ENERGY RESILIENCY SOLUTION

Building a Sustainable Microgrid

How renewable-centric microgrids can make facility operations more resilient

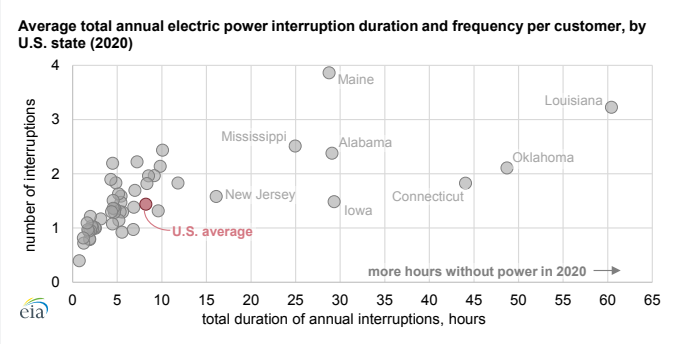
The Need for Energy Resiliency

Businesses and communities across the United States are under enormous pressure to adapt to reliability challenges within each state's power grid. As society continues to become more dependent on uninterrupted electricity supply, the frequency of outages is rising rapidly. That's because:

- Weather events are becoming increasingly severe. Wildfires and hurricanes, in particular, have been setting records year after year, with no end in sight. Communities spared a direct hit may lose power when transmission lines are damaged.
- Utility companies have deferred infrastructure investments to harden systems. This has led to stop-gap measures like preventative public safety power shutoffs (PSPS) in California and rotating power outages in Texas.

It's imperative for facility managers to ensure that critical operations are not impacted by grid outages. Their systems and facilities need a resilient power source, and their approach to filling that need will determine the project's long-term success.

Sometimes management will focus in on a discrete fix, such as implementing a single backup generator. However, a problem as significant as energy resiliency requires a broad solution that reflects the goals and values of the organization. In many cases, that means building a sustainable microgrid that provides local, renewable power generation.



50% INCREASE — in average power outage duration between 2019 and 2020

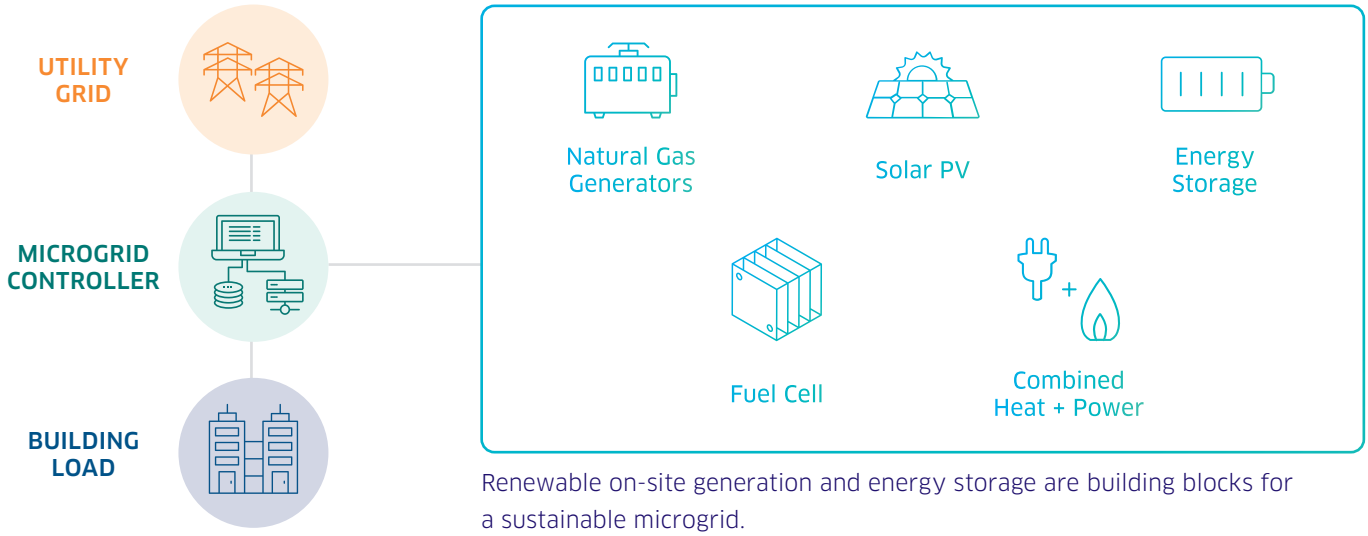
40+ HOURS — of power interruptions on average in Connecticut, Oklahoma, and Louisiana in 2020

What Is a Sustainable Microgrid?

A microgrid is the technical solution to the problem of energy resiliency. It is a group of interconnected energy loads and distributed energy resources that acts as a single controllable entity with respect to the local utility grid.

Microgrids vary widely in size. Their distinguishing characteristic is their ability to "island" during power outages. When the utility grid is operational, a microgrid can run in parallel. When the external grid goes down, the microgrid can isolate from it and continue to provide power.

What makes a **sustainable microgrid** unique is the prominence of renewable energy generation. By incorporating renewables and energy storage, a microgrid can regularly generate and store enough energy to significantly reduce demand for power from the utility. This can make the microgrid economically viable beyond its role as a backup power source – generating energy cost savings.



Renewable on-site generation and energy storage are building blocks for a sustainable microgrid.

Unique Benefits of Sustainable Microgrids

DAY-TO-DAY COST SAVINGS.

A sustainable microgrid provides financial benefits all year long, not just during outages.

- Solar PV systems generate clean and cost-effective electricity, reducing the amount of power purchased from the utility.
- Battery energy storage can take advantage of peak shaving and energy arbitrage opportunities to further reduce electric bills.
- Combined heat and power (CHP) systems improve efficiency by providing heat and energy, further reducing utility costs.
- Smart energy management can optimize loads and generate revenues from utility programs.

RAPID TRANSITION TO BACKUP POWER.

The point of common coupling (PCC) in a sustainable microgrid can cut over to the backup power solution in milliseconds.

REDUCED CARBON EMISSIONS.

Aligning with government mandates and organizational goals, many businesses and organizations have ambitious sustainability objectives in place. Relying on renewable energy in the event of a power outage avoids the pollution associated with backup diesel generators. This also avoids difficulties with siting diesel generators that may not comply with local air quality regulations.

LONGER-DURATION RESILIENCY.

Reduced dependency on diesel or natural gas generators supports longer-duration backup power. With renewables, generation does not stop when the finite amount of fuel stored onsite is exhausted. This is crucial as the average duration of power outages continue to increase.

ENGIE's Comprehensive Approach

Assessment

A sustainable microgrid could include a range of different technologies. The first step is to assess the organization's energy resiliency needs, sustainability goals, and the current state of equipment.

ENGIE works with facility managers to identify the systems and loads that are most crucial to keep operational, setting priorities and considering:

- **Size:** Which loads need to be protected from prospective power outages? Are phones and IT systems most important? Does every area of the building need to be operational?
- **Duration:** Does the system or facility need backup for a few minutes, hours or days?
- **Speed:** How fast do these loads need to transition?
- **Sustainability:** What sustainability targets are being pursued, and how can resiliency technologies help?
- **Financials:** What are the project's economic requirements – what are these objectives worth?

Cost Modeling

ENGIE helps plan project financials, including grants and incentives, to minimize the cost of renewable energy and storage technologies. As an example of what's possible, one California water district is receiving $7 million in incentives under California's Self-Generation Incentive Program (SGIP).

ENGIE will also help the clients optimize cost-saving and revenue-generation opportunities throughout the microgrid.

Planning

ENGIE assists with design of the sustainable microgrid and operations planning. Based on the organization's goals and current state, we come up with a portfolio of technology options that leads to the optimal solution for each site. Considerations include:

- Which generation technologies will best meet operational needs?
- Does battery energy storage make sense in this location?
- Should legacy solutions, like an existing generator, be incorporated into the microgrid?
- Are upgrades to the electrical infrastructure, such as transformers or switch gear, necessary?
- Does the facility need a new panel and wiring to segment critical loads?

Implementation, Operation, and Maintenance

After planning and design, ENGIE can build and operate a sustainable microgrid. Over the life of the microgrid, we provide routine service and preventative testing.

- **Preventative testing:** If the entity has not recently experienced an outage, ENGIE will run a test to ensure everything is functioning properly.
- **Post-outage follow-up:** After an outage, ENGIE will provide a review of system performance, reporting on how the microgrid performed.

Utilizing these services on a quarterly or annual basis gives facility managers confidence that they're ready for an outage.

Recent Projects


Photo: Scott Roth

Solano County

Solano County has been severely impacted by wildfires in recent years. As part of a broader energy program, the county is installing microgrids utilizing solar PV and battery energy storage at four key locations. The project's goals include:

- Maintain critical operations during power outages and PSPS events
- Reduce utility expenses and exposure to rising utility rates
- Transition to more energy-efficient lighting and HVAC, implement water conservation measures, and install EV charging stations
- Increase community engagement through an online, real-time public dashboard
- Leverage workforce development activities to provide real-world experience for students in engineering and other fields


Photo: Santa Barbara USD

Santa Barbara Unified School District

Santa Barbara USD has six microgrids at campuses across the district, generating a total of 2.5 MW of solar power, with 1.9 MW / 3.8MWh of battery storage. In a power outage, each microgrid "islands," separating from the external utility grid and prioritizing loads identified as critical.

- Initially, all loads across campus are powered by solar generation and stored energy
- When batteries get low, only critical loads are powered, to extend their life
- If solar is generating enough power to recharge batteries, additional loads are added
- When the external power outage ends, the microgrid ties back to the grid

City of Milpitas

The City of Milpitas is implementing a smart city infrastructure modernization program including 10 different measures to improve citywide services, conserve and generate clean energy, and reduce operation and maintenance expenses. Microgrids at two community centers are key components of the program.

- The microgrids include 200 kW of solar paired with battery energy storage to provide an initial source of backup power during grid outages and to reduce peak demand costs
- The battery system is supported by a natural gas generator, which provides a second source of backup power for outages of a long duration
- The microgrids will allow Milpitas to open community centers as a resource or charging center during Public Safety Power Shutoff events or other power outages

Contact ENGIE today for a free evaluation of your organization's path forward with a sustainable microgrid: **info@es.engie-na.com**

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