U.S. DEPARTMENT OF
ENERGY

Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY

Kickstart Your Federal Microgrid Project: Financing Opportunities and Best Practices

Recent high-impact events such as hurricanes and wildfires have resulted in the loss of utility grid power to federal sites, highlighting the need for energy system resilience. To sustain critical functions, site loads may need to operate during an electric grid outage or at least have power restored quickly after the event. A microgrid can provide reliable backup power to critical loads when electric utility power is interrupted, and may also provide value during normal operations.

Microgrids Power Critical Loads During Electric Utility Outages

A microgrid is comprised of distributed energy resources (DERs) interconnected through the site's electrical distribution system and provides power to designated critical loads upon loss of the serving utility. A microgrid can serve a single building or can provide power to multiple buildings or loads at a federal site.

Multiple Mechanisms for Microgrid Procurement

While microgrids provide benefits over traditional backup generators, they are typically more complex and can be expensive to install. However, certain components of a microgrid (and potentially the entire system) can often be justified economically and paid for out of energy savings and/or avoided costs. In addition to providing cost savings, technologies such as solar photovoltaics, wind, and energy storage can help contribute towards a site's decarbonization goals. In these cases, implementation with a privately financed federal procurement mechanism is possible. Procurement options available to federal agencies include:

- Energy savings performance contracts (ESPCs) including ESPC Energy Sales Agreements (ESA)
- Utility energy service contracts (UESCs)
- Utility services contracts.

Other mechanisms such as a power purchase agreement (PPA), enhanced use lease (EUL), and utility privatization may be useful to agencies that have the authority to use them. Agencies can also use appropriations to purchase microgrids, potentially in conjunction with a privately financed procurement mechanism. If an agency is implementing a microgrid in multiple phases (potentially using multiple funding mechanisms), it is important that the overall concept is well defined in the early project planning.

Figure 1. The Food and Drug Administration (FDA) Federal Research Center in Silver Spring, Maryland (proposed future buildings in pink). FDA used an energy savings performance contract (ESPC) to install a 60-MW microgrid capable of operating the campus regardless of disruptions to the external utility grid. *Photo from FDA*

FDA Campus Saves $60 Million With ESPC Microgrid Project

The FDA campus in Silver Spring, Maryland, included a microgrid as part of a comprehensive ESPC project implemented in three phases. A 60-megawatt combined heat and power plant provides the backbone of the microgrid, which also includes back-up generators, fixed and tracking solar photovoltaic systems, and thermal energy storage, along with various energy efficiency measures that reduce the electric load. The project has resulted in annual energy and operations and maintenance cost savings of about $60 million in addition to enhanced resilience. For more information, see the U.S. Department of Energy Federal Energy Management Program (FEMP) success story, "Honeywell Helps Deliver Resiliency and Cost Savings to Food and Drug Administration's White Oak Campus," at energy.gov/eere/femp/honeywell-helps-deliver-resiliency-and-cost-savings-food-and-drug-administrations-white.

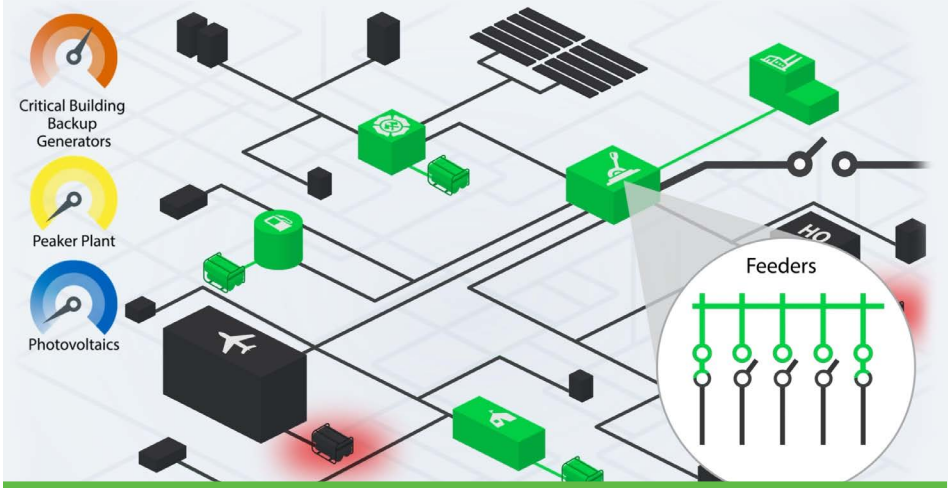

Figure 2. A microgrid is defined by the U.S. Department Energy Microgrid Exchange Group as a group of interconnected loads and DERs within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. In the figure above, backup generators (orange dial), a peaker plant (yellow dial), and photovoltaics (blue dial) at a campus are coordinated through central controls to provide power (green) to critical buildings after the loads have been disconnected from the grid. Watch "Islanding a Microgrid" for an example of microgrid project execution at a federal campus at energy.gov/eere/femp/articles/islanding-microgrid. *Illustration by Brittany Conrad, NREL*

Getting Started With a Microgrid Project

Given the technical considerations and multiple procurement options for implementing a microgrid, determining where to start can be a challenge. Following is one approach for implementation. FEMP can provide support in determining a site-specific process.

Define site goals and needs.

An agency or site will first need to identify energy goals, critical loads, and resilience needs.

Evaluate on-site DERs and controls systems.

Evaluate existing on-site DERs and controls systems to determine how they may be used in a planned microgrid. Microgrids are deeply integrated with existing infrastructure. It is important to verify actual field conditions during the design process. The current use, configuration, and contractual arrangement of existing systems should be considered to determine if modifications or upgrades are needed for integration into a microgrid.

Discuss goals, needs, and plans with serving utilities.

Discuss goals, needs, and plans with serving utilities early in the process. The utility needs to understand what projects (e.g., interconnection of DERs, ability to island) may affect their system, and may offer programs that support agency energy and resilience efforts. The agency needs to understand utility regulations, rate structures, and offerings that may impact and benefit microgrid implementation.

Pursue private financing.

Pursue private financing to procure and implement the microgrid. UESCs and ESPCs may include operations and maintenance, repair and replacement, and measurement and verification as added benefits to ensure long-term performance of the resilience measures. A comprehensive project that leverages energy and water efficiency upgrades can result in avoided costs and reduced site loads, improving resilience and project payback. If microgrid controls and integration cannot be financed from cost savings, appropriations can be combined with financing to cover these costs. If pursuing an ESPC, consider implementing DERs as ESA energy conservation measures in an ESPC, as private ownership allows tax and other incentives to be captured that are otherwise not available to the government.

Define the microgrid design before awarding the contract.

If the microgrid project is implemented using a phased approach, ensure the overall design and concept is well defined before the first contract is awarded. Decisions made early in the process will impact the effectiveness of the microgrid system. Ensure each phase results in a complete and usable system so that the agency sees a benefit even if later phases are not completed for some reason. In addition to technical details, consider how ownership models may affect the outcome. Also consider future expansion, and the ease with which new DERs and loads can be added. Lessons learned in early phases should be incorporated into later phases.

Get help with the best approach for your project.

FEMP has expertise and resources to help an agency determine the best approach for a specific project. FEMP can also support the implementation of a microgrid project with special expertise and resources for ESPCs and UESCs. Submit your request for technical assistance to FEMP at www7.eere.energy.gov/femp/assistance/de-assistance.

Learn More

This fact sheet provides an overview and actionable next steps in the microgrid implementation process, and complements the FEMP report, Financing Microgrids in the Federal Sector, available at energy.gov/eere/femp/downloads/financing-microgrids-federal-sector.

Learn more about distributed energy and energy procurement at energy.gov/eere/femp/federal-distributed-energy-and-energy-procurement.

Learn more about DERs for resilience at energy.gov/eere/femp/distributed-energy-resources-resilience.

Read about the U.S. Department of Energy's Microgrid Exchange Group at https://doi.org/10.1016/j.tej.2012.09.013.

For questions about distributed energy projects and procurement, visit FEMP's technical assistance portal at www7.eere.energy.gov/femp/assistance/de-assistance. ■

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