Graham Arvidson comments, "*AVL and VSUN Energy's vertical integration strategy was built on the conviction that long-duration energy storage would soon become a major market opportunity in Australia and globally. That moment has arrived with the Australian energy sector advancing multiple eight-hour plus utility-scale storage projects nationwide, and for the first time we are seeing VFB BESS identified as the preferred solution in some of these longer duration projects.*

*As Project Lumina nears investment readiness, VSUN Energy is actively pursuing utility-scale projects across five states, aligning with government policies supporting long duration energy storage, VFB adoption, vanadium mining and domestic downstream processing of critical minerals.*

*Project Lumina remains on track for detailed design by Q3 CY2025, aligning with the accelerating demand for long-duration energy storage. We are pleased that additional work highlights improvement to LCOS underscoring the competitiveness of Project Lumina's architecture to compete in the long duration energy storage market.*

*Importantly, these LCOS estimations continue to be underpinned by an assumed US$10/lb $V_2O_5$ vanadium price. This indicates that vanadium pricing supportive of incentivising new upstream vanadium oxide supply does not inhibit competitiveness of VFB BESS in long duration energy storage applications.*

*The advanced design status and competitiveness of our Project Lumina VFB BESS architecture positions us well to pursue a growing pipeline of long duration opportunities such as the 500MWh VFB BESS proposed for Kalgoorlie in WA and several even larger project opportunities emerging on the east coast of Australia where market duration price signals are moving to eight hours and beyond.*"

**Project Lumina**

VSUN Energy continues to progress Project Lumina, the development of a cost-effective, scalable, turnkey, utility-scale BESS using VFB technology for use in Australian energy markets.

Early contractor involvement activities with Genus and Sedgman and VFB manufacturer CellCube have advanced design and costing for Project Lumina's VFB BESS product. The design is focused on delivering material potential benefits including:

- faster deployment
- reduced construction capital costs
- reduced shipping and logistic capital costs
- increased local content
- simplicity and low capital intensity of future power or duration expansions

The Project Lumina VFB BESS is expected to utilise CellCube cell stack technology and local components (such as pumps, pipes and tanks) to provide the electrolyte storage capacity.

Sedgman and Genus have assisted in the technical aspects of the design and the development of engineering a storage and pumping solution that utilises off-the-shelf technology to secure supply chains, maximise local content and drive capital efficiency.

The design utilises advanced system architecture with a modular array. Each array has rated power of 15 MW which has been determined to be the optimal technical and capital configuration to build scale (for example, a 90 MW VFB BESS would consist of 6 arrays). The storage capacity of the solution is flexible ranging from four up to 12 hours and beyond.

| System Scope | |
|---|---|
| **VFB System** | 15 MW array, consisting of:<br>• Power unit<br>• Electrolyte storage unit<br>• Vanadium electrolyte<br>• Power conversion system (PCS)<br>• Electrolyte distribution system<br>• High efficiency pumps with variable speed drive<br>• Non-compressor cooling system |
| **Control** | Energy management system (EMS), Battery management system (BMS) |
| **Switchyard and HV switch room** | HV transformers, switch room, grid connection infrastructure, harmonic filter |
| **Site administration** | Site administration office, control room, warehouse |

Significant work on Project Lumina has been undertaken following initial LCOS estimates prepared in November 2024 including additional detailed engineering which continues to give the Company insights into the improved competitiveness of the LCOS of Project Lumina's VFB BESS.

Additional design work on Project Lumina VFB BESS has also focused on configuring the design for simple and low capital intensity future 'brownfield' expansion of the battery via the addition of extra electrolyte and tanks to increase the storage capacity.

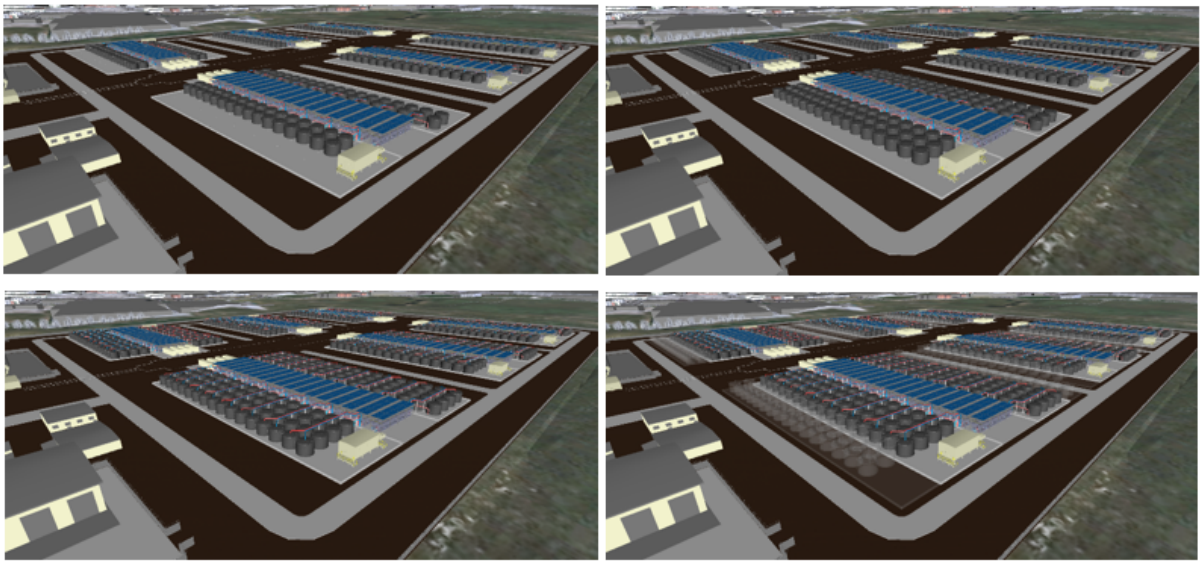

*Figure 2 – Project Lumina's simplicity of duration expansion: clockwise (from top left) 4h, 6h, 8h, and longer durations*

## Next steps

The work completed to date continues to give the Company confidence to proceed with remaining Project Lumina activities including:

- Development of a construction-ready, detailed design and delivery strategy for commercial, turnkey, utility-scale VFB BESS
- Advancement of conversations with potential energy offtake partners for the deployment of energy storage solutions
- Progression of discussions on land access for the future deployment of energy storage solutions
- Continued development of a funding strategy (debt and equity) to allow for the rapid deployment of energy storage solutions
- Determination of the merits of deploying a VSUN Energy Build-Own-Operate (BOO) business model as well as delivering on an engineering and project delivery basis

The Company is considering a range of funding options for the deployment of VFB BESS from Project Lumina, which is expected to be funded by a mix of debt and strategic equity or cornerstone equity funding options and possibly including Australian Government Agencies. AVL will continue to progress discussions with the aim of delivering funding options to support a financial investment decision.

Project Lumina has the potential to position the Company as a globally competitive supplier of BESS solutions and battery materials, realising its vertically integrated business model in Australia. This facilitates the delivery of value across the supply chain from the Company's upstream Australian Vanadium Project, through its operational midstream vanadium electrolyte production capability and into VSUN Energy's downstream activities in energy markets.

The successful implementation of this strategy would assist in providing a secure and resilient domestic battery supply chain, in alignment with the Australian Government's National Battery Strategy which is part of its Future Made in Australia agenda.[4]

For further information, please contact:

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*This announcement has been approved in accordance with the Company's published continuous disclosure policy and has been approved by the Board.*

[4] https://treasury.gov.au/publication/p2024-526942

## APPENDIX A – Levelised Cost of Storage

### Overview, definition and modelling approach

LCOS can be described as the total lifetime cost of the investment in an energy storage technology divided by its cumulative delivered electricity (where delivered electricity can refer to electrical energy or electric power).[5]

It reflects the average price at which electricity can be sold for the investment's net present value to be zero (i.e. its revenue requirement) and is therefore analogous to the concept of Levelised Cost of Energy (LCOE) for generation technologies.

VSUN Energy has used the LCOE and LCOS modelling approach[6] used by the Australian Energy Regulator (AER) and other industry participants to calculate the LCOS of energy storage systems.

[5] Lazard, Levelized Cost of Energy, June 2024. Levelised Cost of Storage Comparison – Methodology page 43

[6] Australian Energy Regulator, LCOE and LCOS modelling approach, limitations and results – Wholesale electricity market performance report, December 2022, www.aer.gov.au

## APPENDIX B – Assumptions for VFB LCOS calculations

LCOS calculations use scoping study level capital and operating cost estimates and inputs to calculate LCOS at ± 30%.

Details of the core assumptions made in calculating the LCOS are as follows:

- the battery acts as a load when charging, and as a generator when discharging;
- charging occurs at the lowest possible daily spot prices;
- forced outages are assumed to be 0% because the battery is inactive for about 60% of the day;
- batteries are assumed to be fully discharged each day i.e. 90MW discharged for 8 hours;
- the capital cost perimeter is the boundary of the site, including capital cost for engineering, procurement, construction and commissioning to get the site 'generation ready';
- all capital cost, operating cost, and revenue numbers in the LCOS model are derived from the throughput, capacity and duration specifications below:

| | **8-hour VFB BESS** |
|---|---|
| **Power** | 90 MW |
| **Capacity** | 720 MWh (non-degrading) |
| **Duration** | 8 hours |
| **Utilisation (cycle days / year)** | 350 days per year |
| **Depth of discharge** | 100% |
| **Cycles per day** | 1 |
| **Round trip efficiency** | 78% |
| **Targeted battery life** | 30 years |

- capital cost estimates are based upon:
  - Battery cell stack and OEM technical and commercial input in line with latest Project Lumina design evolution
  - Scoping study level capital estimates at ± 30% with input from ECI consultants
- operating cost estimate of A$1.86/kWh with a 30-year operating life;
- vanadium electrolyte costs are derived from the following key parameters and utilise AVL's knowledge of electrolyte conversion costs as an electrolyte producer:

| Input Parameter | Input Value | Comment |
|---|---|---|
| $V_2O_5$ cost US$/lb | 10.0 | Base case is assumed to be US$10/lb |
| Electrolyte concentration $V_2O_5$ mol/litre | 1.7 | Equivalent to 0.155 kg $V_2O_5$/litre or 0.342 lb $V_2O_5$/litre |

| | | |
|---|---|---|
| $V_2O_5$ energy equivalent per tonnes/MWh | 7.9 | 7.9 tonnes/MWh calculated from electrolyte concentration of $V_2O_5$ that AVL is currently producing |

- economic assumptions are summarised in the table below:

| Input Parameter | Input Value | Comment |
|---|---|---|
| Discount rate/ weighted average cost of capital (WACC) | 7.5% (real) | AEMO engaged Synergies Economic Consulting to recommend the discount rate for the 2021 and 2022 ISP (focused on the NEM). Synergies Economic Consulting recommended a discount rate of 7.2% for ISP/NEM projects.<br>AEMO engaged Oxford Economics to review and validate Synergies Economic Consulting WACC recommendations. Oxford Economics' Cost of Capital survey 2023 for AEMO validated Synergies Economic Consulting WACC recommendations and gave actual examples of WACC for battery storage projects, ranging from 6% to 8.5%. |
| Foreign exchange rate (AUD:USD) | 0.7 | AVL internal assumption, consistent with the market and other industry benchmarks. |
| Project life | 30 years | Model period assumption of 30 years. |
| Depreciation | 20 years | OEM life span for VFB batteries is 20 to 25 years. |
| Debt amount (%)<br>Cost of debt (%) | Unlevered | The model is assumed to be unlevered (equity funded) for simplicity. |
| Tax (%) | N/A | LCOS is calculated pre-tax. Post-tax LCOS will depend on project funding structure and potential tax incentives, benefits and/or subsidies. |
| Inflation (%) (nominal case) | 3.00% | AVL assumption based on CPI forecasts which are consistent with external benchmarks and long-term CPI forecasts. |
| Terminal value | - | A perpetuity model has been used for terminal value. A salvage value model recovering electrolyte was calculated as an alternative. Both the terminal value perpetuity model and salvage value model give similar results and are not material to the calculated LCOS value. |

## ABOUT AUSTRALIAN VANADIUM LTD

AVL is a resource company focused on vanadium, seeking to offer investors a unique exposure to all aspects of the vanadium value chain – from resource through to steel and energy storage opportunities. AVL is advancing the development of its world-class Australian Vanadium Project at Gabanintha. The Australian Vanadium Project is one of the most advanced vanadium projects being developed globally, with 395.4Mt at 0.77% vanadium pentoxide ($V_2O_5$), containing a high-grade zone of 173.2Mt at 1.09% $V_2O_5$, reported in compliance with the JORC Code 2012 (see ASX announcement dated 7 May 2024 *'39% Increase in High Grade Measured and Indicated Mineral Resource'*).

VSUN Energy is AVL's 100% owned renewable energy and energy storage subsidiary which is focused on developing the Australian market for VFBs for long duration energy storage. VSUN Energy was set up in 2016 and is widely respected for its VFB expertise. AVL's vertical integration strategy incorporates processing vanadium to high purity, manufacturing vanadium electrolyte and working with VSUN Energy as it develops projects based on renewable energy generation and VFB energy storage.

## MINERAL RESOURCE ESTIMATE

The Australian Vanadium Project – Mineral Resource estimate by domain and resource classification using a nominal 0.4% $V_2O_5$ wireframed cut-off for low-grade and nominal 0.7% $V_2O_5$ wireframed cut-off for high-grade (total numbers may not add up due to rounding).

| Zone | Category | Mt | $V_2O_5$ % | Fe % | $TiO_2$ % | $SiO_2$ % | $Al_2O_3$ % |
|---|---|---|---|---|---|---|---|
| **HG** | Measured | 30.6 | 1.14 | 46.3 | 12.9 | 7.4 | 6.2 |
| | Indicated | 74.8 | 1.11 | 47.5 | 12.6 | 7.0 | 5.7 |
| | Inferred | 67.9 | 1.06 | 45.3 | 12.1 | 9.0 | 6.6 |
| | **Subtotal** | **173.2** | **1.09** | **46.5** | **12.5** | **7.8** | **6.1** |
| **LG** | Indicated | 61.8 | 0.55 | 26.1 | 7.1 | 26.6 | 16.3 |
| | Inferred | 142.5 | 0.48 | 24.9 | 6.6 | 28.9 | 15.2 |
| | **Subtotal** | **204.3** | **0.50** | **25.3** | **6.8** | **28.2** | **15.5** |
| **Transported** | Inferred | 17.9 | 0.65 | 31.0 | 7.3 | 24.1 | 14.4 |
| | **Subtotal** | **17.9** | **0.65** | **31.0** | **7.3** | **24.1** | **14.4** |
| **Total** | Measured | 30.6 | 1.13 | 46.3 | 12.9 | 7.4 | 6.2 |
| | Indicated | 136.6 | 0.85 | 37.8 | 10.1 | 15.8 | 10.5 |
| | Inferred | 228.2 | 0.66 | 31.4 | 8.3 | 22.6 | 12.6 |
| | **Subtotal** | **395.4** | **0.77** | **34.8** | **9.3** | **19.1** | **11.4** |

*Note: Totals may not add up due to rounding*

## ASX Listing Rule 5.23

The information in this announcement relating to mineral resource estimates for the Australian Vanadium Project is extracted from the announcement entitled '39% Increase in High Grade Measured and Indicated Mineral Resource' released to the ASX on 7 May 2024 which is available on the Company's website www.avl.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

Some statements in this announcement regarding estimates or future events are forward-looking statements. They include indications of, and guidance on, future matters. Forward-looking statements include, but are not limited to, statements preceded by words such as "planned", "expected", "projected", "estimated", "may", "scheduled", "intends", "anticipates", "believes", "potential", "could", "nominal", "conceptual" and similar expressions. Forward-looking statements, opinions and estimates included in this announcement are based on assumptions and contingencies which are subject to change without notice, as are statements about market and industry trends, which are based on interpretations of current market conditions.

Forward-looking statements are provided as a general guide only and should not be relied on as a guarantee of future performance. Forward-looking statements may be affected by a range of variables that could cause actual results to differ from estimated results and may cause AVL's actual performance and financial results in future periods to materially differ from any projections of future performance or results expressed or implied by such forward-looking statements. These risks and uncertainties include but are not limited to liabilities inherent in technology development, mine development and production, technology advancement, battery development, geological, mining and processing technical problems, skilled personnel, incorrect assessments of the value of acquisitions, changes in commodity prices and exchange rate, currency and interest fluctuations, various events which could disrupt operations a including labour stoppages, the ability to secure adequate financing and management's ability to anticipate and manage the foregoing factors and risks. These and other factors should be considered carefully and readers should not place undue reliance on such forward-looking information. There can be no assurance that forward-looking statements will prove to be correct.