

Tiny Electric Grids Help States Weather Extreme Storms

Eastern states in the U.S. are employing microgrids to improve resilience after big weather

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Interest in microgrids have soared in recent years as extreme weather events like Superstorm Sandy have battered the United State.

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Two years ago this week, a fierce, fast-moving thunderstorm system known as a derecho ripped through the Mid-Atlantic leaving more than 1 million of Maryland's 2.5 million electricity customers without power.

In the aftermath of the storm, the state stepped up efforts to improve the resiliency and reliability of the grid. This week, at the behest of Gov. Martin O'Malley (D), the Maryland Energy Administration (MEA) released a road map for microgrid deployment as part of a strategy to withstand future storms, which are expected to become more intense as a result of climate change.

"Governor O'Malley has been an outspoken champion of climate action," said Abigail Ross Hopper, MEA director and chairwoman of Maryland's microgrid task force. "The scientists and the data support the fact that we are seeing more and more severe weather as a result of climate change."

As a result, "we have to take proactive steps to help our citizens deal with this changing reality," she added.

Building microgrids is one possible solution. A microgrid combines various loads with distributed energy resources and advanced control equipment to allow portions of the electric grid to operate independently from the larger grid network, or to "island" in the case of the macrogrid going down.

Islanding capability is attractive to universities, hospitals and military installations aiming to protect their critical loads. It's also attractive to communities looking to survive the next storm, a dynamic that is spurring the development of a new, potentially controversial microgrid model.

Military drives U.S. market

Interest in microgrids has soared in recent years as extreme weather events like Superstorm Sandy have battered the United States and as the price of solar, combined heat and power plants and other decentralized energy sources has dropped.

As part of President Obama's Climate Action Plan, the Department of Energy launched a microgrid competition yesterday that will give six operational microgrids an award of \$100,000. The submissions,

due Aug. 29, are intended to help DOE learn more about how microgrids can improve grid resiliency while promoting cleaner, cost-effective power generation.

According to Navigant Research, North America will be the global leader in total microgrid capacity through 2020, when global annual market revenue is expected to hit \$40 billion.

In the United States, military microgrids will be a key market driver. More than 40 U.S. military bases already have microgrids in operation, or that are in the planning or study stage. College campuses across the country have also established microgrids, including Princeton University; University of Missouri, St. Louis; and University of California, San Diego.

Single customer, or "campus-style," projects used at schools, military bases and even individual buildings are becoming a popular microgrid application. A new, more complex microgrid model in development is one that serves multiple customers over several properties and crosses over public rights of way on the distribution system.

The Maryland report calls these "public purpose microgrids," which are designed to power a community's essential operations as well as services that maintain quality of life. According to Hopper of MEA, this includes places like grocery stores, pharmacies and gas stations.

"If you don't have power for a week but you have a generator, after the first day when you run out of gasoline it doesn't really matter," she said. "Or if you can be somewhat comfortable in your home even if you don't have power, but you run out of your medication and you don't have anywhere to get it that's a serious quality of life issue."

The idea is to link up several community assets to create an "oasis of safety," said Hopper. "Those are the kinds of microgrids we are really looking at because those are not really being done yet."

Severe snowstorm in Conn. sparked movement

While microgrid projects are being deployed around the country, "the Northeast is really the epicenter of what's going on nationally with microgrids," said Tom Bourgeois, deputy director of Pace Law School's Energy and Climate Center.

Connecticut was the first state in the country to announce a microgrid pilot project in 2012 after a severe snowstorm knocked out power to hundreds of thousands of people for up to 10 days. Rather than spend \$19 billion to put power lines underground, the state approved an \$18 million investment for nine microgrid projects, which are currently in development. In the second round of the program, closing Aug. 5, Connecticut will invest \$15 million on 5 to 10 projects

When Superstorm Sandy hit in 2012, it plunged half of Manhattan into darkness and left New York City with an estimated \$50 billion in indirect economic losses. In January, New York Gov. Andrew Cuomo (D)

created a \$40 million competitive microgrid program to bolster the state's grid system. Solicitations are expected to go out next quarter.

Massachusetts is also offering \$40 million for energy resiliency and microgrid projects. New Jersey is developing the country's first microgrid designed to keep transit lines running if the regional grid goes down. And Maryland is moving forward with a series of additional studies ahead of launching its first pilot project.

For Bourgeois, it's not only exciting that Northeastern states have committed to building microgrids, but that they're testing the economic and technical feasibility of microgrids that serve multiple unaffiliated customers.

"The single campus model is one that's a little easier," said Bourgeois. "What we're seeing now is going beyond that and looking at multiple unaffiliated entities and linking them together. It's not just critical infrastructure, but tying critical infrastructure to something that improves quality of life."

"We want to demonstrate that microgrids can provide benefits for everyone, not just for universities, government or the military," said James Gallagher, executive director of the New York State Smart Grid Consortium.

The goal is to create a business model for microgrids that can be replicated without government assistance, but that also serves a diverse customer base, he added. "We don't want microgrids to end up as a case of the haves and the have-nots."

'Utilities know this is coming'

How these projects are put in place depends on each state's regulatory framework, existing politics and political climate.

In Maryland, the MEA recommended focusing on the deployment of utility-owned public purpose microgrids. Utilities have the authority under state law to construct, own and operate these systems, as well as the expertise and the rate base to build and pay for them.

In the long-term, however, the state sees private, third-parties getting into the microgrid game.

"We believe very strongly that while utility-owned microgrids are an important first step, allowing competition in the microgrid space would lead to faster deployments, better products and lower prices," said Hopper.

"The utilities can certainly participate in the competition," she added. "It's not an effort to phase them out, it's an effort to bring new players in."

In Connecticut, utilities don't have the legal ability to own distributed generation and so any microgrid projects are required to belong to third parties, such as cities or business collectives. The state Legislature passed a bill allowing municipal microgrid owners to cross public rights of way in order to build their distribution infrastructure, a right traditionally reserved for utilities.

Some see this as a threat to the long-established and successful utility business model.

"Utilities know this is coming. And I'll be honest, from my vantage point, it scares them to death," said Leia Guccione, manager of electricity and industrial practices at the Rocky Mountain Institute, speaking at a microgrid summit last week in Washington, D.C.

"Distributed generation of any kind and efficiency is a financial threat to the utilities," echoed Peter Lilienthal, founder of Homer Energy, a distributed power design company and leader in microgrid software technology. "They're in an awkward position because they don't want to sound against it, but it hurts them."

Others have a rosier outlook.

"I think there's always going to be a role for utilities," Rick Fioravanti, head of distributed energy resources for DNV GL Energy, said last week.

"They see a world where they're providing services to their customers and their customers are providing services to them," he said. "They just have to find ways to do that."

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