Utility Microgrid Procurement

NARUC-NASEO Microgrids State Working Group Webinar

AUGUST 19, 2020 | 3:00 – 4:00 PM ET

Moderator: **Megan Levy,** Local Energy Programs Manager and Energy Assurance Coordinator, Wisconsin Office of Energy Innovation

Speakers:

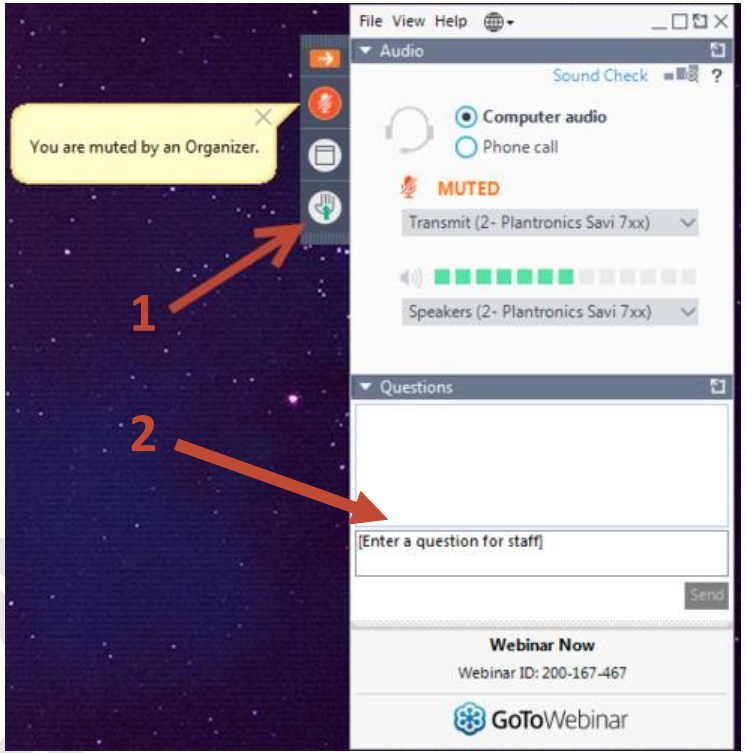
- **Aleksi Paaso,** Director of Distribution Planning, Smart Grid, and Innovation, Commonwealth Edison
- **Matthew Schultz,** Business Development Manager, Duke Energy

QUESTIONS

Submit questions two ways:

1. Raise your hand and the moderator will call on you to unmute your line

2. Type a question into the question box



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The Bronzeville Community Microgrid: A Case for Public Purpose Microgrids

NARUC-NASEO Microgrids State Working Group
Webinar: Utility Microgrid Procurement

August 19, 2020

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Our Company:
- One of six utilities owned by Exelon. (Exelon also owns generation and energy sales businesses.)
- 6,400 Employees
- Service Territory: 11,428 square miles

Our Customers:
- 4 million customers in northern Illinois, including the City of Chicago

Our Grid:
- Peak Load: 23,753 MW (7/20/2011)
- 553,800 distribution transformers
- 66,200 circuit miles of primary distribution
- 53% overhead, 43% underground
- 5,800 circuit miles of transmission
- 93% overhead, 7% underground

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Changing Challenges: Climate and Security

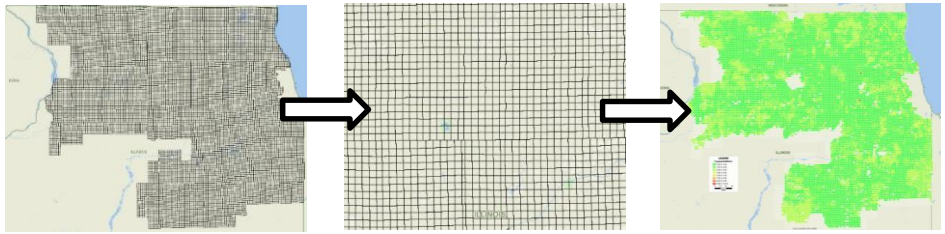
- Electric utilities typically focus on reliability, or assuring that there is adequate supply under credible contingencies, focused on high-frequency, low-impact events

- In recent years, there is more emphasis on the resilience of the electric grid
  - Greater numbers and impact of major weather events
  - Increased salience of physical and cyber-terrorism against energy infrastructure

- Resilience: The ability to prepare for, withstand, recover from and reduce the magnitude and/or duration of disruptive events

Identifying Locations to Improve Resilience

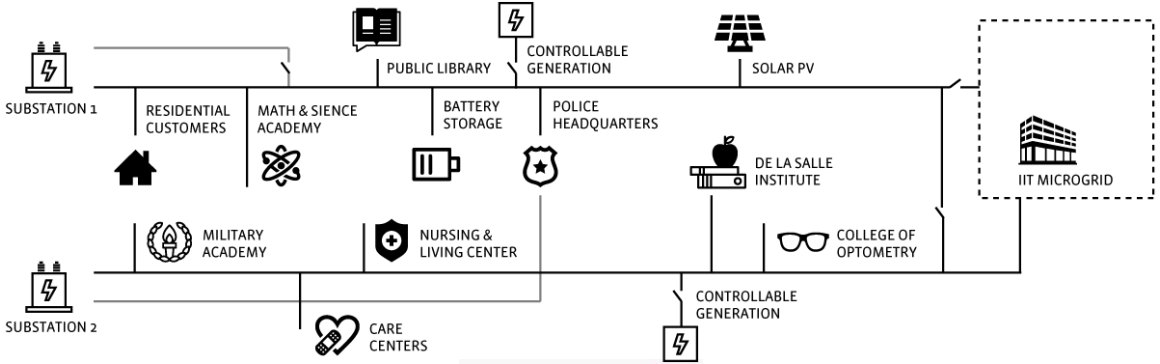
- ComEd utilized a holistic data driven approach to evaluate its entire service territory for microgrid pilot installation locations. The approach considered three key drivers:
  - Power delivery infrastructure scope
  - Critical infrastructure
  - Input from external stakeholders
- The approach divided the service territory into one-mile by one-mile sections outside the city of Chicago and into half-mile by half-mile sections inside the city of Chicago.



- In the selection process, ComEd leveraged its partnerships with governmental organizations including the Department of Energy (DOE), Department of Homeland Security (DHS), Illinois Emergency Management Agency (IEMA), and City of Chicago Office of Emergency Management and Communications (OEMC).

Building a Flexible & Responsive Grid with the BCM

- The Bronzeville Community Microgrid (BCM) enables a green, resilient, sustainable neighborhood for consumers.
- 7 MW aggregate load, serving approximately 1,000 residences, businesses and public institutions
- Installation of first utility-operated microgrid cluster powered by DER including solar PV and energy storage
- A place for demonstration of advanced technologies supported by grants from the Department of Energy
- Developed with partnerships with universities, vendors, and national labs



NuGrid

NREL Transforming ENERGY

Argonne NATIONAL LABORATORY

ILLINOIS INSTITUTE OF TECHNOLOGY

UNIVERSITY of DENVER

QUANTA TECHNOLOGY

SIEMENS

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Using Cutting-Edge Technologies

- 750 kW Solar PV and 500kW/2MWh Battery Energy Storage System along with smart inverters to demonstrate microgrid integrated solar storage technology (MISST)

SHINES Project

- Phasor Measurement Units (PMU) on the distribution system to provide real time monitoring and enhanced visibility for operation and analysis

Phasor Measurement Units

- Upgrade and increase the number of Distribution Automation (DA) devices to improve grid reliability
- Faster clearing time, momentary reduction, lower fault energy

Communication assisted DA schemes

- Provide real time monitoring on circuits to decrease CAIDI through the rapid identification of fault location and to reduce patrol time after fault events

Line Sensors and Predictive Analysis

- High speed communications requirement for distribution applications
- Material and construction standards for distribution applications

High-Speed Communication

- Deploy the microgrid master controller which will provide coordinated control of solar and storage together with other components as well as clustering capabilities.

Microgrid Master Controller

- Exploring different applications of distribution PMUs including Distribution Linear State Estimation to enhance situation awareness as well as system resiliency

Distribution Linear State Estimation

- Received funding from DOE to develop and deploy a foundational blockchain technology based transactive energy and demand response applications

Blockchain Technology

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Supporting Solar and Storage with SHINES

- Development and demonstration of integrated, scalable, and cost-effective technologies for solar PV that incorporate energy storage in a microgrid
- Advanced smart inverter technology
- Enhanced microgrid controller with solar-storage coordinate control

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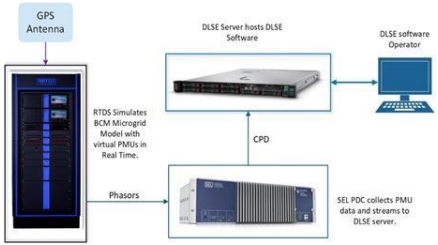
Distribution PMUs and Applications

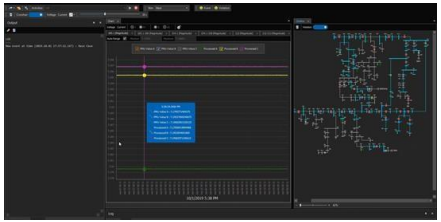
Phasor Measurement Units (PMU)

- PMUS on the distribution system provide real-time monitoring and enhanced visibility for operation and analysis
- Deploying distribution PMUs at substations and in BCM to enhance monitoring and the situation awareness of the distribution grid, and to enable efficient integration of Distributed Energy Resources (DER)

Distribution Linear State Estimator (DLSE)

- Three-phase DLSE platform has been developed to leverage the PMU data that provides observability analysis, optimal PMU placement, bad-data detection, alarming, archiving and visualization for situational awareness.
- Tested and demonstrated in ComEd's GrIT lab using RTDS that simulates virtual PMUs modeled within BCM
- Developing the ability to identify switching and other events in the microgrid





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What We've Learned

- **Distribution Capacity Procurement:** Solar PV capacity procured from local veteran and minority-owned developer. Installed on rooftops of 17 buildings at Dearborn Homes, a Chicago Housing Authority complex in Bronzeville. Solar procurement coordinated through stakeholder workshops.

- **Battery Energy Storage:** The 500kW/2MWh BESS was installed in a newly constructed substation within microgrid footprint.

- **Department of Energy Partnership:** Developed solar storage for Microgrid Master Controller and tested in the Grid Integration & Technology Lab, as required by DOE SHINES project.

- **Advanced Testing Capabilities:** Grid Integration & Technology Lab with Real Time Digital Simulation (RTDS) capability was critical for simulating power system conditions before field deployment.

- **Islanding Testing:** Successful field test proved BCM can create conditions with DER to allow system to island.

- **Microgrid Metrics**: The limited set of metrics applicable to the Phase I were collected prior to proceeding to Phase II.

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Partnerships to Measure the Impact of Resilience

Lawrence Berkeley National Lab (LBNL):

- Estimating direct and indirect economic impact metrics of power disruptions of various geographic extents and duration
- Developing hypothetical power interruption scenarios for Cook County, the greater Chicago metro area, and all other areas within the ComEd service territory.
- Collecting critical information by administering and collecting customer survey responses, and estimating local and regional economic impacts of both short- and long-duration power interruptions

National Center for Disaster Preparedness (NCDP):

- Preparing a tabletop exercise, focused on a Chicago neighborhood to bring together community partners to test the broad impacts of different strategies for developing a microgrid in the neighborhood.
- Setting the stage for more complex operations-based exercises in the future

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Bringing it all together into the Community of the Future

•ComEd's role includes local employer, contributor to local economic development, and community partner, collaborating to achieve objectives for safe and affordable housing, public safety, quality of life, and a clean environment.
•This role has been demonstrated through the Community of the Future in Bronzeville.

ComEd will connect the microgrid on the campus of IIT to the Bronzeville microgrid, creating the first utility-operated microgrid cluster in the nation.

ComEd partnered with IKE Smart City to install three smart Kiosks in Bronzeville to demonstrate technical viability, and customer engagement

ComEd initiated STEM programs as part of CoF. Addressing social equity via STEM is a key component of CoF vision and strategy.

The DASH EV pilot provides affordable, zero-emission transportation to seniors in Chicago's Bronzeville neighborhood.

Recently installed (5) remote lighting units manufactured by ARIS Wind and powered by Solar, Wind, and battery at two CPS facilities in Bronzeville

February of 2020 - ComEd Partnered with South Side Community Arts Center, Gallery Guichard, and BITL for an educational event introducing the Augmented Reality Mural at the BESS.

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Duke Energy Microgrids - NARUC Presentation

August 19, 2020

Regulated Battery Energy Storage Plans

1. Duke Energy Indiana:

15 MW approved as “Clean Energy Projects” for Flexibility and Reliability, Resiliency

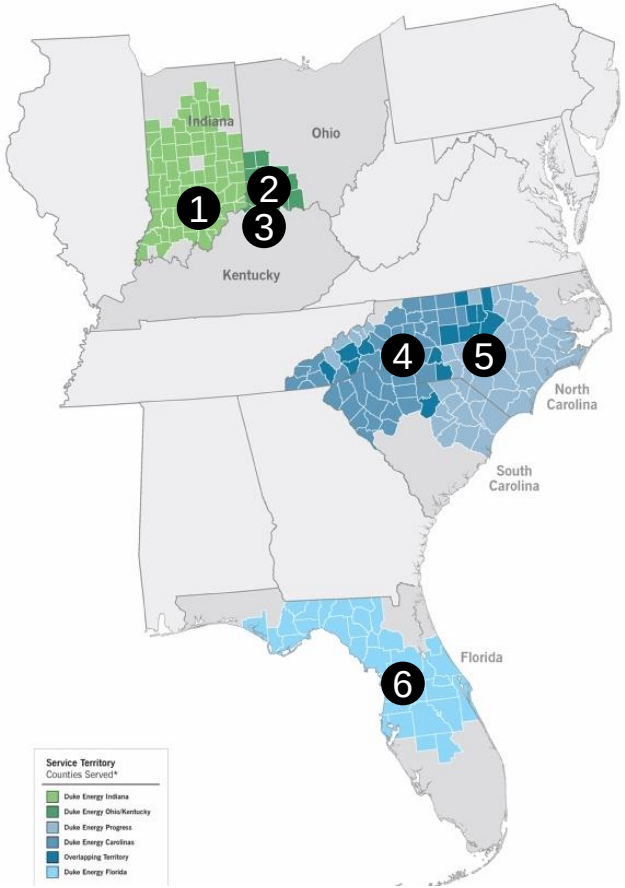
- Camp Atterbury
- Nabb

2. Duke Energy Ohio:

10 MW pilot filed in Electric Security Plan for Reliability, Resiliency

3. Duke Energy Kentucky:

2 MW year over year in 2018 Integrated Resource Plan



4. Duke Energy Carolinas

290 MW in the DEC 15-year Integrated Resource Plan

5. Duke Energy Progress:

- 95 kWh Mt. Sterling Microgrid (2017)
- 13 MW approved as part of “Western North Carolina Modernization Plan”
  - Hot Springs
  - Asheville – Rock Hill

6. Duke Energy Florida

50 MW pilot approved by PSC in 2017

- Cape San Blas
- Trenton
- Jennings

Development focus depends on jurisdiction

Jurisdiction	Regulatory Environment	Development Factors
Carolinas	• Vertically Integrated • No Market	• Some mountainous terrain • Solar mitigated by pumped hydro • Generation values unknown
Florida	• Vertically Integrated • No Market	• Capes and Islands • Hurricanes increase need for resiliency • Generation values unknown
Indiana	• Vertically Integrated • MISO	• Long rural feeders • MISO frequency regulation and capacity market
Kentucky	• Vertically Integrated • PJM	• Some mountainous terrain • PJM frequency regulation
Ohio	• Distribution Utility • PJM	• Distribution Focus • Long rural feeders • PJM frequency regulation if authorized

Why Microgrids?

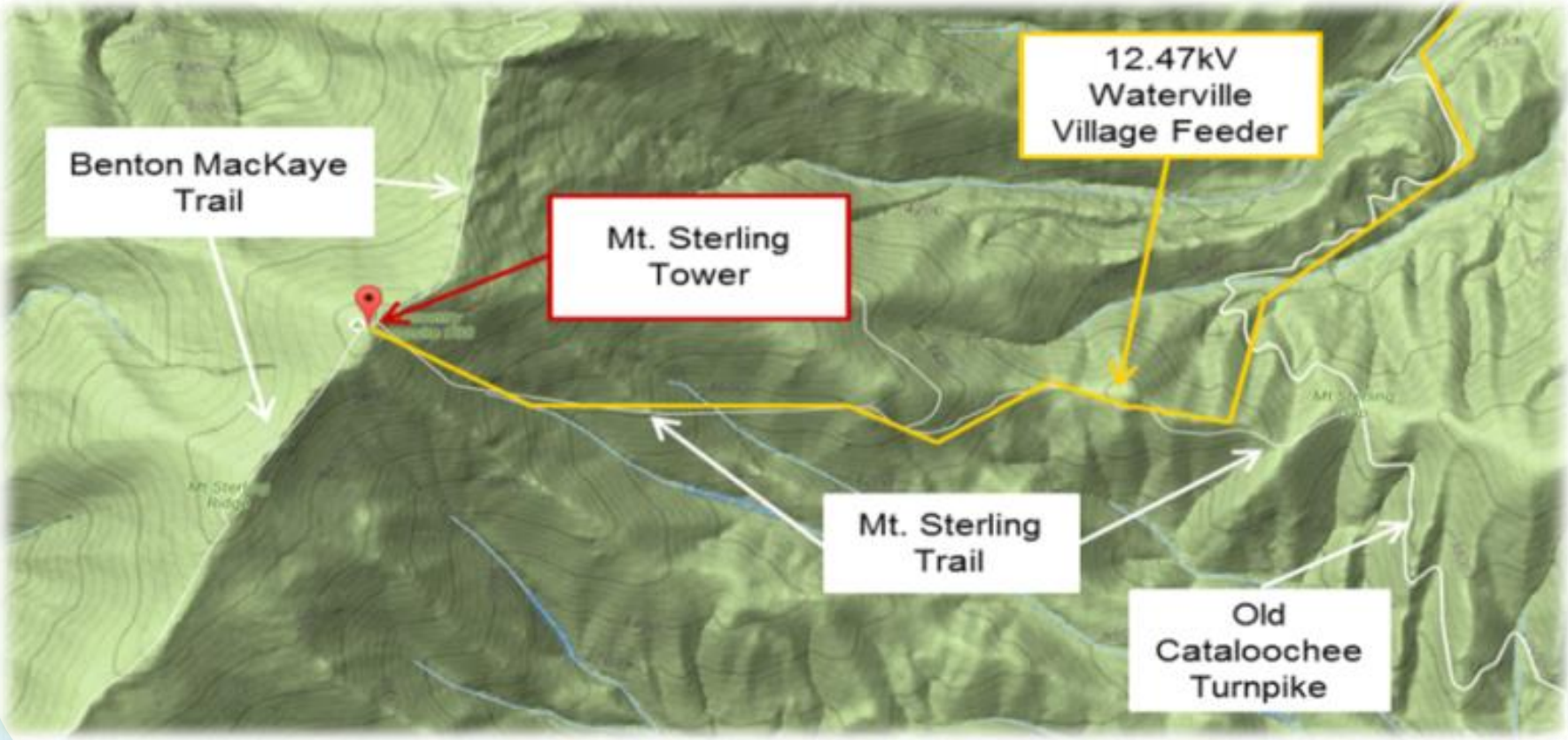
- Most of the time standard distribution solutions are the most cost effective way to improve customer reliability

- Unique geographic features are typically required to justify a microgrid solution
  - Long isolated radial line
  - Mountainous terrain
  - Capes and Islands

- Critical infrastructure can also justify a microgrid investment
  - Military
  - Hurricane shelters
  - Fire and police stations

- Generation benefits often used to improve business case (stacked value)

Mt. Sterling Microgrid (North Carolina)

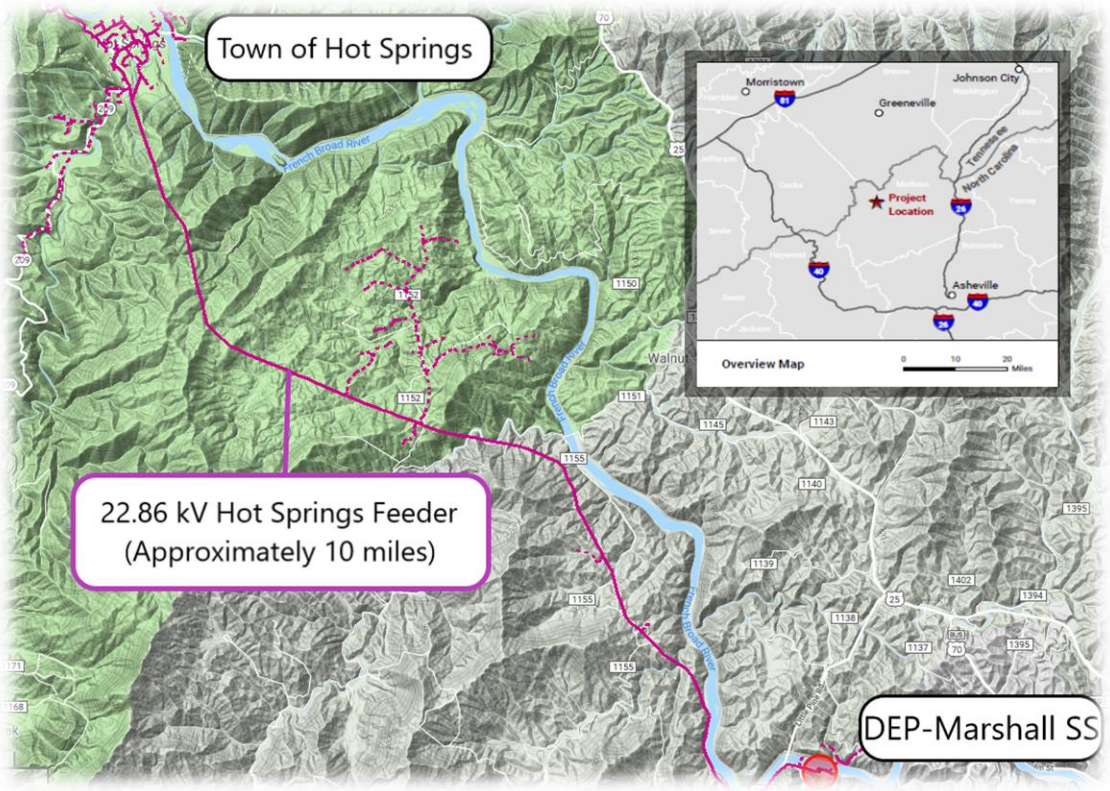


Mt. Sterling: Microgrid

Utility-owned and -operated microgrid that serves a remote customer off-grid through 10 kW solar PV + 95 kWh battery

	Base Case	Microgrid Case
Technology	12.47 kV Distribution Feeder	10 kW Solar PV & 95 kWh Battery
Employee Safety	↓	↑
Footprint	↑	↓
Reliability	↓	↑
Emissions	↑	↓
Revenue Requirement	↑	↓

Hot Springs Microgrid: Existing Service



- 22.86 kV Hot Springs Distribution Feeder
- Single feeder serving the Town of Hot Springs, NC
- 10 Miles from Town to nearest substation
- Customers exhibit long duration and frequent outages

Hot Springs Microgrid

- 2 MW-ac solar facility
- 4 MW/4MWh battery storage system
- Provides a safe, cost-effective and reliable grid solution for serving remote town
- Provides energy and grid support to all customers
- Part of broader effort to meet the region's power demand by balancing public input, environmental impacts and the need to provide customers with safe, reliable and affordable energy.

Camp Atterbury: Customer Reliability and Sustainability

Business Case

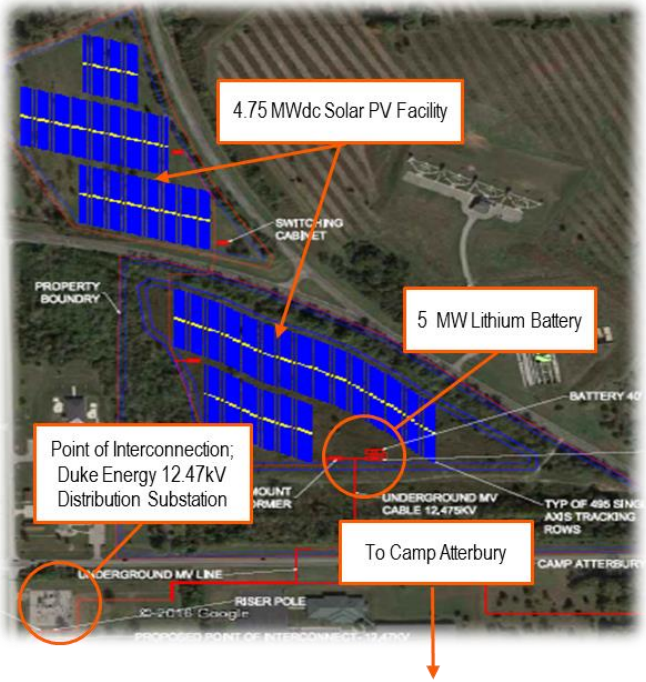
The Indiana National Guard seeks some redundancy for critical loads during outage. Duke Energy Indiana will deploy PV + energy storage/microgrid

Goals

- Provide system benefits (frequency regulation in MISO) for all Indiana customers
- Provide solar generation for all Indiana customers
- Operate a safe and resilient microgrid for this customer's critical loads

Technology

3 MWdc Solar PV Facility + 5 MW Lithium Battery + system protection and Micro-grid controls



Regulatory Challenges

- Market participation for distribution utilities and associated accounting
- Valuing reliability benefits
- Interconnection rules focused on generation applications and not distribution applications
- Approval process for new technologies and applications
- Rates vs. customer programs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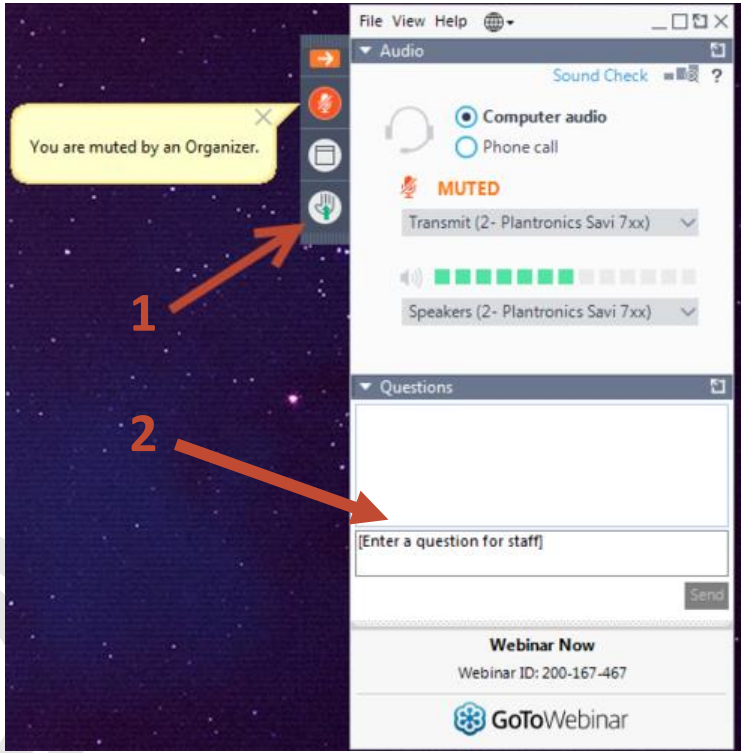

THANK YOU

This concludes the public webinar.

Members of the NARUC-NASEO Microgrids State Working Group are invited to remain on the webinar for a members-only discussion.