South ossetia energy storage for grid stability

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Non-synchronous renewable energy affects grid stability but storage-as-transmission (SAT) assets offer grid companies a trump card. Whether it"s "virtual transmission" in Australia, Germany"s "Grid Booster" program, or the giga-scale pipeline of projects emerging in the United Kingdom, energy storage is finding a way.

W?rtsil? is the battery partner on the 300 MW/600 MWh Blackhillock BESS project.

Photo: W?rtsil?

In February 2023, construction began on 200 MW of a 300 MW/600 MWh battery energy storage system (BESS) site in Blackhillock, Scotland. Developers want it to be the world"s first transmission-connected BESS to offer grid stability. Rather than boost or replace wires, Blackhillock will provide full active and reactive power services.

With the UK aiming for zero-carbon power by 2025, as part of its 2050 net-zero-economy goal, utility National Grid ESO (NGESO) buys grid-stability services from private assets including Blackhillock. While phase 1 of NGESO"s Stability Pathfinder project included only synchronous condensers, phase 2 admitted grid forming inverter assets to the tender.

Four companies secured 10 contracts under the tender last April, to address insufficient short-circuit levels (SCL) - the amount of current flowing during faults - across Scotland. The winning bidders will also offer "green" inertia to balance supply and demand after events such as trips at power stations, which change system frequency. Five synchronous condensers and five battery sites secured GBP 323 million ($395 million) worth of contracts.

"We believe this is the first time in the world where grid forming inverters have been used in multiple locations across a region to provide a system-wide solution to short circuit level and inertia," said National Grid Head of Networks Julian Leslie. "These zero-carbon, stability-improving devices will enable more green electricity to run, are cheaper for consumers, and will allow the market to deliver as much wind generation as possible."

Three of the battery contracts, including Blackhillock, were won by UK-based Zenobe. The company will also develop the 300 MW/600 MWh Kilmarnock South site due in 2025 and a 400MW/800 MWh Eccles facility the following year. The gigawatt of batteries should provide 4.4 GVAs (gigavolt ampere seconds) of inertia - 5% to 10% of Britain"s requirement.

"The reason why we were so competitive is that we were able to stack the revenues that we would generate

from day-ahead and intraday markets, frequency response services, reactive power, balancing mechanism, and other services in combination with stability services," says Semih Oztreves, director of network infrastructure at Zenobe. "When you stack these services up, you can provide stability services almost at one tenth of what it would cost to provide it exclusively. Stability services are an additional revenue stack without a lot of additional capex (capital expenditure) and opex (operating expenditure). It"s about utilizing your BESS to the maximum."

In Europe, EU law prohibits storage-as-transmission projects from trading electricity in energy or balancing markets as the batteries are owned by electricity transmission system operators and deemed "fully integrated network components." Grid booster batteries spend most of the time on standby for grid congestion relief. Regulators are debating whether SAT assets should be permitted to offer additional services.

"Stacking up revenues for SAT projects depends on their use case," says Lars Stephan, senior policy and market development manager for Europe, the Middle East, and Africa at German and US-owned energy storage heavyweight Fluence. "In Germany, we see that Netzbooster [grid booster] SAT projects can create significant economic benefits by increasing the utilization of existing transmission lines and by being executed much faster than the construction of new traditional transmission lines. They don"t need additional revenues but are executed based on the SAT case alone."

Spanish grid company Red Electrica will tender a SAT project to raise use of interconnectors from the mainland to the Balearic Islands. "This use case also does not require additional revenue streams and it could also be interesting for the UK," adds Stephan.