





A **big** boost for **microgrids**:

RELIABILITY, RESILIENCE AND FAVORABLE ECONOMICS

BY JOHN EGAN, CONTRIBUTING WRITER

Whether offering backup generation for a hospital or demonstrating potential attributes of new technologies, microgrids are a frequent part of the conversation on reliability and resilience. With drastically changing economics for generating resources and storage technology, microgrids are seeing growing interest from utilities and businesses alike as they weigh the potential costs of various risks and benefits of increased resilience.

Defining microgrids

Consultancy Wood Mackenzie defines microgrids as a set of distributed energy resources with unique capabilities that include:

- Providing power and energy services within a geographic perimeter in both grid-connected and islanded mode
- Supporting loads totaling more than 100 kilowatts in single or multiple buildings for at least 24 hours

- Controlling the DERs as a single entity

What constitutes the “typical” microgrid is also changing. Most microgrids in operation today are powered by fossil fuel generators — typically diesel or natural gas — but a growing number are being configured with solar plus storage. As costs for wind, solar and storage continue to decline, and public interest in sustainability keeps rising, a growing share of the microgrid market is expected to be from renewable generating resources paired with storage.

Rebuilding for resilience

A few years ago, two of the costliest hurricanes on record, Irma and Maria, devastated the U.S. Virgin Islands, including a significant portion of its electric infrastructure. Even with help from mutual aid crews from the mainland, it took months to fully restore the electric system.

The Virgin Islands Water and Power Authority (WAPA) is working to make sure the lights stay on the next time a hurricane blasts through the islands.

“We know it is not a question of if, but rather, when, another hurricane will hit us,” said Jean P. Greaux Jr., director of corporate communications for the agency. “We can’t be without power for months at a time.”

That’s why the authority, which serves about 55,000 customers across five islands — St. Croix, St. Thomas, St. John, Water Island and Hassel Island — plans to invest about \$258 million over the next decade to build a series of microgrids across the territory.

In April 2021, WAPA received a \$4.4 million grant from the Federal Emergency Management Agency to cover the design and engineering for a microgrid system on the western end of St. Croix, near the island’s airport. It will cost an estimated \$129 million to construct the Adventure Hill Microgrid, which is expected to begin operating in 2025.

That first project will include 18 megawatts of solar generation, 20 megawatt-hours of battery energy storage, and an intelligent control system. No new distribution line will be laid as part of the project. All told, WAPA plans to construct four microgrids with total generation of about 50 MW and total energy storage of

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approximately 82 MWh. All of the microgrid equipment will be above ground and will be built to withstand sustained winds of 200 miles per hour, as specified by FEMA.

WAPA has been working to harden its electric infrastructure to make it less vulnerable to hurricanes and other disruptions, including economic disruption, for more than two decades.

“We have been trying to transform and harden our electric system, at an acceptable cost and with minimal environmental impact,” said Marquis A. McGregor, WAPA’s interim manager for system planning.

The power and water agency began undergrounding some transmission and distribution lines in the mid-1990s, after Hurricane Marilyn devastated the main airport.

“When clouds come, it leads to decreased solar generation and grid instability,” explained Ashley M. Bryan, WAPA’s interim director for transmission and distribution. “That’s why we’re going to renewable energy backed by energy storage and liquefied petroleum gas (LPG, or propane), which is cleaner and cheaper than diesel,” the fuel that provides the islands with most of their electricity today.

On a delivered cost basis, diesel fuel costs nearly \$20 per MMBtu, roughly double the per-MMBtu cost of LPG, according to an assessment conducted for WAPA by Black & Veatch. While the cost of both fuels was projected to rise during this decade, Black & Veatch forecast that LPG’s 2-to-1 cost advantage would continue.

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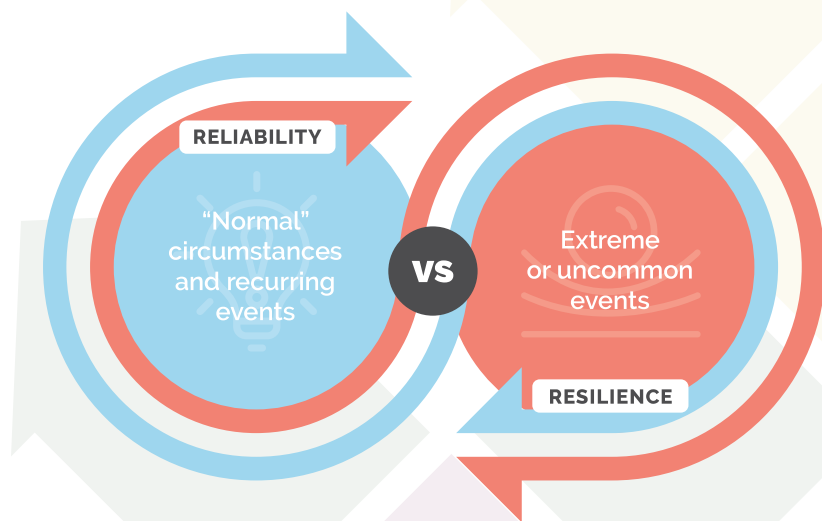
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A strong business case

High reliability has long been important to businesses, and the standard expectations are getting even higher. “It’s a major inconvenience to lose power for several hours or days, but momentary voltage sags are also a problem for many businesses, particularly manufacturers, data centers, or those relying on power-sensitive equipment,” Maze-Rothstein said.

He cited a 2015 study from the Pew Charitable Trust and ICF, “Distributed Generation: Cleaner, Cheaper, Stronger,” that estimated power outages cost American businesses about \$150 billion per year.

A growing number of commercial and industrial customers operate power-sensitive equipment that requires “five nines” of reliability — meaning that power remains on at least 99.999% of the time.

“Availability of at least five nines, or 99.999%, in terms of both reliable and resilient power, is the general standard that companies within the telecommunications industry, including data centers, strive to achieve,” noted a Cleveland State University report.

The study estimated that the local investor-owned utility, which serves a number of large commercial and industrial customers, has 99.93% reliability, or “three nines.”

To better meet the reliability and sustainability needs of these current and future power-sensitive customers, Cuyahoga County is working with some local businesses and Cleveland Public Power to create what it calls the Cuyahoga County Utility — essentially, a series of microgrids outside the boundaries of the city of Cleveland.

Improving value

Microgrids are a still-small, fast-growing and important aspect of the energy transition, driven by improving economics and concerns over resiliency and sustainability, commented Isaac Maze-Rothstein, a grid edge analyst for Wood Mackenzie.

“Costs are falling for natural gas, renewables and computing power, but the cost of low reliability is going up,” he said. “Environmental, social and governance (ESG) factors are another driver for microgrids — everyone wants clean power. And more extreme weather — such as the Texas deep freeze, wildfires in the West, and hurricanes in the southeast and Caribbean — that knocks out the grid underscores the need for reliable power.”

Society’s need for highly reliable electric power was further demonstrated during the COVID-19 pandemic, he continued: “Many people said, ‘How am I supposed to work remotely without my computer and the internet?’”

Through the end of 2020, according to Wood Mackenzie research, nearly 4,400 MW of microgrids were operating in the U.S., and nearly 800 MW more are expected to begin operating this year. Maze-Rothstein noted that the growing interest in microgrids with solar plus storage and other cleaner sources is taking market share from diesel generation.

According to Maze-Rothstein, most microgrids are installed as an emergency backup

for grid power that may be having reliability challenges, such as rural communities at the edge of a long existing distribution system, police stations, military bases, food stores or educational institutions.

The Virgin Islands’ microgrids would be an exception to that trend, as they are expected to be operating 24/7/365.

Solar plus storage is more expensive up front than conventional generation or transmission and distribution solutions, but low operational costs offset the higher upfront costs. Storage costs are declining rapidly and are expected to continue falling over the next few years, following the declining cost curves of wind power and solar generation. These trends buttress the economic argument for microgrids powered by renewable and storage.

The improving economics is a big reason why financial institutions, investor-owned utilities and international oil companies like Shell and Total are getting behind microgrids, typically solar plus storage. The attention on microgrids is driving deployments up and costs down, Maze-Rothstein noted.

In their early years, microgrid control systems were proprietary and customized, but now they are moving toward standardization and modularity, which Maze-Rothstein said should further accelerate a fast-growing business.

“There are clear opportunities for microgrids to provide value as a premium reliability service that rides on top of traditional electric distribution service,” he said.

“At first, we thought of microgrids as a tool to attract new businesses to the area, but we quickly saw many existing customers were having reliability and power quality problems,” commented Mike Foley, director of the department of sustainability in Cuyahoga County.

Foley emphasized that the proposed county utility would not be taking over the poles and wires of either the IOU or of the community-owned Cleveland Public Power. Rather, the first phase of the Cuyahoga County plan would be to set up microgrids in four to six commercial districts outside the Cleveland city boundaries to provide more reliable electric service to C&I customers who require it and are willing to pay for it. The county is confident of its legal ability to do that, but it expects legal challenges.

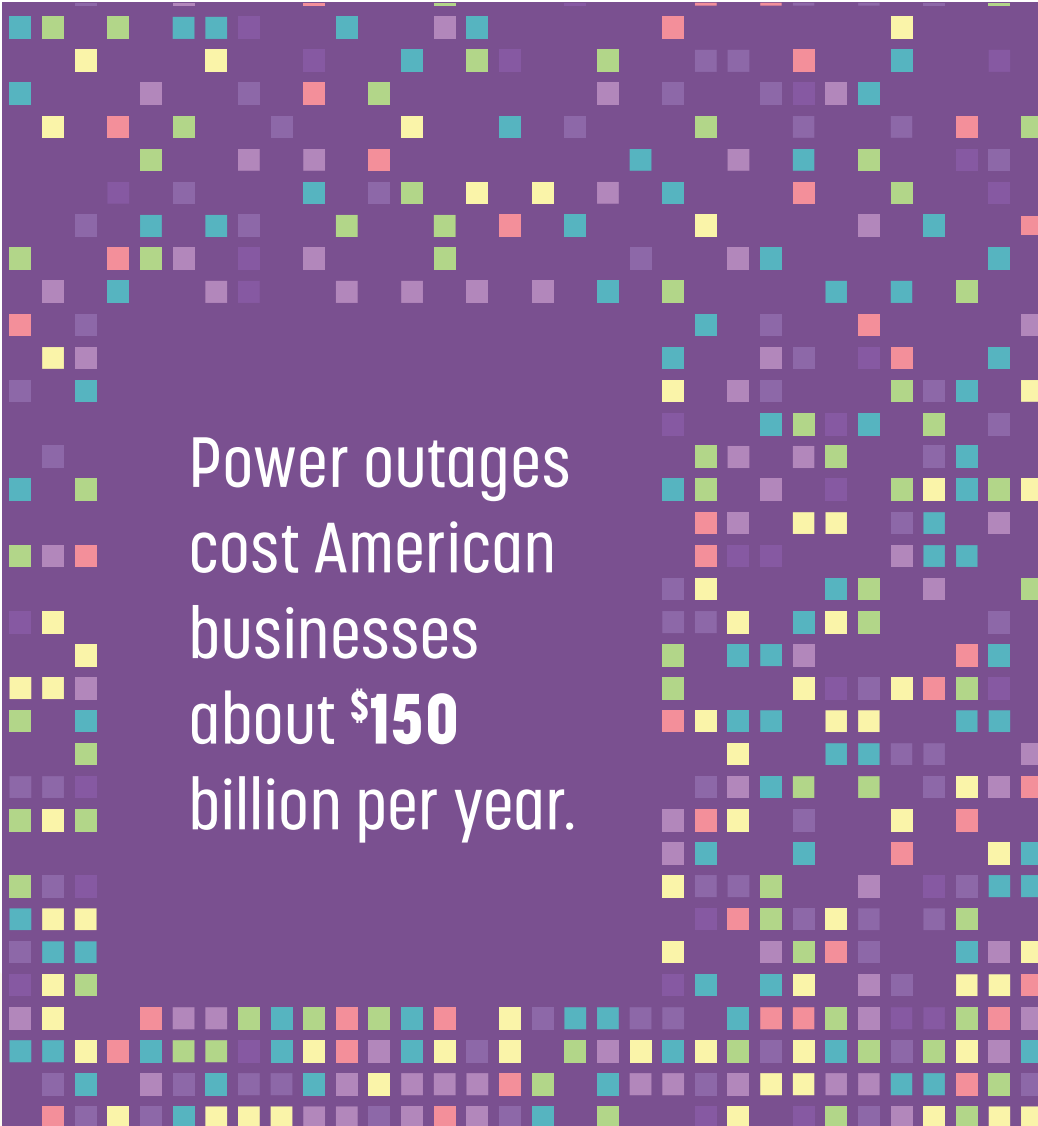
If the proposed county microgrid utility is established, Foley projected it would serve about 25 C&I customers and have about 100 MW of generation. Local sustainable generation would be used whenever possible, but the microgrids also could take power from the PJM Interconnection.

It’s music to the ears of Cleveland-area C&I customers like Nestlé and PPG.

Rose Hanzlik, CEM, is the U.S. energy business partner manager for Nestlé, which employs about 3,000 people at its food manufacturing and corporate site in Solon, Ohio, just outside Cleveland. In a May 2021 hearing, she told the Cuyahoga County Council about some of the effects of electric reliability on the site’s operations and how a microgrid might help.

“It’s very disruptive having employees standing by because machinery has tripped offline, or having to restart production lines,” she said. “Sometimes our equipment has been damaged by power blips which causes further startup delays.”

Hanzlik mentioned that since the beginning of 2021 the site experienced multiple momentary interruptions in service, which resulted in lost production for four to six hours for each event.



Power outages
cost American
businesses
about **\$150**
billion per year.

“There’s a delicate balance between cost and reliability, and having more reliable electricity would be valuable to us,” she continued. “We’re very interested in a microgrid if it can increase the reliability of service.”

As a company, Nestlé has a goal of using 100% renewable energy at all its facilities by 2025, and Hanzlik told the Cuyahoga County Council that having the microgrid powered by renewable energy could help the company to achieve that goal.

At that same hearing, Scott Rinehart, a plant manager at a PPG site in Euclid, Ohio, told council members about two full-day outages that his plant, which manufactures metal pre-treatment products, experienced in late 2020. Employees were sent home for those two days (they were paid), but nothing was produced. The facility couldn’t even ship the product it had because the loading dock was locked — by an electric lock.

While he said two full-day outages in a space of about three weeks was unusual, “even small power blips can be disruptive to the paint and coatings industry: We’d have to restart equipment, reset the variable speed drives, and restart the boilers, scrubbers, and dust collectors.”

“A microgrid could be very helpful to us from a reliability and sustainability standpoint,” Rinehart told the Cuyahoga County Council in May 2021.

While supportive of microgrids, Rinehart was not willing to write a blank check. “It all depends on the cost of the microgrid,” he said.