New York ISO
Independent System Operator

Winter 2022-2023 Cold Weather Operations

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NYISO Management Committee

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Key Observations from Winter 2022/23

- Winter 2022-2023 temperatures were above average with the exception of two short duration cold weather events
- Winter started with higher-than-normal and volatile fuel prices (natural gas, LNG, distillate fuel, etc.) but have moderated throughout the season
- Significant amount of stored fuel burned in short duration periods of cold weather. Operations will continue to monitor replenishment in preparation for winter 2023/24
- 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
- Commencing 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: 24% natural gas, 23% oil, 21% hydro, 12% imports, 14% nuclear, 0% other fossil, 5% wind, 1% other renewables

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Cold Weather Conditions (12/23-12/27) Winter Storm Elliott

- FERC, NERC and the regional entities have opened a joint inquiry into operations of the bulk electric system during the storm.
  - https://www.nerc.com/news/Pages/FERC,-NERC-to-Open-Joint-Inquiry-into-Winter-Storm-Elliott.aspx
- Regions to the South and East experienced high levels of generation unavailability and issued load management/emergency procedures. In the Southeast, electric systems required rotating customer outages in response to the high electric demand as well as forced generation outages due to the cold weather.
  - https://www.pjm.com/markets-and-operations/winter-storm-elliott
  - https://www.iso-ne.com/static-assets/documents/2023/01/january-2023-coo-report.pdf
- Regions to the North experienced record high demand during the cold weather events.
  - https://montreal.ctvnews.ca/quebecers-break-record-for-electricity-demand-as-cold-snap-continues-1.6259858

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Cold Weather Conditions Winter Storm Elliott - Continued

- The impacts to NY occurred Thursday 12/23- Tuesday 12/27 with high winds, a rapid temperature drop on Friday afternoon/evening as well as Blizzard conditions in western and northern NY throughout the weekend
- While the absolute temperatures were not extreme for NY, the rate of change in temperature drop was noteworthy. Actual air temperatures in Albany and NYC were 50°F at 12:00 noon, and by 8:00 pm, temperatures dropped to 15°F with wind chill temperatures as low as -10°F
- The Actual peak during this period was 22,004 MW, HB17, 92% of the winter 2022/2023 baseline forecast.
- Most severe Operational Flow Orders (OFOs) during the period:
  - Con Ed Interruption of Service, 12/24/22 15:05 - 12/26/22 10:00
  - NG Downstate Power Generators Interruption, 12/24/22 15:45 – 12/26/22 14:00
  - Various pipelines and suppliers declared OFOs/Force Majeure conditions due to freezing of production wells and unplanned forced outages of compressor stations in addition to strong firm demand.
- SREs –Cricket Valley CC3 12/24/22 HB10-23 and 12/26/22 HB12-23, Bowline 1 12/24/22 HB 17 – 12/25/22 HB 23, Falcon Seaboard CC1 & CC2 12/26/22 HB16 – 23, Bowline 2 12/27/22 HB 12-23, Oswego 6 12/27/22 HB 00-11 for statewide capacity (generator performance)

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Cold Weather Conditions (2/2 – 2/5) Electric Peak

- 2/3/23 - The forecast peak temperature index was 12.3°F. Partly sunny, plummeting temperatures and gusty winds through the day resulting in low wind chills, scattered snow showers.
- Forecast highs were mainly in the 20s upstate; upper-20s downstate. Overnight lows were mainly in the negative single digits upstate to near 10 downstate.
- The Actual peak on 2/3/23 and peak of the winter was 23,369 MW, HB18, 98% of the winter 2022/2023 baseline forecast.
- Most severe Operational Flow Orders (OFOs) during the period:
  - Con Ed 1/24th Hourly OFO, 2/4/23 04:00 - 2/4/22 10:00
  - NG Downstate 1/24th Hourly OFO, 2/3/22 10:00 – 2/5/23 10:00
  - NG Upstate East and West gate Interruption, 2/3/23 10:00 – 2/4/23 10:00
- SREs – 2/4/23, Bowline 2, HB11-23 for statewide capacity

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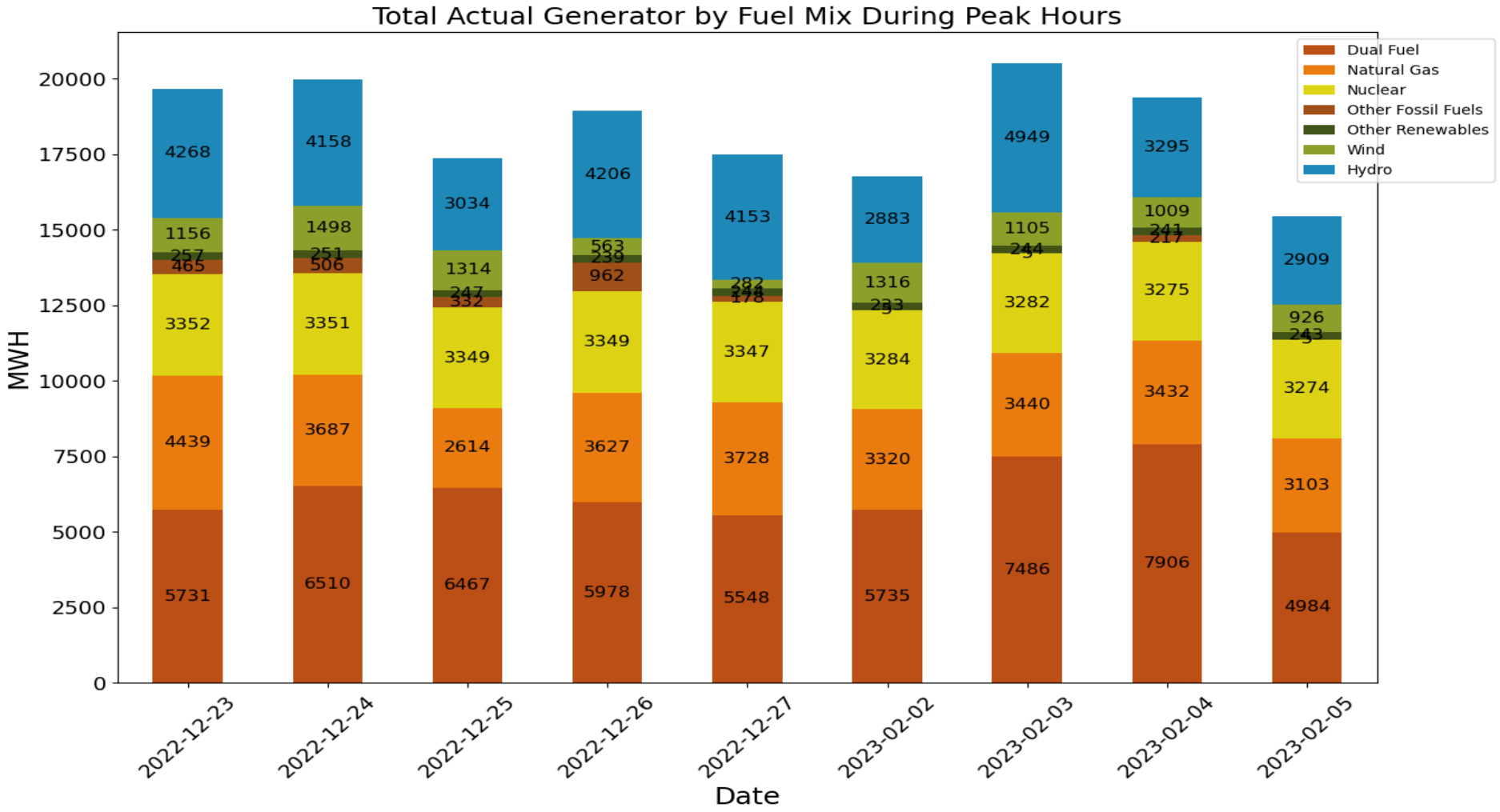
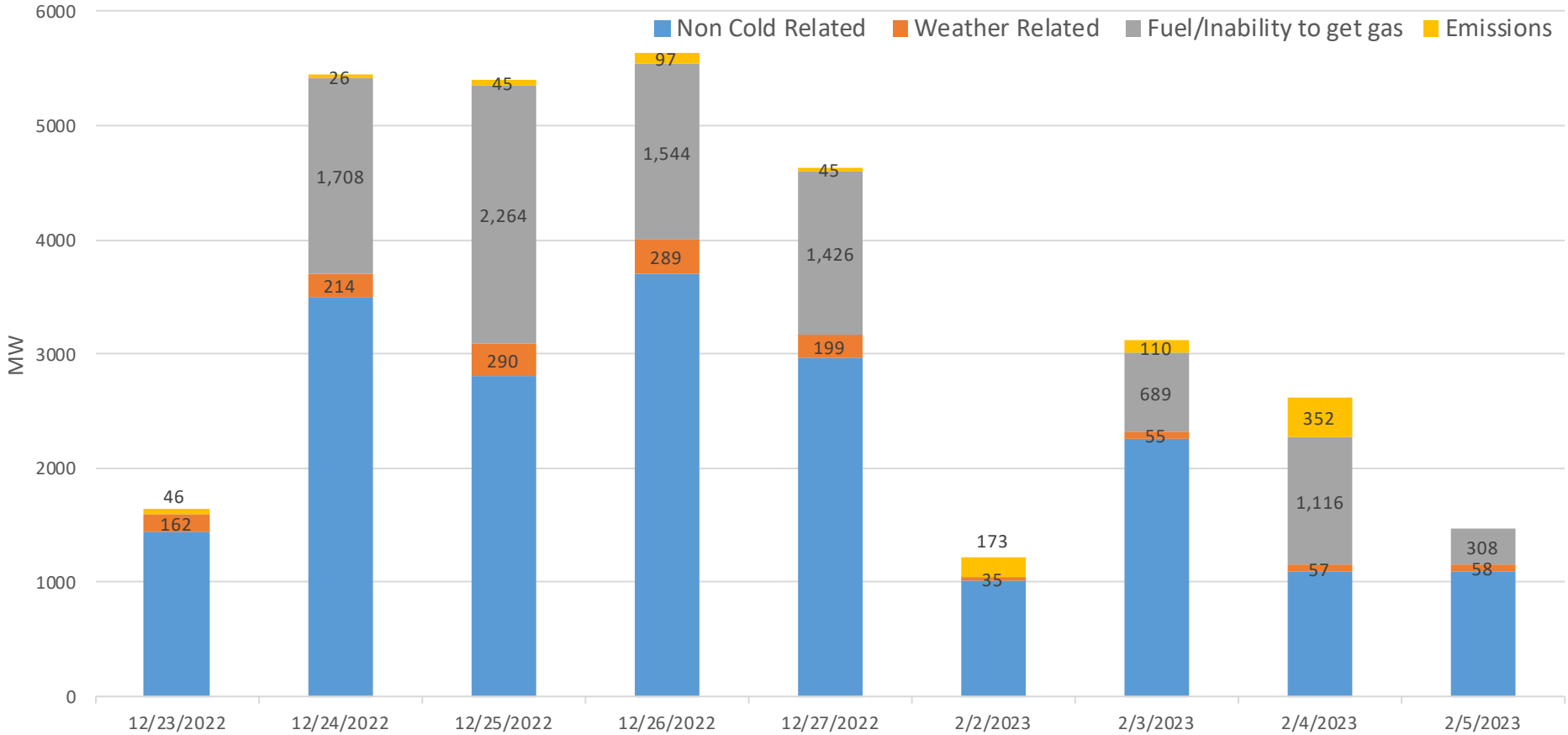
Generation Mix, Outage Data, and Fuel Inventory/Burn



Thermal and Hydro Forced Outages and Forced Derates by Category



In the November 30, 2022 Management Committee presentation," 2022-23 Winter Assessment & Winter Preparedness" based on 60 months of history the projection was 2,987MW of Hydro and Thermal Forced outages

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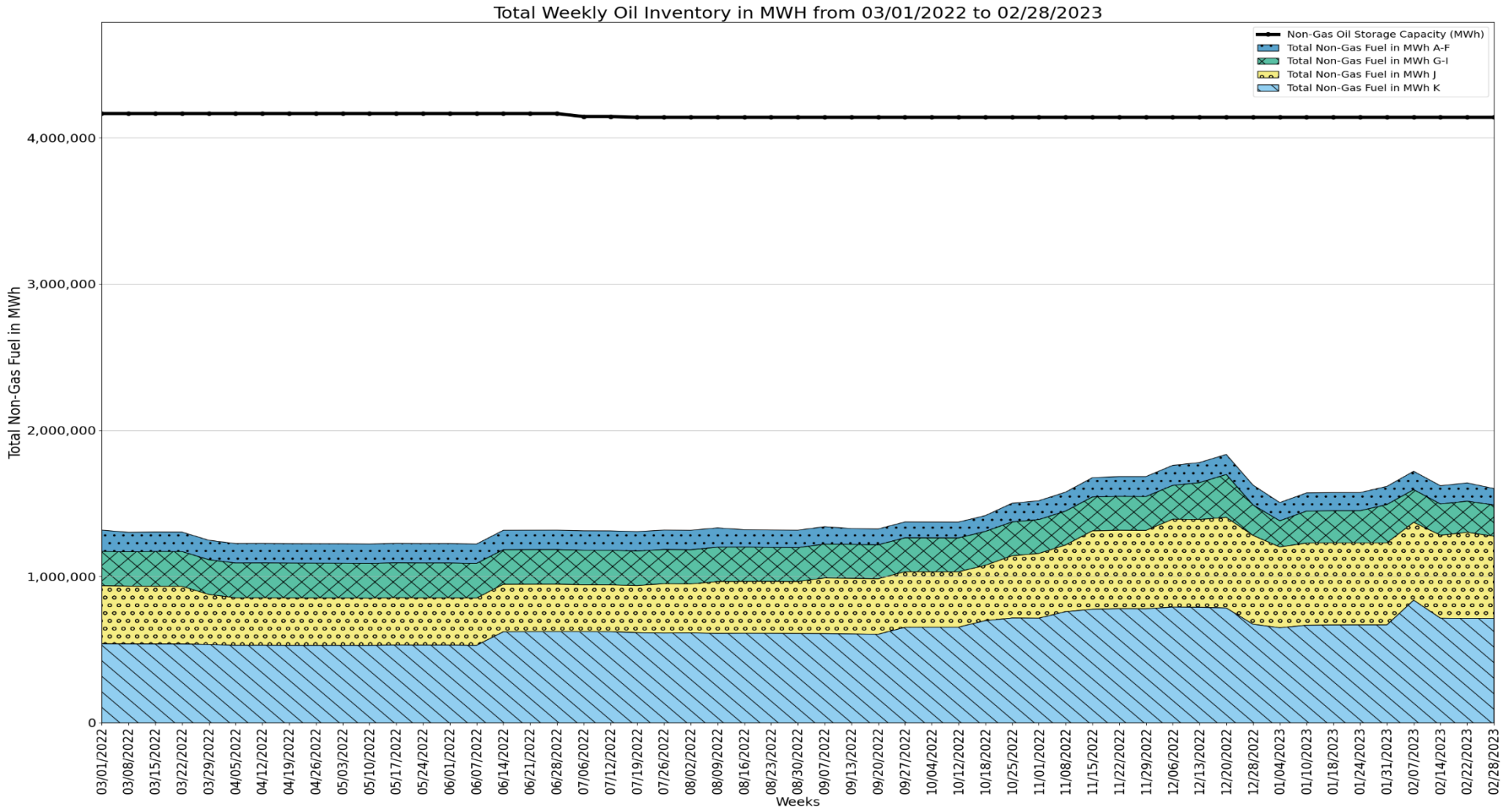
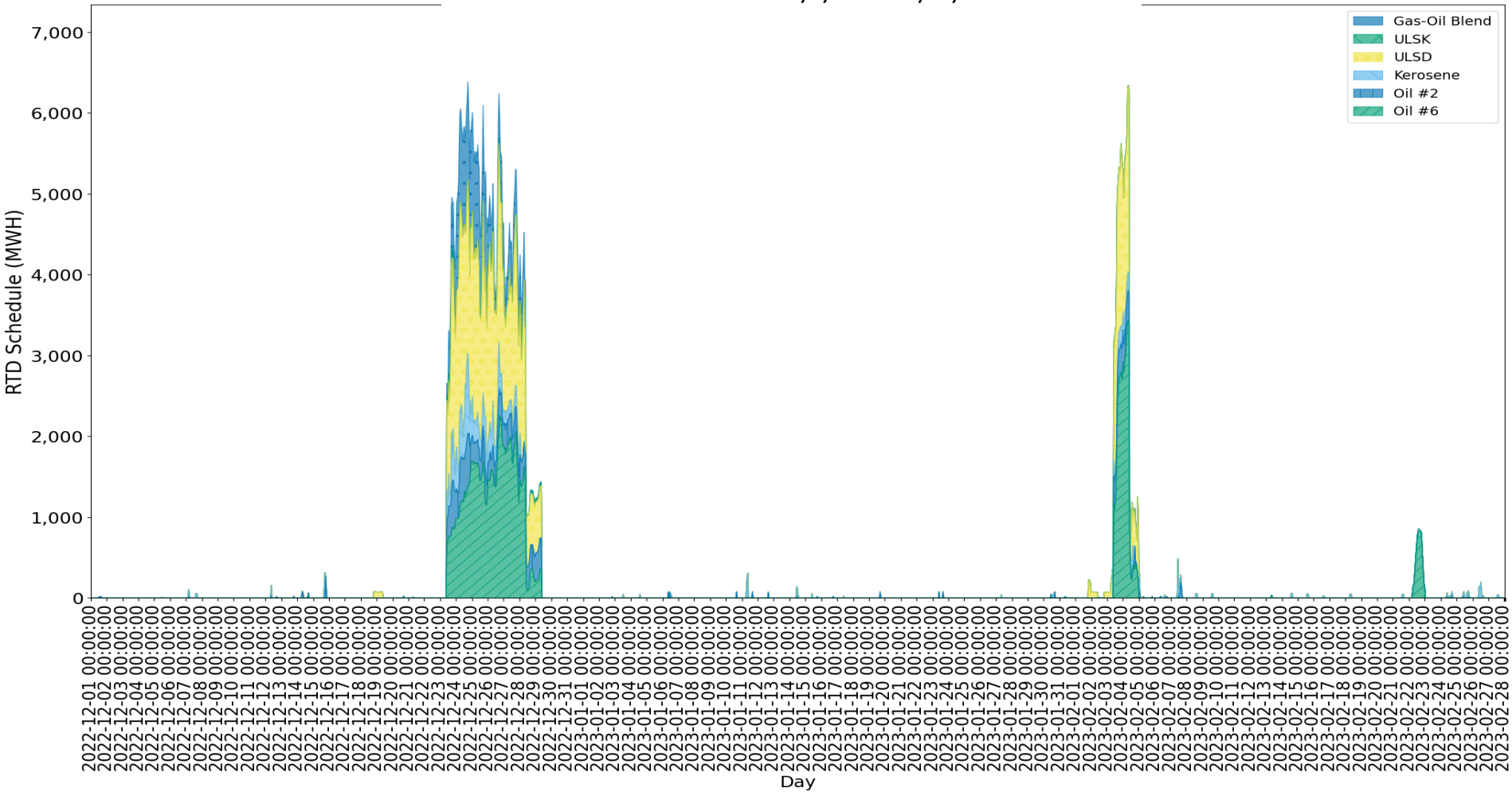


Estimated Oil Fuel Mix 12/1/2022 – 2/28/2023



DRAFT – FOR DISCUSSION PURPOSES ONLY

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
- NERC Standards TOP-003-5 and EOP-011-2 go into effect April 1, 2023
  - Timely and accurate reporting in the GFER surveys fulfills some of the Generator Owner data reporting requirements
- 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.)

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Gas System NY

- 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, including many days not identified as cold weather timeframes in this presentation

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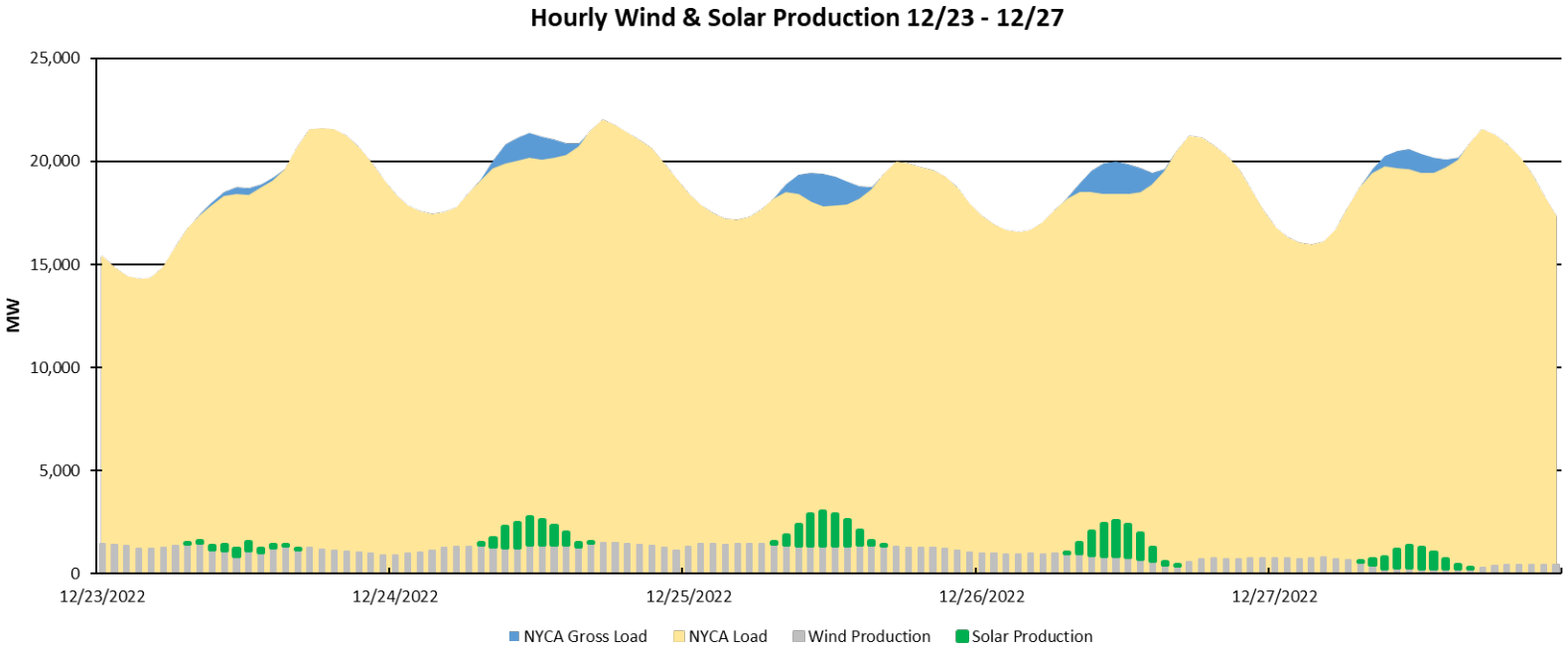
Intermittent Generation Data

12/23 – 12/27 Renewable Chart #3b



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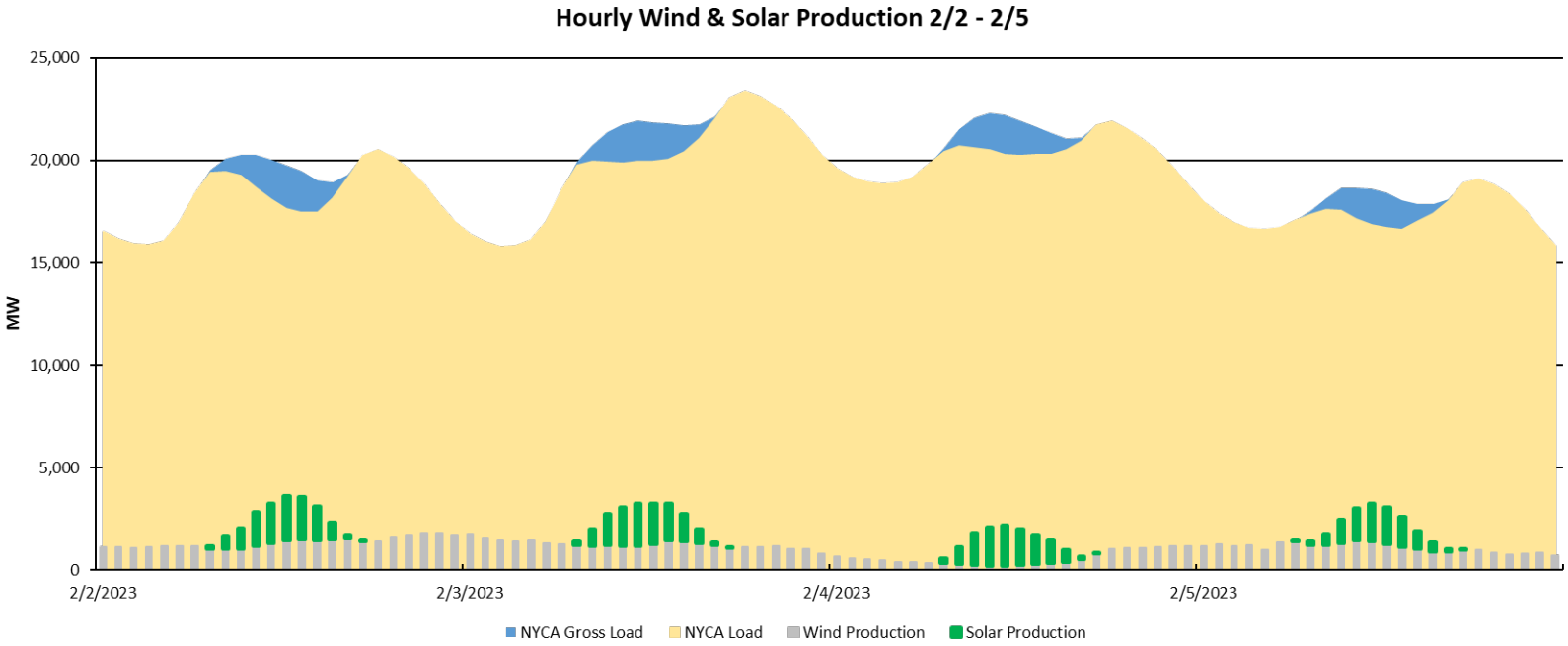
2/2 – 2/5 Renewable Chart #3b



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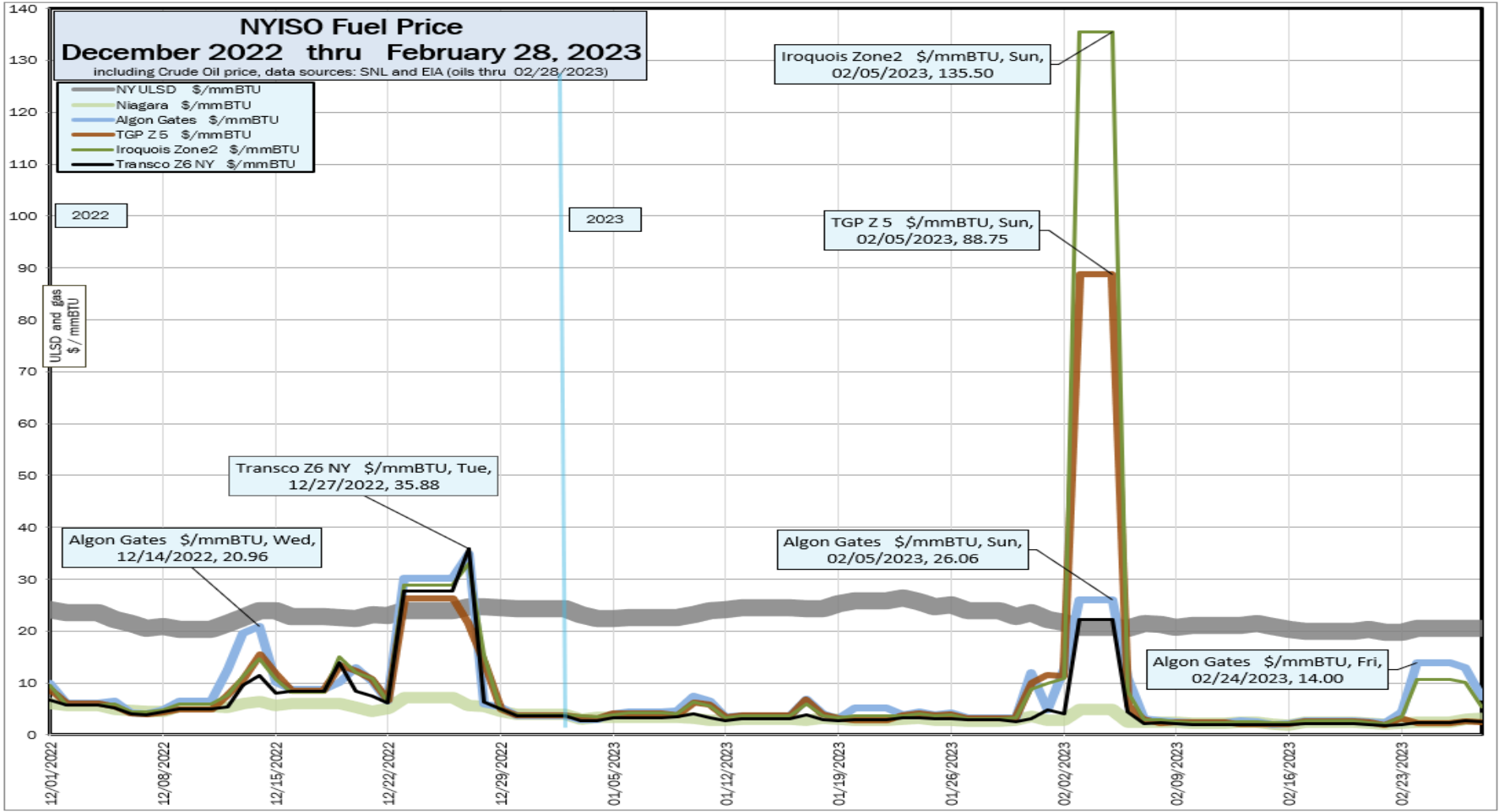
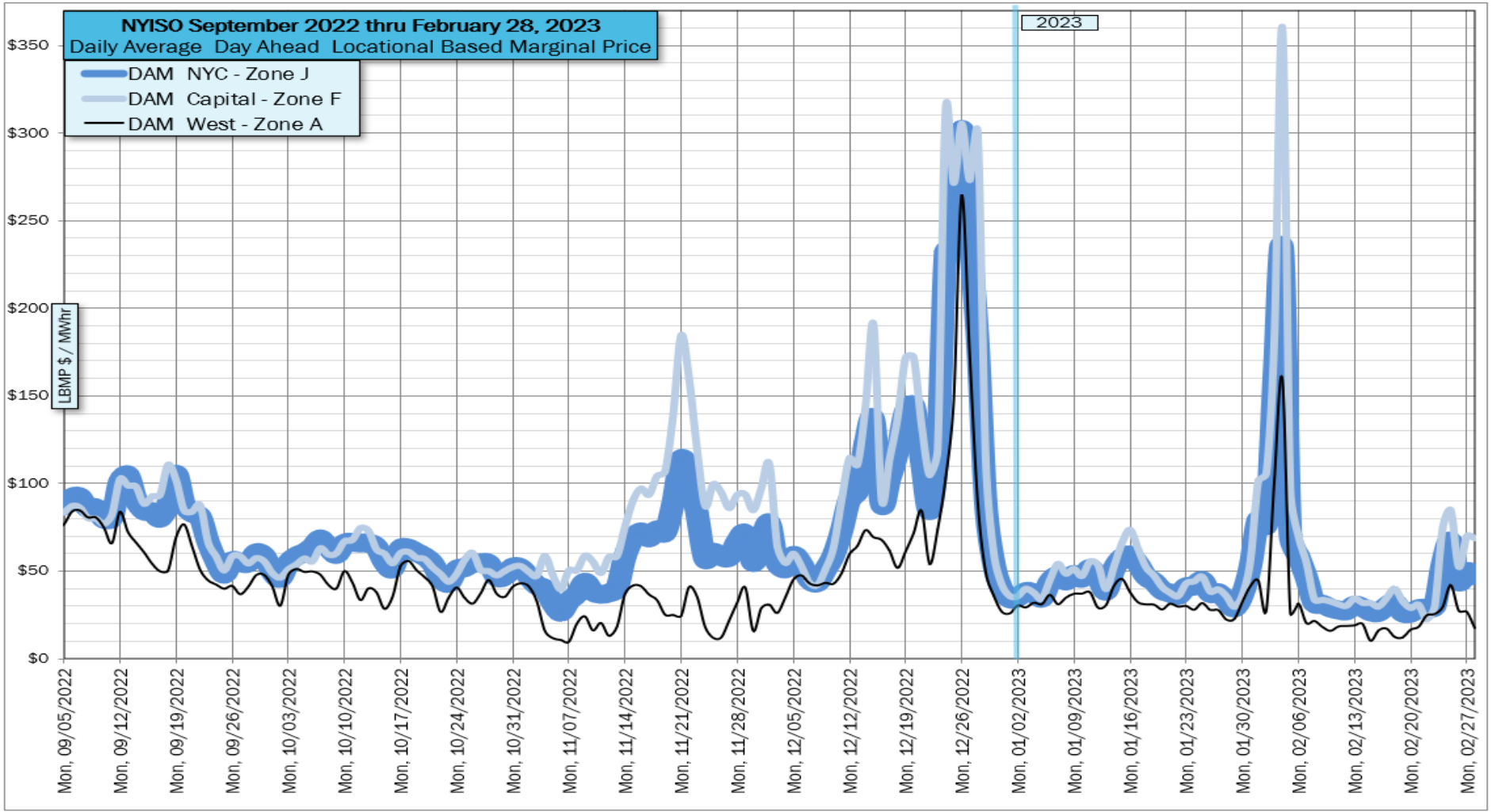
Fuel and Energy Prices





Questions?

Appendix

Peak Loads

- NYCA all-time Winter Electric Peak Load was 25,738 MW on January 7, 2014
- NYCA Seasonal Peak Forecast was 23,893 MW for Winter 2022-2023
- This Winter's Actual Peak (to date) is 23,369 MW on Friday, February 3, 2023

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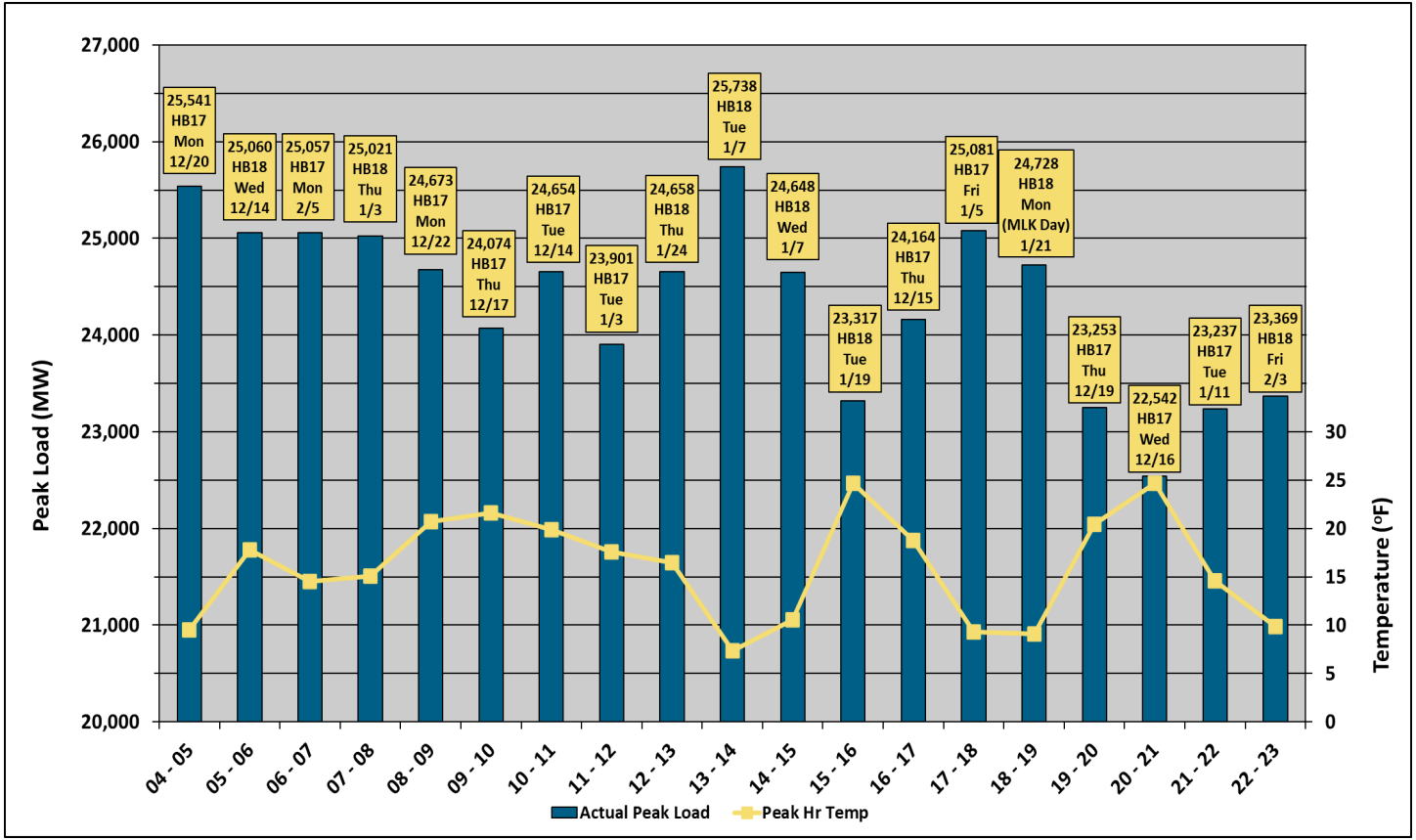
Winter Peak Loads in MW: 2004-05 to 2022-23



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Above Normal Winter Temperatures Prevailed

Average Temperatures and Departures from 1991 – 2020 Normals					
Station	December	January	February	Season	Coldest
Islip	36.8 °F (-0.3 °F)	41.1 °F (+9.2 °F)	38.1 °F (+4.8 °F)	38.7 °F (+4.5 °F)	3 °F (2/4)
Central Park	38.5 °F (-0.6 °F)	43.5 °F (+9.8 °F)	41.1 °F (+5.2 °F)	41.0 °F (+4.8 °F)	3 °F (2/4)
Albany	31.9 °F (+1.5 °F)	32.9 °F (+8.5 °F)	31.5 °F (+4.7 °F)	32.1 °F (+4.9 °F)	-13 °F (2/4)
Syracuse	32.1 °F (+1.7 °F)	32.3 °F (+8.2°F)	31.6 °F (+6.1 °F)	32.0 °F (+5.3 °F)	-13 °F (2/4)
Buffalo	32.0 °F (+0.6 °F)	32.8 °F (+7.3 °F)	32.1 °F (+5.7 °F)	32.3 °F (+4.5 °F)	0 °F (2/4)
Plattsburgh	29.3 °F (+2.9 °F)	27.4 °F (+8.3 °F)	23.7 °F (+2.7 °F)	26.9 °F (+4.7 °F)	-22 °F (2/4)

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

Legend: Below Normal Above Normal

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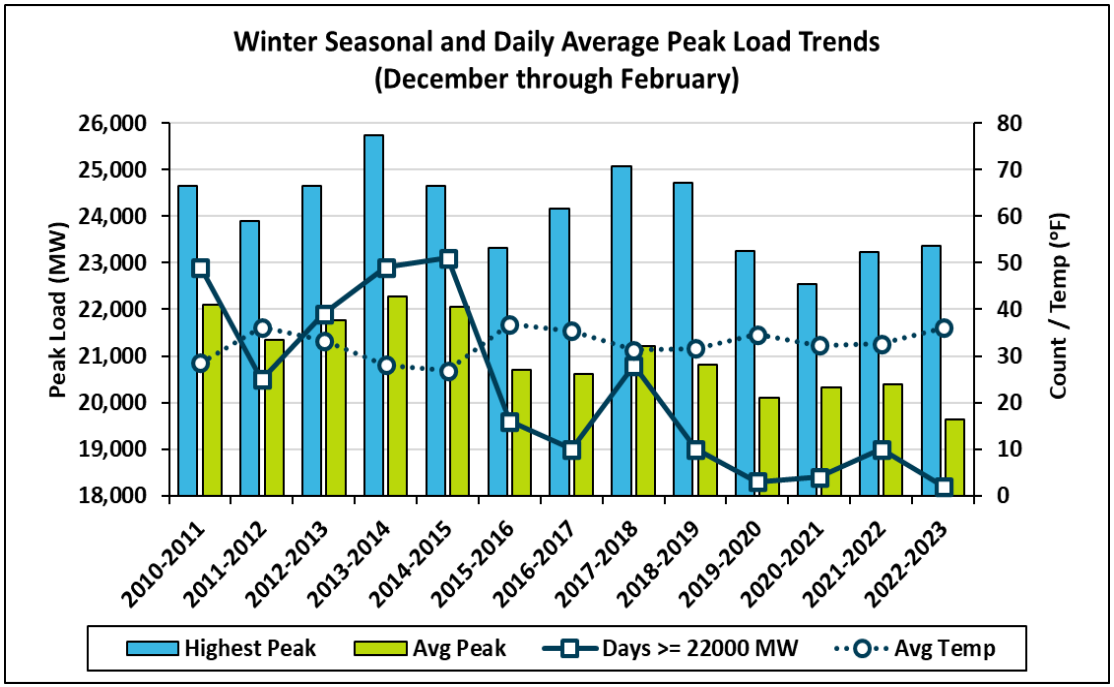
Winter 2022 – 2023 Daily Peak Loads In Perspective



- Third highest Winter average hourly temperature (36.0°F) since 2010 - 2011
  - 2015 – 2016: 36.8°F
  - 2011 – 2012: 36.2°F
- Winter 2022 – 2023 peak load (23,369 MW) occurred on 2/3
  - Second February Winter peak since 2004 - 2005
  - Previous occurrence in Winter 2006 – 2007
  - Highest February peak load since 2015
  - Third time exceeding 23,000 MW in February since 2016
- Peak load exceeded 22,000 MW only one other time on 12/24 (22,004 MW)

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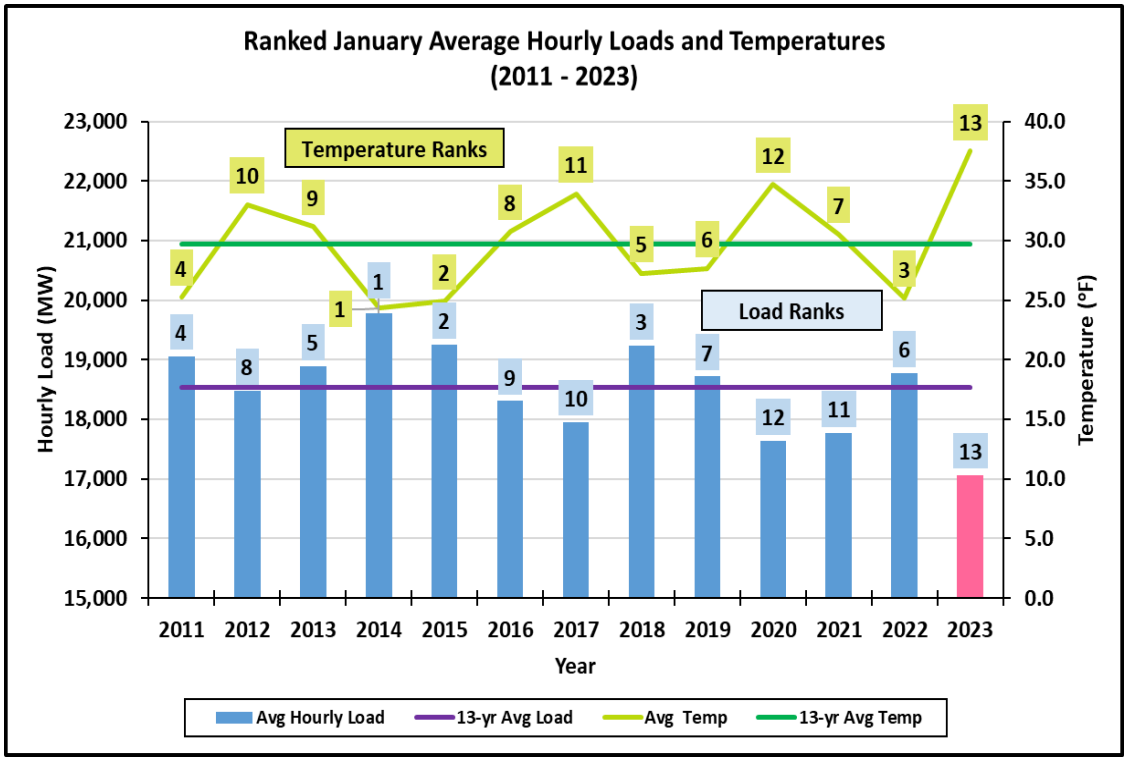
January 2023 Hourly Average Loads In Perspective



- Highest average hourly January temperature since 2011
  - Average temperature: 37.5°F
- Lowest average hourly load over the same period
  - Average hourly load: 17,070 MW
- January peak load was 20,641 MW on 1/31
  - 11 January days above 20,000 MW in 2023
  - 2011-2022 Average: 26 days

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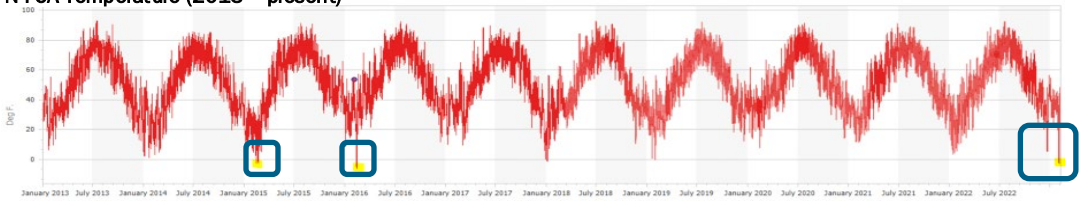
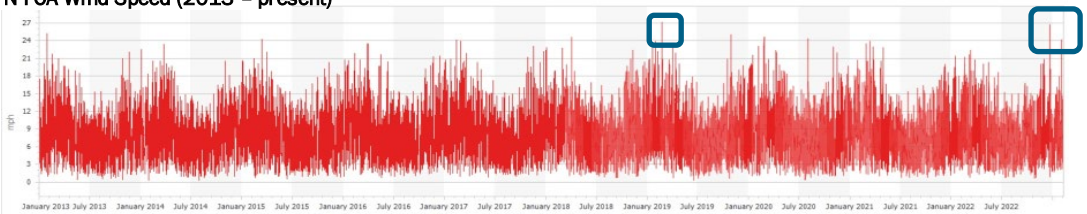
Temperature and Peak Load Statistics for Selected Periods

Date	DOW	AM Low Temp	Aft High Temp	HB18 Temp	Avg Temp	Peak Load (MW)
12/23/2022	Fri	43.1	41.6	16.2	33.9	21,563
12/24/2022	**Sat**	**6.1**	**13.6**	**12.7**	**10.0**	**22,004**
12/25/2022	Sun	13.0	25.4	22.8	19.4	19,949
12/26/2022	Mon	17.5	26.2	25.4	22.1	21,209
12/27/2022	Tue	25.3	30.9	29.7	28.2	21,525
2/2/2023	Thu	23.6	36.7	35.1	30.0	20,489
2/3/2023	**Fri**	**15.5**	**15.2**	**9.8**	**16.2**	**23,369**
2/4/2023	Sat	-2.3	20.5	18.3	9.5	21,913
2/5/2023	Sun	23.5	43.7	41.2	35.0	19,084

NYCA Temperature (2013 – present)



NYCA Wind Speed (2013 – present)



December 24 – 27, 2022

- Lowest Temperature was 6.1°F
- Saturday, 12/24 Average Temperature: 10.0 °F
- Sunday, 12/25 Average Temperature: 19.4 °F
- Coincidence with Christmas Holiday resulted in lower load levels than would typically be realized under similar weather conditions

February 3 - 4, 2023

- Lowest Temperature was -2.3 °F
  - Coldest since 2/13 to 2/14/2016 (-6.3 °F)
  - Similar conditions observed in 2015 (2/16, 2/20, & 2/24)
- Friday, 2/3 Average Temperature: 16.2 °F
- Saturday, 2/4 Average Temperature: 9.5 °F
- High winds resulted in very low wind chill values and strongly impacted heating load

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

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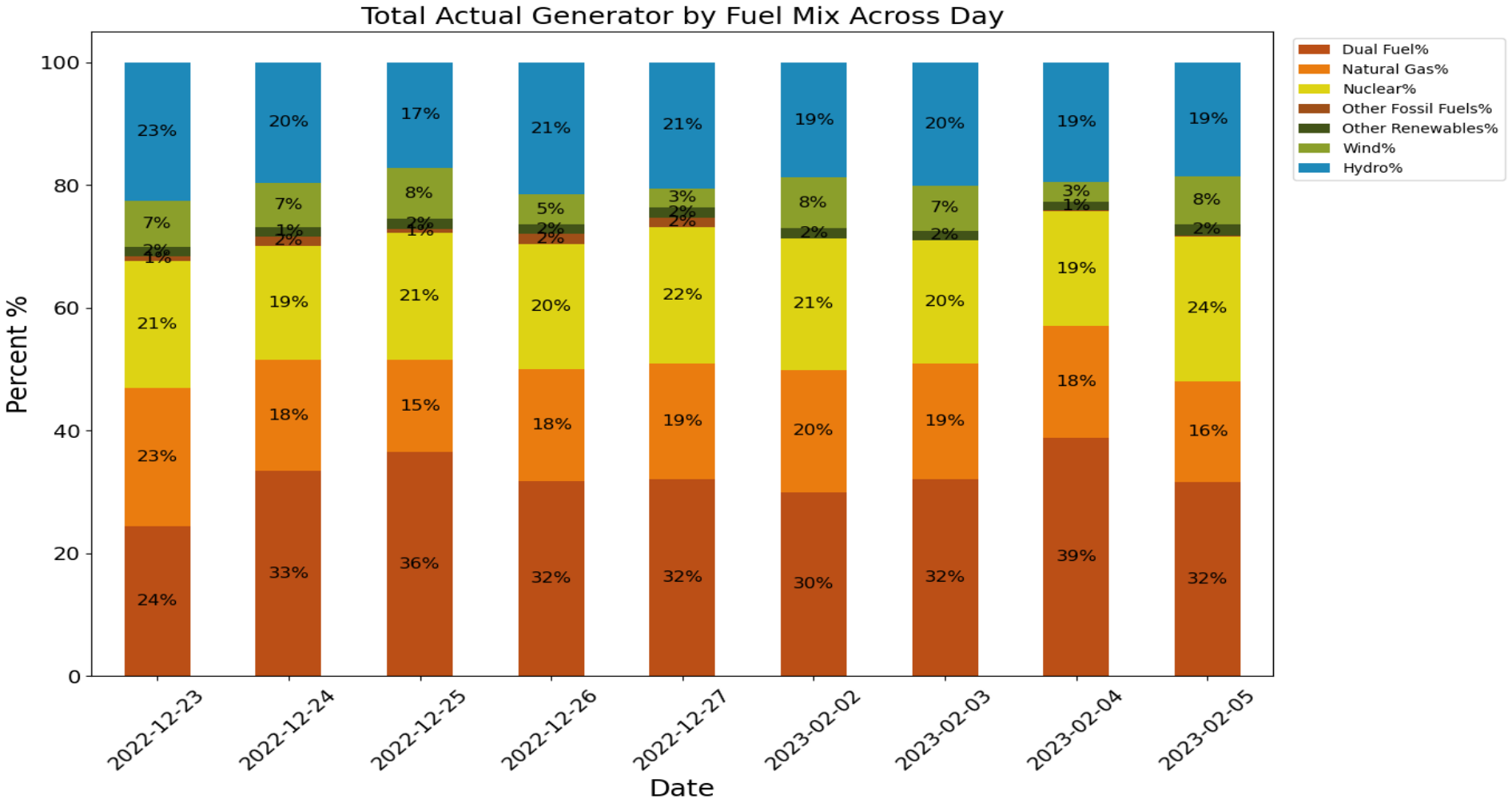
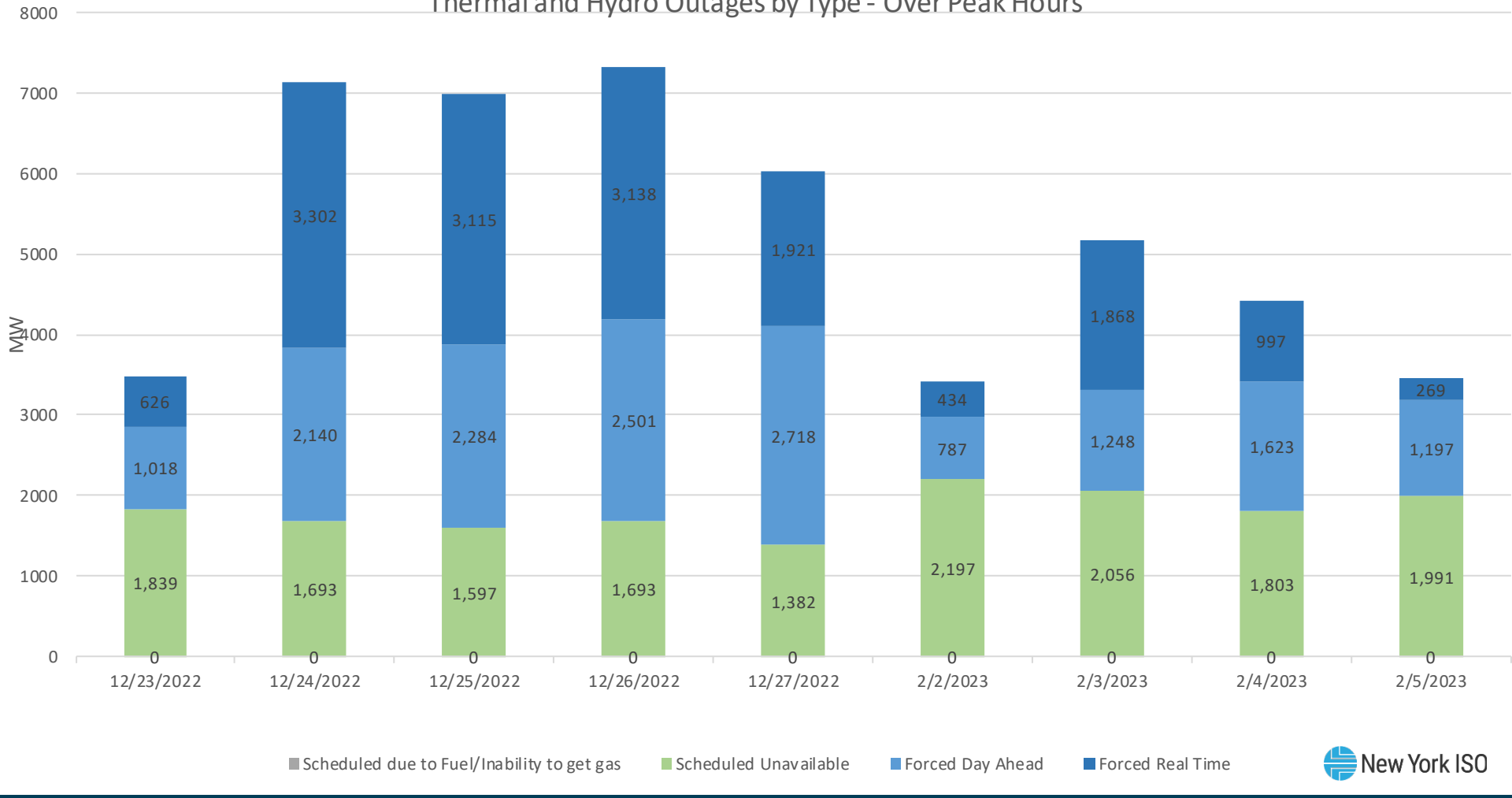


Thermal and Hydro Outages by Type - Over Peak Hours



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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
- **Other impactful outages throughout the season (not all occurring concurrently)**
  - Sprainbrook- East Garden City 345kV Y49
  - St. Lawrence-Moses 230kV L34P
  - Moses-Adirondack 230kV MA1
  - Moses-Willis 230kV MW1
  - Chases Lake-Porter 230kV 11
  - Valley Stream-Barrett 138kV 292
  - Northport-Elwood 138kV 681

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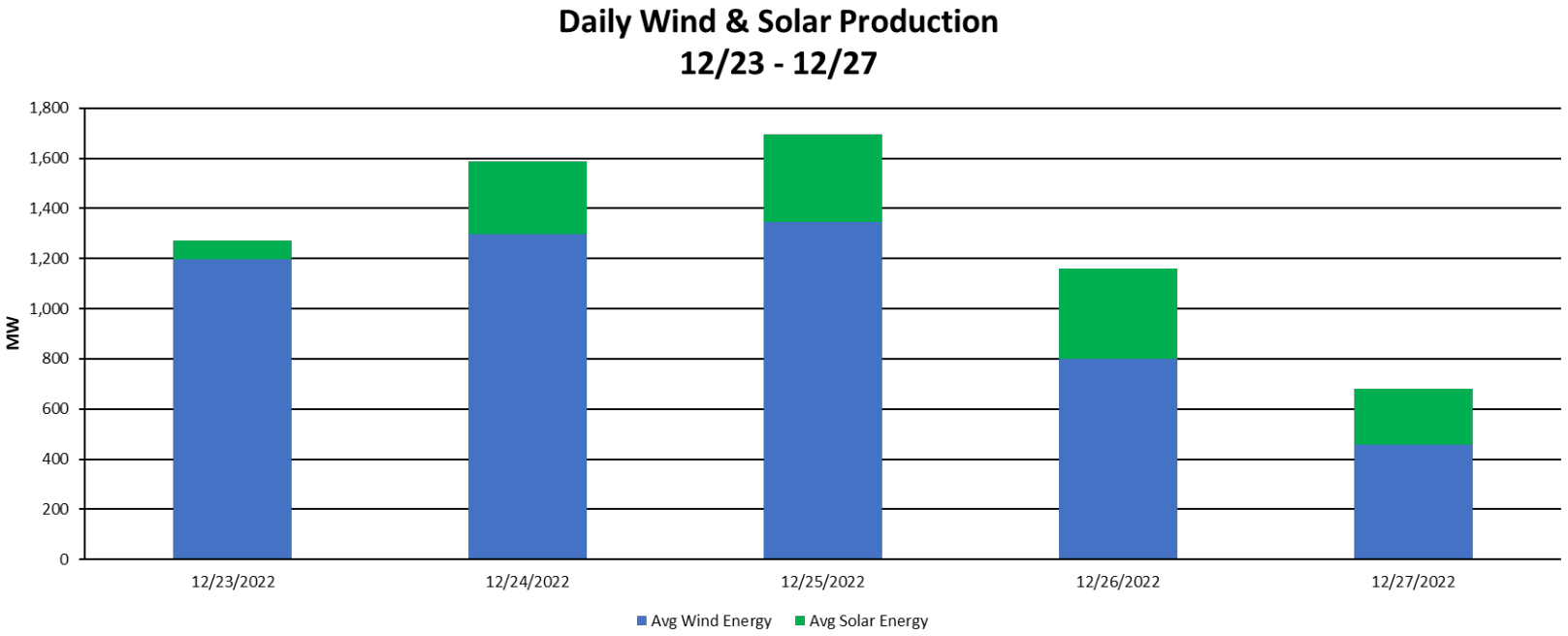
12/23 – 12/27 Renewable Chart #1



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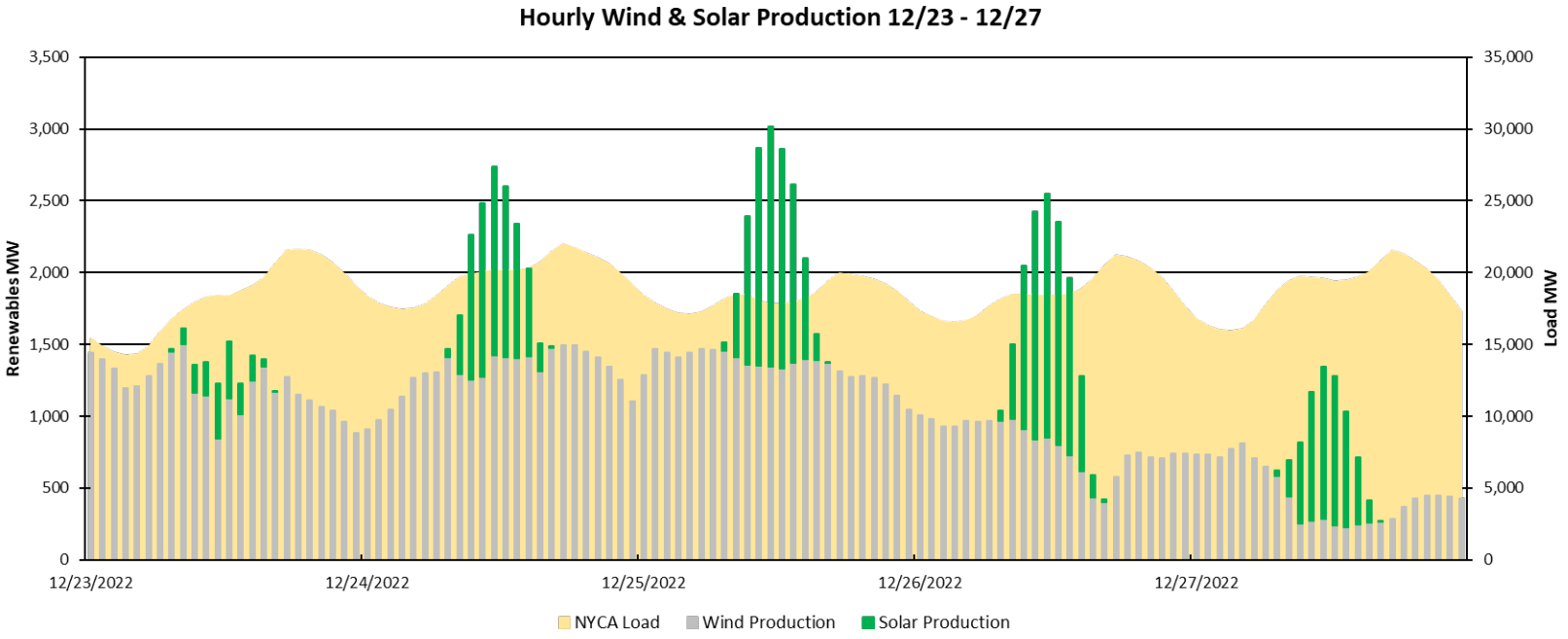
12/23 – 12/27 Renewable Chart #2a



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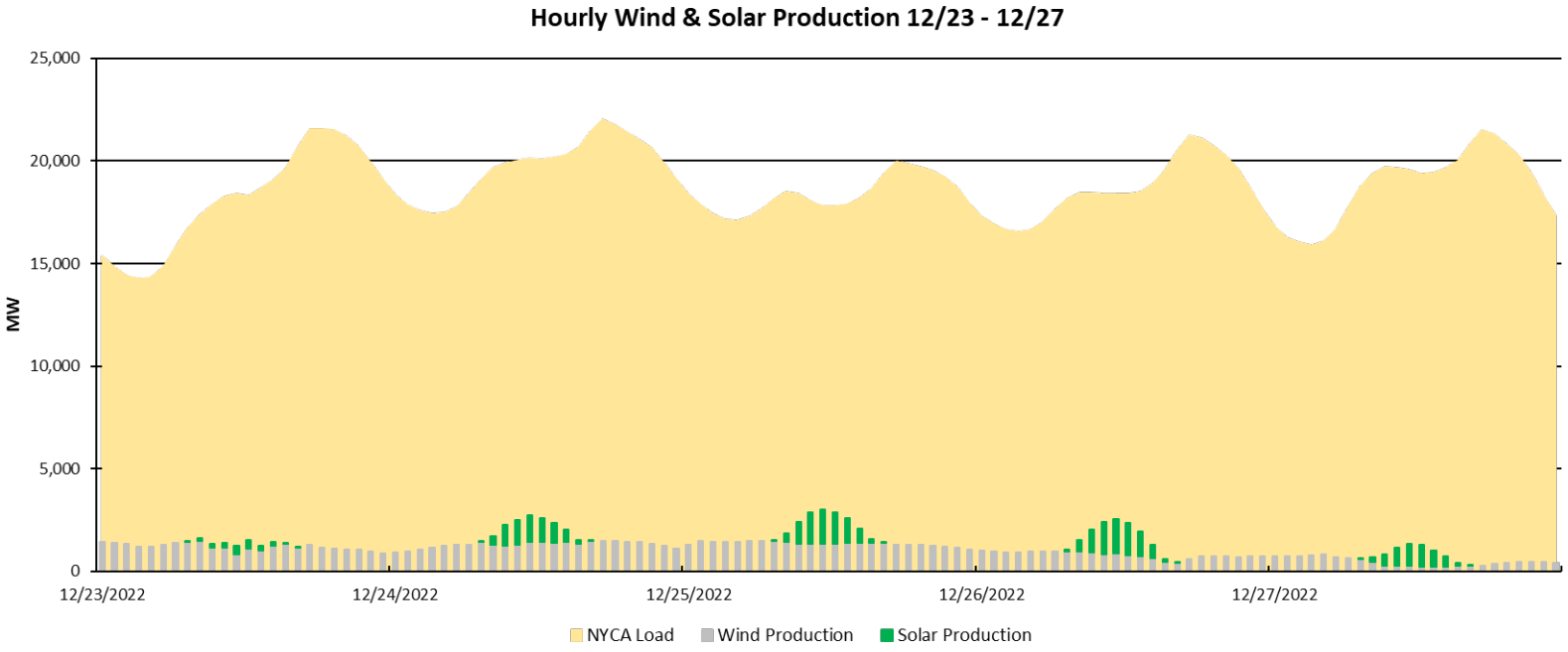
12/23 – 12/27 Renewable Chart #2b



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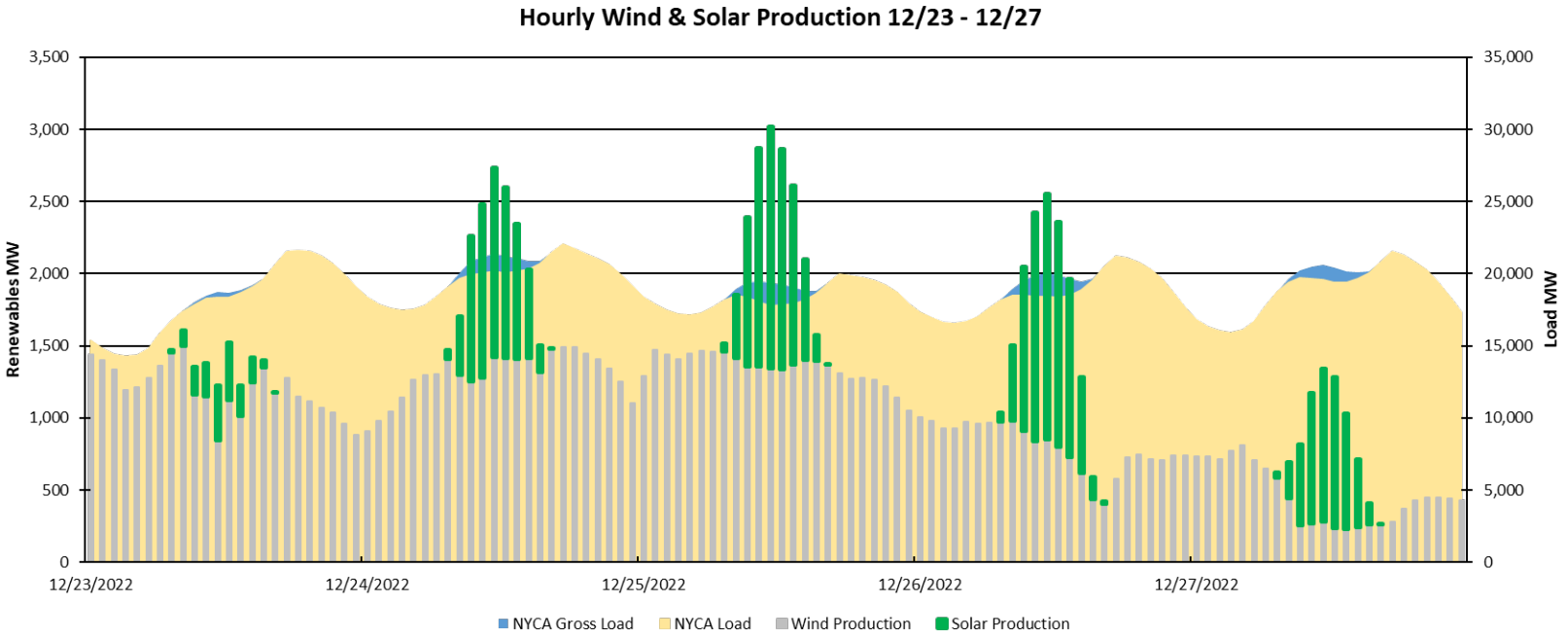
12/23 – 12/27 Renewable Chart #3a



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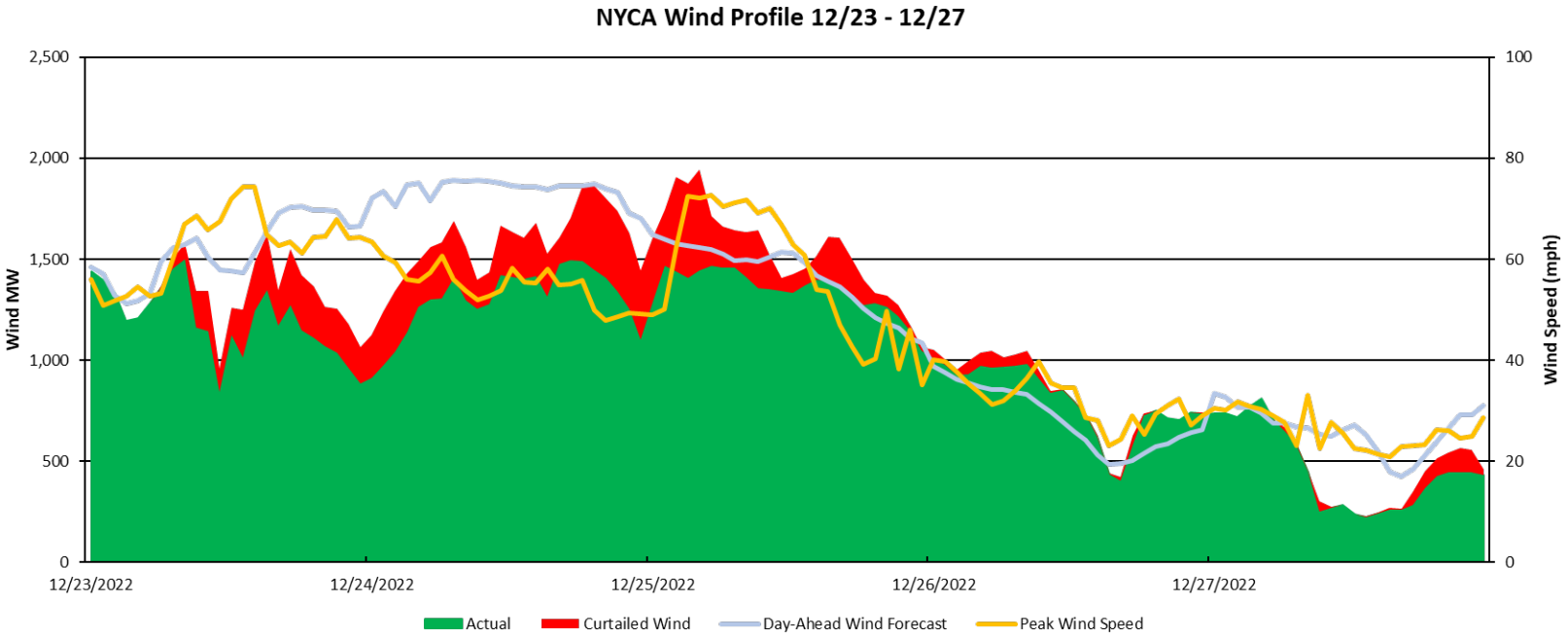
12/23 – 12/27 Wind Chart



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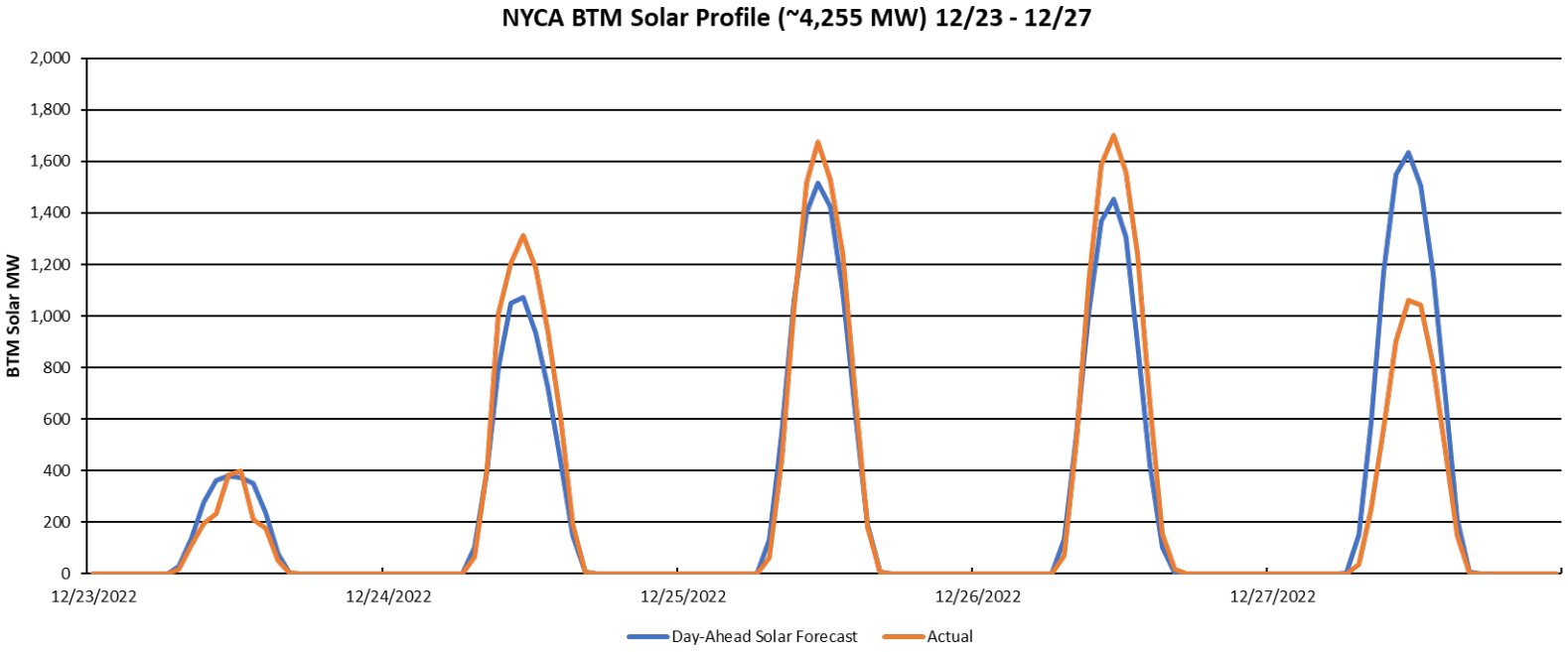
12/23 – 12/27 Solar Chart



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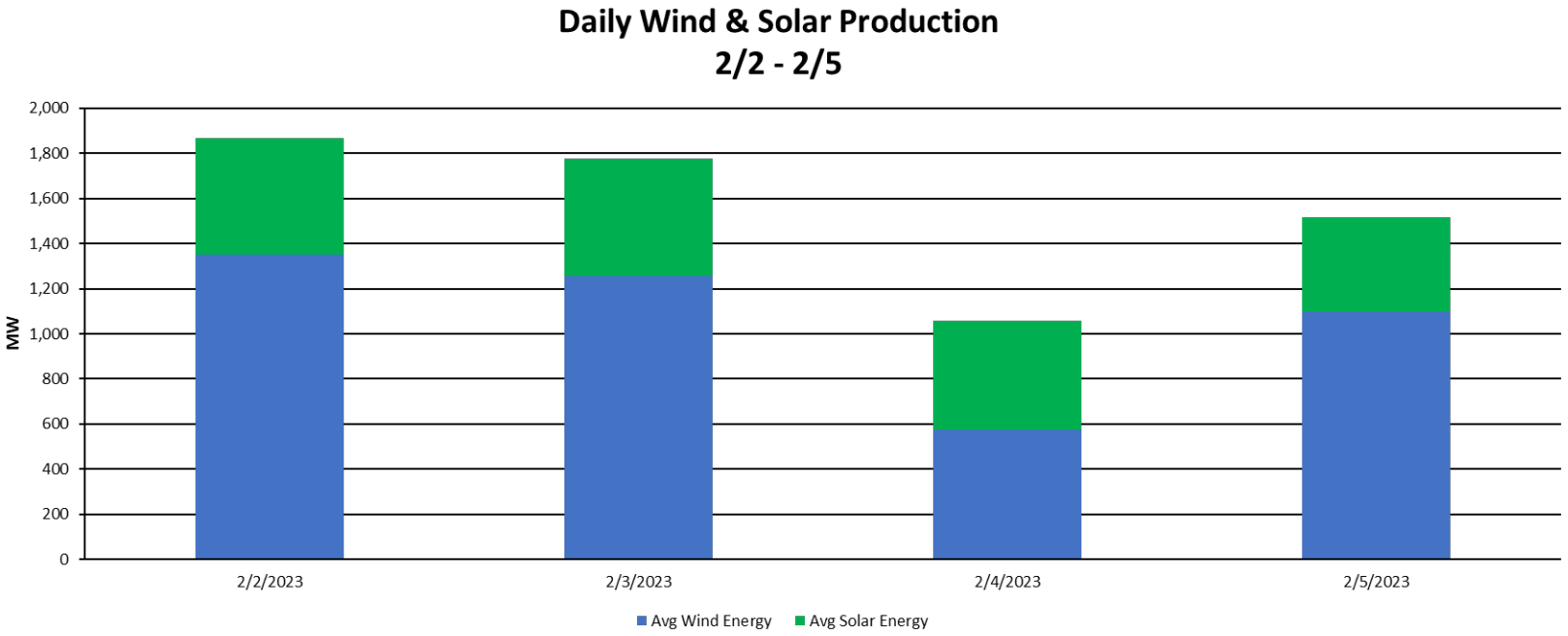
2/2 – 2/5 Renewable Chart #1



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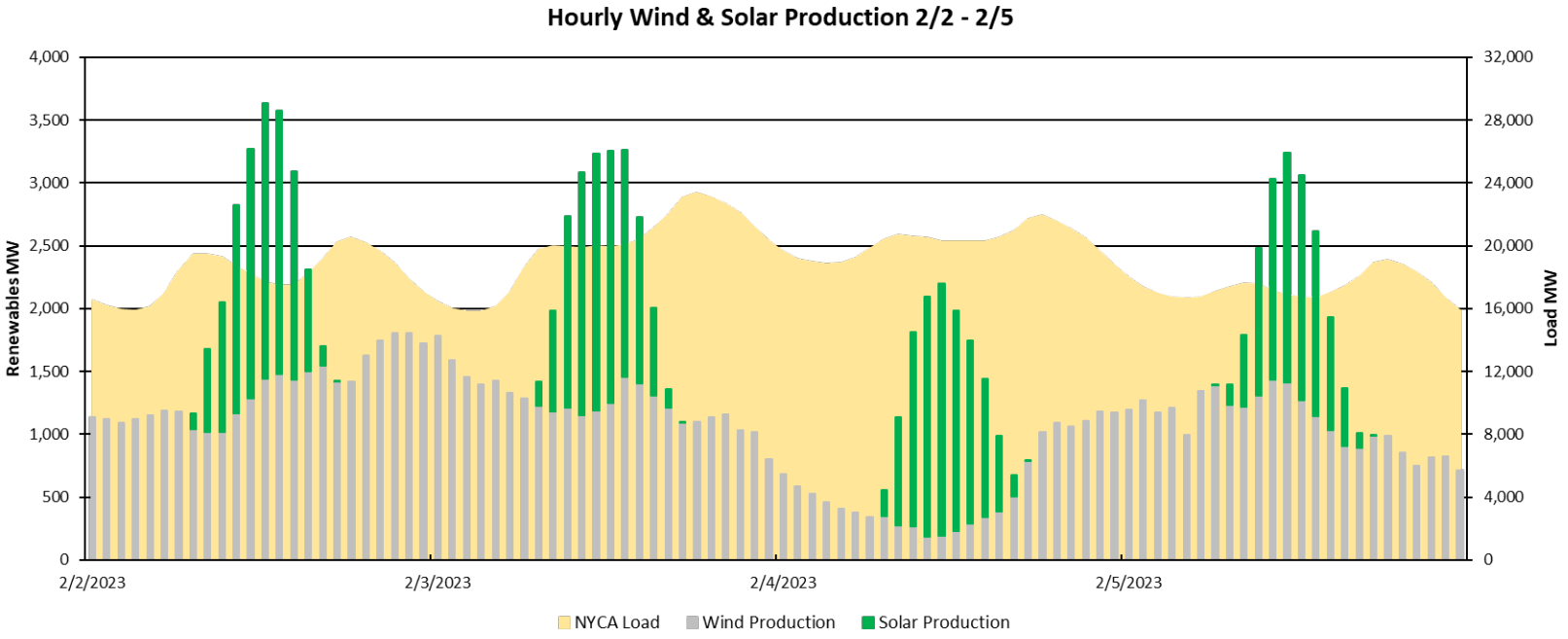
2/2 – 2/5 Renewable Chart #2a



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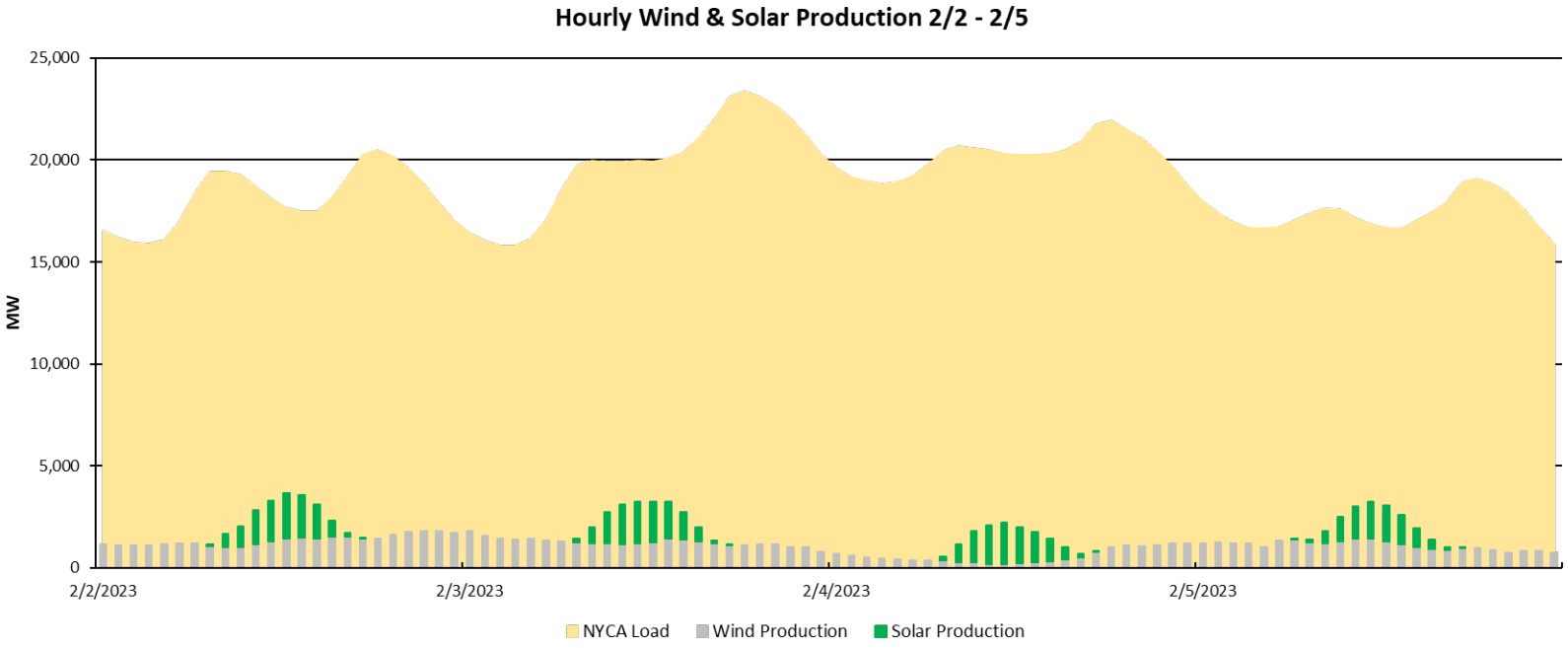
2/2 – 2/5 Renewable Chart #2b



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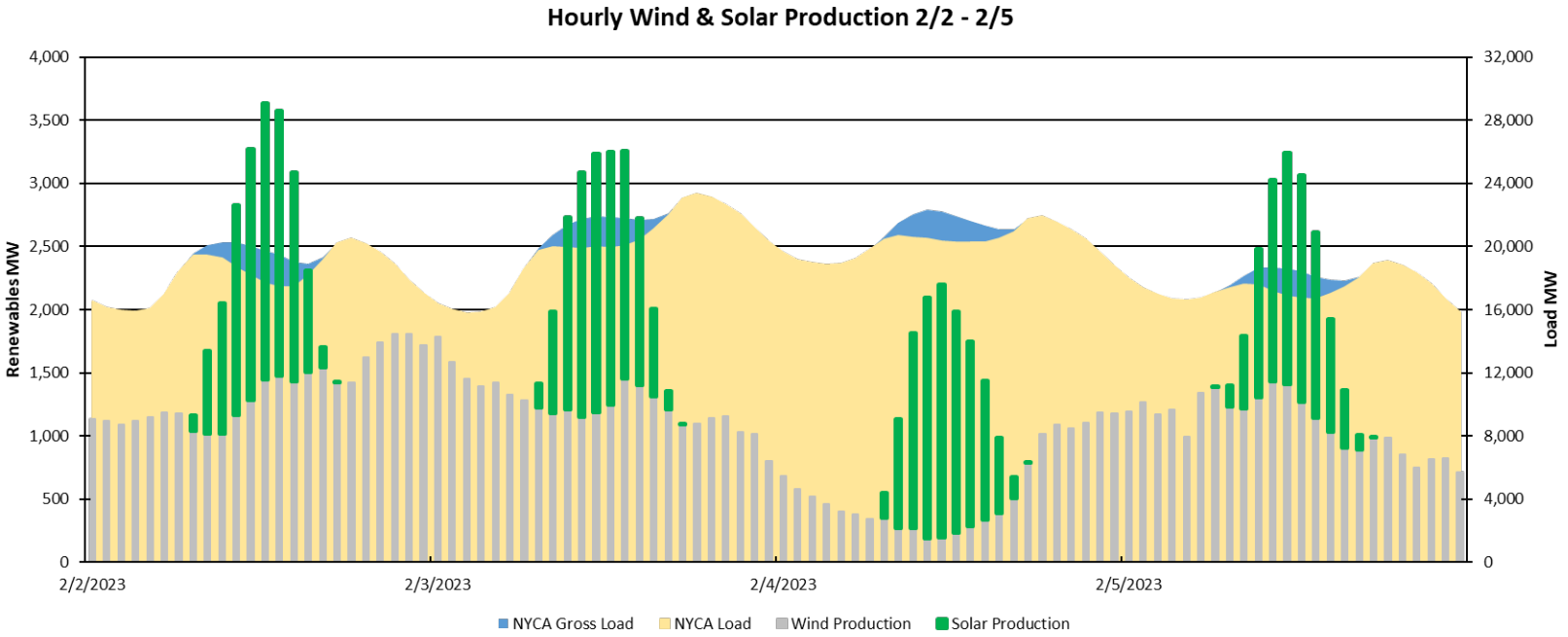
2/2 – 2/5 Renewable Chart #3a



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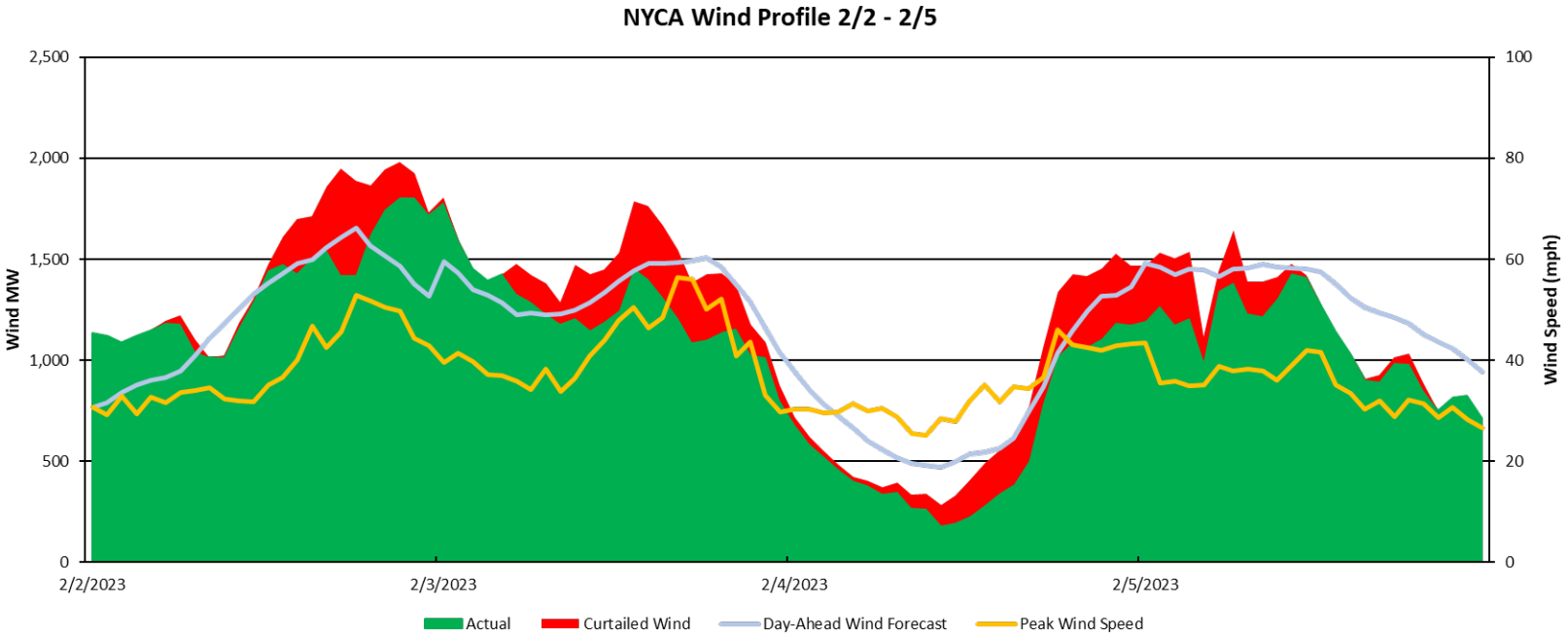
2/2 – 2/5 Wind Chart



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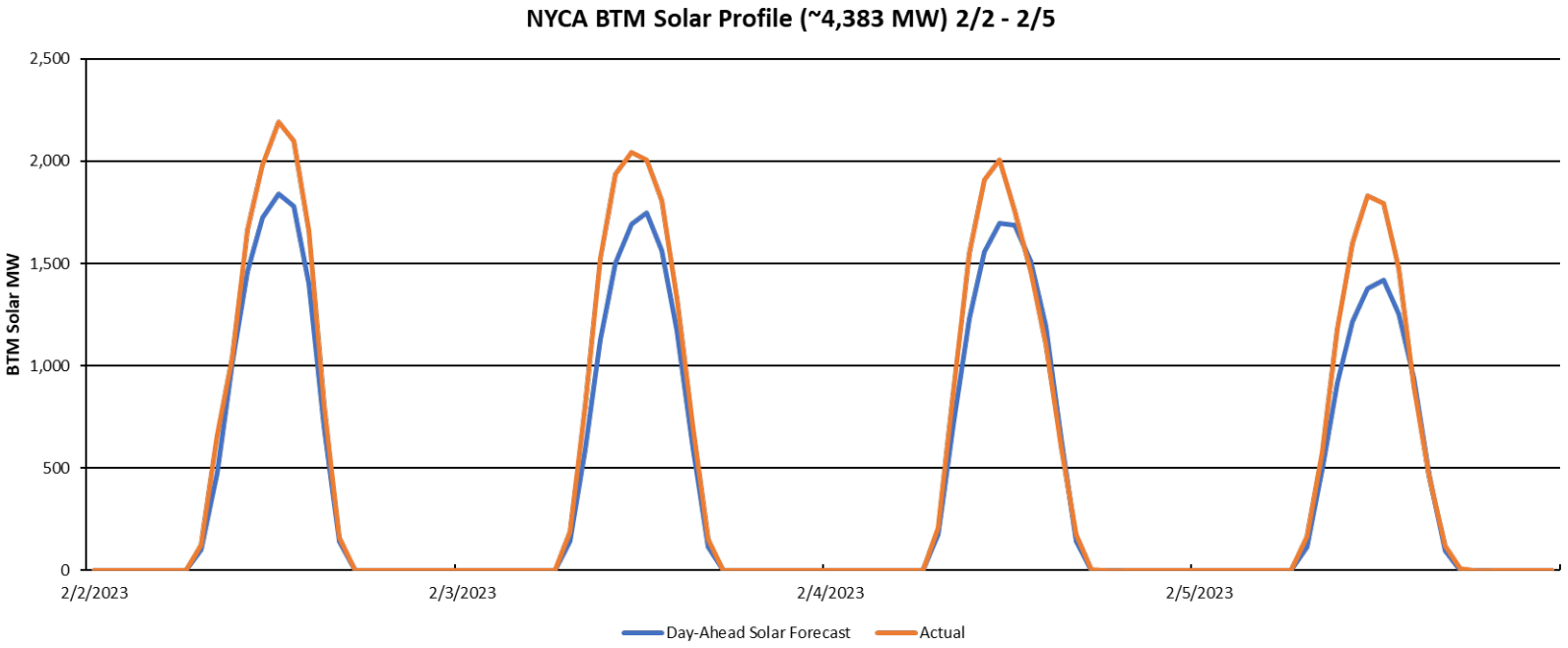
2/2 – 2/5 Solar Chart



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