

Stakeholders in the Microgrid and Electric Power Industry



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Learning Objectives

In this lesson, you will learn to:

- Identify stakeholder roles in the microgrid industry
- Identify policies and regulation pertaining to microgrids
- Identify primary forms of financial agreements for microgrids

Microgrid Stakeholders

Client – single or joint ownership

Beneficiary – those benefiting from the microgrid

Electric utility – interconnection, possibly ownership

Developer – engineering, procurement, construction

Integrator – component and system integration

Technology vendor – supply microgrid components

Financing – financial resource, underwriting

Standards – technical guidelines or requirements

Regulator – policy and governance

Operator – responsible for microgrid operation

Technician – maintains equipment after installation

Microgrid Clients and Beneficiaries

Clients and beneficiaries may not be the same person / people

“I want power to pump water”



“We need 14 days of mission autonomy for resiliency”



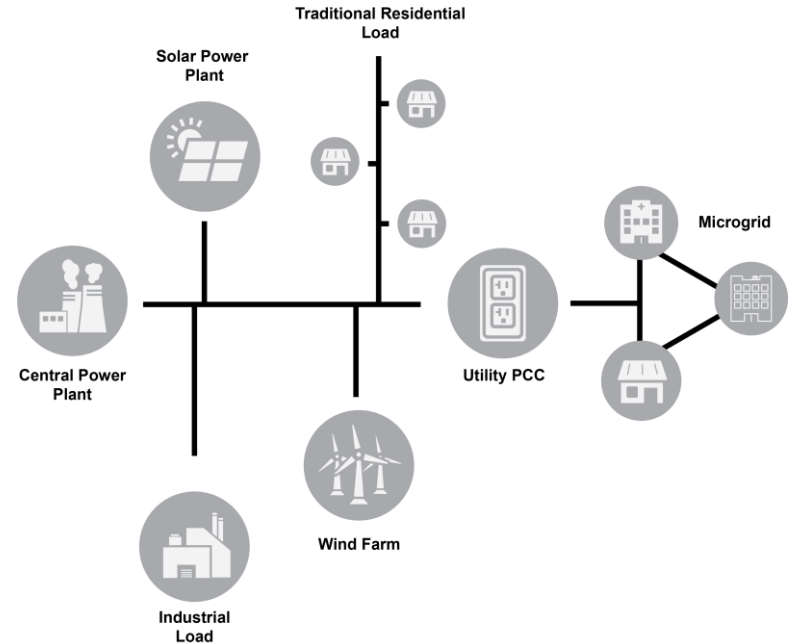
“We are federally mandated to have backup power”



“A microgrid helps us reduce energy bills by shaving peak demand”

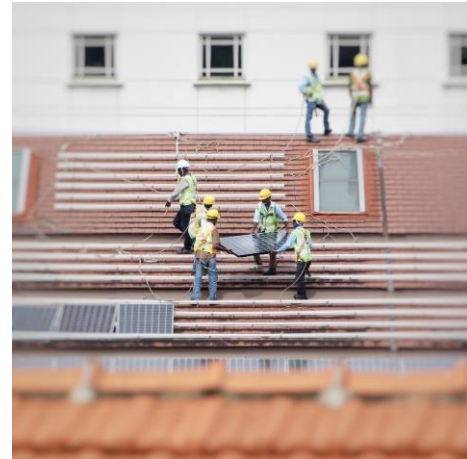
Electric Utility

- Could be vertically integrated or wires-only utility
- Responsible for interconnection at the point of common coupling (PCC)
- May jointly own the microgrid
 - Partial ownership indicates some value to the utility and its ratepayers (clients)
- May jointly operate the microgrid
 - Operate for 3-10% of the year
 - Use for peak power, voltage regulation, reduced congestion
 - Deferred investment or better than alternatives to upgrade local infrastructure



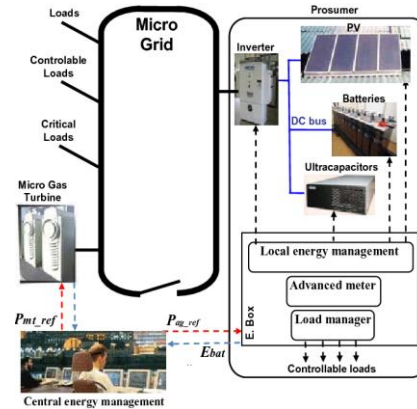
Microgrid Developer

- General contractor for “EPC” services
 - Engineering – design
 - Procurement – purchasing equipment
 - Construction – installation
- Often has contractors and partners including technology vendors, designers, integrators, financing, etc.
- May also serve as operator
- May hold overall warranty and maintenance contract that is included within installation agreement, or, is a separate agreement



Microgrid Integrator

- Works closely with project developer
- Supports developer, or may be responsible for, engineering design and asset procurement
- Specializes in system integration
- Often owns microgrid controls hardware and/or software
- May specialize in systems with one node or multiple nodes, potentially include distribution network, and behind-the-meter or utility integrated



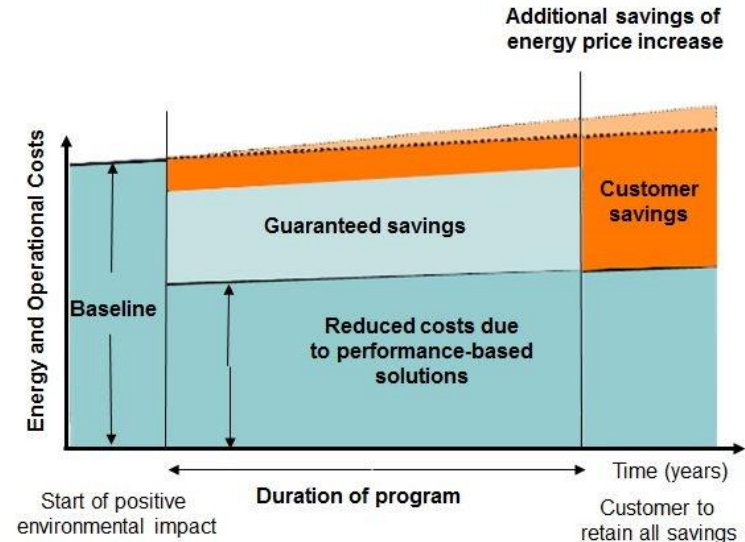
Microgrid Technology Vendor

- Supplies assets such as solar, wind, generator, storage, controller, data acquisition and communications, and balance of plant (e.g., conductors, transformers, breaker boxes)
- Supplies assets to microgrid integrator and/or microgrid developer
- Provides asset-level warranties
- May provide specialized training and services for their specific technology (e.g., how to use their proprietary Battery Management System, or BMS)



Microgrid Financing

- **Financing horizon** – typically 5-30 years
- **Long-term loan** – owned by beneficiary with payments made over lifetime of the loan to a financing agency
- **Power Purchase Agreement (PPA)** – third-party owned with beneficiary paying an agreed rate for power (and other services) provided by the microgrid
- **Energy services contract** – third-party owned, no up-front costs needed, savings begin from day 1, and a portion of those savings are used to pay off the microgrid development -- includes guarantees in energy and cost savings



Microgrid Standards

- Governmental and professional organization develop standards through “professional consensus”
- Interconnection standards (e.g., UL 1741, IEEE 1547)
- Asset-level standards (e.g., UL 1703, IEC 60086-2)
- Network standards (e.g., ANSI C84.1)
- Interoperability standards (e.g., IEEE 2030.2)
- Microgrid control standards (e.g., IEEE 2030.7)

The screenshot displays the IEEE SA Standards Association website. At the top, there is a navigation bar with links for 'IEEE.org', 'IEEE Explore Digital Library', 'IEEE Standards', 'IEEE Spectrum', and 'More Sites'. The main header features the IEEE SA logo and a search bar. Below the header, there are tabs for 'Standards', 'Products & Services', 'Technologies & Initiatives', and 'Participate'. A secondary navigation bar includes 'MAC ADDRESS' and 'BUY STANDARDS'. The main content area highlights the '2030.7-2017 - IEEE Standard for the Specification of Microgrid Controllers' with buttons for 'BUY THIS STANDARD' and 'ACCESS VIA SUBSCRIPTION'. A sidebar on the left titled 'Explore This Standard' lists 'Standard Details', 'Additional Resources', and 'Working Group'. The 'Standard Details' section on the right provides a brief description of the MEMS system and its functions.

Microgrid Regulator

- A Public Utilities Commission (PUC) regulates utility policies and rates; in Arizona this is called the Arizona Corporation Commission (ACC)
- Privately regulated utilities also formed and are governed by an elected board (e.g., Salt River Project)



Microgrid Operator

- Responsible for the real-time control of a microgrid including:
 - Scheduling and unit commitment
 - Economic dispatch
 - Demand response and load control
 - Reliability including voltage control
 - Manual islanding and synchronization
 - Other functions
- No certification program exists to become a “Microgrid Operator” but the closest alternative is the System Operator Certification program offered by the North American Electric Reliability Corporation (NERC) for bulk power operations



Microgrid Technician

- Responsible for routine and non-routine maintenance
- Maintenance contract could be included with initial project installation contract, be a separate contract to maintain the system, or possibly maintain AND operate the system
- Technicians may be from the same firm as the microgrid developer or microgrid integrator



Discussion Questions

Break into small groups of 3-5 people and discuss the following. Try to ensure a diverse background of individuals in each group from different stakeholder types.

- Name microgrid stakeholders and describe their role.
- Describe the potential value of a jointly owned and operated microgrid by the customer and utility.
- Name a common financing mechanism for microgrid and other energy infrastructure projects? Describe how it works.
- What is the role of standards? Identify and describe one standard.
- Describe the role of regulators.
- What are the responsibilities of a microgrid operator?