ISO New England
Post Summer 2022 Review

Electric/Gas Operations Committee

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MANAGER – FORECAST & SCHEDULING

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Summer 2022 Forecast Peak Demands

- 50/50 Summer Gross Peak Demand Forecast was 27,743 MW
  - Subtract 903 MW of Behind-the-Meter (BTM) PV at peak hour
  - Subtract 2,153 MW of Energy Efficiency (EE) at peak hour
  - Resultant 50/50 Summer 2022 Net Peak Demand Forecast was 24,686 MW

- 90/10 Summer Gross Peak Demand Forecast was 29,562 MW
  - Subtract the same amounts of BTM PV and EE values
  - Resultant 90/10 Summer 2022 Net Peak Demand Forecast was 26,506 MW

Summer 2022 Actual Peak Demands*

- June 2022 peak demand of 19,664 MW occurred on Sunday, June 26 at HE18
  - At an 8-city, weighted average temperature of 88°F at 63°F Dew Point

- July 2022 peak demand of 24,330 MW occurred on Wednesday, July 20 at HE18
  - At an 8-city, weighted average temperature of 90°F at 66°F Dew Point

*** ISO-NE Control Room EMS Preliminary Data**

SYSTEM OPERATIONS

System Operations – June 2022

Weather Patterns	Boston	Temperature: Below Normal (-0.1°F) Max: 90°F, Min: 51°F Precipitation: 2.33" – Below Normal Normal: 3.89"	Hartford	Temperature: Below Normal (-0.1°F) Max: 92°F, Min: 48°F Precipitation: 2.59" - Below Normal Normal: 4.28"

Peak Load:	19,664 MW	Jun 26, 2022	19:00 (ending)

Emergency Procedure Events (OP-4, M/LCC 2, Minimum Generation Emergency)

Procedure	Declared	Cancelled	Note
None for June 2022			

NPCC Simultaneous Activation of Reserve Events

Date	Area	MW Lost
6/22	IESO	945

System Operations – July 2022

Weather Patterns	Boston	Temperature: Above Normal (3.5°F) Max: 100°F, Min: 61°F Precipitation: 0.62" – Below Normal Normal: 3.27"	Hartford	Temperature: Above Normal (2.5°F) Max: 97°F, Min: 56°F Precipitation: 2.66" - Below Normal Normal: 4.17"

Peak Load:	24,330 MW	July 20, 2022	19:00 (ending)

Emergency Procedure Events (OP-4, M/LCC 2, Minimum Generation Emergency)

Procedure	Declared	Cancelled	Note
M/LCC 2	7/19 16:00	7/24 22:00	Capacity Deficiency

NPCC Simultaneous Activation of Reserve Events

Date	Area	MW Lost
07/08/22	NYISO	1,221
07/07/22	PJM	1,200
07/19/22	ISO-NE	550
07/21/22	ISO-NE	800
07/23/22	ISO-NE	700

Operations Summary, July 19th through July 24th, 2022

Highlights

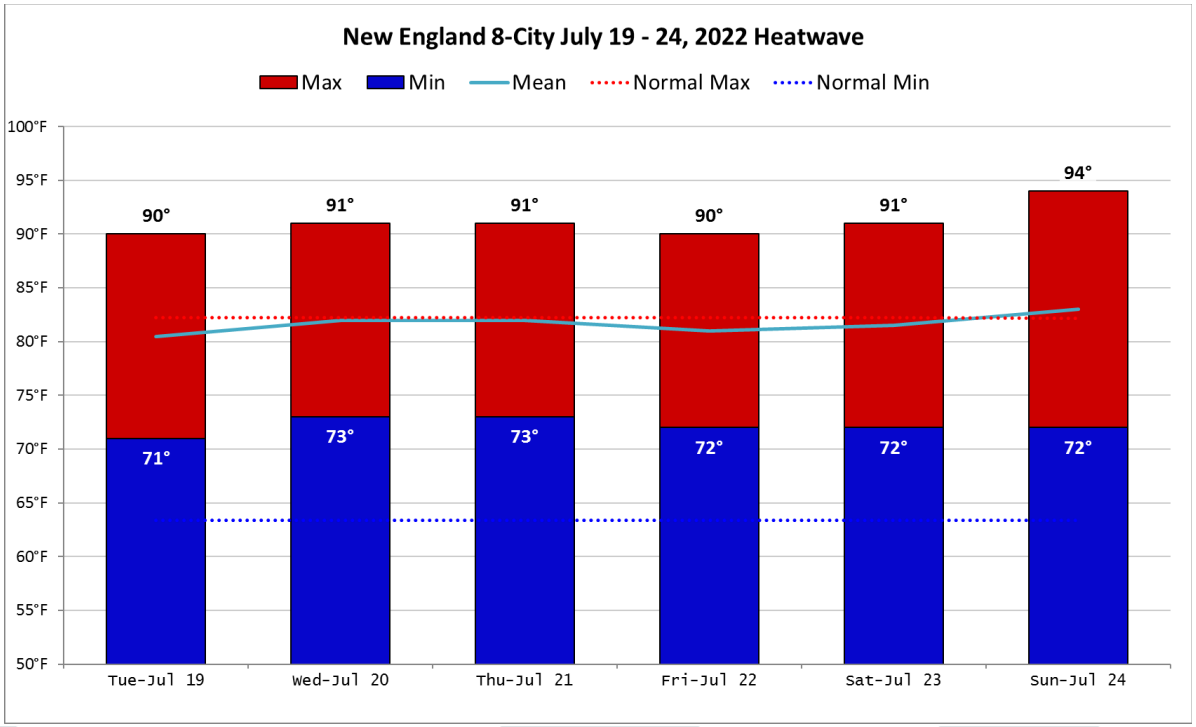
- On average, temperatures in the region were well above normal during the six-day heat wave (7/19 - 7/24)
- Weather and load forecasts were accurate
- The system was operated reliably in accordance with all NERC and NPCC standards
- Despite some unplanned outages, New England's transmission system and resource fleet generally performed well
- System energy and reserve pricing properly reflected the tight system conditions on several days during the heat wave

Preparation Activities

- Beginning on Monday, 7/18, and periodically throughout the week, ISO Operations staff held conference calls and meetings with neighboring NPCC areas and Local Control Center staff
- Due to the forecast system conditions and expectations for capacity reductions, ISO declared M/LCC-2, *Abnormal Conditions Alert*, at 16:00 on Tuesday, 7/19

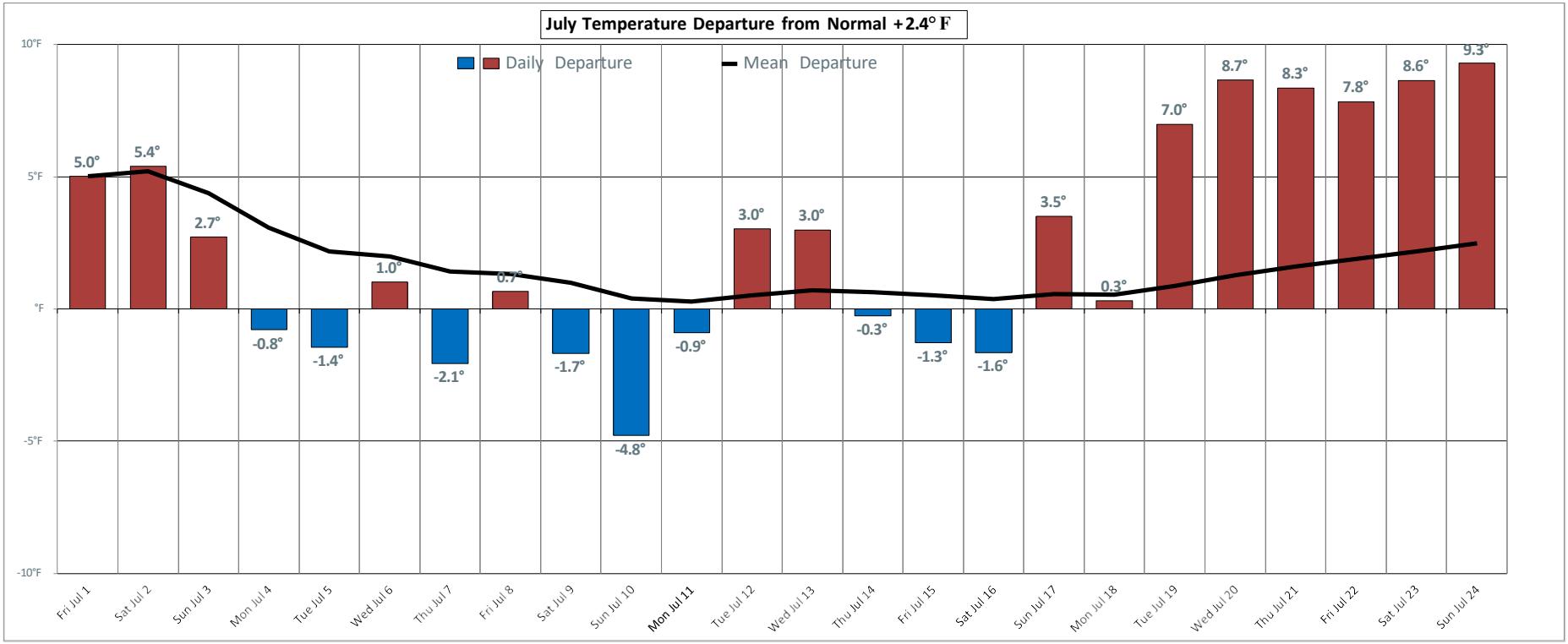
New England Temperatures Reached 90°F For Six Consecutive Days

- While the heat wave was the region's longest in several years, it was not extreme in a historical sense
  - Boston's week-long high temps ranked 11th all-time; Hartford's ranked 20th all-time
- The highest 8-city weighted-average temperature of 94°F occurred on 7/24



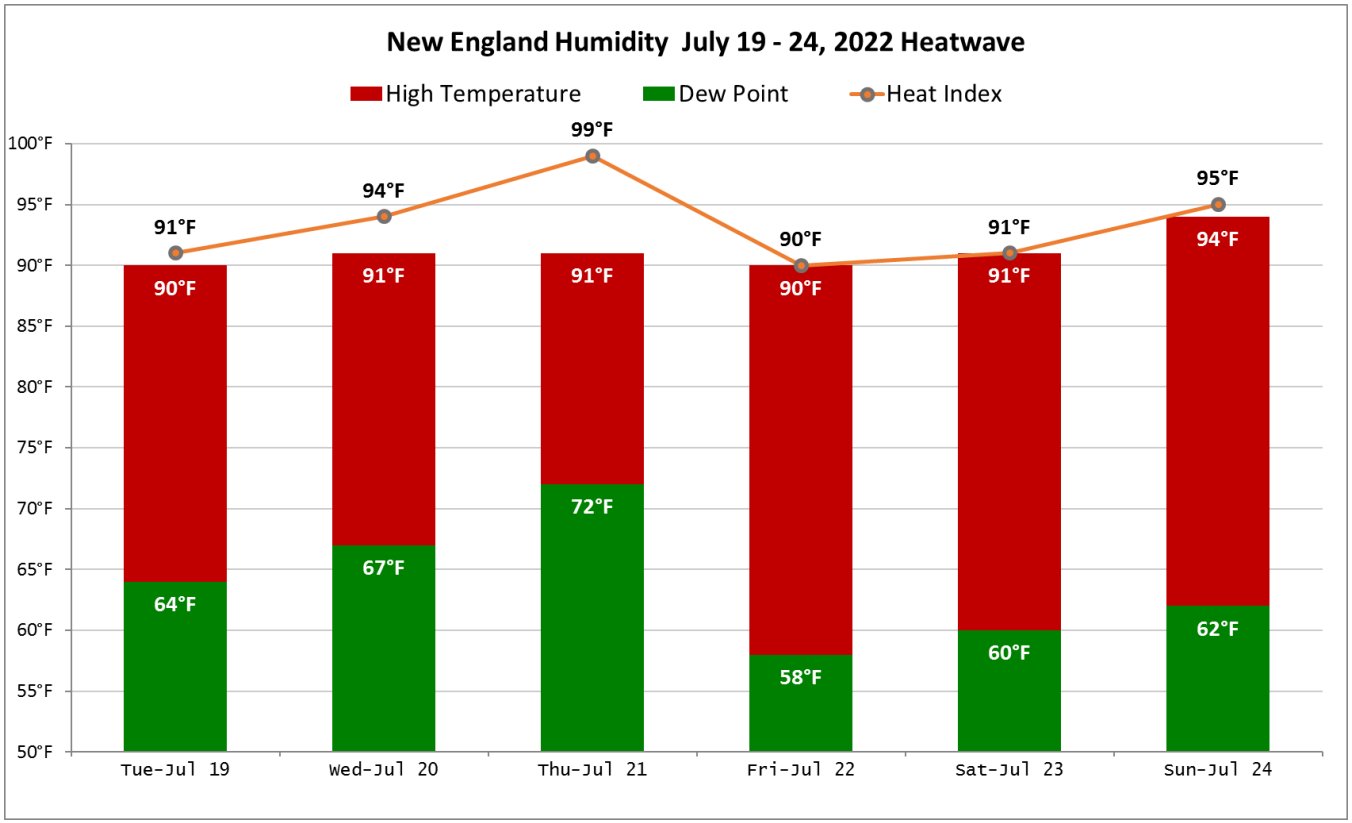
Average Temperatures Departed Significantly From Normal

- Through 7/24, the region's 8-city weighted-average temperature departure from normal for the month of July measured +2.4°F



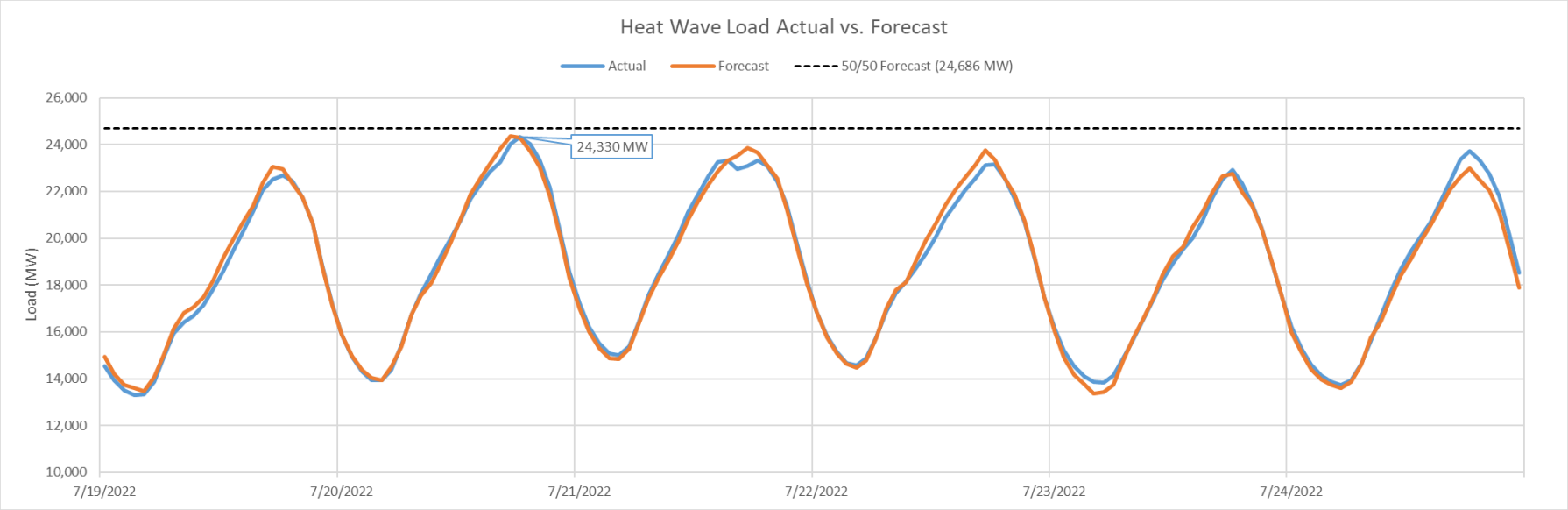
New England Dew Points Were Not Excessive

- Regional dew points were not excessive, resulting in a heat index below 100°F throughout the heat wave



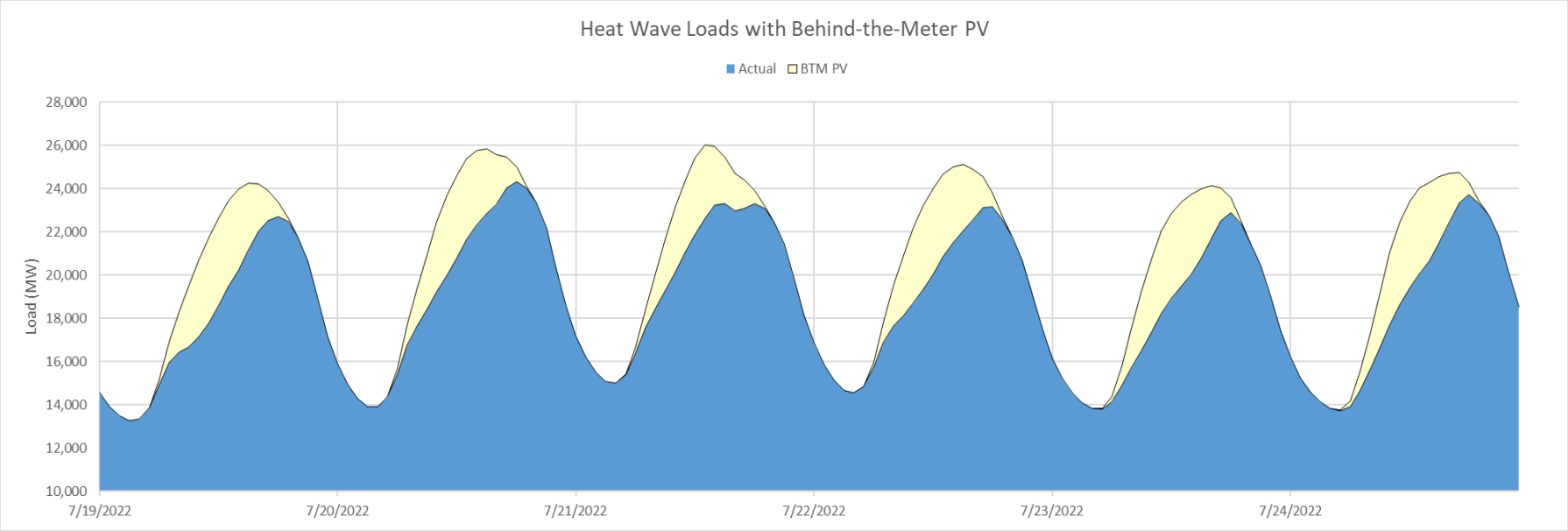
Weather Forecasts and ISO's Load Forecast Were Accurate

- Weather forecasts used by ISO to forecast load averaged less than 1°F error over all hours; ISO's load forecast absolute percent error was 1.3%
- Peak integrated load of 24,330 MW occurred on Wednesday, 7/20; peak hourly integrated load, including load served by settlement only generators, was 24,609 MW
  - 50/50 load forecast for summer 2022 is 24,686 MW
- Total energy demand over the 6 days was 2,691 GWh; avg. ~ 450 GWh/day



Energy Contributions From Behind-the-Meter PV Were Significant

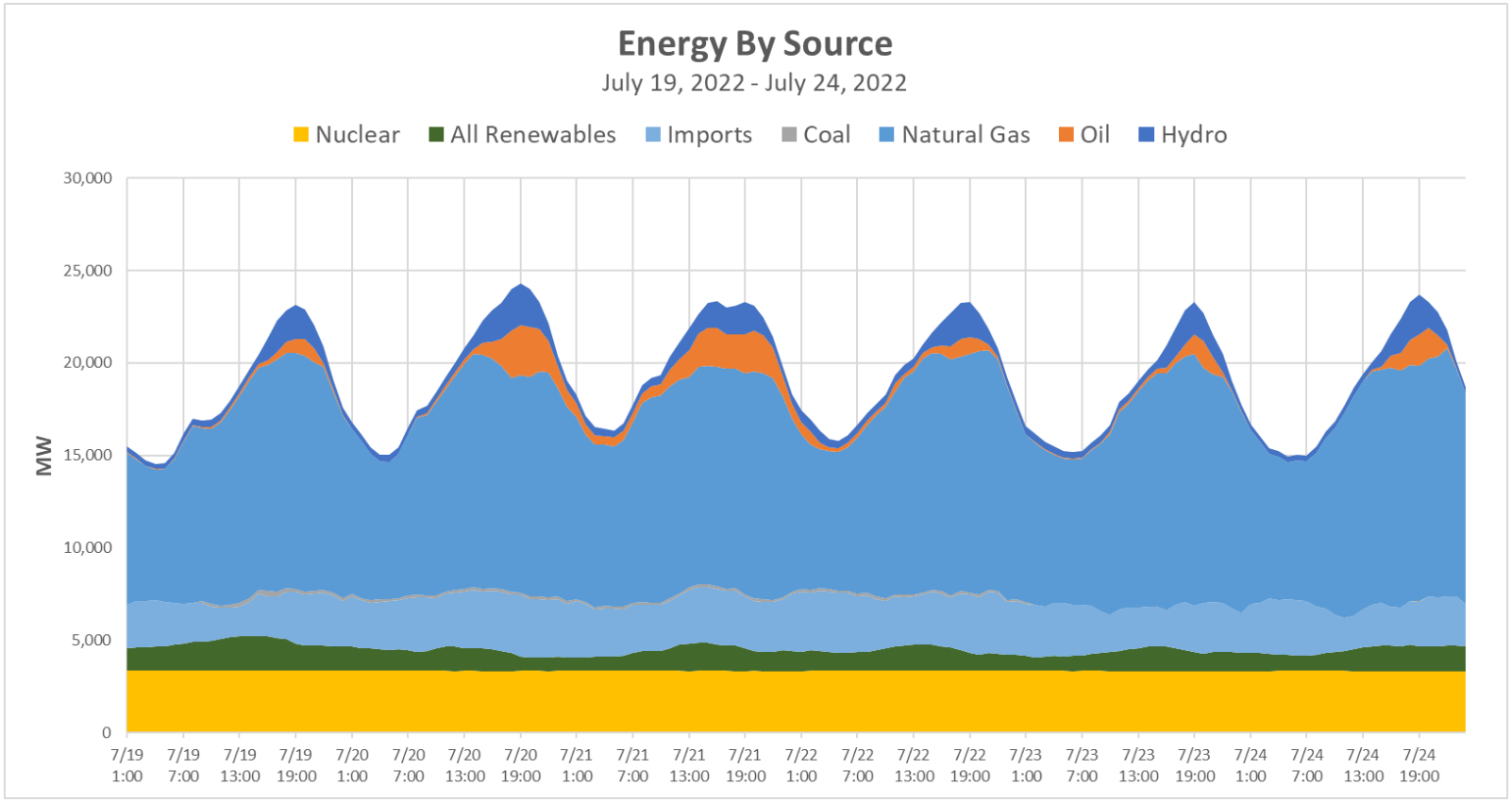
- The peak contribution from behind-the-meter (BTM) PV during the six-day heat wave was approx. 4,000 MW on 7/19; BTM PV contributions were significantly lower during peak hours



In the figure above, load served behind-the-meter is added to load served by the power grid to show total New England demand during the heat wave

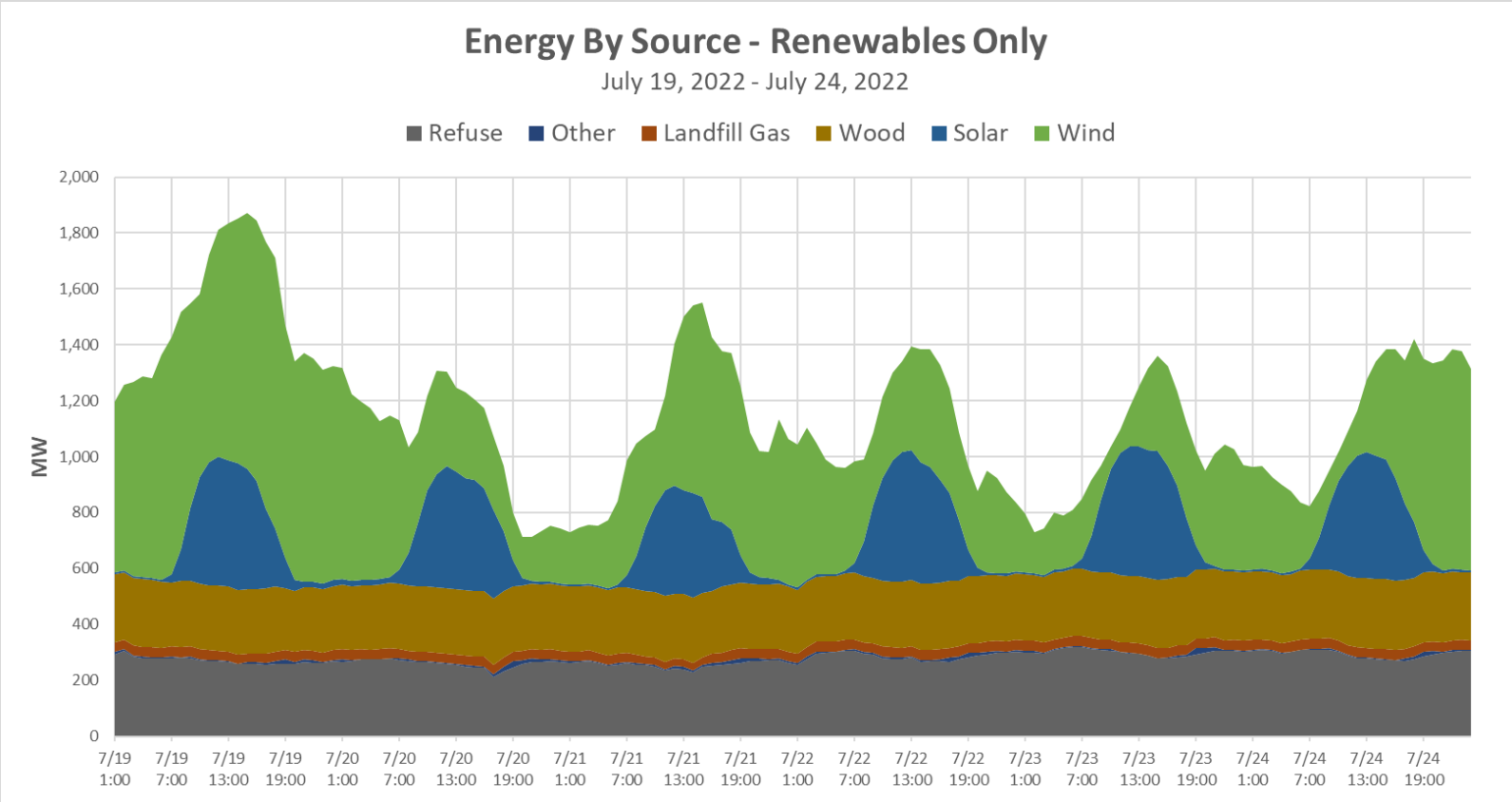
Energy Sources During the Heat Wave

- Natural gas, oil, and hydro-electric resources ramped up to provide energy during times of peak demand



Energy Sources During the Heat Wave – Renewables Only

- Aggregate contributions from wind energy peaked in HE18 on 7/19, and averaged approx. 450 MW/hour during the six-day period



Stored Fuel Usage During the Heat Wave

- Injections of LNG into regional pipelines for use by gas-fired generators was minimal
- According to the most recent generator survey responses, during the two-week span of 7/12 to 7/25;
  - Approx. 6M gallons of fuel-oil was used by generators; a majority of fuel-oil usage occurred during the six-day heat wave
  - Some replenishment has already occurred and additional replenishment of distillate fuel oil (DFO) and residual fuel oil (RFO) is expected over the next few weeks

New England's Transmission System and Resource Fleet Performed As Expected

- Unplanned transmission outages were minimal and those that occurred did not significantly impact generation availability or transfer capability
- Unplanned resource outages and reductions occurred at times throughout the heat wave, averaging ~1,500 MW/day
  - Unplanned outages and reductions occurring on the peak load day of Wednesday, 7/20, totaled ~3,500 MW
- With the exception of Saturday, 7/23, supplemental commitment of resources averaged ~850 MW/day
  - Supplemental commitment is performed in order to meet load and operating reserve requirements following either insufficient DA clearing or unplanned resource outages and reductions

OPERABLE CAPACITY ANALYSIS

Preliminary Fall 2022 Analysis

Preliminary Fall 2022 Operable Capacity Analysis

50/50 Load Forecast (Reference)	September - 2022[2] CSO (MW)	September - 2022[2] SCC (MW)
Operable Capacity MW [1]	27,870	29,867
Active Demand Capacity Resource (+) [5]	559	461
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	684	684
Non Commercial Capacity (+)	127	127
Non Gas-fired Planned Outage MW (-)	2,185	2,553
Gas Generator Outages MW (-)	974	1,049
Allowance for Unplanned Outages (-) [4]	2,100	2,100
Generation at Risk Due to Gas Supply (-) [3]	0	0
Net Capacity (NET OPCAP SUPPLY MW)	23,981	25,437
Peak Load Forecast MW(adjusted for Other Demand Resources) [2]	20,619	20,619
Operating Reserve Requirement MW	2,305	2,305
Operable Capacity Required (NET LOAD OBLIGATION MW)	22,924	22,924
Operable Capacity Margin	1,057	2,513

[1]Operable Capacity is based on data as of July 20, 2022 and does not include Capacity associated with Settlement Only Generators, Passive and Active Demand Response, and external capacity. The Capacity Supply Obligation (CSO) and Seasonal Claim Capability (SCC) values are based on data as of July 20, 2022.

[2] Load forecast that is based on the 2022 CELT report and represents the week with the lowest Operable Capacity Margin, week beginning September 24, 2022.

[3] Total of (Gas at Risk MW) – (Gas Gen Outages MW).

[4] Allowance For Unplanned Outage MW is based on the month corresponding to the day with the lowest Operable Capacity Margin for the week.

[5] Active Demand Capacity Resources (ADCRs) can participate in the Forward Capacity Market (FCM), have the ability to obtain a CSO and also participate in the Day-Ahead and Real-Time Energy Markets.

Preliminary Fall 2022 Operable Capacity Analysis

90/10 Load Forecast	September - 2022[2] CSO (MW)	September - 2022[2] SCC (MW)
Operable Capacity MW [1]	27,870	29,867
Active Demand Capacity Resource (+) [5]	559	461
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	684	684
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Non Gas-fired Planned Outage MW (-)	2,185	2,553
Gas Generator Outages MW (-)	974	1,049
Allowance for Unplanned Outages (-) [4]	2,100	2,100
Generation at Risk Due to Gas Supply (-) [3]	0	0
Net Capacity (NET OPCAP SUPPLY MW)	23,981	25,437
Peak Load Forecast MW(adjusted for Other Demand Resources) [2]	22,095	22,095
Operating Reserve Requirement MW	2,305	2,305
Operable Capacity Required (NET LOAD OBLIGATION MW)	24,400	24,400
Operable Capacity Margin	-419	1,037

[1]Operable Capacity is based on data as of July 20, 2022 and does not include Capacity associated with Settlement Only Generators, Passive and Active Demand Response, and external capacity. The Capacity Supply Obligation (CSO) and Seasonal Claim Capability (SCC) values are based on data as of July 20, 2022.

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Preliminary Fall 2022 Operable Capacity Analysis

50/50 Forecast (Reference)

ISO-NE OPERABLE CAPACITY ANALYSIS

July 20, 2022 - 50-50 FORECAST using CSO MW

This analysis is a tabulation of weekly assessments shown in one single table. The information shows the operable capacity situation under assumed conditions for each week. It is not expected that the system peak will occur every week during September, October & November.

Report created: 7/20/2022

Study Week (Week Beginning , Saturday)	CSO Supply Resource Capacity MW	CSO Demand Resource Capacity MW	External Node Capacity MW	Non-Commercial Capacity MW	CSO Non Gas-Only Generator Planned Outages MW	CSO Gas-Only Generator Planned Outages MW	Unplanned Outages Allowance MW	CSO Generation at Risk Due to Gas Supply 50-50PLE MW	CSO Net Available Capacity MW	Peak Load Forecast 50-50PLE MW	Operating Reserve Requirement MW	CSO Net Required Capacity MW	CSO Operable Capacity Margin MW	Season Min Opcap Margin Flag	Season_Label
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
9/17/2022	27870	559	684	127	1303	272	2100	0	25565	20711	2305	23016	2549	N	Fall 2022
9/24/2022	**27870**	**559**	**684**	**127**	**2185**	**974**	**2100**	**0**	**23981**	**20619**	**2305**	**22924**	**1057**	**Y**	**Fall 2022**
10/1/2022	28158	559	1070	70	2837	3273	2800	0	20947	15169	2305	17474	3473	N	Fall 2022
10/8/2022	28158	559	1070	70	3913	4158	2800	0	18986	15205	2305	17510	1476	N	Fall 2022
10/15/2022	28158	559	1070	70	3490	2239	2800	0	21328	16121	2305	18426	2902	N	Fall 2022
10/22/2022	28158	559	1070	70	1851	2479	2800	0	22727	16482	2305	18787	3940	N	Fall 2022
10/29/2022	28158	559	1070	70	2310	3229	3600	0	20718	16687	2305	18992	1726	N	Fall 2022
11/5/2022	28158	559	1070	70	2332	1766	3600	0	22159	16802	2305	19107	3052	N	Fall 2022
11/12/2022	28158	559	1070	70	1882	940	3600	0	23435	17143	2305	19448	3987	N	Fall 2022
11/19/2022	28158	559	1070	70	1137	306	3600	1064	23750	17875	2305	20180	3570	N	Fall 2022

Column Definitions

1. CSO Supply Resource Capacity MW: Summation of all resource Capacity **S**upply Obligations (CSO). Does not include Settlement Only Generators (SOG).

2.CSO Demand Resource Capacity MW: Demand resources known as Real-Time Demand Response (RTDR) will become Active Demand Capacity Resources (ADCRs) and can participate in the Forward Capacity Market (FCM).
These resources will have the ability to obtain a CSO and also particpate in the Day-Ahead and Real-Time Energy Markets.

3. External Node Capacity MW: Sum of external Capacity Supply Obligations (CSO) imports and exports.

4. Non-Commercial capacity MW: New resources and generator improvements that have acquired a CSO but have not become commercial.

5. CSO Non Gas-Only Generator Planned Outages MW: All Non-Gas Planned Outages is the total of Non Gas-fired Generator/DARD Outages for the period. This value would also include any known long-term Non Gas-fired Forced Outages.Outages.

6. CSO Gas-Only Generator Planned Outages MW: All Planned Gas-fired generation outage for the period. This value would also include any known long-term Gas-fired Forced Outages.

7. Unplanned Outage Allowance MW: Forced Outages and Maintenance Outages scheduled less than 14 days in advance per ISO New England Operating Procedure No. 5 Appendix A.

8. CSO Generation at Risk Due to Gas Supply Mw: Gas fired capacity expected to be at risk during cold weather conditions or gas pipeline maintenance outages.

9. CSO Net Available Capacity MW: the summation of columns (1+2+3+4-5-6-7-8=9)

10. Peak Load Forecast MW: Provided in the annual 2022 CELT Report and adjusted for Passive Demand Resources assumes Peak Load Exposure (PLE) and does include credit of Passive Demand Response (PDR) and behind-the-meter PV (BTM PV).

11. Operating Reserve Requirement MW: 120% of first largest contingency plus 50% of the second largest contingency.

12. CSO Net Required Capacity MW: (Net Load Obligation) (10+11=12)

13. CSO Operable Capacity Margin MW: CSO Net Available Capacity MW minus CSO Net Required Capacity MW (9-12=13)

14. Operable Capacity Season Label: Applicable season and year.

15. Season Minimum Operable Capacity Flag: this column indicates whether or not a week has the lowest capacity margin for its applicable season.

Preliminary Fall 2022 Operable Capacity Analysis
90/10 Forecast

ISO-NE OPERABLE CAPACITY ANALYSIS

July 20, 2022 - 90/10 FORECAST using CSO MW

This analysis is a tabulation of weekly assessments shown in one single table. The information shows the operable capacity situation under assumed conditions for each week. It is not expected that the system peak will occur every week during September, October & November.

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Study Week (Week Beginning , Saturday)	CSO Supply Resource Capacity MW	CSO Demand Resource Capacity MW	External Node Capacity MW	Non-Commercial Capacity MW	CSO Non Gas-Only Generator Planned Outages MW	CSO Gas-Only Generator Planned Outages MW	Unplanned Outages Allowance MW	CSO Generation at Risk Due to Gas Supply 90-10PLE MW	CSO Net Available Capacity MW	Peak Load Forecast 90-10PLE MW	Operating Reserve Requirement MW	CSO Net Required Capacity MW	CSO Operable Capacity Margin MW	Season Min Opcap Margin Flag	Season_Label
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10/15/2022	28158	559	1070	70	3490	2239	2800	0	21328	16690	2305	18995	2333	N	Fall 2022
10/22/2022	28158	559	1070	70	1851	2479	2800	0	22727	17063	2305	19368	3359	N	Fall 2022
10/29/2022	28158	559	1070	70	2310	3229	3600	0	20718	17274	2305	19579	1139	N	Fall 2022
11/5/2022	28158	559	1070	70	2332	1766	3600	0	22159	17392	2305	19697	2462	N	Fall 2022
11/12/2022	28158	559	1070	70	1882	940	3600	595	22840	17744	2305	20049	2791	N	Fall 2022
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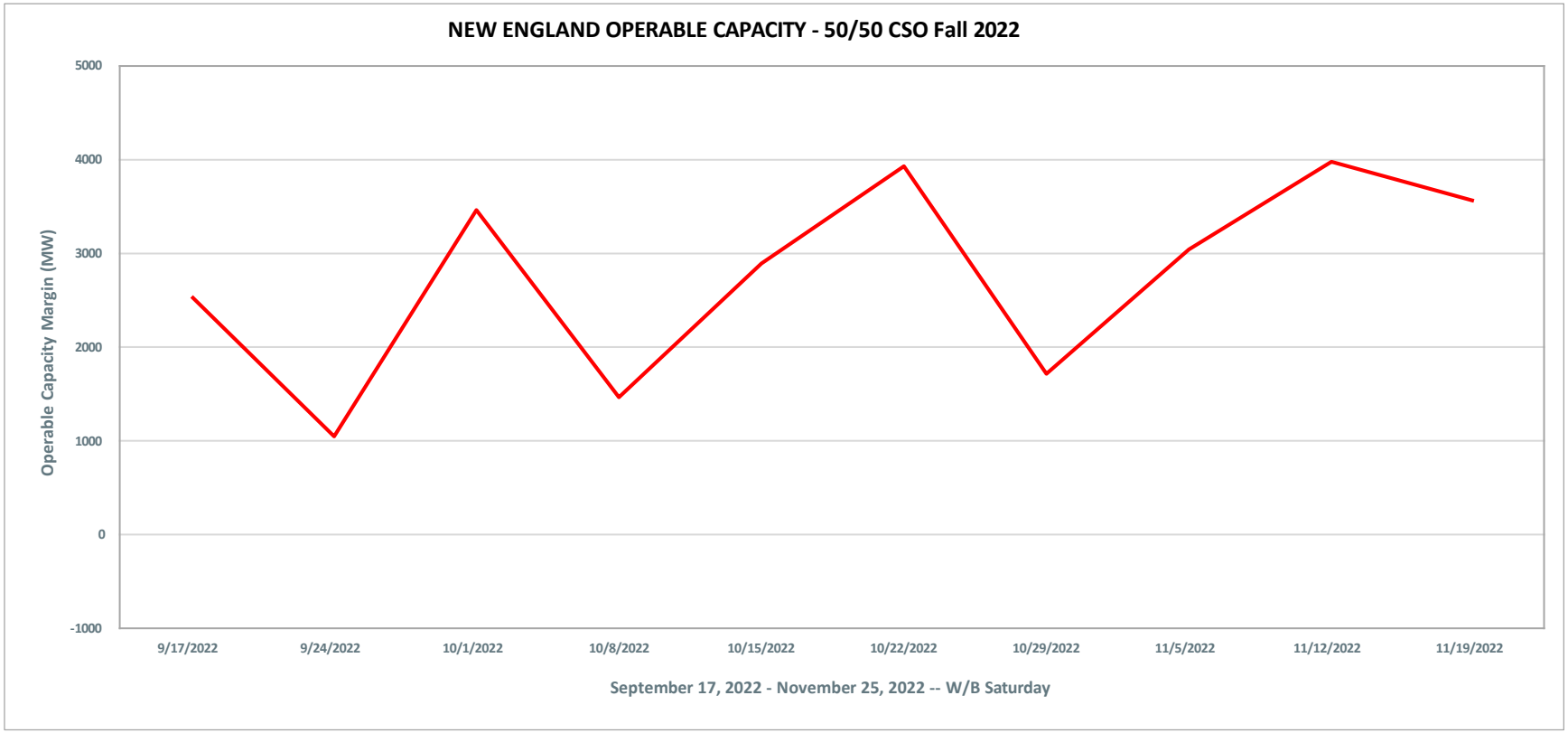
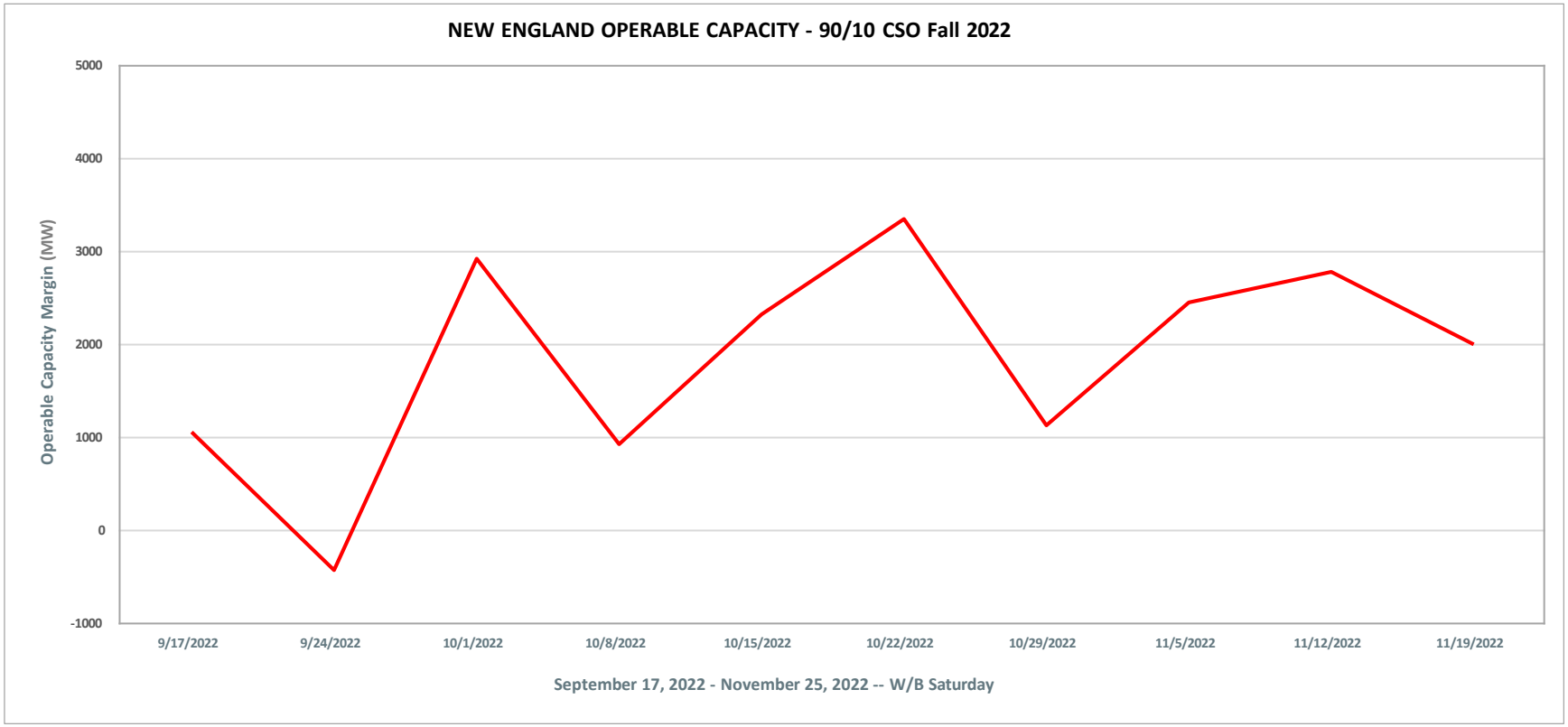
12. CSO Net Required Capacity MW: (Net Load Obligation) (10+11=12)
13. CSO Operable Capacity Margin MW: CSO Net Available Capacity MW minus CSO Net Required Capacity MW (9-12=13)
14. Operable Capacity Season Label: Applicable season and year.
15. Season Minimum Operable Capacity Flag: this column indicates whether or not a week has the lowest capacity margin for its applicable season.

***Highlighted week is based on the week determined by the 50/50 Load Forecast Reference week**

Preliminary Fall 2022 Operable Capacity Analysis
50/50 Forecast (Reference)



Preliminary Fall 2022 Operable Capacity Analysis
90/10 Forecast



OPERABLE CAPACITY ANALYSIS

Appendix

Possible Relief Under OP4: Appendix A

OP 4 Action Number	Page 1 of 2 Action Description	Amount Assumed Obtainable Under OP 4 (MW)
1	Implement Power Caution and advise Resources with a CSO to prepare to provide capacity and notify "Settlement Only" generators with a CSO to monitor reserve pricing to meet those obligations. Begin to allow the depletion of 30-minute reserve.	0 [1] 600
2	Declare Energy Emergency Alert (EEA) Level 1[4]	0
3	Voluntary Load Curtailment of Market Participants' facilities.	40 [2]
4	Implement Power Watch	0
5	Schedule Emergency Energy Transactions and arrange to purchase Control Area-to-Control Area Emergency	1,000
6	Voltage Reduction requiring > 10 minutes	125 [3]

NOTES:

1. Based on Summer Ratings. Assumes 25% of total MW Settlement Only units <5 MW will be available and respond.
2. The actual load relief obtained is highly dependent on circumstances surrounding the appeals, including timing and the amount of advanced notice that can be given.
3. The MW values are based on a 25,000 MW system load and verified by the most recent voltage reduction test.
4. EEA Levels are described in Attachment 1 to NERC Reliability Standard EOP-011 - Emergency Operations

Possible Relief Under OP4: Appendix A

OP 4 Action Number	Page 2 of 2 Action Description	Amount Assumed Obtainable Under OP 4 (MW)
7	Request generating resources not subject to a Capacity Supply Obligation to voluntary provide energy for reliability purposes	0
8	5% Voltage Reduction requiring 10 minutes or less	250 [3]
9	Transmission Customer Generation Not Contractually Available to Market Participants during a Capacity Deficiency. Voluntary Load Curtailment by Large Industrial and Commercial Customers.	5 200 [2]
10	Radio and TV Appeals for Voluntary Load Curtailment Implement Power Warning	200 [2]
11	Request State Governors to Reinforce Power Warning Appeals.	100 [2]
Total		**2,520**

NOTES:

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Questions