GridSolar, LLC

GridSolar’s Boothbay Smart Grid Pilot Project

*Using a smart(er) grid to lower costs, energy use, and pollution.*

E2Tech, May 8, 2017
Grid Reliability is generally a Peak Load Problem

Maine 2017 Projected Load Duration Curve and 1,750 MW Critical Load Level
Electric Grid Reliability: Potential Solutions

Transmission Solution – Transmission upgrades to import power \textit{into} the Region, or

Non-Transmission (NTA or Non-Wires) Solution – Efficiency, DR, DG, Storage & Voltage Support, etc. \textit{within} the Region
Boothbay Smart Grid Pilot

Radial distribution circuit
Total Peak load – Approx. 30 MW.
Boothbay Smart Grid Pilot

CMP’s 10-year needs assessment
Rebuild 18 Mile 34.5 kV line to Boothbay

Transmission Solution
• $18 million construction (2010)
• $75 million booked to ratepayers - 45 years

GridSolar Alternative
• 2 MW of NTAs by 2020
  • <25 hrs Y1-3
  • <100 hrs after Y3
• Total cost – less than $6 million

NTA-Transmission Hybrid
• Substation Upgrades for Voltage Support
## NTA Resources

<table>
<thead>
<tr>
<th>kW</th>
<th>RFP I</th>
<th>RFP II</th>
<th>Totals</th>
<th>Pct.</th>
<th>$/kW M</th>
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<tbody>
<tr>
<td>Conservation</td>
<td>237.0</td>
<td>111.3</td>
<td>348.3</td>
<td>19%</td>
<td>$10.47</td>
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<tr>
<td>Solar</td>
<td>168.8</td>
<td>106.8</td>
<td>275.6</td>
<td>15%</td>
<td>$13.19</td>
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<tr>
<td>BUGS</td>
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<td>$20.63</td>
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<td>Demand Response</td>
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<td>250.0</td>
<td>13%</td>
<td>$57.65</td>
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<tr>
<td>Battery</td>
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<td>500.0</td>
<td>27%</td>
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<td>Totals</td>
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<td>968.0</td>
<td>1,873.8</td>
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### NTA Resources By Category

- Conservation: 27%
- Solar: 19%
- BUGS: 13%
- Demand Response: 15%
- Battery: 27%
NTAs in Combination to Meet Critical Load Level on Peak Days
Boothbay Pilot – Audit Test

Audit Test was performed – Friday, July 10, 2015, 2 pm
Weather Conditions – Sunny, Temperature mid 80s
Five Days in August, 2015

Figure 5

Figure 6 reproduces CMP's Figure 3 for August 17th through August 21st but adds the ... net load.
Comparison 10-year Pilot Period
66% savings

Comparison of the Annual Costs of the Transmission and NTA Solutions Over 10-Year Planning Period

- CMP Rev. Req.
- GS Costs
- GS Rev. Req.
Lifecycle Cost Comparison
NTAs saved ratepayers $74 mm

<table>
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<tr>
<th>Year</th>
<th>CMP Rev.Req.</th>
<th>GS Costs</th>
<th>GS Rev.Req.</th>
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<tr>
<td>$0</td>
<td>$5.87 Million</td>
<td>$1.75 Million</td>
<td>$75.75 Million</td>
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Cumulative Costs of the Transmission & NTA

- CMP Rev.Req.
- GS Costs
- GS Rev.Req.
PV Output Variability, 1 minute

Individual Project – 47%; Aggregate 17%
NTA Grid Services

- Network Upgrade Deferral – BB Pilot
- NTA Data – real time grid visibility
  - NTA performance
  - Available NTA Capacity
  - Gross Customer (Masked) Load
  - PV Output variability
  - Late Afternoon Production
  - Feeder Voltage Profile in real time
  - Voltage intra-hour variability
  - Phase voltage unbalance
- Distribution Voltage Management/Damping
- Conservation Voltage Reduction
- Responsive Reactive Capacity, Power Factor Management
- Ramp Rate Setting & Soft Start Reconnection
- Voltage & Frequency Ride Through – SP Island Detection
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