New York ISO
Independent System Operator

2021-2022 Fuel & Energy Security Update

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NYISO Installed Capacity Working Group

June 16, 2022, Rensselaer, NY

Agenda

- Background
- Seasonal Assessment Enhancements
- Fuel and Energy Security Monitoring Update
- Appendix A - Review of Winter 2021-2022 Cold Weather Operations
- Appendix B – Additional Fuel and Energy Security Monitoring Observations
- Appendix C – Fall 2021 Fuel and Energy Security Monitoring

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Background

- **In 2019, the NYISO engaged Analysis Group (AG) to perform an assessment of fuel and energy security (FES) in New York**
  - The final study report as well as the NYISO Management Response are posted with the material for the November 21, 2019 ICAPWG/MIWG meeting
- **On October 27, 2020, the NYISO discussed with stakeholders its plan to monitor fuel security at least twice each year going forward.**
  - Aspects related to ongoing fuel and energy security monitoring have been included in the NYISO *Capacity Assessment and Winter Preparedness* and *Fuel and Energy Security Update* presentations to the Operating Committee

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Seasonal Assessment Enhancements

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Enhancements to Winter Preparedness Assessments

- **The NYISO's *2021-22 Winter Assessment & Winter Preparedness* presentation incorporated Fuel and Energy Security enhancements such as (see the presentation at the 11 12, 2021 NYISO Operating Committee meeting):**
  - Evaluating firm and non-firm capacity margins
  - Assessing a 99-1 peak forecast conditions scenario in addition to traditional 50-50, and 90-10 peak forecast scenarios
  - Consideration of scenario analysis utilizing Operations Internal Energy Assessment Tool (refer to Appendix C for further information regarding system conditions considered at the time of the 2021-2022 Winter Assessment & Winter Preparedness presentation)
  - A Weekly Oil Inventory summary based on Generator Fuel and Emissions Reporting (GFER) survey data

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Fuel and Energy Security Monitoring Update

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Spring 2022 Fuel Security Monitoring page 1

Status Key:

Well aligned with FES study
Trending towards bounds FES study
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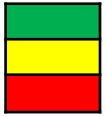

Item	Actual	Actual	Actual	Forecast	Forecast	Study Assumptions	Status
Deployment of new renewable and clean energy resources	2019/20	2020/21	2021/22	2023/24	2025/26	2023/24	
1) Wind	1,739 MW	1,739 MW	1,818 MW	2,763 MW	3,340 MW	2,531 - 5,274 MW	
2) Solar (Utility scale)	32 MW	32 MW	32 MW	882 MW	1,786 MW	2,728 - 7,086 MW (BTM & Utility)	
2a) Solar (BTM)	2,244 MW	2,786 MW	3,523 MW	5,152 MW	6,826 MW	2,728 - 7,086 MW (BTM & Utility)	
3)Energy Storage	207 MW	292 MW	638 MW	882 MW	1,778 MW	350 MW (4 hr)	
4) Offshore Wind	0 MW	0 MW	0 MW	136 MW	136 MW	0 MW 1,696 MW (2024)	
NYSDEC "Peaker Rule" impact	0 MW	100 MW	131 MW	1,241 MW	1,276 MW	1,350 MW	
Pollution Justice Act of 2021	-	-	-	N/A	N/A	N/A	
Winter Peak & 90/10 Forecast	23,253 MW	22,542 MW	23,235 MW	25,535 MW	26,007 MW	26,458 MW	
Nuclear Nameplate Capacity	5,424 MW	4,405 MW	3,358 MW	3,358 MW	3,358 MW	1,435 - 3,356 MW	
SCR/EDRP Capability (Winter)	853 MW	839 MW	630 MW	694 MW	694 MW	893 MW	

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Spring 2022 Fuel Security Monitoring page 2

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System Metrics	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2023/24**	
Largest Hydro and Thermal Forced Outages	3,169 MW (1/22/19)	2,299 MW (12/19/19)	4,704 MW (1/29/21)	2,645 MW (1/29/22)	2,576 - 5,152 MW	
Gas only generator outages due to lack of fuel	632 MW	160 MW	2,110 MW	1,905 MW	3,196 MW	
Change in oil nameplate capacity	-	-73 MW	137 MW	4 MW	0 to -2,185 MW	
Winter starting/ending oil inventory (MWh) ***See Slide 17***	2,008,788 MWh 2,040,097 MWh	2,038,589 MWh 1,948,550 MWh	1,971,746 MWh 1,795,308 MWh	1,874,101 MWh 1,225,457 MWh	Approx. 1,000,000 - 2,000,000 MWh	
Interchange over Winter Peak	2,890 MW	3,806 MW	3,541 MW	3,387 MW	-1,600MW to 900MW	
Winter Peak Real Time Fuel Mix Natural Gas (NG) Dual Fuel (DF)	 3,935 MW 5,651 MW	 4,454 MW 4,426 MW	 3,856 MW 5,430 MW	 3,216 MW 8,768 MW	NG 3,500 - 2,000 (A-F), NG 2,500 - 1,000 (G-K), 0MW (J-K)	
Firm Gas Generators	1,915 MW	1,911 MW	371 MW	2,484 MW	1,915 MW	
Pipeline Capacity	Im: 13,963 MMcf/d Ex: 6,827 MMcf/d	Im:13,978 MMcf/d Ex: 6,827 MMcf/d	Im:13,978 MMcf/d Ex: 6,827 MMcf/d	I:13,978 MMcf/d Ex: 6,827 MMcf/d	Im: 13,923 MMcf/d Ex: 7,136 MMcf/d	
WNY PPTN transmission project AC Transmission project (A&B)	AC transmission projects selected	2020 RNA COD 12/2023	2020 RNA COD 12/2023	6/22 (expected) 12/23 (expected)	In-Service	
SCR/EDRP Activations	0	0	0	-	5 activations/4 hours	

Proposed 2023 Project (Enhancing Fuel and Energy Security)

Problem / Opportunity

The 2023 Enhancing Fuel and Energy Security project would refresh the assumptions developed in the 2019 Enhancing Fuel and Energy Security project in recognition of the ongoing transformation of the bulk power system to assess emerging operational and grid reliability concerns. The NYISO also appreciates stakeholder concerns related to a wide range of potential grid resilience risks, including extreme weather scenarios and climate change impacts. The NYISO is concerned that future changes to New York's fuel supply mix as well as the expected increases in winter peak loads due to electrification may challenge the ability to meet electric system demands under certain stressed system conditions, such as a prolonged cold weather event and/or natural gas supply/transportation disruptions. NERC, NPCC and NYSRC are all currently considering new mandatory standards in this area. The 2023 Enhancing Fuel and Energy Security project should examine potential new reliability standards and the changing nature of the supply mix and load patterns and quantify the amount of resources that will be required based on a wide array of various study assumptions. Depending on the results of the study, the NYISO would facilitate the subsequent development of recommendations for potential operational and/or capacity and energy market enhancements necessary to achieve desired improvements in grid resilience as related to fuel and energy security.

Project Objective(s) & Anticipated Deliverable(s)

The 2023 project deliverable for this project will be Study Complete.

Project Justification

The NYISO is concerned that future changes to New York's fuel supply mix as well as the expected increases in winter peak loads due to electrification may challenge the ability to meet electric system demands under certain stressed system conditions, such as a prolonged cold weather event and/or natural gas supply/transportation disruptions. Additionally, NERC, NPCC and NYSRC are all currently considering new mandatory standards in this area.

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Cold Weather Events/Winter Storm Uri

- **The NYISO continues to monitor and evaluate important events and ongoing industry actions in response to potential winter reliability concerns, including:**
  - The cold weather events that occurred in the South-Central U.S. in February 2021 (Winter Storm Uri)
  - The FERC-NERC joint inquiry/report in response to Winter Storm Uri
    - Final report issued in November 2021
- **The NYISO provided its review of the final FERC-NERC joint inquiry report at the March 17, 2022 Operating Committee meeting**

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Appendix A – Review of Winter 2021-2022 Cold Weather Operations

(Slides from the April 27, 2022 presentation to the Management Committee)

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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

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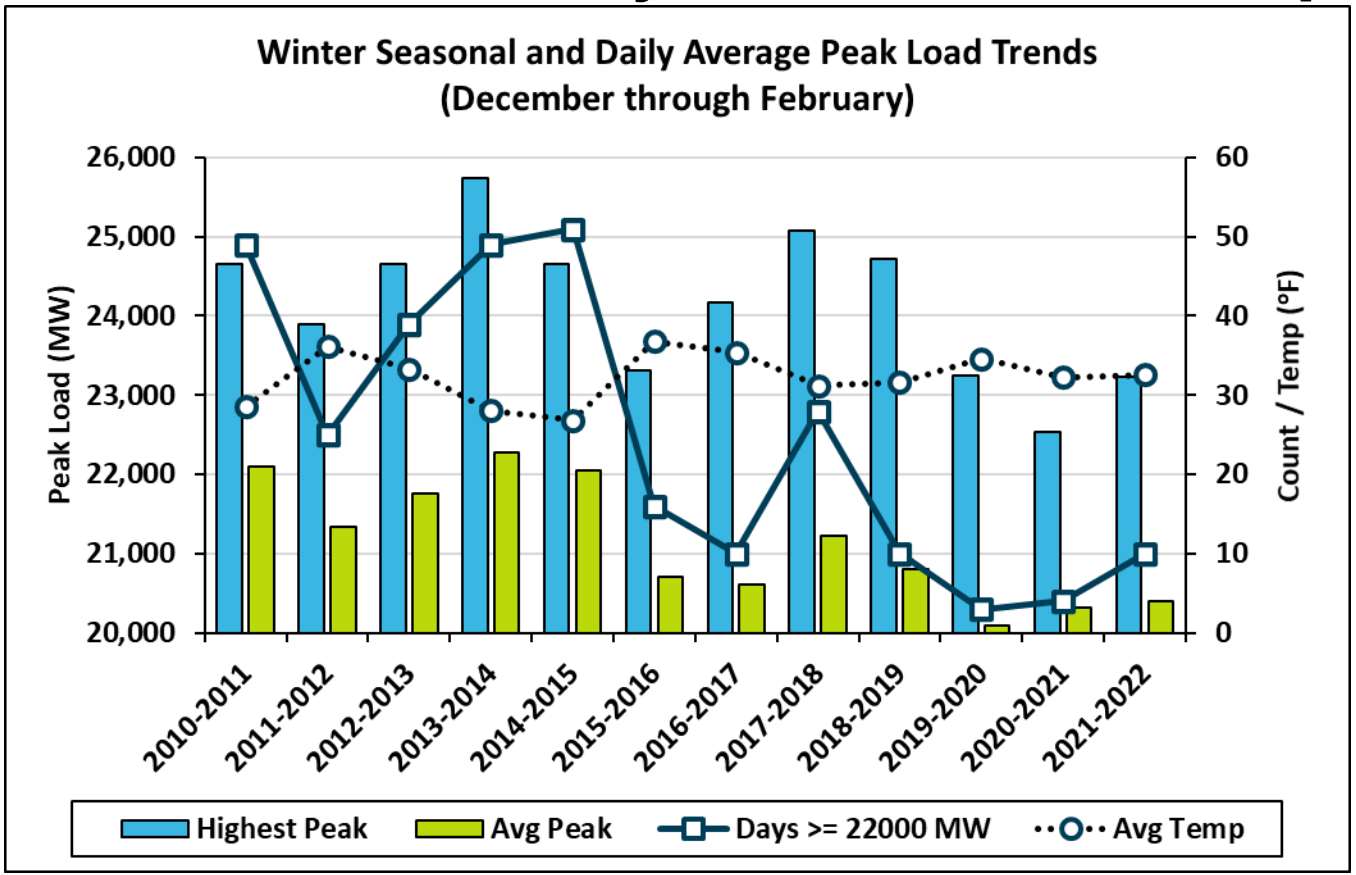
Winter 2021 – 2022 Daily Peak Loads In Perspective



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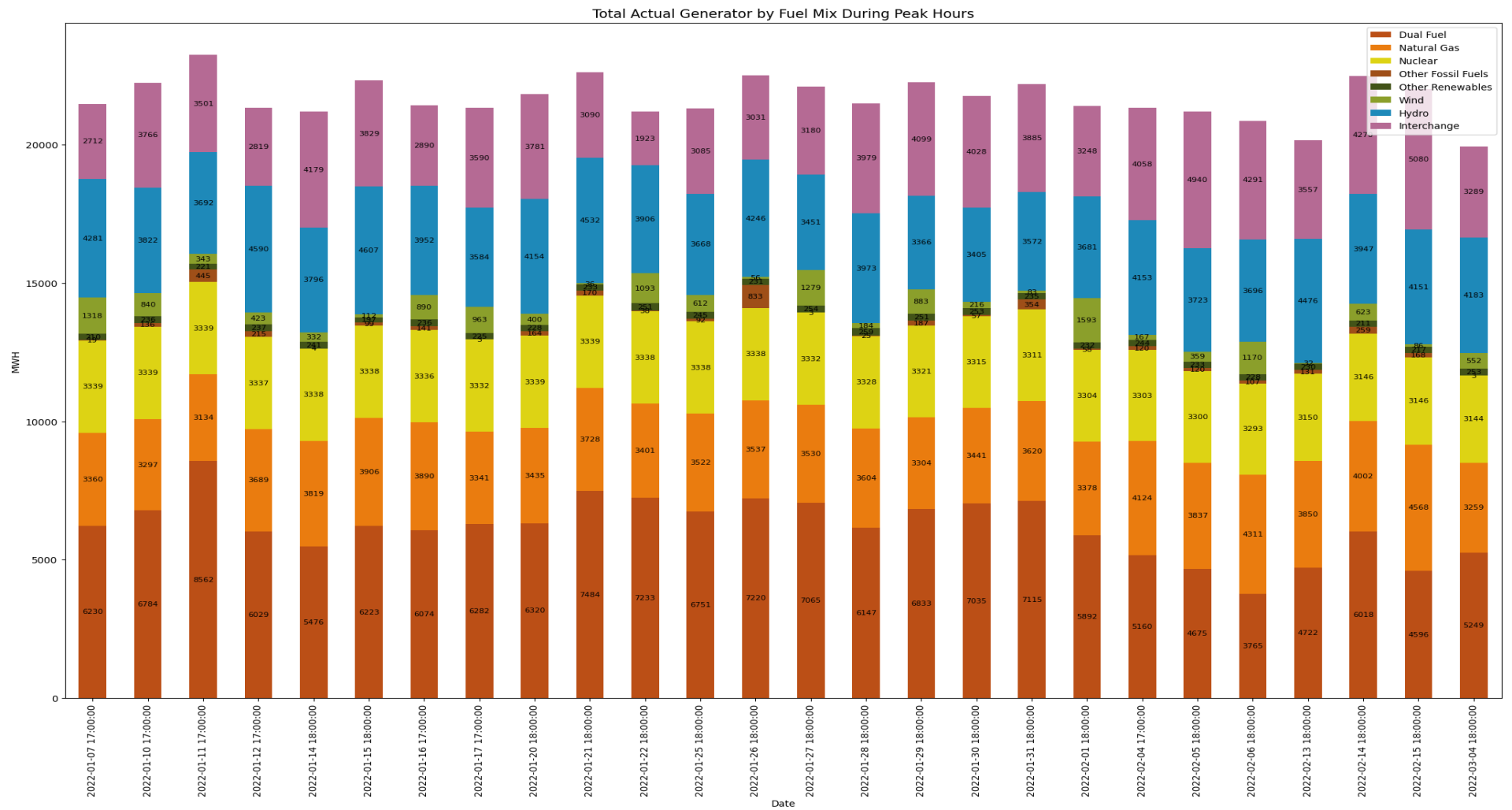
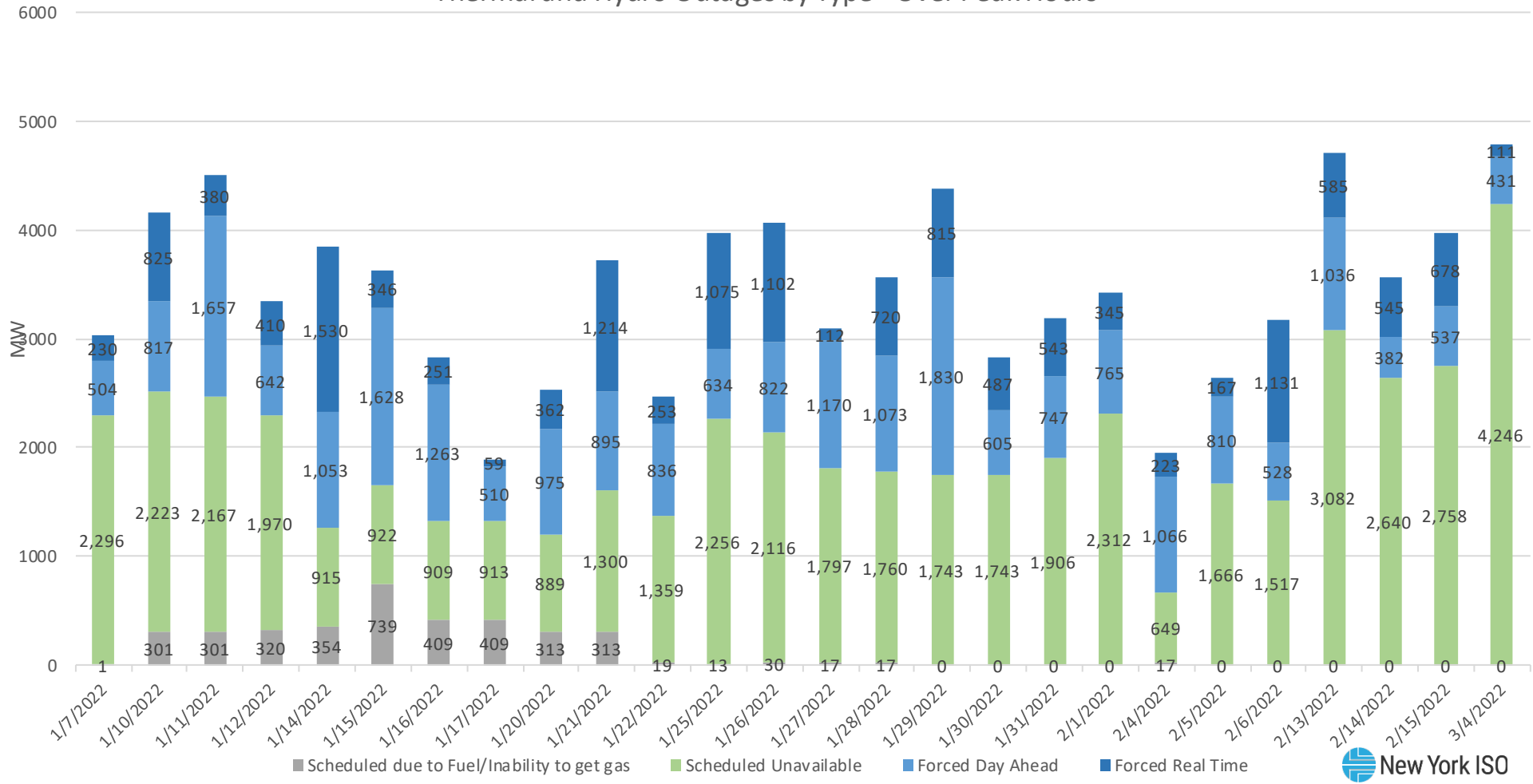
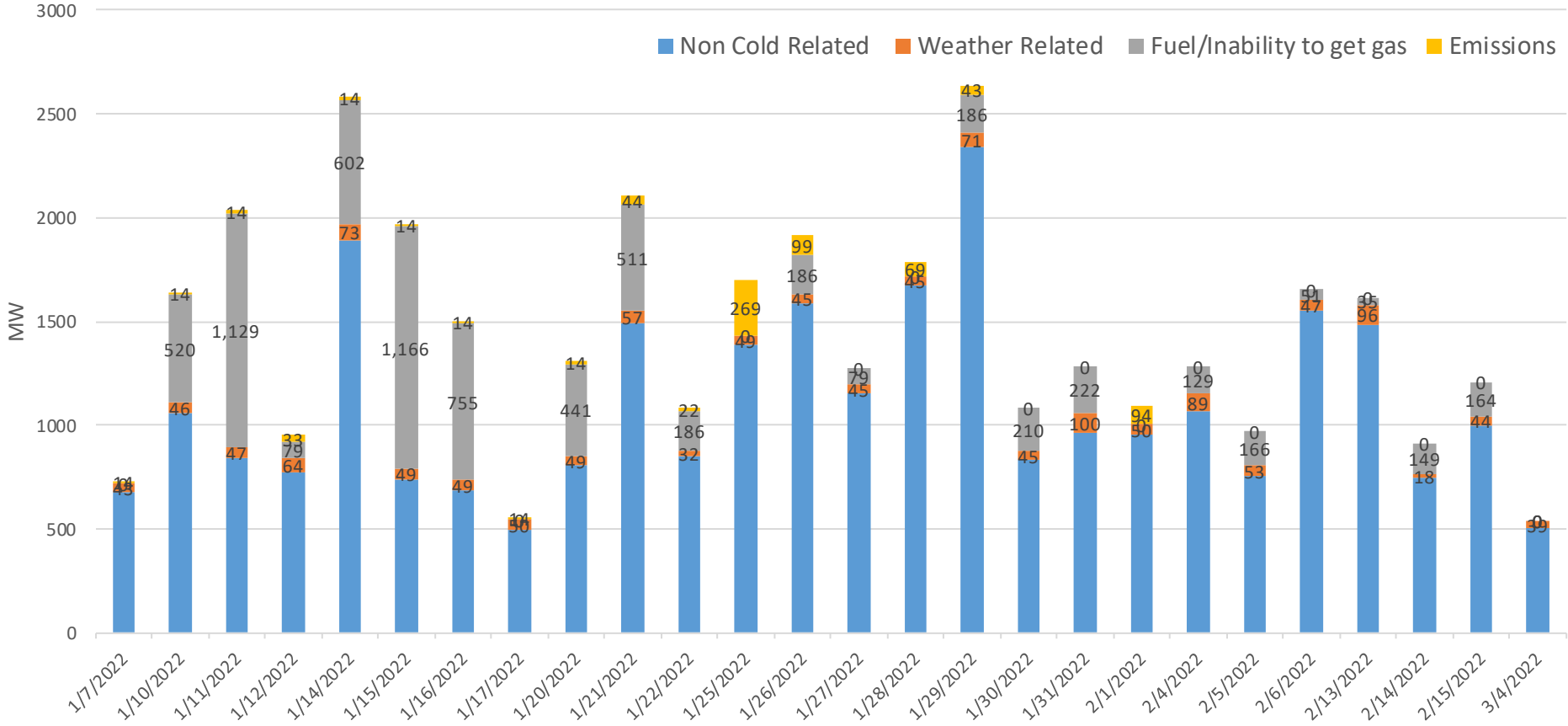


Thermal and Hydro Outages by Type - Over Peak Hours





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

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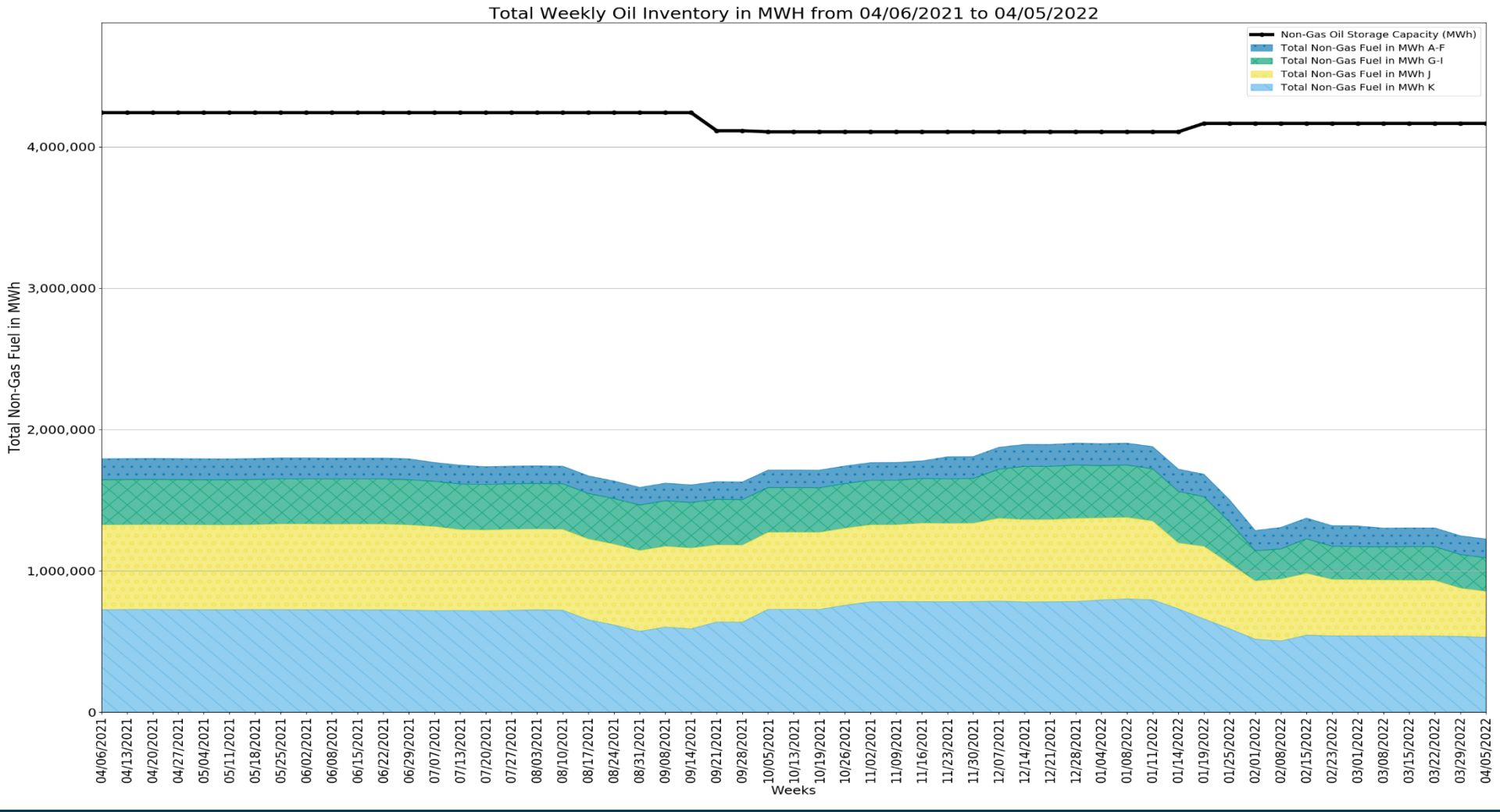
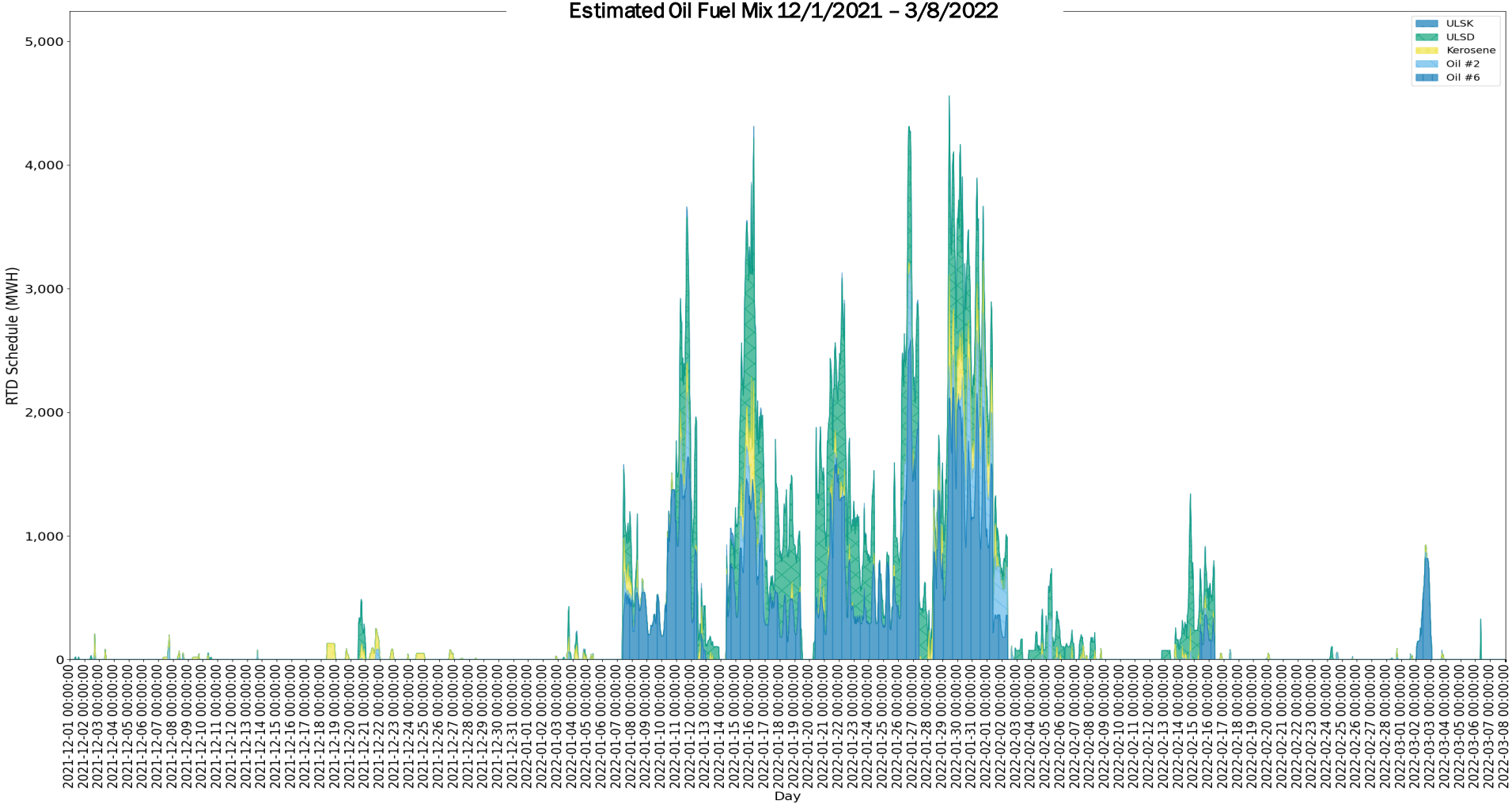


Estimated Oil Fuel Mix 12/1/2021 – 3/8/2022



Appendix B –Additional Fuel and Energy Security Monitoring Observations

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Monitoring related to FES study results

- **Based on the current Fuel Security Monitoring dashboard results (see Slides 7-8), the following slide identifies the cases from the 2019 FES study that appear most relevant in assessing the current status of fuel and energy security in NY.**
  - The “Low Fuel Inventory” disruption had 5 of 8 cases called out for concern when considering probability, consequence, and ease of mitigation
  - 6 of the 11 relevant cases present potential for loss of load events that are limited to Long Island
  - 3 of the 11 relevant cases identify potential for reliability concerns (reserve shortages or potential for loss of load events) within the first 7 days of the 17 day extended severe cold weather event modeled in the 2019 FES study

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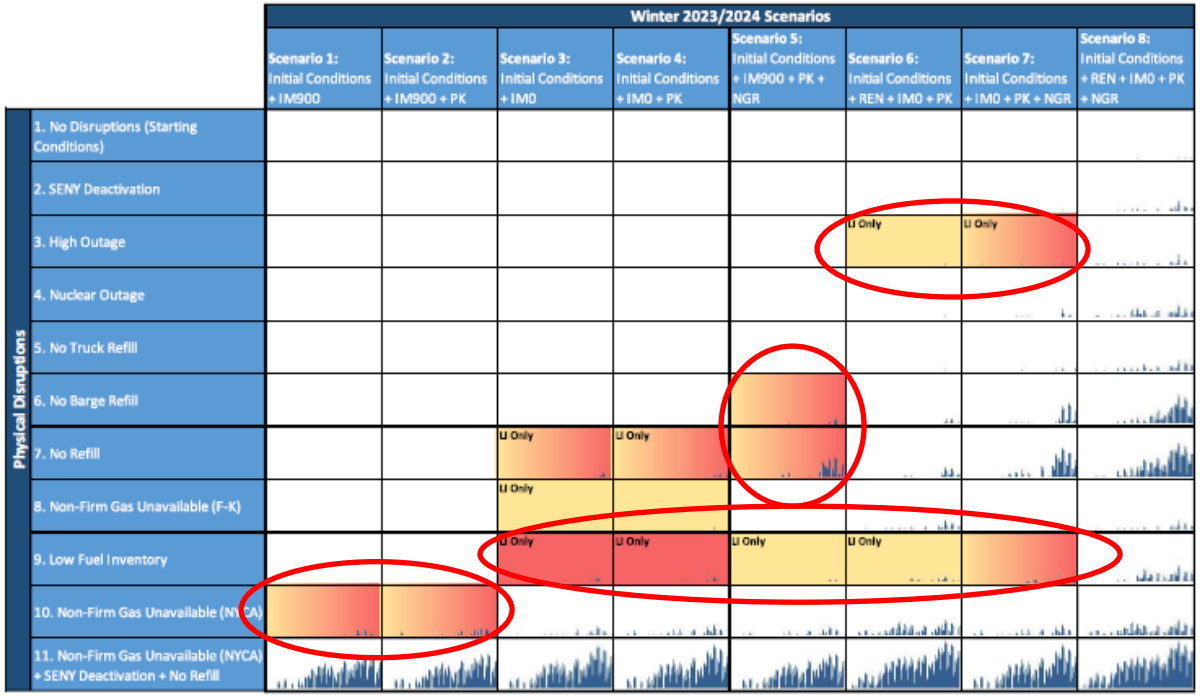
Figure ES-5: Heat Map of Reliability Risks



Note: The scale of the axes are equal in all cells. The y-axis is set to have a maximum of 16,000 MW.

Combined Assessment: Based on qualitative assessments of Probability, Consequence, and ease of Mitigation, grouped as follows:

- Consequence 0-100 MW or probability extremely low (far outside normal operational assessments)
- Consequence 100 - 1,500 MW, of moderate duration/frequency, and probability low (meaningfully less likely than normal operational assessments)
- Consequence greater than 1,500 MW, and probability low (meaningfully less likely than normal operational assessments)
- Consequence greater than 1,500 MW, and probability on the order of normal operational assessments

Scenario Key

REN = Delayed construction of new renewables, such that solar capacity is reduced to 38.5% and wind capacity is reduced to 48% of System Resource Shift assumed levels.
IM900 = 900 MW Capacity Imports.
IM0 = 0 MW Capacity Imports.
PK = NYSDEC "Peaker Rule" Retirements.
NGR = Reduced non-firm gas availability to support ~2000 MW of gas generation in Zones A-F, ~1000 MW of gas generation in Zones G-I, and no non-firm gas generation in Zones J and K.

4. Full Heat Map of Results and Emergency Actions Taken

		Winter 2023/2024 Scenarios							
		Scenario 1: Initial Conditions + IM900	Scenario 2: Initial Conditions + IM900 + PK	Scenario 3: Initial Conditions + IM0	Scenario 4: Initial Conditions + IM0 + PK	Scenario 5: Initial Conditions + IM900 + PK + NGR	Scenario 6: Initial Conditions + REN + IM0 + PK	Scenario 7: Initial Conditions + IM0 + PK + NGR	Scenario 8: Initial Conditions + REN + IM0 + PK + NGR
Physical Disruptions	1. No Disruptions (Starting Conditions)						Day 15	Day 9	Day 9
	2. SENY Deactivation (1000 MW)					Day 3	Day 15	Day 9	Day 6
	3. High Outage			Day 15	Day 15	Day 2	Day 15	Day 3	Day 3
	4. Nuclear Outage		Day 9		Day 15	Day 2	Day 15	Day 8	Day 3
	5. No Truck Refill			Day 7	Day 6	Day 3	Day 15	Day 9	Day 3
	6. No Barge Refill		Day 15	Day 16	Day 15	Day 9	Day 15	Day 7	Day 6
	7. No Refill	Day 15	Day 15	Day 15	Day 15	Day 8	Day 9	Day 6	Day 3
	8. Non-Firm Gas Unavailable (F-K)	Day 8	Day 8	Day 9	Day 15	Day 8	Day 3	Day 15	Day 3
	9. Low Fuel Inventory	Day 16	Day 16	Day 10	Day 10	Day 15	Day 10	Day 10	Day 6
	10. Non-Firm Gas Unavailable (NYCA)	Day 9	Day 2	Day 3	Day 2	Day 2	Day 2	Day 2	Day 2
	11. Non-Firm Gas Unavailable (NYCA) + SENY Deactivation + No Refill	Day 2	Day 2	Day 2	Day 2	Day 2	Day 1	Day 2	Day 1

No identified concerns

Curtailing of energy-only exports to ISO-NE

SCR/EDRP activation

Reserve shortage

Potential for loss of load (first occurring after Day 7)

Potential for loss of load (first occurring on or before Day 7)

Note: White text indicates a concern that is confined to occurring on Long Island only

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Appendix C – Fall 2021 Fuel and Energy Security Monitoring

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Fall 2021 Fuel Security Monitoring page 1

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2) Solar (Utility scale)	32 MW	32 MW	32 MW	951 MW	1,281 MW	2,728 - 7,086 MW (BTM & Utility)	
2a) Solar (BTM)	1,563 MW	2,116 MW	2,545 MW	4,736 MW	5,883 MW	2,728 - 7,086 MW (BTM & Utility)	
3)Energy Storage	44 MW	207 MW	292 MW	919 MW	1,569 MW	350 MW (4 hr)	
4) Offshore Wind	0 MW	0 MW	0 MW	0 MW	GB doesn't currently track Offshore Wind	0 MW 1,696 MW (2024)	
NYSDEC "Peaker Rule" impact	0 MW	0 MW	0 MW	756 MW	791 MW	1,350 MW	
Pollution Justice Act of 2021	-	-	-	N/A	N/A	N/A	
Winter Peak & 90/10 Forecast	24,728 MW	23,253 MW	22,542 MW	25,257 MW	25,224 MW	26,458 MW	
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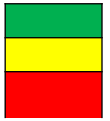

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Pipeline Capacity	Im: 13,963 MMcf/d Ex: 6,827 MMcf/d	Im:13,978 MMcf/d Ex: 6,827 MMcf/d	Im:13,978 MMcf/d Ex: 6,827 MMcf/d	-	Im: 13,923 MMcf/d Ex: 7,136 MMcf/d	
WNY PPTN transmission project AC Transmission project	AC transmission projects selected	2020 RNA COD 12/2023	2020 RNA COD 12/2023	2022 2023	In-Service	
SCR/EDRP Activations	0	0	0	-	5 activations/4 hours	

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

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