New York ISO
Independent System Operator

# Manual 2

# Ancillary Services Manual

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## Prepared By: NYISO Operations Engineering

New York Independent System Operator
10 Krey Boulevard
Rensselaer, NY 12144
(518) 356-6060
www.nyiso.com

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# Table of Contents

**TABLE OF CONTENTS** ..... III

**TABLE OF FIGURES** ..... VII

**REVISION HISTORY** ..... VIII

**1. OVERVIEW** ..... 1

1.1. Purpose ..... 1

1.2.Summary of Services ..... 1

1.3.Payments and Charges for Ancillary Services ..... 2

1.4.Self-Supply of Ancillary Services ..... 3

1.5.Metering Requirements ..... 3

**2. ANNUAL BUDGET CHARGE AND OTHER NON-BUDGET CHARGES AND PAYMENTS** ..... 4

2.1.Description ..... 4

2.2.Recovery of NYISO Costs ..... 4

2.3.Payment for Service ..... 4

2.4.Services Performed at the Request of a Market Participant ..... 4

**3. VOLTAGE SUPPORT SERVICE** ..... 6

3.1.Description ..... 6

3.2.Supplier Qualification ..... 6

*3.2.1 Qualification Package* ..... 7

3.3.Responsibilities for Service ..... 10

3.4.Payment for Service ..... 10

3.5.Failure to Perform by Suppliers ..... 10

3.6.Reactive Power Capability Testing or Demonstration ..... 10

*Definitions* ..... 12
*3.6.1. Frequency, Timing, and Other Requirements* ..... 13
*3.6.1.2 Identical Treatment Units* ..... 14
*3.6.2. Test Procedure for Generators* ..... 15
*3.6.2.1 Testing Coordination* ..... 16
*3.6.3. Test Procedure for Synchronous Condensers* ..... 16
*3.6.4. Test Procedures for HVDC with Voltage Source Converter (VSC) Technology* ..... 16
*3.6.5. Test Procedures for Energy Storage Resources* ..... 17
*3.6.6. Reporting Requirements* ..... 17
*3.6.6.1. Data Transmission Requirements* ..... 18

*3.6.7. Allowance for Out-of-Period Reactive Capability Testing* ..... *18*
*3.6.8. Exemption from Requirement to Absorb Reactive Power* ..... *20*

3.7.Voltage Support ..... 21

*3.7.1. Request for Voltage Support Service* ..... *21*
*3.7.2. Voltage Support Availability* ..... *21*

**4. REGULATION AND FREQUENCY RESPONSE SERVICE ..... 23**

4.1.Description ..... 23

4.2.Source of Service ..... 24

4.3.Scheduling of Service ..... 31

*4.3.1. Generating Unit Operating States* ..... *32*
*4.3.2. Regulation Service Capacity Scheduling* ..... *33*
*4.3.3. Control Signals to Satellite Control Centers* ..... *35*
*4.3.4. Regulation Service* ..... *35*
*4.3.5. AGC and RTD Program Response* ..... *36*

4.4.Performance Tracking ..... 36

*Performance Adjustment* ..... *38*

4.5.Regulation Service Settlements – Day-Ahead Market ..... 38

4.6.Regulation Service Settlements – Real-Time Markets ..... 38

4.7.Energy Settlement Rules for Resources Providing Regulation Service ..... 38

4.8.Regulation Service Demand Curve ..... 38

4.9.Charges Applicable to Suppliers That Are Not Providing Regulation Service ..... 39

4.10.Charges to Load Serving Entities ..... 39

4.11.Regulation Service Qualification and Performance Criteria ..... 40

*4.11.1. Regulation Qualified Resource Requirements* ..... *40*
*4.11.2. Prequalification/Verification Performance Test* ..... *40*
*4.11.3. Supplier Regulation Service Performance Audit* ..... *42*

**5. ENERGY IMBALANCE SERVICE ..... 44**

5.1.Description ..... 44

5.2.External Imbalances ..... 44

5.3.Monthly Meter Reading Adjustments ..... 45

**6. OPERATING RESERVE SERVICE ..... 46**

6.1.Description ..... 46

*Types of Operating Reserves* ..... *46*
*Minimum Operating Reserve Requirement* ..... *47*

6.2.General Responsibilities and Requirements ..... 48

*6.2.1. NYISO Responsibilities* ..... *48*
*6.2.2. Supplier Eligibility Criteria* ..... *50*

6.3.General Day-Ahead Market Rules ..... 52

*6.3.1. Bidding and Bid Selection* ..... *52*
*6.3.2. NYISO Notice Requirement* ..... *54*
*6.3.3. Responsibilities of Suppliers Scheduled to Provide Operating Reserves in the Day-Ahead Market* ..... *54*

6.4.General Real-Time Market Rules ..... 54

*6.4.1. Bid Selection* ..... *54*
*6.4.2. NYISO Notice Requirements* ..... *56*
*6.4.3. Obligation to Make Resources Available to Provide Operating Reserves* ..... *56*
*6.4.4. Activation of Operating Reserves* ..... *56*
*6.4.5. Performance Tracking and Supplier Disqualifications* ..... *56*

6.5.Operating Reserve Settlements – General Rules ..... 57

*6.5.1. Establishing Locational Reserve Prices* ..... *57*
*6.5.2. Settlements Involving Suppliers of Operating Reserves Located on Long Island* ..... *57*
*6.5.3. Establishing Reserve Clearing Prices during EDRP/SCR Activation Intervals* ..... *57*
*6.5.4. "Cascading" of Operating Reserves* ..... *57*

6.6.Operating Reserve Settlements – Day-Ahead Market ..... 58

6.7.Operating Reserve Settlements – Real-Time Market ..... 58

6.8.Operating Reserve Demand Curves ..... 58

*6.8.1. 30-Minute Operating Reserve Demand Curves during EDRP/SCR Activation Intervals* ..... *64*
*6.8.2. Operating Reserve and Regulation Service Demand Curves* ..... *98*

6.9.Self-Supply ..... 100

6.10.Operating Reserve Charge ..... 100

6.11.Failure to Provide Operating Reserve ..... 100

6.12.Reserve Service Qualification and Performance Criteria ..... 101

*6.12.1. Reserve Qualified Resource Requirements* ..... *101*
*6.12.2. Pre-Qualification and Re-Qualification Performance Test* ..... *101*

**7. BLACK START CAPABILITY SERVICE ..... 104**

7.1.Description ..... 104

7.2.Source and Scheduling of Service ..... 104

7.3.Payment for Service ..... 105

7.4.Black Start Service Procedures.....105

**8. AUTOMATIC FUEL SWAP CAPABILITY TESTING ..... 107**

8.1.Description.....107

8.2.Automatic Fuel Swap Testing Requirements.....107

8.3.Automatic Fuel Swap Testing Frequency.....107

8.4.Automatic Fuel Swap Testing Procedures .....107

8.5.Documentation of Automatic Fuel Swap Testing and Mitigation of Failed Tests.....107

**ATTACHMENT A VOLTAGE SUPPORT SERVICE QUALIFICATION FORMS ..... A**

Attachment A-1 ..... B

Attachment A-2 ..... C

**ATTACHMENT B PERFORMANCE ADJUSTMENT FOR REGULATING AND NON-REGULATING SUPPLIERS..... D**

**ATTACHMENT C REGULATION PERFORMANCE AUDIT STANDARDS ..... E**

**ATTACHMENT D: UNCERTAINTY RESERVE REQUIREMENT CALCULATION PROCESS ..... G**

# Table of Figures

Figure 1: Ancillary Services Summary ..... 2
Figure 2: Rate Schedules for Ancillary Services ..... 2
Figure 3: Theoretical MVAr versus MW Capability Curves ..... 8
Figure 4: Capability Curves with Power Factor Limits and MW Boundary ..... 13
Figure 5: Real Power Level Requirements for Reactive Power Capability Testing ..... 16
Figure 6: Demand Side Resources Operating Characteristics ..... 26
Figure 7: Generating Unit Operating Characteristics ..... 26
Figure 8: LESR with Full Regulation Service Deployment ..... 27
Figure 9: LESR with RTD Managing Energy Level; Equal Reg Up and Reg Down ..... 28
Figure 10A: Participation Limit for CCGTs with Duct-Firing Capability that opt for Limiting Participation Flag (if the Generator is scheduled to provide Spinning Reserves, Regulation, or both) ..... 29
Figure 10B: Participation Limit for CCGTs with Duct-Firing Capability that opt for Limiting Participation Flag (if the Generator is NOT scheduled to provide Spinning Reserves or Regulation) ..... 30
Figure 11: Generating Unit Operating States ..... 32
Figure 12: Perfect Performance ..... 37
Figure 13: Error in Performance (30-Second Bandwidth not Included) ..... 37
Figure 14: Minimum Operating Reserve Requirements ..... 47
Figure 15: Ancillary Service Eligibility ..... 48

# Revision History

| Version | Effective Date | Revisions |
|---|---|---|
| 1.0 | 07/15/1999 | Initial Release<br>➢ Section 2.3.2, page 8<br>• Clarification of applicability of service charges.<br>➢ Section 2.3.3, page 10<br>• Charges Associated with Local Reliability Rules.<br>➢ Section 3.3.5, page 7<br>• Clarification of applicability of voltage support charges. |
| 2.0 | 04/06/2004 | Global<br>➢ Complete reformatting of document.<br>➢ Grammatical and syntactical corrections.<br>Sections 3.3.1 through 3.3.3, 3.5.1, and 3.5.2<br>➢ Deleted references to Six-year testing, and updated the cost determination to reflect current *NYISO Services Tariff* /Rate Schedule No. 2.<br>Section 4.1<br>➢ Added "which may vary by hour and by season. Seasonally, the NYISO shall post the hourly regulation and frequency response requirements and, prior to the start of the season, shall present the regulation and frequency response requirements to the SOAS for discussion and comment. Should the NYISO determine that it intends to establish regulation and frequency response requirements for any hour that are lower than any requirement for that hour in the seasonal regulation and frequency response requirements published as of March 1, 2004, it shall present, prior to posting, its analysis and the revised requirement to the Operating Committee for approval. Should the NYISO determine, for reliability reasons, that it intends to establish regulation and frequency response requirements for any hour that are higher than the requirement for that hour currently in effect, it shall raise the requirement, issue a notice as soon as possible, repost the hourly regulation and frequency response requirements for that season, and discuss its adjusted regulation and frequency response requirement for that hour at the next regularly scheduled Operating Committee meeting. Shortly after the end of each Capability Period, the NYISO shall present SOAS with an analyses of the regulation performance in that Capability Period." to second paragraph.<br>Section 4.3<br>➢ Added "As specified in Section 4.1, r" to first sentence.<br>➢ Added "or directly from the NYISO." to last sentence.<br>Section 4.3.2<br>➢ Added "for that day" to first sentence. |

| Version | Effective Date | Revisions |
|---|---|---|
| | | Attachment B<br>➢ Replaced Reactive Capability test form with current (2004) version. |
| 3.0 | 11/01/2005 | Global Changes<br>➢ All Sections and Attachments include changes to reflect SMD2. All references to SCD changed to RTD, Pool Control Error (PCE) changed to ACE, NYISO changed to NYISO, Security Constrained Dispatch to Real-Time Dispatch.<br>➢ All references to 30- and 10-minute synchronized reserves were changed to 30- and 10-minute spinning reserves. In addition, all references to Transmission Provider (TP) were changed to Transmission Owner (TO).<br>➢ When and where appropriate, RTD was changed to RTDCAM.<br>➢ Document formatting was repaired.<br>Section 2.3.3<br>➢ Reference to Section 2.2.1 instead of repeating the lengthy description.<br>Section 3<br>➢ Added new text after figure 3.1.<br>Sections 3.4.1 and 3.4.2<br>➢ Added “Reinstatement of Payments”.<br>Section 4.2<br>➢ Changed generating unit operating characteristics exhibit and response rate definitions to reflect Technical Bulletin 71.<br>Section 4.3.1<br>➢ Updated figure 4.3.1-1.<br>Section 4.3.2<br>➢ Added regulation default description.<br>Section 4.3.5<br>➢ Added “in proportion to this ramp rate; however, some quantization is needed to avoid very small schedule changes,” to second paragraph.<br>Section 4.4.1<br>➢ Renamed section to Performance Penalty to Performance Adjustment and deleted Deferral of Regulation Performance Penalties.<br>Section 4.4.2<br>➢ Deleted. Old Section 4.4.2, Regulation Performance Penalty, moved to new Attachment D.<br>Section 4.6<br>➢ Old Section 4.6 was moved to new Section 4.13.<br>Section 4.6.4 |

| Version | Effective Date | Revisions |
|---|---|---|
| | | ➢ Added "In addition, Attachment D of this Manual provides additional information on performance-based adjustments to regulation service payments" to last paragraph.<br>➢ Moved equation for $K_{PI}$ and additional text to Attachment D.<br>Section 4.6.5<br>➢ Deleted.<br>Sections 4.7 through 4.13 ➢ New additions.<br>Section 6.1<br>➢ Joint optimization descriptions added.<br>➢ Deleted text under figure 6.1-1.<br>Sections 6.2 through 6.10<br>➢ Replaces old Sections 6.2 through 6.4.<br>Section 6.2<br>➢ Inserted new section and table to be consistent with Technical Bulletin 87.<br>Section 6.7.2<br>➢ Added the following paragraph "Scarcity pricing rules A and B are invoked when SCR/EDRP resources are activated and, but for the SCR/EDRP resources, the NYCA would experience a shortage of reserve. Scarcity pricing rule A applies when, but for SCR/EDRP resources, the NYCA would experience a shortage of reserve. Scarcity pricing rule B applies when, but for SCR/EDRP resources, the eastern portion of the NYCA would experience a shortage of reserve."<br>Section 6.11<br>➢ Same as old Section 6.5.<br>Section 6.12<br>➢ Same as old Section 6.6.<br>Attachments<br>➢ Deleted original Attachment A – Dispatch Load and Spinning Reserve. The remaining attachments were renumbered.<br>Attachment A<br>➢ New test forms.<br>Attachment B – AGC Functional Requirements ➢ Under section "Unit Response Rates"<br>➢ First paragraph – added "A unit may specify up to three NORMAL response rates. When multiple NORMAL response rates are defined, each is applied to a portion of the unit's operating range."<br>➢ Second paragraph – added "the capacity-weighted" before the three instances of NRR. In addition, made NRR plural.<br>➢ End of Ramped RTD Basepoints section, added text from section 5.3.7 of the *Transmission and Dispatching Operations Manual*. |

| Version | Effective Date | Revisions |
|---|---|---|
| | | Attachment C<br>➢ Replaced Regulation Performance Penalty with Regulation Performance Adjustment.<br>➢ Added equation for $K_{PI}$ and additional text from section 4.6.4 to Attachment C.<br>Attachment D<br>➢ Replaced – Removed actual document and provided a link to the document, which is maintained by NERC.<br>Attachment E<br>➢ Deleted.<br>Attachment F<br>Deleted. |
| 3.5 | 05/18/2006 | Section 3.1<br>➢ Second paragraph – Added Note.<br>Section 3.2<br>➢ First para, first sent. – Deleted "Generating" added "Supplier's".<br>➢ Third bullet, second sent. – Added "range" after capability. Added "…, as directed by…System Operator" to second sentence.<br>Section 3.3<br>➢ Third bullet – Deleted "payments…utility generators."<br>Section 3.3.1<br>➢ First sent. – Added "synchronous" before generators. Also, added "the gross…MVAr" before capability.<br>Section 3.3.2<br>➢ First sent. – Added "…as the product of…The NYISO shall…" Also, added "to Suppliers on a monthly basis."<br>Section 3.3.5<br>➢ First sent. – Added "in accordance with Rate Schedule No. 2 of the OATT." Deleted second sentence and all other text until section 3.4.<br>Section 3.4<br>➢ Added line item #4.<br>➢ Second paragraph – Added "…and is not otherwise…section 3.6.2."<br>Sections 3.4.1 and 3.4.2<br>➢ Line items a) through c) – Added "supplier" deleted "provider". Line item c) – Added "Resource" deleted "provider".<br>New Section 3.4.3<br>➢ Added entirely new section. |

| Version | Effective Date | Revisions |
|---|---|---|
| | | Section 3.5<br>➢ First para, first sent. – Deleted "…generators used" added "resources". Also, added "…, and provides the basis…support service".<br>➢ Second para, first sent. – Deleted "…are used for" added, "participate in".<br>➢ Second para, second sent. – Added "…reports must be…upon". Also, deleted "for any unit will be accepted" and added "acceptance will be".<br>Section 3.5.1<br>➢ First para, first sent. – Added "synchronous" and "voltage support". Second sent. Added "*The demonstrated Gross… (calendar) year.*" Second sentence was completely rewritten.<br>Section 3.5.2<br>➢ First para, first sent. – Deleted "conduct" and added "perform and report". Third sent. deleted "terminals" and added "terminal (gross)… interconnection (net)". Added new first paragraph under "Annual Tests". Under "Test Results" deleted "five (5)" and replaced with "ten (10). Added new second sentence "The test report…electronically."<br>Section 3.5.4 ➢ New.<br>Section 3.6.2<br>➢ Changed title of section from "Automatic Voltage Regulator Availability" to "Voltage Support Availability". Under "Supplier Actions" added "…is obligated…support capability.<br>➢ The supplier…" Added line item #1 – "The Automatic Voltage…System Operator." Added to line item #2 was rewritten. Added to line item #3 "and TO System Operator…"<br>Deleted "needed" and replaced with "necessary." Added "(or other)". Added new line item #4. |
| 3.6 | 12/08/2006 | Attachment B – AGC Functional Requirements<br>➢ Deleted. There were no references to the Attachment in version 3.5 of the manual.<br>Attachment A – VSS Qualifications Request Form<br>➢ New. Inserted Qualification Request Form from TB 103. (TB 103 can be retired.) Subsequent Attachments have been relabeled.<br>Section 1.3<br>➢ Inserted new section 1.3 "Payments and Charges for Ancillary Services" (from TB 121; TB 121 should be incorporated in the *Accounting and Billing Manual* before being retired). Sections following 1.3 have been renumbered.<br>Section 3.2<br>➢ Inserted new section 3.2 Supplier Qualifications (from TB 091 and TB 103); sections following 3.2 have been renumbered. |

| Version | Effective Date | Revisions |
|---|---|---|
| | | Section 3.6<br>➢ Modified in accordance with RT SCHD 2, Sect 1.1.<br>• Changed title of heading to "Reactive Power Capability Demonstration".<br>• Second paragraph – inserted language on providing data during actual operation.<br>• Section 3.6 (old section 3.5) – Incorporated TB 091. (TB 091 can be retired.)<br>Section 3.6.1<br>➢ Changed title of heading to "Frequency and Timing".<br>➢ First paragraph – inserted language stating each calendar year resources providing VSS must demonstrate both lagging and leading reactive capability.<br>Section 3.6.2<br>➢ First paragraph – inserted language on how measurements should be taken and how tests must be performed.<br>Section 3.6.4<br>➢ Changed title of heading to "Reporting Requirements."<br>➢ Replaced demonstration with "tests and/or demonstrations."<br>➢ Section 3.6.4 (old section 3.5.4) – Incorporated TB 126. (TB 126 must also be incorporated in ICAP manual then can be retired.) |
| 3.7 | 03/08/2007 | Administrative Change<br>➢ Removed 10 Krey Blvd address for Manager, AMO, and replaced with 3890 Carman Road address.<br>Section 3.6<br>➢ Clarify that functioning AVR is required during |
| 3.8 | 06/06/2007 | Section 3.2<br>➢ Second paragraph – added "Attachment A".<br>Section 3.6<br>➢ Second paragraph – corrected "Test data reports must be submitted electronically by the VSS Supplier within ten (10) business days…" – originally stated five (5) business days.<br>Attachment A<br>➢ Updated first bullet – added, "including voltage regulator…data sheet ("D-curve")."<br>Attachment B<br>➢ Section B-1 – Restored missing "Reason for Limit" column.<br>➢ Section B-2 and B-3 – Removed "Part 1" from figure titles. |
| 3.9 | 10/30/2007 | Section 3.1<br>➢ Deleted "generation" from first paragraph. |

| Version | Effective Date | Revisions |
|---|---|---|
| | | Section 3.2<br>➢ Formatted first paragraph into bullets.<br>➢ Corrected address of Manager, Auxiliary Market Operations.<br>Section 3.4.2<br>➢ Added "and, except as noted in the following paragraph, Qualified Non-Generator Voltage Support Resources" to first paragraph.<br>Section 3.4.3<br>➢ Added "In the case of the Cross-Sound Scheduled Line, the product of $3919/MVAr and that tested, Reactive Power (MVAr) capacity measured at maximum real power flow." as a third bullet.<br>Section 3.4.4<br>➢ Clarified definitions of D1, D2, and Bid.<br>Section 3.5<br>➢ Added "its Normal Operating limit, which must be at least 90% of its" to first paragraph.<br>Section 3.5.2<br>➢ Added "Generators that fail to provide voltage support following contingencies will not be charged lost opportunity costs for replacement sources of voltage support because there will not be enough time to arrange for replacement sources." to paragraph b.<br>Section 3.6.1<br>Added the following: "Small units at the same site may apply test results from one unit to another unit at the same site. In order to qualify for this treatment, the units must be electrically identical and must be less than 60 MW nameplate capacity. Qualification to apply test results from one unit to another requires one-time submittal of the Dcurve and registration information for each unit, along with a request for this treatment, and pre-approval by the Manager, Auxiliary Market Operations. Each year, a test result form must be submitted for each unit that is requesting this treatment. The test form must reference the PTID of the unit at the site that actually performed the test and the date and time of the test."<br>Section 3.6.5<br>➢ Added fourth condition for Out of Period Reactive Capability Testing, with associated guidance: "A nuclear generating unit that has an AVR that is not functioning during the test period."<br>Attachment C<br>➢ Added clarifying language to table: *each 30-second interval "p" or during each 30-second interval "p"*.<br>➢ Added definition of "measured output:, $MW_{meas\ p.}$<br>➢ Corrected Regulation Performance Index formula. |
| 3.10 | 02/26/2008 | Section 3.2<br>➢ Added clarifying sub-bullet to first bullet in first paragraph. |

| Version | Effective Date | Revisions |
|---|---|---|
| | | ➢ Added clarifying sub-bullet to first bullet in second paragraph.<br>Section 3.6.2<br>➢ Added clarifying language to the lagging MVAr test requirements to third paragraph, including bullets clarifying DMNC test requirements and nameplate data allowances.<br>Section 3.6.4<br>➢ Grammatical edits related to Attachment B and the clarification of the usage of a spreadsheet, report, test and form.<br>Sections 4.6.3, 6.10, and Various Sections throughout Manual ➢ Minor formatting changes.<br>Attachment A<br>➢ Resource table updated with clarifying column-heading information.<br>➢ Document approval requirements were edited for clarity.<br>Attachment B<br>➢ Figures B-1, B-2, and B-3 updated with new spreadsheet content. |
| 3.11 | 09/16/2008 | Section 4<br>➢ Substantial information added to address Demand Side Ancillary Services (DSASP) related resources.<br>Section 5.3<br>➢ Monthly Meter Reading Adjustments detail regarding internal NYISO procedures was removed and reader is directed to refer to the Accounting and Billing Manual for this information.<br>Section 6<br>➢ Substantial information added to address Demand Side Ancillary Services related resources.<br>Various Sections throughout Manual<br>➢ Grammatical edits related to changing language to be consistent with DSASP Tariff language. a spreadsheet, report, test and form.<br>Attachment C<br>➢ Substantial information added to address Demand Side Ancillary Services (DSASP) related resources.<br>Attachment E<br>New Attachment added to address Demand Side Ancillary Services (DSASP) related resources. |
| 3.12 | 04/23/2009 | Global<br>➢ Reformatted per new template to standardize presentation.<br>➢ Implemented minor stylistic changes.<br>➢ Standardized labeling and numbering of graphical and tabular material.<br>Revision History Table |

| Version | Effective Date | Revisions |
|---|---|---|
| | | ➢ Changed column headings as follows:<br>• "Revision" changed to "Version"<br>• "Changes" changed to "Revisions"<br>➢ Standardized date format to mm/dd/yyyy.<br>➢ Implemented minor stylistic changes in entries.<br>Section 3.2<br>➢ Added provisions for exemption of Leading VAr test requirements.<br>➢ Changed form to Attachment A-1.<br>➢ Clarified qualification form submittal requirements.<br>➢ Included e-mail address for qualification form.<br>Section 3.6<br>➢ Added reference to exemption of Leading VAr test requirements.<br>Section 3.6.1<br>➢ Added reference to exemption of Leading VAr test requirements in two paragraphs.<br>Section 3.6.2<br>➢ Added provision for submitting net metered data for absorbing reactive power.<br>Section 3.6.6<br>➢ New section detailing exemption of Leading VAr test requirements.<br>Attachment A<br>➢ Revised "Attachment A" name to "Attachment A-1." ➢ Clarified qualification form submittal requirements.<br>➢ Removed requirement to submit test results at the same time as the qualification form.<br>➢ Added Attachment A-2, "Request for Identical Treatment."<br>Attachment B<br>➢ Changed title to "MVAr Capability Test Forms." |
| 3.13 | 06/02/2009 | Global<br>➢ Revised external-document links to explicitly cite URLs from which documents may be accessed.<br>Section 4 Global<br>➢ Added process and procedures specific to Limited Energy Storage Resources.<br>➢ Replaced or inserted, were appropriate, "Regulation" with "Regulation Service."<br>Section 4.2<br>➢ Added Figures describing LESR scheduling limits.<br>Section 4.3.2<br>➢ Added LESR Regulation Service scheduling protocol. |

| Version | Effective Date | Revisions |
|---|---|---|
| | | Section 4.3.4<br>➢ Modified Description of Regulation Service energy deployments by AGC that include LESR devices.<br>Section 4.3.5<br>➢ Described RTD/AGC interaction during the scheduling of LESR Regulation service<br>➢ Defined treatment of LESRs during RTD-CAM events.<br>Section 4.4<br>➢ Defined Performance Tracking exemption in place for LESR devices.<br>Section 4.5.2<br>➢ Clarified LESR DAM settlement eligibility.<br>Section 4.6.4<br>➢ Clarified LESR Real-Time settlement eligibility.<br>Section 4.7.4<br>➢ Added section to describe LESR energy settlements.<br>Section 4.13.2<br>➢ Modified Regulation Service Pre-qualification test procedure. |
| 3.14 | 09/17/2009 | Section 3.6.2<br>➢ Added requirement for real-power level at which Leading VAr tests must be conducted. |
| 3.15 | 10/21/2009 | Section 7.2<br>➢ Corrected reference to Rate Schedule 5 of the *NYISO Market Administration and Control Area Services Tariff* (*Services Tariff*).<br>Section 7.3<br>➢ Corrected title and replaced text with reference to Rate Schedule 6 of the *NYISO Open Access Transmission Tariff* (*OATT*), Rate Schedule 5 of the *NYISO Services Tariff*, and the *Accounting and Billing Manual*.<br>Section 7.4<br>➢ Added requirement for annual certification. |
| 3.16 | 07/16/2010 | Global<br>➢ Standardized references to NYISO tariffs and updated tariff citations to reflect section renumbering secondary e-Tariff implementation.<br>Section 3.6.2<br>➢ Changed requirements for real-power level for Limited Control Run of River Hydro Resources to test as a percentage of UCAP.<br>➢ Changed real-power levels for reactive power testing to a table format (Table 3.1).<br>Attachment A<br>➢ In Attachment A-1, added *UCAP* to column heading for DMNC entry. |

| Version | Effective Date | Revisions |
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| | | ➢ In Attachment A-1, added footnote that UCAP is used only for Limited Control Run of River Hydro Resources.<br>Attachment B<br>➢ Updated Figure B-1 to provide for using UCAP for Limited Control Run of River Hydro Resources. |
| 3.17 | 09/21/2010 | Section 3.6.2<br>➢ Updated Table 3.1 to reflect revised real-power level for Leading Reactive Power tests.<br>Section 3.6.4<br>➢ Changed timing for reporting test results.<br>Section 3.7.2<br>➢ Corrected misspelled word.<br>Section 4.1<br>➢ Changed Regulation and Frequency Response Requirement posting to as needed.<br>Section 4.2<br>➢ Corrected and added Response Rate Requirements.<br>Section 4.3.1<br>➢ Changed paragraph formatting.<br>Section 4.3.2<br>➢ Corrected Regulation Service capacity allocation with respect to the Regulation Response Rate.<br>Section 4.7.3<br>➢ Corrected equation for Payment/Charge calculation.<br>Section 4.13.2<br>➢ Changed MMP to MMA.<br>Section 4.13.3<br>➢ Changed MMP to MMA.<br>Section 6.1<br>➢ Corrected description of transaction types that result in energy loss.<br>Section 6.2.1<br>➢ Revised Table 6.2 as follows:<br>☐ Added zones to locational titles.<br>☐ Changed Long Island 10-minute Spinning Reserve requirement.<br>☐ Updated references to NYSRC, NERC and NPCC requirements.<br>Section 6.4.1<br>➢ Added reference to Real-Time dispatch.<br>Section 6.8<br>➢ Changed paragraph formatting. |

| Version | Effective Date | Revisions |
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| | | Section 6.9<br>➢ Referred to Market Services Tariff for exceptions to requirements for Self-Supply of Operating Reserves.<br>Section 6.12.2<br>➢ Changed MMP to MMA.<br>Attachment D<br>➢ Removed attachment.<br>Attachment E<br>➢ Corrected misspelled word. |
| 3.18 | 11/18/2010 | Sections 3.6 and 3.6.1<br>➢ Changed timing and requirements for Leading Reactive Power tests.<br>Attachment B<br>➢ Included certification for Leading Reactive Power tests on Figure B-3. |
| 3.19 | 2/1/2011-<br>3/9/2011 | Section 4.8<br>➢ Updates to the Regulation Service quantities and their associated prices<br>Section 6.8<br>➢ Updates to the prices associated with certain reserve products (Total 10-Minute Reserves and Long Island 30 Minute Reserves)<br>Section 7.4<br>➢ Updates to black start service procedures for black start Generator actions. |
| 3.20 | 5/16/2011 | Section 3.2<br>➢ Removal of language allowing a resource under the operational control of an External Control Area operator to be eligible for supplying VSS<br>Section 3.4.1<br>➢ Clarifying the method for determining the payments for VSS suppliers<br>Section 3.5<br>➢ Removed VSS penalty structure from the Ancillary Services Manual. This language is found in the Market Services Tariff<br>Section 3.6.1<br>➢ Revised the reactive power metering requirements for existing generators<br>➢ Conformed the Ancillary Services Manual to comply with NPCC Directory #10 test data retention requirements<br>Section 3.6.2<br>➢ Conformed the Ancillary Services Manual to comply with NPCC Directory #10 generators with common elements testing requirements |

| Version | Effective Date | Revisions |
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| 3.21 | 10/27/2011 | Section 2.2 & 2.3<br>➢ Refer to OATT, MST & Accounting & Billing Manual for Settlement Information<br>Section 3.4<br>➢ Refer to OATT, MST & Accounting & Billing Manual for Settlement Information<br>Section 3.6.1<br>➢ Move specification of acceptable generator VSS data from section 3.4.1 to section 3.6<br>Section 4.4, 4.5, 4.6, 4.7, 4.11 & 4.12<br>➢ Refer to OATT, MST & Accounting & Billing Manual for Settlement Information<br>Section 4.13.2<br>➢ Regulation Test Requirements are adjusted including changes to the testing window for the prequalification performance test<br>Section 6.1, 6.6, 6.7 & 6.10<br>➢ Refer to OATT, MST & Accounting & Billing Manual for Settlement Information<br>Attachment C<br>➢ Refer to OATT, MST & Accounting & Billing Manual for Settlements Information |
| 3.22 | 4/19/2012 | Section 3.6.1<br>➢ Revised the reactive power metering requirements for existing generators to include an extraordinary circumstances case |
| 3.23 | 9/21/2012 | Global<br>➢ All references to Customer Relations changed to Stakeholder Services<br>Section 1.2<br>➢ Revised language in Table 1.1<br>Section 2<br>➢ Revised language for the title of Section 2<br>Section 2.1<br>➢ Revised language corresponding to title change of Section 2 ➢ Removed Table 2.1 and 2.2<br>Section 4<br>➢ Clarified Regulation Service as Regulation Capacity, where applicable<br>Section 4.2<br>➢ Added two-part Regulation Service Bid<br>➢ Added Regulation Movement Response Rate as static bid parameter |

| Version | Effective Date | Revisions |
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| | | Section 4.3.2<br>➢ Added language describing summation of Regulation Bid components for use by the optimization<br>➢ Revised language on Real-Time payments for providing Regulation Service in the Real-Time Market<br>Section 4.3.4<br>➢ Revised language describing allocation of ACE to Regulation Service resources scheduled by RTD<br>Section 4.3.5<br>➢ Specified that AGC will use Regulation Movement Response Rate in determining basepoints<br>➢ Added Small Event RPU<br>➢ Clarified that Regulation Service schedules are set to zero during Large and Small Event Pick-ups and Max Gen Pickups<br>➢ Moved last sentence of 4.10 (resume sending AGC Base Point Signals) to this section<br>Section 4.4<br>➢ Added PTS calculation of Movement MW<br>➢ Removed PTS performance adjustment exclusion for LESRs in settlement calculations<br>Section 4.8<br>➢ Reference Rate Schedule 3 of MST for Regulation Service market price calculations<br>➢ Minor wording revisions to conform with Market Services Tariff<br>Section 4.9<br>➢ Deleted section 'Reinstating Performance Charges' (was removed from tariff)<br>Section 4.10<br>➢ Deleted section. Redundant with 4.3.5. Moved last sentence (resume sending AGC Base Point Signals) to 4.3.5.<br>Section 4.11<br>➢ Section 4.11 now referenced as Section 4.9<br>Section 4.12<br>➢ Section 4.12 now referenced as Section 4.10<br>Section 4.13<br>➢ Section 4.13 now referenced as Section 4.11<br>Section 4.13.1<br>➢ Section 4.13.1 now referenced as Section 4.11.1<br>Section 4.13.2<br>➢ Changed 'regulation ramp rate' to 'Regulation Capacity response rate' |

| Version | Effective Date | Revisions |
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| | | ➢ Section 4.13.2 now referenced as Section 4.11.2<br>Section 4.13.3<br>➢ Added that other data besides Performance Index may be used for LESRs<br>➢ Section 4.13.3 now referenced as Section 4.11.3<br>Section 6.2.1<br>➢ Removal of Table 6.2<br>Section 6.2.3.1<br>➢ Added Requirements for Demand-Side Ancillary Service Program (DSASP) resources<br>Section 6.2.3.2<br>➢ Added DSASP Provider Responsibilities<br>Section 6.2.3.3<br>➢ Added Interaction with other NYISO Demand Response Programs<br>Section 6.2.3.4<br>➢ Added Participation Requirements of Demand Side Resources Aggregated as a DSASP Resource<br>Section 6.2.3.5<br>➢ Added Participation Requirements of an Individual Demand Side Resource enrolled as a DSASP Resource<br>Section 6.2.3.6<br>➢ Added Enrolling Demand Side Resources into the DemandSide Ancillary Service Program<br>Section 6.2.3.6.1<br>➢ Added Enrollment via DRIS<br>Section 6.2.3.6.2<br>➢ Added Registration in MIS<br>Section 6.2.3.7<br>➢ Added Modeling of DSASP Resources<br>Section 6.2.3.8<br>➢ Added Communication Requirements for DSASP Resources<br>Section 6.2.3.9<br>➢ Added Limit on Direct Communication for DSASP Resources<br>Section 6.2.3.10<br>➢ Added Changes to enrolled and Registered DSASP Resources<br>Section 6.2.3.10.1<br>➢ Added Changes to Individual Demand Side Resources Aggregated as a DSASP Resource<br>Section 6.2.3.10.2 |

| Version | Effective Date | Revisions |
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| | | ➢ Added Changes to Limits for the Capability Periods of a DSASP Resources<br>Section 6.2.3.11<br>➢ Added Metering and Measurement of Aggregated DSASP Resources<br>Section 6.4.1<br>➢ Changed 'Regulation Service' to 'Regulation Capacity'<br>Section 7.4<br>➢ Added new requirements for black start providers<br>Attachment D<br>➢ Clarified Regulation Capacity Response Rate<br>Added Regulation Movement Response Rate |
| 3.24 | 11/29/2012 | Section 3.6.2<br>➢ Revised VSS Supplier and NYISO testing notification requirements to those found in TB-155<br>Section 4.11<br>➢ Corrected references to Section 4.13 which is now Section 4.11<br>Section 4.11.2<br>➢ Revised Regulation Service qualification and performance criteria to those found in TB-221 |
| 3.25 | 02/04/2013 | Section 6.4.1<br>➢ Conform the requirements for synchronized 30-Minute reserves emergency response rate with the requirements found in Rate Schedule of the Market Services Tariff |
| 3.26 | 03/13/2013 | Section 6.2.3<br>➢ Across the entire section, changed the use of “aggregation” or “aggregated” to “group” or “grouped” to be consistent with the Demand Response Information System (DRIS).<br>➢ Clarified in several areas in Section 6.2.3 the use of the Demand Response Information System (DRIS) to enroll Demand Side Resources as individual and grouped DSASP Resources.<br>➢ Added the responsibility to the DSASP Provider to obtain authorization from each Demand Side Resource allowing the DSASP Provider to act on its behalf.<br>➢ Added the responsibility of the DSASP Provider to inform NYISO Operations of any temporary de-rate in the DSASP Resources capability.<br>➢ In multiple areas of Section 6.2.3, revised the responsible department to send registration/enrollment requests (Member Relations).<br>➢ Provided hyperlinks for metering-related documents. |

| Version | Effective Date | Revisions |
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| | | ➢ Clarified and simplified the language associated with which DRIS Response Type of DSRs may be enrolled in Spinning Reserves/Regulation Markets, and the Non-Synchronized Reserve Market.<br>➢ Added a paragraph to specify how an individual DSR may be enrolled as a grouped DSASP Resource.<br>➢ Clarified when in the registration process the DSASP Resource may proceed to communications and prequalification testing.<br>➢ Clarified the process necessary for changes to individual DSRs of a grouped DSASP Resource.<br>➢ Clarified that the DSASP Resource must maintain a minimum of 1 MW of Summer and Winter Operating Capacity.<br>➢ Added verbiage on the DSASP Providers requirement to update the totalization of the real-time metered load within 48 hours of receiving notice of change from the NYISO.<br>Section 6.2.4<br>➢ Entirely new section to incorporate the Technical Specifications for DSASP Direct Communications which were approved by BIC on 12/14/2011. |
| 4.0 | 12/31/2013 | Section 2<br>➢ Corrected grammar in statement “payments for services”<br>Section 2.1<br>➢ Corrected grammar in statement “payments for services”<br>Section 3.6.2<br>➢ Added “Intermittent Power” resources to Table 3.1<br>Section 4.3.3<br>➢ Text removed from the title of Section 4.3.3 and correctly placed at the end of Section 4.3.2<br>Section 4.4<br>➢ Added additional detail on how Performance Adjustments are developed<br>Section 4.11.2<br>➢ Changed “month” to “week” in the time weighted Performance Index demonstration period, from TB-211<br>Section 6.2.3.2<br>➢ Updated hyperlink to the Approved Meter List<br>Section 6.2.3.7<br>➢ Updated Zone D Station in table to ALCOA_PA 115<br>Section 6.2.3.11<br>➢ DSASP real-time data retention period changed from “five” to “six” years to be maintain consistency with Section |

| Version | Effective Date | Revisions |
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| | | 30.6.3.2 and Section 30.6.2.2.3 of Attachment O of the Market Services Tariff<br><u>Section 7.1</u><br>➢ Added out of period black start testing rules from TB-202 and Appendix II of Rate Schedule 5 of the Market Services Tariff |
| 4.1 | 03/03/2015 | Section 6.2.3.9<br>➢ Updated the enrollment limit on the DSASP resources with direct communications to 200 MW. |
| 4.2 | 06/30/2015 | Section 3.4<br>➢ Changed "Rate Schedule 2" to "Section 15.2"<br>Section 3.5<br>➢ Changed "Rate Schedule 2" to "Section 15.2"<br>Section 3.6<br>➢ Changed Leading test frequency from once every three years to once each year<br>➢ Added Leading demonstrated performance as part of the basis for VSS compensation<br>Section 3.6.1<br>➢ Changed Leading test frequency from once every three years to once each year<br>➢ Added Leading and Lagging demonstrated capability are the basis for VSS compensation<br>➢ Added specification that gross metering data transmitted to the NYISO will be the basis for test verification, if gross metering is not available then net metering will be used<br>➢ Leading test period expanded to include January, February, March, April<br>➢ Removed unnecessary language referring to a 2012 change to the VSS program<br>Section 3.6.2<br>➢ Added specification that gross meter data will be used for the purposes of VSS test verification, if gross data is not available then net data will be used<br>Section 3.6.4<br>➢ Expanded test form submission deadline to November 15th for the submission of operational data<br>Section 3.7.2<br>➢ Changed the penalty for an unreported AVR outage |
| 4.3 | 12/02/2015 | Section 3.2<br>➢ Replaced reference to Auxiliary Market Operations with Operations Engineering |

| Version | Effective Date | Revisions |
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| | | Section 3.6.2<br>➢ Updated the Reactive Capability test notification deadline from 3 to 2 days<br>➢ Replaced reference to Auxiliary Market Operations with Operations Engineering<br>Section 3.6.6<br>➢ Replaced reference to Auxiliary Market Operations with Operations Engineering |
| 4.4 | 02/01/2016 | Section 4.8<br>➢ Revised Regulation Service Demand Curve values to: (i) reduce the first price point to $25 per MW; (ii) increase the middle price point to $400 per MW; and (iii) increase the third price point to $775 per MW<br>Section 6.2.1<br>➢ Added reference to Southeastern New York reserve requirements<br>Section 6.2.3.5<br>➢ Minor clarifying revisions regarding eligibility of certain DSASP Resources to provide non-synchronous reserves<br>Section 6.5.1<br>➢ Added reference to Southeastern New York reserve clearing prices<br>Section 6.5.2<br>➢ Revised to specify that providers of reserves located on Long Island will receive settlement payments as if they were providing reserves in Southeastern New York<br>Section 6.8<br>➢ Revised Operating Reserve Demand Curves to: (i) add descriptions of Southeastern New York demand curves for each reserve product; (ii) update the Total Spinning Reserve demand curve value; (iii) update the Total 10-Minute Reserve demand curve value; (iv) update the Eastern 10Minute Reserves demand curve value; (v) update the Total 30-Minute Reserves demand curve values; and (vi) add new subsection 6.8.1 to provide an overview of the reserve, regulation and transmission demand curves implemented by the NYISO. |
| 4.5 | 04/28/2016 | Section 6.8.1<br>➢ Revise Transmission Shortage Cost values to reflect implementation of the graduated transmission demand curve |
| 4.6 | 07/01/2016 | Section 3.6.4<br>➢ Revised VSS reporting requirement to direct generators to submit test results with the Voltage Support Test Data System.<br>➢ Changed submission time period for submitting operational data.<br>Attachment B |

| Version | Effective Date | Revisions |
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| | | ➢ Removed. No longer applicable. |
| 4.7 | 10/28/2016 | Comprehensive Scarcity Pricing Revisions<br>Section 6.5.3<br>➢ New section. Establishing Reserve Clearing Prices during EDRP/SCR Activation Intervals<br>Section 6.8.1<br>➢ New section. 30-Minute Operating Reserve Demand Curves during EDRP/SCR Activation Intervals |
| 4.8 | 12/13/2016 | Section 3.6.2<br>➢ Updated BTM:NG Resources as a classification of "Generators" for testing purposes<br>Section 4.2<br>➢ Updated Source of Service to include BTM:NG Resource<br>Section 4.11.1<br>➢ Updated criteria of a Regulation Qualified Resource to include BTM:NG Resources<br>Section 6.1<br>➢ Updated Types of Operating Reserves to include BTM:NG Resources<br>Section 6.2.2<br>➢ Updated the Supplier Eligibility Criteria for BTM:NG Resources supplying Operating Reserves<br>Section 6.3.1<br>➢ Clarified the Operating Reserve products on which BTM:NG Resources may bid in the Day-Ahead Market<br>Section 6.4.1<br>➢ Clarified the Operating Reserve products on which BTM:NG Resources may bid in the Real-Time Market |
| 4.9 | 10/02/2017 | Section 6.8.2<br>➢ Removed reference to transmission demand curve in section title, description and table |
| 5.0 | 04/02/2018 | Section 8.1<br>➢ New section. Introduction of testing requirements for combined cycle units participating in Con Edison MOB program<br>Section 8.2<br>➢ New section. Establishes testing requirements for combined cycle units participating in Con Edison MOB program<br>Section 8.3 |

| Version | Effective Date | Revisions |
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| | | ➢ New section. Establishes frequency of testing for combined cycle units participating in Con Edison MOB program<br><br>Section 8.4<br>➢ New section. Establishes procedure requirements for testing for combined cycle units participating in Con Edison MOB program<br><br>Section 8.5<br>➢ New section. Establishes documentation and requirements for testing for combined cycle units participating in Con Edison MOB program |
| 5.1 | 07/17/2019 | Global<br>➢ Updated links and references<br><br>Section 3.2<br>➢ Clarified that all providers must have a functioning AVR<br><br>Section 3.6.5<br>➢ New allowance for Out-of-Period reactive testing for providers prevented from testing by their TO due to a transmission outage<br><br>Section 4.8<br>➢ Updated description of the Regulation Service Demand Curve<br><br>Section 6.2.1<br>➢ Added reference to New York City reserve requirements<br><br>Section 6.5.1<br>➢ Added reference to New York City reserve clearing prices<br><br>Section 6.5.3<br>➢ Added reference to New York City reserve requirements<br><br>Section 6.8<br>➢ Added descriptions of New York City demand curves for each reserve product<br><br>Section 6.8.1<br>➢ Added reference to New York City reserve requirements<br><br>Section 8.4<br>➢ Specified that updates/verifications of automatic fuel swap testing procedures shall be provided to the Manager of OP ENG and Con Ed in the capability period after each test.<br>Section 8.5<br>➢ Specified that documentation of automatic fuel swap testing shall be provided in the capability period following each test. |

| Version | Effective Date | Revisions |
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| 6.0 | 05/01/2020 | Section 6.2.3.2<br>➢ Corrected hyperlink to NYISO Revenue Metering Requirements Manual<br>➢ Removed hyperlink to NYSEME Meter Practices<br>➢ Removed hyperlink to NYSPSC Approved Meter List<br>➢ Removed hyperlink to NYSPC Operating Procedure<br>Section 6.2.4.3.1<br>➢ Removed reference to PSC approved metering and replaced with reference to MSE, RMR and CCR Manuals<br>➢ Removed references to PSC Approved Meter List<br>Section 6.2.4.4.4<br>➢ Removed reference to NYSPSC approved<br>Section 3.3<br>➢ Dual Participation language added to Section 3.3 Responsibilities for Service<br>Section 3.7.2<br>➢ Dual Participation language added to Section 3.7.2 Voltage Support Availability<br>Section 4.4<br>➢ Dual Participation language added to Section 4.4 Performance Tracking<br>Section 6.2.3<br>➢ Dual Participation language added to Section 6.2.3 Other Supplier Requirements<br>Section 6.3.1<br>➢ Dual Participation language added to Section 6.3.1 Bidding and Bid Selection<br>Section 6.3.3<br>➢ Dual Participation language added to Section 6.3.3<br>➢ Responsibilities of Suppliers Scheduled to Provide Operating Reserves in the Day Ahead Market |
| 6.1 | 08/28/2020 | Section 6.1 Description<br>➢ Added language in Types of Operating Reserves for Energy Storage Resources<br>Section 6.2.2 Supplier Eligibility Criteria<br>➢ Added language in Supplier Eligibility Criteria for Energy Storage Resources<br>Section 6.3.1 Bidding and Bid Selection<br>➢ Added language in Bidding and Bid Selection for Energy Storage Resources |

| Version | Effective Date | Revisions |
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| 6.2 | 11/11/2020 | Section 3.2<br>➢ Changed AVR-specific references to automatic voltage controlling equipment<br>➢ Added example capability curves for non-inverter based resources and inverter-based resources<br>Section 3.6<br>➢ Added definitions for charging and discharging modes<br>Section 3.6.2<br>➢ Language added for resources behind a single Point of Injection<br>Section 3.6.4<br>➢ New section added for test procedures for ESRs |
| 6.3 | 10/04/2021 | Recertified<br><br>Global<br>➢ Updated capitalization of terms for improved consistency in use of tariff-defined terms<br><br>Section 4.10<br>➢ Minor clean up edit to delete words “and the”<br><br>Section 4.11<br>➢ Minor clean up edit to change to pluralize “Service” in the phrase “NYISO Service Tariff”<br><br>Section 6.2.3<br>➢ Included a footnote on eligibility of IPRs to provide Operating Reserve products<br><br>Section 6.8<br>➢ Updated the Operating Reserve Demand Curve descriptions for various reserve zones and reserve products<br>Section 6.8.1<br>➢ Updated descriptions of revised 30-minute Operating Reserve Demand Curves applicable during real-time SCR/EDRP activations to reflect SENY incremental 30-minute reserve procurements, enhancements to NYCA 30-minute reserve demand curve modifications providing for consistent demand curve structure during all SCR/EDRP activations, and updated Operating Reserve Demand Curve values<br>Section 6.8.2<br>➢ Updated the Operating Reserve Demand Curve values |
| 6.4 | 12/15/2021 | Section 6.3.1<br>➢ Included discussion on the consideration of CSR Scheduling Limits when scheduling Energy, Operating Reserves, and Regulation Capacity on CSR Generators under Day-Ahead Market rules |

| Version | Effective Date | Revisions |
|---|---|---|
| | | Section 6.4.1<br>➢ Included discussion on the consideration of CSR Scheduling Limits when scheduling Energy, Operating Reserves, and Regulation Capacity on CSR Generators under Real-Time Market rules |
| 6.5 | 06/07/2022 | Section 6.2.3.9<br>➢ Included discussion of alternative Interim Control Operations communication processes for DSASP Resources |
| 6.6 | 11/01/2022 | Section 3.6.1<br>➢ Clarified "net" and "gross" measurements, timeline for setting up ICCP data link.<br>Section 3.6.5<br>➢ Added NYISO test review window<br>Section 3.6.5.1<br>➢ New subsection: the NYISO may reject tests on the grounds of insufficient data for test validation.<br>Section 3.6.6<br>➢ New out of period testing exemption: if NYISO rejects a test after September 30.<br>Section 6.2.3.1<br>➢ Added Critical Electric System Infrastructure Load eligibility criteria to Requirements for Demand Side Ancillary Services Program (DSASP) Resources<br>Section 7<br>➢ Throughout, replaced references to "generators" and "generating units" with "resources" and "facilities". |
| 7.0 | 04/16/2024 | Recertified<br>➢ Corrected ordering of Revision History entries<br>Global<br>➢ Replaced "Generator" with "Resource," which includes both Generators and Aggregations.<br>➢ Added Aggregations when applicable.<br><br>Section 1.2<br>➢ Added definition of Resource term and reference to Aggregation Manual.<br>Section 3.1<br>➢ Added statement about Aggregation ineligibility to provide VSS.<br>Section 4<br>➢ Added eligibility criteria for Aggregations to provide Regulation and Frequency Response Service.<br>Section 6<br>➢ Added eligibility criteria for Aggregations to provide Operating Reserve Service.<br>Section 7.1<br>➢ Added statement about Aggregation ineligibility to provide black start capability service. |

| Version | Effective Date | Revisions |
|---|---|---|
| 8.0 | 08/02/2024 | Section 3<br>➢ Reordered text for clarity.<br>Section 3.2.1<br>➢ New subsection.<br>➢ Modified requalification paperwork requirements: re-qualifying participants only need to resubmit changed documentation as part of document submittal.<br>Section 3.6.1.3<br>➢ New subsection to describe Testing Periods.<br>Section 3.6.2.1<br>➢ New subsection to describe Testing Coordination.<br>Section 3.6.6<br>➢ Expanded out-of-period tests to satisfy requirements for current year **and** following year's participation.<br>Attachment A-1<br>➢ Removed legacy AVR terminology. |
| 9.0 | 05/01/2025 | Section 4.3.2<br>➢ Added details about the Regulation Movement Multiplier (RMM) and how it will be calculated and reviewed.<br>➢ Added a table containing the historic values of the RMM. |
| 10.0 | 05/01/2026 | Section 3.6<br>➢ Added language to specify HVDC VSS testing requirements mirror those for generators<br>➢ Added formulas and description to illustrate the new compensable range calculations in compliance with FERC Order 904<br><br>Section 5.2<br>➢ Added language to highlight that Inadvertent Interchange across the CHPE MTF will be tallied and repaid separate from the NYISO's other External Interfaces with Hydro Quebec |
| 11.0 | 07/31/2026 | Section 4.2<br>➢ Added language pertaining to the Participation Limit<br>➢ Added Figures 10A and 10B showing the Participation Limit for CCGTs<br>Section 6.1<br>➢ Added URR into the types of Operating Reserves<br>➢ Updated Total 10-Minute Reserve and Total 30-Minute Reserve to include URR<br>Section 6.2.1<br>➢ Introduced language describing NYISO's calculation of URRs |

| Version | Effective Date | Revisions |
|---|---|---|
| | | Section 6.2.2<br>➢ Added language for CCGTs with duct-firing that opted for Limiting Participation<br>Section 6.3<br>➢ Added language in 6.3.1 reflecting MST 15.4.2 General Day-Ahead Market Rules<br>Section 6.4<br>➢ Added language in 6.4.1 reflecting MST 15.4.3 General Real-Time Market Rules<br>➢ Added language in 6.4.1 reflecting MST 17.1 RTD General Procedures<br>Section 6.8<br>➢ Added language describing the locational requirements for the URR.<br>➢ Updated Operating Reserve Demand Curves with language mirroring the tariff URR updates for ORDCs.<br>Section 6.8.1<br>➢ Updated the curves during Scarcity events with language mirroring the tariff URR updates for ORDCs during Scarcity events.<br>➢ Added new example graphs and removed the old example graphs.<br>Section 6.8.2<br>➢ Revamped the ORDC table for Reserves and Regulation with language mirroring the tariff language for ORDCs and added in the shortage pricing for URRs<br>Attachment D<br>➢ New attachment to provide detailed information on the Uncertainty Reserve Requirement Calculation Process<br>Section 6.2.3<br>➢ Removed since the DSASP program had been sunset unrelated to Duct-Firing and Uncertainty Reserve Requirements<br>Section 6.2.4<br>➢ Removed since the DSASP program had been sunset unrelated to Duct-Firing and Uncertainty Reserve Requirements |
| 11.1 | 09/29/2026 | Recertified<br>Global<br>➢ Updated document formatting<br>➢ Corrected broken hyperlinks |

# 1. Overview

This section gives an overall description of the following Ancillary Services.

- Scheduling, System Control and Dispatch Service
- Voltage Support Service
- Regulation and Frequency Response Service
- Energy Imbalance Service
- Operating Reserve Service
- Black Start Capability Service

## 1.1. Purpose

The purpose of this Manual is to provide an overview of the Ancillary Services available in the New York market along with settlement process associated with each of the available ancillary services.

## 1.2. Summary of Services

Ancillary Services support the transmission of energy from resources to loads, while maintaining reliable operation of the New York State (NYS) Power System. Ancillary Services consist of physical equipment and human resources. The New York Independent System Operator (NYISO) is also responsible for directing the actions of Generation Resources and other facilities that provide Ancillary Services to the NYISO.

The NYISO coordinates the provision of all Ancillary Services and directly arranges for the supply of all Ancillary Services that are not self-supplied. Some Ancillary Services must be provided by the NYISO; others can either be provided by the NYISO or procured by the Transmission Customers and Suppliers themselves. Some Ancillary Services are provided at market-based prices, while others, due to the nature of the service, are provided at embedded cost-based prices. All Ancillary Service providers must be scheduled by the NYISO. Figure 1 presents a summary of the NYISO Ancillary Services.

**Figure 1: Ancillary Services Summary**

| Ancillary Service | Is the Service Location Dependent? | Who provides the Service – NYISO or Self-Supplied (SS)? | What is the Pricing method for the Ancillary Service? |
|---|---|---|---|
| Annual Budget Charge and Other Non-Budget Charges and Payments | No | NYISO | Embedded |
| Voltage Support Service | No | NYISO | Embedded |
| Regulation and Frequency Response Service | No | NYISO or (SS) | Market-based |
| Energy Imbalance Service | No | NYISO | Market-based |
| Operating Reserve Service | Yes | NYISO or (SS) | Market-based |
| Black Start Capability Service | Yes | NYISO | Embedded |

Throughout this Ancillary Services Manual, the term "Resource" is used to refer to both Generators and Aggregations. Additional information on Aggregations can be found in Market Administration and Control Area Services Tariff Section 4.1.10 and in the Aggregation Manual ( available from the NYISO Web site at the following URL: https://www.nyiso.com/manuals-tech-bulletins-user-guides). Throughout this Ancillary Services Manual, any explicit reference to an existing NYISO participation model is also applicable to Aggregations classified under the same participation model. For example, ESR and LESR Aggregations shall follow the same rules as set forth for single resources of those types.

## 1.3. Payments and Charges for Ancillary Services

Payments and charges for ancillary services are described in the *NYISO Accounting and Billing Manual* (available from the NYISO Web site at the following URL: https://www.nyiso.com/manuals-tech-bulletins-user-guides) and set forth in the *NYISO Open Access Transmission Tariff* (*OATT*) and *NYISO Market Administration and Control Area Services Tariff* (*Services Tariff*) as noted in Figure 2.

**Figure 2: Rate Schedules for Ancillary Services**

| Ancillary Service | *NYISO OATT* Rate Schedule | *NYISO Services Tariff* Rate Schedule |
|---|---|---|
| Scheduling, System Control and Dispatch Service | 1 | 1 |
| Voltage Support Service | 2 | 2 |
| Regulation and Frequency Response Service | 3 | 3 |

| | | |
|---|---|---|
| Energy Imbalance Service | 4 | N/A |
| Operating Reserve Service | 5 | 4 and 6 |
| Black Start Capability Service | 6 | 5 |

## 1.4. Self-Supply of Ancillary Services

Transmission Customers and Suppliers are permitted to Self-Supply certain Ancillary Services, as identified in Figure 1. In general, the following process must occur in order to Self-Supply Ancillary Services:

1. A Transmission Customer bids the resource required to provide the Ancillary Service into the Ancillary Services market.
2. The NYISO selects the successful bidders to provide each Ancillary Service. The selection of all Ancillary Service providers is subject to the same locational criteria.
3. Transmission Customers and Suppliers with resources selected by the NYISO use the revenues that they would otherwise have received for providing these services as an offset against charges they would otherwise need to pay the NYISO for the service.
    - The Load Serving Entities (LSE) identify in their application to NYISO the Ancillary Services that they plan to purchase through the NYISO.
    - All suppliers of Ancillary Services using the self-supply option must place the facility under the operational control of the NYISO. All of these resources are subject to the same NYISO locational and performance criteria, and are subject to all payments and penalties as are defined for all other suppliers of the service.
    - For more information, see the *NYISO Accounting and Billing Manual* (available from the NYISO Web site at the following URL: https://www.nyiso.com/manuals-tech-bulletins-user-guides)

## 1.5. Metering Requirements

- Ancillary Services Suppliers must ensure that adequate metering data is made available to the NYISO by direct transmission to the NYISO through existing Transmission Owner communication equipment.
- Additionally, for operational purposes, metered data provided to the NYISO must also simultaneously be provided to the Transmission Owner, which will handle such information consistent with the OASIS standards of conduct as specified in FERC Order No. 889.

# 2. Annual Budget Charge and Other Non-Budget Charges and Payments

This section describes the annual budget charge, other non-budget charges, and payments for services provided by the New York Independent System Operator (NYISO).

## 2.1. Description

The annual budget charge, other non-budget charges, and payments for service is grouped into three broad categories related to the physical operation of the NY Control Area:

- Physical Operation of the NY Control Area
- Administration of the NYISO tariffs and related agreements
- Other Non-Budget Charges

The list of services, together with a description of each service is presented in Rate Schedule 1 the NYISO OATT and the Accounting and Billing Manual.

## 2.2. Recovery of NYISO Costs

Please refer to Rate Schedule 1 of the NYISO OATT, Rate Schedule 1 of the NYISO Services Tariff, and the Accounting and Billing Manual for information about recovery of NYISO costs associated with ISO Annual Budget Charge and Other Non-Budget Charges and Payments.

## 2.3. Payment for Service

Please refer to Rate Schedule 1 of the NYISO OATT, Rate Schedule 1 of the NYISO Services Tariff, and the Accounting and Billing Manual for information about ISO Annual Budget Charge and Other Non-Budget Charges and Payments.

## 2.4. Services Performed at the Request of a Market Participant

Market Participants may request and pay for the following NYISO Services:

- System Reliability Impact Study (ESRIS)
- Facilities Study
- Local Control Center operator training
- Re-enforcement Option Study (PSC can also request)
- System Impact Study
- Interconnection Study

Studies may also be requested by the New York State Reliability Council (NYSRC). For further details, see the *Transmission Expansion and Interconnection Manual* (available from the NYISO Web site at the following URL:

https://www.nyiso.com/manuals-tech-bulletins-user-guides).

# 3. Voltage Support Service

This section describes the voltage support service (VSS).

## 3.1. Description

In order to maintain transmission voltages on the NYS Transmission System within acceptable limits, facilities under the control of the NYISO are operated to produce (or absorb) Reactive Power. Thus, Reactive Supply and Voltage Control Service ("Voltage Support Service") must be provided to support all Transactions on the NYS Transmission System. The amount of VSS that must be supplied will be determined based on the Reactive Power support necessary to maintain transmission voltages within limits that are generally accepted in the region and consistently adhered to by the NYISO.

## 3.2. Supplier Qualification

The NYISO requires that VSS suppliers meet the following criteria. Each resource must:

- Be able to produce and absorb Reactive Power within its tested reactive capability range

(If the resource is precluded from running in "lead" mode in which it can absorb reactive power, then the unit is not eligible to provide Voltage Support Services. For information on exemptions from the requirement to absorb Reactive Power, see section 3.6.6. Exemption from Requirement to Absorb Reactive Power.)

- Be able to maintain a specific voltage level under both steady-state and post-contingency operating conditions, subject to the limitation of its tested reactive capability.
- Have functioning automatic voltage controlling equipment to be able to automatically respond to voltage control signals. The automatic voltage controlling equipment could include, but is not limited to, an Automatic Voltage Regulator (AVR) for synchronous resources or an inverter capable of automatic voltage control for inverter-based resources.
- Be under the operational control of the NYISO or a Transmission Owner.
- Successfully perform Reactive Power (MVAr) capability tests in accordance with the NYISO Procedures described below.
- DER Aggregations are not eligible to provide Voltage Support Service.

### 3.2.1 Qualification Package

In order to qualify to receive payments as a VSS Supplier, the potential service provider must submit a package of necessary documents to the NYISO. When candidates that have been disqualified as VSS Suppliers submit a new qualification package, it need only contain a new VSS Qualification Form, statement of intent, and whichever of the listed documents need revision, along with an explanation of changes.

Please submit the qualification package to the following e-mail box or address:

vss_test_results@nyiso.com

Manager, Operations Engineering
New York Independent System Operator, Inc.
10 Krey Boulevard
Rensselaer, NY 12144

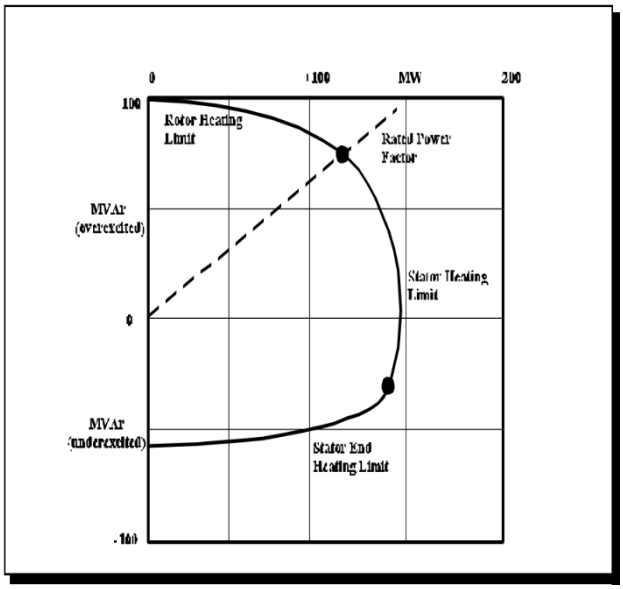
The necessary documents are as follows:

- A completed VSS Qualification Form. That form is provided as Attachment A-1 of this manual. The Qualification Form must be completed by a representative of the Supplier and signed by a Vice-President (or equivalent signing authority) of the corporation.
- A statement of intent to provide Voltage Support Services.
- Generator, collector, turbine, or other producing unit documentation, including:
    - Original Equipment Manufacture name.
    - Manufacturer's specifications sheet.
- Documentation for the automatic voltage controlling equipment:
    - Original Equipment Manufacture name.
    - Manufacturer's specification document.
    - Voltage regulation block diagram.
- A plant level single line diagram as commissioned, depicting:
    - Point of interconnection.
    - Relevant telemetry locations.
- A plot of the unit's theoretical real (P) and reactive (Q) power capability at the point of interconnection (a PQ/capability curve).

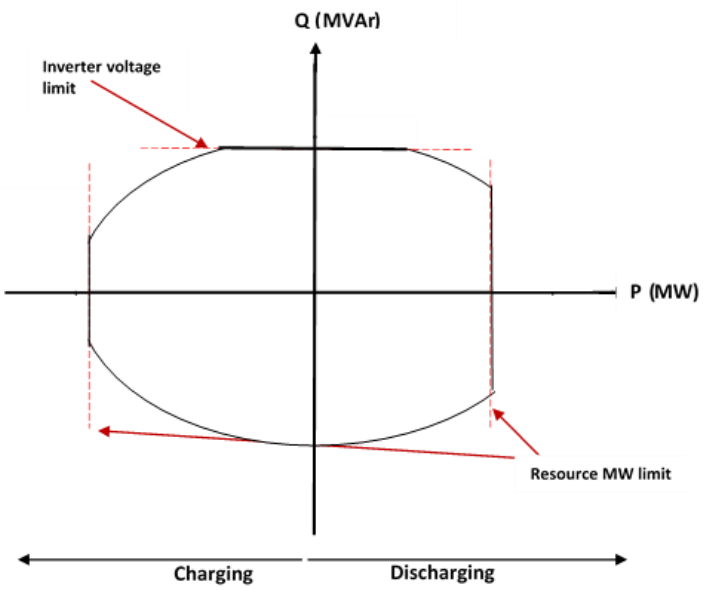
The submitted capability curve may appear similar to one of the following sample capability curves.:

**Figure 3: Theoretical MVAr versus MW Capability Curves**

**a. Synchronous resource**



**b. Inverter-based resource**



### 3.3. Responsibilities for Service

The NYISO directs the Supplier's Resources to operate within their tested reactive capability limits. The scheduling of VSS is the responsibility of the NYISO.

- NYISO – The NYISO coordinates the NYS Power System voltages throughout the NYCA.
- Transmission Owners – Transmission Owners are responsible for the local control of the Reactive Power resources that are connected to their network.
- VSS Suppliers – Suppliers are expected to operate their Resources within demonstrated reactive capability limits. VSS Suppliers are also expected to maintain a specific voltage level, as directed by the NYISO and the Transmission Owner System Operator, under both steady state and post-contingency operating conditions subject to the limitations of the Resource's tested reactive capability. Resources engaged in Dual Participation and providing VSS must meet all requirements identified in the NYISO Market Services Tariff and this Ancillary Services Manual. Suppliers are required to provide updated documentation (such as capability curves, inverter block diagrams, automatic voltage controlling equipment documentation) if any equipment is changed.

### 3.4. Payment for Service

Please refer to Section 15.2 of the NYISO Services Tariff for information about Payments for Supplying Voltage Support Service.

### 3.5. Failure to Perform by Suppliers

Please refer to Section 15.2 of the NYISO Services Tariff for information about VSS Supplier failure to perform penalties.

### 3.6. Reactive Power Capability Testing or Demonstration

The purpose of the Reactive Power capability testing or demonstration is to establish a uniform procedure of determining, confirming, and documenting the Reactive Power capability of VSS Suppliers for real-time system voltage control. The procedures set forth below provide the NYISO with accurate and timely information on the Reactive Power capability of the VSS Suppliers. The demonstration also provides confirmation that the supplier is able to automatically adjust its reactive power production or consumption to properly control voltage.

Each year resources that participate in VSS must demonstrate Lagging and Leading Reactive Power capability. Resources can satisfy this requirement by either performing Reactive Capability Tests as described below in section 3.6.2. Test Procedure for Generators, or by providing data collected during

actual operation. However, if granted an exemption for absorbing Reactive Power as described in section 3.6.6 Allowance for Out-of-Period Reactive Capability Testing of this manual, a resource is not required to demonstrate Leading Reactive Power capability. In all cases, the Supplier must have its automatic voltage controlling equipment enabled during the demonstration period.

All tests must be coordinated with the NYISO and the Transmission Owner (TO) in whose service territory the unit is located. See the Transmission & Dispatch Operations Manual, section 6.7.6. Rules for Resources Conducting Certain Scheduled Steady-State Tests for more details. All test data reports must be submitted electronically by the VSS Supplier within ten (10) business days of the test to the NYISO for review and acceptance.

The demonstrated performance of the Lagging and Leading Reactive Power capability tests is the basis for compensation to Suppliers of VSS. The performance demonstration will be the starting point for the compensable range calculation, which removes the standard power factor range, as illustrated in the formula below:

***Lagging Compensable MVAr:***

$$MVAr_{Lag,\ Comp} = \max\left(0,\ MVAr_{Lag,\ Demonstrated} - MVAr_{Lag,\ StdPF}\right)$$

***Leading Compensable MVAr:***

$$MVAr_{Lead,\ Comp} = \min\left(0,\ MVAr_{Lead,\ Demonstrated} - MVAr_{Lead,\ StdPF}\right)$$

***Where:***

- $MVAr_{Lag,\ Demonstrated}$ = demonstrated Lagging reactive capability
- $MVAr_{Lead,\ Demonstrated}$ = demonstrated Leading reactive capability
- $MVAr_{Lag,\ StdPF}$ = MVAr capability corresponding to 0.95 lagging
- $MVAr_{Lead,\ StdPF}$ = MVAr capability corresponding to 0.95 leading

**Definitions**

***Lagging MVAr*** – Reactive Power that is generated out of a generator and into the power system. By convention, lagging MVAr is a positive (+) number.

***Leading MVAr*** – Reactive Power that is absorbed by a generator out of the power system. By convention, leading MVAr is a negative (-) number.

***Charging Mode*** – State of operation of an Energy Storage Resource where real power flows from the grid, through the inverter, to be stored in the Energy Storage Resource for later injection back onto the grid at the same location.

***Discharging Mode*** – State of operation of an Energy Storage Resource where real power flows from the Energy Storage Resource, through the inverter, onto the grid.

***Standard Power Factor Range –*** DMNC multiplied by 0.312 (for synchronous resources), or DMNC multiplied by 0.329 (for inverter-based resources)

Q, the amount of reactive power that a resource can produce or absorb at a power factor of 0.95, can be determined as a function of S, the amount of apparent power produced at that power factor, using the following equation:

Q = S sin (inverse cos (0.95)),

or as a function of P, the amount of active power produced at that power factor, using the following equation:

Q = P tan (inverse cos (0.95)).

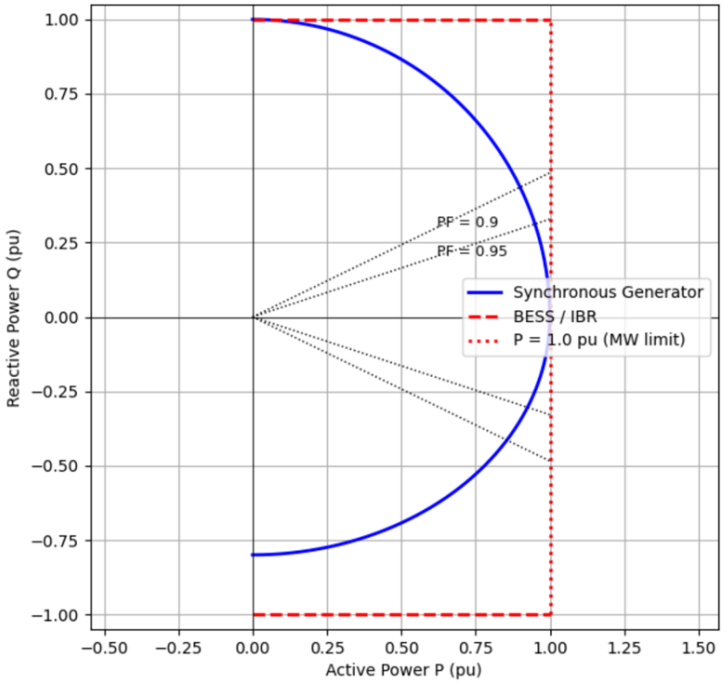
Inverter-based resources can provide reactive power without much impact on the active power output, whereas synchronous units' active power output will be impacted by reactive power output/absorption. To account for these differences, NYISO's standard power factor range for synchronous resources will be calculated under the assumption that the DMNC reflects the amount of apparent power that the resource can produce, while the NYISO's standard power factor range for inverter-based resources will be calculated under the assumption that the DMNC reflects the amount of active power that the resource can produce. This yields the following formulas:

Reactive Power (synchronous resources) = DMNC * sin (inverse cos (0.95)) = DMNC * 0.312

Reactive Power (inverter-based resources) = DMNC * tan (inverse cos (0.95)) = DMNC * 0.329

Figure 4 below illustrates the reactive and active power capabilities of synchronous generators and inverter-based resources.

**Figure 4: Capability Curves with Power Factor Limits and MW Boundary**




### 3.6.1. Frequency, Timing, and Other Requirements

At least once each calendar year each Resource providing Voltage Support Service must test or demonstrate Lagging and Leading Reactive Capability. If granted an exemption for absorbing Reactive Power as described in section 3.6.7 of this manual, a resource is not required to demonstrate Leading Reactive Power capability.

The demonstrated gross Lagging and Leading MVAr capability (output without discounting any consumption required for operation and delivery to the NYCA transmission system), will be the basis for compensation in the next compensation (calendar) year. However, if gross metering data is not available, net metering data of Lagging and Leading MVAr capability (output net of any consumption required for operation and delivery to the NYCA transmission system) will be the

basis for compensation in the next compensation (calendar) year. All reactive power demonstrations and tests will be verified using metering data transmitted to the NYISO through existing Transmission Owner communication equipment. VSS suppliers that do not make adequate metering data available for the NYISO during the Capability Year will be disqualified as VSS suppliers.

#### 3.6.1.2 Identical Treatment Units

Small, identical units at the same site may apply test results from one unit to another unit at the same site. In order to qualify for this treatment, the units must be electrically identical and must be less than 60 MW nameplate capacity each. Qualification to apply test results from one unit to another requires one-time submittal of the capability-curve and registration information for each unit, along with a request for this treatment, and pre-approval by the Manager of Operations Engineering. The form to request this treatment is provided as Attachment A-2 Each year, only one identical treatment unit must be tested to represent the capabilities of each other identical treatment unit.

3.6.1.3 Testing PeriodsLagging and leading MVAR capability tests shall be performed during different yet overlapping time periods:

- Lagging MVAr capability must be tested or demonstrated during the Summer Capability Period (May 1 through October 31, inclusive).
    - Normally performed during on-peak hours. The VSS Supplier must operate at maximum Lagging MVAr for at least one hour for the test to be acceptable.
- Leading MVAr capability must be tested or demonstrated between January 1 and October 31, inclusive, unless granted an exemption for absorbing Reactive Power as described in section 3.6.6. Allowance for Out-of-Period Reactive Capability Testing.
    - Normally performed during off-peak hours. The VSS Supplier must operate at maximum Leading MVAr for at least one hour for the test to be acceptable.

Both Lagging and Leading testing may be performed on the same day during the Summer Capability Period.

A VSS Supplier may schedule additional MVAr tests during the testing periods after completing their Reactive Capability tests When scheduling an additional Reactive Capability Test, the VSS Supplier must again follow the test procedures given in the Transmission & Dispatch Operations Manual, section 6.7.6. Rules for Resources Conducting Certain Scheduled Steady-State Tests.. The VSS Supplier will be placed at

the end of the queue for scheduling requests when requesting additional tests during a given capability period.

Demonstration results must be retained for the current and most recent prior test period. Any supplemental engineering analysis to support data for the current and most recent prior test period must also be retained.

#### 3.6.2. Test Procedure for Generators

Reactive Power capability tests are to be carried out under normal operating conditions. Extreme measures that might overstate a unit's reactive capability must be avoided. (For example, measurements should be made with the unit operating with normal hydrogen pressure or other normal coolant conditions).

Both Lagging and Leading MVAr capability are to be measured at the generator terminal (gross) and, if available, at the point of interconnection (net). If generator terminal (gross) metering is not available, then Lagging and Leading MVAr capability are to be measured at the point of interconnection (net). If a VSS Supplier's gross metered data does not reflect its ability to absorb or produce MVArs, the net metered data at the point of interconnection may be used as the basis of MVAr compensation.

The verification of Reactive Power capability for facilities with multiple resources that share a single Point of Injection and/or are dependent upon one another for normal operation shall be based on the Reactive Power capability of the facility at the Point of Injection, and not the sum of the capabilities of the individual generators. (Example: A Combined Cycle combustion turbine.)

Lagging and Leading tests must be performed for a duration of at least one hour at the real power levels described in Figure 5.

**Figure 5: Real Power Level Requirements for Reactive Power Capability Testing**

| | Intermittent Power and Limited Control Run-of-River Hydro Resources | | All Other Generators | |
|---|---|---|---|---|
| | **Lagging** | **Leading** | **Lagging** | **Leading** |
| **ICAP Suppliers[1] and Non-ICAP Suppliers with a Valid DMNC (or DMGC, where appropriate) Test[2]** | ≥ 90% of UCAP[3] | ≥ 10% of UCAP[3] | ≥ 90% of DMNC[4] | ≥ 10% of DMNC[4] |
| **All Other Non-ICAP Suppliers** | ≥ 90% of Generator Nameplate MW | ≥ 10% of Generator Nameplate MW | ≥ 90% of Generator Nameplate MW | ≥ 10% of Generator Nameplate MW |

1 *ICAP Supplier* refers to resources qualified to supply UCAP as defined in the *NYISO Services Tariff*.

2 DMNC tests cannot be used for Limited Control Run-of-River Hydro Resources that are not ICAP Suppliers.

3 *Unforced Capacity* (*UCAP*) refers to the rating assigned to ICAP Suppliers as defined in the *NYISO Services Tariff*. The UCAP value that is tested to must correspond to the Available UCAP recorded in the NYISO ICAP Automated Market System.

4 *DMNC* refers to the Dependable Maximum Net that is in effect at the time of the test. The DMNC value that is tested to must correspond to the DMNC recorded in the NYISO ICAP Automated Market System.

#### 3.6.2.1 Testing Coordination

See Transmission & Dispatch Operations Manual, section 6.7.6. Rules for Resources Conducting Certain Scheduled Steady-State Tests.

### 3.6.3. Test Procedure for Synchronous Condensers

Each synchronous condenser providing this service will be required to demonstrate the maximum leading and lagging MVAr capability it can maintain for one hour.

### 3.6.4. Test Procedures for HVDC with Voltage Source Converter (VSC) Technology

Each HVDC providing Voltage Support Service will be required to demonstrate its leading and lagging capabilities as described in Section 3.6.2. of this manual.

### 3.6.5. Test Procedures for Energy Storage Resources

Each Energy Storage Resource (ESR) providing this service will be required to demonstrate its leading and lagging capabilities while it injects Energy onto the grid (*i.e.*, Discharging Mode) and while it withdraws Energy from the grid (*i.e.*, Charging Mode). The test requirements to demonstrate Reactive Capability for both charging and discharging are described in Section 3.6.2. Test Procedure for Generators. Charging Reactive Power capability demonstrations do not have associated real power requirements. The lower of the two demonstrated leading capabilities and the lower of the two demonstrated lagging capabilities, as verified by metering data, will be the basis of compensation for the following calendar year. For example,

| Charging/discharging | Leading MVAr | Lagging MVAr | Compensation MVAr |
|---|---|---|---|
| Charging | 50 | 40 | 30 (leading) + 40 (lagging) = [70 MVAr – the resource's standard power factor range] (total) |
| Discharging | 30 | 45 | |

### 3.6.6. Reporting Requirements

Suppliers of VSS must submit test results to the NYISO Voltage Support Test Data System within ten (10) business days of the test. Suppliers of VSS using operational data to demonstrate their Reactive Power capability must submit the operational data to the NYISO Voltage Support Test Data System within ten (10) business days of the end of the test period (October 31st). Any operational data that is submitted more than 10 business days after the end of the test period will not be accepted. Any Supplier that did not submit their test data or operational data by this time will be disqualified from the Voltage Support Service. The submitted data must include supporting performance data including gross and net MW and MVAr output, terminal or station bus voltage, and unit auxiliary load MW and MVAr.

The NYISO will review and indicate the status of submitted test data in the Voltage Support Test Data System within fifteen (15) business days of the data submittal. If the test results are rejected, the VSS Supplier may qualify for an Out-of-Period test under Section 3.6.6, Allowance for Out-of-Period Reactive Capability Testing.

The NYISO collects the reactive capability data of VSS Suppliers. The NYISO provides these data to the operating division of the supplier's Transmission Owner (TO) within sixty (60) days of the end of the Summer Capability Period. This allows sufficient time for the NYISO to assemble the data with due consideration to VSS Supplier owner reporting requirements.

#### 3.6.6.1. Data Transmission Requirements

The NYISO may reject a Reactive Capability Test if the resource does not provide accurate metering data transmitted through existing Transmission Owner telecommunication equipment, that can be used to verify the resource's real and reactive power output for the duration of the Reactive Capability Test.

If during a Reactive Capability Test, the Transmission Owner's telecommunication equipment is not functioning, and an ICCP link is already available, the NYISO will use direct ICCP communications to validate the test. However, if there is no pre-existing direct ICCP link, the Generator Owner may qualify for an Out-of-Period test under Section 3.6.6, Allowance for Out-of-Period Reactive Capability Testing.

If during a Reactive Capability Test, the Transmission Owner's telecommunication equipment is functioning, but the Generator Owner's metering data is inaccurate, the NYISO will reject the test, and the Generator Owner will have to schedule another test. If the NYISO rejects a test on the grounds of data inaccuracy, the generator may qualify for an Out-of-Period test exemption under Section 3.6.6, Allowance for Out-of-Period Reactive Capability Testing.

### 3.6.7. Allowance for Out-of-Period Reactive Capability Testing

There are six (6) conditions where NYISO, at their discretion, will provisionally accept testing for Voltage Support Service when that test is not conducted within the specified test or demonstration period. If approved by the NYISO, the results of successful Out-of-Period Reactive Capability Testing can be used to satisfy the requirement to demonstrate reactive power capability for the following year. The six (6) conditions are as follows:

- A new resource entering the Voltage Support Service
- An existing provider's resource returning to service from an extended forced outage
- An existing resource that was prevented from testing during the specified period by the Transmission Owner (TO), in whose Transmission District the resource is located, due to a transmission facility outage
- An existing resource becoming eligible to qualify as a VSS supplier
- A nuclear generating unit that has an AVR that is not functioning during the test period
- An existing resource has its test results rejected by the NYISO after September 30.

#### Qualification of New Resource

For a new resource entering the Voltage

Support Service, the resource must complete the annual test requirements within thirty (30) days of entering service, and forward the completed test report, in electronic form, to NYISO within ten (10) business days of the completion of that test.

#### Existing Resource returning from Extended Forced Outage

An existing VSS resource returning to service following an extended forced outage must complete the annual test requirements within thirty (30) days of returning to service, and forward the completed test report, in electronic form, to NYISO within ten (10) business days of the completion of that test.

#### Existing Resource prevented from Testing due to a Transmission Facility Outage

An existing VSS resource that was prevented from testing by a Transmission Owner, due to a transmission facility outage reported to the NYISO in accordance with the Outage Scheduling Manual, must complete the annual test requirements within thirty (30) days of the transmission facility returning to service, and forward the completed test report, in electronic form, to NYISO within ten (10) business days of the completion of that test. Suppliers must notify the NYISO of a planned test within two (2) business days of the Transmission Owner's decision to allow the test.

#### Existing Resource becoming eligible as a VSS Supplier

If, as the result of equipment upgrades or changes in qualification requirements, an existing resource becomes eligible to provide VSS, the Supplier must complete the annual test requirements within thirty (30) days of the effective date of the change in qualification requirement or equipment upgrade, and forward the completed test report, in electronic form, to NYISO within ten (10) business days of the completion of that test.

#### Nuclear Unit with Non-Functioning AVR

If the unit is able to successfully complete the test with a functioning AVR after the test period but before the end of the current year, full compensation will be allowed for the next payment year. The unit will be required to meet the follow-up requirement set forth below to continue receiving payments after the beginning of the test period. If that test results in reduced voltage support, the payments will be reduced for that entire year, including return of excess compensation for the months before the in-period test.

If the unit is able to successfully conduct an out-of-period test after the beginning of the year, the unit will receive monthly VSS payments at the level achieved in the test for all months following the conduct of the test. To receive payments at the levels achieved in the out-of-period test, the unit will voluntarily

provide voltage support within operational limits without compensation in the months of the year prior to its out-of-period test. The unit will be required to meet the follow-up requirement set forth below to continue receiving payments after the beginning of the test period. If the units produces a lower level of MVArs than was achieved in the out-or-period test, the VSS payments will be reduced consistent with the results of the in-period test for the remaining months of the year; provided further, however, should a generator perform a subsequent in-period test that demonstrates a higher level of MVAr capability, the VSS payments will be based on the results of the later test for the remaining months of the year.

#### Test Rejected Near the End of the Testing Period

If the NYISO rejects an in-period Reactive Capability Test after September 30, and the Supplier cannot demonstrate its leading and lagging reactive capability using either other performed tests or data collected during actual operation, the Supplier must complete the annual test requirements before December 1, and forward the completed test report, in electronic form, to NYISO within ten (10) business days of the completion of that test.

### 3.6.8. Exemption from Requirement to Absorb Reactive Power

The following three conditions must be met in order for the NYISO to grant an exemption from the requirement to absorb Reactive Power.

1. The ability of the resource to produce Reactive Power must be determined by the NYISO to be needed for reliable system operation.
2. The ability of the resource to absorb Reactive Power must be determined by the NYISO to not be necessary for reliable system operation.
3. The resource must be unable, due to system configuration, to absorb Reactive Power.

The NYISO will review a request for exemption with the Transmission Owner in whose Transmission District the Resource is located and determine whether the request will be granted. An exemption will not be granted over the objection of the Transmission Owner, except upon the approval of the President and Chief Executive Officer of the NYISO. Exemptions that are granted will be reviewed annually with the Transmission Owner in whose Transmission District the resource is located.

All requests for exemptions from absorbing Reactive Power must be made in writing to the Manager of Operations Engineering at the NYISO. These requests must include the specific resource(s) and the basis for requesting the exemption. Additional documentation may be required during the NYISO review. A request for exemption must be signed by an officer of the organization owning the resource (or equivalent signing authority) and can be submitted to the following e-mail box or address:

vss_test_results@nyiso.com

Manager, Operations Engineering
New York Independent System Operator, Inc.
10 Krey Boulevard
Rensselaer, NY 12144

Requests for exemptions from absorbing Reactive Power must be submitted prior to the end of the test period.

## 3.7. Voltage Support

The following procedures apply to VSS.

### 3.7.1. Request for Voltage Support Service

The NYISO may request corrective actions from voltage support facilities that are already in service and available. The procedures for real-time voltage control are covered in the *NYISO Emergency Operations* and *Transmission and Dispatching Operations* manuals (both of which are available from the NYISO Web site at the following URL: https://www.nyiso.com/manuals-tech-bulletins-user-guides).

### 3.7.2. Voltage Support Availability

***Supplier Actions:***

The supplier is obligated to provide timely notification of any operational restrictions that may limit the voltage support capability, including, for suppliers engaged in Dual Participation, any limitations caused by the services provided by the supplier to the distribution utility or other entity.

The supplier must perform the following:

1. The automatic voltage controlling equipment shall be maintained in service in automatic voltage regulation mode at all times, unless instructed otherwise by the NYISO or the Transmission Owner System Operator.
2. Provide immediate notification to the NYISO through the Transmission Owner System Operator whenever the automatic voltage controlling equipment , or any other equipment necessary for maintaining the resource's demonstrated Reactive Power capability (including, but not limited to, auxiliary cooling systems, exciters, etc.) is forced out of service or derated, and provide notice as required by the *NYISO Outage Scheduling Manual* (available from the NYISO Web site at the following URL: https://www.nyiso.com/manuals-tech-bulletins-user-guides) prior to removal from service for scheduled maintenance.

3. VSS suppliers are required to notify the NYISO of an automatic voltage controlling equipment outage lasting longer than thirty (30) days by submitting a written notice and plans for a timely repair electronically to the following e-mail address:

   vss_test_results@nyiso.com

   Failure to notify the NYISO within thirty (30) days of the outage and submit plans for a timely repair may result in disqualification from the VSS program or reduced monthly VSS payments as outlined in Section 15.2 of the NYISO Services Tariff.

4. Notify the NYISO and Transmission Owner System Operator of the estimated time for completion of necessary automatic voltage controlling equipment (or other) repairs, or scheduled maintenance.
5. Notify the NYISO and Transmission Owner System Operator when maintenance is complete and the resource's voltage support capability is fully restored.

# 4. Regulation and Frequency Response Service

This section describes the regulation and frequency response service.

## 4.1. Description

Regulation and frequency response services are necessary for the continuous balancing of resources (generation and NY Control Area interchange) with load, and to assist in maintaining scheduled Interconnection frequency at 60 Hz. This service is accomplished by scheduling Resources including qualified Generators, Limited Energy Storage Resources (LESRs), Energy Storage Resources (ESRs), Demand Side Resources (Regulation Service Suppliers) and Aggregations whose output or demand is raised or lowered (predominately using Automatic Generation Control (AGC)) as necessary to follow moment-by-moment changes in load.

The service is in addition to operating reserve services required for system contingency purposes. The NYISO offers regulation and frequency response services to serve Load within the NY Control Area.

The NYISO establishes the regulation and frequency response requirements consistent with criteria established by North American Electric Reliability Council (NERC), which may vary by hour and by season. The NYISO shall post the hourly regulation and frequency response requirements and shall present any updates of the regulation and frequency response requirements to the System Operation Advisory Subcommittee (SOAS) for discussion and comment. Should the NYISO determine that it intends to establish regulation and frequency response requirements for any hour that are lower than any requirement for that hour in the seasonal regulation and frequency response requirements published as of March 1, 2004, it shall present, prior to posting, its analysis and the revised requirement to the Operating Committee for approval. Should the NYISO determine, for reliability reasons, that it intends to establish regulation and frequency response requirements for any hour that are higher than the requirement for that hour currently in effect, it shall raise the requirement, issue a notice as soon as possible, repost the hourly regulation and frequency response requirements for that season, and discuss its adjusted regulation and frequency response requirement for that hour at the next regularly scheduled Operating Committee meeting. Shortly after the end of each Capability Period, the NYISO shall present SOAS with an analysis of the regulation performance in that Capability Period. The NYISO also establishes Regulation Service Supplier performance measurement criteria and procedures for bidder qualification and for the disqualification of bidders that fail to meet such criteria as defined in section 4.11.

## 4.2. Source of Service

Regulation Service is bid into the market by Regulation Service qualified suppliers that have AGC capability and that wish to participate in the Regulation Service market. Resources bidding to provide Regulation Service are required to submit two-part Bids, consisting of the following: a Regulation Capacity Bid indicating the MW and price ($/MW) of the Regulation Capacity they are making available to the NYISO, and a Regulation Movement Bid indicating the price ($/MW) for each MW of Regulation Movement they can provide when instructed. Regulation Service Resources are not obligated to participate and provide Regulation Service unless they have bid for Regulation Service and that bid has been accepted. If the Supplier is a Behind-the-Meter Net Generation Resource, the ISO shall only consider price-MW pairs in excess of the forecasted Host Load for the Resource.

The NYISO selects Regulation Service in the Day-Ahead Market and the Real-Time Market from qualified Resources that bid to provide Regulation Service. Market Participants may submit bids to the NYISO for Regulation Service up to the Real-Time Market market-close time (75-minutes prior to the operation hour).

The bid evaluation program validates a Regulation Service bid and returns a message to the bidder indicating that data supplied is either validation passed or validation failed. Validation passed and validation failed bids (or any bid) may be changed and resubmitted prior to market closing time. Bid information includes:

- Regulation Capacity price, in $/MW
- Regulation Movement price, in $/MW
- Regulation Capacity MW – regulation capacity available in one direction

For example a bid of 5 MWs is a bid to provide 5 MWs of regulation up and 5 MWs of regulation down.

There are also static bid parameters that can be modified only through a request to the NYISO:

- Regulation Capacity Response Rate (RCRR), in MW/min, with the exception that LESRs are not required to provide a RCRR.
- Regulation Movement Response Rate (RMRR), in MW/6 seconds. Regulation suppliers are not required to provide a Regulation Movement Response Rate. By default, the RMRR will be established as the RCRR ÷ 10. Regulation suppliers may provide a RMRR that exceeds the equivalent RCRR in the event that the supplier is capable of responding at a faster response rate; however, the RMRR may not be less than the RCRR on a time-equivalent basis.

The NYISO Market Participants User's Guide describes the bidding protocols and the checks that the NYISO makes to ensure validity. For Resources that are not LESR devices, Demand Side Resources, and

Aggregations comprised of Demand Side Resources only, the maximum Regulation Capacity (or regulating margin) that can be offered is calculated as the regulation capacity response rate times five minutes. For LESR devices, the maximum Regulation Capacity that can be offered is the unit's bid in Upper Operating Limit. A Behind-the-Meter Net Generation Resource that is comprised of more than one generating unit that is dispatched as an aggregate unit at a single PTID is not qualified to provide Regulation Service or Spinning Reserves. For a Combined Cycle Gas Turbine ("CCGT") Resource, equipped with duct-firing, that opted for the Limiting Participation flag, the sum of the its Spinning Reserves, Regulation Service, and Energy schedules cannot exceed the Participation Limit while the sum of its Spinning Reserves, Regulation Service, Energy, and 30-Minute Reserves can be scheduled up to the resource's Upper Operating Limit.

Figure 6 shows how Regulation Capacity is defined with respect to a Demand Side Resource's operating range. The assumption in this scenario is that the Demand Side Resource has not been scheduled to provide energy other than to support a Regulation Service schedule.

Figure 7shows how Regulation Capacity is defined with respect to a generating unit's operating range, for the situation without Reserve activation.

Figure 8 shows the Regulation Service deployment for an LESR that has no energy limitations and has an accepted bid for its full bid Regulation Capacity. The Upper and Lower Regulating Limits = the Upper Operating and Lower Operating limits respectively.

Figure 9 shows the Regulation Service deployment for an LESR whose energy storage position limits the amount of Regulation Service it can provide. RTD has set a BP to consume, and the Regulation Service deployed is centered on that BP. The Upper Regulating Limit is reduced below the Upper Operating Limit as the energy storage is limited and the device cannot sustain energy injection at its maximum operating capacity for the next 5 minute RTD interval.

Figure 10A - If a CCGT equipped with duct-firing that opted for the Limiting Participation flag is scheduled to provide Spinning Reserves, Regulation Service, or both, the sum of its Energy, Spinning Reserves and Regulation Service schedules for that hour will not exceed its Participation Limit.

Figure 10B - If a CCGT equipped with duct-firing that opted for the Limiting Participation flag is not scheduled to provide Spinning Reserves or Regulation Service, the sum of its Energy and 30-Minute Reserve schedules may exceed the Participation Limit.

**Figure 6: Demand Side Resources Operating Characteristics**

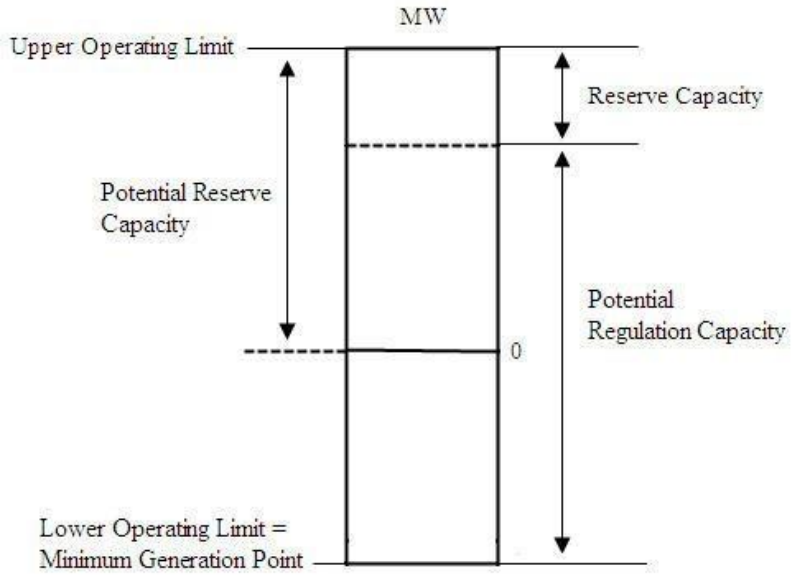



**Figure 7: Generating Unit Operating Characteristics**

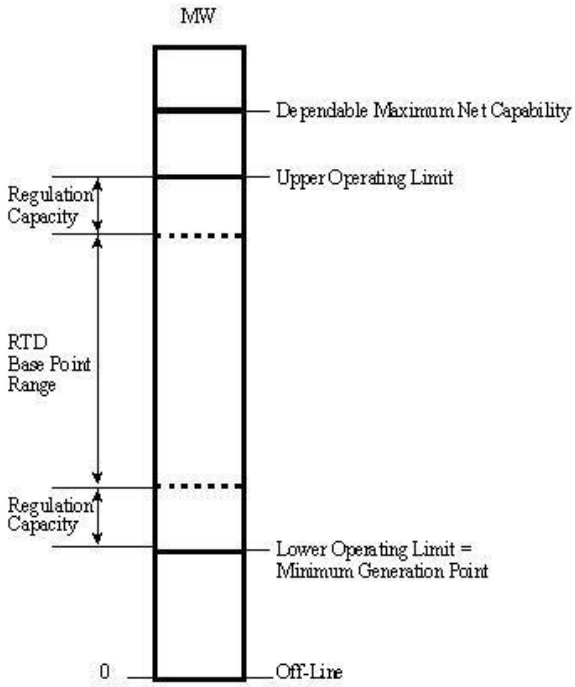


**Figure 8: LESR with Full Regulation Service Deployment**

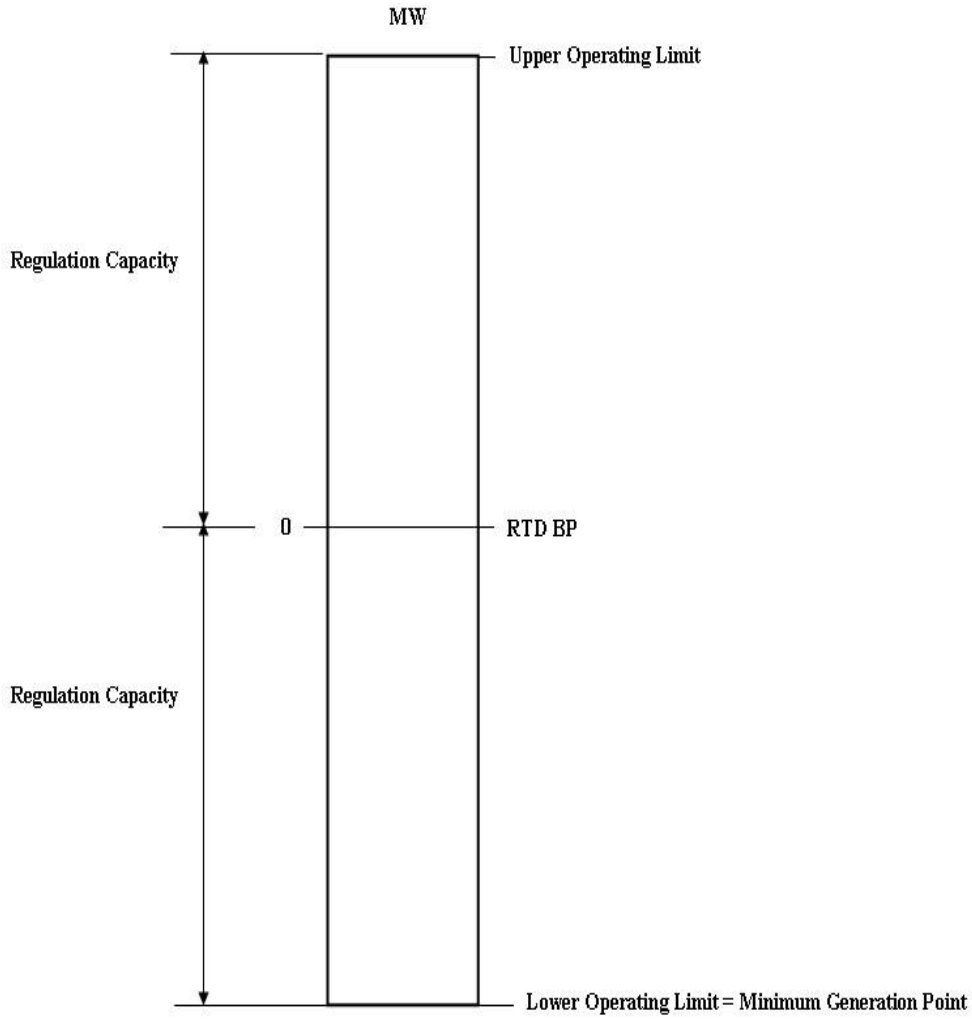


**Figure 9: LESR with RTD Managing Energy Level; Equal Reg Up and Reg Down**

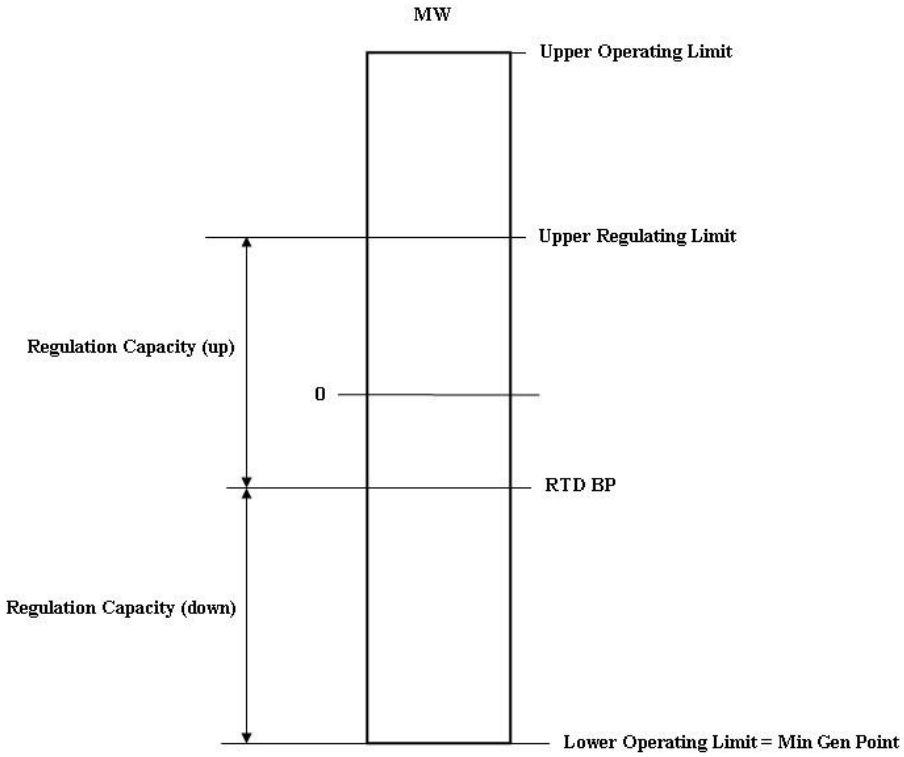


**Figure 10A: Scheduling ranges for CCGTs with Duct-Firing Capability that opt for Limiting Participation Flag (if the Generator is scheduled to provide Spinning Reserves, Regulation, or both)**

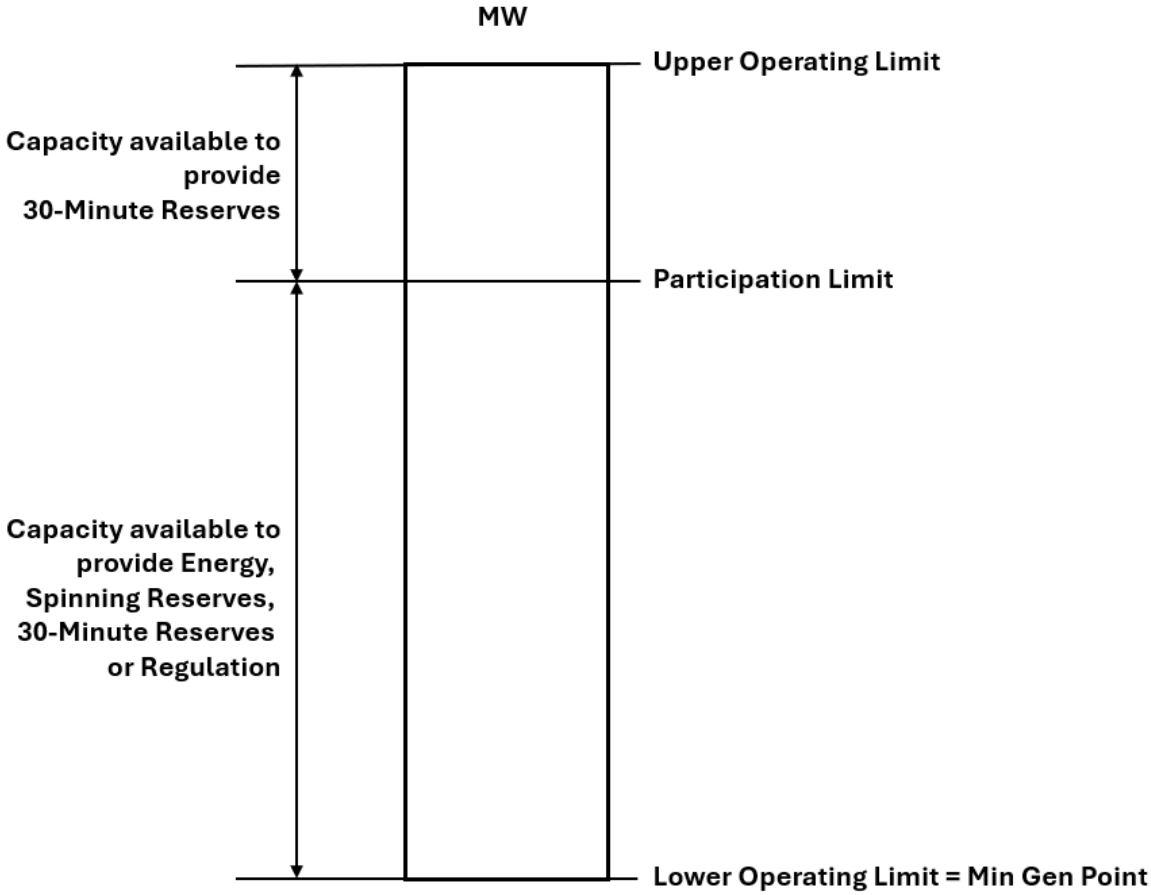
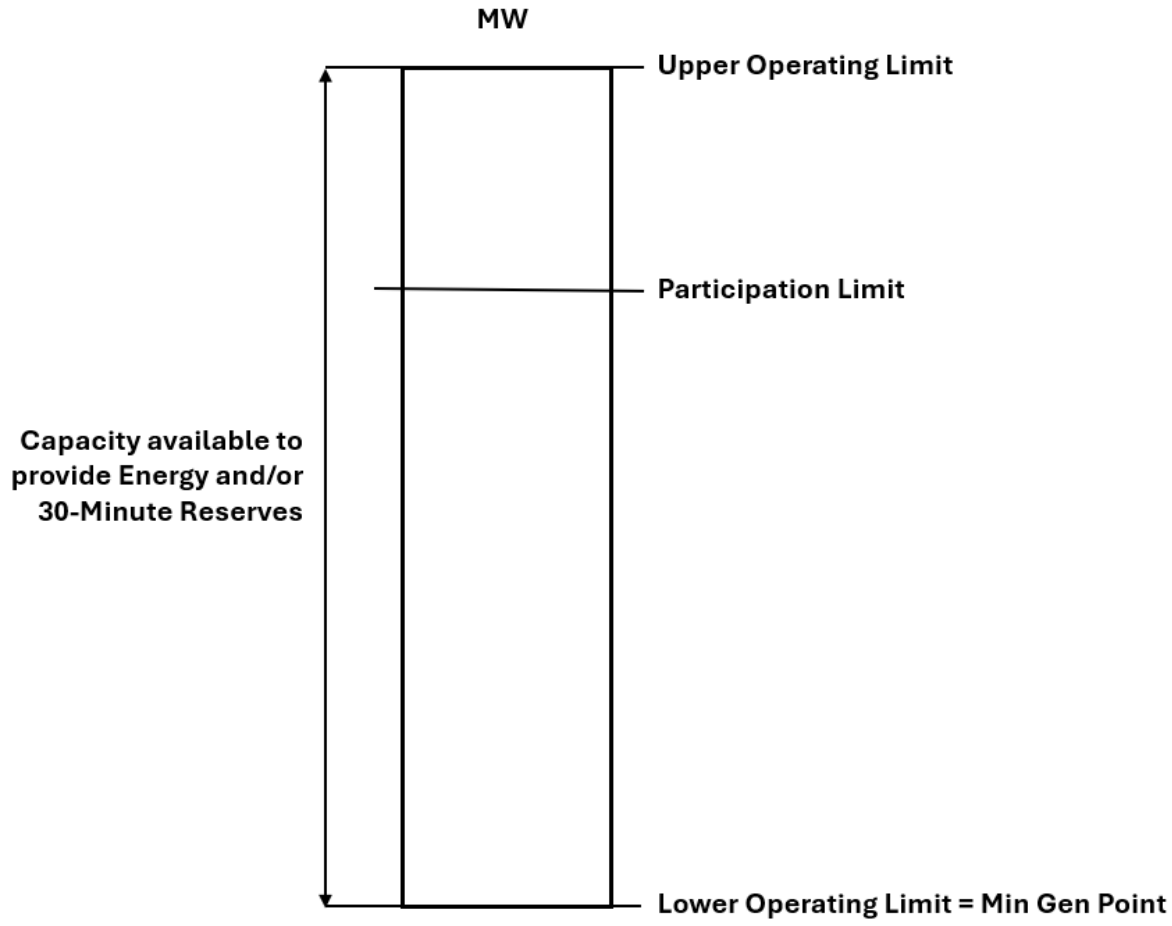


**Figure 10B: Scheduling ranges for CCGTs with Duct-Firing Capability that opt for Limiting Participation Flag (if the Generator is not scheduled to provide Spinning Reserves or Regulation)**




***Note:*** Modification of response rates must be coordinated with Stakeholder Services.

There are up to six response rates that are provided by the suppliers:

- *Normal Response Rate (NRR)* – There may be up to ***three*** response rates given with each Resource. They are used under non-reserve pickup conditions.
- *Regulation Capacity Response Rate (RCRR)* – This response rate is used for scheduling Regulation Capacity.
- *Regulation Movement Response Rate (RMRR) - This response rate is used for dispatching Regulation Service providers.*
- *Emergency Response Rate (ERR)* – This response rate is used under reserve pickup conditions. ERR must be greater than or equal to the maximum NRR. Demand Side Ancillary Service Providers may only bid one NRR and the ERR must equal the NRR.

***Note:*** With the exception of RMRR, the above response rates are not applicable to LESRs.

For all Regulation Service providers except LESRs, the RCRR must be ≤ to the minimum NRR, and the ERR must be ≥ to the maximum NRR. The minimum NRR must be ≥ 0.01 * Maximum Summer Operating Limit (Summer Capability Period) and ≥ 0.01 * Maximum Winter Operating Limit (Winter Capability Period). The Maximum Summer and Winter Operating Limits are modified by Stakeholder Services and are described in the *NYISO Market Participants User Guide* (available from the NYISO Web site at https://www.nyiso.com/manuals-tech-bulletins-user-guides).

Regulation Service providers are not required to provide a RMRR, but should supply one if they want a value other than the default value of RCRR ÷ 10. If submitted, the RMRR must be ≥ RCRR ÷ 10

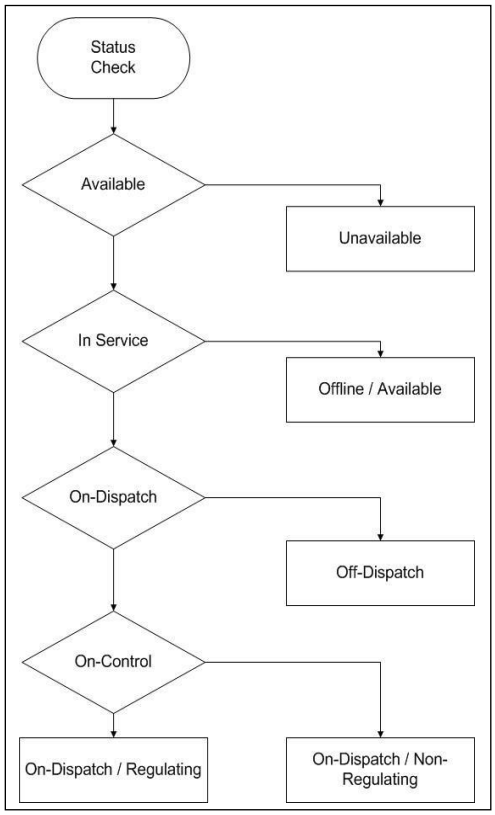
- Individual Resources may bid into the market as groups of Resources, providing the Resources are prequalified to be bid and operated together as though they are a single unit for all Resource bid services (units participating as part of a group are not allowed to bid individually or as part of another group). Pre-qualification specifications for Resources to bid as a group include metering support, billing, and performance measurements as if a single unit.

## 4.3. Scheduling of Service

Regulation Service requirements are determined by the NYISO consistent with industry standards set by NERC. The Regulation Service requirements may include locational requirements and consider transmission constraints. Automatic Generation Control signals for Regulation Service are transmitted to the individual Resources via the Transmission Owners. Regulation Service providers may also receive Regulation Service signals directly from the NYISO. Receiving regulation signals directly from the NYISO does not eliminate the need to receive signals directly from the TO.

### 4.3.1. Generating Unit Operating States

**Figure 10: Generating Unit Operating States**




Generating units have the NYISO operating states as shown in Figure 10. Demand Side Resources and Aggregations participating in the energy or ancillary services programs for scheduling purposes are modeled as generators. This class of supplier has the same operating states as physical generating units.

- ***Unavailable –*** The unit is Off-Line and is not available for any ancillary services contribution.
- ***Off-Line/Available –*** The unit is Out-of-Service and Off-Line, but is available for ancillary services contribution.
- ***Fixed (Off-Dispatch) –*** The unit is In-Service and On-Line and is not under automatic control. This unit's RT schedule is predetermined. Schedule changes may occur only on the quarter hour.
- ***Flexible (On-Dispatch) and Non-Regulating –*** The unit typically is not under automatic control. The basepoint for the unit is normally updated every five minutes. The unit does not participate in Regulation Service.
- ***Flexible (On-Dispatch) and Regulating –*** The unit is under automatic control. The unit has an Energy schedule that is established by RTD. The unit participates in Regulation Service as directed by AGC and, thus, may be requested to deviate from its RTD schedule.

#### 4.3.2. Regulation Service Capacity Scheduling

In the Day-Ahead and Real-Time Markets, the NYISO submits to its scheduling and pricing software the Regulation Service Bids provided by each Supplier for use in solving to meet the NYISO's Regulation Capacity requirement. Specifically, the NYISO enters into the Day-Ahead and real-time software each Regulation Service Supplier's Regulation Capacity Bid MW and the sum of its i) Regulation Capacity Bid price and ii) the product of: a) the Supplier's Regulation Movement Bid price and b) the Regulation Movement Multiplier established for that hour. The Regulation Movement Multiplier (RMM) reflects the anticipated value of the AGC instructed Regulation Movement to the Regulation Requirement. The NYISO will base the RMM on the ratio of AGC instructed Regulation Movement to the Regulation Requirement for a past period of time. The NYISO will review the RMM value at least twice per calendar year and will present its review to stakeholders if a revised RMM value is warranted. A new Regulation Movement Multiplier value will always become effective on the first day of a month.

The effective Regulation Movement Multiplier value is 13.

Regulation Movement Multiplier (RMM) History

| RMM Value | Effective Date |
|---|---|
| 13 | 5/1/2025 |
| 8 | 8/31/2021 |
| 13 | 4/7/2015 |
| 10 | 6/26/2013 |

##### Resources

The Regulation Capacity awarded to each Regulation Service resource that was selected to provide Regulation Service is based on the economics of the bid and the NYISO Regulation Service requirement, not to exceed the lesser of the regulation response rate (RRR) times 5 minutes or the regulation availability MW's bid.

Regulation Capacity comprises two regions. The upper region is bounded by the unit upper operating limit. The lower region is bounded by the minimum generation point. Each region is equal to the Regulation Capacity accepted for that Unit. (See Figure 6.)

### Limited Energy Storage Resources

All offers by LESR devices in the Day-Ahead Regulation Services market are evaluated and scheduled on an hourly basis without consideration that there may be energy limitations during the operating hour, due to the LESR's energy storage position, that may prevent the LESR from providing as much Regulation Service in real-time as it was scheduled to provide in the Day-Ahead Market.

In real-time, the amount of Regulation Capacity that an LESR can provide will depend on the current energy storage position of the LESR. As the amount of energy stored in the device increases or decreases, the amount of Regulation Service that can be sustained over an RTD interval may be less than the amount of Regulation Capacity originally offered in the Real-Time Market. In such cases, the RTD system will reduce amount of Regulation Capacity offered to reflect the amount of Regulation Service the LESR is currently able to provide, given its energy storage position. The amount of Regulation Capacity that an LESR is actually scheduled to provide in the Real-Time Market is based on this calculation of the amount of Regulation Capacity it is able to provide, given its energy storage position, and the economics of the bid.

The Regulation Capacity calculation is performed by taking the measured energy storage position of the device and calculating an upper and lower regulation limit (URL, LRL). The midpoint of the upper and lower limits establishes an RTD base point and the available Regulation Capacity = 0.5 * (URL + abs (LRL)).

During energy shortage intervals, as indicated by the activation of the Regulation Service Demand Curve, the Regulation Capacity offer may be further reduced. The Regulation Capacity available to be scheduled during the energy shortage condition is based on the energy storage position of the device with an RTD base point set equal to 0. The available Regulation Capacity = Min (abs (LRL, URL)).

### Commitment for Additional Regulation

The NYISO may commit additional resources in the Real-Time Market to provide Regulation Service if any of the following conditions exist:

1. Insufficient Regulation Service MW is bid into the Day-Ahead Market.
2. Resources that were scheduled in the Day-Ahead Market to provide Regulation Service are not available in real-time.
3. More Regulation Service is required than had been anticipated would be needed in the Day-Ahead Market.

### Regulation Service in Real-Time

Regulation Service Suppliers, including those not awarded a forward contract to provide Regulation Service in the Day-Ahead Market, may bid uncommitted capacity into the Real-Time Market to provide Regulation Service. A Resource providing Regulation Service in the Real-Time Market will be paid based on

its real-time schedule for Regulation Capacity at the Regulation Capacity market price, and its real-time Movement MW at the Regulation Movement market price, taking into account the resource's performance relative to its instruction. The Resource will also be subject to a Regulation Service performance charge to account for non-performance. Calculation of Day-Ahead and real-time Regulation market prices is defined in Rate Schedule 3 of the NYISO Services Tariff.

A Supplier with a Day-Ahead Regulation Service schedule that notifies the NYISO that it cannot provide Regulation Service in real-time will receive a zero real-time Regulation Capacity schedule and buy out of its Day-Ahead commitment. A Supplier with a real-time Regulation Service schedule is subject to the performance settlement provisions as defined in section 4.6. A Supplier with a Day-Ahead Regulation Service schedule that continues into real-time is subject to the balancing and performance settlement provisions as defined in section 4.6. A Supplier that is providing Regulation Service using an LESR will be subject to Regulation Service balancing in real-time for any Regulation Capacity scheduled day ahead that is not scheduled in real-time as a result of the LESR's energy storage limitations.

#### 4.3.3. Control Signals to Satellite Control Centers

Control signals designating the value of Unit Desired Generation (UDG) for each Resource are sent to the satellite control centers every six seconds. For Demand Side Resources, the UDG is the terminology used to indicate the AGC 6 second regulation schedule.

#### 4.3.4. Regulation Service

The AGC function calculates an area control error (ACE) and allocates this error to Regulation Service providers scheduled by RTD. The ACE is allocated to all Regulation Service resources proportionally based on the amount of Regulation Movement MWs they are able to provide in the next six seconds using their Regulation Movement Response Rates, their current physical limitations, and security constraints. AGC will determine the UDG for each Resource by combining the Resource's Regulation requirement (if any) with its ramped basepoint derived from its RTD 5minute basepoint, if any. The NYISO computer system will send UDGs to TOs that will in turn retransmit the UDGs to Regulation Service Resources in their control area. Regulation Service balancing payments and charges for all NYCA resources will be assigned by the NYISO directly to individual suppliers based on their monitored performance.

When LESR devices are approaching their energy limitations, as measured by their metered energy storage, AGC will transfer regulation energy deployments from the LESR's to other suppliers. This transfer is calculated by AGC and is designed such that the LESR's regulation energy schedule will become zero to coincide with the time that the LESR is either fully charged or fully discharged.

The amount of Regulation Capacity (MW) and Regulation Capacity Response Rate (MW/Minute) that is required for the NY Control Area is established by the NYISO and can vary on a seasonal and hourly basis. The *NYISO Transmission and Dispatching Operations Manual* (available from the NYISO Web site at the following URL: https://www.nyiso.com/manuals-tech-bulletins-user-guides) describes how the Regulation Service requirements are defined for the New York Control Area.

#### 4.3.5. AGC and RTD Program Response

The AGC program uses each supplier's Regulation Movement Response Rate in determining base points. The RTD program uses the Normal Response Rate(s). RTD will assign basepoints to LESRs based solely on their stored energy levels. RTD-CAM may use either the Normal or the Emergency Response Rate, depending on reserve activation. All flexible Resources, including those with and without a real-time reserve schedule, may be required to respond to a reserve Pick Up.
Resources with a real-time reserve schedule will have base points calculated using their Emergency Response Rates, others will have base points calculated using their Normal Response Rates. For RTD-CAM modes of Large or Small Event Reserve Pick-ups or Max Gen Pickups, all Regulation Service schedules are set to zero and LESRs will be assigned a zero RTD base point and a zero UDG. The NYISO will resume sending AGC Base Point Signals as soon as possible after the end of the reserve or maximum generation pickup.

When more Regulation Service is required, the NYISO may request more Regulation Service capacity from the real-time Regulation Service market.

A minimum ACE distribution value is established by the NYISO so that base point changes are distributed to only a few (or one) units when ACE is small.

## 4.4. Performance Tracking

The NYISO has a Performance Tracking System (PTS) to monitor the performance of Resources that provide Regulation Service. Payments and charges by the NYISO to each Supplier of this Service are based in part on the Resource's performance with respect to expectations. The PTS will also be used to calculate, for each RTD interval, the total Movement MW instructed for each unit that was scheduled to provide regulation, and to determine penalties assessed to non-regulating Resources that do not follow their RTD basepoints, thereby increasing the regulation burden.

Figure 11illustrates a regulating Resource that has perfect performance and illustrates a regulating Resource with performance errors.

**Figure 11: Perfect Performance**

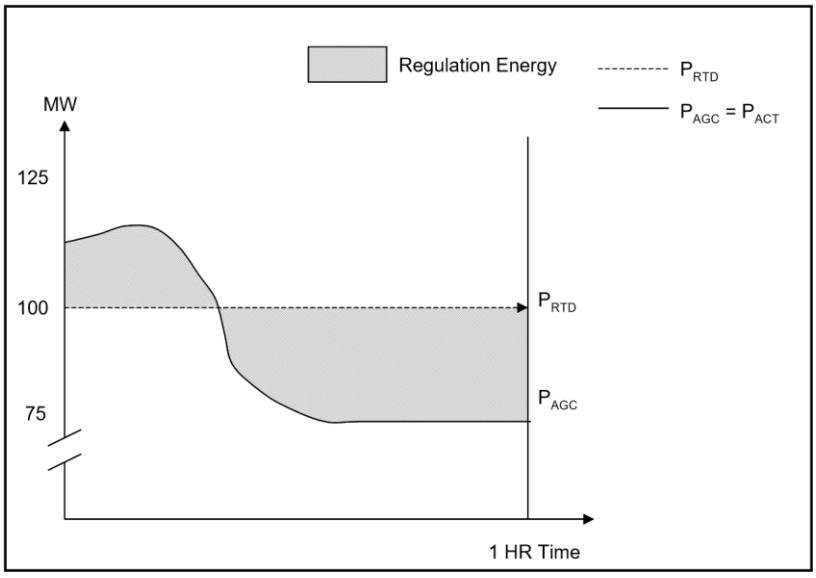
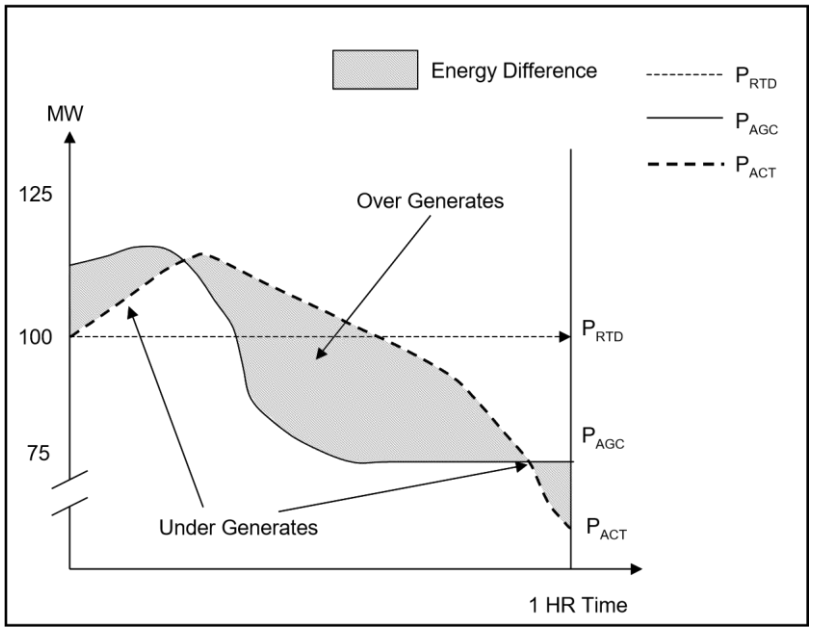



**Figure 12: Error in Performance (30-Second Bandwidth not Included)**




Regulation Service Resources, including Resources engaged in Dual Participation, are required to change their output level at a rate consistent with the amount of Regulation Service each resource has been scheduled to provide.

Regulation Service Resources will not receive payments for additional Regulation Capacity as a result of following AGC signals that call for them to provide more Regulation Service than they have been scheduled to provide; but they will be paid for any additional energy they produce as a result of following such signals.

#### Performance Adjustment

Based on the performance measurements developed by PTS and the Billing Settlement System, the Billing Settlement System will calculate performance adjustments for both Regulation Service Suppliers and Energy Suppliers that are not providing Regulation Service. Appendix G of the Accounting and Billing manual presents a detailed description of the calculation of Regulation Service performance adjustments and Appendix I.7 presents a detailed description of the Under Generation Penalty Settlement.

## 4.5. Regulation Service Settlements – Day-Ahead Market

Please refer to Rate Schedule 3 of the NYISO OATT, Rate Schedule 3 of the NYISO Services Tariff, and the Accounting and Billing Manual for information about Day-Ahead Market Settlements.

## 4.6. Regulation Service Settlements – Real-Time Markets

Please refer to Rate Schedule 3 of the NYISO OATT, Rate Schedule 3 of the NYISO Services Tariff, and the Accounting and Billing Manual for information about Real-Time Market Settlements.

## 4.7. Energy Settlement Rules for Resources Providing Regulation Service

Please refer to Rate Schedule 3 of the NYISO OATT, Rate Schedule 3 of the NYISO Services Tariff, and the Accounting and Billing Manual for information about Energy Settlement rules for Resources providing Regulation Service.

## 4.8. Regulation Service Demand Curve

The NYISO shall establish a Regulation Service Demand Curve that will apply to both the Day-Ahead and real-time Regulation Capacity market price and settlements. The market prices for Regulation Capacity calculated pursuant to Rate Schedule 3 of the NYISO Services Tariff shall take account of the demand curve established in Rate Schedule 3, so that Regulation Capacity is not scheduled at a cost higher than the demand curve indicates should be paid in the relevant market.

The NYISO shall establish and post a target level of Regulation Service for each hour, which will be the number of MW of Regulation Capacity that the NYISO would seek to maintain in that hour. The NYISO will then define a Regulation Service Demand Curve for that hour as follows:

1. For quantities of Regulation Capacity that are less than or equal to the target level of Regulation Service minus 80 MW, the price on the Regulation Service demand curve shall be $775/MW.

2. For quantities of Regulation Capacity that are less than or equal to the target level of Regulation Service minus 25 MW but that exceed the target level of Regulation Service minus 80 MW, the price on the Regulation Service demand curve shall be $525/MW.
3. For quantities of Regulation Capacity that are less than or equal to the target level of Regulation Service but that exceed the target level of Regulation Service minus 25 MW, the price on the Regulation Service demand curve shall be $25/MW.
4. For all other quantities, the price on the Regulation Service demand curve shall be $0/MW. However, the NYISO shall not schedule more Regulation Service than the target level for the requirement for that hour.

In order to respond to operational or reliability problems that arise in real-time, the NYISO may procure Regulation Capacity at a quantity and/or price point different from those specified above. The NYISO shall post a notice of any such purchase as soon as reasonably possible and shall report on the reasons for such purchases at the next meeting of its Business Issues Committee. The NYISO shall also investigate whether it is necessary to modify the quantity and price points specified above to avoid future operational or reliability problems. The NYISO will consult with its Market Monitoring Unit when it conducts this investigation.

If the NYISO determines that it is necessary to modify the quantity and/or price points specified above in order to avoid future operational or reliability problems, it may temporarily modify them for a period of up to ninety days. If circumstances reasonably allow, the NYISO will consult with its Market Monitoring Unit, the Business Issues Committee, FERC, and the PSC before implementing any such modifications. In all circumstances, the NYISO will consult with those entities as soon as reasonably possible after implementing a temporary modification.

The NYISO shall conduct periodic reviews as to whether the Regulation Service Demand Curve should be adjusted to optimize the economic efficiency of the NYISO markets. The Market Monitoring Unit shall be given the opportunity to review and comment on the NYISO's periodic reviews of the Regulation Service Demand Curve.

## 4.9. Charges Applicable to Suppliers That Are Not Providing Regulation Service

Please refer to Rate Schedule 3-A of the NYISO Services Tariff and the Accounting and Billing Manual for information about charges applicable to suppliers that are not providing Regulation Service.

## 4.10. Charges to Load Serving Entities

Please refer to Rate Schedule 3 of the NYISO OATT Rate Schedule 3 of the Accounting and Billing Manual for information about charges to Load Serving Entities.

## 4.11. Regulation Service Qualification and Performance Criteria

### 4.11.1. Regulation Qualified Resource Requirements

Any Resource that meets the following criteria will be considered a Regulation Qualified Resource and may submit offers for Regulation Service. All Regulation Qualified Resources must:

- Have the appropriate control equipment installed and be capable of providing Regulation Service.
- Be capable of receiving and responding to automatic control signals on a 6 second periodicity and must provide telemetered output data that can be scanned every 6 seconds.
- Aggregations may only qualify to provide regulation service when each of the facilities comprising the Aggregation use inverter-based energy storage technology or is a Demand Side Resource (that does not facilitate its Demand Reductions through the use of a Local Generator, unless the Local Generator utilizes inverter-based energy storage technology).
- An Aggregation of Demand Side Resources in which at least one Demand Side Resource facilitates its demand reduction by using a local generating unit, is not eligible to provide Regulation Service, unless each local generator included in the Aggregation uses inverter-based energy storage technology.

- Provide for all required interfaces to the Transmission Owner (TO) control centers as defined by the TOs as described in the TO-MP Interconnection Agreement (if any).
- In order for a Demand Side Resource to provide Regulation Service the Demand Side Resource must take service from a qualified Load Serving Entity which is subject to the energy settlements of the *NYISO Services Tariff* and *NYISO OATT*.
- Be capable of supplying Regulation Service continuously in both the up or down direction for intervals in the scheduled hour and for all hours with accepted bids.
- Register the intent to provide Regulation Service with the Stakeholder Services department and provide all data required as defined in the Market Participant Registration Packet.
- Post all collateral requirements as defined in the *NYISO Services Tariff* Attachment K and Section 2 of the Market Participant Registration Packet.
- If requesting to qualify or required to re-qualify as a Regulation Service Supplier, successfully complete the pre-qualification performance test as described in section 4.11.2
    - A Behind-the-Meter Net Generation Resource that is comprised of more than one generating unit that is dispatched as an aggregate unit at a single PTID is not qualified to provide Regulation Service or Spinning Reserves.

### 4.11.2. Prequalification/Verification Performance Test

- All participants requesting to become Regulation Service Suppliers and all participants that are required to prequalify as Regulation Service Suppliers must successfully complete the prequalification performance test. Aggregations are tested using a 'verification' rather than a prequalification – the Aggregator is permitted to enroll an Aggregation and begin participating to provide Regulation Service without prequalifying but will be required to verify performance during the first two weeks of the first month active in the market. An Aggregation will be verified when it first seeks to provide Regulation Service, and when any of the following conditions are true: When the Aggregation UOL has changed by at least 10 MW (increase and/or decrease), when one or more

DER facilities have been added to an Aggregation, when the Aggregation's Ancillary Service bid flags are switched from "N" to "Y", including Aggregations that failed Regulation verification testing for the first time in the previous testing window. Market Participants must notify the NYISO's Stakeholder Services department of their intent to complete a Regulation Service pre-qualification test. All qualification criteria defined in section 4.11.1 must be completed prior to the test request. Aggregators are not required to provide this notice – the NYISO's Aggregation System software will inform the appropriate NYISO personnel to schedule and conduct the verification test during the Aggregation's first month of operation

- Stakeholder Services will coordinate with Grid Operations to schedule the test.
- Once a time period has been identified, Stakeholder Services will activate the Regulation Service bidding privileges of the test participant. Aggregation Regulation Service bidding privileges will be activated prior to the verification test period.
- The Market Participant will be notified by a NYISO Stakeholder Services representative a minimum of two days prior to the test period, instructing the Supplier to begin bidding to provide Regulation Service. The Supplier should begin bidding to provide Regulation Service for all hours that the Resource is capable of providing the service.
- The testing window will be open for a calendar week. Qualification/verification requires that the unit bid Regulation Service such that it get scheduled within a calendar week, for 24 hours, including at least two four-hour periods, one that spans the morning pick up from hour beginning 5:00 through hour beginning 8:00 and the other that spans the evening load drop off from hour beginning 19:00 through hour beginning 22:00. The participant must bid into the Day-Ahead or Real-Time Market the maximum Regulation Service capability that wish to qualify. This value must be the lesser of the Regulation Capacity response rate * 5 minutes or the Operating Capacity of the unit.
- The NYISO may not require a retest of Regulation Service providers that do not meet the scheduling criteria defined in the qualification/verification test, through reasons beyond their control, if the NYISO determines sufficient information on the performance of their unit is available from the test results actually achieved.
- Stakeholder Services will coordinate with Operations at the end of the test period to obtain the results of the test.
- A time weighted Performance Index greater than or equal to .85 must be demonstrated over the calendar week period in order to pass the prequalification/verification test.

Given the metering latency issue that may exist for LESR devices, the Performance Index methodology for passing the prequalification test will not be the only measure used by Stakeholder Services. The NYISO may request metering records of and engage in consultation with the LESR for this analysis.

- Actions in the event of a failed pre-qualification test
    - Stakeholder Services will complete all standard audit documentation as defined in Attachment D of this Manual.
    - Stakeholder Services will notify the customer indicating the results of the test.
    - Stakeholder Services will remove all regulation bidding privileges.
    - Stakeholder Services will forward the test results to Market Mitigation and Analysis (MMA).

- Prior to requesting a re-test the test participant must provide an explanation to MMA describing the cause of the failed prequalification/verification test.
- Market Mitigation and Analysis will notify Stakeholder Services when the test participant is authorized to perform another test.

- Test participants will be paid for all Regulation Service provided during the test as if the participant was a qualified Regulation Service Supplier.

The test participant will be responsible for any balancing payments due to poor performance during the test.

#### 4.11.3. Supplier Regulation Service Performance Audit

All Resources that bid Regulation Service into the NYISO markets may be requested to demonstrate their ability to achieve an acceptable Regulation Service response. The NYISO may conduct a performance audit of an individual Resource at any time and without prior notification.

- The audit time period is defined as a calendar month.
- Regulation Service Suppliers with a time weighted Performance Index for the period chosen that is less than .85 will be referred to MMA for review. As with the pre-qualification test described in Section 4.11.2, the NYISO may review other data for LESRs in performing the audit analysis.

Suppliers who fail an audit, after consultation with MMA, may be subject to disqualification from participation in the Regulation market. The procedure for notifying suppliers in the event that they fail an audit is as follows:

##### NYISO Actions

The NYISO shall:

- Notify the poor performing supplier via telephone or E-mail, upon determination by the NYISO that the supplier has failed an audit.
- Notify the Supplier that it is currently responsible for balancing Regulation Service market payments as described in *NYISO Services Tariff* Rate Schedule 3 and the *NYISO Accounting and Billing Manual* (available from the NYISO Web site at http://www.nyiso.com/public/documents/manuals/administrative.jsp), and that persistent non-compliance in accordance with this procedure may result in the provider being removed from the bidders list.

Market Mitigation and Analysis will review the individual cases of suppliers that fail an audit and will notify Stakeholder Services if they determine that the Supplier should no longer be qualified to bid Regulation Service.

Market Mitigation and Analysis can require that the Regulation Service provider perform a prequalification test once the Supplier has reported that it has addressed the cause of the poor performance.

#### Regulation Service Provider Actions

The Regulation Service Supplier shall acknowledge the NYISO notification and report its expectation of the time it will be able to return to normal performance. The provider shall also describe the cause of its poor performance. This notification should be sent to the following e-mail address:

Reference_Price_Update@NYISO.com

Subject line of the e-mail should state "Regulation Service Performance Audit."

If the Supplier has its qualified to bid Regulation Service status changed to not qualified to bid then the Supplier will be required to complete a prequalification/verification test prior to being reinstated in the market.

# 5. Energy Imbalance Service

This section describes the energy imbalance service.

## 5.1. Description

Energy imbalance service falls into the following categories:

- ***Internal Energy Imbalance under the* NYISO Services Tariff** – All internal Energy imbalances for Transmission Customers taking service under the *NYISO Services Tariff* are addressed through the Real-Time Market and through the real-time Settlement process. All scheduled withdrawals and injections, including deviations from Bilateral Transaction schedules by Transmission Customers taking service under the *NYISO Services Tariff*, are subject to the real-time Settlement. Refer to the *NYISO Accounting and Billing Manual* (available from the NYISO Web site at https://www.nyiso.com/manuals-tech-bulletins-user-guides) for the description of charges associated with internal energy imbalances. Generators, LSEs and Transmission Customers with imbalances may also be subject to charges for Regulation and Frequency Response Service.
- ***Internal Energy Imbalance Under the* NYISO OATT** – All internal energy imbalances for Transmission Customers taking service under the *NYISO OATT* and not under the *NYISO Services Tariff* shall, when the Transmission Customer's actual energy withdrawals are less than its scheduled energy delivery, pay to the NYISO an amount equal to the greater of 150% of the Real-Time LBMP at the point of delivery or $100/Mwh. If the Transmission Customer's actual energy delivery exceeds its actual energy withdrawals, it will not be paid for the excess energy.
- ***External Energy Imbalance*** – External energy imbalance refers to the mismatch between scheduled and actual flows between the NY Control Area and other Control Areas. Inadvertent energy accounting is implemented according to existing NERC guidelines. Monthly internal/external meter corrections are also accounted for. Any increase or decrease in costs resulting from pay back of accumulated inadvertent interchange is included in the NYISO Scheduling, System Control, and Dispatch Service Charge.

The NYISO is responsible for providing this service.

## 5.2. External Imbalances

The NYISO performs the following for External inadvertent interchange:

- accurately accounts for inadvertent Energy interchange, through daily schedule verification and the use of reliable metering equipment.
- minimizes unintentional inadvertent accumulation in accordance with NERC and NPCC policies.
- minimizes accumulated inadvertent Energy balances in accordance with NERC and NPCC policies.

The NYISO reduces accumulated External inadvertent Energy balances by unilaterally offsetting the tie-line interchange schedule when such action will assist in correcting an existing time error.

External inadvertent interchange accumulated during On-Peak hours is paid back during On-Peak hours. Inadvertent interchange accumulated during Off-Peak hours is paid back during Off-Peak hours. In either case, payback is made with Energy "in-kind."

The Energy Imbalance consists of calculations and inadvertent interchange reports that are produced on an hourly, daily, and monthly basis. The *NYISO Accounting and Billing Manual* (available from the NYISO Web site at the following URL: https://www.nyiso.com/manuals-tech-bulletins-user-guides) gives a detailed description.

The payback process for inadvertent interchange between the NY Control Area and its neighboring control areas is covered in the *NYISO Transmission and Dispatching Operations Manual* (available from the NYISO Web site at the following URL: https://www.nyiso.com/manuals-tech-bulletins-user-guides)

**5.3.** Inadvertent interchange across the CHPE MTF External Interface will be tallied and repaid separate from the NYISO's other External Interfaces with the Quebec Balancing Authority Area. **Monthly Meter Reading Adjustments**

The meter reading adjustment process is discussed in the *NYISO Accounting and Billing Manual* (available from the NYISO Web site at the following URL: https://www.nyiso.com/manuals-tech-bulletins-user-guides).

# 6. Operating Reserve Service

## 6.1. Description

Operating Reserve service provides backup generation and/or demand response in the event that the NYISO experiences a real-time power system Contingency requiring emergency corrective action. In order for the New York Control Area (NYCA) to respond in a timely fashion, the reserves must be available from qualified Resources located within the NYCA and within specific regions, as required by the NYSRC and other applicable reliability standards.

### Types of Operating Reserves

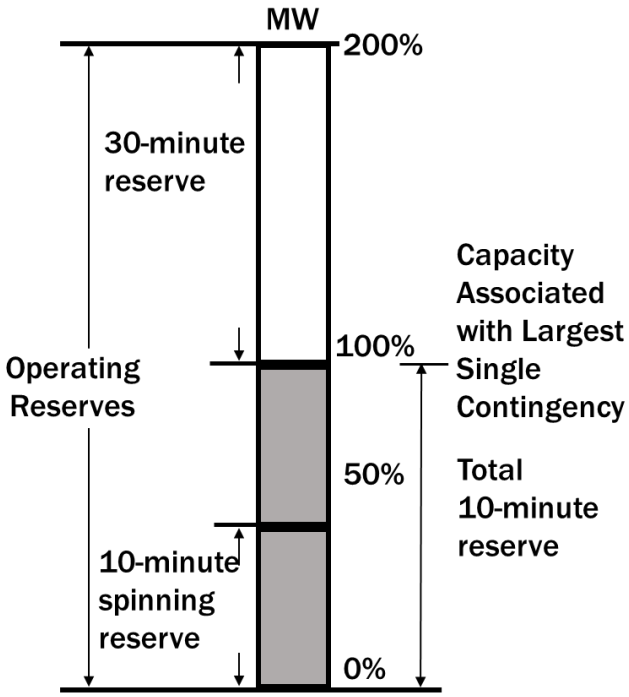
- ***10-Minute Spinning Reserve*** – Operating Reserves provided by qualified Resources located within the NYCA that are already synchronized to the NYS Power System and can respond to instructions from the NYISO to change output level within 10 minutes. Spinning reserve may not be provided by Behind-the-Meter Net Generation Resources that are comprised of more than one generating unit that are dispatched as a single aggregate unit.
- ***10-Minute Non-Synchronized Reserve (10-Minute NSR)*** – Operating Reserves provided by Resources that can be started, synchronized, and loaded within 10 minutes. Operating Reserves may also be provided by Demand Side Resources where the demand response is provided by a Local Generator or by Behind-the-Meter Net Generation Resources that are comprised of more than one generating unit that are dispatched as an aggregate unit.
- ***30-Minute Spinning Reserve*** – Operating Reserves provided by qualified Resources except Behind-the-Meter Net Generation Resources that are comprised of more than one generating unit and dispatched as a single aggregate unit located within the NYCA that are already synchronized to the NYS Power System and can respond to instructions from the NYISO to change output level within 30 minutes.
- ***30-Minute Non-Synchronized Reserve (30-Minute NSR)*** – Operating reserves that can be provided by Resources, Behind-the-Meter Net Generation Resources that are comprised of more than one generating unit that are dispatched as an aggregate unit, that can be started, synchronized, and loaded within 30 minutes. Operating Reserves may also be provided by Demand Side Resources where the demand response is provided by a Local Generator.
- ***Uncertainty Reserve Requirements ("URR") -*** A component of the Operating Reserves requirements in the Day-Ahead and Real-Time Markets to address the uncertainties of Load forecasts and the Wind and Solar Energy Forecasts.
- ***Total 10-Minute Reserve*** – The sum of the 10-Minute Spinning Reserve, 10-Minute NSR, and 10-Minute URR. [NERC defines the sum of the 10-Minute Spinning Reserve and 10-Minute NSR as "contingency reserve"]
- ***Total 30-Minute Reserve*** – The sum of the 30-minute Spinning Reserve, 30-Minute NSR, and 30-Minute URR provided by Generators and Demand Side Resources that respond to instructions to change output or provide a demand reduction within 30 minutes.
- ***Total Operating Reserve*** – The sum of the total 10-minute reserve and the total 30-minute reserve. [The NERC definition of operating reserve includes regulation]

### Minimum Operating Reserve Requirement

The NYCA's Operating Reserve requirements are:

- Total Operating Reserve must be greater than or equal to twice the largest single Contingency (in MW) as defined by the NYISO;
- Total 10-Minute Reserve must be greater than or equal to the largest single Contingency (in MW) as defined by the NYISO;
- 10-Minute Spinning Reserve must be greater than or equal to one-half of the largest single Contingency (in MW) as defined by the NYISO.
- Figure 13illustrates these requirements. At all times sufficient total 10-minute reserve is maintained to cover the energy loss due to the most severe Normal Transfer Criteria contingency within the NYCA or the energy loss caused by the cancellation of an interruptible import transaction (neighboring control area to NYCA) whichever is greater.
- In addition:
    - The NYISO may establish additional categories of Operating Reserves if necessary to ensure reliability.
    - The NYISO ensures that providers of Operating Reserves are properly located electrically so that transmission constraints resulting from either commitment or dispatch of units do not limit the ability to deliver Energy to Loads in the case of a Contingency.
    - The NYISO ensures that Capacity counted toward meeting NYCA Operating Reserve requirements is not counted toward meeting Regulation and Frequency Response Service requirements.

Figure 13: Minimum Operating Reserve Requirements



## 6.2. General Responsibilities and Requirements

The NYISO is responsible for scheduling the Operating Reserve service. The NYISO ensures that Operating Reserves are properly geographically located so that transmission constraints do not limit the ability to deliver Operating Reserves. Reserve suppliers may receive either or both a Day-Ahead and a real-time schedule. The real-time schedule may differ from the Day-Ahead schedule. Reserve suppliers must specify a Day-Ahead availability bid for each category of reserves. The real-time availability bid is automatically set to zero for each category of reserves and cannot be changed by a reserve supplier. Figure 14 summarizes supplier eligibility to provide ancillary services of reserve and regulation.

**Figure 14: Ancillary Service Eligibility**

| | Ancillary Service | | | | |
|---|---|---|---|---|---|
| **Unit Type** | **10-S** | **10-NS** | **30-S** | **30-NS** | **Reg** |
| Flexible (on-dispatch)<br>Start-up time greater than 30 minutes<br>Not block loaded | ✔ | no | ✔ | no | ✔ |
| Flexible (on-dispatch)<br>10-minute start<br>Not block loaded | ✔ | ✔ | ✔ | no | ✔ |
| Flexible (on-dispatch)<br>10-minute start<br>Block loaded (no dispatchable range) | no | ✔ | no | no | no |
| Flexible (on-dispatch)<br>30-minute start<br>Not block loaded | ✔ | no | ✔ | ✔ | ✔ |
| Flexible (on-dispatch)<br>30-minute start<br>Block loaded (no dispatchable range) | no | no | no | ✔ | no |
| Fixed (off-dispatch) | no | no | no | no | no |

### 6.2.1. NYISO Responsibilities

The NYISO shall procure on behalf of its Customers a sufficient quantity of Operating Reserve products to comply with the Reliability Rules and with other applicable reliability standards. To the extent that the NYISO enters into Operating Reserve sharing agreements with neighboring Control Areas its Operating Reserves requirements shall be adjusted accordingly.

The NYISO shall define requirements for Spinning Reserve, which may be met only by Suppliers that are eligible to provide Spinning Reserve; 10-Minute Reserve, which may be met by Suppliers that are eligible to provide either Spinning Reserve or 10-Minute Non-Synchronized Reserve; and 30-Minute Reserve, which may be met by Suppliers that are eligible to provide any Operating Reserve product. The NYISO shall also define locational requirements for Spinning Reserve, 10-Minute Reserve, and 30-Minute Reserve located East of Central-East, in Southeastern New York, in New York City, and on Long Island. The NYISO shall post the applicable reserve requirements for each hour on its website. Such posting is currently maintained at the following location on the NYISO's website:

https://www.nyiso.com/documents/20142/3694424/Locational-Reserves-Requirements.pdf

The NYISO shall also calculate the Uncertainty Reserve Requirements, which are Operating Reserves needed to account for the uncertainty associated with Load forecasts and Wind and Solar Energy Forecasts, for both the Day-Ahead and Real-Time Markets. Detailed information on the Uncertainty Reserve Requirements is available in Attachment D of this Manual.

In addition to being subject to the preceding limitations on Suppliers that can meet each of these requirements, the requirements for Operating Reserve located East of Central East may only be met by eligible Suppliers that are located East of Central East, the requirements for Operating Reserve located in Southeastern New York may only be met by eligible Suppliers that are located in Southeastern New York, requirements for Operating Reserve located in New York City may only be met by eligible Suppliers that are located in New York City, and requirements for Operating Reserve located on Long Island may only be met by eligible Suppliers located on Long Island. Each of these Operating Reserve requirements shall be defined consistent with the Reliability Rules and other applicable reliability standards. The NYISO shall select Suppliers of Operating Reserves products to meet these requirements, including the locational Operating Reserves requirements as part of its overall co-optimization process. The NYISO shall select Operating Reserves Resources that are properly located electrically so that all locational Operating Reserves requirements are satisfied, and so that transmission constraints resulting from either the commitment or dispatch of Resources do not limit the NYISO's ability to deliver Energy to Loads in the case of a Contingency. The NYISO will ensure that Suppliers that are compensated for using Capacity to provide one Operating Reserve product are not simultaneously compensated for providing another Operating Reserve product, or Regulation Service, using the same Capacity.

### 6.2.2. Supplier Eligibility Criteria

The NYISO shall enforce the following criteria, which define which types of Resources are eligible to supply particular Operating Reserve products.

***Spinning Reserve*** – Generators or Demand Side Resources that are not supporting their Demand Reduction through the use of Local Generation that are ISO-Committed Flexible or Self-Committed Flexible; are operating within the dispatchable portion of their operating range (which for offers by BTM:NG Resources corresponds to quantities in excess of its Host Load and subject to its Injection Limit); and are capable of responding to NYISO instructions to change their output level within ten minutes, shall be eligible to supply Spinning Reserve. Behind-the-Meter Net Generation Resources that are comprised of more than one generating unit that are dispatched as a single aggregate unit are not qualified to provide Spinning Reserves. Aggregations that are (i) ISO-Committed Flexible or Self-Committed Flexible; (ii) are operating within the dispatchable portion of their operating range; (iii) are capable of responding to NYISO instructions to change its operating level within ten minutes, shall be eligible to supply Spinning Reserve. The following Aggregation types may only provide Spinning Reserves if all of the generating units in their Aggregation use inverter-based energy storage technology and they meet the criteria in the NYISO's procedures: (i) Aggregations comprised of one or more generating units, and (ii) Aggregations that include Demand Side Resource(s) where at least one Demand Side Resource facilitates its Demand Reduction by using a Local Generator. Energy Storage Resources that are capable of responding to NYISO instructions to change their output level within ten minutes, shall be eligible to supply Spinning Reserve.

***10-Minute Non-Synchronized Reserve*** – (i) Off-line Generators that are capable of starting, synchronizing, and increasing their output level within ten (10) minutes, (ii) Behind-the-Meter Net Generation Resources that are comprised of more than one generating unit that are dispatched as a single aggregate unit that are capable of increasing their output level within ten (10) minutes, (iii) Aggregations comprised of Demand Side Resources, that are supporting their demand reduction through the use of Local Generators and are capable of reducing their Energy usage within ten (10) minutes, and (iv) Aggregations comprised of generating units (including Local Generators facilitating Demand Reductions by Demand Side Resources) that are capable of increasing their supply levels within ten (10) minutes, but which are not eligible to supply Spinning Reserve, shall be eligible to supply 10-Minute Non-Synchronized Reserve.

***30-Minute Reserve (synchronized and non-synchronized)*** – (i) ESR units that are capable of responding to NYISO instructions to change their output level within thirty minutes, shall be eligible to supply 30-

Minute synchronized Reserve. Generators, except Behind-the-Meter Net Generation Resources that are comprised of more than one generating unit and dispatched as a single aggregate unit, that are ISO-Committed Flexible or Self-Committed Flexible and operating within the dispatchable portion of their operating range and Aggregations comprised of Demand Side Resources that are not supporting their Demand Reduction through the use of Local Generation that are ISO-Committed Flexible or Self-Committed Flexible and operating within the dispatchable portion of their operating range, shall be eligible to supply 30-Minute synchronized Reserves. Aggregations (i) that are offered as ISO-Committed Flexible or Self-Committed Flexible, and (ii) operating within the dispatchable portion of their operating range shall be eligible to provide 30-minute synchronized reserve. As described above for Spinning Reserves, an Aggregation may not provide 30-Minute synchronized reserve if it has one or more generating units in the Aggregation, unless all such generating units (including Local Generators facilitating Demand Reductions by Demand Side Resources) utilize inverter-based energy storage technology.

(i) Off-line Generators that are capable of starting, synchronizing, and increasing their output level within thirty (30) minutes, (ii) Behind-the-Meter Net Generation Resources that are comprised of more than one generating unit and dispatched as a single aggregate unit that are capable of increasing their output level within thirty (30) minutes, and (iii) Aggregations comprised of Demand Side Resources that are supporting their demand reduction through the use of Local Generators that are capable of starting, synchronizing, and increasing their output level within thirty minutes, (iv) Aggregations whose facility mix include one or more generating units (including Local Generators facilitating Demand Reductions by Demand Side Resources), but which are not eligible to supply 30-minute synchronized reserves, shall be eligible to supply non-synchronized 30-minute reserves.

***Self-Committed Fixed and ISO-Committed Fixed Resources*** – Shall not be eligible to provide any kind of Operating Reserve.

***Combined Cycle Gas Turbine ("CCGT") Resources equipped with duct-firing, that opted for the Limiting Participation Flag*** – The sum of the Spinning Reserves, Regulation Service, and Energy schedules cannot exceed the Participation Limit while the sum of its Spinning Reserves, Regulation Service, Energy, and 30-Minute Resources can be scheduled up to the resource's Upper Operating Limit.

## 6.3. General Day-Ahead Market Rules

### 6.3.1. Bidding and Bid Selection

Resources capable of providing Spinning Reserve, 10-Minute Non-Synchronized Reserve, and/or 30-Minute Reserve (spinning and non-synchronized) in the Day-Ahead commitment may submit Availability Bids for each hour of the upcoming day. If a Supplier offers Resources that are capable, based on their indicated commitment status, of providing Operating Reserves but does not submit an Availability Bid, its Day-Ahead bid will be rejected in its entirety. A supplier may resubmit a complete Day-Ahead Bid, provided that the new bid is timely. Refer to Figure 14. Availability Bids submitted for Resources engaged in Dual Participation shall reflect the capability available to the wholesale market, accounting for any obligation(s) to a distribution utility or other entity.

An Aggregation can be qualified to bid synchronous or non-synchronous reserves, but not both. Demand Side Resources that are qualified to bid synchronous reserves must bid a start up cost of $0 and a minimum generation cost of $0. Demand Side Resources that are qualified to bid non-synchronous reserves may bid a start up cost but the minimum generation cost must be set to $0. Demand Side Resources will not receive a Day-Ahead energy schedule but the Day-Ahead energy bid submitted will be passed to the hour ahead market if the Day-Ahead reserve bid is accepted.
This energy bid will be used by RTD to schedule demand reductions in real-time.

Behind-the-Meter Net Generation Resources consisting of a single generating unit and a Host Load are qualified to bid synchronous reserves. Behind-the-Meter Net Generation Resources that are comprised of more than one generating unit and dispatched as a single aggregate unit are qualified to bid 10-Minute Non-Spinning Reserves or 30-Minute Non-Spinning Reserves. Behind the-Meter Net Generation Resources do not bid Minimum Generation MWs, Minimum Generation costs or Start-Up costs.

ESR are only qualified to bid synchronous reserves. ESR are not eligible to bid Minimum Generation MWs, Minimum Generation costs or Start-Up costs.

The NYISO may schedule Suppliers that make themselves available to provide Operating Reserves up to the following maximum Operating Reserve levels:

1. For Spinning Reserves, the Resource's emergency response rate multiplied by ten.
2. For 10-Minute Non-Synchronized Reserves, or for non-synchronized 30-Minute Reserves, the Resource's $UOL_N$ or $UOL_E$, whichever is applicable at the relevant time (the Resource may offer one product or the other depending on the time required for it to start-up and synchronize to the grid).

3. For synchronized 30-Minute Reserves, the Resource's emergency response rate multiplied by 20. This represents the amount of spinning reserve, above and beyond 10-minute spinning reserve, that the Resource could convert to energy within 30 minutes.

However, the sum of the amount of Energy or Demand Reduction each Resource is scheduled to provide, the amount of Regulation Service it is scheduled to provide, and the amount of each Operating Reserve product it is scheduled to provide shall not exceed $UOL_N$ or $UOL_E$, whichever is applicable.

For a set of CSR Generators, the sum of (a) the Energy injection schedule(s) minus the Energy withdrawal schedule, (b) the Operating Reserve schedule, and (c) the Regulation Capacity schedule(s) will ordinarily be less than or equal to the applicable CSR injection Scheduling Limit. For a set of CSR Generators, the sum of (a) the Energy withdrawal schedule minus the Energy injection schedule(s), and (b) the Regulation Capacity schedule(s) will ordinarily be less than or equal to the applicable CSR withdrawal Scheduling Limit. The NYISO may relax a CSR Scheduling Limit when it is in direct conflict with other limits. Conflicting limits are expected to be a response rate, upper storage limit (USL), lower storage limit (LSL), upper operating limit or lower operating limit of a CSR Generator. In all cases, the NYISO will relax the CSR Scheduling Limit by the minimum amount and for the shortest time period necessary to resolve the conflict.

The NYISO may schedule a Combined Cycle Gas Turbine Generator with Duct-Firing Capability that has opted for the Limiting Participation Flag, which is available to provide Operating Reserves, up to the following maximum Operating Reserve levels: (i) for Spinning Reserves, the resource's emergency response rate multiplied by ten, to the extent that doing so would not cause the sum of its Spinning Reserves, Regulation Service, and Energy schedules to exceed the Participation Limit; and (ii) for synchronized 30-Minute Reserves, the resource's emergency response rate multiplied by twenty, to the extent that doing so would not cause the sum of its Spinning Reserves, Regulation Service, and Energy schedules to exceed the Participation Limit, and would not cause the sum of its Spinning Reserves, Regulation Service, Energy and 30-Minute Reserves schedules to exceed the applicable Upper Operating Limit.

The NYISO shall select Operating Reserve Suppliers for each hour of the upcoming day through a co-optimized Day-Ahead commitment process that minimizes the total cost of Energy, Operating Reserves, and Regulation Service, using Bids submitted to the NYISO. As part of the co-optimization process, the NYISO shall determine how much of each Operating Reserves product particular Suppliers will be required to provide in light of the Reliability Rules and other applicable reliability standards, including the locational Operating Reserves requirements specified above.

#### 6.3.2. NYISO Notice Requirement

The NYISO shall notify each Operating Reserve Supplier that has been selected in the Day-Ahead Scheduling process of the amount of each Operating Reserve product that it has been scheduled to provide. This notification is provided through the Market Information System consistent with all other Day-Ahead Market notifications.

#### 6.3.3. Responsibilities of Suppliers Scheduled to Provide Operating Reserves in the Day-Ahead Market

Suppliers, including Suppliers engaged in Dual Participation, that are scheduled Day-Ahead to provide Operating Reserves shall either provide Operating Reserve, or Energy, or, when the NYISO has the capability to support demand side participation, reduce demand in real-time when scheduled by the NYISO in all hours for which they have been selected to provide Operating Reserve and are physically capable of doing so. However, Suppliers that are scheduled Day-Ahead to provide Operating Reserves and have startup periods of two hours or less may advise the NYISO no later than three hours prior to the first hour of their Day-Ahead schedule that they will not be available to provide Operating Reserves or Energy in real-time under normal conditions. Such Suppliers will be required to settle their Day-Ahead schedule at real-time prices. The only restriction on Suppliers' ability to exercise this option is that all Suppliers with Day-Ahead Operating Reserves schedules must make the scheduled amount of Capacity available to the NYISO for dispatch in the RTD if the NYISO initiates a Supplemental Resource Evaluation.

## 6.4. General Real-Time Market Rules

#### 6.4.1. Bid Selection

The NYISO will automatically select Operating Reserves Suppliers in real-time from eligible Resources. All Suppliers will automatically be assigned a real-time Operating Reserves Availability Bid of $0/MW.

Aggregations comprised of Demand Side Resources and BTM:NG Resources can be qualified to bid synchronous or nonsynchronous reserves, but not both. Demand Side Resources that are qualified to bid synchronous reserves must bid a start up cost of $0 and a minimum generation cost of $0. Demand Side Resources that are qualified to bid non-synchronous reserves may bid a start up cost but the minimum generation cost must be set to $0. BTM:NG Resources cannot bid any start up cost or minimum generation cost or MWs. Demand Side Resources AND BTM:NG Resources make themselves eligible to offer reserves in the Real-Time Market by submitting a real-time energy bid. Real-time energy bids created from day-ahead bids, based on accepted day-ahead reserve bids cannot be increased. The real-time energy bid will be used by RTD to determine energy schedules in real-time.

The NYISO may schedule Suppliers that make themselves available to provide Operating Reserves up to the following maximum Operating Reserve levels:

1. For Spinning Reserves, the Resource's emergency response rate multiplied by ten.
2. For 10-Minute Non-Synchronized Reserves, or for non-synchronized 30-Minute Reserves, the Resource's $UOL_N$ or $UOL_E$, whichever is applicable at the relevant time (the Resource may offer one product or the other depending on the time required for it to start-up and synchronize to the grid).
3. For synchronized 30-Minute Reserves, the Resource's emergency response rate multiplied by 20. This represents the amount of spinning reserve, above and beyond 10-minute spinning reserve, that the Resource could convert to energy within 30 minutes.

However, the sum of the amount of Energy, or Demand Reduction, that each Resource is scheduled to provide, the amount of Regulation Capacity it is scheduled to provide, and the amount of each Operating Reserves product it is scheduled to provide shall not exceed its $UOL_N$ or $UOL_E$, whichever is applicable.

For a set of CSR Generators, the sum of (a) the Energy injection schedule(s) minus the Energy withdrawal schedule, (b) the Operating Reserve schedule, and (c) the Regulation Capacity schedule(s) will ordinarily be less than or equal to the applicable CSR injection Scheduling Limit. For a set of CSR Generators, the sum of (a) the Energy withdrawal schedule minus the Energy injection schedule(s), and (b) the Regulation Capacity schedule(s) will ordinarily be less than or equal to the applicable CSR withdrawal Scheduling Limit. The NYISO may relax a CSR Scheduling Limit when it is in direct conflict with other limits. Conflicting limits are expected to be a response rate, upper storage limit (USL), lower storage limit (LSL), upper operating limit or lower operating limit of a CSR Generator. In all cases, the NYISO will relax the CSR Scheduling Limit by the minimum amount and for the shortest time period necessary to resolve the conflict.

The NYISO may schedule a Combined Cycle Gas Turbine Generator with Duct-Firing Capability that has opted for the Limiting Participation Flag, which is available to provide Operating Reserves, up to the following maximum Operating Reserve levels: (i) for Spinning Reserves, the resource's emergency response rate multiplied by ten, to the extent that doing so would not cause the sum of its Spinning Reserves, Regulation Service, and Energy schedules to exceed the Participation Limit; and (ii) for synchronized 30-Minute Reserves, the resource's emergency response rate multiplied by twenty, to the extent that doing so would not cause the sum of its Spinning Reserves, Regulation Service, and Energy schedules to exceed the Participation Limit, and would not cause the sum of its Spinning Reserves, Regulation Service, Energy and 30-Minute Reserves schedules to exceed the applicable Upper Operating Limit.

Each RTD run shall dispatch Combined Cycle Gas Turbine Generators with Duct-Firing Capability, that have opted for the Limiting Participation Flag, within the operating range determined by the corresponding RTC run, provided however, after an RTD-CAM interval, Combined Cycle Gas Turbine Generators with Duct-

Firing Capability, that have opted for the Limiting Participation Flag, will be dispatched within the operating range determined by RTD-CAM for at least 15 minutes, if the RTD-CAM determines the operating zone to be different than the last RTC run.

Suppliers will thus be selected based on their response rates, their applicable upper operating limit, and their Energy Bid (which will reflect their opportunity costs) through a co-optimized real-time commitment and dispatch process that minimizes the total cost of Energy, Regulation Service, and Operating Reserves. As part of the process, the NYISO shall determine how much of each Operating Reserves product particular Suppliers will be required to provide in light of the Reliability Rules and other applicable reliability standards, including the locational Operating Reserves requirements specified above.

#### 6.4.2. NYISO Notice Requirements

The NYISO shall notify each Supplier of Operating Reserve that has been selected by RTD of the amount of Operating Reserve that it is scheduled to provide. This notification is provided through the Market Information System consistent with all other Real-Time Market notifications.

#### 6.4.3. Obligation to Make Resources Available to Provide Operating Reserves

Any Resource that is eligible to supply Operating Reserves and that is made available to the NYISO for dispatch in real-time, must also make itself available to provide Operating Reserves.

#### 6.4.4. Activation of Operating Reserves

All Resources that are selected by the NYISO to provide Operating Reserves shall respond to the NYISO's directions to activate in real-time.

#### 6.4.5. Performance Tracking and Supplier Disqualifications

When a Supplier selected to supply Operating Reserves is activated, the NYISO shall measure and track its actual Energy production or actual demand reduction against its expected performance in real-time. The NYISO may disqualify Suppliers that consistently fail to provide Energy when scheduled from providing Operating Reserves in the future. If a Resource has been disqualified, the NYISO shall require it to pass a re-qualification test before accepting any additional Bids to supply Operating Reserves, as described in Sections 6.1 and 6.12 of this manual.

## 6.5. Operating Reserve Settlements – General Rules

### 6.5.1. Establishing Locational Reserve Prices

Except as noted below in Sections 6.5.2 and 6.5.3, the NYISO shall calculate separate Day-Ahead Market and Real-Time Market prices for each of the three Operating Reserve products for each of the Load Zones based on the following five locations:

1. West of Central-East (West or Western)
2. East of Central-East Excluding Southeastern New York (East or Eastern)
3. Southeastern New York Excluding New York City and Long Island (Southeastern)
4. New York City (N.Y.C.)
5. Long Island (L.I.).

The NYISO will thus calculate fifteen different locational Operating Reserve prices in both the Day-Ahead Market and the Real-Time Market.

### 6.5.2. Settlements Involving Suppliers of Operating Reserves Located on Long Island

Suppliers of Operating Reserves located on Long Island shall receive settlement payments as if they were providing Operating Reserves located in Southeastern New York. The NYISO will calculate separate locational Long Island Operating Reserves prices but will not post them or use them for settlement purposes. If an activation of the EDRP and/or SCR program, as described in Section 6.5.3, includes Long Island in addition to at least one other Load Zone, Suppliers of Operating Reserves located on Long Island shall receive payments as if they were providing Operating Reserves located in Southeastern New York and were part of the applicable Scarcity Reserve Region.

### 6.5.3. Establishing Reserve Clearing Prices during EDRP/SCR Activation Intervals

Additional 30-minute reserves are procured in Scarcity Reserve Region(s), as identified by the NYISO, in real-time during periods when EDRP resources and/ or SCRs have been called upon by the NYISO to provide load reduction. In such an instance, the NYISO shall calculate separate Real-Time Market prices for each of the three Operating Reserve products for each of the Load Zones based on the five locations outlined in Section 6.5.1, as well as for any applicable Scarcity Reserve Region(s).

### 6.5.4. "Cascading" of Operating Reserves

The NYISO will deem Spinning Reserve to be the "highest quality" Operating Reserve, followed by 10-Minute Non-Synchronized Reserve and by 30-Minute Reserve (spinning and then non-synchronized). The NYISO shall substitute higher quality Operating Reserves in place of lower quality Operating Reserves,

when doing so lowers the total as-bid cost (*i.e.*, when the marginal cost for the higher quality Operating Reserve product is lower than the marginal cost for the lower quality Operating Reserve product), and the substitution of a higher quality for the lower quality product does not cause locational Operating Reserve requirements to be violated. However, to the extent that reliability standards require the use of higher quality Operating Reserves, substitution cannot be made in the opposite direction.

The price of higher quality Operating Reserves will not be set at a price below the price of lower quality Operating Reserves in the same location. Thus, for a given location, the price of Spinning Reserves will not be below the price for 10-Minute Non-Synchronized Reserves or 30-Minute Reserves and the clearing price for 10-Minute Non-Synchronized Reserves will not be below the clearing price for 30-Minute Reserves.

## 6.6. Operating Reserve Settlements – Day-Ahead Market

Please refer to Rate Schedule 5 of the NYISO OATT, Rate Schedule 4 of the NYISO Services Tariff, and the Accounting and Billing Manual for information about Operating Reserve Settlements for the Day-Ahead Market.

## 6.7. Operating Reserve Settlements – Real-Time Market

Please refer to Rate Schedule 5 of the NYISO OATT, Rate Schedule 4 of the NYISO Services Tariff, and the Accounting and Billing Manual for Information about Operating Reserve Settlements for the Real-Time Market.

## 6.8. Operating Reserve Demand Curves

The NYISO shall establish fifteen Operating Reserve Demand Curves, one for each Operating Reserves requirement, except as noted in section 6.8.1 below. Specifically, there shall be a demand curve for:

1. Total Spinning Reserves
2. Eastern, Southeastern, New York City, or Long Island Spinning Reserves
3. Southeastern, New York City, or Long Island Spinning Reserves
4. New York City Spinning Reserves
5. Long Island Spinning Reserves
6. Total 10-Minute Reserves
7. Eastern, Southeastern, New York City, or Long Island 10-Minute Reserves
8. Southeastern, New York City or Long Island 10-Minute Reserves
9. New York City 10-Minute Reserves
10. Long Island 10-Minute Reserves
11. Total 30-Minute Reserves
12. Eastern, Southeastern or Long Island 30-Minute Reserves

13. Southeastern or Long Island 30-Minute Reserves
14. New York City 30-Minute Reserves
15. Long Island 30-Minute Reserves.

Each Operating Reserve Demand Curve will apply to both the Day-Ahead Market and the Real-Time Market for the relevant product and location, except for those reserve demand curves that apply to certain Scarcity Reserve Requirements which will be applicable only during the real-time intervals that a Scarcity Reserve Requirement has been established by the NYISO.

The NYISO Procedures shall establish a target level for each Operating Reserves requirement for each hour, which will be the number of MW of Operating Reserves meeting that requirement that the NYISO would seek to maintain in that hour if cost were not a consideration.

The following locational Operating Reserves requirements shall each include an Uncertainty Reserve Requirement: (i) Total 10- Minute Reserves; (ii) Eastern, Southeastern, New York City, or Long Island 10-Minute Reserves; (iii) New York City 10-Minute Reserves; (iv) Long Island 10-Minute Reserves; (v) Total 30-Minute Reserves; (vi) Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves (including separate demand curves applicable for each real-time interval the NYISO has established certain Scarcity Reserve Requirements); (vii) Southeastern, New York City, or Long Island 30-Minute Reserves; (viii) New York City 30-Minute Reserves; and (ix) Long Island 30-Minute Reserves.

The NYISO will then define an Operating Reserves demand curve for that hour corresponding to each Operating Reserves requirement as follows (for all hours except real-time intervals when EDRP resources and/or SCRs have been called upon by the NYISO to provide load reduction; refer to Section 6.8.1 of this manual for further details regarding the 30-minute Operating Reserve Demand Curves that apply during real-time periods when the NYISO has activated EDRP resources and/or SCRs):

1. ***Total Spinning Reserves*** – For quantities of Operating Reserves meeting the total Spinning Reserves requirement that are less than or equal to the target level for that requirement the price on the total Spinning Reserves demand curve shall be $775/MW. For all other quantities, the price on the total Spinning Reserves demand curve shall be $0/MW.
2. ***Eastern, Southeastern, New York City, or Long Island Spinning Reserves*** – For quantities of Operating Reserves meeting the Eastern, Southeastern, New York City, or Long Island Spinning Reserves requirement that are less than or equal to the target level for that requirement the price on the Eastern, Southeastern, New York City, or Long Island Spinning Reserves demand curve shall be $40/MW. For all other quantities, the price on the Eastern, Southeastern, New York City, or Long Island Spinning Reserves demand curve shall be $0/MW.

3. ***Southeastern, New York City, or Long Island Spinning Reserves*** - For quantities of Operating Reserves meeting the Southeastern, New York City, or Long Island Spinning Reserves requirement that are less than or equal to the target level for that requirement, the price on the Southeastern, New York City, or Long Island Spinning Reserves demand curve shall be $40/MW. For all other quantities, the price on the Southeastern, New York City, or Long Island Spinning Reserves demand curve shall be $0/MW.
4. ***New York City Spinning Reserves*** - For quantities of Operating Reserves meeting the New York City Spinning Reserves requirement that are less than or equal to the target level for that locational requirement, the price on the New York City Spinning Reserves demand curve shall be $25/MW. For all other quantities, the price on the New York City Spinning Reserves demand curve shall be $0/MW.
5. ***Long Island Spinning Reserves*** – For quantities of Operating Reserves meeting the Long Island Spinning Reserves requirement that are less than or equal to the target level for that requirement, the price on the Long Island Spinning Reserves demand curve shall be $25/MW. For all other quantities, the price on the Long Island Spinning Reserves demand curve shall be $0/MW.
6. ***Total 10-Minute Reserves*** – For quantities of Operating Reserves meeting the total 10minute reserves requirement (referred to as the "NYCA" 10-Minute Reserves target level"), that are less than or equal to the NYCA 10-Minute Reserves target level minus the total 10-Minute Uncertainty Reserve Requirement, the price on the total 10-minute reserves demand curve shall be $750/MW. For quantities of Operating Reserves meeting the NYCA 10-Minute Reserves target level that (i) are less than or equal to the NYCA 10-Minute Reserves target level, but (ii) exceed the NYCA 10-Minute Reserves target level minus the total 10-Minute Uncertainty Reserves Requirement, the price on the total 10-minute reserves demand curve shall be $40/MW. For all other quantities, the price on the total 10-minute reserves demand curve shall be $0/MW.
7. ***Eastern, Southeastern, New York City, or Long Island 10-Minute Reserves*** – For quantities of Operating Reserves meeting the Eastern, Southeastern, New York City, or Long Island 10-minute reserves requirement (referred to as the "Eastern, Southeastern, New York City, or Long Island 10-Minute Reserves target level"), that are less than or equal to the Eastern, Southeastern, New York City, or Long Island 10-Minute Reserves target level minus the Eastern, Southeastern, New York City, or Long Island 10-Minute Uncertainty Reserve Requirement, the price on the Eastern, Southeastern, New York City, or Long Island 10-minute reserves demand curve shall be $775/MW. For quantities of Operating Reserves meeting the Eastern, Southeastern, New York City, or Long Island 10-Minute Reserves target level that (i) are less than or equal to the Eastern, Southeastern, New York City, or Long Island 10-Minute Reserves target level, but (ii) exceed the Eastern, Southeastern, New York City, or Long Island 10-Minute Operating Reserve target level minus the Eastern, Southeastern, New York City, or Long Island 10-Minute Uncertainty Reserves Requirement, the price on the Eastern, Southeastern, New York City, or Long Island 10-minute reserves demand curve shall be $40/MW. For all other quantities, the price on the Eastern, Southeastern, New York City, or Long Island 10-Minute Reserves demand curve shall be $0/MW.
8. ***Southeastern, New York City, or Long Island 10-Minute Reserves*** - For quantities of Operating Reserves meeting the Southeastern, New York City, or Long Island 10-minute reserves requirement that are less than or equal to the target level for that requirement, the price on the Southeastern, New York City, or Long Island 10-minute reserves demand curve shall be $40/MW. For all other quantities, the price on the Southeastern, New York City, or Long Island 10-Minute Reserves demand curve shall be $0/MW.

9. ***New York City 10-Minute Reserves*** - For quantities of Operating Reserves meeting the New York City 10-minute reserves requirement (referred to as the "N.Y.C. 10-Minute Reserves target level"), that are less than or equal to the N.Y.C. 10-Minute Reserves target level minus the N.Y.C. 10-Minute Uncertainty Reserve Requirement, the price on the New York City 10-minute reserves demand curve shall be $25/MW. For quantities of Operating Reserves meeting the N.Y.C. 10-Minute Reserves target level that (i) are less than or equal to the N.Y.C. 10-Minute Reserves target level, but (ii) exceed the N.Y.C. 10-Minute Operating Reserve target level minus the N.Y.C. 10-Minute Uncertainty Reserve Requirement, the price on the New York City 10- minute reserves demand curve shall be $20/MW. For all other quantities, the price on the New York City 10-minute reserves demand curve shall be $0/MW.
10. ***Long Island 10-Minute Reserves*** – For quantities of Operating Reserves meeting the Long Island 10-minute reserves requirement (referred to as the "Long Island 10-Minute Reserves target level"), that are less than or equal to the Long Island 10-Minute Reserves target level minus the Long Island 10-Minute Uncertainty Reserve Requirement, the price on the Long Island 10-minute reserves demand curve shall be $25/MW. For quantities of Operating Reserves meeting the Long Island 10-Minute Reserves target level that (i) are less than or equal to the Long Island 10-Minute Reserves target level, but (ii) exceed the Long Island 10-Minute Operating Reserves target level minus the Long Island 10-Minute Uncertainty Reserve Requirement, the price on the Long Island 10- minute reserves demand curve shall be $20/MW. For all other quantities, the price on the Long Island 10-minute reserves demand curve shall be $0/MW.
11. ***Total 30-Minute Reserves*** – For quantities of Operating Reserves meeting the total 30-Minute Reserves requirement (referred to as the "NYCA 30-Minute Reserves target level"), that are less than or equal to the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 655 MW and the total 30-Minute Uncertainty Reserve Requirement, the price on the total 30-Minute Reserves demand curve shall be $750/MW. For quantities of Operating Reserves meeting the NYCA 30- Minute Reserves target level that are less than or equal to the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 600 MW and the total 30-Minute Uncertainty Reserve Requirement, but exceed the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 655 MW and the total 30-Minute Uncertainty Reserve Requirement, the price on the total 30-Minute Reserves demand curve shall be $625/MW. For quantities of Operating Reserves meeting the NYCA 30- Minute Reserves target level that are less than or equal to the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 545 MW and the total 30-Minute Uncertainty Reserve Requirement, but exceed the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 600 MW and the total 30-Minute Uncertainty Reserve Requirement, the price on the total 30-Minute Reserves demand curve shall be $500/MW. For quantities of Operating Reserves meeting the NYCA 30- Minute Reserves target level that are less than or equal to the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 490 MW and the total 30-Minute Uncertainty Reserve Requirement, but exceed the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 545 MW and the total 30-Minute Uncertainty Reserve Requirement, the price on the total 30-Minute Reserves demand curve shall be $375/MW. For quantities of Operating Reserves meeting the NYCA 30- Minute Reserves target level that are less than or equal to the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 435 MW and the total 30-Minute Uncertainty Reserve Requirement, but exceed the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 490 MW and the total 30-Minute Uncertainty Reserve Requirement, the price on the total 30-Minute Reserves demand curve shall be $300/MW. For quantities of Operating Reserves meeting the NYCA 30- Minute Reserves target level that are less than or equal to the NYCA 30-Minute Reserves target level minus an amount equal to the sum of

380 MW and the total 30-Minute Uncertainty Reserve Requirement, but exceed the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 435 MW and the total 30-Minute Uncertainty Reserve Requirement, the price on the total 30-Minute Reserves demand curve shall be $225/MW. For quantities of Operating Reserves meeting the NYCA 30- Minute Reserves target level that are less than or equal to the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 325 MW and the total 30-Minute Uncertainty Reserve Requirement, but exceed the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 380 MW and the total 30-Minute Uncertainty Reserve Requirement, the price on the total 30-Minute Reserves demand curve shall be $175/MW. For quantities of Operating Reserves meeting the NYCA 30- Minute Reserves target level that are less than or equal to the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 200 MW and the total 30-Minute Uncertainty Reserve Requirement, but exceed the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 325 MW and the total 30-Minute Uncertainty Reserve Requirement, the price on the total 30-Minute Reserves demand curve shall be $100/MW. For quantities of Operating Reserves meeting the NYCA 30- Minute Reserves target level that are less than or equal to the NYCA 30-Minute Reserves target level minus the total NYCA 30-Minute Uncertainty Reserve Requirement, but exceed the NYCA 30-Minute Reserves target level minus an amount equal to the sum of 200 MW and the total 30-Minute Uncertainty Reserve Requirement, the price on the total 30-Minute Reserves demand curve shall be $40/MW. For quantities of Operating Reserves meeting the NYCA 30-Minute Reserves target level that (i) are less than or equal to the NYCA 30-Minute Reserves target level, but (ii) exceed the NYCA 30-Minute Operating Reserve target level minus the total NYCA 30-Minute Uncertainty Reserve Requirement, the price on the total 30-Minute Reserves demand curve shall be $20/MW. For all other quantities, the price on the total 30-Minute Reserves demand curve shall be $0/MW. The NYISO, however, will not schedule more total 30-minute Reserves than the target level established for the requirement for that hour.

12. ***Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves*** – For quantities of Operating Reserves meeting the Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves requirement (referred to as the "Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves target level"), that are less than or equal to the Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves target level minus the Eastern, Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, the price on the Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves demand curve shall be $40/MW. For quantities of Operating Reserves meeting the Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves target level that (i) are less than or equal to the Eastern 30-Minute Reserves target level, but (ii) exceed the Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves target level minus the Eastern, Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, the price on the Eastern, Southeastern, New York City, or Long Island 30-minute reserves demand curve shall be $20/MW. For all other quantities, the price on the Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves demand curve shall be $0/MW.

13. ***Southeastern, New York City, or Long Island 30-Minute Reserves*** - For quantities of Operating Reserves meeting the Southeastern, New York City, or Long Island 30-Minute Reserves requirement (referred to as the "Southeastern, New York City, or Long Island 30-Minute Reserves target level"), that are less than or equal to the Southeastern, New York City, or Long Island 30-Minute Reserves target level minus the sum of the Southeastern, New York City, or Long Island 30-minute Uncertainty Reserve Requirement and any incremental 30-Minute Reserve target level established by the NYISO for an amount not to exceed 500 MW ("SENY incremental

reserve target level"), the price on the Southeastern, New York City, or Long Island 30-Minute Reserves demand curve shall be $500/MW. For quantities of Operating Reserves meeting the Southeastern, New York City, or Long Island 30-Minute Reserves target level that are less than or equal to the Southeastern, New York City, or Long Island 30-Minute Reserves target level minus the Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, but exceed the Southeastern, New York City, or Long Island 30-Minute Reserves target level minus the sum of the Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement and the SENY incremental reserve target level, the price on the Southeastern, New York City, or Long Island 30-Minute Reserves demand curve shall be $40/MW. For quantities of Operating Reserves meeting the Southeastern, New York City, or Long Island 30-Minute Reserves Requirement that (i) are less than or equal to the Southeastern, New York City, or Long Island 30-Minute Reserves target level, but (ii) exceed the Southeastern, New York City, or Long Island 30-Minute Reserves target level minus the Southeastern 30-Minute Uncertainty Reserve Requirement, the price on the Southeastern, New York City, or Long Island 30-Minute Reserves demand curve shall be $20/MW. For all other quantities, the price on the Southeastern, New York City, or Long Island 30-Minute Reserves demand curve shall be $0/MW.

14. ***New York City 30-Minute Reserves*** - For quantities of Operating Reserves meeting the New York City 30-Minute Reserves requirement (referred to as the "N.Y.C. 30-Minute Reserves target level"), that are less than or equal to the N.Y.C. 30-Minute Reserves target level minus the N.Y.C. 30-minute Uncertainty Reserve Requirement, the price on the New York City 30-Minute Reserves demand curve shall be $25/MW. For quantities of Operating Reserves meeting the N.Y.C. 30-Minute Reserves target level that (i) are less than or equal to the N.Y.C. 30-Minute Reserves target level, but (ii) exceed the N.Y.C. 30-Minute Reserves target level minus the N.Y.C. 30-Minute Uncertainty Reserves Requirement, the price on the New York City 30-minute reserves demand curve shall be $20/MW. For all other quantities, the price on the New York City 30-Minute Reserves demand curve shall be $0/MW.
15. ***Long Island 30-Minute Reserves*** – For quantities of Operating Reserves meeting the Long Island 30-Minute Reserves requirement (referred to as the "Long Island 30-Minute Reserves target level"), that are less than or equal to the Long Island 30-Minute Reserves target level minus the Long Island 30-minute Uncertainty Reserve Requirement, the price on the Long Island 30-Minute Reserves demand curve shall be $25/MW. For quantities of Operating Reserves meeting the Long Island 30-Minute Reserves target level that (i) are less than or equal to the Long Island 30-Minute Reserves target level, but (ii) exceed the Long Island 30-Minute Operating Reserves target level minus the Long Island 30-Minute Uncertainty Reserves Requirement, the price on the Long Island 30-minute reserves demand curve shall be $20/MW. For all other quantities, the price on the Long Island 30-Minute Reserves demand curve shall be $0/MW.

In order to respond to operational or reliability problems that arise in real-time, the NYISO may procure any Operating Reserve product at a quantity and/or price point different than those specified above. The NYISO shall post a notice of any such purchase as soon as reasonably possible and shall report on the reasons for such purchases at the next meeting of its Business Issues Committee. The NYISO shall also investigate whether it is necessary to modify the quantity and price points specified above to avoid future operational or reliability problems. The NYISO will consult with its Market Monitoring Unit when it conducts this investigation.

If the NYISO determines that it is necessary to modify the quantity and/or price points specified above in order to avoid future operational or reliability problems it may temporarily modify them for a period of up to ninety days. If circumstances reasonably allow, the NYISO will consult with its Market Monitoring Unit, the Business Issues Committee, FERC, and the PSC before implementing any such modification. In all circumstances, the NYISO will consult with those entities as soon as reasonably possible after implementing a temporary modification.

The NYISO and its Market Monitoring Unit shall conduct periodic reviews as to whether the Operating Reserve Demand Curves should be adjusted to optimize the economic efficiency of the NYISO markets.

#### 6.8.1. 30-Minute Operating Reserve Demand Curves during EDRP/SCR Activation Intervals

As is further described in Sections 15.4.6.2 and 15.4.7 of Rate Schedule 4 of the NYISO Services Tariff, the NYISO shall establish new 30-minute reserve demand curves or modify existing 30-minute demand curves during real-time periods when EDRP resources and/or SCRs have been called upon by the NYISO to provide load reduction. The NYISO may activate these resources throughout the NYCA, within a single Load Zone, or within a group of Load Zones; the area in which those resources are activated is called the Scarcity Reserve Region. In the event of simultaneous activations of these resources in different areas to address different needs, there may be multiple Scarcity Reserve Regions. The NYISO will determine a Scarcity Reserve Requirement in each interval for each Scarcity Reserve Region, which is generally equal to the amount of Load reduction that the NYISO anticipates that EDRP resources and/or SCRs in that Scarcity Reserve Region will provide, minus the amount of unscheduled energy production capability that could be provided by available Suppliers located in that Scarcity Reserve Region in greater than 30-minutes, but less than or equal to 60 minutes.

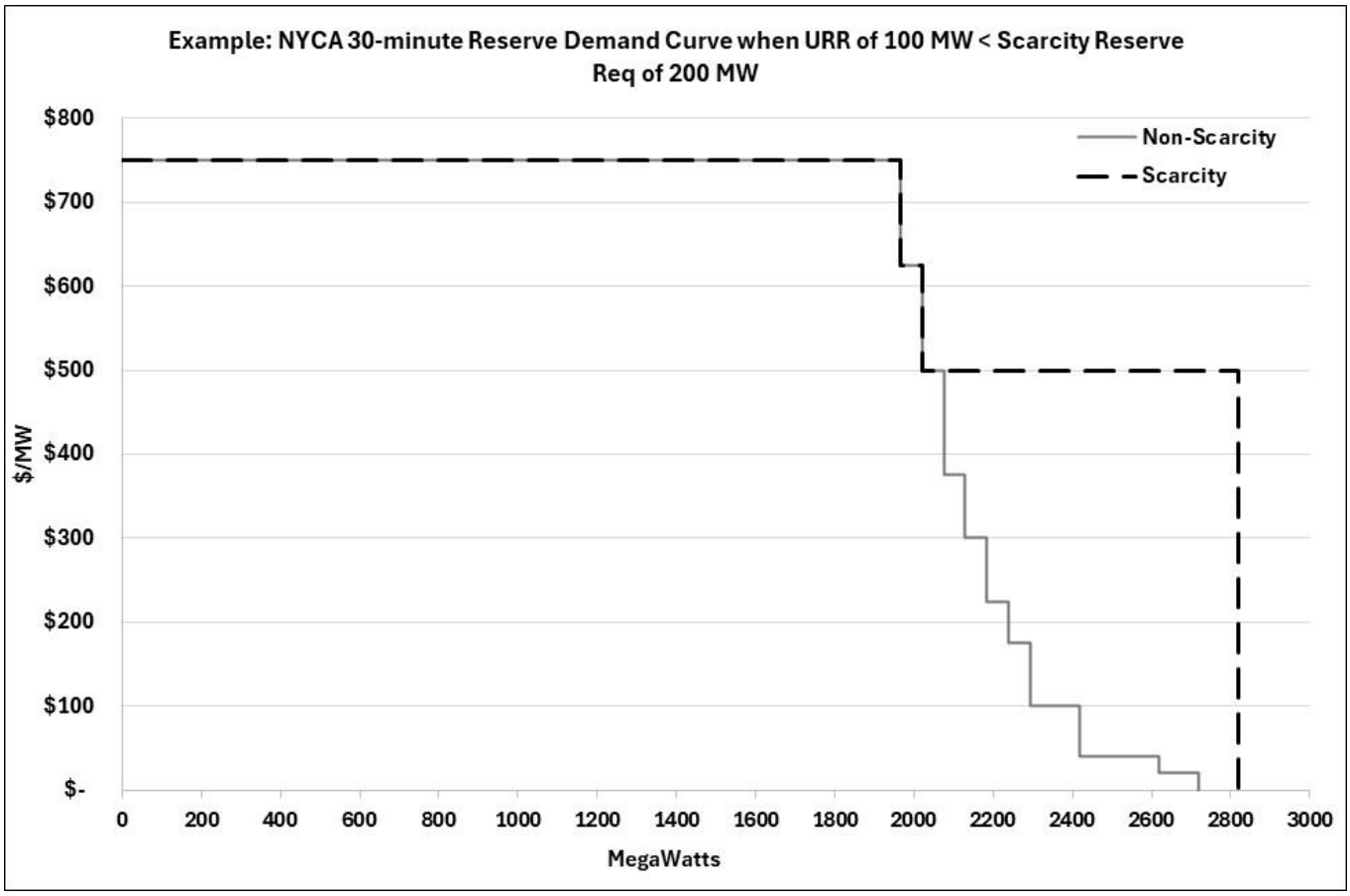
The impact of the EDRP/SCR program activations on the 30-minute reserve demand curve of the existing locational reserve region(s) or the newly created Scarcity Reserve Region(s) are outlined below, together with illustrative examples for each scenario.

For purposes of the examples below, the following variables are used to represent the 30-minute Operating Reserve requirements that are applicable at times when EDRP resources and/or SCRs have not been activated to provide load reduction. See Section 6.2.1 of this manual for additional information regarding locational reserve requirements established by the NYISO:

| Variable | 30-Minute Locational Reserve Requirement |
|---|---|
| NYCA | NYCA |
| EAST | East of Central-East |
| SENY | Southeastern New York (SENY) |
| NYC | New York City |
| LI | Long Island |

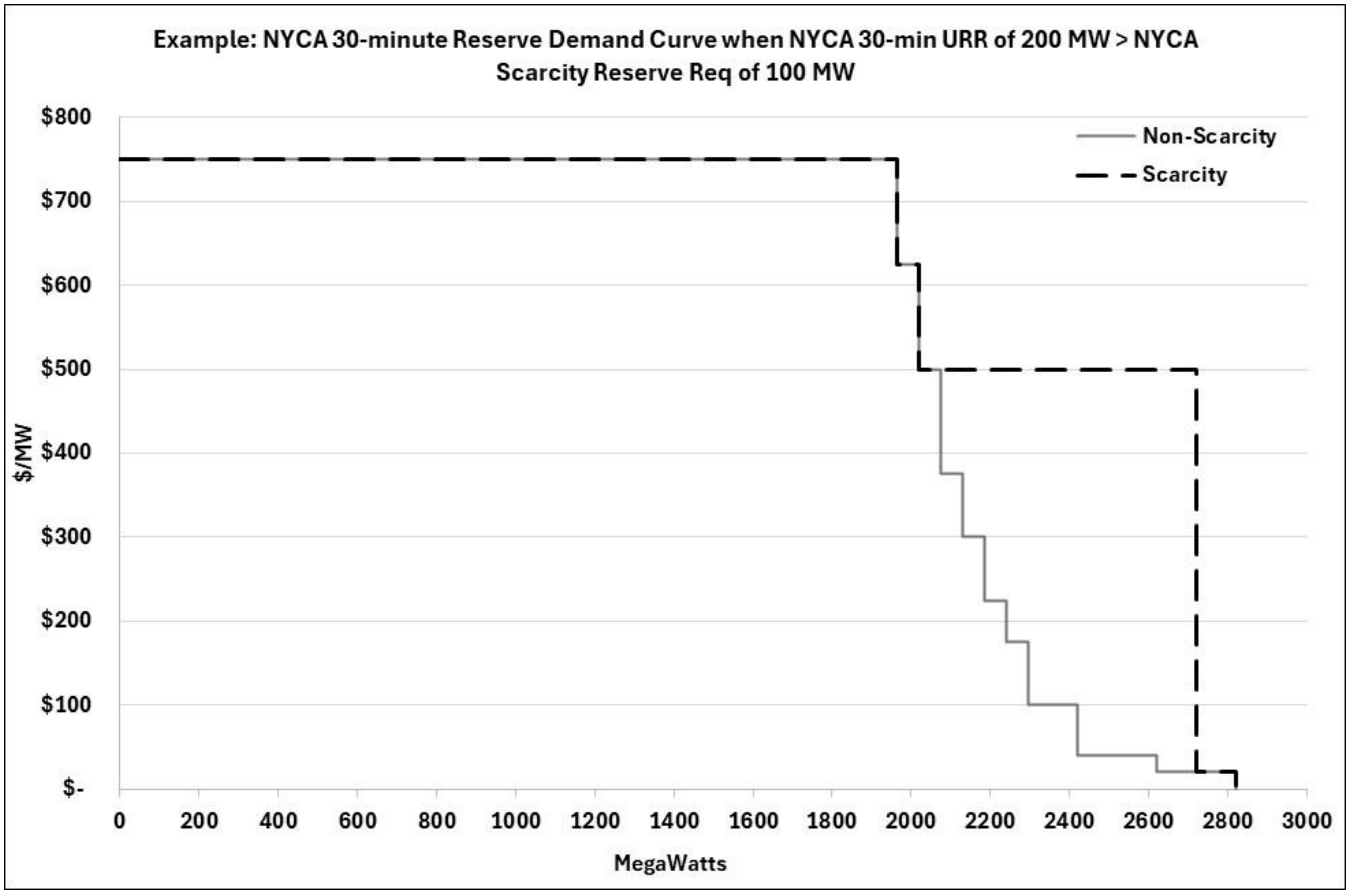
1. If NYCA (all Load Zones) is identified as a Scarcity Reserve Region, then the NYCA 30-Minute Reserves target level will be increased by the greater of (i) the value obtained from subtracting the total 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $20/MW. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $500/MW. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $625/MW. If the quantity of 30-minute reserve provided in the NYCA is less than orequal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $750/MW.

For example 1, consider that NYCA is the only Scarcity Reserve Region identified, the additional NYCA Scarcity Reserve Requirement for NYCA is calculated as 200 MW for an interval, and the NYCA 30-Minute Uncertainty Reserve Requirement is calculated as 100 MW. In this example, the NYCA 30-Minute Uncertainty Reserve Requirement is less than the Scarcity Reserve Requirement. The applicable impacts on the NYCA 30-minute reserve demand curve during that real-time interval would be as follows:




In the above example, no other 30-minute reserve demand curves are modified.

For example 2, consider that NYCA is the only Scarcity Reserve Region identified, the additional NYCA Scarcity Reserve Requirement for NYCA is calculated as 100 MW for an interval, and the NYCA 30-Minute Uncertainty Reserve Requirement is calculated as 200 MW. In this example, the NYCA 30-Minute Uncertainty Reserve Requirement is greater than NYCA's Scarcity Reserve Requirement. The applicable impacts on the NYCA 30-minute reserve demand curve during that real-time interval would be as follows:




In the above example, no other 30-minute reserve demand curves are modified.

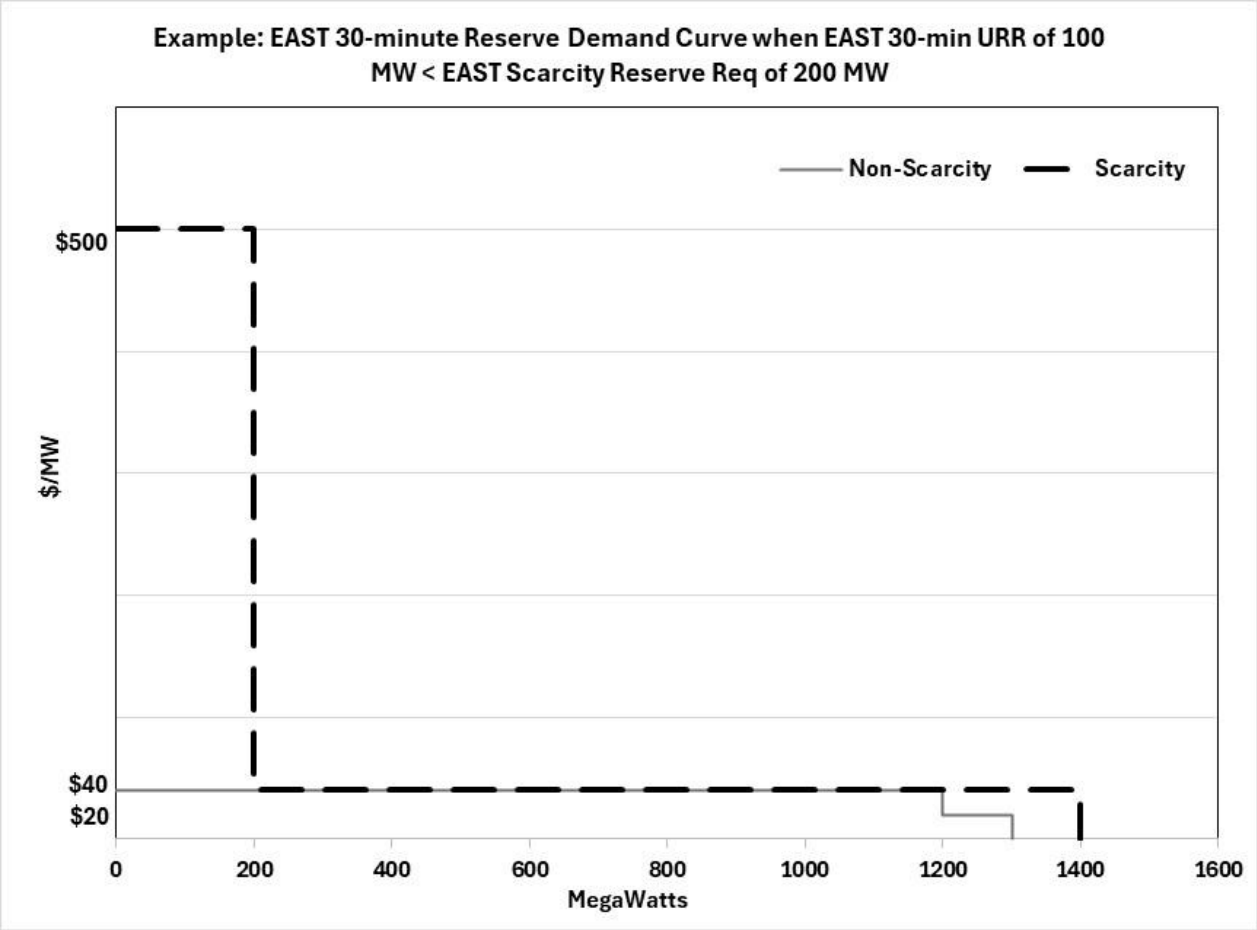
2. If East of Central-East (Load Zones F, G, H, I, J, and K) is identified as a Scarcity Reserve Region, then the Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves target level will be increased by the greater of (i) the value obtained from subtracting the Eastern, Southeastern, New York, or Long Island 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in East of Central-East exceeds the revised East of Central-East 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the Eastern, Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised East of Central-East 30-minute reserve requirement, the corresponding price on the East of Central-East 30-minute reserve demand curve will be $20/MW. If the quantity of 30-minute reserve provided in East of Central-East exceeds the revised East of Central-East 30-minute reserve requirement minus an amount equal to the Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves target level, but is less than or equal to the revised East of Central-East 30-minute

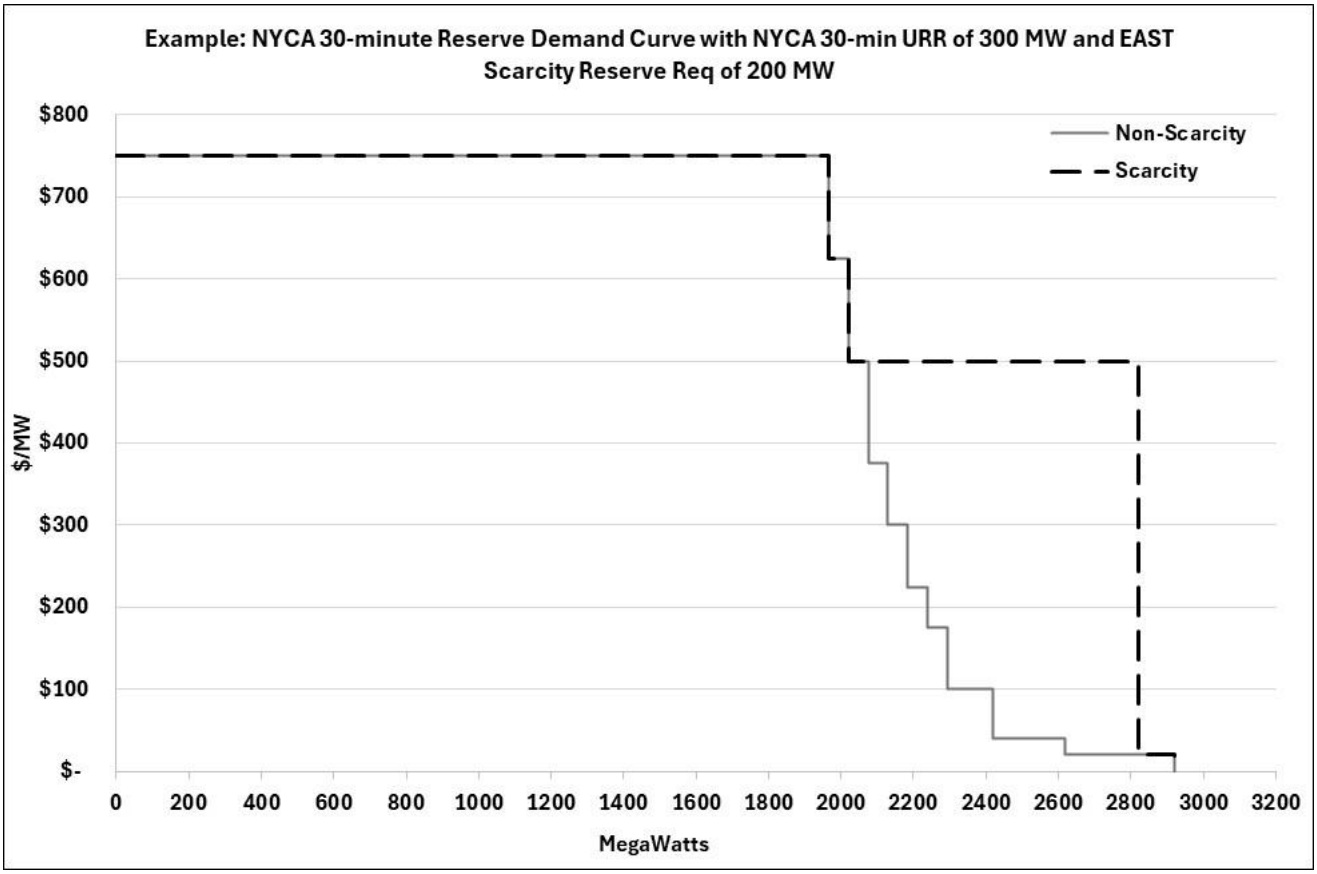
reserve requirement minus an amount equal to the greater of (a) zero, or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the Eastern, Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the East of Central-East 30-minute reserve demand curve will be $40/MW. If the quantity of 30-minute reserve provided in East of Central-East is less than or equal to the revised East of Central-East 30-minute reserve requirement minus an amount equal to the Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves target level, the corresponding price on the East of Central-East 30-minute reserve demand curve will be $500/MW. Additionally:

i. The NYCA 30- Minute Reserves target level will be increased by the greater of (i) the value obtained from subtracting the total 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $20/MW. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $500/MW. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $625/MW. If the quantity of 30-minute reserve provided in the NYCA is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total

30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $750/MW.

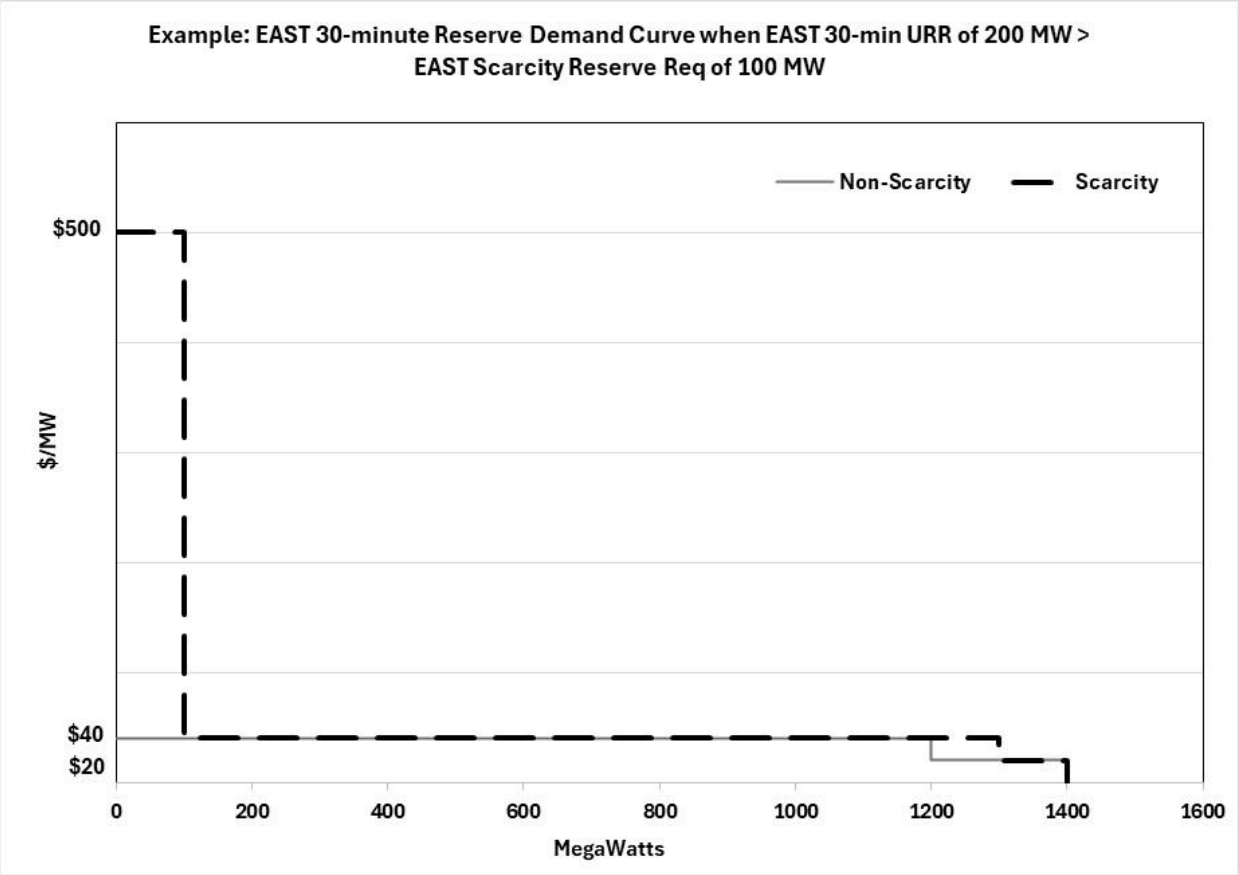
For example 1, consider that East of Central-East is the only Scarcity Reserve Region identified, the additional Scarcity Reserve Requirement for East of Central-East is calculated as 200 MW for an interval, and the EAST 30-Minute Uncertainty Reserve Requirement is calculated as 100 MW. In this example, the EAST 30-Minute URR is less than EAST's Scarcity Reserve Requirement. Also, it is assumed that the NYCA 30-Minute URR is 300 MW and so the EAST's Scarcity Reserve Requirement of 200 MW is less than NYCA 30-Minute URR of 300 MW. The applicable impacts to the affected 30-minute reserve demand curves during such real-time interval would be as follows:

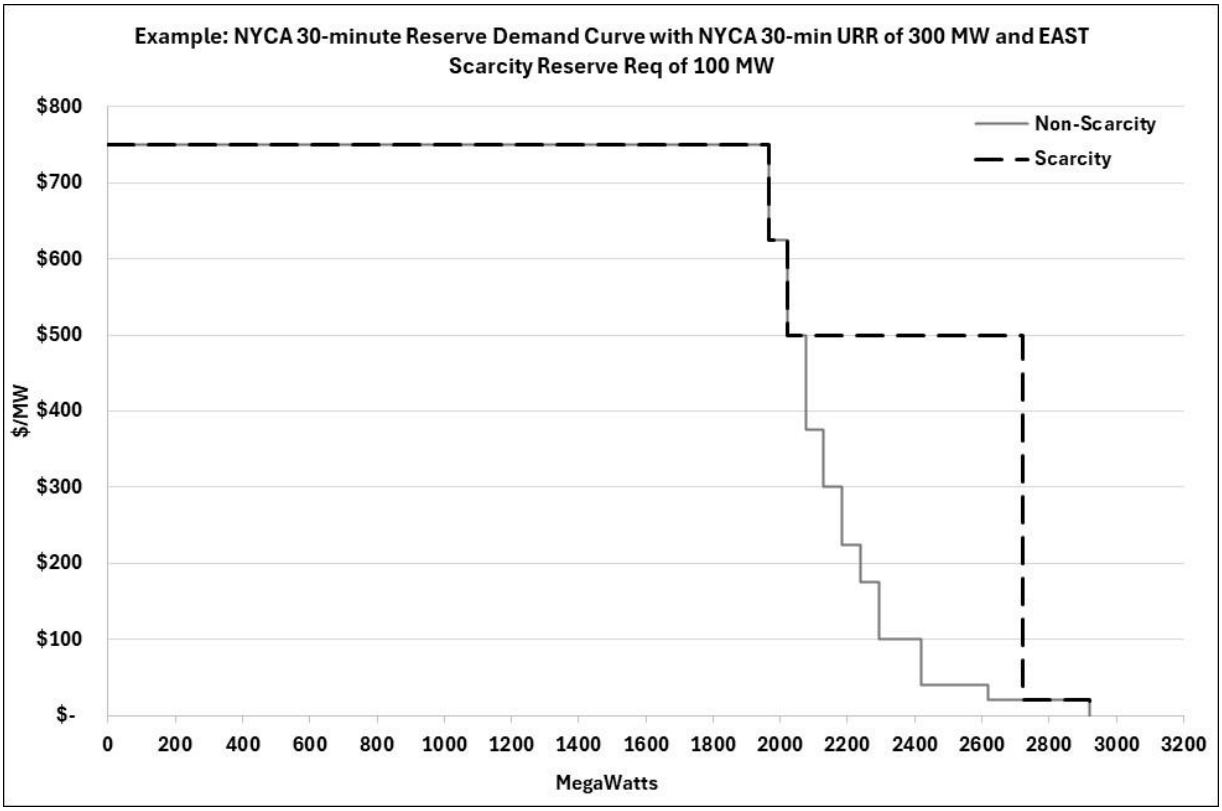





In the above example, no other 30-minute reserve demand curves are modified.

For example 2, consider that East of Central-East is the only Scarcity Reserve Region identified, the additional Scarcity Reserve Requirement for East of Central-East is calculated as 100 MW for an interval, and the EAST 30-Minute Uncertainty Reserve Requirement is calculated as 200 MW. In this example, the EAST 30-Minute URR is greater than EAST's Scarcity Reserve Requirement. Also, it is assumed that the NYCA 30-Minute URR is 300 MW and so the EAST's Scarcity Reserve Requirement of 100 MW is less than NYCA 30-Minute URR of 300 MW. The applicable impacts to the affected 30-minute reserve demand curves during such real-time interval would be as follows:


Example: EAST 30-minute Reserve Demand Curve when EAST 30-min URR of 200 MW > EAST Scarcity Reserve Req of 100 MW
Non-Scarcity
Scarcity
$500
$40
$20
$/MW
0
200
400
600
800
1000
1200
1400
1600
MegaWatts


Example: NYCA 30-minute Reserve Demand Curve with NYCA 30-min URR of 300 MW and EAST Scarcity Reserve Req of 100 MW
Non-Scarcity
Scarcity
$800
$700
$600
$500
$400
$300
$200
$100
$-
$/MW
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
MegaWatts

In the above example, no other 30-minute reserve demand curves are modified.

3. If Southeastern New York (Load Zones G, H, I, J, and K) is identified as a Scarcity Reserve Region, then the applicable Southeastern, New York City, or Long Island 30-Minute Reserves target level (accounting for any applicable SENY incremental reserve target level) will be increased by the greater of (i) the value obtained from subtracting the Eastern, Southeastern, New York, or Long Island 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in SENY exceeds the revised SENY 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised SENY 30-minute reserve requirement, the corresponding price on the SENY 30-minute reserve demand curve will be $20/MW.. If the quantity of 30-minute reserve provided in SENY exceeds the revised SENY 30-minute reserve requirement minus a value equal to the sum of the SENY incremental reserve target level and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised SENY 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the SENY 30-minute reserve demand curve will be $40/MW. If the quantity of 30-minute reserve provided in Southeastern New York is less than or equal to the revised SENY 30-minute reserve requirement minus a value equal to the sum of the SENY incremental reserve target level and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the Southeastern New York 30-minute reserve demand curve will be $500/MW. Additionally:

    i. The NYCA 30- Minute Reserve target level will be increased by the greater of (i) the value obtained from subtracting the total 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided

in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $20/MW.. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $500/MW. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $625/MW. If the quantity of 30-minute reserve provided in the NYCA is less than or

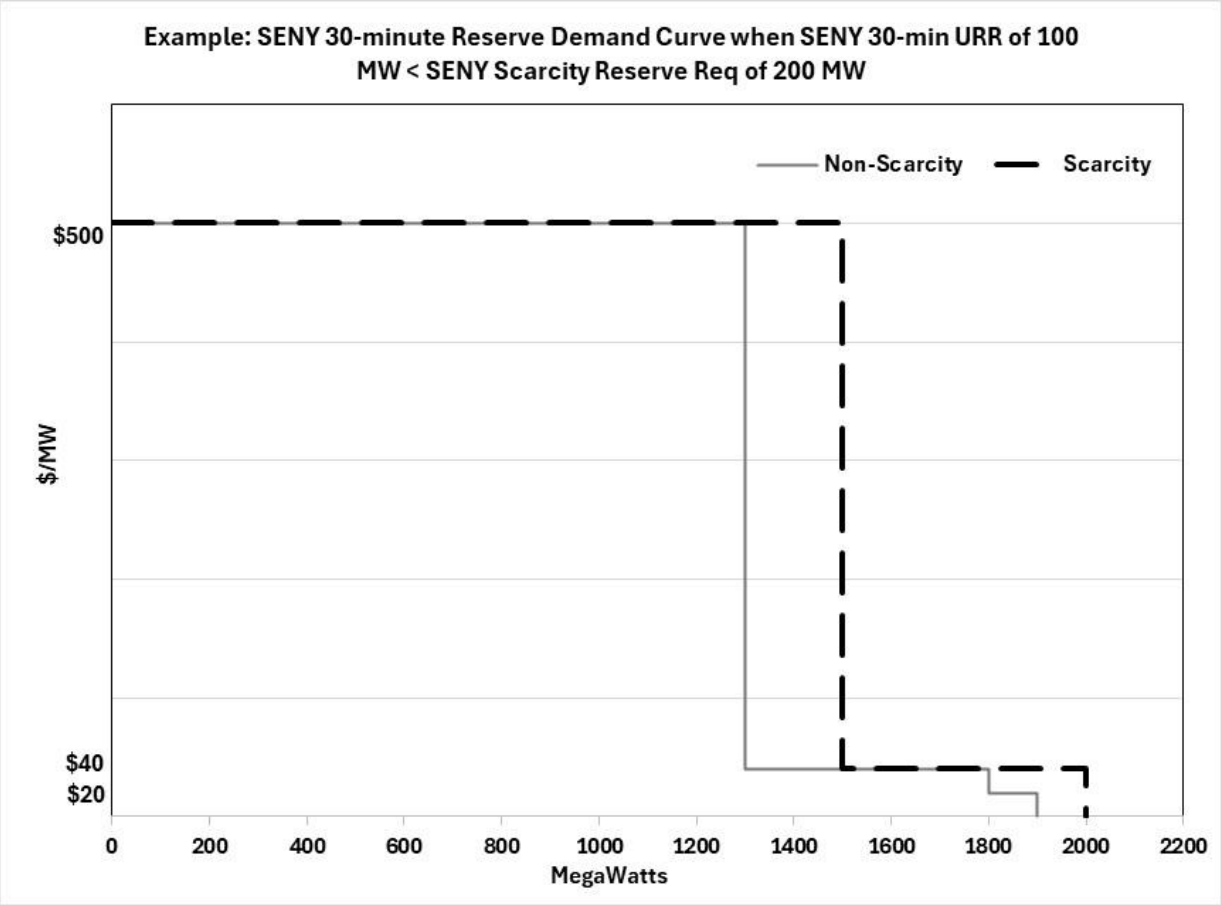
equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $750/MW.

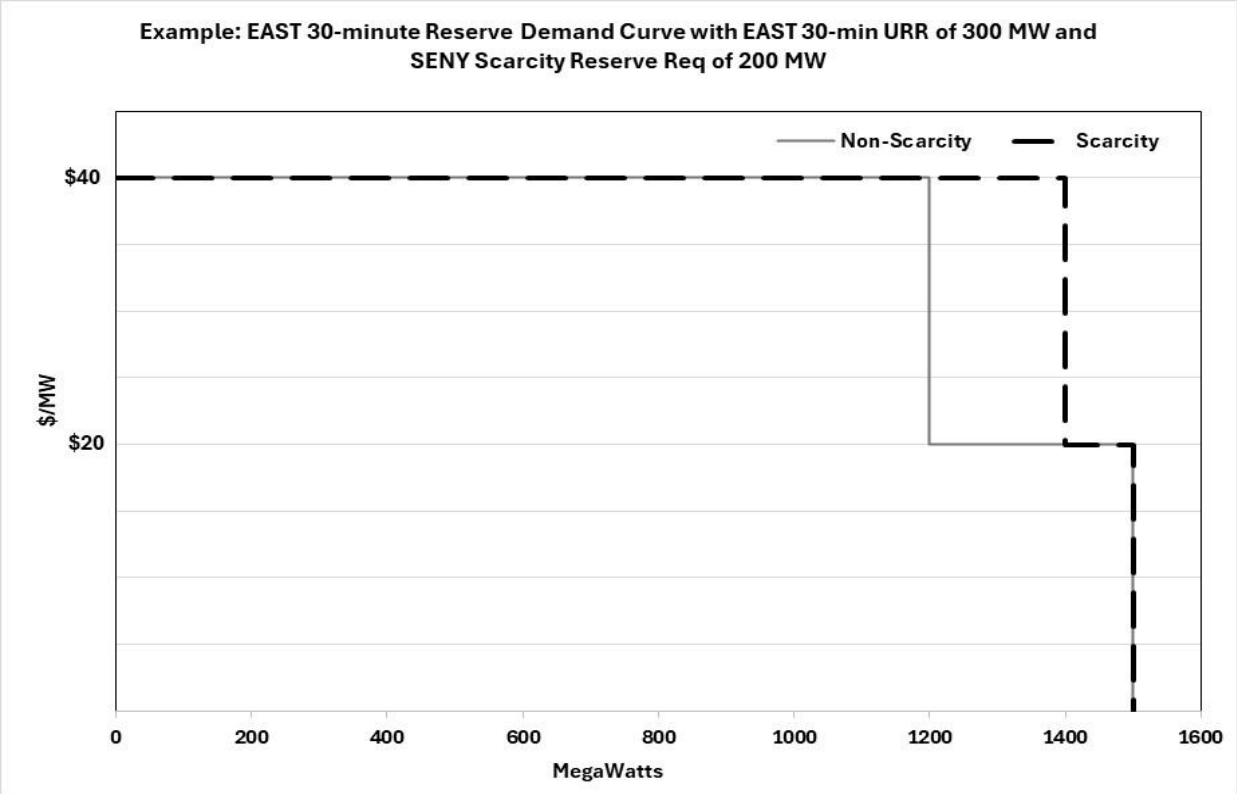
ii. The Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves target level will be increased by the

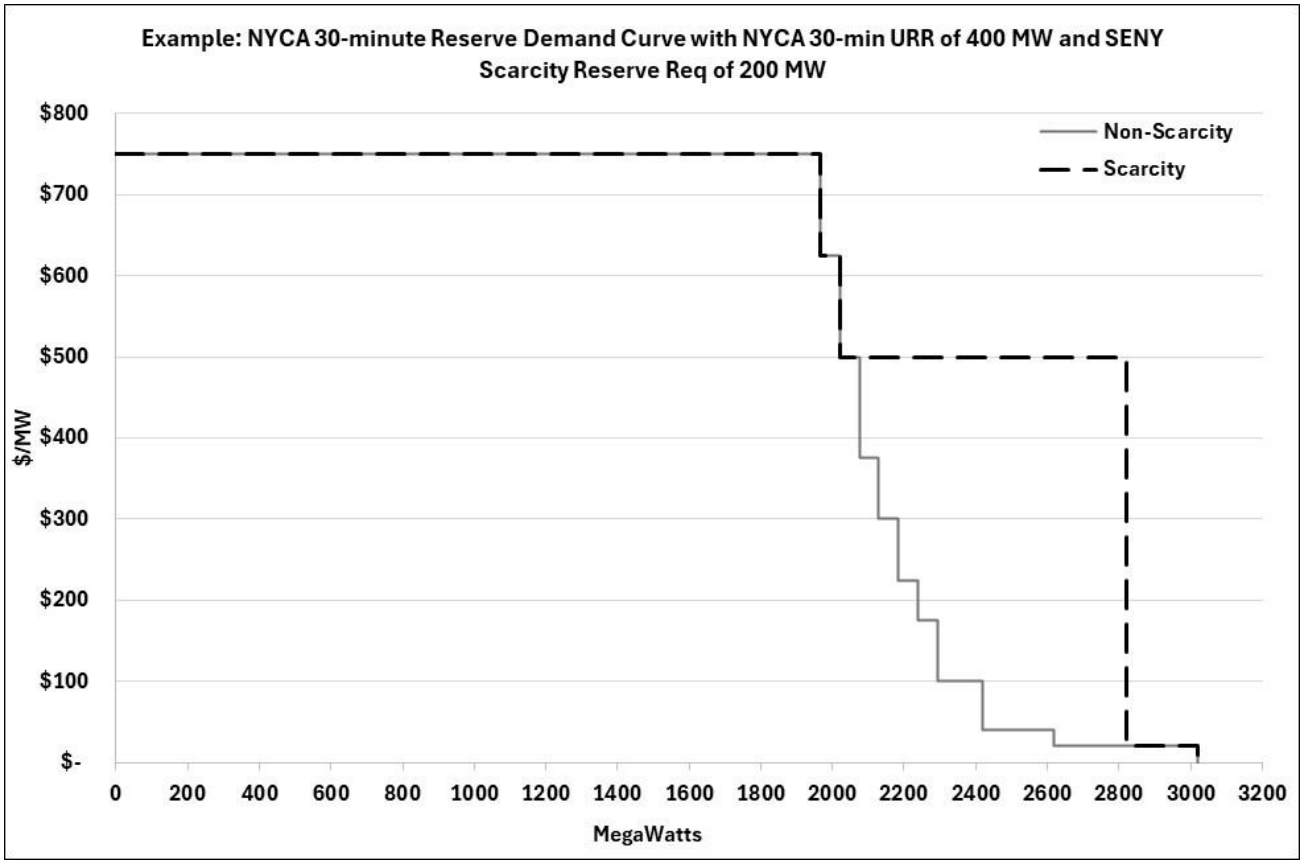
greater of (i) the value obtained from subtracting the Eastern, Southeastern, New York, or Long Island 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in East of Central-East exceeds the revised East of Central-East 30-minute reserve requirement minus the Eastern, Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised East of Central-East 30-minute

reserve requirement, the corresponding price on the East of Central-East 30-minute reserve demand curve will be $20/MW. . If the quantity of 30-minute reserve provided in East of Central-East is less than or equal to the revised East of Central-East 30-minute reserve requirement minus an amount equal to the Eastern, Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the East of Central-East 30-minute reserve demand curve will be $40/MW.

For example 1, consider that Southeastern New York is the only Scarcity Reserve Region identified, the additional Scarcity Reserve Requirement for Southeastern New York is calculated as 200 MW, SENY Incremental Flexible Reserve Requirement is 500 MW, and the SENY 30-Minute Uncertainty Reserve Requirement is calculated as 100 MW for an interval. In this example, the SENY 30-Minute URR is less than SENY's Scarcity Reserve Requirement. Also, it is assumed that the NYCA 30-Minute URR is 400 MW and the EAST 30-Minute URR is 300 MW, and so the SENY's Scarcity Reserve Requirement of 200 MW is less than NYCA 30-Minute URR and EAST 30-Minute URR. The applicable impacts to the affected 30-minute reserve demand curves during such real-time interval would be as follows:



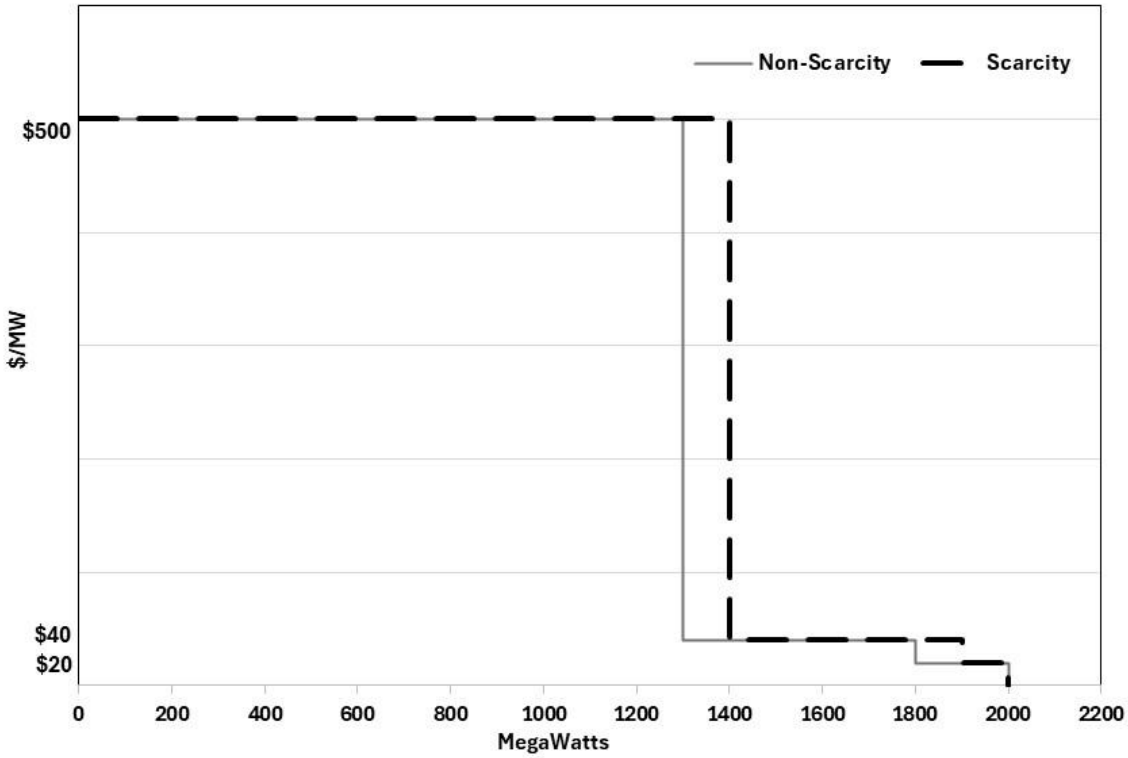

Example: EAST 30-minute Reserve Demand Curve with EAST 30-min URR of 300 MW and SENY Scarcity Reserve Req of 200 MW
Non-Scarcity
Scarcity
$40
$20
$/MW
0
200
400
600
800
1000
1200
1400
1600
MegaWatts


Example: NYCA 30-minute Reserve Demand Curve with NYCA 30-min URR of 400 MW and SENY Scarcity Reserve Req of 200 MW
Non-Scarcity
Scarcity
$800
$700
$600
$500
$400
$300
$200
$100
$-
$/MW
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
MegaWatts

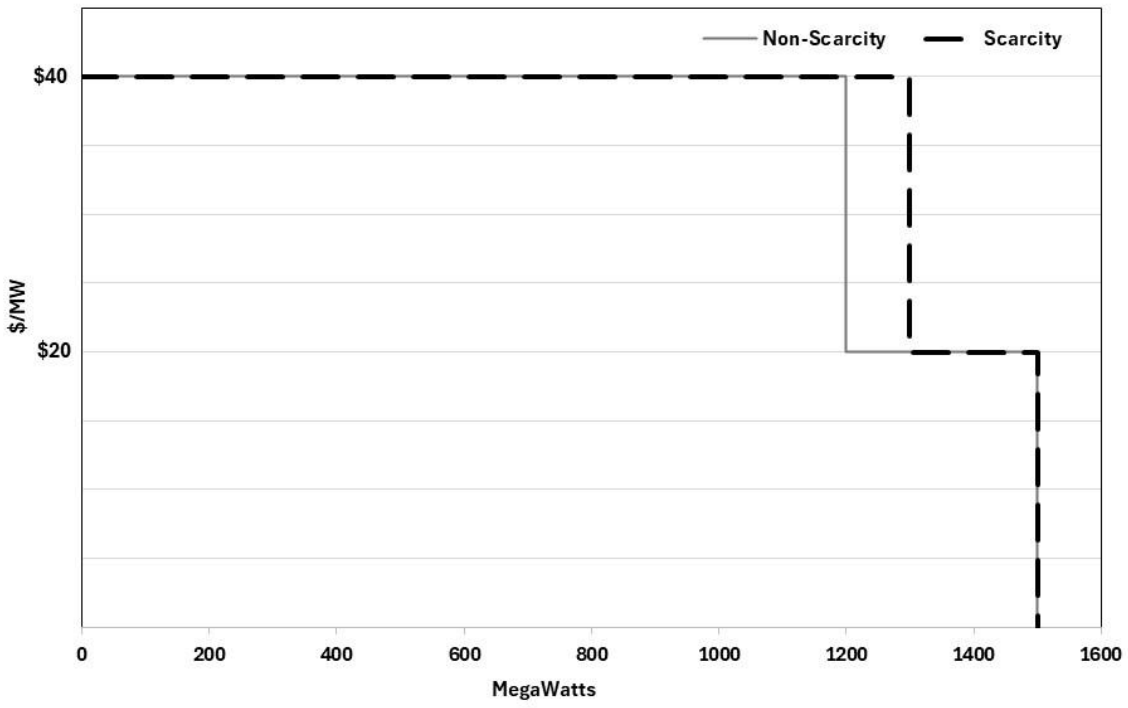
In the above example, no other 30-minute reserve demand curves are modified.

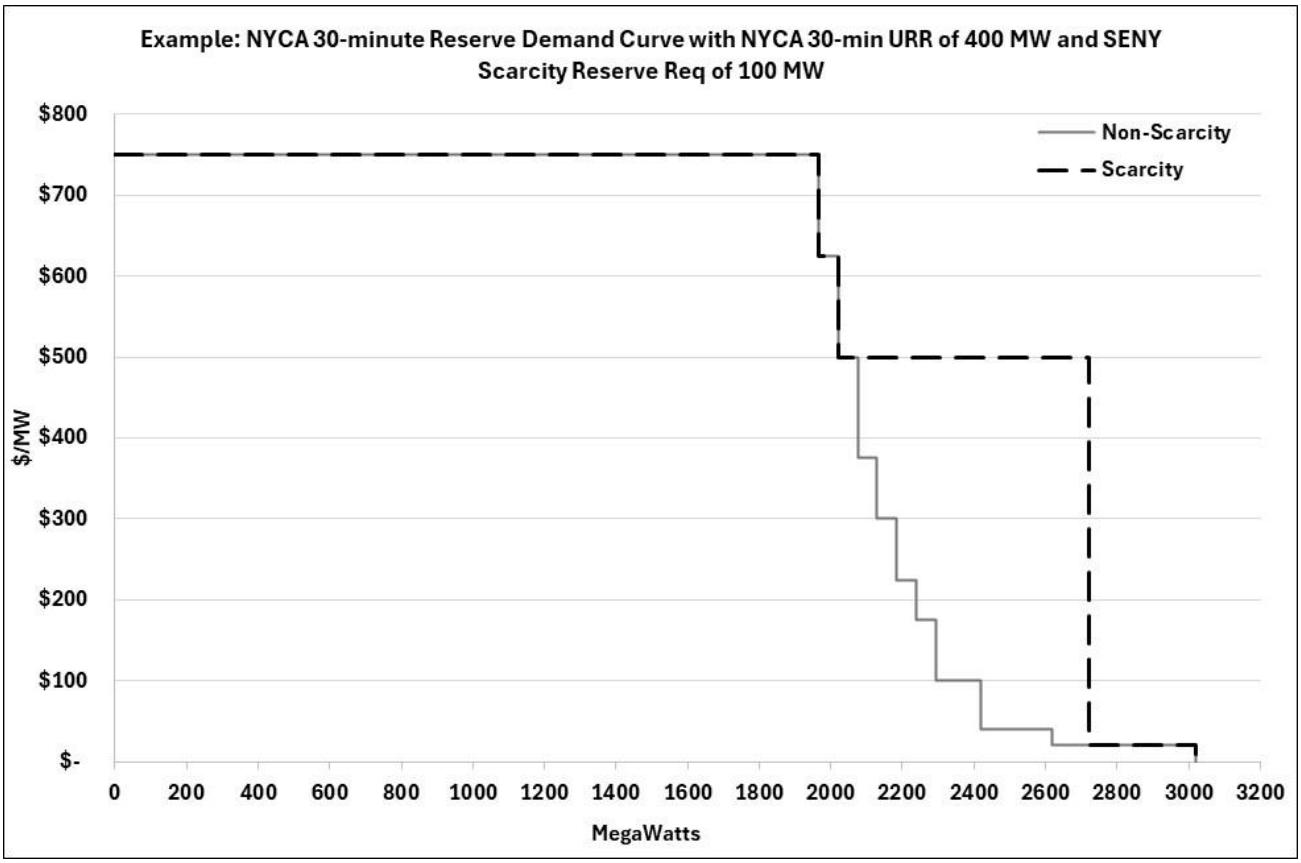
For example 2, consider that Southeastern New York is the only Scarcity Reserve Region identified, the additional Scarcity Reserve Requirement for Southeastern New York is calculated as 100 MW, SENY Incremental Flexible Reserve Requirement is 500 MW, and the SENY 30-Minute Uncertainty Reserve Requirement is calculated as 200 MW for an interval. In this example, the SENY 30-Minute URR is greater than SENY's Scarcity Reserve Requirement. Also, it is assumed that the NYCA 30-Minute URR is 400 MW and the EAST 30-Minute URR is 300 MW, and so the SENY's Scarcity Reserve Requirement of 200 MW is less than NYCA and EAST 30-Minute URR. The applicable impacts to the affected 30-minute reserve demand curves during such real-time interval would be as follows:

Example: SENY 30-minute Reserve Demand Curve when SENY 30-min URR of 200 MW > SENY Scarcity Reserve Req of 100 MW




Example: EAST 30-minute Reserve Demand Curve with EAST 30-min URR of 300 MW and SENY Scarcity Reserve Req of 100 MW






In the above example, no other 30-minute reserve demand curves are modified.

4. If N.Y.C. (Load Zone J) is identified as a Scarcity Reserve Region, then the N.Y.C. 30- Minute Reserves target level will be increased by the greater of (i) the value obtained from subtracting the New York City 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in N.Y.C. exceeds the revised N.Y.C. 30-minute reserve requirement minus an amount equal to the greater of (i) zero or (ii) a value obtained from subtracting the Scarcity Reserve Requirement from the N.Y.C. 30-Minute Uncertainty Reserve Requirement but is less than or equal to the revised N.Y.C. 30-minute reserve requirement, the corresponding price on the New York City 30-minute reserve demand curve shall be $20/MW. If the quantity of 30-minute reserve provided in N.Y.C. exceeds the revised N.Y.C. 30-minute reserve requirement minus a value equal to the sum of the N.Y.C. 30-Minute Reserves target level and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the New York City 30-Minute Uncertainty Reserve Requirement but is less than or equal to the revised N.Y.C. 30-minute reserve requirement minus an amount equal to the greater of (i) zero or (ii) a value obtained from subtracting the Scarcity Reserve Requirement from the N.Y.C. 30-Minute Uncertainty Reserve Requirement, the corresponding price in the N.Y.C. 30-minute reserve demand curve will be $25/MW. If the quantity of

30-minute reserve provided on N.Y.C. is less than or equal to the revised N.Y.C. 30-minute reserve requirement minus a value equal to the sum of the N.Y.C. 30-Minute Reserves target level and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the N.Y.C. 30-Minute Uncertainty Reserve Requirement, the corresponding price on the N.Y.C. 30-minute reserve demand curve will be $500/MW. Additionally:

i. The NYCA 30- Minute Reserves target level will be increased by the greater of (i) the value obtained from subtracting the total 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $20/MW. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $500/MW. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $625/MW. If the quantity of 30-minute reserve provided in the NYCA is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $750/MW.

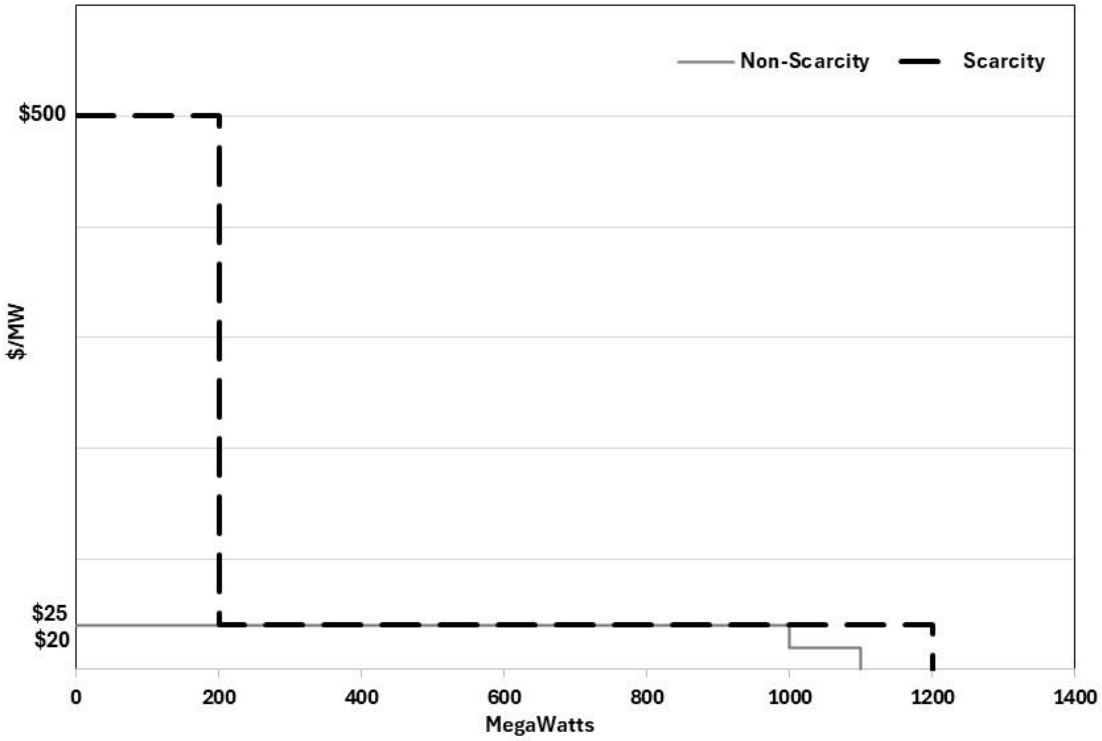
ii. The Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves target level will be increased by the greater of (i) the value obtained from subtracting the Eastern, Southeastern, New York, or Long Island 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in East of Central-East exceeds the revised East of Central-East 30-minute reserve requirement minus the Eastern, Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised East of Central-East 30-minute reserve requirement, the corresponding price on the East of Central-East 30-minute reserve demand curve will be $20/MW. . If the quantity of 30-minute reserve provided in East of Central-East is less than or equal to the revised East of Central-East 30-minute reserve requirement minus an amount equal to the Eastern, Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the East of Central-East 30-minute reserve demand curve will be $40/MW.

iii. The applicable Southeastern, New York City, or Long Island 30-Minute Reserves target level(accounting for any applicable SENY incremental reserve target level) will be increased by the greater of (i) the value obtained from subtracting the Eastern, Southeastern, New York, or Long Island 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in SENY exceeds the revised SENY 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised SENY 30-minute reserve requirement, the corresponding price on the SENY 30-minute reserve demand curve will be $20/MW. If the quantity of 30-minute reserve provided in SENY exceeds the revised SENY 30-minute reserve requirement minus a value equal to the sum of the SENY incremental reserve target level and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised SENY 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the SENY 30-minute reserve demand

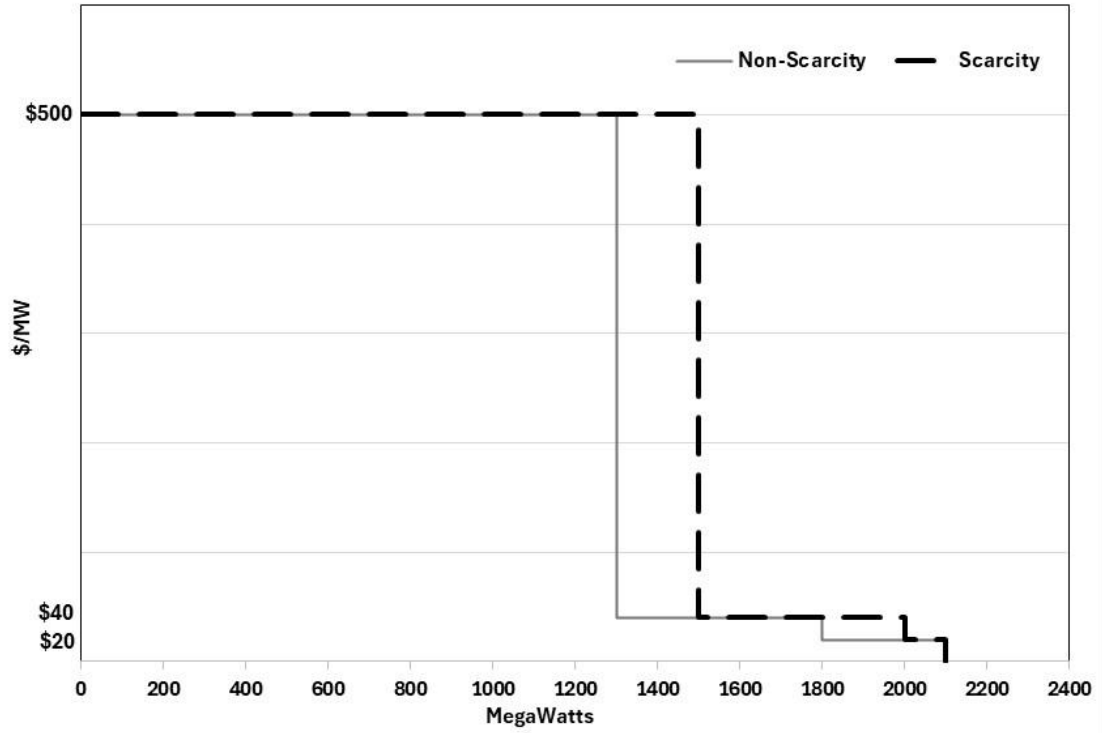
curve will be $40/MW. If the quantity of 30-minute reserve provided in Southeastern New York is less than or equal to the revised SENY 30-minute reserve requirement minus a value equal to the sum of the SENY incremental reserve target level and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the Southeastern New York 30-minute reserve demand curve will be $500/MW.

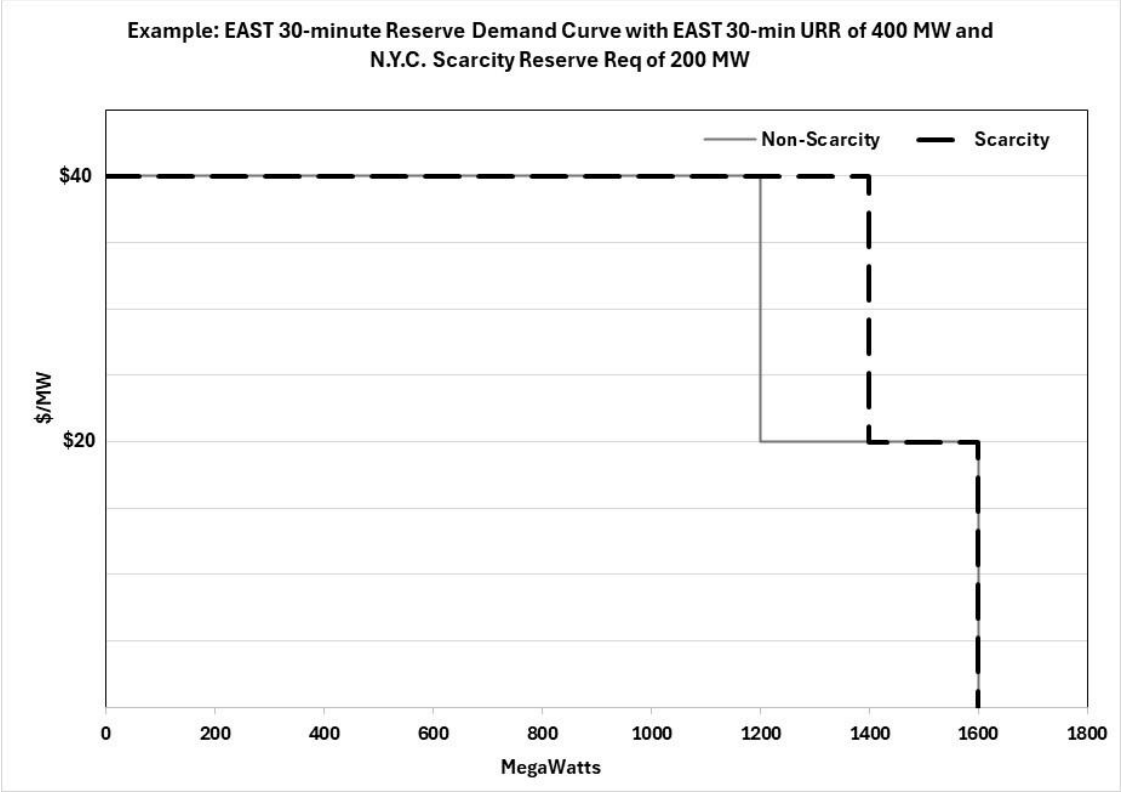
For example 1, consider that N.Y.C. is the only Scarcity Reserve Region identified, the additional Scarcity Reserve Requirement for N.Y.C. is calculated as 200 MW, and the N.Y.C. 30-Minute Uncertainty Reserve Requirement is calculated as 100 MW for an interval. In this example, the N.Y.C. 30-Minute URR is less than N.Y.C.'s Scarcity Reserve Requirement. Also, it is assumed that the NYCA 30-Minute URR is 500 MW, the EAST 30-Minute URR is 400 MW, the SENY 30-Minute URR is 300 MW, the SENY Incremental Flexible Reserve Requirement is 500 MW, and so N.Y.C.'s Scarcity Reserve Requirement of 200 MW is less than NYCA 30-Minute URR, EAST 30-Minute URR, and SENY 30-Minute URR. The applicable impacts to the affected 30-minute reserve demand curves during such real-time interval would be as follows (note that, in this example, because the Load Zone that comprises the Scarcity Reserve Region does not belong to Long Island, no adjustments would be made to the otherwise applicable 30-minute reserve demand curve for the Long Island region):

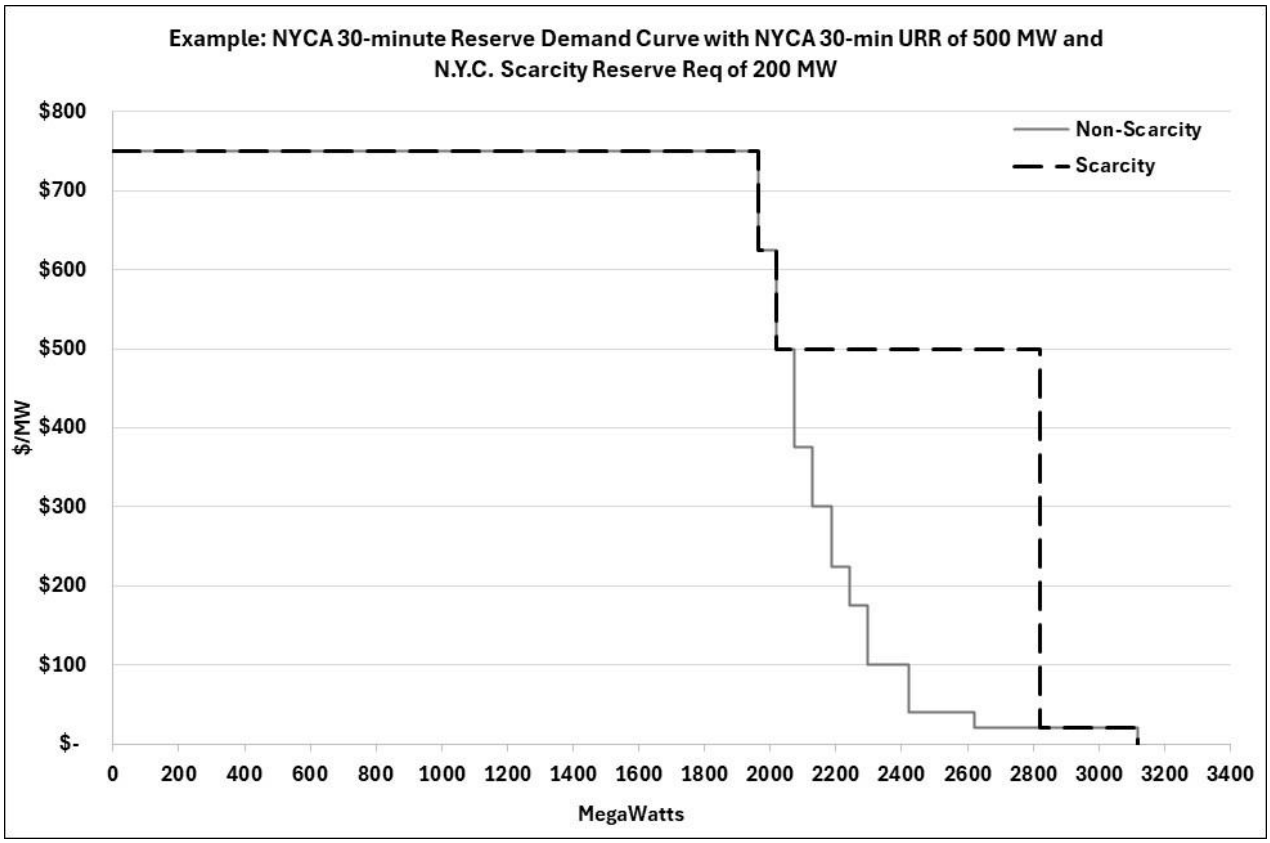
Example: N.Y.C. 30-minute Reserve Demand Curve when N.Y.C. 30-min URR of 100 MW < N.Y.C. Scarcity Reserve Req of 200 MW




Example: SENY 30-minute Reserve Demand Curve with SENY 30-min URR of 300 MW and N.Y.C. Scarcity Reserve Req of 200 MW



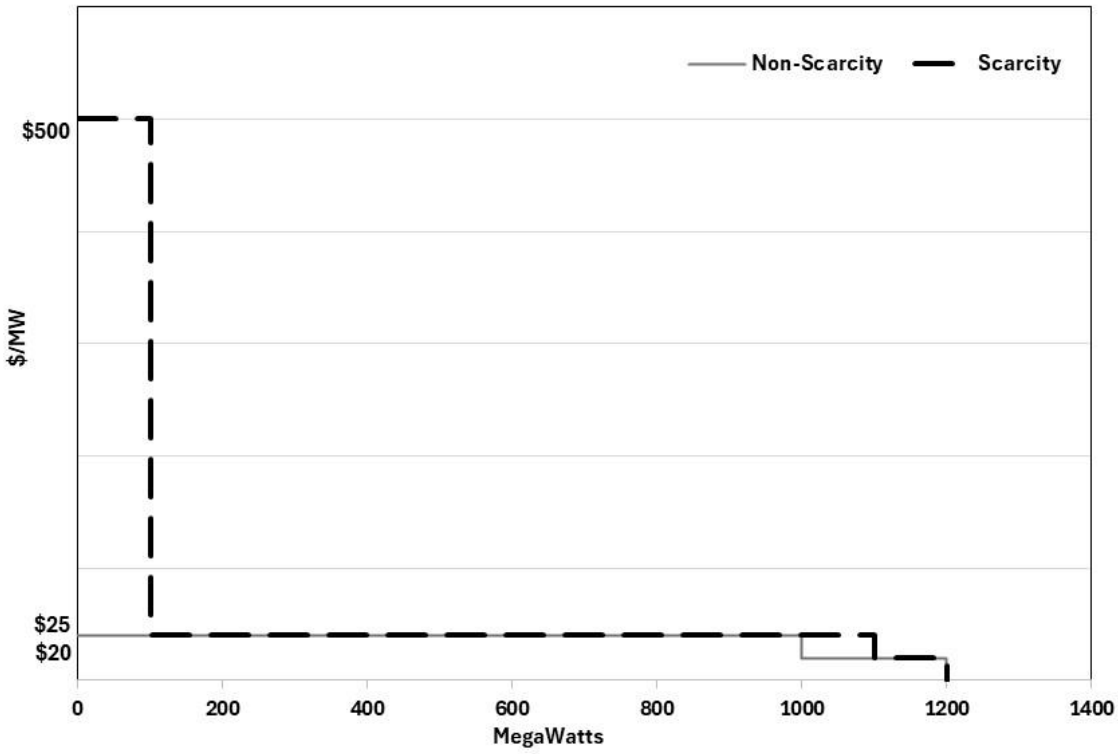

Example: EAST 30-minute Reserve Demand Curve with EAST 30-min URR of 400 MW and N.Y.C. Scarcity Reserve Req of 200 MW
Non-Scarcity
Scarcity
$40
$20
$/MW
0
200
400
600
800
1000
1200
1400
1600
1800
MegaWatts


Example: NYCA 30-minute Reserve Demand Curve with NYCA 30-min URR of 500 MW and N.Y.C. Scarcity Reserve Req of 200 MW
Non-Scarcity
Scarcity
$800
$700
$600
$500
$400
$300
$200
$100
$-
$/MW
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
MegaWatts

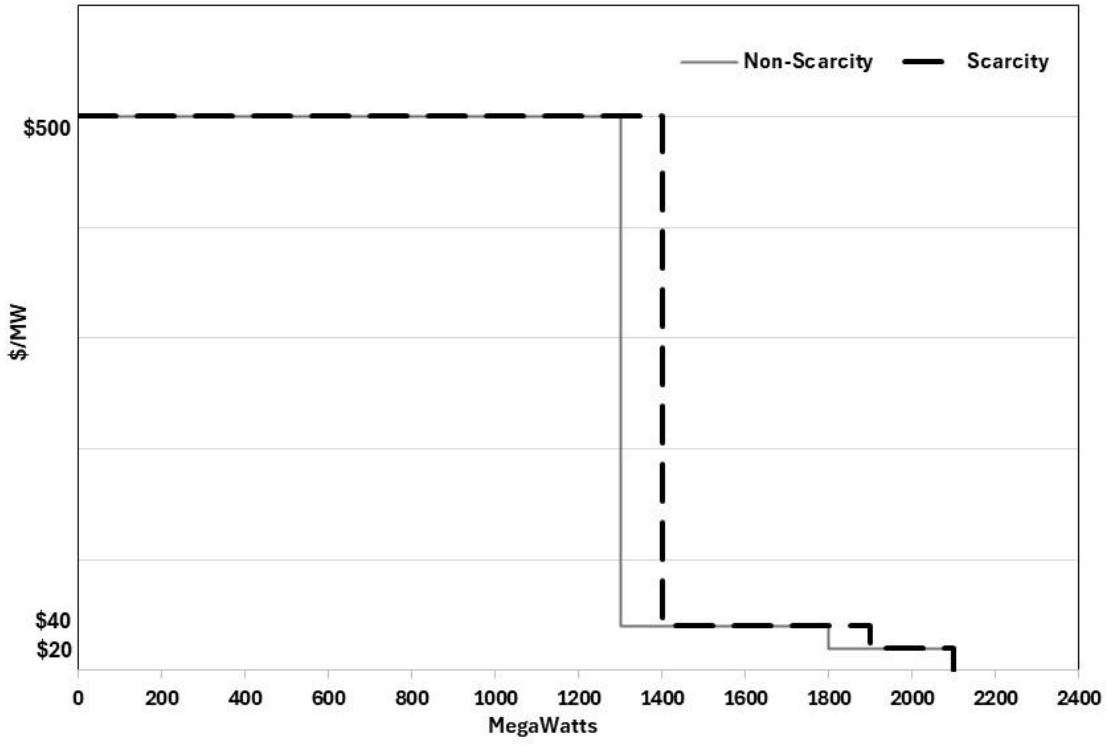
In the above example, no other 30-minute reserve demand curves are modified.

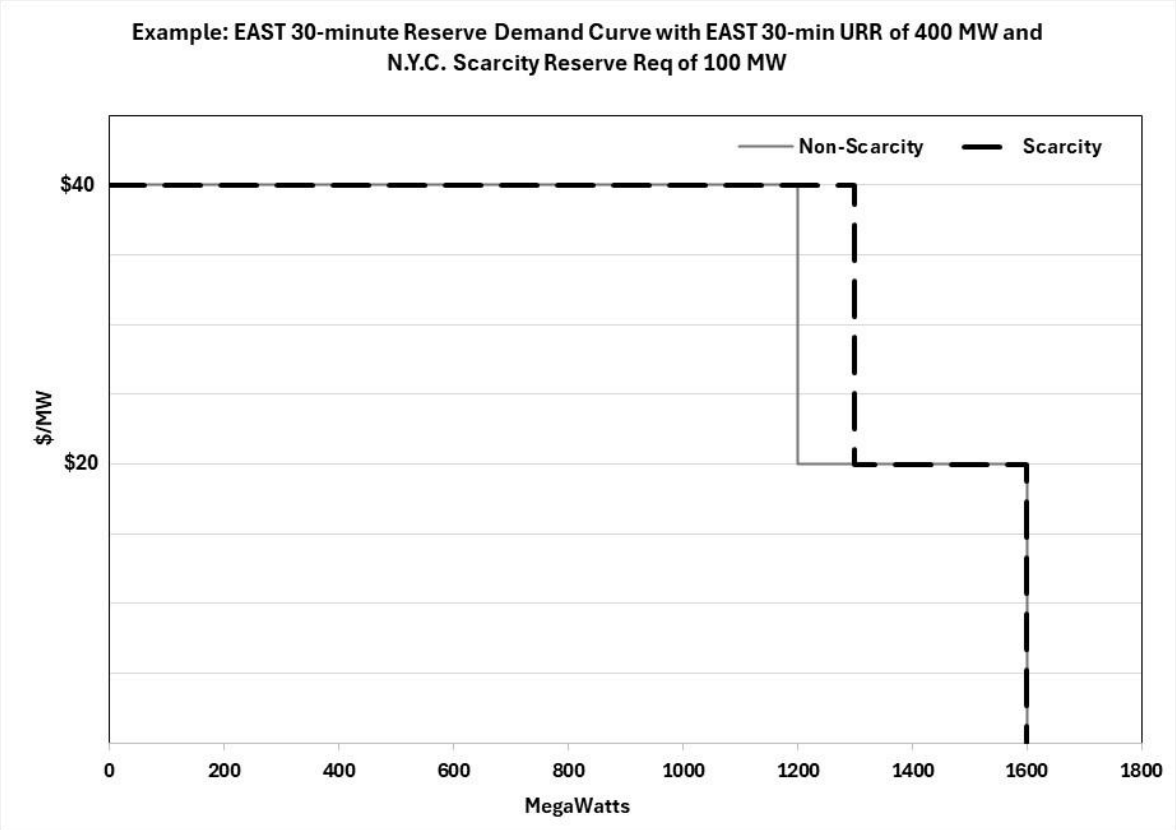
For example 2, consider that N.Y.C. is the only Scarcity Reserve Region identified, the additional Scarcity Reserve Requirement for N.Y.C. is calculated as 100 MW, and the N.Y.C. 30-Minute Uncertainty Reserve Requirement is calculated as 200 MW for an interval. In this example, the N.Y.C. 30-Minute URR is greater than N.Y.C.'s Scarcity Reserve Requirement. Also, it is assumed that the NYCA 30-Minute URR is 500 MW, the EAST 30-Minute URR is 400 MW, the SENY 30-Minute URR is 300 MW, the SENY Incremental Flexible Reserve Requirement is 500 MW, and so N.Y.C.'s Scarcity Reserve Requirement of 100 MW is less than NYCA 30-Minute URR, EAST 30-Minute URR, and SENY 30-Minute URR. The applicable impacts to the affected 30-minute reserve demand curves during such real-time interval would be as follows:

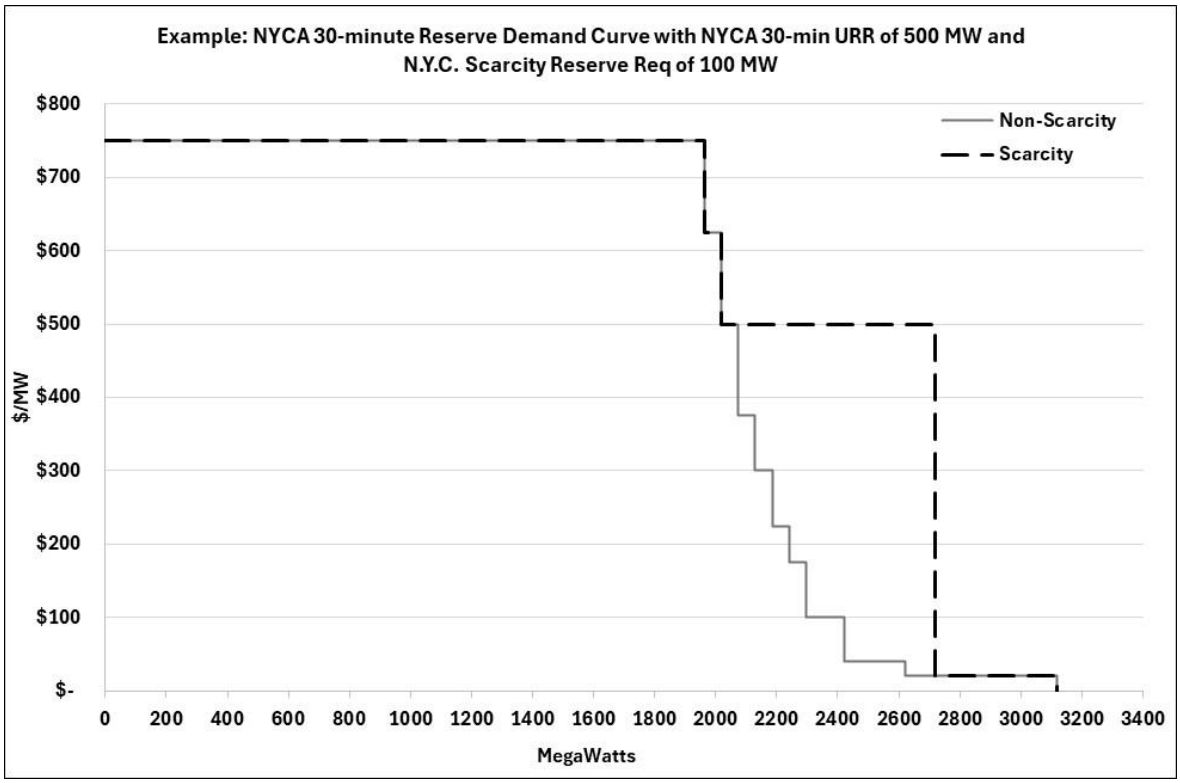
Example: N.Y.C. 30-minute Reserve Demand Curve when N.Y.C. 30-min URR of 200 MW > N.Y.C. Scarcity Reserve Req of 100 MW




Example: SENY 30-minute Reserve Demand Curve with SENY 30-min URR of 300 MW and N.Y.C. Scarcity Reserve Req of 100 MW






In the above example, no other 30-minute reserve demand curves are modified.

5. If LI (Load Zone K) is identified as a Scarcity Reserve Region, then the LI 30-Minute Reserves target level will be increased by the greater of (i) the value obtained from subtracting the LI 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in LI exceeds the revised LI 30-minute reserve requirement minus an amount equal to the greater of (i) zero or (ii) a value obtained from subtracting the Scarcity Reserve Requirement from the LI 30-Minute Uncertainty Reserve Requirement but is less than or equal to the revised LI 30-minute reserve requirement, the corresponding price on the LI 30-minute reserve demand curve shall be $20/MW. If the quantity of 30-minute reserve provided on LI exceeds the revised LI 30-minute reserve requirement minus a value equal to the sum of the LI 30-Minute Reserves target level and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the LI 30-Minute Uncertainty Reserve Requirement but is less than or equal to the revised LI 30-minute reserve requirement minus an amount equal to the greater of (i) zero or (ii) a value obtained from subtracting the Scarcity Reserve Requirement from the LI 30-Minute Uncertainty Reserve Requirement, the corresponding price on the LI 30-minute reserve demand curve will be $25/MW. If the quantity of 30-minute reserve provided on LI is less than or equal to the revised LI 30-minute reserve requirement minus a value equal to the sum of the LI 30-Minute Reserves target level and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the LI 30-Minute Uncertainty Reserve Requirement, the corresponding price on the LI 30-minute reserve demand curve will be $500/MW. Additionally:

   i. The NYCA 30-Minute Reserve target level will be increased by the greater of (i) the value obtained from subtracting the total 30-Minute Uncertainty Reserve Requirement from the Scarcity

      Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $20/MW. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve

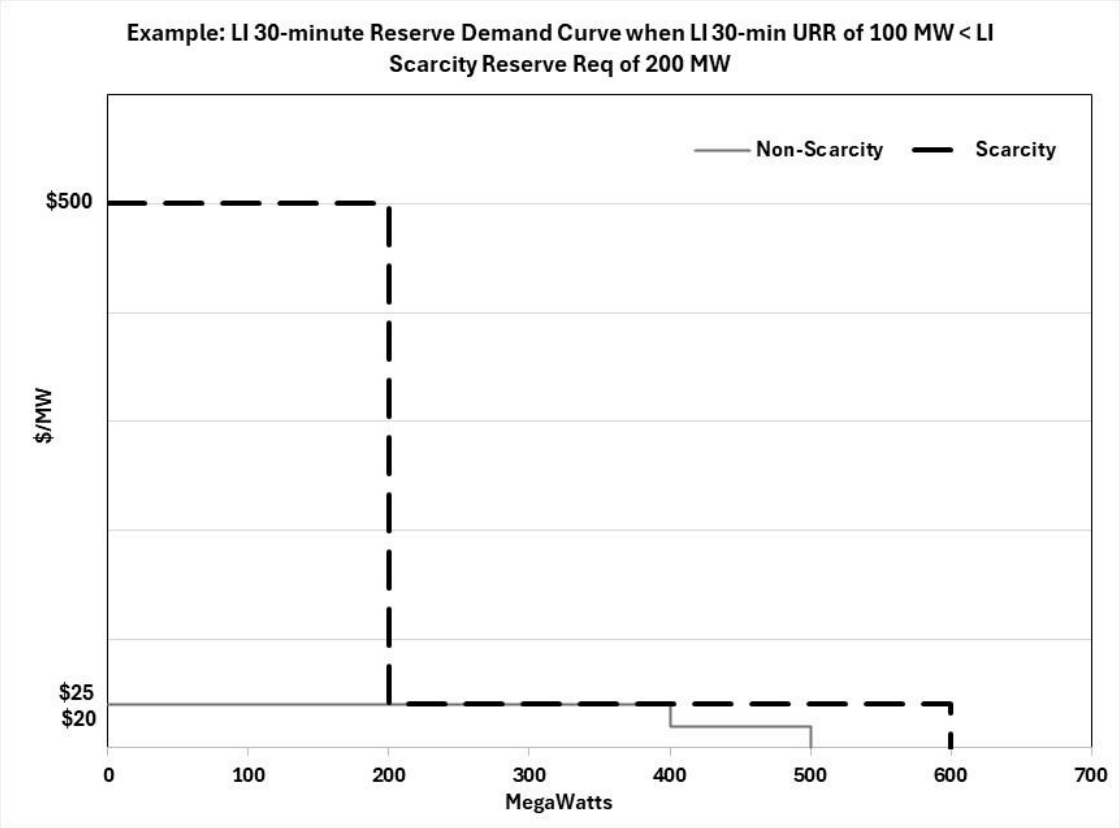
Requirement from the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $500/MW. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $625/MW. If the quantity of 30-minute reserve provided in the NYCA is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $750/MW.

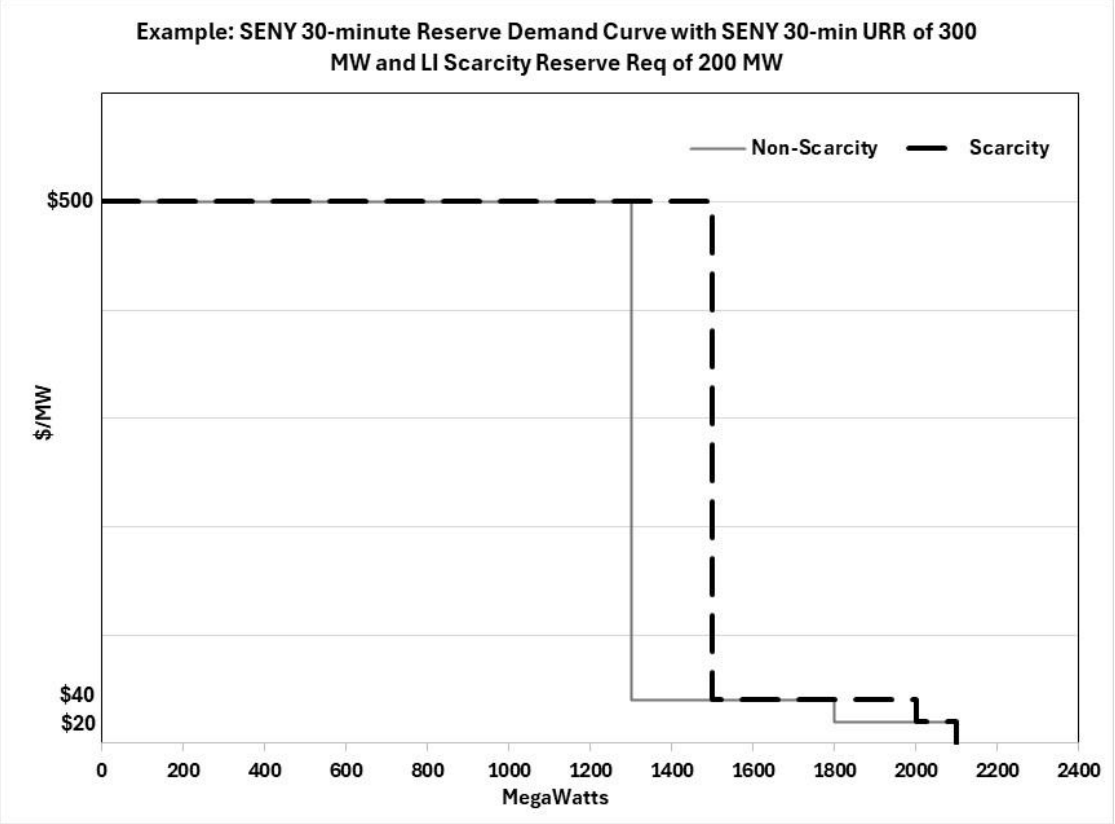
ii. The Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves target level will be increased by the greater of (i) the value obtained from subtracting the Eastern, Southeastern, New York, or Long Island 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in East of Central-East exceeds the revised East of Central-East 30-minute reserve requirement minus the Eastern, Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised East of Central-East 30-minute reserve requirement, the corresponding price on the East of Central-East 30-minute reserve demand curve will be $20/MW. If the quantity of 30-minute reserve provided in East of Central-East is less than or equal to the revised East of Central-East 30minute reserve requirement, the corresponding price on the East of Central-East 30-minute reserve demand curve will be $40/MW.

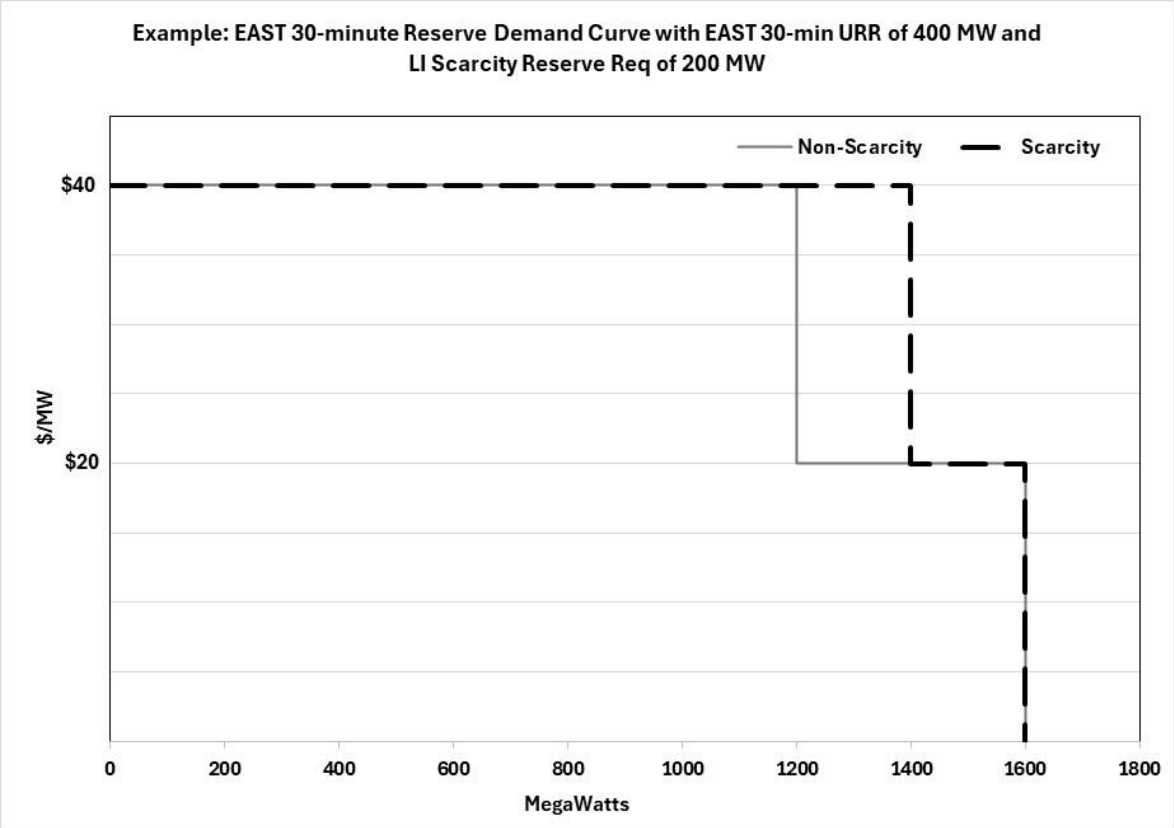
iii. The applicable Southeastern, New York City, or Long Island 30-Minute Reserves target level (accounting for any applicable SENY incremental reserve target level) will be increased by the greater of (i) the value obtained from subtracting the Southeastern, New York, or Long Island 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in SENY exceeds the revised SENY 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve

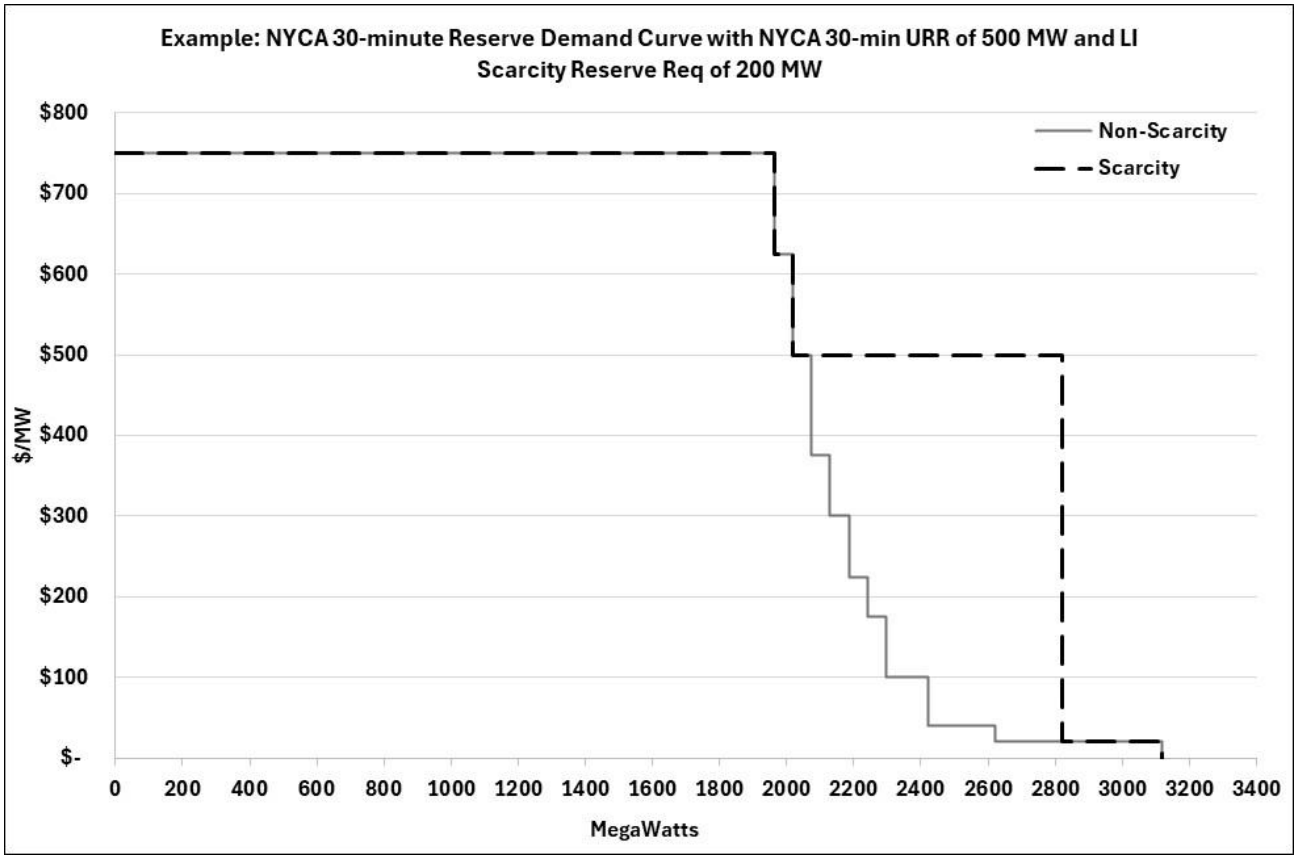
Requirement from the Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised SENY 30-minute reserve requirement, the corresponding price on the SENY 30-minute reserve demand curve will be $20/MW. If the quantity of 30-minute reserve provided in SENY exceeds the revised SENY 30-minute reserve requirement minus a value equal to the sum of the SENY incremental reserve target level and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised SENY 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the SENY 30-minute reserve demand curve will be $40/MW. If the quantity of 30-minute reserve provided in Southeastern New York is less than or equal to the revised SENY 30-minute reserve requirement minus a value equal to the sum of the SENY incremental reserve target level and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the Southeastern New York 30-minute reserve demand curve will be $500/MW.

For example 1, consider that LI is the only Scarcity Reserve Region identified, the additional Scarcity Reserve Requirement for LI is calculated as 200 MW, the LI Reserve Requirement is 400 MW, and the LI 30-Minute Uncertainty Reserve Requirement is calculated as 100 MW for an interval. In this example, the LI 30-Minute URR is less than LI's Scarcity Reserve Requirement. Also, it is assumed that the NYCA 30-Minute URR is 500 MW, the EAST 30-Minute URR is 400 MW, the SENY 30-Minute URR is 300 MW, the SENY Incremental Flexible Reserve Requirement is 500 MW, and so LI's Scarcity Reserve Requirement of 200 MW is less than NYCA 30-Minute URR, EAST 30-Minute URR, and SENY 30-Minute URR. The applicable impacts to the affected 30-minute reserve demand curves during such real-time interval would be as follows (note that, in this example, because the Load Zone that comprises the Scarcity Reserve Region does not belong to New York City, no adjustments would be made to the otherwise applicable 30-minute reserve demand curve for the New York City region):


Example: LI 30-minute Reserve Demand Curve when LI 30-min URR of 100 MW < LI Scarcity Reserve Req of 200 MW
Non-Scarcity
Scarcity
$500
$25
$20
$/MW
0
100
200
300
400
500
600
700
MegaWatts

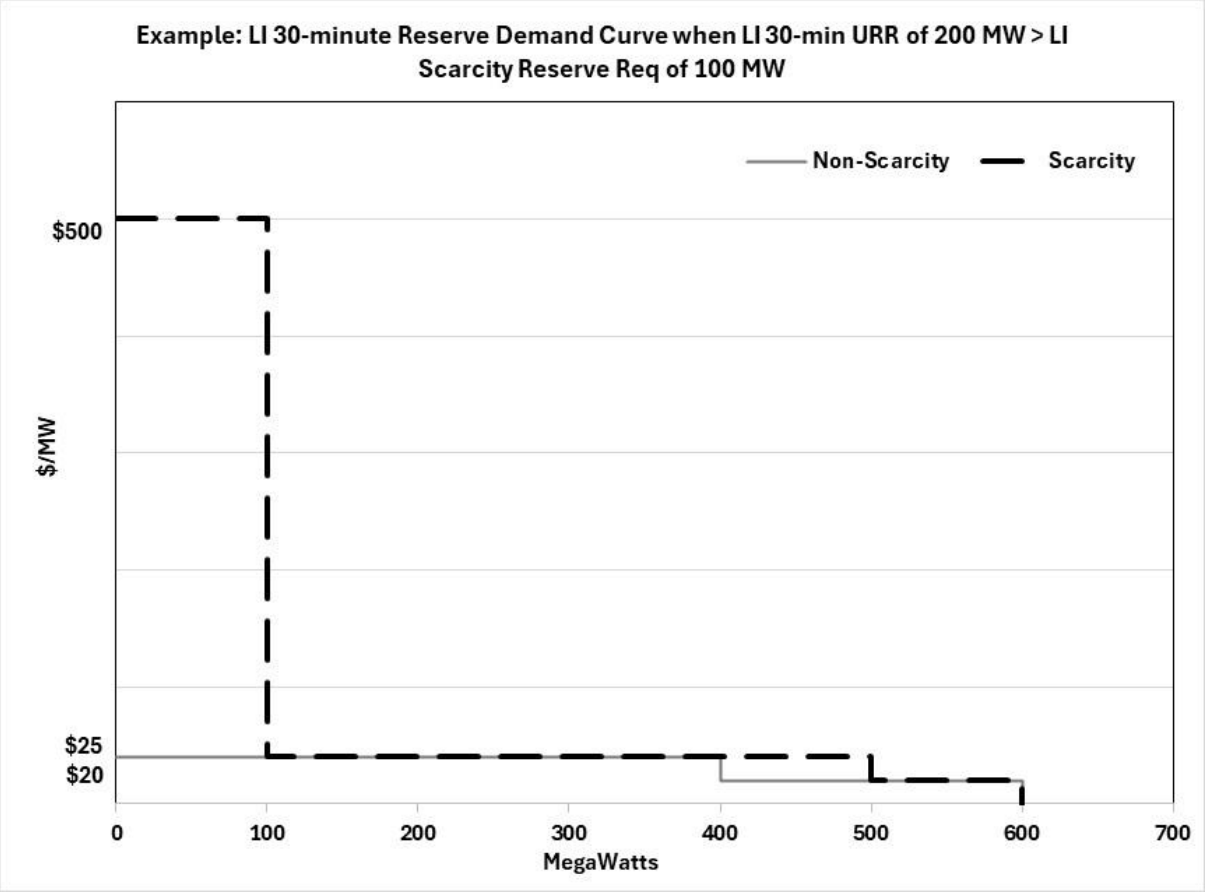

Example: SENY 30-minute Reserve Demand Curve with SENY 30-min URR of 300 MW and LI Scarcity Reserve Req of 200 MW
Non-Scarcity
Scarcity
$500
$40
$20
$/MW
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
MegaWatts


Example: EAST 30-minute Reserve Demand Curve with EAST 30-min URR of 400 MW and LI Scarcity Reserve Req of 200 MW
Non-Scarcity
Scarcity
$40
$20
$/MW
0
200
400
600
800
1000
1200
1400
1600
1800
MegaWatts

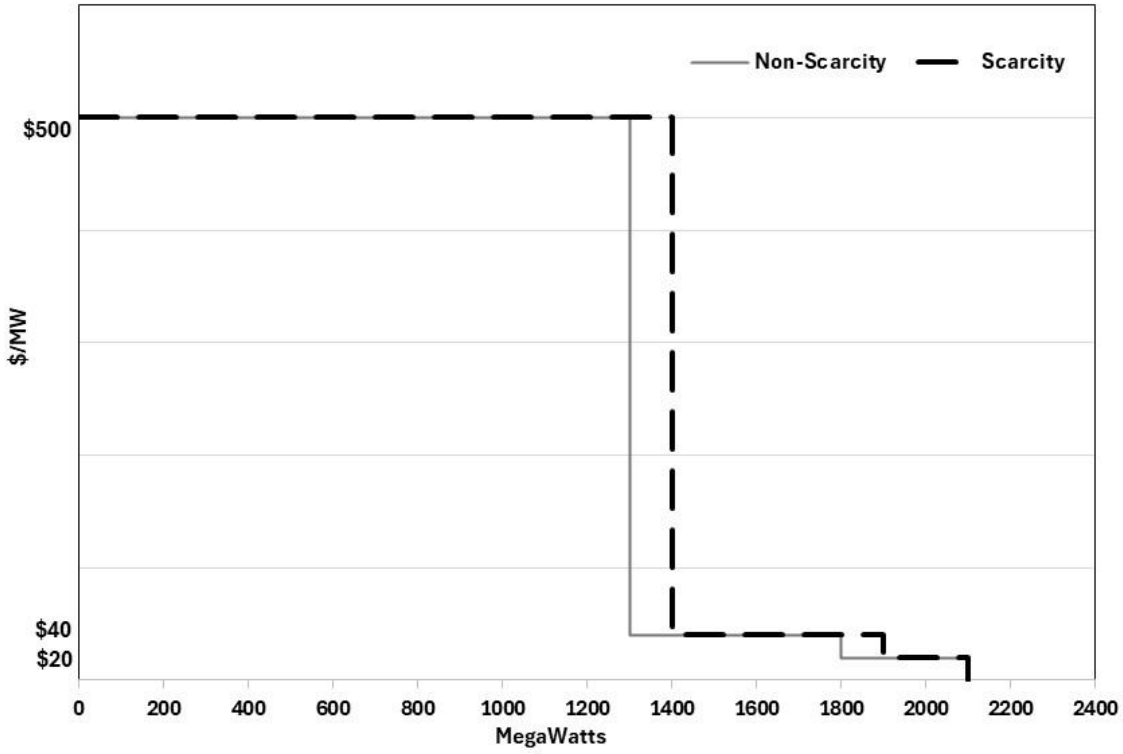

Example: NYCA 30-minute Reserve Demand Curve with NYCA 30-min URR of 500 MW and LI Scarcity Reserve Req of 200 MW
Non-Scarcity
Scarcity
$800
$700
$600
$500
$400
$300
$200
$100
$-
$/MW
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
MegaWatts

In the above example, no other 30-minute reserve demand curves are modified.

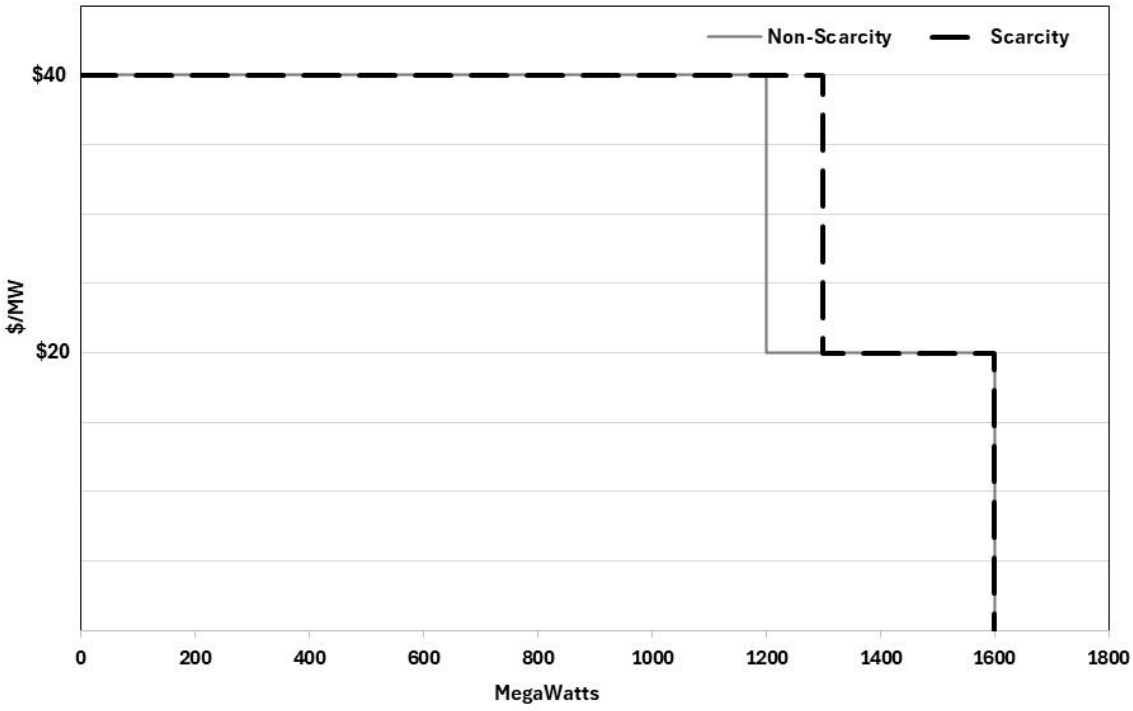
For example 2, consider that LI is the only Scarcity Reserve Region identified, the additional Scarcity Reserve Requirement for LI is calculated as 100 MW, the LI Reserve Requirement is 400 MW, and the LI 30-Minute Uncertainty Reserve Requirement is calculated as 200 MW for an interval. In this example, the LI 30-Minute URR is greater than LI's Scarcity Reserve Requirement. Also, it is assumed that the NYCA 30-Minute URR is 500 MW, the EAST 30-Minute URR is 400 MW, the SENY 30-Minute URR is 300 MW, the SENY Incremental Flexible Reserve Requirement is 500 MW, and so LI's Scarcity Reserve Requirement of 100 MW is less than NYCA 30-Minute URR, EAST 30-Minute URR, and SENY 30-Minute URR. The applicable impacts to the affected 30-minute reserve demand curves during such real-time interval would be as follows:

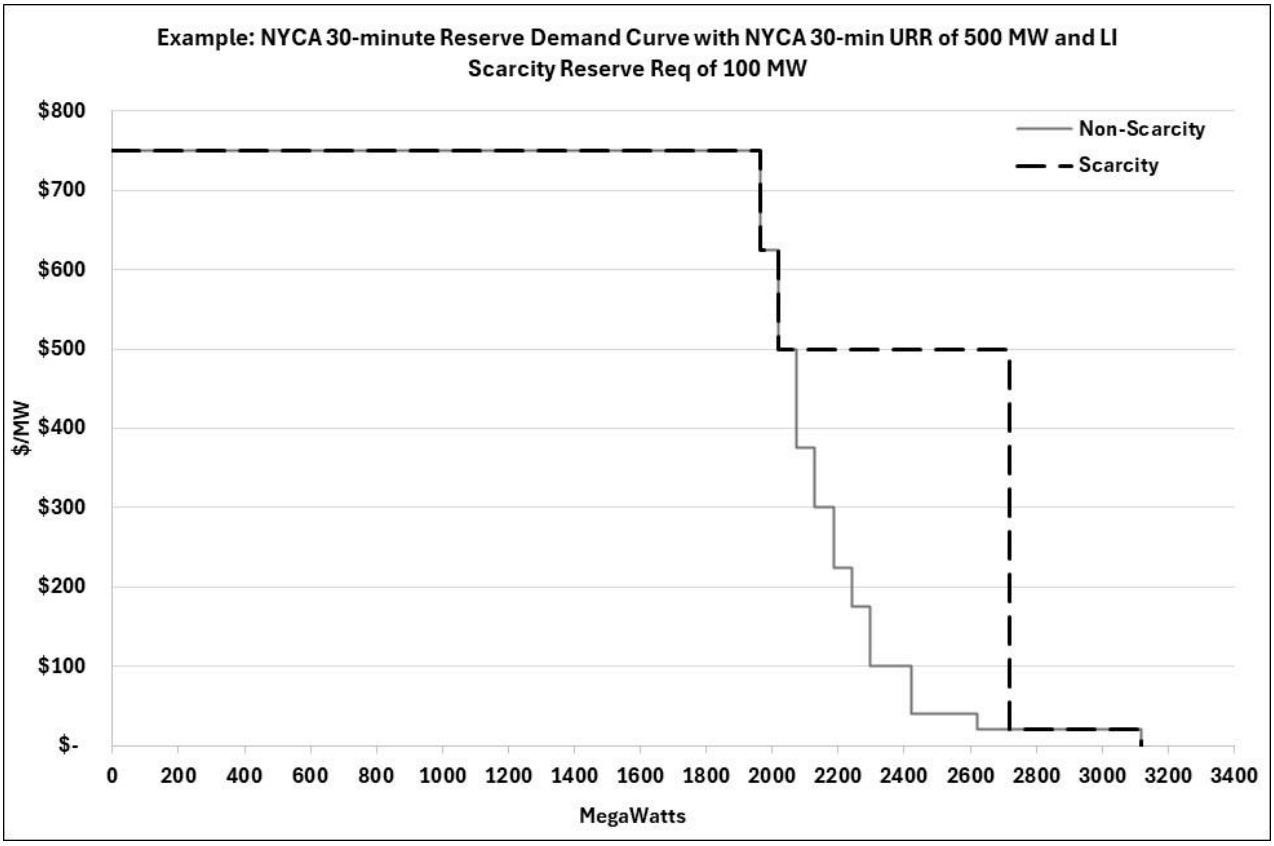


Example: SENY 30-minute Reserve Demand Curve with SENY 30-min URR of 300 MW and LI Scarcity Reserve Req of 100 MW




Example: EAST 30-minute Reserve Demand Curve with EAST 30-min URR of 400 MW and LI Scarcity Reserve Req of 100 MW






In the above example, no other 30-minute reserve demand curves are modified.

6. If a Scarcity Reserve Region is identified that is not NYCA, East of Central-East, Southeastern New York, New York City, or Long Island, then that Scarcity Reserve Region will have a single demand curve price of $500/MW for the applicable Scarcity Reserve Requirement relating thereto. Additionally:

    i. The NYCA 30-Minute Reserve target level will be increased by the greater of (i) the value obtained from subtracting the total 30-Minute Uncertainty Reserve Requirement from the Scarcity

    Reserve Requirement, or (ii) zero. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $20/MW. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or

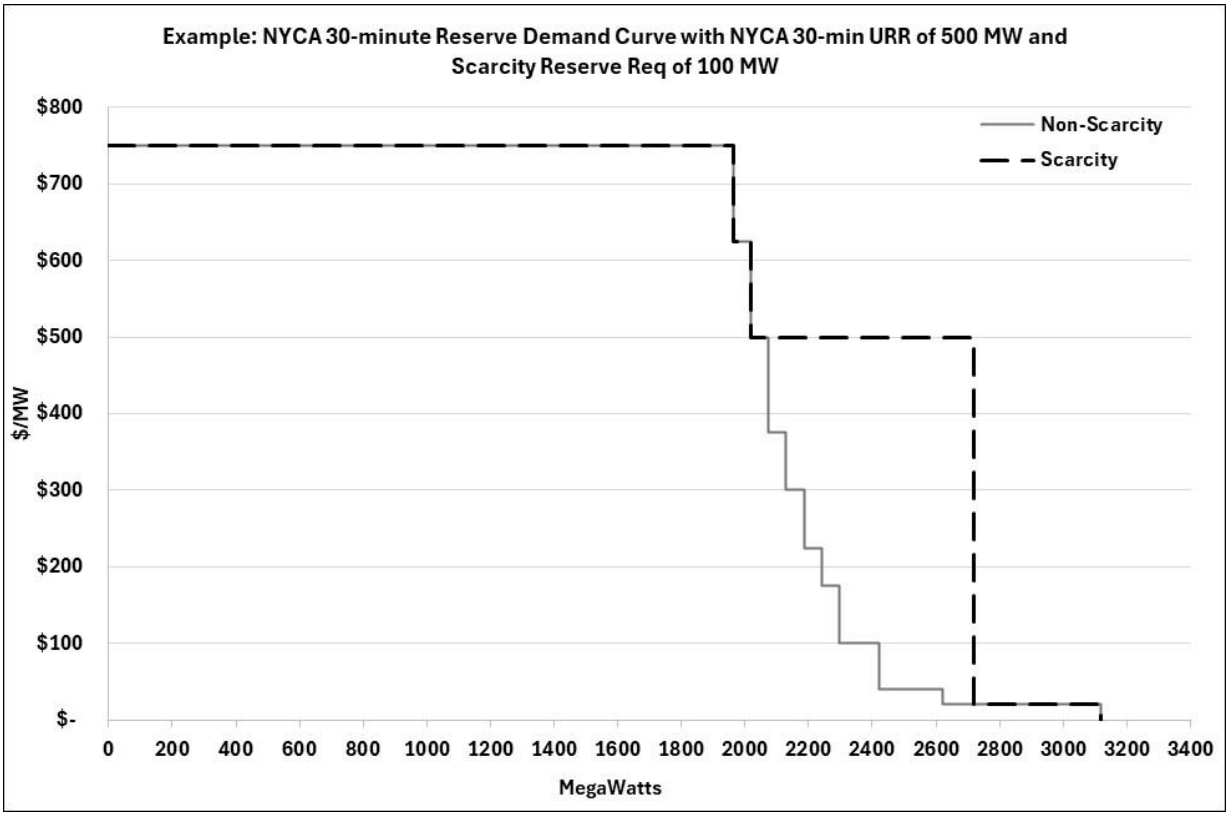
equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $500/MW. If the quantity of 30-minute reserve provided in the NYCA exceeds the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 600 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $625/MW. If the quantity of 30-minute reserve provided in the NYCA is less than or equal to the revised NYCA 30-minute reserve requirement minus an amount equal to the sum of 655 MW and the greater of the Scarcity Reserve Requirement or the total 30-Minute Uncertainty Reserve Requirement, the corresponding price on the NYCA 30-minute reserve demand curve will be $750/MW.

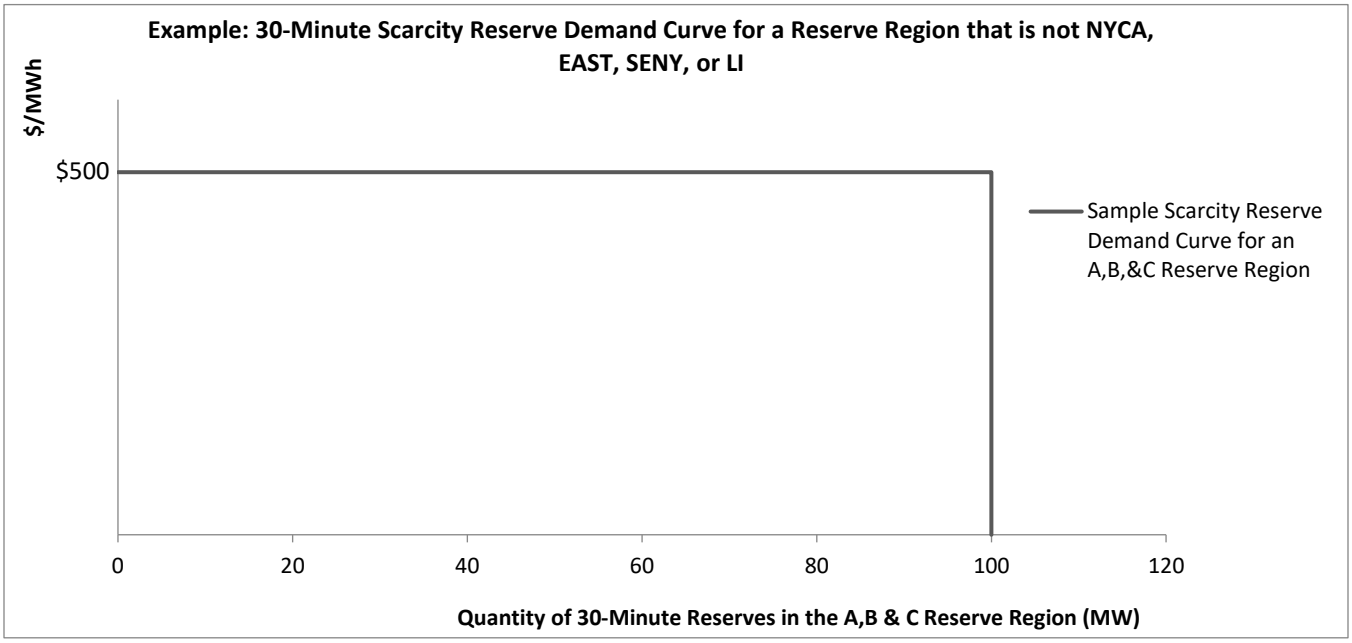
ii. The Eastern, Southeastern, New York City, or Long Island 30-Minute Reserves target level will only be increased by the greater of (i) the value obtained from subtracting the Eastern, Southeastern, New York, or Long Island 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement if all Load Zones included within the Scarcity Reserve Region belong to East of Central-East, or (ii) zero. If the quantity of 30-minute reserve provided in East of Central-East exceeds the revised East of Central-East 30-minute reserve requirement minus the Eastern, Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised East of Central-East 30-minute reserve requirement, the corresponding price on the East of Central-East 30-minute reserve demand curve will be $20/MW. If this is the case and the quantity of 30-minute reserve provided in East of Central-East is less than or equal to the revised East of Central-East 30-minute reserve requirement minus an amount equal to the Eastern, Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the East of Central-East 30-minute reserve demand curve will be $40/MW.

iii. The applicable Southeastern, New York City, or Long Island 30-Minute Reserves target level (accounting for any applicable SENY incremental reserve target level) will only be

increased by the greater of (i) the value obtained from subtracting the Southeastern, New York, or Long Island 30-Minute Uncertainty Reserve Requirement from the Scarcity Reserve Requirement if all Load Zones included within the Scarcity Reserve Region belong to Southeastern New York, or (ii) zero. If the quantity of 30-minute reserve provided in SENY exceeds the revised SENY 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised SENY 30-minute reserve requirement, the corresponding price on the SENY 30-minute reserve demand curve will be $20/MW. If the quantity of 30-minute reserve provided in SENY exceeds the revised SENY 30-minute reserve requirement minus a value equal to the sum of the SENY incremental reserve target and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City or Long Island 30-Minute Uncertainty Reserve Requirement, but is less than or equal to the revised SENY 30-minute reserve requirement minus an amount equal to the greater of (a) zero or (b) a value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City, or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the SENY 30-minute reserve demand curve will be $40/MW. If the quantity of 30-minute reserve provided in Southeastern New York is less than or equal to the revised SENY 30-minute reserve requirement minus a value equal to the sum of the SENY incremental reserve target and the greater of (i) zero or (ii) the value obtained from subtracting the Scarcity Reserve Requirement from the Southeastern, New York City or Long Island 30-Minute Uncertainty Reserve Requirement, the corresponding price on the Southeastern New York 30-minute reserve demand curve will be $500/MW.

For example, consider that a Scarcity Reserve Region that consists solely of Load Zones A, B, and C is the only Scarcity Reserve Region identified, and that the additional Scarcity Reserve Requirement for that region is calculated as 100 MW for an interval. Also, it is assumed that the NYCA 30-Minute URR is 500 MW. The applicable impacts to the affected 30-minute reserve demand curves during such real-time interval would be as follows (note that, in this example, because the Load Zones that comprise the Scarcity Reserve Region do not belong to East of Central-East, Southeastern New York, New York City, or Long Island no adjustments would be made to the otherwise applicable 30-minute reserve demand curves for such regions):


Example: NYCA 30-minute Reserve Demand Curve with NYCA 30-min URR of 500 MW and Scarcity Reserve Req of 100 MW
$800
$700
$600
$500
$400
$300
$200
$100
$-
$/MW
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
MegaWatts
Non-Scarcity
Scarcity




In the above example, no other 30-minute reserve demand curves are modified.

### 6.8.2. Operating Reserve and Regulation Service Demand Curves

The unit commitment and dispatch module used in both the SCUC and RTS systems utilizes demand curves to reflect shortages. The demand curves allow the program to relax the applicable requirement if the shadow cost needed to supply the requirement exceeds a preset value. The demand curve functionality is used for the reserve and regulation requirements. The term "URR" in the table below refers to the Uncertainty Reserve Requirements. The following demand curves are implemented (except during real-time intervals when EDRP resources and/or SCRs have been called upon by the NYISO to provide load reduction; refer to Section 6.8.1 of this manual for further details regarding the 30-Minute Reserve Operating Reserve Demand Curves that apply during real-time periods when the NYISO has activated EDRP resources and/or SCRs):

| New York Region | Type of Product | Procured Quantity Greater than (MW) | Procured Quantity Less than or equal to (MW) | Associated Demand Curve Cost ($/MW) |
|---|---|---|---|---|
| NYCA | Regulation | 0<br>Reg Reqt – 80<br>Reg Reqt – 25 | Reg Reqt – 80<br>Reg Reqt – 25<br>Reg Reqt | $775<br>$525<br>$25 |
| | Spinning Reserve | 0 | 655 | $775 |
| | 10 Minute Reserve | 0<br>1310 | 1310<br>1310 + NYCA 10-min URR | $750<br>$40 |
| | 30 Minute Reserve | 0<br>1965<br>2020<br>2075<br>2130<br>2185<br>2240<br>2295<br>2420<br>2620 | 1965<br>2020<br>2075<br>2130<br>2185<br>2240<br>2295<br>2420<br>2620<br>2620 + NYCA 30-min URR | $750<br>$625<br>$500<br>$375<br>$300<br>$225<br>$175<br>$100<br>$40<br>$20 |
| Eastern New York (EAST) | Spinning Reserve | 0 | 330 | $40 |
| | 10 Minute Reserve | 0<br>1200 | 1200<br>1200 + EAST 10-min URR | $775<br>$40 |
| | 30 Minute Reserve | 0<br>1200 | 1200<br>1200 + EAST 30-min URR | $40<br>$20 |
| Southeastern New York (SENY) | Spinning Reserve | 0 | 0 | $40 |
| | 10 Minute Reserve | 0 | 0 | $40 |
| | 30 Minute Reserve | 0<br>1300<br><br>1300 + SENY Flex Reserve Req | 1300<br>1300 + SENY Flex Reserve Req<br><br>1300 + SENY Flex Reserve Req + SENY 30-min URR | $500<br>$40<br><br>$20 |
| New York City (NYC) | Spinning Reserve | 0 | 0 | $25 |
| | 10 Minute Reserve | 0<br>625 | 625<br>625 + NYC 10-min URR | $25<br>$20 |
| | 30 Minute Reserve | 0<br>1250 | 1250<br>1250 + NYC 30-min URR | $25<br>$20 |
| Long Island (LI) | Spinning Reserve | 0 | 0 | $25 |
| | 10 Minute Reserve | 0<br>120 | 120<br>120 + LI 10-min URR | $25<br>$20 |
| | 30 Minute Reserve | 0<br>LI 30-min Res Reqt | LI 30-min Res Reqt<br>LI 30-min Res Reqt + LI 30-min URR | $25<br>$20 |

Note: The 10-minute URR MWs in DAM are zero since URRs are not calculated for the 10-minute product in DAM.

Note: "LI 30-min Res Reqt" refers to the Long Island 30-Minute Total Reserve Requirement which is defined on the NYISO's website at the following location: https://www.nyiso.com/documents/20142/3694424/Locational-Reserves-Requirements.pdf.

Note: The applicable reserve requirements (including any incremental SENY 30-minute flexible reserve quantity) are posted on the NYISO's website at the following location: https://www.nyiso.com/documents/20142/3694424/Locational-Reserves-Requirements.pdf.

Note: The Uncertainty Reserve Requirements for Day-Ahead Market and Real-Time Market are posted on the NYISO's website at the following location: https://www.nyiso.com/power-grid-data

## 6.9. Self-Supply

Transactions may be entered into to provide for Self-Supply of Operating Reserves. Except as noted in Section 15.4.8 of Rate Schedule 4 of the *NYISO Service Tariff*, Customers seeking to Self-Supply Operating Reserves must place the Resource(s) supplying any one of the Operating Reserves under NYISO control. The Resource(s) must meet NYISO rules for acceptability. The amount that any such Customer will be charged for Operating Reserves will be reduced by the market value of the services provided by the specified Resource(s) as determined in accordance with the *NYISO Services Tariff*.

## 6.10. Operating Reserve Charge

Please refer to Rate Schedule 5 of the NYISO OATT, Rate Schedule 4 of the NYISO Services Tariff, and the Accounting and Billing Manual for information about Operating Reserve charges.

## 6.11. Failure to Provide Operating Reserve

There is no explicit penalty for failing to provide Energy or failing to provide a Demand Reduction when Suppliers are scheduled for Energy or a Demand Reduction by RTD. If the Supplier does not perform, the following will occur:

- RTD converts the reserve schedule to energy (i.e., the reserve schedule went to zero) and the unit would buy out of its Day-Ahead reserve commitment at the applicable real-time reserve market clearing price.
- A Resource would not receive any payment for energy scheduled but not produced and the Resource may receive Persistent Undergeneration charges.
- A Demand Side Resource will have a reserve performance index calculated for each interval of its real-time demand reduction schedule as follows:

$$\textbf{Reserve PI}_i = \textbf{Min } [((\textbf{ADR}_i / \textbf{RSR}_i) + .10), 1]$$

***Where:***

$ADR_i$ = Average Actual Demand Reduction for interval *i*

If $ADR_i <= 0$ then set Reserve $PI_i = 0$

$RSR_i$ = Ramped Scheduled Reduction for interval *i*

- The Reserve Performance Index is used in the Day-Ahead Margin Assurance Payment ("DAMAP") calculation which may reduce the DAMAP payments to Demand Side Resources. The result is that the Demand Side Resource may buy out of its Day-Ahead reserve position and not receive sufficient DAMAP payments to cover real-time reserve market balancing costs.
- For more information, see *NYISO Accounting and Billing Manual* (available from the NYISO Web site at the following URL: https://www.nyiso.com/manuals-tech-bulletins-user-guides)

## 6.12. Reserve Service Qualification and Performance Criteria

### 6.12.1. Reserve Qualified Resource Requirements

Any resource that meets the following criteria will be considered a "Reserve Qualified Resource" and may submit offers for Operating Reserves service. All Reserve Qualified Resources must:

- Have the appropriate control equipment installed and be capable of providing Operating Reserves service.
- Be capable of receiving and responding to automatic control signals on a 5 minute periodicity and must provide telemetered output data that can be scanned every 6 seconds.
- Provide for all required interfaces to the Transmission Owner (TO) control centers as defined by the TO's as described in the TO-MP Interconnection Agreement.
- In order for a Demand Side Resource to provide Operating Reserves service the Demand Side Resource must take service from a qualified Load Serving Entity and all demand is subject to the energy settlements of the *NYISO Services Tariff* and *NYISO OATT*.
- Register the intent to provide Operating Reserves service and provide all data required by the NYISO.
- Comply with all applicable credit security requirements set forth in Attachment K of the *NYISO Services Tariff*.
- Successfully complete the pre-qualification performance test as described in Section 6.12.2 of this manual.

### 6.12.2. Pre-Qualification and Re-Qualification Performance Test

All participants requesting to become reserve suppliers and all participants that are required to re-qualify as reserve providers must successfully complete the pre-qualification performance test. Aggregations are tested using a 'verification' rather than a prequalification – the Aggregator is permitted to enroll an Aggregation and begin participating to provide Operating Reserves without prequalifying but will

be required to verify performance during the first two weeks of the first month active in the market. An Aggregation will be verified when it first seeks to provide Operating Reserves, and when any of the following conditions are true: When the Aggregation UOL has changed by at least 10 MW (increase and/or decrease), when one or more DER facilities have been added to an Aggregation, when the Aggregation's Ancillary Service bid flags are switched from "N" to "Y", including Aggregations that failed Operating Reserve verification testing for the first time in the previous testing window.

- Market Participants must notify the Stakeholder Services department of their intent to complete a reserve pre-qualification test. All qualification criteria defined in Section 6.12.1 of this manual must be completed prior to the test request. Aggregators are not required to provide this notice – the NYISO's Aggregation System software will inform the appropriate NYISO personnel to schedule and conduct the verification test during the first month of operation.
- Stakeholder Services will coordinate with Grid Operations to schedule the test.
- The Market Participant will be notified by a NYISO Stakeholder Services representative a minimum of two days prior to the test period indicating the dates that will be subject to prequalification/verification test.
- Test participants will be instructed to submit reserve and energy bids for specified dates and for all hours that the Resource is capable of changing energy schedules or modifying demand in real-time at the request of the NYISO.
- The NYISO will conduct a random audit(s) as described in Technical Bulletin 142, Generator Performance Audit, with the exception, as described below, for testing of nonsynchronous reserves. Actions based on the results of the audit as a pre-qualification/verification test described in Technical Bulletin 142, Generator Performance Audit will be replaced with actions as defined in this section.
- The NYISO will select providers that are qualifying non-synchronous reserve by randomly scheduling the resource within the first 14 days after notifying Stakeholder Services that they would like to perform a test. The participant must be scheduled to provide the service in order for Operations to schedule the unit for energy or demand response.
- Actions in the event of a failed pre-qualification/verification audit (test)

1. NYISO Grid Operations will complete all standard audit documentation
2. NYISO Grid Operations will inform NYISO Stakeholder Services and NYISO MMA of the results of the audit (test)
3. NYISO Stakeholder Services will notify the customer indicating the results of the test. If the test participant fails the test, NYISO Stakeholder Services will remove all reserve bidding privileges.
4. Prior to requesting a re-test the test participant must provide an explanation to NYISO MMA describing the cause of the failed prequalification/verification test. Documentation should be sent to;

   Reference_Price_Update@NYISO.com

   Subject line of the e-mail should state "Reserve Performance Audit"

5. NYISO MMA will notify NYISO Stakeholder Services when the test participant is authorized to perform another test.

- Test participants will be paid for all reserve provided during the test as if the participant was a qualified reserve supplier.

The test participant will be responsible for any balancing payments due to poor performance during the test.

# 7. Black Start Capability Service

This section describes the black start capability service.

## 7.1. Description

Black start capability represents the key resources that, following a system-wide blackout, can start without the availability of an outside electric supply and are available to participate in system restoration activities that are under the control of the NYISO or, in some cases, under local Transmission Owner Control. If a partial or system-wide blackout occurs, these units assist in the restoration of the New York Control Area (NYCA). Specific resources, identified in the NYISO Restoration Plan or, in specific Transmission Owners' local restoration plan(s), have the capability and training required to start up without the presence of a synchronized grid to provide the necessary auxiliary station power. Aggregations are not permitted to provide black start capability service.

Participating resources are required to test their black start capability for each Capability Year. With due regard for reliability considerations and subject to approval by the NYISO and by the

If a resource is part of a Transmission Owner's system restoration plan, a test performed by black start facilities within one month beyond the Capability Year test period, or longer in force majeure cases, shall be considered a valid test for that Capability Year. For black start providers under the Consolidated Edison black start and system restoration plan, the Capability Year test period is from May 1st to April 30th, excluding June, July, and August. The test period for providers other than those in the Consolidated Edison black start and system restoration plan is from May 1st to April 30th.

The NYISO Restoration Plan and/or Transmission Owner restoration plan(s) are implemented if a partial or complete system blackout occurs. The NYISO selects the resources with black start capability by considering the following operating characteristics:

- electrical location in the NYCA
- startup time: from NYISO order to start to minimum output
- maximum response rate (MW/minute) above minimum output
- maximum power output

## 7.2. Source and Scheduling of Service

LSEs must purchase black start capability service from the NYISO. Resources providing this service must successfully pass the test for black start capability.

The NYISO identifies the facilities that are in critical areas for NYS Power System restoration. During system restoration activities, the NYISO manages and deploys the black start capability, as needed, depending on the specific situation.

The NYISO develops and periodically reviews the Black Start Restoration Plan for the NYS Power System. The NYISO may amend this restoration plan and determine black start requirements to account for changes in system configuration if the NYISO determines that additional black start resources are needed. The NYISO has the flexibility to seek bids for new resources whenever it amends the current plan.

Although the NYISO plan will restore a major portion of the state electric system, portions of the local Transmission Owner restoration plans may require some additional black start resources, which are located in local Transmission Owner areas and which are not presently listed in the NYISO restoration plan. The NYISO will make payments for local area black start capability directly to the facilities that provide that service. Those payments will be determined under the terms of Rate Schedule 5 of the *NYISO Services Tariff*. The LSEs in those local Transmission Owner areas will be additionally charged for that black start capability Service by the NYISO. Facilities, which are obligated to provide black start service as a result of divestiture contract agreements, will not receive NYISO payments for that service if they are already compensated for such service as part of those divestiture contracts.

## 7.3. Payment for Service

Please refer to Rate Schedule 6 of the *NYISO OATT*, Rate Schedule 5 of the *NYISO Services Tariff*, and the *Accounting and Billing Manual* for information about payments for Black Start.

## 7.4. Black Start Service Procedures

The following procedures apply to black start capability service:

#### NYISO Actions

The NYISO Staff shall perform the following:

1. On a periodic basis, determine the amount and location for black start capability.
2. Select the resources for black start capability based on location, price, and quality of supply.
3. Notify the selected resources for black start testing.

***Transmission Owner Actions***

The Transmission Owner actions are found in Section 3 of the System Restoration Manual.

### Black Start Participating Resource Actions

The Black Start suppliers shall perform the following:

1. Those that are part of the ISO Plan, not including existing facilities under the Consolidated Edison Plan, will provide the NYISO with embedded cost information on an annual basis.
2. All black start providers must conduct performance testing annually during their respective test periods. All black start providers must submit testing data to the NYISO upon request. Following its completion of a black start test, a black start provider must provide the NYISO with its plan, within a reasonable time, to mitigate any deficiencies in its facility's black start capability identified during the performance of its test.
3. During black start tests of steam units, the ability of gas turbine units to control frequency and voltage while isolated from the transmission system shall be monitored by the Generator Owner.
4. All suppliers on an annual basis, provide a letter to the NYISO confirming that they:
    a. Identify and maintain a list of critical components in their black start facilities (e.g., batteries, diesel back-up generators, inverters, etc.) and perform tests to verify the condition of these critical components in accordance with good industry practice.
    b. Have developed test procedures and accordingly tested their black start facilities for each Capability Year.
    c. Have met the black start provider training requirements.

# 8. Automatic Fuel Swap Capability Testing

## 8.1. Description

The *NYISO* requires that Generator Owners of combined cycle units that are part of the Con Edison Minimum Oil Burn ("MOB") program and have the ability to automatically swap from natural gas to a liquid fuel source in the event of the sudden interruption of gas fuel supply or loss of gas pressure or unavailability of gas supply to the generator ("Applicable Unit") test that capability. The current list of dual fuel units that are part of the Con Edison MOB program are published in the seasonal reports presented to the NYISO Operating Committee.

## 8.2. Automatic Fuel Swap Testing Requirements

The test by each Generator Owner of an Applicable Unit shall demonstrate the ability to swap from natural gas to oil following an actual or simulated loss of gas pressure, or an operator-initiated swap, within a time consistent with the design parameters for the Applicable Unit, not to exceed 60 seconds, while remaining synchronized to the transmission system and in stable operation.

## 8.3. Automatic Fuel Swap Testing Frequency

Each Generator Owner must, at least once each NYISO Capability Period (Summer and Winter), successfully test or demonstrate the ability each Applicable Unit to perform their intended function. The results of a successful, real-time automatic fuel swap can be utilized to satisfy the testing requirement for the Capability Period in which it occurs.

Tests must be coordinated with the NYISO and Con Edison.

## 8.4. Automatic Fuel Swap Testing Procedures

The Generator Operator must develop and implement specific testing procedures for each Applicable Unit to demonstrate they are able to perform their intended function. These procedures shall be provided to the NYISO Manager of Operations Engineering and Con Edison. In the capability period following each automatic fuel swap test, updated restoration procedures or verifications of continued applicability of previously supplied procedures shall be provided to the NYISO and Con Edison.

## 8.5. Documentation of Automatic Fuel Swap Testing and Mitigation of Failed Tests

Generator Operators of Applicable Units shall document the date, start-time, and duration of all tests, and indicates if the tests meet the criteria in the unit's Automatic Fuel Swap testing procedure. In the

capability period following each automatic fuel swap test, documentation of a successful test shall be provided to the NYISO Manager of Operations Engineering. If the automatic swap from natural gas to liquid fuel test is not successful, the Generator Owner shall identify the causes of the failure, shall take steps to undertake remedial actions that are necessary to resolve the failure, and keep the NYISO and Con Edison informed as to the progress of its remedial actions. If an Automatic Fuel Swap Test is not successful, the Generator will have a reasonable opportunity to reschedule and conduct a subsequent test following completion of remedial actions.

# Attachment A Voltage Support Service Qualification Forms

**Attachment A-1**

# VSS Qualifications Form

Attached to this form is: ☐ Generator or synchronous condenser documentation, including the manufacturer's model number or equivalent data as determined by the NYISO, manufacturer's specifications, a block diagram and associated data, and a generator reactive capability data sheet ("D-curve"). ☐ Documentation that demonstrates that the resource(s) listed below have automatic voltage controlling equipment, including the equipment's manufacturer model number, manufacturer's specifications, a voltage regulation block diagram and associated data. In the case of multiple pieces of equipment working to provide automatic voltage control, please include each piece of equipment on a new line.

The resource(s) listed below will participate in Voltage Support Ancillary Service under the direction of the NYISO and agree to comply with all applicable rules and procedures associated with NYISO voltage and Reactive Power control.

| Unit Name | Station Name | Generator's Transmission Owner | NYISO MIS PTID | Type (Generator, Synchronous Condenser, etc.) | NYISO ICAP DMNC, UCAP* or Nameplate Rating | Generator Model and Number | Automatic Voltage Controlling Equipment Model and Number |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

Market Participant Signature: _____ Date: _____

Title: _____ Organization: _____

NYISO Approval: _____

Title: _____ Date: _____

*UCAP rating is only used for Limited Control Run-of-River Hydro Resources.

**Attachment A-2**

# Request for Identical Treatment

For a resource's Voltage Support Service test to be applied to identical resources, the following criteria must be met:

- Resources must be rated at less than 60MW manufacturer's nameplate
- Resources must be at the same site
- Resources must be electrically identical
- Resources must be stand alone (not part of a combined cycle unit, etc.)

The resources listed below are identical and are requesting that the test results from one resource apply to all the resources listed.

| Unit Name | Station Name | NYISO MIS PTID | Type (Gen, Sync Cond, etc.) | Manufacturer | Model # | Nameplate MW | Nameplate MVar | Rated Power Factor | Interface Bus Name |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Market Participant Signature: _____ Date: _____

Title: _____ Organization: _____

NYISO Approval: _____

Title: _____ Date: _____

# Attachment B Performance Adjustment for Regulating and Non-Regulating Suppliers

Please refer to Rate Schedule 3 of the NYISO OATT, Rate Schedule 3 of the NYISO Services Tariff, and the Accounting and Billing Manual for information about Performance Adjustment for Regulating and Non-Regulating Suppliers.

# Attachment C Regulation Performance Audit Standards

The Regulation Response Audit form, as appropriate, will be completed after each specific audit.

# Regulation Response Audit

## INDIVIDUAL RESOURCE REGULATION PERFORMANCE RESPONSE TEST

Type of test: Regulation Performance Pass_____ Fail_____

This is a NYISO individual resource audit of _____regulation performance.

The resource has a Regulation Capacity Response Rate of _____ MWs per minute.

The resource has a Regulation Movement Response Rate of _____ MW per 6 seconds.

The audit start time: _____.

The audit end time: _____.

Time weighted Performance Index:_____

Date_____

Comments and or actions taken _____

Audit Requested By:

Name: _____

Department:_____

# Attachment D: Uncertainty Reserve Requirement Calculation Process

The Uncertainty Reserve Requirements ("URR") for Day-Ahead and Real-Time Markets are calculated to quantify additional reserve needs arising from forecast uncertainty and is determined before the Day-Ahead Market run for application to the market day. The Uncertainty Reserve Requirement is composed of four distinct components: Net Load (defined as Gross Load net of the impact of resources such as Behind-the-meter solar), Land Based Wind ("LBW"), Offshore Wind ("OSW"), and Front-of-the-Meter ("FTM") Solar, each of which is calculated separately and then combined into a composite requirement. The calculation uses historical forecast error percentage statistics derived from the prior calendar year and applies those statistics to the forecast data used in the Day-Ahead Market run for the applicable market day.

The historical forecast error metrics for Net Load, Land Based Wind, Offshore Wind, and FTM Solar are posted annually on the NYISO's website at the following location: https://www.nyiso.com/power-grid-data

The DAM Uncertainty Reserve Requirements would be allocated to the 30-minute product only. The RT Uncertainty Reserve Requirements for the 30-minute product would be calculated using the 60-minute ahead forecast error distribution statistics, while the RT Uncertainty Reserve Requirements for the 10-minute product would be calculated using the 30-minute ahead forecast error distributions statistics.

### *Inputs for Day-Ahead Uncertainty Reserve Requirement Calculation – Net Load*

The historical NYCA DA Net Load forecast error percentages over each hour for the prior calendar year will be calculated as per the formula below:

$$\text{NYCA } DA\ Net\ Load\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ Actual\ Net\ Load - NYCA\ DA\ Forecast\ Net\ Load}{NYCA\ DA\ Forecast\ Net\ Load} \times 100$$

The mean and standard deviation of the historical prior calendar year's NYCA DA Net Load forecast error percentages from above will be calculated annually. These static values will be used to calculate the Composite DAM 30-minute Uncertainty Reserve Requirement as shown in the Composite Uncertainty Reserve Requirement calculation section below.

### *Inputs for Day-Ahead Uncertainty Reserve Requirement Calculation – Land Based Wind and Offshore Wind*

The historical NYCA DAM Land Based Wind and Offshore Wind forecast error percentages over each hour for the prior calendar year will be calculated as per the formula below:

$$\text{NYCA } DAM\ Land\ Based\ Wind\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ DAM\ Land\ Based\ Wind\ Forecast - NYCA\ Actual\ Land\ Based\ Wind\ Output}{NYCA\ DAM\ Land\ Based\ Wind\ Forecast} \times 100$$

$$\text{NYCA } DAM\ Offshore\ Wind\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ DAM\ Offshore\ Wind\ Forecast - NYCA\ Actual\ Offshore\ Wind\ Output}{NYCA\ DAM\ Offshore\ Wind\ Forecast} \times 100$$

These hourly forecast error percentages are grouped into each of the forecast/Installed capacity bins that are listed below for Land Based Wind and Offshore Wind separately.

| DAM Forecast MW/Installed Capacity Bins |
|---|
| <=20% |
| 20% - 40% |
| 40% - 60% |
| >60% |

The means and standard deviations for each forecast/Installed capacity bin of the historical prior calendar year's DAM Land Based Wind and Offshore Wind forecast error percentages will be calculated annually. These static values will be used to calculate the Composite DAM 30-minute Uncertainty Reserve Requirements as shown in the Composite Uncertainty Reserve Requirement Calculation section below.

Please note that the automated calculation logic utilizes the Operating Capacities in place of the Installed Capacity to account for Winter and Summer capacity differences.

### *Inputs for Day-Ahead Uncertainty Reserve Requirement Calculation – Front-of-The-Meter Solar*

The historical NYCA DAM FTM Solar forecast error percentages over each hour for the prior year will be calculated as per the formula below:

$$\text{NYCA } DAM\ FTM\ Solar\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ DAM\ FTM\ Solar\ Forecast - NYCA\ Actual\ FTM\ Solar\ Output}{NYCA\ DAM\ FTM\ Solar\ Forecast} \times 100$$

Nighttime intervals of HB 0, 1, 2, 3, 4, 21, 22, and 23 are excluded from the forecast error dataset because expected resource output/forecast during these hours is zero or near zero, causing forecast error percentages to be undefined or to exhibit disproportionately high variance driven by small denominators.

The calculated hourly forecast error percentages from above are grouped into each of the forecast/Installed capacity bins that are listed below for Front-of-The-Meter Solar.

| DAM Forecast MW/Installed Capacity Bins |
|---|
| <=10% |
| 10% - 30% |
| 30% - 45% |
| >45% |

The ≤10% bin is introduced to isolate forecast error behavior during very low forecast conditions, associated usually with sunrise and sunset time periods. Separating these observations into a dedicated low-forecast bin prevents disproportionate influence on the 10–30% bin and preserves the statistical integrity of the forecast error distributions used in the Uncertainty Reserve Requirement calculation.

The means and standard deviations for each forecast/Installed Capacity bin of the historical prior calendar year's DAM Front-of-The-Meter Solar forecast error percentages will be calculated annually. These static values will be used to calculate the Composite DAM 30-minute Uncertainty Reserve Requirements as shown in the Composite Uncertainty Reserve Requirement section below.

Please note that the automated calculation logic utilizes the Operating Capacities in place of the Installed Capacity to account for Winter and Summer capacity differences.

### *Inputs for Real-Time Uncertainty Reserve Requirement Calculation – Net Load*

The historical NYCA RT 60-minute ahead Net Load forecast error percentages (used for calculating the RT URRs for the 30-minute product) over each hour for the prior calendar year will be calculated as per the formula below:

$$\text{NYCA } RT\ 60\ \text{min}\ ahead\ \ Net\ Load\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ Actual\ Net\ Load - NYCA\ RT\ 60\ \text{min}\ ahead\ Forecast\ Net\ Load}{NYCA\ DAM\ Forecast\ Net\ Load} \times 100$$

The historical NYCA RT 30-minute ahead Net Load forecast error percentages (used for calculating the RT URRs for the 10-minute product) over each hour for the prior calendar year will be calculated as per the formula below:

$$\text{NYCA } RT\ 30\ \text{min}\ ahead\ \ Net\ Load\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ Actual\ Net\ Load - NYCA\ RT\ 30\ \text{min}\ ahead\ Forecast\ Net\ Load}{NYCA\ DAM\ Forecast\ Net\ Load} \times 100$$

The means and standard deviations of the historical prior calendar year's NYCA RT 60-minute ahead and RT 30-minute ahead forecast error percentages from above will be calculated annually. These static values will be used to calculate the Composite RT 30-minute and RT 10-minute Uncertainty Reserve Requirements as shown in the Composite Uncertainty Reserve Requirement section below.

### *Inputs for Real-Time Uncertainty Reserve Requirement Calculation – Land Based Wind and Offshore Wind*

The historical NYCA RT 60-minute ahead Land Based Wind forecast error percentages (used for calculating the 30-minute URR) and 30-minute ahead Land Based Wind forecast error percentages (used for calculating the 10-minute URR) over each hour for the prior calendar year will be calculated as per the formulae below:

$$\text{NYCA } RT \text{ 60 min } Ahead\ Land\ Based\ Wind\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ RT \text{ 60 min } Ahead\ Land\ Based\ Wind\ Forecast - NYCA\ Actual\ Land\ Based\ Wind\ Output}{NYCA\ DAM\ Land\ Based\ Wind\ Forecast} \times 100$$

$$\text{NYCA } RT \text{ 30 min } Ahead\ Land\ Based\ Wind\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ RT \text{ 30 min } Ahead\ Land\ Based\ Wind\ Forecast - NYCA\ Actual\ Land\ Based\ Wind\ Output}{NYCA\ DAM\ Land\ Based\ Wind\ Forecast} \times 100$$

The historical NYCA RT 60-minute ahead Offshore Wind forecast error percentages (used for calculating the 30-minute URR) and 30-minute ahead Offshore Wind forecast error percentages (used for calculating the 10-minute URR) over each hour for the prior calendar year will be calculated as per the formulae below:

$$\text{NYCA } RT \text{ 60 min } Ahead\ Offshore\ Wind\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ RT \text{ 60 min } Ahead\ Offshore\ Wind\ Forecast - NYCA\ Actual\ Offshore\ Wind\ Output}{NYCA\ DAM\ Offshore\ Wind\ Forecast} \times 100$$

$$\text{NYCA } RT \text{ 30 min } Ahead\ Offshore\ Wind\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ RT \text{ 30 min } Ahead\ Offshore\ Wind\ Forecast - NYCA\ Actual\ Offshore\ Wind\ Output}{NYCA\ DAM\ Offshore\ Wind\ Forecast} \times 100$$

The hourly forecast error percentages from each step above are grouped into each of the forecast/Installed Capacity bins that are listed below for Land Based Wind and Offshore Wind separately.

| DAM Forecast MW/Installed Capacity Bins |
|---|
| <=20% |
| 20% - 40% |
| 40% - 60% |

| >60% |
|---|

The means and standard deviations for each DA forecast/Installed Capacity bin of the historical prior calendar year's RT 60-minute ahead and RT 30-minute ahead Land Based Wind and Offshore Wind forecast error percentages will be calculated annually. These static values will be used to calculate the Composite RT 30-minute and RT 10-minute Uncertainty Reserve Requirements as shown in the Composite DAM Uncertainty Reserve Requirement Calculation section below.

Please note that the automated calculation logic utilizes the Operating Capacities in place of the Installed Capacity to account for Winter and Summer capacity differences.

### *Inputs for Real-Time Uncertainty Reserve Requirement Calculation – Front-of-The-Meter Solar*

The historical NYCA RT 60-minute ahead FTM Solar forecast error percentages (used for calculating the 30-minute URR) and 30-minute ahead FTM Solar forecast error percentages (used for calculating the 10-minute URR) over each hour for the prior year will be calculated as per the formulae below:

$$\text{NYCA } RT \text{ 60 min } Ahead\ FTM\ Solar\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ RT \text{ 60 min } Ahead\ FTM\ Solar\ Forecast - NYCA\ Actual\ FTM\ Solar\ Output}{NYCA\ DAM\ FTM\ Solar\ Forecast} \times 100$$

$$\text{NYCA } RT \text{ 30 min } Ahead\ Wind\ Forecast\ Error\ \%\ (for\ a\ particular\ hour) = \frac{NYCA\ RT \text{ 30 min } Ahead\ Wind\ Forecast - NYCA\ Actual\ Wind\ Output}{NYCA\ DAM\ FTM\ Solar\ Forecast} \times 100$$

Nighttime intervals of HB 0, 1, 2, 3, 4, 21, 22, and 23 are excluded from the forecast error dataset because expected resource output/forecast during these hours is zero or near zero, causing forecast error percentages to be undefined or to exhibit disproportionately high variance driven by small denominators.

The calculated hourly forecast error percentages from above are grouped into each of the DA forecast/Installed capacity bins that are listed below for Front-of-The-Meter Solar.

| DAM Forecast MW/Installed Capacity Bins |
|---|
| <=10% |
| 10% - 30% |
| 30% - 45% |
| >45% |

The means and standard deviations for each DA forecast/Installed Capacity bin of the historical prior calendar year's RT 60-minute ahead and RT 30-minute ahead FTM forecast error percentages will be calculated annually. These static values will be used to calculate the Composite RT 30-minute and RT 10-

minute Uncertainty Reserve Requirements as shown in the Composite RT Uncertainty Reserve Requirement Calculation section below. Please note that the automated calculation logic utilizes the Operating Capacities in place of the Installed Capacity to account for Winter and Summer capacity differences.

### *Bounds for the Historical Day-Ahead and Real-Time Forecast Error Percentages for Land Based Wind, Offshore Wind and Front-of-The-Meter Solar*

The historical prior calendar year's forecast error percentages for Land Based Wind, Offshore Wind, and Front-of-The-Meter Solar are bounded between −100% and +100% to prevent extreme percentage values arising from near-zero forecasts from dominating the statistical calculations. For example, a 1 MW forecast and a 5 MW actual output produces a -400% forecast error illustrating why unbounded percentage errors can disproportionately skew statistical metrics at very low forecast levels.

### *Composite Uncertainty Reserve Requirement Calculation*

The Uncertainty Reserve Requirements for DAM, RT 30-min ahead, and RT 10-min ahead products for every hour and for every reserve region will be calculated using the formulae given below. The NYCA historical error metrics derived from above sections and the forecast information used in the DAM process for every hour and for every reserve region will be used in the formulae below. The percentile chosen is the 95th percentile.

$$\begin{aligned}\textbf{Composite DAM Uncertainty Reserve Req.} = {} & (\mu_{NL\,DA} \times \textbf{Net Load DAM Forecast MW}) \\ & + (\mu_{LBW\,DA} \times \textbf{Land Based Wind DAM Forecast MW}) \\ & + (\mu_{OSW\,DA} \times \textbf{Offshore Wind DAM Forecast MW}) \\ & + (\mu_{FTMS\,DA} \times \textbf{FTM Solar DAM Forecast MW}) \\ & + \textbf{z-score} \times \sqrt{\begin{array}{c}((\sigma_{NL\,DA})^2 \times (\textbf{Net Load DAM Forecast MW})^2) + \\ ((\sigma_{LBW\,DA})^2 \times (\textbf{Land Based Wind DAM Forecast MW})^2) + \\ ((\sigma_{OSW\,DA})^2 \times (\textbf{Offshore Wind DAM Forecast MW})^2) + ((\sigma_{FTMS\,DA})^2 \times (\textbf{FTM Solar DAM Forecast MW})^2)\end{array}}\end{aligned}$$

where,

$\mu_{NL\,DA}$ is the Mean of the Historical DAM Net Load forecast error percentages,

$\mu_{LBW\,DA}$ is the Mean of the corresponding Bin's Historical DAM Land Based Wind Forecast Error percentages,

$\mu_{OSW\,DA}$ is the Mean of the corresponding Bin's Historical DAM Offshore Wind Forecast Error percentages,

$\mu_{FTMS\,DA}$ is the Mean of the corresponding Bin's Historical DAM FTM Solar Forecast Error percentages,

$\sigma_{NL\,DA}$ is the Standard Deviation obtained from the Historical DAM Net Load Forecast Error percentages

$\sigma_{LBW\,DA}$ is the Standard Deviation of the corresponding Bin's Historical DAM Land Based Wind Forecast Error percentages,

$\sigma_{OSW\,DA}$ is the Standard Deviation of the corresponding Bin's Historical DAM Offshore Wind Forecast Error percentages,

$\sigma_{FTMS\,DA}$ is the Standard Deviation of the corresponding Bin's Historical DAM FTM Solar Forecast Error percentages.

*z-score* is the z-score pertaining to the chosen percentile.

*Net Load DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Net Load

*Land Based Wind DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Land Based Wind

*Offshore Wind DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Offshore Wind

*FTM Solar DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Front-of-The-Meter Solar

$$\begin{aligned}\textbf{Composite RT 30min Uncertainty Reserve Req.} = {} & (\mu_{NL\,RT60} \times \textbf{Net Load DAM Forecast MW}) \\ & + (\mu_{LBW\,RT60} \times \textbf{Land Based Wind DAM Forecast MW}) \\ & + (\mu_{OSW\,RT60} \times \textbf{Offshore Wind DAM Forecast MW}) \\ & + (\mu_{FTMS\,RT60} \times \textbf{FTM Solar DAM Forecast MW}) \\ & + \textbf{z-score} \times \sqrt{\begin{array}{c}((\sigma_{NL\,RT60})^2 \times (\textbf{Net Load DAM Forecast MW})^2) + \\ ((\sigma_{LBW\,RT60})^2 \times (\textbf{Land Based Wind DAM Forecast MW})^2) + \\ ((\sigma_{OSW\,RT60})^2 \times (\textbf{Offshore Wind DAM Forecast MW})^2) + ((\sigma_{FTMS\,RT60})^2 \times (\textbf{FTM Solar DAM Forecast MW})^2)\end{array}}\end{aligned}$$

where,

$\mu_{NL\,RT60}$ is the Mean of the Historical RT 60-min ahead Net Load forecast error percentages,

$\mu_{LBW\,RT60}$ is the Mean of the corresponding Bin's Historical RT 60-min ahead Land Based Wind Forecast Error percentages,

$\mu_{OSW\,RT60}$ is the Mean of the corresponding Bin's Historical RT 60-min ahead Offshore Wind Forecast Error percentages,

$\mu_{FTMS\,RT60}$ is the Mean of the corresponding Bin's Historical RT 60-min ahead FTM Solar Forecast Error percentages,

$\sigma_{NL\,RT60}$ is the Standard Deviation obtained from the Historical RT 60-min ahead Net Load Forecast Error percentages

$\sigma_{LBW\,RT60}$ is the Standard Deviation of the corresponding Bin's Historical RT 60-min ahead Land Based Wind Forecast Error percentages,

$\sigma_{OSW\,RT60}$ is the Standard Deviation of the corresponding Bin's Historical RT 60-min ahead Offshore Wind Forecast Error percentages,

$\sigma_{FTMS\,RT60}$ is the Standard Deviation of the corresponding Bin's Historical RT 60-min ahead FTM Solar Forecast Error percentages.

*z-score* is the z-score pertaining to the chosen percentile.

*Net Load DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Net Load

*Land Based Wind DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Land Based Wind

*Offshore Wind DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Offshore Wind

*FTM Solar DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Front-of-The-Meter Solar

$$\begin{aligned}\textbf{Composite RT 10min Uncertainty Reserve Req.} = {} & (\mu_{NL\,RT30} \times \textbf{Net Load DAM Forecast MW}) \\ & + (\mu_{LBW\,RT30} \times \textbf{Land Based Wind DAM Forecast MW}) \\ & + (\mu_{OSW\,RT30} \times \textbf{Offshore Wind DAM Forecast MW}) \\ & + (\mu_{FTMS\,RT30} \times \textbf{FTM Solar DAM Forecast MW}) \\ & + \textbf{z-score} \times \sqrt{\begin{array}{c}((\sigma_{NL\,RT30})^2 \times (\textbf{Net Load DAM Forecast MW})^2) + \\ ((\sigma_{LBW\,RT30})^2 \times (\textbf{Land Based Wind DAM Forecast MW})^2) + \\ ((\sigma_{OSW\,RT30})^2 \times (\textbf{Offshore Wind DAM Forecast MW})^2) + ((\sigma_{FTMS\,RT30})^2 \times (\textbf{FTM Solar DAM Forecast MW})^2)\end{array}}\end{aligned}$$

where,

$\mu_{NL\,RT30}$ is the Mean of the Historical RT 30-min ahead Net Load forecast error percentages,

$\mu_{LBW\,RT30}$ is the Mean of the corresponding Bin's Historical RT 30-min ahead Land Based Wind Forecast Error percentages,

$\mu_{OSW\,RT30}$ is the Mean of the corresponding Bin's Historical RT 30-min ahead Offshore Wind Forecast Error percentages,

$\mu_{FTMS\,RT30}$ is the Mean of the corresponding Bin's Historical RT 30-min ahead FTM Solar Forecast Error percentages,

$\sigma_{NL\,RT30}$ is the Standard Deviation obtained from the Historical RT 30-min ahead Net Load Forecast Error percentages

$\sigma_{LBW\,RT30}$ is the Standard Deviation of the corresponding Bin's Historical RT 30-min ahead Land Based Wind Forecast Error percentages,

$\sigma_{OSW\,RT30}$ is the Standard Deviation of the corresponding Bin's Historical RT 30-min ahead Offshore Wind Forecast Error percentages,

$\sigma_{FTMS\,RT30}$ is the Standard Deviation of the corresponding Bin's Historical RT 30-min ahead FTM Solar Forecast Error percentages.

*z-score* is the z-score pertaining to the chosen percentile.

*Net Load DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Net Load

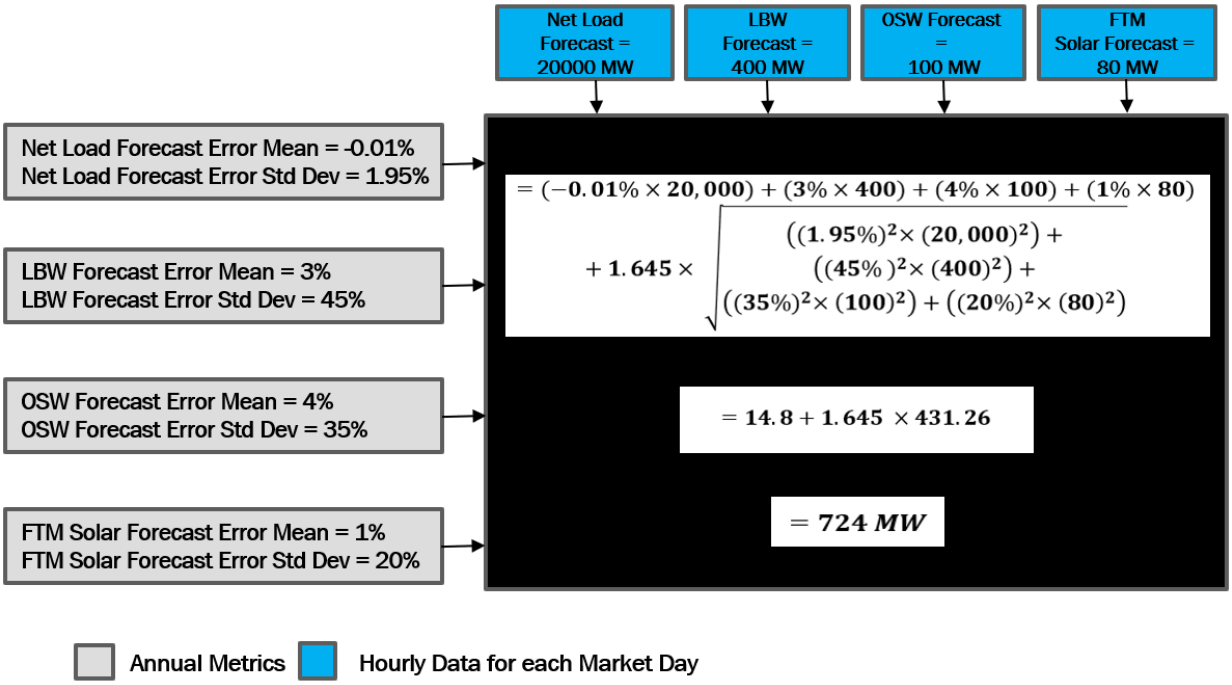
*Land Based Wind DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Land Based Wind

*Offshore Wind DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Offshore Wind

*FTM Solar DAM Forecast MW* is the Forecast (in MW) for a particular hour and reserve region used in the Day-Ahead Market for Front-of-The-Meter Solar

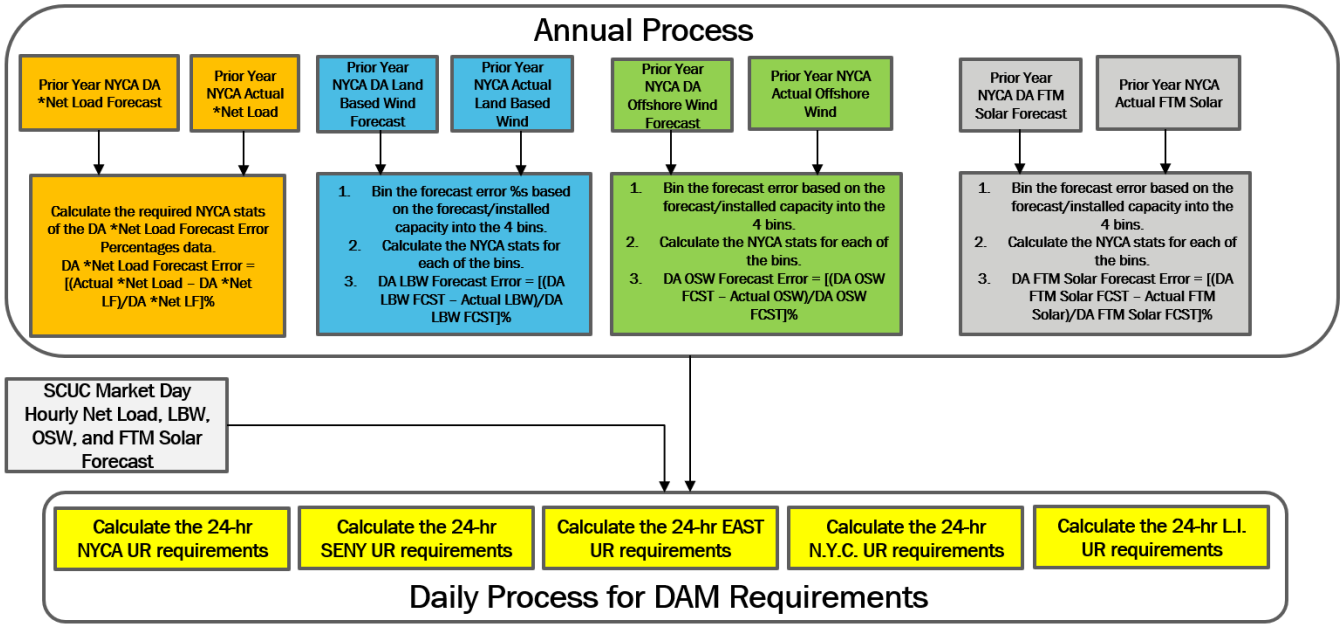
The following example illustrates the calculation of DAM NYCA 30-minute URR for a particular hour using the Composite DAM URR calculation formula.

# DAM NYCA Example

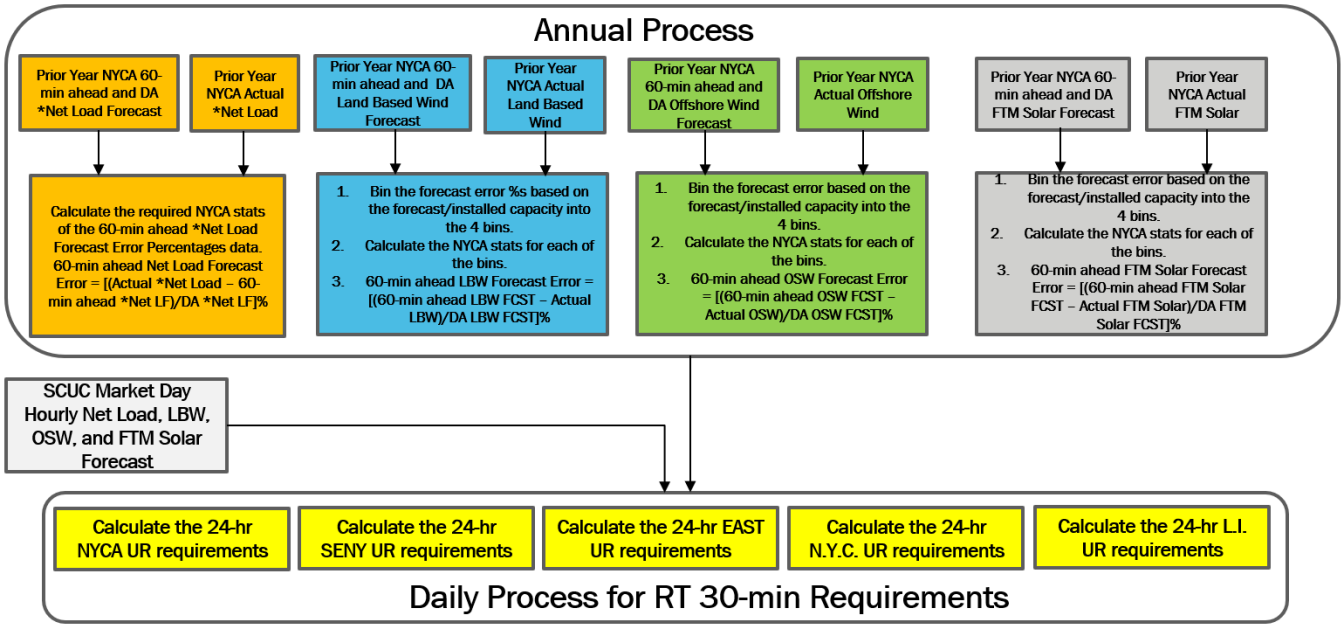
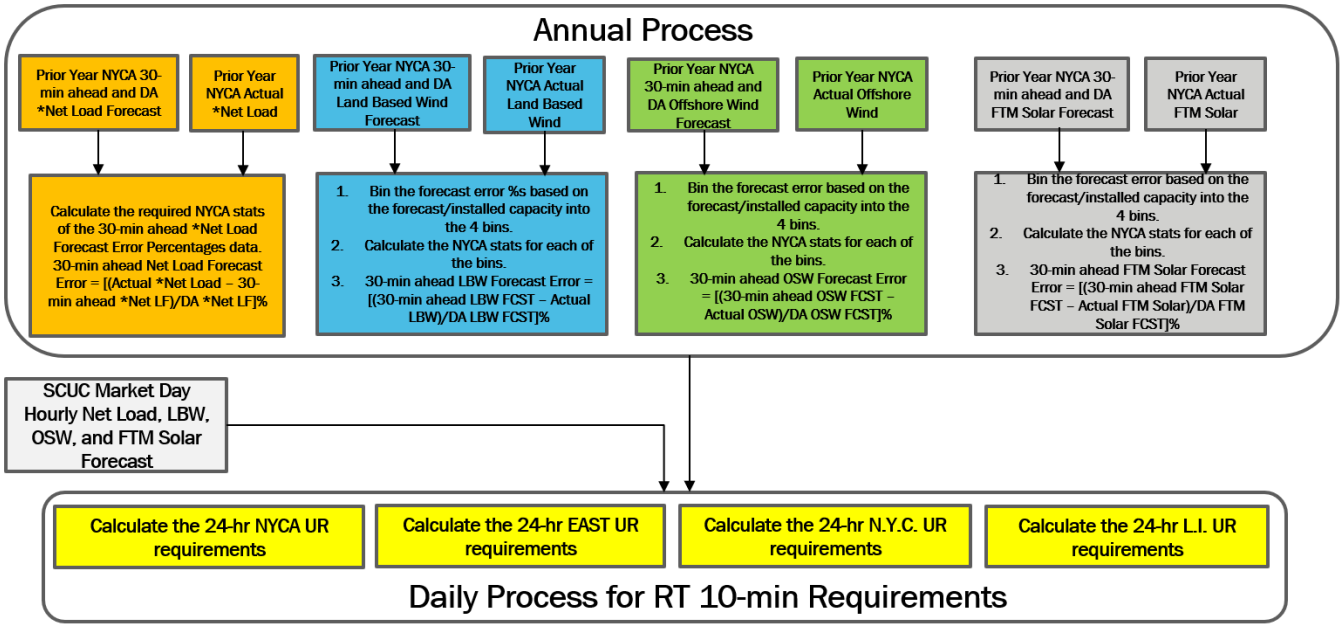


## *Uncertainty Reserve Requirement Calculation Process Flows*

### DAM 30-minute Uncertainty Reserve Requirement Calculation Process




### RT 30-minute Uncertainty Reserve Requirement Calculation Process



## RT 10-minute Uncertainty Reserve Requirement Calculation Process