GridSolar, LLC

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

E2Tech Microgrids Forum

April 17, 2014
GridSolar History

   - DG Alternative to the MPRP
2. MidCoast & Port. Smart Grid Demos
   - Boothbay NTA Pilot Project
3. Alternative to CMP Rate Plan, 2013
   - Incentivize efficient use of grid
   - Demand rates based on system peak
4. Smart Grid Coordinator Petition, 2013
   - CMP & EmeraME Service Territories
   - NTAs, Smart Rates, Targeted E/R, Demand Pricing, Consumer Ed., Big Data, Smart Devices
MPRP – Central Maine Power

Proposed Solution
N5 S1 Elm

- Cost in Excess of $1.5 Billion
- More than 300 Miles of New Transmission Lines
- More than 550 private landowners impacted

Peak Load Growth
800 MW
Reliability on the CMP Grid is a Peak Load Problem

Maine 2017 Projected Load Duration Curve and 1,750 MW Critical Load Level
DG solar is better solution for CMP’s peak load

Solar is not a perfect match;
Back-up Generation and Smart Grid Technology needed
Boothbay Smart Grid Pilot

CMP’s 10-year needs assessment – at 2000 MW
Rebuild 34.5 kV line from Newcastle to Boothbay

Transmission Solution
• $18 million project (2010)
• $3 million/year

GridSolar Alternative
• 2 MW of NTAs by 2020
• <25 hrs Y1-3
• <100 hrs at Y1-Y3

NTA-Transmission Hybrid
• Substation Upgrades for Voltage Support (shock)
• 2 MW NTAs for Thermal Violations (Sag)
NTA Operations

GridSolar NTA Resource Dispatch
Boothbay Pilot – 2200 MW

Hours of the Year

KW Required

0 500 1,000 1,500 2,000 2,500 3,000 3,500

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Pilot Design

- Term – 3 Years, option to 10
- Need – up to 2 MW of NTA Res.
  - modular, can scale with load
- NTA Types – 250 kW each
  - Efficiency
  - Renewable DG (125 kW Solar)
  - Non-renewable DG (preference net zero CO2)
  - Demand Response
- Competitive Bids
  - PUC approves all contracts
- Cost recoverable in rates
### Boothbay NTA Pilot
### NTA Availability & Price Discovery

<table>
<thead>
<tr>
<th>10 year Levelized Cost</th>
<th>RFP I</th>
<th></th>
<th>RFP II</th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Bids</td>
<td>Capacity</td>
<td>$/kW Month</td>
<td>Bids</td>
<td>Capacity</td>
<td>$/kW Month</td>
<td>Price Change</td>
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<tr>
<td>Efficiency</td>
<td>2</td>
<td>156</td>
<td>$8.14</td>
<td>5</td>
<td>235</td>
<td>$16.60</td>
<td>104%</td>
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<tr>
<td>PV Solar</td>
<td>7</td>
<td>489</td>
<td>$24.86</td>
<td>8</td>
<td>456</td>
<td>$21.57</td>
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<tr>
<td>Back Up Generator</td>
<td>1</td>
<td>100</td>
<td>$130.00</td>
<td>2</td>
<td>600</td>
<td>$44.95</td>
<td>-65%</td>
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<tr>
<td>Demand Response</td>
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<td>250</td>
<td>$66.50</td>
<td>1</td>
<td>250</td>
<td>$57.65</td>
<td>-13%</td>
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<tr>
<td>Battery**</td>
<td>5</td>
<td>3500</td>
<td>$76.18</td>
<td>6</td>
<td>2500</td>
<td>$72.83</td>
<td>-4%</td>
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<tr>
<td><strong>Total Available</strong></td>
<td>16</td>
<td>4496</td>
<td>$68.89</td>
<td>22</td>
<td>4041</td>
<td>$58.69</td>
<td>-15%</td>
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</table>

* Levelized Cost of Solar 20 years, 8% Discount Rate used for all resources
** Only the largest battery bid by each provider is included
# NTA Resources

<table>
<thead>
<tr>
<th></th>
<th>RFP I</th>
<th>RFP II</th>
<th>Totals</th>
<th>Pct.</th>
<th>$/kW M</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Efficiency</strong></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><strong>Solar</strong></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><strong>BUGS</strong></td>
<td>500.0</td>
<td>0.0</td>
<td>500.0</td>
<td>27%</td>
<td>$20.63</td>
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<tr>
<td><strong>Demand Response</strong></td>
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<td>250.0</td>
<td>250.0</td>
<td>13%</td>
<td>$57.65</td>
</tr>
<tr>
<td><strong>Battery</strong></td>
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<td>500.0</td>
<td>500.0</td>
<td>27%</td>
<td>$75.99</td>
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<tr>
<td><strong>Totals</strong></td>
<td>905.8</td>
<td>968.0</td>
<td>1,873.8</td>
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**NTA Resources By Category**

- Efficiency: 27%
- Solar: 19%
- BUGS: 15%
- Demand Response: 13%
- Battery: 27%

![NTA Resources By Category Pie Chart](chart.png)
GridSolar Ops Center - Portland

- **Dispatch (SCADA) System**
  - Direct/Cellular Link to Active NTAs
  - Data loggers at Passive NTAs

- **Command Interface**
  - CMP dispatch: load, location, duration
  - GS define & issue dispatch order
    - Automated, failsafe backup
  - Real time monitoring & data logging
  - CMP collect data at substations
Comparative Costs

Note: The costs of the Hybrid components have been removed from both the CMP Transmission Solution and the GridSolar Solution.
Updates

- CMP load forecast down, will bring on fewer NTAs
  - Efficiency, Solar reduced
- BUG, DR, Battery 100% by June 1
- GridSolar SCADA
  - Partially deployed, testing
- CMP SG Platform
  - Partially deployed, testing
Boothbay Project is a Step Toward to Smart Electric Grid
GridSolar, LLC

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