



Winter 2021-2022 Cold Weather Operations

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Key Observations from Winter 2021/22

- First winter season operating without Indian Point 2 & 3
- High natural gas and LNG prices in eastern NY/NE based on world markets
- Significant stored fuel burned in January and inventory levels have not been replenished. Operations will continue to monitor replenishment in preparation for winter 2022/23.
- Continued examples of limited flexibility on the gas system to start and operate generators on gas without a Day Ahead Schedule for energy or reserves.
- Proposing a 2023 project to refresh the Fuel and Energy Security assessment conducted by AG in 2019 with updated future assumptions.
- Estimated supply mix for the peak hour, 30% natural gas, 21% oil, 15% hydro, 15% imports, 14% nuclear, 2% other fossil, 2% wind, 1% other renewables

Peak Loads

- **NYISO all-time Winter Electric Peak Load was 25,738 MW on January 7, 2014**
- **NYISO Seasonal 50-50 Load Forecast was 24,025 MW for Winter 2021/2022**
- **The Winter 2021/2022 Winter Actual Peak was 23,237 MW on Tuesday, January 11, 2022**

Variable Winter Weather Prevailed

Average Temperatures and Departures from 1991 – 2020 Normals					
Station	December	January	February	Season	Coldest
Islip	41.7 °F (+4.6 °F)	28.8 °F (-3.1 °F)	34.7 °F (+1.4 °F)	35.1 °F (+1.0 °F)	6 °F (1/30 & 1/31)
Central Park	43.8 °F (+4.7 °F)	30.3 °F (-3.4 °F)	37.3 °F (+1.4 °F)	37.1 °F (+0.9 °F)	10 °F (1/15 & 1/16)
Albany	36.1 °F (+5.7 °F)	19.7 °F (-4.7 °F)	27.5 °F (+0.7 °F)	27.8 °F (+0.6 °F)	-6 °F (1/22)
Syracuse	38.0 °F (+7.6 °F)	19.5 °F (-4.6 °F)	27.8 °F (+2.3 °F)	28.4 °F (+1.7 °F)	-9 °F (1/22 & 1/30)
Buffalo	38.2 °F (+6.8 °F)	21.9 °F (-3.6 °F)	28.5 °F (+2.1 °F)	N/A	1 °F (1/22)

Data Source: NWS Local Offices (www.weather.gov)

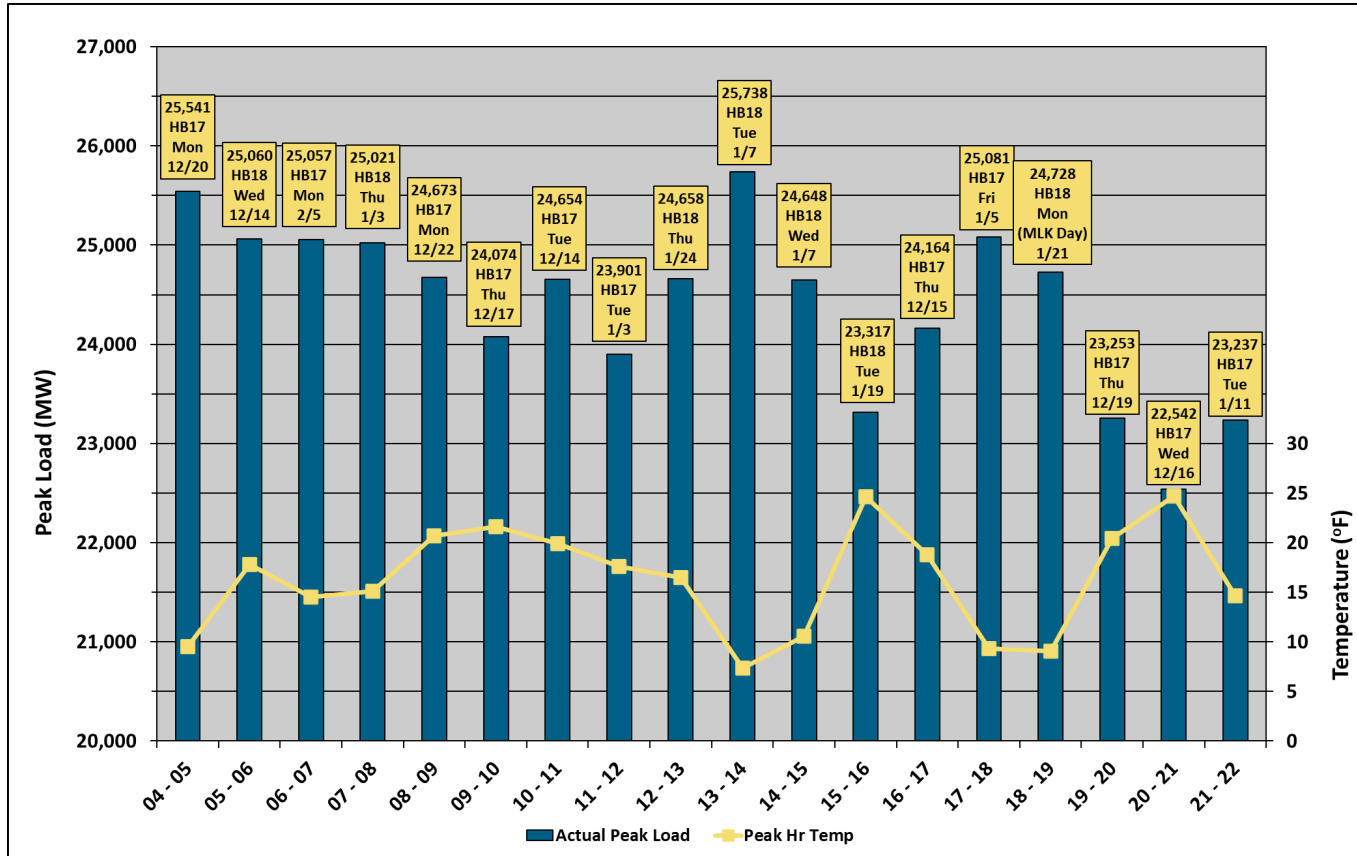
Cold Weather Conditions (1/7, 1/10 – 1/12) Electric Peak

- 1st instance of significantly cold weather without coal generation and Indian Point 2&3.
- OFOs
 - Con Ed 1/24th Hourly OFO, 1/11/22 04:00 - 1/12/22 10:00
 - NG Downstate Tier 1 Interruption, 1/11/22 06:00 – 1/12/22 10:00
- SREs – 1/11/22, Bethlehem 2, HB7-22 for statewide capacity (generator performance)
- 1/11/22 - The day-ahead forecast was 23,720 MW. The forecast peak temperature index was 14.4°F. Partly to mostly sunny, breezy, and very cold. The Actual peak on 1/11/22 and peak of the winter was 23,237 MW, HB17.
- Forecast highs were mainly in the teens upstate to lower-20s downstate. Overnight lows were in the single digits (east) to lower-teens (west) upstate and mid-teens to near 20 downstate, with temperatures expected to steadily rise a bit overnight.

Longest consecutive Cold Weather Conditions (1/25 – 2/1)

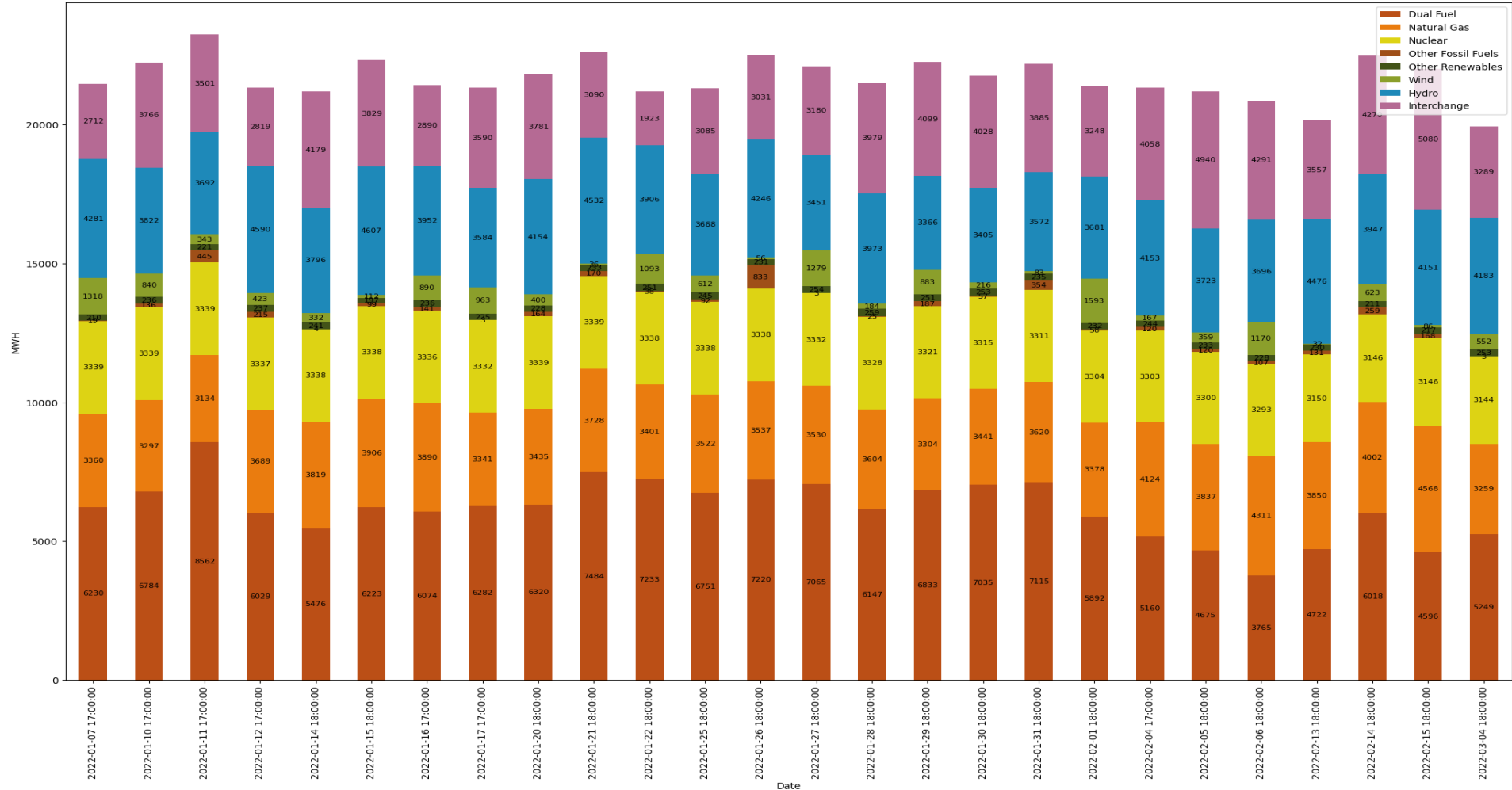
- Estimated largest hourly stored fuel burn for the season (4,550 MWh) occurred on 1/29/2022 HB13
- OFOs
 - Con Ed 1/20th Hourly OFO, 1/26/22 04:00 - 1/27/22 10:00 & 2/1/22 04:00 - 10:00
 - Con Ed 1/24th Hourly OFO 1/29/22 04:00 - 1/31/22 10:00
 - NG Downstate Tier 2 Interruption, 1/26/22 22:00 - 1/27/22 12:00
 - NG Downstate Tier 1 Interruption, 1/29/22 10:00 - 1/31/22 10:00
- SREs
 - 1/25/22 - Astoria 3, HB10-23 for statewide capacity concerns due to colder weather/increased load forecast and uncertainty in DAM scheduled imports.
 - 1/28/22 - In-day SRE of Roseton 1 HB15-23 for statewide capacity concerns due to generator performance and uncertainty in DAM scheduled imports.
- 1/29/22 - The day-ahead forecast was 22,070 MW. The forecast peak temperature index was 15.5°F. Mostly cloudy, cold, and windy as snow, moderate to heavy at times continues throughout the day, especially downstate.
- Published downstate highs were expected to occur shortly after midnight, with afternoon highs ranging from the lower- to mid-teens upstate to the lower-20s downstate. Overnight lows range from the single digits (and lower in northern areas) upstate to the mid-teens downstate.

Winter Peak Loads in MW: 2004-05 to 2021-22

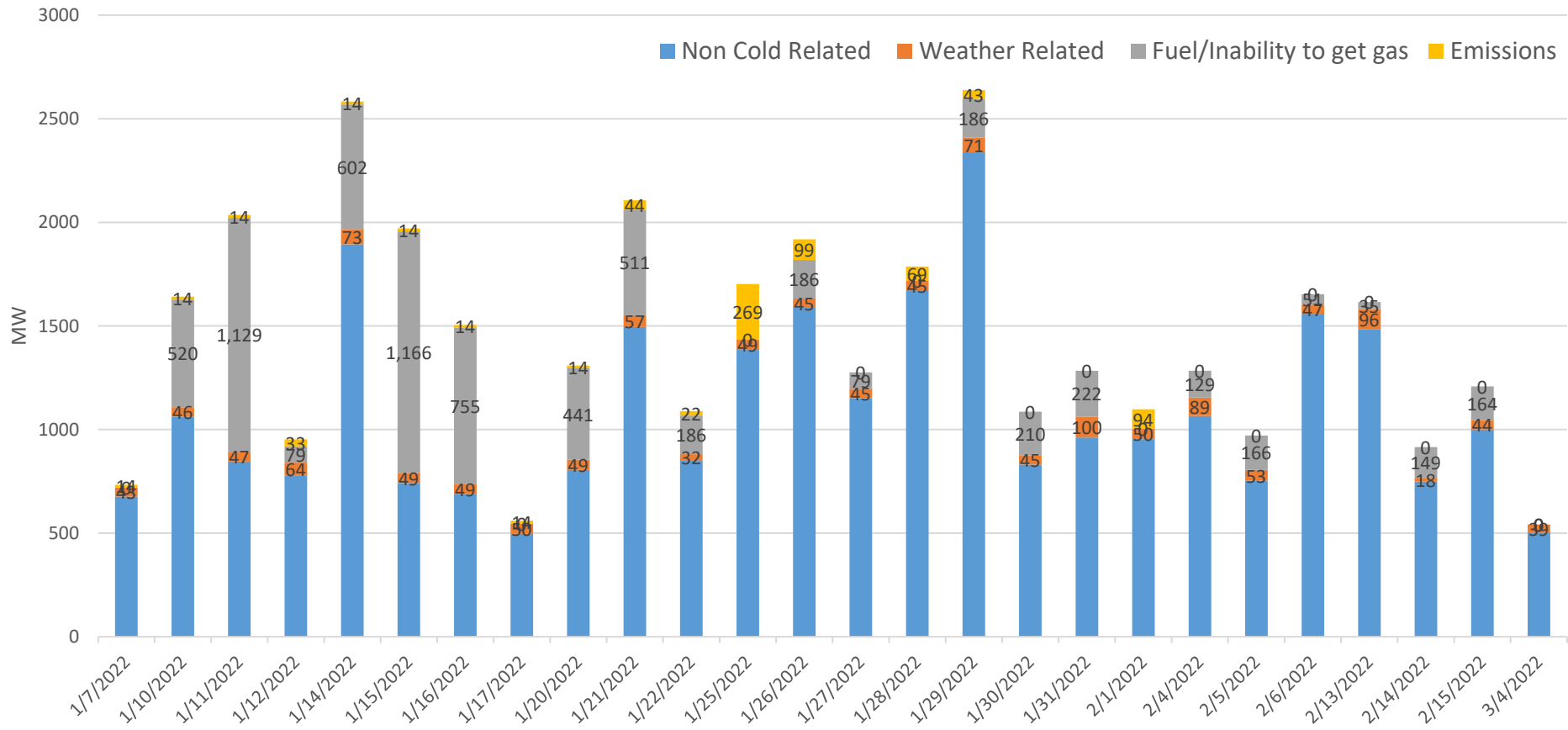


Gen Mix, Outage data, and Fuel Inventory/Burn

Total Actual Generator by Fuel Mix During Peak Hours



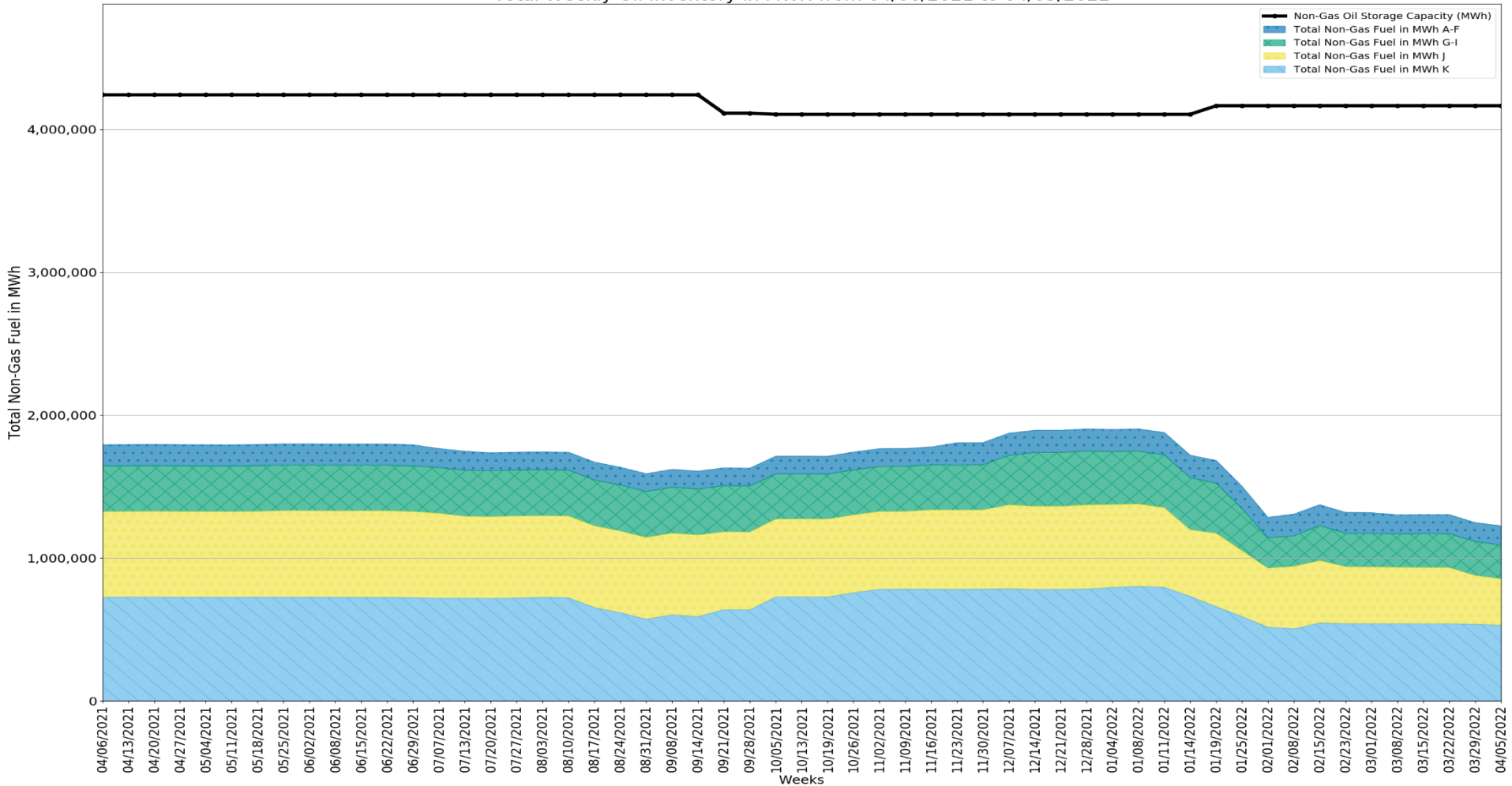
Thermal and Hydro Forced Outages and Forced Derates by Category - Over Peak Hours



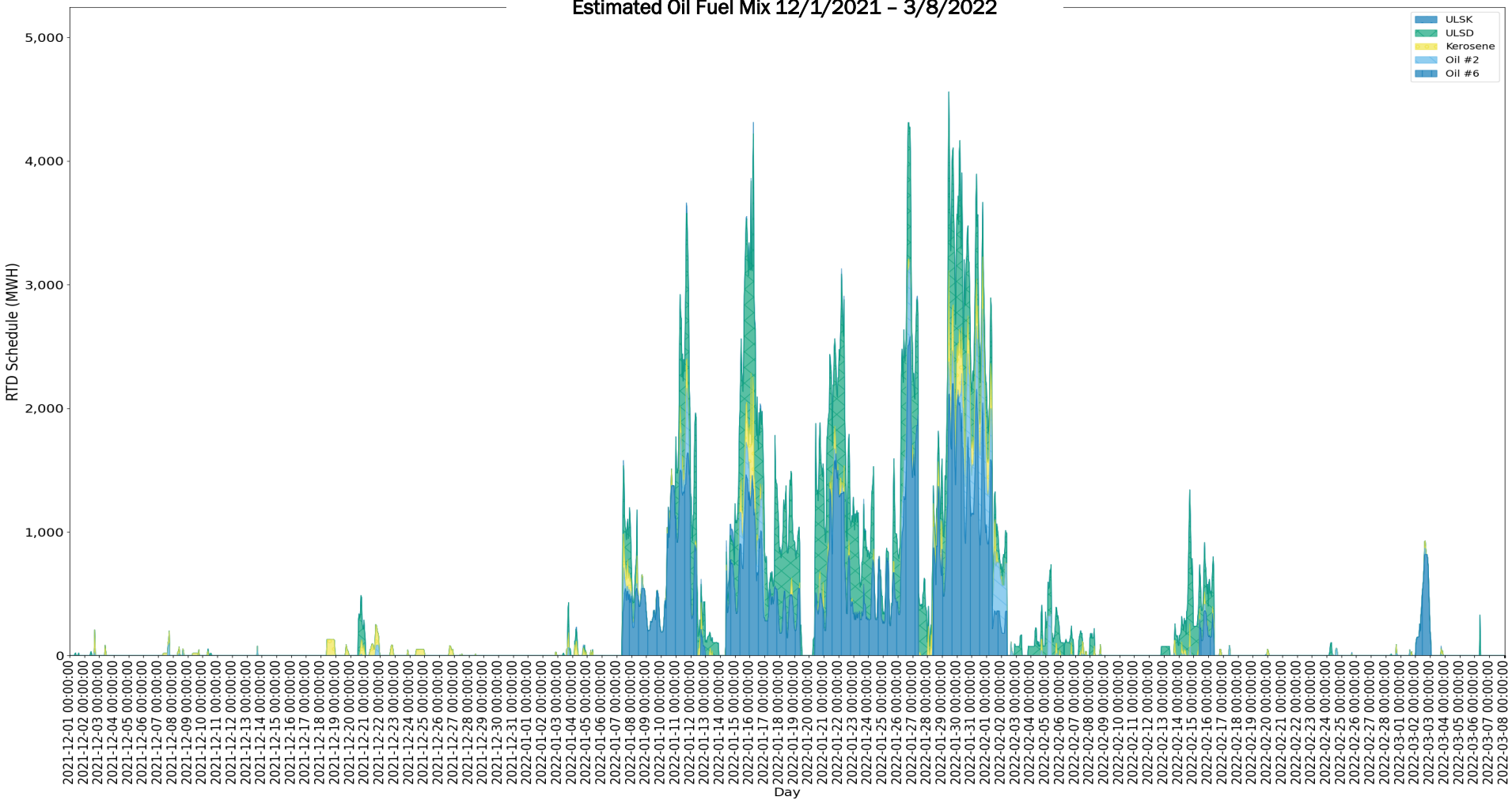
In the November 17, 2021 Management Committee presentation, "2021-22 Winter Assessment & Winter Preparedness" based on 60 months of history the projection was 2,768MW of Hydro and Thermal Forced outages



Total Weekly Oil Inventory in MWH from 04/06/2021 to 04/05/2022



Estimated Oil Fuel Mix 12/1/2021 - 3/8/2022



- ULSK
- ULSL
- Kerosene
- Oil #2
- Oil #6

Major Takeaways

Operations

- The NYISO worked with the TOs to recall certain transmission line outages, and participated in NPCC coordination calls with neighboring external market systems
- NYISO weekly fuel surveys indicated sufficient alternate fuel inventory (Ad-hoc fuel surveys issued 1/7/22 & 1/13/22)
- NYISO met operating criteria throughout the winter
- No need for NYISO to call Demand Response
- No need for emergency actions (voltage reduction, public appeals, etc.)
- No need for emergency purchases from neighboring control areas to resolve capacity issues.

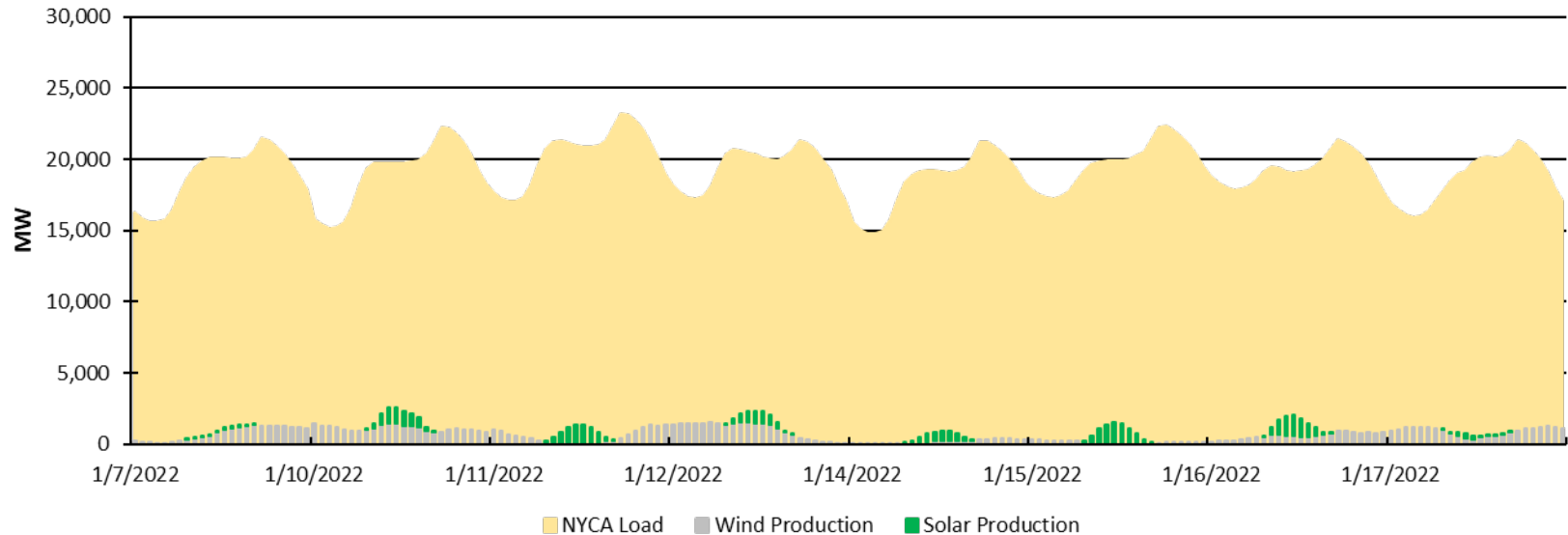
Gas System NY

- **The interstate and gas LDC pipelines all remained in-service**
- **Gas pipelines and Gas LDCs issued many of the following**
 - Gas Alerts
 - Daily OFOs (Operational Flow Orders)
 - Hourly OFOs
 - Interruption of Transportation Services (Interruptible Gas Customers will not be able to get Gas)
- **In many cases these notices were issued with enough lead time (before the Day Ahead market closes at 5 am the prior day) to properly account for the impacts in Day Ahead Market solution**
- **NY experienced a high number of OFO conditions during Winter 2022 including many days not identified as cold weather timeframes in this presentation.**

Intermittent Generation Data

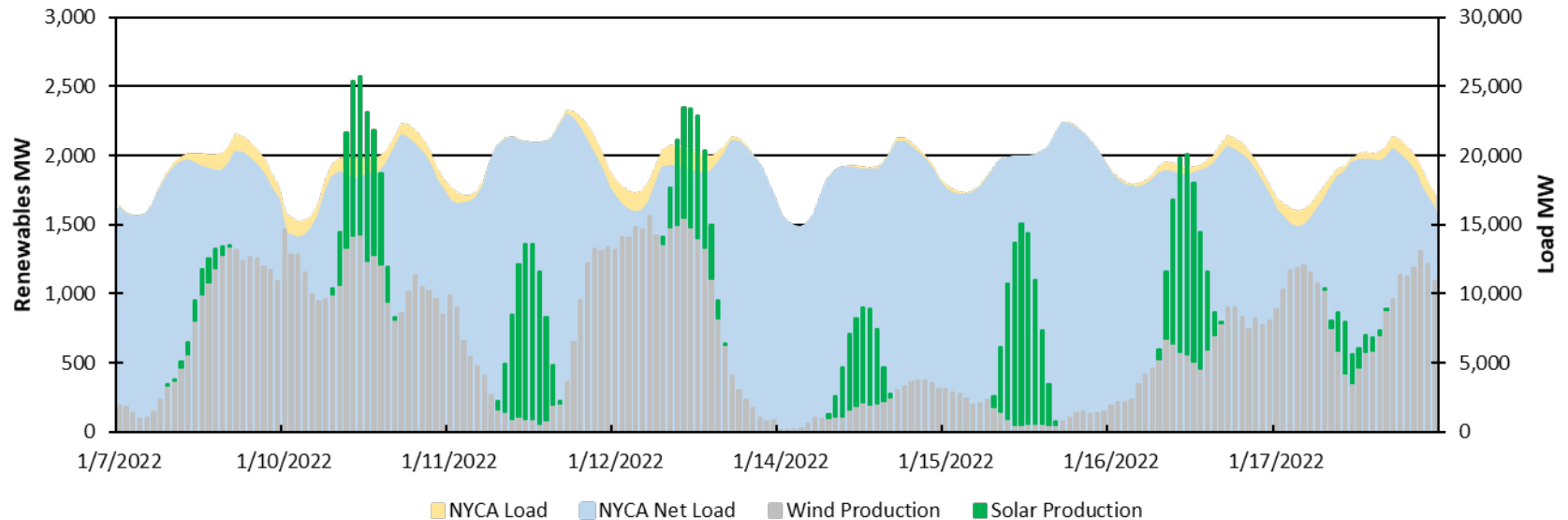
1/7, 1/10 - 1/12, 1/14 - 1/17 Renewable Chart #2b

Hourly Wind & Solar Production 1/7, 1/10 - 1/12, 1/14 - 1/17



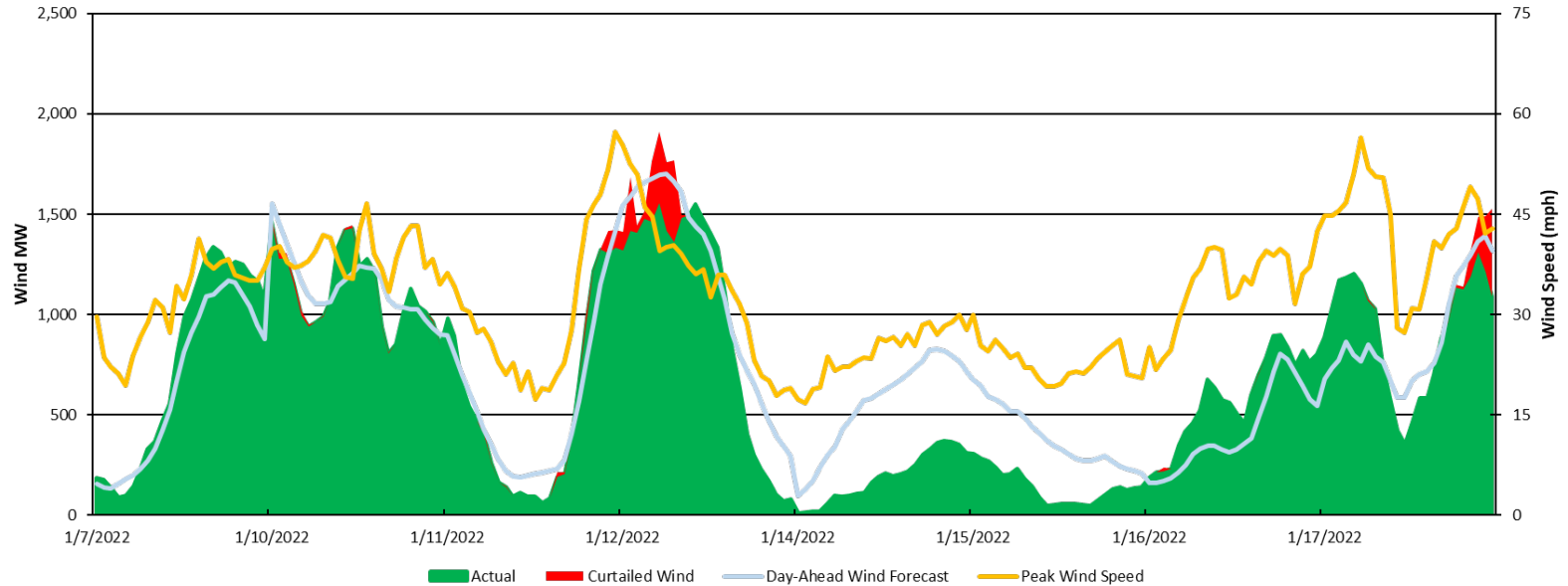
1/7, 1/10 - 1/12, 1/14 - 1/17 Renewable Chart #3

Hourly Wind & Solar Production 1/7, 1/10 - 1/12, 1/14 - 1/17



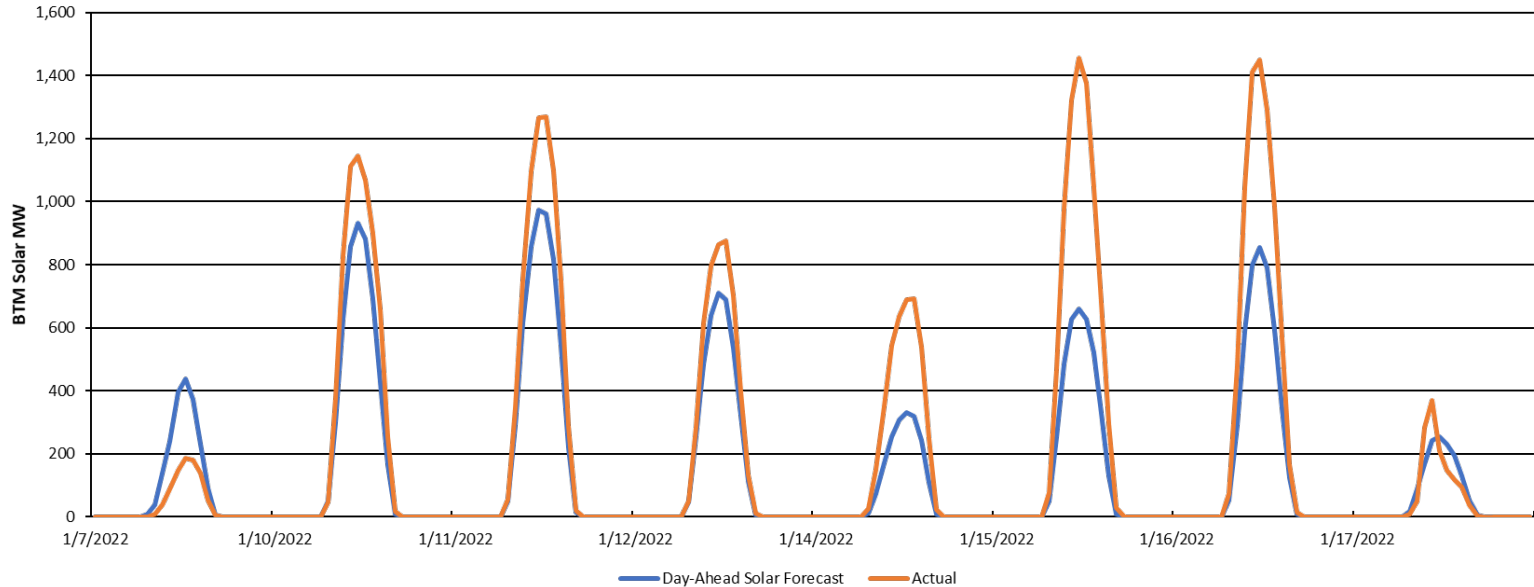
1/7, 1/10 - 1/12, 1/14 - 1/17 Wind Chart

NYCA Wind Profile 1/7, 1/10 - 1/12, 1/14 - 1/17



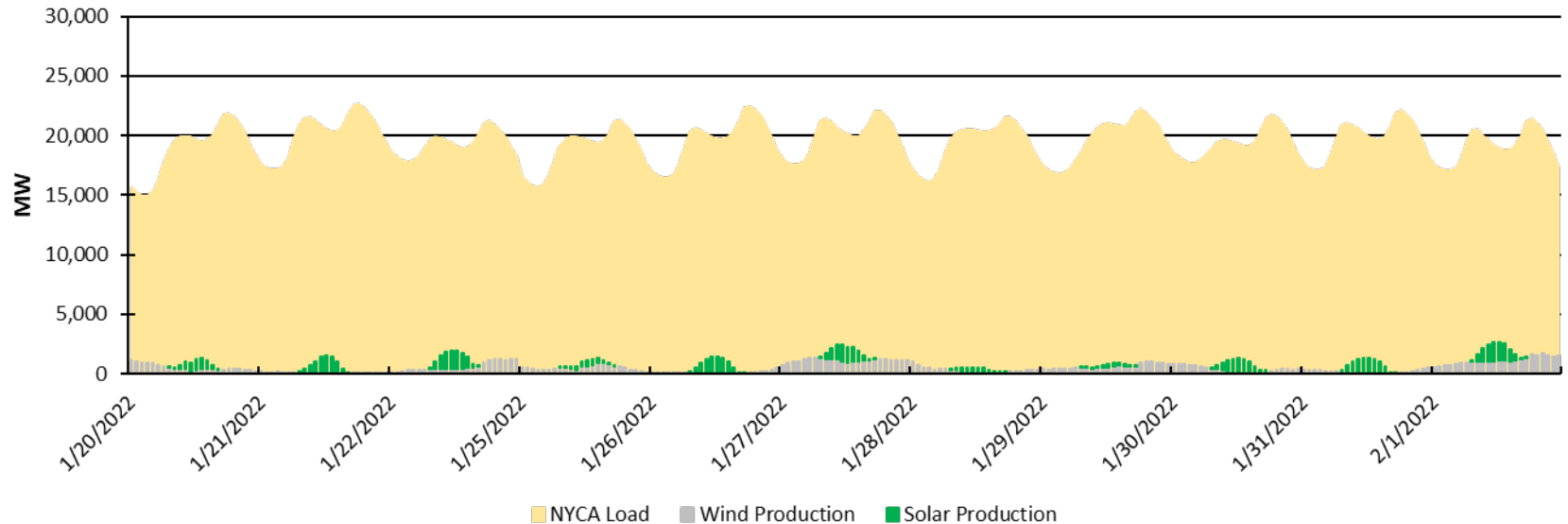
1/7, 1/10 - 1/12, 1/14 - 1/17 Solar Chart

NYCA BTM Solar Profile (~3,290 MW) 1/7, 1/10 - 1/12, 1/14 - 1/17



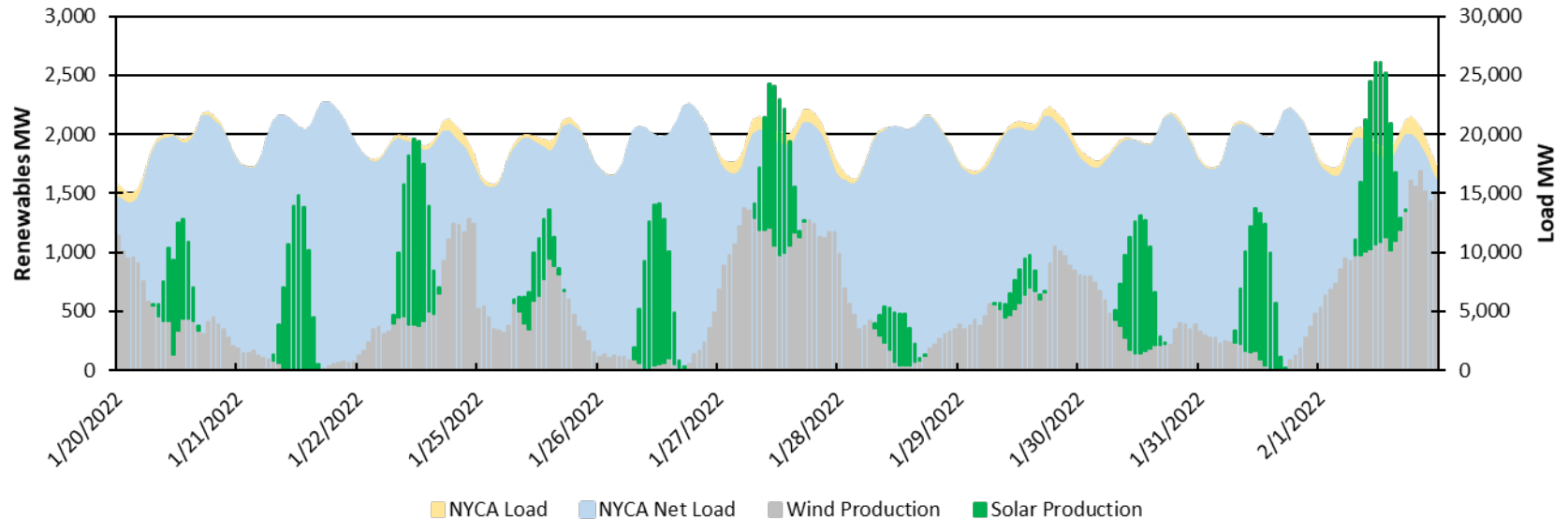
1/20 - 1/22, 1/25 - 2/1 Renewable Chart #2b

Hourly Wind & Solar Production 1/20 - 1/22, 1/25 - 2/1



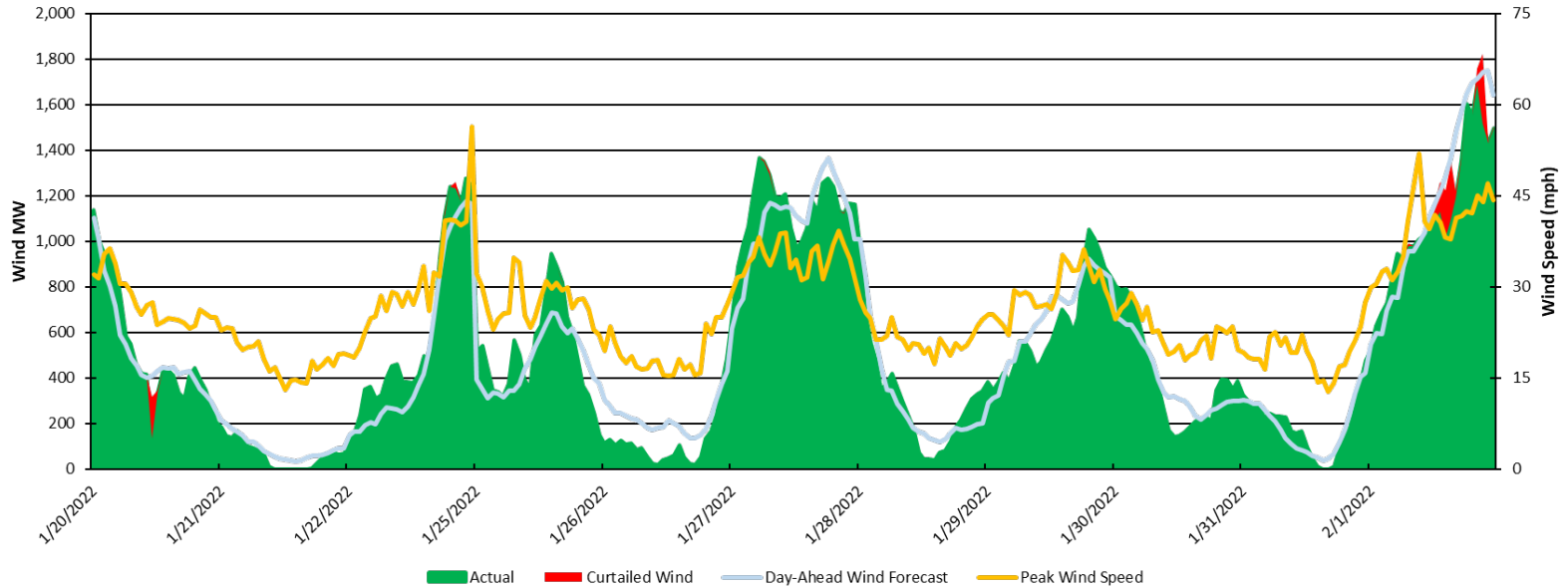
1/20 - 1/22, 1/25 - 2/1 Renewable Chart #3

Hourly Wind & Solar Production 1/20 - 1/22, 1/25 - 2/1



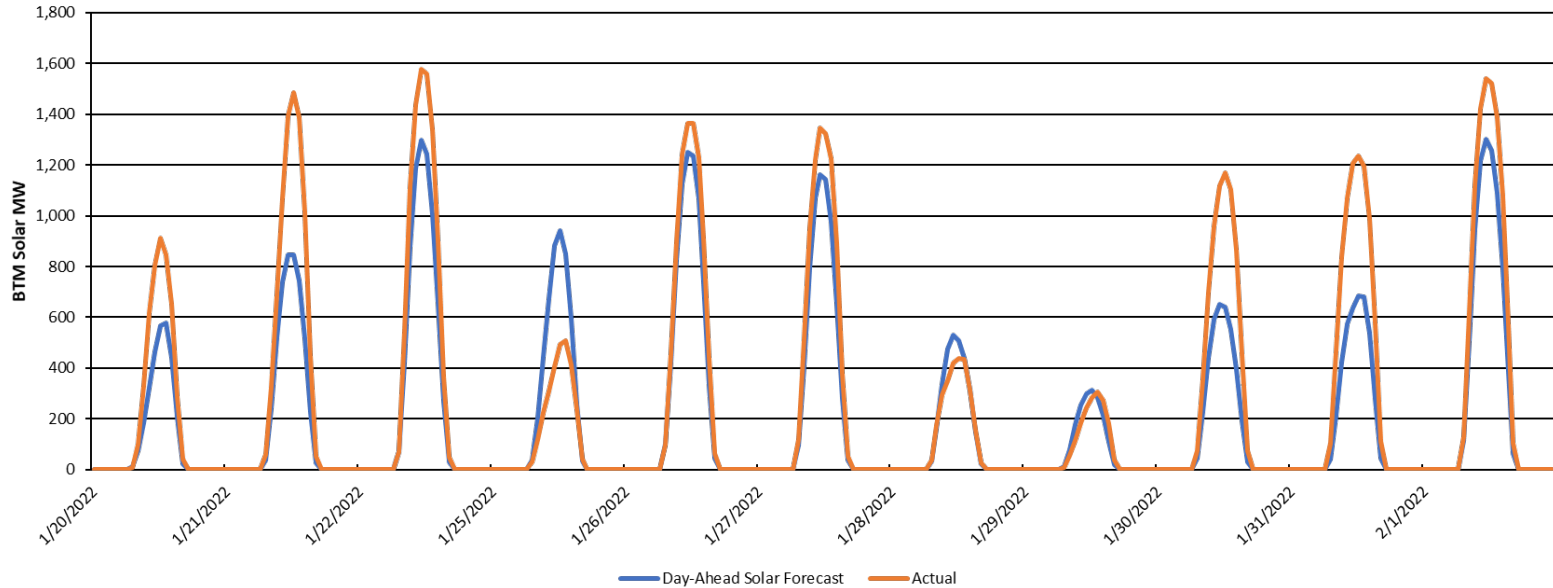
1/20 - 1/22, 1/25 - 2/1 Wind Chart

NYCA Wind Profile 1/20 - 1/22, 1/25 - 2/1



1/20 - 1/22, 1/25 - 2/1 Solar Chart

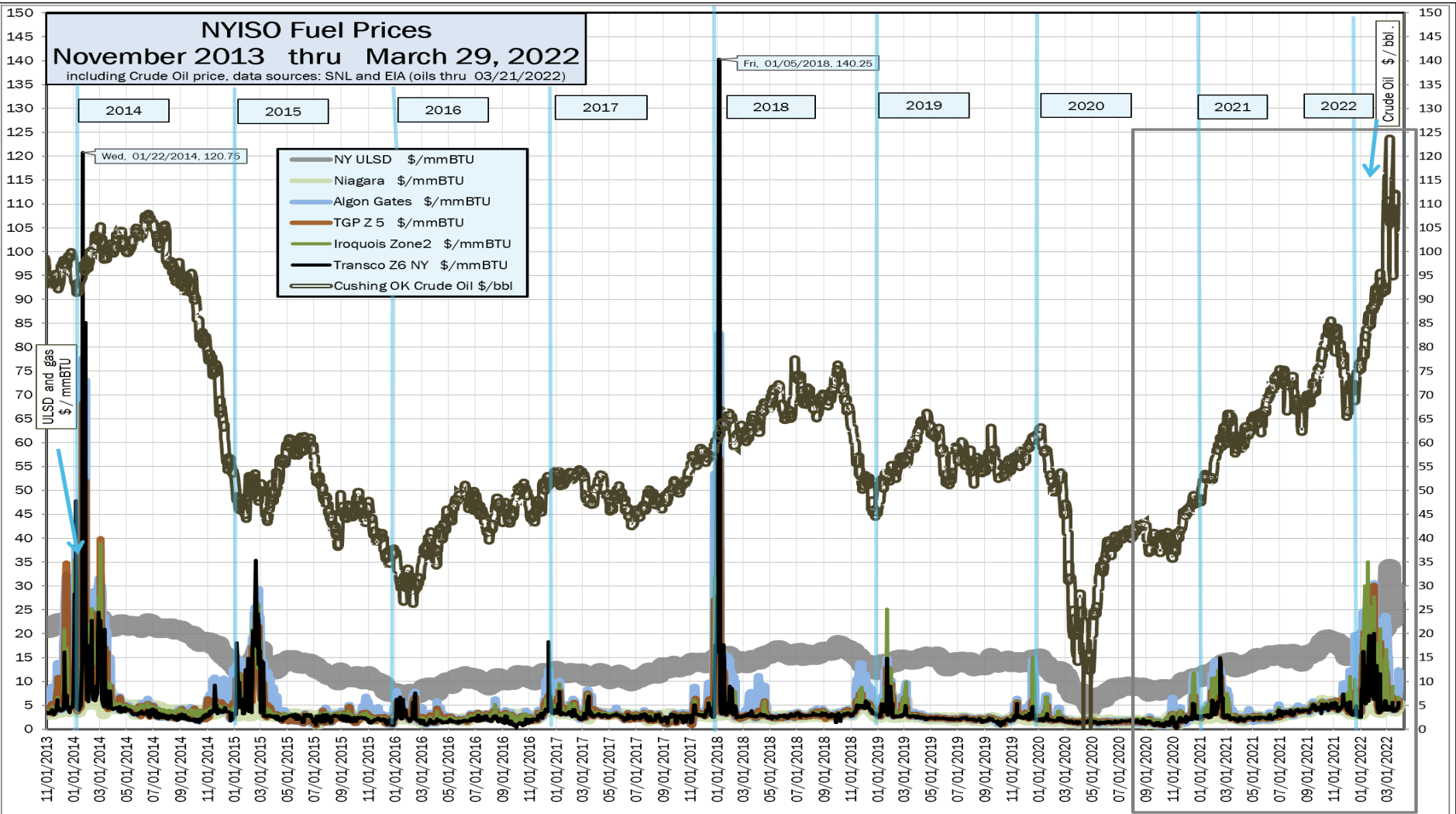
NYCA BTM Solar Profile (~3,290 MW) 1/20 - 1/22, 1/25 - 2/1



Fuel and Energy Prices

NYISO Fuel Prices November 2013 thru March 29, 2022

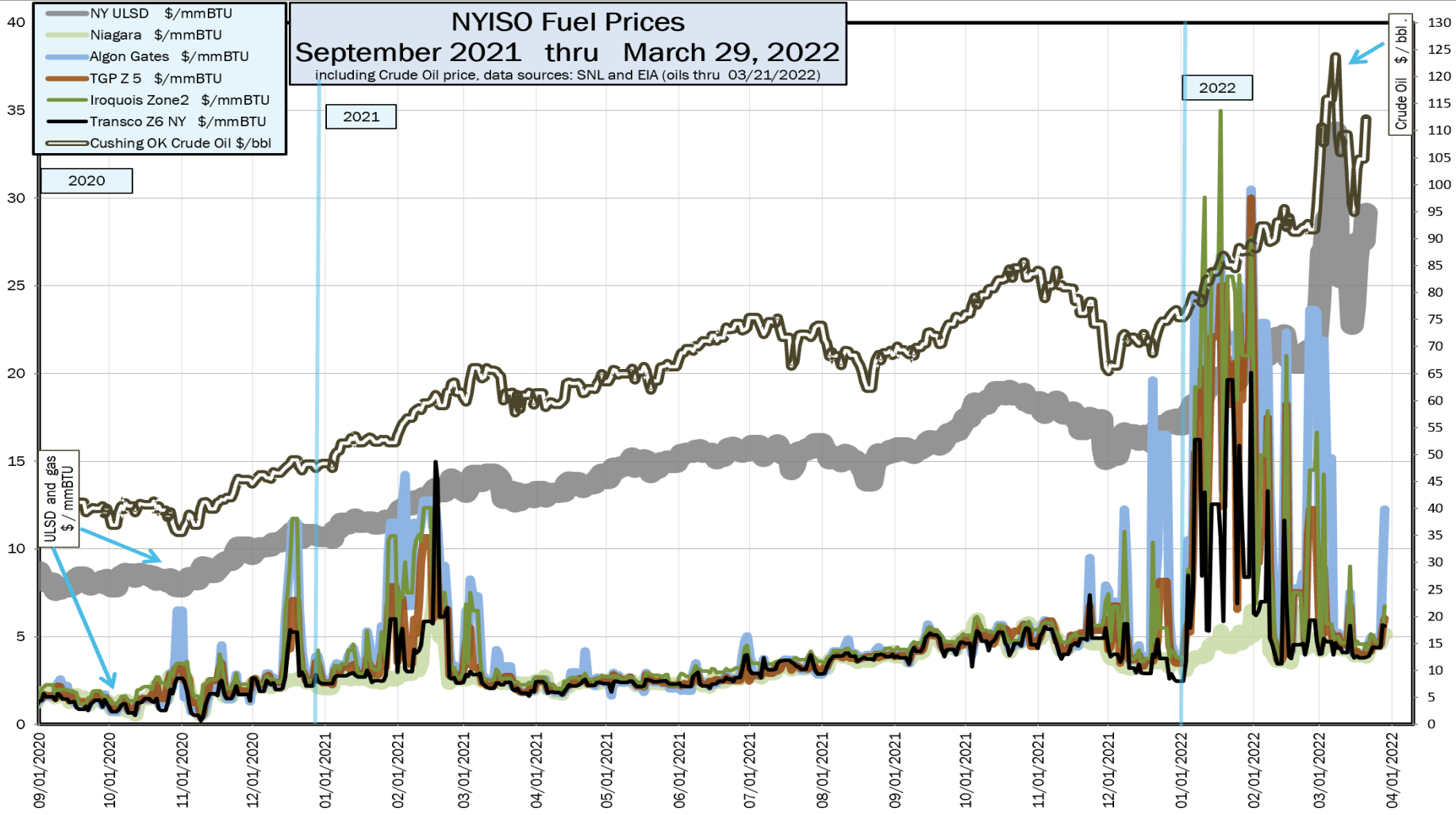
including Crude Oil price, data sources: SNL and EIA (oils thru 03/21/2022)

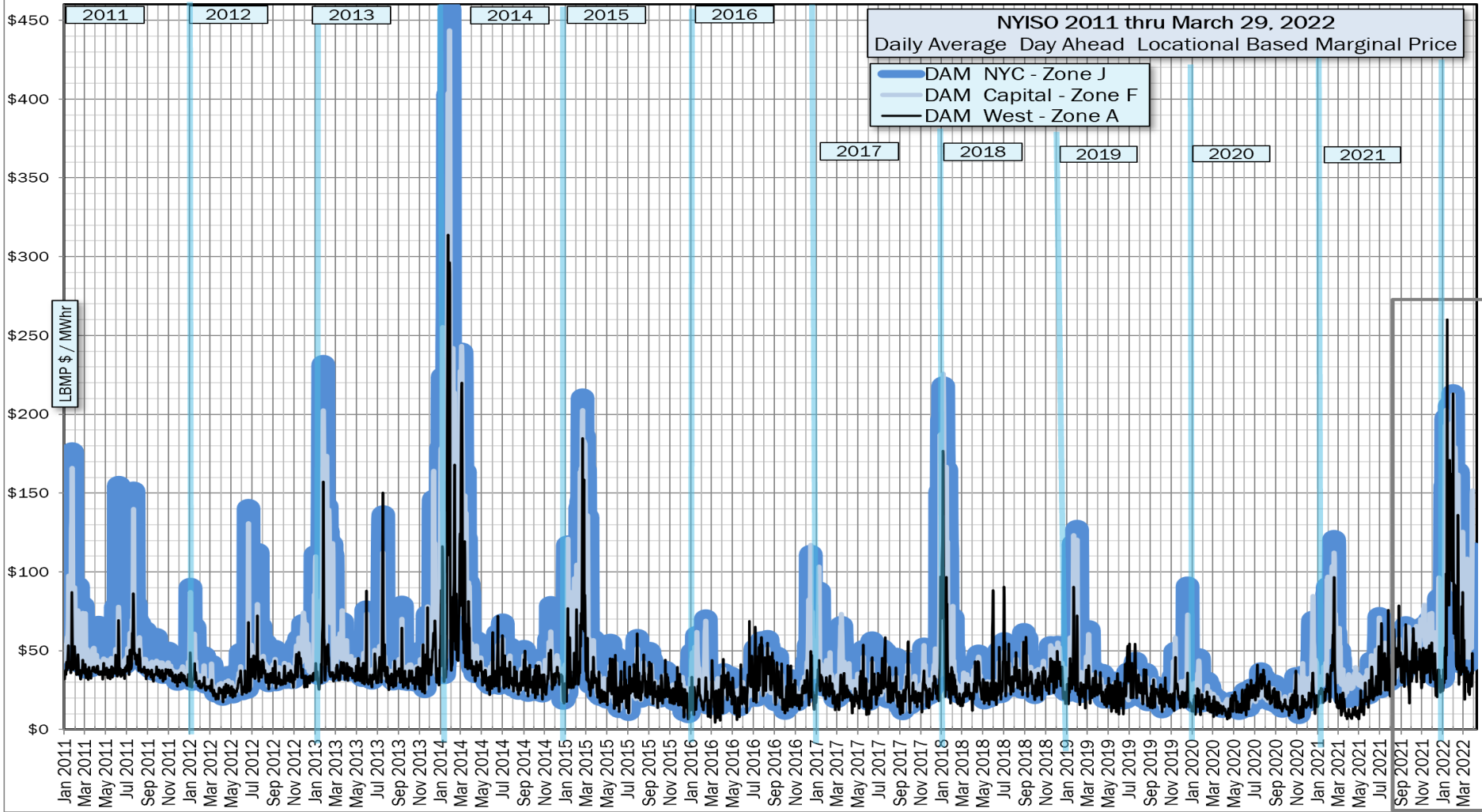


NYISO Fuel Prices September 2021 thru March 29, 2022

including Crude Oil price, data sources: SNL and EIA (oils thru 03/21/2022)

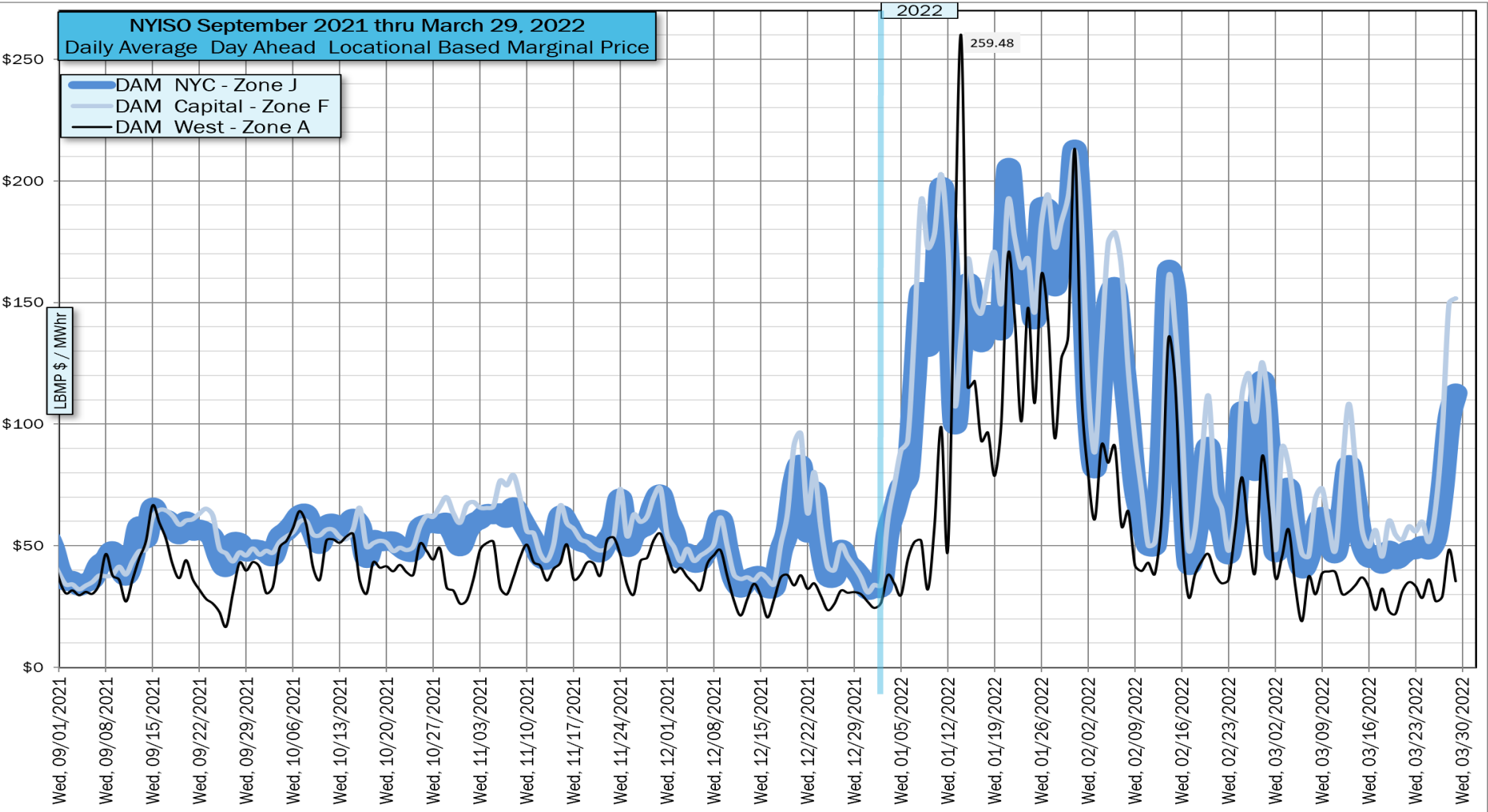
- NY ULSD \$/mmBTU
- Niagara \$/mmBTU
- Algon Gates \$/mmBTU
- TGP Z 5 \$/mmBTU
- Iroquois Zone2 \$/mmBTU
- Transco Z6 NY \$/mmBTU
- Cushing OK Crude Oil \$/bbl





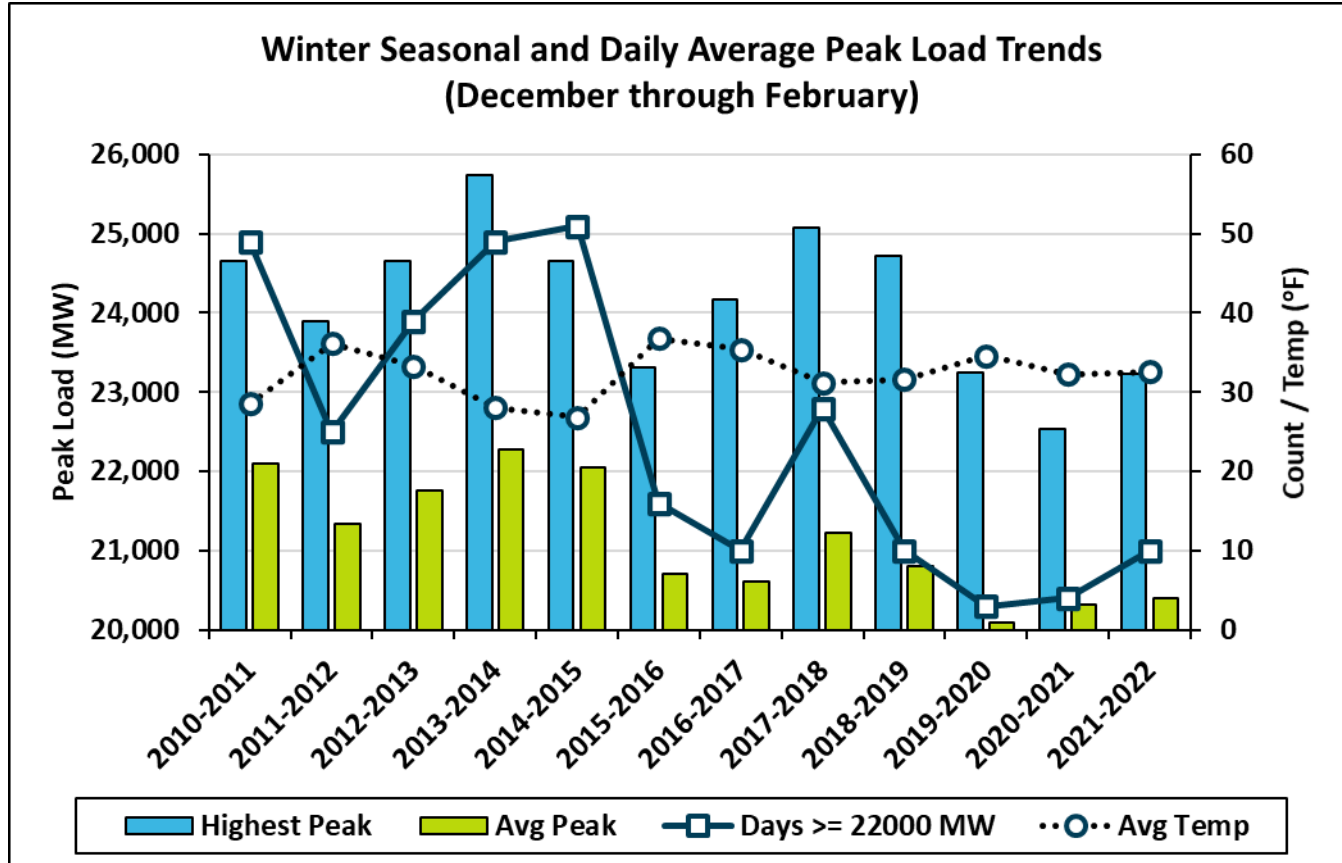
NYISO September 2021 thru March 29, 2022 Daily Average Day Ahead Locational Based Marginal Price

- DAM NYC - Zone J
- DAM Capital - Zone F
- DAM West - Zone A

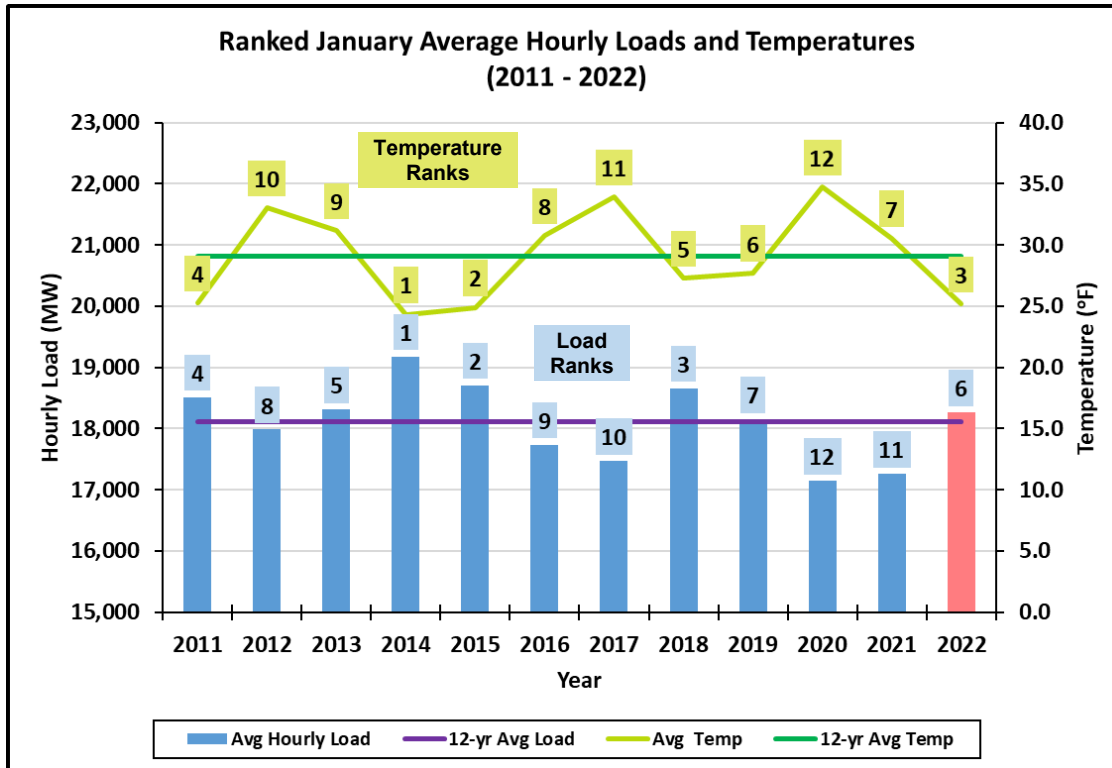


Appendix

Winter 2021 – 2022 Daily Peak Loads In Perspective



January 2022 Hourly Average Loads In Perspective



- **Lowest average temperature since 2015 yielded the second highest average hourly loads over the same period**
 - Third lowest January average temperature since 2011
 - The average from 1/3 - 1/31 would have been the lowest
- **Winter 2021 - 2022 peak load (23,237 MW) occurred on 1/11**
- **8 of 10 peak load days above 22,000 MW occurred between 1/10 and 1/31**
 - 2/14 and 2/15 were the other days

MLK Weekend Cold Weather Conditions (1/14 – 1/17)

- Coldest seasonal NYCA Hourly Temperature occurred 1/16/22 HB7 (3.6°F).
- OFOs
 - Con Ed 1/24th Hourly OFO, 1/15/22 04:00 - 1/16/22 10:00
 - NG Downstate Tier 1 Interruption, 1/14/22 22:00 – 1/16/22 10:00
 - NG UPNY East and West Gate Interruption 1/14/2022 22:00 – 1/16/22 10:00
- SREs
 - 1/15/22 - Astoria 5, HB00-23 and Empire CC1, HB7-22 for statewide capacity concerns with uncertainty in DAM scheduled imports.
 - 1/16/22 - In-day SRE of Astoria 5 and Empire CC1, HB12-23 for statewide capacity concerns due to generator performance and uncertainty in DAM scheduled imports (IESO issued a Level 3A TLR on the Frontier interface curtailing 1,672MW HB02). Also instituted pumping at Gilboa in-day to restore water levels.
- 1/15/22 - The day-ahead forecast was 21,600 MW. The forecast peak temperature index was 13.4°F. Partly to mostly sunny, breezy, and very cold.
- Forecast highs were in the single digits to lower-teens upstate; mid-teens to lower-20s downstate. Overnight lows were near 0 upstate (colder to the north) and in the lower- to mid-teens downstate. A significant winter storm was expected to impact the area by Sunday evening and last into Monday.

Mid January Cold Weather Conditions (1/20 – 1/22)

- OFOs
 - Con Ed 1/24th Hourly OFO, 1/21/22 04:00 - 1/22/22 10:00
 - NG Downstate Tier 1 Interruption, 1/21/22 08:00 – 1/22/22 10:00
 - NG UPNY East and West Gate Interruption 1/20/2022 22:00 – 1/22/22 12:00
- SREs – 1/20/22, Cricket Valley 1, HB7-22 for statewide capacity (increase in load forecast, uncertainty in DAM scheduled imports, generator performance)
- 1/21/22 - The day-ahead forecast was 22,780 MW. The forecast peak temperature index was 16.0°F. Mostly sunny, breezy, and cold.
- Forecast highs were mainly in the lower- to mid-teens; lower-20s near NYC and Long Island. Overnight lows were near 0 and below upstate (potentially mid-teens below 0 in typically colder spots); lower-teens near NYC and Long Island.

Early February Cold Weather Conditions (2/4 – 2/6)

- Winter Storm Warnings and Advisories due to a significant winter storm on 2/3-2/4.
- OFOs
 - Con Ed 1/20th Hourly OFO, 2/6/22 04:00 - 2/6/22 10:00
 - NG Downstate Tier 2 Interruption, 2/5/22 22:00 – 2/6/22 12:00
- SREs - None
- 2/5/22 - The day-ahead forecast is 20,730 MW. The forecast peak temperature index was 21.5°F. Mostly sunny, breezy, and cold.
- Forecast highs range from the mid- to upper-teens upstate to upper-20s downstate. Overnight lows range from the single digits (and below in spots, especially to the north) upstate to the teens (near 20 around NYC) downstate.

Mid February Cold Weather Conditions (2/13 – 2/15)

- February Peak Load occurred on 2/14/22, HB18 at 22,477 MW
- OFOs
 - Con Ed 1/20th Hourly OFO, 2/14/22 & 2/15/22 04:00 - 10:00
 - NG Long Island Tier 2 Interruption, 2/14/22 04:00 - 13:00
 - NG NYC Tier 2 Interruption, 2/14/22 06:00 - 12:00 & 2/15/22 02:00 - 12:00
- SREs - None
- The in-day forecast was 22,600 MW. The forecast peak temperature index was 19.8°F. Partly to mostly sunny, breezy, and cold.
- Forecast highs range from the mid-teens upstate to the mid-20s downstate. Overnight lows range from the single digits to near 10 upstate (colder in northern areas) to the upper-teens downstate.

Early March Cold Weather Conditions (3/4)

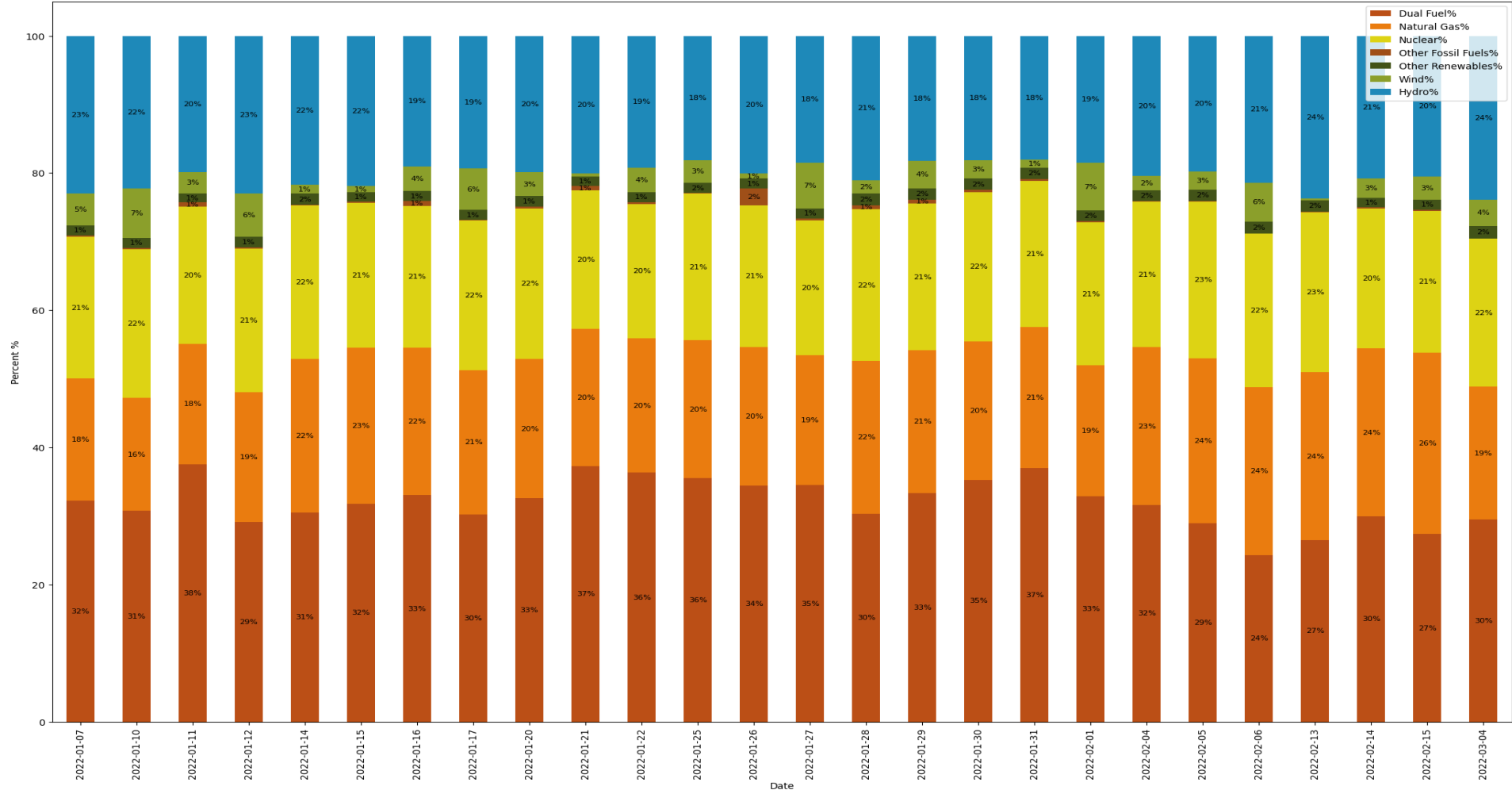
- OFOs
 - NG Long Island Tier 2 Interruption, 3/4/22 05:00 - 11:00
- SREs - None
- NYISO weekly fuel surveys indicated sufficient alternate fuel inventory
- The day-ahead forecast was 19,530 MW The forecast peak temperature index was 32.6°F. Mostly sunny and cold on Friday.
- Overnight lows are generally in single digits and teens upstate and lower-20s downstate. Forecast highs in 30s statewide.

Temperature and Peak Load Statistics for Selected Periods

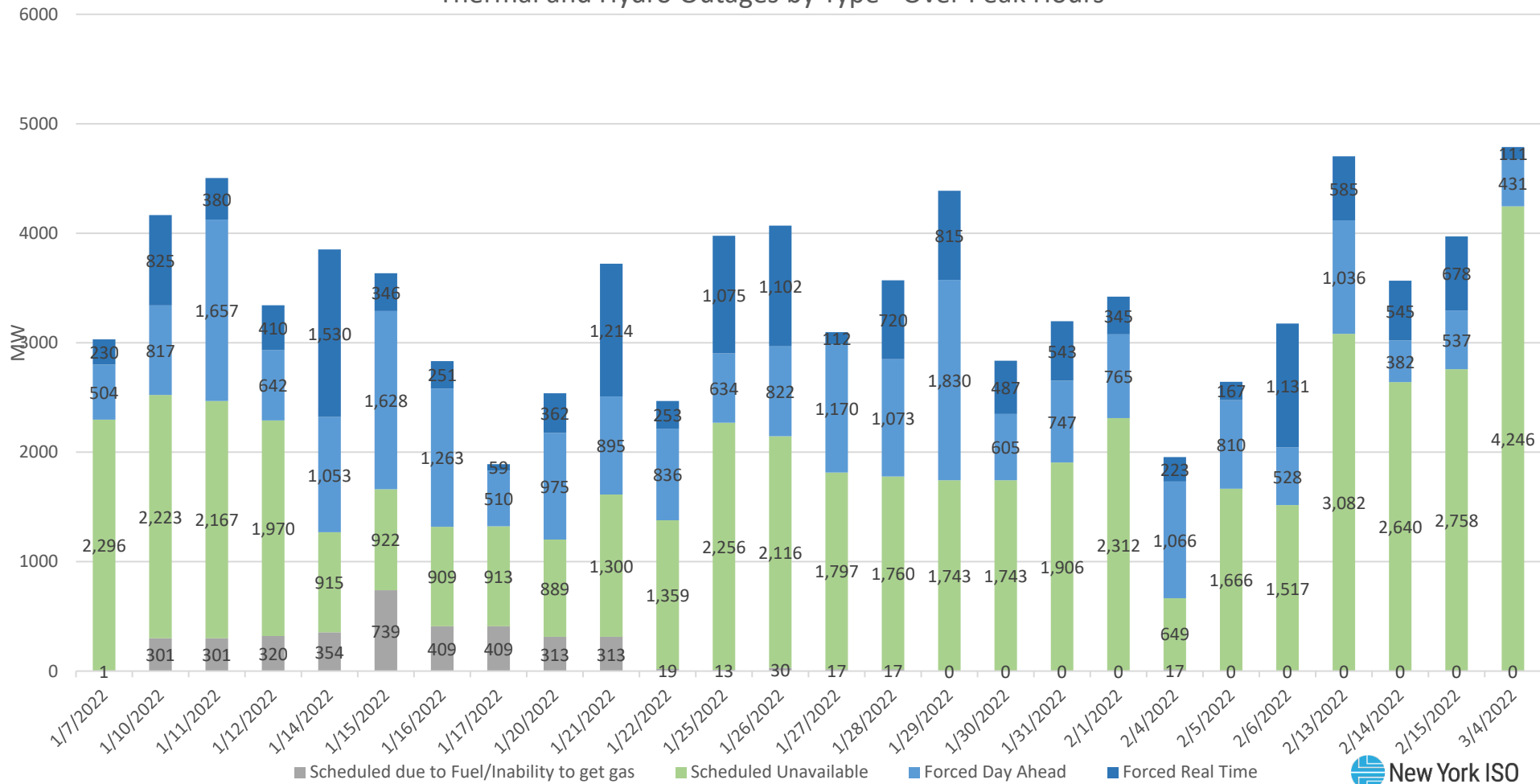
Date	DOW	AM Low Temp	Aft High Temp	HB18 Temp	Avg Temp	Peak Load (MW)
1/10/2022	Mon	23.9	26.1	22.7	25.8	22,220
1/11/2022	Tue	9.9	15.6	14.5	13.8	23,237
1/12/2022	Wed	15.0	37.0	33.9	28.3	21,338
1/13/2022	Thu	30.4	42.0	37.3	35.4	20,312
1/14/2022	Fri	33.5	34.5	25.4	30.4	21,185
1/15/2022	Sat	5.3	13.4	11.0	9.5	22,311
1/16/2022	Sun	3.6	28.6	27.7	16.7	21,409
1/17/2022	Mon	31.9	35.4	32.6	34.1	21,320
1/18/2022	Tue	27.1	30.6	26.3	27.6	21,710
1/19/2022	Wed	21.9	44.3	42.7	35.1	20,583
1/20/2022	Thu	25.8	26.7	23.3	27.6	21,820
1/21/2022	Fri	7.9	18.5	15.4	13.0	22,611
1/22/2022	Sat	5.0	25.7	24.0	15.9	21,184
1/23/2022	Sun	22.2	30.7	28.1	25.7	20,590
1/24/2022	Mon	17.7	26.8	26.0	23.7	21,850
1/25/2022	Tue	29.8	34.7	29.2	30.5	21,313
1/26/2022	Wed	13.9	22.9	19.1	18.2	22,492
1/27/2022	Thu	8.4	28.7	28.5	19.6	22,094
1/28/2022	Fri	25.9	27.1	24.0	25.9	21,498
1/29/2022	Sat	11.9	15.6	14.7	14.1	22,245
1/30/2022	Sun	6.2	22.9	19.9	14.4	21,749
1/31/2022	Mon	11.1	29.7	24.8	19.8	22,175
2/1/2022	Tue	15.1	35.8	33.5	26.0	21,386
2/13/2022	Sun	24.0	26.0	23.8	25.2	20,147
2/14/2022	Mon	12.2	20.6	18.7	16.5	22,477
2/15/2022	Tue	12.6	27.5	25.7	20.0	22,013
2/16/2022	Wed	20.4	43.7	42.7	34.6	20,312

All temperatures listed represent the NYCA load-weighted composite values.

Total Actual Generator by Fuel Mix Across Day



Thermal and Hydro Outages by Type - Over Peak Hours



Scheduled due to Fuel/Inability to get gas
 Scheduled Unavailable
 Forced Day Ahead
 Forced Real Time

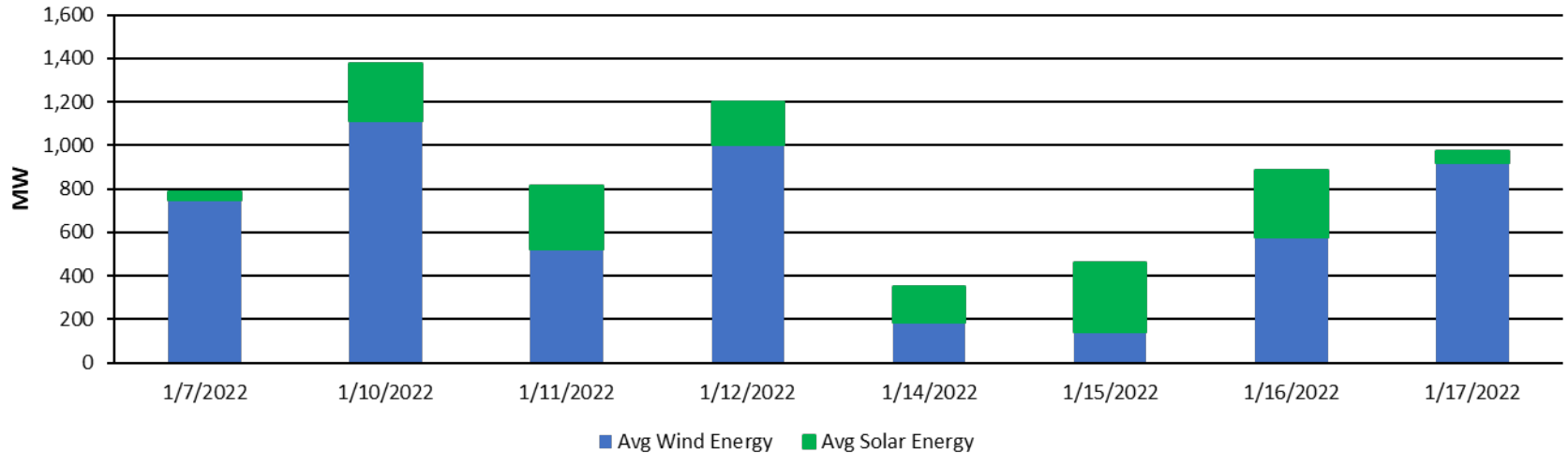


Transmission Infrastructure Performance

- **Continuing Forced Outages**
 - B and C lines from NJ to NYC, Hudson-Farragut 345 kV B3402 and Marion-Farragut 345 kV C3403
 - One Phase Angle Regulator (PAR) at the Ontario border, L33P St. Lawrence – Moses
- **Other impactful outages throughout the season (not all occurring concurrently)**
 - Newbridge 345kV/138kV Bk 1
 - Mortimer-Shelby 115kV 114
 - Northport-Pilgrim 138kV 679
 - Niagara-Packard 115kV 191
 - Moses-Adirondack 230kV MA1
 - Beck-Niagara 345kV PA301
 - Leeds-Pleasant Valley 345kV 92

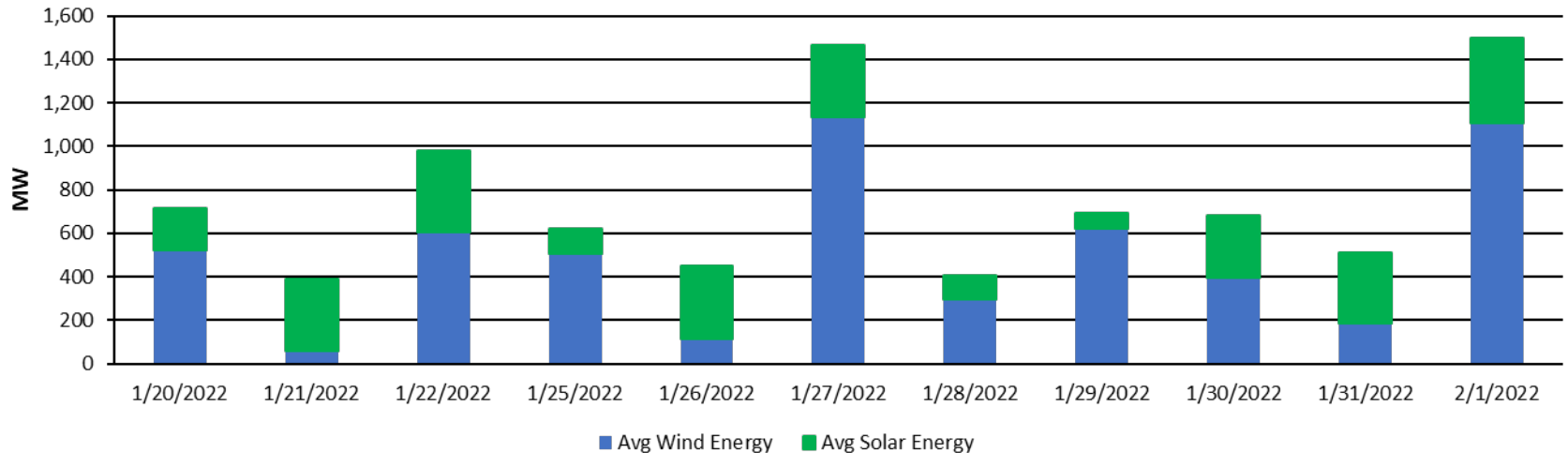
1/7, 1/10 - 1/12, 1/14 - 1/17 Renewable Chart #1

Daily Wind & Solar Production
1/7, 1/10 - 1/12, 1/14 - 1/17



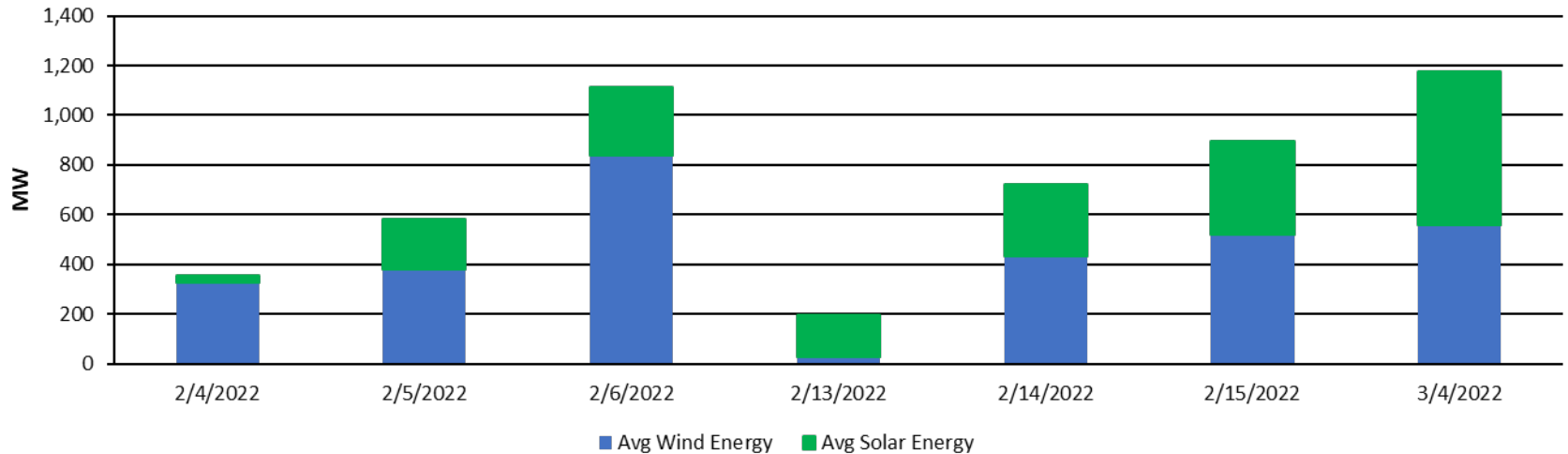
1/20 - 1/22, 1/25 - 2/1 Renewable Chart #1

Daily Wind & Solar Production 1/20 - 1/22, 1/25 - 2/1



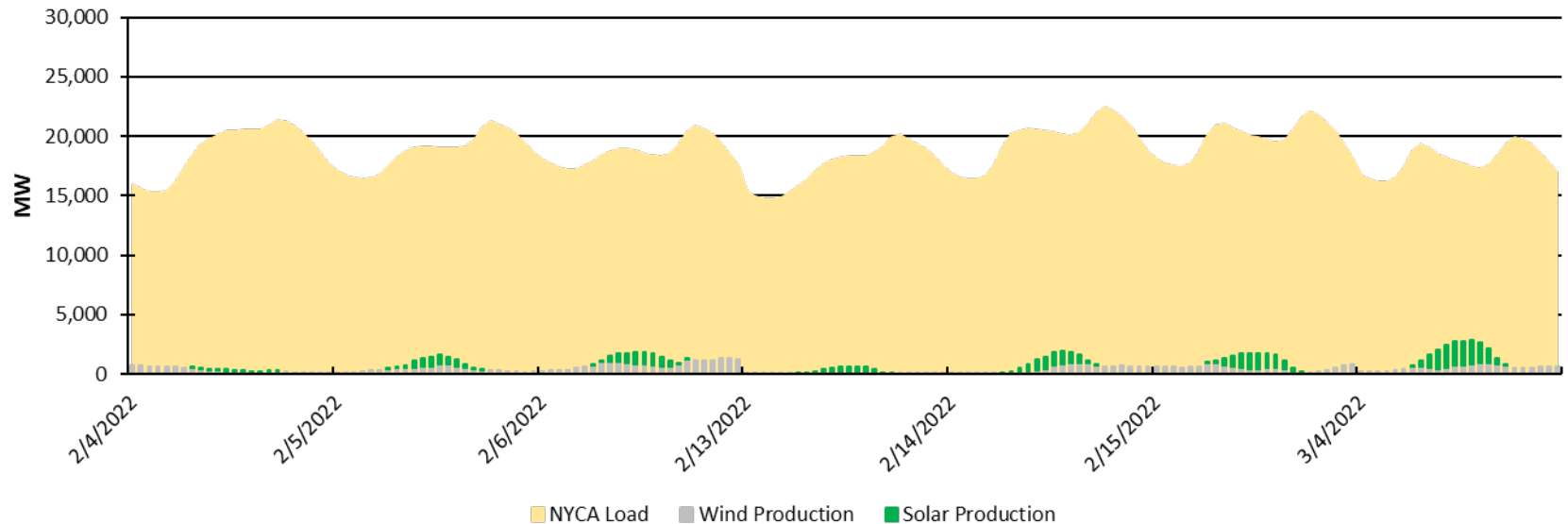
2/4 - 2/6, 2/13 - 2/15, 3/4 Renewable Chart #1

Daily Wind & Solar Production 2/4 - 2/6, 2/13 - 2/15, 3/4



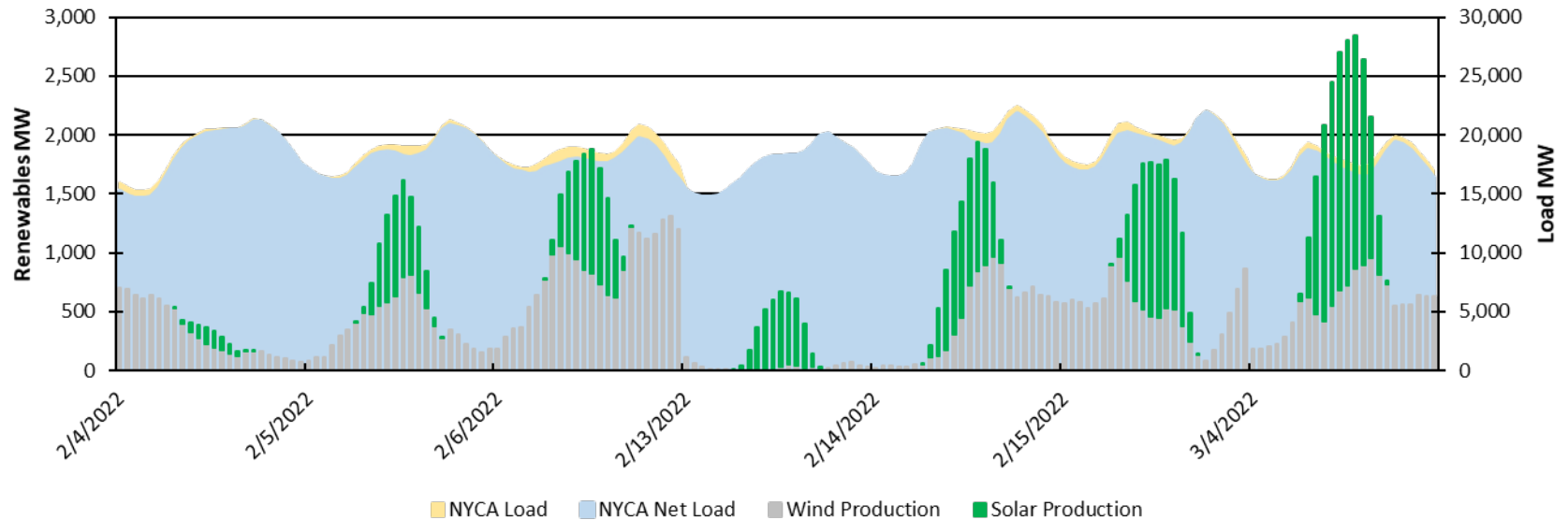
2/4 - 2/6, 2/13 - 2/15, 3/4 Renewable Chart #2b

Hourly Wind & Solar Production 2/4 - 2/6, 2/13 - 2/15, 3/4

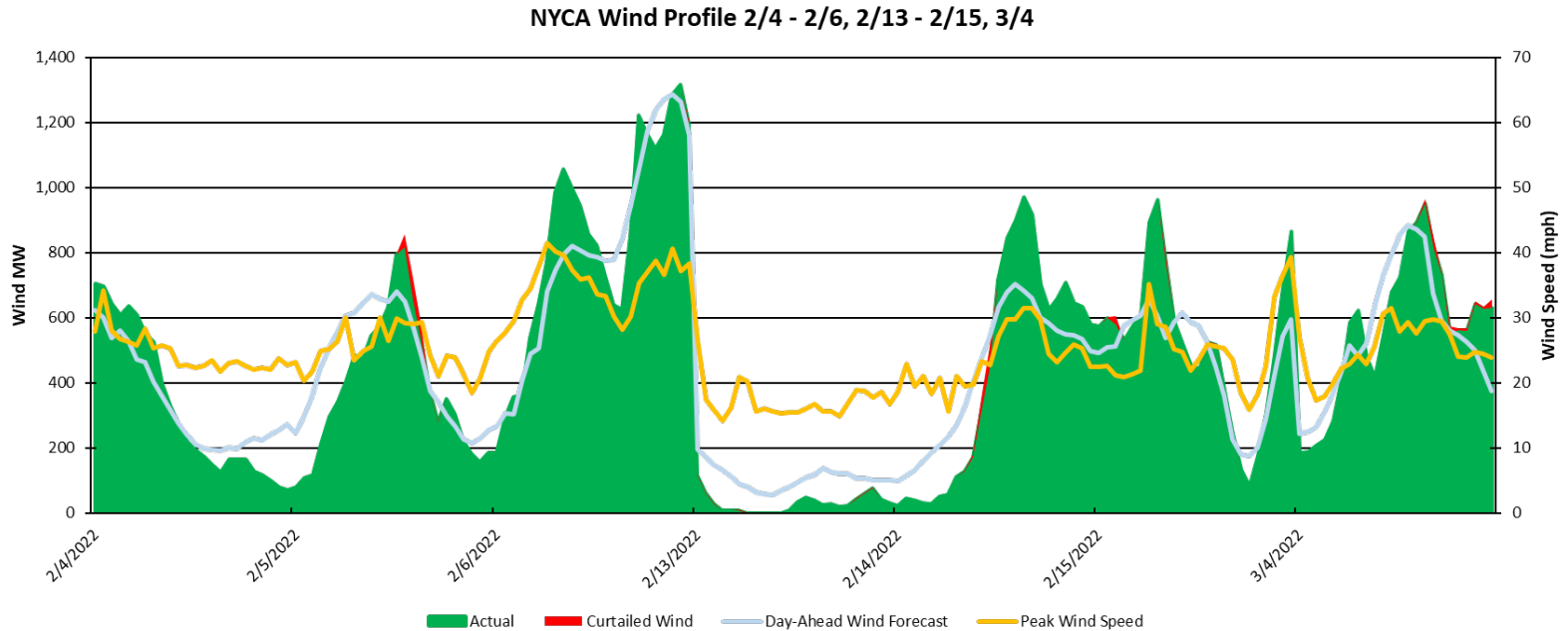


2/4 - 2/6, 2/13 - 2/15, 3/4 Renewable Chart #3

Hourly Wind & Solar Production 2/4 - 2/6, 2/13 - 2/15, 3/4

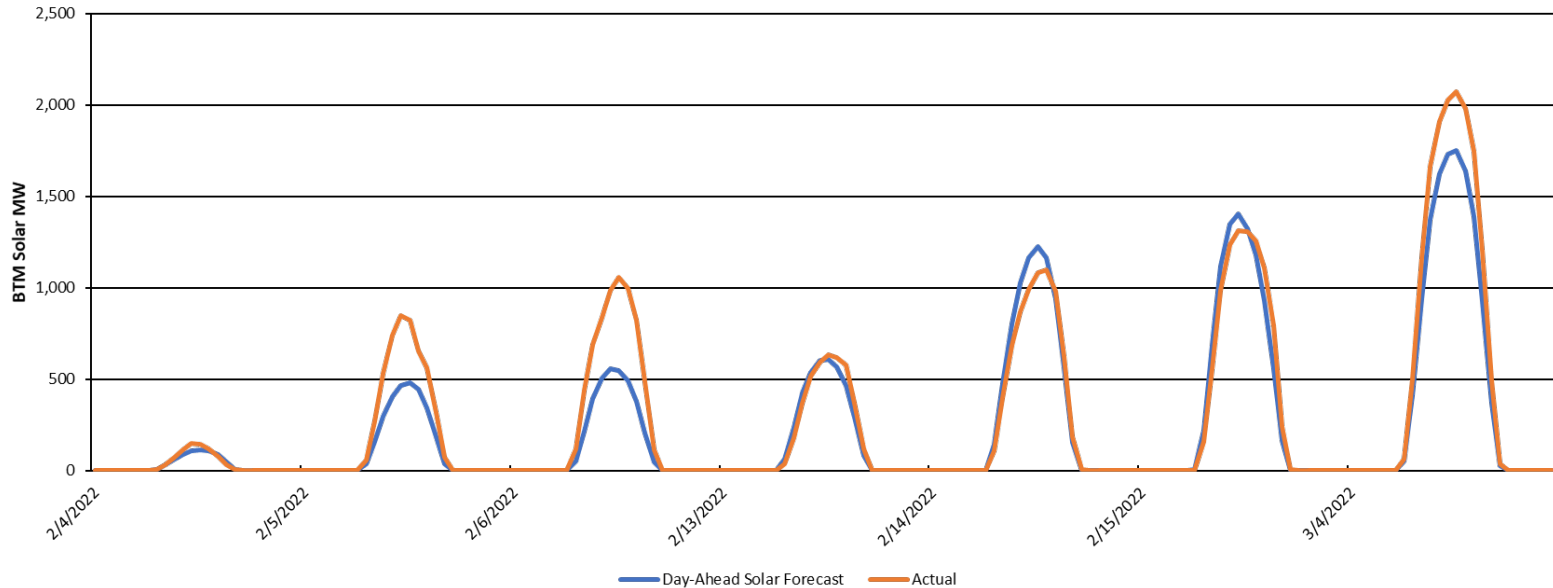


2/4 - 2/6, 2/13 - 2/15, 3/4 Wind Chart



2/4 - 2/6, 2/13 - 2/15, 3/4 Solar Chart

NYCA BTM Solar Profile (~3,373 MW) 2/4 - 2/6, 2/13 - 2/15, 3/4



Questions?

Our Mission & Vision



Mission

Ensure power system reliability and competitive markets for New York in a clean energy future



Vision

Working together with stakeholders to build the cleanest, most reliable electric system in the nation