New York ISO
Independent System Operator

2022-23 Winter Assessment & Winter Preparedness

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Agenda

- Key Observations
- Winter 2022-23 Capacity Assessment
- Winter 2022-23 Preparedness
- Infrastructure Updates
- Appendix A: Regional and Local Fuel Inventories & Fuel Prices
- Appendix B: Short Term Fuel and Energy Security Assessment
- Appendix C: Fuel & Energy 2024 Study; Update Tracking & Monitoring

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Key Observations – 2022-23 Winter Capacity Assessment

- **The NYISO expects sufficient winter capacity margins assuming all firm and non-firm fuel generation available under normal and extreme weather conditions**
    - 10,296 MW - capacity margin for 50-50 peak forecast conditions
    - 9,067 MW - capacity margin for 90-10 peak forecast conditions
    - 8,103 - capacity margin for 99-1 peak forecast conditions
- **Winter capacity margins assuming all firm and non-firm fuel generation available are declining (1,140 MW reduction since Winter 2018-19)**
    - Non-firm fuel generation includes gas-only fired generation without firm gas transportation contract arrangements.
    - Firm fuel generation includes all generation types other than non-firm fuel generation (e.g., nuclear, hydro, wind, solar, oil fired only, dual fuel capable, gas only with firm gas transportation)

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Key Observations – 2022-23 Winter Capacity Assessment

- The NYISO expects sufficient winter capacity margins assuming only firm fuel generation available under normal and extreme weather conditions
  - 3,813 MW - capacity margin for 50 -50 peak forecast conditions
  - 2,584 MW - capacity margin for 90-10 peak forecast conditions
  - 1,620 MW - capacity margin for 99-1 peak forecast conditions
- Winter capacity margins assuming only firm fuel generation available has declined significantly (3,007 MW reduction since Winter 2018-19)
- Continued reductions in winter capacity margins, disruptions in fuel supplies or other winter operational concerns may result in operational challenges given the reliance on firm fuel generation during extreme cold weather events. NYISO and stakeholders have prioritized a 2023 project to update the 2019 Energy and Fuel Security Assessment to evaluate operational reliability needs

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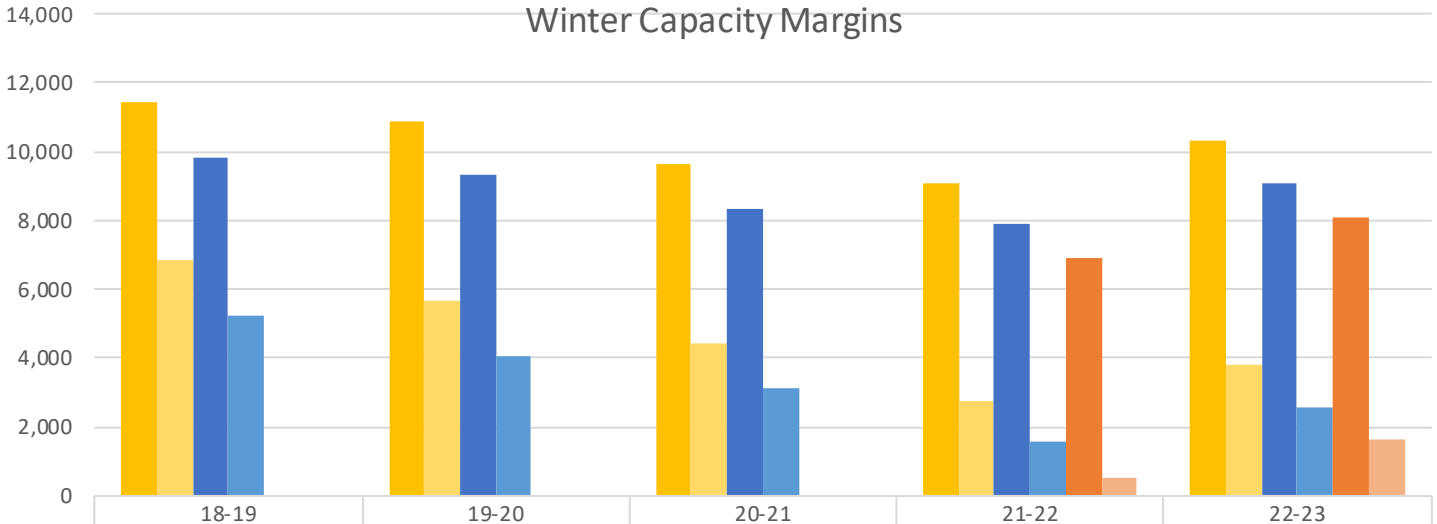
Winter 2018-19 to Winter 2022-23 Capacity Margins



	18-19	19-20	20-21	21-22	22-23
50/50 - Firm and Non-Firm Fuel	11,436	10,900	9,638	9,080	10,296
50/50 - Only Firm Fuel	6,820	5,668	4,447	2,730	3,813
90/10 - Firm and Non-Firm Fuel	9,821	9,299	8,309	7,916	9,067
90/10 - Only Firm Fuel	5,205	4,067	3,118	1,566	2,584
99/1 - Firm and Non-Firm Fuel				6,875	8,103
99/1 - Only Firm Fuel				525	1,620

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Winter Assessment Summary

- Capacity included from NYISO Gold Book
- Capacity is adjusted for projected and actual additions and deactivations
- Two Fuel Cases: Base Case & Loss of Gas
- Three Weather Scenarios: Normal, 90/10 Cold Weather, 99/1 Cold Weather

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2021-22 & 2022-23 Winter Capacity Assessment & Comparison

Line	Item	2021-22		2022-23		
		Baseline Forecast	90th Percentile Forecast	Baseline Forecast	90th Percentile Forecast	99th Percentile Forecast
1a	Winter Generation Capacity[1]	40,239	40,239	40,393	40,393	40,393
1b	SCR - ICAP Values	630	630	694	694	694
1c	Net Purchases & Sales	1,546	1,546	2,097	2,097	2,097
1	**Total Capacity Resources**	**42,415**	**42,415**	**43,184**	**43,184**	**43,184**
2	Assumed Unavailable Capacity (Gen+SCR)[2]	-6,690	-6,690	-6,375	-6,375	-6,375
3 = 1 + 2	**Net Capacity Resources**	**35,725**	**35,725**	**36,809**	**36,809**	**36,809**
4	Peak Load Forecast	24,025	25,189	23,893	25,122	26,086
5	Operating Reserve Requirement	2,620	2,620	2,620	2,620	2,620
6 = 4 + 5	**Total Capacity Requirement**	**26,645**	**27,809**	**26,513**	**27,742**	**28,706**
7 = 3 - 6	**Capacity Margin**	**9,080**	**7,916**	**10,296**	**9,067**	**8,103**

1. Reflects the 2022 Gold Book existing capacity with projected and actual deactivations and additions during 2022-23
2. Derates: 2,073 MW for wind, 515 MW for Hydro, 2,472 MW for thermal units, 82 MW for other renewables, and 326 MW for SCRs.

- 2021-2022 actual winter peak load was 23,235 MW on January 11 HB 17.
- The all-time winter peak was 25,738 MW, set on January 7, 2014

2022-23 Winter Capacity Assessment - Gas Scenarios

Line	Item	Baseline Forecast	90th Percentile Forecast	99/1 Forecast
1a	Installed Capacity Resources	40,393	40,393	40,393
1b	SCR - ICAP Values	694	694	694
1c	Net ICAP External Imports	2,097	2,097	2,097
1	NYCA Resource Capability	**43,184**	**43,184**	**43,184**
2	Total Projected Capacity Outages	-6,375	-6,375	-6,375
3 = (1-2)	Net Installed Capacity Resources	**36,809**	**36,809**	**36,809**
4	Load Forecast	23,893	25,122	26,086
5	Operating Reserve Requirement	2,620	2,620	2,620
6 = (3-4-5)	Capacity Margin	**10,296**	**9,067**	**8,103**
7a	Subtract All Gas Only Units and Duct Burner Capabilities	-8,968	-8,968	-8,968
7 = (6-7a)	Capacity Margin, Loss of Gas	1,328	99	-865
8a	Add Back Units with Firm Gas Contracts	2,484	2,484	2,484
8 = (7-8a)	Expected Capacity, Loss of Non-Firm Gas Case	3,813	2,584	1,620

- Duct Burner derates account for approximately 500 MW

Winter 2022-23 Operational Preparedness

- ISO Operations is monitoring regional fuel supplies as indications are these could be limited in supply this winter. US Energy Information Administration (EIA) indicates oil inventories both regionally and throughout the United States are below historical values.
- Seasonal and weekly fuel surveys indicate oil and dual fuel capability generation have lower than normal start-of-winter oil inventories. Outreach to generators whose inventory level was significantly lower than 1 year ago generally indicates replenishments are planned prior to winter. See Appendix B "Total weekly oil inventory in MWh"
- ISO Operations has surveyed most generating stations to discuss past winter operations, preparations for the upcoming winter, including last dual fuel operation, cold-weather preventative maintenance, fuel procurement arrangements, and fuel switching capabilities.
- ISO Operations' coordination of transmission and generation maintenance outages helps mitigate the reliability impact of such outages during extreme cold weather periods.

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Winter 2022-23 Operational Preparedness

- Participated in various communications and coordination efforts with NERC, state agencies (DPS, NYSERDA), other ISOs/RTOs, and gas industry personnel, including Interstate Natural Gas Association of America (INGAA), Natural Gas Supply Association (NGSA), Northeast Gas Association (NGA), NY pipelines, and NY LDCs
- NERC Project 2019-06 Cold Weather was completed and approved resulting in changes to the EOP-011, IRO-010, and TOP-003 Standards, effective April 1, 2023
  - EOP-011-2 requires generators to have a cold weather preparedness plan for its generators and to provide this information to their Transmission Operator (TOP). NYISO is performing an analysis of the minimum operating temperatures provided via the annual GFER survey to use in future efforts.

https://www.nerc.com/pa/Stand/Pages/Project%202019-06%20Cold%20Weather.aspx

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Winter 2022-23 Operational Preparedness

- The NYISO continues to monitor and evaluate important events and ongoing industry actions in response to potential winter reliability concerns and provided its review of the final FERC-NERC joint inquiry report at the March 17, 2022 Operating Committee meeting
- NYISO led a review of load shedding processes/procedures and coordination of the gas-electric critical infrastructure survey with the New York Transmission Owner Planning Working Group (TOPWG)
- Defined and implemented Tariff modifications to support Critical Electric System Infrastructure Load (CESIL) being excluded from NYISO Demand Response Programs

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Gas-Electric Coordination

- **A communications protocol is in place with NY state agencies to improve the speed and efficiency of generator requests to state agencies for emissions waivers if needed for reliability**
  - Protocol was leveraged in January 2018 and proved effective in facilitating communications between parties
- **An emergency communications protocol is in place to communicate electric reliability concerns to pipelines and gas LDCs during tight electric operating conditions**
  - Cooperative process with interstate pipelines and LDCs for providing OFO information to the NYISO
- **FERC Order No. 787**
  - The NYISO modified its Code of Conduct (ISO OATT Att F) per the Order to accommodate pipeline requests for reliability information

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Situational Awareness

- **Control Room gas-electric support**
- **Video boards**
  - Northeast interstate pipeline system is displayed
  - Operational Flow Orders are displayed with readily detectable visualization techniques
  - Continuously enhancing weather displays to analyze potential impacts on NY generation and loads
- **A web-based, fuel survey "portal" provides generator fuel information to the operators**
  - Updated weekly by generators
  - Updated daily during cold weather conditions, upon request by the NYISO

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Other Winter Operational Challenges

- **Intra-day Gas Procurement**- Gas only fired generating resources are likely to be unavailable for operation if not scheduled in the ISO's day-ahead energy market due to the difficulty in procuring intra-day gas
- **Alternate Fuel Replenishment**– Generator burn rates of alternative fuels can exceed replacement rates during extreme cold weather conditions
- **Emissions Limitations**– Use of alternate distillate fuels by oil or dual fuel capable generation may be further restricted by emission limits
- **Retail Gas LDC Priority** - Gas Local Distribution Company (LDC) retail gas demand has priority over electric power generation

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Generation Deactivations*

Station Name	Nameplate MW
Ravenswood GT 11 (IIFO)	25
Sterling (proposed retirement)	65
Nassau Energy Corporation (retired)	55
Hudson Avenue 3	16
Hudson Avenue 5	16
Gowanus 1-1 through 1-7	140
Gowanus 4-1 through 4-8	160
TOTAL	**477**

* Since the 2022 Summer Assessment

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Generation Additions*

Station Name	Nameplate MW
Ball Hill Wind	100
Eight Point Energy Center	101
Baron Wind (Phase 1)	118
Calverton Solar Energy Center	23
Number 3 Wind Energy	106
Bluestone Wind	124
Bear Ridge Solar	100
TOTAL	**672**

* Since the 2022 Summer Assessment

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Transmission Operations

Equipment	Voltage (kV)	Status
Hudson-Farragut B3402	345	Out-of-Service
Marion-Farragut C3403	345	Out-of-Service
St. Lawrence-Moses L34 PAR	230	Out-of-Service
Warren-Falconer 171	115	Operated Normally Open
Sprain Brook/Dunwoodie Series Reactors	345	Bypassed
Marcy South Series Capacitors	345	Bypassed
Moses-Adirondack MA-1 or MA-2	230	Out-of-Service for rebuild, 48 hour recall
Sprainbrook-East Garden City Y49	345	Out-of-Service until May 31
Moses-Willis MW1	230	Out-of-Service for rebuild, 24 hour recall

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Appendix A
Regional and Local Fuel Inventories

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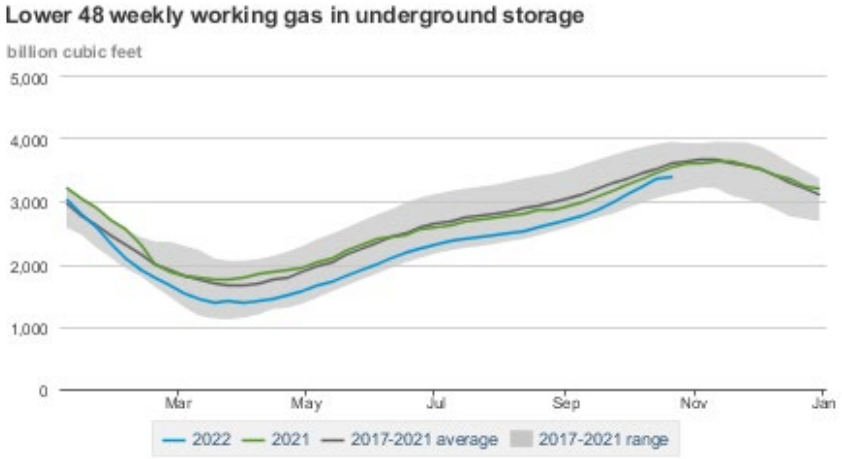
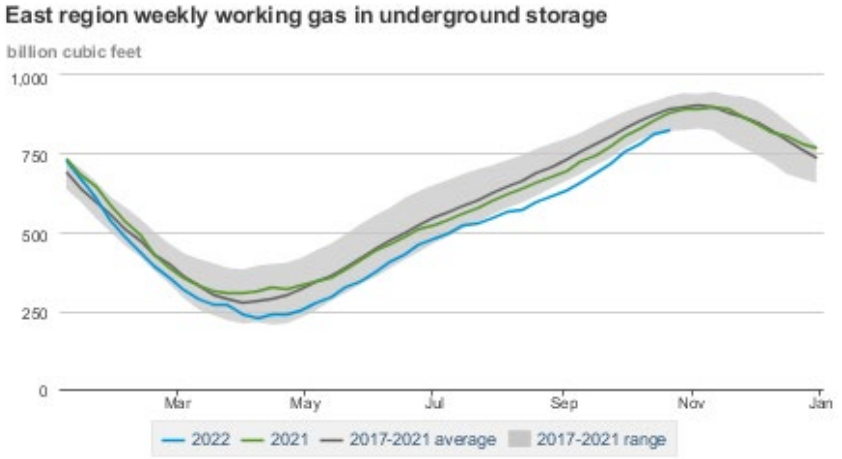
Natural gas underground storage levels





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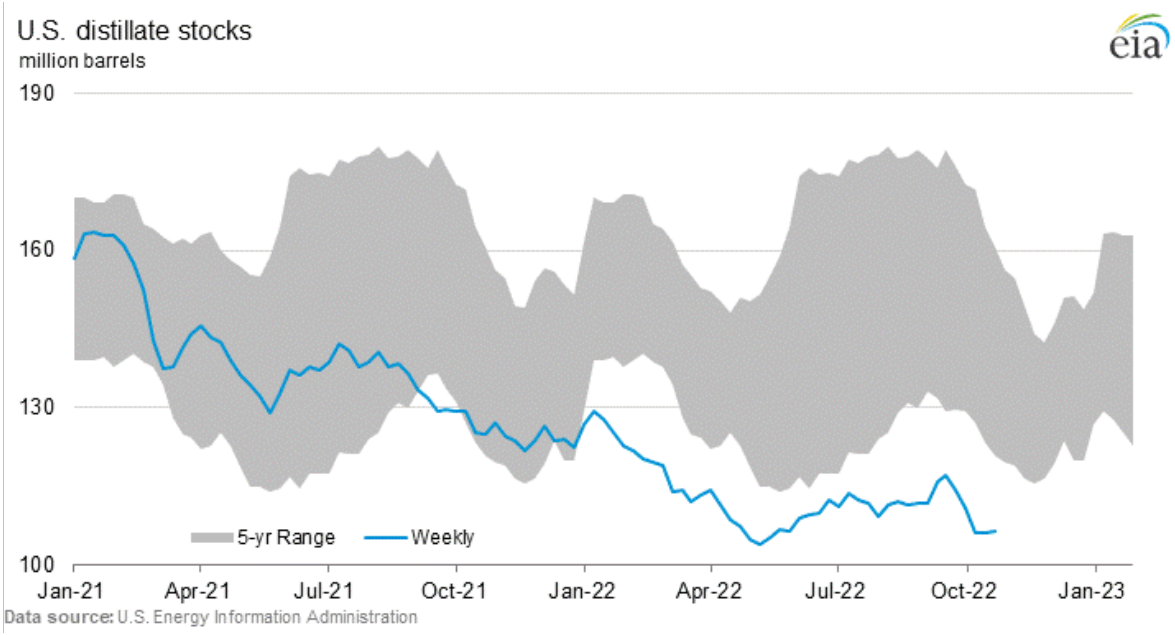
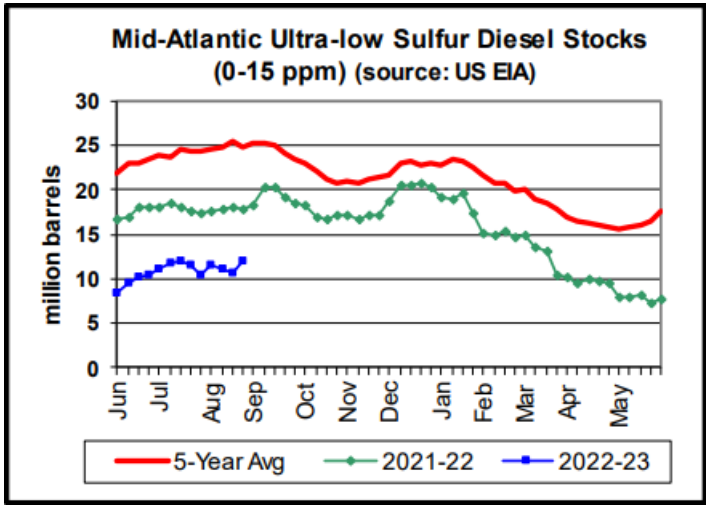
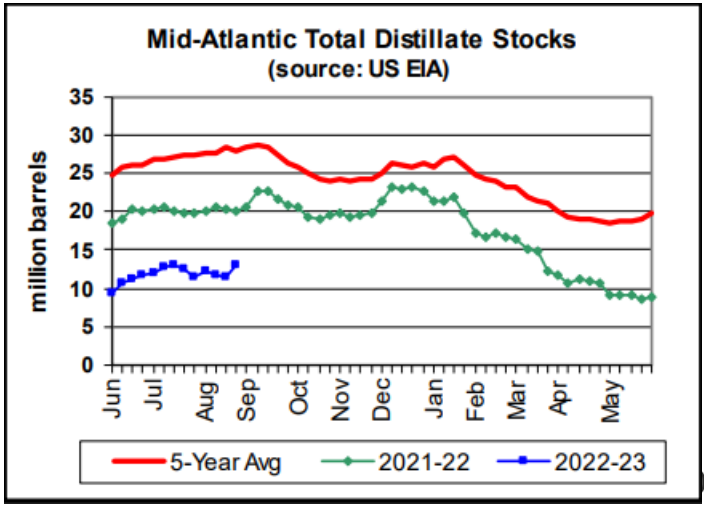
Distillate Inventories

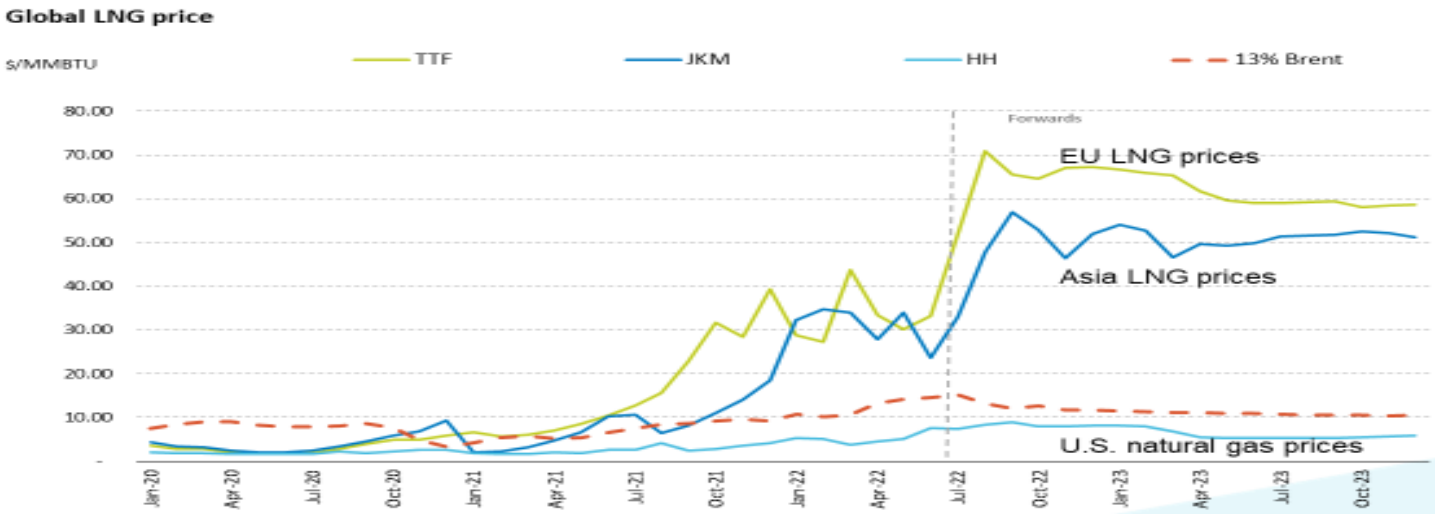






LNG export capability exposing domestic natural gas markets to global dynamics

U.S. Natural Gas Prices Exponentially Lower Than EU, Asia



Source: ICE. Future curves are based on 8/17/2022 settlements

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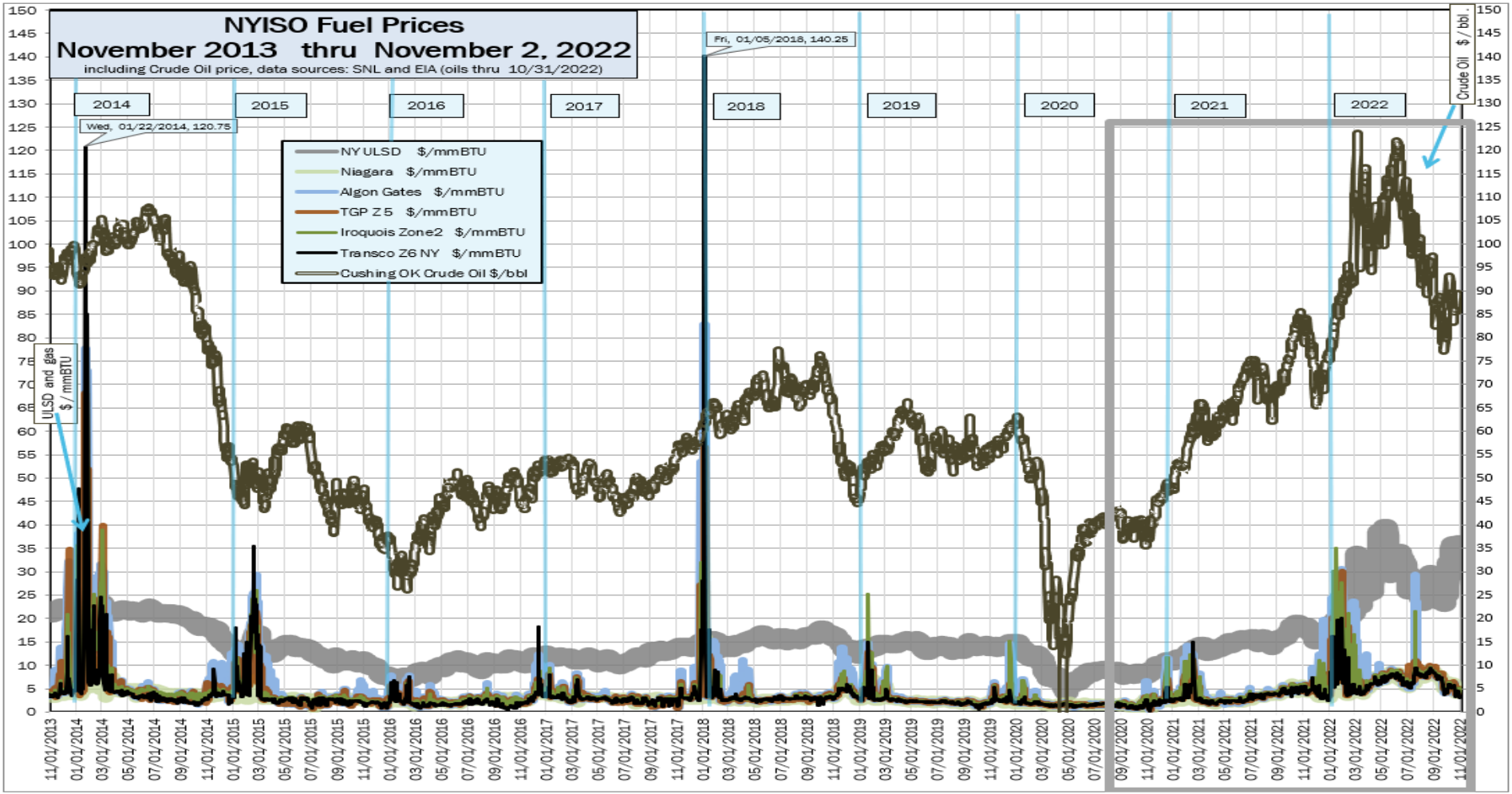

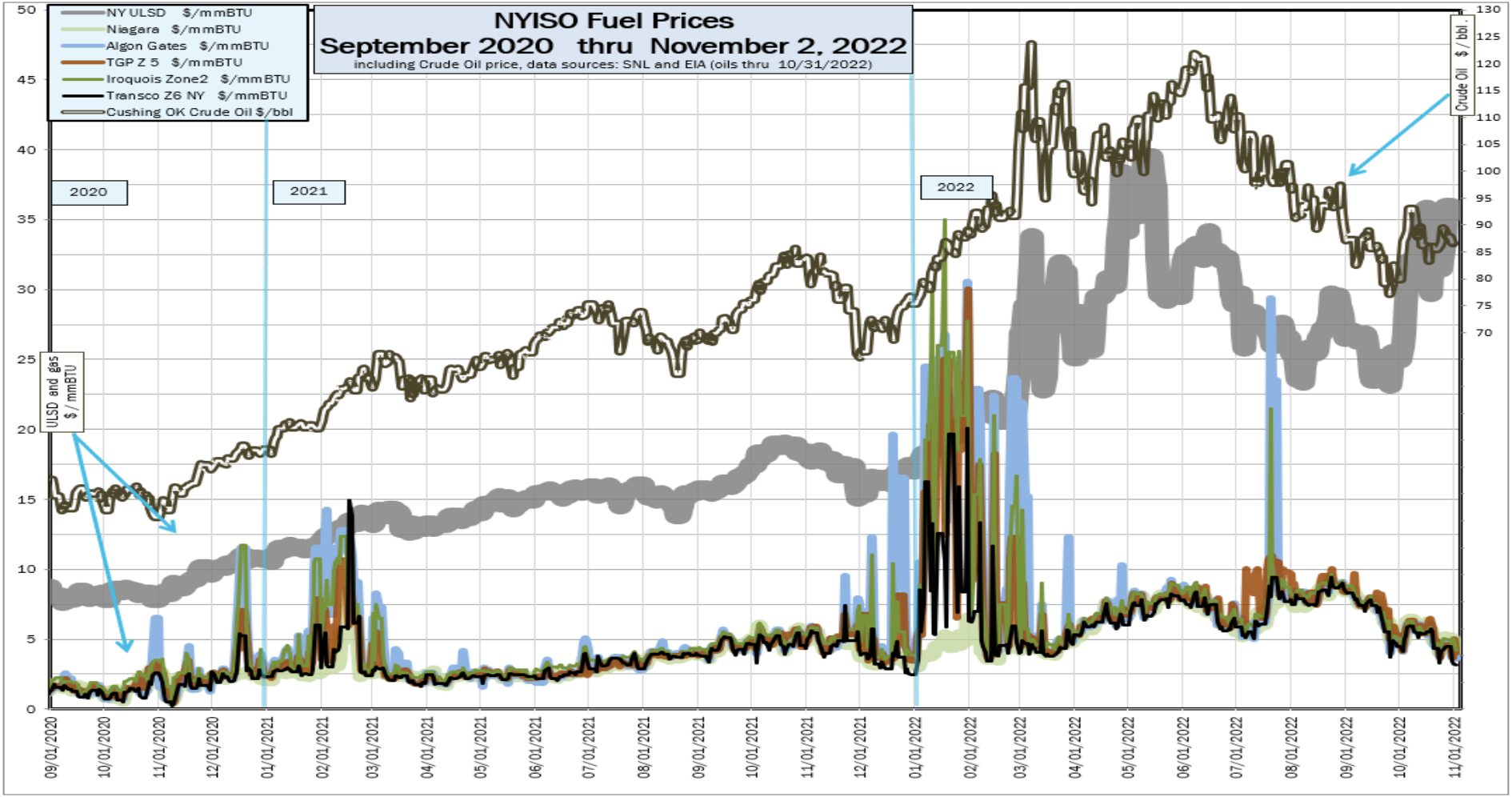

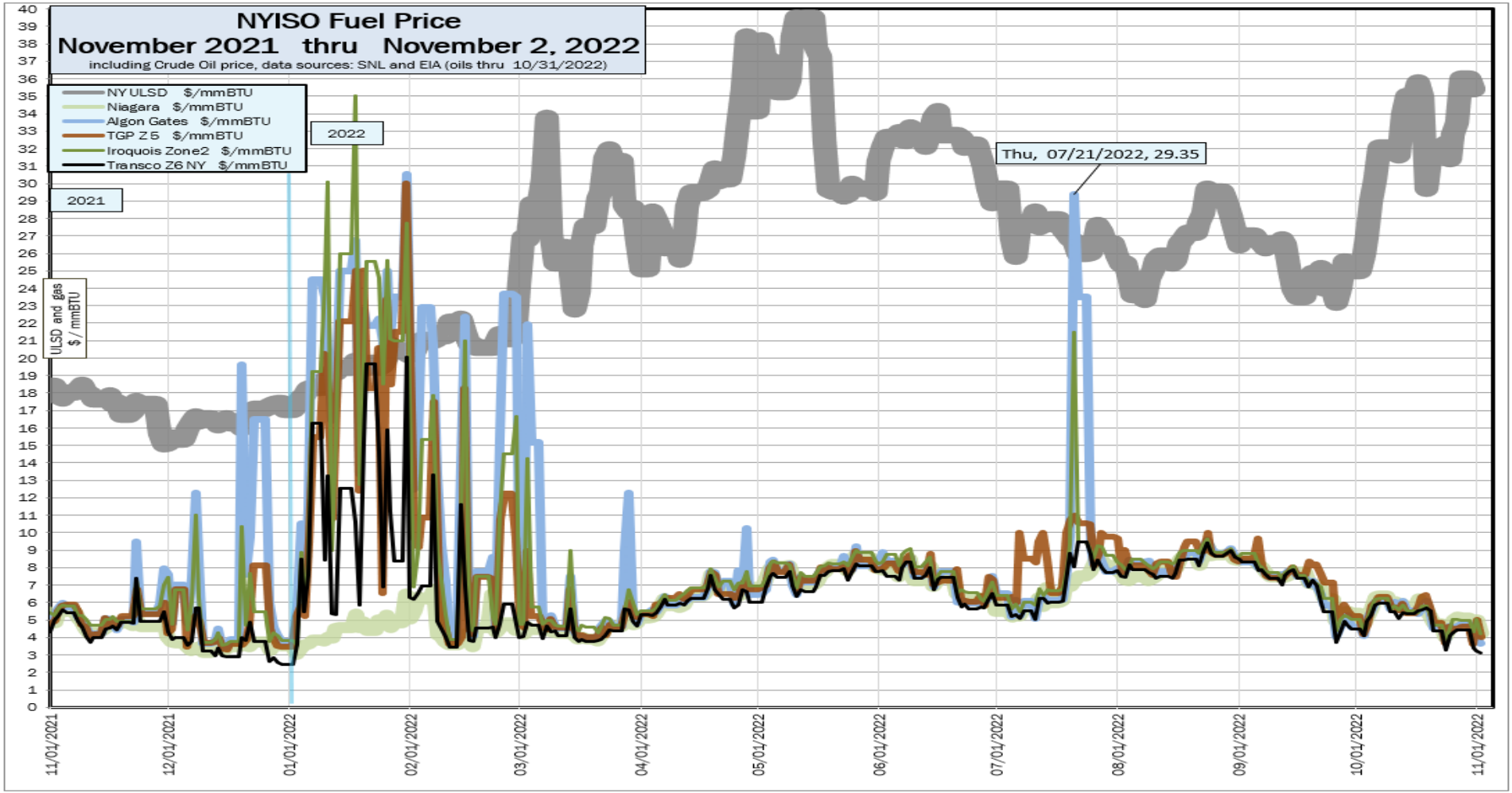

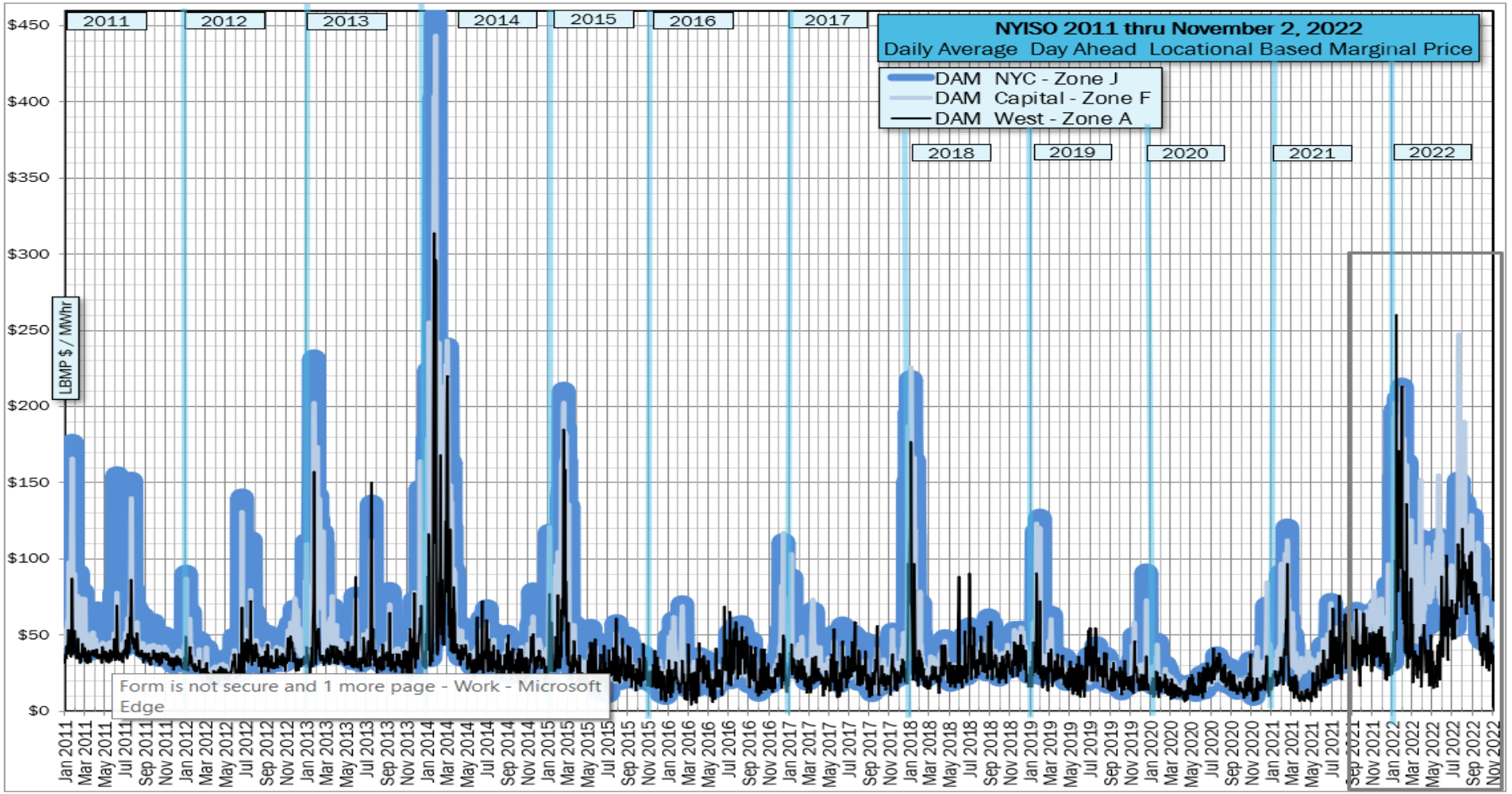

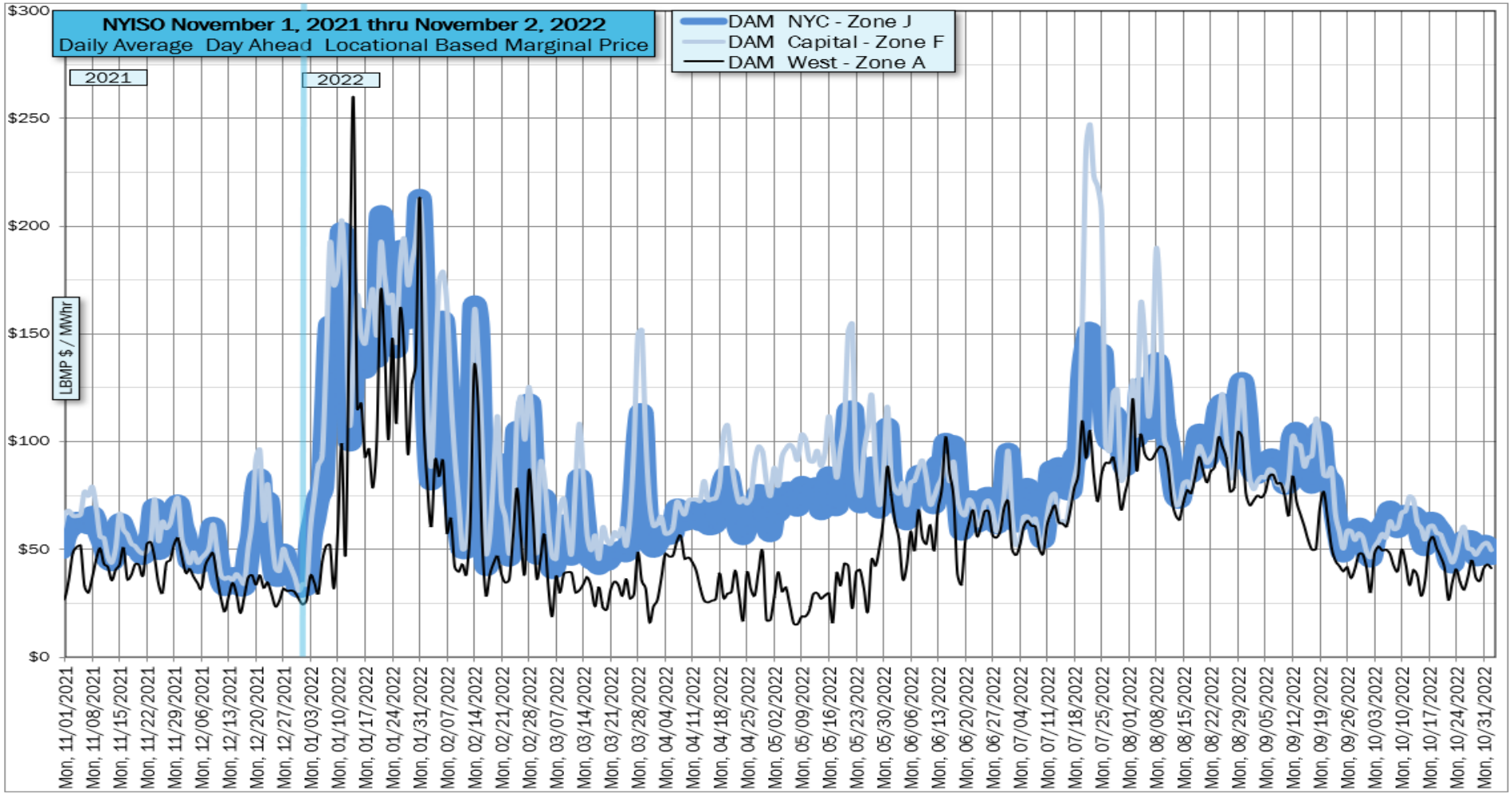

Appendix B
Day 1-14
Fuel and Energy Assessments

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Operations Internal Energy Assessment Tool

- **Different from the Analysis Group ("AG") Fuel and Energy Security model, this Internal Energy Assessment tool gives NYISO the ability to:**
  - Observe the reported fuel inventory levels and scheduled replenishments
  - Monitor the load forecast up to 30 days in the future
  - Apply commitment/dispatch assumptions to monitor fuel/energy shortfalls
  - Model scenarios and disruptions similar to the 2019 FES study

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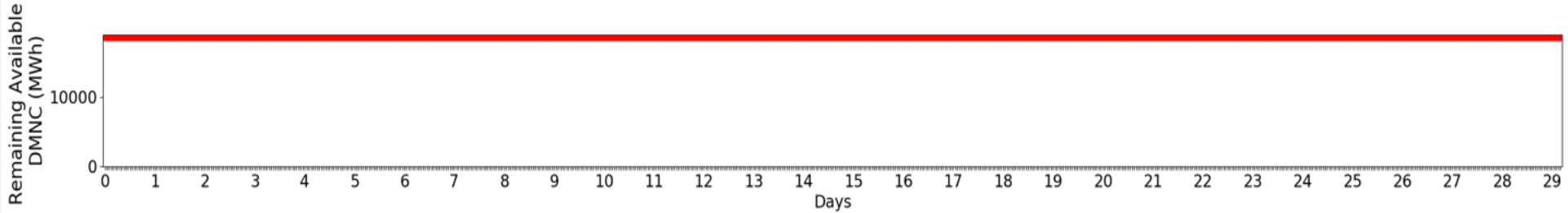
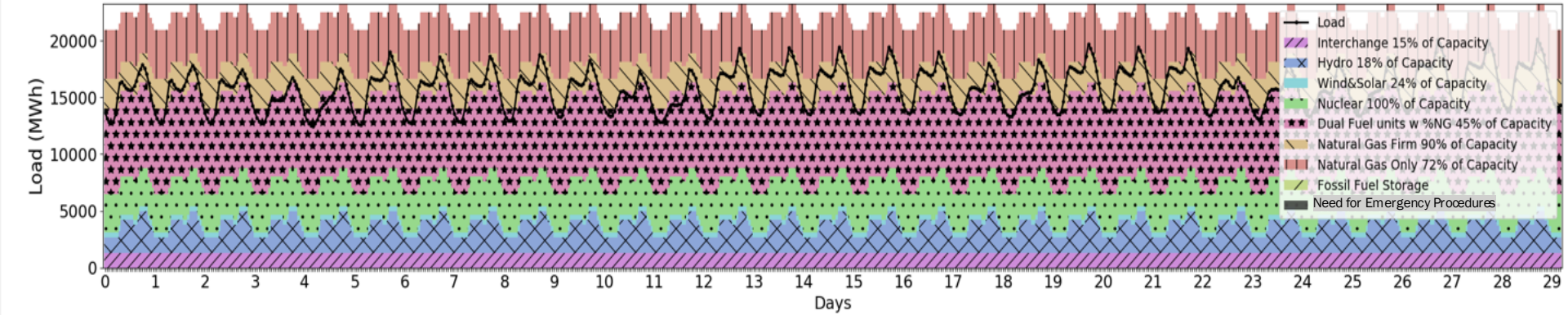
Internal Energy Assessment Tool – Forecast (Typical Spring or Fall Day)

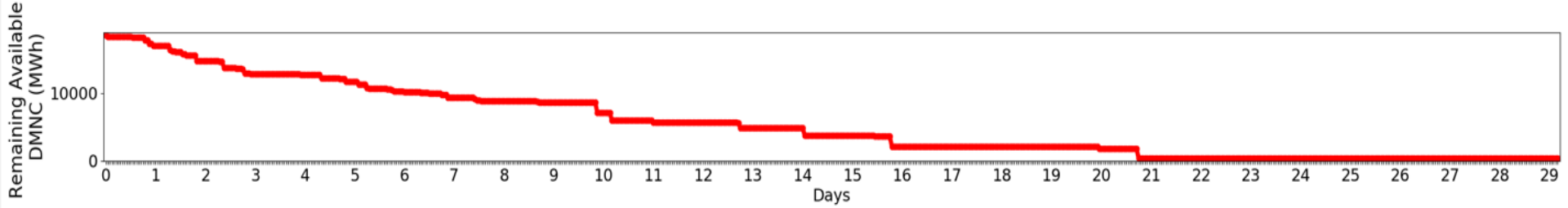
- No/minor scheduled deliveries (1.5 million MWh)
- Low shoulder season loads (19,500 MW peak)
- Gas available for firm and gas only units, 50% dual fuel capable MWs from gas

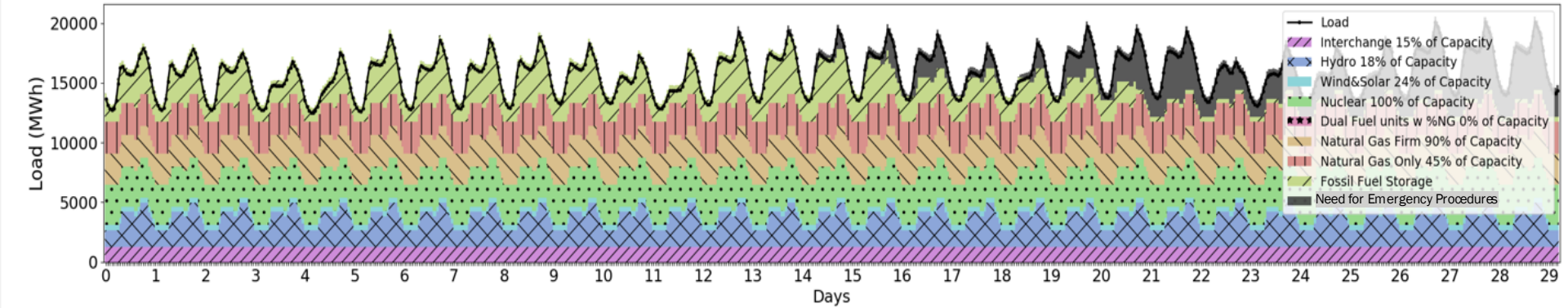




Internal Energy Assessment Tool – Forecast, Cold Snap assumptions

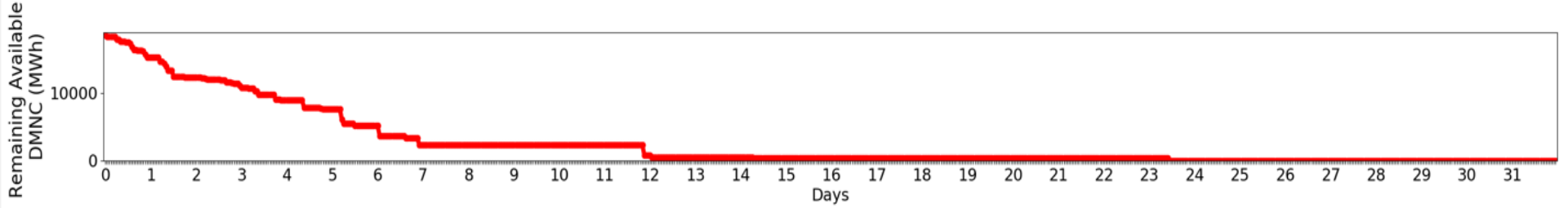
- No/minor scheduled deliveries (1.5 million MWh)
- Low shoulder season loads (19,500 MW peak)
- Limited gas only generation (4,500 MW), no gas for dual fuel units

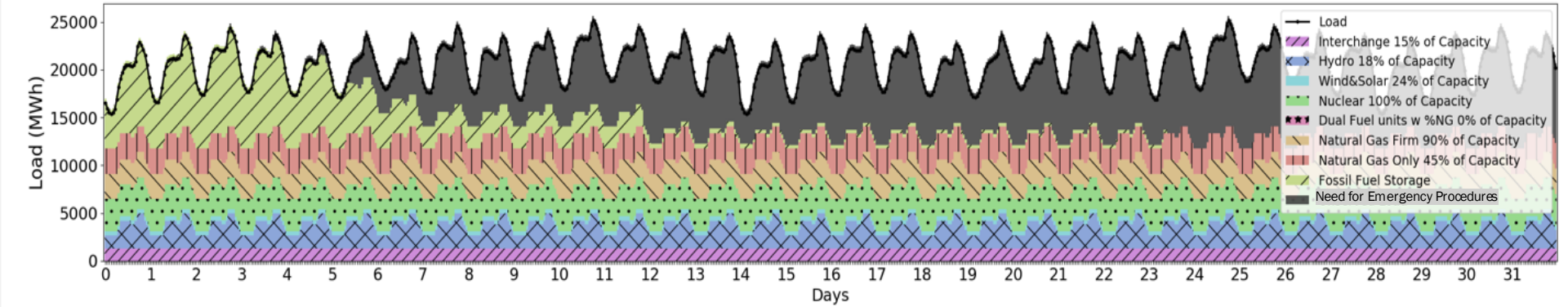




Internal Energy Assessment model – Extreme Cold, Cold Snap assumptions

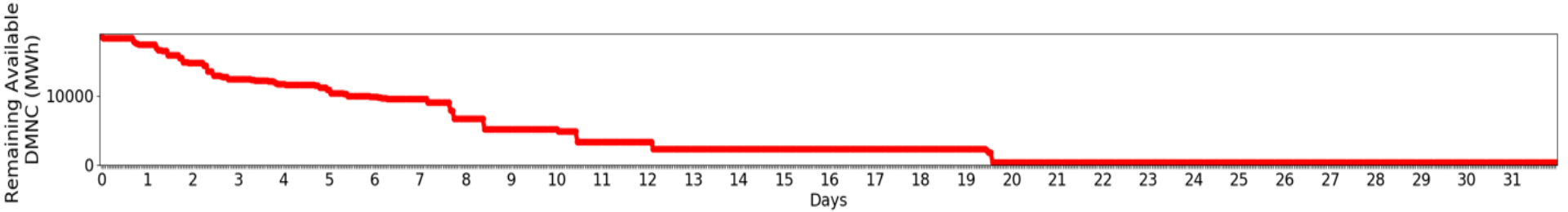
- No/minor scheduled deliveries (1.5 million MWh)
- Extreme Cold Weather Load Forecast (Similar to 17-18, - 25,200 MW)
- Limited gas only generation (4,500 MW), no gas for dual fuel units

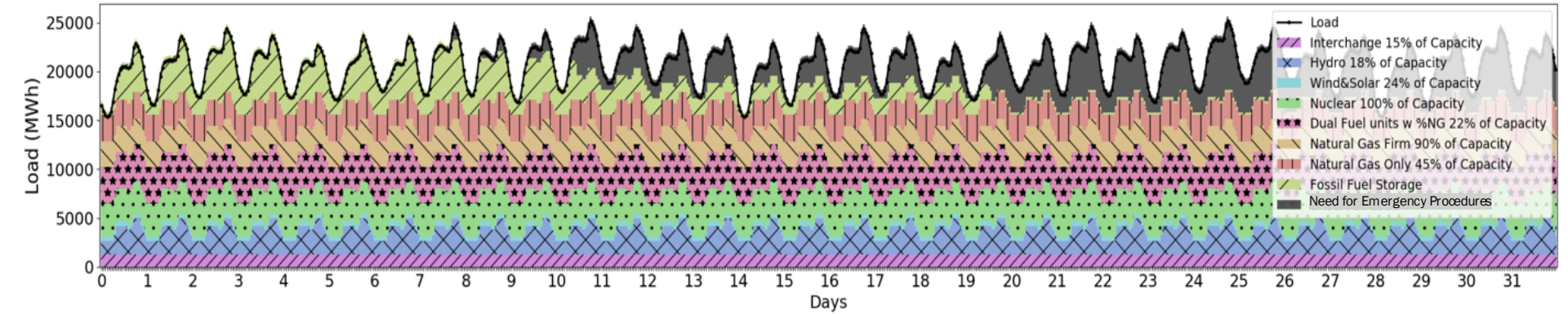




Internal Energy Assessment model – Extreme Cold, Cold Snap assumptions

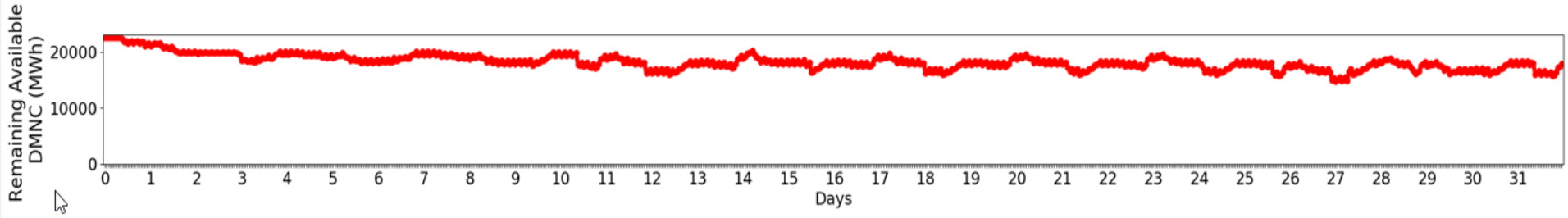
- No/minor scheduled deliveries (1.5 million MWh)
- Extreme Cold Weather Load Forecast (Similar to 17-18, - 25,200 MW)
- Gas available for firm and gas only units, 25% dual fuel capable MWs from gas

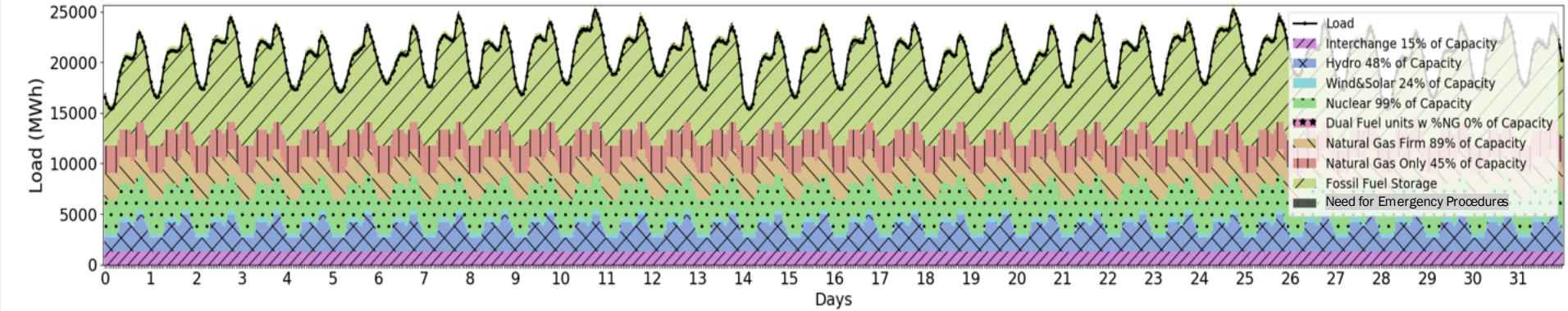


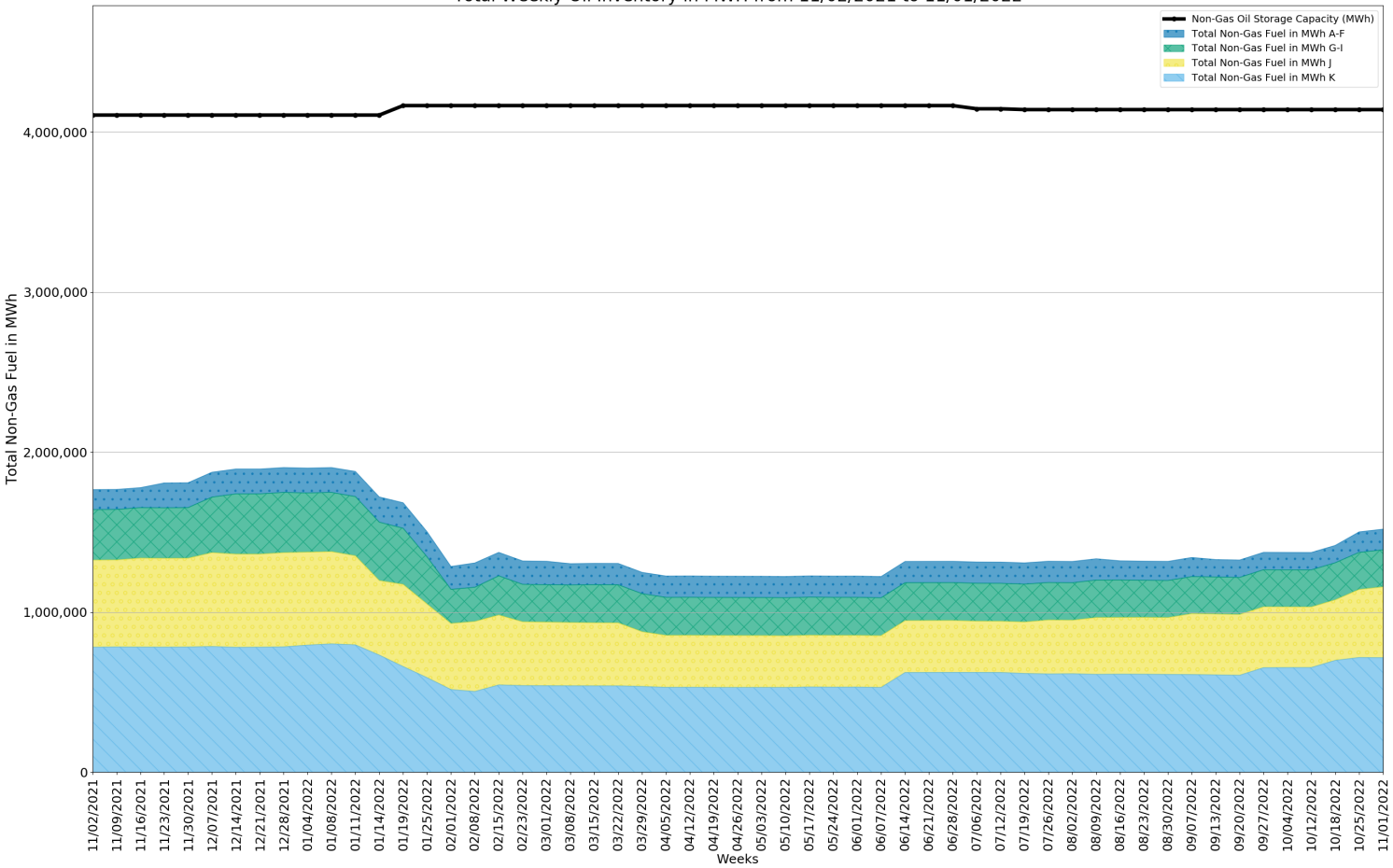


Internal Energy Assessment model – Extreme Cold, Cold Snap assumptions

- Generic refill assumptions similar to AG 2019 FES model
- Extreme Cold Weather Load Forecast (Similar to 17-18, - 25,200 MW)
- Limited gas only generation (4,500 MW), no gas for dual fuel units







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Appendix C
2024 Fuel & Energy Assessment Tracking of Actual Developments

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Fuel Security Study Tracking

- Fuel Security monitoring will be updated at least twice each year and compared to the assumptions in the 2019 FES study
- Identification of large deviations between (1) actual conditions and the conditions assessed in the 2019 FES study and/or (2) the assumptions used by the 2019 FES study that could adversely impact reliability would trigger a need to collaborate with stakeholders on refreshing the study

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Fall 2022 Fuel Security Monitoring page 1

Item	Actual	Actual	Actual	Actual/ Forecast	Forecast	Forecast	Study Assumptions
Deployment of new renewable and clean energy resources	2019/20	2020/21	2021/22	2022/23	2023/24	2025/26	2023/24
1) Wind	1,739 MW	1,739 MW	1,818 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	52 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	4,269 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	1,395 MW	1,778 MW	350 MW (4 hr)
4) Offshore Wind	0 MW	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	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	3,358 MW	1,435 - 3,356 MW
SCR/EDRP Capability (Winter)	853 MW	839 MW	630 MW	694	694 MW	694 MW	893 MW

Fall 2022 Fuel Security Monitoring page 2

Status Key:
Well aligned with FES study
Trending towards bounds FES study
Deviating from FES study with potential impact to reliability

Item	Actual	Actual	Actual	Actual	Actual/Forecast	Study Assumptions
System Metrics	**2018/19**	**2019/20**	**2020/21**	**2021/22**	**2022/23**	**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 MW	0 to -2,185 MW
Winter starting/ending oil inventory (MWh)	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	1,518,432 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	2,484 MW	1,915 MW
Pipeline Capacity	I: 13,963 MMcf/d Ex: 6,827 MMcf/d	I:13,978 MMcf/d Ex: 6,827 MMcf/d	I:13,978 MMcf/d Ex: 6,827 MMcf/d	I:13,978 Bcf/d Ex: 6,827 Bcf/d	I:13,978 Bcf/d Ex: 6,827 Bcf/d	I: 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	In-Service 12/23 (expected)	In-Service 12/23 (expected)	In-Service
SCR/EDRP Activations	0	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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Questions?

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