Regulatory and Business Models for Community Microgrids

Establishing an economic foundation for customer energy resilience

IEEE PES General Meeting
Denver, Colo.
July 28, 2015

Michael Burr, Director
mtburr@microgridinstitute.org
320.632.5342

Presentation agenda

1. Microgrid Institute intro and current work
2. Defining and understanding microgrids
3. Community microgrid drivers and challenges
4. Emerging structures and models

1. What is Microgrid Institute?

Microgrid Institute is a collaborative organization that focuses on key factors affecting microgrids and distributed energy.

Our efforts address markets, regulation, financing, and project feasibility and development.

- Multidisciplinary collaboration with industry leaders
- Independent, objective thought leadership
- Studies, analysis, development support

Current projects and initiatives

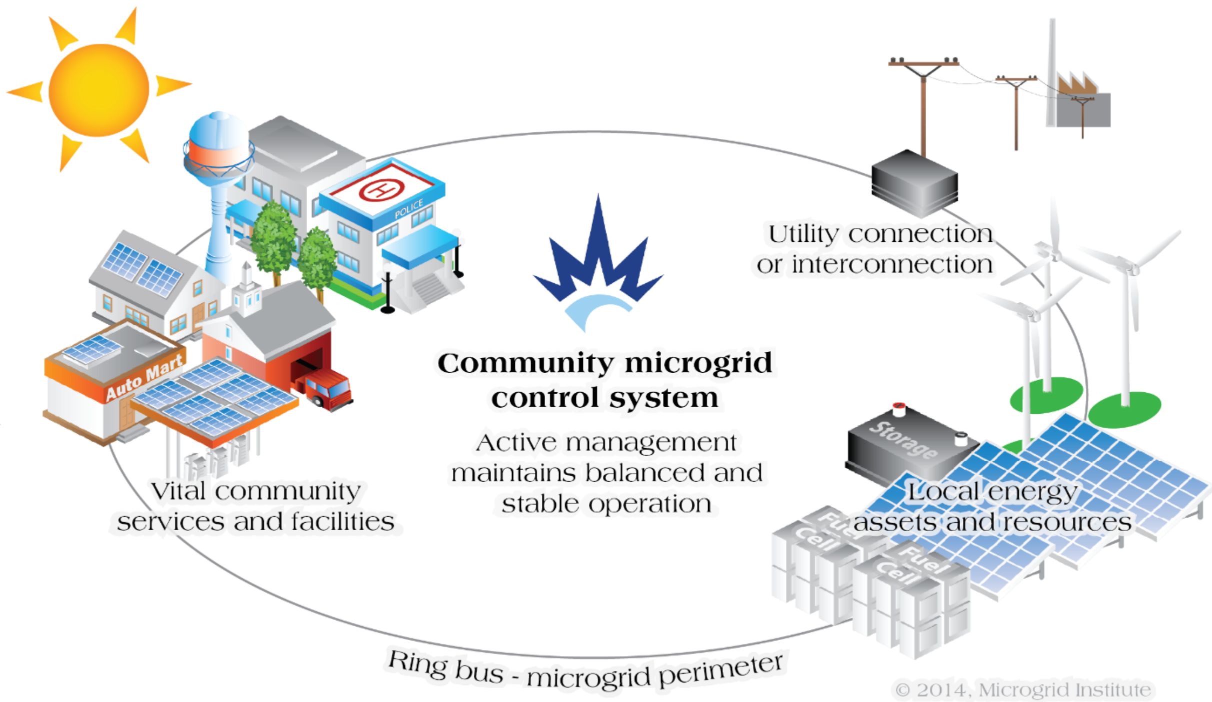
- NY Prize Community Grid Projects – New Paltz and Warwick *(July 2015 – February 2016)*
- District of Columbia Dept. of Environment Microgrid and District Energy Assessment *(July – Sept. 2015)*
- Olney Town Center microgrid R&D project *(Nov. 2014 – Oct. 2016)*
- Minnesota CHP Stakeholder Engagement *(Aug. 2014 – Aug. 2015)*
- Resilient Communities Initiative *(June 2014 – Ongoing)*
- Microgrid Finance Initiative *(1Q 2015 – Ongoing)*

2. What is a microgrid?

Microgrid Institute definition

*A microgrid is a small energy system capable of **balancing captive supply and demand** resources to maintain stable service within a defined boundary.*

*A **community microgrid** provides resilient and stable energy supplies for vital community facilities and assets.*

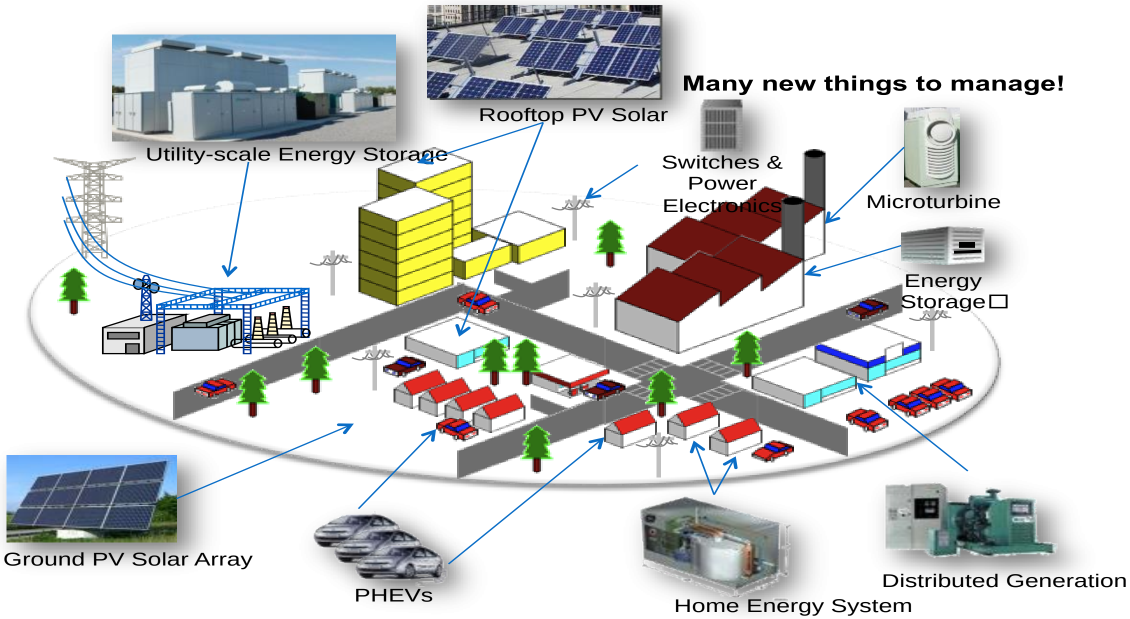


What is a microgrid?

U.S. DOE definition

*“A **microgrid** is 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. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or island mode.”*

~DOE Microgrid Exchange Group, October 2010



Source: ***Green Energy Corp***.

IEEE PES Power & Energy Society®

IEEE

Types of microgrids

- ***Utility-integrated campus microgrids:*** *fully interconnected with a local utility grid, but can also maintain some level of service in isolation from the grid, such as during a utility outage. Typical examples serve university and corporate campuses, prisons, and military bases.*
- ***Community microgrids:*** *integrated into utility networks. Such microgrids serve multiple customers or services within a community, generally to provide resilient power for vital community assets.*
- ***Off-grid microgrids:*** *including islands, remote sites, and other microgrid systems not connected to a local utility network.*
- ***Nanogrids:*** *serving single buildings or assets, such as commercial, industrial, or residential facilities, or dedicated systems, such as water treatment and pumping stations.*

3. Community microgrid drivers

Centralized utility grids are vulnerable

- U.S. utility grids are reliable, but not necessarily resilient *(SAIDI ignores "events")*
- Weather events etc. can cause widespread disruptions of extended duration
- Cybersecurity and EMF disruptions can have widespread effects

Distributed energy technologies provide new options to achieve resilience

- Rapidly advancing technologies improve the full suite of technologies that make microgrids work – from PV to software controls
- Federal, state, and local government agencies are pursuing various approaches to encourage innovation and development

Resilience for critical services

Microgrid systems help communities
to achieve ***local resilience for vital services*** *and interdependent community assets:*

- Hospital, police, fire, ambulance
- City water and wastewater
- Emergency ops and public shelters
- Gasoline, grocery, pharmacy
- Telecom c.o., Internet, cell towers
- Lighting, street lights, traffic lights
- Pumping, refrigeration, HVAC

Modern resilient communities support public safety, convenience, and economic growth

4. Emerging Structures and Models

Successful community microgrids will address:

Utility regulatory and business issues

- Energy sales across utility rights of way challenge franchise rights
- Service equivalency requirements hinder customized service offerings
- Central-station model discourages DERs
- Volumetric pricing discourages conservation and self-generation
- Bundled billing prevents cost transparency

Political complexities

- Conflicting goals and interests
- Information deficits yield unrealistic expectations

Market challenges

- Inadequate models and precedents
- Vendor solutions in search of customers
- High threshold for financial returns
- Novel regulatory and business risks
- Small sizes limit investor options
- *Dispersed critical assets in communities*

Emerging Structures and Models

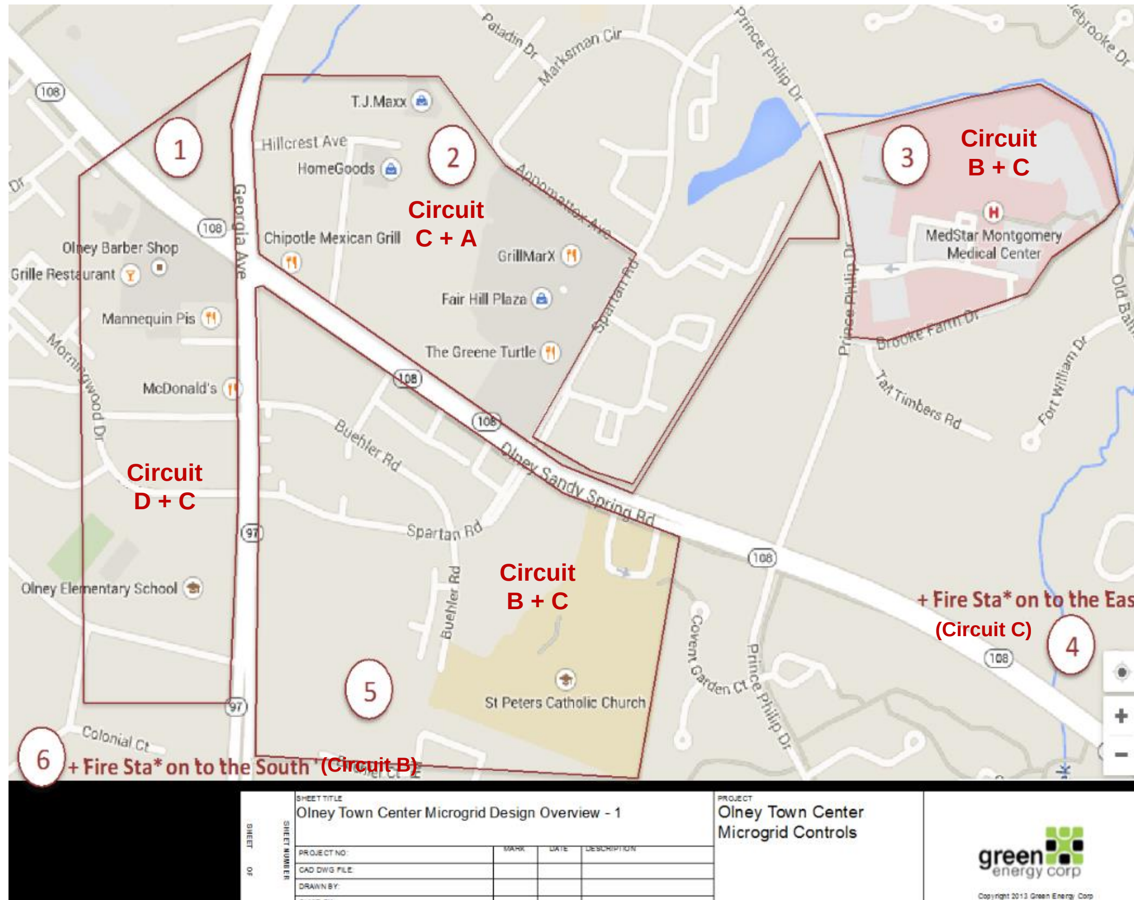
Nested Microgrid Architecture

In many towns and cities, ***critical facilities are dispersed across a wide area.*** *Multi-nodal systems can be made more cost-efficient by grouping clustered nodes into control groups.*

Olney Town Center Microgrid Nodes

Nested architecture benefits:

- *Increased resiliency with more vital community assets*
- *Reduced need for undergrounding*
- *Lower costs through standardization, volume procurement*
- *Portfolio management yields better economics*



Emerging Structures and Models

Hybrid Models / Public-Private Partnerships (PPP)

Pros	Cons
• Reduces disincentives and service-equivalency challenges • Avoids franchise and right-of-way challenges • Allows service innovation and price competition	• Complex business structures • Mixed capital access

100% Utility Ownership

Pros	Cons
• Avoids disincentives • Simple business structure • Easy capital access • Avoids franchise and right-of-way challenges	• Raises service equivalency, cross-subsidy challenges • Precludes service innovation and price competition

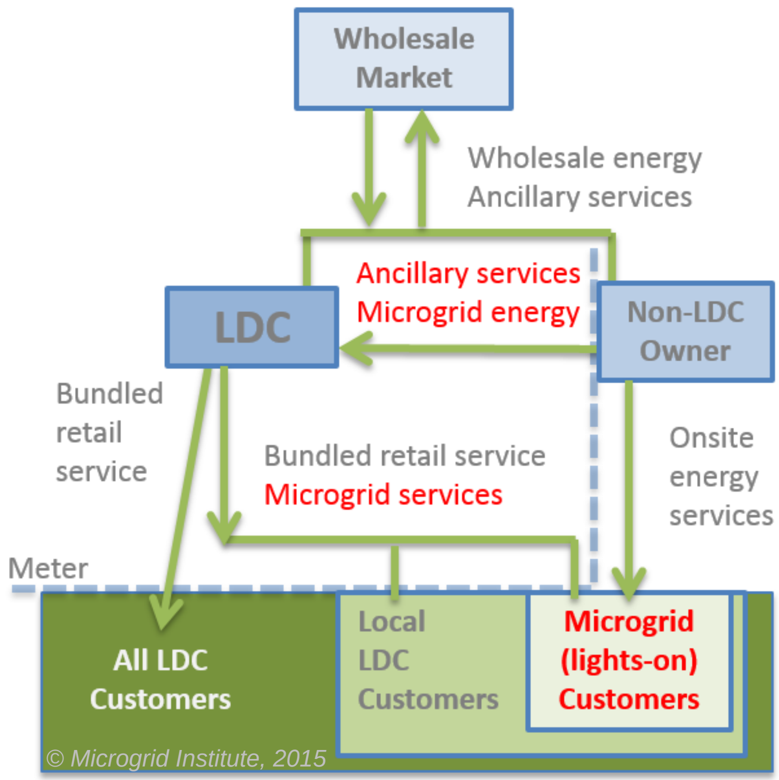
100% Nonutility Ownership

Pros	Cons
• Avoids disincentives • Simple business structure • Easy capital access • Allows service innovation and price competition	• Raises franchise and right-of-way challenges

Community microgrid value streams

Monetization and Cost-Recovery Questions

- Who will own microgrid assets?
- How are costs and values from such assets monetized under *current* rate structures/transaction models?
- What *new* transaction models are needed to allow costs to be recovered and value streams to be monetized?



Microgrid Transaction Models

Hybrid structures

- Microgrids combine various value streams
- No single transaction model likely will monetize all benefits or recover all costs
- Community microgrids likely will be PPP entities representing consortia of owners and stakeholders
- PPP community microgrids likely will use a combination of transaction models

Transaction Model	Buyer	Seller	Regulation
• Standard retail utility rate • Special microgrid services rate or surcharge	End user	LDC	State PUC
• Net metering rate • Power purchase agreements (PPA) • Intra-microgrid capacity, energy, or ancillary services agreements • Transactive energy/micro-markets	LDC	Non-LDC operator	State PUC
• Wholesale capacity • Wholesale energy (forward and spot) • Wholesale ancillary services	ISO, LDC, and non-LDC operator	LDC and non-LDC operator	ISO, FERC
• Onsite service contracts © Microgrid Institute, 2015	End user	LDC or non-LDC operator	State PUC

Contact us

www.microgridinstitute.org
Michael Burr, Director
+1.320.632.5342
mtburr@microgridinstitute.org

Microgrid Institute