

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

Managing comprehensive regional power **system planning**

Developing and administering the region's competitive **wholesale electricity markets**



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

Forward Capacity Market

- Have obligations
- Contribute to Installed Capacity Requirement
- Well understood

Settlement Only Resources

- Participate in energy markets
- Counted as load assets
- Understood

Other DG

- Existing DG that reduces load
- Embedded in historic loads used to forecast
- Not well understood



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

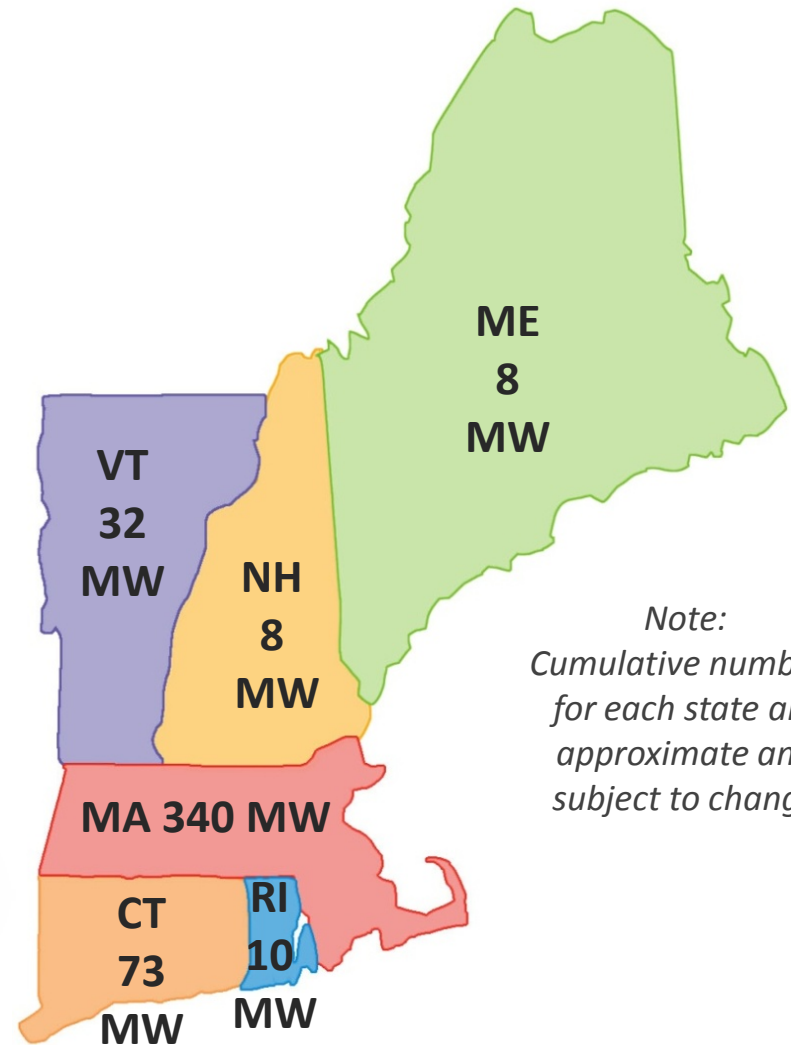
ISO's PV Data Collection

- 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



*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

Policy-based MWs											Post-policy MWs
Through 2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
0% but must be confirmed via utility data	10%	15%	20%	25%	25%	25%	25%	25%	25%	25%	75%

Final Interim PV Forecast

States	Annual Total MW (MW, AC nameplate rating)											Totals
	Thru 2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
CT	73.1	51.4	46.4	66.4	46.4	46.4	46.4	46.4	46.4	46.4	46.4	561.8
MA	361.6	187.2	138.1	138.1	138.1	131.6	131.6	131.6	131.6	131.6	131.6	1,752.8
ME	8.1	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	30.0
NH	8.2	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	35.4
RI	10.9	8.1	6.3	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	62.8
VT	31.7	22.8	16.2	9.2	9.2	9.2	9.2	9.2	9.2	9.2	6.8	141.8
Annual Policy-Based MWs	493.6	274.5	211.9	223.3	198.6	192.1	148.7	148.7	17.1	14.4	2.2	1,925.0
Annual Post-Policy MWs	0.0	0.0	0.0	0.0	4.7	4.7	48.0	48.0	179.7	182.4	192.2	659.7
Annual Nondiscounted Total (MW)	493.6	274.5	211.9	223.3	203.3	196.7	196.7	196.7	196.7	196.7	194.4	2,584.7
Cumulative Nondiscounted Total (MW)	493.6	768.1	980.1	1,203.3	1,406.6	1,603.3	1,800.1	1,996.8	2,193.6	2,390.3	2,584.7	2,584.7

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	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	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



For More Information: www.iso-ne.com/dgfwg



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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

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