A RELIABLE, EFFICIENT, FLEXIBLE AND COST EFFECTIVE VANADIUM-REDOX BATTERY TECHNOLOGY FOR LARGE SCALE ELECTRICITY STORAGE: A NOVEL SOLUTION FOR A GREEN GRID.

Results in Brief

New low-cost flow battery could sustain a future powered by renewable energy

An emerging vanadium redox flow battery could become a cost-effective solution for smoothing out the variable supply of wind and solar energy.

Clean and sustainable energy offers a real answer to today’s energy crisis. But it takes a lot more than just solar farms and wind turbines for renewable energy to benefit society and environment. Progress in the field hinges on the inherently random and intermittent nature of renewables.

Storing excess electricity is essential for creating a more flexible and reliable grid system or for backing up stand-alone energy systems. However, current energy storage technologies do not satisfy the complex set of technological, environmental and economic requirements set by the renewable industries.
Creating storage solutions at any scale

Renewable energy has experienced two major trends – a very rapid growth in the installed power generation capacity and a dramatic reduction in costs that continues to accelerate. “Energy storage is an enabling technology for high shares of variable renewables, but to remain viable, it needs to keep up with these trends,” notes Luis Collantes, VR-ENERGY coordinator.

“The flexibility of the newly developed vanadium redox flow batteries could be customised to suit renewable installations like solar parks or wind farms at various scales,” adds Collantes. Unlike lithium-ion batteries, vanadium redox flow batteries do not maintain a fixed power-to-energy ratio – the power that can flow into or out of the battery to the amount of energy that can be stored.

The electrolyte is stored in two separate tanks connected to a reactor where electrons can be exchanged. Voltage is controlled by the electrodes of the cells, and the total capacity of the battery is determined by the size of the tanks. Adding more electrochemical cells and increasing the amount of the electrolyte solution enables to increase power and storage capacity, respectively, of the vanadium flow redox battery.

Low cost could accelerate commercialisation

“Energy storage is an emerging sector in constant development that is reshaping the renewable energy market. Whereas economies of scale and learning curves will have a major impact on the renewable energy industries, we recognise that the foundation of our technology needs to be more cost competitive to be sustainable. Cutting costs across the board will be achieved through a mix of business model solutions and
higher levels of industrial compliance,” explains Collantes.

For successful commercialisation of large-scale energy storage, prices need to fall sharply, from the current broad range of EUR 500-1 200 per kWh to below EUR 100 per kWh over the next 5 years.

**Keywords**

VR-ENERGY, renewable energy, energy storage, power, vanadium redox flow battery

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