A RESILIENT ENERGY VISION FOR THE EAST SHORE OF STATEN ISLAND

June 29th, 2016
Part 1: Introduction to the Project Team

Part 2: Description of Staten Island East Shore
- Physical location and issues
- Electrical grid location and issues

Part 3: Proposed Concept for the Staten Island East Shore
- Facilities involved
- Technologies proposed
- Infrastructure upgrades proposed

Part 4: Cost and Benefits Analysis
- Explanation of results

Part 5: Potential Project Structure for Implementation
- Look-ahead to potential project development needs
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• One of the nation’s largest healthcare systems
• Cares for people at every stage of life at 21 hospitals and about 450 outpatient physician practices throughout the NY Metropolitan area
• Founded in 1861 as the Smith Infirmary, Staten Island University Hospital (SIUH) is one of the nation’s oldest healthcare institutions

• Energy Infrastructure Developer
• Large projects in State of NY (>$3 Billion)
• Dedicated to renewables transmission and microgrids

• Founded in 1953, one of the world’s foremost consulting engineering firms
• Extensive planning and permitting experience on Staten Island
• Retained by the Governor’s Office of Storm Recovery (GOSR) to help develop resiliency plans for Staten Island

• Multi-discipline power and energy engineering firm
• Expertise in infrastructure and utility-scale and distributed generation
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• Key causes of damage from Superstorm Sandy
Con Edison – Seaside Substation

• Con Edison typical distribution circuits are networked; fed from both ends from separate substations

• Seaside substation (33kV) in area is one of a very few in system that have “radial” distribution feeders; they are fed from a single end

• Radial feeders are inherently more prone to outages and are not “self-healing”
• Grid Repairs Post-Sandy
Physical location and issues
Electrical grid location and issues

• Community Vision for Staten Island: ISLAND / INFRASTRUCTURE
• Staten Island Community Infrastructure Assets At Risk
Physical location and issues
Electrical grid location and issues

• Staten Island University Hospital – Critical Facility in a Critical Community
• One of three Microgrid Proposed Projects Under NY Rising
Physical location and issues
Electrical grid location and issues

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The Proposed Concept:

SIUH Campus Distributed Generators

- 33 kV Campus Feed
- Possible New DER
- Existing Central Plant (DER/TGR)
- Central Plant Expansion
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Benefits and Costs

**Benefit:Cost Ratio of 3.6**

### Costs
- Emissions Damages (Grid-Connected Mode)
- Emissions Allowance Costs
- Emission Control Costs
- Fuel Costs (Grid-Connected Mode)
- Variable O&M Costs (Grid-Connected Mode)
- Fixed O&M Costs
- Capital Investments
- Initial Design and Planning Costs

### Benefits
- Major Power Outage Benefits
- Avoided Emissions Damages
- Avoided Emissions Allowance Costs
- Power Quality Improvements
- Reliability Improvements
- Distribution Capacity Cost Savings
- Generation Capacity Cost Savings
- Fuel Savings from CHP
- Reduction in Generating Costs
<table>
<thead>
<tr>
<th>COST OR BENEFIT CATEGORY</th>
<th>PRESENT VALUE OVER 20 YEARS (2014$)</th>
<th>ANNUALIZED VALUE (2014$)</th>
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<tbody>
<tr>
<td>Costs</td>
<td></td>
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<tr>
<td>Initial Design and Planning</td>
<td>$1,000,000</td>
<td>$88,200</td>
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<td>Capital Investments</td>
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<tr>
<td>Fixed O&amp;M</td>
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<td>Emission Control</td>
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<td>Emissions Allowances</td>
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<td>Emissions Damages (Grid-Connected Mode)</td>
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<td><strong>Total Costs</strong></td>
<td><strong>$172,000,000</strong></td>
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<tr>
<td>Benefits</td>
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<tr>
<td>Reduction in Generating Costs</td>
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<tr>
<td>Fuel Savings from CHP</td>
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<td>Generation Capacity Cost Savings</td>
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<tr>
<td>Distribution Capacity Cost Savings</td>
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<tr>
<td>Reliability Improvements</td>
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<td>$41,300,000</td>
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<td>Avoided Emissions Allowance Costs</td>
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<td>Avoided Emissions Damages</td>
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<td>Major Power Outage Benefits</td>
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<td><strong>Total Benefits</strong></td>
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<td><strong>Net Benefits</strong></td>
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<td>Benefit/Cost Ratio</td>
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<td>Internal Rate of Return</td>
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Potential Recovery of Capital Costs

• CHP supply to OMH under retail Power and Thermal Sales Agreements

• Peaking generation capacity under regional capacity supply contract with local utility (similar to LIPA procurement in Long Island South Fork and the Western Nassau load area)

• Infrastructure improvements recovered through agreed-upon development coordination between Con Edison and microgrid developer
Potential Business Models

- Private microgrid developer to EPC the construction of all microgrid generation and control facilities
- Developer owns, operates and sells CHP energy to host and thermal energy (when dispatched) to utility
- Depending on results of further commercial due diligence, developer may also purchase existing CHP facility at SIUH and include in the portfolio
- Commercial discussions between Con Edison and developer need to take place to determine business structure around generation and infrastructure improvements (grid upgrades, switching) – who makes the infrastructure modifications, how are parties compensated