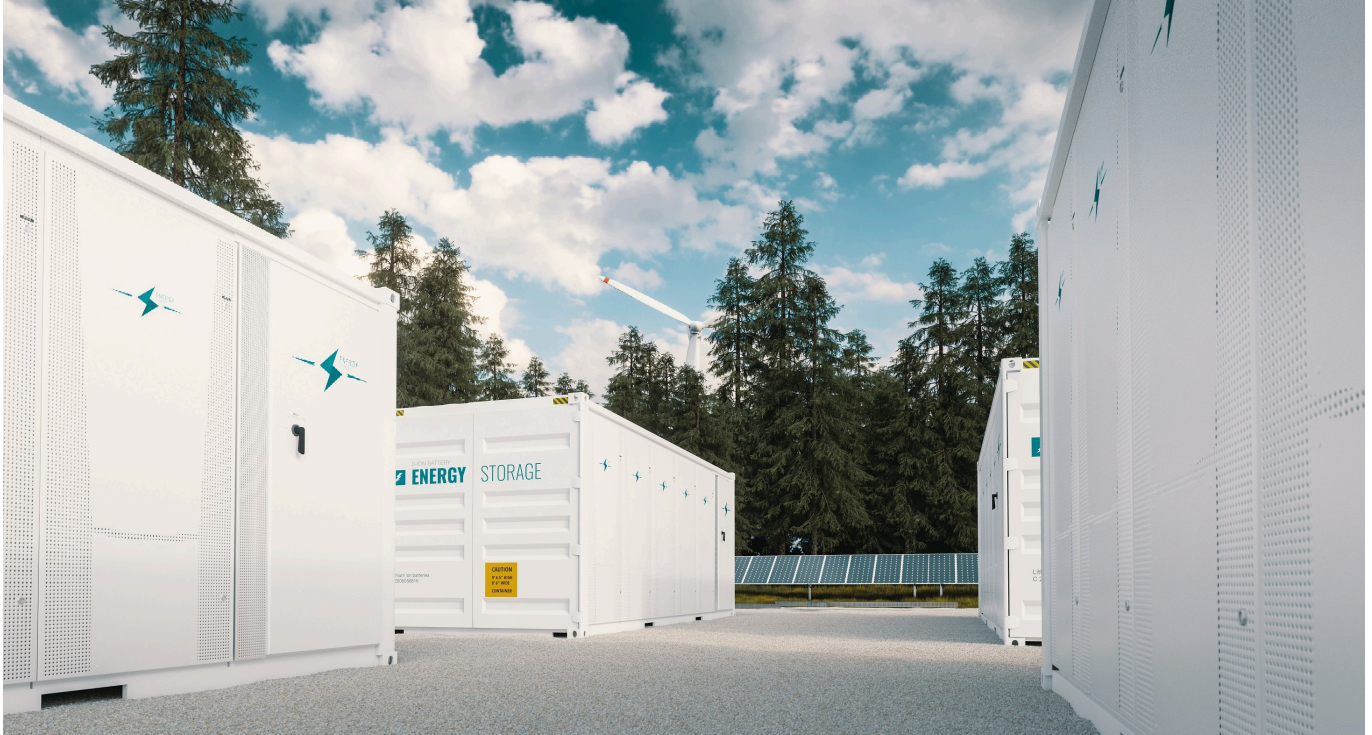


TECH OFFER

Vanadium Redox Flow Battery for Enhanced Energy Storage Solution



KEY INFORMATION

TECHNOLOGY CATEGORY:

Energy - Battery & SuperCapacitor

Energy - Fuel Cells

Energy - Sensor, Network, Power Conversion, Power
Quality & Energy Management

Energy - Solar

Sustainability - Low Carbon Economy

TECHNOLOGY READINESS LEVEL (TRL): **TRL7**

COUNTRY: **SINGAPORE**

ID NUMBER: **TO174609**

OVERVIEW

Today, the cost of energy generated by renewable sources is less than conventional energy. However, current energy storage solutions (e.g. Lithium-ion battery etc.) used to harness energy from renewables are expensive, unsafe and unreliable which has severely impeded the adoption and development of such renewable sources. Hence, there is a need for a cost efficient, safe, environmentally friendly and reliable energy storage system (ESS) to address these existing issues.

This technology offer is a vanadium redox flow battery (VRFB) as a promising ESS. Unlike lithium-ion and lead acid batteries, VRFB has the flexibility to design and customise its power and energy density independently. This results in enhanced performance in terms of round-trip efficiency, energy density and thermal window as well as lowered levelised cost of storage

when benchmarked against lithium-ion battery based ESS for long discharge duration. The VRFB also uses a unique stack design and an organic additive mixture on the electrolyte that improves the thermal stability and allows for a 25% increase in energy efficiency when compared to other VRFB solutions. It also reduces safety risks related to over-charging, discharging and thermal runaways. This VRFB ESS is stable for up to 25 years with no electrolyte degradation and is made with environmentally friendly materials.

The technology owner is seeking partners and collaborators especially those in renewable energy, large scale utility and microgrid projects to test and refine their technology.

TECHNOLOGY FEATURES & SPECIFICATIONS

This technology offer is a vanadium redox flow battery as an energy storage system. The features and specifications of the technology are as follows:

- **Long lifetime:** Performance guarantee on the daily energy output for 25 years with no degradation issues.
- **Enhanced temperature operation:** Innovative stack design allows up to 10% higher round trip efficiency which further helps in cost reduction and organic chemical additive allows higher operating temperature (-10°C to 55°C).
- **Fire-safe and reliable technology:** No leakage, smoke or fire occurring under several realistic scenarios. The system is equipped with advanced sensors to prevent any possible leakage of electrolyte.
- **Recyclability and sustainability:** Components of the VRFB are environmentally friendly and 100% recyclable.
- **Energy density and low maintenance:** Highest density in its segment and hassle-free maintenance.
- **In-house system monitoring platform (BMS/EMS):** Custom-built real-time monitoring platform for batteries' performance monitoring. Enhanced digital platform for predictive analytics and supply demand management monitoring.

POTENTIAL APPLICATIONS

The use of this technology is for industries that are interested in renewables and energy storage systems. The potential applications include (but are not limited to):

- **Renewables:** VRFB as a cost efficient, reliable and environmentally friendly ESS to store energy from renewables.
- **Microgrid:** Complete replacement of diesel genset through the low-cost VRFB ESS coupled with solar. Economical and more reliable for applications that require back up power for more than 3 hours.
- **Green charging station:** Using VRFB as a reliable battery solution to mitigate the stress on the power grid by EV-charging stations.
- **Powering building, telecom tower and data center:** VRFB are designed for long hour back-ups with renewables.
- **Grid stabilisation and renewable peak shifting:** Peak-load demand, frequency regulation and solving intermittency problem with renewable integration by using VRFB ESS.

UNIQUE VALUE PROPOSITION

- Can be left completely discharged for long periods with no negative effects or degradation.
- Easy to scale as power stack and electrolyte (energy) can be decoupled.
- Long lifespan with no performance degradation (25 years)
- Intrinsically non-flammable