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MICROGRIDS

RESILIENCE TECHNOLOGY PROFILE

IFA ILLINOIS FINANCE AUTHORITY
Illinois Climate Bank

See the GDO Microgrid Overview for more details.

OVERVIEW

The U.S. Department of Energy defines a microgrid as **a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid.**[1]

Microgrids can operate in either grid-connected or islanded mode, including entirely off-grid applications.[1] Microgrids vary in size from small systems serving specific portions of a property to large-scale deployments supporting facilities such as data centers, communities, or military installations. Core components of a microgrid typically include electricity generation, energy storage, and control systems for demand response and system management.

PROGRAM OVERVIEW

This document was developed under the **Customized Help and Expertise on Energy Resilience for States (CHEERS)** program. CHEERS is a community of practice focused on helping states implement **Infrastructure Investment and Jobs Act (IIJA) Section 40101(d) Grid Resilience State and Tribal Formula Grants ("40101(d)")**. CHEERS is managed by the U.S. Department of Energy (DOE) Grid Deployment Office (GDO), and convenes an annual cohort of states to deliver grid resilience technical assistance.

RESILIENCE BENEFITS

Grid Independence. Microgrids can island from the bulk power system, ensuring that critical infrastructure such as hospitals and emergency services remains operational if the broader grid fails.

Grid Flexibility. Microgrids can support the larger grid by using their generation assets during demand response events or periods of high congestion. Reducing stress on the grid helps lower the risk of blackouts and enhances overall system stability for the local area.

Local Energy Sources. By using local energy resources such as solar panels, batteries, or generators, microgrids reduce the risk of power loss due to grid disturbances (e.g., dependence on transmission lines that are vulnerable to disruption).

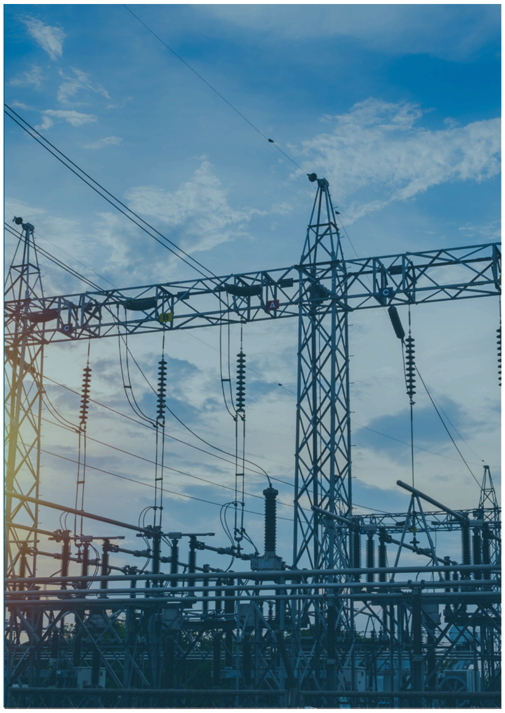

Image Source: Canva

CHECKLIST

Consider this technology if you experience the following:

- [ ] Frequent power outages or grid instability
- [ ] Need reliable power for critical infrastructure (hospitals, emergency services, etc.)
- [ ] Challenges meeting load demand during peak conditions
- [ ] Interest in energy independence or local control

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40101(D) APPLICABILITY

Eligible Uses of 40101(d) Grid Resilience Formula Grants:

- **Batteries.** Provide backup power during disruptive events.
- **Integrative Equipment or Management Systems.** Inverters and other technologies needed to connect existing generation sources and/or batteries into a microgrid.
- **Microgrid Controller.** Equipment required to manage system operations, balance supply and demand, and facilitate islanding from the main grid.
- **Electric Cables.** Connections between buildings within the microgrid that enable shared access to energy resources.
- **Distribution Equipment.** Protective devices, transformers, and other equipment required to distribute power within the microgrid.

KNOW BEFORE YOU DEVELOP

Consider the following before choosing a microgrid for your 40101(d) application:

- **High Costs.** Microgrids often require significant upfront investment, typically ranging from $2 - $5 million per megawatt.[1]
- **Identified Load Location.** To optimize design and cost, loads served by a microgrid should be geographically clustered and avoid replicating large portions of the existing distribution network.
- **Determining Critical Loads.** Utilities should collaborate with customers/members to identify essential loads and assess the best energy support options for each site.
- **Operations and Maintenance.** Microgrids need ongoing resources, expertise, and staffing to stay reliable and effective.

CASE STUDY#1: BAYFIELD COUNTY, WISCONSIN[2]


Image Source: Canva

The Wisconsin Office of Sustainability and Clean Energy, in partnership with the Office of Rural Prosperity, was awarded $9.7 million through the DOE's Energy Improvements in Rural or Remote Areas (ERA) program to deploy solar-powered microgrids at 24 sites in Bayfield County. The project will install 841 kW of solar and 1,065 kW of battery storage on municipally-owned critical facilities, supporting 28 rural and tribal communities with populations ranging from 101 to 2,000 residents. The microgrids will provide 3 hours of backup power during outages and serve as community resilience hubs.

CASE STUDY #2: POUDRE VALLEY RURAL ELECTRIC ASSOCIATION[3]


Image Source: Poudre Valley REA

In Colorado, Poudre Valley Rural Electric Association used $250,000 from the Department of Energy Grid Resilience State and Tribal Formula Grants program to help finance a microgrid with battery energy storage for Red Feather Lakes. The remote mountain community was often impacted by outages from snowstorms, wildfires, car accidents, and even tornadoes.

The microgrid includes a 140-kilowatt, 446-kilowatt-hour Tesla Powerpack battery, supported by a 20-kW solar PV system and a 1,000-gallon propane generator, enhancing the town's energy reliability and resilience.

1. U.S. Department of Energy (2024). "Microgrid Overview," Grid Deployment Office
2. Yañez-Barnuevo, Miguel (2024). "Three Microgrid Projects in Rural Areas Showcase New DOE Program," Environmental and Energy Study Institute
3. Kelly, Erin (2022). "Electric Co-ops Leverage Federal Grants to Support the Communities They Serve," Rural Electric Magazine