



Distributed Generation/PV in the Forward Capacity Market

*Distributed Generation Forecast Working
Group*

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Presentation Outline

- Demand Resource Treatment in Load Forecast
- Qualification Requirements
 - Information Requirements
 - Submittal Timeline
 - FCM Study Process Timeline
 - Qualification Review
 - Critical Path Schedule and Performance Monitoring
 - Cost Recovery and Financial Assurance
- Additional Requirements
- Appendix: Demand Resources in ISO-NE Forward Capacity Market Presentation

Load Forecast and Associated Studies

- The load forecast is used to determine:
 - Installed Capacity Requirement
 - Local Sourcing Requirements
 - Maximum Capacity Limits
 - Transfer Limit Determination
 - Capacity Zone modeling
 - Qualification of New Resources
 - De-list Bid and Non-Price Retirement analyses



FCM Qualified and Cleared Demand Resources

- Demand Resource (EE, DG, load management) reductions in the historical period that received Forward Capacity Market (FCM) payments for these reductions, or
- Demand Resource reductions that are expected to receive FCM payments by participating in the upcoming Forward Capacity Auction or having cleared in a previous Forward Capacity Auction,
- Shall be added back into the appropriate historical loads to ensure that such resources are not reflected as a reduction in the load forecast

FCM Qualified Demand Resources

- Installed or forecasted to be installed Demand Resources that qualify to participate in the Forward Capacity Auction as new capacity
 - Pursuant to MR1, Section III.13
- Participates, but does not clear in the Forward Capacity Auction
- Shall not be reflected as a reduction in the load forecast



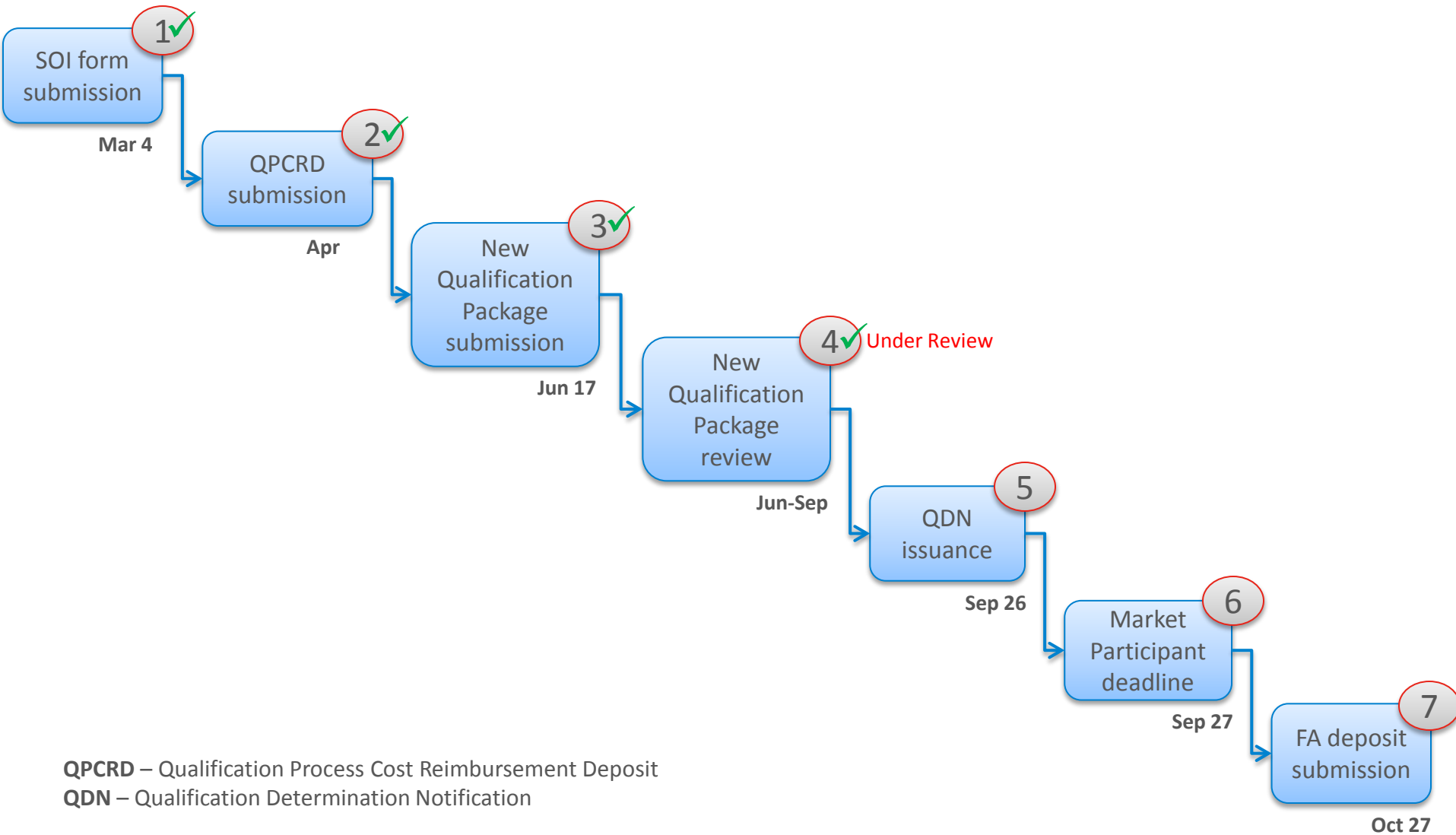
Non FCM Demand Resource

- Installed or forecast Demand Resource not qualifying for or not participating in the Forward Capacity Auction shall be reflected as a reduction in the load forecast once they are in-service
- These resources shall be included in the load forecast to the extent that they meet the qualification process rules, including monitoring and verification plan and financial assurance requirements
 - Pursuant to MR1, Section III.12.8
- A means to incorporate other reductions in the Load Forecast for FCM purposes, beyond what is already explicit in the Tariff, is yet to be determined

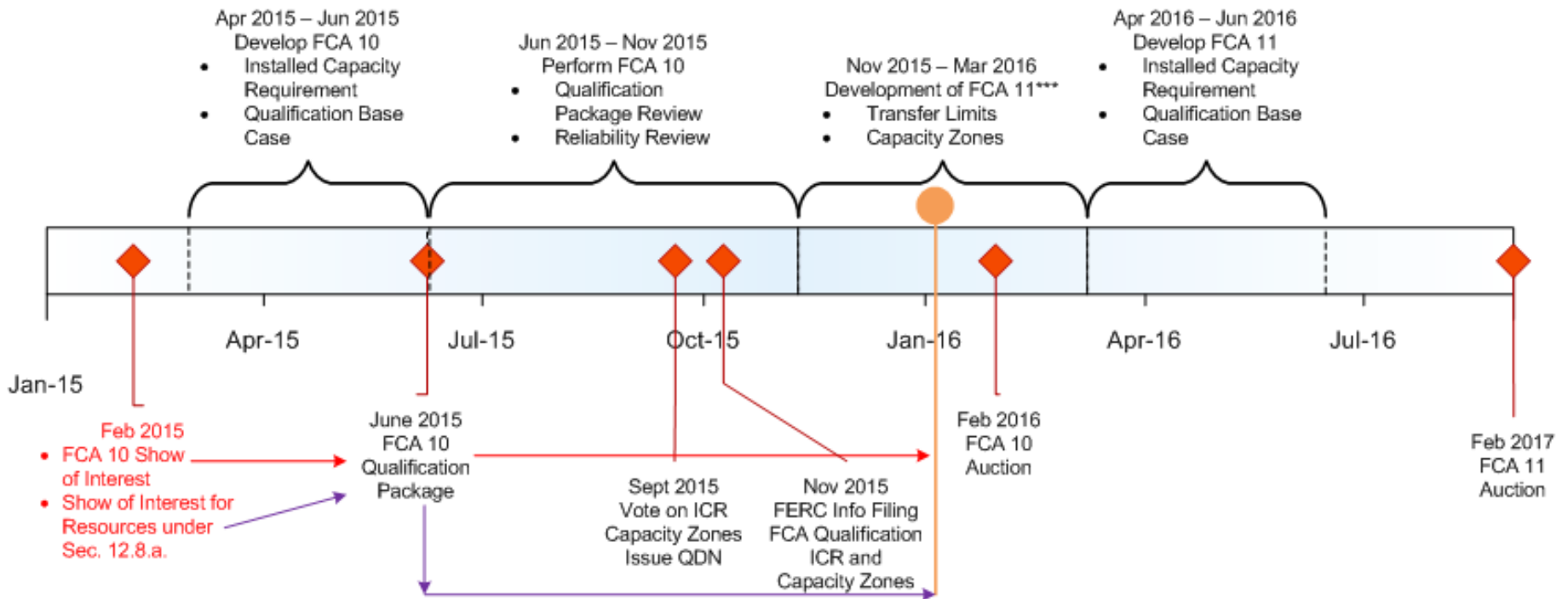
FCM Qualification Information Required of Demand Resources

- Show of Interest
- Project Description
- Measurement and Verification Plan
- Critical Path Schedule
- Customer Acquisition Plan
- Funding Plan
- Offer Review Trigger Price

Qualification Process Timeline



FCM Study Process Timeline



* FCA Cycle - not all events illustrated in this example, refer to MR 1 Section 13 and ISO Manuals for all requirements

** FCA 10 – Commitment Period 2019-20

*** FCA 11 – Commitment Period 2020-21

Qualification Package Review

- Determine Tariff compliance
 - Meets definition of Demand Resource
 - Measureable and Verifiable Reductions
 - Verification of Proposed Capacity Values
 - Estimates of Installed Measures
 - Renewable Resource Capacity Calculation
 - Utilization of the Capacity Estimator Tool or outside consultant
 - Practicality of Commercial Operation Date
 - Critical Path Schedule – funding, site control, permits, equipment availability, equipment delivery, commission
 - Customer Acquisition for aggregations

Solar PV Qualified Capacity Estimator

Scope: Provides estimated summer and winter qualified capacity calculations for solar PV systems in New England (Maine, Vermont, New Hampshire, Massachusetts, Connecticut and Rhode Island)

Estimator Inputs:

- Latitude and Longitude
- Tracker - single-axis (north-south) tracker not designed to estimate qualified capacity for a dual-axis tracker
- Azimuth
- Tilt
- Module Type - Mono-Crystalline and Poly- Crystalline are crystalline Silicon and Thin Film (First Solar) is CdTe (Cadmium Telluride)
- Project Size - AC size in kW

Wind Qualified Capacity Estimator

Scope: Provides estimated summer and winter qualified capacity calculations for wind projects in New England

Estimator Inputs:

- Name Plate Capacity (MW)
- IEC Class - IEC design class of the wind turbine either a 1, 2, 3
- Elevation (m)
- Summer Average Wind Speed (m/s) and Winter Average Wind Speed (m/s)
- Summer QCP Wind Speed (m/s) - summer Qualified Capacity Period (QCP) wind speed, average annual median wind speed for June through Sept during the hours 1400 and 1800
- Winter QCP Wind Speed (m/s) - winter Qualified Capacity Period (QCP) wind speed, average annual median wind speed for October through May during the hours 1800 and 1900
- Confidence - confidence or probability of exceedance of the predicted values can be selected. The default confidence is the P50 (Optional).

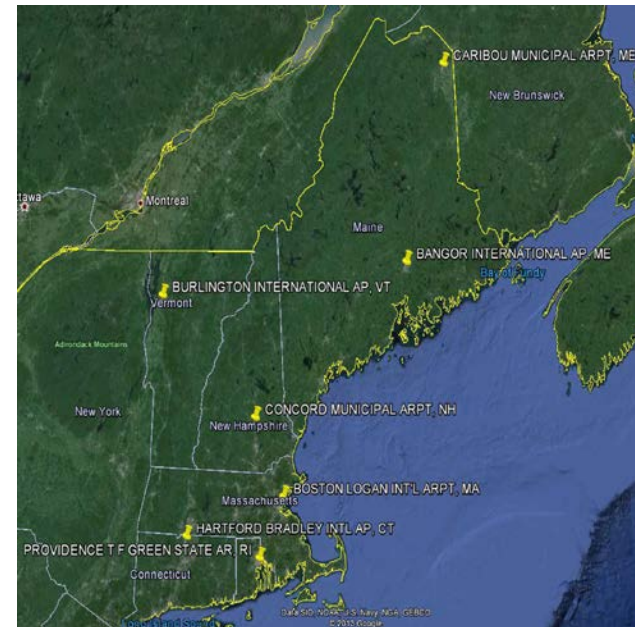
Qualified Capacity Estimator Data Sources

Solar

Weather sources are typical meteorological years (TMY3) weather files available from the National Renewable Energy Laboratory (NREL) for selected sites in ISO New England's service area (image below)

Wind

Data from the NREL Eastern Renewable Generation Integration Study is used to develop relationships of qualified capacity to the inputs provided on the Inputs sheet using multiple linear regression. The regression parameters from these relationships are used in estimating the summer and winter qualified capacities.



Qualification Costs

- Qualification Package Cost Recovery Deposit - \$1000/project
 - Actual ISO costs billed to project sponsor for QP review and CPS monitoring; true-up each November
- Financial Assurance (FA)
 - \$2/kW required after issuance of FCA Qualification Determination Notification
 - Balance of FA required prior to the auction (auction starting price)

Critical Path Schedule Monitoring

- Monitor Resources until the Resource achieves Commercial Operation
- Enable qualification for Reconfiguration Auctions according to projected Commercial Operation Date
- Project Sponsors submit quarterly CPS updates or monthly updates depending on project status
- Project Sponsors submit documentation in support of schedule submittals including: Major milestones, performance data, customer pipeline or a combination of these and other relevant documents

Withdrawal from CPS Monitoring

- Project Sponsor may withdraw its resource from critical path schedule monitoring by the ISO at any time by submitting a written request to the ISO
- The ISO also may deem a resource withdrawn from critical path schedule monitoring if the Project Sponsor does not adhere to the requirements of MR1 Section III.13.3
- Any resource withdrawn from critical path schedule monitoring shall lose its Capacity Supply Obligation and its right to any payments associated with that Capacity Supply Obligation in the Capacity Commitment Period, and it shall forfeit any financial assurance provided with respect to that Capacity Supply Obligation

Demand Resource Performance

Passive Demand Resources

Passive Demand Resources report performance during on-peak or seasonal-peak performance hours, in the applicable seasonal performance months

Resource Type	Performance Months	Days	Performance Hours
On-Peak	Summer: June, July, August Winter: December, January	M-F, non-holidays	Summer: H.E. 14:00-17:00 Winter: H.E. 18:00-19:00
Seasonal Peak	Summer: June, July, August Winter: December, January	M-F, non-holidays	Hours where load \geq 90% of the most recent 50/50 system peak load

Registration and Monthly Performance Submission

- Distributed Generation On-Peak Demand Resources
 - Register each DG facility as an Asset in the ISO-NE Customer Asset Management System (CAMS)
 - DG performance is the average hourly output over the performance hours for the month (MW)
 - Report hourly DG output values for all assets using the Meter User Interface in Settlement Management System for the performance hours
 - Must be submitted during the 2.5 business days after the end of the month



Additional Requirements

- Distributed Generation as a Demand Resource must have a nameplate rating less than 5 MW or nameplate rating less than the non-coincident peak load at the facility (legal boundary at which the generator is located) for the prior 12 months, whichever is greater
- Demand Resources including Energy Efficiency and Distributed Generation may not participate in wholesale energy markets
- Demand Resources without a Capacity Supply Obligation
 - Have no financial assurance requirement*
 - Are not subject to penalty under Two Settlement FCM* but may be eligible for performance payment

Summary

- FCM provides three methods to include Demand Resources:
 - Inclusion in historical loads
 - Qualification for participation in the FCA and receive a Capacity Supply Obligation pursuant to Tariff Section III.13.1
 - Qualification to reduce the Load Forecast pursuant to Tariff Section III.12.8 (no Capacity Supply Obligation)
- Processes for FCA 9 (Capacity Commitment Period 2018-19) are near complete, and it is too late to adjust any FCM studies
- Consideration for including other reductions in the Load Forecast for FCM purposes beyond what is already explicit in the Tariff, if determined to be appropriate, needs to occur before the end of 2014 in order to be included in FCA 10 processes

APPENDIX

Demand Resources in ISO-NE Forward Capacity Market

April 2, 2014



Demand Resources in ISO-NE Forward Capacity Market

Distributed Generation Forecast

Working Group

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RESOURCE ANALYSIS AND INTEGRATION, SYSTEM PLANNING



Objectives of a Forward Capacity Market

Procure enough capacity to meet New England's forecasted Demand approximately three years in advance

Provide compensation for the Capacity Cost of an existing Generation, Import or Demand Resource

Attract New Resources to Constrained Regions through an additional source of income

Implement a Penalize-for-non-Performance approach for not providing capacity during a shortage event

Eligible Resources

- Supply Resources
 - Traditional Generation (oil, coal, natural gas, etc.)
 - Intermittent Generation (wind, solar, etc.)
 - Imports
- Demand Resources
 - Energy Efficiency
 - Load Management
 - Distributed Generation
- Minimum project size = 100 kW



Demand Resource Categories

- Passive Demand Resources (passive DR)
 - On-Peak & Seasonal Peak
 - Defined at a Load Zone
 - Reduce energy demand (MW) during peak hours
 - Are *non*-dispatchable
- Active Demand Resources (active DR)
 - Demand Response Resources & Real-Time Emergency Generation
 - Defined at a Dispatch Zone
 - Reduce energy demand (MW) during reliability hours
 - Operate based on energy market and real-time system conditions via dispatch by ISO



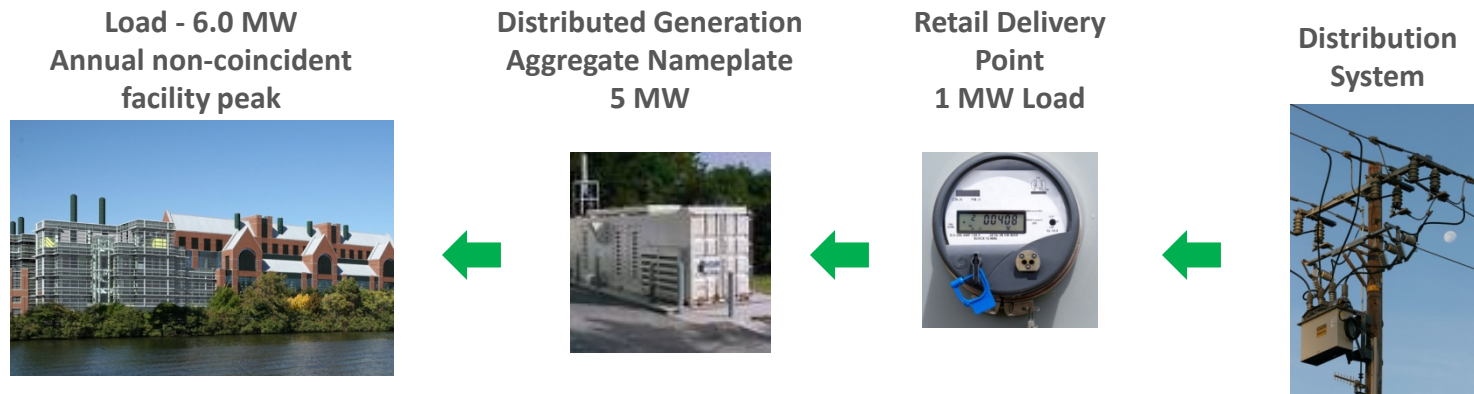
Minimum Criteria for Demand Resources

Partial Listing

- Resource size 100 kW
- Equipment installed after applicable cutoff (approximately 48 months before primary delivery date)
- Annual host facility load must exceed name plate rating (DG <5 MW allowed to push back)
- Operation during Resource Type performance hours
- Appropriate metering configuration
- Monthly reporting capability
- Market participant
- Able to post Financial Assurance
- Deliverable to System (Overlapping Impact Test for Active)

Distributed Generation DR Measures

Distributed Generation* means generation resources directly connected to end-use customer load and located behind the end-use customer's Retail Delivery Point for the end-use customer, which reduce the amount of energy that would otherwise have been produced by other capacity resources on the electricity network in the New England Control Area during Demand Resource On-Peak Hours, Demand Resource Seasonal Peak Hours, Demand Resource Critical Peak Hours, Real-Time Demand Response Event Hours, or Real-Time Emergency Generation Event Hours, provided that the aggregate nameplate capacity of the generation resource does not exceed 5 MW, or does not exceed the most recent annual non-coincident peak demand of the end-use metered customer at the location where the generation resource is directly connected, whichever is greater.



* ISO NEW ENGLAND INC. TRANSMISSION, MARKETS AND SERVICES TARIFF, General Terms and Conditions Section I.2.2.

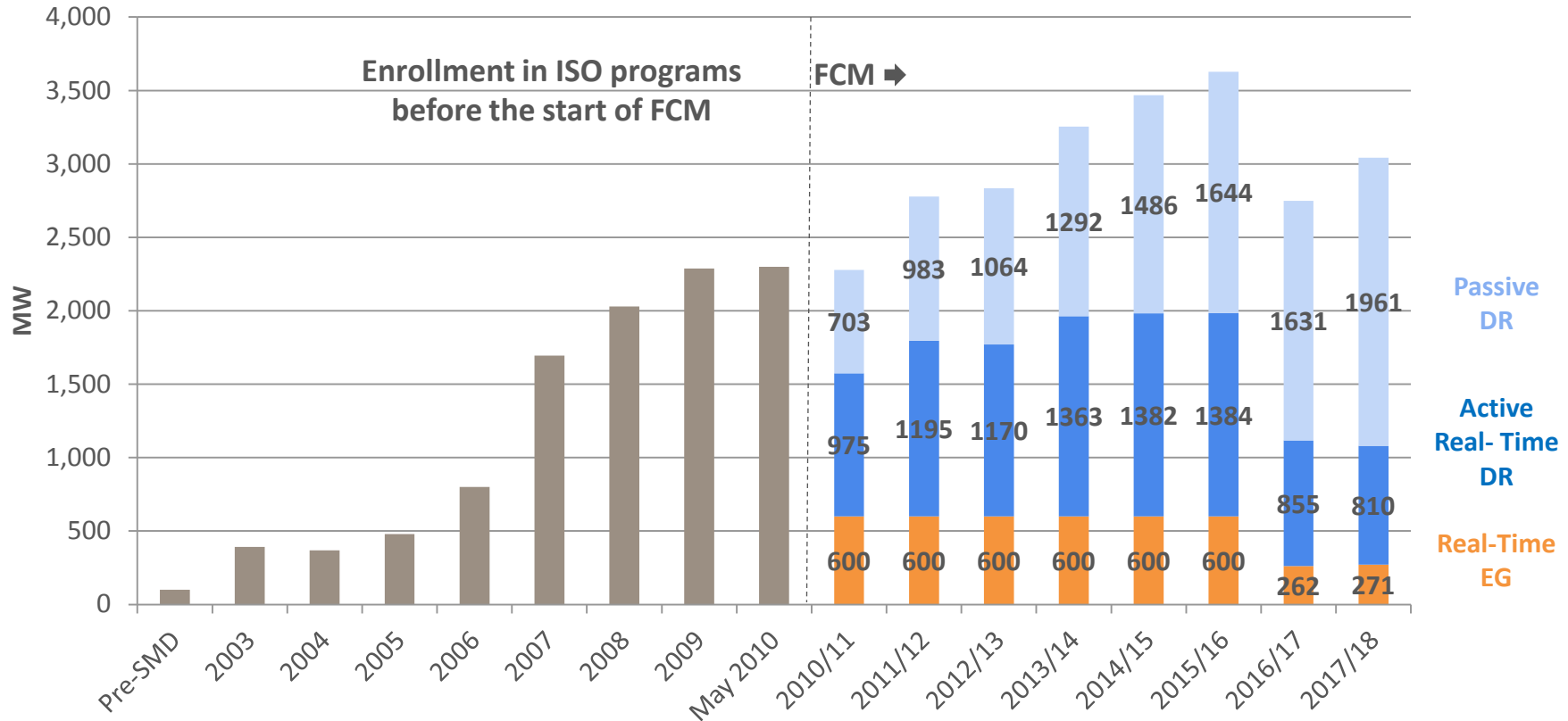
Measurement & Verification for Metered Loads

- Metered loads include: Option B Retrofit Isolation/Metered Equipment
 - Demand response, emergency generation and distributed generation
- Utilize interval meter data (15 minute or less) on Generator and host load at Retail Delivery Point
- Demand Response and Emergency Generation utilizes interval data and Base Line Telemetry System (BLTS)
 - Data is reported and collected near real-time (5 minute tele-metered)
 - Interval data is used to calculate baseline and Demand Reduction Values (DRV) by ISO system software
- Demand Response and Emergency Generation Distributed Generation measure baseline utilizes Type 1 performance evaluation methodology pursuant to ISO-NE Measurement and Verification of Demand Reduction Value from Demand Resources (M-MVDR)
- On-Peak and Seasonal Peak Distributed Generation baseline utilizes Meter Generator Output performance evaluation methodology pursuant to M-MVDR



Demand Resources in New England Capacity Market

Demand Resource Participation in Region



Note : Total real-time emergency generation (EG) capped at 600 MW:
 Cap reached for FCAs #1 – #6 (2010/11–2014/16); RTEG cleared below cap over last two auctions

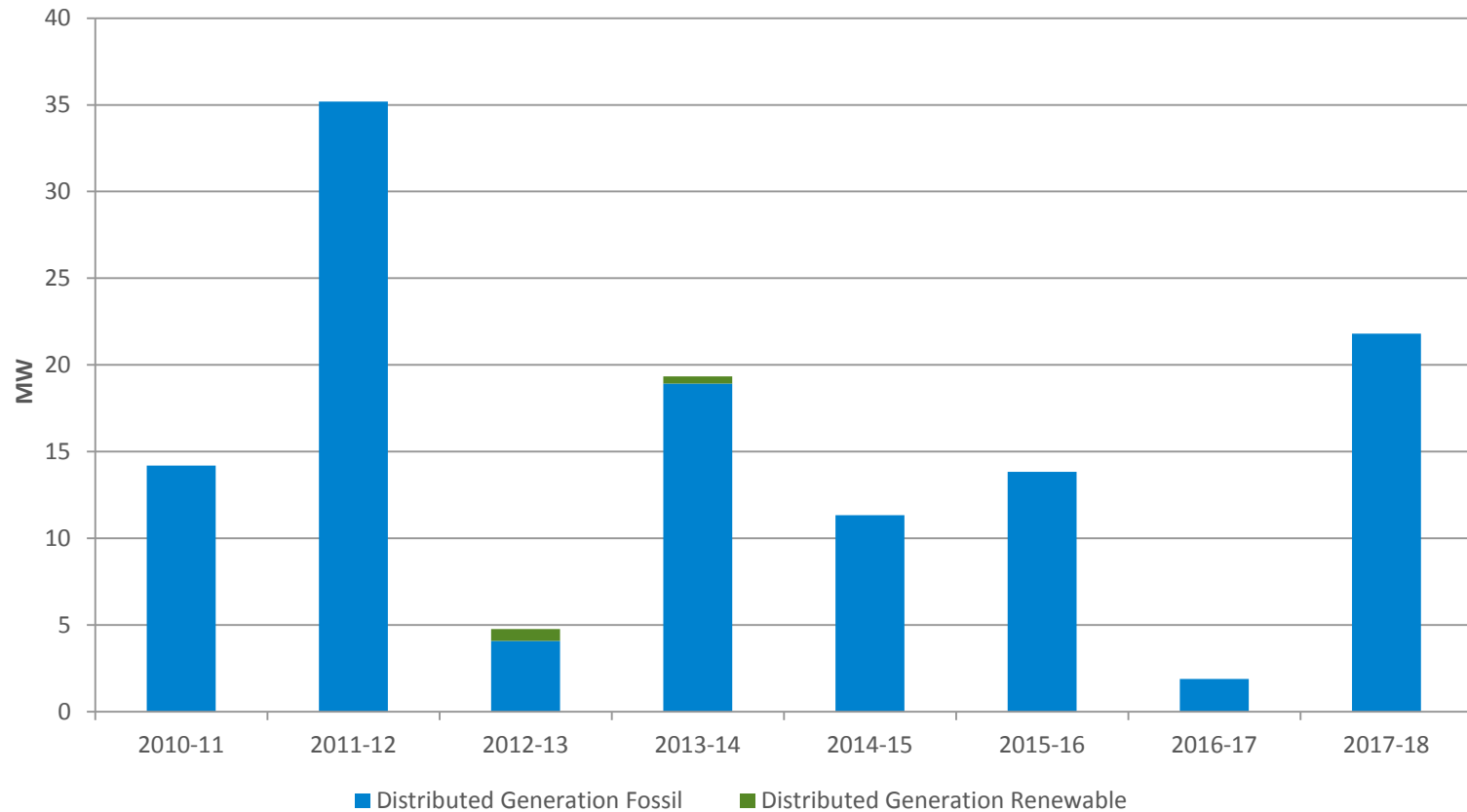
Source data: ISO-NE FCA Auction Results filings

FCA Cleared Demand Resources by Measure Type in MW*

Commitment Period	Distributed Generation Fossil	Distributed Generation Renewable	Energy Efficiency	RTDR & Load Management	Emergency Generation	Grand Total
2010-11	46.309	0.168	654.543	977.718	874.824	2553.562
2011-12	92.681	0.171	890.378	1194.779	758.603	2936.612
2012-13	86.236	0.682	974.635	1205.788	630.297	2897.638
2013-14	126.921	1.188	1166.503	1366.621	688.209	3349.442
2014-15	130.675	1.188	1350.556	1385.628	721.807	3589.854
2015-16	255.378	1.188	1513.619	1257.925	616.734	3644.844
2016-17	212.757	1.229	1537.611	734.223	262.213	2748.033
2017-18	214.030	1.188	1844.227	710.627	270.524	3040.596

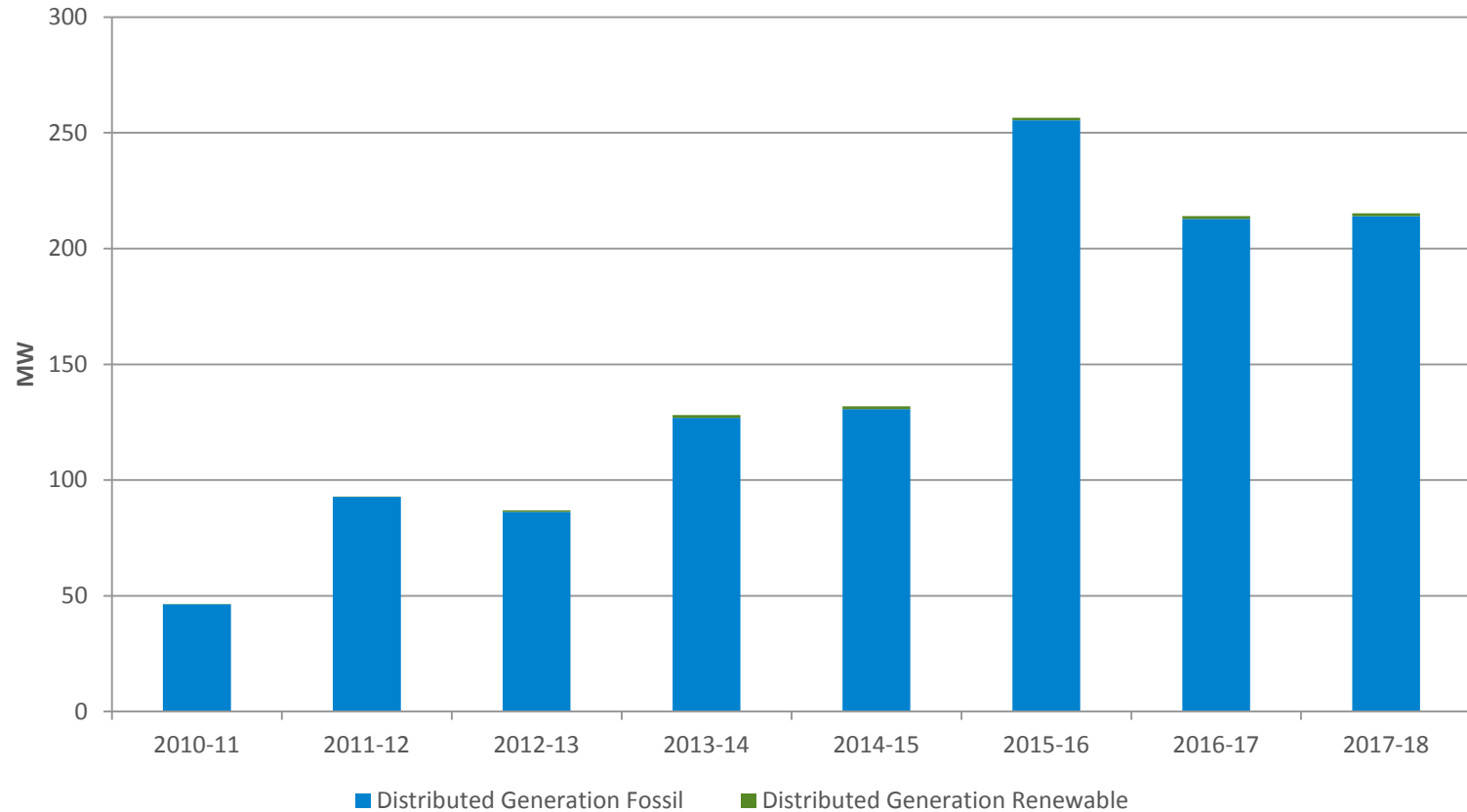
*This information represents ISO New England's estimate of measure types of Demand Resource projects that cleared in prior FCAs based on project descriptions, asset registration, and CPS monitoring, all values in MW and include the applicable gross-up factor. Source data: ISO-NE FCA Auction Results filings

New DG Cleared in Forward Capacity Market



*This information represents ISO New England's estimate of measure types of Demand Resource projects that cleared in prior FCAs based on project descriptions, asset registration, and CPS monitoring, all values include the applicable gross-up factor. Source data: ISO-NE FCA Auction Results filings. Renewable includes wind, solar and biomass.

All DG Cleared in Forward Capacity Market



*This information represents ISO New England's estimate of measure type of Demand Resource projects that cleared in prior FCAs based on project descriptions, asset registration, and CPS monitoring, all values include the applicable gross-up factor. Source data: ISO-NE FCA Auction Results filings. Renewable includes wind, solar and biomass.

Added notice 9/15/2014:
These data are effective April 2014

Current DG Performance 2013-14

DR TYPE/Fuel Type	Summer MW	Winter MW
On-Peak Demand Resource	70.485	58.58
Biomass	0.256	2.608
Distillate Fuel Oil	0.002	0.222
Natural Gas	64.648	54.631
Other	0.186	0.342
Purchased Steam	1.199	0
Solar	4.194	0
Wind	0	0.777
Real-Time Demand Response Resource	211.428	110.728
Distillate Fuel Oil	59.066	34.311
Natural Gas	31.065	3.356
Other	83.56	52.708
Purchased Steam	6.968	0.797
Water at a Conventional Hydroelectric Turbine	30.769	19.556
Real-Time Emergency Generation Resource	167.748	148.589
Distillate Fuel Oil	165.013	142.408
Natural Gas	2.733	1.33
Other	0.002	4.851
Total	449.661	317.897

*This information represents ISO New England's estimate of fuel types based on Demand Resource Asset registration and recent preliminary or final performance data, all values are in DRV.

SETTLEMENT ONLY RESOURCES IN FCM

Non Demand Resource Distributed Generation

Settlement Only Resources (SORs)

AKA settlement only generators (SOGs)

*Generation resources that are generators of less than 5 MW or otherwise eligible for Settlement Only Resource treatment as described in ISO New England Operating Procedure No. 14 and that have elected Settlement Only Resource treatment as described in the ISO New England Manual for Registration and Performance Auditing**

- Intermittent and non-intermittent SORs may participate in the Forward Capacity Market
- Solar and wind SORs generally have not qualified for the Forward Capacity Auction and do not have Capacity Supply Obligations
- The remaining SORs that do have a Capacity Supply Obligations are primarily existing resources in service prior to June 1, 2010

* ISO NEW ENGLAND INC. TRANSMISSION, MARKETS AND SERVICES TARIFF, General Terms and Conditions Section I.2.2.

Settlement Only Resources

As of March 2014

Fuel Type	Summer Season				Winter Season			
	Settlement Only Resources*		Forward Capacity Market Resources†		Settlement Only Resources*		Forward Capacity Market Resources†	
	Count	SCC (MW)‡	Count	Qualified Capacity (MW)	Count	SCC (MW)	Count	Qualified Capacity (MW)
Distillate Fuel Oil	12	26.839	11	28.487	12	28.889	11	29.578
Landfill Gas	24	31.467	21	32.873	24	33.513	21	36.566
Muni Solid Waste	3	7.970	3	8.194	3	8.417	3	8.338
Natural Gas	4	0.000	1	0.224	4	0.000	1	0.188
Other Biomass	11	5.247	7	5.499	11	5.865	6	5.598
Purchased Steam	1	0.000	1	30.000	1	0.000	1	30.000
Solar	360	39.473	14	7.894	360	10.071	0	0.000
Water	220	104.073	182	83.750	220	121.427	201	152.137
Wood/Wood Waste	4	0.000	0	0.000	4	0.223	0	0.000
Wind	46	5.984	7	1.195	46	9.515	8	3.866
Total	685	221.053	247	198.116	685	217.920	252	266.271

* SCC Source: http://www.iso-ne.com/genrtion_resrcs/snl_clmd_cap/2014/scc_march_2014.xls

† Qualified Capacity Source: http://www.iso-ne.com/markets/othrmkts_data/fcm/cal_results/ccp18/fca18/fca_8_results_v2.xlsx

‡ These data reflect summer values measured in 2013 (Added footnote 9/15/2014)

Questions

