

Balancing Intermittency: Percentiles and Shortage Pricing Curves

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March 4, 2024

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Agenda

Background

- Previous project presentations
- 2023 Market Design Concept Proposal Summary
- Percentiles (Phase 1)
- Shortage Pricing Curves (Phase 1)
- Next Steps



Background



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Previous Presentations

Date	Working Group	Discussion Points and Links to Materials
01-25-2024	ICAPWG/MIWG	Balancing Intermittency 2024 Kick-off: https://www.nyiso.com/documents/20142/42590322/BI%202024%20MIWG%20Kick%200ff_final.pdf/ac2f0112-f542-f4da-3c9c- f43d0309868f
11-10-2023	ICAPWG/MIWG	Market Design Concept Proposed: <u>https://www.nyiso.com/documents/20142/41130653/Balancing%20Intermittency_MDCP%20Presentation_final.pdf/ab912240-d021- <u>0e7a-a02a-987a94928bf7</u></u>
10-12-2023	ICAPWG/MIWG	1hr notification/4hr sustainability Reserves Product: https://www.nyiso.com/documents/20142/40342797/Balancing%20Intermittency_100323%20ICAPWG_MIWG_final.pdf/71269f5b-1e84- 4bda-3219-b36a71a9be24
10-03-2023	ICAPWG/MIWG	Introductory Analysis regarding Uncertainty Reserve product : https://www.nyiso.com/documents/20142/40342797/Balancing%20Intermittency_100323%20ICAPWG_MIWG_final.pdf/71269f5b-1e84- 4bda-3219-b36a71a9be24
09-18-2023	ICAPWG/MIWG	Analysis and proposal regarding Uncertainty Reserve requirement locational distribution: https://www.nyiso.com/documents/20142/40044890/3%20Balancing%20Intermittency_09182023%20ICAPWG_MIWG.pdf/0d0e82b7- 1d3a-7af0-fef7-237dbf5c1b77
09-05-2023	ICAPWG/MIWG	Analysis and proposal regarding Uncertainty Reserve requirement calculation methodology: https://www.nyiso.com/documents/20142/39768278/6%20Balancing%20Intermittency_ICAPWG_MIWG_090523.pdf/23391d26-0559- 5757-1289-d043e833e16c
07-19-2023	ICAPWG/MIWG	Initial analysis regarding the need to address net load uncertainty: <u>https://www.nyiso.com/documents/20142/38852999/Balancing%20Intermittency%20Initial%20Analyses_ICAPWG_MIWG_071923_Finalp df/c4adb509-3c09-0361-7f52-b52cae880997</u>
04-17-2023	ICAPWG/MIWG	Kick-off for Regulation Requirements study (Stakeholder vote passed at May OC): https://www.nyiso.com/documents/20142/37014190/Proposed%20Regulation%20Requirements_20230406_SOAS_v1.pdf/a2d7d51a- 5511-37c6-ad04-a177d69f5424
02-21-2023	ICAPWG/MIWG	Project Kickoff: <u>https://www.nyiso.com/documents/20142/36339783/Balancing%20Intermittency_MIWG_022123_FINAL%20(002).pdf/5ff99fc1-1eb2- 8bec-d385-b4983568802a</u>



2023 Market Design Concept Proposal Summary

- Phase 1: Uncertainty Reserve Requirement on existing 10- and 30minute reserve products
 - The NYISO proposes to establish locational Uncertainty Reserve requirements using percentages calculated from historical data, which will be individually applied to net load, land-based wind, and offshore wind forecasts.
 - Targeting 2025 implementation

Phase 2: New 60-minute, 4-hour reserve product

- The features of the proposed new reserve product include a longer Notification Time and a longer Duration Availability Requirement, which aim to address needs driven by uncertainty that arises further in advance.
- Currently targeting 2026 implementation



Percentiles



Percentiles

- The NYISO proposes to use the 90th percentile for calculating the requirement pertaining to the Net Load, Land based Wind, and Offshore Wind Forecast Error for dealing with both DAM and RT uncertainty.
- The change in percentages for the Net Load (Load net of BTM Solar only) uncertainty requirement is uniform at an average rate of 0.4% per 5 percentile increase from the 75th percentile to the 90th percentile.
- Beyond the 90th percentile, the change in percentage jumps up by 80% to a 0.9% increase for the next 5 percentile of data.
 - The net load uncertainty requirements are increasing rapidly beyond the 90th percentile and using percentiles beyond the 90th percentile could mean setting requirements based on extreme forecast errors, which is not recommended for the introduction of these uncertainty reserves.
- The performance of the uncertainty reserves will be assessed at a time period yet to be determined, and the assessment will consider whether these percentile values would have to be revised to a higher or a lower value.





Sample DAM Uncertainty Requirements for Net Load (March-December 2022)

- The sample blended DAM Net Load (Load net of BTM Solar) uncertainty requirement percentages in the table in the following slides are obtained by analyzing the prior year's net load forecast error distribution and past two months' net load forecast error distribution.
 - The forecast percentages from these two error distributions are blended using the 80/20 • weighted average method to calculate the final net load uncertainty requirement percentages.

	Uncertainty Reserve Requirement Percentage Statistics										
	75th	80th	85th	90th	95th	97.5	99th				
	Percentile Requ	Percentile Requir	Percentile Req	Percentile Requ	Percentile Requi	Percentile Requ	Percentile Requ				
	irement	ement	uirement	irement	rement	irement	irement				
Mean	1.2%	1.5%	1.9%	2.4%	3.3%	4.1%	4.9%				
Max	1.3%	1.6%	2.0%	2.5%	3.4%	4.3%	5.2%				
Min	1.1%	1.4%	1.8%	2.3%	3.2%	4.0%	4.7%				
25th	1.1%	1.4%	1.9%	2.4%	3.3%	4.1%	4.8%				
Median	1.2%	1.5%	1.9%	2.4%	3.3%	4.1%	4.8%				
75th	1.2%	1.5%	2.0%	2.5%	3.4%	4.2%	5.1%				



DAM Uncertainty Reserve Requirement MW Stats for March-December 2022 (Load Net of BTM Solar only)

Uncertainty Reserve Requirement MW Statistics									
	75th Percentile	80th Percentile	85th Percentile	90th Percentile	95th Percentile	97.5 Percentile	99th Percentile		
	Requirement	Requirement	Requirement	Requirement	Requirement	Requirement	Requirement		
Mean	194	250	320	406	553	690	819		
Max	345	446	574	731	1,001	1,238	1,455		
Min	123	158	203	<mark>259</mark>	356	447	528		
25th	166	214	274	347	474	593	707		
Median	187	241	308	391	532	664	792		
75th	215	275	353	447	610	761	904		



Sample DAM Wind Uncertainty Requirements for Forecast MW Bins (March-December 2022)

- The sample blended wind uncertainty requirement percentages in the table below are obtained by analyzing the prior year's wind forecast error distribution and past two months' wind forecast error distribution for the associated wind forecast MW bins.
 - The forecast percentages from these two error distributions are blended using the 80/20 weighted average method to calculate the final wind uncertainty requirement percentages for the associated forecast MW bins.
 - The NYISO is still evaluating the most appropriate bin structure.
 - These bins will be adjusted at a time period TBD.

	% of		80th					
Forecast MW (% of	2021	75th Percentile	Percentile	85th Percentile	90th Percentile	95th Percentile	97.5 Percentile	99th Percentile
Wind Capacity)	Intervals	Requirement	Requirement	Requirement	Requirement	Requirement	Requirement	Requirement
<= 8%	25%	67%	74%	81%	90%	98%	99%	100%
9% - 15%	25%	33%	39%	46%	55%	65%	72%	79%
16% - 29%	25%	23%	28%	33%	39%	49%	59%	67%
30% - 44%	15%	13%	17%	21%	25%	34%	40%	49%
45% - 54%	5%	10%	12%	15%	18%	26%	32%	40%
>=55%	5%	9%	11%	13%	16%	19%	24%	39% S

DAM Uncertainty Reserve Requirement MW and Percentage Stats for March-December 2022 (Land Based Wind only)

Wind Uncertainty Reserve Requirement MW Statistics									
	75th Percentile Requirement	80th Percentile Requirement	85th Percentile Requirement	90th Percentile Requirement	95th Percentile Requirement	97.5 Percentile Requirement	99th Percentile Requirement		
Mean	107	128	153	181	227	265	315		
Max	200	236	287	341	425	513	823		
Min	1	1	1	1	1	1	1		
25th	91	106	123	143	163	172	182		
Median	109	131	157	187	232	271	305		
75th	127	153	189	227	300	363	438		



Shortage Pricing Levels for Uncertainty Reserves



Proposed Shortage Pricing Levels for Uncertainty Reserves

- NYISO proposes to add the uncertainty reserve MWs for each interval to a lower pricing step than the existing pricing steps in the ancillary shortage pricing curves.
 - The lower price step indicates that the uncertainty reserves are of a lower priority than that of the contingency reserves.
- The price chosen for the additional uncertainty reserves added to the 30-min NYCA, 30-min East, and 30-min SENY reserve curves would be half of the lowest pricing step which would be \$20.
- For the 10-min total shortage pricing curves where there is a single step, the price step of \$40 will be created for the associated uncertainty reserve MWs. (Supporting analysis is shown in the next slide)
- For N.Y.C. and Long Island, the price chosen for the additional uncertainty reserves added to the 10-min and 30-min reserve shortage curves would be \$20.
- Tables with the updated curves are shown in the appendix.



Shortage Pricing Analysis during Forecast Error Intervals

- The DAM net load forecast errors and non-zero RT NYCA 10-min non-sync prices for the months of January, April, and July 2022 are used for this analysis.
- There are a total of 249 instances of positive net load forecast error (Actual > Forecast) out of 362 instances of non-zero 10-min non-sync prices (69%).
 - 82% of the 10-min non-sync price instances with positive net load forecast errors are less than or equal to \$100.
 - 67% of the 10-min non-sync price instances with positive net load forecast errors are less than or equal to \$40.
- Since we are not simply adding pricing steps to the existing curves but also increasing the reserve requirement with the uncertainty reserve MWs, which are of a lower priority than that of the contingency reserves, the \$40 pricing step is proposed to be used for the uncertainty reserve MWs added to the NYCA 10-min total reserves.
 - The \$40 price step would also be used for the uncertainty reserves added to the East 10-min total reserves.



Example NYCA 30-min Reserve Demand Curve



Assuming 500 MW of NYCA 30-min Uncertainty Reserves at \$20/MWh



Example NYCA 10-min Total Reserve Demand Curve



Assuming 200 MW of NYCA 10-min total Uncertainty Reserves at \$40/MWh



Additional Considerations

- Should the shortage pricing levels for the uncertainty reserves change based on the time of the year?
- Should the DAM uncertainty reserves be procured only through 30min reserves or through 30-min and 10-min reserves?



Next Steps



Next Steps (Phase 1)

March 20

- Phase 1: Additional Market Design Elements
- Initial Tariff Revisions

April 2

- Consumer Impact Analysis Results
- Final Tariff Revisions
- Market Design Complete

May

- BIC/MC Vote
- Filing date TBD pending tariff/BIC/MC/NYISO Board of Directors
- Q3-Q4
 - Phase 1 FRS Complete



Appendix



Overview of Proposed Enhancements

Reserve	Reserve Product	Current Reserve Reqt.	Proposed Reserve Reqt.	Demand curve (\$/MWh)		
Region				Current	Proposed	
NYCA	30-minute	ute 2,620 MW	2,620 MW + NYCA 30- min UR MW	-	NYCA 30-min UR MW at \$20/MWh	
				200 MW at \$40/MWh	200 MW at \$40/MWh	
				125 MW at \$100/ MWh	125 MW at \$100/MWh	
				55 MW at \$175/MWh	55 MW at \$175/MWh	
				55 MW at \$225/MWh	55 MW at \$225/MWh	
				55 MW at \$300/ MWh	55 MW at \$300/MWh	
				55 MW at \$375/MWh	55 MW at \$375/MWh	
				55 MW at \$500/ MWh	55 MW at \$500/MWh	
				55 MW at \$625/MWh	55 MW at \$625/MWh	
				1,965 MW at \$750/MWh	1,965 MW at \$750/MWh	

UR – Uncertainty Reserves



Overview of Proposed Enhancements

Reserve	Reserve	Current Reserve Reqt.	Proposed	Demand curve (\$/MWh)		
Region	Product		Reserve Reqt.	Current	Proposed	
NYCA	10-minute total	1,310 MW	1,310 MW + NYCA 10-	-	NYCA 10-min UR MW at \$40/MWh	
			min ur mw	\$750/MWh	\$750/MWh	
NYCA	10-minute spin	655 MW	655 MW	\$775/MWh	\$775/MWh	
EAST	30-minute	1,200 MW	1,200 MW + EAST30- min UR MW	-	EAST 30-min UR MW at \$20/MWh	
				\$40/MWh	\$40/MWh	
EAST	10-minute total	1,200 MW	1,200 MW + EAST 10- min UR MW	-	EAST 10-min UR MW at \$40/MWh	
				\$775/MWh	\$775/MWh	
EAST	10-minute spin	330 MW	330 MW	\$40/MWh	\$40/MWh	
SENY	30-minute	1,300, 1,550 MW or 1,800 MW	1,300, 1,550 MW	-	SENY 30-min UR MW at \$20/MWh	
			or 1,800 MW + SENY 30- min UR MW	500 MW at \$40/MWh	500 MW at \$40/MWh	
				800 MW, 1,050 MW, or 1,300 at \$500/MWh	800 MW, 1,050 MW, or 1300 MW at \$500/ MWh	



UR – Uncertainty Reserves

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Overview of Proposed Enhancements

Reserve	Reserve Product	Current Reserve	Proposed	Demand curve (\$/MWh)		
		Reqt.	Reqt.	Current	Addition to the Step/Reqt	
NYC	30-minute	1,000 MW	1,000 MW + NYC 30- min UR MW	-	NYC 30-min UR MW at \$15/MWh	
				\$25/MWh	\$25/MWh	
NYC	10-minute total	500 MW	500 MW + NYC 10- min UR MW	-	NYC 10-min UR MW at \$15/MWh	
				\$25/MWh	\$25/MWh	
LI	30-minute	270-540 MW	270-540 MW + LI 30-min UR MW	-	LI 30-min UR MW at \$15/MWh	
				\$25/MWh	\$25/MWh	
LI	10-minute total	120 MW	120 MW + LI 10-min UR MW	-	LI 10-min UR MW at \$15/MWh	
				\$25/MWh	\$25/MWh	

UR – Uncertainty Reserves

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Our Mission & Vision

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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



Questions?

