

# Ancillary Services Shortage Pricing

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# Agenda

- **Background**
- **Proposal for Procuring Supplemental Reserves**
- **Proposal for Pricing Supplemental Reserves**
- **Next Steps**
- **Appendix: Proposed Reserve Demand Curve Enhancements**

# Background

# A Grid in Transition – The Plan

- Carbon Pricing
- Comprehensive Mitigation Review
- DER Participation Model
- Energy Storage Participation Model
- Hybrid Storage Model

Aligning Competitive Markets and New York State Clean Energy Objectives



- Enhancing Energy & Shortage Pricing
  - Ancillary Services Shortage Pricing
  - Constraint Specific Transmission Shortage Pricing
  - Enhanced Fast Start Pricing
- Review Energy & Ancillary Services Product Design
  - More Granular Operating Reserves
  - Reserve Enhancements for Constrained Areas
  - Reserves for Resource Flexibility

Valuing Resource & Grid Flexibility



- Enhancements to Resource Adequacy Models
- Revise Resource Capacity Ratings to Reflect Reliability Contribution
  - Expanding Capacity Eligibility
  - Tailored Availability Metric
- Capacity Demand Curve Adjustments

Improving Capacity Market Valuation



# Previous Presentations

Date	Working Group	Discussion points and links to materials
12-05-19	ICAPWG/MIWG	<p>Ancillary Services Shortage Pricing - Study Report  <a href="https://www.nyiso.com/documents/20142/9622070/Ancillary%20Services%20Shortage%20Pricing_study%20report.pdf/15fb5f26-e1af-fa5a-ee29-3943ab483369">https://www.nyiso.com/documents/20142/9622070/Ancillary%20Services%20Shortage%20Pricing_study%20report.pdf/15fb5f26-e1af-fa5a-ee29-3943ab483369</a></p> <p>Ancillary Services Shortage Pricing - Study Report Overview(presentation)  <a href="https://www.nyiso.com/documents/20142/9622070/Ancillary%20Services%20Shortage%20Pricing_study%20overview_12_5_MIWG.pdf/99b7c720-ba5d-f656-01e4-4fd54a930d4b">https://www.nyiso.com/documents/20142/9622070/Ancillary%20Services%20Shortage%20Pricing_study%20overview_12_5_MIWG.pdf/99b7c720-ba5d-f656-01e4-4fd54a930d4b</a></p>
04-07-20	ICAPWG/MIWG	<p>Ancillary Services Shortage Pricing - Reserve Demand Curve Enhancements  <a href="https://www.nyiso.com/documents/20142/11759586/Ancillary%20Services%20Shortage%20Pricing%20MIWG%2004072020.pdf/bf7106a3-c817-db1e-97a2-bf53baa5ad96">https://www.nyiso.com/documents/20142/11759586/Ancillary%20Services%20Shortage%20Pricing%20MIWG%2004072020.pdf/bf7106a3-c817-db1e-97a2-bf53baa5ad96</a></p>
04-27-20	ICAPWG/MIWG	<p>Ancillary Services Shortage Pricing  <a href="https://www.nyiso.com/documents/20142/12170360/Ancillary%20Services%20Shortage%20Pricing%20MIWG%2004272020.pdf/9e1730e1-c8d2-33eb-b3c4-8e2e7574534a">https://www.nyiso.com/documents/20142/12170360/Ancillary%20Services%20Shortage%20Pricing%20MIWG%2004272020.pdf/9e1730e1-c8d2-33eb-b3c4-8e2e7574534a</a></p>
07-14-20	ICAPWG/MIWG	<p>Consumer Impact Methodology- Ancillary Services Shortage Pricing  <a href="https://www.nyiso.com/documents/20142/13769834/CIA%20Methodology%20for%20Ancillary%20Services%20Shortage%20Pricing%20-%20Final.pdf/593104d6-6bde-3cbf-0919-38729f6e7dac">https://www.nyiso.com/documents/20142/13769834/CIA%20Methodology%20for%20Ancillary%20Services%20Shortage%20Pricing%20-%20Final.pdf/593104d6-6bde-3cbf-0919-38729f6e7dac</a></p>
08-10-20	ICAPWG/MIWG	<p>Ancillary Services Shortage Pricing  <a href="https://www.nyiso.com/documents/20142/14404876/Ancillary%20Services%20Shortage%20Pricing_08102020_MIWG_final.pdf/8e436ea5-8061-8dc6-f0dd-b27d14acc7bc">https://www.nyiso.com/documents/20142/14404876/Ancillary%20Services%20Shortage%20Pricing_08102020_MIWG_final.pdf/8e436ea5-8061-8dc6-f0dd-b27d14acc7bc</a></p>

# Ancillary Services Shortage Pricing

- **This is a continuation of a 2019 project**
  - In December 2019, NYISO published a report that evaluated the appropriateness of revising the structure of the current reserve demand curves (including additional, more granular steps).
- **2020 Project Goal : Market Design Complete**

# Project Overview

- **This project consists of two primary components:**
  - Revisions to the current reserve demand curves (presented on April 27, 2020)
    - Adjustments to shortage pricing values
    - supplemental “steps” for a more graduated demand curve for NYCA 30-minute reserves
  - Procurement of supplemental reserves
    - These are additional reserves beyond minimum reliability requirements
    - This component will be discussed today, and will be addressed in future presentations
- **This project will also evaluate the structure of the NYCA 30-minute reserve demand curve that applies in real-time during SCR/EDRP activations of less than all zones**
  - Presented on August 10, 2020

# Proposal for Procuring Supplemental Reserves



# Procuring Reserves Beyond Minimum Requirements

- **The NYISO will discuss procuring supplemental reserves for system uncertainty within the scope of this project.**
  - Procuring these reserved should be considered along with the potential adjustments to the existing reserve demand curves.
  - Supplemental reserve procurements can help provide ready access to capability to account for system uncertainty introduced by weather-dependent resources (distributed and grid-connected), as well as potentially more volatile load
- **Procuring supplemental reserves has been identified as a potential solution to address a number of reliability gaps in the Grid in Transition whitepaper.**

# Proposal for Increasing Reserve Requirements

- **The NYISO does not propose to add any supplemental reserve requirements at this time.**
- **Instead the NYISO proposes to establish the process/procedures for implementing supplemental reserves when warranted in the future**
  - The NYISO is seeking to implement the necessary tariff revisions to add these requirements in the future as part of this proposal.

# Proposal for Increasing Reserve Requirements

- **Process to evaluate potential need for supplemental reserves:**
  - The levels of increased reserve procurement under this approach will be based on the normal expected levels of 30 and 60 minute net load forecast error<sup>1</sup> due to the NYISO's expected forecasting accuracy of load and production capability from installed wind and solar resources
    - Net load forecast error = {(Forecast load- actual load) - (forecast wind - actual wind) - (forecast FTM solar- actual FTM solar)}
      - Forecast and actual load includes the impacts of production by BTM solar
    - A negative value indicates an under-forecast error which could be due to any of the three factors.
      - Actual load exceeds the forecast load and/or
      - Actual wind is lower than forecasted wind and/or
      - Actual FTM solar is lower than forecasted solar

1. The 30 and 60-minute net load forecast errors are currently reported in the NYISO Monthly Report [https://www.nyiso.com/documents/20142/14062304/03%20Operations\\_Report.pdf/3787716a-240f-ee6e-e174-38b812c7b55a](https://www.nyiso.com/documents/20142/14062304/03%20Operations_Report.pdf/3787716a-240f-ee6e-e174-38b812c7b55a)

# Proposal for Increasing Reserve Requirements

- The under-forecast scenario of the net load forecast error will be considered when proposing increases to the 30 and/or 10-minute reserves.
- The NYISO proposes to monitor the normal expected levels of 60-minute under-forecast net load forecast error and may recommend increases in the 30-minute reserves to maintain the resources available to restore 10-minute and 30-minute reserves as required by NYSRC and NPCC.
- The NYISO also proposes to monitor the normal expected values of 30-minute under-forecast net load forecast error and may recommend increases in the 10-minute total reserve product (with 50% of any proposed increase to be procured as spinning reserve) to allow ready access to flexible resources in real-time to maintain the levels of 10-minute synchronous and 10-minute total reserve as required by NYSRC

# Proposal for Increasing Reserve Requirements

- **Considerations that may trigger the need for supplemental reserves**
  - The following conditions are examples of events that may trigger the need to increase 30-minute and/or 10-minute reserve requirements:
    - Every increase in quantity of installed solar and wind capacity equal to or greater than 2,000 MW above the 2020 base line of 4,000 MW of wind and solar resources.
    - A maximum under-forecast net load forecast error of 1,000 MW or higher for at least 2 consecutive months that cannot be addressed through improvements to the forecasting systems.
    - An increase in the occurrence of state changes (Alert, Major Emergency) associated with reserve shortages driven by net load and/or wind/solar forecast error

# Proposal for Increasing Reserve Requirements

## ■ Evaluation/Reporting Procedure:

- Upon occurrence of any triggering event the NYISO will conduct an assessment which will include the following (see next slide for supplemental details):
  - An evaluation of the NYISO's current forecasting systems and whether improvements thereto may address the observed under-forecasting concerns such as to alleviate or mitigate the need for increasing reserve requirements
  - The reliability requirements at risk of becoming non-compliant absent remedial action
  - Any recommended increases to 10-minute and/or 30-minute reserve requirements (either statewide or for a specific reserve region) and the rationale for any such proposed increases

# Proposal for Increasing Reserve Requirements

- Prior to proposing any increase to 10-minute or 30-minute reserve procurement targets, the NYISO will evaluate whether the under-forecast net load forecast error being observed can be corrected or mitigated by changes to the NYISO's forecasting systems.
- If forecasting systems enhancements cannot fully resolve the under-forecast net load forecast error being observed, the NYISO will conduct a historical analysis of the data to establish an increase to 10-minute and/or 30-minute reserves that is sufficient to capture 95% of the under-forecast net load forecast error being observed.
- The NYISO will review the results of the evaluation described above with stakeholders at the Operating Committee.
  - Any proposed increase to existing reserve requirements will be reviewed with stakeholders at least 30 days prior to being implemented in the market

# Proposal for Pricing Supplemental Reserves



# Proposal for Pricing Supplemental Reserve Requirements

## ■ Pricing of supplemental reserves

- Appropriate shortage pricing values will support procurement of the supplemental reserves, as well as conversion of such reserves to energy when required to meet system needs
- The NYISO is proposing pricing these reserves lower than the proposed lowest shortage pricing value
  - The proposal to price the supplemental reserves at a non-zero value lower than the \$25/MWh would provide a signal to procure these reserves when the cost of doing so is relatively low.
  - Additionally, the market software would go short of these reserves prior to going short of the reserves established to meet applicable reliability requirements.

# Proposal for Pricing Supplemental Reserve Requirements

- **The NYISO is proposing to tier these shortage pricing values to reflect the inherent values of these reserve products.**
  - 10-minute spinning reserve is more valuable than 10-minute total reserve; and the 10-minute total product is more valuable than 30-minute reserves.
  - These products would follow the same cascading logic as applies to current reserve regions and reserve products.

# Proposal for Pricing Supplemental Reserve Requirements

- **The NYISO analyzed the following to help inform the appropriate shortage pricing value for these supplemental reserves :**
  - Historic reserve shadow prices to determine cost of providing the next MW and;
  - Historic reserve offers to determine the willingness to be paid/expected costs

# Proposal for Pricing Supplemental Reserve Requirements

## ■ Historic reserve shadow price analysis

- The NYISO evaluated shadow prices for all day-ahead and real-time (RTD) instances from December 2015 to July 2020 where there were no reserve shortages
  - Reserve shadow prices for any product was either \$0/MWh or greater than \$0/MWh but less than or equal to the applicable shortage price for the respective product.
  - The shadow price represents the cost to procure one supplemental MW of the reserve product in question
- This timeframe was considered to account for the changes from the Comprehensive Shortage Pricing project which was implemented in November 2015.

# Pricing Analysis- Historic Reserve Shadow Price

## ■ DA shadow price analysis

- This analysis includes data from all reserve regions
  - 10-minute spin = NYCA spin, EAST spin
  - 10-minute total = NYCA 10, EAST 10, NYC 10, LI 10
  - 30-minute = NYCA 30, EAST 30, SENY 30, NYC 30, LI 30

	10-minute Spin	10-minute total	30-minute
95 <sup>th</sup> percentile of reserve shadow price	\$2/MWh	\$0.3/MWh	\$5/MWh
98 <sup>th</sup> percentile of reserve shadow price	\$4/MWh	\$1.3/MWh	\$5.8/MWh
99 <sup>th</sup> percentile of reserve shadow price	\$6.6/MWh	\$2.1/MWh	\$8/MWh

# Pricing Analysis- Historic Reserve Shadow Price

## ■ RTD shadow price analysis

- This analysis includes data from all reserve regions
  - 10-minute spin = NYCA spin, EAST spin
  - 10-minute total = NYCA 10, EAST 10, NYC 10, LI 10
  - 30-minute = NYCA 30, EAST 30, SENY 30, NYC 30, LI 30

	10-minute Spin	10-minute total	30-minute
95 <sup>th</sup> percentile of reserve shadow price	\$1.2/MWh	\$0/MWh	\$0/MWh
98 <sup>th</sup> percentile of reserve shadow price	\$10.9/MWh	\$0/MWh	\$0/MWh
99 <sup>th</sup> percentile of reserve shadow price	\$19.2/MWh	\$0/MWh	\$0/MWh

# Proposal for Pricing Supplemental Reserve Requirements

- **The NYISO also evaluated historic reserve supply offers**
  - One day from each month in 2019 was considered for this analysis
    - Days with high forecast error and/or peak load days were considered
    - Day-Ahead Market (DAM) reserve offers for 10-minute spinning, 10-minute total and 30-minute reserves were analyzed

# Pricing Analysis – Historic Reserve Supply Offers

	10-minute spin		10-minute total		30-minute	
	95 <sup>th</sup> percentile of offers	99 <sup>th</sup> percentile of offers	95 <sup>th</sup> percentile of offers	99 <sup>th</sup> percentile of offers	95 <sup>th</sup> percentile of offers	99 <sup>th</sup> percentile of offers
NYCA	\$7/MWh	\$50/MWh	\$5.95/MWh	\$11.74/MWh	\$8.75/MWh	\$50/MWh
NYC and LI	\$5.5/MWh	\$6/MWh	\$6.45/MWh	\$14.49/MWh	\$8.75/MWh	\$10/MWh

- Note - NYC and LI reserve offers are broken out separately to help identify any potential for material differences in offer costs from resources in these regions



# Pricing Proposal

- **The NYISO proposes to price supplemental reserves when added in the future based on the following shortage pricing values in all reserve regions**
  - Any supplemental 30-minute reserves = \$10/MWh
  - Any supplemental 10-minute total reserves = \$12/MWh
  - Any supplemental 10-minute spinning reserves = \$15/MWh
- **The pricing values would be set forth in the tariff along with language related to the process for adding supplemental reserves when warranted in the future.**

# Pricing of Supplemental Reserves during SCR/EDRP activations

- **For non-NYCA reserve regions the NYISO is proposing to maintain the current demand curve treatment during SCR/EDRP activations.**
  - During SCR/EDRP activations, the NYISO proposes to maintain the applicable proposed shortage pricing values for any supplemental 30-minute reserves in all reserve regions.
- **During SCR/EDRP activations, the NYCA 30-minute reserve demand curve would result in a revised four “step” curve in real-time with consistent logic for assigning MW quantities across the four “steps”, when supplemental reserves are added in the future.**
  - \$750/MWh “step” up to and including 1,965 MW
  - \$625/MWh “step” beyond 1,965 through 2,020 MW
  - \$500/MWh “step” beyond 2,020 MW through (2,620 + the applicable Scarcity Reserve Requirement)
  - \$10/MWh “step” beyond (2,620 + the applicable Scarcity Reserve Requirement) up to and including any applicable 30-minute supplemental reserves requirement for NYCA

# Next Steps

# Next Steps

## ■ September 2020

- Present Consumer Impact Analysis
- Further discussion of proposal including draft tariff revisions

## ■ October 2020

- Seek stakeholder approval of proposal at BIC and MC

## ■ 2021

- Currently targeted timeframe to implement the proposed enhancements
- Implementation of the proposed enhancements is currently expected to occur after implementation of the Reserves for Resource Flexibility project

# Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system



# Appendix

# Proposed Reserve Demand Curve Enhancements

# Reserve Demand Curve Enhancements

- **Proposed revisions to the values and steps of the current reserve demand curves are intended to:**
  - Ensure continued compliance with applicable reliability requirements
  - Account for more recent data and information regarding resource operating costs
  - Provide targeted market signals that align with actual reliability needs of the NYCA at times when actions are being taken to maintain reliability
  - Provide appropriate locational price signals to incentivize resources to include/maintain capability to provide reserves when and where needed
  - Maintain consistency with actions taken by operators to maintain system reliability



# Considerations for Shortage Pricing Values

- Shortage pricing values should be set at levels that are consistent with operator actions to maintain reliability.
- In evaluating the current shortage pricing values, the NYISO has considered the following:
  - Cost of resources capable of providing reserves on peak load days
  - Cost of demand reductions from SCR/EDRP activations
  - Cost of Supplement Resource Evaluation (SRE) commitments
  - Cost of out-of-merit (OOM) actions to commit fast-start resources
  - Re-run of certain Real-Time Commitment (RTC) cases

# Overview of Proposed Enhancements

Reserve Region	Reserve Product	Reserve Reqt.	Demand curve (\$/MWh)		Rationale
			Current	Proposed	
NYCA	30-minute	2,620 MW	300 MW at \$25/MWh	200 MW at \$40/MWh	Allow a portion of the 30 minute total reserves to be forgone against price volatility
			-	125 MW at \$100/MWh	Facilitate reduction of unnecessary price volatility by further graduation of the NYCA 30-minute reserve demand curve
			355 MW at \$100/MWh	55 MW at \$175/MWh	Consistent with cost of operator actions to maintain 30-minute reserves (GT OOMs)
			-	55 MW at \$225/MWh	Consistent with cost of operator actions to maintain 30-minute reserves (SREs)
			300 MW at \$200/MWh	55 MW at \$300/MWh	Facilitate reduction of unnecessary price volatility by further graduation of the NYCA 30-minute reserve demand curve
			-	55 MW at \$375/MWh	Represents a value aligned with the average cost of 99% of the resource costs observed for historic SRE and OOM commitments
			-	55 MW at \$500/MWh	Consistent with cost of activating SCR/EDRP resources to maintain reserves
			-	55 MW at \$625/MWh	Facilitate reduction of unnecessary price volatility by further graduation of the NYCA 30-minute reserve demand curve
			1,665 MW at \$750/MWh	1,965 MW at \$750/MWh	Consistent with cost of operator actions to replenish by converting 30 min GTs to energy
NYCA	10 minute total	1,310 MW	\$750/MWh	\$750/MWh	Consistent with cost of operator actions to replenish by converting 30 min GTs to energy
NYCA	10 minute spin	655 MW	\$775/MWh	\$775/MWh	Provide scheduling priority to NYCA 10-minute total and NYCA 30-minute reserves
EAST	30-minute	1,200 MW	\$25/MWh	\$40/MWh	Facilitates distribution of reserves throughout NYCA
EAST	10 minute total	1,200 MW	\$775/MWh	\$775/MWh	Recognizes equal importance with NYCA 10-min spinning reserves
EAST	10 minute spin	330 MW	\$25/MWh	\$40/MWh	Facilitates distribution of reserves throughout NYCA

# Overview of Proposed Enhancements

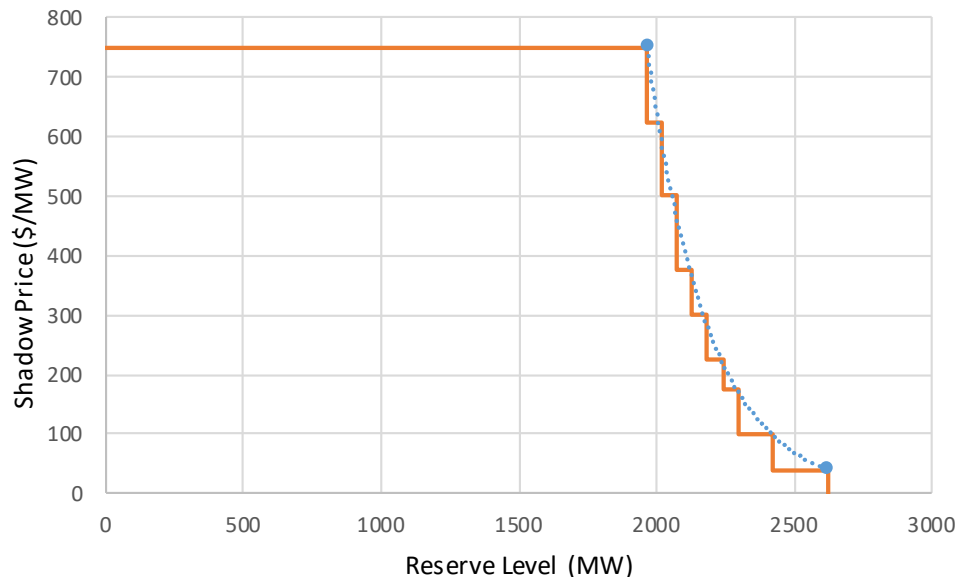
Reserve Region	Reserve Product	Reserve Req.	Demand curve (\$/MWh)		Rationale
			Current	Proposed	
SENY	30-minute	1,550 MW or 1,800 MW	250 MW or 500 MW at \$25/MWh (proposed; pending stakeholder review/approval)	250 MW or 500 MW at \$40/MWh (only if SENY incremental reserves proposal is approved by stakeholders)	supplemental reserves to facilitate returning transmission assets to Normal Transfer Criteria following a contingency (see Reserves for Resource Flexibility project)
			1,300 MW at \$500/MWh	1,300 MW at \$500/MWh	Consistent with cost of activating SCR/EDRP resources to maintain reserves
NYC	30-minute	1,000 MW	\$25/MWh	\$25/MWh	Facilitates distribution of reserves throughout NYCA
NYC	10-minute total	500 MW	\$25/MWh	\$25/MWh	Facilitates distribution of reserves throughout NYCA
LI	30-minute	270-540 MW	\$25/MWh	\$25/MWh	Facilitates distribution of reserves throughout NYCA
LI	10-minute total	120 MW	\$25/MWh	\$25/MWh	Facilitates distribution of reserves throughout NYCA

# Proposed NYCA 30-minute Reserve Demand Curve

- **Based on the NYSRC rules, the NYCA 30-minute requirement of 2,620 MW addresses the following:**
  - 1.5 times the single largest contingency ( $1.5 \times 1,310 = 1,965$  MW)
  - Following a contingency, 10-minute operating reserve shall be restored within 30 minutes
    - NYCA 10-minute reserve requirement = 1,310 MW.
    - 1965 MW covers a portion of the supplemental 1,310 MW needed to meet this requirement ( $1,965 - 1,310 = 655$  MW)
    - supplemental 655 MW is required to address this rule bringing the NYCA 30-minute requirement to 2,620 MW ( $1,965 + 655 = 2,620$  MW)
- **The binding NYSRC requirement relates to 1,965 MW. Thus, NYISO operators would seek to avoid reserves falling below the 1.5 x largest single contingency component of the requirement.**
- **Therefore, the NYISO proposes to price this 1,965 MW portion of the total statewide reserve requirement at \$750/MWh**
- **For the remaining 655 MW of 30-minute reserves, the NYISO proposes to utilize a stepped approximation of an exponential curve to help smooth the NYCA 30-minute reserve demand curve**
  - An exponential curve was used because, as available reserves approach 1,965 MW, the operators are more likely to take actions to maintain system reliability
  - The cost of various operator actions that may be taken to maintain reliability were utilized in developing the exponential curve construct

# Exponential Curve Construct Analysis

NYCA 30-Minute Reserve Demand Curve



Shortage Price (\$/MW)	Reserve Level (MW)	Demand Curve (MW)
750	$\leq 1,965$ to 0	1,965
625	1,965 to 2,020	55
500	2,020 to 2,075	55
375	2,075 to 2,130	55
300	2,130 to 2,185	55
225	2,185 to 2,240	55
175	2,240 to 2,295	55
100	2,295 to 2,420	125
40	2,420 to 2,620	200

Note:

- Highlighted shortage price cells indicate the values from the costs of operator actions analysis

# Scarcity Pricing: NYCA 30-Minute Reserve Demand Curve

- The NYISO proposes to align the treatment of the applicable Scarcity Reserve Requirement within the MW quantities assigned to the “steps” of the NYCA 30-minute reserve demand curve during all SCR/EDRP activations
- Based on the proposed revisions to the NYCA 30-minute reserve demand curve for the existing statewide reserve requirement of 2,620 MW (see the Appendix for supplemental details), the proposed enhancements would result in a revised three “step” curve during SCR/EDRP activations in real-time with consistent logic for assigning MW quantities across the three “steps”
  - \$500/MWh “step” = 600 MW + the applicable Scarcity Reserve Requirement
  - \$625/MWh “step” = 55 MW
  - \$750/MWh “step” = 1,965 MW