

Agenda Item 2.0

PSPC Meeting 276

April 22, 2010

Local Resource Adequacy Requirements (LRA), Maximum Capacity Limits (MCL) and Representative Future LRA & MCL for RSP10

Maria Agustin

Objective of this Presentation

- For the 2010 – 2019 Capability Years:
 - Present the Local Resource Adequacy Requirements (LRA) and Representative Future LRA for the Connecticut (CT) and NEMA/Boston Load Zones
 - Present the Maximum Capacity Limits (MCL) and Representative Future MCL for the Maine Load Zone
- Review the load, capacity and transmission assumptions used to simulate these values

Purpose of Representative Future LRA & MCL Calculations

- Forecast of representative locational capacity needs for the 2010 Regional System Plan (RSP10)
- To provide a high level overview of where the current import and export constrained load zones stand in terms of future resource needs

Market Rule Changes Relating to LSR and LRA

- The Forward Capacity Market (FCM) market rule changes relating to the calculation of zonal requirements were filed by the ISO with the FERC on February 22, 2010 under “ER10-787-000, Various Revisions To FCM Rules Related to FCM Redesign”
- The Local Sourcing Requirements (LSR) calculated for the 2010/11 ARA3, 2011/12 ARA2 and 2012/13 FCA were determined by the probabilistic MARS calculation with the “As Is” methodology.
- The LSR for the 2013/14 FCA was based on the revised market rules and the Transmission Security Analysis (TSA) set the LSR, as it was higher than the LRA requirement (calculated with the “At criteria” methodology).
- All Representative Future LRA and MCL values were calculated “At criteria.”
- Details of the filing and rule changes can be found at the link below:

http://www.iso-ne.com/regulatory/ferc/filings/2010/feb/er10-____-000_02-22-10_fcm_redesign_filing.pdf

Load Zones Modeled

- For this study, only the current import constrained load zones of CT and NEMA/Boston and the current export constrained ME load zone were modeled
- No consideration was given to whether these load zones would continue to be import or export constrained in the future. Nor were any other load zones considered in this study.

Notes

- 2009 Capacity, Energy Loads and Transmission Report (CELT) Load Forecast was used to calculate:
 - LSR & MCL for the 2010/11 3rd Annual Reconfiguration Auction (2010/11 ARA3)
 - LSR & MCL for the 2011/12 2nd Annual Reconfiguration Auction (2011/12 ARA2)
 - LSR & MCL for the 2012/13 Forward Capacity Auction (FCA3)
- 2010 CELT Load Forecast was used to calculate:
 - LRA & MCL for the 2013/14 Forward Capacity Auction (FCA4)
 - Representative Future LRA & MCL for 2014/15 – 2019/20

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

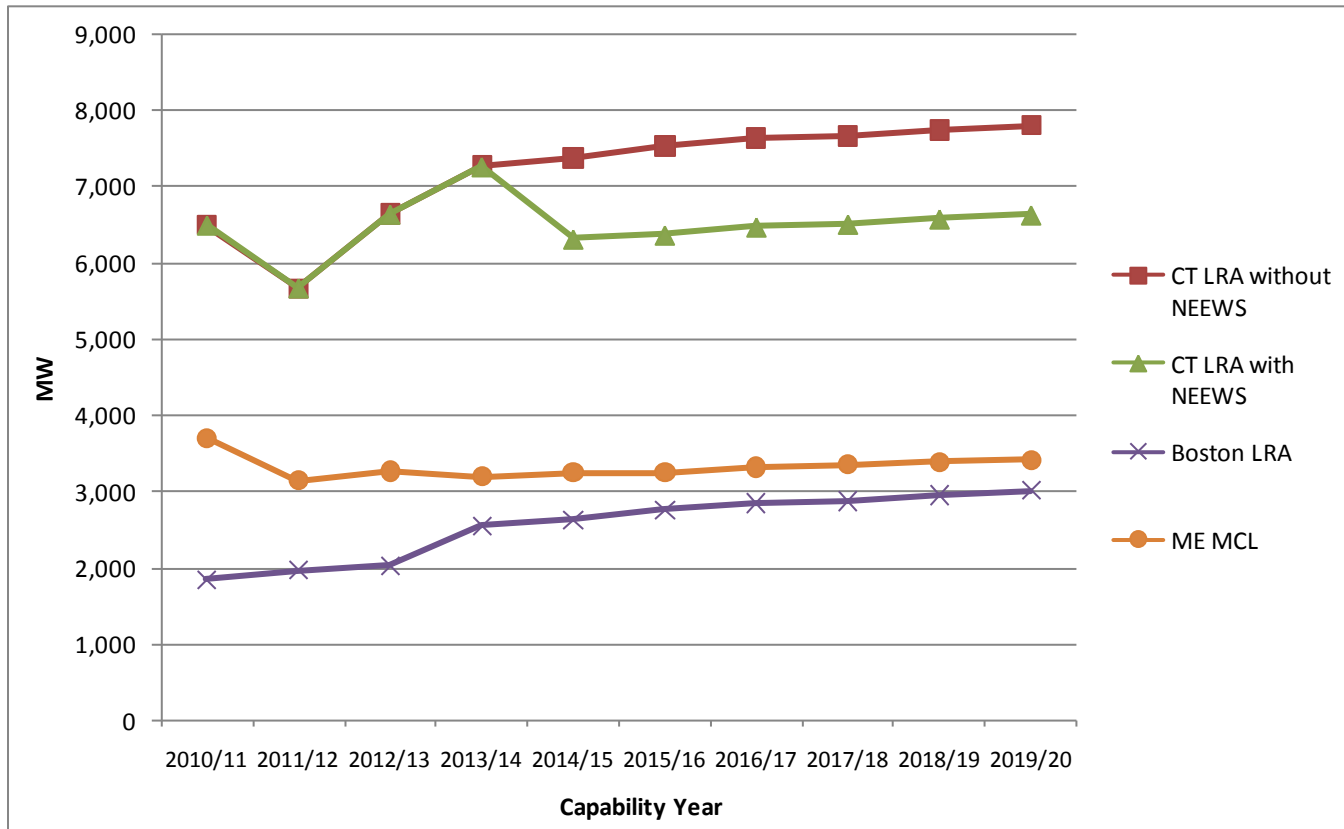
- Net ICR values for 2010/11 – 2012/13 are the latest values approved by the FERC (shown with 2010 CELT Load Forecast of 50-50 Peaks but calculated with 2009 CELT Load Forecast). Net ICR value for 2013 is the ISO recommended ICR for 2013/14
- Assumed Existing ICAP for 2010/11 through 2012/13 reflect 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. The value for 2012/13, which is the value reflected in the 2010 CELT report, is shown prior to MW proration. The value after MW prorate is 32,882 MW.
- 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

LRA & MCL for 2010/11 – 2013/14 and Future Representative LRA & MCL for 2014/15 – 2019/20 (MW)

Year	CT LRA without NEEWS In-service	CT LRA with NEEWS In-service in 2014	Boston LRA	ME MCL
2010/11	6,496	6,496	1,838	3,697
2011/12	5,666	5,666	1,956	3,140
2012/13	6,640	6,640	2,019	3,257
2013/14	7,266	7,266	2,549	3,187
2014/15	7,372	6,311	2,625	3,238
2015/16	7,532	6,364	2,756	3,249
2016/17	7,638	6,470	2,838	3,310
2017/18	7,664	6,507	2,866	3,348
2018/19	7,744	6,576	2,948	3,385
2019/20	7,802	6,629	3,008	3,408

- The 2010/11 – 2012/13 LRA values are the actual LSR values calculated with the “As is” methodology
- 2013/14 shows the LRA values calculated with the “At criteria” methodology
- 2014/15 – 2019/20 are the Representative Future LRA and MCL values and are calculated “At criteria”

LRA and MCL for 2010/11 – 2019/20



CT LRA (without NEEWS) Calculation Details (MW)

Local Resource Adequacy Requirement - Connecticut											
Connecticut Zone		2010/11 ARA3	2011/12 ARA2	2012/13 FCA	2013/14 FCA	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Resource _z	[1]	7,846	9,027	9,111	9,337	9,337	9,337	9,337	9,337	9,337	9,337
Proxy Units _z	[2]	0	0	0	0	0	0	0	0	0	0
Proxy Units Adjustment _z	[3]	0	0	0	0	0	0	0	0	0	0
Firm Load Adjustment _z	[4]	1,327	3,236	2,325	1,950	1,850	1,700	1,600	1,575	1,500	1,445
FOR _z	[5]	0.0599	0.0638	0.0592	0.0583	0.0583	0.0583	0.0583	0.0583	0.0583	0.0583
LRA _z	[6]=[1]+[2]-([3]/(1-[5]))-(4)/(1-[5]))	6,434	5,571	6,640	7,266	7,372	7,532	7,638	7,664	7,744	7,802
Rest of New England Zone											
Resource	[7]	24,954	27,994	27,948	27,623	27,623	27,623	27,623	27,623	27,623	27,623
Proxy Units	[8]	0	0	0	0	0	0	0	0	0	0
Proxy Units Adjustment	[9]	0	0	0	0	0	0	0	0	0	0
Firm Load Adjustment	[10] = -[4]	-1,327	-3,236	-2,325	-1,950	-1,850	-1,700	-1,600	-1,575	-1,500	-1,445
Total System Resource	[11]=[1]+[2]-[3]-[4]+[7]+[8]-[9]-[10]	32,800	37,021	37,059	36,959	36,959	36,959	36,959	36,959	36,959	36,959

- Total Resources exclude HQICCs
- 2010/11 ARA3 RM gross-up is 62 MW for CT, 2011/12 ARA2 is 95 MW RM gross-up

CT LRA (with NEEWS In-Service in 2014) Calculation Details (MW)

LRA Requirement - CT with NEEWS In-Service								
Connecticut Zone		2013/14 FCA	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Resource _z	[1]	9,337	9,337	9,337	9,337	9,337	9,337	9,337
Proxy Units _z	[2]	0	0	0	0	0	0	0
Proxy Units Adjustment _z	[3]	0	0	0	0	0	0	0
Firm Load Adjustment _z	[4]	1,950	2,850	2,800	2,700	2,665	2,600	2,550
FOR _z	[5]	0.0583	0.0583	0.0583	0.0583	0.0583	0.0583	0.0583
LRA _z	[6]=[1]+[2]-([3]/(1-[5]))-(4)/(1-[5]))	7,266	6,311	6,364	6,470	6,507	6,576	6,629
Rest of New England Zone								
resource	[7]	27,623	27,623	27,623	27,623	27,623	27,623	27,623
Proxy Units	[8]	0	0	0	0	0	0	0
Proxy Units Adjustment	[9]	0	0	0	0	0	0	0
Firm Load Adjustment	[10] = -[4]	-1,950	-2,850	-2,800	-2,700	-2,665	-2,600	-2,550
Total System Resource	[11]=[1]+[2]-[3]-[4]+[7]+[8]-[9]-[10]	36,959	36,959	36,959	36,959	36,959	36,959	36,959

- Total Resources exclude HQICCs

NEMA/Boston LRA Calculation Details (MW)

Local Resource Adequacy Requirement - NEMA/BOSTON											
NEMA/BOSTON Zone		2010/11 ARA3	2011/12 ARA2	2012/13 FCA	2013/14 FCA	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Resource _z	[1]	3,501	3,743	3,813	3,960	3,960	3,960	3,960	3,960	3,960	3,960
Proxy Units _z	[2]	0	0	0	0	0	0	0	0	0	0
Proxy Units Adjustment _z	[3]	0	0	0	0	0	0	0	0	0	0
Firm Load Adjustment _z	[4]	1,538	1,665	1,620	1,290	1,220	1,100	1,025	1,000	925	870
FOR _z	[5]	0.0956	0.0982	0.0970	0.0859	0.0859	0.0859	0.0859	0.0859	0.0859	0.0859
LRA _z	[6]=[1]+[2]-([3]/(1-[5]))-(4)/(1-[5]))	1,801	1,897	2,019	2,549	2,625	2,756	2,838	2,866	2,948	3,008
Rest of New England Zone											
Resource	[7]	29,299	33,278	33,246	33,000	33,000	33,000	33,000	33,000	33,000	33,000
Proxy Units	[8]	0	0	0	0	0	0	0	0	0	0
Proxy Units Adjustment	[9]	0	0	0	0	0	0	0	0	0	0
Firm Load Adjustment	[10] = -[4]	-1,538	-1,665	-1,620	-1,290	-1,220	-1,100	-1,025	-1,000	-925	-870
Total System Resource	[11]=[1]+[2]-[3]-[4]+[7]+[8]-[9]-[10]	32,800	37,021	37,059	36,959	36,959	36,959	36,959	36,959	36,959	36,959

- Total Resources exclude HQICCs
- 2010/11 ARA3 RM gross-up is 37 MW for NEMA/Boston, 2011/12 ARA2 RM gross-up is 59 MW

ME MCL Calculation Details (MW)

LRA Requirement - RestofNewEngland (for ME MCL Calculation)											
Rest of New England Zone		2010/11 ARA3	2011/12 ARA2	2012/13 FCA	2013/14 FCA	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Resource _z	[1]	29,458	33,240	33,443	33,338	33,338	33,338	33,338	33,338	33,338	33,338
Proxy Units _z	[2]	0	0	0	0	0	0	0	0	0	0
Surplus Capacity Adjustment _z	[3]	0	0	0	4,240	3,725	3,270	2,900	2,520	2,170	1,830
Firm Load Adjustment _z	[4]	2,100	4,659	4,455	-100	-50	-60	-35	-15	-15	-15
FOR _z	[5]	0.0582	0.0528	0.0591	0.0586	0.0586	0.0586	0.0586	0.0586	0.0586	0.0586
LRA _z	[6]=[1]+[2]-([3]/(1-[5]))-([4]/(1-[5]))]	27,228	28,321	28,708	28,940	29,434	29,928	30,295	30,677	31,049	31,410
Maine Zone											
Resource	[7]	3,342	3,781	3,616	3,621	3,621	3,621	3,621	3,621	3,621	3,621
Proxy Units	[8]	0	0	0	0	0	0	0	0	0	0
Proxy Units Adjustment	[9]	0	0	0	0	0	0	0	0	0	0
Firm Load Adjustment	[10] = -[4]	-2,100	-4,659	-4,455	100	50	60	35	15	15	15
Total System Resource	[11]=[1]+[2]-[3]-[4]+[7]+[8]-[9]-[10]	32,800	37,021	37,059	36,959	36,959	36,959	36,959	36,959	36,959	36,959
Maximum Capacity Limit - Maine											
Year		2010/11 ARA3	2011/12 ARA2	2012/13 FCA	2013/14 FCA	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
ICR for New England	[1]	30,897	31,425	31,965	32,127	32,672	33,178	33,604	34,025	34,434	34,818
LRA _{RestofNewEngland}	[2]	27,228	28,321	28,708	28,940	29,434	29,928	30,295	30,677	31,049	31,410
Maximum Capacity Limity	[3]=[1]-[2]	3,669	3,104	3,257	3,187	3,238	3,249	3,310	3,348	3,385	3,408

- Net ICRs shown are the actual Net ICR for 2010/11 – 2013/14 and the Representative Future Net ICRs for 2014/15 – 2019/20
- 2010/11 ARA3 RM gross-up is 28 MW for ME, 2011/12 ARA2 RM gross-up is 36 MW
- Total Resources exclude HQICCs

Assumptions for Calculating Representative Future LRA & MCL

Net ICR for 2010/11 – 2013/14

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

Modeling the Load Zones

- The CT, NEMA/Boston LRA and ME MCL and the Representative LRA & MCL are calculated using the multi-area probabilistic MARS model
- Calculations are based on the methodology described in slides 20 - 24

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 multipliers developed consistent with the Westinghouse Capacity Model load forecast uncertainty**

Load Forecast Data – 50-50 Load Forecast for New England & Sub-areas (MW)

Year	New England	CT	NEMA/ Boston	ME
2010	27,190	7,165	5,485	2,035
2011	27,660	7,275	5,575	2,065
2012	28,165	7,390	5,665	2,105
2013	28,570	7,485	5,730	2,145
2014	29,025	7,585	5,805	2,185
2015	29,450	7,690	5,890	2,215
2016	29,785	7,765	5,960	2,240
2017	30,110	7,830	6,020	2,265
2018	30,430	7,900	6,080	2,290
2019	30,730	7,965	6,140	2,315

- **50-50 load forecast shown for informational purposes**
- **The MARS model uses hourly sub-area load forecasts with load forecast uncertainty multipliers consistent with the Westinghouse model load forecast uncertainty**

RSP10 Transmission Interface Limits (MW)

Year	CT Import without NEEWS	CT Import with NEEWS In-service in 2014	Boston Import	ME-NH
2010	2,500	2,500	4,900	1,600
2011	2,500	2,500	4,900	1,600
2012	2,500	2,500	4,900	1,600
2013	2,500	2,500	4,900	1,600
2014	2,500	3,600	4,900	1,600
2015	2,500	3,600	4,900	1,575
2016	2,500	3,600	4,900	1,550
2017	2,500	3,600	4,900	1,525
2018	2,500	3,600	4,900	1,500
2019	2,500	3,600	4,900	1,475

- The Maine Power Reliability Program is expected prior to 2012 summer. This project is likely to result in increased transfer capability across these interfaces. However, sufficient testing has not been completed to provide values to be used.

OP 4 Assumptions – Actions 6 & 8

Voltage Reduction (%)

Capacity Commitment Period	Actions 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 sub-area load to obtain MW values

Summary of Resource Assumptions for 2010/11 – 2019/20 (MW)

	Year	Generating Resources	Intermittent Power Resources	Demand Resources	Import Resources	Total Resources
New England	2010/11	28,768.138	1,051.796	2,173.124	806.959	32,800.017
	2011/12	31,122.126	1,085.137	2,529.404	2,284.390	37,021.057
	2012/13	31,443.790	1,122.910	2,808.615	1,684.000	37,059.315
	2013/14 - 2019/20	31,489.152	1,086.057	3,130.140	1,254.100	36,959.449
Connecticut	2010/11	6,694.687	418.508	732.850	-	7,846.045
	2011/12	7,792.439	414.624	819.941	-	9,027.004
	2012/13	7,807.263	413.191	890.366	-	9,110.820
	2013/14 - 2019/20	7,965.798	413.891	957.240	-	9,336.929
NEMA/Boston	2010/11	3,032.926	67.058	401.346	-	3,501.330
	2011/12	3,223.644	4.580	515.118	-	3,743.342
	2012/13	3,211.408	68.377	533.113	-	3,812.898
	2013/14 - 2019/20	3,278.415	68.868	612.489	-	3,959.772
Maine	2010/11	2,853.721	259.689	228.821	-	3,342.231
	2011/12	2,983.388	307.163	253.101	284.000	3,827.652
	2012/13	2,995.471	332.392	288.288	-	3,616.151
	2013/14 - 2019/20	3,011.753	236.849	372.671	-	3,621.273

Methodology for Calculating LRA

For each import-constrained Load Zone, the LRA is calculated using the following method:

1. Model the Load Zone under study and the rest of the NE Control Area using the GE MARS simulation model.
 - Reflect load and resources electrically connected to them, including external Control Area support from tie benefits.
2. Add proxy units that are required, if any, in the NE Control Area to meet the resource adequacy planning criterion of once in 10 years disconnection of non-interruptible customers.
3. If the system LOLE is less than 0.1 days/year, firm load is added (or unforced capacity is subtracted) so that the system LOLE equals 0.1 days/year.
4. Model the transmission interface constraint between the Load Zone under study and the rest of the NE Control Area.
5. Adjust the firm load within the Load Zone under study until the LOLE of the NE Control Area reaches 0.105 days per year LOLE. As firm load is added to (or subtracted from) the Load Zone under study, an equal amount of firm load is removed from (or added to) the rest of the NE Control Area.

Methodology for Calculating LRA (cont'd)

6. Calculate the LRA for the import-constrained Load Zone in accordance with the following formula:

$$\text{LRA}_z = \text{Resources}_z + \text{Proxy Units}_z - (\text{Surplus Capacity Adjustment}_z / (1 - \text{FOR}_z)) - (\text{Firm Load Adjustment}_z / (1 - \text{FOR}_z))$$

in which,

- LRA_z = MW of Local Sourcing Requirement for Load Zone Z
- Resources_z = MW of resources electrically located within the Load Zone Z, including Import Capacity Resource on the import-constrained side of the interface, if any
- Proxy Units_z = MW of proxy unit additions in the Load Zone Z
- $\text{Firm Load Adjustment}_z$ = MW of firm load added (or subtracted) within the Load Zone Z to make the LOLE of the NE Control Area equal to 0.105 days per year,
- FOR_z = Capacity weighted average of the forced outage rate modeled for all resources within the Load Zone Z, including any proxy unit additions to the Load Zone Z
- $\text{Surplus Capacity Adjustment}_z$ = MW of firm load added to (or unforced capacity subtracted from) Load Zone Z to bring the system LOLE to exactly 0.1 days/year.

Methodology for Calculating MCL

For each export-constrained Load Zone, the MCL is calculated using the following method:

1. Model the export-constrained Load Zone under study and the rest of the NE Control Area using the GE MARS simulation model
 - Reflect load and resources electrically connected to them, including external Control Area support from tie benefits
2. Calculate the LRA for the rest of the NE Control Area, which is treated as an import-constrained region, following methodology for calculating the LRA in prior slides.

Methodology for Calculating MCL (cont'd)

3. Calculate the MCL for the export-constrained Load Zone Y in accordance with the following formula:

$$\text{Maximum Capacity Limit}_Y = \text{ICR} - \text{LRA}_{\text{RestofNewEngland}}$$

In which,

- Maximum Capacity Limit_Y = Maximum amount of resources, including import Capacity Resources on the export-constrained side of the interface, if any that can be procured in the export-constrained Load Zone Y under study to meet the ICR.
- ICR = MW of Net Installed Capacity Requirement for the NE Control Area
- LRA_{RestofNewEngland} = MW of Local Resource Adequacy Requirement for the rest of the NE Control Area, which for the purposes of this calculation is treated as an import-constrained region. LRA_{RestofNewEngland} is determined in accordance with the methodology presented in prior slides.



Questions?