



## ASX ANNOUNCEMENT

By e-lodgement

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# POSITIVE LEAD-ACID BATTERY TEST WORK RESULTS

## Highlights

- Testwork undertaken in the United States indicates Volt's ultra-high purity graphite improves the performance of lead-acid batteries
- Performance testing conducted with direct oversight by lead-acid battery specialists, Apollo Energy Systems, Volt's potential offtake partner
- Offtake discussions commencing with other lead-acid battery manufacturers
- The development of non-spherical graphite products for the lead-acid and alkaline battery markets will improve the economics of Volt's planned Battery Anode Material facilities in the United States and Europe, including the ESD Super Site/Gigafactory

Graphite producer and battery anode material developer **Volt Resources Limited (ASX: VRC)** ("**Volt**" or "**the Company**") is implementing plans to become a battery materials manufacturer in the United States and Europe. The non-spherical ultra-high purified graphite ("**UHPG**"), produced as a by-product when manufacturing Lithium-ion Battery Anode Material ("**BAM**"), is converted into high-margin products that can be used in applications such as conductivity enhancement in the lead-acid and alkaline battery markets and other specialty uses.

**Volt Managing Director, Trevor Matthews, commented, "We are very excited about the encouraging results obtained with our ultra-high purity graphite in lead-acid battery applications.**

**The testwork with Apollo Energy Systems and AETC has supported Volt's strategy of developing high value products that will allow us to monetise the non-spherical by-product created during the production of lithium-ion battery anode material. We look forward to offtake discussions with Apollo and the continuation of the excellent working relationship we have with our technology partner, AETC."**

The market for carbon products for lead-acid batteries is very large at over 500 GWh and is increasing year-to-year. It is currently estimated to consume approximately 75,000 tonnes of carbon products

annually and purified versions of natural graphite play an important role.

Improved lead-acid batteries are expected to fill the growing market demand in a diverse range of technologies that include start-stop applications; photovoltaic grid energy storage and load-leveling systems; Starting, Lighting, and Ignition (SLI), backup energy storage/uninterrupted power supply (UPS); and vehicles.

A variety of carbon, graphite and graphene-based solutions for use in lead-acid battery electrodes are expected to complement emerging battery designs, effectively boosting their performance. Volt realises that any performance benefits coming from graphite have to be balanced with cost competitiveness for the product offerings. **Volt is positioned to be a cost leader for the lead-acid battery technologies because of its adoption of the inverted BAM flowsheet.** This allows Volt to allocate processing costs to spherical lithium-ion battery anode material and use the non-spherical graphite as a lower cost, yet premium-performing, by-product in other value-added markets such as lead-acid batteries.

### **Lead-Acid Battery Testwork**

Volt is evaluating the electrochemical performance of its UHPG for use in the expander of lead-acid batteries. The evaluation is being undertaken by Apollo Energy Systems (“AES”), a potential Volt off-take partner, and Volt’s technology partner in the United States, American Energy Technologies Co. (“AETC”).

Under the supervision of engineers and scientists of AES, AETC has installed a pilot assembly line for in-house manufacturing of fully-functional, unspillable, absorbent glass mat (AGM) prototype batteries rated for a variety of segments of the lead-acid battery market.

### **Summary**

In recent months Volt has undertaken lead-acid battery testwork using UHPG produced from the Bunyu resource. All lead-acid batteries employ various forms of carbon in their composition. Specifically, carbon is used in the negative electrodes of nearly every lead-acid battery. It is added as part of a compound known as “expander” which constitutes between 2% and 5% by weight of the negative electrode.

Volt’s graphite concentrate was thermally purified and, after efficient processing, was converted into an 8.5 micron UHPG product which was successfully used as part of the expander composition in the negative electrodes of lead-acid batteries. Testwork was undertaken at AETC’s Arlington Heights, Illinois facilities using 4 Ah battery cells. The construction of lead-acid cells as well as the assessment of data was done with close oversight of AETC’s customer, AES, who is also the intended offtake partner of graphite products generated by Volt from its graphite projects.

Lead-acid batteries containing Volt’s graphite were tested side-by-side with the control formulation whose expander was based on the formulation of traditional carbon materials such as carbon black and ligna sulfonate. **Cells containing Volt’s graphite consistently delivered higher capacity than the control. With Volt’s graphite expander product, the capacity of the battery continued to gradually increase during cycling which can be attributed to the unique capacitance effect of the Bunyu flake.**

Volt is strongly positioned to address both cost management, as well as improved performance sought by the lead-acid battery industry, given its UHPG product is used for lead-acid battery expanders is actually a by-product of a larger downstream process for manufacturing of spherical graphite or BAM for lithium-ion battery anodes.

The testwork results provided very favourable information regarding the behaviour and performance of Volt's UHPG in lead-acid battery applications. More work is planned with this product and battery technology and Volt will update the market as more data becomes available.

### **About Apollo Energy Systems**

Apollo is a company with 60-years' experience in development of batteries, fuel cells and electric vehicle systems which incorporate those products. Apollo's roots go back to 1953 when it built its first battery plant in Puerto Rico.

The Apollo Tri-polar Advanced Lead-Acid Batteries have the flexibility to be utilised in many markets from electric vehicles and forklift trucks, to load leveling, solar-powered applications, and grid storage. This technology is based on 50-years' manufacturing experience and will prove to be the future of energy storage for off-grid locations.

For more information regarding Apollo Energy Systems visit <https://apolloenergysystemsinc.com/>

**-ENDS-**

**This announcement was authorised for release by the Board of Volt Resources Ltd.**

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### **About Volt Resources Limited**

Volt Resources Limited ("Volt") is a graphite producer/developer and gold exploration company listed on the Australian Stock Exchange under the ASX code VRC. Volt has a 70% controlling interest in the Zavalievsky Graphite business in Ukraine. Zavalievsky is in close proximity to key markets with significant developments in LIB facilities planned to service the European based car makers and renewable energy sector. ZG benefits from an existing customer base and graphite product supply chains based on excellent transport infrastructure covering road, rail, river and sea freight combined with reliable grid power, ample potable ground water supply and good communications<sup>1</sup>.

Volt acquired three licence applications that are considered to be prospective for lithium-borate mineralisation. The licence applications are in respect to a total area of 291km<sup>2</sup>, located in Serbia and are west and south-west of the Serbian capital, Belgrade<sup>2</sup>.

Volt is progressing the development of its large wholly-owned Bunyu Graphite Project in Tanzania, as well as gold exploration in Guinea leveraging the Company's existing extensive networks in Africa.

The Bunyu Graphite Project is ideally located near to critical infrastructure with sealed roads running through the project area and ready access to the deep-water port of Mtwara 140km from the Project. In 2018, Volt

<sup>1</sup> Refer to Volt's ASX announcements titled "Volt to Acquire European Graphite Business following Completion of Due Diligence" dated 14 May 2021 and "Completion of the ZG Group Transaction Following Execution of New Convertible Securities Facility" dated 26 July 2021.

<sup>2</sup> Refer to Volt's ASX announcement titled "Strategic European Lithium Acquisition – Jadar North" dated 18 November 2021.

reported the completion of the Feasibility Study ("FS") into the Stage 1 development of the Bunyu Graphite Project. The Stage 1 development is based on a mining and processing plant annual throughput rate of 400,000 tonnes of ore to produce on average 23,700tpa of graphite products<sup>3</sup>. A key objective of the Stage 1 development is to establish infrastructure and market position in support of the development of the significantly larger Stage 2 expansion project at Bunyu.

The Guinea Gold Projects comprise 6 permits in Guinea, West Africa having a total area of 348km. The Projects are located in the prolific Siguiri Basin which forms part of the richly mineralised West African Birimian Gold Belt.

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<sup>3</sup> Refer to Volt's ASX announcement titled "Positive Stage 1 Feasibility Study Bunyu Graphite Project" dated 31 July 2018. The Company confirms that it is not aware of any new information or data that materially affects the information included in this document and that all material assumptions and technical parameters underpinning the estimates continue to apply and have not materially changed.