

# NEPOOL Participants Committee Report

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*February 2020*



Vamsi Chadalavada

EXECUTIVE VICE PRESIDENT AND CHIEF OPERATING OFFICER



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# Highlights

- Day-Ahead (DA), Real-Time (RT) Prices and Transactions
  - Energy market value over the period was \$280M, down \$188M from December 2019 and down \$391M from January 2019
    - January natural gas prices over the period were 38% lower than December average values
    - Average RT Hub Locational Marginal Prices (\$26.29/MWh) over the period were 39% lower than December averages
      - DA Hub: \$26.66/MWh
    - Average January 2020 natural gas prices and RT Hub LMPs over the period were down 58% and 49%, respectively, from January 2019 averages
  - Average DA cleared physical energy during the peak hours as percent of forecasted load was 99.5% during January, up from 98.7% during December\*
    - The minimum value for the month was 94.8% on Friday, January 10<sup>th</sup>, 2020

**DATA THROUGH JANUARY 29, EXCEPT WHERE NOTED.**

\*DA Cleared Physical Energy is the sum of Generation and Net Imports cleared in the DA Energy Market

Underlying natural gas data furnished by:



# Highlights, cont.

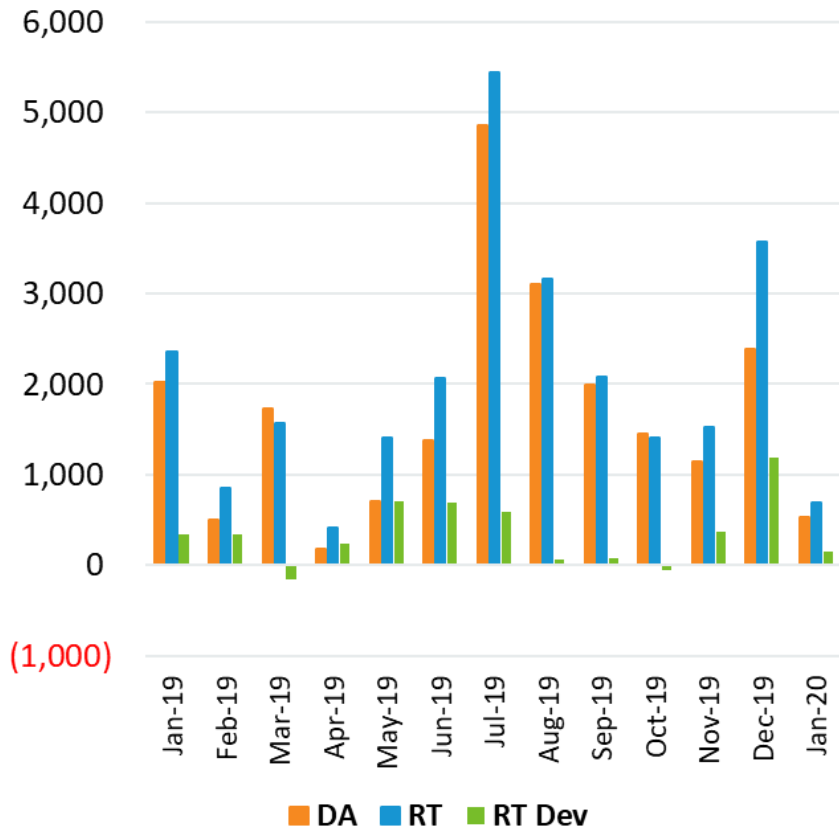
- Daily Net Commitment Period Compensation (NCPC)
  - January NCPC payments totaled \$1.6M over the period, down \$3.1M from December and down \$0.6M from January 2019
    - First Contingency\* payments totaled \$1.5M, down \$0.5M from December
      - \$1.5M paid to internal resources, down \$0.4M from December
        - » \$404K charged to DALO, \$482K to RT Deviations, \$621K to RTLO
      - \$2K paid to resources at external locations, down \$168K from December
        - » Charged to RT Deviations
    - Second Contingency payments totaled \$108K, down \$2.5M from December
  - NCPC payments over the period as percent of Energy Market value were 0.6%

\* NCPC types reflected in the First Contingency Amount: Dispatch Lost Opportunity Cost (DLOC) - \$172K; Rapid Response Pricing (RRP) Opportunity Cost - \$147K; Posturing - \$84K; Generator Performance Auditing (GPA) - \$219K

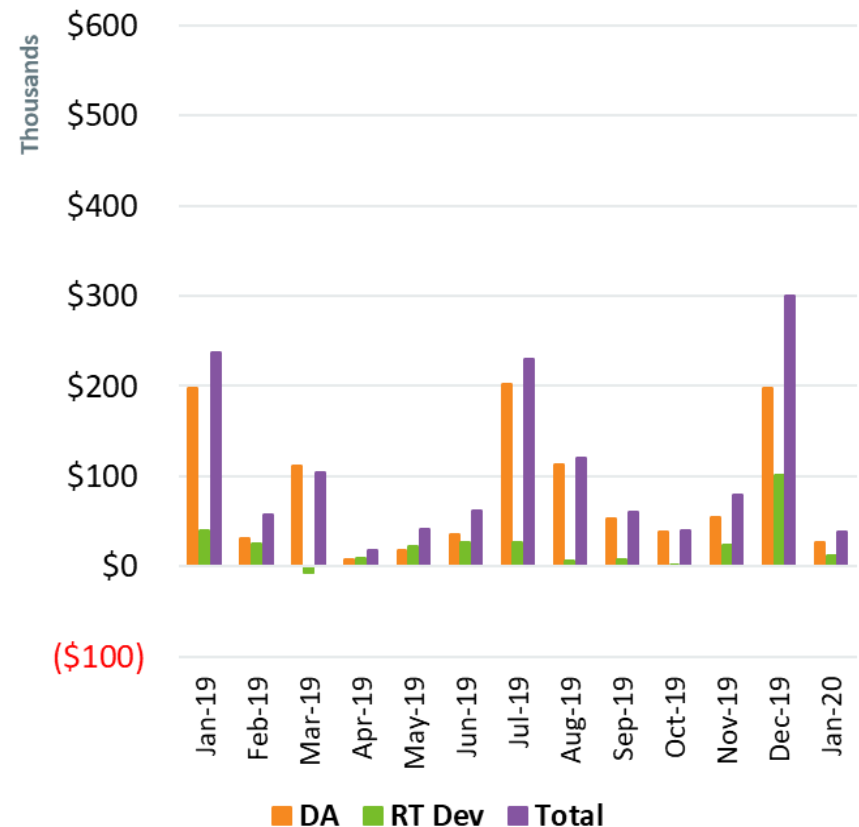


# Price Responsive Demand (PRD) Energy Market Activity by Month

## DA, RT, and RT Dev MWh



## Market Value



Note: DA and RT (deviation) MWh are settlement obligations and reflect appropriate gross-ups for distribution losses.



# Highlights

- FCA 14 was held February 3-4
- On January 23, the ISO sent a short survey to New England stakeholders as a means to provide input to possible enhancements to the Regional System Plan
  - Responses are due February 13
- The Public Policy Process was initiated on January 14
  - Stakeholder input on federal, state, and local Public Policy Requirements must be submitted by February 28
- Boston 2028 RFP Phase One Proposals must be submitted by 11:00 p.m. on March 4



# Forward Capacity Market (FCM) Highlights

- CCP 10 (2019-2020)
  - Late, new resources (regardless of size) are being monitored closely
- CCP 11 (2020-2021)
  - Third and final annual reconfiguration auction (ARA3) to be held March 2-4 and results to be posted no later than April 1
    - FERC approved ICR & Related Values for ARA3 on January 6
- CCP 12 (2021-2022)
  - Second reconfiguration auction (ARA2) will be August 3-5 and results to be posted by September 2
    - FERC approved ICR & Related Values for ARA2 on January 6

CCP – Capacity Commitment Period  
ICR – Installed Capacity Requirement



# Forward Capacity Market (FCM) Highlights

- CCP 13 (2022-2023)
  - First reconfiguration auction (ARA1) will be June 1-3, and results to be posted by July 1
    - FERC approved ICR & Related Values for ARA1 on January 6
- CCP 14 (2023-2024)
  - FCA 14 was held February 3-4





# FCM Highlights, cont.

- CCP 15 (2024-2025)
  - The qualification process has started, and training materials are under development
  - Topology certifications were sent to the TOs on October 9, 2019
  - Capacity zone development discussions began in November 2019 at the PAC meeting
    - All subsequent reconfiguration auctions model the same zones as the FCA
  - ICR & Related Values development will commence in May with discussions at the PSPC



# Load Forecast

- The 2020 load forecast process has begun
  - Energy-Efficiency Forecast Working Group WebEx will be held on February 13
  - Distributed Generation Forecast Working Group meeting will be held on February 14
  - Load Forecast Committee meeting will be held on February 18
- Efforts continue to enhance load forecast models and tools to improve day-ahead and long-term load forecast performance
- ISO is developing forecasts of the anticipated energy and demand impacts of electrification of the transportation and heating sectors for incorporation in the 2020 CELT forecast
  - Methodologies and supporting assumptions are being discussed as part of the annual Load Forecast Committee stakeholder process



# FERC Order 1000

- Qualified Transmission Project Sponsor (QTPS)
  - 23 companies have achieved QTPS status
  - 2 companies are currently moving through the QTPS application process
- The ISO issued the Boston 2028 request for proposal (RFP) on 12/20/2019, which is its first RFP for a competitively-selected transmission solution
  - Phase One Proposals must be submitted by 11:00 p.m. on 3/4/2020
- The ISO filed a response on 12/27/2019 to a 10/17/2019 FERC Section 206 Proceeding regarding the ISO's implementation of Order 1000 time-sensitive needs for immediate need reliability projects (i.e., projects needed to meet reliability needs that are determined to exist three years or less from the completion of a Needs Assessment)
- The Public Policy Process was initiated on 1/14/20
  - Stakeholder input on federal, state, and local Public Policy Requirements must be submitted by 2/28/20

# Highlights

- The lowest 50/50 and 90/10 Winter Operable Capacity Margins are projected for week beginning February 1, 2020.
- The lowest 50/50 and 90/10 Preliminary Spring Operable Capacity Margins are projected for week beginning May 9, 2020.



# SYSTEM OPERATIONS



# System Operations

<u>Weather Patterns</u>	Boston	Temperature: Above Normal (9.0°F) Max: 74°F, Min: 14°F Precipitation: 1.39" – Below Normal Normal: 3.36" Snow: 3.1"	Hartford	Temperature: Above Normal (6.9°F) Max: 70°F, Min: 4°F Precipitation: 1.79" – Below Normal Normal: 3.23" Snow: 3.3"
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<u>Peak Load:</u>	17,934 MW	January 20,2020	18:00 (ending)
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## Emergency Procedure Events (OP-4, M/LCC 2, Minimum Generation Emergency)

Procedure	Declared	Cancelled	
None for January 2020			



# System Operations

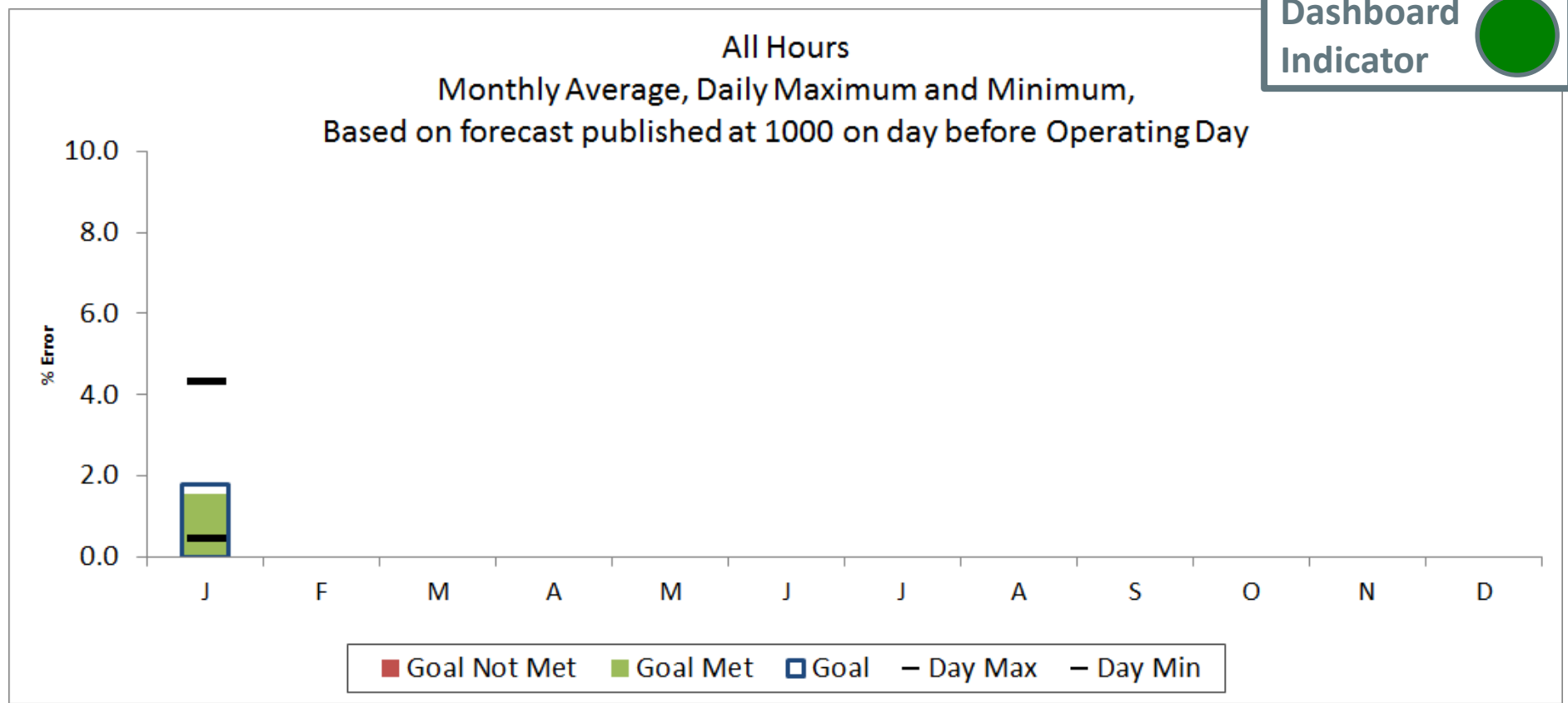
## NPCC Simultaneous Activation of Reserve Events

Date	Area	MW Lost
1/13	IESO	1400
1/16	NBPSO	350
1/21	IESO	880
1/23	PJM	1082
1/31	IESO	945



# 2020 System Operations - Load Forecast Accuracy

Dashboard Indicator

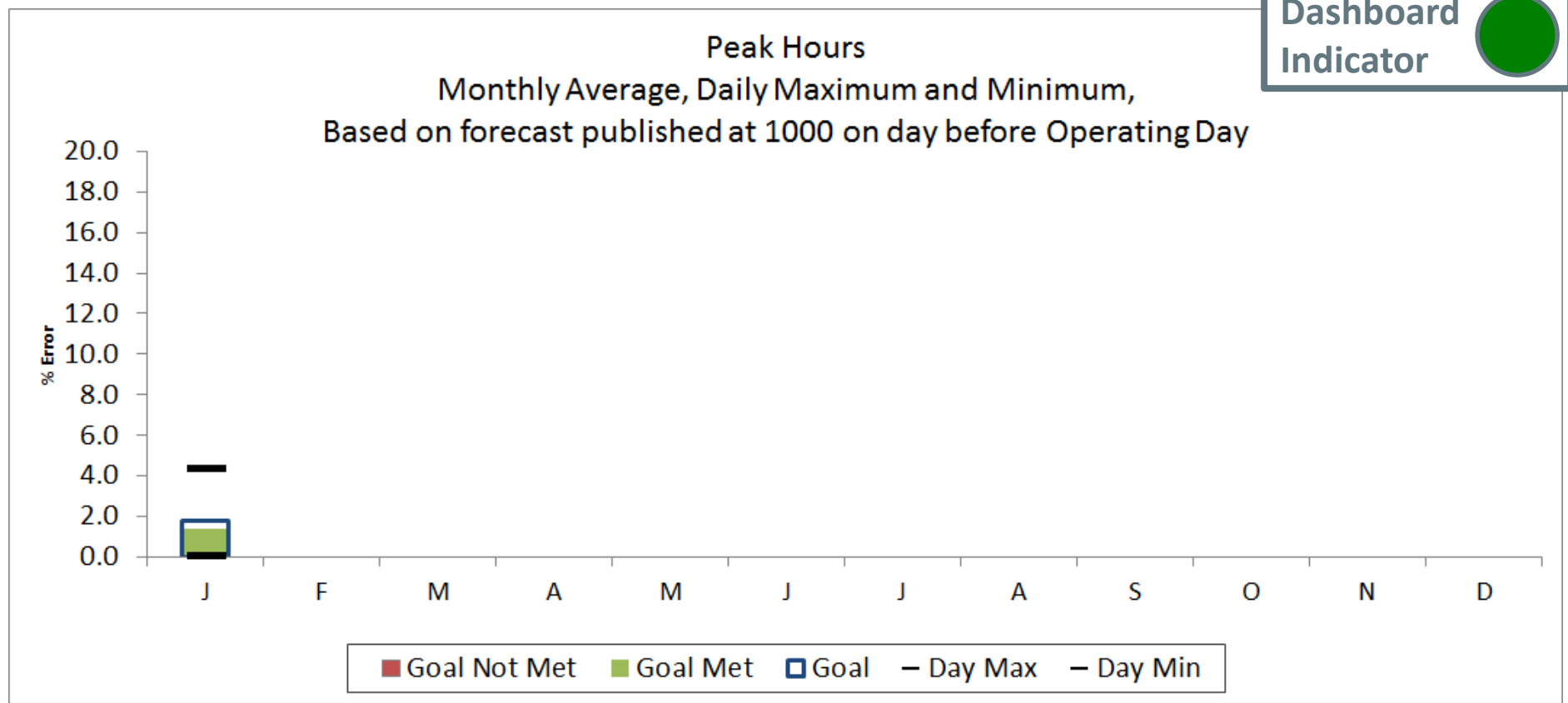


Month	J	F	M	A	M	J	J	A	S	O	N	D	
Day Max	4.31												4.31
Day Min	0.46												0.46
MAPE	1.57												1.57
Goal	1.80												



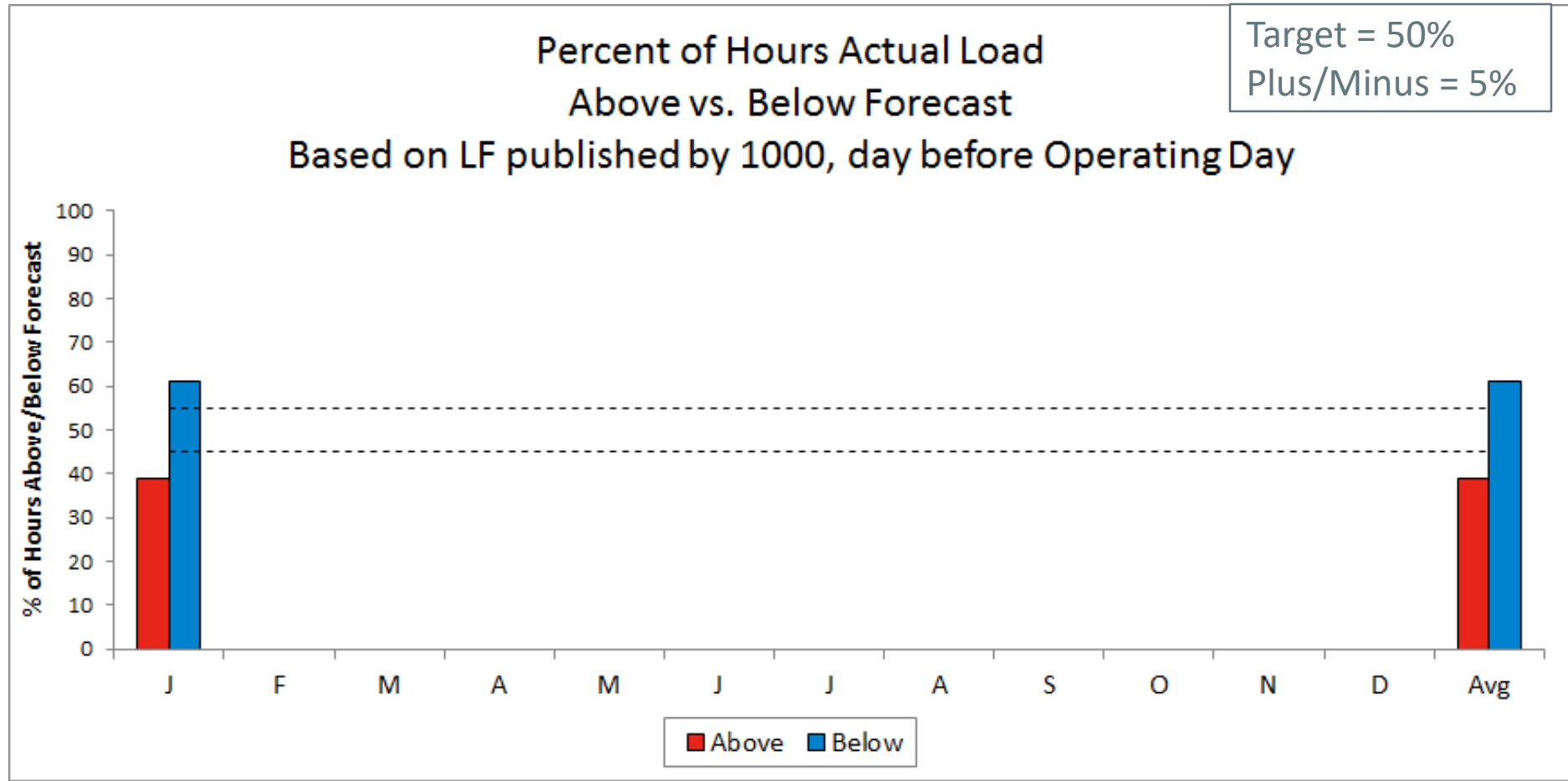
# 2020 System Operations - Load Forecast Accuracy cont.

Dashboard Indicator



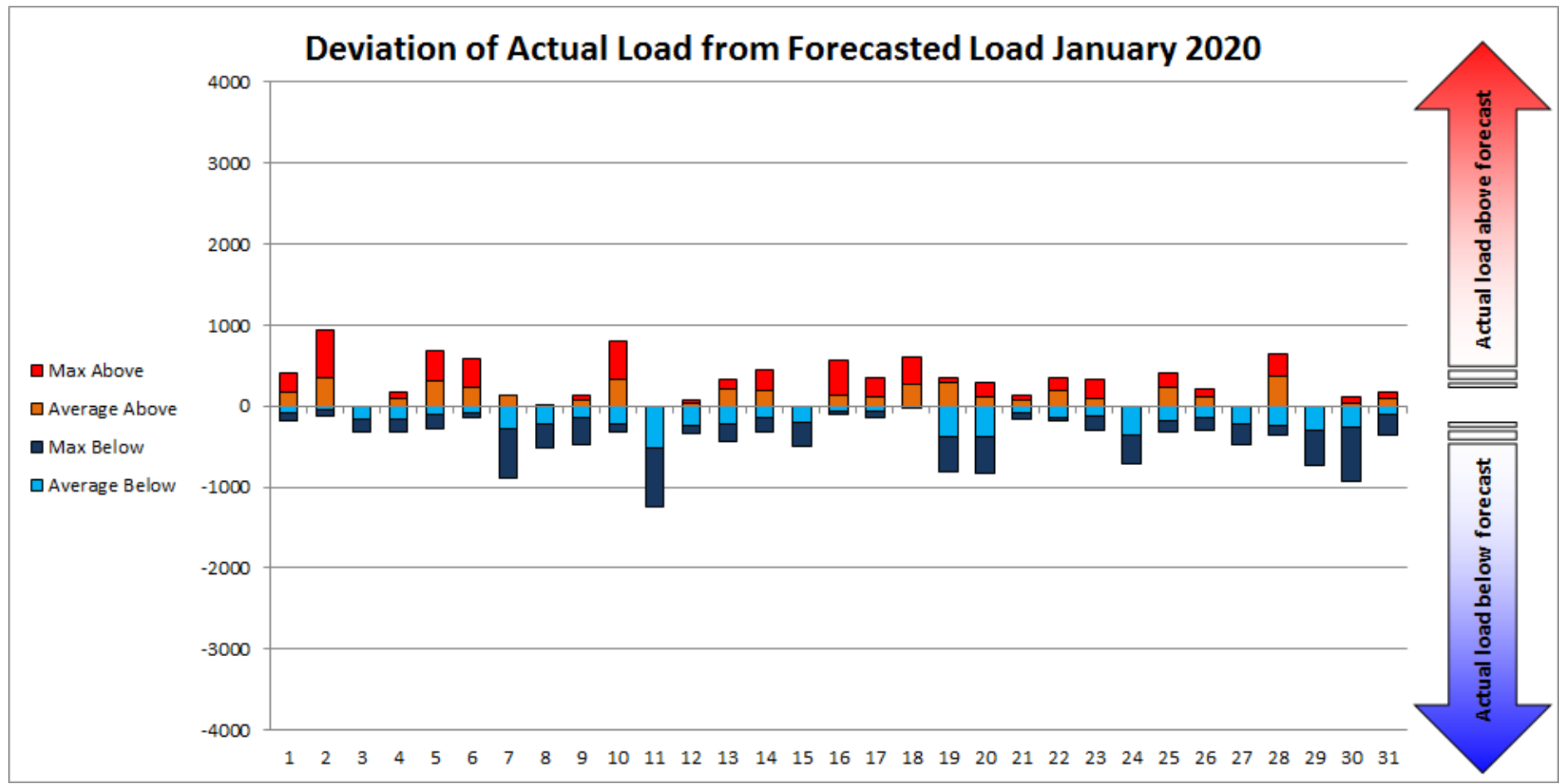
Month	J	F	M	A	M	J	J	A	S	O	N	D	
Day Max	4.33												4.33
Day Min	0.07												0.07
MAPE	1.41												1.41
Goal	1.80												

# 2020 System Operations - Load Forecast Accuracy cont.



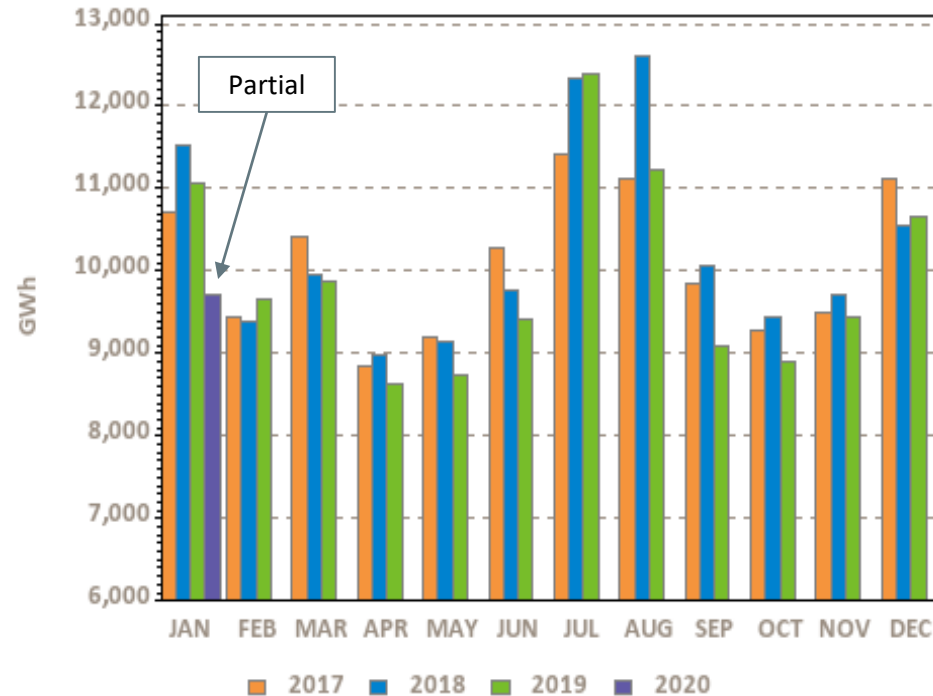
	J	F	M	A	M	J	J	A	S	O	N	D	Avg
Above %	39												39
Below %	61												61
Avg Above	136.2												136
Avg Below	-192.4												-192
Avg All	-65												-65

# 2020 System Operations - Load Forecast Accuracy cont.



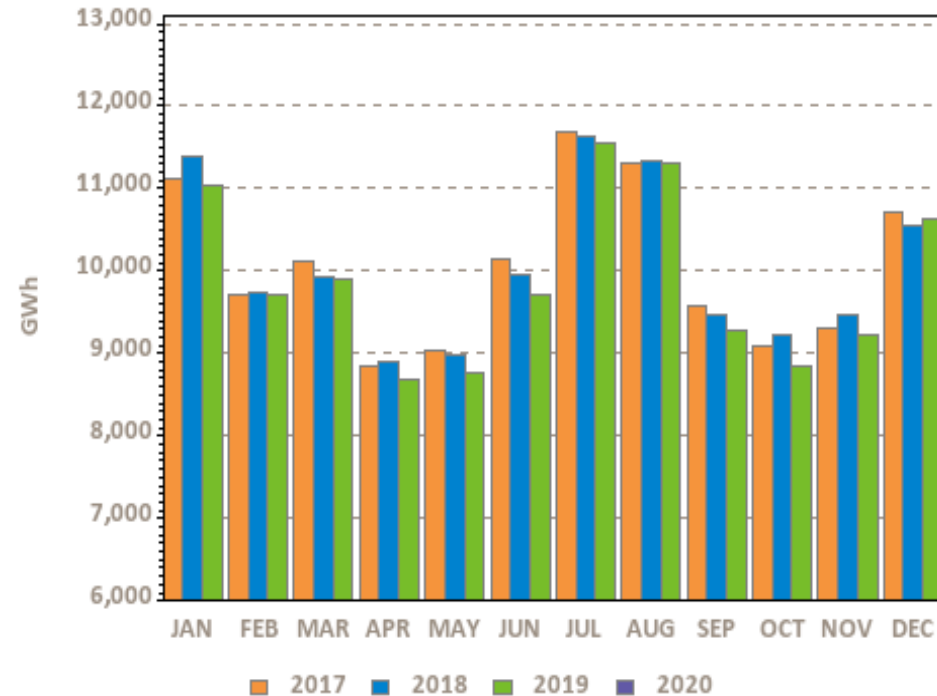
# Monthly Recorded Net Energy for Load (NEL) and Weather Normalized NEL

Net Energy for Load (NEL)



Ann Tot (TWh): 121.2 123.5 119.1 9.7

Weather Normalized NEL



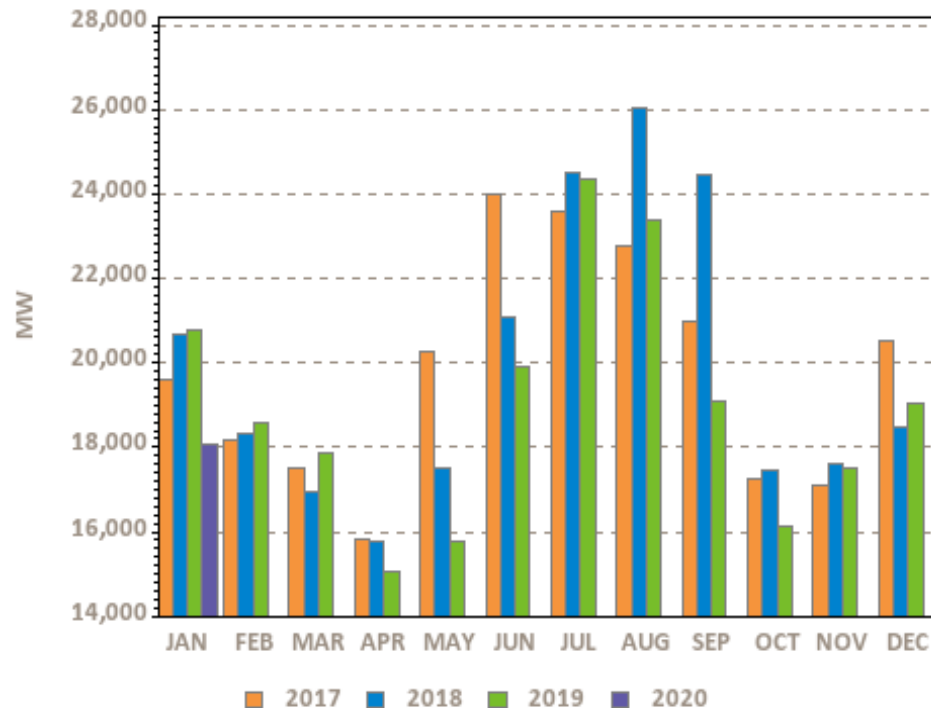
Ann Tot (TWh): 120.7 120.6 118.7 0

NEPOOL NEL is the total net revenue quality metered energy required to serve load and is analogous to 'RT system load.' NEL is calculated as: Generation – pumping load + net interchange where imports are positively signed. Current month's data may be preliminary. Weather normalized NEL may be reported on a one-month lag.



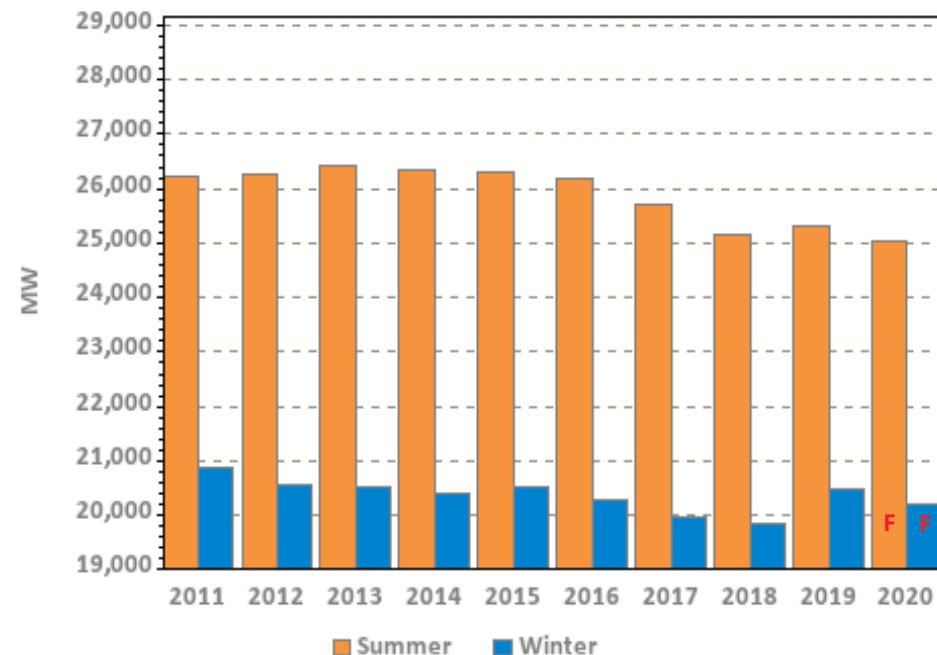
# Monthly Peak Loads and Weather Normalized Seasonal Peak History

System Peak Load



Revenue quality metered value

Weather Normalized Seasonal Peaks



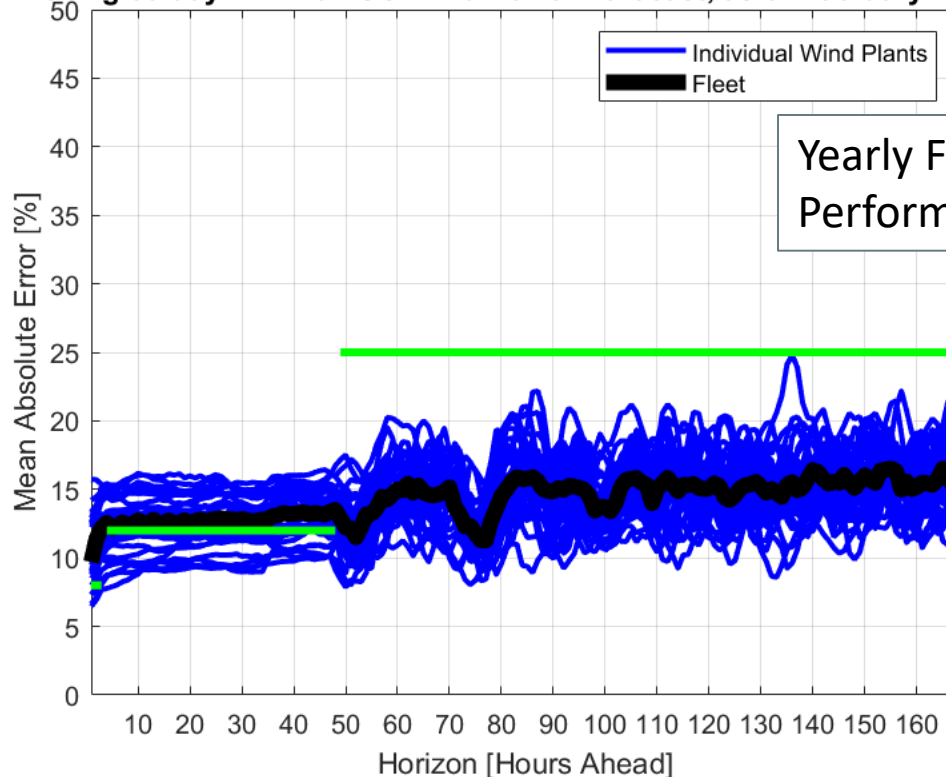
Winter beginning in year displayed

F – designates forecasted values, which are updated in April/May of the following year; represents “net forecast” (i.e., the gross forecast net of passive demand response and behind-the-meter solar demand)



# Wind Power Forecast Error Statistics: Medium and Long Term Forecasts MAE

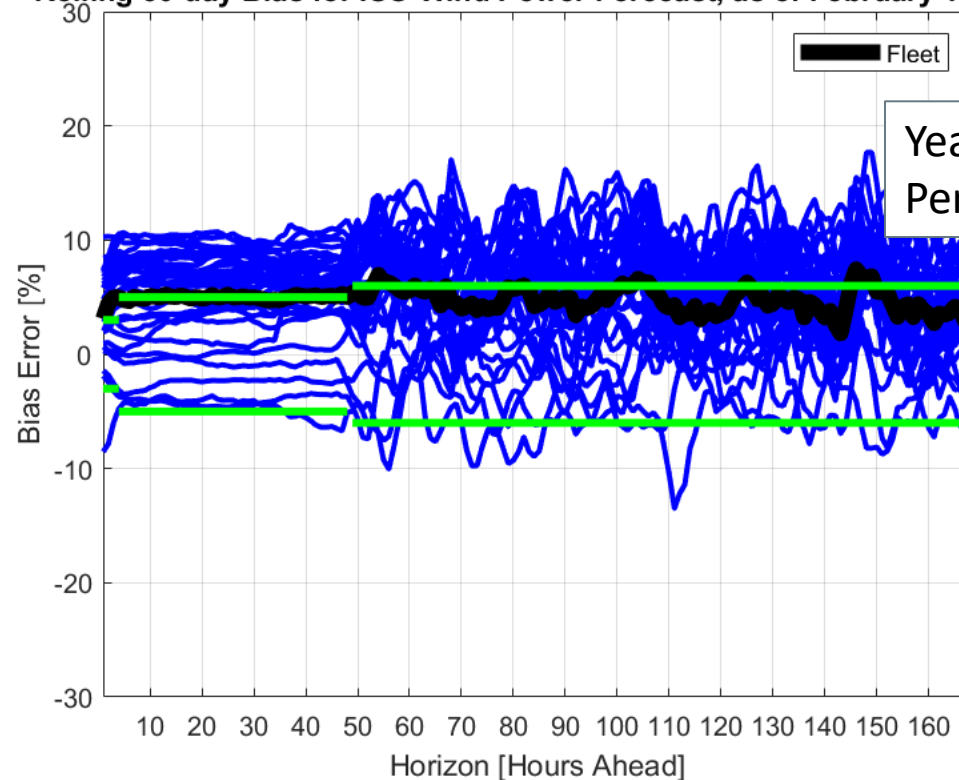
Rolling 30-day MAE for ISO Wind Power Forecast, as of February 1, 2020



Ideally, MAE and Bias would be both equal to zero. As is typical, MAE increases with the forecast horizon. MAE and Bias for the fleet of wind power resources are less due to offsetting errors. Across all time frames, the ISO-NE/DNV-GL forecast is very good compared to industry standards, and, except for hours 37 to 48, monthly MAE is within the yearly performance targets.

# Wind Power Forecast Error Statistics: Medium and Long Term Forecasts Bias

Rolling 30-day Bias for ISO Wind Power Forecast, as of February 1, 2020



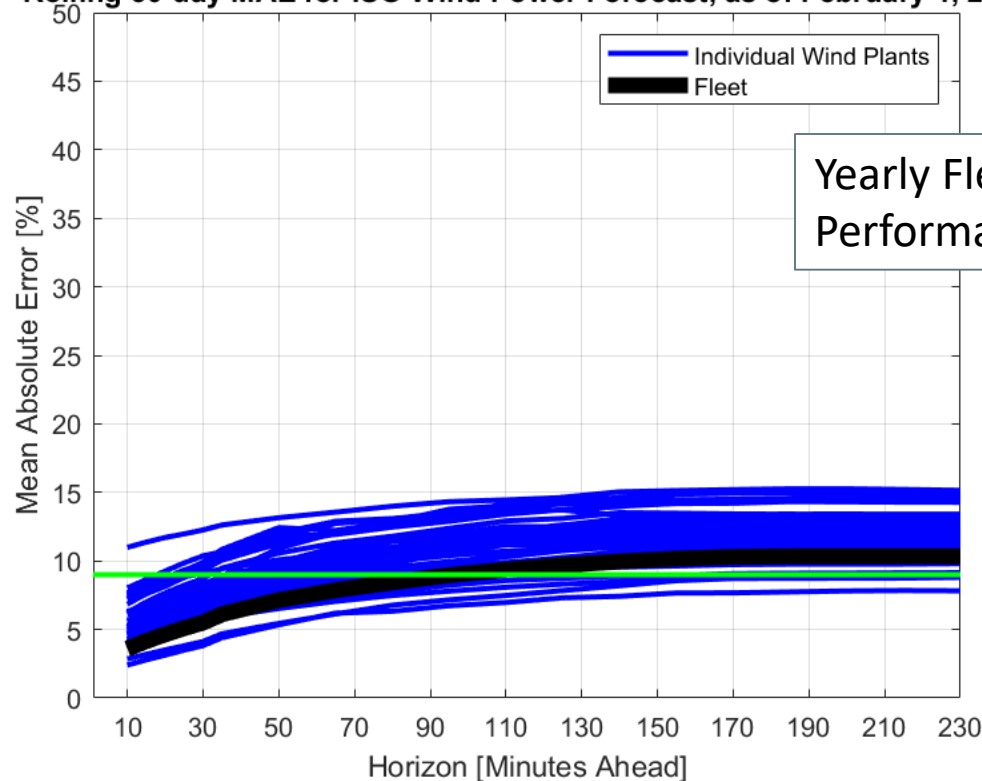
Dashboard Indicator 

Yearly Fleet  
Performance targets

Ideally, MAE and Bias would be both equal to zero. Positive bias means less windpower was actually available compared to forecast. Negative bias means more windpower was actually available compared to forecast. Across all time frames, the ISO-NE/DNV-GL forecast compares well with industry standards, and monthly Bias is mostly within yearly performance targets.

# Wind Power Forecast Error Statistics: Short Term Forecast MAE

Rolling 30-day MAE for ISO Wind Power Forecast, as of February 1, 2020



Dashboard Indicator

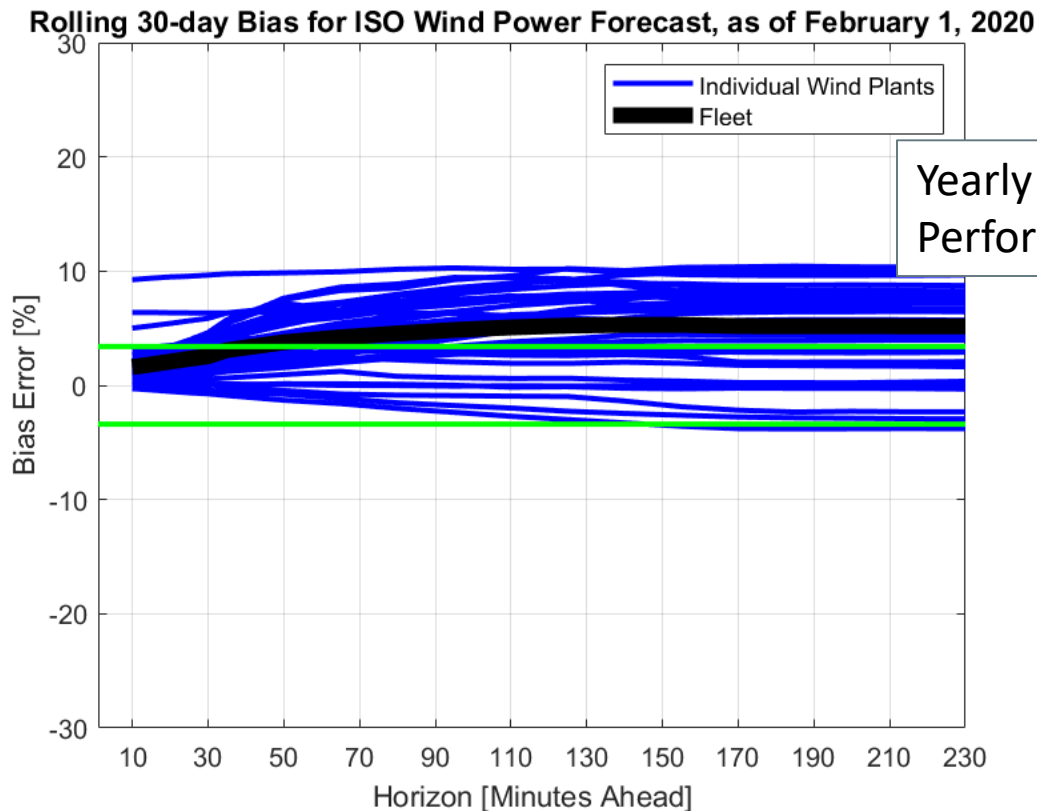


Yearly Fleet  
Performance targets

Ideally, MAE and Bias would be both equal to zero. As is typical, MAE increases with the forecast horizon. MAE and Bias for the fleet of wind power resources are less due to offsetting errors. Across all time frames, the ISO-NE/DNV-GL forecast is very good compared to industry standards, and, out to 3 hours ahead, monthly MAE is within the yearly performance targets out to 110 minutes.



# Wind Power Forecast Error Statistics: Short Term Forecast Bias



Dashboard Indicator

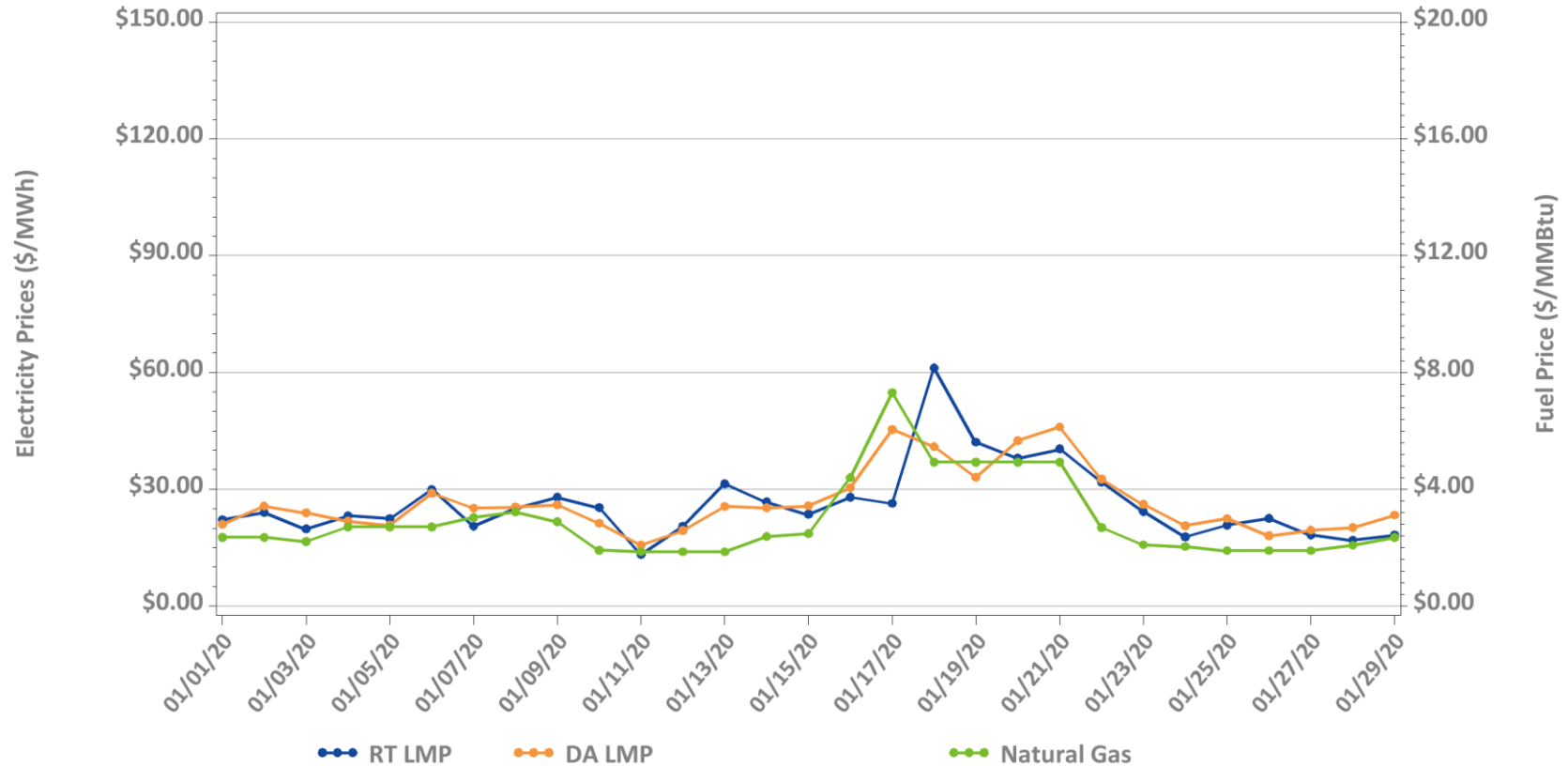


Ideally, MAE and Bias would be both equal to zero. Positive bias means less windpower was actually available compared to forecast. Negative bias means more windpower was actually available compared to forecast. Across all time frames, the ISO-NE/DNV-GL forecast compares well with industry standards, and monthly Bias is within yearly performance targets out to 70 minutes ahead.

# MARKET OPERATIONS



# Daily Average DA and RT ISO-NE Hub Prices and Input Fuel Prices: January 1-29, 2020

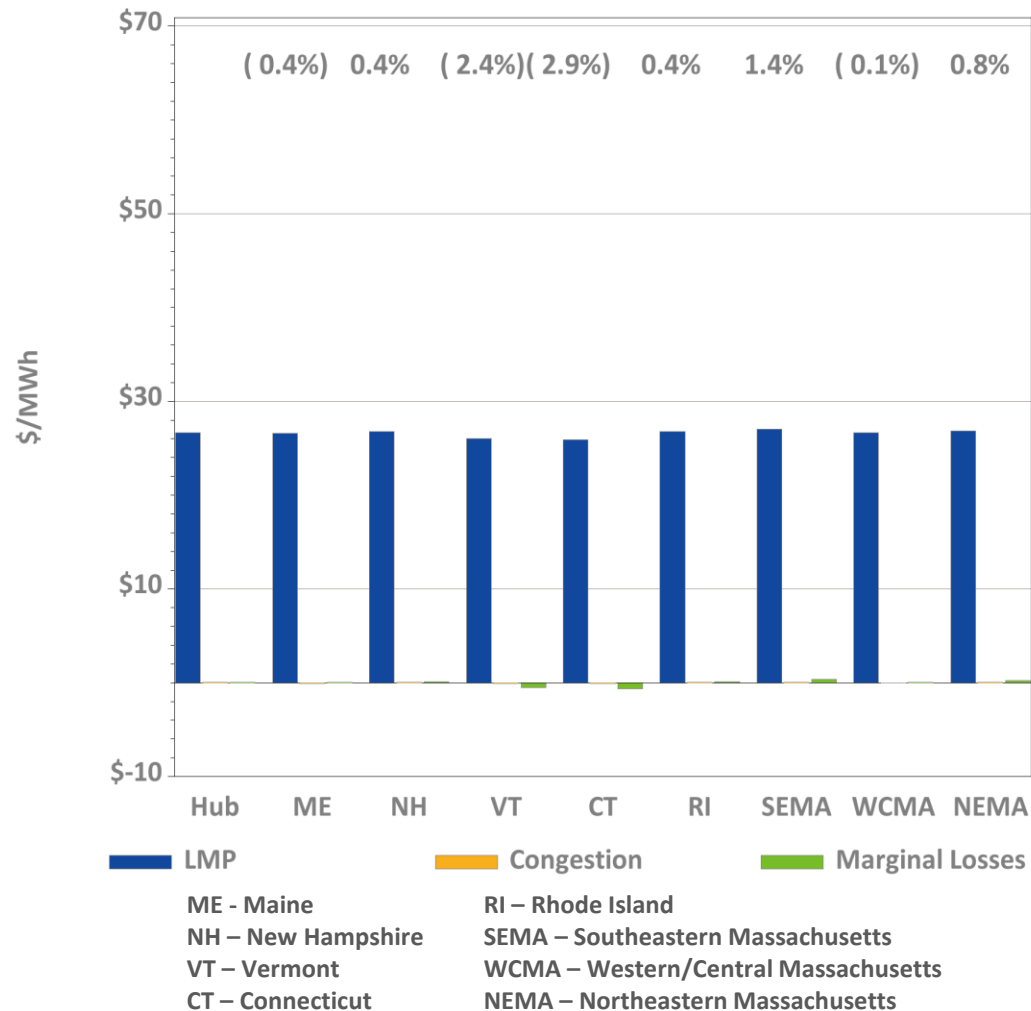


Underlying natural gas data furnished by:

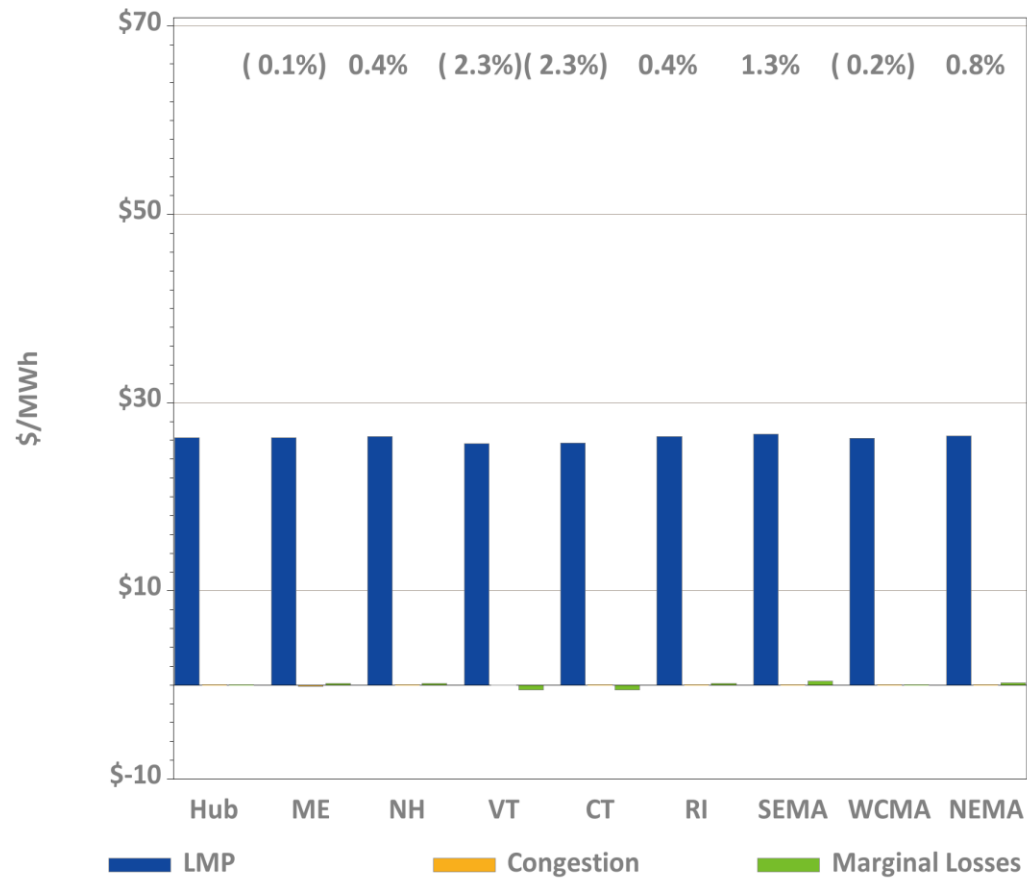


Average price difference over this period (DA-RT): \$0.37  
 Average price difference over this period ABS(DA-RT): \$4.04  
 Average percentage difference over this period ABS(DA-RT)/RT Average LMP: 15%  
 Gas price is average of Massachusetts delivery points

# DA LMPs Average by Zone & Hub, January 2020



# RT LMPs Average by Zone & Hub, January 2020



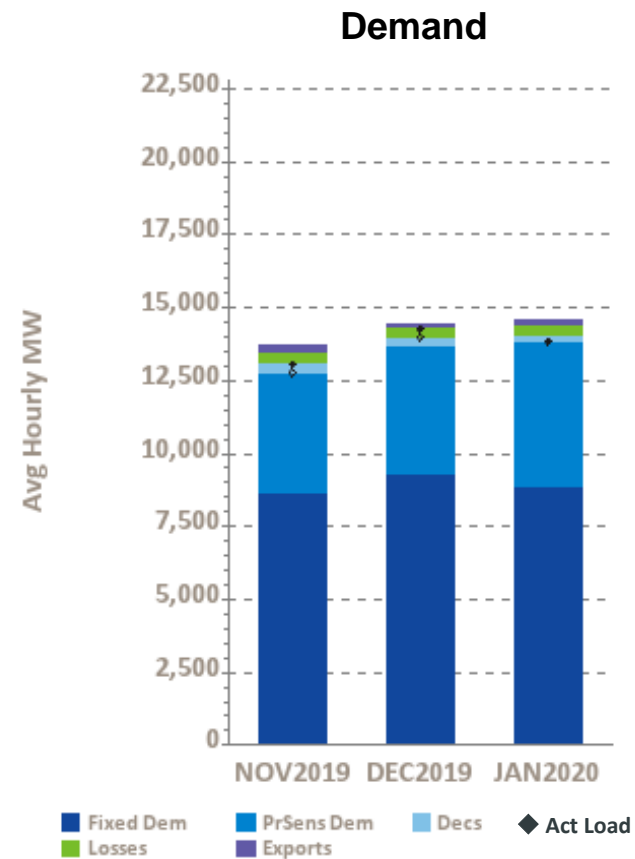
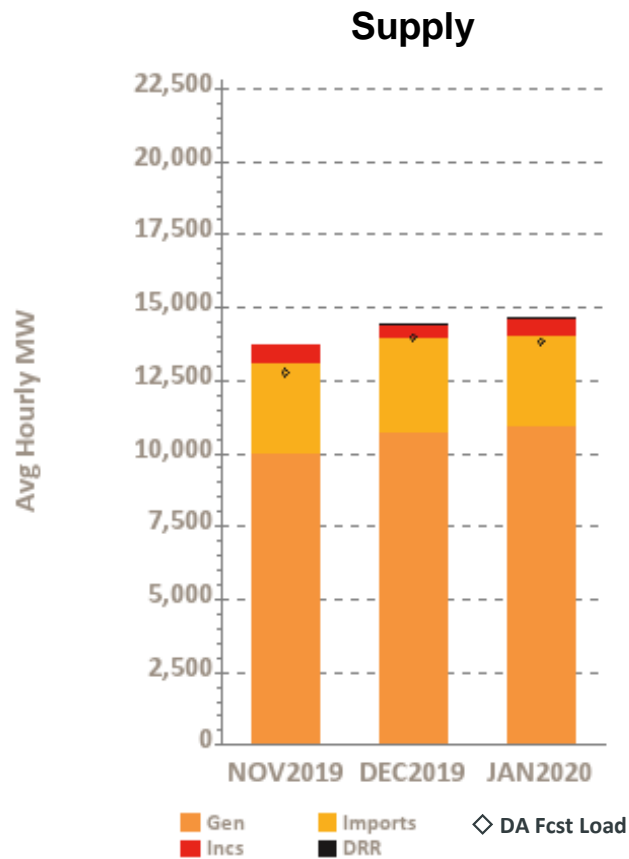
# Definitions

Day-Ahead Concept	Definition
Day-Ahead Load Obligation ( <b>DALO</b> )	The sum of day-ahead cleared load (including asset load, pump load, exports, and virtual purchases and excluding modeled transmission losses)
Day-Ahead Cleared Physical Energy	The sum of day-ahead cleared generation and cleared net imports

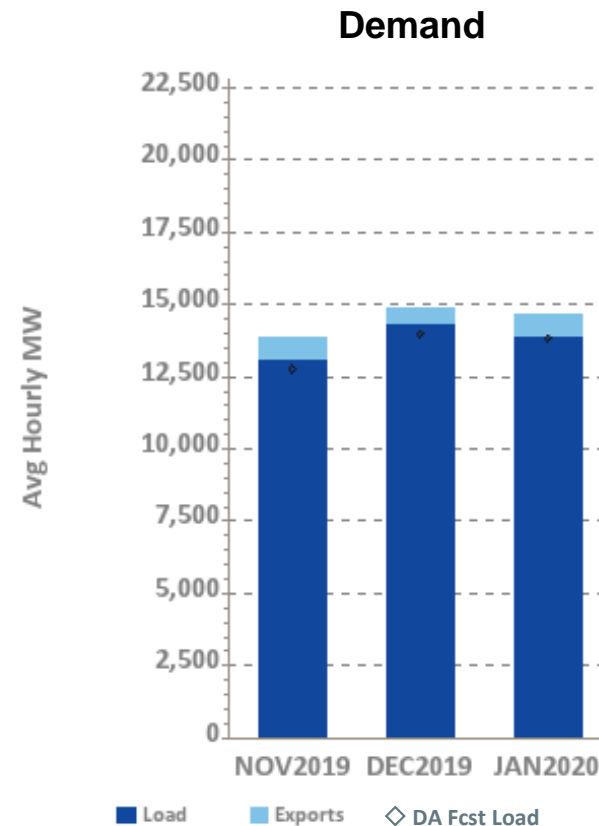
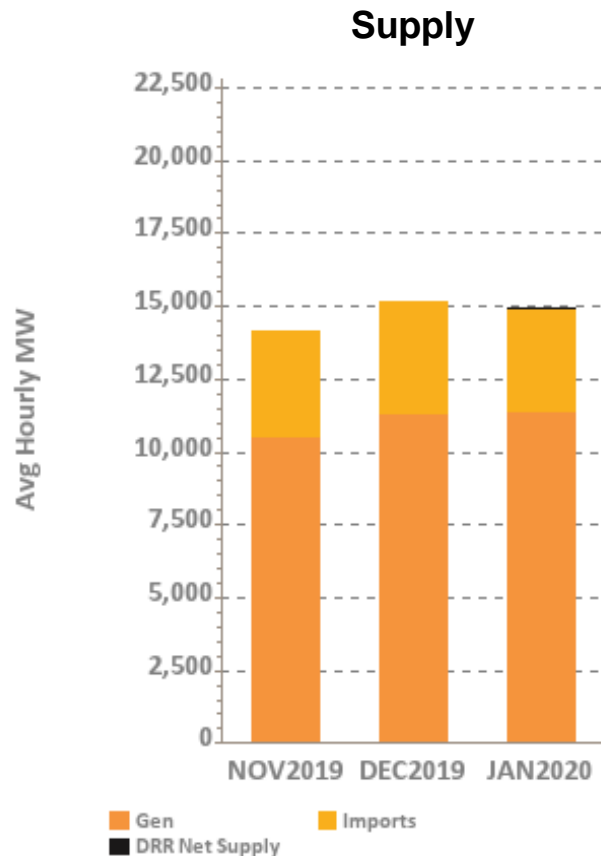


# Components of Cleared DA Supply and Demand

## – Last Three Months

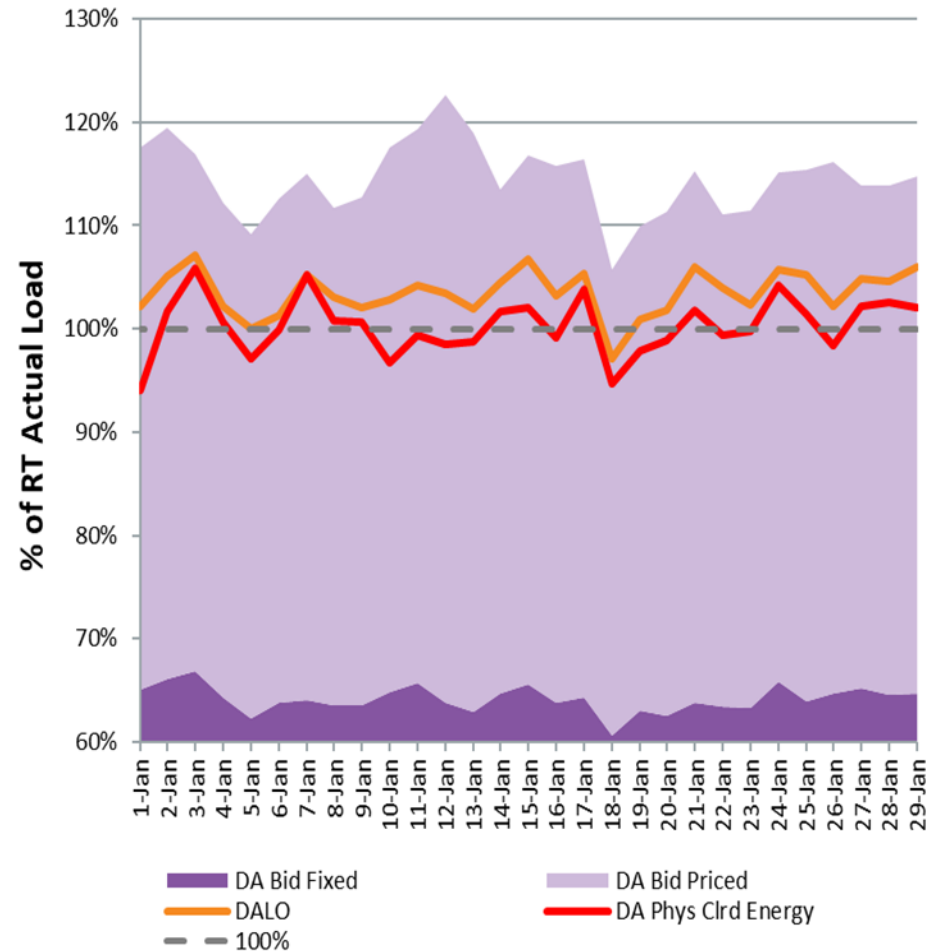
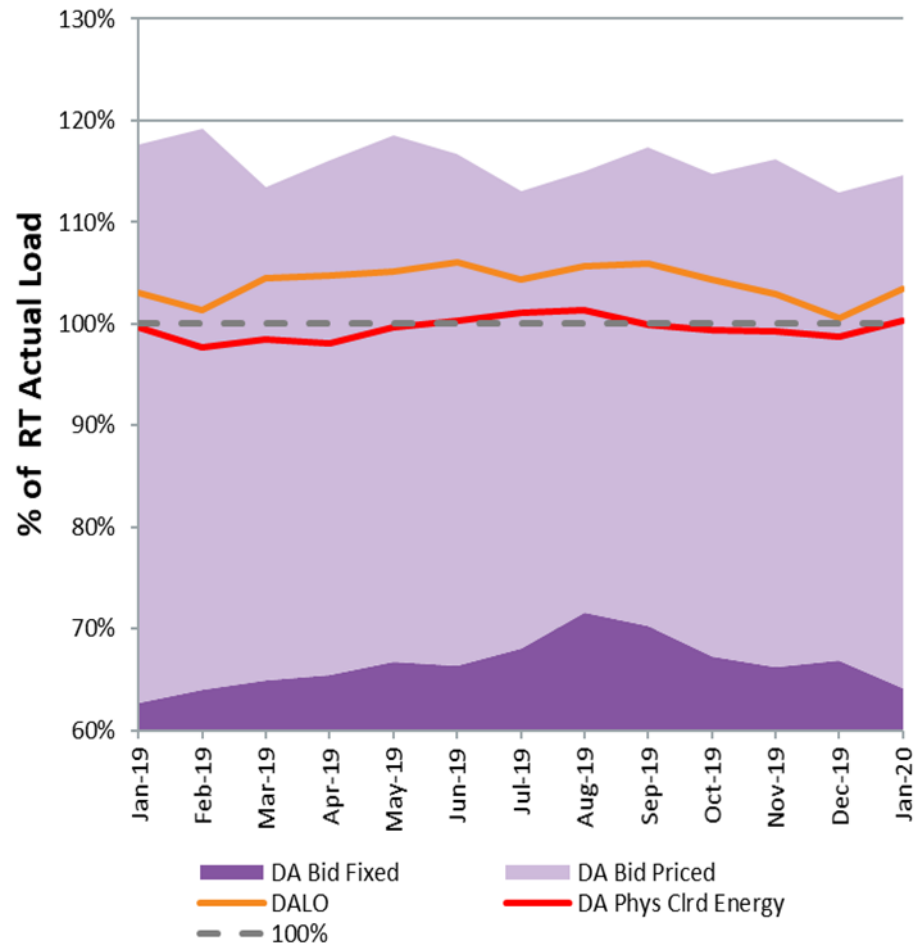


# Components of RT Supply and Demand – Last Three Months





# DAM Volumes as % of RT Actual Load (Forecasted Peak Hour)

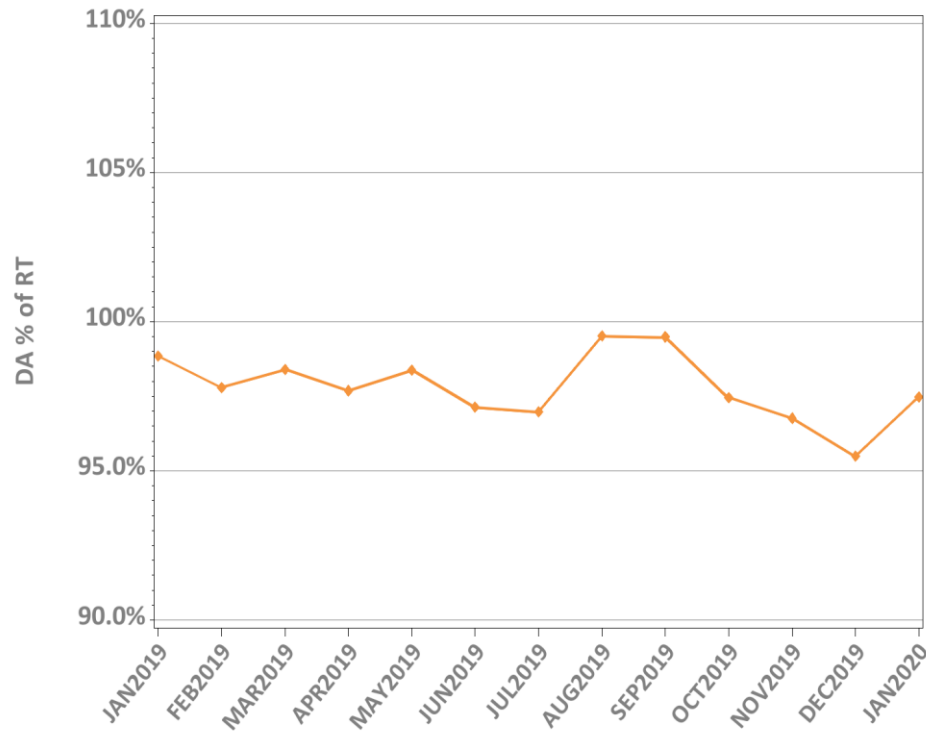


Note: Percentages were derived for the peak hour of each day (shown on right), then averaged over the month (shown on left). Values at hour of forecasted peak load. DA Bid categories reflect internal load asset bidding behavior (Virtual demand and export bid behavior not reflected).

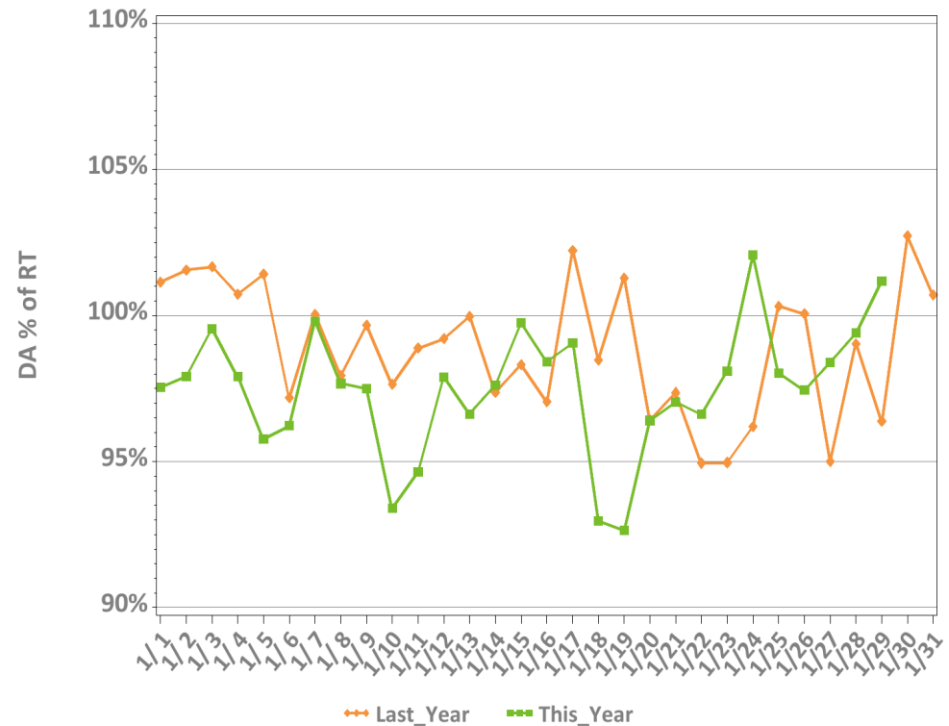


# DA vs. RT Load Obligation: December, This Year vs. Last Year

Monthly, Last 13 Months



Daily, This Year vs. Last Year

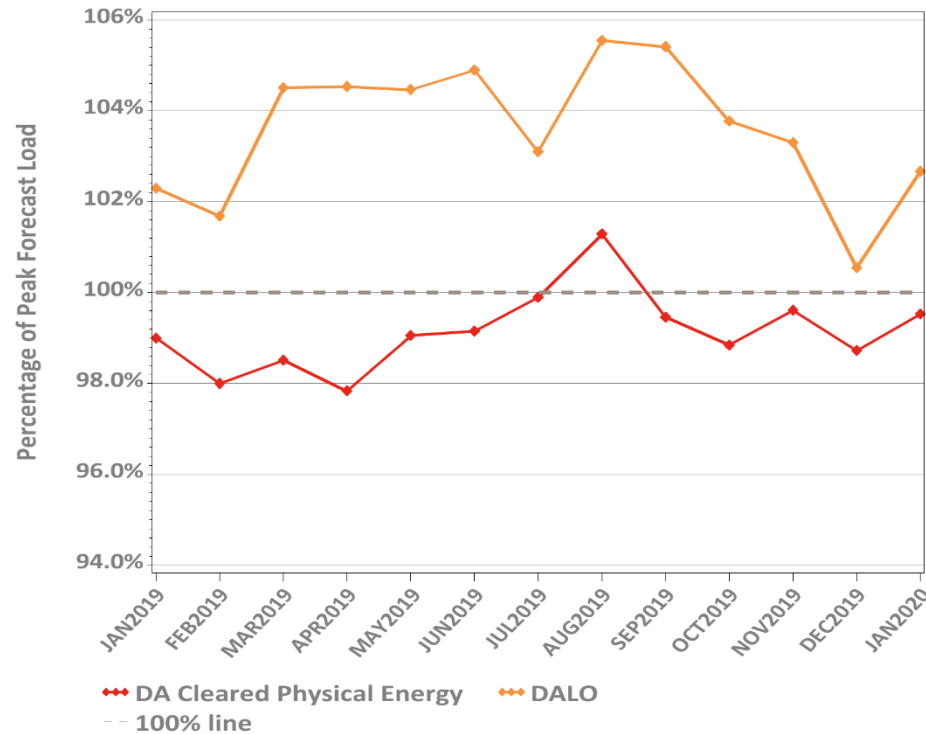


\*Hourly average values

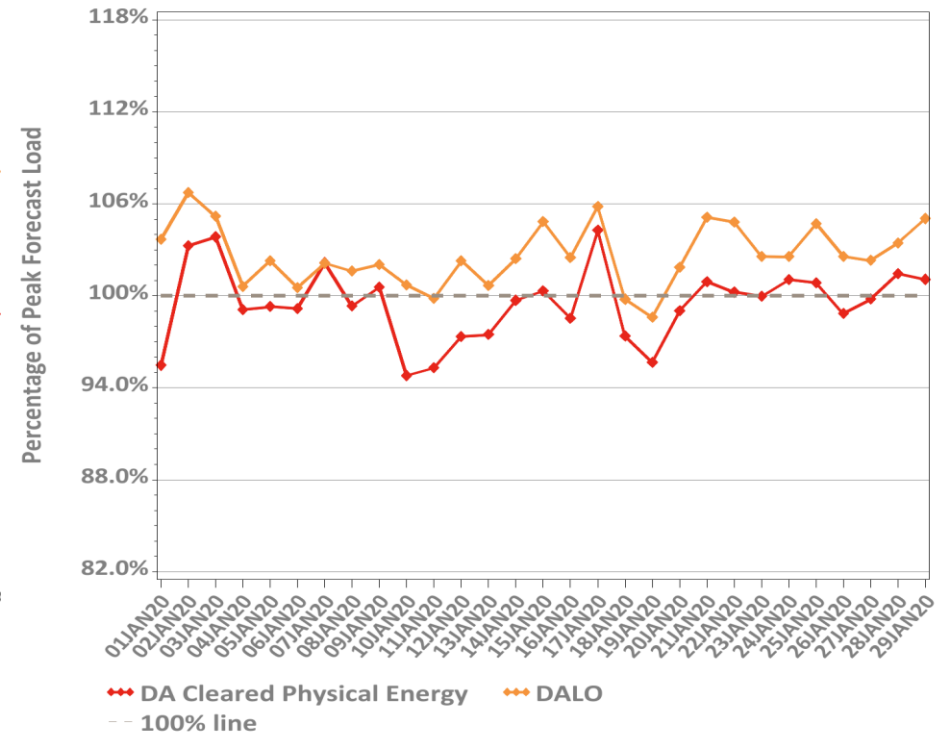


# DA Volumes as % of Forecast in Peak Hour

Monthly, Last 13 Months

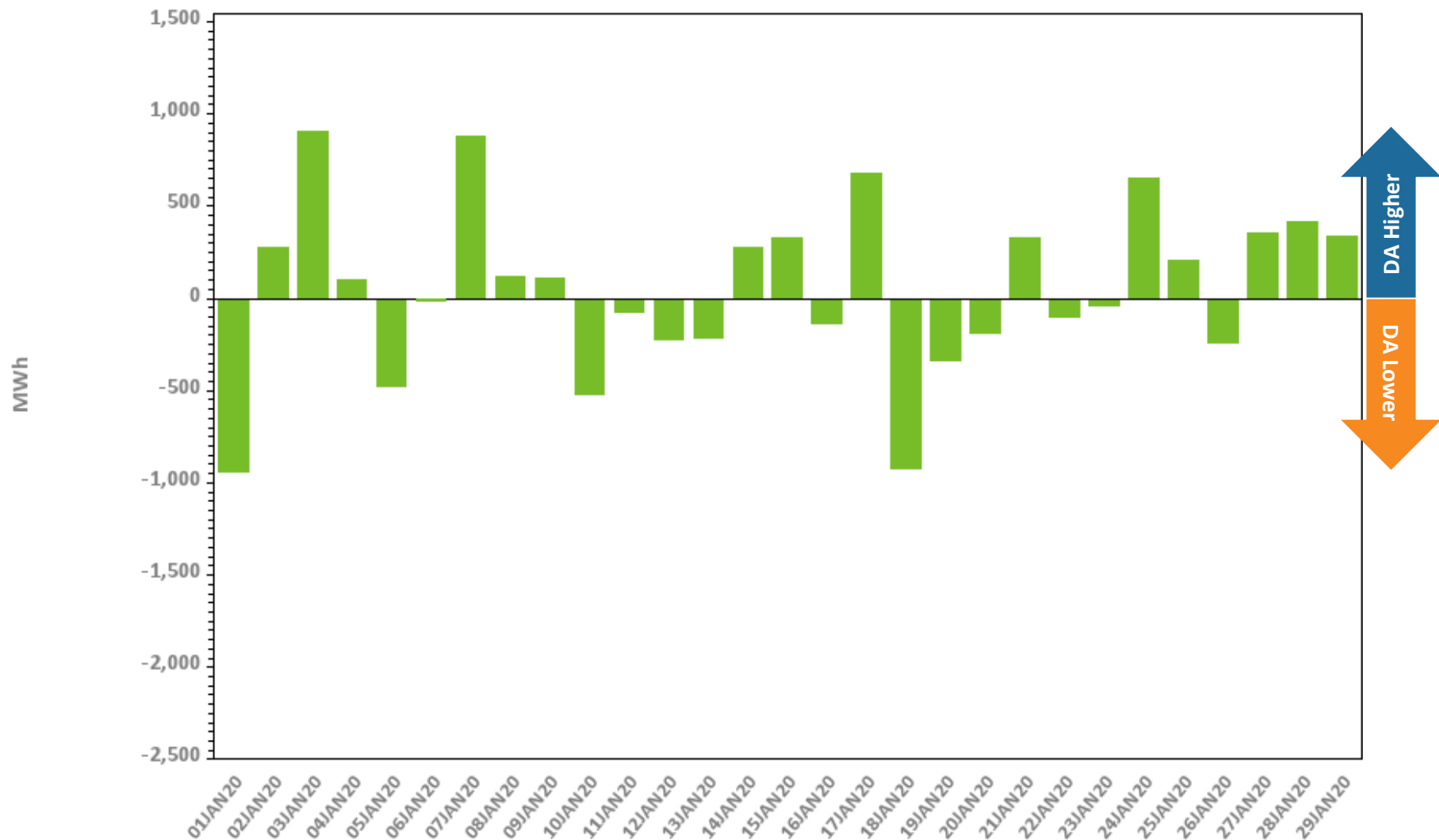


Daily: This Month



\* There were **no** system-level supplemental commitments for capacity required during the Reserve Adequacy Assessment (RAA) during January.

# DA Cleared Physical Energy Difference from RT System Load at Peak Hour\*

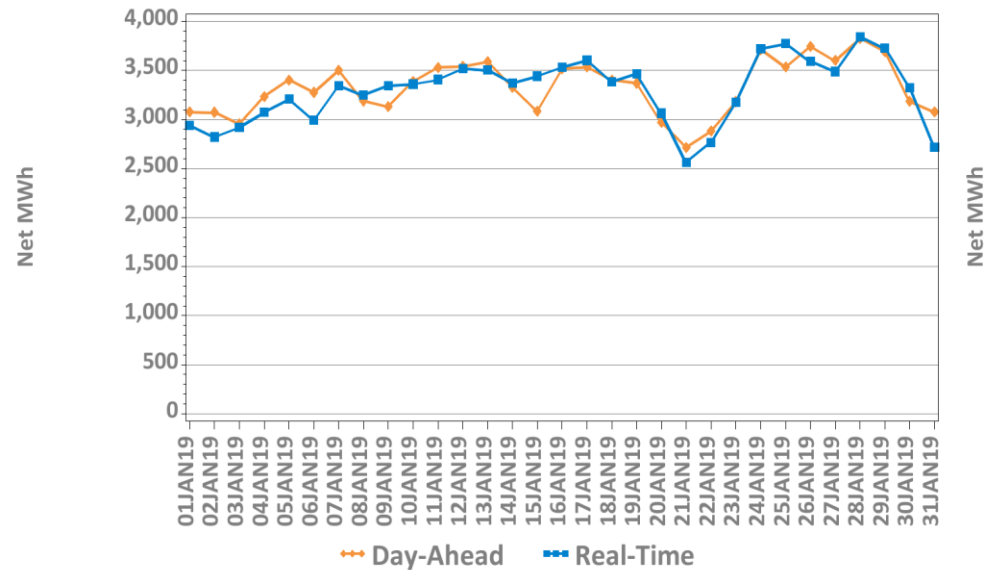


\*Negative values indicate DA Cleared Physical Energy value below its RT counterpart. Forecast peak hour reflected.

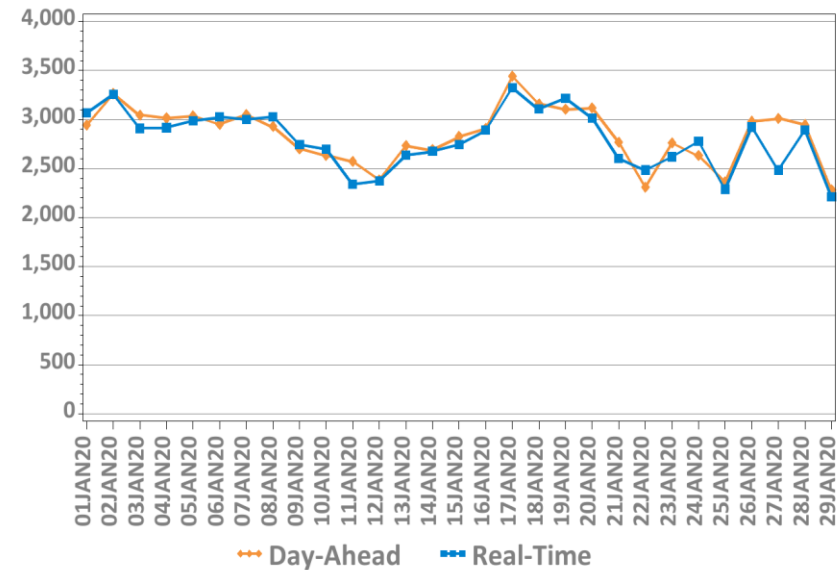
# DA vs. RT Net Interchange

## January 2020 vs. January 2019

Hourly Average by Day, Last Year



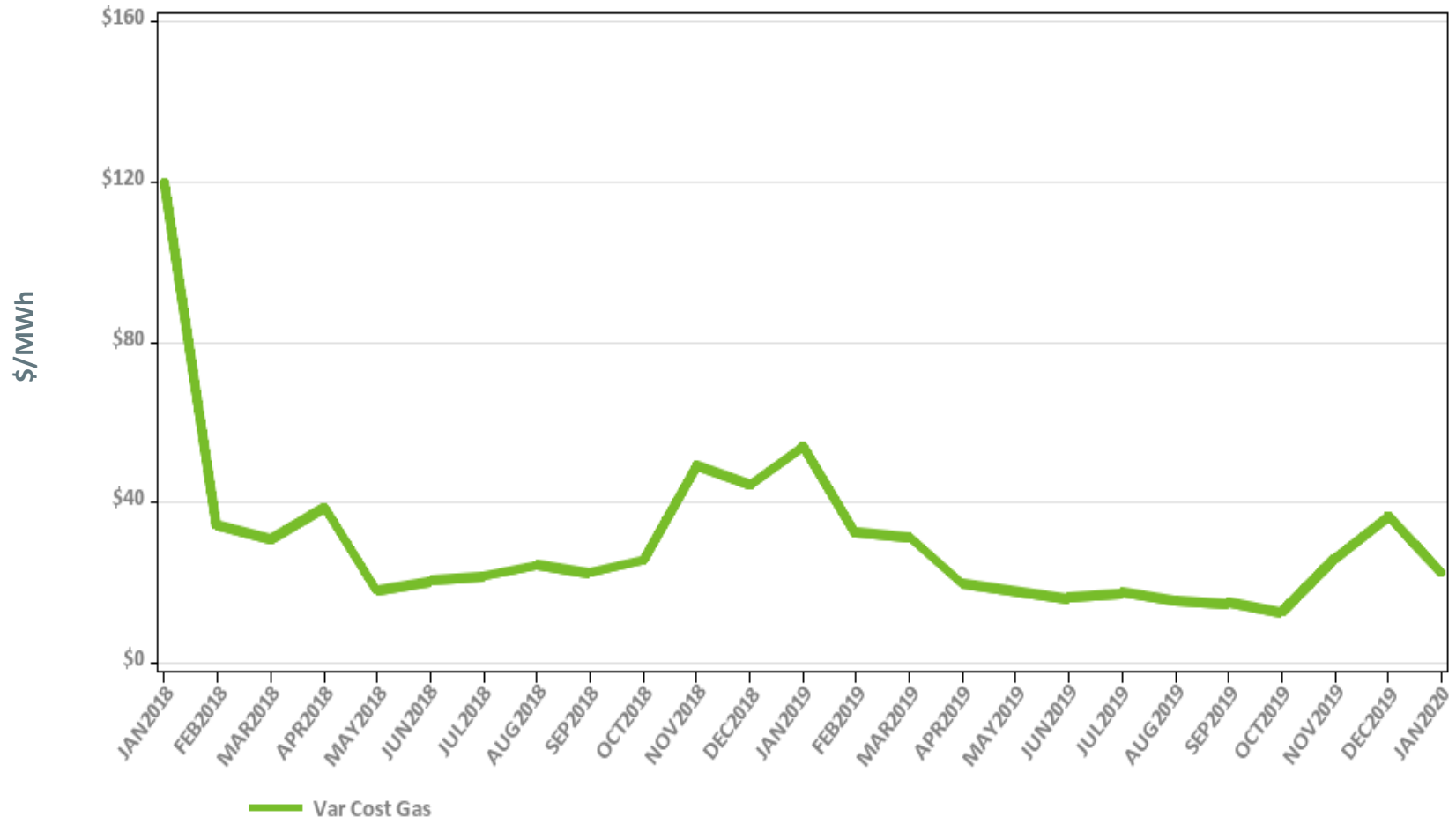
Hourly Average by Day, This Year



Net Interchange is the sum of daily imports minus the sum of daily exports  
Positive values are net imports



# Variable Production Cost of Natural Gas: Monthly

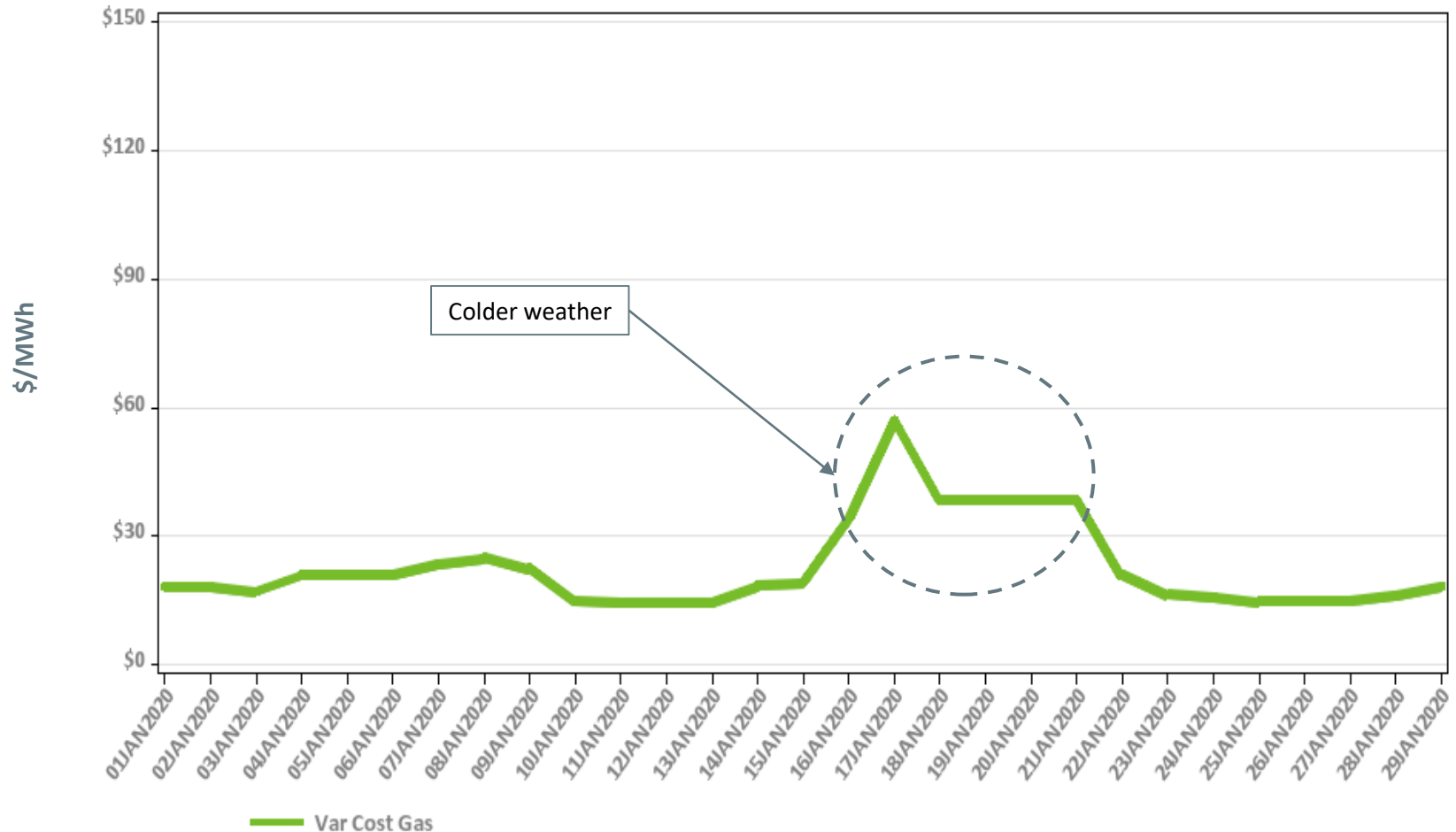


**Note:** Assumes proxy heat rate of 7,800,000 Btu/MWh for natural gas units.

Underlying natural gas data furnished by:



# Variable Production Cost of Natural Gas: Daily



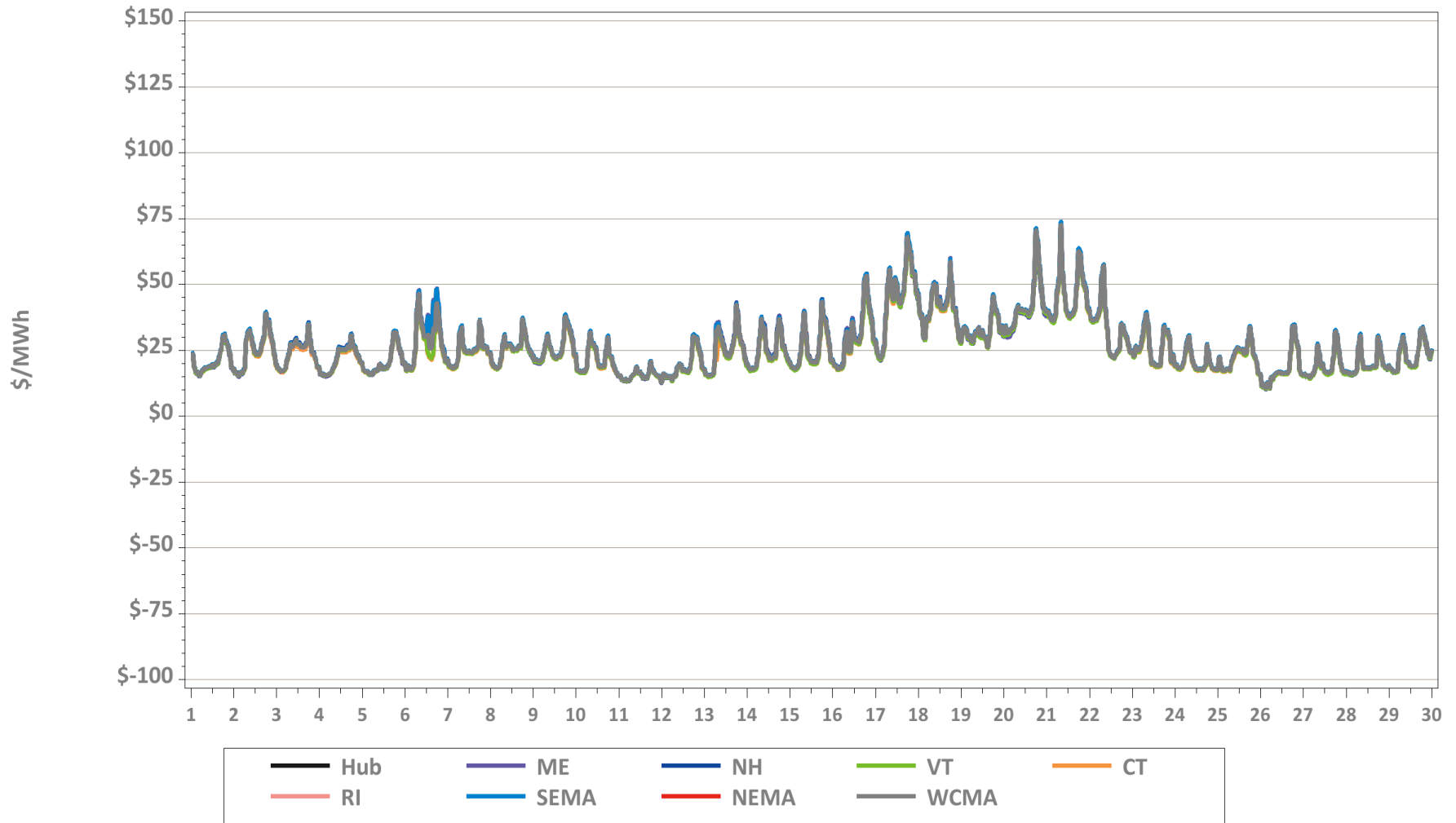
Note: Assumes proxy heat rate of 7,800,000 Btu/MWh for natural gas units.

Underlying natural gas data furnished by:



# Hourly DA LMPs, January 1-29, 2020

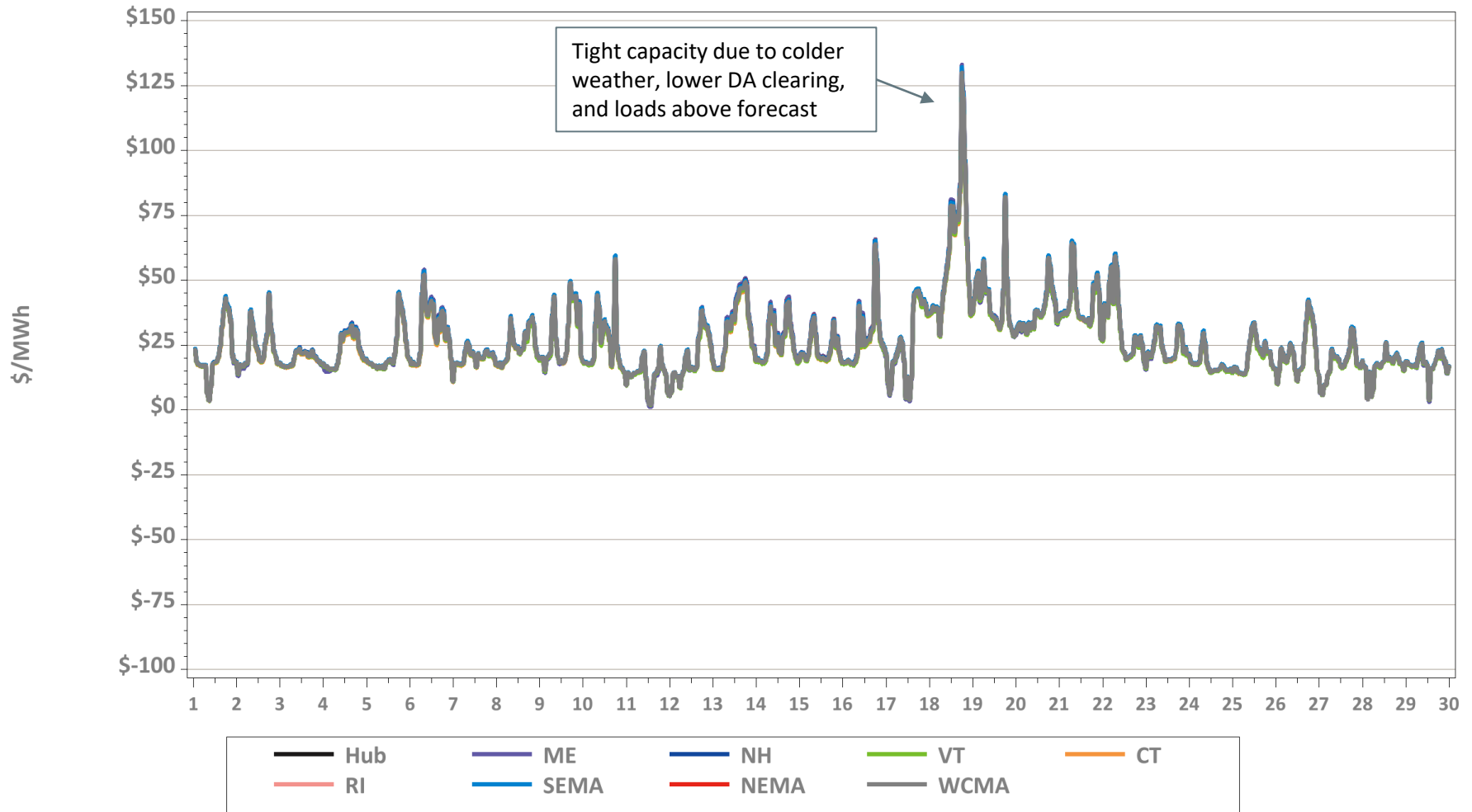
Hourly Day-Ahead LMPs



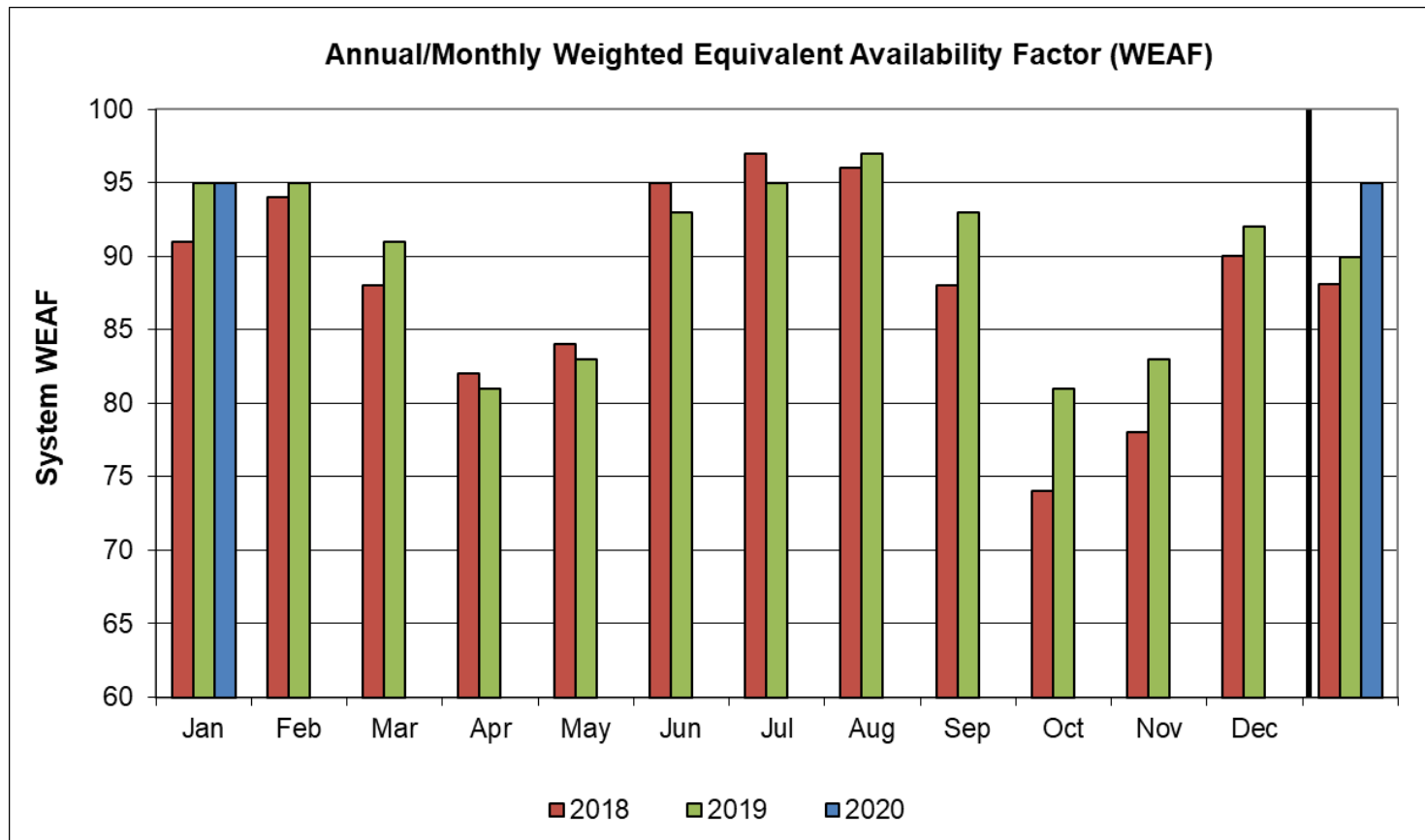


# Hourly RT LMPs, January 1-29, 2020

Hourly Real-Time LMPs



# System Unit Availability



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	YTD
2020	95												95
2019	95	95	91	81	83	93	95	97	93	81	83	92	90
2018	91	94	88	82	84	95	97	96	88	74	78	90	88

Data as of 1/30/2020

# BACK-UP DETAIL



# DEMAND RESPONSE



# Capacity Supply Obligation (CSO) MW by Demand Resource Type for February 2020

Load Zone	ADCR*	On Peak	Seasonal Peak	Total
ME	108.3	168.0	0.0	276.3
NH	27.4	115.4	0.0	142.8
VT	29.5	174.4	0.0	203.9
CT	99.2	77.4	437.6	614.2
RI	31.5	262.2	0.0	293.7
SEMA	38.7	411.2	0.0	449.9
WCMA	59.3	453.9	33.9	547.1
NEMA	50.9	637.3	0.0	688.1
<b>Total</b>	<b>444.7</b>	<b>2,299.6</b>	<b>471.5</b>	<b>3,215.9</b>

\* Active Demand Capacity Resources

NOTE: CSO values include T&D loss factor (8%).

# NEW GENERATION



# New Generation Update

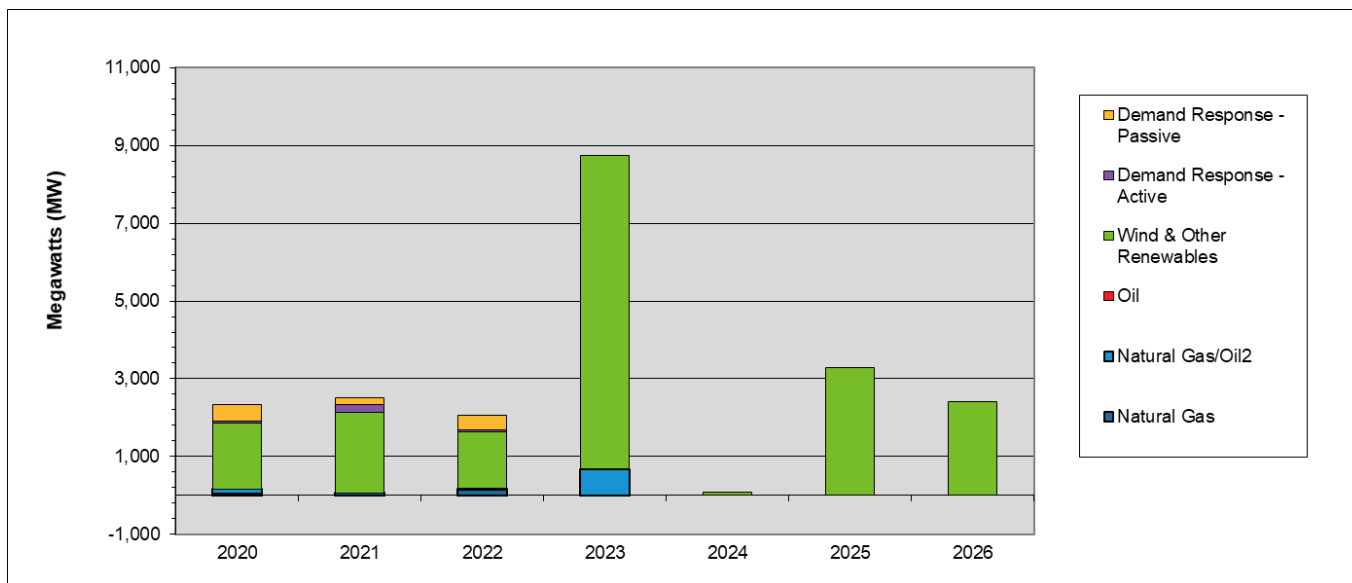
*Based on Queue as of 1/31/20*

- 4 projects totaling 278 MW applied for interconnection study since the last update
- 2 projects went commercial, 2 withdrew, and net decreases in project capacities resulted in a net decrease in new generation projects of 868 MW
- In total, 183 generation projects are currently being tracked by the ISO, totaling approximately 20,119 MW



# Actual and Projected Annual Capacity Additions

## *By Supply Fuel Type and Demand Resource Type*



	2020	2021	2022	2023	2024	2025	2026	Total MW	% of Total <sup>1</sup>
Demand Response - Passive	422	184	380	0	0	0	0	986	4.6
Demand Response - Active	42	204	62	0	0	0	0	308	1.4
Wind & Other Renewables	1,707	2,068	1,450	8,071	80	3,276	2,400	19,052	88.9
Oil	0	0	0	0	0	0	0	0	0.0
Natural Gas/Oil <sup>2</sup>	121	0	39	672	0	0	0	832	3.9
Natural Gas	43	61	136	0	0	0	0	240	1.1
<b>Totals</b>	<b>2,336</b>	<b>2,517</b>	<b>2,067</b>	<b>8,743</b>	<b>80</b>	<b>3,276</b>	<b>2,400</b>	<b>21,419</b>	<b>100.0</b>

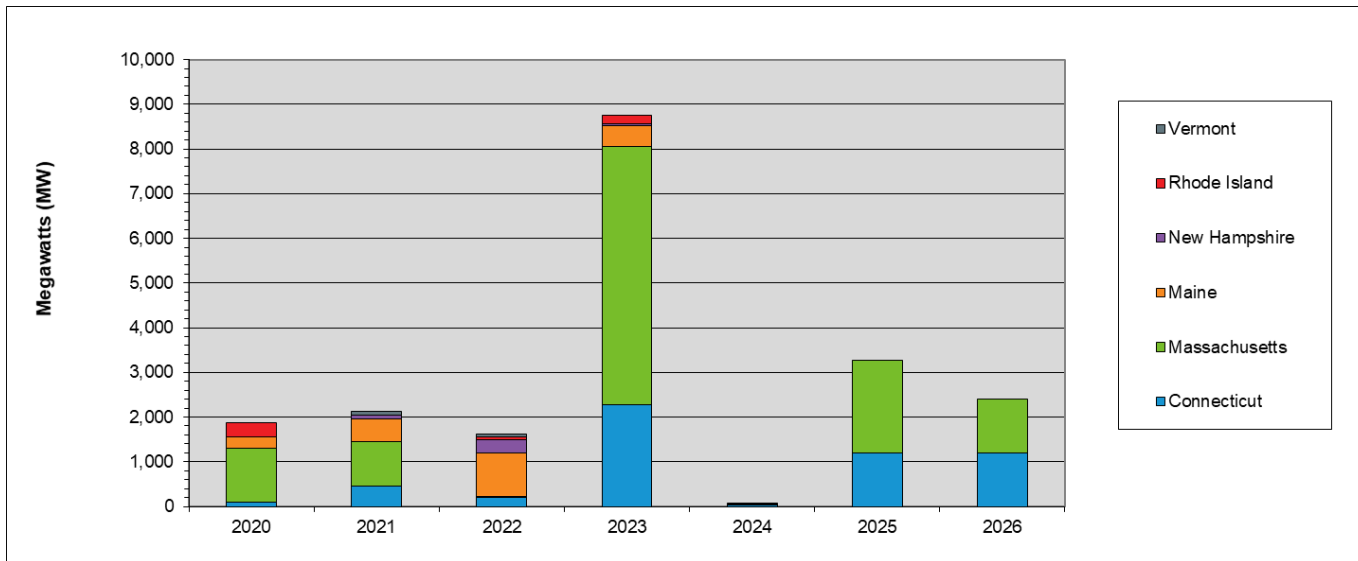
<sup>1</sup> Sum may not equal 100% due to rounding

<sup>2</sup> The projects in this category are dual fuel, with either gas or oil as the primary fuel

- DR reflects changes from the initial FCM Capacity Supply Obligations since 2010-11



# Actual and Projected Annual Generator Capacity Additions By State



	2020	2021	2022	2023	2024	2025	2026	Total MW	% of Total <sup>1</sup>
Vermont	0	85	60	0	0	0	0	145	0.7
Rhode Island	312	6	73	180	0	0	0	571	2.8
New Hampshire	0	83	306	50	20	0	0	459	2.3
Maine	248	513	972	451	20	0	0	2,204	11.0
Massachusetts	1,211	990	16	5,780	0	2,076	1,200	11,273	56.0
Connecticut	100	452	198	2,282	40	1,200	1,200	5,472	27.2
<b>Totals</b>	<b>1,871</b>	<b>2,129</b>	<b>1,625</b>	<b>8,743</b>	<b>80</b>	<b>3,276</b>	<b>2,400</b>	<b>20,124</b>	<b>100.0</b>

<sup>1</sup> Sum may not equal 100% due to rounding

# New Generation Projection

## *By Fuel Type*

Fuel Type	Total		Green		Yellow	
	No. of Projects	Capacity (MW)	No. of Projects	Capacity (MW)	No. of Projects	Capacity (MW)
Biomass/Wood Waste	2	57	0	0	2	57
Battery Storage	15	2,115	0	0	15	2,115
Hydro	2	71	1	66	1	5
Landfill Gas	0	0	0	0	0	0
Natural Gas	8	240	0	0	8	240
Natural Gas/Oil	6	832	1	45	5	787
Nuclear	1	37	0	0	1	37
Oil	0	0	0	0	0	0
Solar	128	3,543	4	111	124	3,432
Wind	21	13,224	0	0	21	13,224
Total	183	20,119	6	222	177	19,897

- Projects in the Natural Gas/Oil category may have either gas or oil as the primary fuel
- Green denotes projects with a high probability of going into service
- Yellow denotes projects with a lower probability of going into service or new applications

# New Generation Projection

## *By Operating Type*

Operating Type	Total		Green		Yellow	
	No. of Projects	Capacity (MW)	No. of Projects	Capacity (MW)	No. of Projects	Capacity (MW)
Baseload	9	217	0	0	9	217
Intermediate	2	116	0	0	2	116
Peaker	151	6,562	6	222	145	6,340
Wind Turbine	21	13,224	0	0	21	13,224
Total	183	20,119	6	222	177	19,897

- Green denotes projects with a high probability of going into service
- Yellow denotes projects with a lower probability of going into service or new applications

# New Generation Projection

## *By Operating Type and Fuel Type*

Fuel Type	Total		Baseload		Intermediate		Peaker		Wind Turbine	
	No. of Projects	Capacity (MW)	No. of Projects	Capacity (MW)	No. of Projects	Capacity (MW)	No. of Projects	Capacity (MW)	No. of Projects	Capacity (MW)
Biomass/Wood Waste	2	57	2	57	0	0	0	0	0	0
Battery Storage	15	2,115	0	0	0	0	15	2,115	0	0
Hydro	2	71	1	5	0	0	1	66	0	0
Landfill Gas	0	0	0	0	0	0	0	0	0	0
Natural Gas	8	240	5	118	2	116	1	6	0	0
Natural Gas/Oil	6	832	0	0	0	0	6	832	0	0
Nuclear	1	37	1	37	0	0	0	0	0	0
Oil	0	0	0	0	0	0	0	0	0	0
Solar	128	3,543	0	0	0	0	128	3,543	0	0
Wind	21	13,224	0	0	0	0	0	0	21	13,224
Total	183	20,119	9	217	2	116	151	6,562	21	13,224

- Projects in the Natural Gas/Oil category may have either gas or oil as the primary fuel

# FORWARD CAPACITY MARKET



# Capacity Supply Obligation FCA 10

Resource Type	Resource Type	FCA	Annual Bilateral for ARA 1		ARA 1		Annual Bilateral for ARA 2		ARA 2		Annual Bilateral for ARA 3		ARA 3	
		*CSO	CSO	Change	CSO	Change	CSO	Change	CSO	Change	CSO	Change	CSO	Change
		MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
Demand	Active Demand	377.525	367.227	-10.298	464.715	97.488	460.55	-4.165	459.928	-0.622	457.966	-1.962	493.5	35.534
	Passive Demand	2,368.631	2,366.783	-1.848	2,363.949	-2.834	2,363.789	-0.16	2,527.244	163.46	2,529.014	1.77	2594.08	65.066
Demand Total		2,746.156	2,734.01	-12.146	2,828.664	94.654	2,824.339	-4.325	2,987.172	162.83	2,986.98	-0.192	3,087.58	100.6
Generator	Non-Intermittent	30,520.433	30,462.67	-57.763	30,048.398	-414.272	30,103.684	55.286	30,093.142	-10.54	30,081.64	-11.502	30,146.76	65.115
	Intermittent	850.143	893.189	43.046	904.311	11.122	831.251	-73.06	798.958	-32.293	800.387	1.429	733.668	-66.719
Generator Total		31,370.576	31,355.86	-14.716	30,952.709	-403.151	30,934.935	-17.774	30,892.1	-42.84	30,882.027	-10.073	30,880.42	-1.604
Import Total		1,449.8	1,449.8	0	1,451	1.2	1,451	0	1,451	0	1,459	8	1,428	-31
**Grand Total		35,566.532	35,539.668	-26.864	35,232.373	-307.295	35,210.274	-22.099	35,330.272	120.00	35,328.007	-2.265	35,396	67.996
Net ICR (NICR)		34,151	33,755	-396	33,755	0	33,407	-348	33,407	0	33,390	-17	33,390	0

\* Real-time Emergency Generators (RTEG) CSO not capped at 600.000 MW

\*\* Grand Total reflects both CSO Grand Total and the net total of the Change Column.

Note: A resource's CSO may change for a variety of reasons outside ISO-NE administered trading windows. Reasons for CSO changes beyond bilaterals and reconfiguration auction may include terminations or recent declaration of commercial operation. Details of the changes that occurred due to non-annual event purposes are contained in the 2015-2020 CCP Monthly Capacity Supply Obligation Changes report on the ISO New England website.

# Capacity Supply Obligation FCA 11

Resource Type	Resource Type	FCA	ARA 1		ARA 2		ARA 3	
		*CSO	CSO	Change	CSO	Change	CSO	Change
		MW	MW	MW	MW	MW	MW	MW
Demand	Active Demand	419.928	441.221	21.293	594.551	153.33		
	Passive Demand	2,791.02	2,835.354	44.334	2,883.767	48.413		
Demand Total		3,210.95	3,276.575	65.625	3,478.318	201.743		
Generator	Non-Intermittent	30,494.80	30,064.23	-430.569	30,159.891	95.661		
	Intermittent	894.217	823.796	-70.421	809.571	-14.225		
Generator Total		31,389.02	30,888.03	-500.993	30,969.462	81.432		
Import Total		1,235.40	1,622.037	386.637	1,609.844	-12.193		
**Grand Total		35,835.37	35,786.64	-48.731	36,057.624	270.984		
Net ICR (NICR)		34,075	33,660	-415	33,520	-140		

\* Real-time Emergency Generators (RTEG) CSO not capped at 600.000 MW

\*\* Grand Total reflects both CSO Grand Total and the net total of the Change Column.

Note: A resource's CSO may change for a variety of reasons outside ISO-NE administered trading windows. Reasons for CSO changes beyond bilaterals and reconfiguration auction may include terminations or recent declaration of commercial operation. Details of the changes that occurred due to non-annual event purposes are contained in the 2015-2020 CCP Monthly Capacity Supply Obligation Changes report on the ISO New England website.

# Capacity Supply Obligation FCA 12

Resource Type	Resource Type	FCA	ARA 1		ARA 2		ARA 3	
		*CSO	CSO	Change	CSO	Change	CSO	Change
		MW	MW	MW	MW	MW	MW	MW
Demand	Active Demand	624.445	659.137	34.692				
	Passive Demand	2,975.36	3,045.073	69.713				
Demand Total		3,599.81	3,704.21	104.4				
Generator	Non-Intermittent	29,130.75	29,244.404	113.654				
	Intermittent	880.317	806.609	-73.708				
Generator Total		30,011.07	30,051.013	39.943				
Import Total		1,217	1,305.487	88.487				
**Grand Total		34,827.88	35,060.710	232.83				
Net ICR (NICR)		33,725	33,550	-175				

\* Real-time Emergency Generators (RTEG) CSO not capped at 600.000 MW

\*\* Grand Total reflects both CSO Grand Total and the net total of the Change Column.

Note: A resource's CSO may change for a variety of reasons outside ISO-NE administered trading windows. Reasons for CSO changes beyond bilaterals and reconfiguration auction may include terminations or recent declaration of commercial operation. Details of the changes that occurred due to non-annual event purposes are contained in the 2015-2020 CCP Monthly Capacity Supply Obligation Changes report on the ISO New England website.



# Capacity Supply Obligation FCA 13

Resource Type	Resource Type	FCA	ARA 1		ARA 2		ARA 3	
		*CSO	CSO	Change	CSO	Change	CSO	Change
		MW	MW	MW	MW	MW	MW	MW
Demand	Active Demand	685.554						
	Passive Demand	3,354.69						
Demand Total		4,040.244						
Generator	Non-Intermittent	28,586.498						
	Intermittent	1,024.792						
Generator Total		2,961.29						
Import Total		1,187.69						
**Grand Total		34,839.224						
Net ICR (NICR)		33,750						

\* Real-time Emergency Generators (RTEG) CSO not capped at 600.000 MW

\*\* Grand Total reflects both CSO Grand Total and the net total of the Change Column.

Note: A resource's CSO may change for a variety of reasons outside ISO-NE administered trading windows. Reasons for CSO changes beyond bilaterals and reconfiguration auction may include terminations or recent declaration of commercial operation. Details of the changes that occurred due to non-annual event purposes are contained in the 2015-2020 CCP Monthly Capacity Supply Obligation Changes report on the ISO New England website.

# Active/Passive Demand Response

## *CSO Totals by Commitment Period*

Commitment Period	Active/ Passive	Existing	New	Grand Total
2010-11	Active	1,246.40	603.675	1,850.07
	Passive	119.211	584.277	703.488
	Grand Total	1365.61	1187.952	2553.562
2011-12	Active	1,768.39	184.99	1,953.38
	Passive	719.98	263.25	983.23
	Grand Total	2488.372	448.24	2936.612
2012-13	Active	1,726.55	98.227	1,824.78
	Passive	861.602	211.261	1,072.86
	Grand Total	2588.15	309.488	2897.638
2013-14	Active	1,794.20	257.341	2,051.54
	Passive	1,040.11	257.793	1,297.91
	Grand Total	2834.308	515.134	3349.442
2014-15	Active	2,062.20	41.945	2,104.14
	Passive	1,264.64	221.072	1,485.71
	Grand Total	3326.837	263.017	3589.854
2015-16	Active	1,935.41	66.104	2,001.51
	Passive	1,395.89	247.449	1,643.33
	Grand Total	3331.291	313.553	3644.844
2016-17	Active	1,116.47	0.23	1,116.70
	Passive	1,386.56	244.775	1,631.34
	Grand Total	2503.028	245.005	2748.033
2017-18	Active	1,066.59	13.486	1,080.08
	Passive	1,619.15	341.37	1,960.52
	Grand Total	2685.74	354.856	3040.596
2018-19	Active	565.866	81.394	647.26
	Passive	1,870.55	285.602	2,156.15
	Grand Total	2436.415	366.996	2803.411
2019-20	Active	357.221	20.304	377.525
	Passive	2,018.20	350.43	2,368.63
	Grand Total	2375.422	370.734	2746.156
2020-21	Active	334.634	85.294	419.928
	Passive	2,236.73	554.292	2,791.02
	Grand Total	2571.361	639.586	3210.947
2021-22	Active	480.941	143.504	624.445
	Passive	2,604.79	370.568	2,975.36
	Grand Total	3085.734	514.072	3599.806
2022-23	Active	598.376	87.178	685.554
	Passive	2,788.33	566.363	3,354.69
	Grand Total	3386.703	653.541	4040.244

# RELIABILITY COSTS – NET COMMITMENT PERIOD COMPENSATION (NCPC) OPERATING COSTS



# What are Daily NCPC Payments?

- Payments made to resources whose commitment and dispatch by ISO-NE resulted in a shortfall between the resource's offered value in the Energy and Regulation Markets and the revenue earned from output during the day
- Typically, this is the result of some out-of-merit operation of resources occurring in order to protect the overall resource adequacy and transmission security of specific locations or of the entire control area
- NCPC payments are intended to make a resource that follows the ISO's operating instructions "no worse off" financially than the best alternative generation schedule



# Definitions

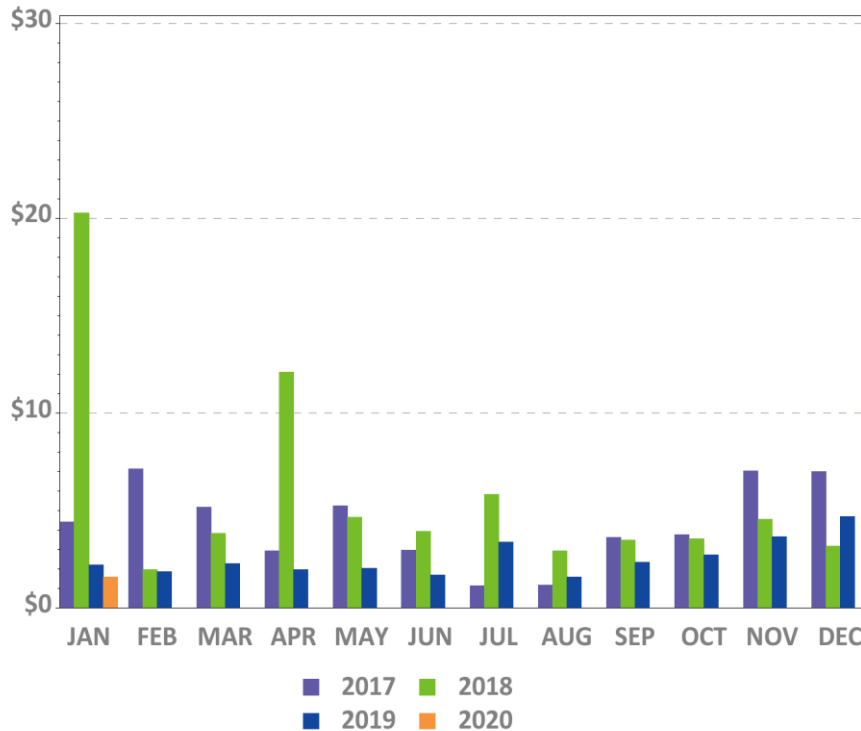
1 <sup>st</sup> Contingency NCPC Payments	Reliability costs paid to eligible resources that are providing first contingency (1stC) protection (including low voltage, system operating reserve, and load serving) either system-wide or locally
2 <sup>nd</sup> Contingency NCPC Payments	Reliability costs paid to resources providing capacity in constrained areas to respond to a local second contingency. They are committed based on 2 <sup>nd</sup> Contingency (2ndC) protocols, and are also known as Local Second Contingency Protection Resources (LSCPR)
Voltage NCPC Payments	Reliability costs paid to resources operated by ISO-NE to provide voltage support or control in specific locations
Distribution NCPC Payments	Reliability costs paid to units dispatched at the request of local transmission providers for purpose of managing constraints on the low voltage (distribution) system. These requirements are not modeled in the DA Market software
OATT	Open Access Transmission Tariff

# Charge Allocation Key

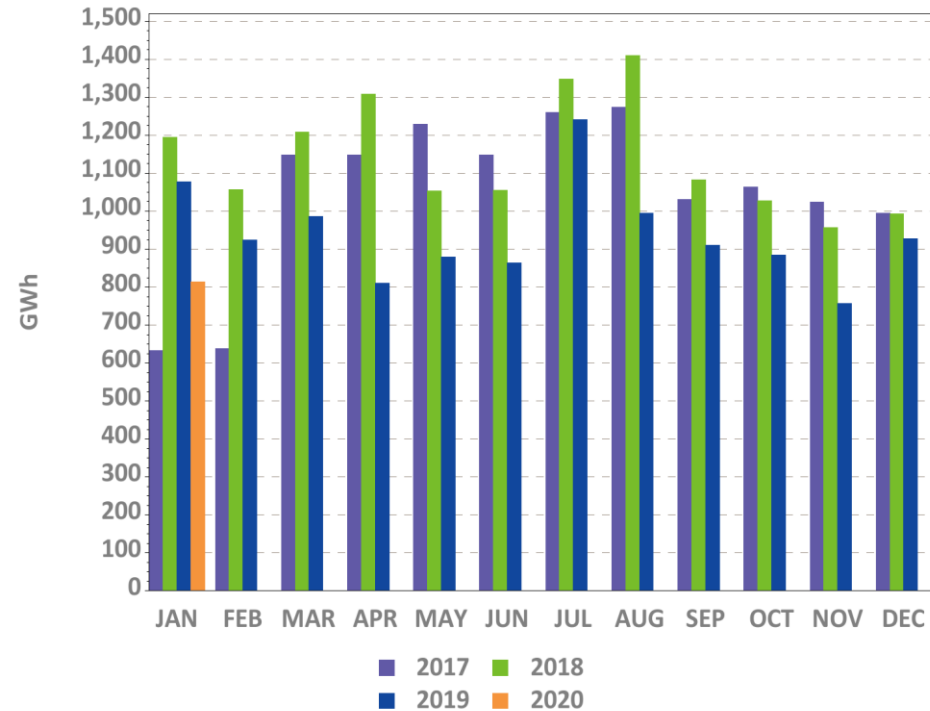
Allocation Category	Market / OATT	Allocation
System 1 <sup>st</sup> Contingency	Market	DA 1 <sup>st</sup> C (excluding at external nodes) is allocated to system DALO. RT 1 <sup>st</sup> C (at all locations) is allocated to System 'Daily Deviations'. Daily Deviations = sum of(generator deviations, load deviations, generation obligation deviations at external nodes, increment offer deviations)
External DA 1 <sup>st</sup> Contingency	Market	DA 1 <sup>st</sup> C at external nodes (from imports, exports, Incs and Decs) are allocated to activity at the specific external node or interface involved
Zonal 2 <sup>nd</sup> Contingency	Market	DA and RT 2 <sup>nd</sup> C NCPC are allocated to load obligation in the Reliability Region (zone) served
System Low Voltage	OATT	(Low) Voltage Support NCPC is allocated to system Regional Network Load and Open Access Same-Time Information Service (OASIS) reservations
Zonal High Voltage	OATT	High Voltage Control NCPC is allocated to zonal Regional Network Load
Distribution - PTO	OATT	Distribution NCPC is allocated to the specific Participant Transmission Owner (PTO) requesting the service
System – Other	Market	Includes GPA, Economic Generator/DARD Posturing, Dispatch Lost Opportunity Cost (DLOC), and Rapid Response Pricing (RRP) Opportunity Cost NCPC (allocated to RTLO); and Min Generation Emergency NCPC (allocated to RTGO).

# Year-Over-Year Total NCPC Dollars and Energy

NCPC Dollars



NCPC Energy\*

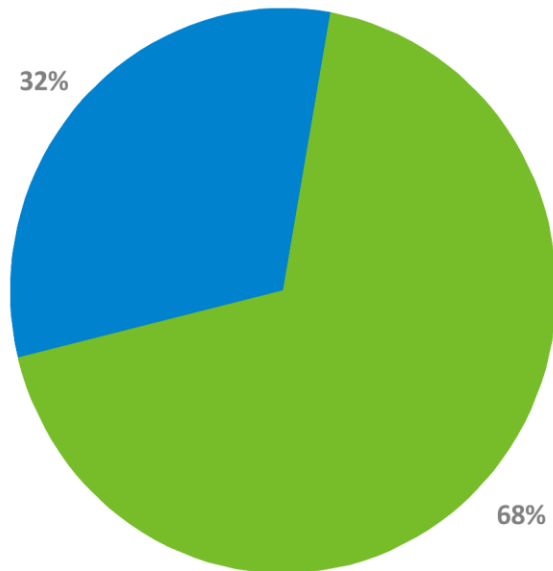


\* NCPC Energy GWh reflect the DA and/or RT economic minimum loadings of all units receiving DA or RT NCPC credits (except for DLOC, RRP, or posturing NCPC), assessed during hours in which they are NCPC-eligible. Scheduled MW for external transactions receiving NCPC are also reflected. All NCPC components (1<sup>st</sup> Contingency, 2<sup>nd</sup> Contingency, Voltage, and RT Distribution) are reflected.



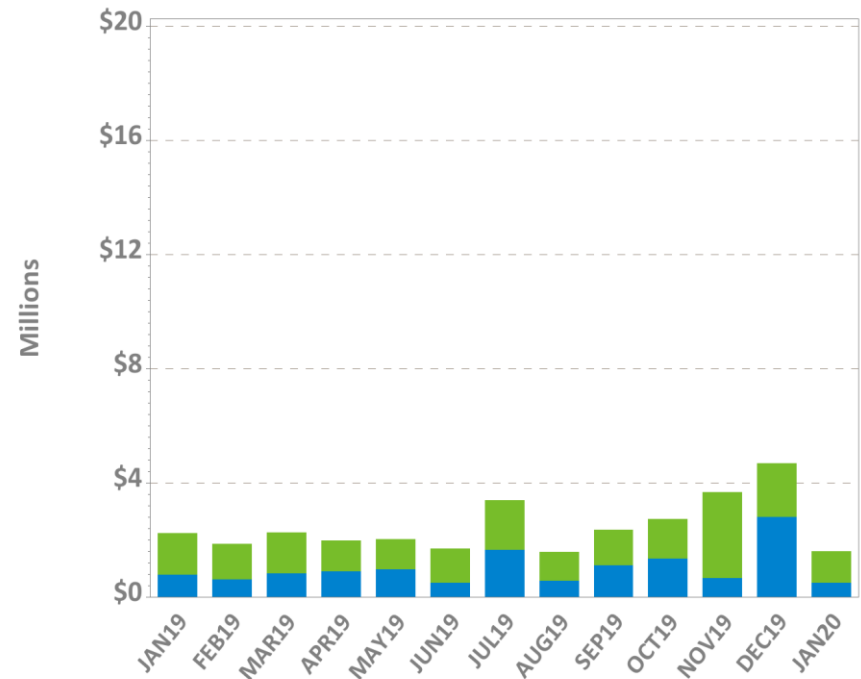
# DA and RT NCPC Charges

Jan-20 Total = \$1.61 M



■ Day-Ahead ■ Real-Time

Last 13 Months

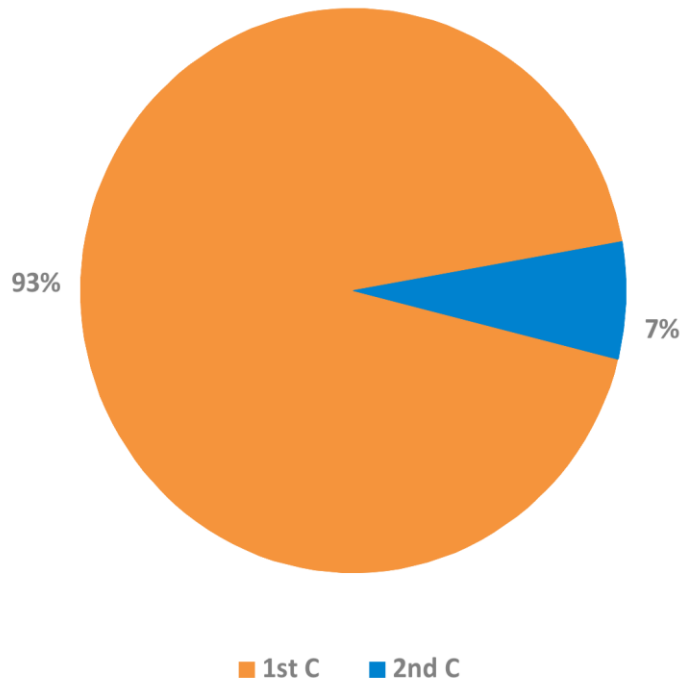


■ Day-Ahead ■ Real-Time

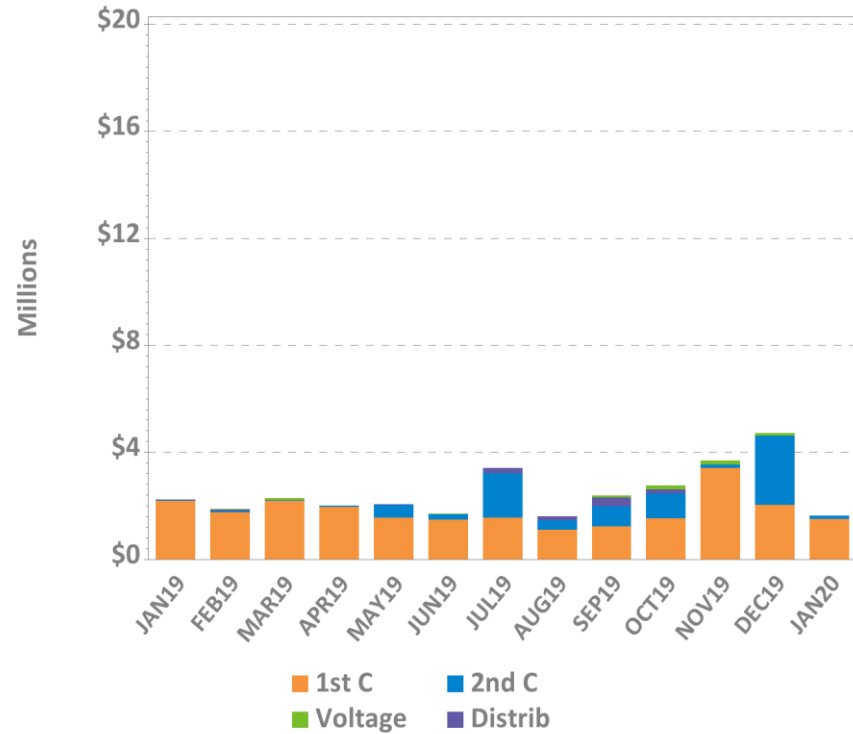


# NCPC Charges by Type

Jan-20 Total = \$1.61 M



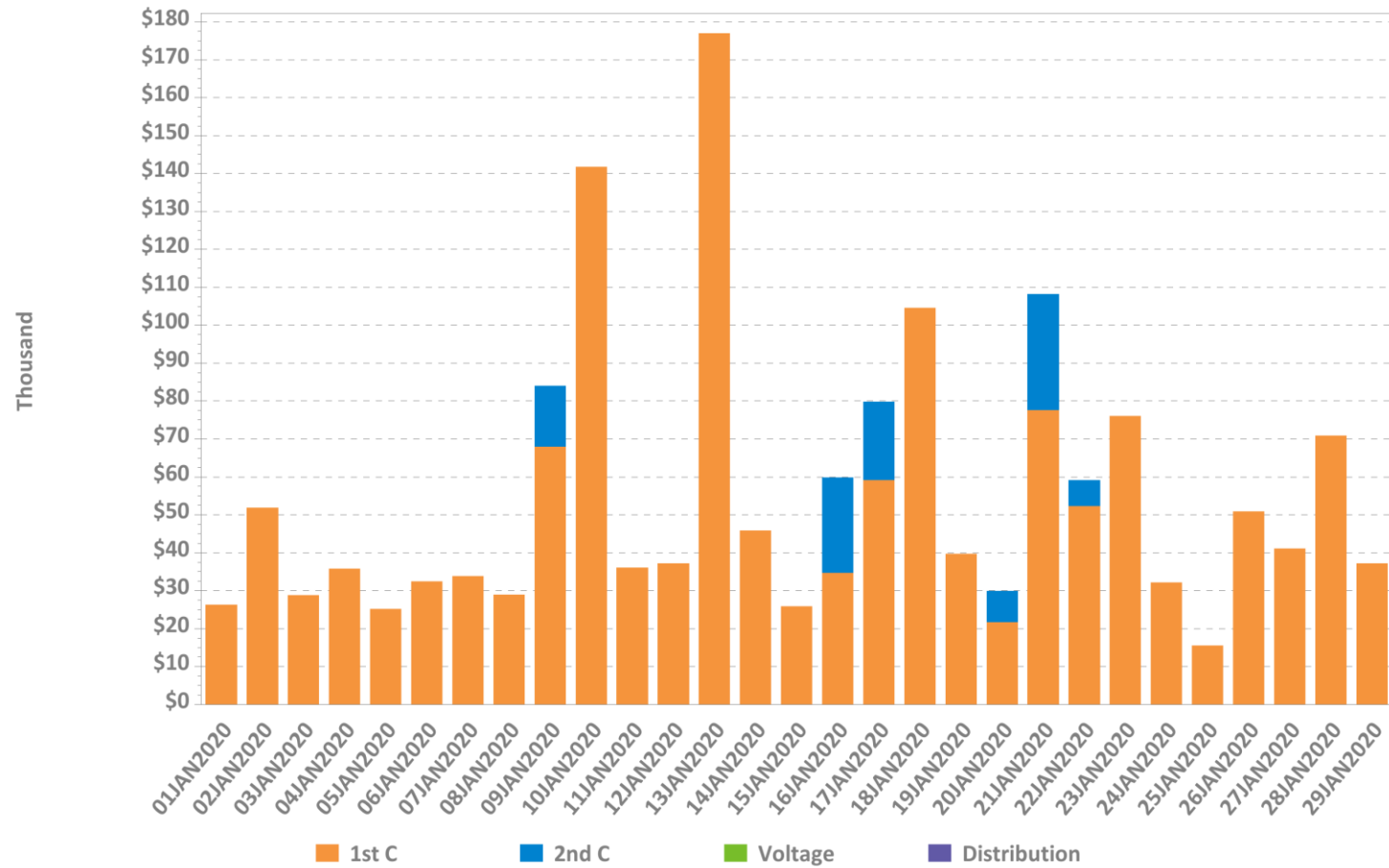
Last 13 Months



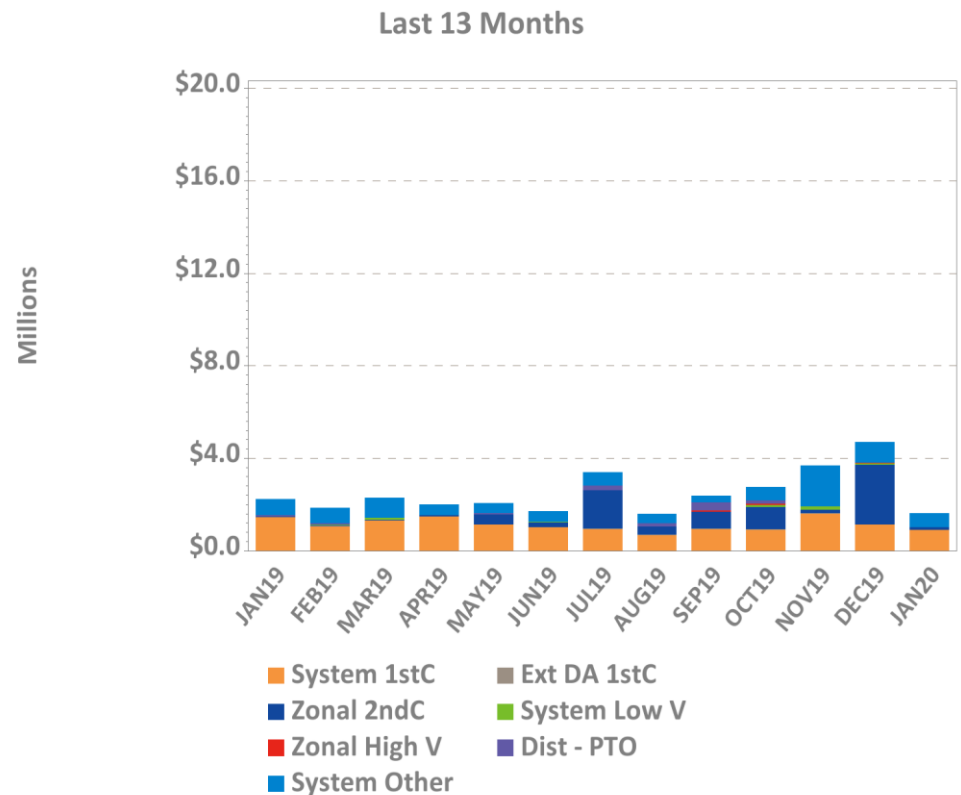
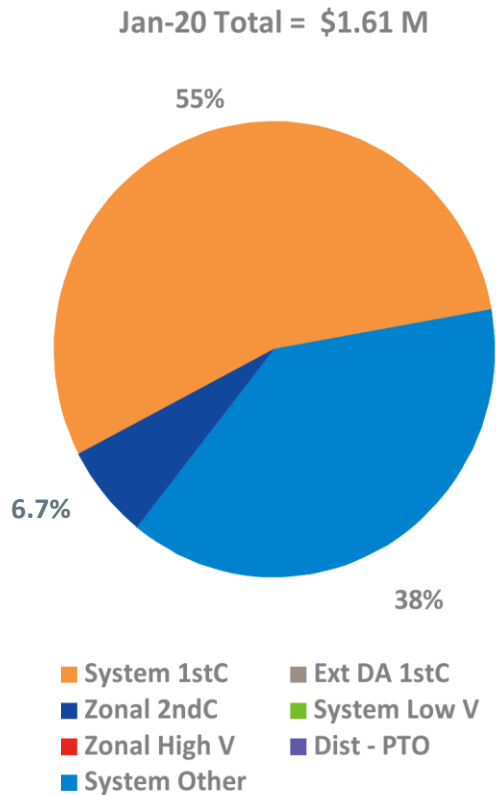
1<sup>st</sup> C – First Contingency  
2<sup>nd</sup> C – Second Contingency  
Distrib – Distribution  
Voltage – Voltage



# Daily NCPC Charges by Type



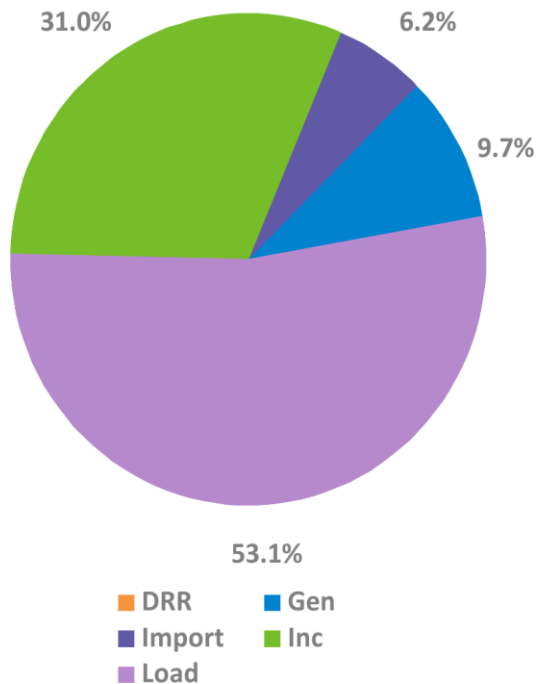
# NCPC Charges by Allocation



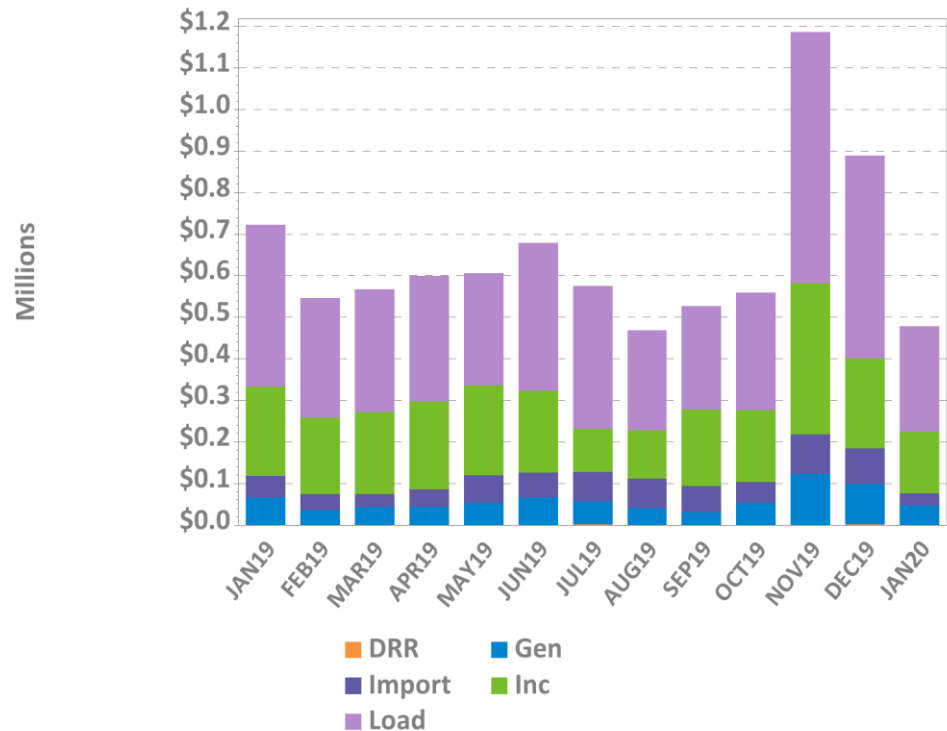
Note: 'System Other' includes, as applicable: Resource Economic Posturing, GPA, Min Gen Emergency, Dispatch Lost Opportunity Cost (DLOC), and Rapid Response Pricing (RRP) Opportunity Cost credits.

# RT First Contingency Charges by Deviation Type

Jan-20 Total = \$0.48 M



Last 13 Months



DRR – Demand Response Resource deviations

Gen – Generator deviations

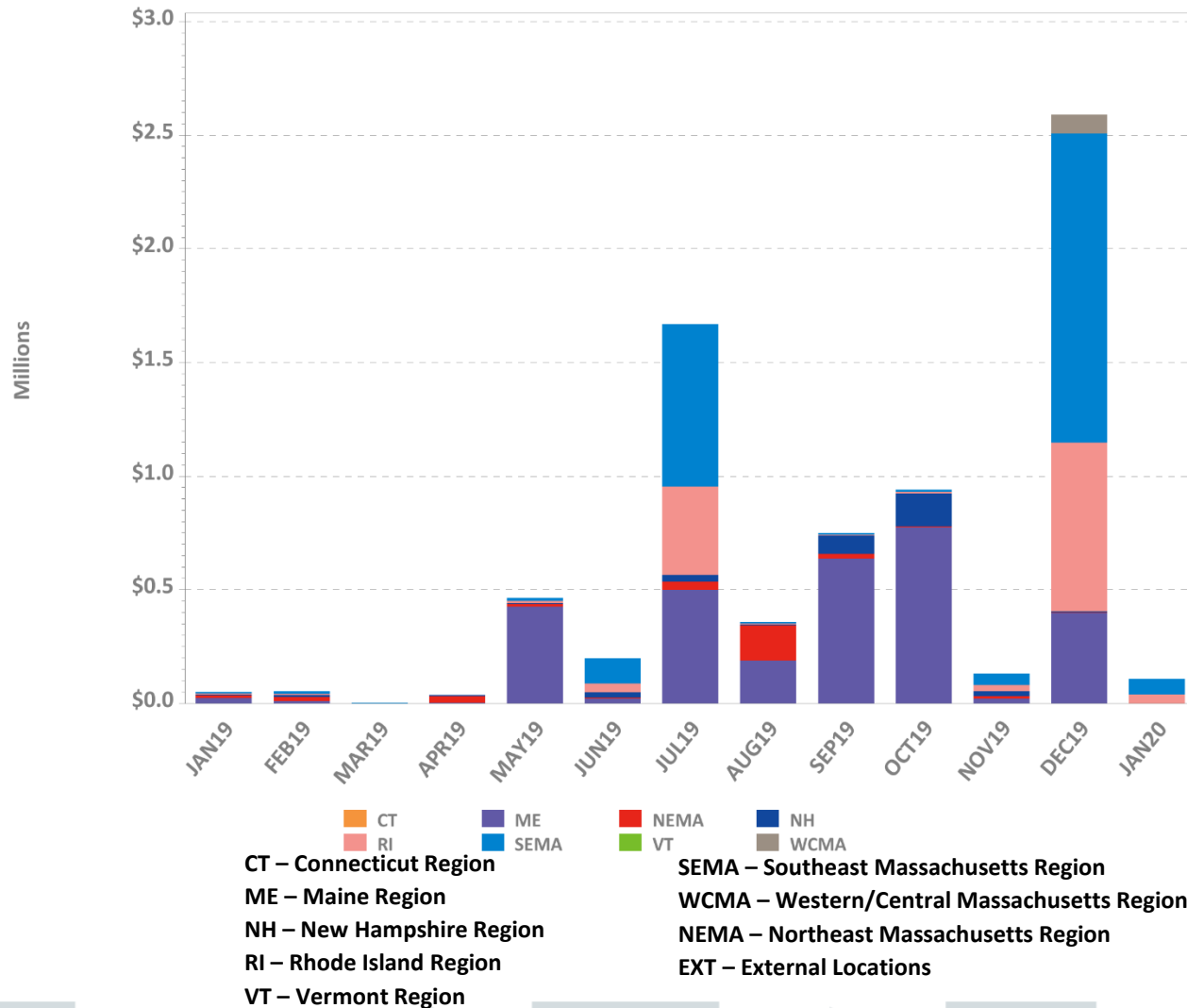
Inc – Increment Offer deviations

Import – Import deviations

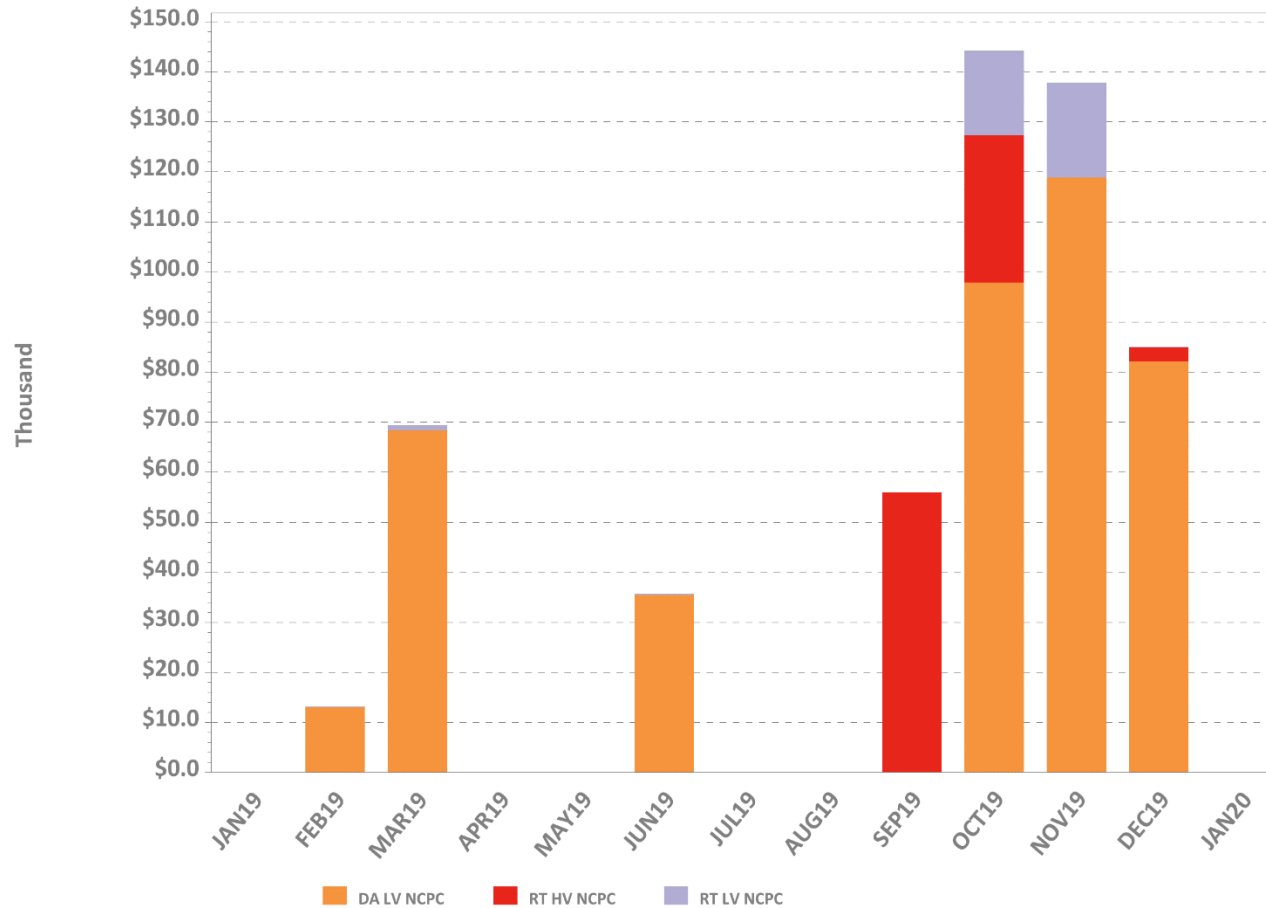
Load – Load obligation deviations



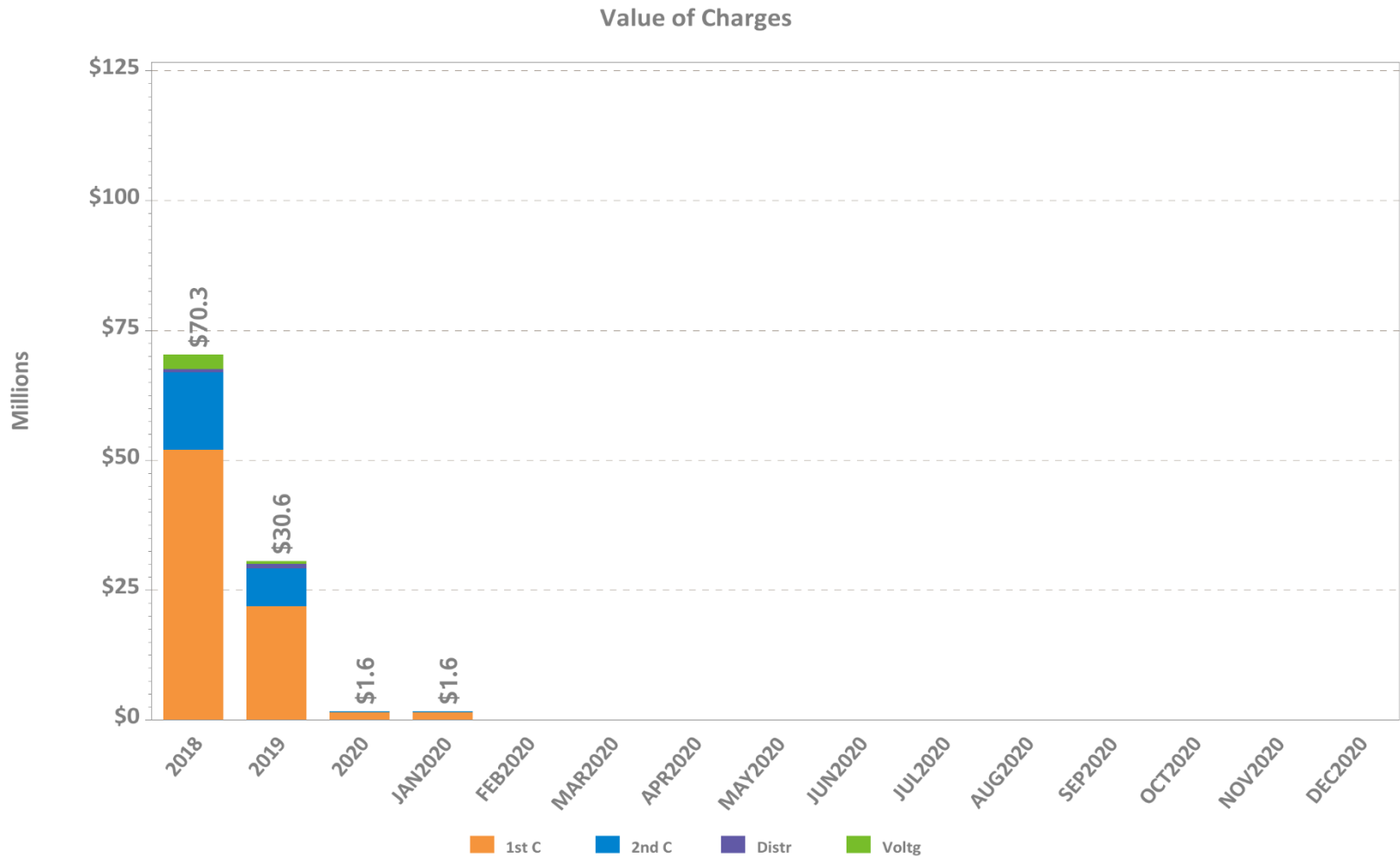
# LSCPR Charges by Reliability Region



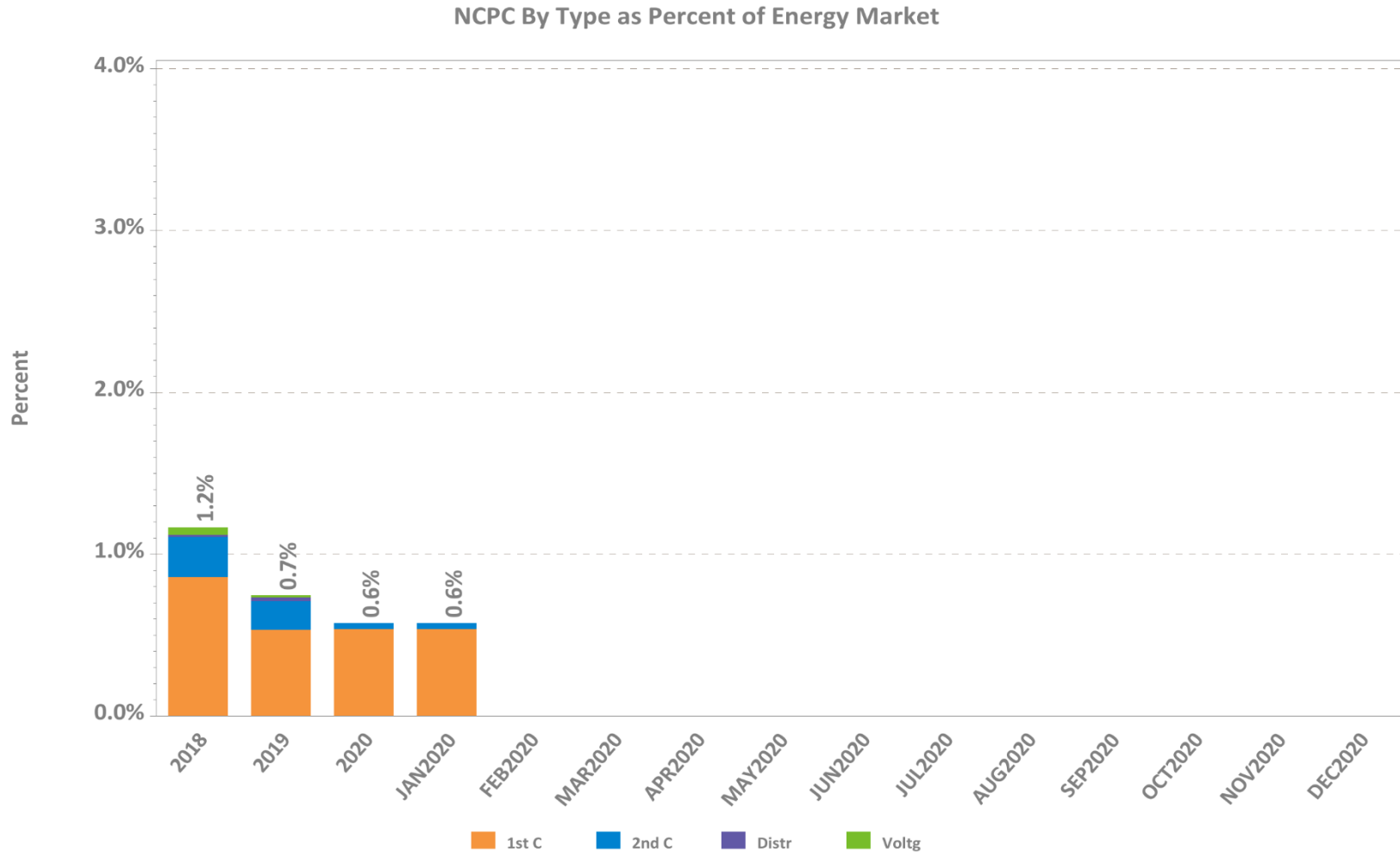
# NCPC Charges for Voltage Support and High Voltage Control



# NCPC Charges by Type

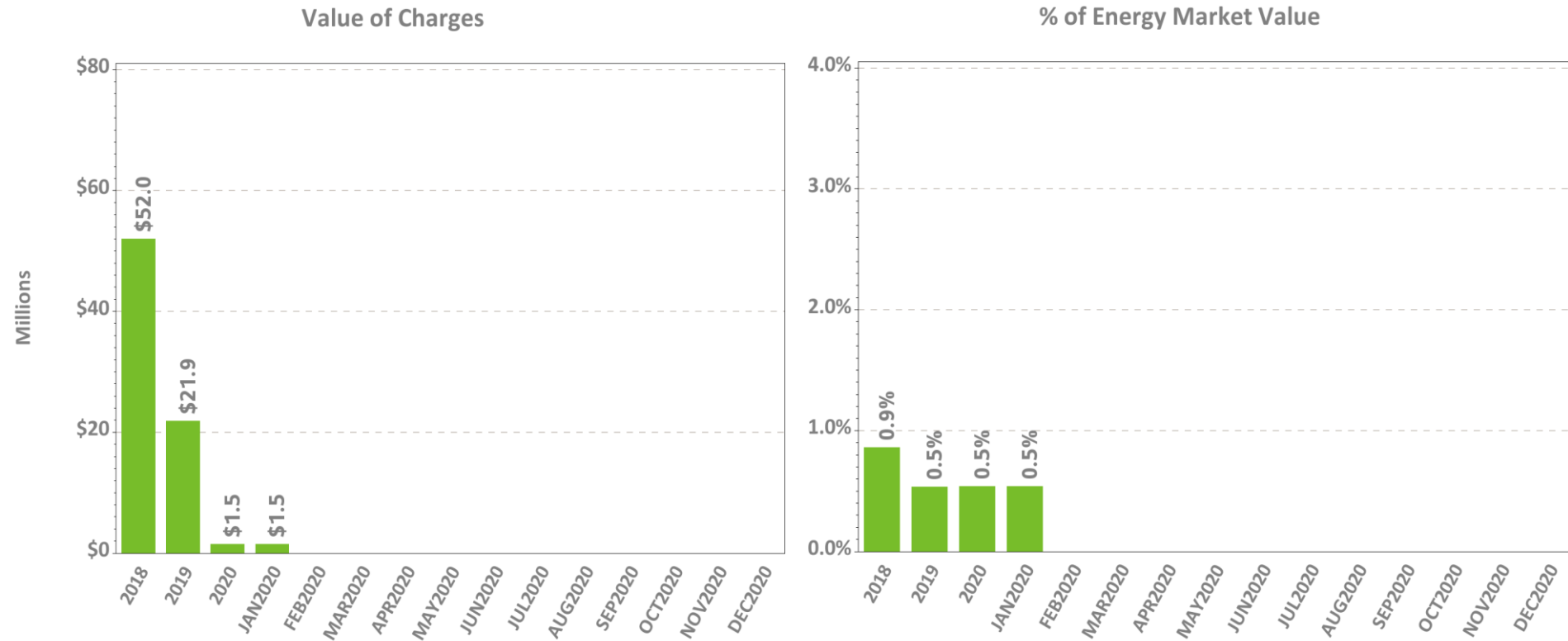


# NCPC Charges as Percent of Energy Market





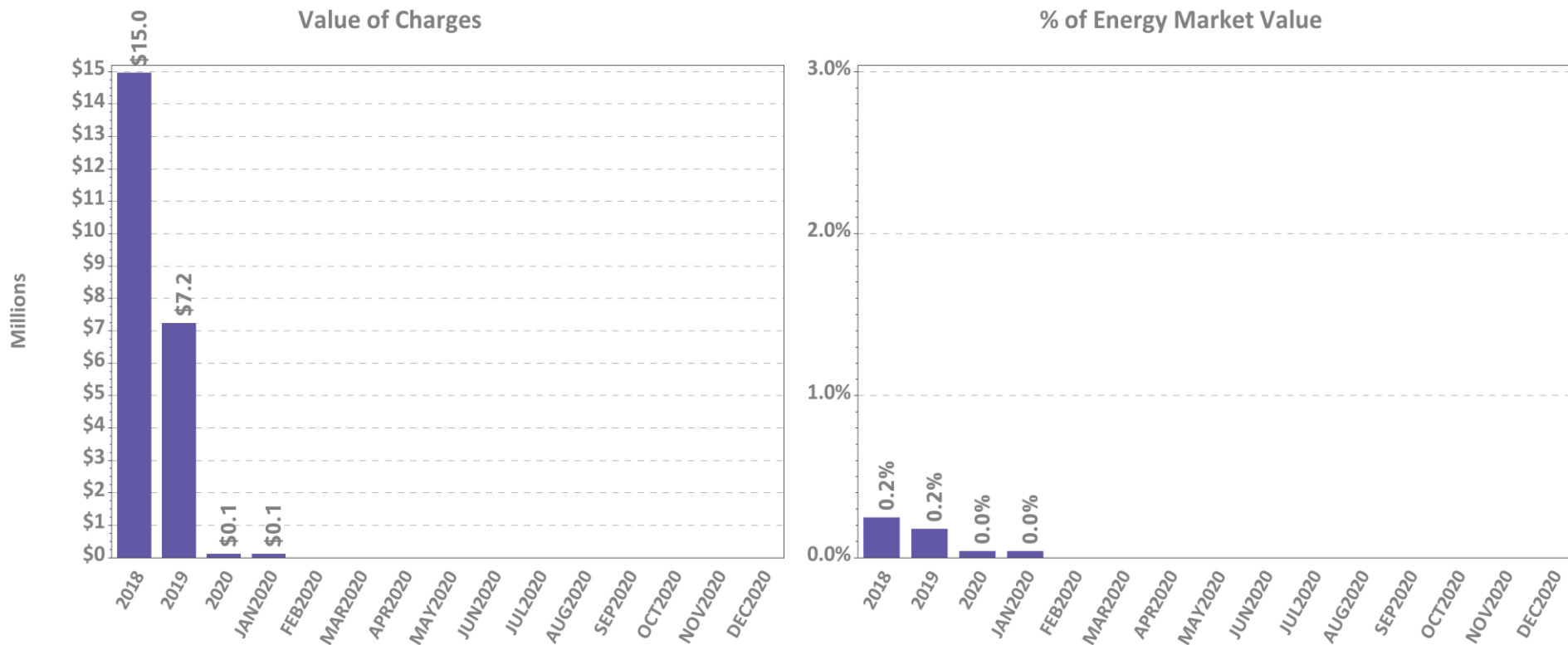
# First Contingency NCPC Charges



**Note:** Energy Market value is the hourly locational product of load obligation and price in the DA Market plus the hourly locational product of price and RT Load Obligation Deviation in the RT Market



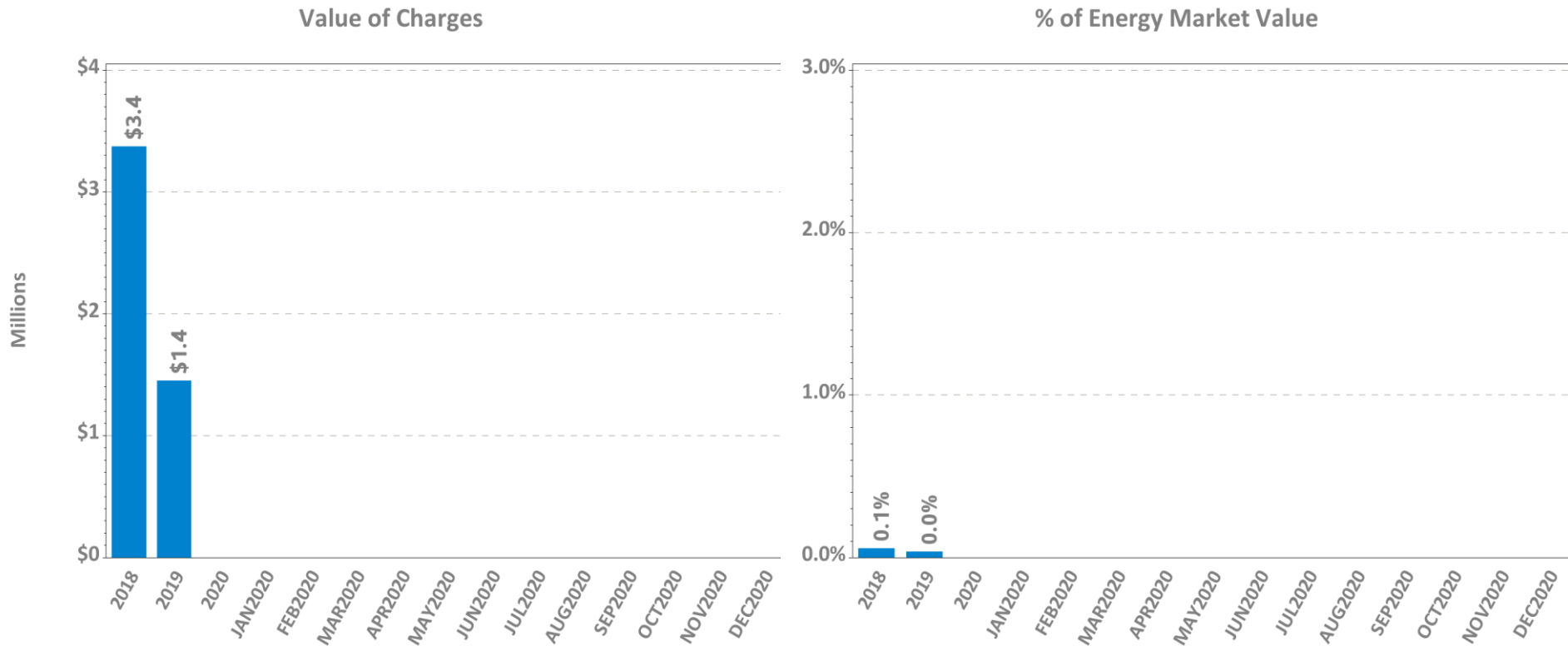
# Second Contingency NCPC Charges



**Note:** Energy Market value is the hourly locational product of load obligation and price in the DA Market plus the hourly locational product of price and RT Load Obligation Deviation in the RT Market



# Voltage and Distribution NCPC Charges



**Note:** Energy Market value is the hourly locational product of load obligation and price in the DA Market plus the hourly locational product of price and RT Load Obligation Deviation in the RT Market



# DA vs. RT Pricing

## The following slides outline:

- This month vs. prior year's average LMPs and fuel costs
- Reserve Market results
- DA cleared load vs. RT load
- Zonal and total incs and decs
- Self-schedules
- DA vs. RT net interchange



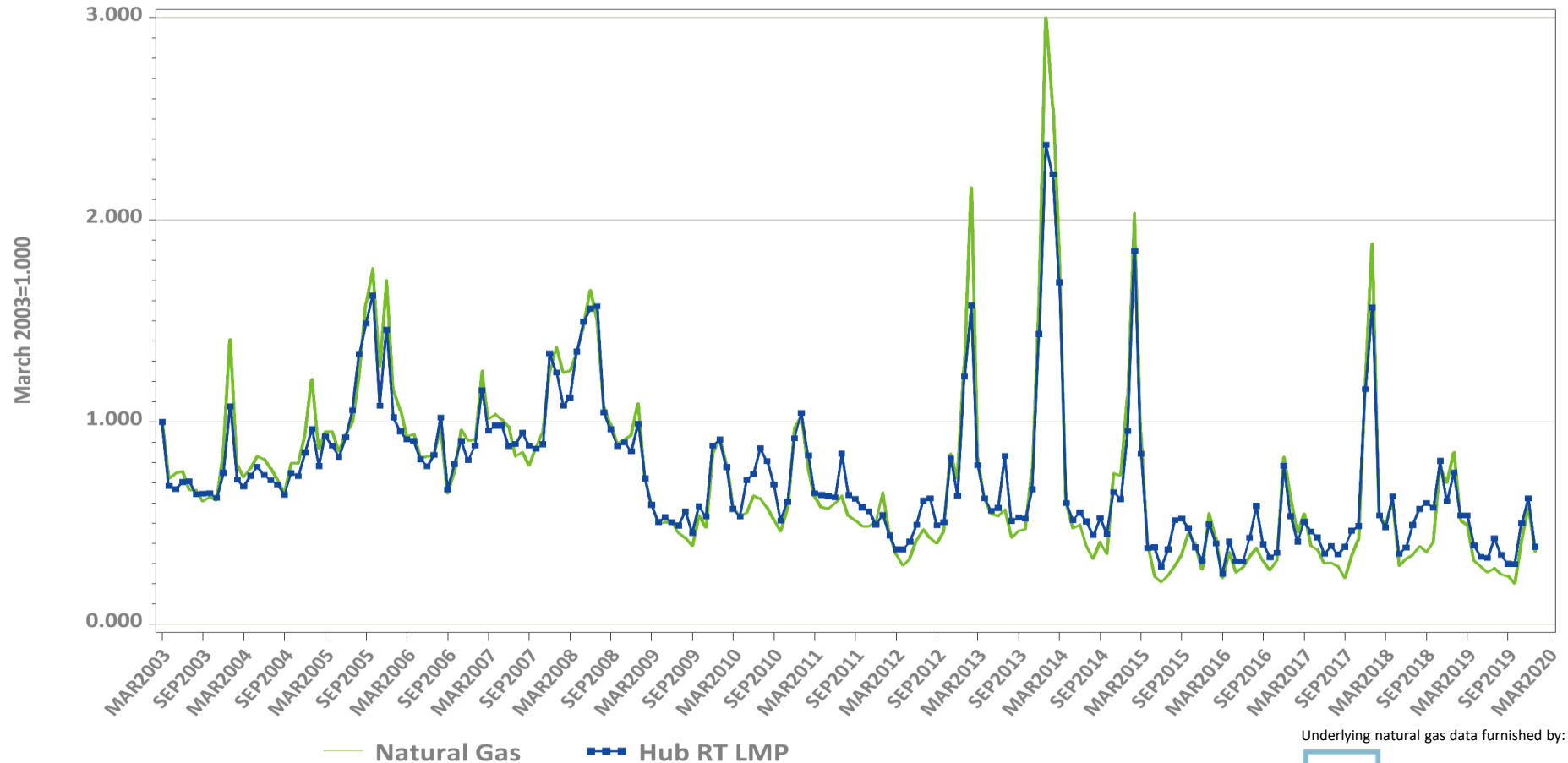
# DA vs. RT LMPs (\$/MWh)

## Arithmetic Average

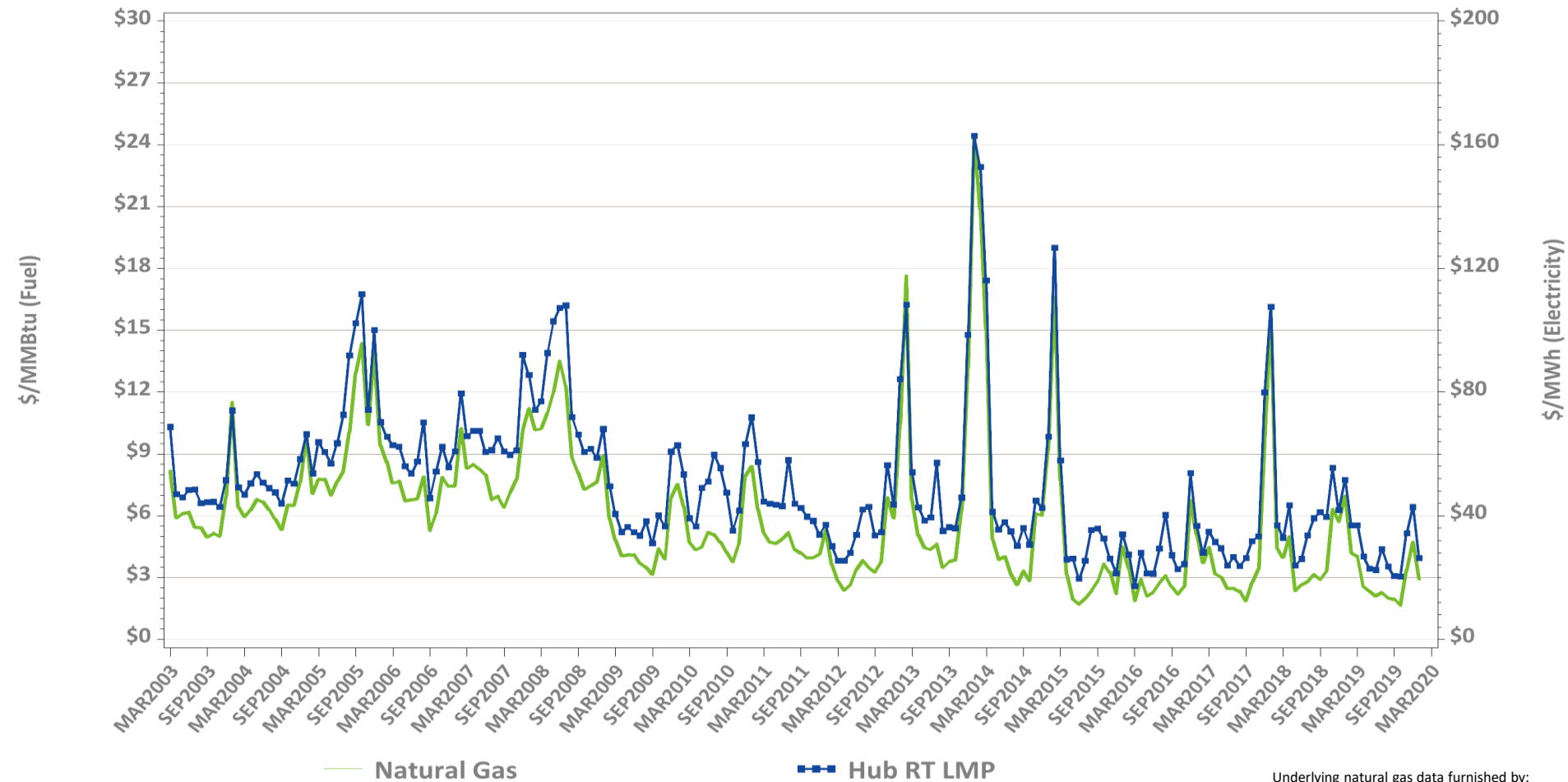
Year 2018	NEMA	CT	ME	NH	VT	RI	SEMA	WCMA	Hub
Day-Ahead	\$44.45	\$43.60	\$42.63	\$44.04	\$43.71	\$44.11	\$44.62	\$44.19	\$44.13
Real-Time	\$43.87	\$43.13	\$41.03	\$43.17	\$42.83	\$43.37	\$43.68	\$43.58	\$43.54
RT Delta %	-1.3%	-1.1%	-3.8%	-2.0%	-2.0%	-1.7%	-2.1%	-1.4%	-1.3%
Year 2019	NEMA	CT	ME	NH	VT	RI	SEMA	WCMA	Hub
Day-Ahead	\$31.54	\$30.72	\$30.76	\$31.20	\$30.67	\$31.19	\$31.51	\$31.24	\$31.22
Real-Time	\$30.92	\$30.26	\$30.12	\$30.70	\$30.05	\$30.61	\$30.80	\$30.68	\$30.67
RT Delta %	-2.0%	-1.5%	-2.1%	-1.6%	-2.0%	-1.9%	-2.2%	-1.8%	-1.8%

January-19	NEMA	CT	ME	NH	VT	RI	SEMA	WCMA	Hub
Day-Ahead	\$57.07	\$55.81	\$55.53	\$56.43	\$55.79	\$56.89	\$56.97	\$56.74	\$56.76
Real-Time	\$51.78	\$50.68	\$50.28	\$51.22	\$50.28	\$51.59	\$51.60	\$51.42	\$51.50
RT Delta %	-9.3%	-9.2%	-9.4%	-9.2%	-9.9%	-9.3%	-9.4%	-9.4%	-9.3%
January-20	NEMA	CT	ME	NH	VT	RI	SEMA	WCMA	Hub
Day-Ahead	\$26.88	\$25.89	\$26.56	\$26.78	\$26.03	\$26.77	\$27.04	\$26.63	\$26.66
Real-Time	\$26.49	\$25.69	\$26.25	\$26.39	\$25.67	\$26.39	\$26.64	\$26.24	\$26.29
RT Delta %	-1.5%	-0.8%	-1.2%	-1.5%	-1.3%	-1.4%	-1.5%	-1.5%	-1.4%
Annual Diff.	NEMA	CT	ME	NH	VT	RI	SEMA	WCMA	Hub
Yr over Yr DA	-52.9%	-53.6%	-52.2%	-52.5%	-53.3%	-52.9%	-52.5%	-53.1%	-53.0%
Yr over Yr RT	-48.9%	-49.3%	-47.8%	-48.5%	-48.9%	-48.9%	-48.4%	-49.0%	-49.0%

# Monthly Average Fuel Price and RT Hub LMP Indexes



# Monthly Average Fuel Price and RT Hub LMP

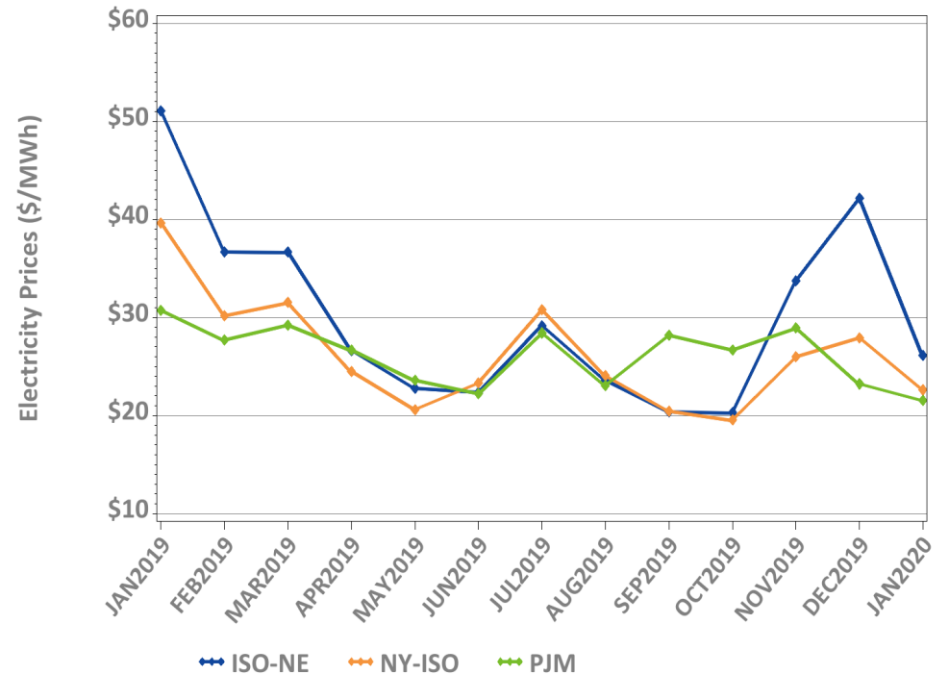


Underlying natural gas data furnished by:



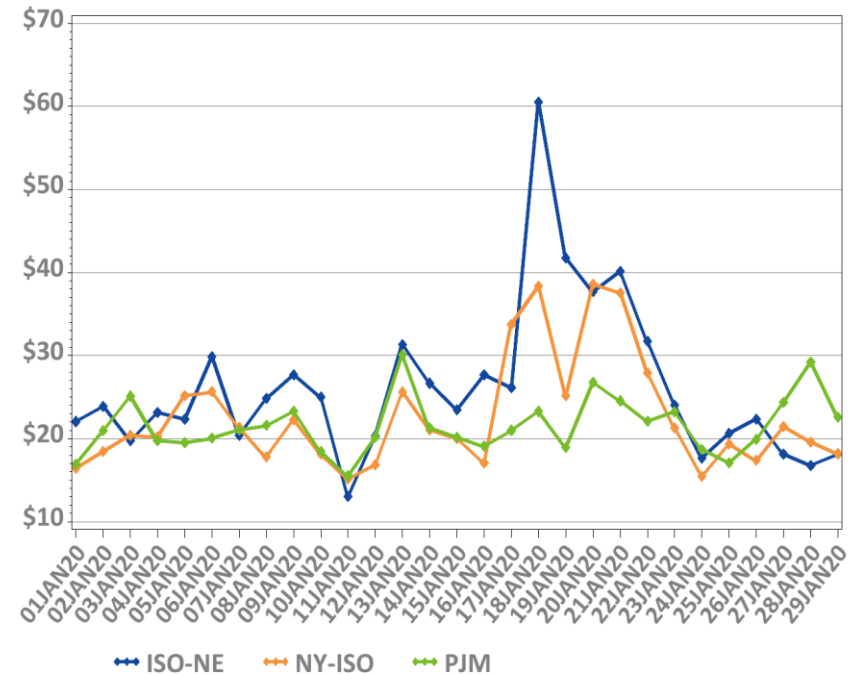
# New England, NY, and PJM Hourly Average Real Time Prices by Month

Monthly, Last 13 Months



\*Note: Hourly average prices are shown.

Daily: This Month



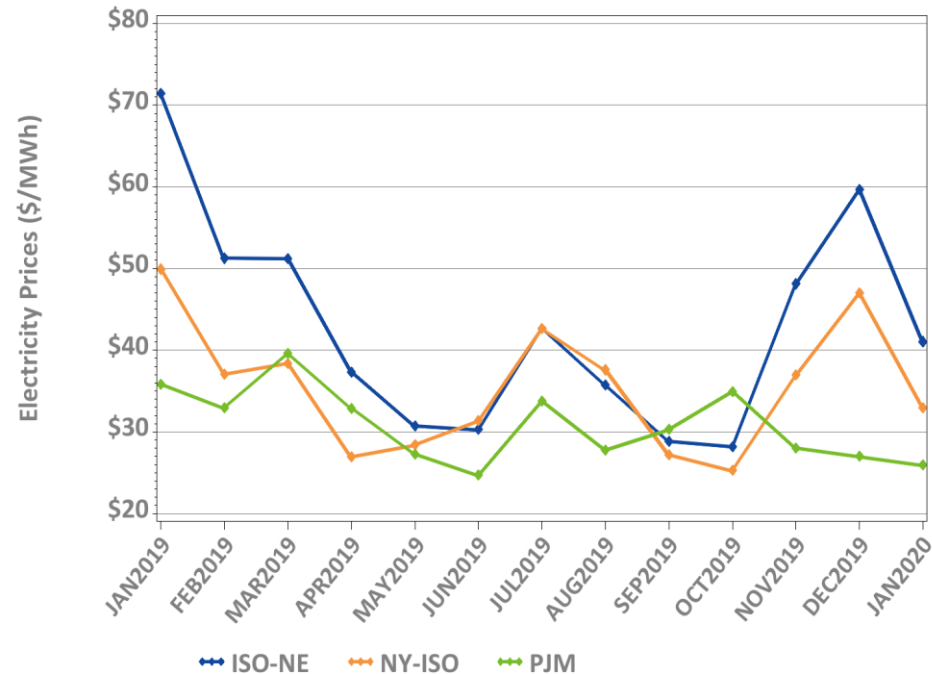
\*Note: Hourly average prices are shown.



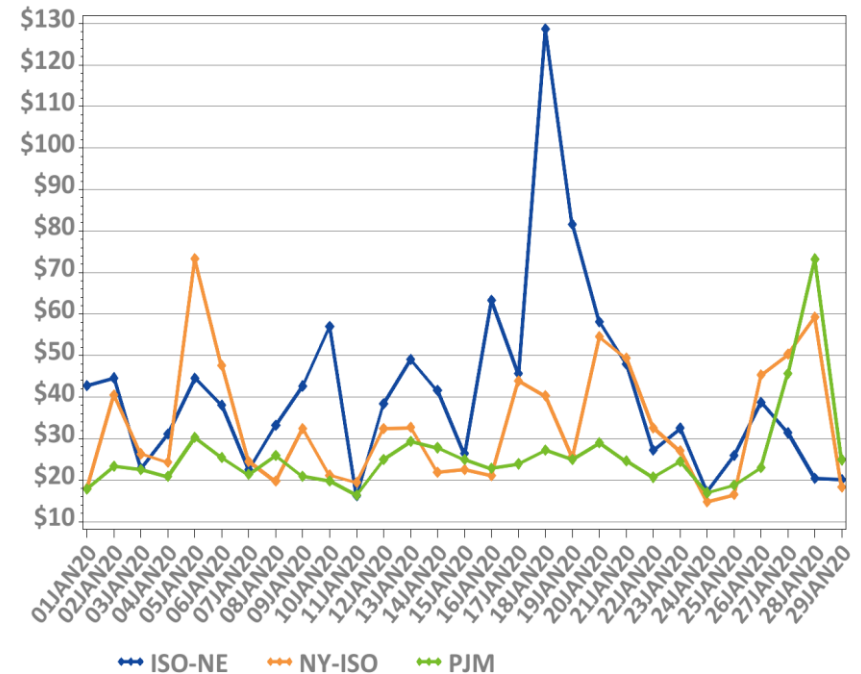


# New England, NY, and PJM Average Peak Hour Real Time Prices

Monthly, Last 13 Months



Daily: This Month



\*Forecasted New England daily peak hours reflected



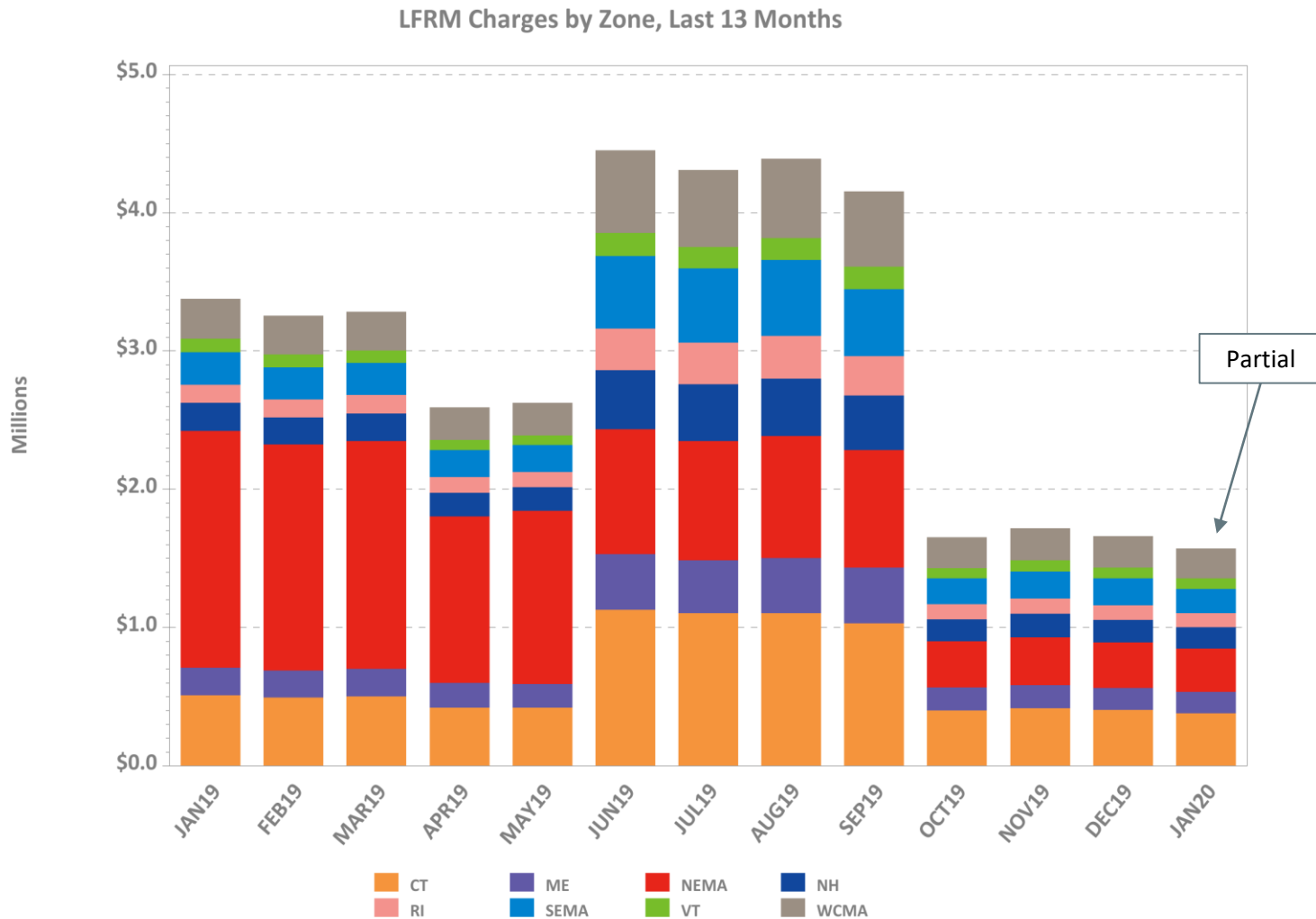
# Reserve Market Results – January 2020

- Maximum potential Forward Reserve Market payments of \$1.6M were reduced by credit reductions of \$8K, failure-to-reserve penalties of \$12K and no failure-to-activate penalties, resulting in a net payout of \$1.6M or 99% of maximum
  - Rest of System: \$1.2M/1.21M (99%)
  - Southwest Connecticut: \$0.04M/0.05M (87%)
  - Connecticut: \$0.32M/0.33M (98%)
- \$407K total Real-Time credits were not reduced by any Forward Reserve Energy Obligation Charges for a net of \$409K in Real-Time Reserve payments
  - Rest of System: 232 hours, \$236K
  - Southwest Connecticut: 232 hours, \$72K
  - Connecticut: 232 hours, \$48K
  - NEMA: 232 hours, \$54K

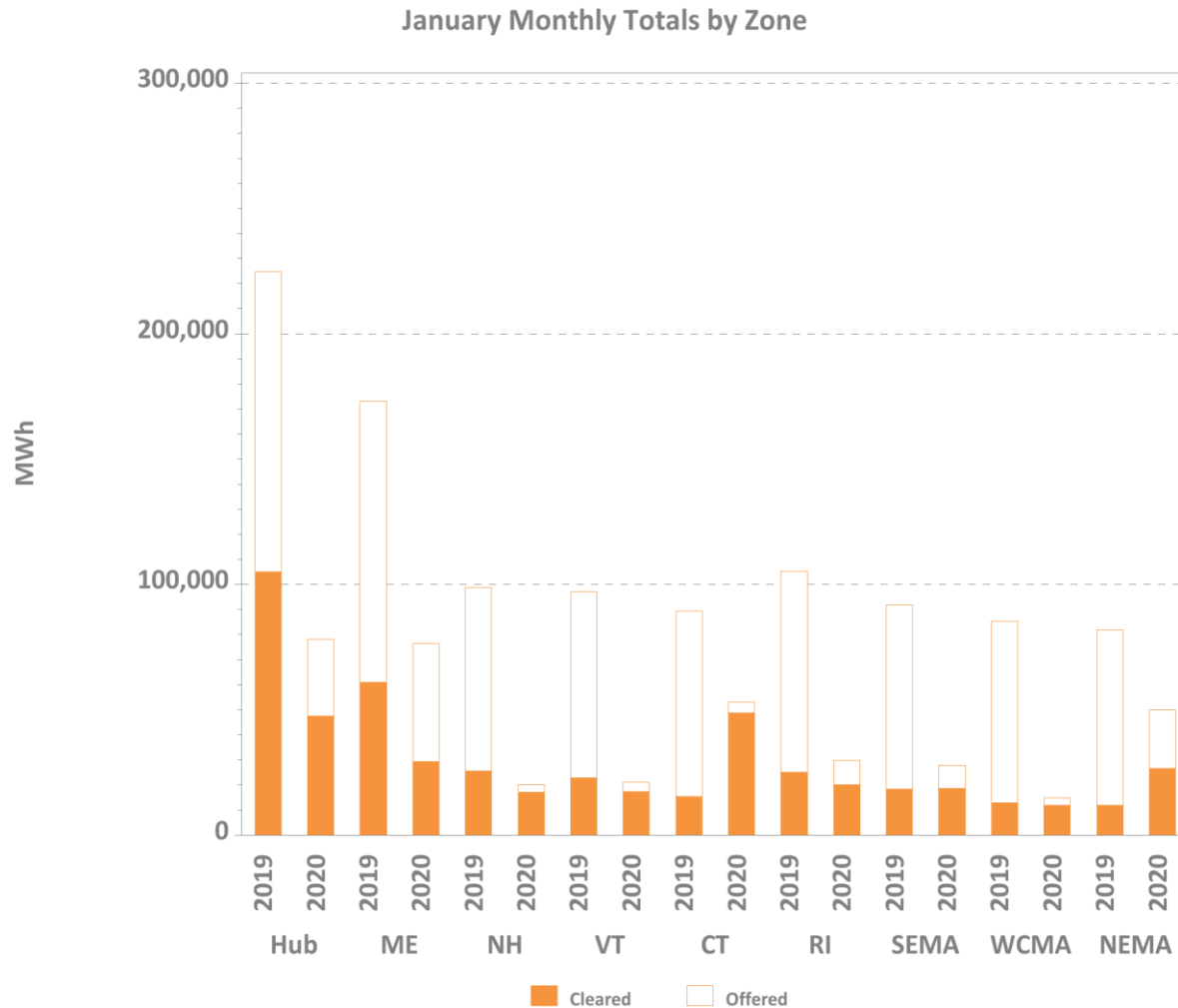
Note: “Failure to reserve” results in both credit reductions and penalties in the Locational Forward Reserve Market. While this summary reports performance by location, there were no locational requirements in effect for the current Forward Reserve auction period.



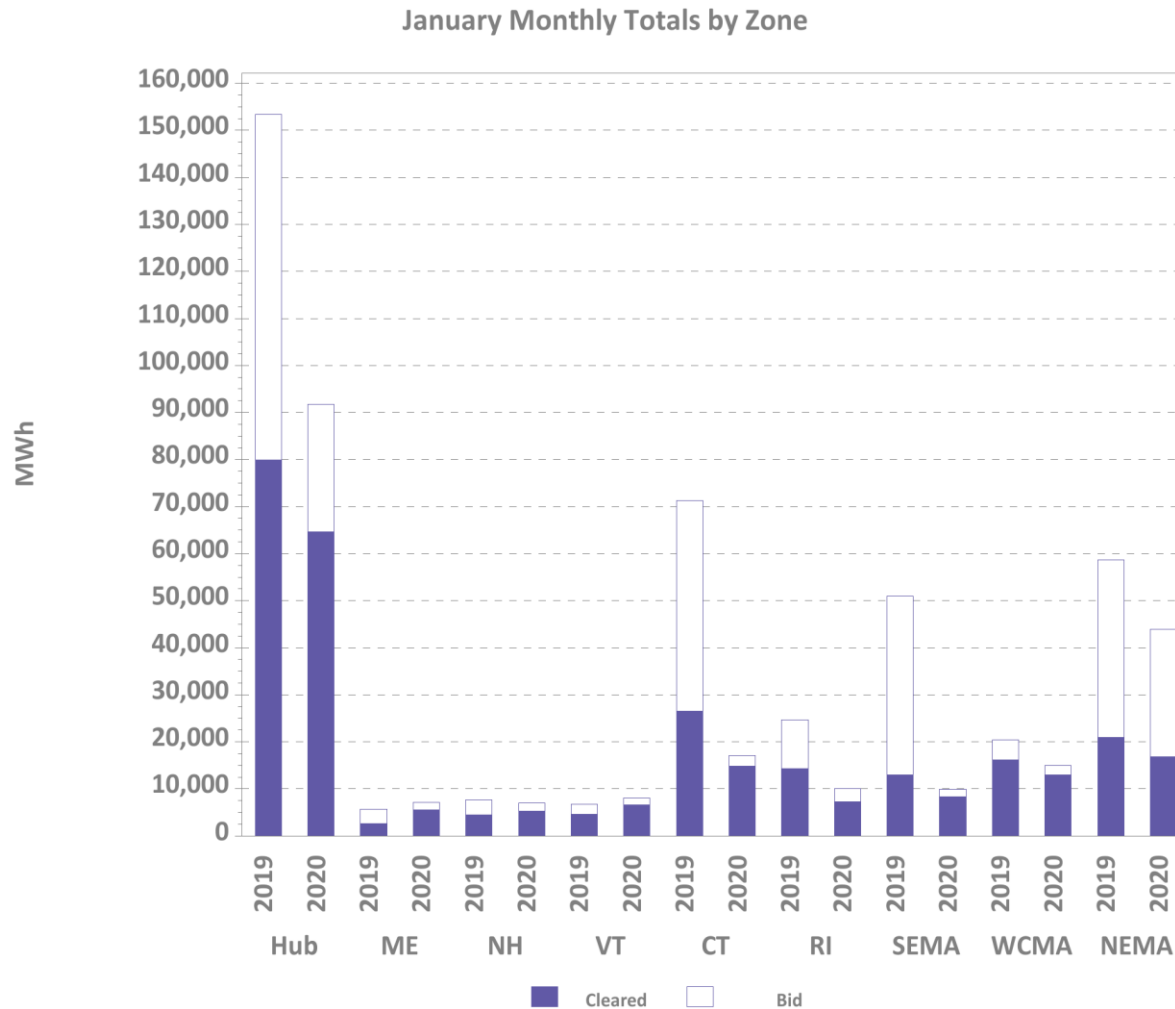
# LFRM Charges to Load by Load Zone (\$)



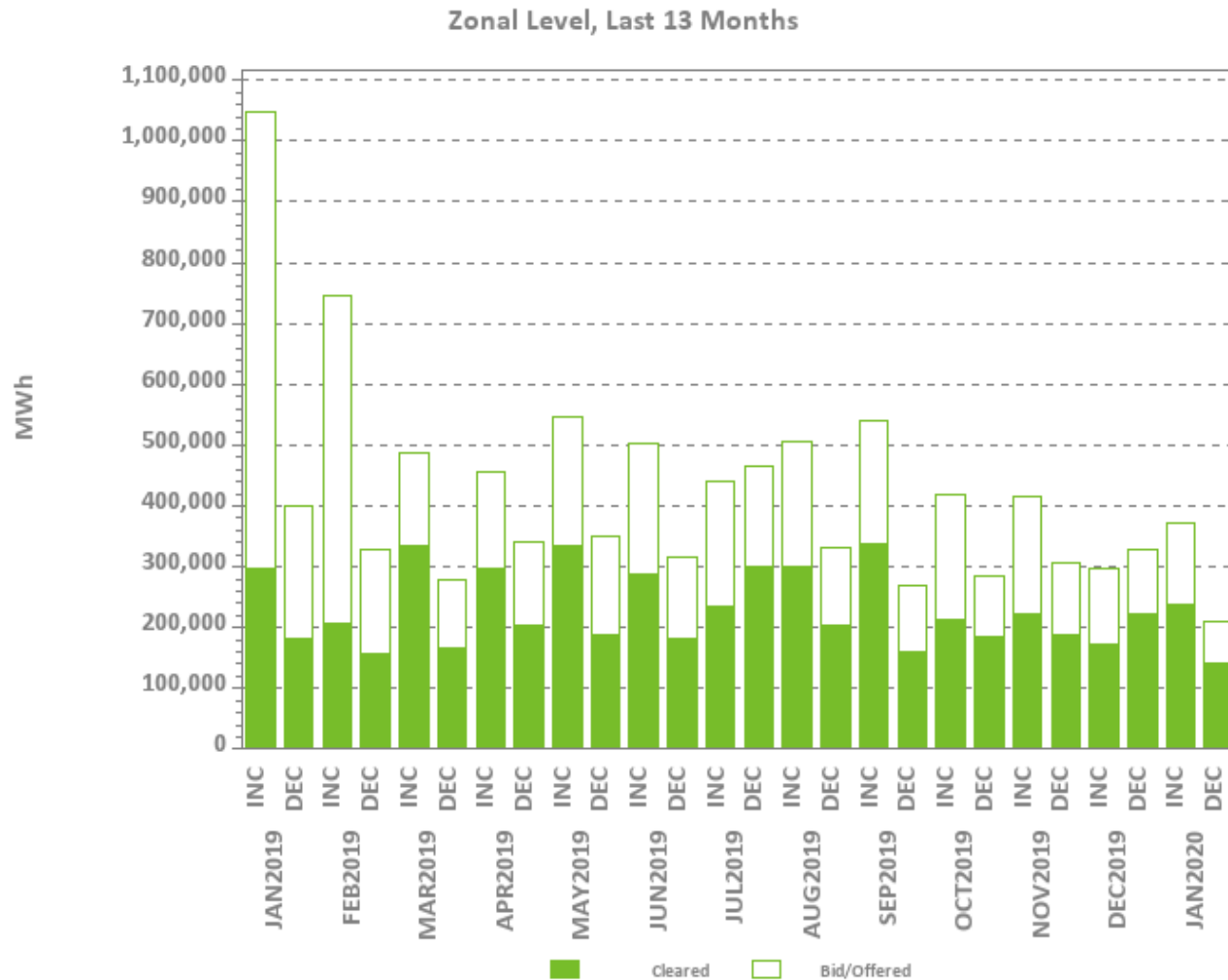
# Zonal Increment Offers and Cleared Amounts



# Zonal Decrement Bids and Cleared Amounts

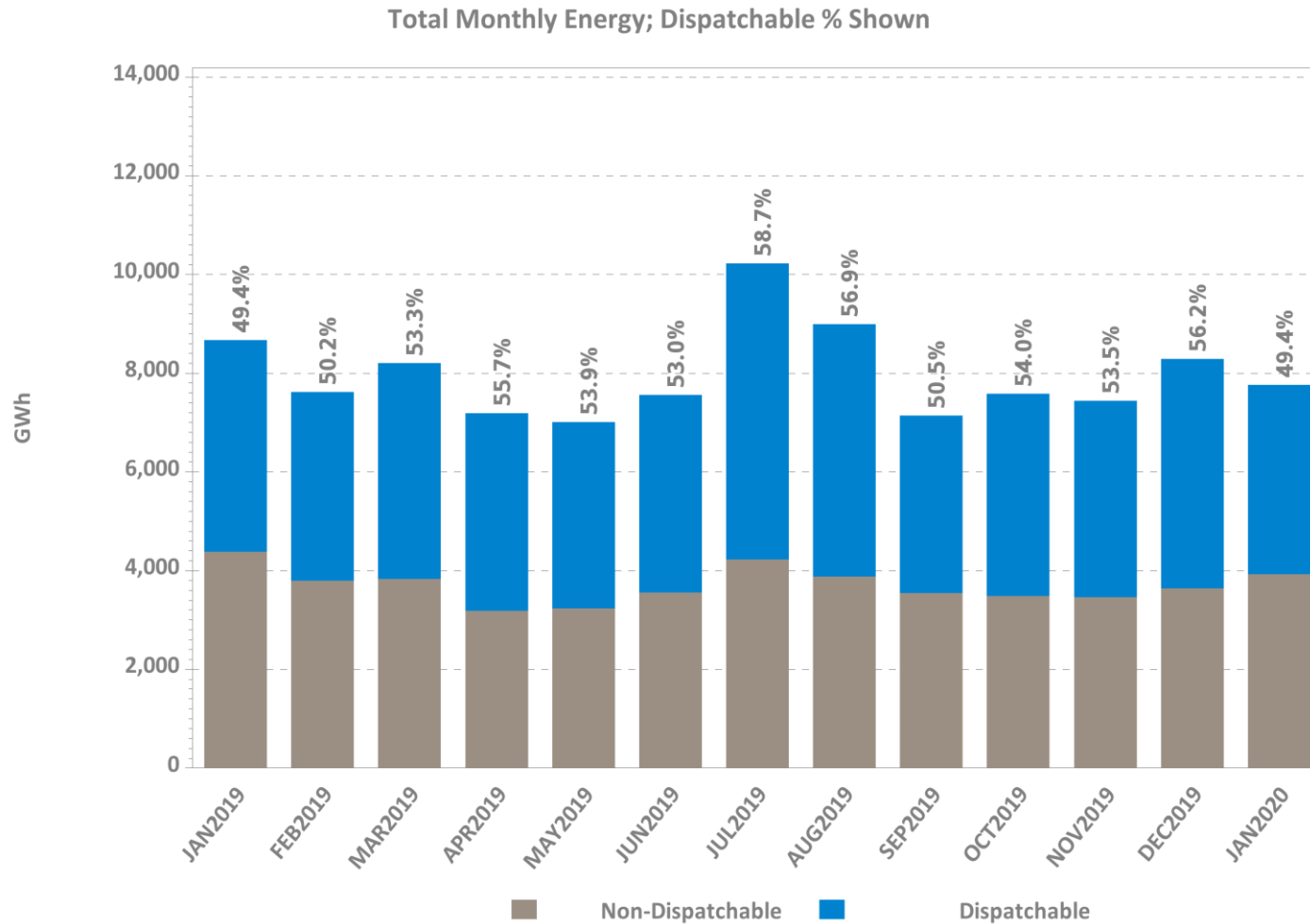


# Total Increment Offers and Decrement Bids



Data excludes nodal offers and bids

# Dispatchable vs. Non-Dispatchable Generation



\* Dispatchable MWh here are defined to be all generation output that is not self-committed ('must run') by the customer.



# REGIONAL SYSTEM PLAN (RSP)





# Future Regional System Plans

- Prior to developing the next Regional System Plan (RSP), the ISO would like input from stakeholders on how to enhance the report
- On January 23, the ISO sent a short survey to New England stakeholders (PAC members as well as NEPOOL committees such as the TC and PC)
  - Survey responses are due February 13
- Goals
  - Increase usability of the RSP
  - Focus on content that stakeholders are interested in
  - Find new ways to keep the RSP forward looking
  - Streamline the development process
  - Increase visibility of the regional system planning process



# Planning Advisory Committee (PAC)

- February 20 PAC Meeting Agenda Topics\*
  - Stakeholder Presentations of Public Policy Requirements for New England Transmission Needs
  - 2019 NESCOE Economic Study Results (8,000 MW Scenario)
  - NEMA/Boston Import Transfer Capability - Update for FCA 15
  - ISO Wind Data Study
  - Upper ME 2029 Needs Assessment Results
  - Western and Central Massachusetts (WCMA) 2029 Needs Assessment Results
  - Glenbrook STATCOM Rebuild Project - Eversource
  - Update on Implementation Plan for Revised NPCC Directory 1 - National Grid

\* Agenda topics are subject to change. Visit <https://www.iso-ne.com/committees/planning/planning-advisory> for the latest PAC agendas.



# Economic Studies

- Economic study requests were submitted by Anbaric, NESCOE, and RENEW Northeast
  - Detailed assumptions for each study request were discussed at the August 8 PAC meeting
- Preliminary results for the NESCOE study (up to 6,000 MW of offshore wind additions) were presented at the December 19 PAC meeting
  - Answers to questions raised on the preliminary results were discussed at the January 23 PAC meeting
  - Additional results to be presented in February related to the 8,000 MW scenario
  - The transmission portion of the study anticipated to be completed in the March-April timeframe
- Preliminary results for the Anbaric and RENEW studies are anticipated to be discussed with PAC in the March-May timeframe
- The ISO plans to complete reports for all three requests by Q2 2020



# 2018 Generator Emissions Report

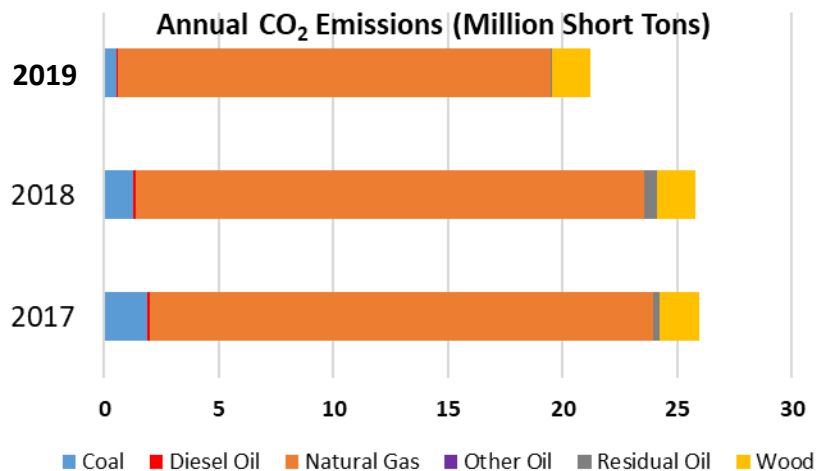
- Preparation of the Annual Electric Generator Air Emissions Report is underway and expected to be completed in the April timeframe
- Preliminary results for the load-weighted and non-load-weighted marginal resource analyses will be presented to the EAG on February 18
  - Similar methodology that ISO-NE's market monitoring unit uses
- Efforts to include emission intensity of imports into New England are being considered as well as the ability to report emissions information more frequently



# Environmental Matters – Annual Emissions

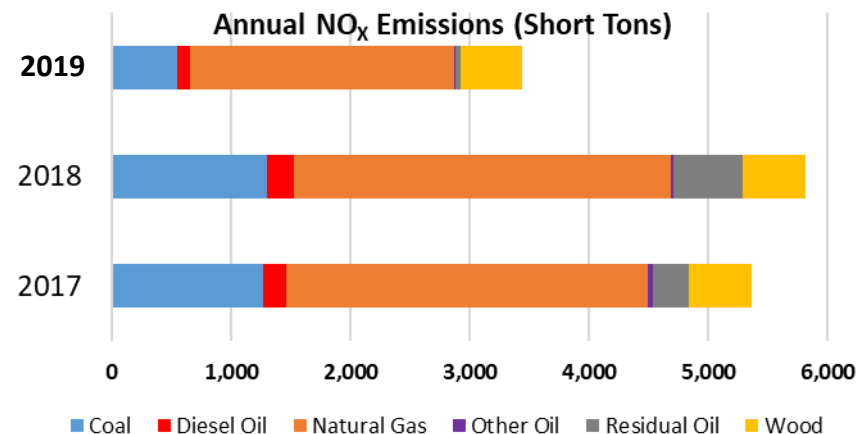
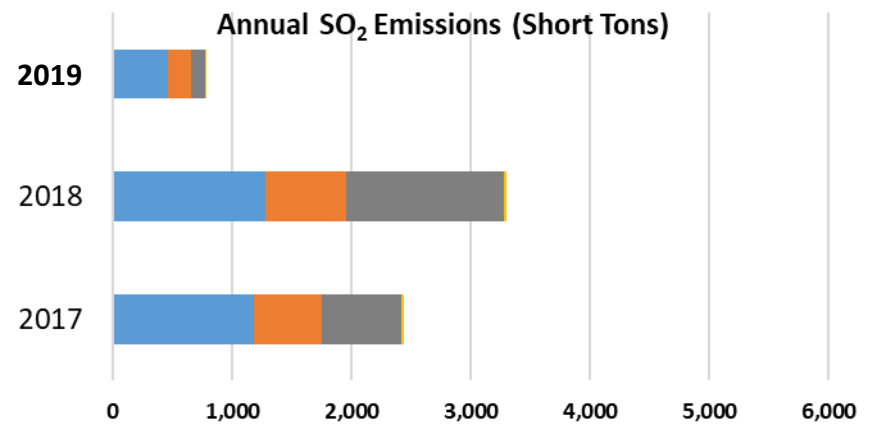
*Reported to EPA by native emitting generators directly*

## Regional 2019 CO<sub>2</sub> Emissions Trend Lower for All Fuel Types



- Compared to 2017 & 2018, a 4% decline in NEL during 2019 vs. 2018 caused all emissions to decline:
  - CO<sub>2</sub> emissions < 18%
  - SO<sub>2</sub> emissions < 73%
  - NO<sub>x</sub> emissions < 39%

## Lower Production by All Fuel Types Lowers Other System Emissions



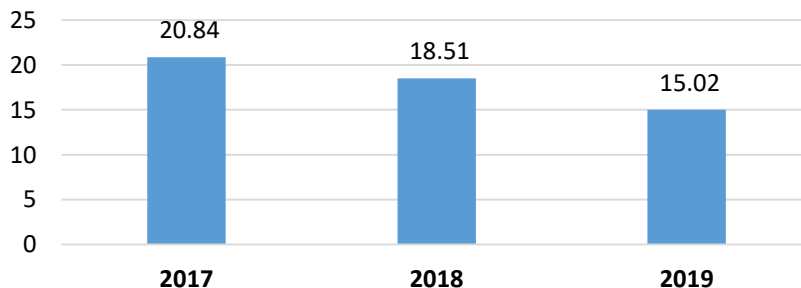
# Environmental Matters – Massachusetts CO<sub>2</sub> Generator Emissions Cap

*2019 Emissions Declined 23%, Generation Declined 19% vs. 2018*

## 2019 CO<sub>2</sub> Emissions Well Below Cap

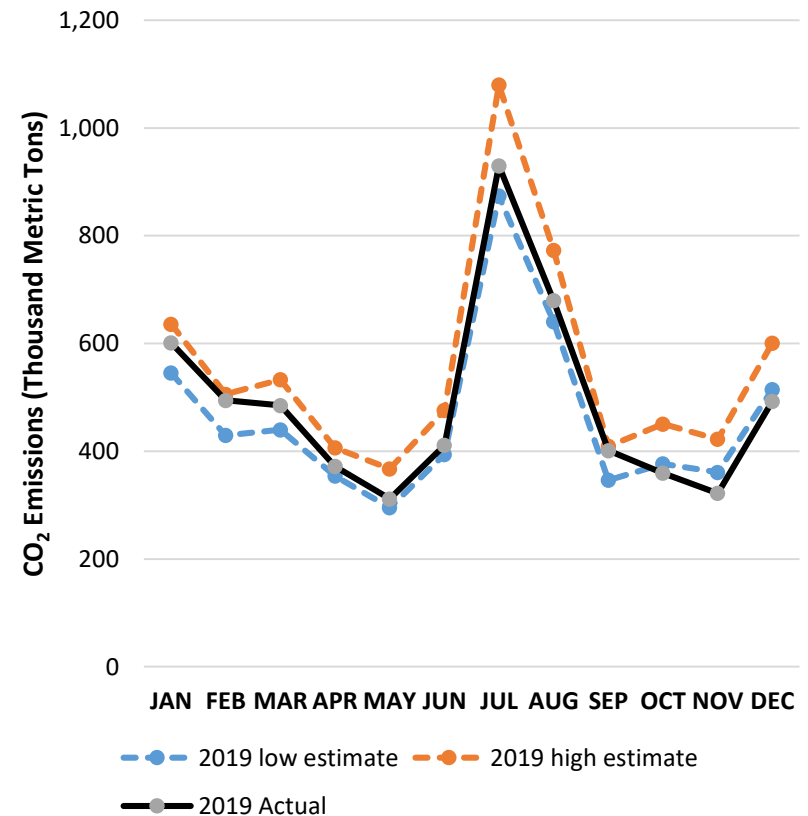
- 2019: **8.73** million metric ton (MMT) cap (25% auctioned, 75% allocated)
  - 2019 actual emissions **5.86** MMT
- 2020: **8.50** MMT cap (50% auctioned, 50% allocated)
- Generation from GWSA affected generators declined 19%, while NEL overall declined 4%

GWSA Annual Generation (TWh)



GWSA - Global Warming Solutions Act

## 2019 Estimated v. Actual GWSA CO<sub>2</sub> Cap Emissions



# RSP Project Stage Descriptions

Stage	Description
1	Planning and Preparation of Project Configuration
2	Pre-construction (e.g., material ordering, project scheduling)
3	Construction in Progress
4	In Service

Note: The listings in this section focus on major transmission line construction and rebuilding.



# New Hampshire/Vermont 10-Year Upgrades

*Status as of 1/27/20*

*Project Benefit: Addresses Needs in New Hampshire and Vermont*

Upgrade	Expected/ Actual In-Service	Present Stage
Eagle Substation Add: 345/115 kV autotransformer	Dec-16	4
Littleton Substation Add: Second 230/115 kV autotransformer	Oct-14	4
New C-203 230 kV line tap to Littleton NH Substation	Nov-14	4
New 115 kV overhead line, Fitzwilliam-Monadnock	Feb-17	4
New 115 kV overhead line, Scobie Pond-Huse Road	Dec-15	4
New 115 kV overhead/submarine line, Madbury-Portsmouth	May-20	3
New 115 kV overhead line, Scobie Pond-Chester	Dec-15	4





# New Hampshire/Vermont 10-Year Upgrades, cont.

*Status as of 1/27/20*

*Project Benefit: Addresses Needs in New Hampshire and Vermont*

Upgrade	Expected/ Actual In-Service	Present Stage
Saco Valley Substation - Add two 25 MVAR dynamic reactive devices	Aug-16	4
Rebuild 115 kV line K165, W157 tap Eagle-Power Street	May-15	4
Rebuild 115 kV line H137, Merrimack-Garvins	Jun-13	4
Rebuild 115 kV line D118, Deerfield-Pine Hill	Nov-14	4
Oak Hill Substation - Loop in 115 kV line V182, Garvins-Webster	Dec-14	4
Uprate 115 kV line G146, Garvins-Deerfield	Mar-15	4
Uprate 115 kV line P145, Oak Hill-Merrimack	May-14	4



# New Hampshire/Vermont 10-Year Upgrades, cont.

*Status as of 1/27/20*

*Project Benefit: Addresses Needs in New Hampshire and Vermont*

Upgrade	Expected/ Actual In-Service	Present Stage
Upgrade 115 kV line H141, Chester-Great Bay	Nov-14	4
Upgrade 115 kV line R193, Scobie Pond-Kingston Tap	Dec-14	4
Upgrade 115 kV line T198, Keene-Monadnock	Nov-13	4
Upgrade 345 kV line 326, Scobie Pond-NH/MA Border	Dec-13	4
Upgrade 115 kV line J114-2, Greggs - Rimmon	Dec-13	4
Upgrade 345 kV line 381, between MA/NH border and NH/VT border	Jun-13	4



# Greater Hartford and Central Connecticut (GHCC) Projects\*

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the four study sub-areas of Greater Hartford, Middletown, Barbour Hill and Northwestern Connecticut and increases western Connecticut import capability*

Upgrade	Expected/ Actual In-Service	Present Stage
Add a 2nd 345/115 kV autotransformer at Haddam substation and reconfigure the 3-terminal 345 kV 348 line into two 2-terminal lines	Apr-17	4
Terminal equipment upgrades on the 345 kV line between Haddam Neck and Beseck (362)	Feb-17	4
Redesign the Green Hill 115 kV substation from a straight bus to a ring bus and add two 115 kV 25.2 MVAR capacitor banks	Jun-18	4
Add a 37.8 MVAR capacitor bank at the Hopewell 115 kV substation	Dec-15	4
Separation of 115 kV double circuit towers corresponding to the Branford – Branford RR line (1537) and the Branford to North Haven (1655) line and adding a 115 kV breaker at Branford 115 kV substation	Mar-17	4
Increase the size of the existing 115 kV capacitor bank at Branford Substation from 37.8 to 50.4 MVAR	Jan-17	4
Separation of 115 kV double circuit towers corresponding to the Middletown – Pratt and Whitney line (1572) and the Middletown to Haddam (1620) line	Dec-16	4

\* Replaces the NEEWS Central Connecticut Reliability Project



# Greater Hartford and Central Connecticut Projects, cont.\*

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the four study sub-areas of Greater Hartford, Middletown, Barbour Hill and Northwestern Connecticut and increases western Connecticut import capability*

Upgrade	Expected/ Actual In-Service	Present Stage
Terminal equipment upgrades on the 115 kV line from Middletown to Dooley (1050)	Jun-15	4
Terminal equipment upgrades on the 115 kV line from Middletown to Portland (1443)	Jun-15	4
Add a 3.7 mile 115 kV hybrid overhead/underground line from Newington to Southwest Hartford and associated terminal equipment including a 1.4% series reactor	Jun-20	3
Add a 115 kV 25.2 MVAR capacitor at Westside 115 kV substation	Jun-18	4
Loop the 1779 line between South Meadow and Bloomfield into the Rood Avenue substation and reconfigure the Rood Avenue substation	May-17	4
Reconfigure the Berlin 115 kV substation including two new 115 kV breakers and the relocation of a capacitor bank	Nov-17	4
Reconductor the 115 kV line between Newington and Newington Tap (1783)	Jun-20	3

\* Replaces the NEEWS Central Connecticut Reliability Project



# Greater Hartford and Central Connecticut Projects, cont.\*

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the four study sub-areas of Greater Hartford, Middletown, Barbour Hill and Northwestern Connecticut and increases western Connecticut import capability*

Upgrade	Expected/ Actual In-Service	Present Stage
Separation of 115 kV DCT corresponding to the Bloomfield to South Meadow (1779) line and the Bloomfield to North Bloomfield (1777) line and add a breaker at Bloomfield 115 kV substation	Dec-17	4
Separation of 115 kV DCT corresponding to the Bloomfield to North Bloomfield (1777) line and the North Bloomfield – Rood Avenue – Northwest Hartford (1751) line and add a breaker at North Bloomfield 115 kV substation	Dec-17	4
Install a 115 kV 3% reactor on the 115 kV line between South Meadow and Southwest Hartford (1704)	Jun-20	3
Replace the existing 3% series reactors on the 115 kV lines between Southington and Todd (1910) and between Southington and Canal (1950) with a 5% series reactors	Dec-18	4
Replace the normally open 19T breaker at Southington 115 kV with a normally closed 3% series reactor	Jun-19	4
Add a 345 kV breaker in series with breaker 5T at Southington	May-17	4

\* Replaces the NEEWS Central Connecticut Reliability Project

# Greater Hartford and Central Connecticut Projects, cont.\*

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the four study sub-areas of Greater Hartford, Middletown, Barbour Hill and Northwestern Connecticut and increases western Connecticut import capability*

Upgrade	Expected/ Actual In-Service	Present Stage
Add a new control house at Southington 115 kV substation	Dec-18	4
Add a new 115 kV line from Frost Bridge to Campville	Dec-17	4
Separation of 115 kV DCT corresponding to the Frost Bridge to Campville (1191) line and the Thomaston to Campville (1921) line and add a breaker at Campville 115 kV substation	Jun-18	4
Upgrade the 115 kV line between Southington and Lake Avenue Junction (1810-1)	Dec-16	4
Add a new 345/115 kV autotransformer at Barbour Hill substation	Dec-15	4
Add a 345 kV breaker in series with breaker 24T at the Manchester 345 kV substation	Dec-15	4
Reconductor the 115 kV line between Manchester and Barbour Hill (1763)	Apr-16	4

\* Replaces the NEEWS Central Connecticut Reliability Project



# Southwest Connecticut (SWCT) Projects

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the four study sub-areas of Frost Bridge/Naugatuck Valley, Housatonic Valley/Plumtree – Norwalk, Bridgeport, New Haven – Southington and improves system reliability*

Upgrade	Expected/ Actual In-Service	Present Stage
Add a 25.2 MVAR capacitor bank at the Oxford substation	Mar-16	4
Add 2 x 25 MVAR capacitor banks at the Ansonia substation	Oct-18	4
Close the normally open 115 kV 2T circuit breaker at Baldwin substation	Sep-17	4
Reconductor the 115 kV line between Bunker Hill and Baldwin Junction (1575)	Dec-16	4
Expand Pootatuck (formerly known as Shelton) substation to 4-breaker ring bus configuration and add a 30 MVAR capacitor bank at Pootatuck	Jul-18	4
Loop the 1570 line in and out the Pootatuck substation	Jul-18	4
Replace two 115 kV circuit breakers at the Freight substation	Dec-15	4



# Southwest Connecticut Projects, cont.

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the four study sub-areas of Frost Bridge/Naugatuck Valley, Housatonic Valley/Plumtree – Norwalk, Bridgeport, New Haven – Southington and improves system reliability*

Upgrade	Expected/ Actual In-Service	Present Stage
Add two 14.4 MVAR capacitor banks at the West Brookfield substation	Dec-17	4
Add a new 115 kV line from Plumtree to Brookfield Junction	Jun-18	4
Reconductor the 115 kV line between West Brookfield and Brookfield Junction (1887)	Dec-20	2
Reduce the existing 25.2 MVAR capacitor bank at the Rocky River substation to 14.4 MVAR	Apr-17	4
Reconfigure the 1887 line into a three-terminal line (Plumtree - W. Brookfield - Shepaug)	May-18	4
Reconfigure the 1770 line into 2 two-terminal lines (Plumtree - Stony Hill and Stony Hill - Bates Rock)	May-18	4
Install a synchronous condenser (+25/-12.5 MVAR) at Stony Hill	Jun-18	4
Relocate an existing 37.8 MVAR capacitor bank at Stony Hill to the 25.2 MVAR capacitor bank side	May-18	4





# Southwest Connecticut Projects, cont.

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the four study sub-areas of Frost Bridge/Naugatuck Valley, Housatonic Valley/Plumtree – Norwalk, Bridgeport, New Haven – Southington and improves system reliability*

Upgrade	Expected/ Actual In-Service	Present Stage
Relocate the existing 37.8 MVAR capacitor bank from 115 kV B bus to 115 kV A bus at the Plumtree substation	Apr-17	4
Add a 115 kV circuit breaker in series with the existing 29T breaker at the Plumtree substation	May-16	4
Terminal equipment upgrade at the Newtown substation (1876)	Dec-15	4
Rebuild the 115 kV line from Wilton to Norwalk (1682) and upgrade Wilton substation terminal equipment	Jun-17	4
Reconductor the 115 kV line from Wilton to Ridgefield Junction (1470-1)	Dec-19	4
Reconductor the 115 kV line from Ridgefield Junction to Peaceable (1470-3)	Dec-19	4



# Southwest Connecticut Projects, cont.

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the four study sub areas of Frost Bridge/Naugatuck Valley, Housatonic Valley/Plumtree – Norwalk, Bridgeport, New Haven – Southington and improves system reliability*

Upgrade	Expected/ Actual In-Service	Present Stage
Add 2 x 20 MVAR capacitor banks at the Hawthorne substation	Mar-16	4
Upgrade the 115 kV bus at the Baird substation	Mar-18	4
Upgrade the 115 kV bus system and 11 disconnect switches at the Pequonnock substation	Dec-14	4
Add a 345 kV breaker in series with the existing 11T breaker at the East Devon substation	Dec-15	4
Rebuild the 115 kV lines from Baird to Congress (8809A / 8909B)	Dec-18	4
Rebuild the 115 kV lines from Housatonic River Crossing (HRX) to Barnum to Baird (88006A / 89006B)	Jun-21	2



# Southwest Connecticut Projects, cont.

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the four study sub areas of Frost Bridge/Naugatuck Valley, Housatonic Valley/Plumtree – Norwalk, Bridgeport, New Haven – Southington and improves system reliability*

Upgrade	Expected/ Actual In-Service	Present Stage
Remove the Sackett phase shifter	Mar-17	4
Install a 7.5 ohm series reactor on 1610 line at the Mix Avenue substation	Dec-16	4
Add 2 x 20 MVAR capacitor banks at the Mix Avenue substation	Dec-16	4
Upgrade the 1630 line relay at North Haven and Wallingford 1630 terminal equipment	Jan-17	4
Rebuild the 115 kV lines from Devon Tie to Milvon (88005A / 89005B)	Nov-16	4
Replace two 115 kV circuit breakers at Mill River	Dec-14	4



# Greater Boston Projects

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the Greater Boston area and improves system reliability*

Upgrade	Expected/ Actual In-Service	Present Stage
Install new 345 kV line from Scobie to Tewksbury	Dec-17	4
Reconductor the Y-151 115 kV line from Dracut Junction to Power Street	Apr-17	4
Reconductor the M-139 115 kV line from Tewksbury to Pinehurst and associated work at Tewksbury	May-17	4
Reconductor the N-140 115 kV line from Tewksbury to Pinehurst and associated work at Tewksbury	May-17	4
Reconductor the F-158N 115 kV line from Wakefield Junction to Maplewood and associated work at Maplewood	Dec-15	4
Reconductor the F-158S 115 kV line from Maplewood to Everett	Jun-19	4
Install new 345 kV cable from Woburn to Wakefield Junction, install two new 160 MVAR variable shunt reactors and associated work at Wakefield Junction and Woburn*	May-21	3*
Refurbish X-24 69 kV line from Millbury to Northboro Road	Dec-15	4
Reconductor W-23W 69 kV line from Woodside to Northboro Road	Jun-19	4

\* Substation portion of the project is a Present Stage status 4

# Greater Boston Projects, cont.

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the Greater Boston area and improves system reliability*

Upgrade	Expected/ Actual In-Service	Present Stage
Separate X-24 and E-157W DCT	Dec-18	4
Separate Q-169 and F-158N DCT	Dec-15	4
Reconductor M-139/211-503 and N-140/211-504 115 kV lines from Pinehurst to North Woburn tap	May-17	4
Install new 115 kV station at Sharon to segment three 115 kV lines from West Walpole to Holbrook	May-20	3
Install third 115 kV line from West Walpole to Holbrook	May-20	3
Install new 345 kV breaker in series with the 104 breaker at Stoughton	May-16	4
Install new 230/115 kV autotransformer at Sudbury and loop the 282-602 230 kV line in and out of the new 230 kV switchyard at Sudbury	Dec-17	4
Install a new 115 kV line from Sudbury to Hudson	Dec-23	2

# Greater Boston Projects, cont.

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the Greater Boston area and improves system reliability*

Upgrade	Expected/ Actual In-Service	Present Stage
Replace 345/115 kV autotransformer, 345 kV breakers, and 115 kV switchgear at Woburn	Dec-19	4
Install a 345 kV breaker in series with breaker 104 at Woburn	May-17	4
Reconfigure Waltham by relocating PARs, 282-507 line, and a breaker	Dec-17	4
Upgrade 533-508 115 kV line from Lexington to Hartwell and associated work at the stations	Aug-16	4
Install a new 115 kV 54 MVAR capacitor bank at Newton	Dec-16	4
Install a new 115 kV 36.7 MVAR capacitor bank at Sudbury	May-17	4
Install a second Mystic 345/115 kV autotransformer and reconfigure the bus	May-19	4
Install a 115 kV breaker on the East bus at K Street	Jun-16	4
Install 115 kV cable from Mystic to Chelsea and upgrade Chelsea 115 kV station to BPS standards	Jul-20	3
Split 110-522 and 240-510 DCT from Baker Street to Needham for a portion of the way and install a 115 kV cable for the rest of the way	Dec-20	3

# Greater Boston Projects, cont.

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the Greater Boston area and improves system reliability*

Upgrade	Expected/ Actual In-Service	Present Stage
Install a second 115 kV cable from Mystic to Woburn to create a bifurcated 211-514 line	Dec-21	3
Open lines 329-510/511 and 250-516/517 at Mystic and Chatham, respectively. Operate K Street as a normally closed station.	May-19	4
Upgrade Kingston to create a second normally closed 115 kV bus tie and reconfigure the 345 kV switchyard	Mar-19	4
Relocate the Chelsea capacitor bank to the 128-518 termination position	Dec-16	4



# Greater Boston Projects, cont.

*Status as of 1/27/20*

*Plan Benefit: Addresses long-term system needs in the Greater Boston area and improves system reliability*

Upgrade	Expected/ Actual In-Service	Present Stage
Upgrade North Cambridge to mitigate 115 kV 5 and 10 stuck breaker contingencies	Dec-17	4
Install a 200 MVAR STATCOM at Coopers Mills	Nov-18	4
Install a 115 kV 36.7 MVAR capacitor bank at Hartwell	May-17	4
Install a 345 kV 160 MVAR shunt reactor at K Street	Dec-19	4
Install a 115 kV breaker in series with the 5 breaker at Framingham	Apr-17	4
Install a 115 kV breaker in series with the 29 breaker at K Street	Apr-17	4





# Pittsfield/Greenfield Projects

*Status as of 1/27/20*

*Project Benefit: Addresses system needs in the Pittsfield/Greenfield area in Western Massachusetts*

Upgrade	Expected/ Actual In-Service	Present Stage
Separate and reconductor the Cabot Taps (A-127 and Y-177 115 kV lines)	Mar-17	4
Install a 115 kV tie breaker at the Harriman Station, with associated buswork, reconductor of buswork and new control house	Nov-17	4
Modify Northfield Mountain 16R Substation and install a 345/115 kV autotransformer	Jun-17	4
Build a new 115 kV three-breaker switching station (Erving) ring bus	Mar-17	4
Build a new 115 kV line from Northfield Mountain to the new Erving Switching Station	Jun-17	4
Install 115 kV 14.4 MVAR capacitor banks at Cumberland, Podick and Amherst Substations	Dec-15	4



# Pittsfield/Greenfield Projects, cont.

*Status as of 1/27/20*

*Project Benefit: Addresses system needs in the Pittsfield/Greenfield area in Western Massachusetts*

Upgrade	Expected/ Actual In-Service	Present Stage
Rebuild the Cumberland to Montague 1361 115 kV line and terminal work at Cumberland and Montague. At Montague Substation, reconnect Y177 115 kV line into 3T/4T position and perform other associated substation work	Dec-16	4
Remove the sag limitation on the 1512 115 kV line from Blandford Substation to Granville Junction and remove the limitation on the 1421 115 kV line from Pleasant to Blandford Substation	Dec-14	4
Loop the A127W line between Cabot Tap and French King into the new Erving Substation	Mar-17	4
Reconductor A127 between Erving and Cabot Tap and replace switches at Wendell Depot	Apr-15	4



# Pittsfield/Greenfield Projects, cont.

*Status as of 1/27/20*

*Project Benefit: Addresses system needs in the Pittsfield/Greenfield area in Western Massachusetts*

Upgrade	Expected/ Actual In-Service	Present Stage
Install a 115 kV 20.6 MVAR capacitor at the Doreen substation and operate the 115 kV 13T breaker N.O.	Oct-17	4
Install a 75-150 MVAR variable reactor at Northfield substation	Dec-17	4
Install a 75-150 MVAR variable reactor at Ludlow substation	Dec-17	4
Construct a 115 kV three-breaker ring bus at or adjacent to Pochassic 37R Substation, loop line 1512-1 into the new three-breaker ring bus, construct a new line connecting the new three-breaker ring bus to the Buck Pond 115 kV Substation on the vacant side of the double-circuit towers that carry line 1302-2, add a new breaker to the Buck Pond 115 kV straight bus and reconnect lines 1302-2, 1657-2 and transformer 2X into new positions	Jun-20	3



# SEMA/RI Reliability Projects

*Status as of 1/27/20*

*Project Benefit: Addresses system needs in the Southeast Massachusetts/Rhode Island area*

Project ID	Upgrade	Expected/ Actual In-Service	Present Stage
1714	Construct a new 115 kV GIS switching station (Grand Army) which includes remote terminal station work at Brayton Point and Somerset substations, and the looping in of the E-183E, F-184, X3, and W4 lines	May-20	3
1742	Conduct remote terminal station work at the Wampanoag and Pawtucket substations for the new Grand Army GIS switching station	Nov-20	3
1715	Install upgrades at Brayton Point substation which include a new 115 kV breaker, new 345/115 kV transformer, and upgrades to E183E, F184 station equipment	Jun-20	3
1716	Increase clearances on E-183E & F-184 lines between Brayton Point and Grand Army substations	Nov-19	4
1717	Separate the X3/W4 DCT and reconductor the X3 and W4 lines between Somerset and Grand Army substations; reconfigure Y2 and Z1 lines	Nov-19	4

# SEMA/RI Reliability Projects, cont.

*Status as of 1/27/20*

*Project Benefit: Addresses system needs in the Southeast Massachusetts/Rhode Island area*

Project ID	Upgrade	Expected/ Actual In-Service	Present Stage
1718	Add 115 kV circuit breaker at Robinson Ave substation and re-terminate the Q10 line	Dec-20	2
1719	Install 45.0 MVAR capacitor bank at Berry Street substation	Dec-20	2
1720	Separate the N12/M13 DCT and re-conductor the N12 and M13 between Somerset and Bell Rock substations	Nov-21	2
1721	Reconfigure Bell Rock to breaker-and-a-half station, split the M13 line at Bell Rock substation, and terminate 114 line at Bell Rock; install a new breaker in series with N12/D21 tie breaker, upgrade D21 line switch, and install a 37.5 MVAR capacitor	Dec-21	2
1722	Extend the Line 114 from the Dartmouth town line (Eversource- NGRID border) to Bell Rock substation	Dec-21	2
1723	Reconductor L14 and M13 lines from Bell Rock substation to Bates Tap	Sep-21	2

# SEMA/RI Reliability Projects, cont.

*Status as of 1/27/20*

*Project Benefit: Addresses system needs in the Southeast Massachusetts/Rhode Island area*

Project ID	Upgrade	Expected/ Actual In-Service	Present Stage
1725	Build a new 115 kV line from Bourne to West Barnstable substations which includes associated terminal work	Dec-21	1
1726	Separate the 135/122 DCT from West Barnstable to Barnstable substations	Nov-20	1
1727	Retire the Barnstable SPS	Dec-21	1
1728	Build a new 115 kV line from Carver to Kingston substations and add a new Carver terminal	Dec-21	1
1729	Install a new bay position at Kingston substation to accommodate new 115 kV line	Dec-21	1
1730	Extend the 114 line from the Eversource/National Grid border to the Industrial Park Tap	Dec-21	1

# SEMA/RI Reliability Projects, cont.

*Status as of 1/27/20*

*Project Benefit: Addresses system needs in the Southeast Massachusetts/Rhode Island area*

Project ID	Upgrade	Expected/ Actual In-Service	Present Stage
1731	Install 35.3 MVAR capacitors at High Hill and Wing Lane substations	Dec-21	1
1732	Loop the 201-502 line into the Medway substation to form the 201-502N and 201-502S lines	Dec-21	1
1733	Separate the 325/344 DCT lines from West Medway to West Walpole substations	Dec-21	1
1734	Reconductor and upgrade the 112 Line from the Tremont substation to the Industrial Tap	Jun-18	4
1736	Reconductor the 108 line from Bourne substation to Horse Pond Tap*	Oct-18	4
1737	Replace disconnect switches on 323 line at West Medway substation and replace 8 line structures	Dec-21	3

\* Does not include the reconductoring work over the Cape Cod canal



# SEMA/RI Reliability Projects, cont.

*Status as of 1/27/20*

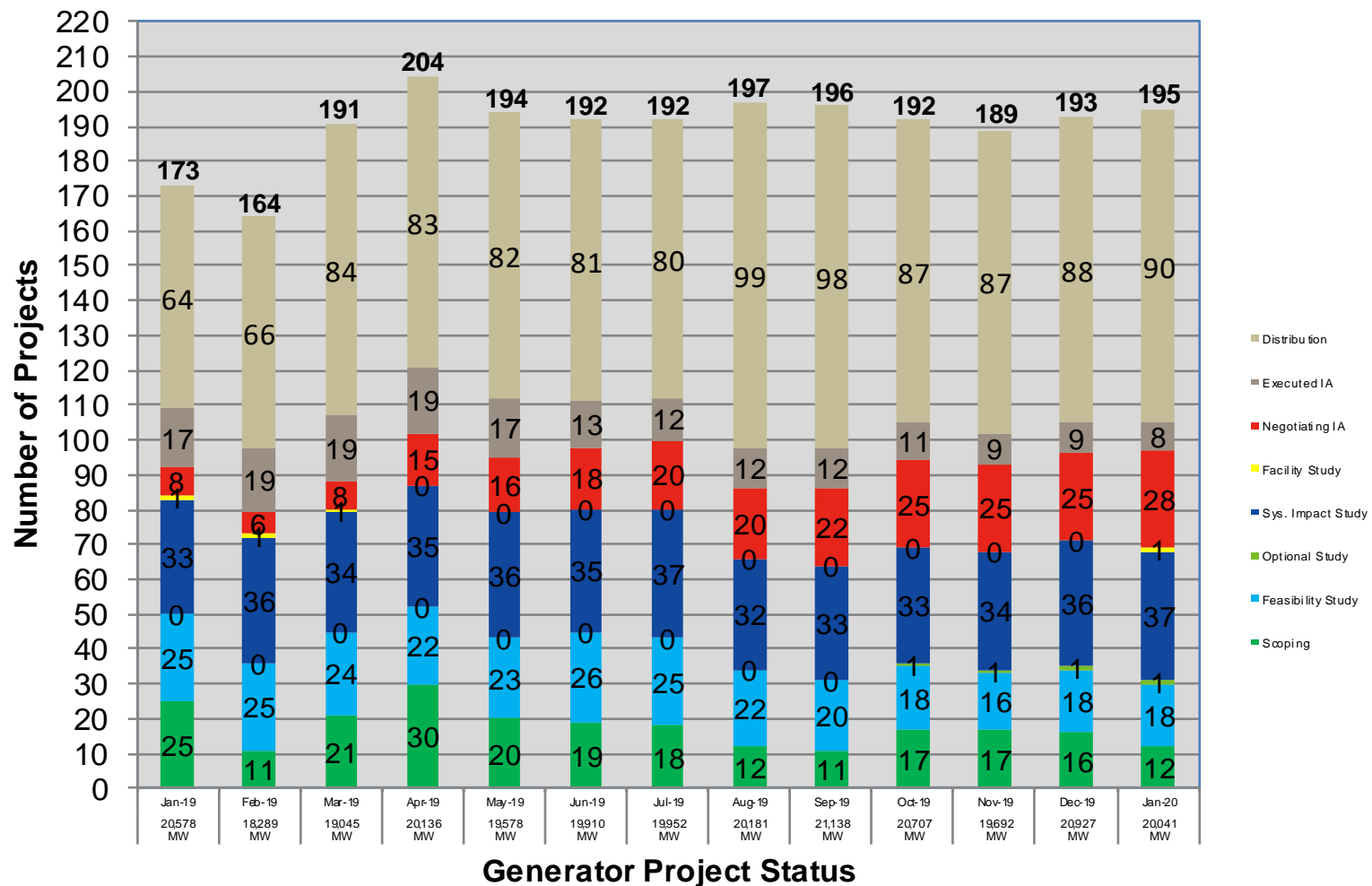
*Project Benefit: Addresses system needs in the Southeast Massachusetts/Rhode Island area*

Project ID	Upgrade	Expected/ Actual In-Service	Present Stage
1741	Rebuild the Middleborough Gas and Electric portion of the E1 line from Bridgewater to Middleborough	Apr-19	4
1782	Reconductor the J16S line	Dec-20	2
1724	Replace the Kent County 345/115 kV transformer	Feb-21	2
1789	West Medway 345 kV circuit breaker upgrades	Dec-21	2
1790	Medway 115 kV circuit breaker replacements	Dec-21	3





# Status of Tariff Studies

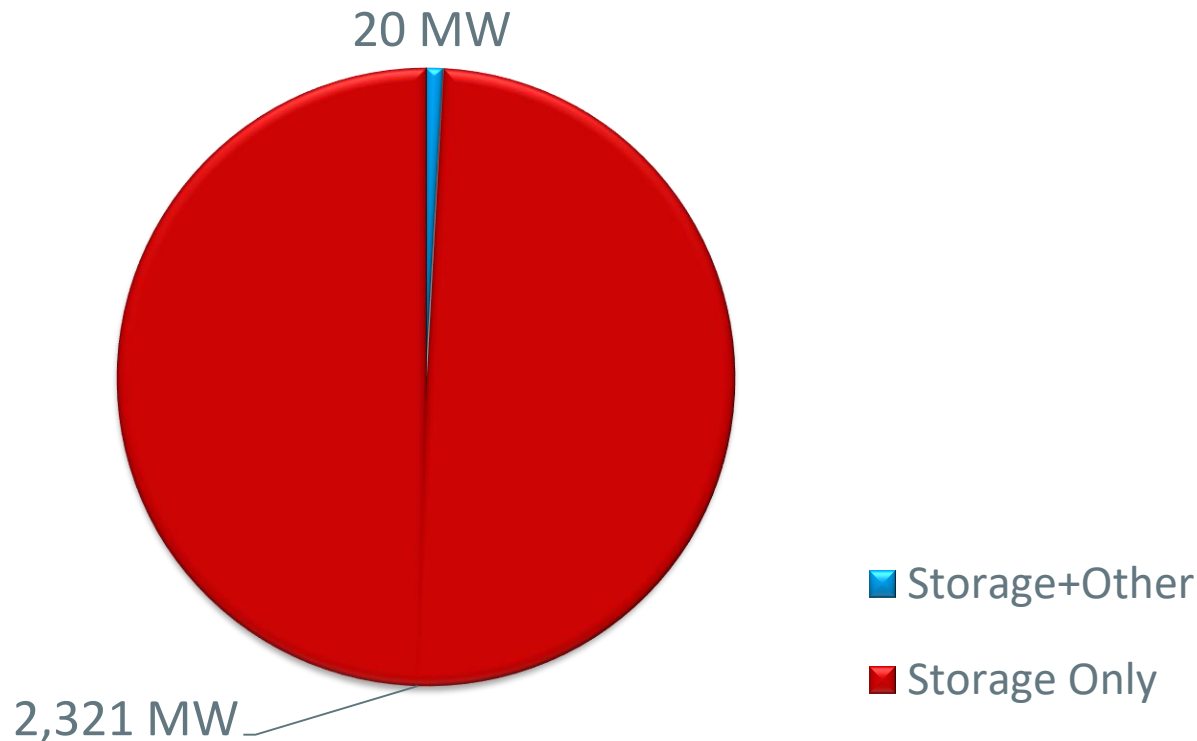


As of January 2020, there are 4 ETU's in Scoping, 4 in FS, 4 in SIS, 0 in FAC, 1 Negotiating IA, and 1 with Executed IA

<https://irrt.iso-ne.com/external.aspx>

# What is in the Queue (as of January 30, 2020)

Storage Projects are proposed as stand-alone storage or as co-located with wind or solar projects



# OPERABLE CAPACITY ANALYSIS

*Winter 2019/2020 Analysis*



# Winter 2019/2020 Operable Capacity Analysis

50/50 Load Forecast (Reference)	February - 2020 <sup>2</sup> CSO (MW)	February - 2020 <sup>2</sup> SCC (MW)
Operable Capacity MW <sup>1</sup>	31,029	33,821
Active Demand Capacity Resource (+) <sup>5</sup>	412	363
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	1,094	1,094
Non Commercial Capacity (+)	28	28
Non Gas-fired Planned Outage MW (-)	434	473
Gas Generator Outages MW (-)	0	0
Allowance for Unplanned Outages (-) <sup>4</sup>	3,100	3,100
Generation at Risk Due to Gas Supply (-) <sup>3</sup>	2,958	3,269
Net Capacity (NET OPCAP SUPPLY MW)	26,071	28,464
Peak Load Forecast MW (adjusted for Other Demand Resources) <sup>2</sup>	19,967	19,967
Operating Reserve Requirement MW	2,305	2,305
Operable Capacity Required (NET LOAD OBLIGATION MW)	22,272	22,272
Operable Capacity Margin	3,799	6,192

<sup>1</sup>Operable Capacity is based on data as of **January 20, 2020** 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 **January 20, 2020**.

<sup>2</sup> Load forecast that is based on the 2019 CELT report and represents the week with the lowest Operable Capacity Margin, week beginning **February 1, 2020**.

<sup>3</sup> Total of (Gas at Risk MW) – (Gas Gen Outages MW).

<sup>4</sup> Allowance For Unplanned Outage MW is based on the month corresponding to the day with the lowest Operable Capacity Margin for the week.

<sup>5</sup> 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.

# Winter 2019/2020 Operable Capacity Analysis

90/10 Load Forecast (Extreme)	February - 2020 <sup>2</sup> CSO (MW)	February - 2020 <sup>2</sup> SCC (MW)
Operable Capacity MW <sup>1</sup>	31,029	33,821
Active Demand Capacity Resource (+) <sup>5</sup>	412	363
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	1,094	1,094
Non Commercial Capacity (+)	28	28
Non Gas-fired Planned Outage MW (-)	434	473
Gas Generator Outages MW (-)	0	0
Allowance for Unplanned Outages (-) <sup>4</sup>	3,100	3,100
Generation at Risk Due to Gas Supply (-) <sup>3</sup>	4,204	4,645
Net Capacity (NET OPCAP SUPPLY MW)	24,825	27,088
Peak Load Forecast MW (adjusted for Other Demand Resources) <sup>2</sup>	20,648	20,648
Operating Reserve Requirement MW	2,305	2,305
Operable Capacity Required (NET LOAD OBLIGATION MW)	22,953	22,953
Operable Capacity Margin	1,872	4,135

<sup>1</sup> Operable Capacity is based on data as of **January 20, 2020** 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 **January 20, 2020**.

<sup>2</sup> Load forecast that is based on the 2019 CELT report and represents the week with the lowest Operable Capacity Margin, week beginning **February 1, 2020**.

<sup>3</sup> Total of (Gas at Risk MW) – (Gas Gen Outages MW).

<sup>4</sup> Allowance For Unplanned Outage MW is based on the month corresponding to the day with the lowest Operable Capacity Margin for the week.

<sup>5</sup> 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.

# Winter 2019/2020 Operable Capacity Analysis

## 50/50 Forecast (Reference)

### ISO-NE OPERABLE CAPACITY ANALYSIS

February 1, 2020 - 50-50 FORECAST using CSO

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 June, July, August, and Mid September

STUDY WEEK (Week Beginning, Saturday)	AVAILABLE OPCAP MW	Active Capacity Demand MW	EXTERNAL NODE AVAIL CAPACITY MW	NON COMMERCIAL CAPACITY MW	NON-GAS PLANNED OUTAGES CSO MW	GAS GENERATOR OUTAGES CSO MW	ALLOWANCE FOR UNPLANNED OUTAGES MW	GAS AT RISK MW	NET OPCAP SUPPLY MW	PEAK LOAD FORECAST MW	OPER RESERVE REQUIREMENT MW	NET LOAD OBLIGATION MW	OPCAP MARGIN MW
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
2/1/2020	31029	412	1094	28	434	0	3100	2958	26071	19967	2305	22272	3799
2/8/2020	31029	412	1094	28	246	0	3100	2647	26570	19937	2305	22242	4328
2/15/2020	31029	412	1094	28	222	164	3100	2172	26905	19664	2305	21969	4936
2/22/2020	31029	412	1094	28	101	164	3100	1705	27493	18636	2305	20941	6552
2/29/2020	31344	457	917	28	1303	0	2200	1557	27686	18273	2305	20578	7108
3/7/2020	31344	457	917	28	1260	0	2200	1246	28040	18069	2305	20374	7666
3/14/2020	31344	457	917	28	1629	647	2200	0	28270	17690	2305	19995	8275
3/21/2020	31344	457	917	28	2220	655	2200	0	27671	17102	2305	19407	8264

1. Available OPCAP MW based on resource Capacity Supply Obligations, CSO. Does not include Settlement Only Generators.
2. The active 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 participate in the Day-Ahead and Real-Time Energy Markets.
3. External Node Available Capacity MW based on the sum of external Capacity Supply Obligations (CSO) imports and exports.
4. New resources and generator improvements that have acquired a CSO but have not become commercial.
5. 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.
6. All Planned Gas-fired generation outage for the period. This value would also include any known long-term Gas-fired Forced Outages.
7. Allowance for Unplanned Outages includes forced outages and maintenance outages scheduled less than 14 days in advance per ISO New England Operating Procedure No. 5 Appendix A.
8. Generation at Risk due to Gas Supply pertains to gas fired capacity expected to be at risk during cold weather conditions or gas pipeline maintenance outages.
9. Net OpCap Supply MW Available  $(1 + 2 + 3 + 4 - 5 - 6 - 7 - 8 = 9)$
10. Peak Load Forecast as provided in the 2019 CELT Report and adjusted for Passive Demand Resources assumes Peak Load Exposure (PLE) of 25,323 and does include credit of Passive Demand Response (PDR) and behind-the-meter PV (BTM PV)
11. Operating Reserve Requirement based on 120% of first largest contingency plus 50% of the second largest contingency.
12. Total Net Load Obligation per the formula  $(10 + 11 = 12)$
13. Net OPCAP Margin MW = Net Op Cap Supply MW minus Net Load Obligation  $(9 - 12 = 13)$

# Winter 2019/2020 Operable Capacity Analysis

## 90/10 Forecast (Extreme)

### ISO-NE OPERABLE CAPACITY ANALYSIS

February 1, 2020 - 90-10 FORECAST using CSO

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 June, July, August, and Mid September

STUDY WEEK (Week Beginning, Saturday)	AVAILABLE OPCAP MW	Active Capacity Demand MW	EXTERNAL NODE AVAIL CAPACITY MW	NON COMMERCIAL CAPACITY MW	NON-GAS PLANNED OUTAGES CSO MW	GAS GENERATOR OUTAGES CSO MW	ALLOWANCE FOR UNPLANNED OUTAGES MW	GAS AT RISK MW	NET OPCAP SUPPLY MW	PEAK LOAD FORECAST MW	OPER RESERVE REQUIREMENT MW	NET LOAD OBLIGATION MW	OPCAP MARGIN MW
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
2/1/2020	31029	412	1094	28	434	0	3100	4204	24825	20648	2305	22953	1872
2/8/2020	31029	412	1094	28	246	0	3100	3737	25480	20617	2305	22922	2558
2/15/2020	31029	412	1094	28	222	164	3100	3262	25815	20336	2305	22641	3174
2/22/2020	31029	412	1094	28	101	164	3100	2639	26559	19277	2305	21582	4977
2/29/2020	31344	457	917	28	1303	0	2200	2336	26907	18903	2305	21208	5699
3/7/2020	31344	457	917	28	1260	0	2200	2180	27106	18693	2305	20998	6108
3/14/2020	31344	457	917	28	1629	647	2200	910	27360	18302	2305	20607	6753
3/21/2020	31344	457	917	28	2220	655	2200	435	27236	17697	2305	20002	7234

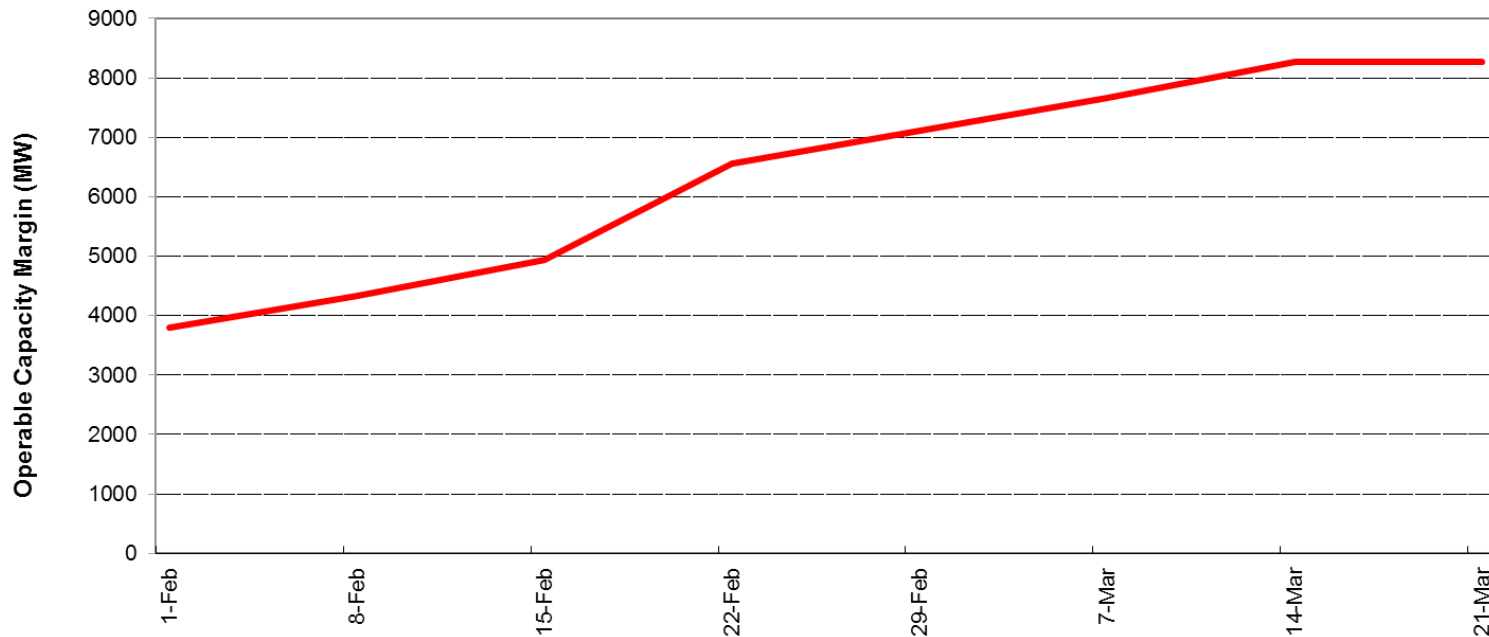
1. Available OPCAP MW based on resource Capacity Supply Obligations, CSO. Does not include Settlement Only Generators.
2. The active demand resources known as Real-Time Demand Response (RTDR) will become Active Demand Capacity Resources (ADCRs) and can participate in the Forward Capacity Market (FCM). These resources will have the ability to obtain a CSO and also participate in the Day-Ahead and Real-Time Energy Markets.
3. External Node Available Capacity MW based on the sum of external Capacity Supply Obligations (CSO) imports and exports.
4. New resources and generator improvements that have acquired a CSO but have not become commercial.
5. 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.
6. All Planned Gas-fired generation outage for the period. This value would also include any known long-term Gas-fired Forced Outages.
7. Allowance for Unplanned Outages includes forced outages and maintenance outages scheduled less than 14 days in advance per ISO New England Operating Procedure No. 5 Appendix A.
8. Generation at Risk due to Gas Supply pertains to gas fired capacity expected to be at risk during cold weather conditions or gas pipeline maintenance outages.
9. Net OpCap Supply MW Available  $(1 + 2 + 3 + 4 - 5 - 6 - 7 - 8 = 9)$
10. Peak Load Forecast as provided in the 2019 CELT Report and adjusted for Passive Demand Resources assumes Peak Load Exposure (PLE) of 27,212 and does include credit of Passive Demand Response (PDR) and behind-the-meter PV (BTM PV)
11. Operating Reserve Requirement based on 120% of first largest contingency plus 50% of the second largest contingency.
12. Total Net Load Obligation per the formula  $(10 + 11 = 12)$
13. Net OPCAP Margin MW = Net Op Cap Supply MW minus Net Load Obligation  $(9 - 12 = 13)$

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

# Winter 2019/2020 Operable Capacity Analysis

## 50/50 Forecast (Reference)

2020 ISO-NEW ENGLAND OPERABLE CAPACITY  
-50/50 CSO-



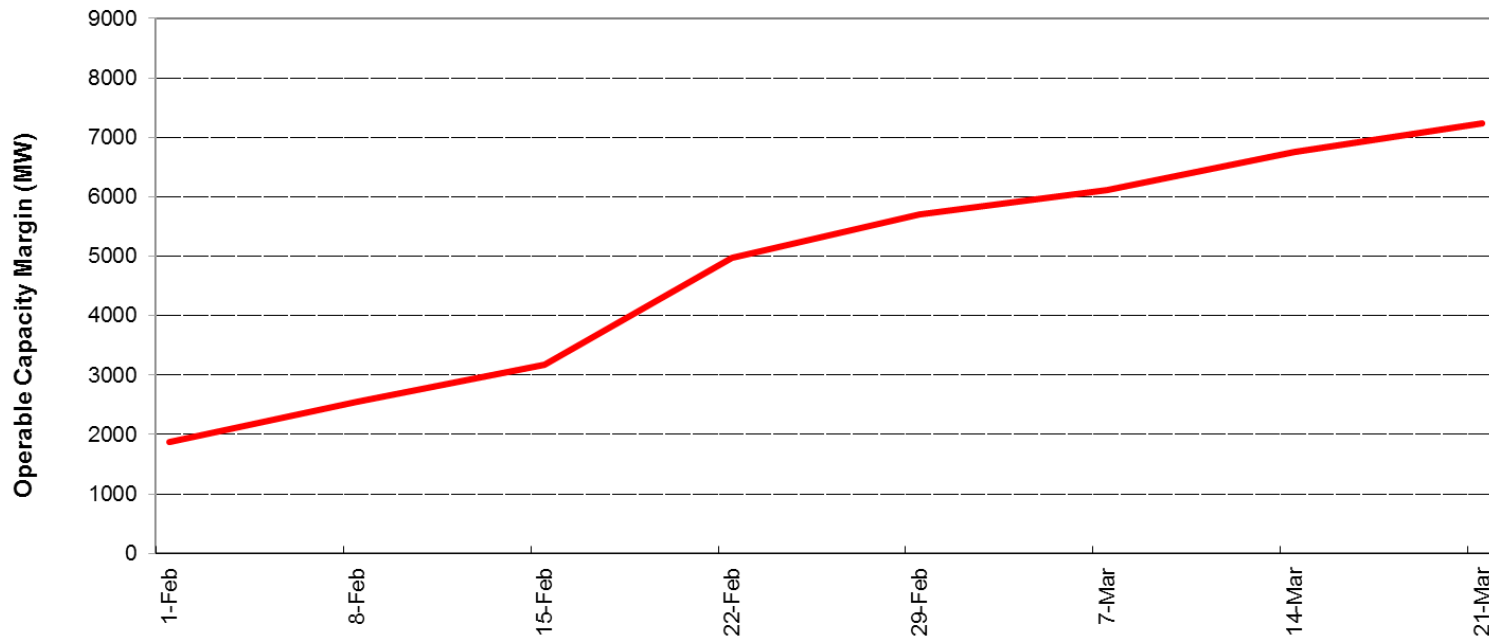
February 1, 2020- March 27, 2020, W/B Saturday



# Winter 2019/2020 Operable Capacity Analysis

## 90/10 Forecast (Extreme)

2020 ISO-NEW ENGLAND OPERABLE CAPACITY  
-90/10 CSO-



February 1, 2020- March 27, 2020, W/B Saturday

# OPERABLE CAPACITY ANALYSIS

*Preliminary Spring 2020 Analysis*

# Preliminary Spring 2020 Operable Capacity Analysis

50/50 Load Forecast (Reference)	May - 2020 <sup>2</sup> CSO (MW)	May - 2020 <sup>2</sup> SCC (MW)
Operable Capacity MW <sup>1</sup>	31,344	33,821
Active Demand Capacity Resource (+) <sup>5</sup>	453	443
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	917	917
Non Commercial Capacity (+)	28	28
Non Gas-fired Planned Outage MW (-)	5,654	5,839
Gas Generator Outages MW (-)	1,293	1,461
Allowance for Unplanned Outages (-) <sup>4</sup>	3,400	3,400
Generation at Risk Due to Gas Supply (-) <sup>3</sup>	0	0
Net Capacity (NET OPCAP SUPPLY MW)	22,395	24,509
Peak Load Forecast MW (adjusted for Other Demand Resources) <sup>2</sup>	19,340	19,340
Operating Reserve Requirement MW	2,305	2,305
Operable Capacity Required (NET LOAD OBLIGATION MW)	21,645	21,645
Operable Capacity Margin	750	2,864

<sup>1</sup>Operable Capacity is based on data as of **January 20, 2020** 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 **January 20, 2020**.

<sup>2</sup> Load forecast that is based on the 2019 CELT report and represents the week with the lowest Operable Capacity Margin, week beginning **May 9, 2020**.

<sup>3</sup> Total of (Gas at Risk MW) – (Gas Gen Outages MW).

<sup>4</sup> Allowance For Unplanned Outage MW is based on the month corresponding to the day with the lowest Operable Capacity Margin for the week.

<sup>5</sup> 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 Spring 2020 Operable Capacity Analysis

90/10 Load Forecast (Extreme)	May - 2020 <sup>2</sup> CSO (MW)	May - 2020 <sup>2</sup> SCC (MW)
Operable Capacity MW <sup>1</sup>	31,344	33,821
Active Demand Capacity Resource (+) <sup>5</sup>	453	443
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	917	917
Non Commercial Capacity (+)	28	28
Non Gas-fired Planned Outage MW (-)	5,654	5,839
Gas Generator Outages MW (-)	1,293	1,461
Allowance for Unplanned Outages (-) <sup>4</sup>	3,400	3,400
Generation at Risk Due to Gas Supply (-) <sup>3</sup>	0	0
Net Capacity (NET OPCAP SUPPLY MW)	22,395	24,509
Peak Load Forecast MW (adjusted for Other Demand Resources) <sup>2</sup>	20,858	20,858
Operating Reserve Requirement MW	2,305	2,305
Operable Capacity Required (NET LOAD OBLIGATION MW)	23,163	23,163
Operable Capacity Margin	-768	1,346

<sup>1</sup>Operable Capacity is based on data as of **January 20, 2020** 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 **January 20, 2020**.

<sup>2</sup> Load forecast that is based on the 2019 CELT report and represents the week with the lowest Operable Capacity Margin, week beginning **May 9, 2020**.

<sup>3</sup> Total of (Gas at Risk MW) – (Gas Gen Outages MW).

<sup>4</sup> Allowance For Unplanned Outage MW is based on the month corresponding to the day with the lowest Operable Capacity Margin for the week.

<sup>5</sup> 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 Spring 2020 Operable Capacity Analysis

## 50/50 Forecast (Reference)

### ISO-NE OPERABLE CAPACITY ANALYSIS

February 1, 2020 - 50-50 FORECAST using CSO

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 June, July, August, and Mid September

STUDY WEEK (Week Beginning, Saturday)	AVAILABLE OPCAP MW	Active Capacity Demand MW	EXTERNAL NODE AVAIL CAPACITY MW	NON COMMERCIAL CAPACITY MW	NON-GAS PLANNED OUTAGES CSO MW	GAS GENERATOR OUTAGES CSO MW	ALLOWANCE FOR UNPLANNED OUTAGES MW	GAS AT RISK MW	NET OPCAP SUPPLY MW	PEAK LOAD FORECAST MW	OPER RESERVE REQUIREMENT MW	NET LOAD OBLIGATION MW	OPCAP MARGIN MW
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
3/28/2020	31344	453	917	28	4150	1039	2700	0	24853	16344	2305	18649	6204
4/4/2020	31344	453	917	28	4245	1809	2700	0	23988	16082	2305	18387	5601
4/11/2020	31344	453	917	28	4361	1797	2700	0	23884	15552	2305	17857	6027
4/18/2020	31344	453	917	28	5597	2206	2700	0	22239	15277	2305	17582	4657
4/25/2020	31344	453	917	28	5862	1422	2700	0	22758	14472	2305	16777	5981
5/2/2020	31344	453	917	28	5436	1386	3400	0	22520	18318	2305	20623	1897
5/9/2020	31344	453	917	28	5654	1293	3400	0	22395	19340	2305	21645	750
5/16/2020	31344	453	917	28	3420	1374	3400	0	24548	20290	2305	22595	1953
5/23/2020	31344	453	917	28	1912	267	3400	0	27163	21333	2305	23638	3525

1. Available OPCAP MW based on resource Capacity Supply Obligations, CSO. Does not include Settlement Only Generators.
2. The active 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 participate in the Day-Ahead and Real-Time Energy Markets.
3. External Node Available Capacity MW based on the sum of external Capacity Supply Obligations (CSO) imports and exports.
4. New resources and generator improvements that have acquired a CSO but have not become commercial.
5. 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.
6. All Planned Gas-fired generation outage for the period. This value would also include any known long-term Gas-fired Forced Outages.
7. Allowance for Unplanned Outages includes forced outages and maintenance outages scheduled less than 14 days in advance per ISO New England Operating Procedure No. 5 Appendix A.
8. Generation at Risk due to Gas Supply pertains to gas fired capacity expected to be at risk during cold weather conditions or gas pipeline maintenance outages.
9. Net OpCap Supply MW Available  $(1 + 2 + 3 + 4 - 5 - 6 - 7 - 8 = 9)$
10. Peak Load Forecast as provided in the 2019 CELT Report and adjusted for Passive Demand Resources assumes Peak Load Exposure (PLE) of 25,323 and does include credit of Passive Demand Response (PDR) and behind-the-meter PV (BTM PV)
11. Operating Reserve Requirement based on 120% of first largest contingency plus 50% of the second largest contingency.
12. Total Net Load Obligation per the formula  $(10 + 11 = 12)$
13. Net OPCAP Margin MW = Net Op Cap Supply MW minus Net Load Obligation  $(9 - 12 = 13)$

# Preliminary Spring 2020 Operable Capacity Analysis

## 90/10 Forecast (Extreme)

### ISO-NE OPERABLE CAPACITY ANALYSIS

February 1, 2020 - 90-10 FORECAST using CSO

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 June, July, August, and Mid September

STUDY WEEK (Week Beginning, Saturday)	AVAILABLE OPCAP MW	Active Capacity Demand MW	EXTERNAL NODE AVAIL CAPACITY MW	NON COMMERCIAL CAPACITY MW	NON-GAS PLANNED OUTAGES CSO MW	GAS GENERATOR OUTAGES CSO MW	ALLOWANCE FOR UNPLANNED OUTAGES MW	GAS AT RISK MW	NET OPCAP SUPPLY MW	PEAK LOAD FORECAST MW	OPER RESERVE REQUIREMENT MW	NET LOAD OBLIGATION MW	OPCAP MARGIN MW
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	
3/28/2020	31344	453	917	28	4150	1039	2700	0	24853	16923	2305	19228	5625
4/4/2020	31344	453	917	28	4245	1809	2700	0	23988	16654	2305	18959	5029
4/11/2020	31344	453	917	28	4361	1797	2700	0	23884	16108	2305	18413	5471
4/18/2020	31344	453	917	28	5597	2206	2700	0	22239	15824	2305	18129	4110
4/25/2020	31344	453	917	28	5862	1422	2700	0	22758	15018	2305	17323	5435
5/2/2020	31344	453	917	28	5436	1386	3400	0	22520	19768	2305	22073	447
5/9/2020	31344	453	917	28	5654	1293	3400	0	22395	20858	2305	23163	-768
5/16/2020	31344	453	917	28	3420	1374	3400	0	24548	21870	2305	24175	373
5/23/2020	31344	453	917	28	1912	267	3400	0	27163	22982	2305	25287	1876

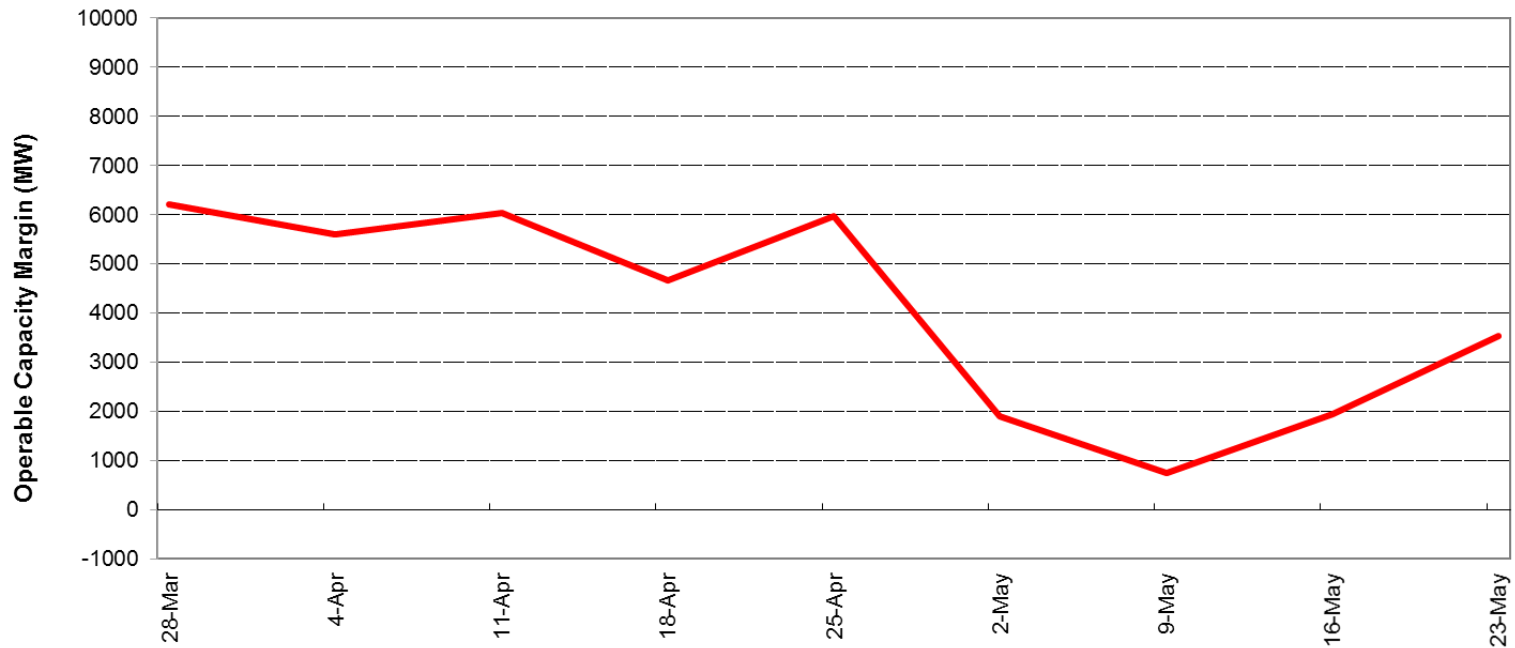
1. Available OPCAP MW based on resource Capacity Supply Obligations, CSO. Does not include Settlement Only Generators.
2. The active demand resources known as Real-Time Demand Response (RTDR) will become Active Demand Capacity Resources (ADCRs) and can participate in the Forward Capacity Market (FCM). These resources will have the ability to obtain a CSO and also participate in the Day-Ahead and Real-Time Energy Markets.
3. External Node Available Capacity MW based on the sum of external Capacity Supply Obligations (CSO) imports and exports.
4. New resources and generator improvements that have acquired a CSO but have not become commercial.
5. 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.
6. All Planned Gas-fired generation outage for the period. This value would also include any known long-term Gas-fired Forced Outages.
7. Allowance for Unplanned Outages includes forced outages and maintenance outages scheduled less than 14 days in advance per ISO New England Operating Procedure No. 5 Appendix A.
8. Generation at Risk due to Gas Supply pertains to gas fired capacity expected to be at risk during cold weather conditions or gas pipeline maintenance outages.
9. Net OpCap Supply MW Available  $(1 + 2 + 3 + 4 - 5 - 6 - 7 - 8 = 9)$
10. Peak Load Forecast as provided in the 2019 CELT Report and adjusted for Passive Demand Resources assumes Peak Load Exposure (PLE) of 27,212 and does include credit of Passive Demand Response (PDR) and behind-the-meter PV (BTM PV)
11. Operating Reserve Requirement based on 120% of first largest contingency plus 50% of the second largest contingency.
12. Total Net Load Obligation per the formula  $(10 + 11 = 12)$
13. Net OPCAP Margin MW = Net Op Cap Supply MW minus Net Load Obligation  $(9 - 12 = 13)$

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

# Preliminary Spring 2020 Operable Capacity Analysis

## 50/50 Forecast (Reference)

2020 ISO-NEW ENGLAND OPERABLE CAPACITY  
-50/50 CSO-

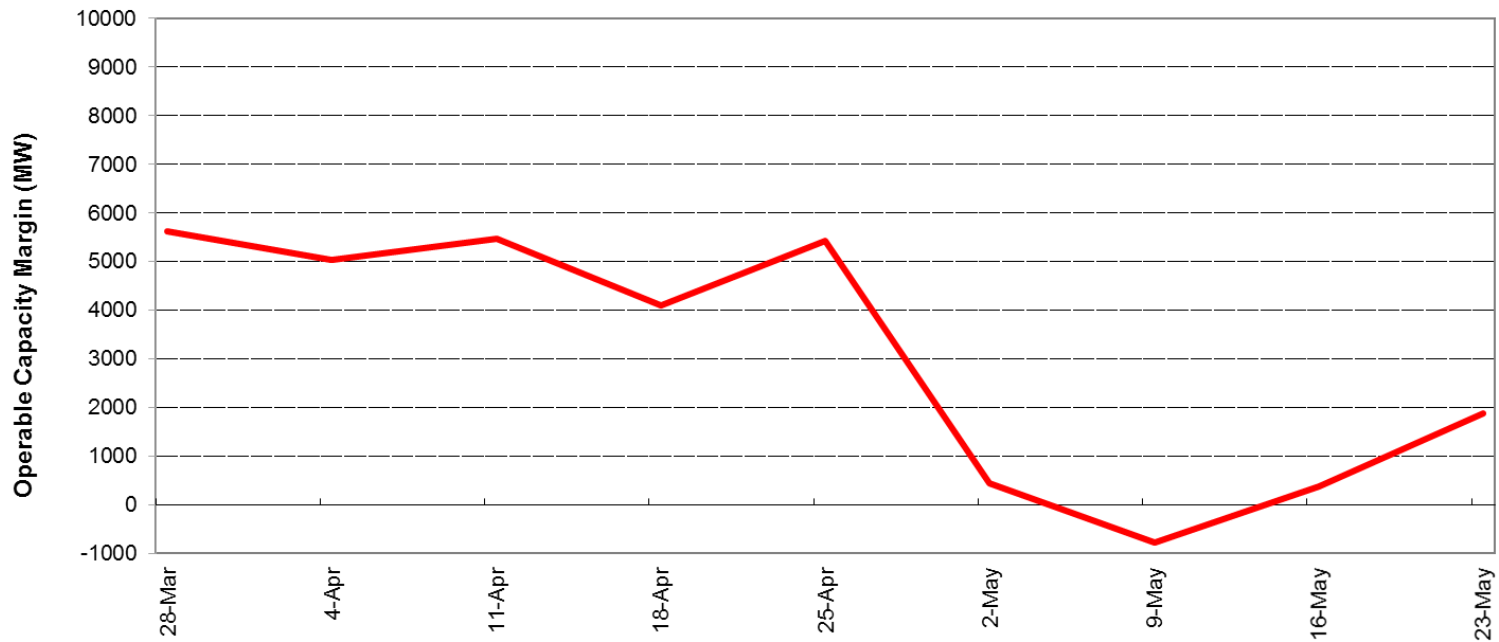


March 28, 2020 - May 29, 2020 W/B Saturday

# Preliminary Spring 2020 Operable Capacity Analysis

## 90/10 Forecast (Extreme)

2020 ISO-NEW ENGLAND OPERABLE CAPACITY  
-90/10 CSO-



March 28, 2020 - May 29, 2020 W/B Saturday



# 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 <sup>1</sup>  600
2	Declare Energy Emergency Alert (EEA) Level 1 <sup>4</sup>	0
3	Voluntary Load Curtailment of Market Participants’ facilities.	40 <sup>2</sup>
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 <sup>3</sup>

## 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 <sup>3</sup>
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 <sup>2</sup>
10	Radio and TV Appeals for Voluntary Load Curtailment Implement Power Warning	200 <sup>2</sup>
11	Request State Governors to Reinforce Power Warning Appeals.	100 <sup>2</sup>
Total		<b>2,520</b>

## 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