Distributed Generation News and Challenges in New England

Dr. Jonathan Raab, Raab Associates, Ltd.

68th Harvard Electricity Group Plenary
October 12, 2012

www.RaabAssociates.org
35 Years as DG ‘‘Paratrooper’’

- Late 1970’s/80’s (Researcher/Biz)
  - City of Palo Alto—Comprehensive Solar and EE Plan
  - U.S. DOE SERI (NREL)—Barriers to solar in rental housing
  - Co-Owned Solar DHW Company in CA
  - President Solar Energy Assoc. of Oregon

- 1990’s to Present (Regulator, Mediator/Facilitator, Educator, Trainer)
  - Regulator—IRP at MA DPU
  - Educator—MIT Energy Policy for Sustainable Future (5 years); NE Electric Restructuring Roundtable (18 years)
  - Trainer-Engaging Stakeholders in Wind Siting/Policy (U.S DOE funded—pilot at Harvard 2011)
What’s Newsworthy in DG in MA & CT?

- Massachusetts
  - SRECs
  - Net Metering
  - Interconnection Working Group Report
  - Grid Modernization NOI
- Connecticut
  - LREC/ZREC Auction
Intro - DG Observations

- DG (behind the meter) currently “dominated by solar”
- Flood of applications (many speculative) to reserve a place under net metering caps and within acceptable saturation on feeders, and in MA to get SRECs
- Utilities can’t keep pace w/interconnection requests
- Downtown area networks (with buildings fed from multiple directions to enhance reliability) is not DG-friendly
- Siting wind near where people live is extremely contentious (first aesthetics, now noise/health concerns)
  - But even siting large PV arrays losing their sex appeal (witness opposition in Northamton, MA on capped landfill)
Installed Solar Capacity in Massachusetts

- Annual Installed Capacity (MW)
- Cumulative Installed Capacity (MW)

2002: 0.04 MW  
2003: 0.29 MW  
2004: 0.59 MW  
2005: 0.81 MW  
2006: 1.84 MW  
2007: 1.64 MW  
2008: 3.63 MW  
2009: 9.64 MW  
2010: 22.91 MW  
2011: 42.12 MW  
2012: 78.27 MW  
Total: 162 MW
A Snapshot of MA Solar Market Segments Shows Evolution

Operating Capacity 9/11 - 5/12

Development Pipeline 9/11 - 5/12

<table>
<thead>
<tr>
<th>Operating Capacity Growth</th>
<th>&lt; 25</th>
<th>25-500</th>
<th>500-1000</th>
<th>&gt; 1000</th>
<th>&lt; 25</th>
<th>25-500</th>
<th>500-1000</th>
<th>&gt; 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW/Mo (Since Sep ’11)</td>
<td>0.0</td>
<td>0.4</td>
<td>0.1</td>
<td>0.7</td>
<td>0.5</td>
<td>1.1</td>
<td>0.4</td>
<td>0.7</td>
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</table>

<table>
<thead>
<tr>
<th>Development Pipeline Growth</th>
<th>&lt; 25</th>
<th>25-500</th>
<th>500-1000</th>
<th>&gt; 1000</th>
<th>&lt; 25</th>
<th>25-500</th>
<th>500-1000</th>
<th>&gt; 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW/Mo (Since Sep ’11)</td>
<td>0.1</td>
<td>0.4</td>
<td>0.4</td>
<td>7.9</td>
<td>0.5</td>
<td>1.1</td>
<td>1.8</td>
<td>20.6</td>
</tr>
</tbody>
</table>
Application Process by Technology (kW)

<table>
<thead>
<tr>
<th></th>
<th>Applied</th>
<th>App Complete</th>
<th>Agmnt Sent</th>
<th>Authorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar</td>
<td>765,974</td>
<td>649,799</td>
<td>122,814</td>
<td>65,204</td>
</tr>
<tr>
<td>Wind</td>
<td>144,049</td>
<td>95,259</td>
<td>28,487</td>
<td>17,582</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>56,041</td>
<td>41,694</td>
<td>7,882</td>
<td>6,462</td>
</tr>
<tr>
<td>Other</td>
<td>13,367</td>
<td>12,518</td>
<td>7,796</td>
<td>6,413</td>
</tr>
</tbody>
</table>
Aggregate Success Rate (kW)

<table>
<thead>
<tr>
<th></th>
<th>Applied</th>
<th>App Complete</th>
<th>Agmnt Sent</th>
<th>Authorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Grid</td>
<td>502,717</td>
<td>457,268</td>
<td>96,430</td>
<td>49,900</td>
</tr>
<tr>
<td>NSTAR</td>
<td>395,651</td>
<td>319,054</td>
<td>63,662</td>
<td>43,695</td>
</tr>
<tr>
<td>WMECo</td>
<td>95,766</td>
<td>18,013</td>
<td>18,003</td>
<td>8,502</td>
</tr>
<tr>
<td>Unitil</td>
<td>16,216</td>
<td>14,216</td>
<td>2,541</td>
<td>2,541</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,010,350</td>
<td>808,551</td>
<td>180,636</td>
<td>104,638</td>
</tr>
</tbody>
</table>

621 MW Awaiting Agreement
### MA Solar Carve Out/SREC
#### Dynamic Minimum Standard Adjustment

<table>
<thead>
<tr>
<th>Compliance Year</th>
<th>Compliance Obligation (MWh)</th>
<th>Minimum Standard Percentage</th>
<th>Equivalent Full-Year Solar Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>34,164</td>
<td>0.0679%</td>
<td>30</td>
</tr>
<tr>
<td>2011</td>
<td>78,577</td>
<td>0.1627%</td>
<td>69</td>
</tr>
<tr>
<td>2012</td>
<td>81,559</td>
<td>0.1630%</td>
<td>72</td>
</tr>
<tr>
<td>2013</td>
<td>135,495</td>
<td>0.2744%</td>
<td>119</td>
</tr>
</tbody>
</table>

For 2012 and beyond, the Minimum Standard (Compliance Obligation) is adjusted each August according to a formula set in the program regulation.

\[
2013 \text{ Min. Stand} = 2012 \text{ Min. Stand} + [\text{Projected 2012 SRECs} - \text{Actual 2011 SRECs}] \times 1.3 - 2011 \text{ ACP Volume} + 2011 \text{ Banked Volume} + 2011 \text{ Auction Volume}
\]

**Actual 2013 Calculation**

\[
135,495 \text{ MWh} = 81,559 \text{ MWh} + [109,465 - 26,598] \times 1.3 - 53,802 + 11 + 0
\]
MA Solar SREC News

- 2011—Under-supply SRECs-about 2/3 SREC obligation met thru Alternative Compliance Payments ($550/MWh)
- 2012—Expect over-supply of SRECs
- Fall 2012--Rulemaking to make some adjustments
  - Insert 10-year forward ACP Rate schedule into regulation
  - Remove the subtraction of ACP Volume from Minimum Standard formula
- July 2013-Hold first residual SREC auction
  - For SRECs created in 2012, used for compliance in 2013 & beyond
  - Fixed price auction at $300/MWh ($285 to SREC supplier & $15 DOER auction fee)—buyers bid quantity only
  - $300 price won’t change at any point for projects qualified under the current program (first 400 MW solar installed in MA)
  - (Note: Most SRECs currently procured bi-laterally at prices in the $200’s for 1 year or a few years (not long-term)
- DOER exploring and seeking input on how to continue to incentivizing solar beyond the initial 400 MW--nothing definitive put forward yet
Recent Evolution of Net Metering Changes in MA

- **New Law (SB 2395, Chapter 209—2012)**
  - Increases net metering caps (per utility) from 1% for private projects and 2% for public to 3% for each project category, for a total of 6%
    - Note: Applications for interconnection “potentially” greater than caps at some utilities
  - Exempts small projects (10 kW on single phase and 25 kW on 3-phase power) from the cap entirely
  - Anaerobic digestion now eligible technology

- **MA DPU 11-11**
  - Utilities propose hiring Cadmus Group as a Net Metering Assurances Administrator to set up and manage a net metering queue (awaiting DPU approval posed price $3.15/kW)
  - Net metering limited to 2 MW per private “facility”, and 10 MW for public facility as long as no single “unit” (wind turbine, inverter) is above 2 MW

- **Other notable is MA has “virtual” net metering (host can allocate credits to (multiple) other customers served by same distribution utility in same ISO zone)**

“Facility”—“energy generating equipment associated with a single parcel of land, interconnected with the electric distribution system at a single point, behind a single meter”
# MA Net Metering Credits

<table>
<thead>
<tr>
<th>Credit Calculation</th>
<th>Units</th>
<th>Class I</th>
<th>Class II</th>
<th>Class III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Size or Unit Size (Govt)</td>
<td>$/month</td>
<td>≤ 60 kW</td>
<td>&gt;60 kW - ≤ 1 MW</td>
<td>&gt;1 MW - ≤ 2 MW</td>
</tr>
<tr>
<td>Customer Charge</td>
<td></td>
<td>≤ 60 kW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution Charge</td>
<td>¢/kWh</td>
<td>✓</td>
<td>✓</td>
<td>*</td>
</tr>
<tr>
<td>Transmission Charge</td>
<td>¢/kWh</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Transition Charge</td>
<td>¢/kWh</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>System Benefit Charge</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSM (EE)</td>
<td>¢/kWh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply</td>
<td>¢/kWh</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Generation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Monthly Clearing Price at the ISO-NE</td>
<td>¢/kWh</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

* Only applies to municipal or governmental Class III
MA DG Interconnection Settlement

- Interconnection process appears to be bogged down and not working as designed
- DPU re-established DG Interconnection Working Group
- Hires facilitator/mediator
- Working Group meets for 4 months—over Summer
- Consensus Package Report filed w/DPU 9/14 (only one unsettled issue), redlined tariff filed in October and Technical Conference 10/24
MA DG Interconnection WG Report Recommendations

- Allow more projects to stay in Simplified and Expedited processes (change technical screens and review process)
- Additional time for “complex” projects, and “cluster study” option
- Accurate “chess-clock” time tracking
  - Stale project mgt. protocols to boot applicants who don’t comply with timelines
  - Utility timeline assurance plan including refund of application fees and including compliance as part of Service Quality Metrics
- Uniform Technical Standards Manual, regularly updated w/DG input
- Required Pre-Application Report for applicants over 500 kW, optional for others to help reduce speculative applications
- (Only unresolved issue was to use 67% or 100% in new minimum load screen used to allow more projects to stay in Expedited review process)
MA DPU Grid Modernization NOI
(issued October 2, 2012)

- Establishes Working Group to assist DPU in developing roadmap and policy framework
  - Current Status of the Electric Grid Infrastructure as it relates to Grid Modernization;
  - Grid-Facing Technologies;
  - Customer-Facing Technologies;
  - Time-Varying Rate Design;
  - Cost and Benefits of Grid Modernization;
  - Grid Modernization Policies;
  - The Pace of Grid Modernization Implementation; and
  - Health, Interoperability, Cyber Security and Privacy.

- Kick-off workshop Nov. 14, 7-month WG process, final report to DPU in June 2013

- (Although not primarily about DG, DG is included and could be substantially enabled/impacted e.g., by time varying rates)
Connecticut’s New REC RFP Process

- RFP covers all LREC Projects and ZREC Projects >100 kW—all RECs not residual
- Open to customers and developers
- Projects will be selected, and utilities will enter into 15 year contracts to purchase the ZRECs and LRECs from selected projects
- Commit $12 million new RECs each year ($8 ZREC/$4 LREC) for total of approx. $1 billion dedicated to this REC program over 15 years
LREC & ZREC Eligibility

General Project Eligibility Criteria
- Must be located behind contracting utility distribution meter
- Must not have received funding/grants from Clean Energy Finance Investment Authority, or its predecessor the CT Clean Energy Fund (other than low cost financing)
- Projects must be in service on, or after, July 1, 2011

LRECs
- No larger than 2,000 kW
- Must have low emissions
  - <0.07 lbs/MWh NOx; <0.10 lbs/MWh CO; 0.02 lb/MWh VOCs, 1 grain per 100 standard cubic feet
- May include fuel cells and other low emission Class I resources, as well as all zero emission Class I resources

ZRECs
- No larger than 1,000 kW
- Must have zero emissions
- May include solar, hydro and wind
## Procurement Processes

### 1) Competitive Solicitation - (RFP)

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Size</th>
<th>Annual Budget</th>
<th>Renewable Energy Credit Price Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large ZRECs</td>
<td>≥250 kW to 1,000 kW</td>
<td>Approximately $2.7 M</td>
<td>Max. $350/REC</td>
</tr>
<tr>
<td>Medium ZRECs</td>
<td>&gt;100 kW &lt; 250 kW</td>
<td>Approximately $2.7 M</td>
<td>Max. $350/REC</td>
</tr>
<tr>
<td>LRECs</td>
<td>Up to 2,000 kW</td>
<td>$4 M</td>
<td>Max. $200/REC</td>
</tr>
</tbody>
</table>

### 2) Tariff (filed for PURA approval 5/14/12)

<table>
<thead>
<tr>
<th>Project Type</th>
<th>Size</th>
<th>Annual Budget</th>
<th>Renewable Energy Credit Price Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small ZRECs</td>
<td>Up to 100 kW</td>
<td>Approximately $2.7 M</td>
<td>Weighted Average of the Medium ZREC price + 10% up to $350/REC</td>
</tr>
</tbody>
</table>
Next New England Electric Restructuring Roundtable (#131): Focuses on DG 10/26

- **Evolving Regulatory Landscape for DG in New England**
  - Chairman Ann Berwick, Massachusetts Dept. of Public Utilities
  - Christie Bradway, Manager Renewable Power Contracts, Northeast Utilities
  - Fran Cummings, Vice President, Peregrine Energy Group (SEIA/SEBANE)
  - Tim Roughan, Director Energy & Environmental Policy, National Grid

- **Potential Next Wave DG-Related Resources/Technologies**
  - Phil Giudice, CEO & President, Ambri Inc. (storage)
  - Charles Fox, Dir. East Coast Regulatory Affairs, Bloom Energy (fuel cells)
  - Wayne Davis, Co-Founder/VP Gov’t Affairs, Harvest Power (anaerobic)
  - John Howe, Director of Public Affairs, FloDesign Wind Turbine
Parting DG Questions

- What will happen to solar PV prices over time?
- Will other DG technologies take off (e.g., CHP, fuel cells, anaerobic digestion, and shrouded wind)?
- How will the following transform the landscape for DG?
  - Batteries and other storage devices
    - especially vehicle-to-grid capabilities
  - AMI and time varying rates
- At what point will net metering, RECs/SRECs, RPS, and FITs no longer be needed to support DG?