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Last week, the new Microgrid Knowledge Special Report series that explores the benefits of distributed energy management systems (DERMS) and virtual power plants (VPPs) covered how VPPs can replace conventional power plants while also providing higher efficiency, greater flexibility and increased grid reliability. Here"s the third post, that focuses on why DERMS are essential to today"s new generation of grid control and optimization.

DERMS are state-of-the-art systems that seamlessly integrate high penetrations of solar energy and other distributed energy resources into the grid. When properly deployed, their capabilities provide multiple benefits to both utilities and their customers, a win-win.

Consisting of a suite of software management tools that allow distribution utilities and wire operators to manage an array of DERs, they offer near real-time control of grid assets.

Navigant Research defines DERMS as "a control system that enables optimized control of the grid and DERs, including capabilities such as Volt/ VAR optimization (VVO), power quality management and the coordination of DER dispatch to support operational needs."

DERMS-controlled grid services are delivered by manipulating power and voltage along individual feeders, giving the utility precise control of a wide range of equipment, including smart inverters, capacitor banks, on-load tap changers, voltage regulators (VRegs) and customer loads.

"Because a DERMS knows exactly where every asset is located on the distribution system, it can precisely target specific assets of the distribution system," says Eric Young, vice president, industry solutions for Enbala.

"For example," he continues, "this allows the DERMS to control devices down-line of specified transformers or measured points on feeder lines so that when a utility experiences challenges with too many renewables coming online, the system knows exactly which assets to control to mitigate associated problems."

These assets might include smart inverters or more traditional utility control equipment. This location-driven focus allows the DERMS to exercise a high degree of control over both real power (watts), voltage and reactive power (VARs). Operators can increase load on one part of a feeder while decreasing load (or increasing distributed supply) on another part of the same feeder. Utilizing DERMS, utilities and wire operators can also bias the reactive power of DERs to manage voltage or regulate distribution feeder voltage profiles.

DERMS reap advantages by teaming up with devices such as smart inverters to protect the grid feeder

systems. For example, too much solar on the grid can cause voltage problems. To address this challenge, DERMS can sense this is happening and control real-time voltage signatures and power flows on a distribution feeder to regulate grid conditions, preventing voltage excursions, brownouts and power outages. DERMS can dynamically control a variety of settings on smart inverters, which optimize the voltage and phase angle at the inverter"s terminals, resulting in better line voltage regulation and decreased technical losses throughout the distribution system.

The ability of DERMS to manage large numbers of distributed assets can lead to a more flexible and resilient grid. This is especially important as more renewable energy sources come online. For example, voltage fluctuations that result from the high variability of PV can be effectively dealt with by optimizing DERs, including client loads, on the grid.

DERMS balance the grid by using advanced optimization algorithms that can compute the most efficient usage of each grid asset. To do this, DERMS utilize data obtained from DERMS-enabled devices, smart metering infrastructure and other distribution grid sensors. By sending control signals, DERMS will adjust, turn on or off the devices connected to the DERMS network, including behind-the-meter resources, such as on-site generators and batteries. The systems can even efficiently regulate client assets. These might be chillers, fans, lights or other assets able to both cut costs for the customer and optimize the operation of the entire distribution network.

In conjunction with a distributed management system, DERMS will automatically control all the devices along a feeder line, including customer loads and utility equipment, to achieve this goal for peak energy savings.