Agenda Item 2.0

PSPC Meeting 275

April 12, 2010

ISO Installed Capacity Requirements (ICR), Representative Future Net ICR and Operable Capacity Analysis for RSP10

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Objective of this Presentation

- Present the New England Net Installed Capacity Requirement (ICR), Representative Future Net ICR and Operable Capacity Analysis covering the 2010 - 2019 Capability Years

- Review the load, capacity and transmission assumptions used to simulate the New England bulk power supply system for calculating these Net ICRs

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Purpose of Representative Future Net ICR Calculation

- Forecast of representative capacity needed for the NERC Long Term Resource Adequacy Assessment (LTRA) and for the 2010 Regional System Plan (RSP10)

- To provide a high level overview of where New England stands in terms of future resource needs

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Notes

- 2009 Capacity, Energy Loads and Transmission Report (CELT) Load Forecast was used to calculate:
  - Net ICR for 2010/11 3rd Annual Reconfiguration Auction (2010/11 ARA3)
  - Net ICR for the 2011/12 2nd Annual Reconfiguration Auction (2011/12 ARA2)
  - Net ICR for the 2012/13 Forward Capacity Auction (FCA3)

- 2010 CELT Load Forecast was used to calculate:
  - Net ICR for the 2013/14 Forward Capacity Auction (FCA4)
  - Representative Future Net ICR for 2014/15 – 2019/20

Actual Net ICR for 2010/11 – 2013/14

- Net ICR for 2010 is the 31,110 MW value approved by FERC for the 2010/11 ARA3
- Net ICR for 2011 is the 31,741 MW value approved by FERC for the 2011/12 ARA2
- Net ICR for 2012 is 31,965 MW value approved by FERC for FCA3
- Net ICR for 2013 is the 32,127 MW ISO recommended value for FCA4 to be filed with FERC by April 30, 2010

Net ICR and Representative Future Net ICR

Year	CELT 2010 Forecast 50/50 Peak (MW)	Net ICR and Representative Future Net ICR (MW)	Annual Resulting Reserve Margin (%)	Assumed Existing ICAP (MW)
2010	27,190	31,110	14.4	32,666
2011	27,660	31,741	14.8	33,016
2012	28,165	31,965	13.5	37,026
2013	28,570	32,127	12.5	35,440
2014	29,025	32,672	12.6	35,440
2015	29,450	33,178	12.7	35,390
2016	29,785	33,604	12.8	35,218
2017	30,110	34,025	13.0	35,112
2018	30,430	34,434	13.2	35,112
2019	30,730	34,818	13.3	35,112

- **Net ICR values for 2010/11 – 2012/13 are the latest values approved by the FERC (shown with 2010 CELT Load Forecast of 50-50 Peaks but calculated with 2009 CELT Load Forecast). Net ICR value for 2013 is the ISO recommended ICR for 2013/14**
- **Assumed Existing ICAP for 2010/11 through 2012/13 reflect the most recent FCM obligations as of March 12, 2010 for those years but with reserve-margin gross up, if any, for both New York Power Authority imports (NYPA) and demand resources removed**
- **Assumed Existing ICAP for 2014 and beyond are based on the 2012/13 obligations as of March 12, 2010 but with non-grandfathered capacity imports removed and the full amount of RTEGs included**
- **The resulting reserve margin calculated for 2010 - 2012 are higher than if calculated with the 2009 CELT forecast value used to determine these ICRs**

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Net ICR Calculation Details

	Total Monthly Capacity									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Internal Installed Capacity	29,820	32,207	32,566	32,716	32,716	32,716	32,716	32,716	32,716	32,716
Tie Benefits	1,860	1,800	1,665	1,700	1,700	1,700	1,700	1,700	1,700	1,700
Imports/Sales	807	2,284	1,684	1,114	1,114	1,114	1,114	1,114	1,114	1,114
Demand Response	2,173	2,529	2,809	3,130	3,130	3,130	3,130	3,130	3,130	3,130
OP 4 Actions 6 & 8 - Min. Reserve	451	454	569	213	219	226	231	236	240	245
Expansion Unit Capacity	-	-	-	-	-	-	-	-	-	-
Capacity	35,111	39,275	39,293	38,873	38,879	38,886	38,891	38,896	38,900	38,905

	Installed Capacity Requirement Calculation Details									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Annual Peak	28,160	28,575	29,020	28,570	29,025	29,450	29,785	30,110	30,430	30,730
Capacity	35,111	39,275	39,293	38,873	38,879	38,886	38,891	38,896	38,900	38,905
Tie Benefits	1,860	1,800	1,665	1,700	1,700	1,700	1,700	1,700	1,700	1,700
HQICCs	1,400	911	914	916	916	916	916	916	916	916
OP 4 - Action 6 & 8	651	654	569	413	419	426	431	436	440	445
Minimum Reserve Requirement	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
ALCC	1,735	5,088	4,625	4,298	3,809	3,357	2,974	2,597	2,232	1,890
Installed Capacity Requirement	32,297	32,336	32,879	33,043	33,588	34,094	34,520	34,941	35,350	35,734
Net ICR	30,897	31,425	31,965	32,127	32,672	33,178	33,604	34,025	34,434	34,818

$$Installed\ Capacity\ Requirement\ (ICR) = \frac{Capacity - Tie\ Benefits - OP4\ Load\ Relief}{1 + \frac{ALCC}{APk}} + HQICCs$$

- **ALCC is the "*Additional Load Carrying Capability*" used to bring the system to the 0.1 Days/Year Loss of Load Expectation (LOLE) Reliability Criterion**
- **2010 - 2012 Net ICR is calculated with the 2009 CELT Load Forecast which is shown here**
- **2010 & 2011 Net ICR also have 213 MW and 316 MW of Reserve Margin Gross-up Adjustment applied to the final values**

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Operable Capacity Analysis

- The system-wide operable capacity analysis is used to estimate the net capacity that will be available under specific scenarios
- The analysis identifies *operable capacity margins* (i.e., the amount of resources that must be operational to meet peak demand plus operating-reserve requirements) under assumed 50/50 and 90/10 peak-load conditions
- The results of these examinations show either a positive or negative operating margin in meeting system operating requirements
- A negative margin for a specific scenario indicates the extent of possible mitigation actions that would be required through predefined protocols, such as ISO Operating Procedure No. 4 (OP 4), *Action during a Capacity Deficiency*

Operable Capacity Analysis Assumptions

- The Operable Capacity Analysis, on slides 10 – 11, assumes the available capacity (Total Net Capacity) as the Net ICR minus 2,100 MW of summer “Allowance for Unplanned Outages”

- All Real-Time Emergency Generator Demand Resources obligated in the FCM are included in the “Total Net Capacity”, therefore they are not part of capacity relief from implementing OP 4 Actions

RSP10 Operable Capacity Analysis

Capacity Situation (Summer MW)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Load (50/50 forecast)	27,190	27,660	28,165	28,570	29,025	29,450	29,785	30,110	30,430	30,730
Operating reserves	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Total Requirement	**29,190**	**29,660**	**30,165**	**30,570**	**31,025**	**31,450**	**31,785**	**32,110**	**32,430**	**32,730**
Installed Capacity (Net ICR)	31,110	31,741	31,965	32,127	32,672	33,178	33,604	34,025	34,434	34,818
Assumed unavailable capacity	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)
Total net capacity	**29,010**	**29,641**	**29,865**	**30,027**	**30,572**	**31,078**	**31,504**	**31,925**	**32,334**	**32,718**
Operable capacity margin	(180)	(19)	(300)	(543)	(453)	(372)	(281)	(185)	(96)	(12)

Capacity Situation (Summer MW)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Load (90/10 forecast)	29,310	29,835	30,390	30,840	31,340	31,810	32,180	32,545	32,895	33,225
Operating reserves	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Total Requirement	**31,310**	**31,835**	**32,390**	**32,840**	**33,340**	**33,810**	**34,180**	**34,545**	**34,895**	**35,225**
Installed Capacity (Net ICR)	31,110	31,741	31,965	32,127	32,672	33,178	33,604	34,025	34,434	34,818
Assumed unavailable capacity	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)	(2,100)
Total net capacity	**29,010**	**29,641**	**29,865**	**30,027**	**30,572**	**31,078**	**31,504**	**31,925**	**32,334**	**32,718**
Operable capacity margin	(2,300)	(2,194)	(2,525)	(2,813)	(2,768)	(2,732)	(2,676)	(2,620)	(2,561)	(2,507)

- **Assumed unavailable capacity of 2,100 MW reflects the summer "Allowance for Unplanned Outages", consistent with the amount assumed in the ISO-NE 2010 Operable Capacity Analysis used for generator maintenance scheduling**

- **Installed Capacity is assumed to be the NET ICR and it consists of generation, imports and Demand Resources, including Real-Time Emergency Generators**

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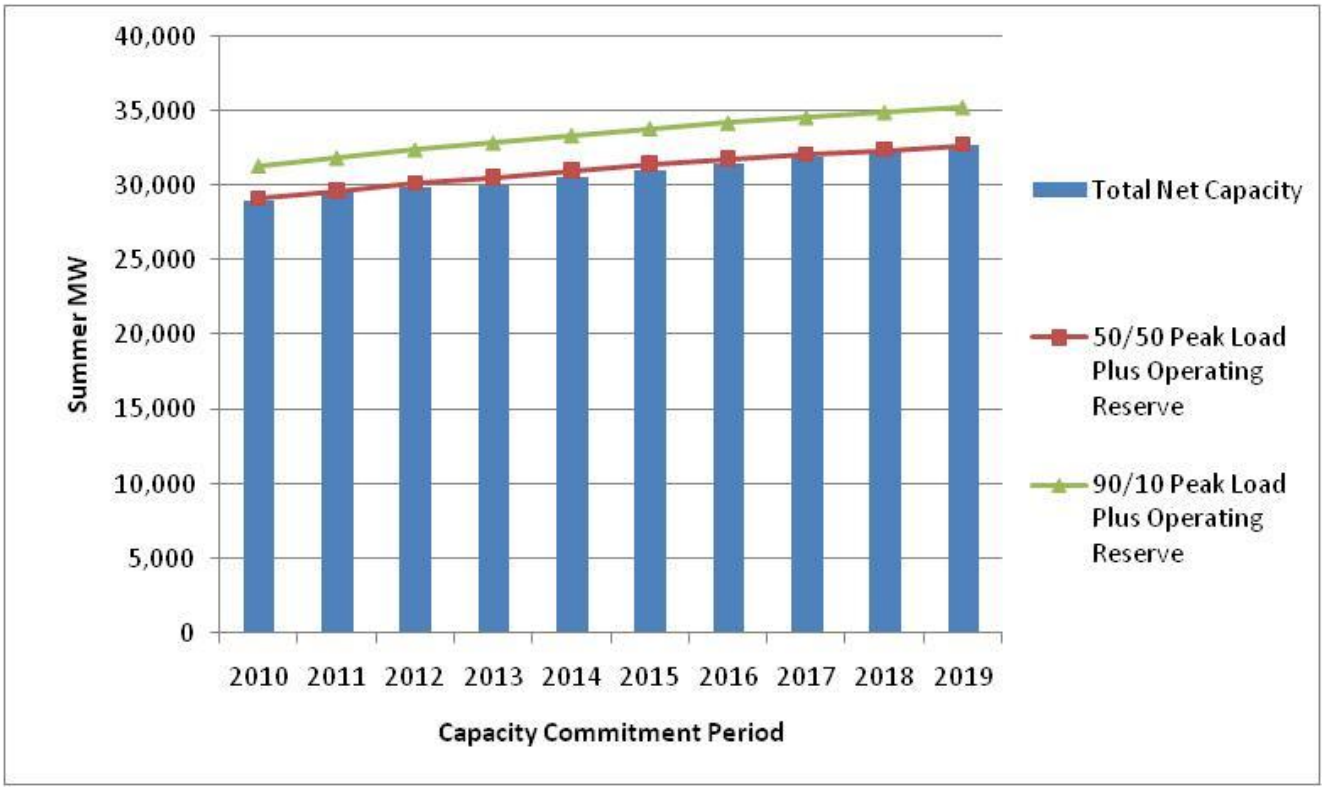
RSP10 Operable Capacity Analysis



- Net Capacity is the Net ICR minus the 2,100 MW assumed summer "Allowance for Unplanned Outages"
- Operating Reserve is assumed to be 2,000 MW

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Observations

- New England will have to rely on the expected load relief of approximately 2,200 – 2,900 MW from implementing OP 4 Actions to meet the 90/10 projected peak load forecast demand, if there is no surplus installed capacity above the net ICR

Assumptions for Calculating Representative Future Net ICR

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Net ICR for 2010/11 – 2013/14

- For more detail on the assumptions relating to the calculation of Net ICR for the following capacity commitment periods see:
  - 2010/11 ARA3: http://www.iso-ne.com/committees/comm_wkgrps/relblty_comm/relblty/mtrls/2009/oct222009/a2_icr_values.pdf
  - 2011/12 ARA2: http://www.iso-ne.com/committees/comm_wkgrps/relblty_comm/relblty/mtrls/2009/dec152009/a6_icr_values_2011_2012_ara2.pdf
  - 2012/13 FCA: http://www.iso-ne.com/committees/comm_wkgrps/relblty_comm/relblty/mtrls/2009/may192009/icr_values_2012_13_rc_05_19_2009.pdf
  - 2013/14 FCA: http://www.iso-ne.com/committees/comm_wkgrps/relblty_comm/relblty/mtrls/2010/mar172010/index.html

Modeling the New England Control Area

The New England Net ICR and Representative Net ICR are calculated using a single area Loss of Load Expectation (LOLE) model (Westinghouse Capacity Model Program)

- Calculations are based on the methodology described in Section III.12 of Market Rule 1 – Calculation of Capacity Requirements

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Load Forecast Data

- **Load forecast assumed is the 2010 CELT Report Load Forecast for 2013/14 - 2019/20**

- **The load forecast weather related uncertainty is represented by a weekly distribution of daily peak loads for calculating system resource adequacy.**
  - Weekly distributions of daily peak loads represented by the expected value (mean), the standard deviation and the skewness

Load Forecast Data – New England System Load Forecast

Probability Distribution of Annual Peak Load (MW) used for Net ICR for 2013/14 and Representative Net ICR for 2014 - 2019

Year	Peak Load Forecast at Milder Than Expected Weather				Reference Forecast at Expected Weather	Peak Load Forecast at More Extreme Than Expected Weather				
	10/90	20/80	30/70	40/60	50/50	60/40	70/30	80/20	90/10	95/5
2013	27,230	27,470	27,795	28,160	28,570	29,005	29,450	30,085	30,840	31,490
2014	27,665	27,905	28,240	28,610	29,025	29,465	29,915	30,560	31,340	32,000
2015	28,070	28,315	28,650	29,030	29,450	29,895	30,355	31,010	31,810	32,480
2016	28,390	28,640	28,975	29,360	29,785	30,235	30,700	31,365	32,180	32,865
2017	28,700	28,950	29,295	29,680	30,110	30,565	31,035	31,705	32,545	33,240
2018	29,005	29,260	29,605	29,995	30,430	30,890	31,365	32,040	32,895	33,600
2019	29,290	29,545	29,895	30,290	30,730	31,195	31,675	32,360	33,225	33,940

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OP 4 Assumptions – Actions 6 & 8 Voltage Reduction (%)

Capacity Commitment Period	Action 6 & 8 5% Voltage Reduction Assumption (MW)
2010 & 2011	2.35%
2012	2.65%
2013 - 2019	1.50%

- Impact of implementing a 5% voltage reduction expressed as a percent of load is calculated
  - using a five year average of 2005 - 2009 spring and fall voltage reduction tests for 2010 & 2011
  - using the average results of the 2008 spring and fall voltage reduction tests for 2012
  - using the proposed ISO Operations value of 1.5% for 2013 – 2019

- These percentage values are used as multipliers against the 50-50 summer and winter peak load to obtain MW values

Summary of Resource and OP 4 Assumptions for 2010 through 2019 (MW)

Type of Resource	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Generating Resources	28,768	31,122	31,444	31,629	31,629	31,629	31,629	31,629	31,629	31,629
Intermittent Power Resources	1,052	1,085	1,123	1,086	1,086	1,086	1,086	1,086	1,086	1,086
Demand Resources	2,173	2,529	2,809	3,130	3,130	3,130	3,130	3,130	3,130	3,130
Import Resources	807	2,284	2,164	1,356	1,356	1,356	1,356	1,356	1,356	1,356
Export Delist	-	-	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)
Import Derating due to TTC	-	-	(55)	(142)	(142)	(142)	(142)	(142)	(142)	(142)
OP 4 Voltage Reduction	651	654	769	413	419	426	431	436	440	445
Minimum Operating Reserve	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
Tie Benefits	1,860	1,800	1,665	1,700	1,700	1,700	1,700	1,700	1,700	1,700
HQICCs (Included in Tie Benefits)	1,400	911	914	916	916	916	916	916	916	916
Total MW Modeled in ICR	**35,111**	**39,275**	**39,618**	**38,872**	**38,878**	**38,885**	**38,890**	**38,895**	**38,899**	**38,904**

Notes:

- For Generating Resources, only the summer capacity values are modeled
- Intermittent Power Resources have both the summer and winter capacity values modeled
- Demand Resources values include the 8% Transmission & Distribution gross-up
- Import Resources are modeled with deratings due to Transmission Transfer Capability (TTC)
- OP 4 Voltage Reduction includes both Action 6 and Action 8 MW assumptions
- Minimum Operating Reserve of 200 MW is the minimum Operating Reserve requirement for transmission system security
- Totals may not sum due to rounding

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Summary of Resource Availability Assumptions for 2013 - 2019

Resource Category	Summer MW	Assumed Average EFORd or FOR Weighted by Summer Ratings (%)	Assumed Average Maintenance Weeks Weighted by Summer Ratings
Total System Generation	**31,629.152**	**4.9**	**4.3**
Combined Cycle	11,385.119	4.6	5.8
Fossil	9,332.675	7.2	4.3
Nuclear	4,628.670	1.4	3.1
Hydro (Includes Pumped Storage)	3,027.321	1.9	2.6
Combustion Turbine	2,914.483	6.7	2.0
Diesel	226.111	5.7	1.0
Miscellaneous	114.773	7.5	5.0
Intermittent Power Resources	**1,086.057**	**0.0**	**0.0**
Import Resources	**1,114.100**	**3.4**	**0.0**
Total Demand Resources	**3,130.140**	**16.0**	**0.0**
On-Peak	792.340	0.0	0.0
Seasonal Peak	273.369	0.0	0.0
Real-time Demand Response	1,251.999	24.0	0.0
Real-time Emergency Generators	812.432	27.0	0.0

Notes:

- EFORd is calculated as a 5-year average of the latest ISO submitted NERC GADS data
- Intermittent Power Resources are assumed as 100% available since their outage history is incorporated in their ratings
- Non-system backed imports are modeled with NERC Class Average EFORd for large hydro
- FOR (for Demand Resources) is an assumed Forced Outage Rate based on historical performance of current Demand Resources

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Questions?