

Ancillary Services Manual

May 2008

Version: 3.11
Revision Date:
Committee Acceptance: OC:
BIC:

This document was prepared by:
NYISO Auxiliary Market Operations

New York Independent System Operator
3890 Carman Rd
Schenectady, NY 12303
(518) 356-6060
www.nyiso.com

Disclaimer

The information contained within this manual, along with the other NYISO manuals, is intended to be used for informational purposes and is subject to change. The NYISO is not responsible for the user's reliance on these publications or for any erroneous or misleading material.

© *Copyright 1999-2008 New York Independent System Operator*

Table of Contents

1. Overview	1-1
1.1 Purpose	1-1
1.2 Summary of Services	1-1
1.3 Payments and Charges for Ancillary Services	1-2
1.4 Self-Supply of Ancillary Services	1-2
1.5 Metering Requirements	1-3
2. Scheduling, System Control & Dispatch Service	2-1
2.1 Description	2-1
2.2 Recovery of NYISO Costs	2-3
2.2.1 Costs Recovered Through NYISO Open Access Transmission Tariff	2-3
2.2.2 Costs Recovered Through NYISO Services Tariff	2-6
2.3 Payment for Service	2-6
2.3.1 Computation of Rate	2-6
2.3.2 Billing	2-7
2.3.3 Charges Associated with Local Reliability Rules	2-7
2.4 Services Performed at the Request of a Market Participant	2-7
3. Voltage Support Service	3-1
3.1 Description	3-1
3.2 Supplier Qualification	3-2
3.3 Responsibilities for Service	3-2
3.4 Payment for Service	3-3
3.4.1 Method for Determining the Payments for Voltage Support Service	3-3
3.4.2 Payments made to Suppliers for Voltage Support Service	3-3
3.4.3 Payments for Voltage Support Service Provided by Non-Utility Generators with Existing Power Purchase Agreements	3-4
3.4.4 Payments for Lost Opportunity Cost	3-4
3.4.5 Payments made by Transmission Customers and LSEs	3-5
3.5 Failure to Perform by Suppliers	3-5
3.5.1 Failure to Respond to NYISO’s Request for Steady State Voltage Control	3-6
3.5.2 Failure to Provide Voltage Support Service when a Contingency Occurs on the NYS Power System	3-6
3.5.3 Failure to Maintain Automatic Voltage Regulator in Service	3-7
3.6 Reactive Power Capability Testing or Demonstration	3-8
3.6.1 Frequency, Timing, and Other Requirements	3-8
3.6.2 Test Procedure for Generators	3-9
3.6.3 Test Procedure for Synchronous Condensers	3-11
3.6.4 Reporting Requirements	3-11
3.6.5 Allowance for Out-of-period Reactive Capability Testing	3-12
3.7 Voltage Support	3-13
3.7.1 Request for Voltage Support Service	3-13
3.7.2 Voltage Support Availability	3-13

4. Regulation & Frequency Response Service.....	4-1
4.1 Description.....	4-1
4.2 Source of Service	4-1
4.3 Scheduling of Service.....	4-4
4.3.1 Generating Unit Operating States.....	4-4
4.3.2 Regulation Capacity Scheduling	4-5
4.3.3 Control Signals to Satellite Control Centers.....	4-6
4.3.4 Regulation Service	4-6
4.3.5 AGC & RTD Program Response.....	4-6
4.4 Performance Tracking	4-7
4.5 Regulation Service Settlements – Day-Ahead Market	4-8
4.5.1 Calculation of Day-Ahead Market Clearing Prices.....	4-8
4.5.2 Other Day-Ahead Payments.....	4-9
4.6 Regulation Service Settlements – Real-Time Markets	4-9
4.6.1 Calculation of Real-Time Market Clearing Prices	4-9
4.6.2 Calculation of Real-Time Market Clearing Prices for Regulation Service during EDRP/SCR Activations.....	4-10
4.6.3 Real-Time Regulation Service Balancing Payments	4-10
4.6.4 Other Real-Time Regulation Service Payments	4-11
4.7 Energy Settlement Rules for Generators Providing Regulation Service	4-11
4.7.1 Energy Settlements.....	4-11
4.7.2 Additional Payments/Charges When AGC Base Point Signals Exceed RTD Base Point Signals.....	4-11
4.7.3 Additional Charges/Payments When AGC Base Point Signals are Lower than RTD Base Point Signals 4-12	
4.8 Regulation Service Demand Curve.....	4-13
4.9 Reinstating Performance Charges.....	4-13
4.10 Temporary Suspension of Regulation Service Markets During Reserve Pick-Up.....	4-14
4.11 Charges Applicable to Suppliers That Are Not Providing Regulation Service.....	4-15
4.11.1 Persistent Under-generation Charges.....	4-15
4.11.2 Restoration of Performance Charges.....	4-15
4.11.3 Exemptions.....	4-15
4.12 Charges to Load Serving Entities	4-16
4.13 Regulation Service Qualification and Performance Criteria	4-17
4.13.1 Regulation Qualified Resource Requirements.....	4-17
4.13.2 Prequalification Performance Test	4-17
4.13.3 Supplier Regulation Service Performance Audit.....	4-19
5. Energy Imbalance Service.....	5-1
5.1 Description.....	5-1
5.2 External Imbalances	5-1
5.3 Monthly Meter Reading Adjustments.....	5-2
6. Operating Reserve Service	6-1
6.1 Description.....	6-1
6.2 General Responsibilities and Requirements	6-2
6.2.1 NYISO Responsibilities	6-3

NYISO ANCILLARY SERVICES MANUAL

6.2.2	<i>Supplier Eligibility Criteria</i>	6-5
6.2.3	<i>Other Supplier Requirements</i>	6-6
6.3	General Day-Ahead Market Rules	6-6
6.3.1	<i>Bidding and Bid Selection</i>	6-6
6.3.2	<i>NYISO Notice Requirement</i>	6-7
6.3.3	<i>Responsibilities of Suppliers Scheduled to Provide Operating Reserves in the Day-Ahead Market</i>	6-7
6.4	General Real-Time Market Rules	6-8
6.4.1	<i>Bid Selection</i>	6-8
6.4.2	<i>NYISO Notice Requirements</i>	6-8
6.4.3	<i>Obligation to Make Resources Available to Provide Operating Reserves</i>	6-9
6.4.4	<i>Activation of Operating Reserves</i>	6-9
6.4.5	<i>Performance Tracking and Supplier Disqualifications</i>	6-9
6.5	Operating Reserve Settlements – General Rules	6-9
6.5.1	<i>Establishing Locational Reserve Prices</i>	6-9
6.5.2	<i>Settlements Involving Suppliers of Operating Reserves Located on Long Island</i>	6-9
6.5.3	<i>“Cascading” of Operating Reserves</i>	6-10
6.6	Operating Reserve Settlements – Day-Ahead Market	6-10
6.6.1	<i>Calculation of Day-Ahead Market Clearing Prices</i>	6-10
6.6.2	<i>Other Day-Ahead Payments</i>	6-13
6.7	Operating Reserve Settlements – Real-Time Market	6-13
6.7.1	<i>Calculation of Real-Time Market Clearing Prices</i>	6-13
6.7.2	<i>Calculation of Real-Time Market Clearing Prices for Operating Reserves During EDRP/SCR Activations</i>	6-15
6.7.3	<i>Operating Reserve Balancing Payments</i>	6-17
6.7.4	<i>Other Real-Time Payments</i>	6-17
6.8	Operating Reserve Demand Curves	6-19
6.9	Self-Supply	6-21
6.10	Operating Reserve Charge	6-21
6.11	Failure to Provide Operating Reserve	6-21
6.12	Reserve Service Qualification and Performance Criteria	6-22
6.12.1	<i>Reserve Qualified Resource Requirements</i>	6-22
6.12.2	<i>Pre-qualification & re-qualification Performance Test</i>	6-23
6.13	Supplier Response and Capacity Performance Audit	6-24
6.13.1	<i>Test Procedure</i>	6-25
6.13.2	<i>Frequency of Tests</i>	6-25
6.13.3	<i>Payments and Penalties</i>	6-26
6.13.4	<i>Acceptance Criteria</i>	6-26
6.13.5	<i>Actions in the Event of Unsuccessful Performance</i>	6-27
6.13.6	<i>Reserve Pick-Up in Lieu of Test</i>	6-29
6.13.7	<i>Documentation</i>	6-29
7.	Black Start Capability Service	7-1
7.1	<i>Description</i>	7-1
7.2	<i>Source & Scheduling of Service</i>	7-1
7.3	<i>Payment or Service</i>	7-2
7.4	<i>Black Start Service Procedures</i>	7-3

NYISO ANCILLARY SERVICES MANUAL

Attachment A – VSS Qualification Request Form 1
Attachment B – Generator MVAR Capability Test 1
**Attachment C – Performance Adjustment for Regulating and Non-Regulating
Suppliers 1**
Attachment D – Performance Standards..... 1
Attachment E – Reserve & Regulation Performance Audit Standards..... 1

Table of Figures

Figure 3.1: Generator MVA _r versus MW Capability	3-1
Figure 3.4.4-1: Method for Calculating LOC	3-5
Figure 4.2a: Demand Side Resources Operating Characteristics	4-2
Figure 4.2b: Generating Unit Operating Characteristics	4-3
Figure 4.3.1: Generating Unit Operating States.....	4-4
Figure 4.3: Perfect Performance	4-7
Figure 4.4: Error in Performance (30 Second bandwidth not included).....	4-8
Figure 6.1: Operating Reserve Requirements	6-2
Figure B-1: NYISO Voltage Support Ancillary Service Annual Reactive Capability Test Report	2
Figure B-2: Lagging Test Data Recording Form	3
Figure B-3: Leading Test Data Recording Form	4

Table of Tables

Table 1.1: Ancillary Services Summary	1-1
Table 1.2: Rate Schedules for Ancillary Services	1-2
Table 2.1: System Security Management in Real Time Functions.....	2-1
Table 2.2: Capacity Management Functions	2-2
Table 6.1: Ancillary Service Eligibility	6-3
Table 6.2: NYISO Locational Reserve Requirements.....	6-4

Revision History Page

Revision	Date	Changes
3.11	4/15/2008	<p>Section 4:</p> <ul style="list-style-type: none"> • Substantial information added to address Demand Side Ancillary Services (DSASP) related resources. <p>Section 5.3:</p> <ul style="list-style-type: none"> • 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. <p>Section 6:</p> <ul style="list-style-type: none"> • Substantial information added to address Demand Side Ancillary Services related resources. <p>Various Sections Throughout Manual:</p> <ul style="list-style-type: none"> • Grammatical edits related to changing language to be consistent with DSASP Tariff language. a spreadsheet, report, test and form. <p>Attachment C:</p> <ul style="list-style-type: none"> • Substantial information added to address Demand Side Ancillary Services (DSASP) related resources. <p>Attachment E:</p> <ul style="list-style-type: none"> • New Attachment added address Demand Side Ancillary Services (DSASP) related resources.
3.10	2/26/2008	<p>Section 3.2:</p> <ul style="list-style-type: none"> • Added clarifying sub-bullet to first bullet in first paragraph. • Added clarifying sub-bullet to first bullet in second paragraph. <p>Section 3.6.2:</p> <ul style="list-style-type: none"> • Added clarifying language to the lagging MVAR test requirements to third paragraph, including bullets clarifying DMNC test requirements and nameplate data allowances. <p>Section 3.6.4:</p> <ul style="list-style-type: none"> • Grammatical edits related to Attachment B and the clarification of the usage of a spreadsheet, report, test and form. <p>Sections 4.6.3, 6.10, and Various sections throughout manual :</p> <ul style="list-style-type: none"> • Minor formatting changes. <p>Attachment A:</p> <ul style="list-style-type: none"> • Resource table updated with clarifying column-heading information. • Document approval requirements were edited for clarity. <p>Attachment B:</p> <ul style="list-style-type: none"> • Figures B-1, B-2, and B-3 updated with new spreadsheet content.

<p>3.9</p>	<p>10/30/2007</p>	<p>Section 3.1:</p> <ul style="list-style-type: none"> Deleted “generation” from first paragraph. <p>Section 3.2</p> <ul style="list-style-type: none"> Formatted first paragraph into bullets. Corrected address of Manager, Auxiliary Market Operations <p>Section 3.4.2</p> <ul style="list-style-type: none"> Added “and, except as noted in the following paragraph, Qualified Non-Generator Voltage Support Resources” to first paragraph <p>Section 3.4.3</p> <ul style="list-style-type: none"> 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. <p>Section 3.4.4</p> <ul style="list-style-type: none"> Clarified definitions of D1, D2, and Bid <p>Section 3.5</p> <ul style="list-style-type: none"> Added “its Normal Operating limit, which must be at least 90% of its” to first paragraph. <p>Section 3.5.2</p> <ul style="list-style-type: none"> 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. <p>Section 3.6.1</p> <ul style="list-style-type: none"> 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 D-curve 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.” <p>Section 3.6.5</p> <ul style="list-style-type: none"> 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.” <p>Attachment C:</p> <ul style="list-style-type: none"> Added clarifying language to table: <i>each 30-second interval “p” or during each 30-second interval “p”.</i> Added definition of “measured output:, $MW_{meas p}$” Corrected Regulation Performance Index formula
------------	-------------------	---

NYISO ANCILLARY SERVICES MANUAL

<p>3.8</p>	<p>6/6/07</p>	<p>Section 3.2</p> <ul style="list-style-type: none"> ▪ Second paragraph – added “Attachment A”. <p>Section 3.6</p> <ul style="list-style-type: none"> ▪ 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. <p>Attachment A</p> <ul style="list-style-type: none"> ▪ Updated first bullet – added, “including voltage regulator...data sheet (“D-curve”). <p>Attachment B</p> <ul style="list-style-type: none"> ▪ Section B-1 – Restored missing “Reason for Limit” column. ▪ Section B-2 and B-3 – Removed “Part 1” from figure titles.
<p>3.7</p>	<p>3/8/07</p>	<p>Administrative change</p> <ul style="list-style-type: none"> ▪ Removed 10 Krey Blvd address for Manager, AMO, and replaced with 3890 Carman Road address. <p>Section 3.6</p> <ul style="list-style-type: none"> ▪ Clarify that functioning AVR is required during
<p>3.6</p>	<p>12/8/06</p>	<p>Deleted Attachment B – AGC Functional Requirements</p> <ul style="list-style-type: none"> ▪ There were no references to the Attachment in version 3.5 of the manual <p>Inserted New Attachment A – VSS Qualifications Request Form</p> <ul style="list-style-type: none"> ▪ Inserted Qualification Request Form from TB 103 (TB 103 can be retired). Subsequent Attachments have been relabeled. <p>Inserted New Section 1.3</p> <ul style="list-style-type: none"> ▪ Inserted new section 1.3 “Payments and Charges for Ancillary Services” (from TB 121, TB 121 should be incorporated in the Accounting & Billing Manual before being retired) sections following 1.3 have been renumbered. <p>Inserted New Section 3.2</p> <ul style="list-style-type: none"> ▪ Inserted new section 3.2 Supplier Qualifications (from TB 091 and TB 103) sections following 3.2 have been renumbered. <p>Modified Section 3.6</p> <p>Changes to this section are in accordance with RT SCHD 2, Sect 1.1.</p> <ul style="list-style-type: none"> ▪ Changed title of heading to “Reactive Power Capability Demonstration” ▪ Second paragraph – inserted language on providing data during actual operation. ▪ Section 3.6 (old section 3.5) – Incorporated TB 091 (TB 091 can be retired) <p>Modified Section 3.6.1</p> <ul style="list-style-type: none"> ▪ Changed title of heading to “Frequency and Timing” ▪ First paragraph – inserted language stating each calendar year resources providing VSS must demonstrate both lagging and leading reactive capability. <p>Modified Section 3.6.2</p> <ul style="list-style-type: none"> ▪ First paragraph – inserted language on how measurements should be taken and how tests must be performed. <p>Modified Section 3.6.4</p> <ul style="list-style-type: none"> ▪ Changed title of heading to “Reporting Requirements” ▪ Replaced demonstration with “tests and/or demonstrations.” ▪ 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)

NYISO ANCILLARY SERVICES MANUAL

<p>3.5</p>	<p>5/18/06</p>	<p>All changes pertain only to Section 3 - VSS</p> <p>Section 3.1</p> <ul style="list-style-type: none"> ▪ Second paragraph – Added Note. <p>Section 3.2</p> <ul style="list-style-type: none"> ▪ First para, first sent. – Deleted “Generating” added “Supplier’s” ▪ Third bullet, second sent. – Added “range” after capability. Added “..., as directed by...System Operator” to second sentence. <p>Section 3.3</p> <ul style="list-style-type: none"> ▪ Third bullet – Deleted “payments...utility generators” <ul style="list-style-type: none"> ○ 3.3.1 –First sent. – Added “synchronous” before generators. Also, added “the gross...MVAR” before capability. ○ 3.3.2 – First sent. – Added “...as the product of...The NYISO shall...” Also, added “to Suppliers on a monthly basis.” ○ 3.3.5 - First sent. – Added “in accordance with Rate Schedule No. 2 of the OATT.” Deleted second sentence and all other text until section 3.4. <p>Section 3.4</p> <ul style="list-style-type: none"> ▪ Added line item #4. ▪ Second paragraph – Added “...and is not otherwise...section 3.6.2.” <ul style="list-style-type: none"> ○ 3.4.1 & 3.4.2 – Line items a) – c) – Added “supplier” deleted “provider”. Line item c) – Added “Resource” deleted “provider” ○ New 3.4.3 – Added entirely new section. <p>Section 3.5</p> <ul style="list-style-type: none"> ▪ First para first sent. – Deleted “...generators used” added “resources”. Also, added “..., and provides the basis...support service.” ▪ Second para, first sent. – Deleted “...are used for” added, “participate in”. ▪ Second para, second sent. – Added “...reports must be...upon”. Also, deleted “for any unit will be accepted” and added “acceptance will be”. <ul style="list-style-type: none"> ○ 3.5.1 – First para, first sent. – Added “synchronous” and “voltage support”. Second sent. Added “<i>The demonstrated Gross... (calendar year).</i>” Second sentence was completely rewritten. ○ 3.5.2 - 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.” ○ New 3.5.4 – Added entirely new section. <p>Section 3.6</p> <ul style="list-style-type: none"> ○ 3.6.2 – Changed title of section from “Automatic Voltage Regulator Availability” to “Voltage Support Availability”. Under “Supplier Actions” added “...is obligated...support capability. 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...” Deleted “needed” and replaced with “necessary.” Added “(or other)”. Added new line item #4.
------------	----------------	--

NYISO ANCILLARY SERVICES MANUAL

<p>3.0</p>	<p>11/1/05</p>	<p><u>Global Changes</u></p> <ul style="list-style-type: none"> ▪ All Sections and Attachments include changes to reflect SMD2--Through out the document-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. ▪ 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). ▪ When and where appropriate, RTD was changed to RTD-CAM. ▪ Document formatting was repaired. <p>Section 2.3.3</p> <ul style="list-style-type: none"> ▪ Reference to Section 2.2.1 instead of repeating the lengthy description <p>Section 3</p> <ul style="list-style-type: none"> ▪ Added new text after figure 3.1. ▪ Sections 3.4.1 and 3.4.2 ▪ Added “Reinstatement of Payments” <p>Section 4.2</p> <p>Changed generating unit operating characteristics exhibit and response rate definitions to reflect Technical Bulletin #71</p> <p>Section 4.3.1</p> <ul style="list-style-type: none"> ▪ Updated figure 4.3.1-1 <p>Section 4.3.2</p> <ul style="list-style-type: none"> ▪ Added regulation default description. <p>Section 4.3.5</p> <ul style="list-style-type: none"> ▪ Added “in proportion to this ramp rate; however, some quantization is needed to avoid very small schedule changes,” to second paragraph. <p>Section 4.4.1</p> <ul style="list-style-type: none"> ▪ Renamed section to Performance Penalty to Performance Adjustment and deleted Deferral of Regulation Performance Penalties <p>Section 4.4.2 (deleted)</p> <ul style="list-style-type: none"> ▪ Old Section 4.4.2 – Regulation Performance Penalty moved to new Attachment D <p>Section 4.6</p> <ul style="list-style-type: none"> ▪ Old Section 4.6 was moved to new Section 4.13 <p>Section 4.6.4</p> <ul style="list-style-type: none"> ▪ Added “In addition, Attachment D of this Manual provides additional information on performance-based adjustments to regulation service payments” to last paragraph. ▪ Moved equation for K_{PI} and additional text to Attachment D. <p>Section 4.6.5</p> <ul style="list-style-type: none"> ▪ Deleted <p>Section 4.7 – 4.13</p> <ul style="list-style-type: none"> ▪ New additions <p>Section 6.1</p> <ul style="list-style-type: none"> ▪ Joint optimization descriptions added ▪ Deleted text under figure 6.1-1.
-------------------	-----------------------	---

		<p>Sections 6.2 – 6.10</p> <ul style="list-style-type: none"> ▪ Replaces old Sections 6.2 – 6.4 <p>Section 6.2</p> <ul style="list-style-type: none"> ▪ Inserted new section and table to be consistent with Technical Bulletin #87 <p>Section 6.7.2</p> <ul style="list-style-type: none"> ▪ 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.” <p>Section 6.11 Same as old Section 6.5</p> <p>Section 6.12</p> <ul style="list-style-type: none"> ▪ Same as old Section 6.6 <p><u>ATTACHMENTS</u></p> <ul style="list-style-type: none"> ▪ Deleted original Attachment A- Dispatch Load & Spinning Reserve—The remaining attachments were re-numbered <p>Attachment A</p> <ul style="list-style-type: none"> ▪ New test forms <p>Attachment B-AGC Functional Requirements</p> <ul style="list-style-type: none"> ▪ Under section “Unit Response Rates” ▪ 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.” ▪ Second paragraph-added “the capacity-weighted” before the three instances of NRR. In addition, made NRR plural. ▪ End of Ramped RTD Basepoints section, added text from section 5.3.7 of the Transmission and Dispatching Ops Manual. <p>Replaced Attachment C</p> <ul style="list-style-type: none"> ▪ Regulation Performance Penalty with Regulation Performance Adjustment. ▪ Added equation for K_{pl} and additional text from section 4.6.4 to Attachment C. <p>Replaced Attachment D</p> <ul style="list-style-type: none"> ▪ Removed actual document and provided a link to the document, which is maintained by NERC. <p>Deleted Attachment E</p> <p>Deleted Attachment F</p>
--	--	---

NYISO ANCILLARY SERVICES MANUAL

<p>2.0</p>	<p>4/6/04</p>	<p>*Complete reformatting of document. - All sections, grammar and syntax corrections.</p> <p>Section 3.3.1 – 3.3.3 Section 3.5.1, 3.5.2</p> <ul style="list-style-type: none"> ▪ Deleted references to Six-year testing, and updated the cost determination to reflect current NYISO Market Services Tariff/Rate Schedule No. 2. <p>Section 4.1</p> <ul style="list-style-type: none"> ▪ 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. <p>Section 4.3</p> <ul style="list-style-type: none"> ▪ Added “As specified in Section 4.1, r” to first sentence. Added “or directly from the NYISO.” to last sentence. <p>Section 4.3.2</p> <ul style="list-style-type: none"> ▪ Added “for that day” to first sentence. <p>Attachment B</p> <ul style="list-style-type: none"> ▪ Replaced Reactive Capability test form with current (2004) version.
Initial Release		
<p>1.0</p>	<p>7/15/99</p>	<p>Section 2.3.2, page 8</p> <ul style="list-style-type: none"> ▪ Clarification of applicability of service charges <p>Section 2.3.3, page 10</p> <ul style="list-style-type: none"> ▪ Charges Associated with Local Reliability Rules <p>Section 3.3.5, page 7</p> <ul style="list-style-type: none"> ▪ Clarification of applicability of voltage support charges

1. OVERVIEW

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

- Scheduling, System Control & Dispatch Service
- Voltage Support Service
- Regulation & 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. [Table 1.1](#) presents a summary of the NYISO Ancillary Services.

Table 1.1: 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?
Scheduling, System Control and Dispatch Service	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

1.3 Payments and Charges for Ancillary Services

Payments and charges for ancillary services are described in the [NYISO Accounting and Billing Manual](#) and set forth in the NYISO Open Access Transmission Tariff (OATT) and Services Tariff as noted in Table 1.2.

Table 1.2: Rate Schedules for Ancillary Services

Ancillary Service	OATT Rate Schedule	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 [Table 1.1](#). 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 LSEs 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](#).

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. SCHEDULING, SYSTEM CONTROL & DISPATCH SERVICE

This section describes the scheduling, system control and dispatch services provided by the New York Independent System Operator (NYISO).

2.1 Description

The scheduling, system control and dispatch service is grouped into two broad categories related to the physical operation of the NY Control Area:

- System Security Management in real-time
- Capacity Management

The list of services, together with a description of each service is presented in Tables 2.1 and [2.2](#).

Table 2.1: System Security Management in Real Time Functions

Service Function	Description
Tie-Line Regulation & Frequency Support	The NYISO develops the Area Control Error (ACE) for the NY Control Area and Automatic Generation Control (AGC).
System Restoration	The NYISO develops and manages operating procedures to be used as a guide to NY Control Area restoration, following major disturbances. The NYISO provides restoration training to NYISO Dispatchers, Transmission Owners, LSEs, and Generators.
Time Error Management	The NYISO performs all required activities for time error correction and coordinates this activity with neighboring Control Areas.
Interchange Scheduling Management	The NYISO coordinates the scheduling of all Bilateral Transactions in the Day-Ahead and Real-Time Market. The NYISO prepares a monthly forecast, on a daily basis, of all system transfer limitations due to scheduled facility outages.
System Emergency Management	The NYISO develops procedures for operation of the New York Control Area that define the various security operating states and the responsibilities of the NYISO and the LSEs. System emergency management entails the cooperation of the NYISO, LSEs, Transmission Owners, and Generators in returning the NY Control Area to a Normal State from either a Major Emergency, Warning, or Alert State.
Administration of Inter-Control Area Emergency Transactions	The NYISO coordinates the purchases and sales of Energy and Capacity, on a prescheduled or emergency basis, to prevent the NY Control Area from leaving the Normal State or to assist neighboring Control Areas.
Operator Initiated Load Shedding	The NYISO develops and manages operating procedures that specify conditions under which NYISO directed Load Shedding is carried out.
Under Frequency Load Shedding	The NYISO establishes guidelines and coordinates the settings and amounts of automatic under-frequency Load Shedding that is executed by under-frequency relays within each Transmission Owners' distribution area.

NYISO ANCILLARY SERVICES MANUAL

Service Function	Description
Transmission System Operation	The NYISO monitors the operation of the transmission system and coordinates circuit, capacitor, and reactor switching, as well as scheduling flows on phase angle regulators (PARs) which control the flows into or out of neighboring control areas.
Real-Time Commitment (RTC) and Real-Time Dispatch (RTD) Programs	The NYISO maintains and modifies the RTC and RTD programs, as required, to maintain reliable power system operation.
Security Constrained Unit Commitment (SCUC) Programs	The NYISO maintains and modifies the SCUC programs, as required, to maintain reliable power system operation.
Locational-Based Marginal Price Programs	The NYISO maintains and modifies the LBMP software programs as required.
Communications	The NYISO PCC and Transmission Owner Control Centers maintain communication systems and SCADA systems. The NYISO also maintains an OASIS node and an Electronic Bid System.

Table 2.2: Capacity Management Functions

Service Function	Description
Installed Capacity Criteria & Requirements	The NYISO establishes the installed capacity requirements for each LSE, based on standards promulgated by the NYSRC.
On-Line & Forecasted Capacity Management	The NYISO, on a Day-Ahead and week-ahead basis, forecasts the expected operating capacity that is required to meet the forecasted peak load and reserve requirement.
Operating Reserve Management	The NYISO continuously monitors the Operating Reserve to ensure that there is sufficient on-line capacity to meet the peak load and reserve requirements of the dispatch day.
Operating Reserve Scheduling	The NYISO establishes operating procedures for the management of Operating Reserve. The NYISO establishes the required amount of Operating Reserve and schedules the bidding suppliers to provide the service.
Generator Outage Scheduling	The NYISO coordinates the generator maintenance schedules to ensure sufficient Operating Reserve margins.
Transmission Facility Outage Coordination	The NYISO coordinates all requested transmission outages to ensure system reliability and transmission transfer capabilities.
Generation and Auxiliary Facility Outage Coordination	The NYISO coordinates the simultaneous outages of generators and key auxiliary generator equipment such as Automatic Voltage Regulators (AVRs) and Power System Stabilizers (PSSs), in order to maintain the security of the NY Control Area.

2.2 Recovery of NYISO Costs

This section describes how NYISO's costs are recovered.

2.2.1 Costs Recovered Through NYISO Open Access Transmission Tariff

New York Independent System Operator (NYISO) costs to be recovered through the Rate Schedule 1 charge of the NYISO OATT include:

Costs associated with the operation of the NYS Transmission System by the NYISO and administration of this Tariff by the NYISO, including without limitation, the following:

- Processing and implementing requests for transmission service including support of the NYISO OASIS node;
- Coordination of transmission system operation and implementation of necessary control actions by the NYISO and support for these functions;
- Performing centralized real-time dispatch to optimally redispatch the NYS Power System to mitigate transmission Interface overloads and provide balancing services;
- Billing associated with Transmission Service provided under this Tariff;
- Preparation of Settlement statements;
- Rebilling which supports this service;
- NYS Transmission System studies, when the costs of the studies are not recoverable from a Transmission Customer;
- Engineering services and operations planning;
- Data and voice communications network service coordination;
- Metering maintenance and calibration scheduling;
- Dispute resolution
- Record keeping and auditing;
- Training of NYISO personnel;
- Development of new information, communication and control systems;
- Professional services;
- Carrying costs on NYISO assets, capital requirements and debts;
- Tax expenses, if any;
- Administrative and general expenses;
- Insurance expenses;
- Costs the NYISO incurs as a result of bad debt, including finance charges;

The costs associated with differences between the amounts bid by suppliers that have

been committed and scheduled by the NYISO to provide Energy and certain Ancillary Services, and the actual revenues received by these suppliers for providing such Energy and Ancillary Services. Where the costs are incurred to compensate suppliers for satisfying Local Reliability Rules, the associated charge shall apply only to Transmission Customers serving Load in the Load Zone(s) where the rule is applied.

Subject to the above, where costs, expenses, or receipts are incurred on a basis other than a monthly basis, the NYISO shall use reasonable judgment consistent with commonly accepted accounting practices to develop the monthly components. The sum of the costs identified above shall be adjusted by all ancillary service penalties collected by the NYISO and by the Residual Adjustment.

Residual Adjustment

a) Open Access Transmission Tariff

The ISO's payments from Transmission Customers will not equal the ISO's payments to Suppliers. The Residual Adjustment adjusts settlements to Transmission Customers to balance the payments and costs as calculated above. The most significant components of the Residual Adjustment include:

- The greater revenue the NYISO collects for Marginal Losses from Transmission Customers, in contrast to payments for losses remitted to generation facilities:
 - Costs or savings associated with the NYISO redispatch of Generators resulting from a change in Transfer Capability between the Day-Ahead schedule and the real-time dispatch;
 - The cost resulting from inadvertent interchange (if unscheduled Energy flows out of the NYCA to other Control Areas), or the decrease in cost resulting from inadvertent interchange (if unscheduled Energy flows into the NYCA from other Control Areas) and associated payments in kind;
 - Costs or revenues from Emergency Transactions with other Control Area operators;
 - Metering errors resulting in payments to or from Transmission Customers to be either higher or lower than they would have been in the absence of metering errors;
 - Deviation between actual system Load and the five-minute ahead Load forecast used by RTD, resulting in either more or less Energy than is needed to meet Load;
 - Energy provided by generation facilities in excess of the amounts requested by the NYISO (through RTD Basepoint Signals or AGC Basepoint Signals);
 - Transmission Customers serving Load in the NYCA will be billed based upon an estimated distribution of Loads to buses within each Load Zone. If the actual distribution of Load differs from this assumed distribution, the total amount collected from Transmission Customers could be either higher or lower than the amount that would have been collected if the actual distribution of Loads had been known.

NYISO ANCILLARY SERVICES MANUAL

- Settlements for losses revenue variances, as described in Attachment K of this Tariff, with Transmission Owners that pay marginal losses to the NYISO for losses associated with modified TWAs (not converted to TCCs) while receiving losses payments from the participants in those TWAs other than marginal losses.

The calculation of the Residual Adjustment for each month is described in the Accounting and Billing Manual.

2.2.2 Costs Recovered Through NYISO Services Tariff

Other New York Independent System Operator costs which are recovered through the Rate Schedule 1 charge of the NYISO Services Tariff shall include costs incurred by the NYISO that are directly related to the services provided by the NYISO under the Services Tariff but which are not recovered under Rate Schedule 1 of the NYISO Open Access Transmission Tariff (OATT). Costs recoverable under this charge shall include costs related to: the NYISO's administration of the Locational Based Marginal Pricing (LBMP) Markets; the NYISO's administration of Installed Capacity requirements and an Installed Capacity Market; the NYISO's administration of Control Area Services, other than Ancillary Services provided under the NYISO OATT; the NYISO's administration of the Market Power Monitoring Program; and other activities related to the maintenance of reliability in the New York Control Area (NYCA). These costs shall be offset by installed capacity deficiency penalties collected by the NYISO.

Where costs, expenses, or receipts are incurred on a basis other than a monthly basis, the NYISO shall use reasonable judgment consistent with commonly accepted accounting practices to develop the monthly components.

2.3 Payment for Service

The NYISO charges and Transmission Customers pay the Scheduling, System Control, and Dispatch Service charge on all Transmission Services provided pursuant to the NYISO Tariff, including Bilateral Transactions within the NYCA, purchases of Energy from the LBMP Market, Wheels Through, and Exports.

For more information, see the *NYISO Accounting & Billing Manual*.

2.3.1 Computation of Rate

The Scheduling, System Control, and Dispatch Service charge rate for both the NYISO OATT and the NYISO Services Tariff are computed on a monthly basis based on information available from the prior month. Each charge rate is equal to the quotient of the NYISO's monthly costs and expenses allocated to that tariff, as discussed in the preceding section, divided by the total number of billing units that apply to that tariff.

NYISO Billing Units

For the purposes of the NYISO OATT, the billing units for each customer shall consist of the actual energy withdrawals for that month to supply load in the NYCA, and hourly energy schedules for all wheel-through and export transactions. The total billing units will be equal to the sum of the billing units for all customers taking service under the OATT.

NYISO Services Tariff Billing Units

For the purposes of the NYISO Services Tariff, the billing units for each customer shall consist of the actual energy withdrawals for that month to supply load in the NYCA, and all other purchases from LBMP markets to supply load outside the NYCA. The total billing units will be equal to the sum of the billing units for all customers taking service under the NYISO Services Tariff.

2.3.2 Billing

The amount the NYISO charges each Transmission Customer under both the NYISO OATT and the NYISO Services Tariff are calculated as follows:

NYISO Charge = NYISO Service Charge Rate for the Appropriate Tariff * Monthly Billing Units for the Appropriate Tariff

Note: In cases where a Transmission Customer is a retail access customer served by an LSE, the LSEs shall be responsible for paying this charge to the NYISO.

The billing units will be based on the number of MWH withdrawn in each month from the NYCA, to supply load inside or outside the NYCA. In addition, Transmission Customers not taking service under the NYISO Services Tariff will not be assessed its Rate Schedule 1 charge.

2.3.3 Charges Associated with Local Reliability Rules

In addition to the above charges, Transmission Customers taking service under the NYISO OATT may be assessed additional Schedule 1 charges associated with local reliability rules. These charges shall be allocated among the customers in the affected areas based on the actual energy withdrawals in the subzones when the local reliability rules were applied. In cases where a Transmission Customer is a retail access customer served by an LSE, the LSE shall be responsible for paying these charges.

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](#).

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.

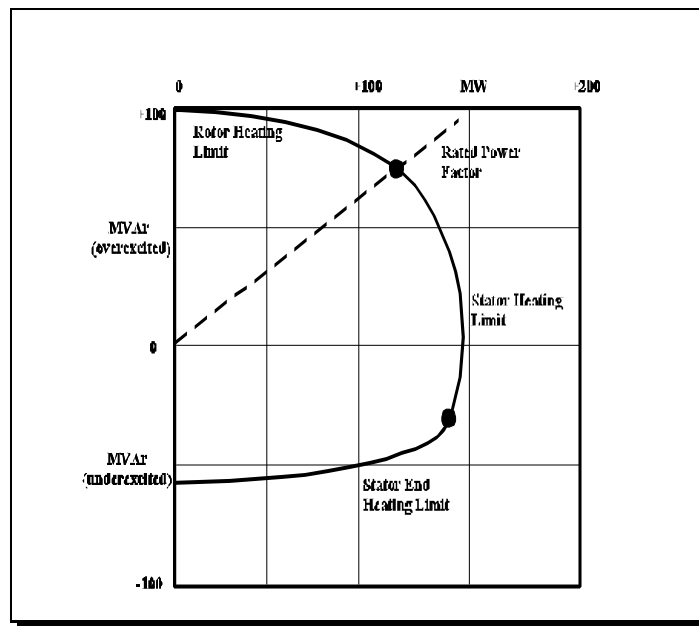


Figure 3.1: Generator MVar versus MW Capability

The ability of a generator to produce or absorb Reactive Power (MVar) is limited by generator heating considerations. At full load, a generator is able to produce or absorb a relatively small amount of Reactive Power. As the generator’s production of real power decreases, its ability to produce or absorb Reactive Power increases. [Figure 3.1](#), called a reactive capability curve or a D-Curve, is representative of generators limiting characteristics at a particular temperature. Reactive capability decreases as the generator heats up and increases as the generator cools down. The reactive capability curve therefore will “shrink” with heating and “expand” with cooling of the machine.

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.*
- 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
- Be able to automatically respond to voltage control signals; for a generator, a functioning Automatic Voltage Regulator (AVR) is required
- Be under the operational control of the NYISO, a Transmission Owner, or an External Control Area operator
- Successfully perform a Reactive Power (MVar) capability tests in accordance with the NYISO Procedures described below

In order to qualify to receive payments as a VSS Supplier the candidate Supplier, including previously disqualified VSS Suppliers that must re-qualify, must:

- complete a VSS Qualification Form. That form is provided as [Attachment A](#) 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
 - include a statement of intent to provide Voltage Support Services and attach documentation that the synchronous generator or synchronous condenser has an automatic voltage regulator (AVR). This documentation shall include the voltage regulator block diagram and associated data, the manufacturer’s model number and specifications, and a generator reactive capability data sheet (“D-curve”).
- return the Voltage Support Service Suppliers Qualification Form, and supporting data to:

Manager, Auxiliary Market Operations
 New York Independent System Operator, Inc.
 3890 Carman Road
 Schenectady, NY 12303

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.

- 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.

3.4 Payment for Service

This section describes the payments for VSS and covers the following:

- Method for determining payment
- Payments made to suppliers of VSS
- Payment for lost opportunity cost
- Payments made by transmission customers and LSEs

For more information, see [NYISO Accounting & Billing Manual](#).

3.4.1 Method for Determining the Payments for Voltage Support Service

Payments to synchronous generators and synchronous condensers eligible for VSS are based upon a fixed dollar amount per MVAR as specified in the NYISO Market Services Tariff Rate Schedule 2 and the gross lagging MVAR capability as determined by annual capability testing performed by the generator and verified by the NYISO.

3.4.2 Payments made to Suppliers for Voltage Support Service

The rate provided in Rate Schedule 2 shall be used to calculate payments to all eligible Suppliers providing VSS as applied on a Resource-specific basis. The NYISO shall calculate the payments on an annual basis, as the product of the compensation rate specified in Rate Schedule 2 and the gross lagging MVAR capability as demonstrated by actual test in the preceding calendar year. The NYISO shall make payments to Suppliers on a monthly basis. Suppliers whose Resource(s) meet the requirements to supply Installed Capacity and are under contract to supply Installed Capacity receive one-twelfth the annual payment for VSS except as noted below for Non-Utility Generators. Suppliers whose Generators are not under contract to supply Installed Capacity, Suppliers with synchronous condensers, and, except as noted in the following paragraph, Qualified Non-Generator Voltage Support Resources receive one-twelfth the annual payment pro-rated by the number of hours that Generator or synchronous condenser operated in that month, as recorded by the NYISO.

For Non-Utility Generators that are operating under existing power purchase agreements, the entity that is purchasing Energy and/or Capacity under such agreement or providing Transmission Service under that agreement is contacted by the NYISO when the NYISO requires VSS from the contracted Resource.

3.4.3 Payments for Voltage Support Service Provided by Non-Utility Generators with Existing Power Purchase Agreements

The NYISO pays each holder of a contract for a Non-Utility Generator operating under an existing power purchase agreement, which provides VSS.

- If that non-utility Generator provides installed capacity, the NYISO will pay it the product of: (1) one -twelfth of the annual \$/MVA_r rate for NYISO payments to Suppliers of VSS and (2) the lesser of the tested Reactive Power production capability (MVA_r) of the Non-Utility Generator or the contract MVA_r capability.
- If that non-utility Generator does not provide Installed Capacity, the NYISO will pay it the product of (1) and (2), as calculated above, multiplied by the number of hours in the month the Non-Utility Generator provided VSS divided by the number of hours in the month.
- In the case of the Cross-Sound Scheduled Line, the product of \$3919/MVA_r and that tested, Reactive Power (MVA_r) capacity measured at maximum real power flow.

The NYISO calculates and makes payments on a monthly basis.

3.4.4 Payments for Lost Opportunity Cost

A Supplier providing VSS from a Generator that is In-Service is entitled to receive Lost Opportunity Costs (LOCs) in the event the NYISO dispatches or directs the Generator to reduce its real power (MW) output in order to allow the unit to produce or absorb more Reactive Power (MVA_r).

The method for calculating LOC is based on the following:

- Real-Time LBMP
- Original dispatch point
- New dispatch point
- Bid curve of Generation supplying VSS

Figure 3.3.4 graphically portrays the calculation of the LOC for a Generator that reduced its MW output to allow it to produce or absorb more Reactive Power (MVA_r).

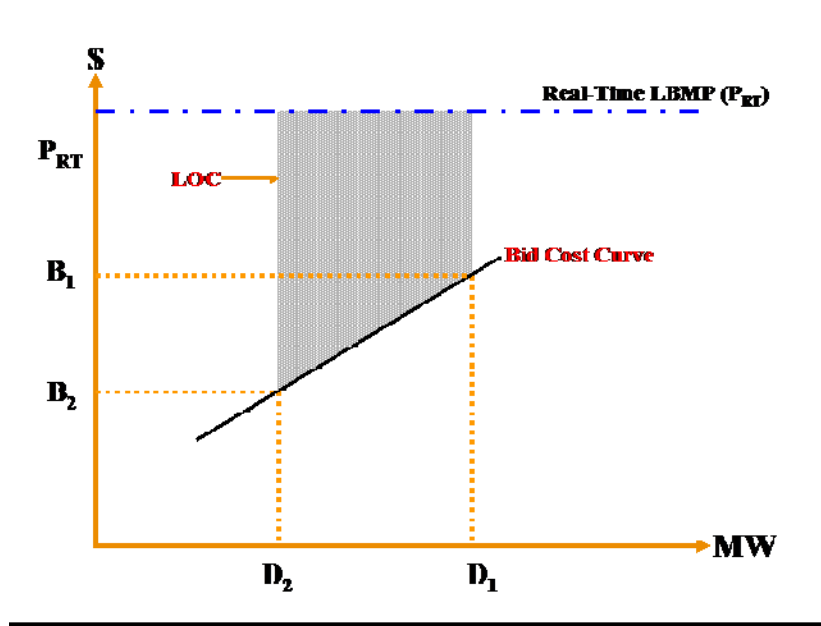


Figure 3.4.4-1: Method for Calculating LOC

$$LOC = P_{RT} (D_1 - D_2) - \int_{D_2}^{D_1} Bid$$

Where: P_{RT} = Real Time LBMP

D_1 = Original Dispatch Point, which shall be equal to the Generator's Economic Operating Point

D_2 = New Dispatch Point, which shall be the greater of the Generator's Real-Time Scheduled Energy Injection, or the Generator's Actual Energy Injection, or the amount of Energy the Generator is scheduled to produce for the hour in the Day-Ahead Market

Bid = Bid curve for generation supplying Voltage Support Services

3.4.5 Payments made by Transmission Customers and LSEs

Transmission Customers and Load Serving Entity (LSEs) taking service under the NYISO OATT pay the NYISO for VSS associated with energy withdrawals from the transmission system in accordance with Rate Schedule No. 2 of the OATT.

3.5 Failure to Perform by Suppliers

A resource will have failed to provide voltage support if it:

- 1) fails at the end of 10 minutes to be within 5% (+/-) of the requested Reactive Power (VARS) level of production or absorption as requested by the NYISO or applicable Transmission Owners for levels below its Normal Operating limit, which must be at least 90% of its Dependable Maximum Net Capability

(DMNC).

- 2) fails at the end of 10 minutes to be at 95% or greater of the resource's demonstrated Reactive Power capability (tested at its Normal Operating Limit or at 90% of its DMNC, whichever is greater in MW) in the appropriate lead or lag direction when requested to go to maximum lead or lag reactive capability by the NYISO or applicable Transmission Owner.
- 3) fails to automatically respond, following a system contingency, to produce (or absorb) the Reactive Power required in accordance with published NYISO (or Transmission Owner) system operating studies.
- 4) fails to maintain its automatic voltage regulator (AVR) in service and in automatic voltage control mode, or fails to commence timely repairs to the AVR.

Any resource that fails to provide voltage support when it is being paid to provide voltage support and is not otherwise excused pursuant to a forced outage, derate or maintenance outage as addressed in [section 3.7.2](#) will be penalized in accordance as described below.

3.5.1 Failure to Respond to NYISO's Request for Steady State Voltage Control

- a) An installed capacity supplier of voltage support that fails to provide steady-state voltage support on a given day will forfeit 1/12th of the annual payment that resource would have received for providing voltage support, and must reimburse the NYISO for any lost opportunity costs paid to replacement sources of steady-state voltage support.
- b) A non-installed capacity supplier of voltage support that fails to provide steady-state voltage support on a given day will forfeit the voltage support payment received by that resource in the last month in which that payment was positive (as a proxy for 1/12th of the annual payment that resource would have received for providing voltage support), and must reimburse the NYISO for any lost opportunity costs paid to replacement sources of steady-state voltage support.
- c) A Resource will be disqualified as a supplier of voltage support after it fails to provide steady-state voltage support on three separate days within a 30-day period.

Reinstatement of Payments

The NYISO may reinstate payments once the Supplier complies with the following conditions to the NYISO's satisfaction:

- the Supplier's Resource must successfully perform a Reactive Power (MVAR) capability test, and
- the Resource must provide VSS for 30 consecutive days without any compliance failures. No payments for VSS or LOC are made to the Supplier during this period.

3.5.2 Failure to Provide Voltage Support Service when a Contingency Occurs on the NYS Power System

- a) An installed capacity supplier of voltage support that fails to provide voltage support following a contingency on a given day will forfeit 1/12th of the annual payment that resource would have received for providing voltage support on the first such occurrence, and 1/4th of the annual payment that resource would have received for providing voltage support on the second such occurrence. 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.
- b) A non-installed capacity supplier of voltage support that fails to provide voltage support following a contingency on a given day will forfeit the voltage support payment received by that resource in the last month in which that payment was positive (as a proxy for 1/12th of the annual payment that resource would have received for providing voltage support) on the first occurrence. Additionally, it will forfeit the payment received by that resource in the last three months in which those payments were positive (as a proxy for 1/4th of the annual payment that resource would have received for providing voltage support) for the second failure. 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.
- c) A Resource will be disqualified as a supplier of voltage support after it fails to provide voltage support following a contingency on two separate occasions within a 30-day period.

Reinstatement of Payments

In addition, the Supplier that is in violation is prohibited from receiving VSS payments for the non-complying Resource until the Supplier complies with the following conditions to the NYISO's satisfaction:

- the Supplier's Resource successfully performs a Reactive Power (MVAR) capability test, and
- the Resource provides VSS for 30 consecutive days without any compliance failures. No payments for VSS or LOC are made to the Supplier during this period.

3.5.3 Failure to Maintain Automatic Voltage Regulator in Service

- a) A Resource will be disqualified as a supplier of voltage support after it fails to maintain the automatic voltage regulator in operation and fails to commence timely repairs following a failure of the automatic voltage regulator within a 30-day period.

Reinstatement of Payments

The Supplier will not receive Voltage Support Service payments for the disqualified Resource until the Supplier complies with the following conditions:

- the Supplier provides documentation to the NYISO of the completion of the repairs,

- the Supplier's Resource successfully performs a Reactive Power (MVar) capability test, and
- the Resource provides Voltage Support Service for 30 consecutive days without any compliance failures. No payments for Voltage Support Service or LOC are made to the Supplier during this period.

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. VSS suppliers must have a functioning automatic voltage regulator (AVR). 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's AVR is in proper working condition and 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 be tested to demonstrate both Lagging and Leading Reactive Power capability or must provide data collected during actual operation to demonstrate both Lagging and Leading Reactive Power capability. In all cases, the Supplier's AVR must be enabled and providing automatic voltage control during the demonstration period. Tests may take the form of demonstration of Reactive Power capability based upon actual generator output data or tests conducted pursuant to the procedures set forth in this Manual. Tests must be coordinated with the NYISO and the Transmission Owner (TO) in whose service territory the unit is located. 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 Reactive Power capability tests is the basis for compensation to Suppliers of VSS.

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.

3.6.1 Frequency, Timing, and Other Requirements

At least once each calendar year each Resource providing Voltage Support Service must test or demonstrate both Lagging and Leading Reactive Capability. The demonstrated *Gross* Lagging MVar capability will be the basis for compensation in the next compensation (calendar) year.

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 D-curve 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.

Both Lagging MVAR and Leading MVAR capability must be tested or demonstrated during the Summer capability period (May 1 through October 31, inclusive). Failure to test or demonstrate the resource's Reactive Power capability will result in the disqualification of the resource in the next compensation year. The Supplier's AVR must be enabled and providing automatic voltage control during the demonstration period. Lagging MVAR capability testing will normally be 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.

The Leading MVAR testing will normally be 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.

A VSS Supplier may schedule additional MVAR tests during the Summer capability period, however; only one test at a time may be scheduled. When scheduling an additional Reactive Capability Test, the VSS Supplier must again follow the test procedures given below. The VSS Supplier will be placed at the end of the queue for scheduling requests when requesting additional tests during a given capability period.

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 leading and lagging MVAR are to be measured at the generator terminal (gross) and, if metered data is available, at the point of interconnection (net).

The lagging MVAR test must be performed at a net real power level of 90% (or greater) of,

- the generator's Dependable Maximum Net Capability (DMNC), that is in effect at the time of the test, for ICAP providers and non-ICAP providers with a valid DMNC test. The DMNC value that is tested to must correspond to the DMNC recorded in the Automated ICAP Market System.
- the generator's nameplate value for non-ICAP providers without a valid DMNC test.

The leading MVAR test should be performed at the generator's minimum MW level (consistent with a real power level typical for off-peak or light load conditions).

The Transmission Owner is responsible for coordinating the test with the respective plant. Each Transmission Owner shall notify the NYISO at least one hour prior to the initiation of generator MVAR testing. The NYISO in turn notifies any other affected

Transmission Owners. Test procedures are set forth below:

1. The VSS Supplier must notify the NYISO and the Transmission Owner (TO), at least five (5) business days prior to the day that the test is to be performed if the Supplier is a generator sized 100 MW or larger. Other VSS Suppliers must also notify the NYISO and TO of their plan to test, but a five-day notification is not required, though it is encouraged. The following information must be included in the notification of intent to perform a Reactive Capability test:
 - VSS Supplier name (as listed in the NYISO MIS)
 - VSS Supplier point identifier (PTID – a five digit number)
 - Net operating capability of the unit (MW)
 - VSS Supplier operator company name
 - Transmission Owner area
 - Test requested (lagging or leading)
 - Date and time of the test start
 - Name and telephone number of the person requesting the test

A generator that is normally scheduled in the DAM and is operating within 100 MW of its normal operating capability may perform the MVAR test without the 5-day prior notification. If a generator's normal operating capability is less than 100 MW, the 5-day prior notification is also not required but is still recommended.

2. The NYISO will notify the VSS Supplier of the status of the request three (3) business days prior to the planned test date. It should be noted that test approvals are subject to a NYISO reliability review and the NYISO reserves the right to cancel or terminate the test at any time. The TO may also request that the NYISO cancel or terminate the test at any time should local reliability criteria be violated. The NYISO will document all approvals, cancellations, and terminations including the party responsible and reason for implementing the cancellation or termination.
3. On the day prior to the scheduled date of the Reactive Capability Test, generators with a normal MW operating capability of 100 MW or greater must bid energy into the Day-Ahead Market (DAM). The bid must be structured to ensure that the generator is scheduled at the appropriate MW level for the hours requested to perform the Reactive Capability Test. The VSS Supplier must notify the NYISO (notify NYISO Generation Scheduling at (518) 356-6050) by hour 14:00 of the prior business day that the unit has been scheduled in the DAM, and that the test will be conducted as scheduled. If the generator is not scheduled, then the Reactive Capability Test is cancelled. If the generator has a net operating capability of less than 100 MW or if the generator is a quick start unit that can be committed by the Real-Time Commitment (RTC), a DAM bid is not required. The VSS Supplier must still notify the NYISO and the TO, by hour 14:00 of the prior business day, of the intent to perform a Reactive Capability Test.
4. On the day of the scheduled Reactive Capability Test, the VSS Supplier, through

the TO, must request permission from the NYISO System Operator to perform the test at least three (3) hours prior to the test start time. The generator must also bid energy into the Hour-Ahead Market (if not previously committed in the DAM) to ensure that the generator is scheduled at the appropriate MW level for the hours requested to perform the Reactive Capability Test. The NYISO System Operator will approve or deny the request, through the TO, at least two (2) hours prior to the scheduled test, allowing time for any desired Hour-Ahead Market bid adjustments. The NYISO will document all approvals, cancellations and terminations of the tests. The log will include the name of the party and reason for implementing the cancellation or termination.

5. Upon beginning the test, the VSS Supplier must notify the NYISO System Operator, through the TO, that the Reactive Capability Test has started.
6. The NYISO will log that the VSS Supplier is performing a Reactive Capability Test.
7. Upon completion of the test, the VSS Supplier must notify the NYISO System Operator, through the TO, that the test is complete. The NYISO will log the completion time and the name of the generator plant personnel reporting the test.

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 Reporting Requirements

Attachment B of this manual illustrates the spreadsheet based test report forms that are to be used to document the results of Reactive Power capability tests and demonstrations. An electronic version of the test report forms is available on the NYISO's web site. Suppliers of VSS must complete the forms and submit the completed forms to the NYISO within ten (10) business days of the test or demonstration. The forms 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. These data must be sampled at the beginning and end of the test or demonstration period and least once every five (5) minutes during the test or demonstration period. The test report forms must clearly indicate the start and end times of the test or demonstration period.

The completed test report forms must be submitted electronically (by email) to the NYISO at the following email address: vss_test_results@nyiso.com. If the lagging and leading MVar capability tests or demonstrations are performed on different dates, then the results of the lagging and leading tests or demonstrations can be submitted separately.

The NYISO collects generator reactive capability data of VSS Suppliers. The NYISO provides these data to the operating division of the Generator's Transmission Owner (TO) within sixty (60) days of the end of the capability period. This allows sufficient

time for the NYISO to assemble the data with due consideration to Generator owner reporting requirements.

3.6.5 Allowance for Out-of-period Reactive Capability Testing

There are four (4) conditions where NYISO will provisionally accept testing for Voltage Support Service when that test is not conducted within the specified Summer Capability Period:

1. A new resource entering commercial operation, or
2. An existing provider's resource returning to service from an extended forced outage, or
3. An existing resource becoming eligible to qualify as a VSS supplier, or
4. A nuclear generating unit that has an AVR that is not functioning during the test period.

Initial Qualification of New Resource

For a new resource entering commercial service and requesting qualification as a Voltage Support Service supplier, 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. The resource shall also provide, in writing, the required documentation of the resource's reactive capability and automatic voltage regulator.

Existing Resource returning from Extended Forced Outage

An existing supplier's 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 becoming eligible as a VSS Supplier

If, as the result of equipment upgrades or changes in qualification requirements, an existing supplier's resource becomes eligible, 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 MVAr 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.

Follow-up Testing Requirement

For any of the above conditions, the following conditions and requirements apply:

The NYISO will accept the demonstrated lagging MVAr capability as the basis for compensation on a provisional basis until the beginning of the next Summer Capability Period.

To continue qualification to receive VSS payments the resource is required to perform a complete annual test within thirty (30) days of the start of the Summer Capability Period, and forward the completed test report, in electronic form, to NYISO within ten (10) business days of the completion of that test. This “in period” test will also qualify the resource for continued participation in the VSS in the next compensation year.

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 & Dispatching Operations](#) Manuals*.

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.

The supplier must perform the following:

- 1) The Automatic Voltage Regulator (AVR) 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 AVR, 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 provided notice as required by the [NYISO Outage Scheduling Manual](#) prior to removal from service for scheduled maintenance.
- 3) Notify the NYISO and Transmission Owner System Operator of the estimated time for completion of necessary AVR (or other) repairs, or scheduled maintenance.
- 4) Notify the NYISO and Transmission Owner System Operator when maintenance is complete and the resource's voltage support capability is fully restored.

4. REGULATION & 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 committing Generators and Demand Side Resources (Regulation Suppliers) 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. 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 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 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 4.13.

4.2 Source of Service

Regulation service is bid into the market by regulation qualified suppliers that have AGC capability and that wish to participate in the regulation market. Regulation Resources are not obligated to participate and provide regulation service unless they have bid for Regulation and that bid has been accepted.

The NYISO selects regulation service in the Day-Ahead 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 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 response rate, in MW/min
 Regulation Response Rate is a static bid parameter and can only be modified through a request to the Customer Relations Department.
- Regulation availability/price, in \$/MW
- Regulation Availability 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.

The NYISO Market Participants User’s Guide describes the bidding protocols and the checks that the NYISO makes to ensure validity. Maximum regulation capacity (or regulating margin) that can be offered is calculated as the regulation response rate times five minutes.

[Figure 4.2a 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 schedule.

[Figure 4.2b](#) shows how regulation capacity is defined with respect to a unit's operating range, for the situation without Reserve activation.

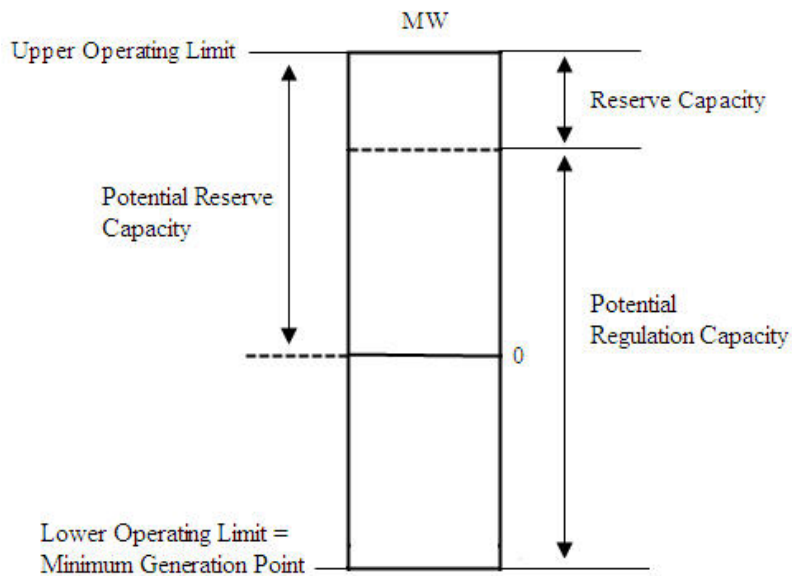


Figure 4.2a: Demand Side Resources Operating Characteristics

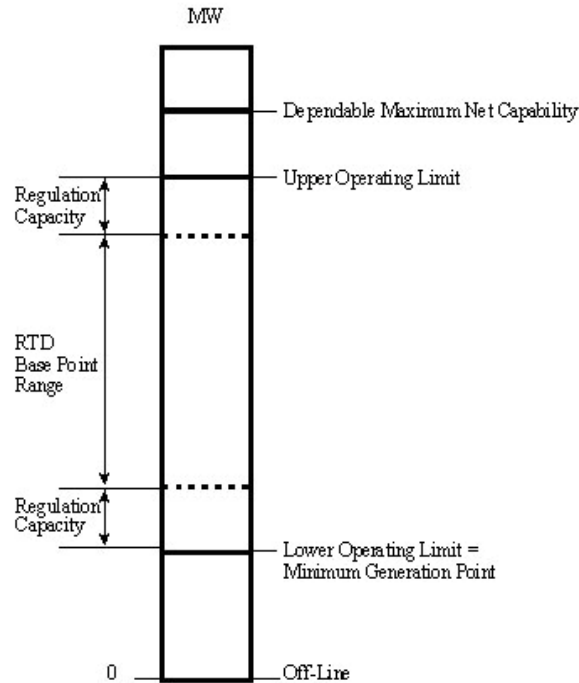


Figure 4.2b: Generating Unit Operating Characteristics

Note: Modification of response rates must be coordinated with the Customer Relations Department

There are up to five response rates that are bid by the suppliers:

- *Normal Response Rate (NRR)* — There may be up to **three** response rates given with each generator. They are used under non-reserve pickup conditions.
- *Regulation Response Rate (RRR)* — This response rate is used for scheduling regulation service.
- *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.

For all Regulation providers the RRR must be \geq to the minimum NRR and the ERR must be \geq to the maximum NRR.

Individual units may bid into the market as groups of units, providing the units are pre-qualified to be bid and operated together as though they are a single unit for all generator 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 units to bid as a group include metering support, billing, and performance measurements as if a single unit.

4.3 Scheduling of Service

Regulation requirements are determined by the NYISO consistent with industry standards set by NERC. The regulation requirements may include locational requirements and consider transmission constraints. Automatic Generation Control signals for regulation service are transmitted to the individual units via the Transmission Owners. Regulation providers may also receive regulation 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

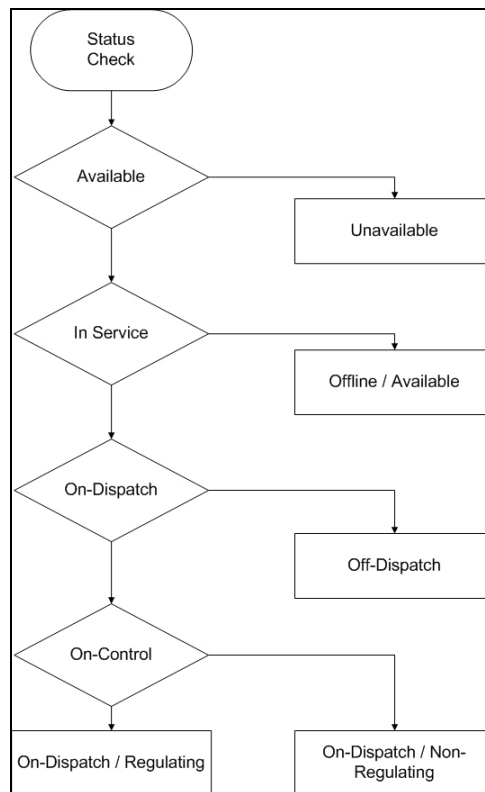


Figure 4.3.1: Generating Unit Operating States

Generating units have the NYISO operating states as shown in [Figure 4.3.1](#).

Demand Side Resources 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.
- **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 as directed by AGC and, thus, may be requested to deviate from its RTD schedule.

4.3.2 Regulation Capacity Scheduling

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

Regulation capacity is comprised of 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 4.1](#), above)

Commitment for Additional Regulations

The NYISO may commit additional generation resources in the real-time market to provide regulation if any of the following conditions exist:

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

Regulation Service in Real-Time

Regulation 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:

- 1) The Real-Time market clearing price (MCP) for regulation
- 2) Its real-time scheduled regulation in MWs
- 3) The length of the period of time during which it is committed to provide regulation.

A Supplier with a Day-Ahead Regulation schedule that notifies the NYISO that it cannot provide Regulation Service in real-time will receive a zero real-time Regulation Service 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 4.6.3. 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 4.6.3.

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 and allocates this error to selected Regulation Resources in proportion to the amount of their scheduled Regulation Service. 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 5-minute basepoint. 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 balancing payments and charges for all NYCA resources will be assigned by the NYISO directly to individual suppliers based on their monitored performance.

The amount of regulation capacity (MW) and 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 & Dispatching Operations Manual](#) describes how the regulation requirements are defined for the New York Control Area.

4.3.5 AGC & RTD Program Response

The AGC program uses each supplier's Regulation Response Rate in determining base points. The RTD program uses the Normal Response Rate(s). 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.

When more Regulation Service is required, the NYISO may request more regulation capacity from the real-time regulation 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 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 determine penalties assessed to non-regulating Resources that do not follow their RTD basepoints, thereby increasing the regulation burden.

[Figure 4.3](#) illustrates a regulating Resource that has perfect performance and [Figure 4.4](#) illustrates a regulating Resource with performance errors.

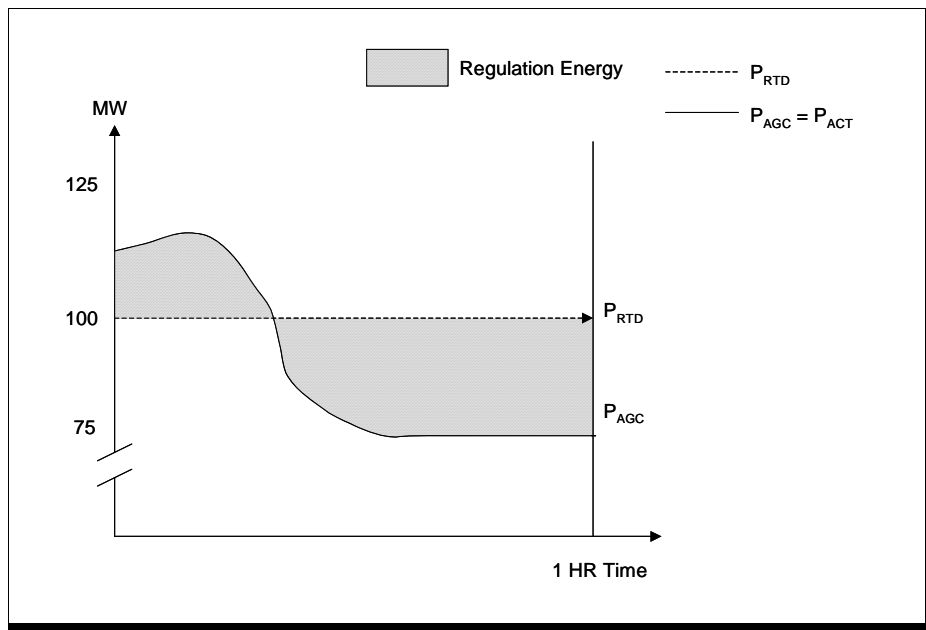


Figure 4.3: Perfect Performance

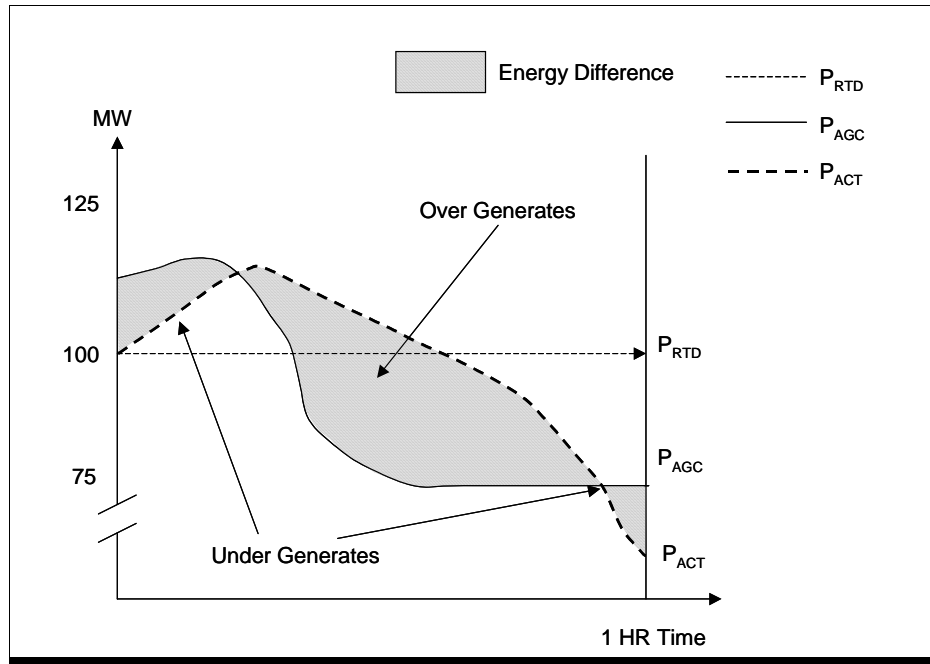


Figure 4.4: Error in Performance (30 Second bandwidth not included)

Regulation Resources are required to change their output level at a rate consistent with the amount of regulation each resource has been scheduled to provide.

Regulation Resources will not receive payments for additional Regulation Service 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, the Billing and Accounting System will calculate performance adjustments for both Regulation Suppliers and Energy Suppliers that are not providing Regulation Service. Attachment C of this Manual presents a detailed description of the calculation of regulation performance adjustments and Persistent Under Generation charges.

4.5 Regulation Service Settlements – Day-Ahead Market

4.5.1 Calculation of Day-Ahead Market Clearing Prices

The NYISO shall calculate a Day-Ahead Market clearing price for Regulation Service for each hour of the following day. The Day-Ahead Market clearing price for each hour shall equal the Day-Ahead Shadow Price for the NYISO’s Regulation Service constraint for that hour, as described in Attachment B to the NYISO Services Tariff, and Attachment J to the NYISO OATT.

The Shadow Price takes account of the Day-Ahead Regulation Service Bid of the marginal Resource selected to provide Regulation Service (or the applicable price on

the Regulation Service Demand Curve during shortage conditions), plus any margins on the sale of Energy or Operating Reserves in the Day-Ahead Market that the Resource would forego if scheduling it to provide additional Regulation Service would lead to it being scheduled to provide less Energy or Operating Reserves. The Shadow Price also takes into account of the Regulation Service Demand Curves described in Section 4.8 of this Manual, which will ensure that Regulation Service is not scheduled by SCUC at a cost greater than the Demand Curve indicates should be paid.

Each Supplier that is scheduled Day-Ahead to provide Regulation Service is paid the Day-Ahead Market clearing price in each hour, multiplied by the amount of Regulation Service that it is scheduled to provide for that hour.

4.5.2 Other Day-Ahead Payments

As provided in Section 4 and Attachment C of the NYISO Services Tariff, the NYISO shall compensate each ISO-Committed Flexible Generator that provides Regulation Service if its Bid Production Cost to provide the Energy and Ancillary Services it is scheduled to supply in the Day-Ahead Market, including start-up costs, minimum load costs, and Availability Bids, exceeds the revenues it receives from the sale of Energy and Ancillary Services.

No payments shall be made to any Supplier providing Regulation Service in excess of the amount of Regulation Service scheduled by the NYISO in the Day-Ahead Market, except to the extent that a Supplier is directed to provide the excess amount by the NYISO.

4.6 Regulation Service Settlements – Real-Time Markets

4.6.1 Calculation of Real-Time Market Clearing Prices

The NYISO shall calculate a Real-Time Market clearing price for Regulation Service for every RTD interval, except as noted in Section 4.10 of this Manual. Normally, the Real-Time Market clearing price for each interval shall equal the real-time Shadow Price for the NYISO's Regulation Service constraint for that RTD interval. Calculation of the Real-Time Market Clearing Price (MCP) during EDRP/SCR events is set forth in Section 4.6.2.

The Real-Time MCP for each RTD interval shall equal the Real-Time Shadow Price for the NYISO's Regulation Service constraint for that interval, as described in Attachment B to the NYISO Services Tariff, and Attachment J to the NYISO OATT.

The Shadow Price takes account of the Real-Time Regulation Service Bid of the marginal Resource selected to provide Regulation Service (or the applicable price on the Regulation Service Demand Curve during shortage conditions), plus any margins on the sale of Energy or Operating Reserves in the Real-Time Market that the Resource would forego if scheduling it to provide additional Regulation Service would lead to it being scheduled to provide less Energy or Regulation. The Shadow

Price also takes account of the Regulation Service Demand Curves described in Section 4.8 of this Manual, which will ensure that Regulation Service is not scheduled by RTC at a cost greater than the Demand Curve indicates should be paid.

Each supplier that is scheduled in Real-Time to provide Regulation Service is paid the Real-Time MCP, for each RTD interval multiplied by the amount of Regulation Service that it is scheduled to provide during that interval.

4.6.2 Calculation of Real-Time Market Clearing Prices for Regulation Service during EDRP/SCR Activations

During any interval in which the NYISO is using scarcity pricing rule “A” or “B” to calculate LBMPs under Section I.A.2.a or 2.b of Attachment B to the NYISO Services Tariff, and Attachment J to the NYISO OATT, the real-time Regulation Service market clearing price may be recalculated in light of the Availability Bids and Lost Opportunity Costs of Generators scheduled to provide Regulation Service in real-time.

Specifically, when either scarcity pricing rule is applicable, the real-time Regulation Service clearing price shall be set to the higher of:

1. The highest total Availability Bids and Lost Opportunity Cost of any Regulation Service provider scheduled by RTD
2. The Market clearing price calculated under Section 4.6.1 of this Manual.

Demand Side Resources with DAM Ancillary Service schedules have their Real-Time Schedules set from their DAM Ancillary Service Schedules. Demand Side Resources that are scheduled to provide Ancillary Services and also participate in the EDRP or SCR programs, will be taken Out of Merit during a SCR or EDRP activation. Demand Side Resources participating in both Ancillary Services and EDRP/SCR must respond to SCR/EDRP activations in real-time.

4.6.3 Real-Time Regulation Service Balancing Payments

Subject to performance adjustments as described in Section 4.4 and Attachment C to this Manual, any deviation from a Supplier’s Day-Ahead schedule to provide Regulation Service shall be settled pursuant to the following rules:

1. When the Supplier’s Real-Time Regulation Service schedule is less than its Day-Ahead Regulation Service award, the Supplier shall pay a charge for the imbalance equal to the product of:
 - a. The Real-Time Market clearing price for Regulation Service
 - b. The difference between the Supplier’s Day-Ahead Regulation Service schedule and its Real-Time Regulation Service schedule
2. When the Resource’s Real-Time Regulation Service schedule is greater than its Day-Ahead Regulation Service schedule, the NYISO shall pay the Supplier an amount to compensate it for the imbalance equal to the product of:
 - a. The Real-Time Market clearing price for Regulation Service

- b. The difference between the Supplier's Day-Ahead Regulation Service schedule and its Real-Time Regulation Service schedule

4.6.4 Other Real-Time Regulation Service Payments

As is provided in Section 4 and Attachment C of the NYISO Services Tariff, the NYISO shall compensate each ISO-Committed Flexible Generator that provides Regulation Service if its Bid Production Cost to provide the Energy and Ancillary Services it is scheduled to supply in the Real-Time Market, including start-up costs, minimum Load costs, and Availability Bids, exceeds the revenues it receives from the sale of Energy and Ancillary Services.

No payments shall be made to any Supplier providing Regulation Service in excess of the amount of Regulation Service scheduled by the NYISO in the Real-Time Market, except to the extent that a Resource is directed to provide the excess amount by the NYISO.

Finally, whenever a Supplier's Real-Time Regulation Service schedule is reduced by the NYISO to a level lower than its Day-Ahead schedule for that product, the Supplier's Day-Ahead Margin shall be protected after accounting for any margin associated with other products that the Resource is scheduled to provide in real-time. The rules governing the calculation of these Day-Ahead Margin Assurance Payments are set forth in Attachment J to the NYISO Services Tariff. In addition, Attachment C of this Manual provides additional information on performance-based adjustments to Regulation Service payments.

4.7 Energy Settlement Rules for Generators Providing Regulation Service

Demand Side Resources are not eligible for any Energy settlements, therefore, Section 4.7 does not apply to Demand Side Resource Providers.

4.7.1 Energy Settlements

For any interval in which a Generator that is providing Regulation Service receives an AGC Base Point Signal that is different than its RTD Base Point Signal, the Generator shall receive a settlement payment for Energy consistent with a real-time Energy injection equal to the lower of its actual generation or its AGC Base Point Signal.

4.7.2 Additional Payments/Charges When AGC Base Point Signals Exceed RTD Base Point Signals

For any interval in which a Generator that is providing Regulation Service receives an AGC Base Point Signal that is higher than its RTD Base Point Signal, it shall receive or pay a Regulation Revenue Adjustment Payment (RRAP) or Regulation Revenue Adjustment Charge (RRAC) calculated under the terms of this subsection. If the Energy Bid Cost of such a Generator is higher than the LBMP Revenue in that

interval, the Generator shall receive a RRAP. Conversely, for any interval in which such a Generator’s Energy Bid Cost is lower than the LBMP Revenues in that interval, the Generator shall be assessed a RRAC. RRAPs and RRACs shall be calculated using the following formula:

$$p_1 = \text{RTDBasePointSignal}$$

$$p_2 = \max[\text{RTDBasePointSignal}, \min(\text{AGCBasePointSignal}, \text{ActualOutput})]$$

$$\text{Payment/Charge} = \left(\frac{s}{3600}\right) \times \int_{p_1}^{p_2} (\text{Bid}(p) - \text{LBMP}) dp$$

Where:

- s is the number of seconds in the RTD interval;

If the result of the calculation is positive, then the Generator shall receive a RRAP. If it is negative, then the Generator shall be subject to a RRAC. For purposes of applying this formula, for each Generator bid segment where the actual Bid \$ value exceeds the applicable LBMP, the “Bid \$” term shall be set at a level equal to the lesser of the Generator’s actual Bid \$ or its reference Bid \$ plus \$100/MWh.

4.7.3 Additional Charges/Payments When AGC Base Point Signals are Lower than RTD Base Point Signals

For any interval in which a Generator that is providing Regulation Service receives an AGC Base Point Signal that is lower than its RTD Base Point Signal, it shall receive or pay a RRAP or RRAC calculated under the terms of this subsection. If the Energy Bid Cost of such a Generator is higher than the LBMP Revenues in that interval, the Generator shall be assessed a RRAC. Conversely, for any interval in which such a Generator’s Energy Bid Cost is lower than the LBMP Revenues in that interval, the Generator shall receive a RRAP. RRAPs and RRACs shall be calculated using the following formula:

$$p_1 = \min[\text{RTDBasePointSignal}, \max(\text{AGCBasePointSignal}, \text{ActualOutput})]$$

$$p_2 = \text{RTDBasePointSignal}$$

$$\text{Payment/Charge} = \left(\frac{s}{3600}\right) \times \int_{p_1}^{p_2} (\text{Bid}(p) - \text{LBMP}) dp$$

Where:

- s is the number of seconds in the RTD interval;

If the result of the calculation is positive, then the Generator shall receive a RRAP. If it is negative then the Generator shall be subject to a RRAC. For purposes of this formula, for each Generator bid segment where the actual Bid \$ value is lower than the applicable LBMP, the “Bid \$” term shall be set at a level equal to the higher of the Generator’s actual Bid \$ or its reference Bid \$ minus \$100/MWh.

4.8 Regulation Service Demand Curve

The NYISO shall establish a Regulation Demand Curve that will apply to both the Day-Ahead and Real-Time Regulation Service markets. The market clearing prices for Regulation Service calculated pursuant to Sections 4.5.1 and 4.6.1 of this Manual shall take account of the demand curve established in this Section so that Regulation Service is not purchased at a cost higher than the demand curve indicates should be paid in the relevant market.

The NYISO shall establish a target level of Regulation Service for each hour, which will be the number of MW of Regulation Service that the NYISO would seek to maintain in that hour if cost were not a consideration. The NYISO will then define a Regulation Service demand curve for that hour as follows:

1. For quantities of Regulation Service that are less than or equal to the target level of Regulation Service minus 25 MW, the price on the Regulation Service demand curve shall be \$300/MW.
2. For quantities of Regulation Service that are less than 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 \$250/MW.
3. 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 Service 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 Advisor 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 Advisor, the Business Issues Committee, the Commission, 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 and its Market Advisor shall conduct periodic reviews as to whether the Regulation Service Demand Curves should be adjusted to optimize the economic efficiency of the NYISO Markets.

4.9 Reinstating Performance Charges

The NYISO will monitor, on a Real-Time hourly or daily basis, as appropriate, its compliance with the standards established by NERC and NPCC and with the standards of Good Utility Practice for Control Performance, Area Control Area, Disturbance Control Standards, Reserve Pickup Performance, and System Security. Should it appear to the

NYISO that degradation in performance threatens compliance with one or more of the established standards for these criteria or compromises reliability, and that reinstating the performance charges that were originally part of the NYISO’s market design, would assist in improving compliance with established standards for these criteria, or would assist in re-establishing reliability, the NYISO may require Suppliers of Regulation Service, as well as Suppliers not providing Regulation Service, to pay a performance charge.

Any reinstatement of Regulation penalties pursuant to this Section shall not override previous Commission-approved settlement agreements that exempt a particular unit from such penalties. The NYISO shall provide notice of its decision to reinstate performance charges to the Commission, to each Customer and to the Operating Committee and the Business Issues Committee no less than seven days before it re-institutes the performance charges.

If the NYISO determines that performance charges are necessary, Suppliers of Regulation Service shall pay a performance charge to the NYISO as follows:

$$\text{Performance Charge} = \text{Energy Deviation} * \text{MCP}_{\text{reg}} * (\text{Length of Interval}/60 \text{ minutes})$$

Where:

- Energy Deviation (in MW) is the absolute difference between the actual Energy supplied by the Supplier and the Energy required by the AGC Base Point Signals, whether positive or negative, averaged over each RTD interval; and
- MCP_{reg} is the Market Clearing Price (\$/MW), which applies to the RTD interval for this Service in the Real-Time Market or the Day-Ahead Market, if appropriate.

The method used by the NYISO to calculate the Energy Deviation will permit Suppliers a certain period of time to respond to AGC Base Point Signals. Initially this time period will be 30 seconds, although the NYISO will have the authority to change its length. If the Supplier's output at any point in time is between the largest and the smallest of the AGC Base Points sent to that Supplier within the preceding 30 seconds (or such other time period length as the NYISO may define), the Supplier's Energy Deviation at that point in time will be zero.

Otherwise, the Supplier may have a positive Energy Deviation. However, in cases in which responding to the AGC Base Point within that time period would require a Supplier to change output at a rate exceeding the amount of Regulation it has been scheduled to provide, the Supplier will have a zero Energy Deviation if it changes output at the rate equal to the amount of Regulation it is scheduled to provide.

4.10 Temporary Suspension of Regulation Service Markets During Reserve Pick-Up

During any period in which the NYISO has activated RTD-CAM software and has called for a “large event” or “small event” reserve or maximum generation pick-up, as described in Section 4 of the NYISO Services Tariff, the NYISO will suspend Supplier obligations to follow the AGC Base Point Signals sent to Regulation Service providers and will suspend the Real-Time Regulation Service market. The NYISO will not procure any Regulation Service and will establish a Real-Time Regulation Service Market clearing price of zero for settlement and balancing purposes. The NYISO will resume sending AGC Base Point

Signals and restore the Real-Time Regulation Service market as soon as possible after the end of the reserve or maximum generation pickup.

4.11 Charges Applicable to Suppliers That Are Not Providing Regulation Service

4.11.1 Persistent Under-generation Charges

Resources that are not providing Regulation Service that persistently operate at a level below their schedule shall pay a Persistent Undergeneration charge, unless its operation is within a tolerance described below, provided, however, no Persistent Undergeneration charges shall apply to a Fixed Block Unit that has reached a percentage of its Normal Upper Operating Limit. The percentage has been set at seventy percent (70%). This percentage can be changed by the NYISO if there is an identified Market or Reliability impact that justifies the modification. Persistent Undergeneration charges shall also not apply to Generators described in Section 4.11.3 below. The process and procedures for calculating the Persistent Undergeneration Charge is described in Attachment C of this manual

4.11.2 Restoration of Performance Charges

The Persistent Undergeneration Charges described above shall be suspended in the event that the NYISO re-institutes Regulation performance charges. If the NYISO re-institutes performance charges then Suppliers that sell Energy through the LBMP Markets or that supply Bilateral Transactions that serve Load in the NYCA, but that do not provide Regulation Service, shall pay a performance charge to the NYISO as follows:

$$\text{Performance Charge} = \text{Energy Difference} * \text{MCPreg} * \text{Length of Interval}/60 \text{ minutes}$$

Where:

- Energy Difference (in MW) is the absolute difference between the actual Energy supplied by the Supplier and the Energy it is directed to produce by its RTD Base Point Signals, whether positive or negative, averaged over each RTD interval; and
- MCPreg is the Market Clearing Price (\$/MW), which applies to the interval for which Regulation Service was provided in the Real-Time Market, or, if appropriate, the Day-Ahead Market.

In cases in which the Energy Difference that would be calculated using the procedure described above is less than 3%, the NYISO shall set the Energy Difference for that interval equal to zero.

4.11.3 Exemptions

The following types of Generator shall not be subject to Persistent Undergeneration

charges, or, if they are restored by the NYISO, to performance charges:

- Generators providing Energy under contracts (including PURPA contracts), executed and effective on or before November 18, 1999, in which the power purchaser does not control the operation of the supply source but would be responsible for payment of the persistent under-generation or performance charge
- Existing topping turbine Generators and extraction turbine Generators producing electric Energy resulting from the supply of steam to the district steam system located in New York City (LBMP Zone J) in operation on or before November 18, 1999 and/or topping or extraction turbine Generators utilized in replacing or repowering existing steam supplies from such units (in accordance with good engineering and economic design) that cannot follow schedules, up to a maximum total of 499 MW of such units;
- Existing intermittent (i.e., non-schedulable) renewable resource Generators within the NYCA in operation on or before November 18, 1999 within the NYCA, plus up to an additional 3300* MW of such Generators;
- Capacity Limited Resources and Energy Limited Resources to the extent that their Real-Time Energy injections are equal to or greater than their bid-in upper operating limits but are less than their Real-Time Scheduled Energy Injections.
- Generators operating in their Start-Up Period or their Shutdown Period;

and

- Generators operating during a Testing Period.

Note: This exemption does not apply to points 1, 2, and 3 above, in an hour if the Generator or Resource has bid in that hour as ISO-Committed Flexible or Self-Committed Flexible.

4.12 Charges to Load Serving Entities

All LSEs taking service under the NYISO OATT pay a charge for this Service on all Bilateral Transactions and purchases in the LBMP Markets to serve Load located in the NYCA. The NYISO calculates the charge, for each hour, by summing:

- **Supplier Payment** – the aggregate payments made by the NYISO to all Suppliers of this Service.
- **Supplier Charge** – the aggregate of charges paid by all Regulation Providers.
- **Non-Regulating Generator Charge** – the aggregate of charges paid by all Generators.
- In any hour where the charges paid by Generators and Regulation Suppliers exceed the payments made to Suppliers of Regulation service, the hourly charge will result in payment to the load serving entities.

These charges/payments are allocated to each LSE in the NYCA in proportion to its load ratio share for that hour. Charges/payments that are paid by LSEs for this Service are aggregated to render a monthly charge/payment.

4.13 Regulation Service Qualification and Performance Criteria

4.13.1 Regulation Qualified Resource Requirements

Any Resource that meets the following criteria will be considered a Regulation

* The capacity exempted, 3300 MWs, is pending FERC approval.

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.
- 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 (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 Market Services Tariff and 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 Customer Relations department and provide all data required as defined in the Market Participant Registration Packet.
- Post all collateral requirements as defined in the Market Service Tariff Attachment K and Section 2 of the Market Participant Registration Packet.
- If requesting to qualify or required to re-qualify as a Regulation Supplier, successfully complete the pre-qualification performance test as described in 4.13.2

4.13.2 Prequalification Performance Test

All participants requesting to become Regulation Suppliers and all participants that are required to prequalify as Regulation Suppliers must successfully complete the prequalification performance test.

- Market Participants must notify the Customer Relations Department of their intent to complete a regulation pre-qualification test. All qualification criteria defined in 4.13.1 must be completed prior to the test request.
- Customer Relations will coordinate with Grid Operations to schedule the test.
- Once a time period has been identified, Customer Relations will activate the regulation bidding privileges of the test participant.
- The Market Participant will be notified by a NYISO Customer Relations 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 month. A minimum of 100 hours of Regulation Service must be awarded in the Day-Ahead market to the test participant over the calendar month.
- The participant must bid into the Day-Ahead Market the maximum regulation capability that wish to qualify. This value must be the lesser of the regulation ramp rate * 5 minutes or the Operating Capacity of the unit. The regulation availability \$ value must be bid as \$0.
- Customer Relations 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 month period in order to pass the prequalification test.
- Actions in the event of a failed pre-qualification test
 1. Customer Relations will complete all standard audit documentation as defined in Attachment E of this Manual.
 2. Customer Relations will notify the customer indicating the results of the test.
 3. Customer Relations will remove all regulation bidding privileges.
 4. Customer Relations will forward the test results to MMP.
 5. Prior to requesting a re-test the test participant must provide an explanation to Market Monitoring & Performance describing the cause of the failed prequalification test.
 6. Market Monitoring & Performance will notify Customer Relations 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 Supplier.
- The test participant will be responsible for any balancing payments due to poor performance during the test.

4.13.3 Supplier Regulation Service Performance Audit

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

- The audit time period is defined as a calendar month.
- Regulation Suppliers with a time weighted Performance Index for the period chosen that is less than .85 will be referred to Market Monitoring & Performance for review.

Suppliers who fail an audit, after consultation with Market Monitoring & Performance, 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 market payments as described in Services Tariff Rate schedule 3 and the *NYISO Accounting and Billing Manual*, and that persistent non-compliance in accordance with this procedure may result in the provider being removed from the bidders list.

Market Monitoring & Performance will review the individual cases of suppliers that fail an audit and will notify Customer Relations if they determine that the Supplier should no longer be qualified to bid Regulation Service.

Market Monitoring & Performance can require that the regulation provider perform a prequalification test once the Supplier has reported that it has addressed the cause of the poor performance.

Regulation Provider Actions

The regulation 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

NYISO ANCILLARY SERVICES MANUAL

Subject line of the e-mail should state “Regulation Performance Audit”

If the Supplier has its qualified to bid regulation status changed to not qualified to bid then the Supplier will be required to complete a prequalification 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 & Billing Manual](#) 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 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 one or both of the following methods:

- scheduling interchange payback with another Control Area as an interchange schedule between Control Areas.
- 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 & Billing Manual](#) 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 & Dispatching Operations Manual](#).

5.3 Monthly Meter Reading Adjustments

The meter reading adjustment process is discussed in the [NYISO Accounting & Billing Manual](#).

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 Generators or Demand Side Resources located within the NYCA and within specific regions, as required by the NYSRC.

Types of Operating Reserves:

- 10-Minute Spinning Reserve — Operating Reserves provided by qualified Generators and qualified Demand Side 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.
- 10-Minute Non-Synchronized Reserve (10-Minute NSR) — Operating Reserves provided by Generators that can be started, synchronized, and loaded within 10 minutes. These reserves are carried on quick-start units, such as jet engine type gas turbines. Operating Reserves may also be provided by Demand Side Resources where the demand response is provided by a Local Generator.
- 30-Minute Spinning Reserve - Operating Reserves provided by qualified Generators and qualified Demand Side 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 30 minutes.
- 30-Minute Non-Synchronized Reserve (30-Minute NSR) – Operating reserves that can be provided by Generators 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.
- Total 10-Minute Reserve — The sum of the 10-Minute Spinning Reserve and 10-Minute NSR. [NERC defines this as Contingency Reserve]
- Total 30-Minute Reserve – The sum of the 30-minute Spinning Reserve and 30-Minute NSR 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 one and one-half times 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 6.1](#) illustrates 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 export transaction (NYCA to neighboring control area) 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.

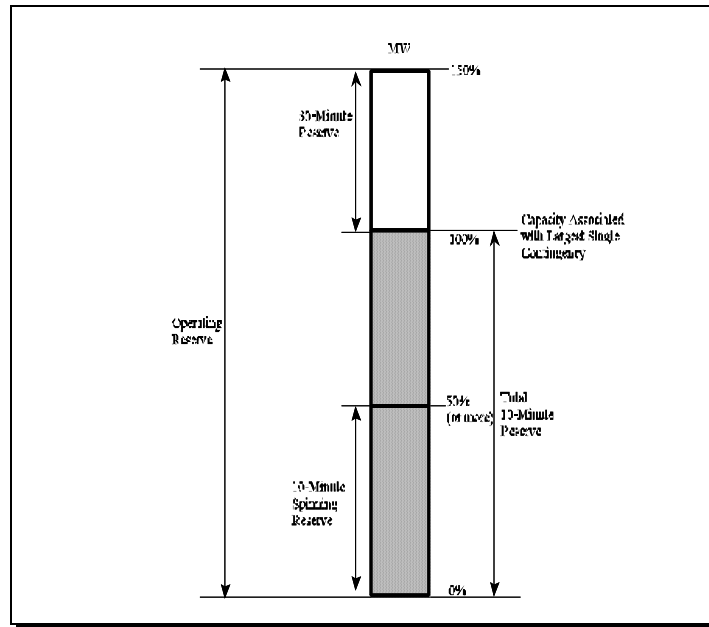


Figure 6.1: Operating Reserve Requirements

6.2 General Responsibilities and Requirements

The NYISO is responsible for scheduling the Operating Reserve service. The NYISO ensures that Operating Reserve is properly geographically located so that transmission constraints do not limit the ability to deliver Operating Reserve. Reserve suppliers receive 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 reserve. The Real-Time availability bid is automatically set to zero for each category of reserve and cannot be changed by a reserve supplier. [Table 6.1](#) summarizes supplier eligibility to provide ancillary services of reserve and regulation.

Table 6.1: Ancillary Service Eligibility

Unit Type	Ancillary Service				
	10-S	10-NS	30-S	30-NS	Reg
Flexible (on-dispatch) Start-up time greater than 30 minutes Not block loaded	✓	no	✓	no	✓
Flexible (on-dispatch) 10-minute start Not block loaded	✓	✓	✓	no	✓
Flexible (on-dispatch) 10-minute start Block loaded (no dispatchable range)	no	✓	no	no	no
Flexible (on-dispatch) 30-minute start Not block loaded	✓	no	✓	✓	✓
Flexible (on-dispatch) 30-minute start 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 and on Long Island as shown in [Table 6.2](#).

Table 6.2: NYISO Locational Reserve Requirements

	New York CA	Eastern New York	Long Island
	A = most severe NYCA operating capability loss (1200MW)		
10 Minute Spinning Reserve	½ A = 600MW (I)	1/4 A = 300MW (IV)	1/20 A = 60MW (VII)
10 Minute Total Reserve	A = 1200MW (II)	1200MW (V)	1/10 A = 120MW (VIII)
30 Minute Reserve	1½ A = 1800MW (III)	1200MW (VI)	270-540MW (IX)
<p>I. NYCA 10-minute spinning reserve is equal to at least one-half of the 10-minute total reserve. [NYS RC Operating Reliability Rules].</p> <p>II. NYCA 10-minute total reserve is equal to the operating capability loss caused by the most severe contingency under normal transfer conditions. [NYS RC Operating Reliability Rules].</p> <p>III. NYCA 30-minute total reserve is equal to one and one-half the 10-minute reserve necessary to replace the operating capability loss caused by the most severe contingency under normal transfer conditions. [NYS RC Operating Reliability Rules].</p> <p>IV. ENY 10-minute spinning reserve is based on the NERC requirement that operating reserves should be dispersed throughout and shall consider the effective use of such in an emergency, time to be effective, transmission limitations, and local area requirements. [NERC OP1]</p> <p>V. ENY 10-minute total reserve is based on Reliability Rules that require immediate measures (activation of ENY 10-minute reserves) be applied to bring loadings on an internal NY transfer interface to within limits in 15 minutes. [NYS RC Operating Reliability Rules].</p> <p>VI. ENY 30-minute total reserve is based on the NERC requirement that operating reserves should be dispersed throughout and shall consider the effective use of such in an emergency, time to be effective, transmission limitations, and local area requirements. [NERC OP1]</p> <p>VII. LI 10-minute spinning reserve is based on the NERC requirement that operating reserves should be dispersed throughout and shall consider the effective use of such in an emergency, time to be effective, transmission limitations, and local area requirements. [NERC OP1]</p> <p>VIII. LI 10-minute total reserve is based on the NERC requirement that operating reserves should be dispersed throughout and shall consider the effective use of such in an emergency, time to be effective, transmission limitations, and local area requirements. [NERC OP1]</p> <p>IX. LI 30-minute total reserve is based on ISO Reliability Rules that require the ability to restore a transmission circuit loading to Normal Operating Criteria within 30 minutes of the contingency. The LI 30-minute reserve requirement will vary from 270MW for off-peak hours to 540MW for on-peak hours. [NYS RC Reliability Rules]</p>			

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, 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 Generators or Demand Side Resources are eligible to supply particular Operating Reserve products.

1. ***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; and are capable of responding to NYISO instructions to change their output level within ten minutes, shall be eligible to supply Spinning Reserve.
2. ***10-Minute Non-Synchronized Reserve*** – Off-line Generators or 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 ten minutes, shall be eligible to supply 10-Minute Non-Synchronized Reserve.
3. ***30-Minute Reserve (spinning and non-synchronized)*** – (i) Generators and Demand Side Resources that are not supporting their Demand Reduction through the use of Local Generation that are ISO-Committed Flexible or f-Committed Flexible and operating within the dispatchable portion of their operating range shall be eligible to supply synchronized 30-Minute Reserves; (ii) Off-line Generators or 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, shall be eligible to supply non-synchronized 30-Minute Reserves.
4. ***Self-Committed Fixed and ISO-Committed Fixed Generators*** – Shall not be eligible to provide any kind of Operation Reserve.

6.2.3 Other Supplier Requirements

All Suppliers of Operating Reserve must be located within the NYCA and must be under NYISO Operational Control. Each Supplier bidding to supply Operational Reserve or reduce demand must be able to provide Energy or reduce demand consistent with the Reliability Rules and the NYISO Procedures when called upon by the NYISO. All Suppliers that are selected to provide Operating Reserve shall ensure that their Resources maintain and deliver the appropriate quantity of Energy, or reduce the appropriate quantity of demand, when called upon by the NYISO during any interval in which they have been selected.

Generators or Demand Side Resources that are selected to provide Operating Reserve in the Day-Ahead Market or any supplemental commitment may not increase their Energy Bids or Demand Reduction Bids for portions of their Resources that have been scheduled through those processes, or reduce their commitments, in Real-Time except to the extent that they are directed to do so by the NYISO. Generators and Demand Side Resources may enter into alternate sales arrangements utilizing any Capacity that has not been scheduled to provide Operating Reserve.

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 [Table 6.1](#).

Demand Side Resources can be qualified to bid synchronous or non-synchronous reserves, but not both. Resources that are qualified to bid synchronous reserves must bid a start up cost of \$0 and a minimum generation cost of \$0. 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.

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 Reserves product it is scheduled to provide shall not exceed UOL_N or UOL_E , whichever is applicable.

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 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.

Demand Side Resources can be qualified to bid synchronous or non-synchronous reserves, but not both. Resources that are qualified to bid synchronous reserves must bid a start up cost of \$0 and a minimum generation cost of \$0. 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 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 30.

However, the sum of the amount of Energy, or Demand Reduction, that each Resource is scheduled to provide, the amount of Regulation Service 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.

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 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, as described in Section 6.13 of this manual. 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, the NYISO shall calculate separate Day-Ahead Market and Real-Time Market prices for each of the three Operating Reserve products for each of three locations:

1. West of Central-East (West or Western)
2. East of Central-East Excluding Long Island (East or Eastern)
3. Long Island (L.I.).

The NYISO will thus calculate nine 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 the East. The NYISO will calculate separate locational Long Island Operating Reserves prices but will not post them or use them for settlement purposes.

6.5.3 “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, 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

6.6.1 Calculation of Day-Ahead Market Clearing Prices

The NYISO shall calculate hourly Day-Ahead Market Clearing Prices for each Operating Reserve product at each location. Each Day-Ahead Market Clearing Price shall equal the sum of the relevant Day-Ahead locational Shadow Prices for that product in that hour, subject to the “cascading” of different quality reserve products described above.

The Day-Ahead Market Clearing Price for a particular Operating Reserve product in a particular location shall reflect the Shadow Prices associated with all of the NYISO-defined Operating Reserve requirements, including locational requirements, that a particular Operating Reserves product from a particular location may be used to satisfy in a given hour. The NYISO shall calculate Day-Ahead Market Clearing Prices using the following formulae:

Market clearing price for Western 30-minute reserve	$MCP_{30}^W = SP_1$
Market clearing price for Western 10-minute non-synchronized reserve	$MCP_{10N}^W = SP_1 + SP_2$
Market clearing price for Western 10-minute spinning reserve	$MCP_{10S}^W = SP_1 + SP_2 + SP_3$
Market clearing price for Eastern 30-minute reserve	$MCP_{30}^E = SP_1 + SP_4$
Market clearing price for Eastern 10-minute	$MCP_{10N}^E = SP_1 + SP_2 + SP_4 + SP_5$

NYISO ANCILLARY SERVICES MANUAL

non-synchronized reserve	
Market clearing price for Eastern 10-minute spinning reserve	$MCP_{10S}^E = SP_1 + SP_2 + SP_3 + SP_4 + SP_5 + SP_6$
Market clearing price for Long Island 30-minute reserve	$MCP_{30}^{LI} = SP_1 + SP_4 + SP_7$
Market clearing price for Long Island 10-minute non-synchronized reserve	$MCP_{10N}^{LI} = SP_1 + SP_2 + SP_4 + SP_5 + SP_7 + SP_8$
Market clearing price for Long Island 10-minute spinning reserve	$MCP_{10S}^{LI} = SP_1 + SP_2 + SP_3 + SP_4 + SP_5 + SP_6$ $+ SP_7 + SP_8$

Where:

SP₁ = Shadow Price for total 30-Minute Reserve requirement constraint for the hour

SP₂ = Shadow Price for total 10-Minute Reserve requirement constraint for the hour

SP₃ = Shadow Price for total Spinning Reserve requirement constraint for the hour

SP₄ = Shadow Price for Eastern or L.I. 30-Minute Reserve requirement constraint for the hour

SP₅ = Shadow Price for Eastern or L.I. 10-Minute Reserve requirement constraint for the hour

SP₆ = Shadow Price for Eastern or L.I. Spinning Reserve requirement constraint for the hour

SP₇ = Shadow Price for Long Island 30-Minute Reserve requirement constraint for the hour

SP₈ = Shadow Price for Long Island 10-Minute Reserve requirement constraint for the hour

SP₉ = Shadow Price for Long Island Spinning Reserve requirement constraint for the hour

Day-Ahead locational shadow prices will be calculated by SCUC. Each hourly Day-Ahead Shadow Price for each Operating Reserves requirement shall equal the marginal Bid cost of scheduling Resources to provide additional Operating Reserves to meet that requirement in that hour, including any impact on the Bid Production Cost of procuring Energy or Regulation Service that would result from procuring an increment of Operating Reserve to meet the requirement in that hour, as calculated during the fifth SCUC pass described in Attachment B to the NYISO Services Tariff, and Attachment J to the NYISO OATT.

As a result, the Shadow Price for each Operating Reserves requirement shall include the Day-Ahead Availability Bid of the marginal Resource selected to meet the requirement (or the applicable price on the Operating Reserve Demand Curve for that requirement during shortage conditions), plus any margins on the sale of Energy or Regulation Service in the Day-Ahead Market that that Resource would forego if scheduling it to provide additional Operating Reserve to meet that requirement would lead to it being scheduled to provide less Energy or Regulation Service.

Shadow Prices will also be consistent with the Operating Reserve Demand Curves, described below, which will ensure that Operating Reserves are not scheduled by SCUC at a cost greater than the relevant Operating Reserve Demand Curve indicates should be paid. If more Operating Reserve of a particular quality than is needed is scheduled to meet a particular locational Operating Reserve requirement, the Shadow Price for that Operating Reserve requirement constraint shall be set at zero.

Each Supplier that is scheduled Day-Ahead to provide Operating Reserve shall be paid the applicable Day-Ahead Market Clearing Price, based on its location and the quality of Operating Reserve scheduled, multiplied by the amount of Operating Reserve that the Supplier is scheduled to provide in each hour.

6.6.2 Other Day-Ahead Payments

As is provided in Section 4 and Attachment C of the NYISO Services Tariff, the NYISO shall compensate each ISO-Committed Flexible Generator providing Operating Reserves if its Bid Production Cost to provide the Energy and Ancillary Services it is scheduled to supply in the Day-Ahead Market, including start-up costs, minimum Load costs, and Availability Bids, exceeds the revenues it receives from the sale of Energy and Ancillary Services. The NYISO shall compensate each ISO-committed Demand Side Resource providing Operating Reserves if its Bid Production Cost to provide the Operating Reserves it is scheduled to provide in the Day-Ahead Market exceeds the revenue it receives from the sale of ancillary services in the Day-Ahead Market.

6.7 Operating Reserve Settlements – Real-Time Market

6.7.1 Calculation of Real-Time Market Clearing Prices

The NYISO shall calculate Real-Time Market clearing prices for each Operating Reserve product for each location in every interval. Except during SCR/EDRP activations, described below, each Real-Time market-clearing price shall equal the sum of the relevant Real-Time locational Shadow Prices for that product, subject to the “cascading” of different quality reserve products described above.

The Real-Time Market clearing price for a particular Operating Reserve product for a particular location shall reflect the Shadow Prices associated with all of the NYISO-defined Operating Reserve requirements, including locational requirements, that a particular Operating Reserves product from given location may be used to satisfy in a given interval. The NYISO shall calculate the Real-Time Market clearing price using the following formulae:

Market clearing price for Western 30-minute reserve	$MCP_{30}^W = SP_1$
Market clearing price for Western 10-minute non-synchronized reserve	$MCP_{10N}^W = SP_1 + SP_2$
Market clearing price for Western 10-minute spinning reserve	$MCP_{10S}^W = SP_1 + SP_2 + SP_3$
Market clearing price for Eastern 30-minute reserve	$MCP_{30}^E = SP_1 + SP_4$
Market clearing price for Eastern 10-minute non-synchronized reserve	$MCP_{10N}^E = SP_1 + SP_2 + SP_4 + SP_5$
Market clearing price for Eastern 10-minute spinning reserve	$MCP_{10S}^E = SP_1 + SP_2 + SP_3 + SP_4 + SP_5 + SP_6$
Market clearing price for Long Island 30-minute reserve	$MCP_{30}^{LI} = SP_1 + SP_4 + SP_7$
Market clearing price for Long Island 10-minute non-synchronized reserve	$MCP_{10N}^{LI} = SP_1 + SP_2 + SP_4 + SP_5 + SP_7 + SP_8$
Market clearing price for Long Island 10-minute spinning reserve	$MCP_{10S}^{LI} = SP_1 + SP_2 + SP_3 + SP_4 + SP_5 + SP_6 + SP_7 + SP_8$

Where:

SP₁ = Shadow Price for total 30-Minute Reserve requirement constraint for the interval

SP₂ = Shadow Price for total 10-Minute Reserve requirement constraint for the interval

SP₃ = Shadow Price for total Spinning Reserve requirement constraint for the interval

SP₄ = Shadow Price for Eastern or L.I. 30-Minute Reserve requirement constraint for the interval

SP₅ = Shadow Price for Eastern or L.I. 10-Minute Reserve requirement constraint for the interval

SP₆ = Shadow Price for Eastern or L.I. Spinning Reserve requirement constraint for the interval

SP₇ = Shadow Price for Long Island 30-Minute Reserve requirement constraint for the interval

SP₈ = Shadow Price for Long Island 10-Minute Reserve requirement constraint for the interval

SP₉ = Shadow Price for Long Island Spinning Reserve requirement constraint for the interval

Real-time locational Shadow Prices will be calculated by the NYISO's RTD. Each Real-Time Shadow Price for each Operating Reserves requirement in each RTD interval shall equal the marginal Bid cost of scheduling Resources to provide additional Operating Reserves to meet that requirement in that interval, including any impact on the Bid Production Cost of procuring Energy or Regulation Service that would result from procuring an increment of Operating Reserve to meet the requirement in that interval, as calculated during the third RTD pass described in Attachment B to the NYISO Service Tariff, and Attachment J to the NYISO OATT.

As a result, the Shadow Price for each Operating Reserves requirement shall include the Real-Time Availability Bid of the marginal Resource selected to meet that requirement (or the applicable price on the Operating Reserve Demand Curve for that requirement during shortage conditions), plus any margins on the sale of Energy or Regulation Service in the Real-Time Market that that Resource would forego if scheduling it to provide additional Operating Reserve to meet that requirement would lead to it being scheduled to provide less Energy or Regulation Service.

Shadow Prices will also be consistent with the Operating Reserve Demand Curves, described below, which will ensure that Operating Reserves are not scheduled by RTC at a cost greater than the relevant Operating Reserve Demand Curve indicates should be paid. If there is more Operating Reserve of the required quality than is needed to meet a particular locational Operating Reserve requirement then the Shadow Price for that Operating Reserve requirement constraint shall be zero.

Each Supplier that is scheduled in Real-Time to provide Operating Reserve shall be paid the applicable Real-Time Market clearing price, based on its location and the quality of Operating Reserve scheduled, multiplied by the amount of Operating Reserve that the Supplier is scheduled to provide in each interval.

6.7.2 Calculation of Real-Time Market Clearing Prices for Operating Reserves During EDRP/SCR Activations

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.

Scarcity Pricing Rule “A”

During any interval in which the NYISO is using scarcity pricing rule “A” to calculate LBMPs under Attachment B to the NYISO Services Tariff, and Attachment J to the NYISO OATT, the Real-Time market clearing prices for some Operating Reserves products may be recalculated in light of the Lost Opportunity Costs of Resources that are scheduled to provide Spinning Reserves and 30-Minute Reserves in the manner described below. The NYISO shall also consider the Lost Opportunity Costs of Resources providing lower quality Operating Reserves to ensure that the “cascading” of different quality reserve products, described above, are not violated. Specifically:

1. The Eastern Spinning Reserve market clearing price shall be higher of:
 - a. The highest Lost Opportunity Cost of any provider of Spinning Reserves and 30-Minute Spinning Reserve that is scheduled by RTD and is not located on Long Island
 - b. The original market clearing price calculated under Section 6.7.1 above.
2. The Eastern 10-Minute Non-Synchronized Reserve market clearing price shall be the higher of:
 - a. The highest Lost Opportunity Cost of any provider of spinning 30-Minute Reserve that is scheduled by RTD and is not located on Long Island
 - b. The original market clearing price calculated under Section 6.7.1 above.
3. The Eastern 30-Minute Reserve market clearing price shall be the higher of:
 - a. The highest Lost Opportunity Cost of any provider of spinning 30-Minute Reserve that is scheduled by RTD and is not located on Long Island
 - b. The original market clearing price calculated under Section 6.7.1 above.
4. The Western Spinning Reserve market clearing price shall be the higher of:
 - a. The highest Lost Opportunity Cost of any provider of Western Spinning Reserve Western Spinning 30-Minute Reserves that is scheduled by RTD
 - b. The original market clearing price calculated under Section 6.7.1 above.
5. The Western 10-Minute Non-Synchronized Reserve market clearing price shall be the higher of:
 - a. The highest Lost Opportunity Cost of any provider of Western spinning and

- 30-Minute Reserve that is scheduled by RTD; and
 - b. The original market clearing price calculated under Section 6.7.1 above.
6. The Western 30-Minute Reserve market clearing price shall be the higher of:
- a. The highest Lost Opportunity Cost of any provider of Western spinning and 30-Minute Reserves that is scheduled by RTD
 - b. The original market clearing price calculated under Section 6.7.1 above.

Scarcity Pricing Rule “B”

During any interval in which the NYISO is using scarcity pricing rule “B” to calculate LBMPs under Attachment B to the NYISO Services Tariff, and Attachment J to the NYISO OATT, the Real-Time market clearing prices for some Operating Reserves products may be recalculated in light of the Lost Opportunity Costs of Resources scheduled to provide Spinning Reserves and 30-Minute Reserves in order to satisfy Eastern Operating Reserve requirements in the manner described below. The NYISO shall also consider the Lost Opportunity Costs of Resources providing lower quality Operating Reserves to ensure that the “cascading” of different quality reserve products, described above, are not violated. Specifically:

1. The Eastern Spinning Reserve market clearing price shall be the higher of:
 - a. The highest Lost Opportunity Cost of any provider of Eastern Spinning Reserve and 30-Minute Reserve that is scheduled by RTD and is not located on Long Island
 - b. The original market clearing price calculated under Section 6.7.1 above.
2. The Eastern 10-Minute Non-Synchronized Reserve market clearing price shall be the higher of:
 - a. The highest Lost Opportunity Cost of any provider of Eastern spinning and 30-Minute Reserve that is scheduled by RTD and is not located on Long Island
 - b. The original market clearing price calculated under Section 6.7.1 above.
3. The Eastern 30-Minute Reserve market clearing price shall be the higher of:
 - a. The highest Lost Opportunity Cost of any provider of Eastern spinning and 30-Minute Reserve that is scheduled by RTD and is not located on Long Island
 - b. The original market clearing price calculated under Section 6.7.1 above.

Real-Time Market clearing prices for Western Reserve shall not be affected under scarcity pricing rule “B.”

6.7.3 Operating Reserve Balancing Payments

Any deviation in performance from a Supplier's Day-Ahead schedule to provide Operating Reserves, including deviations that result from schedule modifications made by the NYISO, shall be settled pursuant to the following rules.

1. When the Supplier's Real-Time Operating Reserves schedule is less than its assigned Day-Ahead Operating Reserves schedule, the Supplier shall pay a charge for the imbalance equal to the product of:
 - a. The Real-Time Market clearing price for the relevant Operating Reserves Product in the relevant location; and
 - b. The difference between the Supplier's Day-Ahead and Real-Time Operating Reserves schedules.
2. When the Supplier's Real-Time Operating Reserves schedule is greater than its assigned Day-Ahead Operating Reserves schedule, the NYISO shall pay the Supplier an amount to compensate it for the imbalance equal to the product of:
 - a. The Real-Time Market Clearing Price for the relevant Operating Reserve product in the relevant location; and
 - b. The difference between the Supplier's Day-Ahead and Real-Time Operating Reserves schedules.

6.7.4 Other Real-Time Payments

The NYISO shall pay Generators that are selected to provide Operating Reserves, but are directed to convert to Energy production in Real-Time, the applicable Real-Time LBMP for all Energy they are directed to produce in excess of their Day-Ahead schedule.

Demand Side Resources providing Operating Reserves are not paid for Energy when directed to reduce demand by the NYISO.

As is provided in Section 4 and Attachment C of the NYISO Services Tariff, the NYISO shall compensate each ISO-Committed Flexible Generator providing Operating Reserves if its Bid Production Cost to provide the Energy and Ancillary Services it is scheduled to supply in the Real-Time Market, including Minimum Generation Bid and Start-Up Bid costs, the revenues it receives from the sale of Energy and Ancillary Services. The NYISO shall compensate each ISO-committed Demand Side Resource providing Operating Reserves if its Bid Production Cost to provide the Operating Reserves it is scheduled to provide in the Real-Time Market exceeds the revenue it receives from the sale of ancillary services in the in the Real-Time Market.

Any Generator that provides Energy during a large event reserve pickup or a maximum generation event shall be eligible for a Bid Production Cost guarantee payment calculated solely for the duration of the large event reserve pickup or maximum generation pickup.

Finally, whenever a Resource's Real-Time Operating Reserves schedule is reduced by the NYISO to a level lower than its Day-Ahead schedule for that product, the

NYISO ANCILLARY SERVICES MANUAL

Resource's Day-Ahead Margin shall be protected after accounting for any margin associated with other products that the Resource is scheduled to provide in Real-Time. The Day-Ahead Margin protected for Demand Side Resources can be reduced based on the value of the Reserve Performance Index, as described in Section 6.11 of this manual. The rules governing the calculation of these Day-Ahead Margin Assurance Payments are set forth in Attachment J to the NYISO Services Tariff.

6.8 Operating Reserve Demand Curves

The NYISO shall establish nine Operating Reserve Demand Curves, one for each Operating Reserves requirement. Specifically, there shall be a demand curve for:

1. Total Spinning Reserves
2. Eastern or Long Island Spinning Reserves
3. Long Island Spinning Reserves
4. Total 10-Minute Non-Synchronized Reserves
5. Eastern or Long Island 10-Minute Non-Synchronized Reserves
6. Long Island 10-Minute Non-Synchronized Reserves
7. Total 30-Minute Reserves
8. Eastern or Long Island 30-Minute Reserves
9. 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.

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 NYISO will then define an Operating Reserves demand curve for that hour corresponding to each Operating Reserves requirement as follows:

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 \$500/MW. For all other quantities, the price on the total Spinning Reserves demand curve shall be \$0/MW.
2. **Eastern or Long Island Spinning Reserves** – For quantities of Operating Reserves meeting the Eastern or Long Island Spinning Reserves requirement that are less than or equal to the target level for that requirement, the price on the Eastern or Long Island Spinning Reserves demand curve shall be \$25/MW. For all other quantities, the price on the Eastern or Long Island Spinning Reserves demand curve shall be \$0/MW.
3. **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.

4. **Total 10-Minute Reserves** – For quantities of Operating Reserves meeting the total 10-minute reserves requirement that are less than or equal to the target level for that requirement, the price on the total 10-minute reserves demand curve shall be \$150/MW. For all other quantities, the price on the total 10-minute reserves demand curve shall be \$0/MW.
5. **Eastern or Long Island 10-Minute Reserves** – For quantities of Operating Reserves meeting the Eastern or Long Island 10-minute reserves requirement that are less than or equal to the target level for that requirement, the price on the Eastern or Long Island 10-minute reserves demand curve shall be \$500/MW. For all other quantities, the price on the Eastern or Long Island 10-Minute Reserves demand curve shall be \$0/MW.
6. **Long Island 10-Minute Reserves** – For quantities of Operating Reserves meeting the Long Island 10-minute reserves requirement that are less than or equal to the target level for that requirement, the price on the Long Island 10-minute reserves demand curve shall be \$25/MW. For all other quantities, the price on the Long Island 10-minute reserves demand curve shall be \$0/MW.
7. **Total 30-Minute Reserves** – For quantities of Operating Reserves meeting the total 30-Minute Reserves requirement that are less than or equal to the target level for that requirement minus 400 MW, the price on the total 30-Minute Reserves demand curve shall be \$200/MW. For quantities of Operating Reserves meeting the total 30-Minute Reserves requirement that are less than or equal to the target level for that requirement minus 200 MW but that exceed the target level for that requirement minus 400 MW, the price on the total 30-Minute Reserves demand curve shall be \$100/MW.

For quantities of Operating Reserves meeting the total 30-Minute Reserves requirement that are less than or equal to the target level for that requirement but that exceed the target level for that requirement minus 200 MW, the price on the total 30-Minute Reserves demand curve shall be \$50/MW. For all other quantities, the price on the total 30-Minute Reserves demand curve shall be \$0/MW. However, the NYISO will not schedule more total 30-Minute Reserves than the level defined by the requirement for that hour.

8. **Eastern or Long Island 30-Minute Reserves** – For quantities of Operating Reserves meeting the Eastern or Long Island 30-Minute Reserves requirement that are less than or equal to the target level for that requirement, the price on the Eastern or Long Island 30-Minute Reserves demand curve shall be \$25/MW. For all other quantities, the price on the Eastern or Long Island 30-Minute Reserves demand curve shall be \$0/MW.
9. **Long Island 30-Minute Reserves** – For quantities of Operating Reserves meeting the Long Island 30-Minute Reserves requirement that are less than or equal to the target level for that requirement, the price on the Long Island 30-Minute Reserves demand curve shall be \$300/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 Advisor 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 Advisor, the Business Issues Committee, the Commission, 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 Advisor shall conduct periodic reviews as to whether the Operating reserves Demand Curves should be adjusted to optimize the economic efficiency of the NYISO Markets.

6.9 Self-Supply

Transactions may be entered into to provide for Self-Supply of Operating Reserves. Except as noted in the next paragraph, Customers seeking to Self-Supply Operating Reserves must place the Generator(s) supplying any one of the Operating Reserves under NYISO control. The Generator(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 Generator(s) as determined in the NYISO Services Tariff.

6.10 Operating Reserve Charge

Each Transmission Customer engaging in an Export and each LSE pays a monthly Operating Reserves charge under the NYISO OATT equal to the sum of the hourly charges for the month. The NYISO calculates and the LSE or Transmission Customer pays the hourly charge equal to the product of:

1. Cost to the NYISO of providing all Operating Reserves less any revenues from penalties collected during each hour
2. The ratio of:
 - a. The LSE's Load or the Transmission Customer's scheduled Export to
 - b. The sum of all Load in the NYCA and all scheduled Exports during that hour.

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 converted 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 real-time reserve market clearing price.
- A Generator would not receive any payment for energy scheduled but not produced and the Generator 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:

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

Where:

ADR_i = Average Actual Demand Reduction for interval i

If $\text{ADR}_i \leq 0$ then set Reserve $\text{PI}_i = 0$

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 & Billing Manual](#).

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 Reserve Service. All Reserve Qualified Resources must:

- Have the appropriate control equipment installed and be capable of providing Reserve 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 reserve 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 Market Services Tariff and OATT.

- Register the intent to provide reserve service with the Customer Relations department and provide all data required as defined in the Market Participant Registration Packet.
- Post all collateral requirements as defined in the Market Service Tariff Attachment K and Section 2 of the Market Participant Registration Packet.
- Successfully complete the pre-qualification performance test as described in 6.12.2.

6.12.2 Pre-qualification & 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.

- Market Participants must notify the Customer Relations Department of their intent to complete a reserve pre-qualification test. All qualification criteria defined in 6.12.1 must be completed prior to the test request.
- Customer Relations will coordinate with Grid Operations to schedule the test.
- The Market Participant will be notified by a NYISO Customer Relations representative a minimum of two days prior to the test period indicating the dates that will be subject to pre-qualification 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.
- Operations will conduct a random audit(s) as described in Section 6.13 of this manual, with the exception, as described below, for testing of non-synchronous reserves. Actions based on the results of the audit as a pre-qualification test described in Section 6.13.1.8 will be replaced with actions as defined in this section.
- Operations will select providers that are qualifying non-synchronous reserve by randomly scheduling the resource within the first 14 days after notifying Customer Relations 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 audit (test)
 3. Operations will complete all standard audit documentation
 4. Operations will inform Customer Relations and Market Monitoring & Performance of the results of the audit (test)
 5. Customer Relations will notify the customer indicating the results of the test. If the test participant fails the test, Customer Relations will remove all reserve bidding privileges.
 6. Prior to requesting a re-test the test participant must provide an explanation to

Market Monitoring & Performance describing the cause of the failed prequalification test. Documentation should be sent to;

Reference_Price_Update@NYISO.com

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

7. Market Monitoring & Performance will notify Customer Relations 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.

6.13 Supplier Response and Capacity Performance Audit

All Generators and Demand Side Resources that bid energy and reserve services into the NYISO markets may be requested to demonstrate its ability to achieve and sustain its emergency response rate and its ability to reach and operate at its Normal Upper Operating Limit. The NYISO may conduct a performance audit of an individual Generator or Demand Side Resource at any time and without prior notification. The NYISO conducts audits on a random basis and they are done outside of reserve pickup periods as if an actual emergency existed. Audits are used to verify the ability of each Supplier to provide the amount energy or demand response offered. Performance audits described in this manual cover three audit objectives:

- Test an individual Suppliers ability to operate in accordance with the as bid Emergency Response Rate.
- Test an individual Suppliers ability to change output in 10 minutes and 30 minutes in order to meet the 10 minute and 30 minute Operating Reserve Requirement.
- Test an individual Suppliers ability to reach and operate at its Normal Upper Operating Limit (UOLN).

At no time will a Generator be asked to operate in violation of environmental limits that apply to normal operation. When environmental limits on normal operation restrict the ability of a Generator to comply fully with such an audit request, the Generator must advise the Transmission Owner (TO) of the environmental restrictions and that the audit will violate those environmental restrictions. The TO will convey that information to the NYISO and the test will be terminated. The NYISO may randomly select a Generator or Demand Side Resource with a valid Real-Time offer as an ISO Committed Flexible or Self Committed Flexible unit for demonstration of Ten-Minute Reserve or Thirty- Minute Reserve. The NYISO may randomly select a Generator with a valid Real-Time offer for demonstration of claimed UOLN. However, the NYISO will not call for an audit during the start up of a unit until the unit has attained its minimum generation level, or during a period when the unit has been instructed to decrease output. Simple cycle gas turbines, hydro turbines, pumped

storage hydro units, and Demand Side Resources using Local Generators (units that can be started quickly) may be tested even though they may be off-line or below their minimum operating level.

6.13.1 Test Procedure

Prior to a test the NYISO will notify the appropriate TO of the type of test to be conducted. The NYISO will also verify that instructions are understood by the TO and that there is agreement on the parameters being tested, specifically:

- The change in output (MW) that will be required of the Resource;
- The expected response rate of the Resource;
- The current output of the Resource; and
- The operating limits of the Resource and that the test will not cause the Resource to exceed those limits.

The NYISO will use the current clock time as the start of the test and place the Resource Out of

Merit (OOM) for NYISO System Reliability for the duration of the test. The TO will advise the

Resource of the test. The NYISO will increase the Resource's base point at its emergency response rate to test its ability to provide 10-Minute Reserve, 30-Minute Reserve, or to test its ability to achieve UOLN. The test will end when one of the following occurs:

- The Resources output reaches its offered UOLN or the reserve response has been demonstrated, depending on the type of test being conducted.
- The appropriate time period for the test, including tolerance, is exceeded.
- The Resource Owner informs the NYISO Operator, through the TO, that the Resource is unable to demonstrate the claimed response or capability.

6.13.2 Frequency of Tests

The NYISO will normally consider several factors when determining the start of a test; however the NYISO may call a test at any time, regardless of these considerations. Among the factors that are considered are:

- Tests of non-synchronized units or Demand Side Resources using Local Generators will be conducted at times when the Resource is otherwise required so the unit will not incur an unnecessary start.
- Whenever possible, the NYISO will conduct tests of 10-Minute Reserve, 30-Minute Reserve, and UOLN at the same time. In such cases, the Resource will first be asked to demonstrate
 - its ability to provide 10-Minute Reserve. Next the Resource will be asked to continue
 - to demonstrate its ability to provide 30-Minute Reserve. Finally the Resource will be asked to demonstrate that it can attain its UOL_n.
- Whenever possible, tests of synchronized Generator units will be conducted during on-peak hours and when the unit is at least at half load.

6.13.3 Payments and Penalties

Generators will be paid the LBMP at their bus for energy produced during a test. Demand side Resources are not eligible for any energy payments for demand reductions provided during the test period. Bid Production Cost Guarantee (BPCG) and Day-Ahead Margin Assurance Payments (DAMAP) will be paid pursuant to the provisions of the Market Administration and Control Area Services Tariff. Under-generation penalties incurred during a test will be collected or waived pursuant to the provisions of the Market Administration and Control Area Services Tariff.

6.13.4 Acceptance Criteria

The Resource's UOLN and response at the emergency response rate for 10 minutes or 30 minutes must normally be attained or exceeded during a test. The UOLN will be taken from the Resource's Real-Time offer. A Generator Resource may adjust the UOLN in its Real-Time offer to reflect the capacity of the Generator with expected ambient conditions. In addition, due to possible metering differences and time-keeping discrepancies, the following tolerances are allowed in the evaluation of an acceptable demonstration.

10 Minute Reserve

For individual unit demonstration of 10 Minute Reserve, a variation of 2% of required pickup or 1 MW (whichever is greater) of required pickup may be used. A one minute tolerance is allowed.

Example: A 15 MW pickup is required in 10 minutes. Minimum acceptable

performance would be 14 MW in 11 minutes.

30 Minute Reserve

For individual unit demonstration of 30 Minute Reserve, a variation of 2% of required pickup or 2 MW (whichever is greater) of required pickup may be used. A three minute tolerance is allowed.

Example: A 30 MW pickup is required in 30 minutes. Minimum acceptable performance would be 28 MW in 33 minutes.

Normal Upper Operating Limit (UOLN)

For individual unit demonstration of UOLN (adjusted for actual ambient conditions) a variation of 2% of UOLN may be used. The maximum time allowed from the start of test shall be the greater of (i) one (1) hour or (ii) the time required to reach UOLN at the Resources' emergency response rate plus 10%.

Example: UOLN (Real-Time offer) 100 MW

Emergency response rate 3 MW/MIN

Unit load at start of test 53 MW

Minimum acceptable performance 98 MW after one hour

Or

Example: UOLN (Real-Time offer) 200 MW

Unit load at start of test 120 MW

Normal response rate 1 MW/MIN

Minimum acceptable performance 196 MW after 88 minutes

6.13.5 Actions in the Event of Unsuccessful Performance

In the event of unsuccessful performance, the NYISO will inform the TO that a Resource has failed to demonstrate its emergency ramp rate and/or to achieve its UOLN. The TO will inform the Resource of the failure. . In the event of a failure to

reach the UOL_N value, NYISO Operators will take the unit Out Of Merit and derate the unit to the capacity demonstrated in the failed test. In the event of a failure to achieve the 10 Minute Reserve or the 30 Minute Reserve, Market Monitoring & Performance will calculate the ramp rate achieved and request Customer Relations to change the current ramp rates to the achieved value.

Explanation of the Failure

Upon failure of a test of 10-Minute Reserve, 30-Minute Reserve or UOLN, the Resource's owner or agent must submit a letter of explanation to the NYISO stating why the Resource failed the test, how the problem will be corrected, and the time required to make the correction. The letter must be submitted within 5 calendar days to the NYISO and must be directed to the Market Monitoring & Performance Department at the NYISO with a copy to the TO.

Failure of 10-Minute Reserve Test or Failure of 30-Minute Reserve Test

Upon failure of a test of 10-Minute Reserve or upon a failure of a test of 30-Minute Reserve, the Resource must submit a letter of explanation to the NYISO Customer Relations Department and Market Monitoring & Performance Department explaining why the Resource is unable to perform according to its as-bid parameters. The NYISO's Customer Relations Department and the NYISO's Market Monitoring & Performance Department will have been advised of the failed test.

Physical parameters that will require modification are:

- The Resource's emergency response rate will be reset to no higher than the response rate achieved during the test.
- The Resource's Normal Response Rate will be reset to no higher than the response rate achieved during the test.

The NYISO may derate the Resource's response rates if necessary to preserve reliability.

Failure to Reach the Normal Upper Operating Limit (UOLN)

Upon failure of a test of the UOLN, the Resource must submit a letter of explanation to the NYISO Customer Relations Department and Market Monitoring & Performance Department explaining why the unit is unable to perform according to its as bid parameters. The NYISO's Customer Relations Department and the NYISO's Market Monitoring & Performance Department will have been advised of the failed test.

All correspondence between the test participant and the Market Monitoring & Performance Department should be sent to;

Reference_Price_Update@NYISO.com

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

Request to Retest

Generators whose response rates or UOLs have been reduced as a result of a performance audit may request their response rate or UOL be retested to accurately represent unit capability. The NYISO will attempt to conduct a test of the unit's revised capability within 48 hours of the Generator's notification, consistent with the operating parameters described above.

6.13.6 Reserve Pick-Up in Lieu of Test

The NYISO may optionally measure and review the actual response of each Generator or Demand Side Resource that is asked to respond to a reserve pickup. The review period starts when the TOs are informed of the reserve pickup via the hot-line and new base points are made available to the Generators and Demand side Resources. The Generator's or Demand Side Resource's successful response to a reserve pickup is equivalent to an acceptable test of 10-Minute Reserve.

The unsuccessful response of a Generator or Demand Side Resource to a request for reserve pickup is equivalent to failing a test of 10-Minute Reserve.

6.13.7 Documentation

The NYISO records the parameters and results of each test using one of the forms contained in Attachment E of this manual. In order that the Resource may have a copy of the test documentation, the Resource is encouraged to record the parameters and results of a test using the same form.

7. BLACK START CAPABILITY SERVICE

This section describes the black start capability service.

7.1 Description

Black start capability represents the key Generators 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 generating units, 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.

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 generating 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 & Scheduling of Service

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

The NYISO identifies the generating units 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 Generators, 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 generating facilities that provide that service. Those payments

will be determined under the terms of this Rate Schedule. The LSEs in those local Transmission Owner areas will be additionally charged for that Black Start Capability Service by the NYISO. Generating 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 or Service

Initially, the embedded costs and O & M expenses of the equipment required to provide black start capability service are recovered by the suppliers in return for making equipment available to provide Black Start capability service, to the NYISO. For more information, see the [NYISO Accounting & Billing Manual](#).

Payments are made to Generators that are included in the NYISO's Black Start Restoration Plan as well as to Generators included in any Transmission Owner's local restoration plan. The Generators that are designated in these plans are paid at a rate, which is approved by FERC.

By May 1st of each year, the following embedded cost information for Black Start equipment located at one of these Generators is provided to the NYISO based upon FERC Form No. 1 or equivalent data:

1. Capital and fixed operation and maintenance costs associated with only those facilities within Generators that provide Black Start Capability
2. Annual costs associated with training the Generator operators in system restoration.

LSEs taking service under the OATT pay a monthly Black Start Capability Charge on all Transactions to supply Load in the NYCA (including in-state Bilateral Transactions, purchases of Energy from the LBMP Market, and Import transactions) as follows:

$$BSC_{s,t} = ISOBSC_t \frac{L_{x,t}}{\sum_{x \in N} L_{x,t}} + TOBSC_t \frac{L_{x,t}}{\sum_{x \in T_x} L_{x,t}}$$

Where:

$BSC_{x,t}$	=	black start charge for LSE x during month t
$ISOBSC_t$	=	NYISO black start costs for month t
$L_{x,t}$	=	LSE x's load during month t
N	=	set of LSEs in the NYCA
$TOBSC_t$	=	Transmission Owner black start costs for month t
T_x	=	set of LSEs in LSE x's Transmission District

The NYISO (and Transmission Owner, when applicable) shall conduct Black Start Capability tests for providers of Black Start Capability. Any Generator, which is awarded Black Start Capability payments and fails a Black Start capability test, shall forfeit all Black Start capability payments made to that Generator since its last successful test. Payments to that Generator shall not resume until it successfully passes the Black Start Capability test.

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 generation.
2. Select the Generators for black start capability based on location, price, and quality of supply.
3. Notify the selected generators for black start testing.

Black Start Generator Actions

The Black Start suppliers shall perform the following:

1. On an annual basis, provide the NYISO with embedded cost information.
2. Submit to performance testing when requested by the NYISO.

Attachment A – VSS Qualification Request Form

Voltage Support Services Qualifications Request Form

- _____ Attached to this form is documentation that demonstrates that the resource(s) listed below have an Automatic Voltage Regulator (AVR), including voltage regulator, block diagram and associated data, manufacturer’s model number and specifications, and a generator reactive capability data sheet (“D-curve”).
- _____ Attached to this form is a completed NYISO Reactive Power Capability Test Report documenting that the resource(s) listed below have successfully performed Reactive Power capability testing during current calendar year.

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.

<i>Resource</i>	<i>Type(Generator or Synchronous Condenser, etc.)</i>	<i>Location</i>	<i>NYISO ICAP DMNC or Nameplate</i>	<i>NYISO MIS PTID</i>	<i>Generator MW Capability</i>

Market Participant Information:

Officer’s Signature Date

New York ISO Approval:

Manager, Auxiliary Market Operations Date

Attachment B – Generator MVar Capability Test

NYISO Voltage Support Ancillary Service Annual Reactive Capability Test Report												
Generator Owner	(enter owner's name)				NOTE: Reporting entity should complete <u>all</u> fields highlighted in yellow on this sheet, and <u>all</u> appropriate fields on the log and lead test data sheets. Data recorded on the test data sheets will automatically populate into this summary sheet. (Rev. 11/29/07)							
Generator Name	(enter generator name)											
Unit Name/ Number	(enter unit number)											
NYISO MIS PTID	(enter ID number)											
Other PTIDs Applied To	(if applicable)											
Generator ICAP/DMNC Rating	(enter DMNC MW-rating)											
Group ICAP/DMNC Rating	(if applicable)											
LAGGING MVAR MAXIMUM CAPABILITY TEST					Check Workbook							
Test Date:	(enter mm/dd/yyyy)											
Start Time	(enter hh:mm)											
End Time	(enter hh:mm)											
NOTE: Cells shaded light green are automatically populated from the test data sheets.												
	Gross Generator Output		Net Output to system		Hydrogen Pressure (PSIA)	Gen. Terminal Voltage		Tap Positions		In-plant Auxiliary Station Service Load		Reason For Limit
	Gross Real Power MW	Gross Reactive Power MVar	Net Real Power MW	Net Reactive Power MVar		Gen Terminal	Auxiliary Bus	GSU	Auxiliary Bus	MW	MVAR	
HP or CT (Unit/Part 1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
LP or ST (Unit/Part 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sum	0.0	0.0	0.0	0.0								
LEADING MVAR MAXIMUM CAPABILITY TEST												
Test Date:	(enter mm/dd/yyyy)											
Start Time	(enter hh:mm)											
End Time	(enter hh:mm)											
NOTE: Cells shaded light green are automatically populated from the test data sheets.												
	Gross Generator Output		Net Output to system		Hydrogen Pressure (PSIA)	Gen. Terminal Voltage		Tap Positions		In-plant Auxiliary Station Service Load		Reason For Limit
	Gross Real Power MW	Gross Reactive Power MVar	Net Real Power MW	Net Reactive Power MVar		Gen Terminal	Auxiliary Bus	GSU	Auxiliary Bus	MW	MVAR	
HP or CT (Unit/Part 1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
LP or ST (Unit/Part 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sum	0.0	0.0	0.0	0.0								
Note: Annual test requirement is LAGGING test at (at least) 90% Rated DMNC and LEADING test at normal low limit.												
COMMENTS:												
(Additional comments can be included with each station)												
NYISO SHIFT SUPERVISOR:												
TRANSMISSION PROVIDER DISPATCHER:												
REACTIVE SUPPLIER:												

Figure B-1: NYISO Voltage Support Ancillary Service Annual Reactive Capability Test Report

NYISO ANCILLARY SERVICES MANUAL

Lagging Test Data Recording Form - Part 1

Use this section to report test results for the high pressure turbine-generator set of a cross-compound unit, or the combustion turbine-generator set of a combined-cycle		Gross Generator Output		Net Output to system		Hydrogen Pressure (PSIA)	Gen. Terminal Voltage		Tap Positions		In-plant Auxiliary Station Service Load	
		Gross Real Power MW	Gross Reactive Power MVAR	Net Real Power MW	Net Reactive Power MVAR		Gen Terminal	Auxiliary Bus	GSU	Auxiliary Bus	MW	MVAR
Reading	Time											
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
Calculated Average value for hour		0.0	0.0	0.0	0.0	0.0						

Data to be supplied at 5-minute intervals for duration of test hour.

Use Part 2 only for LP-shaft of cross-compound or steam turbine portion of combined-cycle unit when tested at the same time as generator in Part 1.

Lagging Test Data Recording Form - Part 2

Use this section to report test results for the low pressure turbine-generator set of a cross-compound unit, or the HRSG steam turbine-generator set of a combined-cycle unit.		Gross Generator Output		Net Output to system		Hydrogen Pressure (PSIA)	Gen. Terminal Voltage		Tap Positions		In-plant Auxiliary Station Service Load	
		Gross Real Power MW	Gross Reactive Power MVAR	Net Real Power MW	Net Reactive Power MVAR		Gen Terminal	Auxiliary Bus	GSU	Auxiliary Bus	MW	MVAR
Reading	Time											
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
Calculated Average value for hour		0.0	0.0	0.0	0.0	0.0						

Figure B-2: Lagging Test Data Recording Form

Leading Test Data Recording Form - Part 1

Reading	Time	Gross Generator Output		Net Output to system		Hydrogen Pressure (PSIA)	Gen. Terminal Voltage		Tap Positions		In-plant Auxiliary Station Service Load	
		Gross Real Power MW	Gross Reactive Power MVAR	Net Real Power MW	Net Reactive Power MVAR		Gen Terminal	Auxiliary Bus	GSU	Auxiliary Bus	MW	MVAR
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												

Calculated Average value for hour: 0.0 0.0 0.0 0.0 0.0

Data to be supplied at 5-minute intervals for duration of test hour.

Use Part 2 only for LP-shaft of cross-compound or steam turbine portion of combined-cycle unit when tested at the same time as generator in Part 1.

Leading Test Data Recording Form - Part 2

Reading	Time	Gross Generator Output		Net Output to system		Hydrogen Pressure (PSIA)	Gen. Terminal Voltage		Tap Positions		In-plant Auxiliary Station Service Load	
		Gross Real Power MW	Gross Reactive Power MVAR	Net Real Power MW	Net Reactive Power MVAR		Gen Terminal	Auxiliary Bus	GSU	Auxiliary Bus	MW	MVAR
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												

Calculated Average value for hour: 0.0 0.0 0.0 0.0 0.0

Figure B-3: Leading Test Data Recording Form

Attachment C – Performance Adjustment for Regulating and Non-Regulating Suppliers

1.0 Regulation Performance Adjustment for Regulation Suppliers

1.1 Adjustment

Regulating resources assist in maintaining both the scheduled interchange of energy with neighboring control areas and the scheduled frequency. The Automatic Generation Control (AGC) function monitors and controls net interchange and system frequency. The control of these quantities involves frequent signals to the suppliers of regulating service to adjust their output. Nominally, the AGC function requires an adjustment in the output of regulation service providers every six seconds. The effective control of interchange and frequency relies on the responsiveness of regulation service providers. That is, providers must react quickly and accurately to the control signals that would increase or decrease in output. The performance of regulation service providers is monitored and a payment factor is calculated for each provider. Good performers are paid for their regulation service at 100% of the market clearing price for regulation. Poor performers are subject to a performance based adjustment to their regulation service payments based on the real time market clearing price of regulation. That settlement payment for regulation service is dependent on the performance payment factor calculated for the provider – the less responsive the provider, the smaller the performance factor.

Symbol	Description
BP_{AGC30}^+	The largest of the six-second base points determined by AGC for a regulating unit over each 30-second interval “p”
BP_{AGC30}^-	The smallest of the six-second base points determined by AGC for a regulating unit over each 30-second interval “p”
$DAMCPreg_i$	Day-ahead clearing price of regulation service for the hour containing RTD interval “i”
$DARcap_i$	Amount of day-ahead regulation service scheduled from a supplier of regulation service for the hour containing RTD interval “i”
i	Index of an RTD interval.
K_{PI}^i	The regulation payment factor for RTD interval “i”
$MW_{meas,p}$	Measured output of regulation provider during each 30-second interval “p”
NCE_i	The negative control error of a regulating unit in RTD interval “i”
OG_p	Measured over-generation during each 30-second interval “p”
PCE_i	The positive control error of a regulating unit in RTD interval “i”
PI_i	The regulation performance index in RTD interval “i”
PSF	The payment scaling factor

RegPeriod _i	Number of seconds during RTD interval “i” that the generating unit is supplying regulation service.
RR	Regulation ramp rate (MW/min) for a regulating unit
Rsettlement _i	Real-time portion of the settlement to a provider of regulation service for RTD interval “i”
RTMCPreg _i	Real-time clearing price of regulation service in RTD interval “i”
RTRcap _i	Amount of Real-Time regulation service scheduled in RTD interval “i” from a supplier of regulation service
s _i	Number of seconds in RTD interval “i”
UG _p	Measured under-generation during each 30-second interval “p”
URM _i	The unit regulation margin in RTD interval “i”

1.2 Control Error

Both a positive and a negative control error are accumulated for each provider of regulation service in each RTD interval. The positive control error (PCE) is a measure of the provider’s over-generation; the negative control error (NCE) is a measure of the provider’s under-generation. Each 30 seconds the measured output ($MW_{meas,p}$) of the regulation provider is compared to the largest and smallest of six-second base points generated during the previous 30 seconds. The provider is over-generating if measured output is greater than the largest of the six-second base points of the past 30 seconds. The provider is under-generating if measured output is less than the smallest of the six-second base points of the past 30 seconds. That is, every 30 seconds:

$$OG = (MW_{meas} - BP_{AGC30}^+), \text{ but not less than zero}$$

$$UG = (BP_{AGC30}^- - MW_{meas}), \text{ but not less than zero}$$

Over- and under-generation is accumulated for each 30-second period in the RTD interval. That is:

$$PCE_i = \sum_{\substack{30\text{-second periods} \\ \text{in the RTD interval}}} OG$$

$$NCE_i = \sum_{\substack{30\text{-second periods} \\ \text{in the RTD interval}}} UG$$

1.3 Unit Regulation Margin

The unit regulation margin is the amount that the regulation provider’s output could change during an RTD interval. The unit regulation margin is calculated as:

$$URM_i = RR \times \left[\frac{s_i}{60} \right]$$

1.4 Regulation Performance Index

The regulation performance index tracks how well a regulation supplier responds to the control signals that are issued every six seconds. A regulation performance index is calculated for every RTD interval.

$$PI_i = \left[\frac{URM_i - (PCE_i + NCE_i)}{URM_i} + 0.10 \right] \times \left[\frac{RegPeriod_i}{s_i} \right]$$

1.5 Regulation Payment Factor

A payment factor is calculated for each supplier of regulation service. The payment factor is used in the calculation of payments to the supplier. The payment factor is calculated as follows:

$$K_{PI}^i = \left[\frac{PI_i - PSF}{1 - PSF} \right]$$

Where:

PI is the Generator's performance index; and

PSF is the payment scaling factor, where:

The PSF shall be set between 0 and the minimum performance index required for payment of Availability payments. The PSF is established to reflect the extent of NYISO compliance with the standards established by NERC, NPCC, or Good Utility Practice for Control Performance and System Security. The PSF is set initially at zero. Should the NYISO's compliance with these measures deteriorate, in a manner that can be improved if regulation performance improves, the PSF will be increased. Generators providing Regulation Service will be required to increase their performance index to obtain the same total Regulation Service payment as they received during periods of good NYISO performance, as measured by these standards.

1.6 Settlement for Regulation Service

The settlement of a regulation service provider for regulation service includes portions for day-ahead commitments to provide regulation service (if any) and balancing adjustments to account for deviations between day-ahead and Real-Time awards. The regulation payment factor is applied to the Real-Time portion of the settlement as shown below for an RTD interval. Total settlement for the day is simply the sum of the interval settlements for all intervals in the day.

$$Rsettlement_i = (DARcap_i \times DAMCPreg_i) + \left[(RTRcap_i \times K_{PI}^i) - DARcap_i \right] \times RTMCPreg_i$$

Where:

DARcap_i = Regulation service scheduled in the day ahead market for interval i
 DAMCPreg_i = Day ahead regulation market clearing price for interval i
 RTRcap_i = Total real time regulation service scheduled for interval i
 K_{pi}ⁱ = Regulation service payment scaling factor for interval I, as described above
 RTMCPreg_i = Real time regulation market clearing price for interval i

2.0 Settlement Adjustment for Suppliers not providing Regulation Service

Suppliers that are not providing regulation service that persistently operate at a level below their schedule shall pay a Persistent Under generation charge, unless its operation is within a tolerance described below, provided, however, no Persistent Undergeneration charges shall apply to a Fixed Block Unit that has reached a percentage of its Normal Upper Operating Limit. The percentage has been set at seventy percent (70%). This percentage can be changed by the NYISO if there is an identified Market or Reliability impact that justifies the modification.

Persistent under generation charges per interval shall be calculated as follows:

Persistent Undergeneration Charge = Energy Difference * RTMCPreg_i * Interval Length_{sec} / 3600

Energy Difference = The negative deviation from RTD Schedule (MW) calculated for each interval that is outside a tolerance that has a steady state and dynamic component.

The Energy Difference is set to 0 whenever the Energy Deviation < 0 or within the tolerance as defined below.

RTMCPreg_i = Real time regulation market clearing price for interval i

a.) Control Error Tolerance (CET) = MIN (OpCap * .03, Response Rate * 3)

Where:

OpCap = Unit Bid Normal Upper Operating Limit or Bid Emergency Upper Operating Limit. The emergency upper operating limit is only used during periods when the NYISO has taken action to operate the system to emergency limits.

Response Rate = Response rate applicable for the current output of the unit

b.) Penalty Limit for Under Generation (PLU)

PLU = MIN[(ADG_i – CET), ((900 * PLU_{n-1}) + ((Interval Length_{sec}) * (ADG_i – CET))) / (900 + Interval Length_{sec})]

NYISO ANCILLARY SERVICES MANUAL

Where:

ADG_i = Average Desired Generation for interval i

PLU_{n-1} = PLU calculated in the previous interval, if no previous interval set $PLU_{n-1} = 0$

If $PLU < 0$ then set $PLU = 0$

c.) Energy Difference $_i$ = $MAX [(PLU_i - ADG_i), 0]$

Where;

PLU_i = Penalty limit for under generation for interval i

ADG_i – Average Actual Generation for interval i

Attachment D – Performance Standards

The link below will take you to the most current performance standard information on the North American Electric Reliability Council (NERC) web site.

ftp://www.nerc.com/pub/sys/all_updl/oc/opman/PerformStdsRef.pdf

Attachment E – Reserve & Regulation Performance Audit Standards

The following forms as appropriate will be completed after each specific audit:

- 1. 10 Minute Synchronous Reserve**
- 2. 10 Minute GT Reserve**
- 3. 10 – 30 Minute Synchronous and Upper Operating Limit**
- 4. 10 and 30 Minute Synchronous Reserve**
- 5. Regulation Performance**

10 Minute Sync

INDIVIDUAL RESOURCE RESERVE RESPONSE TEST

Type of test: 10 Minute response Pass _____ Fail _____

This is a NYISO individual resource audit of _____ 10 minute reserve.

The resource has an Emergency Response Rate of _____ MWs per minute.

NYISO shows the resource loaded at _____ MWs and it has to increase loading to _____ MWs to pass the 10 minute reserve audit.

The audit start time is _____.

TO confirms Resource Notified at this time _____

Actual output at 10 minutes _____ 11 minutes _____

Expected output in 10 minutes _____ Tolerance _____
Within tolerance Yes _____ No _____

Test terminated at _____ TO notified _____ TO notified Resource _____

Date _____

Comments and or actions taken _____

Shift Supervisor _____

TO Operator _____

10 MINUTE GT

INDIVIDUAL UNIT RESERVE REPOSE TEST

Type of test: 10 Minute GT response Pass _____ Fail _____

This is a NYISO individual unit audit of _____ 10 minute start GT.

The unit has a claimed Upper Operating limit Normal (UOL_N) of _____.
The unit must reach this output within 10 minutes of its start time.

The audit start time is _____.

TO confirms Generator Notified at this time _____

Actual output in 10 minutes _____ 11 minutes _____

Expected output at 10 minutes _____ Tolerance _____
Within tolerance Yes _____ No _____

Test terminated at _____ TO notified _____ TO notified Generator _____

Date _____

Comments and or actions taken _____

Shift Supervisor _____

TO Operator _____

Note: This test is also applicable to 10 minute non-synchronous demand side resource reserve suppliers, that are providing the reserve with Local Generators.

10 – 30 MINUTE Sync and UOL_N

INDIVIDUAL RESOURCE RESERVE RESPONSE TEST

Type of test: 10, 30 response and claimed UOL_N. Pass _____ Fail _____

This is a NYISO individual resource audit of _____ 10 and 30 minute reserve.
This is also an audit of the resources claimed Upper Operating Limit Normal.
The unit has an Emergency Response Rate of _____ MWs per minute.

NYISO shows the unit loaded at _____ MWs and it has to increase loading to _____ MWs to pass the 10 minute reserve audit, _____ MWs to pass the 30 minute reserve audit and to _____ MWs to pass the Upper Operating Limit Normal audit.

The audit start time is _____.

TO confirms resource Notified at this time _____

Actual output at 10 minutes _____ 11 minutes _____

Expected output in 10 minutes _____ Tolerance _____
Within tolerance Yes _____ No _____

Actual output in 30 minutes _____ 33 minutes _____

Expected output at 30 minutes _____ Tolerance _____
Within tolerance Yes _____ No _____

Maximum generation reached _____ Tolerance _____
Expected generation _____ (UOL_N)

Within tolerance Yes _____ No _____

Test terminated at _____ TO notified _____ TO notified Resource _____

Date _____

Comments and or actions taken _____

Shift Supervisor _____

TO Operator _____

10 and 30 MINUTE Sync

INDIVIDUAL RESOURCE RESERVE RESPONSE TEST

Type of test: 10 and 30 Minute response Pass _____ Fail _____

This is a NYISO individual resource audit of _____ 10 and 30 minute reserve.

The resource has an Emergency Response Rate of _____ MWs per minute.

NYISO shows the resource loaded at _____ MWs and it has to increase loading to _____ MWs to pass the 10 minute reserve audit and to _____ MWs to pass the 30 minute reserve audit.

The audit start time is _____.

TO confirms Resource Notified at this time _____

Actual output at 10 minutes _____ 11 minutes _____

Expected output in 10 minutes _____ Tolerance _____
Within tolerance Yes _____ No _____

Actual output in 30 minutes _____ 33 minutes _____

Expected output at 30 minutes _____ Tolerance _____
Within tolerance Yes _____ No _____

Test terminated at _____ TO notified _____ TO notified Generator _____

Date _____

Comments and or actions taken _____

Shift Supervisor _____

TO Operator _____

Regulation Response Audit

INDIVIDUAL RESOURCE REGULATION PERFORMANCE REPOSENSE TEST

Type of test: Regulation Performance Pass _____ Fail _____

This is a NYISO individual resource audit of _____ regulation performance.

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

The audit start time: _____.

The audit end time: _____.

Time weighted Performance Index: _____

Date _____

Comments and or actions taken _____

Audit Requested By:

Name: _____

Department: _____