NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Microgrid / NY Prize

May 14, 2015

What's Different Now?

- Sense of urgency
- Extreme weather events
- Aging infrastructure

Reforming the Energy Vision (REV)

Reforming the Energy Vision — New York's comprehensive strategy to enable self-sustaining clean energy markets supporting a cleaner, more reliable, and affordable energy system.

- What Do We Want and Need?

  - ✓ Affordability
  - ✓ Reliability
  - ✓ Choice and Control
  - ✓ Emissions Reductions
  - ✓ Economic Development & Jobs

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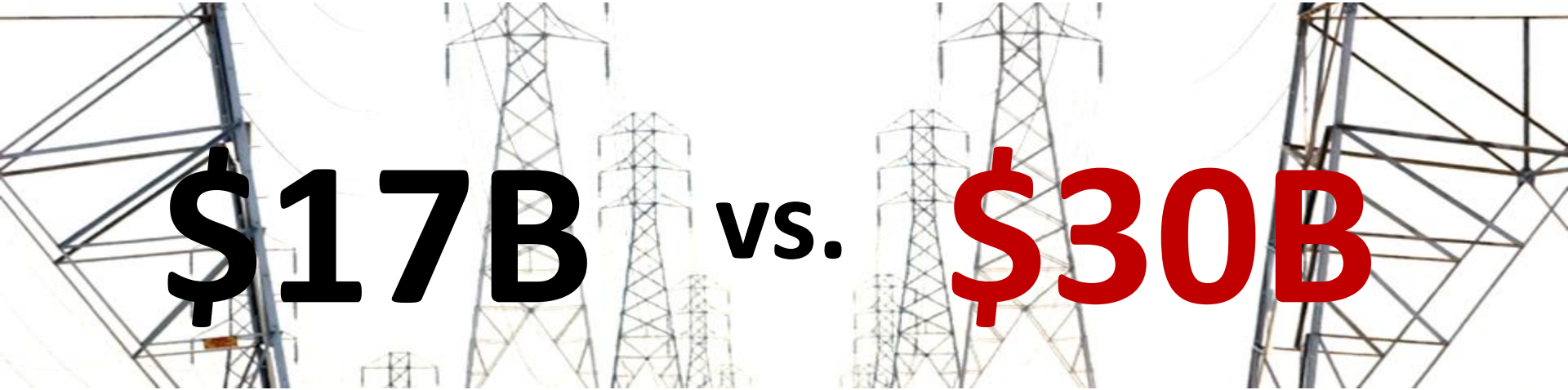
Why

- Economic Burden on **Customers**

Over the past ten years, we spent $17 billion to maintain our electric power grid. We predict that number to jump to $30 billion over the next decade.



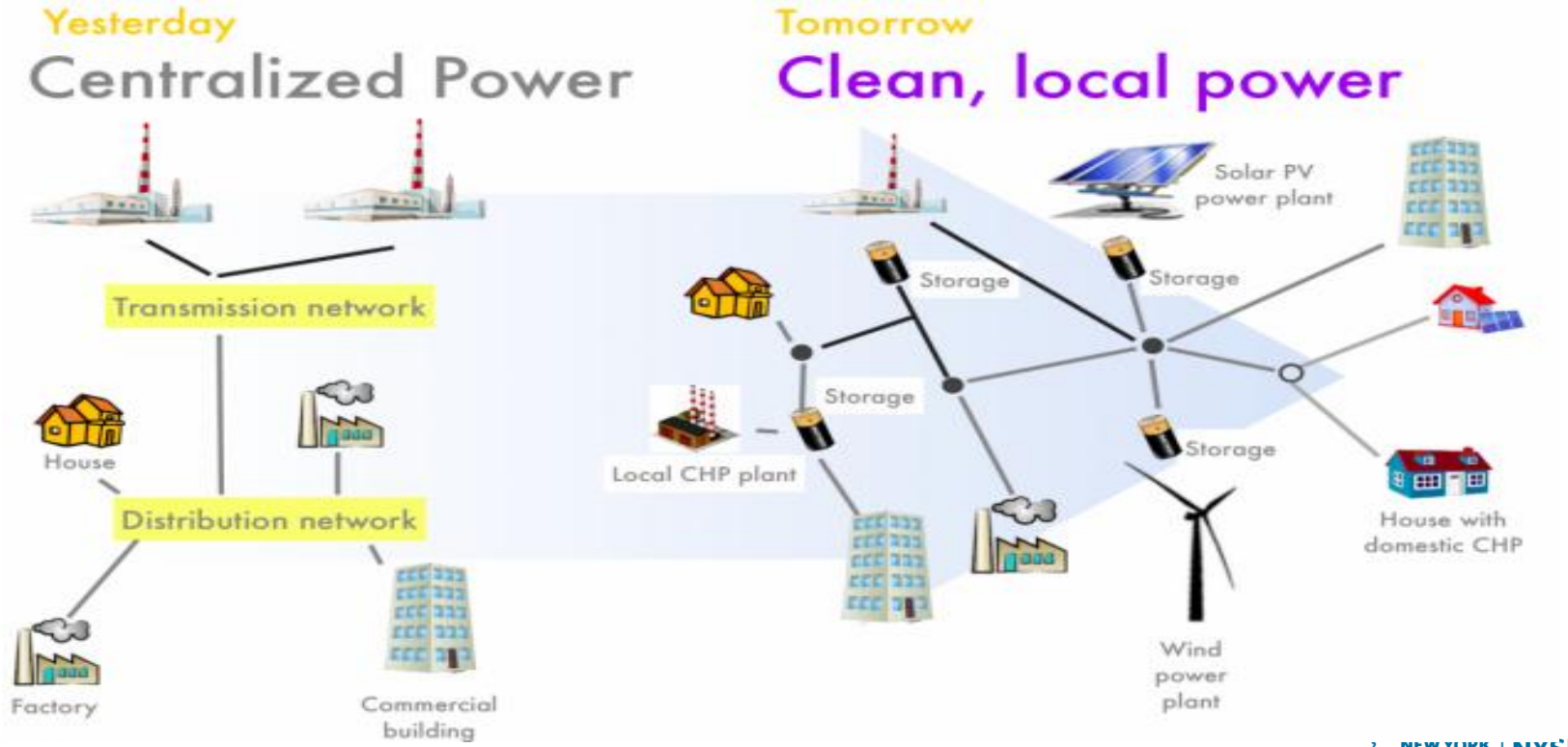
Why

- Economic Burden on **Customers**

The rate of capacity utilization of our electric power grid is:

54%

Future of Energy



What is a Microgrid?

Not New . . . Not Backup Generation

A group of interconnected loads and distributed energy resources that form a single controllable entity capable of operating continuously in both grid-connected and islanded mode.

NY Prize

- Pipeline of ~25 feasibility studies
- 10 designs selected
- At least 5 projects constructed
- Replicable strategies (“playbook”) for communities in NY and beyond

Key New York State Initiatives

- Reforming the Energy Vision (REV)
  - REV Pilots/Demonstrations
- Clean Energy Fund (10 year; multiple R&D and Mkt. Dev. programs)
- Smart Grid RD&D (9 year)
  - Microgrid Design Projects (4 underway)
  - Comprehensive Microgrid Assessments completed

    Microgrid Assessment (2010)
    http://on.ny.gov/1ukZOa8
    Microgrids for Critical Facilities (2014)(includes case studies)
    http://www.nyserda.ny.gov/-/media/Files/Publications/Research/Electic-Power-Delivery/Microgrids-for-Critical-Facility-NYS.pdf
- NY Prize Community Microgrid Competition (Open)

NY Prize – Multi-Stage Competition

- The $40 million NY Prize community microgrid competition (RFP 3044 is comprised of three stages:
- Stage 1: Feasibility Assessment (OPEN)
- Stage 2: Engineering Design and Financial /Business Plan
- Stage 3: Microgrid Build-out and Operation
- Open enrollment structure to accelerate pipeline of projects

Award Process

All **communities enter/apply to competition and are evaluated at each stage by external judges**

Critical project partners: Municipalities and Utilities

Evaluation Panel(s)

Threshold ***Quantitative*** Criteria	**Stage 1** Awards to Conduct Feasibility Assessments	**~25 awards for studies** ($50 - $100K)	**$1-3m**
Threshold ***Audit Grade Design Criteria***	**Stage 2** Feasibility Evaluated Awards for Audit Grade Design	**8-10 Awards** ($500K – $1M)	**$5-10m**
Audit Grade Design Review	**Stage 3** Designs Evaluated Awards for Build-out/ Operation	**5-7 Awards** ($5-$7M)	**$25-35m**

Allocations

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NY Prize – Competition Schedule[1]

Milestone	Date
Stage 1 Proposals Accepted	**Through May 15, 2015**
Stage 1 Proposals Evaluated	Weekly through May 28, 2015
Stage 2 Open/Entries Accepted	July 15, 2015 /through February 2016
Stage 2 Proposals Evaluated	Through March 2016
Stage 3 Open/Entries Accepted	Sept15, 2015 /through December 2017
Stage 3 Proposals Evaluated	Every 6 months through January 2018
Project Commissioning	24 months after contract execution

[1] RFP 3044 governs / schedule subject to change

NY Prize – Stage 1 of Competition

Cultivating Community Prospects

- Community teaming arrangements
- Consider targeting utility “opportunity zones”
- Embedded utility/community-municipal partnership
- Energy efficiency, CHP, solar, other resources part of resource portfolio (leverage portfolio of current incentive programs)
- Mix of customer types
- Critical public facilities in mix (minimum of one must be included)
- U.S. Housing and Urban Development objectives considered (impacted population involved; (weather/income)
- Consider REV demonstration/laboratory

NY Prize – Stage 1 Feasibility Study

•NY Prize is making up to $100,000 available, on competitive basis to conduct assessment (no cost-share is required)

•Applicants expected to conduct preliminary microgrid planning to submit viable proposal(high-level assessment included in proposal)

• Proposals will be evaluated, on an as-received basis, against pre-scribed evaluation criteria

Evaluation Criteria

- The overall cost and benefits of the project
- The project's contribution to public need (increasing safety and quality of life for residents in an outage situation)
- The technical and operational performance of the project
- The demonstrated reliability of the proposed microgrid configuration
- The use of clean and renewable generation resources in the project
- Overall financial and managerial capabilities of the developer

Community Roadmap

Step 1:
Set Project Goals, Organize, and Educate Stakeholders

Step 2:
Identify Project Site

Step 3:
Conduct Feasibility Assessment

Step 4:
Conduct Detailed Design

Step 5:
Acquire Financing, Approvals, and Construct

What is a Critical Facility?

Facilities so vital to the state that the disruption, incapacitation or destruction of such systems could jeopardize the health, safety, welfare or security of the state, its residents or its economy.

Tier 1 Types:

- Hospitals/Critical Care
- Police/Fire
- Wastewater Treatment/Water
- Universities/Schools
- Facility of Refuge/Shelters

NYS Critical Infrastructure Microgrid Study

•Focused on geographic regions that experienced extended power failures due to extreme weather events between April 2011 and April 2013 (NYC, Broome, Rockland, Nassau, Suffolk) :

• Potential regulatory structures under which microgrid systems would operate

• Operation of microgrid conform to or be compatible with current utility requirements and plausible ownership models

• Type of microgrid configurations, incorporating various distributed generation would optimally support mission critical services for extended grid outages

• Technical and regulatory issues needing to be addressed to connect the microgrid to the utility distribution network

• Approaches that would be most appropriate for funding installation, operation and maintenance of a microgrid

New York City Case Study: Facilities to be Served by the Microgrid

- Metropolitan Hospital Center.
  - Main hospital (18 floors): Level II trauma center, capable of initiating definitive care for all patients (240 beds)
  - Mental health building (16 floors): 120 beds
  - Outpatient department (8 floors): provides ambulatory care during business hours
  - Peak demand: 2.4 MW to 5.0 MW (varies seasonally)
- New York City Housing Authority (NYCHA) apartment complex.
  - Lexington Houses - 4 buildings
  - George Washington Houses – 15 buildings
  - Total of approximately 2,000 units; 4,400 residents
  - Peak demand: 3.1 MW to 6.0 MW (varies seasonally)
- Verizon
  - Central telecommunication switching station
  - Peak demand: approximately 700 kW (little seasonal variation)

New York City Microgrid Site

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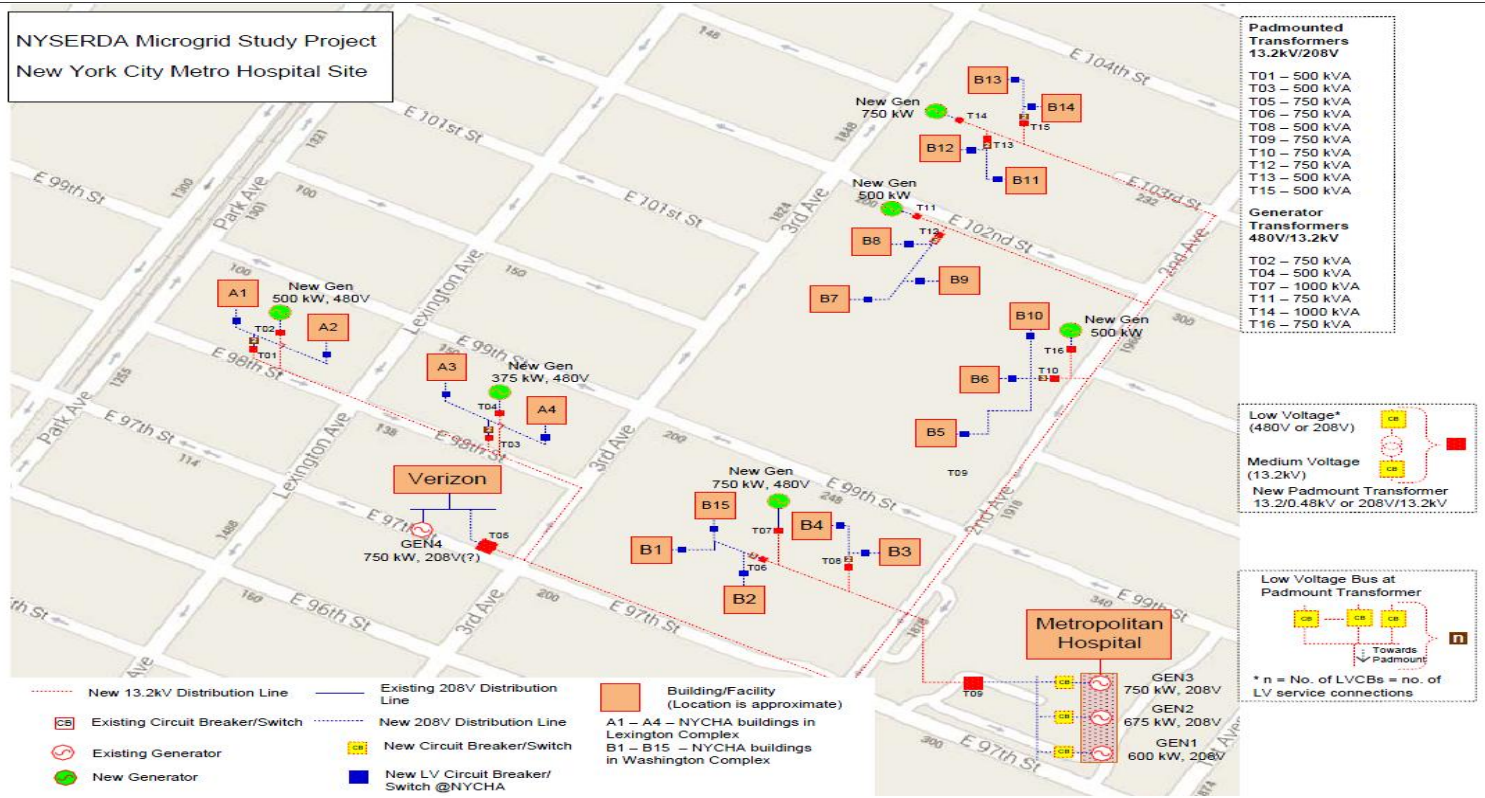
Summary – Site Microgrid Design

- Incorporates the four generators currently available – 2,775 kW capacity
- Adds six diesel generators to meet estimated demand during a major power outage
  - Total added capacity: 3,375 kW
  - Capacity of individual units: 375 kW to 750 kW
- Total system capacity: 6,150 kW
- Sufficient to support the following loads:
  - 40 percent of Metropolitan Hospital peak demand (i.e., critical load)
  - 50 percent of NYCHA peak demand
  - 100 percent of Verizon peak demand

Site Electrical Infrastructure



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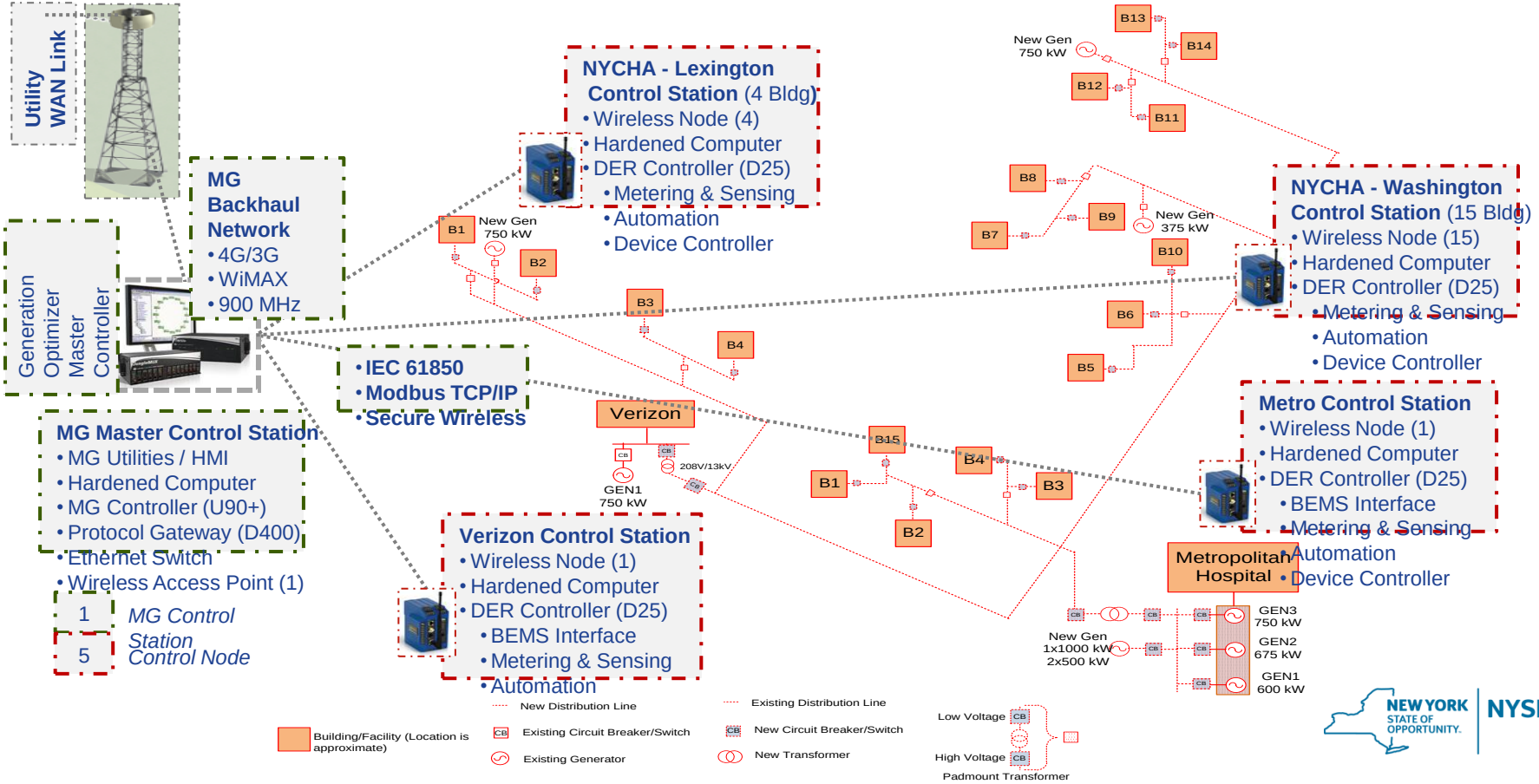
Control & Communications Architecture



Fixed Costs for the New York City Site

- Fully-installed capital costs (GE): $5.9 million
  - New generators - $2.9 million
  - Electrical infrastructure - $2.0 million
  - Control and communications infrastructure - $1.0 million

- Initial design and planning (GE): $5.7 million
  - $5.1 million in site-specific planning and administrative costs
  - $554,000 in engineering design costs (1/5th of a total of $2.76M in design costs, to be spread across 5 sites)

- Fixed O&M costs (GE): $45,000/year
  - Includes software licenses and 24/7 technical support
  - Provides for routine software maintenance and upgrades

- Annualized costs: $914,000/year
  - Assumes 7 percent annual discount rate.
  - Upfront costs annualized over 30-year system life.

Benefit-Cost Analysis – Model Overview

- Structure: linked worksheets
  - Site overview and summary of results
  - Site inputs
  - Intermediate outputs
  - Cost calculations
  - Benefit calculations
  - Calculation of benefits during extended power outages (Fire Station, EMS, Hospital, Police, Electric Power, Wastewater, Water, Other)
  - Data
    (power outages/standard values, crime data)
- Analyzes project impacts over a 20-year operating period
- Results are reported in 2013 dollars

Benefits of Maintaining Critical Services

- Valuation of benefits is based upon the underlying value of the public services maintained during major outages
- FEMA's Hazard Mitigation Grant Benefit-Cost Analysis methodology:
  - Applies standard economic values and site-specific variables to characterize the economic damages that may result if an outage interrupts fire, hospital, police, or emergency medical services
  - Can also be applied to value the impact of lost water, wastewater, and electric power service
- The model includes worksheets designed to help the user apply FEMA's methodology to estimate the value of protecting each of these services during extended outages
- The model can also accommodate the valuation of benefits for other services using methods tailored to the characteristics of a particular site

Microgrid Benefits

- Principal benefit categories:
  - Energy / Economic benefits
  - Reliability benefits
  - Power quality benefits
  - Environmental benefits
  - Safety and security benefits
  - Utility benefits
- Energy benefits include both energy cost savings and capacity cost savings.
- Energy cost savings include costs avoided in generating electricity, as well as efficiencies realized through installation of CHP/CCHP systems.

Peak Load Support Scenario

- Preliminary BCA examined potential impact of participating in peak load support

- Two scenarios studied:
  Use all Generators – including Metro. Hospital
  Total Capacity – 6.15 MW
  Exclude Metro Hospital Generators
  Total Capacity - 4.125 MW

- Approximate annual overall benefit: $970,000

  Assumes support for 20 hours per year
  Capacity Cost Savings - $1.0 million
  Operating Costs - $46,000
  Reduction in Macrogrid Operating Costs - $14,000

NYS CI Microgrid Study Findings

- Cost benefits was not economically feasible at the sites analyzed.
  - Primarily due to the robust backup generation available at most of the critical facilities and costs associated with the electrical wiring, communication and controls

- Microgrid designs are highly unique.
  - Difficult to extrapolate benefits and costs from one site to another.

- Cost-effectiveness improves if the system can operate regularly, rather than solely as back-up generation.

NYS CI Microgrid Study Recommendations

- Support microgrid development at critical infrastructure sites with favorable benefit-cost analysis
- Facilities should determine if a microgrid that includes neighboring buildings and an alternate generation
- Further development on microgrid technology and appropriate applications
- Disseminate objective information, tools and other resources to encourage development of microgrid projects

Questions

Contact:

Mike Razanousky @ michael.razanousky@ nyserda.ny.gov