

Resilience through Microgrids

Trends and opportunities for states and communities



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State Energy Officials*

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Institute**

Presentation outline

1. Microgrid Institute intro. and current work
2. Defining and understanding microgrids
3. Community resilience drivers
4. Policies, strategies, and initiatives



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

- Minnesota CHP Stakeholder Engagement
(Aug. 2014 – May 2015)
- Olney Town Center microgrid R&D project
(Nov. 2014 – Oct. 2016)
- Resilient Communities Initiative
(June 2014 – Ongoing)
- Microgrid Finance Initiative
(1Q 2015 – Ongoing)

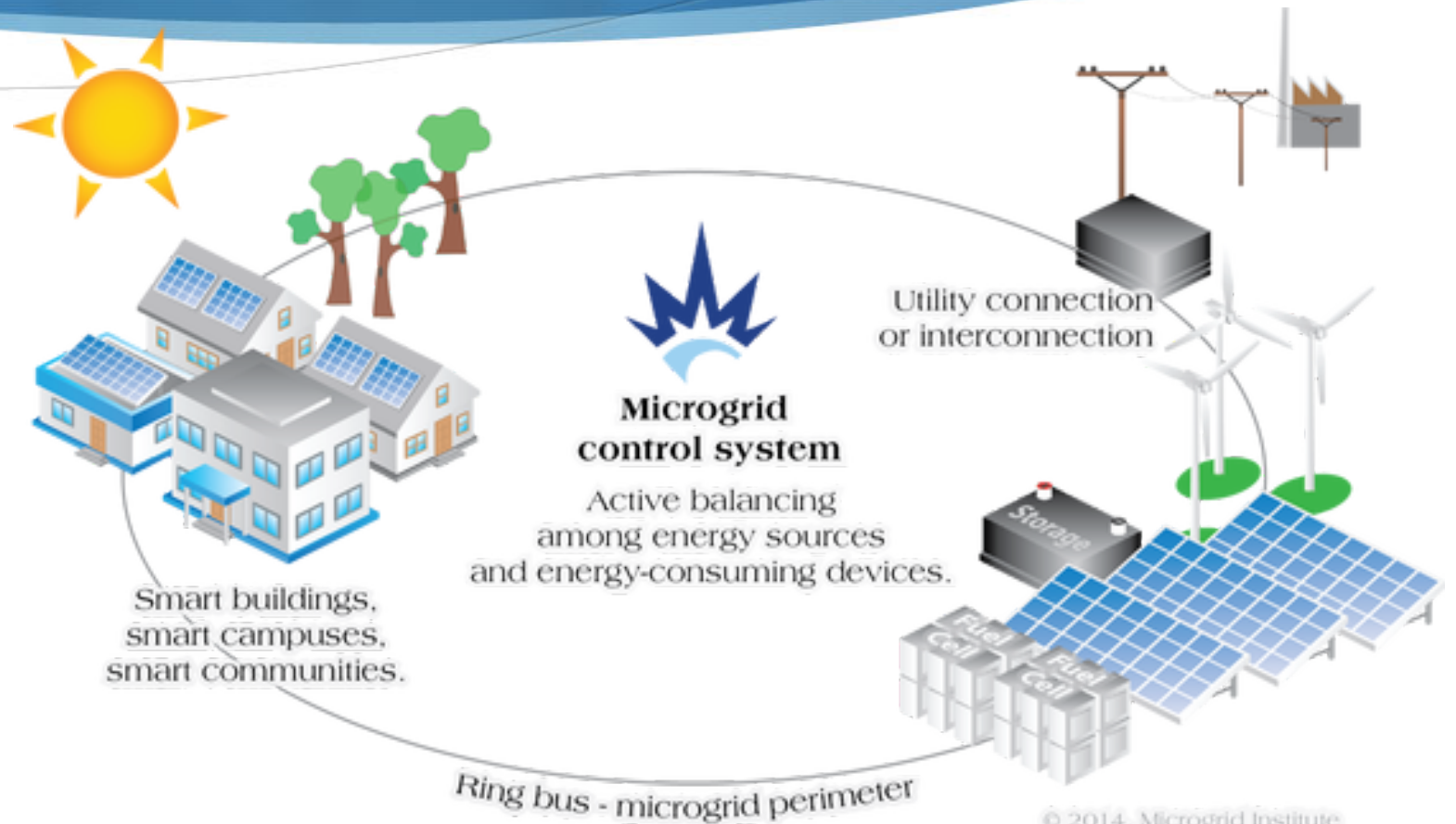


2. What is a microgrid?

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.*

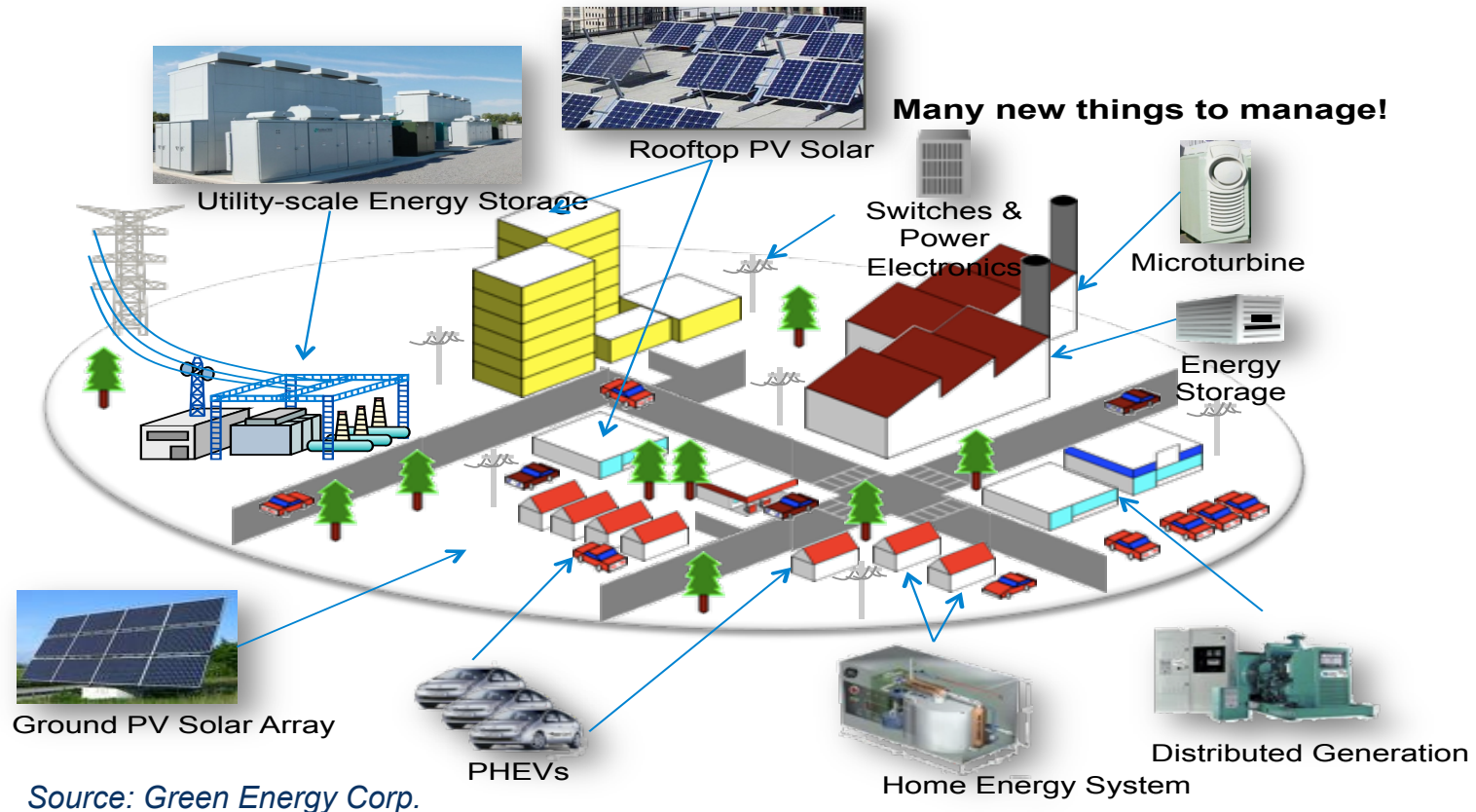


What is a microgrid?

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



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.*

Microgrid trends and opportunities

Buildings and cities are getting smarter

- Increasing focus on efficiency, sustainability, performance
- Advanced automation and interoperability
- Modern customers require modern services

Public mandate to achieve greater resilience

- Applying lessons from Superstorm Sandy
- Exploring models and approaches for improving community resilience while also serving other local objectives

Eliminating energy poverty worldwide

- Electrifying remote and under-served communities and islands
- Saving costs by displacing diesel, kerosene, etc.
- Improving living standards and supporting economic development

3. Microgrids and the resilience mandate

Centralized utility grids are inherently vulnerable

- U.S. utility grids are highly reliable, but not highly resilient (*SAIDI ignores “events”*)
- Centralized T&D systems expose customers to regional outages
- 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

Microgrids Empower Resilient Communities

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

- Lighting, street lights, traffic lights
- Pumping, refrigeration, HVAC
- City water and wastewater
- Cell towers, telecom, Internet
- Gas stations, grocery stores, pharmacies



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

Local energy for local benefits

Microgrid energy management systems help communities to integrate local energy resources to provide resilient power. Community benefits:

- Reducing dependence on energy that must be transported over long distances
- Supporting energy security, emergency management, and public safety objectives
- Conserving energy
- Shrinking environmental footprint
- Modernization and economic development
- *Keeping more energy dollars local*



4. Rates, regulation, and microgrid financing

Key policy questions for financing resilient community microgrids:

- What public objectives could microgrids address?
- How will all microgrid services be valued and monetized?
- How do current regulations and rate structures treat microgrids?
- Who can/will own microgrid assets and market services?
- How will microgrid investments and operating costs be financed?
- What costs may be appropriately socialized or financed as utility rate-base investments – and how?
- What costs must be borne by local microgrid customers – and how?

Fostering community microgrids

Strategies and Actions	Where They're Being Implemented
Study microgrids to understand challenges and options	Maryland Resiliency through [Public Purpose] Microgrids Mass. Clean Energy Center study Minnesota Microgrids study New York REV proceedings, <i>etc.</i>
Provide public support for public benefits	New York (NY Rising, NY Prize) Massachusetts DOER grants for community resilience projects Connecticut DEEP Microgrid program California PON-14-301 D.C. Dept. of Environment Green Building RFA Federal FOA 997 program, <i>etc.</i>
Provide access to low-cost, long-term capital	PACE 2.0, green/resilience bonds (NY, NJ, CT), on-bill repayment (CA, HI, IL, NC, OH, TX)
Monetize microgrid costs associated with regional resilience, public safety, grid modernization, environmental compliance	TBD ...

Olney Town Center microgrid control system R&D project

DOE FOA 997 program awardee:

- **Team:** Microgrid Institute, Pepco, Green Energy Corp., Schneider Electric, and N.C. State University
- **DOE/NETL Program:** \$1.2 million over two years to research, develop, model, and test a community microgrid control system designed for Olney Town Center (Md.)
- **Design objectives** include improving reliability to SAIDI <2 min., increasing efficiency by >20%, and reducing CO2 footprint by 20%+



Public Webinar:

Feb. 5, 2015, 2:00 EST

To register:

www.microgridinstitute.org



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resilient
communities
initiative

[communities](http://www.microgridinstitute.org/communities)

Mission Statement:

*Microgrid Institute formed the **Resilient Communities Initiative** to help communities plan, develop, and implement their resilience strategies.*

We assist communities as they strive to improve resilience for vital services, optimize local energy resources, increase energy efficiency, and reduce their environmental footprint.



Resilient Community Development and Action Planning

	Resilience Strategies	Microgrid Solutions	Development Approaches	Feasibility Factors	Pitfalls and Lessons Learned
Questions	What do resilient communities do differently? What strategic approaches are most successful?	How do microgrids work? What are their limitations? What roles do they play in resilience strategies?	How do resilience projects get built? Who leads the effort and how? Who provides financing?	Which options are best for our community? What factors will determine success?	What mistakes can we avoid? What approaches have succeeded? What examples are most instructive?
Actions	Establishing a strategic vision to achieve multiple community goals	Setting project scope, priorities, and benchmarks	Project initiation, planning, and execution	Research, planning, and feasibility analysis	Integrating lessons and examples into strategic plans

Avoid comparing apples and oranges

A microgrid is to the utility grid as a Tesla is to a bus pass

Transportation		Electricity Service	
Public transportation	Private automobile	Central utility grid	Microgrid
Station/stop-to-station/stop, available per generic schedule	Door-to-door transportation when needed	Commodity service, few or no options	Custom service, many options
Zero capital cost for customers; costs supported by ongoing public subsidies	High up-front capital cost with no (or temporal) public subsidies	Zero capital cost for customers; socialized legacy grid	Up-front capital cost for customers; new infrastructure for advanced capabilities; limited or no socialization or public subsidies

Let's work together!

Contact Us

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