STATE OF RHODE ISLAND
OFFICE OF
ENERGY RESOURCES

Microgrids for Resilient Municipalities

Photo by Clean Energy Group, March 2017.

What they are, Why you may want one, & What resources are available

Wednesday, March 17, 2021 10:00 – 11:30 am

Welcome, and thank you for attending this webinar!

- Purpose of webinar is to both give information and ask for information
- High-level overview of microgrids, use cases and resiliency benefits for municipalities
- **Microgrids -** Group of interconnected loads and distributed energy resources that acts as a single controllable entity to provide back-up power to critical infrastructure during electric grid outages

Mission statement

The Rhode Island Office of Energy Resources' (OER) mission is to lead the state toward a **clean, affordable, reliable**, and **equitable** energy future.

OER develops policies and programs that respond to the state's evolving energy needs, while advancing **environmental sustainability**, **energy security**, and a vibrant **clean energy economy**.

OER is committed to working with public- and private-sector stakeholders to ensure that all Rhode Islanders have access to cost-effective, resilient, and sustainable energy solutions.

Agenda

1. DOE Presentation on Microgrids 101 and Case Study Description
2. Q&A for DOE
3. Microgrid Program RFI
4. More Q&A/Discussion of the RFI

U.S. DEPARTMENT OF ENERGY

Microgrids: An Introduction

Advanced Grid Research
OFFICE OF ELECTRICITY
US DEPARTMENT OF ENERGY

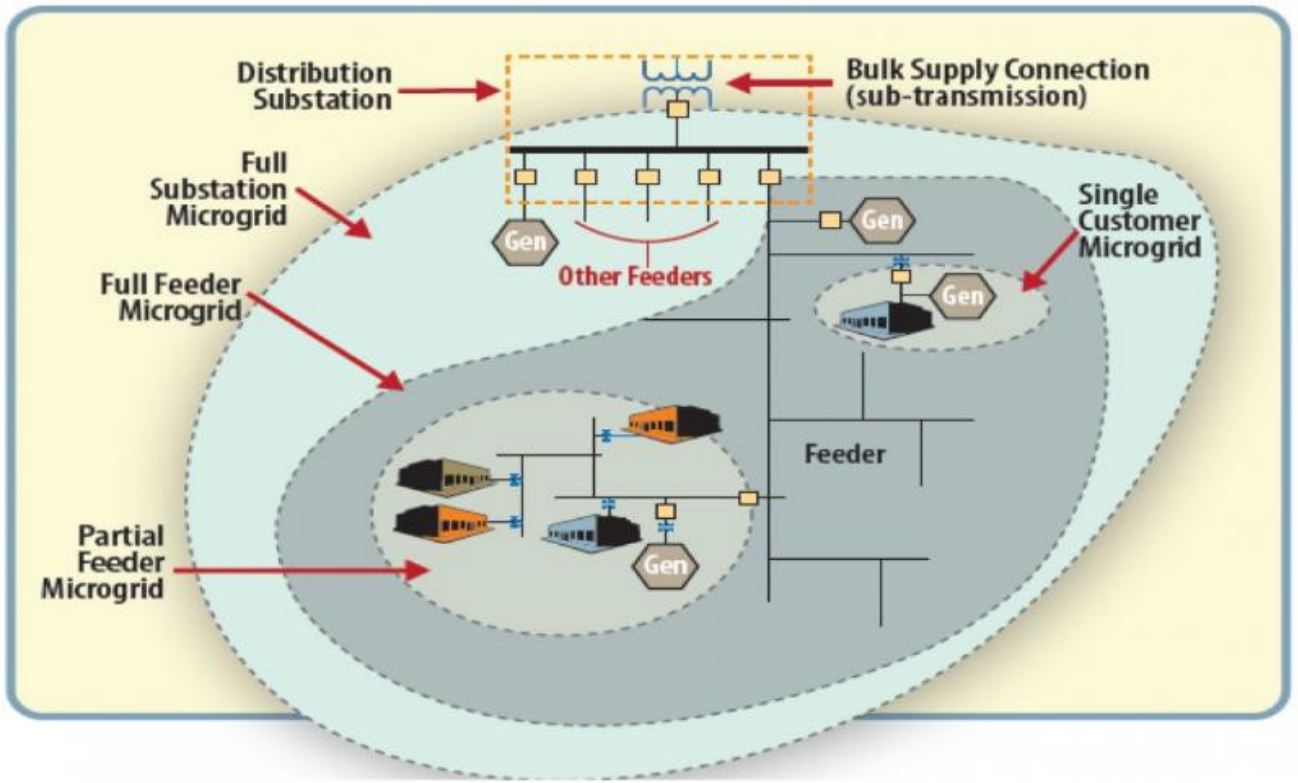
Program Manager: Dan Ton

March 2021

Defining Microgrids

A **microgrid** is a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity.

Microgrids can operate in grid-connected or islanded modes, and switch between modes. *Remote and islanded power systems are also considered microgrids*



Types of Microgrids

Microgrids vs. “Advanced” Microgrids

Basic Features

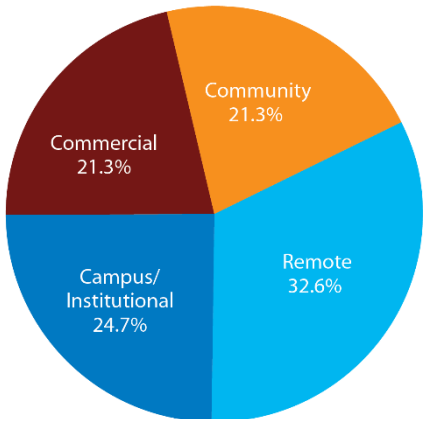
- Have a group of distributed energy resources (DERs) and loads (electrical and thermal)
- The group of DERs can be controlled as a single entity
- Have the ability to disconnect from and parallel with electric grid
- Can be intentionally islanded

Advanced Features

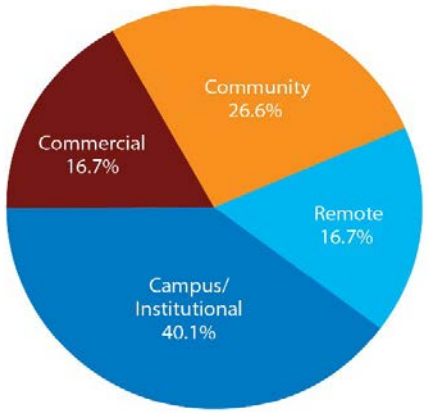
- Can automatically transition to/from and operate islanded while compatible with system protection devices and coordination
- Capable of managing both dispatchable (fossil fuel based) and intermittent (renewable) resources, w/wo integrated energy storage
- Advanced controls and energy management system
  - Optimize combinations of objectives (economics, efficiency, reliability, resilience, etc.)
  - Provide grid-support (ancillary and transactive) services
- Scalable, interoperable, and cyber-secured architectures, enabling
  - networking microgrids
  - Integrated operations of (networked) microgrids with electric grid

Microgrids in the U.S. Tracked by Industry

Navigant Data by # Projects



GTM Data by # Projects



Source: Microgrid Cost Study Phase I Report, NREL 2017

Annual microgrid projects completed*

Source: Wood Mackenzie Grid Edge Service

Microgrid Value Proposition

Microgrid Benefits

- Enhance local reliability and power quality
- Intentional islanding for safety and reliability
- Energy surety during outages and emergency conditions
- Peak-shaving and provision of other grid services (i.e., ancillary services, demand response)
- Arbitrage of energy price differentials
- Enabling integration of distributed energy resources
- Smoothing of intermittent and variable resources

Multiple Objectives

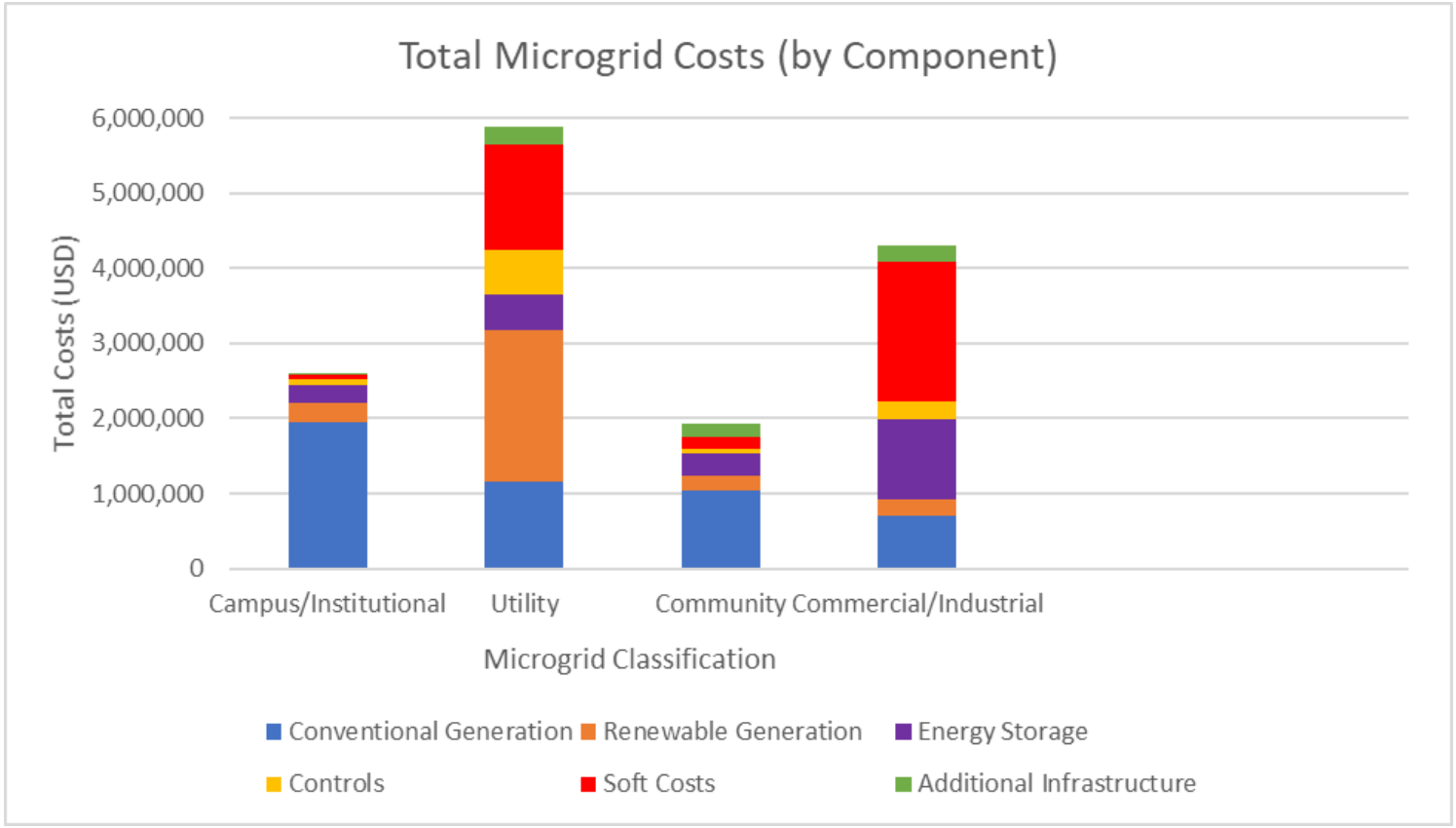
Reliability	Serves as a grid resource in grid-connected mode and switches to island mode upon detecting a contingency
Resilience & Security	Ensures that critical loads can be served for sustained periods of time during and after catastrophic events
Economic	Responds to real-time changes in electricity prices to minimize total energy and operational costs
Environment	Maximizes electricity produced and consumed from renewable resources to reduce overall emissions

Microgrid Value Proposition

Table 2: Types of Multi-User Microgrid Blue-Sky and Island Services		
	Customer Service	**Grid Service**
Blue-Sky Service	▪ Community Solar Programs ▪ Decarbonization	▪ Wholesale Energy Market Participation / PURPA PPA ▪ Wholesale Ancillary Services ▪ Distribution NWA
Island Service	▪ Resilience Services ▪ Islanded Energy Services	▪ System Resilience Services ▪ Microgrid Forming Services

Source: Smart Electric Power Alliance and Pacific Energy Institute, 2020.

Microgrid Cost Components



Source: *Private, State, and Federal Funding and Financing Options to Enable Resilient, Affordable, and Clean Microgrids*, NARUC-NASEO Microgrids State Working Group, 2021. https://www.naseo.org/Data/Sites/1/naseo_microgrid.pdf

Microgrid Project Development Stages

The Planning Stage has two sequential stages:

- **Feasibility study**: technical/economic feasibility of microgrid design options to meet microgrid requirements
- **Preliminary design**: deeper analysis of functional requirements (controls/communication, system, regulatory) - sometime referred to as "30% system design"

A suite of tools available from industry and Federal programs can help the Planning Stage, as listed in:

- *Microgrid Guide for Publicly Owned Critical Infrastructure* (https://microgridknowledge.com/wp-content/uploads/2020/05/1565971484wpdm_Microgrid-Guide-_Rima-Kasia-Oueid.pdf)
- *Updated Energy Resilience Tools & Resource Guides* (to be published soon at energy.gov)

After the Planning stage is completed, P/E firms and industry are the primary entities to carry out the ensuing stages

Case Study: A CERTS Microgrid in Manhattan

Brevoort Co-op, Manhattan

"The CERTS microgrid control technology is the most radical of all options—as well as the lowest cost—as it is embedded into a 100-kW CHP system offered by Tecogen"

Peter Asmus, Navigant

The CERTS (Electric Reliability Technology Solutions) Microgrid system enabled the Brevoort, a 1950's era luxury co-op tower in Greenwich Village, NY, USA, to maintain power, water, and heat during the week of wide spread utility outages left in the wake of Hurricane Sandy in late 2012.

Four 100-kW combined heat and power (CHP) systems, with built-in CERTS microgrid technology:

- Seamlessly transitioning between grid tie and island-mode operation
- Powered the central boilers, domestic water pumps, elevators, and all 20-story apartments, during outages
- Operating in parallel with ConEd utilities during normal operations

Ref: Real-World Performance of a CERTS Microgrid in Manhattan, *IEEE Transactions on Sustainable Energy*, Oct. 2014

Case Study: Stafford Hill Microgrid, Rutland, VT

The solar+storage microgrid in Rutland, VT, saves hundreds of thousands of dollars and can supply backup power to an emergency shelter.

Project Overview

Project Developer/Owner: Green Mountain Power

Location: Rutland, Vermont

Equipment: 2.5 MW solar PV and 4 MW / 3.4 MWh lithium-ion and lead acid batteries; custom multiport inverter

Installed Cost: $5,500,000 (battery costs exclusive of solar costs)

Payback Period: 8 years

Supported Infrastructure: Red Cross emergency shelter at a regional high school

Building Loads Supported: Heating, lights, building infrastructure

Services Provided: Annual and monthly peak demand management, energy arbitrage, frequency regulation, backup power

Project Partners: Green Mountain Power, Vermont Department of Public Service, U.S. Department of Energy, Sandia National Laboratories, Clean Energy States Alliance

Project Funding: $250,000 from U.S. Department of Energy; $40,000 from Clean Energy Development Fund at the VT Department of Public Service; in-kind technical assistance from Sandia National Laboratories and the Clean Energy States Alliance.

Case study report: https://www.cesa.org/wp-content/uploads/Stafford-Hill-Case-Study.pdf

Microgrid Feasibility Analysis, Naval Station Norfolk

Validate a holistic approach to improving resilience of critical infrastructure through consequence-focused system analysis and design of electric distribution systems

Energy Master Planning

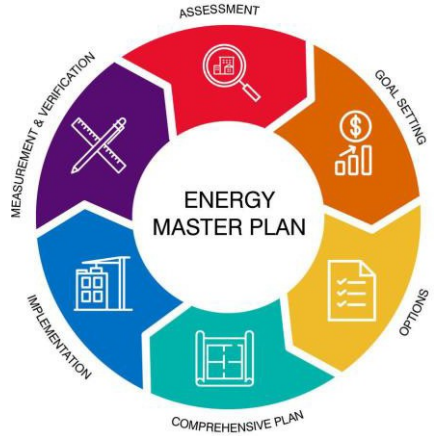
- Holistically considers all energy interventions for a district
  - Thermal and Electrical
  - Supply-side and Demand-side
- Incorporates resilience as a primary goal

Microgrid Feasibility Analysis

- Weighs cost and benefit of alternative microgrid designs
- Incorporates resilience as a requirement

Process Improvement and Validation

- Supports Naval Station Norfolk on a more integrated Installation Energy Plan
- Partners with City of Norfolk and Dominion Energy to show benefits of resilience both inside and outside the fence to national security



NARUC-NASEO Microgrid State Working Group

Working group co-led by NARUC and NASEO, in close collaboration with DOE, to explore state needs for resilient MGs, barriers to broader deployment, and strategies to enhance MG deployment across the States

- Develop and deliver resources for regulators and state energy officials
- Develop a policy/regulatory framework on standardized interconnection rules and practices for microgrids
- Provide the venue for regular stakeholder engagement
  - Technical webinars
  - Virtual site visit

- Completed two briefing papers
  - ✓ *User Objectives and Design Options for Microgrids*
  - ✓ *Funding and Financing Options for Microgrid Deployment*
- Additional briefing papers under development
  - ➢ Valuing Resilience Benefits of Microgrids
  - ➢ Integrating Microgrids in State Clean Energy Strategies

https://www.naseo.org/issues/electricity/microgrids

Thank You

Resilient Microgrids for Rhode Island Critical Services

Prepared for:

STATE OF RHODE ISLAND
OFFICE OF ENERGY RESOURCES

Prepared by:

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Sector Prioritization

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- Critical Manufacturing
- Dams
- Defense Industrial Base
- Government Facilities
- Health Care & Public Health
- Nuclear Reactors, Materials & Waste

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

DEPARTMENT OF ADMINISTRATION

OFFICE OF ENERGY RESOURCES

2018-B PLAN FOR THE ALLOCATION AND DISTRIBUTION OF REGIONAL GREENHOUSE GAS INITIATIVE AUCTION PROCEEDS

Auctions Held March 18, 2018 & June 13, 2018

August 2018

5.3.2.c **$62,030.37 (Sixty-Two Thousand Thirty Dollars and Thirty-Seven Cents)** shall be allocated to support the delivery of cost-effective energy efficiency programs and incentives to electric utility customers of the Block Island Power Company (BIPCo). OER will work in coordination with BIPCo management to leverage existing utility funds and identify cost-effective investment opportunities in the community of New Shoreham.

6.0 Reallocation of RGGI funds from the 2013 and 2016-A Plans for the Allocation and Distribution of Regional Greenhouse Gas Initiative Auction Proceeds.

6.1 OER finds that **$100,995.00 (One Hundred Thousand Nine Hundred and Ninety-Five Dollars)** of funds allocated pursuant to Section 5.3.2.f of the 2013 Plan (Grid Mod WG) shall be reallocated to achieve the purposes of Section 5.3.2.a (REF) of the 2018-B Plan.

6.2 OER finds that **$500,000.00 (Five Hundred Thousand Dollars)** of funds allocated pursuant to Section 5.2.2.e of the 2016-A Plan (Microgrid) shall be reallocated to achieve the purposes of Section 5.3.2.a (REF) of the 2018-B Plan.

7.0 Tracking and Reporting

7.1 Consistent with OER's reporting requirement under RIGL §23-82-6(d), all recipients of RGGI funding are required to comply with OER data and reporting requests, including, but not limited to, those reporting requirements specified in procurement documents and/or any memoranda of understanding.

Request for Information
to Support Program Design for
Microgrids for Resilient Municipalities

Responses Due
April 9, 2021 by 4:00 PM

1. Purpose

The Office of Energy Resources (OER) and the Renewable Energy Fund (REF), herein referred to as the "Program Team", look to support community resiliency efforts that reduce greenhouse gas (GHG) emissions, enable the integration of renewable energy sources, and provide energy resilience for critical facilities during electrical grid outages. Through this Request for Information (RFI), the Program Team seeks to learn directly from municipalities what is needed within their jurisdictions to facilitate, support, and provide resources for resilient community microgrids.

There are many definitions of a microgrid. For the purposes of this RFI, a microgrid is defined as 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 electrical grid. A microgrid can connect and disconnect from the grid to enable it to operate in both grid-connected or "island" mode. Among several use cases and value propositions, microgrids can provide back-up power to critical infrastructure during electric grid outages. Building a microgrid may help a municipality reduce risk related to loss of power to communications hubs, facilities supporting first responders, health care workers, sewage treatment facilities, and other facilities that support food or fuel resources. Microgrids also present an economical option for communities and can connect to a local resource that might be unreliable for traditional grid usage.

In 2018, OER published a comprehensive report, *Resilient Microgrids for Critical Services*, which provides a framework for a future microgrid program, detailed policy recommendations, technologies, procurement strategies, and technical details related to microgrid projects.[1] The report also described lessons learned from other states with existing microgrid programs and provides helpful information for Rhode Island municipalities exploring microgrid opportunities.[2]

[1] http://www.energy.ri.gov/documents/SRP/RI-microgrid-report-170331.pdf
[2] The report is broken into five parts, with Part B: Microgrid Technologies and Application (page 58) perhaps being the most helpful for municipalities considering a microgrid project. Part B provides an overview of the types of technologies commonly included in a microgrid project, ownership models, types of control systems, and performance characteristics.

Request for Information

The Program Team seeks feedback on:

- Microgrid eligibility criteria
- Applicant eligibility criteria
- General program design

Download RFI from **www.energy.ri.gov**

Questions? Email **Jacklyn.Olivieri@energy.ri.gov** no later than **March 28 at 4:00 PM**

One critical piece of program design includes that the microgrid needs to provide a public benefit. We are looking for feedback on the definition of public benefit in the RFI.

Microgrid Eligibility Criteria

1. **Critical Infrastructure Criterion - Must include at least 1 building deemed critical infrastructure**

Q1: Is the definition of critical infrastructure sufficiently detailed and clear to allow a municipality to identify possible microgrid locations or facilities?

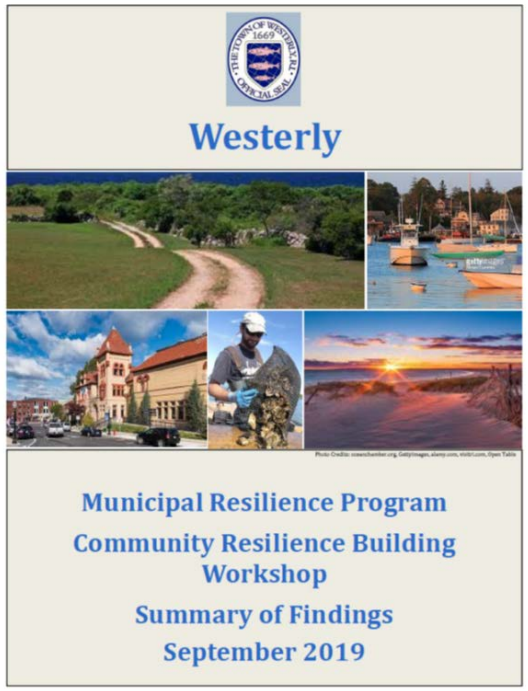
Q2: How could the definition of critical infrastructure be expanded or clarified?

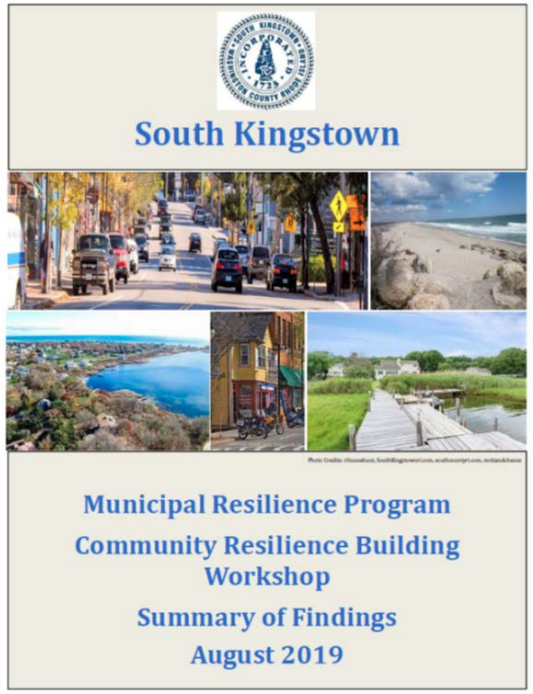
2. **Public Benefit Criterion - Must provide a public benefit**

Q3: Is the definition of public benefit sufficiently detailed and clear to allow a municipality to identify possible microgrid locations or facilities?

Q4: How could the definition of public benefit be expanded or clarified?

Q5: Are any microgrid eligibility criteria missing that should be considered?





Applicant Eligibility Criteria

Must meet at least one of the following:

1. Participated in RI Infrastructure Bank's Municipal Resilience Program and owns, operates, or maintains proposed microgrid
2. Dedicated staff person for lead on project
3. Non-municipal entities must meet both criterion and designated critical infrastructure location

Q6: Are the applicant eligibility criteria sufficiently clear?

Q7: To what extent do the applicant eligibility criteria seem appropriate?

Q8: Would you recommend any modifications to the applicant eligibility criteria?

General Program Design

- Specific information regarding needs of municipalities to support a microgrid project from idea conception through construction

- If any answer is unknown, please indicate such

Instructions for Responding

Responses due by **April 9, 2021 by 4:00 PM EST**

- Responses emailed to **Jacklyn.Olivieri@energy.ri.gov** – any other method will not be accepted

- Limit to 10 single-spaced pages and include feedback on all questions Q1-A16

Optional supplemental material – previously completed microgrid feasibility studies or project case studies


Any Questions?

OER Contact Information

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