Forecasting Distributed Generation

E2 Tech

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Senior External Affairs Representative
Reliability is the Core of ISO New England’s Mission

*Fulfilled by three interconnected and interdependent responsibilities*

- Overseeing the day-to-day **operation** of New England’s electric power generation and transmission system
- Developing and administering the region’s competitive **wholesale electricity markets**
- Managing comprehensive regional power **system planning**
Overview

Distributed Generation (DG) is growing

The ISO is preparing for this growth

The ISO will account for future DG growth in planning studies
Definition of Distributed Generation

*For forecasting purposes*

- Typically 5 MW or less in nameplate capacity
- Interconnected to the distribution system
  - 69 kV or below
- Follow state-jurisdictional interconnection standards
- Installed either:
  - Behind a customer load (i.e., “behind-the-meter”) or;
  - Interconnected directly to the distribution system without a customer load present
## Distributed Generation as Seen by ISO

<table>
<thead>
<tr>
<th>Category</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward Capacity Market</td>
<td>• Have obligations</td>
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<tr>
<td></td>
<td>• Contribute to Installed Capacity Requirement</td>
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<tr>
<td></td>
<td>• Well understood</td>
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<tr>
<td>Settlement Only Resources</td>
<td>• Participate in energy markets</td>
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<td></td>
<td>• Counted as load assets</td>
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<tr>
<td></td>
<td>• Understood</td>
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<tr>
<td>Other DG</td>
<td>• Existing DG that reduces load</td>
</tr>
<tr>
<td></td>
<td>• Embedded in historic loads used to forecast</td>
</tr>
<tr>
<td></td>
<td>• Not well understood</td>
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</table>
Development of the DG Forecast

• The ISO and its stakeholders identified the need to forecast future amounts of DG in New England

• To assist this process, the ISO created and chairs the Distributed Generation Forecast Working Group (DGFWG)
  – Open stakeholder group
  – Provides data and feedback

• Forecast to focus on solar photovoltaics (PV)
  – Largest sector of DG resources

• Forecast based primarily on state PV policy goals and funding
  – PV-related programs have thus far demonstrated success in achieving policy goals
ISO’s PV Data Collection

• Solicited information from New England states
  – To understand existing and future PV policy

• Distribution Utilities provided
  – Existing PV resources
  – Distribution queue information
  – DG technical interconnection requirements

• Distribution Utilities serving approximately 95% of the New England load responded!
Installed PV Capacity in New England
As of February 2014

CT 73 MW
VT 32 MW
NH 8 MW
MA 340 MW
RI 10 MW
ME 8 MW

Note: Cumulative numbers for each state are approximate and subject to change.
PV Forecast Development

- ISO estimated future PV growth based on state policy to determine gross future nameplate values
- Discounts applied to nameplate values
  - DC to AC conversion rate of 83% where appropriate
  - Application of Summer Seasonal Claimed Capability value
  - Discount factor to reflect uncertainty in PV policy achievement

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<tbody>
<tr>
<td>0% but must be confirmed via utility data</td>
<td>10%</td>
<td>15%</td>
<td>20%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>25%</td>
<td>75%</td>
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<tr>
<td>States</td>
<td>Annual Total MW (MW, AC nameplate rating)</td>
<td>Totals</td>
<td></td>
<td></td>
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<tr>
<td>CT</td>
<td>73.1</td>
<td>51.4</td>
<td>46.4</td>
<td>66.4</td>
<td>46.4</td>
<td>46.4</td>
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<tr>
<td>MA</td>
<td>361.6</td>
<td>187.2</td>
<td>138.1</td>
<td>138.1</td>
<td>131.6</td>
<td>131.6</td>
<td>131.6</td>
<td>131.6</td>
<td>131.6</td>
<td>131.6</td>
<td>1,752.8</td>
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<tr>
<td>ME</td>
<td>8.1</td>
<td>2.2</td>
<td>2.2</td>
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<td>2.2</td>
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<td>2.2</td>
<td>30.0</td>
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<td>NH</td>
<td>8.2</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
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<td>2.7</td>
<td>2.7</td>
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<td>2.7</td>
<td>2.7</td>
<td>35.4</td>
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<tr>
<td>RI</td>
<td>10.9</td>
<td>8.1</td>
<td>6.3</td>
<td>4.7</td>
<td>4.7</td>
<td>4.7</td>
<td>4.7</td>
<td>4.7</td>
<td>4.7</td>
<td>4.7</td>
<td>62.8</td>
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<tr>
<td></td>
<td><strong>Annual Policy-Based MWs</strong></td>
<td>493.6</td>
<td>274.5</td>
<td>211.9</td>
<td>223.3</td>
<td>198.6</td>
<td>192.1</td>
<td>148.7</td>
<td>148.7</td>
<td>17.1</td>
<td>14.4</td>
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<tr>
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<td><strong>Annual Post-Policy MWs</strong></td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>4.7</td>
<td>4.7</td>
<td>48.0</td>
<td>48.0</td>
<td>179.7</td>
<td>182.4</td>
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<tr>
<td></td>
<td><strong>Annual Nondiscounted Total (MW)</strong></td>
<td>493.6</td>
<td>274.5</td>
<td>211.9</td>
<td>223.3</td>
<td>203.3</td>
<td>196.7</td>
<td>196.7</td>
<td>196.7</td>
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<tr>
<td></td>
<td><strong>Cumulative Nondiscounted Total (MW)</strong></td>
<td>493.6</td>
<td>768.1</td>
<td>980.1</td>
<td>1,203.3</td>
<td>1,406.6</td>
<td>1,603.3</td>
<td>1,800.1</td>
<td>1,996.8</td>
<td>2,193.6</td>
<td>2,390.3</td>
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</table>

Discounted MWs

|        | Total Discounted Annual | 493.6 | 247.1 | 180.1 | 178.6 | 150.1 | 145.2 | 123.5 | 123.5 | 57.7 | 56.4 | 49.7 | 1,805.6 |
|        | Total Discounted Cumulative | 493.6 | 740.7 | 920.8 | 1,099.4 | 1,249.5 | 1,394.7 | 1,518.3 | 1,641.8 | 1,699.5 | 1,755.9 | 1,805.6 |

Final Summer SCC (MW) Based on 35%  [Assume Winter SCC equal to zero]

|        | Annual: Total Discounted SSCC (MW) | 172.8 | 86.5 | 63.0 | 62.5 | 52.5 | 50.8 | 43.2 | 43.2 | 20.2 | 19.7 | 17.4 | 632.0 |
|        | Cumulative: Total Discounted SSCC (MW) | 172.8 | 259.2 | 322.3 | 384.8 | 437.3 | 488.2 | 531.4 | 574.6 | 594.8 | 614.6 | 632.0 |

Notes:
(1) Yellow highlighted cells indicate that values contain post-policy MWs
Use of the DG Forecast in System Planning

• Will appear in the 10-yr forecast of capacity, energy, loads and transmission (CELT) in May 2014

• ISO intends to use data from the DG forecast in the following types of analyses:
  – Transmission Needs Assessments
  – Transmission Solutions Studies
  – Proposed Plan Application Studies
  – System Impact Studies
Key Challenges of Large-Scale Adoption of DG

• Growing penetrations of DG could impact grid reliability
  – Regional interconnection standards for DG are generally consistent with IEEE Standard 1547™
  – IEEE 1547™ is a “don’t ride through” requirement
  – May lose significant amounts of DG after grid disturbance (if interconnected according to current IEEE standards)
  – Efforts are needed to improve state-jurisdictional interconnection
Distributed Generation Forecast Working Group

Regional forum for interested parties to provide input to ISO-NE concerning the distributed generation forecast.

2014 Distributed Generation Data Collection
- Agenda
- Materials

2013 Distributed Generation Data Collection
- Materials
- Minutes