Why a Nanogrid in a Microgrid: Aquion Energy

September 16, 2016 By Lisa Cohn Leave a Comment

Aquion Energy, Schneider Electric and Azimuth Energy have completed a nanogrid in a microgrid at the Illinois Institute of Technology. The nanogrid has the unique ability to move DC power from solar panels directly to LED lights at the Institute's Keating Sports Center.

The Illinois Institute of Technology in Chicago, home to a unique nanogrid in a microgrid

In reality, the nanogrid is a small microgrid, said Matt Maroon, vice president of product management, Aquion Energy. It has the ability to separate from the institute's bigger microgrid and from the main grid and run independently, he explained. It is made up of solar panels and Aquion's batteries.

"The LED lights can be powered without the microgrid. The nanogrid can stand on its own and the batteries and solar can power those lights all the time. You don't need a grid connection to power those lights," he said.

"The nanogrid is the small system that includes the batteries and the solar panels, both connected on a common DC bus powering the lights inside the building. It's its own self-contained DC bus system, part of the larger AC connected microgrid," Maroon said.

Generally, such DC systems are found either in small systems–such as the solar panel-plus-battery microgrids that power cell phones and lights–or in much larger systems, he said. They're becoming more and more commonplace because they're efficient; they avoid the use of inverters that convert DC power to AC power. Generally, adding an inverter reduces efficiency by about five percent, he said.

"Batteries provide DC power and in most situations when you have battery-plus-solar installations, you also have an inverter that takes DC power out of the batteries and turns it into AC power," he explained.

"There's a lot of interest in setting up DC power systems because people see the advantages. It's a growing segment in the nanogrid and microgrid space."

The nanogrid uses solar during the day to charge lights and batteries. But if the batteries are full and there's excess solar, the system pushes excess solar to the grid. "The overall system architecture with the number of contingencies is pretty unique," Maroon said.

The main challenge in the project was deciding what portion of the system could go off grid, Maroon said.

"The challenge was for the system integrators–putting together strategies for different ways you can use the grid."

The companies describe the nanogrid as "hybrid," which can be interpreted in a number of ways, he said. Aquion's batteries are hybrid because they use both lithium and sodium reactions. The nanogrid also includes mixed energy sources. And the loads are a hybrid of AC and DC loads.

The nanogrid uses Aquion's Aqueous Hybrid Ion batteries, which can operate at high temperatures and are the first batteries in the world to be "cradle-to-cradle certified." Aquion has "a couple hundred" installations around the world, and each installation is unique, he said.

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Schneider's power electronics in the system include the Conext XW+ 6848 Hybrid Inverter and the Conext XW MPPT80-600 Charge Controller.

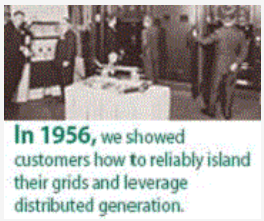
The nanogrid was designed and installed by Azimuth Energy.

> *Aquion says the nanogrid demonstrates what we'll see in distributed energy in the future.*

Aquion says the nanogrid demonstrates what we'll see in distributed energy in the future. More and more, we'll see isolated loads powered by renewable energy combined with energy storage, and they'll be able to stand alone and operate without the grid.

The Illinois Institute of Technology's $14 million microgrid project was designed to enhance reliability and incorporate renewable energy systems, including rooftop solar, wind turbines, flow batteries and charging stations for electric vehicles, according to the institute. It also includes smart building automation technologies that enhance energy efficiency and provide demand response. The project was prompted in part by power outages–three or more a year–that cost up to $500,000 annually.

Learn more about nanogrids in microgrids and other forms of distributed energy by subscribing to the Microgrid Knowledge newsletter. It's free.



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