New York ISO
Independent System Operator

Ancillary Services Shortage Pricing

Pallavi Jain

Market Design Specialist, Energy Market Design

ICAPWG/MIWG

October 16, 2020

Agenda

- Background
- Revised Proposal for the Interaction of Scarcity Pricing and Supplemental Reserves
- Updated Tariff Revisions
- Appendix (previously presented material):
  - Proposed Reserve Demand Curve Enhancements
  - Analysis for Pricing of Supplemental Reserves
  - NYCA 30-minute Reserve Demand Curve Structure during Scarcity Activations

New York ISO

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

New York ISO

Previous Presentations

Date	Working Group	Discussion points and links to materials
12-05-19	ICAPWG/MIWG	Ancillary Services Shortage Pricing - Study Report https://www.nyiso.com/documents/20142/9622070/Ancillary%20Services%20Shortage%20Pricing_study%20report.pdf/15fb5f26-e1af-fa5a-ee29-3943ab483369
04-07-20	ICAPWG/MIWG	Ancillary Services Shortage Pricing - Reserve Demand Curve Enhancements https://www.nyiso.com/documents/20142/11759586/Ancillary%20Services%20Shortage%20Pricing%20MIWG%2004072020.pdf/bf7106a3-c817-db1e-97a2-bf53baa5ad96
04-27-20	ICAPWG/MIWG	Ancillary Services Shortage Pricing https://www.nyiso.com/documents/20142/12170360/Ancillary%20Services%20Shortage%20Pricing%20MIWG%2004272020.pdf/9e1730e1-c8d2-33eb-b3c4-8e2e7574534a
07-14-20	ICAPWG/MIWG	Consumer Impact Methodology- Ancillary Services Shortage Pricing https://www.nyiso.com/documents/20142/13769834/CIA%20Methodology%20for%20Ancillary%20Services%20Shortage%20Pricing%20-%20Final.pdf/593104d6-6bde-3cbf-0919-38729f6e7dac
08-10-20	ICAPWG/MIWG	Ancillary Services Shortage Pricing https://www.nyiso.com/documents/20142/14404876/Ancillary%20Services%20Shortage%20Pricing_08102020_MIWG_final.pdf/8e436ea5-8061-8dc6-f0dd-b27d14acc7bc
09-01-20	ICAPWG/MIWG	Ancillary Services Shortage Pricing https://www.nyiso.com/documents/20142/14935961/Ancillary%20Services%20Shortage%20Pricing%20-%2009012020%20MIWG_final.pdf/1c9f84cf-0f69-91b4-87a8-ab40bfc82aa8 Consumer Impact Analysis- Ancillary Services Shortage Pricing https://www.nyiso.com/documents/20142/14935961/CIA%20-%20Ancillary%20Services%20Shortage%20Pricing%20-%20Final.pdf/e03e0d04-3169-7a9e-d7b0-2738b44d26ac
09-22-20	ICAPWG/MIWG	Ancillary Services Shortage Pricing https://www.nyiso.com/documents/20142/15473217/Ancillary%20Services%20Shortage%20Pricing%2009222020%20MIWG.pdf/bf986803-6446-c04a-81be-fa65c9acebdd

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**

New York ISO

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
    - Additional "steps" for a more graduated demand curve for NYCA 30-minute reserves
  - Procurement of supplemental reserves
    - These are additional reserves beyond minimum reliability requirements
    - Presented on September 22, 2020 and will be furthered discussed in today's presentation
- **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

New York ISO

Scarcity Pricing Enhancements

Pricing of Supplemental Reserves during SCR/EDRP activations: Initial Proposal

- **During SCR/EDRP activations, the NYISO initially proposed to maintain the procurement target for any supplemental 30-minute reserves with an assigned shortage pricing value of $10/MWh.**
  - Supplemental reserve requirements would be treated as wholly incremental to any applicable scarcity reserve requirement(s).
  - Reserves procured to satisfy the applicable scarcity reserve requirement(s) would not simultaneously count toward satisfying any applicable 30-minute supplemental reserve requirement

New York ISO

Pricing of Supplemental Reserves during SCR/EDRP activations: Updated Proposal

- In response to stakeholder feedback, the NYISO proposes to revise its initial proposal regarding the interaction of the scarcity pricing logic with any applicable 30-minute supplemental reserve requirements that may be implemented in the future
- During SCR/EDRP activations, the NYISO's updated proposal would maintain the proposed $10/MWh shortage pricing value for only the quantity of 30-minute supplemental reserves, if any, that exceeds the applicable scarcity reserve requirement(s).
  - During SCR/EDRP activations, the NYISO would procure the greater of the applicable scarcity reserve requirement(s) and any applicable 30-minute supplemental reserve requirements
  - Reserves procured to satisfy the applicable scarcity reserve requirement(s) will simultaneously serve to meet any applicable 30-minute supplemental reserve requirement
- For regions that encompass the scarcity reserve activation region, the updated proposal will account for procuring the greater of the scarcity reserve requirement or applicable supplemental reserve requirement in each affected reserve region
  - For example- If during a real-time interval a 300 MW scarcity reserve requirement were applicable in all EAST Load Zones (zones F-K), 0 MW of 30-minute supplemental reserve requirement was in effect for EAST and 500 MW 30-minute supplemental reserve requirement was in effect for NYCA at $10/MWh
  - The updated proposal would add 300 MW of scarcity reserve priced at a $500/MWh to the EAST 30-minute reserve demand curve
  - Additionally, for the NYCA 30-minute reserve demand curve, the updated proposal would: (1) value the 300 MW of the otherwise applicable 500 MW supplemental reserve requirement at $500/MWh (accounting for the applicable scarcity reserve requirement) and (2) value the remaining 200 MW of supplemental reserves at $10/MWh

New York ISO

Scenario 1 (NYCA): 30-Minute Supplemental Reserves Requirement Exceeds Scarcity Reserves Requirement

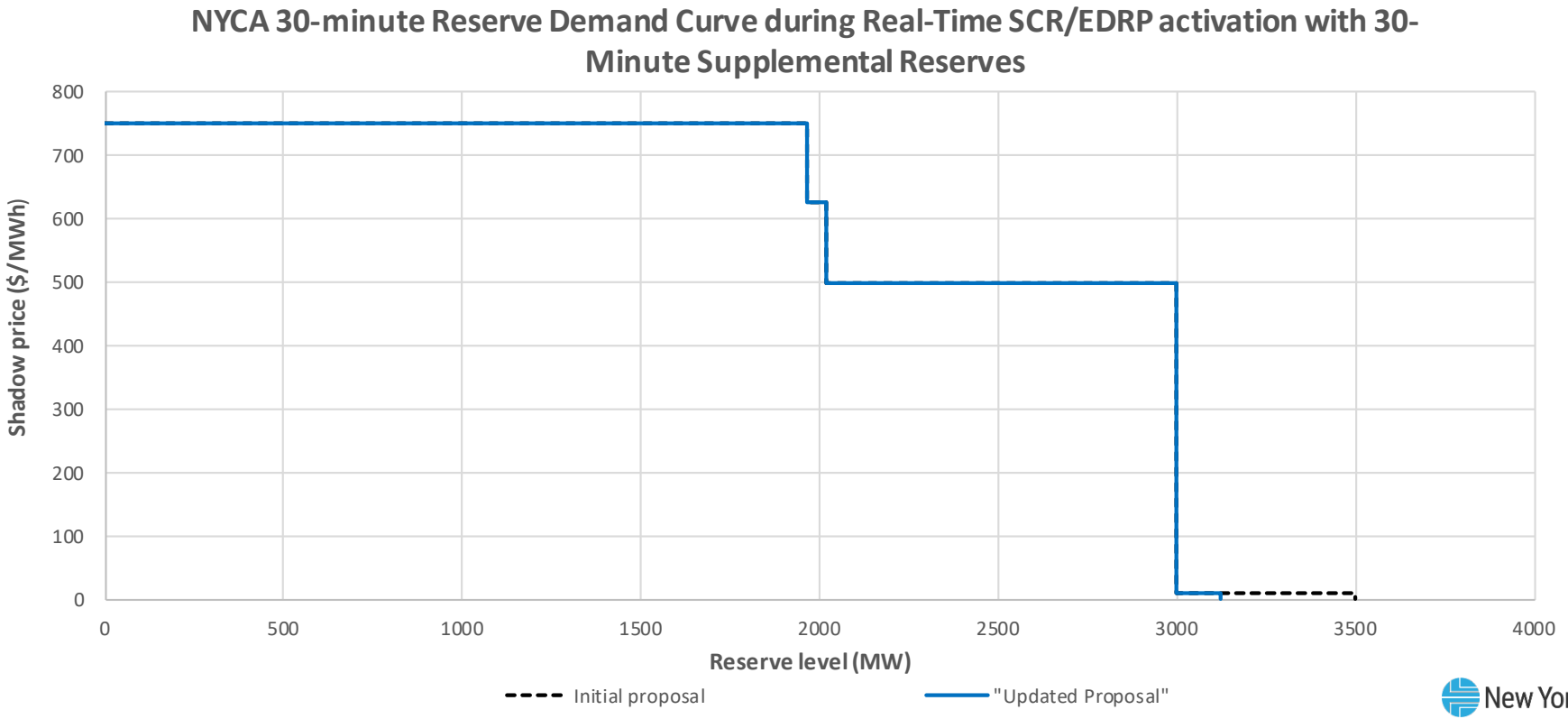
Considerations for Scenario 1	
Ordinary Requirement	2620 MW
Scarcity Reserves Reqt.	380 MW
Supp. Reserves Reqt.	500 MW
Target Level (Initial Proposal)	3500 MW
Target Level (Updated Proposal)	3120 MW

- Updated proposal for NYCA 30-minute reserve requirement during SCR/EDRP activations:
  - Target level = minimum requirement + max(30-minute supplemental reserves req. or the applicable scarcity reserve req.)
  - 2620+max(500,380) = 2620+500 = 3120 MW

- Under the NYISO's updated proposal, when the 30-minute supplemental reserve requirement exceeds the scarcity reserve requirement, the NYCA 30-minute demand curve in real-time during SCR/EDRP activations results in a four "step" demand curve as follows:
  - $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) [beyond 2,020 MW through 3,000 MW for Scenario 1]
  - $10/MWh "step" beyond (2,620 + the applicable Scarcity Reserve Requirement) through ((2,620 + the applicable Scarcity Reserve Requirement) + (Supplemental requirement - Scarcity Reserve Requirement)) [beyond 3,000 MW up to and including 3,120 MW for Scenario 1]

New York ISO

Scenario 1 (NYCA): 30-Minute Supplemental Reserves Requirement Exceeds Scarcity Reserves Requirement



New York ISO

Scenario 2 (NYCA): Scarcity Reserves Requirement Exceeds 30-Minute Supplemental Reserves Requirement

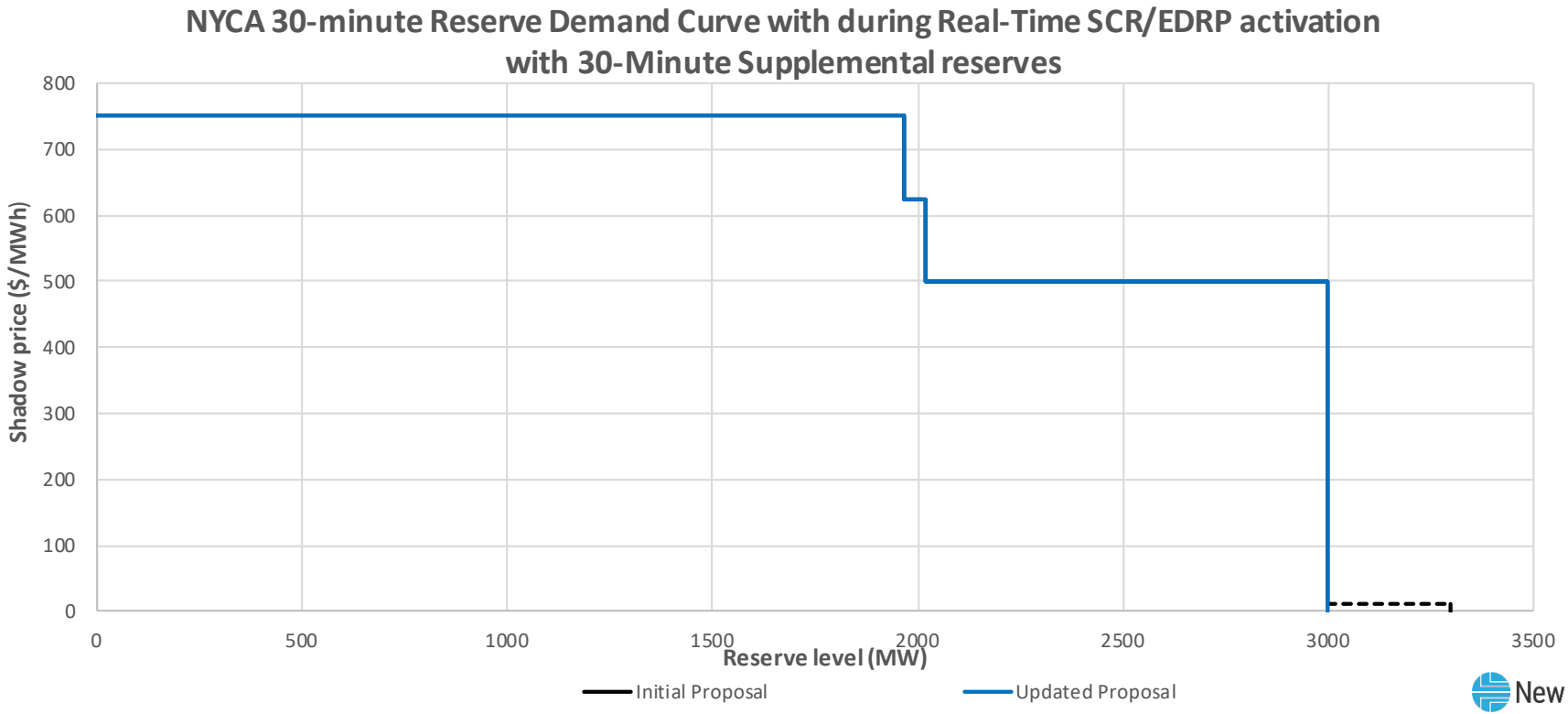
Considerations for Scenario 2	
Ordinary Requirement	2620 MW
Scarcity Reserves Reqt.	380 MW
Supp. Reserves Reqt.	300 MW
Target Level (Initial Proposal)	3300 MW
Target Level (Updated Proposal)	3000 MW

- Updated proposal for NYCA 30-minute reserve requirement during SCR/EDRP activations:
  - Target level = minimum requirement + max(30-minute supplemental reserves req. or the applicable scarcity reserve req.)
  - 2620+max(300,380) = 2620+380 = 3000 MW

- Under the NYISO's updated proposal, when the scarcity reserve requirement exceeds the 30-minute supplemental reserve requirement, NYCA 30-minute demand curve in real-time during SCR/EDRP activations results in a three "step" demand curve as follows:
  - $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) [beyond 2,020 MW up to and including 3,000 MW for Scenario 2]

New York ISO

Scenario 2 (NYCA): Scarcity Reserves Requirement Exceeds 30-Minute Supplemental Reserves Requirement



New York ISO

Updated Draft Tariff Revisions

- **The NYISO proposes revisions to Market Administration and Control Area Services Tariff (MST) Sections 15.4.7(k), 15.4.7(l), 15.4.7(m), 15.4.7(n), and 15.4.7(o) to address the updated proposal regarding the interaction of the scarcity pricing logic with any applicable 30-minute supplemental reserve requirements during SCR/EDRP activations in real-time**
  - Proposed revisions address the procurement of the greater of the applicable scarcity reserve requirement(s) or any applicable 30-minute supplemental reserve requirement during SCR/EDRP activations in real-time
  - Proposed revisions account for reserves procured to meet the applicable scarcity reserve requirement(s) serving to satisfy any applicable 30-minute supplemental reserve requirement
  - $10/MWh shortage pricing value during SCR/EDRP activations in real-time applies only to the extent that any applicable 30-minute supplemental reserve requirement exceeds the otherwise applicable scarcity reserve requirement(s)
- **Incremental changes to the proposed revisions reviewed at the September 22, 2020 ICAPWG/MIWG meeting are highlighted within the document posted as part of the meeting material.**

New York ISO

Next Steps

Next Step & Implementation Timeline

- **November 2020**
  - Seek stakeholder approval of proposal at BIC and MC
- **As discussed at the October 2, 2020 MIWG, the NYISO is currently working with its vendor to estimate the implementation which will inform the timeline for the different aspects of the proposal**
  - The NYISO will continue to keep stakeholders informed as these estimates are developed

New York ISO

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

New York ISO

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

New York ISO

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

New York ISO

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

New York ISO

Overview of Proposed Enhancements

Reserve Region	Reserve Product	Reserve Reqt.	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

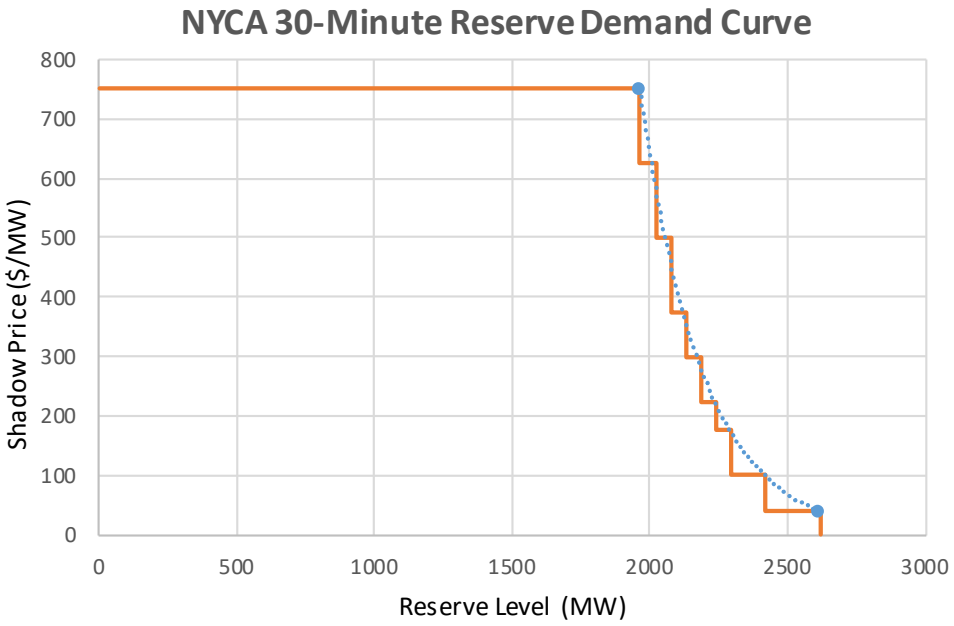
New York ISO

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*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

New York ISO

Exponential Curve Construct Analysis



Shortage Price ($/MW)	Reserve Level (MW)	Demand Curve (MW)
750	≤ 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

New York ISO

Analysis for Pricing of Supplemental Reserves

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

New York ISO

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.

New York ISO

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
95th percentile of reserve shadow price	$2/MWh	$0.3/MWh	$5/MWh
98th percentile of reserve shadow price	$4/MWh	$1.3/MWh	$5.8/MWh
99th percentile of reserve shadow price	$6.6/MWh	$2.1/MWh	$8/MWh

New York ISO

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
95th percentile of reserve shadow price	$1.2/MWh	$0/MWh	$0/MWh
98th percentile of reserve shadow price	$10.9/MWh	$0/MWh	$0/MWh
99th percentile of reserve shadow price	$19.2/MWh	$0/MWh	$0/MWh

New York ISO

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

New York ISO

Pricing Analysis – Historic Reserve Supply Offers

	10-minute spin		10-minute total		30-minute	
	95th percentile of offers	99th percentile of offers	95th percentile of offers	99th percentile of offers	95th percentile of offers	99th 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

New York ISO

NYCA 30-Minute Reserve Demand Curve during SCR/EDRP Activations

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, 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"
  - $750/MWh "step" up to and including 1,965 MW
  - $625/MWh "step" beyond 1,965 MW through 2,020 MW
  - $500/MWh "step" beyond 2,020 MW through (2,620 + the applicable Scarcity Reserve Requirement)

New York ISO