320 kWh battery energy storage technology development

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U.S. energy needs have changed dramatically over the last few decades, and questions are growing as to whether our grid can manage these new demands. Aside from rising temperatures—the National Oceanic and Atmospheric Administration declared 2023 the hottest year on record—the energy sector is managing a trio of additional challenges:

Any one of these developments would warrant an upgrade to our national grid. Taken together, they’re a warning that action needs to be taken quickly. The grid must be prepared to meet heavier demand for longer periods of time, and it must be resilient against unexpected, long-duration outages.

Clean, renewable solutions are waiting in the wings, but the energy sector must address grid deficiencies first. The grid was designed for the consistent baseload power generation provided by fossil fuels and is not ready to integrate intermittent sources such as wind and solar at scale. As pressure increases to harness these renewable energies, new technology will be needed to ensure the grid can accommodate renewables and maintain a balanced power supply and demand.

One promising option: battery energy storage systems (BESSs), designed to hold in reserve excess wind and solar output and distribute it to the grid when needed. BESS manufacturers are deep into testing the technology across chemistries, such as advanced lead, lithium, and vanadium, putting each through real-world paces to demonstrate its viability. Early results suggest BESS technology could be the backup the grid needs to meet accelerating demand.

Here’s an update on the state of BESS testing, what a real-life vanadium BESS test outside Atlanta looks like, and how initial findings are guiding use cases to further research.

BESS technology offers high hopes for ongoing grid support, and manufacturers are exploring ways to make the solutions viable on a larger scale. They’re looking to reduce concerns around the time and money needed to deliver a system, meet a price point the customer can tolerate, and ensure the technology can deliver optimal performance no matter the environment where it’s installed. That’s why much of today’s testing focuses on two areas: enhancing reliability and cost-cutting measures.

In parallel, BESS manufacturers must continue to drive down costs to meet market pricing expectations. Cost savings will come from the economies of scale of large-volume production, as well as continued innovation in designs and manufacturing methods.

Beyond laboratory testing, many battery manufacturers are now taking their technology into the field, partnering with a utility provider to better understand the battery’s capabilities under real-world

pressures. Stryten Energy recently celebrated the first anniversary of its own battery test—the first VRFB energy storage system manufactured and installed in Georgia.

Over the coming months, Stryten Energy will be installing new upgrades to maximize reliability, as well as putting the battery through a second round of testing in real-world scenarios. Findings from the first year with SSEMC suggest further testing will be valuable for three key use cases that energy storage manufacturers across the country should be looking into as well:

Stryten Energy is already moving forward with this type of real-world testing to measure and improve how the VRFB operates in each scenario. The company is encouraged to see its peers across the industry conducting their own testing so that the U.S. energy storage market is prepared to meet today’s challenges to our grids.

BESS manufacturers have made significant headway toward proving the technology’s grid support capabilities. In addition to ongoing vanadium tests, BESSs powered by chemistries such as lithium and advanced lead are now in testing (Figure 2).

Lead, in particular, is a good fit in applications such as community resiliency centers, to help reduce demand charges for commercial businesses, and to provide cost-effective electric vehicle charging stations on demand, even during periods of the day when grid prices are high. The chemistry’s strong safety and domestic supply chain also offers a roadmap for how to produce vanadium energy storage technology at scale in the U.S.