Future Representative Capacity Requirements for 2019/20 – 2023/24

- *Net Installed Capacity Requirements (Net ICR)*
- *Capacity Requirement Values for the System Demand Curve*
- *Local Sourcing Requirements (LSR)*
- *Maximum Capacity Limits (MCL)*

Maria Scibelli

Objective of This Presentation

- To provide an update to the Indicative Net Installed Capacity Requirement (ICR) values presented to the Planning Advisory Committee (PAC) at the April 2014 meeting
- Present the Representative Capacity Requirement values for the System-Wide Demand Curve (1-in-5 and 1-in-87 LOLE)
- Present the Representative values for the Connecticut, NEMA/Boston, and SEMA/RI Capacity Zones:
  - Local Resource Adequacy (LRA) Requirements,
  - Transmission Security Analysis (TSA) Requirements, and
  - Local Sourcing Requirements (LSR)
- Maine was not modeled as an export constrained zone for the 2018/19 Forward Capacity Auction (FCA9); Representative Maximum Capacity Limits (MCL) were not calculated

Background

- Indicative ICR values were presented to the Planning Advisory Committee (PAC) on April 22, 2014
  - Calculated as a constant 14.2% resulting reserve margin from recent future years' net ICR values that had been accepted by the FERC and applied to the 50/50 peak load forecast for 2019/20 – 2023/24
  - Values for the FCA9 (2018/19) were reported as "*to be determined*"

- PAC Presentation available at:
  - http://www.iso-ne.com/static-assets/documents/committees/comm_wkgrps/prtcpnts_comm/pac/mtrls/2014/apr292014/a5_rsp14_resource_adequacy_and_related_studies.pdf

Actual ICR Values for 2015/16 – 2018/19

- The actual ICR, Net ICR, LSR, MCL and Demand Curve Capacity Requirement values (collectively called the ICR Values) are included in this presentation for reference purposes

- The Reliability Committee (RC) presentation of the ICR Values for the:
  - 2015/16 3rd Annual Reconfiguration Auction (2015/16 ARA3),
  - 2016/17 2nd Annual Reconfiguration Auction (2016/17 ARA2),
  - 2017/18 1st Annual Reconfiguration Auction (2017/18 ARA1)

  available at: http://www.iso-ne.com/static-assets/documents/2014/10/a10_icr_related_values_tie_benefits_aras.zip

- The RC presentation of the ICR Values for the:
  - 2018/19 Forward Capacity Auction (FCA9)

  available at: http://www.iso-ne.com/static-assets/documents/2014/09/a6_fca9_icr_values.pdf

- All of the actual ICR Values presented here were vetted with the RC and Participants Committee (PC)
  - FCA9 values were filed with accepted by the FECR on January 2, 2015
  - The values associated with the ARAs were filed on December 2, 2014
  - A summary of all ICR Values can be found at: http://www.iso-ne.com/static-assets/documents/2014/12/summary_of_icr_values_expanded.xlsx.

Methodology

- The ICR Values are calculated according to Market Rule 1 Section III.12 *Calculation of Capacity Requirements,* *http://www.iso-ne.com/static-assets/documents/2014/12/mr1_sec_1_12.pdf*

- The assumptions used to calculate Representative ICR Values for 2019/20 – 2023/24 were the same load forecast and resource assumptions used to calculate the 2018/19 ICR Values

Net Installed Capacity Requirements

Status	Year	2014 CELT Forecast 50/50 Peak (MW)	Actual and Representative Future Net ICR (MW)	Annual Resulting Reserves (%)
A	**2015/16**	28,615	33,391	16.7
A	**2016/17**	29,130	33,764	15.9
A	**2017/18**	29,610	34,061	15.0
A	**2018/19**	30,005	34,189	13.9
R	**2019/20**	30,335	34,603	14.1
R	**2020/21**	30,675	35,020	14.2
R	**2021/22**	30,990	35,426	14.3
R	**2022/23**	31,315	35,833	14.4
R	**2023/24**	31,620	36,227	14.6

- **Status:**
  - **A = Actual Values**
  - **R = Representative Values**

- **Net ICR values for 2015/16 to 2018/19 are the values filed with the FERC in November and December 2014. FCA9 ICR Values were accepted by FERC on Jan 2, 2015.**

ICR Calculation Details (MW)

	Actual				Representative				
Total Capacity Breakdown	**2015/16 ARA3**	**2016/17 ARA2**	**2017/18 ARA1**	**2018/19 FCA**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**
Generating Resources	30,861	30,861	30,010	29,829	29,829	29,829	29,829	29,829	29,829
Demand Resources	3,519	3,519	3,519	3,054	3,054	3,054	3,054	3,054	3,054
Imports/Export Delist & Import Deratings	2,027	1,724	1,669	(41)	(41)	(41)	(41)	(41)	(41)
Tie Benefits	1,624	1,870	1,870	1,970	1,970	1,970	1,970	1,970	1,970
OP4 - Action 6 & 8 (Voltage Reduction)	411	420	427	441	446	452	457	462	467
Minimum Reserve Requirement	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
Proxy Unit Capacity	-	-	-	1,600	2,000	2,400	2,800	3,200	3,600
Total Capacity & OP4 Actions	38,242	38,194	37,295	36,653	37,058	37,464	37,869	38,274	38,679

Installed Capacity Requirement Calculation Details	**2015/16 ARA3**	**2016/17 ARA2**	**2017/18 ARA1**	**2018/19 FCA**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**
Annual Peak	28,615	29,130	29,610	30,005	30,335	30,675	30,990	31,315	31,620
Total Capacity & OP4 Actions	38,242	38,194	37,295	36,653	37,058	37,464	37,869	38,274	38,679
Tie Benefits	1,624	1,870	1,870	1,970	1,970	1,970	1,970	1,970	1,970
HQICCs	1,042	1,055	1,068	953	953	953	953	953	953
OP4 - Action 6 & 8 (Voltage Reduction)	411	420	427	441	446	452	457	462	467
Minimum Reserve Requirement	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
ALCC	2,585	2,019	988	222	210	194	189	183	188
Installed Capacity Requirement	34,433	34,819	35,129	35,142	35,556	35,973	36,379	36,786	37,180
Net ICR	33,391	33,764	34,061	34,189	34,603	35,020	35,426	35,833	36,227
Reserve Margin with HQICCs	20.3%	19.5%	18.6%	17.1%	17.2%	17.3%	17.4%	17.5%	17.6%
Reserve Margin without HQICCs	16.7%	15.9%	15.0%	13.9%	14.1%	14.2%	14.3%	14.4%	14.6%

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

- **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**

1-in-5 LOLE Capacity Requirement Values (MW)
(Cap for the System Demand Curve)

Total Capacity Breakdown	2018/19 (FCA9)	2019/20	2020/21	2021/22	2022/23	2023/24
Generating Resources	29,829	29,829	29,829	29,829	29,829	29,829
Demand Resources	3,054	3,054	3,054	3,054	3,054	3,054
Imports/Export Delist & Import Deratings	(41)	(41)	(41)	(41)	(41)	(41)
Tie Benefits	1,970	1,970	1,970	1,970	1,970	1,970
OP4 - Action 6 & 8 (Voltage Reduction)	441	446	452	457	462	467
Minimum Reserve Requirement	(200)	(200)	(200)	(200)	(200)	(200)
Proxy Unit Capacity	400	800	1,200	1,600	2,000	2,400
Total Capacity & OP4 Actions	**35,453**	**35,858**	**36,264**	**36,669**	**37,074**	**37,479**

Capacity Requirement Calculation Details	2018/19 (FCA9)	2019/20	2020/21	2021/22	2022/23	2023/24
Annual Peak	30,005	30,335	30,675	30,990	31,315	31,620
Total Capacity & OP4 Actions	35,453	35,858	36,264	36,669	37,074	37,479
Tie Benefits	1,970	1,970	1,970	1,970	1,970	1,970
HQICCs	953	953	953	953	953	953
OP4 - Action 6 & 8 (Voltage Reduction)	441	446	452	457	462	467
Minimum Reserve Requirement	(200)	(200)	(200)	(200)	(200)	(200)
ALCC	99	103	106	115	124	138
Capacity Requirement Value @ 1-in-5 LOLE	**33,132**	**33,528**	**33,925**	**34,315**	**34,705**	**35,089**
Reserve Margin without HQICCs	10.4%	10.5%	10.6%	10.7%	10.8%	11.0%

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

- **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**

1-in-87 LOLE Capacity Requirement Values (MW)

(Foot for the System Demand Curve)

Total Capacity Breakdown	2018/19 (FCA9)	2019/20	2020/21	2021/22	2022/23	2023/24
Generating Resources	29,829	29,829	29,829	29,824	29,819	29,814
Demand Resources	1,970	1,970	1,970	1,970	1,970	1,970
Imports/Export Delist & Import Deratings	(41)	(41)	(41)	(41)	(41)	(41)
Tie Benefits	3,054	3,054	3,054	3,054	3,054	3,054
OP4 - Action 6 & 8 (Voltage Reduction)	441	446	452	457	462	467
Minimum Reserve Requirement	(200)	(200)	(200)	(200)	(200)	(200)
Proxy Unit Capacity	4,400	4,800	5,200	5,600	6,000	6,800
Total Capacity & OP4 Actions	**39,453**	**39,858**	**40,264**	**40,664**	**41,064**	**41,864**

Capacity Requirement Calculation Details	2018/19 (FCA9)	2019/20	2020/21	2021/22	2022/23	2023/24
Annual Peak	30,005	30,335	30,675	30,990	31,315	31,620
Total Capacity & OP4 Actions	39,453	39,858	40,264	40,664	41,064	41,864
Tie Benefits	1,970	1,970	1,970	1,970	1,970	1,970
HQICCs	953	953	953	953	953	953
OP4 - Action 6 & 8 (Voltage Reduction)	441	446	452	457	462	467
Minimum Reserve Requirement	(200)	(200)	(200)	(200)	(200)	(200)
ALCC	175	141	97	66	20	302
Capacity Requirement Value @ 1-in-87 LOLE	**37,027**	**37,468**	**37,922**	**38,355**	**38,807**	**39,252**
Reserve Margin without HQICCs	23.4%	23.5%	23.6%	23.8%	23.9%	24.1%

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

- **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**

Connecticut LRA, TSA & LSR for 2015/16 – 2023/24 (MW)

Status	Year	Connecticut LRA	Connecticut TSA	Connecticut LSR
A	2015/16	6,903	6,913	6,913
A	2016/17	7,367	7,242	7,367
A	2017/18	7,419	7,392	7,419
A	2018/19	7,268	7,331	7,331
R	2019/20	7,349	7,413	7,413
R	2020/21	7,425	7,496	7,496
R	2021/22	7,500	7,567	7,567
R	2022/23	7,560	7,649	7,649
R	2023/24	7,646	7,720	7,720

- **Status:**
  A = Actual Values
  R = Representative Values
- **Connecticut LSR values for 2015/16 to 2018/19 are the values filed with the FERC in November and December 2014. FCA9 ICR Values were accepted by FERC on Jan 2, 2015.**

Connecticut LRA Calculation Details

		Actual				Representative				
Connecticut Zone		**2015/16 ARA3**	**2016/17 ARA2**	**2017/18 ARA1**	**2018/19 FCA**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**
$Resource_z$	[1]	8,670	9,422	9,422	9,239	9,239	9,239	9,239	9,239	9,239
$Proxy\ Units_z$	[2]	0	0	0	0	0	0	0	0	0
$Firm\ Load\ Adjustment_z$	[3]	Redacted			1,825	1,750	1,680	1,610	1,555	1,475
FOR_z	[4]				0.0741	0.0741	0.0741	0.0741	0.0741	0.0741
LRA_z	[5]=[1]+[2]-([3]/(1-[4]))	**6,903**	**7,367**	**7,419**	**7,268**	**7,349**	**7,425**	**7,500**	**7,560**	**7,646**
Rest of New England Zone										
Resource	[6]	27,737	26,682	25,776	23,603	23,603	23,603	23,603	23,603	23,603
Proxy Units	[7]	0	0	0	1,600	3,600	3,600	3,600	3,600	3,600
Firm Load Adjustment	[8] = -[3]	Redacted			-1,825	-1,750	-1,680	-1,610	-1,555	-1,475
Total System Resource	[9]=[1]+[2]-[3]+[6]+[7]-[8]	36,406	36,103	35,198	34,442	36,442	36,442	36,442	36,442	36,442

- All values in the table are in MW except the FORz
- Resources for Rest of New England excludes HQICCs
- Firm Load Adjustment and average FOR for CT are redacted to protect confidentiality of the availability of the Lake Road station which is moved from the RI to CT zone for 2016/17 and 2017/18

Connecticut TSA Calculation Details (MW)

Connecticut	Actual TSA Requirements				Representative TSA Requirements				
	2015/16 ARA3	2016/17 ARA2	2017/1 8ARA1	2018/19 FCA9	2019/20	2020/21	2021/22	2022/23	2023/24
Sub-area 90/10 Load	8,090	8,205	8,320	8,415	8,490	8,565	8,630	8,705	8,770
Reserves (Largest Unit)	1,225	1,225	1,225	1,225	1,225	1,225	1,225	1,225	1,225
Sub-area Transmission Security Need	**9,315**	**9,430**	**9,545**	**9,640**	**9,715**	**9,790**	**9,855**	**9,930**	**9,995**
Existing Resources	8,671	REDACTED	9,238	9,239	9,239	9,239	9,239	9,239	9,239
Assumed Unavailable Capacity	-813	0	-808	-808	-808	-808	-808	-808	-808
Sub-area N-1 Import Limit	3,050	2,800	2,800	2,950	2,950	2,950	2,950	2,950	2,950
Sub-area Available Resources	**10,908**	**11,399**	**11,230**	**11,381**	**11,381**	**11,381**	**11,381**	**11,381**	**11,381**
TSA Requirement	**6,913**	**7,242**	**7,392**	**7,331**	**7,413**	**7,496**	**7,567**	**7,649**	**7,720**

NEMA/Boston LRA, TSA & LSR for 2015/16 – 2023/24 (MW)

Status	Year	NEMA/Boston LRA	NEMA/Boston TSA	NEMA/Boston LSR
A	2015/16	2,590	3,214	3,214
A	2016/17	2,753	3,342	3,342
A	2017/18	2,988	3,443	3,443
A	2018/19	3,129	3,572	3,572
R	2019/20	3,169	3,662	3,662
R	2020/21	3,216	3,756	3,756
R	2021/22	3,294	3,846	3,846
R	2022/23	3,367	3,935	3,935
R	2023/24	3,451	4,019	4,019

- **Status:**
  A = Actual Values
  R = Representative Values
- **NEMA/Boston LSR values for 2015/16 to 2018/19 are the values filed with the FERC in November and December 2014. FCA9 ICR Values were accepted by FERC on Jan 2, 2015.**

NEMA/Boston LRA Calculation Details

		Actual				Representative				
NEMA/BOSTON Zone		**2015/16 ARA3**	**2016/17 ARA2**	**2017/18 ARA1**	**2018/19 FCA**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**
$Resource_z$	[1]	3,248	3,248	3,922	3,868	3,868	3,868	3,868	3,868	3,868
$Proxy\ Units_z$	[2]	0	0	0	0	0	0	0	0	0
$Firm\ Load\ Adjustment_z$	[3]	626	471	888	775	670	625	550	480	400
FOR_z	[4]	0.0496	0.0496	0.0497	0.0422	0.0422	0.0422	0.0422	0.0422	0.0422
LRA_z	[5]=[1]+[2]-([3]/(1-[4]))	**2,590**	**2,753**	**2,988**	**3,129**	**3,169**	**3,216**	**3,294**	**3,367**	**3,451**
Rest of New England Zone										
Resource	[6]	33,158	32,855	31,276	28,903	28,973	28,973	28,973	28,973	28,973
Proxy Units	[7]	0	0	0	1,600	3,600	3,600	3,600	3,600	3,600
Firm Load Adjustment	[8] = -[3]	-626	-471	-888	-775	-670	-625	-550	-480	-400
Total System Resource	[9]=[1]+[2]-[3]+[6]+[7]-[8]	36,406	36,103	35,198	34,442	36,442	36,442	36,442	36,442	36,442

- All values in the table are in MW except the FORz
- Resources for Rest of New England excludes HQICCs

NEMA/Boston TSA Calculation Details (MW)

NEMA/Boston	Actual TSA Requirements				Representative TSA Requirements				
	2015/16 ARA3	2016/17 ARA2	2017/1 8ARA1	2018/19 FCA9	2019/20	2020/21	2021/22	2022/23	2023/24
Sub-area 90/10 Load	6,475	6,610	6,730	6,835	6,920	7,010	7,095	7,180	7,260
Reserves (Largest Unit)	1,413	1,413	1,395	1,412	1,412	1,412	1,412	1,412	1,412
Sub-area Transmission Security Need	**7,888**	**8,023**	**8,125**	**8,247**	**8,332**	**8,422**	**8,507**	**8,592**	**8,672**
Existing Resources	3,248	3,077	3,831	3,868	3,868	3,868	3,868	3,868	3,868
Assumed Unavailable Capacity	-177	-156	-187	-190	-190	-190	-190	-190	-190
Sub-area N-1 Import Limit	4,850	4,850	4,850	4,850	4,850	4,850	4,850	4,850	4,850
Sub-area Available Resources	**7,921**	**7,772**	**8,495**	**8,528**	**8,528**	**8,528**	**8,528**	**8,528**	**8,528**
TSA Requirement	**3,214**	**3,342**	**3,443**	**3,572**	**3,662**	**3,756**	**3,846**	**3,935**	**4,019**

SEMA/RI LRA, TSA & LSR for 2018/19 – 2023/24 (MW)

Status	Year	SEMA/RI LRA	SEMA/RI TSA	SEMA/RI LSR
A	2015/16	N/A	N/A	N/A
A	2016/17	N/A	N/A	N/A
A	2017/18	N/A	N/A	N/A
A	2018/19	7,479	7,116	7,479
R	2019/20	7,625	7,211	7,625
R	2020/21	7,740	7,300	7,740
R	2021/22	7,833	7,389	7,833
R	2022/23	7,877	7,479	7,877
R	2023/24	7,910	7,568	7,910

- **Status:**
  A = Actual Values
  R = Representative Values
  N/A = Not Applicable
- **SEMA/RI LSR values for 2018/19 are the values filed with the FERC in December 2014 and accepted by FERC on Jan 2, 2015.**

SEMA/RI LRA Calculation Details

		Actual				Representative				
SEMA/RI Zone		**2015/16 ARA3**	**2016/17 ARA2**	**2017/18 ARA1**	**2018/19 FCA**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**2023/24**
$Resource_z$	[1]				6,984	6,984	6,984	6,984	6,984	6,984
$Proxy\ Units_z$	[2]				800	800	800	1,200	1,200	1,200
$Firm\ Load\ Adjustment_z$	[3]				278	145	40	320	280	250
FOR_z	[4]				0.0900	0.0900	0.0900	0.0883	0.0883	0.0883
LRA_z	[5]=[1]+[2]-([3]/(1-[4]))				**7,479**	**7,625**	**7,740**	**7,833**	**7,877**	**7,910**
Rest of New England Zone										
Resource	[6]				25,857	25,857	25,857	25,857	25,857	25,857
Proxy Units	[7]				800	1,200	1,600	1,600	2,000	2,400
Firm Load Adjustment	[8] = -[3]				-278	-145	-40	-320	-280	-250
Total System Resource	[9]=[1]+[2]-[3]+[6]+[7]-[8]				34,442	34,842	35,242	35,642	36,042	36,442

- **All values in the table are in MW except the FORz**
- **Resources for Rest of New England excludes HQICCs**

= Not Applicable

SEMA/RI TSA Calculation Details (MW)

SEMA/RI	Actual TSA Requirements				Representative TSA Requirements				
	2015/16 ARA3	2016/17 ARA2	2017/18 ARA1	2018/19 FCA9	2019/20	2020/21	2021/22	2022/23	2023/24
Sub-area 90/10 Load	-	-	-	6,465	6,550	6,630	6,710	6,790	6,870
Reserves (Largest Unit)	-	-	-	700	700	700	700	700	700
Sub-area Transmission Security Need	-	-	-	**7,165**	**7,250**	**7,330**	**7,410**	**7,490**	**7,570**
Existing Resources	-	-	-	6,984	6,984	6,984	6,984	6,984	6,984
Assumed Unavailable Capacity	-	-	-	-723	-723	-723	-723	-723	-723
Sub-area N-1 Import Limit	-	-	-	786	786	786	786	786	786
Sub-area Available Resources	-	-	-	**7,047**	**7,047**	**7,047**	**7,047**	**7,047**	**7,047**
TSA Requirement				**7,116**	**7,211**	**7,300**	**7,389**	**7,479**	**7,568**

▨ = Not Applicable

Maine MCL Calculation Details

		Actual		
Rest of New England Zone		**2015/16 ARA3**	**2016/17 ARA2**	**2017/18 ARA1**
$Resource_z$	[1]	32,214	31,975	31,169
$Proxy\ Units_z$	[2]	0	0	0
$Surplus\ Capacity\ Adjustment_z$	[3]	2,896	2,256	1,110
$Firm\ Load\ Adjustment_z$	[4]	-213	-170	-136
FOR_z	[5]	0.0718	0.0723	0.0670
LRA_z	[6]=[1]+[2]-([3]/(1-[5]))-([4]/(1-[5]))	**29,323**	**29,726**	**30,125**
Maine Zone				
Resource	[7]	4,193	4,129	4,029
Proxy Units	[8]	0	0	0
$Surplus\ Capacity\ Adjustment_z$	[9]	0	0	0
Firm Load Adjustment	[10] = -[4]	213	170	136
Total System Resource	[11]=[1]+[2]-[3]-[4]+[7]+[8]-[9]-[10]	36,406	36,103	35,198

		Actual		
Maximum Capacity Limit - Maine		**2015/16 ARA3**	**2016/17 ARA2**	**2017/18 ARA1**
ICR for New England	[1]	33,391	33,764	34,061
$LRA_{RestofNewEngland}$	[2]	29,323	29,726	30,125
$Maximum\ Capacity\ Limit_Y$	[3]=[1]-[2]	**4,068**	**4,038**	**3,936**

- **All values in the table are in MW except the FORz**
- **Resources for Rest of New England excludes HQICCs**

REPRESENTATIVE ICR VALUES CALCULATION ASSUMPTIONS

Load Forecast

- 2014 Capacity, Energy Loads and Transmission Report (CELT) Load Forecast was used to calculate all actual & Representative ICR Values in this presentation

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

Year	New England	CT	NEMA/ Boston	SEMA/RI	ME
2015/16	28,615	7,405	6,015	5,555	2,070
2016/17	29,130	7,530	6,135	5,655	2,105
2017/18	29,610	7,635	6,255	5,770	2,130
2018/19	30,005	7,725	6,350	5,865	2,145
2019/20	30,335	7,795	6,430	5,950	2,170
2020/21	30,675	7,865	6,515	6,020	2,180
2021/22	30,990	7,925	6,590	6,100	2,200
2022/23	31,315	7,990	6,670	6,165	2,225
2023/24	31,620	8,055	6,745	6,240	2,240

- Load forecast assumed is the 2014 CELT Report Load Forecast. CT, NEMA/Boston, SEMA/RI and ME 50/50 load forecast are the values for the Regional System Plan (RSP) sub-areas used as proxies for the load zone values.
- 50/50 load forecast shown for informational purposes.

Load Forecast Data – 90/10 Load Forecast for New England & Sub-areas (MW)

Year	New England	CT	NEMA/ Boston	SEMA/RI	ME
2015/16	30,950	8,090	6,475	6,140	2,205
2016/17	31,495	8,205	6,610	6,255	2,235
2017/18	32,005	8,320	6,730	6,370	2,265
2018/19	32,430	8,415	6,835	6,465	2,285
2019/20	32,790	8,490	6,920	6,550	2,300
2020/21	33,160	8,565	7,010	6,630	2,325
2021/22	33,505	8,630	7,095	6,710	2,340
2022/23	33,865	8,705	7,180	6,790	2,365
2023/24	34,195	8,770	7,260	6,870	2,390

- Load forecast assumed is the 2014 CELT Report Load Forecast. CT, NEMA/Boston, SEMA/RI and ME 90/10 load forecast are the values for the Regional System Plan (RSP) sub-areas used as proxies for the load zone values.
- 90/10 load forecast shown for informational purposes. Only the values for CT, NEMA/Boston and SEMA/RI were used to produce the Representative TSA values.

Transmission Transfer Capability Limits Used in the LSR & MCL Calculations (MW)

Year	CT Import N-1	CT Import N-1-1	Boston Import N-1	Boston Import N-1-1	SEMA/RI Import N-1	SEMA/RI Import N-1-1	ME-NH
2015/16	3,050	1,850	4,850	4,175	-	-	1,900
2016/17	2,800	1,600	4,850	4,175	-	-	1,900
2017/18	2,800	1,600	4,850	4,175	-	-	1,900
2018/19	2,950	1,750	4,850	4,175	786	473	-
2019/20	2,950	1,750	4,850	4,175	786	473	-
2020/21	2,950	1,750	4,850	4,175	786	473	-
2021/22	2,950	1,750	4,850	4,175	786	473	-
2022/23	2,950	1,750	4,850	4,175	786	473	-
2023/24	2,950	1,750	4,850	4,175	786	473	-

- Interface Limit assumptions from "Transmission Interface Transfer Capabilities: 2014 Regional System Plan Assumptions" presented at the January 23, 2014 PAC meeting: http://www.iso-ne.com/static-assets/documents/2014/09/a7_rsp14_transmission_interface_transfer_capabilities_assumptions.pdf.
- Maine Power Reliability Program is expected in service for 2015. The NEEWS Interstate Reliability Program is expected in service 12/2015 (However, not all portions of this project have been certified to be in service prior to 2018)
- The Boston import capabilities include the retirement of Salem Harbor and the inclusion of the advanced NEMA/Boston upgrades. The effect of the addition of the Footprint generation project on the Boston import capability will be evaluated at a future date
- With the certification of the new 345 kV Lake Road-Card line, the Lake Road generating facility is modeled in the Connecticut zone beginning in 2016

Summary of Resource Assumptions for 2015/16 – 2023/24 (MW)

	Year	Generating Resources	Intermittent Power Resources	Demand Resources	Import Resources	Total Resources
New England	2015/16	29,881.702	979.229	3,518.808	2,026.719	36,406.458
	2016/17	29,881.702	979.229	3,518.808	1,723.758	36,103.497
	2017/18	29,031.031	979.229	3,518.808	1,668.752	35,197.820
	2018/19	28,787.722	910.807	3,054.297	88.800	32,841.626
	2019/20 - 2023/24	28,787.722	910.807	3,054.297	88.800	32,841.626
Connecticut	2015/16	7,517.599	204.937	947.044	-	8,669.580
	2016/17	8,269.604	204.937	947.044	-	9,421.585
	2017/18	8,269.604	204.937	947.044	-	9,421.585
	2018/19	8,255.015	186.092	797.892	-	9,238.999
	2019/20 - 2023/24	8,255.015	186.092	797.892	-	9,238.999
NEMA/Boston	2015/16	2,585.562	71.568	591.106	-	3,248.236
	2016/17	2,585.562	71.568	591.106	-	3,248.236
	2017/18	3,259.562	71.568	591.106	-	3,922.236
	2018/19	3,235.563	70.231	562.600	-	3,868.394
	2019/20 - 2023/24	3,235.563	70.231	562.600	-	3,868.394
SEMA/RI	2015/16	-	-	-	-	-
	2016/17	-	-	-	-	-
	2017/18	-	-	-	-	-
	2018/19	6,332.474	80.550	571.296	-	6,984.320
	2019/20 - 2023/24	6,332.474	80.550	571.296	-	6,984.320
Maine	2015/16	3,050.530	271.094	499.062	372.000	4,192.686
	2016/17	3,050.530	271.094	499.062	308.000	4,128.686
	2017/18	3,050.530	271.094	499.062	208.000	4,028.686
	2018/19	-	-	-	-	-
	2019/20 - 2023/24	-	-	-	-	-

Summary of Resource Availability Assumptions for 2018/19 – 2023/24

Resource Category	Summer MW	Assumed Average EFORd or FOR Weighted by Summer Ratings (%)	Assumed Average Maintenance Weeks Weighted by Summer Ratings
Total System Generation	**28,917.722**	**6.7**	**5.1**
Combined Cycle	12,523.352	3.6	5.8
Fossil	6,253.519	14.9	5.2
Nuclear	4,023.769	3.1	3.9
Hydro (Includes Pumped Storage)	2,930.580	4.6	6.5
Combustion Turbine	2,907.764	9.5	2.3
Diesel	193.184	6.5	1.0
Miscellaneous	85.554	14.2	1.8
Intermittent Power Resources	**910.807**	**0.0**	**0.0**
Import Resources	**88.800**	**0.0**	**0.1**
Total Demand Resources	**3,054.297**	**4.0**	**0.0**
On-Peak	1,650.102	0.0	0.0
Seasonal Peak	377.284	0.0	0.0
Real-time Demand Response	756.484	11.7	0.0
Real-time Emergency Generators	270.427	12.4	0.0

Notes:

- Generator 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
- Imports are modeled with historical tie line availability factors and deratings for firm capacity contracts
- FOR (for Demand Resources) is an assumed Forced Outage Rate based on historical performance of Demand Resources in summer & winter 2010 - 2013

OP 4 Assumptions (MW)

- **Load Relief Available from 5% Summer Voltage Reduction (OP4 Actions 6 & 8)**

	Action 6 & 8 5% Voltage Reduction
2015/16	411
2016/17	420
2017/18	427
2018/19	441
2019/20	446
2020/21	452
2021/22	457
2022/23	462
2023/24	467

- Impact of implementing a 5% voltage reduction expressed as a percent of load is calculated using the ISO Operations value of 1.5%
- Calculated as [90-10 Peak Load Forecast] – [all Passive DR & Active DR] *1.5% with RTEG limited to 600 MW, if necessary

OP 4 Assumptions (MW)

- Tie Benefits

Year	Total	Québec - Phase II	Québec - Highgate	Maritimes	New York
2015/16	1,624	1,042	6	328	248
2016/17	1,870	1,055	109	392	314
2017/18	1,870	1,068	83	492	227
2018/19	1,970	953	148	523	346
2019/20	1,970	953	148	523	346
2020/21	1,970	953	148	523	346
2021/22	1,970	953	148	523	346
2022/23	1,970	953	148	523	346
2023/24	1,970	953	148	523	346

- Modeled with tie line availability assumptions

Summary of Resource and OP 4 Assumptions for 2015/16 - 2023/24 (MW)

Type of Resource/OP4 Action	2015/16 ARA3	2016/17 ARA2	2017/18 ARA1	2018/19 FCA9	2019/20	2020/21	2021/22	2022/23	2023/24
Generating Resources	29,882	29,882	29,031	28,918	28,918	28,918	28,918	28,918	28,918
Intermittent Power Resources	979	979	979	911	911	911	911	911	911
Demand Resources	3,519	3,519	3,519	3,054	3,054	3,054	3,054	3,054	3,054
Import Resources	2,027	1,724	1,669	89	89	89	89	89	89
Export Delist & Import Derating	-	-	-	(130)	(130)	(130)	(130)	(130)	(130)
OP 4 Voltage Reduction (Actions 6 & 8)	411	420	427	441	446	452	457	462	467
Minimum Operating Reserve	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)
Tie Benefits	1,624	1,870	1,870	1,970	1,970	1,970	1,970	1,970	1,970
HQICCs (Included in Tie Benefits)	1,042	1,055	1,068	953	953	953	953	953	953
Proxy Units	-	-	-	1,600	2,000	2,400	2,800	3,200	3,600
Total MW Modeled in ICR	**38,241**	**38,193**	**37,295**	**36,653**	**37,058**	**37,464**	**37,869**	**38,274**	**38,679**

Notes:

- 2015/16 – 2017/18 ICRs were calculated using with Existing Qualified resources for the 2015/16 ARA2. 2018/19 – 2023/24 ICR calculations used the Existing Qualified resources for the 2018/19 FCA. The 2017/18 ARA2 model also included the 674 Footprint generating resource and the retirement of Brayton Pt generating station.
- Intermittent Power Resources have both the summer and winter capacity values modeled
- OP 4 5% 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

Questions