2021 NYSRC Long-Term Resource Adequacy Assessments

for an Intervening Year (2021 LTRAA-I)

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Agenda

- Summary of the 2021 NYSRC Long-Term Resource Adequacy Assessment for an Intervening Year (LTRAA-I)
- Appendix: wind lull scenario (from the 2021-2030 CRP)

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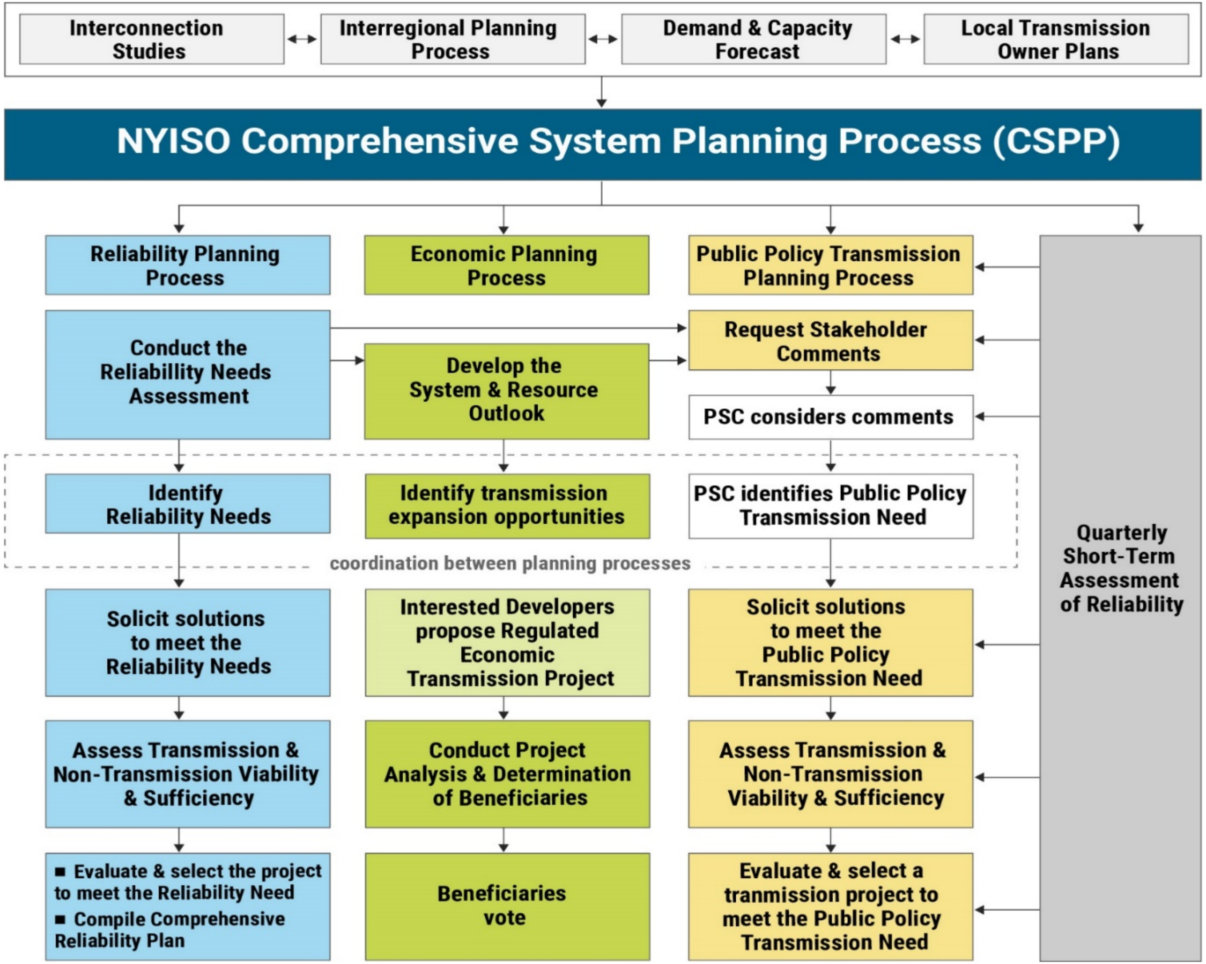
NYISO Planning Processes



2020 (Completed) LTRAA: Background

- **The New York State Reliability Council (NYSRC) Reliability Rule A.3.R2 requires the NYISO to prepare a biennial NYCA Long-Term Resource Adequacy Assessment (LTRAA) covering a ten-year look-ahead period**
  - New requirement in the NYSRC Reliability Rules, starting with the July 17, 2020, version #45: http://www.nysrc.org/NYSRCReliabilityRulesComplianceMonitoring.html
- **The 2020 LTRAA review report used the information from the 2020 RNA for Study Years 2024 through 2030 (year 4 through year 10), and from the 2020 Q3 STAR for the 2021 through 2025 (with a focus on years 1 through year 3)**
- **The 2020 LTRAA was presented at the February 2021 NYSRC's RCMS meeting to fulfill the A.3.R2 requirement**

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2021 LTRAA-I: Background

- **Additionally, NYSRC's Reliability Rule A.3.R3 requires the NYISO to prepare a NYCA LTRAA in the Intervening Year (LTRAA-I)**
  - New requirement in the NYSRC Reliability Rules, starting with the July 17, 2020, version #45: http://www.nysrc.org/NYSRCReliabilityRulesComplianceMonitoring.html
  - A.3. B. R3: *"The NYISO shall submit a report in the Intervening Year between NYCA Long-Term Adequacy Assessments to inform the NYSRC of any significant updates to assumptions and, if available, findings from the latest final NYISO Comprehensive Reliability Plan or other final NYISO reports which may include solutions to reliability needs identified in the Long-Term Resource Adequacy Assessment."*
- **The 2021 LTRAA-I review report updates the 2020 LTRAA and uses the information from NYISO's 2021-2030 Comprehensive Reliability Plan (CRP) for Study Years 2024 through 2030 (year 4 through year 10), and from the 2021 Q3 STAR for the 2021 through 2025**
  - 2021-2030 Comprehensive Reliability Plan (CRP) [Link to the Report]; [link to the Appendices]
  - 2021 Q3 STAR [link]
- **The NYISO plans to present the 2021 LTRAA-I at the February 2022 NYSRC RCMS meeting to fulfill the requirements of Rule A.3.R3**

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2021 LTRAA-I: CRP & STAR Updates

- While the 2020 RNA concluded that there were Reliability Needs and LOLE violations starting in 2027, the process allows for subsequent updates
- These updates included a reduced demand forecast to account for economic and societal effects from the COVID-19 pandemic, and new local transmission plans and operating procedures by Consolidated Edison for the New York City service territory
- With these updates, NYISO's 2021-2030 CRP concluded that the New York State Bulk Power Transmission Facilities as planned will meet all currently applicable reliability criteria from 2021 through 2030 for forecasted system demand in normal weather
- Additionally, the NYISO performs quarterly Short-Term Assessments of Reliability (STAR). The 2021 Q3 STAR was based on the 2021 reliability databases and identified no needs for the study period
  - 2021 Q3 STAR Report: [link]
  - The 2021 Q4 STAR targets January 13, 2022, for completion

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2021 LTRAA-I: CRP & STAR Updates (Cont.)

- While the NYISO finds that there are no remaining actionable Reliability Needs to be addressed in the 2020-2021 cycle of the Reliability Planning Process, the margin to maintain reliability over the next ten years will narrow or could be eliminated based upon changes in forecasted system conditions
- Risk factors such as delayed implementation of projects in this plan, additional generator deactivations, unplanned outages, and extreme weather could potentially lead to deficiencies in reliable electric service in the coming years
- Transmission and resource additions, such as the recently-approved Champlain Hudson Power Express (CHPE) to bring hydro power from Quebec to New York City could help mitigate these deficiencies if timely implemented
- The CRP also included additional scenarios such as wind lull, and other reliability challenges to meeting the 70 x 30 requirement and to achieving an emissions-free electric system by 2040 as required by the Climate Leadership and Community Protection Act (CLCPA)
- The 2021-2030 CRP was approved by the NYISO's Board of Directors on December 2, 2021

2021 LTRAA-I: Conclusions

- Based on the 2021-2030 CRP and the 2021 Q3 STAR, there are no Bulk Power Transmission Facilities (BPTF) Reliability Needs identified for the 2021-2030 study period
- However, the system margin has been decreasing; additional details can be found in the two aforementioned NYISO study reports
- The NYISO continues to monitor the risks and will re-evaluate the system during the 2022-2023 Reliability Planning Process cycle, which starts with the 2022 RNA
- The 2022 quarterly STARs will be performed in parallel, as well as other NYISO planning studies such as Economic Planning, Interconnections, and Public Policy Transmission Planning
- The Transmission Owners will also continue to provide Local Transmission Owner Plans (LTPs) as inputs into the NYISO's planning processes

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2021 LTRAA-I: Conclusions (Cont.)

- The wholesale electricity markets administered by the NYISO are an important tool to mitigate these risks. These markets are designed, and continue to evolve and adapt, to send appropriate price signals for new market entry and retention of resources that assist in maintaining reliability
- The potential risks and resource needs identified in the analyses may be resolved by new capacity resources coming into service, construction of additional transmission facilities, and/or increased energy efficiency, integration of distributed energy resources, and growth in demand response participation
- The NYISO will continue to monitor these and other developments to determine whether changing system resources and conditions could impact the reliability of the New York bulk electric grid

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Questions?

Appendix: 2021-2030 CRP Wind Lull Scenario

(Source: August 18, 2021, ESPWG CRP)

Presentation [link]

MARS: Not a “dispatch” model

- **Not a “dispatch” model**
  - Rather a “bucket of available zonal MW” probabilistically sampled for each hour of the study year, and compared with each of the seven zonal load levels to identify zonal margins or deficiencies (events)
- **The MARS simulations do not take into consideration potential reliability impacts due to:**
  - Unit commitment and dispatch, ramp rate constraints, and other production cost modeling techniques
  - Intra-zonal constraints on the transmission system
  - Development of models for 70% renewable energy by 2030 (70 x 30): changes on the transmission system as a result of the resource additions (renewable mix) or subtractions (age-based)

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Renewable Mix by NYCA Zone

Zonal Renewable Mix (Nameplate MW)
70x30 'Base Load Case'

Zone/Type	OSW	LBW	UPV	BTM-PV
A		2,286	4,432	995
B		314	505	298
C		2,411	2,765	836
D		1,762		76
E		2,000	1,747	901
F			3,592	1,131
G			2,032	961
H				89
I				130
J	4,320			950
K	1,778		77	1,176
Total	**6,098**	**8,772**	**15,150**	**7,542**

Zonal Renewable Mix (Nameplate MW)
70x30 'Scenario Load Case'

Zone/Type	OSW	LBW	UPV	BTM-PV
A		1,640	3,162	995
B		207	361	298
C		1,765	1,972	836
D		1,383		76
E		1,482	1,247	901
F			2,563	1,131
G			1,450	961
H				89
I				130
J	4,320			950
K	1,778		77	1,176
Total	**6,098**	**6,477**	**10,832**	**7,542**

70x30 - Cases At-Criterion and at Low LOLE

70x30 Base Load Case at-Criterion: Age-based Fossil Removal

	Total Thermal Capacity (MW)				Cumulative Capacity Removed (MW)				
Cases (Age >=)	Zone J	Zone K	Other Zones	Total	Zone J	Zone K	Other Zones	Total	NYCA LOLE
Total	8,190	3,962	15,012	27,165	0	0	0	0	0.00
70	6,978	3,564	14,616	25,160	1,212	398	396	2,005	0.02
68	6,601	3,371	14,616	24,590	1,589	591	396	2,575	0.05
67*	6,386	3,360	14,616	24,364	1,804	602	396	2,801	0.11
67	6,236	3,360	14,616	24,214	1,954	602	396	2,951	0.15

70x30 Scenario Load Case at-Criterion: Age-based Fossil Removal

	Total Thermal Capacity (MW)				Cumulative Capacity Removed (MW)				
Cases (Age >=)	Zone J	Zone K	Other Zones	Total	Zone J	Zone K	Other Zones	Total	NYCA LOLE
Total	8,190	3,962	15,012	27,165	0	0	0	0	0
50	4,354	1,541	11,228	17,124	3,836	2421	3784	10,041	0.03
40	4,354	1,393	10,247	15,995	3,836	2569	4765	11,170	0.07
39	4,354	1,349	10,197	15,901	3,836	2613	4815	11,264	0.09
38	3,563	1,325	9,935	14,824	4,627	2637	5077	12,341	0.11

Scenario Scope: NYCA-Wide Weekly Wind Lull Events

All NYCA zones events: The following types of analysis and events are simulated over each of the 3 MARS models described above.

- **Highest % of NYCA LOLE events:**
  - Identify the top 2 weeks with highest % of NYCA LOLE events
  - For each of the top 2 weeks (one week at the time) having highest % of LOLE events, simulate total loss of NYCA wind (0 MW all NYCA zones) for that entire week and calculate NYCA LOLE, LOLH, and EUE.
  - Compute compensatory MW to bring LOLE close to the initial case
- **Top 2 weeks with highest land-based wind (LBW) capacity factor:**
  - Identify the top 2 weeks with highest land – based wind capacity factors
  - On each of the top 2 weeks (one week at the time) simulate total loss of NYCA wind (0 MW) for that entire week and calculate NYCA LOLE, LOLH, and EUE.
  - Compute compensatory MW to bring LOLE close to the initial case
- **Top 2 weeks with highest offshore wind (OSW) capacity factor:**
  - Identify the top 2 weeks with highest offshore wind capacity factors
  - On each of the top 2 weeks (one week at the time) simulate total loss of NYCA wind (0 MW) for that entire week and calculate NYCA LOLE, LOLH, and EUE
  - Compute compensatory MW to bring LOLE close to the initial case
- **Note: the wind lull weeks assume that all land-based or all offshore wind (but not both) have no output to the system for the whole week and then recover to normal output levels for the following week**

70x30 - LBW Wind Lull Analysis

Loss of LBW during the Week with **Highest LBW Capacity Factor**

No LBW during the 1st Highest LBW Capacity Factor (CF) Week					Compensatory MW		
Model	LBW CF	Initial LOLE	Resultant LOLE	Delta LOLE	Zones A-I	Zone J	Zone K
70x30 'Base Load' at-criterion	23%	0.11	0.11	**0.00**	<25	<25	<25
70x30 'Scenario Load' at-criterion	23%	0.11	0.11	**0.00**	<25	<25	<25
70x30 'Scenario Load' at-low-LOLE	23%	0.03	0.03	**0.00**	<25	<25	<25
No LBW during the 2nd Highest LBW Capacity Factor Week					**Compensatory MW**		
Model	**LBW CF**	**Initial LOLE**	**Resultant LOLE**	**Delta LOLE**	**Zones A-I**	**Zone J**	**Zone K**
70x30 'Base Load' at-criterion	20%	0.11	0.11	**0.00**	<25	<25	<25
70x30 'Scenario Load' at-criterion	20%	0.11	0.11	**0.00**	<25	<25	<25
70x30 'Scenario Load' at-low-LOLE	20%	0.03	0.03	**0.00**	<25	<25	<25

Key takeaway: Not much impact as the land-based wind is distributed in Zones A through E, while resource deficiencies are in Zones J and K

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70x30 - LBW Wind Lull Analysis

NYCA LOLE (days/year) for Loss of LBW during the Week with **Highest LOLE Events**

No LBW during the 1st Highest NYCA Event % Week					Compensatory MW		
Model	Event %	Initial LOLE	Resultant LOLE	Delta LOLE	Zones A-I	Zone J	Zone K
70x30 'Base Load' at-criterion	34%	0.11	0.11	**0.00**	<25	<25	<25
70x30 'Scenario Load' at-criterion	23%	0.11	0.11	**0.00**	<25	<25	<25
70x30 'Scenario Load' at-low-LOLE	24%	0.03	0.03	**0.00**	<25	<25	<25
No Land-Based Wind during the 2nd Highest NYCA Event % Week					Compensatory MW		
Model	Event %	Initial LOLE	Resultant LOLE	Delta LOLE	Zones A-I	Zone J	Zone K
70x30 'Base Load' at-criterion	19%	0.11	0.11	**0.00**	<25	<25	<25
70x30 'Scenario Load' at-criterion	18%	0.11	0.11	**0.00**	<25	<25	<25
70x30 'Scenario Load' at-low-LOLE	18%	0.03	0.03	**0.00**	<25	<25	<25

Key takeaway: Not much impact to LOLE as the land-based wind is distributed in Zones A through E, while resource deficiencies are in Zones J and K

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70x30 – OSW Wind Lull Analysis

Loss of OSW during the Week with **Highest OSW Capacity Factor**

No OSW during the 1st Highest OSW Capacity Factor Week					Compensatory MW		
Model	OSW CF	Initial LOLE	Resultant LOLE	Delta LOLE	Zones A-I	Zone J	Zone K
70x30 'Base Load' at-criterion	41%	0.11	0.26	**0.16**	∞	350	∞
70x30 'Scenario Load' at-criterion	41%	0.11	0.22	**0.11**	∞	∞	150
70x30 'Scenario Load' at-low-LOLE	41%	0.03	0.06	**0.03**	∞	∞	150
No OSW during the 2nd Highest OSW Capacity Factor Week					Compensatory MW		
Model	OSW CF	Initial LOLE	Resultant LOLE	Delta LOLE	Zones A-I	Zone J	Zone K
70x30 'Base Load' at-criterion	32%	0.11	0.14	**0.04**	∞	100	∞
70x30 'Scenario Load' at-criterion	32%	0.11	0.47	**0.36**	∞	∞	400
70x30 'Scenario Load' at-low-LOLE	32%	0.03	0.16	**0.13**	∞	∞	350

∞ - Either a large, or no amount of capacity added in the zone can bring NYCA LOLE below 0.1

Outage of all offshore wind generation has a substantial impact on LOLE. This is largely due to the co-location of offshore wind together with the majority of the resource deficiencies in Zones J and K

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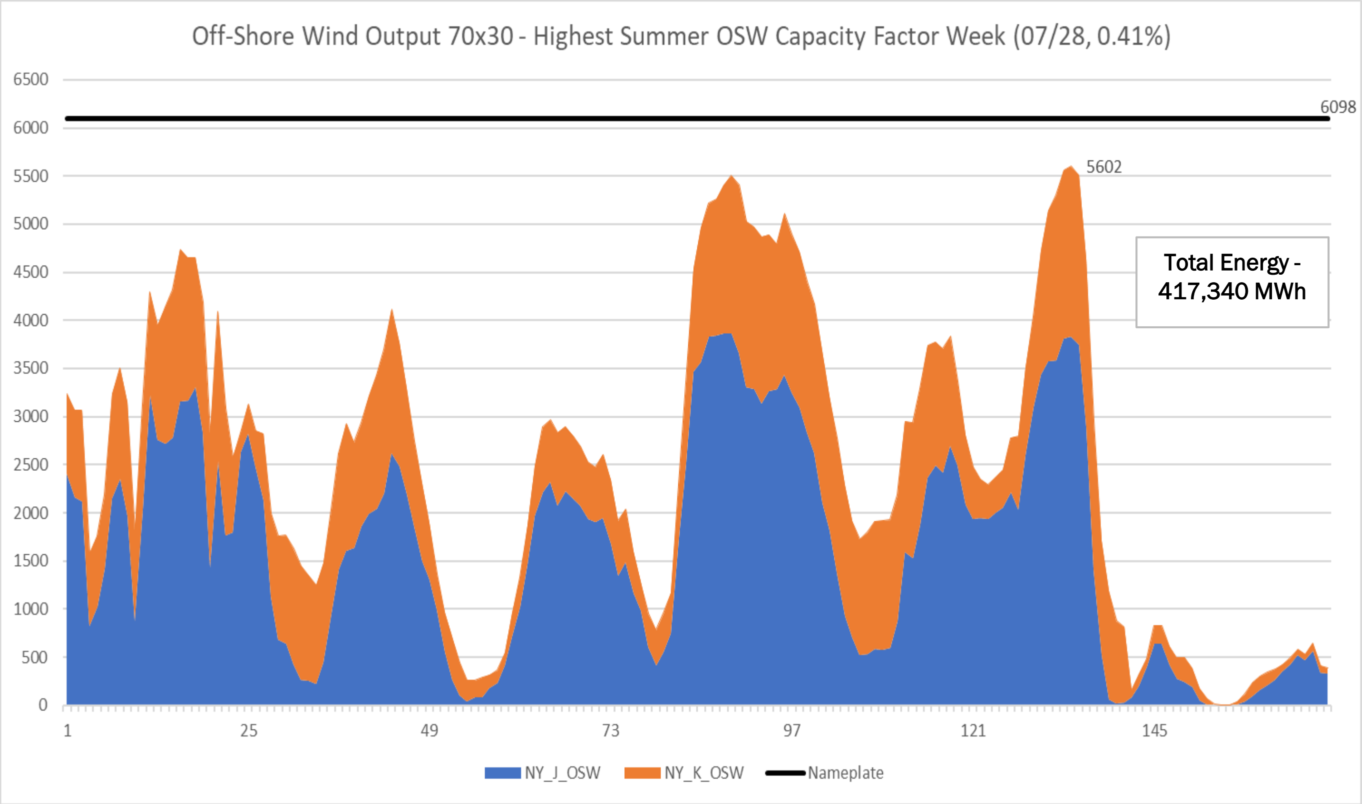
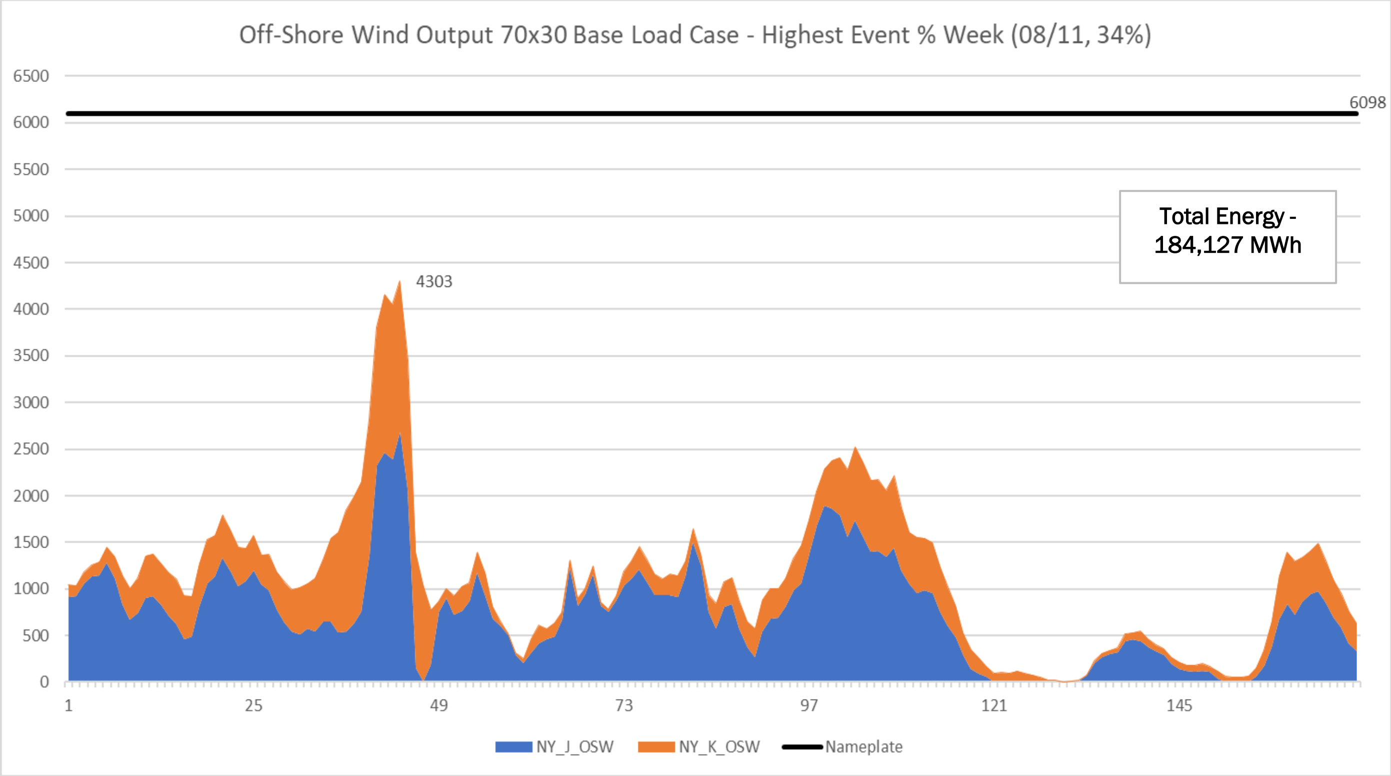
OSW MW Output

During the Week with Highest Capacity Factor



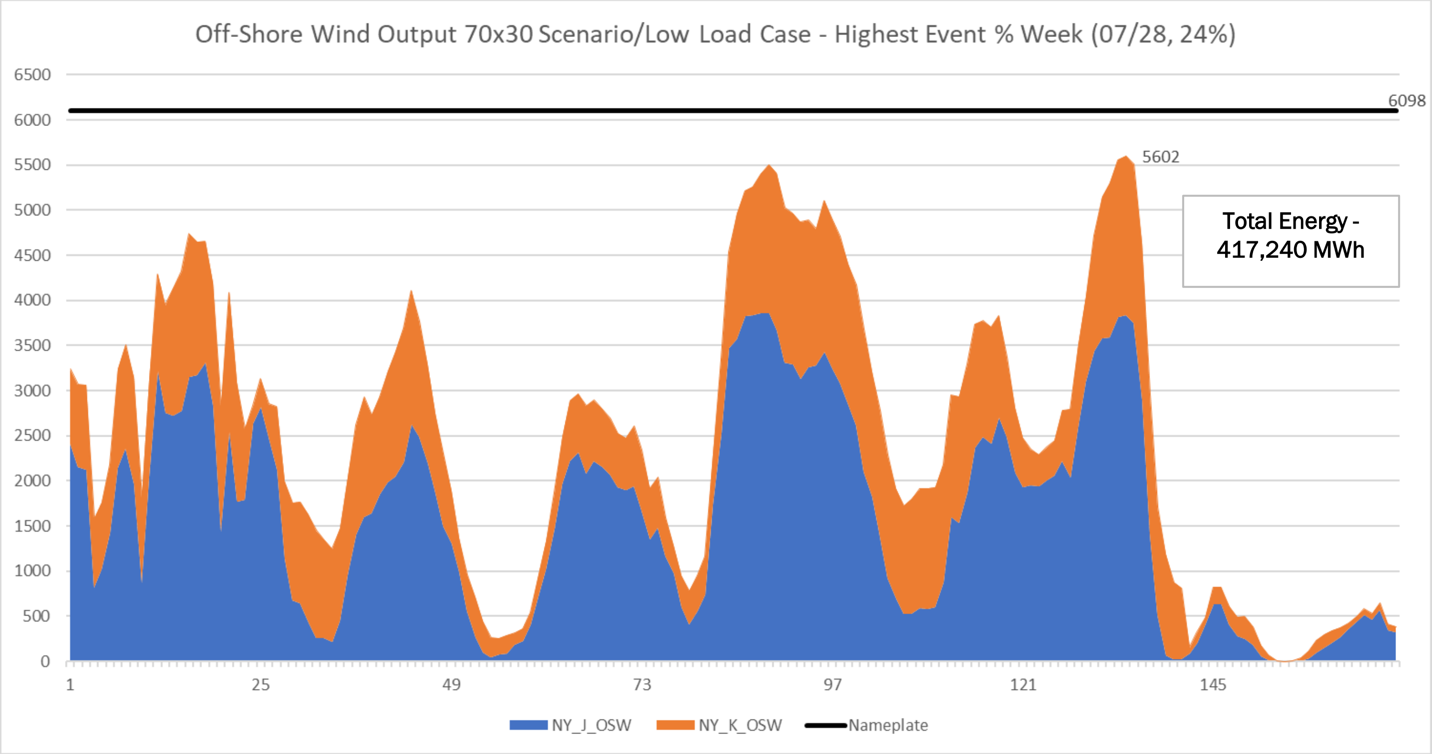
OSW MW Output

During the Week with Highest % Events – 70x30 'Base Load' Cases



OSW MW Output

During the Week with Highest % Events – 70x30 'Scenario Load' and "Low LOLE" Cases



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70x30 – OSW Wind Lull Analysis

Loss of OSW during the Week with **Highest LOLE Events**

No OSW during the 1st Highest NYCA Event % Week				Compensatory MW		
Model	Initial LOLE	Resultant LOLE	Delta LOLE	Zones A-I	Zone J	Zone K
70x30 'Base Load' at-criterion	0.11	0.18	**0.07**	∞	200	∞
70x30 'Scenario Load' at-criterion	0.11	0.22	**0.11**	∞	∞	150
70x30 'Scenario Load' at-low-LOLE	0.03	0.06	**0.03**	∞	∞	150
No OSW during the 2nd Highest NYCA Event % Week				Compensatory MW		
Model	Initial LOLE	Resultant LOLE	Delta LOLE	Zones A-I	Zone J	Zone K
70x30 'Base Load' at-criterion	0.11	0.11	**0.01**	∞	150	∞
70x30 'Scenario Load' at-criterion	0.11	0.13	**0.02**	∞	∞	50
70x30 'Scenario Load' at-low-LOLE	0.03	0.03	**0.00**	∞	∞	25

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L/O Offshore vs L/O Ravenswood 3

- A one-week outage of the largest generation source in New York City (i.e., loss of Ravenswood 3 steam turbine generator) was simulated for the highest event week of the 70 x 30 “Base Load” condition
- The results demonstrate that a one-week outage of approximately 6,100 MW of offshore wind (4,300 MW in New York City and 1,800 MW in Long Island) could have roughly the same impact to resource adequacy as the outage of a 1,000 MW conventional (i.e., non-intermittent) generation

No Offshore Wind during the 1st Highest NYCA Event % Week (34%)					
Model	Removal	Nameplate MW Removal	Initial LOLE	One-Week Outage LOLE	Delta LOLE
70x30 'Base Load' at-criterion	Offshore Wind	6098 *(4320 MW in J and 1778 MW in K)*	0.106	0.179	0.072
	Ravenswood 3	1027		0.180	0.074

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OSW Lull Scenario Observations

- Outage of all offshore wind generation for the studied week has a substantial impact on NYCA LOLE. This is largely due to the location of the offshore wind in Zones J and K, where the majority of the NYCA LOLE events occur
- There is a higher impact in the NYCA LOLE for the "Scenario Load" case (i.e., a lower energy case), which had a higher MW of fossil removed (i.e., around 12,340 MW fossil removed, as identified in the 2020 RNA Report) in order to bring it to the 0.1 day/year criterion ("at criterion")
- Using yearly compensatory MW (i.e., 'perfect capacity MW' available every hour of the study year) to bring the NYCA LOLE back to the levels found in the original cases reduces the resultant LOLH but increases EUE. This is because smaller events are mitigated by the "perfect" compensatory MW, but the large events that are created by the wind lull create a larger energy deficit during that week
  - Note: Annual compensatory MW values are reducing LOLE at other times of the year, not just during the week affected by the wind lull

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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

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