

Designing Advanced Microgrids for 'Shelters in Place': A Case Study of the Town Center Distributed Energy Resource Microgrids - Feasibility Study Incentive Program

Presented by

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How did we get here?



- What got us here
 - Storms, power outages, increased reliance on electricity, air quality vs. electrification
- What's been done since Sandy
 - Hoboken and Town Center microgrid program
- What are the next steps
 - Implementation
- Decoupling the future
 - What will be the utility role, what will be the private sector role, and who will win & who will lose. Money, money, money.

Why are we here?



- **Geography**

- Located in one of the nine Sandy-designated counties
- Proximity to the Atlantic Ocean leaves it vulnerable to extreme weather events and flooding
- Proximity to primary evacuation, rescue, and supply routes to and from the shore communities from Asbury Park to Avon by the Sea

- **High number of critical and/or high energy use facilities in close proximity to each other**

- Hackensack-Meridian University Medical Center (HMUMC) – unmatched crisis assistance resources, especially considering it has been designated as a Level II Trauma Center
- Municipal Complex, Police Department, DPW provide essential emergency services
- School facilities could be utilized for shelter, triage, & response coordination in the event of an emergency

What got us here?

- Reliance on the electric system. Its all tied together - pumps, emergency services, homes, businesses.



Storms, floods, wind, water, fire

A Microgrid is Born – NJ BPU Call Action



- 13 microgrid applications total
- Sandia National Labs
- NJ DEP & BPU
- Rocky Mountain Institute
- PSE&G
- Greener By Design
- CHA
- Hoboken
- Hudson County
- Neptune
- Galloway
- Woodbridge
- Camden



Phase 1

Completed Microgrid Feasibility Study –who's in, who's out, procurement, stakeholders audits and implementation, interconnection details & utility engagement. Document road paving schedules & other activities that might assist in completion of distribution system

Phase 2

Utility Interconnection –define distribution system and outline implementation based on Phase 1. Utility will seek to rate base the distribution system, once final design is complete, will be folded into Phase 3.

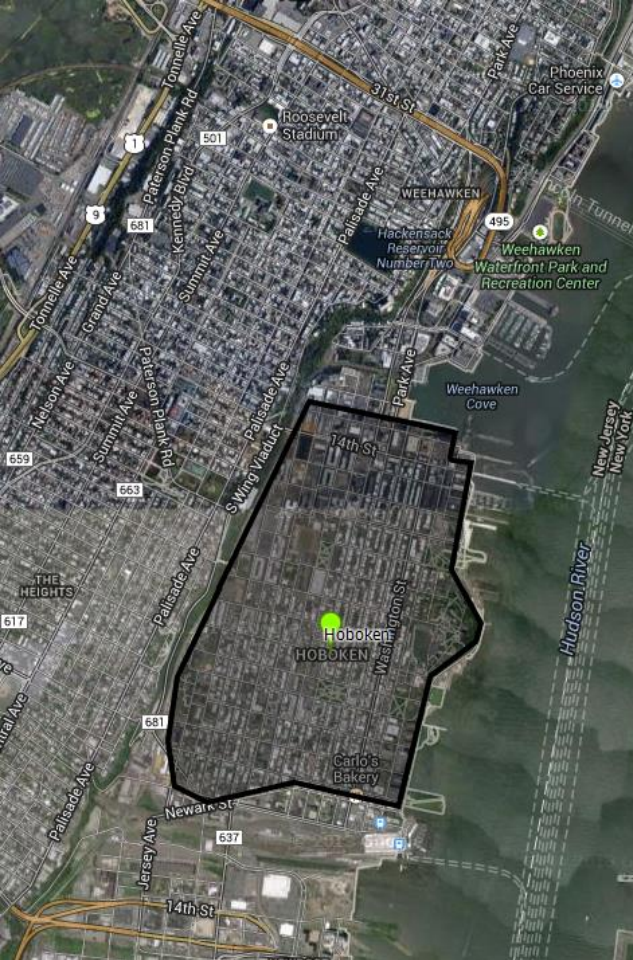
Phase 3

Once distribution system technical and financial details from Phase 1 and 2 are agreed upon and approved by NJ BPU, a **Bid** for a 3rd party DBOOM procurement can proceed

Goals of the Microgrid

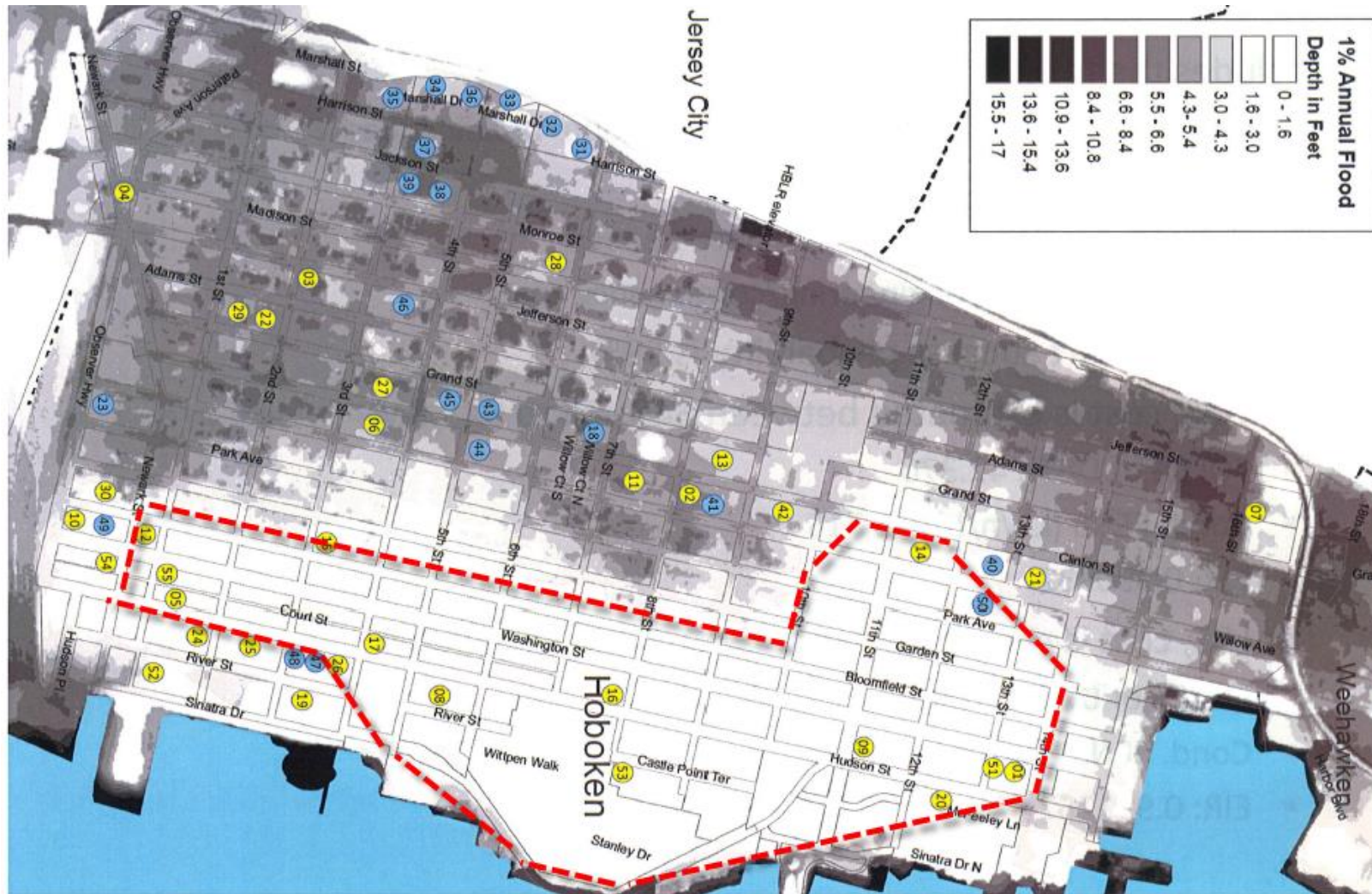
- **Enhance energy security** by reducing our energy requirements and help businesses weather energy price volatility and supply disruptions
- **Advance environmental goals of the LRA** by reducing emissions of CO2 and other pollutants
- **Remove “barriers to entry”** by displacing need for investment in individual building systems
- **Reduce tenant energy spend and improve business competitiveness** by increasing energy efficiency and deploying DER
- **Increase resiliency of energy infrastructure** by limiting congestion, offsetting transmission losses, & having ability to remain operational during severe weather events or other unforeseen grid outages
- **Diversify energy supply** by enabling further integration of domestically produced & renewable fuels
- **Improve energy efficiency** by capturing heat that is normally wasted

City of Hoboken Example



- City of Hoboken, NJ
 - Area
 - Approximately 2 sq. miles (1.275 land, 0.736 water)
 - Population
 - 52,000 people
 - Location
 - West bank of Hudson River
 - Parameters
 - 48 streets laid out in N/S – E/W Grid

Flood Risk to Critical Infrastructure



Summary



- Neptune Township - Selected for study because of geography and tight clustering of critical facilities
- Stakeholder outreach, data collection, site visits, and utility circuitry map analysis led to final Microgrid design
- Final Area A facilities includes HMUMC, Neptune Municipal Complex, and seven (7) surrounding buildings
- Final technology selection includes:
 - Two (2) reciprocating engines with 6.2MW output
 - Up to 1.5MW of PV on various roofs & parking lots

Cost-Benefit Analysis Toolkit & Economic Optimization Modeling

Resilient Microgrids Ideation

Microgrid Project Timeline

Resiliency Options

Cost Benefit Analysis

Benefits Score

Benefits Dashboard

Carbon Neutrality

CO2 Calculation Data

CO2 Calculator

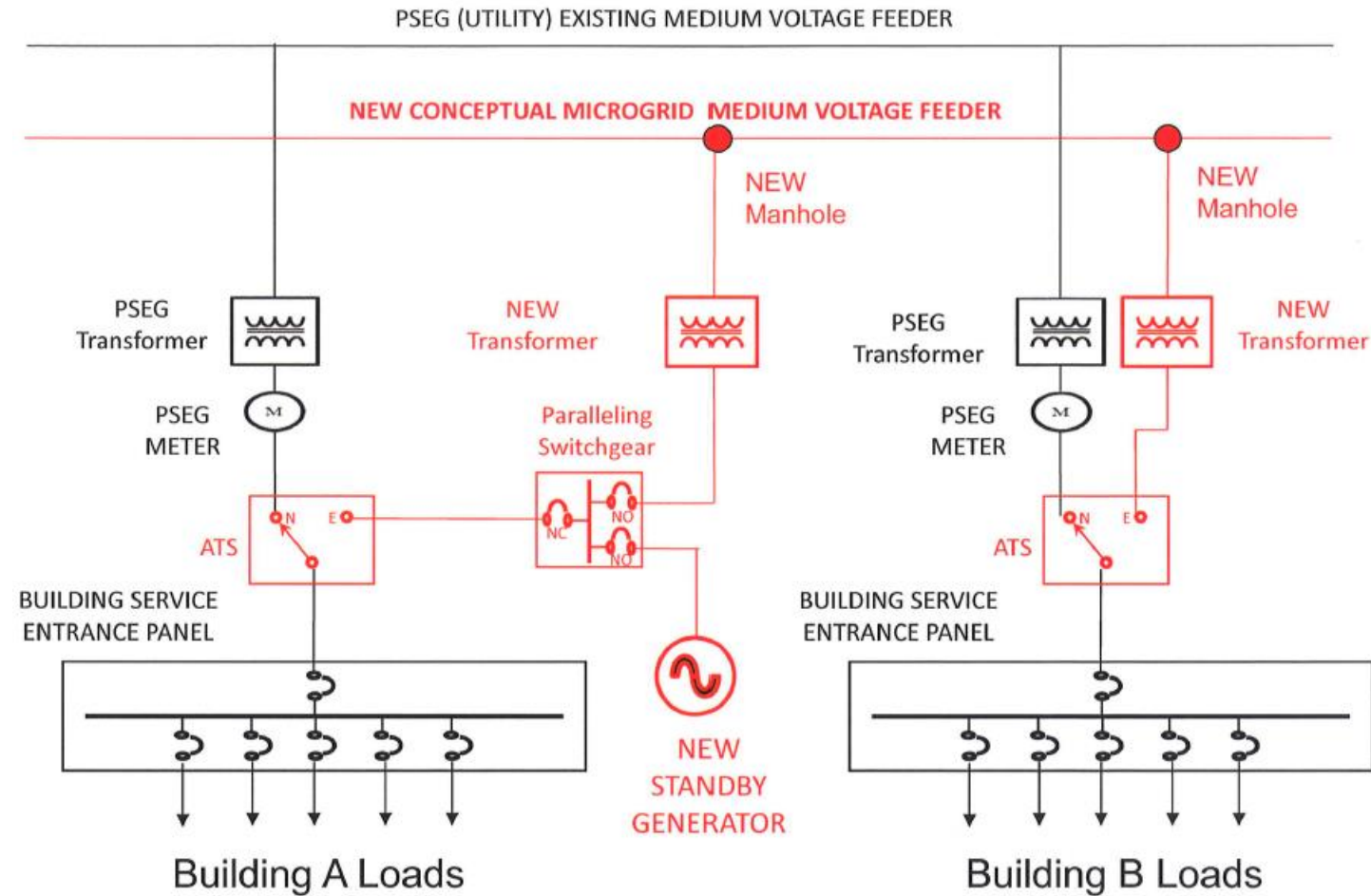
Cost Neutrality

Cost Calculation Data

Cost Calculator

Action Plan

- Do your projects utilize utility infrastructure?
- If so, what? What has been the overall utility involvement in your programs?



Microgrid Factors

- Number of grids installed is small, but growing.
- The International Energy Agency (IEA) estimate that to achieve its goal of universal access to electricity, “70% of the rural areas that currently lack access will need to be connected using mini-grid or off-grid solutions.”
- Economical storage is the key

*Solar-powered microgrids
could help bring power to
millions of the world's
poorest*



Microgrid Project Drivers

- Need for electrification in remote locations & developing countries.
- Grid security and survivability concerns.
- Demand for lower-cost energy supplies that are locally available (especially at remote sites, such as islands, military installations, and isolated communities relying on expensive, high-polluting fuels).

Microgrid Challenges

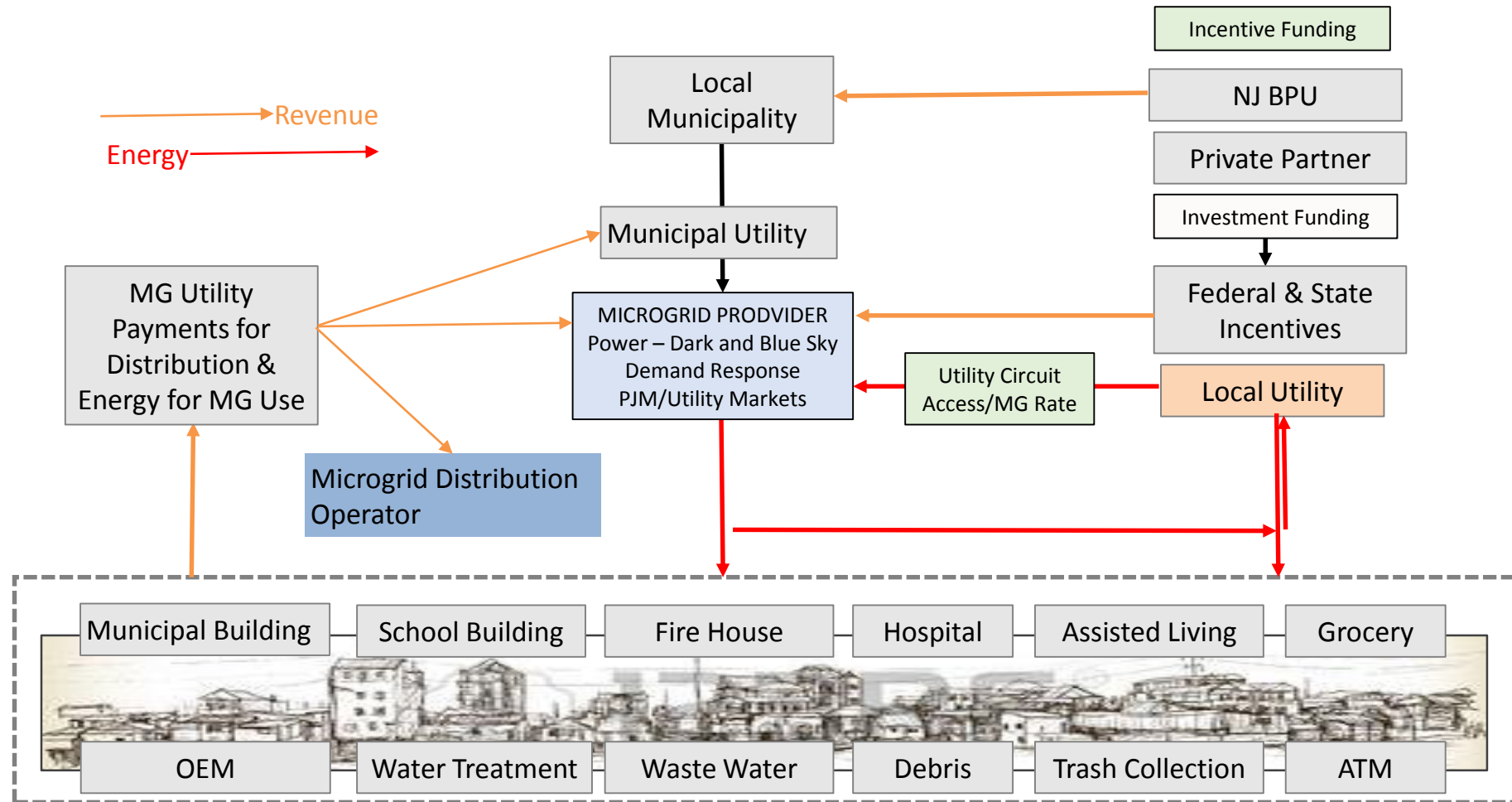
- Government policy/regulation
- Utility tariffs
- Contracting
- Financing
- Risk management
- Interconnection
- Interoperability
- Resource planning
- System operations
- Technology
- Fuel Supply Trends

Cost Sharing Agreements



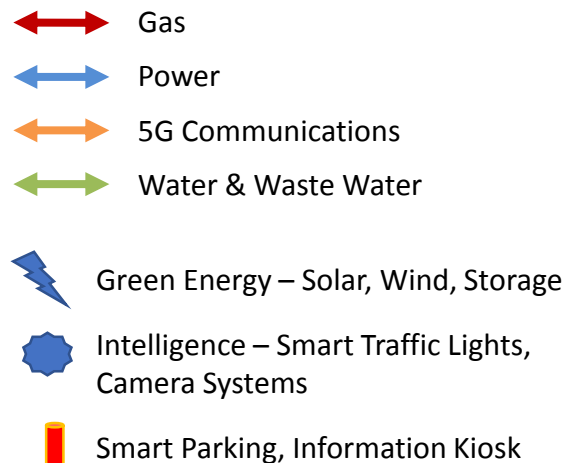
- When project financing is secured - how will microgrids get split with municipality, utility, and other partners?
- Develop agreement with stakeholders and utility company showing project components and associated cost of project implementation.
- Finalize soft & hard costs to develop construction documents.
- Secure project financing loans, grants, & purchase orders.
- Hire engineering firm to finalize construction documents.

Understanding Town Center Microgrid Concepts



Linear Development

- Any infrastructure investment that follows a common right of way such as a road or rail right of way.
- Generally, infrastructure at the distributed level follows common right of ways given the need to access populations and markets (residential, retail, commercial). Roads, sewer, water, electric, gas, telecommunications, outdoor lighting, traffic lights and critical community resources such as police, fire, government and private sector services such as gas stations and supermarkets are all part of the linear development linkage.



Thank You.

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