Global Standards for Vanadium Flow Batteries Underway to Support Long-Duration Energy Storage Growth

Vanitec supports the establishment of a unified standard for vanadium electrolyte

FOR IMMEDIATE RELEASE

LONDON, 05 March 2025 – As the demand for long-duration energy storage (LDES) solutions grows, the development of global standards and specifications for vanadium flow batteries is gaining momentum. The International Electrotechnical Commission (IEC), with input from the Fraunhofer Society and key industry stakeholders, is working to establish a unified standard for vanadium electrolyte. This initiative is crucial for ensuring the commercial viability and scalability of vanadium flow battery technology, which is emerging as a leading solution for energy storage needs beyond four hours.

The Need for Standardisation

Currently, the vanadium electrolyte industry lacks a consistent global standard, leading to disparities in quality, inefficiencies in production, and potential performance issues. In response, a working group comprising battery producers and vanadium producers is actively contributing to the IEC's effort to define electrolyte specifications that align with battery performance requirements. This will enhance reliability, safety, and cost-effectiveness, paving the way for broader adoption of vanadium flow batteries in energy storage markets.

Chinese Standards vs. Global Efforts

China has introduced its own vanadium electrolyte standards, but they allow for a wider range of electrolyte purity levels. This approach may compromise long-term battery performance. Impurities in vanadium electrolyte can impact energy capacity, block electrolyte flow, and catalyse unwanted chemical reactions, ultimately reducing battery lifespan and efficiency. The IEC standard aims to mitigate these risks by implementing more rigorous technical requirements to ensure durability and optimal battery operation.

The Economic Case for Vanadium Flow Batteries

Despite higher upfront costs, vanadium flow batteries present a compelling economic case due to their extended lifespan of 20+ years. Unlike lithium-ion batteries, which degrade over time and require costly replacements, vanadium flow batteries maintain their energy capacity without significant performance loss. The levelised cost of ownership (LCOE) demonstrates that while initial investment in vanadium flow battery technology is substantial, it delivers significant long-term cost savings, making it an attractive option for large-scale energy storage applications.

Vanadium Flow Batteries: A Critical Long-Duration Energy Storage Solution

As renewable energy penetration increases, the need for effective LDES solutions becomes more pronounced. Lithium-ion batteries dominate the market today, but their cost advantage diminishes beyond four-hour discharge durations. Vanadium flow batteries are uniquely suited for applications requiring extended storage, with Rio Tinto and other industry leaders

recognising the growing necessity for 48-hour storage solutions to stabilise power grids and integrate renewable energy sources effectively.

This long-duration nature of vanadium flow batteries is essential in meeting the future demands of renewable energy storage. Capable of discharging energy for extended periods of time ranging from eight hours, to days, weeks, or seasons, vanadium flow batteries offer a compelling solution in accelerating the clean energy transition and decarbonising the energy sector.

Next Steps for Standardisation

The IEC's working group will meet in Tokyo from March 17–19, 2025, to further refine the global standard for vanadium electrolyte. While final publication is expected within the next one to two years, industry players are encouraged to align with these developments early to ensure compliance and position themselves for long-term success in the growing LDES market.

According to Terry Perles, Director of US Vanadium – a Vanitec member company – standardising vanadium flow battery specifications is a crucial step toward commercialising this technology at scale. "A clear and accepted standard will not only improve quality control but also foster investment, innovation, and pave the way for the adoption at scale of this very import decarbonising technology," Perles explains.

As the energy transition accelerates, vanadium flow batteries stand out as a pivotal solution for ensuring reliable, cost-effective, and long-duration energy storage.

About Vanitec

Vanitec, is a not-for-profit international global vanadium member organisation, bringing together representatives of companies and organisations involved in the mining, processing, manufacture, research and use of vanadium and vanadium-containing products. The objective of Vanitec is to promote the use of vanadium bearing materials, and thereby to increase the consumption of vanadium.

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