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For Immediate Release

Alencon Deploys SPOT-ES in First of its Kind Utility Scale DC-Coupled Solar + Storage Project

Alencon Systems has successfully deployed it SPOT-ES in a unique, DC-coupled Solar + Storage project

Above: Alencon recently deployed its SPOT-ES in a first of its kind utility scale DC-coupled Solar + Storage system.

Hatboro, PA – Alencon Systems is pleased to announce the first large scale deployment of its patented SPOT-ES in a DC-coupled Solar + Storage system in the eastern United States in concert with one of the nation's largest energy companies. This deployment marks the first time a 1500-volt utility-scale DC coupled solar and storage system with string level MPPT was brought online.

The Alencon SPOT – which stands for String Power Optimizer and Transmitter – is a string level DC-DC optimizer which optimizes the power from PV string inputs with voltages ranging from 600 to 1500 volts. The SPOT outputs power at virtually any range of voltage that is completely configurable from one deployment to the next. This unique feature assures that it can be used to couple solar with storage in a way that is battery-chemistry agnostic. The ES suffix designates "Energy Storage." The SPOT-ES family of products has been specifically designed for the needs of DC-coupled Solar + Storage deployments.

"The value offered by DC-coupling of Solar and Storage is clear," states Alencon Systems President Hanan Fishman. "To date, the challenge for industry has been to find the appropriate power electronics to facilitate DC-coupling on a large scale. With this deployment, Alencon has demonstrated that its unique, PV-centric approach to the DC-coupling of Solar + Storage is indeed a solution to this challenge."

Why DC-Coupling of Solar + Storage Matters

The coupling of Solar and Storage has been called the "Holy Grail" of alternative energy because it makes renewable sources of fuel like the sun truly dispatchable energy

resources. Without storage linked to it, Solar is a far less reliable and predictable source of energy. The solution to this challenge is of course storage. There are two ways to connect, or couple, solar and storage: AC coupling and DC coupling. In an AC coupled solar plus storage system, the batteries (i.e. storage) are charged after the solar energy has passed through the PV inverter. As a consequence, such systems need two inverters, one for the PV and one for the battery. In a DC-coupled approach to Solar + Storage, the battery is placed on the DC side of the inverter, so the battery is charged with DC power from the panels before passing through the inverter and experiencing DC:AC conversion losses. This approach works so well because just as PV panels are a DC-source of power, batteries are a DC load when being charged as well as a DC-source when being discharged. The DC-coupled approach to Solar + Storage has many advantages to AC-coupling including lower cost, higher efficiency and perhaps most importantly the ability to capture every kilowatt-hour of energy generated by PV plants with DC:AC ratios greater than one by eliminating inverter clipping.

In practical terms, inverter clipping occurs when the amount of power generated by the PV panels (which is transmitted as DC power) exceeds the rated power capacity of the inverter. Solar projects very often feature a "DC overbuild", meaning there is more DC power generating capacity in the form PV panels than the inverter connected to the array could handle at peek sun. This has historically been done to assure that at times of under production such as early in the morning or later in the day as the sun burns less brightly, the maximum amount of power is still being generated. The DC overbuild technique has the unfortunate consequence of causing energy to be "clipped" by the inverter during times of peak production, typically during midday when the sun is shining

its brightest. By coupling solar and storage on the DC side, this otherwise clipped energy can be captured and diverted to the battery and then dispatched later in the day or at night when power is still very much in demand but is no longer available to be collected from the sun's rays. The DC-coupled technique for combining solar and storage at the point of generation offers energy producers and consumers alike tremendous benefits.

Why Alencon's Approach to DC-Coupling of Solar + Storage is So Unique

Alencon's patented SPOT-ES PV Harvesting system offers a completely unique solution to DC-coupling. Alencon's approach to the DC-coupling of Solar + Storage places a galvanically isolated, string level DC-DC optimizer between the PV array and the DC-bus connecting the battery and the PV inverter. A rising and falling DC-bus voltage commanded by the battery energy storage system's (BESS) system controller dictates the behavior of the system, i.e. directing the system to charge or discharge the battery. Alencon's SPOTs extract the maximum amount of power from the panels by performing string level maximum power point tracking (MPPT) while their voltage output is linked to the DC-bus voltage, allowing the output voltage to follow that of the rest of the BESS. By placing the MPPT function at the string level, the SPOT-ES harvests the absolute maximum amount of power possible from the PV array. By connecting the PV panels directly to a battery on the DC-side of the inverter, the SPOT-ES assures that the entire generating capacity of the plant is captured for eventual delivery to energy consumers.

The key to Alencon's DC-coupled Solar + Storage topology is the SPOT's patented galvanic isolation, which is achieved by placing an isolation transformer for

each PV string input inside the device. In addition to allowing the SPOTs to follow the DC-bus voltage, its galvanic isolation provides solar plus storage deployments a number of other benefits including eliminating the possibility of reverse bias from battery into the PV array. Additionally, galvanic isolation provides of host of other O&M and safety benefits to the BESS.

About Alencon

Alencon's solutions for ALternative ENergy CONversion provide high modularity and scalability for systems from several megawatts to several-hundred megawatts. By helping to dramatically reduce balance of system costs and increase power production through new inverter and energy harvesting technology, Alencon helps advance the state of the art and increase the financial viability of solar power. Headquartered in Hatboro, Pennsylvania, has been building PV power conversion hardware since 2009, drawing on the combined decades of power electronics experience of its engineering team.

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