RENEWABLE OPTIMISATION AND EFFICIENCY IN THE SOUTHEASTERN UNITED STATES

Co-optimising hardware and software solutions for utility-scale solar-plus-storage

The Story

With increasing opportunities to connect energy assets with energy markets, renewable energy developers are pursuing solutions that improve performance and yield higher returns.

Two important evolutions in energy storage technology are influencing purchasing decisions. DC-coupled project configurations are becoming more popular just as new market-bidding technologies emerge. The convergence of these two trends is pushing forward the benchmark for utility-scale solar and storage project efficiency.

Optimising Solar-plus-Storage

A 40 MW / 80 MWh solar-plus-storage facility recently commissioned by Wärtsilä in Georgia, USA, serves as a great example of this co-optimisation between hardware and software.

This project is Wärtsilä's first DC-coupled system with the GridSolv Quantum solution, a fully integrated modular energy storage system. The DC-coupled configuration increases energy delivery during peak demand and enables RWE Renewables to sell nearly 200 MW of solar generation onto the grid. GridSolv Quantum's compact design is highly optimised for DC-coupled systems compared to standard 40-ft containers and delivers the lowest lifecycle costs while ensuring maximum space efficiency.

The facility is located in a vertically-integrated electricity market and uses features that can be repurposed for wholesale electricity market participation.

"This is a milestone project for the integration of solar PV and energy storage and is one of the only facilities globally using DC-coupling on this scale. The flexibility and broad capabilities of the GEMS platform enable effective and efficient control over the entire system, which is essential for optimising this 80 MWh project utilising the GridSolv Quantum energy storage system."

Andrew Tang, Vice President, Energy Storage and Optimisation, Wärtsilä Energy

THE CHALLENGE	WÄRTSILÄ'S SOLUTION	BENEFIT
• Provide cost-competitive dispatchable power that meets day-ahead Power Purchase Agreement (PPA) requirements specified by the local off-taker. • Integrate a portfolio of energy assets, including 200 MW of solar generation and 40MW of energy storage. • Integrate DC converters and solar inverters to ensure seamless energy generation.	• Delivered a DC-coupled solar-plus-storage system, which increases energy dispatchability during peak demand times and facilitates the integration of renewable energy into the grid. • Provided forecast-based day-ahead commitments and real-time dispatch optimisation for value-based asset management that stacks applications: solar firming, DC solar PV clipping recovery, and excess solar energy recovering. • Designed and engineered a sophisticated hardware and software solution that included lab integration testing and field testing to ensure system performance and reliability.	• Streamlined system design resulting in lower hybridised balance-of-plant costs. • Dynamic PPA optimisation, including real-time visibility into and leveraging of automated and forecasted data to maximise revenue for the portfolio assets. • Greater system efficiencies for improved energy yield and dispatch.

Focus on DC-coupled technology

Today, almost all solar-plus-storage facilities leverage AC-coupled configurations, where the battery system and PV plant are connected to separate inverters in parallel. But by reducing the number of AC/DC conversions in a solar-plus-storage system, power producers can reduce conversion losses and improve revenues.

With DC-coupled solar-plus-storage systems, solar generation flows directly to the battery, via a cost-efficient DC/DC converter, and avoids conversion losses from an inverter. As a result, DC-coupled systems are up to 3% more efficient than conventional AC-coupled systems. Plus, the DC/DC converter that creates compatibility between the PV panels and the battery is less expensive than purchasing a second inverter needed for AC-coupled systems. This translates to both lower capital expenditure and installation costs.

Market bidding opportunities

The future of solar-plus-storage is more than just hardware. Software optimisation is a critical next step to ensure utility-scale storage systems coupled with renewables are fully optimised. Automated bidding software maximises revenue from assets while also developing new strategies for future growth and return on investment.

Competitive dispatchable power

To further optimise renewable energy, the future of solar-plus-storage will include two converging trends—a shift toward more modular and distributed DC-coupled energy storage systems, and an expansion of revenue opportunities via optimised bidding. Both developments support a clean energy transition by financially optimising renewables.

SITE SIZE:
40 MW / 80MWh

SITE LOCATION:
Georgia, USA

APPLICATIONS:
Renewables+, PPA Optimisation with Day-Ahead Commitments

SCOPE OF SERVICES:
Engineering equipment delivery (EEQ)

DELIVERY:
2021

RELATED RESOURCES

Wartsila - RWE announce 40MW/80MWh DC-coupled solar-plus-storage project

The next chapter for solar-plus-storage

Wartsila Energy Storage Technology

wartsila.com/energy