New York ISO
Independent System Operator

Ancillary Services Shortage Pricing

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Agenda

- Background
- Analysis of Proposed $40/MWh Shortage Price Value
- Scarcity Pricing Enhancement for NYCA 30-Minute Reserve Demand Curve
- Procuring Additional Reserves
- Next Steps

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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

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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
		Ancillary Services Shortage Pricing - Study Report Overview(presentation) https://www.nyiso.com/documents/20142/9622070/Ancillary%20Services%20Shortage%20Pricing_study%20overview_12_5_MIWG.pdf/99b7c720-ba5d-f656-01e4-4fd54a930d4b
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

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**

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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 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**
  - This will also be discussed today

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Analysis of Proposed $40/MWh Shortage Price

Re-run of RTC Cases

- **The NYISO evaluated RTC re-run cases with different demand curve values to determine a pricing level at which re-dispatch occurs to help reduce or fully resolve historically observed shortages.**
- **16 RTC intervals were re-run from August 2019 - April 2020 where NYCA 30-minute reserves or EAST spinning reserves were short.**
  - These products were selected because the current reserve demand curves for each product include use of a $25/MWh shortage price value. The 2019 study also identified shortages of these two products as being among the most frequent over the three year historic period reviewed (July 2016 - July 2019)
  - $30/MWh shortage price value resolved the historically observed shortages 31% of the time
  - $35/MWh shortage price value resolved the historically observed shortages 50% of the time
  - $40/MWh shortage price value resolved the historically observed shortages 87% of the time
- **Re-run results indicate that a shortage price of $40/MWh facilitates re-dispatch to resolve or minimize otherwise observed shortages for various products and locations that currently utilize a $25/MWh shortage pricing value**
  - Results indicate that absent market power/mitigation concerns, increasing existing $25/MWh shortage price values to $40/MWh should assist with efficiently reducing the frequency and/or magnitude of reserve shortages

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Re-run of RTC Cases

- **The NYISO evaluated whether increasing the $25/MWh shortage price value to $40/MWh would present any market power/mitigation concerns for any of the applicable reserve regions and/or products**
  - This evaluation identified potential concerns for NYC and LI due to limited number of eligible suppliers in these reserve regions
  - As a result, the NYISO does not propose to increase $25/MWh shortage pricing values for these reserve regions to $40/MWh
- **The NYISO proposes to increase the current $25/MWh value to $40/MWh for all applicable products an reserve regions other than NYC and LI**
  - Existing reserve products to be adjusted: NYCA 30-minute reserves, East spinning reserves, and East 30-minute reserves
  - If the separate proposal as part of the Reserves for Resource Flexibility project to increase SENY 30-minute reserves up to 500 MW (depending on the hour of the day) is approved by stakeholders, the NYISO proposes to extend this increase to the shortage price value for such additional SENY reserves
    - The Reserves for Resource Flexibility project proposes an initial $25/MWh shortage pricing value for the additional SENY 30-minute reserves; this value would be increased to $40/MWh upon implementation of the enhancements proposed as part of this project

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Scarcity Pricing Enhancements for NYCA 30-Minute Reserve Demand Curve

Scarcity Pricing: NYCA 30-Minute Reserve Demand Curve

- **Scarcity pricing refers to pricing rules in effect during SCR/EDRP activations.**
  - During such SCR/EDRP activations, the NYISO adjusts applicable 30-minute reserve requirements and 30-minute reserve demand curves to better account for the activation cost of SCR/EDRP ($500/MWh).
- **An enhancement for the treatment of the NYCA 30-minute reserve demand curve during SCR/EDRP activations that do not include all Load Zones was proposed by the NYTOs when Comprehensive Scarcity Pricing was previously filed with the FERC.**
  - There is currently a difference between the assignment of MW quantities to the "steps" of the NYCA 30-minute reserve demand curve between a statewide SCR/EDRP activation and an activation of less than all zones
  - The NYTOs noted that this difference could potentially result in circumstances during an activation of less than all zones where a reserve shortage could be assigned a shortage price of $750/MWh instead of a $500/MWh shortage pricing value that would apply to same conditions during a statewide activation of SCR/EDRP
  - The NYTOs recommended that the revised NYCA 30-minute reserve demand curves that apply during SCR/EDRP activations consistently address the assignment of MW quantities among the "steps" of the revised curve for both scenarios (statewide activation vs activation of less than all zones)
- **Although the scenario outlined by the NYTOs is unlikely to occur in practice and has not occurred since the Comprehensive Scarcity Pricing enhancements were implemented in June 2016, the NYISO agrees that the NYTOs' proposal would provide for improved consistency for the revised NYCA 30-minute reserve demand curves that apply during both statewide SCR/EDRP activations and activations of less than all zones.**

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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 additional 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

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Proposal for Procuring Additional Reserves

Procuring Reserves Beyond Minimum Requirements

- **The NYISO will discuss procuring additional reserves for system uncertainty within the scope of this project.**
  - Procuring additional reserves beyond minimum requirements should be considered along with the potential adjustments to the existing reserve demand curves.
  - Additional 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 additional reserves has been identified as potential solution to address a number of reliability gaps in the Grid in Transition whitepaper.**

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ISO-RTO Uncertainty Products

	SPP	CAISO	MISO	PJM	ISO-NE	ERCOT
Product	Uncertainty product	Real time flexible ramping product	Ramp capability product	Included in reserve procurement	Day-ahead replacement energy reserve (RER90, RER 240)	Included in reserve and regulation procurement
Timeframe	1 hour	10 minute	10 minute	30 minute and 10 minute	90 minute or 240 minute	6 sec, 30 minute, and 10 minute
Accounts for	Uncertainty in forecast	Uncertainty between 15 min and 5 min intervals	Net Load plus forecast uncertainty	Load forecast error, interchange forecast error, intermittent generation forecast error, and generator forced outages	Intended to ensure availability of sufficient replacement energy in real-time to restore operating reserves after a contingency and address load forecast error	Net load uncertainty
Requirement	Calculated based on the forecasted net obligation change and the historical net obligation forecast error	Requirement is based on 2.5 and 97.5 percentile observations of net load imbalances	Real-time ramp requirements calculated each dispatch interval based on short-term load forecast and uncertainty	Estimate magnitude of uncertainties using historical data from the most recent three full calendar years		70^{th} – 95^{th} percentile of the net load forecast error depending on the product
Pricing	$10- $418 depending on percentage of requirement short	Probability of violating power balance constraint x $1000/MWh	$5/MWh shortage value	Probability of reserves falling below minimum reserve requirement x $2000/MWh	settled as call options on real-time energy	Probability of reserves falling below 2000 MW x $9000/MWh

* Additional information is provided in the Appendix

Proposal for Increasing Reserve Requirements

- The NYISO does not propose to add any additional reserve requirements at this time.
- Instead the NYISO proposes to establish the process/procedures for implementing additional reserves when warranted in the future

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Proposal for Increasing Reserve Requirements

- **Process to evaluate potential need for incremental 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[1] 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/20142/10981399/Board-Monthly-Report-June-2020.pdf/543fcb4b-8e55-88a6-39c6-baa338565dd3

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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 synchronous (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

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Proposal for Increasing Reserve Requirements

- **Considerations that may trigger the need for additional 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.
    - An 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

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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 additional 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

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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

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Proposal for Increasing Reserve Requirements

- **Pricing of additional reserves**
  - The NYISO is considering pricing these reserves lower than the proposed lowest shortage pricing value on the applicable demand curve
  - The NYISO is continuing to evaluate the appropriate shortage pricing values to support procurement of the additional reserves, as well as conversion of such reserves to energy when required to meet system needs

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Next Steps

- **August and September 2020**
  - Present Consumer Impact Analysis
  - Further discussion of proposal including draft tariff revisions
- **September/October 2020**
  - Seek stakeholder approval of proposal at BIC and MC
- **2021**
  - Currently targeted timeframe to implement the proposed enhancements

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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

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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

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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

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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

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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)	Additional 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

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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 additional 1,310 MW needed to meet this requirement (1,965-1,310 = 655 MW)
    - Additional 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

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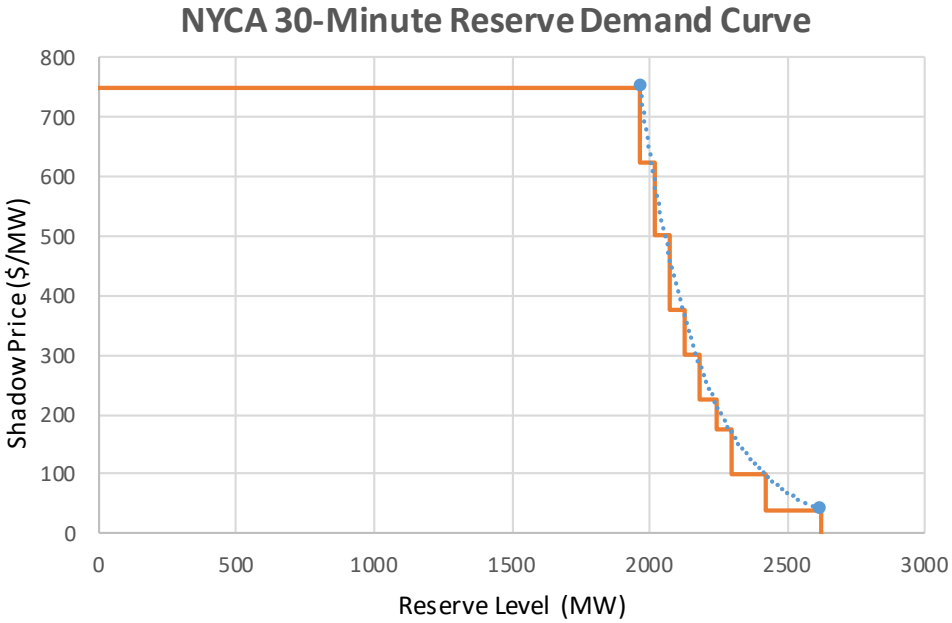
Exponential Curve Construct Analysis



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

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ISO-RTO Uncertainty Products

- SPP
  - Uncertainty product-June 16, 2020 meeting materials

https://spp.org/spp-documents-filings/?id=18437

- ISO-NE

https://www.iso-ne.com/static-assets/documents/2020/04/energy_security_improvements_filing.pdf

- CAISO

http://www.caiso.com/InitiativeDocuments/DraftFinalProposal FlexibleRampingProductRefinements.pdf#search=ramping%20product%20pricing

- PJM

https://www.pjm.com/directory/etariff/FercOrders/4300/20200521-el19-58-000,er19-1486-000.pdf

- MISO

https://16011cdn.misoenergy.org/205%20Ramp%20Workshop%20Presentation128696.pdf

- ERCOT

http://www.ercot.com/content/wcm/key_documents_lists/161483/8_2020_ERCOT_Methodologies_for_Determining_Minimum_Ancillary_Service_Requirements.pdf

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