ISO New England Operating Procedure No. 23 - Resource Auditing

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Table of Contents:

Appendices:

1. Appendix A - Retired
2. Appendix B - Capability Determination for Thermal, Pumped Storage, and Weekly Cycle Hydro Generator Assets
3. Appendix C - Capability Determination for Daily Cycle Hydro Generator Assets
4. Appendix D - Monthly Price Data Form for Settlement Only Generators (SOG)
5. Appendix E - Multi-Generator Station Certification Form
6. Appendix F - No Steam Exports Certification Form
7. Appendix G - Reactive Resources Required to Perform Reactive Capability Auditing
8. Appendix H - Reactive Capability Audit Request Form
9. Appendix I - Reactive Capability Audit Data Recording Form
10. Appendix J - Reactive Capability Audit Waiver Request Form
11. Appendix K - Response Rate Auditing Calculation

References:

1. North American Electric Reliability Corporation (NERC) Reliability Standard BAL-002 - Disturbance Control Standard - Contingency Reserve for Recovery from a Balancing Contingency Event (BAL-002)
2. Northeast Power Coordinating Council Inc. (NPCC) Regional Reliability Reference Directory #5 - Reserve (Directory #5)
3. ISO New England Inc. Transmission, Markets, and Services Tariff (Tariff) Section I - General Terms and Conditions. I.3.9 Review of Market Participant's Proposed Plans
4. ISO New England Inc. Transmission, Markets, and Services Tariff (Tariff) Section II - Open Access Transmission Tariff (OATT)
5. ISO New England Inc. Transmission, Markets, and Services Tariff (Tariff) Section III, Market Rule 1 Standard Market Design (Market Rule 1)
6. ISO New England Inc. Transmission, Markets and Services Tariff (Tariff), Attachment D ISO New England Information Policy
7. ISO New England Ancillary Service Schedule 2 Business Procedure
8. ISO New England Operating Procedure No. 3 - Transmission Outage Scheduling (OP-3)
9. ISO New England Operating Procedure No. 5 - Resource Maintenance and Outage Scheduling (OP-5)

10. ISO New England Operating Procedure No. 12 - Voltage and Reactive Control (OP-12)
11. ISO New England Operating Procedure No. 14 - Technical Requirements for Generators, Demand Response Resources, Asset Related Demands and Alternative Technology Regulation Resources (OP-14), Appendix A - Explanation of Terms and Instructions for Data Preparation of ISO New England Form NX-12, Generator Technical Data
12. ISO New England Operating Procedure No. 18 - Metering and Telemetering Criteria (OP-18)
13. ISO New England Manual for Registration and Performance Auditing (Manual M-RPA)

I. INTRODUCTION

A. This ISO New England Operating Procedure No. 23 - Resource Auditing (OP-23), describes the methods by which ISO verifies certain resource capabilities including:

- ten and thirty minute off-line reserve capability
- Seasonal Claimed Capability (SCC)
- reactive capability

B. Based upon the audit results, ISO may limit the value of the parameter that can be submitted in the Supply Offer of the resource.

II. RESERVE AUDITING

A. FAST START RESERVE AUDITING

1. Economic Dispatch Fast Start Reserve Audit

a. When a Fast Start Generator or Fast Start Demand Response Resource receives an electronic dispatch signal to start (including a Market Participant-requested fast start off-line reserve audit):

(1) The resource shall respond to the dispatch signal in accordance with its Supply Offer.

(2) ISO shall evaluate the resource response to the dispatch signal in accordance with Section III of the ISO New England, Inc. Transmission, Markets, and Services Tariff (Tariff), (Market Rule 1 - Standard Market Design).

(3) Response to these dispatch signals is used to adjust the CLAIM10 or CLAIM30 value for each resource as described in Section III.9.5 of the Tariff - Forward Reserve Resources.

2. Market Participant-Requested Fast Start Reserve Audit

a. For Generator Assets:

(1) The Lead Market Participant (Lead MP) or Designated Entity (DE) may request that the fast start off-line reserve capability of a Generator Asset be audited by submitting a request through the Claimed Capability Auditing Tool (CCAT) software.

i. Each Lead MP or DE-requested fast start off-line reserve audit shall be performed in accordance with Section III.9.5 of the Tariff.

(2) In order to modify or rescind a request to perform a fast start off-line reserve audit the following shall be performed:

i. DE: Inform the ISO control room of the request for modification or cancellation.

ii. Lead MP/DE: Modify or cancel the audit request using the CCAT software.

b. For Demand Response Resources (DRRs):

(1) The Lead MP may request that the fast start reserve capability of a DRR be audited by submitting a request through the Demand Response Audit and Testing Tool (DRATT) software.

(2) In order to modify or rescind a request to perform a fast start reserve audit the following shall be performed:

i. Demand DE: Inform the ISO control room of the request for modification or cancellation.

ii. Lead MP/Demand DE: Modify or cancel the audit request using the DRATT software.

3. Reporting

a. ISO shall provide reports to the Lead MP of a fast start resource as follows:

(1) Within two Business Days of the resource receiving a start-up Dispatch Instruction, a report shall be provided stating:

i. time and date of the dispatch

ii. target value for the dispatch

iii. output or reduction at 10 and 30 minutes following the initial Dispatch Instruction

iv. whether the resource was in-service and available for 60 minutes following the initial Dispatch Instruction.

(2) Each week, prior to 1700 on Thursday, a report shall be provided stating the resource:

i. current CLAIM10 and CLAIM30 performance factors for the following week

ii. CLAIM10 and CLAIM30 for the following week

iii. maximum output at 10 and 30 minutes for the previous Forward Reserve Procurement Period.

4. Disputing Audit Results

a. A Lead MP may dispute the audit results obtained from a start-up Dispatch Instruction by entering an issue in the ISO Participant Support issue tracking system prior to noon of the third Business Day after the day on which the results were provided. The notification shall include any Operating Data that is **not** consistent with the data used by ISO to determine the results.

b. While the dispute is under assessment:

(1) Until the dispute has been resolved, the CLAIM10 or CLAIM30 shall be adjusted using the ISO-derived value in accordance with Section III of the Tariff.

(2) ISO shall consider the data provided by the Lead MP and make good-faith efforts to resolve the data differences.

(3) With respect to disputes, ISO shall make the final determination and inform the Lead MP of the determination.

i. Any changes to a CLAIM10 or CLAIM30 resulting from the ISO's final determination with respect to a dispute is applicable on a prospective basis.

5. CLAIM10 or CLAIM30 Cure

a. Section III.9.5.3.4 of the Tariff - Performance Factor Cure permits the Lead MP, Demand DE, or DE to submit a restoration plan to ISO in order to restore a resource's CLAIM10 or CLAIM30.

(1) ISO shall evaluate the restoration plan in accordance with Section III of the Tariff.

(2) Following completion of the restoration plan, the resource shall perform the Market Participant-requested audit using Section II.A.2. of this Operating Procedure and the CLAIM10 or CLAIM30 shall be adjusted in accordance with Section III.9.5.3.4 of the Tariff.

6. Initial CLAIM10 or CLAIM30 Values

a. For a resource that is newly-determined ready to respond to ISO dispatch by ISO or will be changing its registration from **not** being fast start capable to being fast start capable, the CLAIM10 and CLAIM30 are set to zero until the first electronic start-up following the status change.

B. RESPONSE RATE AUDITING

1. Because response rates affect both Real-Time energy and reserves, ISO shall perform on-going response rate auditing using historical data as needed to verify that offered resource response rates are reflective of the resource's Real-Time performance.

2. ISO shall periodically provide Lead MPs with observed response rates based upon a resource's MW offer blocks. Observed response rates are determined using the method described in OP-23, Appendix K - Response Rate Auditing Calculation (OP-23K).

3. The Lead MP shall use the provided observed response rates to offer the resource. The offered MW/Manual Response Rate (MRR) blocks may differ from the provided observed MW/MRR blocks due to ambient temperature or Real-Time resource configuration. The Lead MP may contact ISO regarding provided observed response rates by emailing RRAudits@iso-ne.com.

4. ISO shall restrict the MRR offer to the maximum expected response rate based upon historical observations.

5. The Lead MP may provide ISO with a restoration plan for response rates as provided for in Section III.1.5.2 of the Tariff - ISO-Initiated Parameter Auditing by emailing RRAudits@iso-ne.com.

6. ISO shall observe response rates following any completed restoration plan and shall modify response rate restrictions based upon observed response rates.

7. For resources that are newly-determined ready to respond to ISO dispatch by ISO, the Lead MP shall offer response rates based upon the most accurate manufacturer, observed, or tested values. ISO shall observe the resource's response to Dispatch Instructions and when sufficient historical data has been obtained, ISO shall provide observed response rates to the Lead MP.

III. CLAIMED CAPABILITY AUDITS

A. Generator Assets:

1. General Auditing Provisions

a. In order to establish and maintain accurate records of Generator Asset real power capabilities, all Generator Assets registered with ISO shall perform real power capability auditing as required in Section III.1.5.1 of the Tariff - Claimed Capability Audits.

b. To recognize certain operating characteristics, the following conditions shall apply:

(1) The Claimed Capability Audit (CCA) values of a gas turbine, combined cycle, or pseudo combined-cycle generator shall be adjusted for ambient temperature, and steam exports in accordance with Section III.1.5.1 of the Tariff, and using the procedures in OP-23, Appendix B - Capability Determination for Thermal, Pumped Storage, and Weekly Cycle Hydro Generator Assets (OP-23B).

(2) The Claimed Capability values of non-intermittent daily cycle hydro Generator Assets shall be based on Generator Asset characteristics and historical monthly river flow data, as detailed in OP-23, Appendix C - Capability Determination for Daily Cycle Hydro Generator Assets (OP-23C). Non-intermittent daily cycle hydro Generator Assets do not perform Establish or Seasonal CCAs.

2. Interdependence of Equipment

a. Any CCA value of a Generator Asset shall reflect any limitations based upon the interdependence of common elements between two or more Generator Assets such as: auxiliaries, limiting operating parameters, and the deployment of operating personnel. Generator Assets that share equipment and/or personnel shall perform one of the following:

(1) Perform CCAs concurrently on all Generator Assets that share equipment and/or personnel, to properly reflect the pertinent limitations

(2) Certify that the Generator Assets do **not** have any common limiting equipment and/or personnel by submitting OP-23, Appendix E - Multi-Generator Station Certification Form (OP-23E) to ISO.

3. Establish Claimed Capability (Establish CCA)

a. To change a Generator Asset Establish CCA value, an audit shall be conducted. The Establish CCA audit shall be performed in accordance with Section III.1.5.1.2 of the Tariff - Establish Claimed Capability Audit. To verify that a request to establish or change the Establish CCA value will be effective by the desired date, the Lead MP should request the audit with sufficient advance notice to allow time for testing and processing. The

change in audit value shall become effective in accordance with Section III.1.5.1.2 of the Tariff and as follows:

(1) A Generator Asset that has been declared ready to follow Dispatch Instruction by the ISO, but for which an Establish CCA has **not** been conducted, may participate in the New England Markets using the preliminary asset ratings and other characteristics from initial registration forms, subject to later adjustments based upon subsequent audited values.

4. Seasonal Claimed Capability (Seasonal CCA)

a. A Seasonal Claimed Capability Audit (Seasonal CCA) is a demonstration of the capability of a Generator Asset that may be achieved through normal dispatch and shall be conducted in accordance with Section III.1.5.1.3 of the Tariff - Seasonal Claimed Capability Audits. A specific request by the Lead MP is **not** necessary. The notification by a Lead MP of past performance includes the date and time period of the demonstration to be used, and other operating data (ambient temperature, steam exports, elevations, etc.) as defined in OP-23B.

b. In accordance with Section III of the Tariff, ISO may issue a Seasonal CCA window to indicate the hour(s) during which an audit performed would meet the applicable temperature requirements. The audit window(s) is (are):

(1) **No** less than one hour in duration.

(2) Effective on a New England-wide basis.

(3) Issued for the third day from the day of posting (e.g., audit periods posted on Monday will be applicable from 0001-2359 on Thursday).

c. Audit temperature windows are used to determine whether or not a Generator Asset meets the temperature requirements of a Seasonal CCA and are **not** to be interpreted as permission to perform an audit in Real-Time. Generator Assets shall follow normal scheduling and dispatch procedures for the performance of an audit in the Day-Ahead or Real-Time Energy Markets.

B. Demand Response Resources (DRRs)

1. A Seasonal DR Audit is a demonstration of the capability of a DRR that may be achieved through normal dispatch or through an audit request in the DRATT software and shall be conducted in accordance with Section III.1.5.1.3.1 of the Tariff. A specific request by the Lead MP is **not** necessary if the Seasonal DR Audit is performed by the designation of a period of dispatch after the fact.

2. The notification by a Lead MP of past performance shall include the date and time period of the demonstration to be used.

C. ISO-Initiated Audits

1. ISO may conduct an audit of the capabilities of a resource as specified in Section III.1.5.1.4 of the Tariff - ISO-Initiated Claimed Capability Audits or that is in addition to required Market Participant-requested audits. An ISO decision to conduct such an audit shall be based upon objective criteria that suggest that the Resource is claiming capability in excess of what the Resource's typical performance would indicate. Such criteria include, but are **not** limited to any of the following conditions:

    a. A consistent pattern of declaring an Economic Maximum Limit or Maximum Reduction, adjusted for ambient temperature as appropriate, that is inconsistent with the SCC, Seasonal DR Audit value, and/or Capacity Supply Obligation (CSO)

    b. Repeated failures of a resource to achieve its current SCC or Seasonal DRR Audit value during audits

    c. Repeated failures to meet Dispatch Instructions

2. Resources are compensated for these audits in accordance with Section III of the Tariff.

IV. REACTIVE CAPABILITY AUDITS

A. Verification of Reactive Power Capability

1. In accordance with the criteria described in Section III.1.5.3 (b) of the Tariff, ISO, in consultation with the Local Control Centers (LCCs), shall determine which Reactive Resources shall be required to perform Reactive Capability Audits.

2. Reactive Resources that are required to perform Reactive Capability Audits in accordance with Section III.1.5.3 (b) of the Tariff are listed in OP-23, Appendix G - Reactive Resources Required to Perform Reactive Capability Auditing (OP-23G).

3. Each Reactive Resource owner shall verify the reactive power capability of a Reactive Resource that is listed in OP-23G. Reactive Resource owners shall also verify the reactive power capability of a Reactive Resource whenever such verification is otherwise required by ISO or the LCC.

4. If the results of the Reactive Capability Audit demonstrate that the reactive capability of a Reactive Resource is different than the reactive capability required under the Interconnection Agreement, then the Reactive Resource owner shall resolve the discrepancy in accordance with the Section I.3.9 of the Tariff - Review of Market Participant's Proposed Plans and, as appropriate, Schedule 22 (Large Generator Interconnection Procedures), Schedule 23 (Small Generator Interconnection Procedures) or Schedule 25 (Elective Transmission Upgrade Interconnection Procedures) to the ISO's Open Access Transmission Tariff.

5. Resources that request to perform reactive capability testing other than that required by ISO shall request that testing using Section IV.D and IV.E of this OP.

6. DRRs are **not** considered Reactive Resources by ISO.

B. Changes to the Reactive Capability of a Reactive Resource

1. ISO, in consultation with the LCC, shall determine whether a change to the reactive capability of the Reactive Resource, including a change to the size of the storage capacity for an Electric Storage Facility (ESF), requires a new Reactive Capability Audit for leading capability, lagging capability, or both.

2. A Reactive Capability Audit that is required due to a change in reactive capability shall be performed as soon as possible but **no** later than six (6) months from the date that the Market Participant (MP) was informed of the requirement to audit.

C. General Auditing Instructions Applicable to All Reactive Resources

NOTE

- Lagging (over-excited) capability is defined as the Reactive Resource providing reactive power to the electrical system and is denoted as a positive value.
- Leading (under-excited) capability is defined as the Reactive Resource absorbing reactive power from the electrical system and is denoted as a negative value.

1. The most recently performed Reactive Capability Audit shall be the audit of record for a Reactive Resource.

2. Reactive Capability Audits for leading or lagging capability may be performed at any time during the year. Certain Reactive Resources may be required to perform Reactive Capability Audits at high or low loads due to the magnitude of the reactive capability required to be demonstrated during the audit. In the event that a Reactive Resource requires certain conditions in order to demonstrate its capability, ISO, the LCC, and the MP shall work together to determine an advantageous auditing window.

3. Reactive Capability Audits shall be performed at least every five (5) years unless otherwise required by ISO or the LCC.

4. Reactive Capability Audits for Reactive Resources listed in OP-23G shall be performed by the end of the calendar year listed in OP-23G unless other direction is provided by ISO (e.g., auditing following a reactive capability change).

5. Reactive Resources that will be listed in OP-23G but have **not** yet been determined ready to follow Real-Time dispatch by ISO are required to perform Reactive Capability Audits prior to being determined ready to follow Real-Time dispatch, unless otherwise agreed to by ISO. ISO shall inform these Reactive Resources of the auditing requirement through the ISO's resource integration process.

6. The Reactive Resource may perform real power or other required testing at the same time as the Reactive Capability Audit so long as the requirements for real and reactive power are met during the audit.

7. During the Reactive Capability Audit, the Reactive Resource shall absorb or produce the maximum reactive power of the Reactive Resource such that the Reactive Resource reaches a defined limit, given the current conditions and limitations, for the entire audit duration. This limit may be internal to the Reactive Resource (e.g., maximum excitation limiters (MEL), under excitation limiters (UEL), volts/hertz limiters, terminal voltage, procedural) or external to the Reactive Resource (e.g., transmission bus voltage). The MP shall provide ISO and the LCC the limit reached by the Reactive Resource during the audit, on OP-23, Appendix I - Reactive Capability Audit Data Recording Form (OP-

23I). OP-23I shall be submitted to ISO by attaching the file to an Ask ISO issue.

8. Unless otherwise directed by ISO or the LCC, Reactive Resources comprised of multiple dynamic devices (e.g., combined cycle, hydro, wind) shall perform Reactive Capability Audits with at least 90% (rounded up) of the turbines or inverters at the Reactive Resource on-line. For example, a Generator Asset comprised of 18 turbines would be required to have at least 17 turbines online at the time of the audit (i.e. 18 turbines*0.9 = 16.2 turbines; rounded up = 17 turbines).

9. In the event that reactive equipment or elements that may limit reactive capability (e.g., transformers, feeders, etc.) are shared between multiple Reactive Resources (e.g., pseudo-combined cycle assets, co-located solar and storage facilities), those Reactive Resources may be required to test at the same time in order to determine limitations. This includes, but is **not** limited to, machines at the same combined-cycle facility and Reactive Resources that share the same interconnection transformer.

10. The Reactive Resource shall have its Automatic Voltage Regulating equipment (AVR), including any limiting functions such as MEL, UEL, etc., in automatic and controlling a voltage setpoint during the Reactive Capability Audit unless the technical capabilities of the Reactive Resource preclude testing in this manner. If the AVR **cannot** be tested in automatic and controlling a voltage setpoint, then the Reactive Capability Audit Request shall state the conditions of the AVR during testing. AVRs may include, but are **not** limited to: synchronous generator AVRs, wind plant controllers, and distributed control systems (DCSs).

11. ISO, the LCC, and the Lead MP shall determine prior to the Reactive Capability Audit if any additional available data is required to be submitted with the required OP-23I data.

12. The Reactive Resource owner shall:

    a. Record Reactive Capability Audit data at five (5) minute intervals and submit that data to ISO on OP-23I. All Reactive Capability Audit data required on OP-23I shall be submitted or ISO shall declare the Reactive Capability Audit to be invalid.

    b. Provide the status (in/out, etc.) and reactive loading for all reactive devices (e.g., capacitors, reactors, statcoms, etc.) at the Reactive Resource during the Reactive Capability Audit on a five (5) minute basis. Such data shall be provided to ISO with the Reactive Capability Audit data required in OP-23I.

    c. Indicate on OP-23I which reactive device was most limiting (if the audited facility is comprised of multiple reactive devices).

    d. Provide MW and MVAR values on the high and low side of the interconnection transformer (if an interconnection transformer is installed and metering is available).

e. Submit Reactive Capability Audit data to ISO within forty-five (45) days of the date from which the data was obtained, for either a scheduled test or an operational data submission.

13. ISO shall review the submitted Reactive Capability Audit data. ISO shall have the ability to reject Reactive Capability Audit data that does **not** meet the auditing requirements, or **cannot** be corroborated through other data means.

D. Scheduling the Audit

1. Based upon studies or Real-Time conditions, ISO or the LCC shall have the ability to approve, propose an alternate auditing time, deny, or cancel a Reactive Capability Audit at any time prior to or during that audit.

2. In order to perform a Reactive Capability Audit, the MP shall submit an outage request as prescribed in ISO New England Operating Procedure No. 3 - Transmission Outage Scheduling (OP-3) or a Reactive Capability Audit Request as prescribed in ISO New England Operating Procedure No. 5 - Resource Maintenance and Outage Scheduling (OP-5).

NOTE

Situations where fewer than five Business Days notice may be approved, include, but are **not** limited to, non-commercial testing of resources or ISO-initiated short notice operation of a resource that has yearly emissions or run time limitations.

3. The outage or Reactive Capability Audit Request:

   a. Shall be submitted through the ISO outage scheduling software at least five Business Days prior to the day of the Reactive Capability Audit.

   b. ISO and the LCC may agree to study an outage or Reactive Capability Audit Request that is submitted fewer than five Business Days prior to the day of the outage or Reactive Capability Audit Request. In order for an outage or Reactive Capability Audit Request to be considered with fewer than five Business Days notice, the MP shall:.

      i. Consult with ISO and the LCC

      ii. Receive verbal or written concurrence for fewer than five Business Days notice

      iii. Submit the outage or Reactive Capability Audit Request to ISO prior to 1500 on the day prior to the day of the outage or Reactive Capability Audit Request

   c. Shall contain a completed OP-23, Appendix H - Reactive Capability Audit Request Form (OP-23H).

4. The LCC shall, at a minimum, conduct area studies for Reactive Capability Audit requests where the combined output or absorption of all concurrently auditing Reactive Resources is greater than 10 MVAR. The study shall,

respecting pre- and post-contingent voltage limits to maintain reliability, determine the maximum level of reactive output or absorption that can be achieved up to the requested reactive value during the requested audit time and date while performing all normal voltage control actions, and document the achievable output level and required actions on the audit request.

5. The LCC shall approve the audit request if either:

   a. The requested output or absorption for all concurrently auditing Reactive Resources is less than or equal to 10 MVAR, or

   b. The study determines that the Reactive Resource(s) can achieve:

      i. Greater than 80% of the requested reactive output value, for a Reactive Resource that has greater than or equal to a 30 MVA nameplate capability, or

      ii. Within 2 MVAR of the requested output value for a Reactive Resource that has less than a 30 MVA nameplate capability.

6. If the LCC study determines that the Reactive Resource would be unable to achieve the specified reactive power levels in Section IV.D.5 of this procedure, the LCC shall confer with ISO and determine if the audit request shall be denied or rescheduled.

7. ISO shall, at a minimum, conduct area studies for Reactive Capability Audit requests where the combined output or absorption of all auditing Reactive Resources is greater than 10 MVAR. The study shall, respecting pre- and post-contingent voltage and stability limits to maintain reliability, determine the maximum level of reactive output or absorption that can be achieved during the requested audit time and date while performing all normal voltage control actions and document the achievable output level and required actions on the audit request. ISO shall approve or deny the Reactive Capability Audit request based upon these studies. ISO shall confer with the LCC prior to denying an audit request that was previously approved by the LCC.

8. In the event that ISO or the LCC deny the Reactive Capability Audit, a reason for denial, subject to the ISO New England Information Policy (Attachment D to the Tariff), shall be provided along with any necessary parameters (e.g., New England load level) that shall be met in order to conduct the Reactive Capability Audit.

E. Requesting Permission to Perform the Audit in Real-Time

1. The MP or DE shall submit Supply Offers to ensure that the Reactive Resource is dispatched to the appropriate MW level for the Reactive Capability Audit, including any ramp time.

2. After the Reactive Capability Audit has been scheduled as detailed in Section IV.D, on the scheduled date and time of the Reactive Capability Audit:

   a. The DE or Transmission Operator shall request permission from the ISO control room to conduct the Reactive Capability Audit.

b. The LCC and ISO shall study and approve or deny the Reactive Capability Audit in Real-Time.

c. The LCC shall provide the Reactive Resource operator with any additional maximum and minimum voltage limits that are applicable during the Reactive Capability Audit.

d. The LCC shall adjust system voltage prior to the Reactive Capability Audit as follows:

i. For a leading Reactive Capability Audit, the LCC shall (to the best of its ability) adjust system voltage at the Reactive Resource's interconnection point in order to achieve voltage in the high end of the tolerance band (or near the voltage schedule maximum for those Reactive Resources with **no** tolerance band provided) prior to allowing the start of the Reactive Capability Audit.

ii. For a lagging Reactive Capability Audit, the LCC shall (to the best of its ability) adjust system voltage at the Reactive Resource's interconnection point in order to achieve voltage in the low end of the tolerance band (or near the voltage schedule minimum for those Reactive Resources with **no** tolerance band provided) prior to allowing the start of the Reactive Capability Audit.

F. Performing Reactive Capability Audits for Generator Assets

1. Reactive Capability Audit Duration:

a. Reactive Capability Audits for non-ESF Reactive Resources shall be performed for a minimum of sixty (60) consecutive minutes.

b. Reactive Capability Audits for ESF Reactive Resources shall be performed for a minimum of sixty (60) consecutive minutes. If the Reactive Resource **cannot** operate at full MW output for sixty (60) consecutive minutes because the installed storage capability does **not** support sixty (60) minutes of operation, then the Reactive Capability Audit shall be performed for the maximum production time at the required MW output given that:

i. At the start of the leading Reactive Capability Audit, the ESF Reactive Resource is at any level of available energy that will allow the Reactive Resource to complete the audit.

ii. At the start of the lagging Reactive Capability Audit, the ESF Reactive Resource is at its maximum available energy.

2. Leading Reactive Capability Audit Requirements:

NOTE

It is possible that the LCC may allow the real-time voltage to become lower than the resource's normal voltage schedule tolerance band low limit. This is acceptable during the Leading Reactive Capability Audit.

a. Voltage Requirements:

iii. The station voltage that the Reactive Resource normally controls shall be below the tolerance band kV high (or below the voltage schedule maximum for those Reactive Resources with **no** tolerance band provided) and above the minimum allowable station voltage for the entire period during which the leading Reactive Capability Audit is conducted.

b. Real Power Requirements:

i. The real power auditing requirements for Reactive Capability Audits performed after ISO determines that the Reactive Resource is ready to follow Real-Time dispatch shall be as follows:

a) Continuous Storage Facilities shall be **neither** generating **nor** consuming, taking into account losses, during the entire duration of the leading Reactive Capability Audit.

b) Intermittent Generator Assets shall be producing at the maximum allowable real power output at the time of the audit with real power output variance less than 10% of the initial output or 2 MW (whichever is greater) for the entire leading Reactive Capability Audit. In the event that ambient conditions (wind, sun, etc.) change significantly during the audit such that real power output variance is greater than required, ISO shall evaluate the provided data in order to determine whether the audit is acceptable.

c) Any other type of Generator Asset shall be generating within 5% or 2 MW (whichever is greater) of its Economic Min for the entire duration of the leading Reactive Capability Audit.

ii. The real power auditing requirements for Reactive Capability Audits performed before ISO determines that the Reactive Resource is ready to follow Real-Time dispatch shall be as follows:

a) Continuous Storage Facilities shall be **neither** generating **nor** consuming, taking into account losses, during the entire duration of the leading Reactive Capability Audit.

b) Intermittent Generator Assets shall be producing at the maximum allowable real power output at the time of the audit with real power output variance less than 10% of the initial output or 2 MW (whichever is greater) for the entire leading Reactive Capability Audit. In the event that ambient conditions (wind, sun, etc.) change significantly during the audit such that real power output variance is greater than required, ISO shall evaluate the provided data in order to determine whether the audit is acceptable.

c) Any other type of Generator Asset shall be generating within 5%

or 2 MW (whichever is greater) of its expected Economic Min for the Reactive Resource for the entire duration of the leading Reactive Capability Audit.

3. Lagging Reactive Capability Audit Requirements:

NOTE

It is possible that ISO and the LCC may allow the real-time voltage to exceed the resource's normal voltage schedule tolerance band high limit. This is acceptable during the Lagging Reactive Capability Audit.

a. Voltage Requirements:

i. The station voltage which the Reactive Resource normally controls shall be above the tolerance band kV low (or above the voltage schedule minimum for those Reactive Resources with **no** tolerance band provided) and below the maximum allowable station voltage for the entire period during which the lagging Reactive Capability Audit is conducted.

b. Real Power Requirements:

i. The real power auditing requirements for Reactive Capability Audits performed after ISO determines that the Reactive Resource is ready to follow Real-Time dispatch shall be as follows:

a) Continuous Storage Facilities shall be generating within 5% or 2 MW (whichever is greater) of 90% of the Generator Asset summer NRC for the entire duration of the lagging Reactive Capability Audit.

b) Intermittent Generator Assets shall be producing at the maximum allowable real power output at the time of the audit with real power output variance less than 10% of the initial output or 2 MW (whichever is greater) for the entire lagging Reactive Capability Audit. In the event that ambient conditions (wind, sun, etc.) change significantly during the audit such that real power output variance is greater than required, ISO shall evaluate the provided data in order to determine whether the audit is acceptable.

c) Ambient-limited Generator Assets (including but **not** limited to combustion turbines) **not** capable of meeting summer-SCC during the audit shall be generating at the maximum real power capability at the time of the audit with real power variance less than 5% or 2 MW (whichever is greater) of the initial output for the entire lagging Reactive Capability Audit.

d) Any other type of Generator Asset shall be generating within 5% or 2 MW (whichever is greater) of its Summer-SCC for the entire

duration of the lagging Reactive Capability Audit.

ii. The real power auditing requirements for Reactive Capability Audits performed before ISO determines that the Reactive Resource is ready to follow Real-Time dispatch shall be as follows:

a) Continuous Storage Facilities shall be generating within 5% or 2 MW (whichever is greater) of 90% of the Generator Asset summer NRC for the entire duration of the lagging Reactive Capability Audit.

b) Intermittent Generator Assets shall be producing at the maximum allowable real power output at the time of the audit with real power output variance less than 10% of the initial output or 2 MW (whichever is greater) for the entire lagging Reactive Capability Audit. In the event that ambient conditions (wind, sun, etc.) change significantly during the audit such that real power output variance is greater than required, ISO shall evaluate the provided data in order to determine whether the audit is acceptable.

c) Ambient-limited Generator Assets (including but **not** limited to combustion turbines) **not** capable of meeting 90% of the summer Network Resource Capability (NRC) during the audit shall be generating at the maximum real power capability at the time of the audit with real power variance less than 5% or 2 MW (whichever is greater) of the initial output for the entire lagging Reactive Capability Audit.

d) Any other type of Generator Asset shall be generating within 5% or 2 MW (whichever is greater) of 90% of summer NRC for the entire duration of the lagging Reactive Capability Audit.

G. Performing Reactive Capability Auditing for Non-Generator Reactive Resources

1. Reactive Capability Audit Duration:

a. Reactive Capability Audits for non-ESF Reactive Resources shall be performed for a minimum of sixty (60) consecutive minutes.

b. Reactive Capability Audits for ESF Reactive Resources shall be performed for a minimum of sixty (60) consecutive minutes. If the Reactive Resource **cannot** operate at full MW consumption for sixty (60) consecutive minutes because the installed storage capability does **not** support sixty (60) minutes of operation, then the Reactive Capability Audit shall be performed for the maximum consumption time at the required MW consumption given that:

i. At the start of the leading Reactive Capability Audit, the ESF Reactive Resource is at its minimum available energy.

ii. At the start of the lagging Reactive Capability Audit, the ESF Reactive Resource is at its minimum available energy.

2. Leading Reactive Capability Audit Requirements:

NOTE

It is possible that ISO and the LCC may allow the real-time voltage to become lower than the resource's normal voltage schedule tolerance band low limit. This is acceptable during the Leading Reactive Capability Audit.

a. Voltage Requirements:

i. The station voltage that the Reactive Resource normally controls shall be below the tolerance band kV high (or below the voltage schedule maximum for those Reactive Resources with **no** tolerance band provided) and above the minimum allowable station voltage for the entire period during which the leading Reactive Capability Audit is conducted.

b. Real Power Requirements:

i. Cross Sound Cable (CSC) shall perform its leading Reactive Capability Audit of the Halvarsson converter terminal during hours in which the Halvarsson converter station is deblocked and the total net sum of external transactions submitted by MPs and scheduled by ISO in the ISO Real-Time Energy Market at the CSC external node [.I.SHOREHAM138 99 (Location ID 4014)] results in zero (0) MW of energy flowing on the CSC.

ii. Synchronous Condensers and Flexible Alternating Current Transmission System (FACTS) devices shall be consuming normal real power consumption levels.

iii. Continuous Storage DARDs shall be consuming within 5% or 2 MW (whichever is greater) of 90% of the associated Continuous Storage Generator Asset summer NRC, applied in the consuming direction, for the entire duration of the Reactive Capability Audit with at least 90% (rounded up) of the energy conversion equipment (e.g. inverters and batteries) in service.

iv. Binary Storage DARDs shall be consuming at the maximum consumption level achievable during the entire duration of the Reactive Capability Audit with at least 90% (rounded up) of the energy conversion equipment (e.g. inverters or turbines) in service.

3. Lagging Reactive Capability Audit Requirements:

NOTE

It is possible that ISO and the LCC may allow the real-time voltage to exceed the resource's normal voltage schedule tolerance band high limit. This is acceptable during the Lagging Reactive Capability Audit.

a. Voltage Requirements:

i. The station voltage which the Reactive Resource normally controls shall be above the tolerance band kV low (or above the voltage schedule minimum for those Reactive Resources with **no** tolerance band provided) and below the maximum allowable station voltage for the entire period during which the lagging Reactive Capability Audit is conducted.

b. Real Power Requirements:

i. CSC shall perform its lagging Reactive Capability Audit of the Halvarsson converter terminal during hours in which the CSC is scheduled at its full MW transfer loading in the southward direction. CSC full MW transfer loading in the southward direction is achieved when the total net sum of external transactions submitted by MPs and scheduled by ISO in the ISO Real-Time Energy Market at the CSC external node [.I.SHOREHAM138 99 (Location ID 4014)] results in 330 MW of energy flowing from New England to New York.

ii. Synchronous Condensers and Flexible Alternating Current Transmission System (FACTS) devices shall be consuming normal real power consumption levels.

iii. Continuous Storage DARDs shall be consuming within 5% or 2 MW (whichever is greater) of 90% of the associated Continuous Storage Generator Asset summer NRC, applied in the consuming direction, for the entire duration of the Reactive Capability Audit with at least 90% (rounded up) of the energy conversion equipment (e.g. inverters and batteries) in service.

iv. Binary Storage DARDs shall be consuming at the maximum consumption level achievable during the entire duration of the Reactive Capability Audit with at least 90% (rounded up) of the energy conversion equipment (e.g. inverters or turbines) in service.

H. Operational Data in Lieu of an Audit

1. Operational data that meets the requirements of the applicable Reactive Capability Audit may be submitted in lieu of performing a scheduled Reactive Capability Audit.

I. Reactive Capability Audit Waivers

1. The Lead MP may request a waiver from performing a required Reactive Capability Audit to full reactive capability by completing and submitting OP-23, Appendix J - Reactive Capability Audit Waiver Request Form (OP-23J) to mvarcaptest@iso-ne.com. A demonstration of the maximum achievable reactive capability of the Reactive Resource for the full duration of a Reactive Capability Audit is required prior to requesting a waiver unless the Reactive Resource is on an extended outage. ISO shall **not** consider valid Reactive

Capability Audits that are **not** completed for their full duration because of a Real-Time contingency. Operational data may **not** be used to satisfy the requirement to perform testing prior to requesting a waiver.

2. ISO, in consultation with the LCC, may grant a waiver for a Reactive Resource that is **not** capable of performing a Reactive Capability Audit because of:

   a. Transmission conditions or outages that limit the Reactive Resource from achieving full reactive capability during the Reactive Capability Audit;

   b. An extended outage; or

   c. Real-Time contingencies that prevented more than one (1) Reactive Capability Audit from being completed successfully for the full duration of the audit.

3. ISO, in consultation with the LCC, shall determine whether or **not** to grant a waiver for the Reactive Capability Audit and, based upon the circumstances justifying the waiver, the length of the waiver.

4. In the event that the conditions justifying the waiver change during the waiver period, ISO may require a Reactive Capability Audit from the Reactive Resource that was granted the waiver.

5. Granted waivers shall be effective for one (1) year starting on the first of January following the year when testing was required.

6. Waivers for Reactive Capability Audits that apply to the Schedule 2 Capacity Cost Compensation Program shall be issued in accordance with the ISO New England Schedule 2 Business Procedure.

V. DUAL-FUEL GENERATOR ASSET CAPABILITY AUDITS

A. A Generator Asset that has indicated that it is capable of operating on multiple fuels on the ISO New England Operating Procedure No. 14 - Technical Requirements for Generators, Demand Response Resources, Asset Related Demands and Alternative Technology Regulation Resources (OP-14), Appendix A - Explanation of Terms and Instructions for Data Preparation of ISO New England Form NX-12, Generator Technical Data form (OP-14 NX-12 form) may be required to audit on a specific fuel. ISO retains the right to require a dual-fuel Generator Asset capability audit at any time if it determines that there is a reliability need. The following guidance is provided for an on-going audit process of dual-fuel Generator Asset capability.

B. Each year, ISO shall:

1. Determine the current list of dual-fuel Generator Assets

2. Evaluate the list of dual-fuel Generator Assets in order to determine the list of dual-fuel Generator Assets that will be required to perform an audit before November 30 of that year. In this determination, ISO may consider Generator Asset parameters including, but not limited to, the operating history of those dual-fuel Assets and the fuels indicated as primary and alternate

3. Notify Lead MPs by September 30 of any dual-fuel audits that are due by November 30 of that year

C. The Lead MP for the dual-fuel Generator Asset shall respond to any data requests from ISO regarding fuel usage and operating history for this analysis.

D. ISO shall notify the Lead MP for the dual-fuel Generator Asset that is required to perform an audit on a specific fuel.

E. The ISO's notification shall include:

1. The date by which the audit shall be conducted (typically November 30 of the current year)

2. The fuel on which the dual-fuel Generator Asset shall operate

3. Any other operational parameters that the test shall fulfill

F. The Lead MP for the dual-fuel Generator Asset may provide ISO with operational data, obtained after the previous December 1, that shows that the dual-fuel Generator Asset has met these audit parameters.

G. ISO shall take into account any operational data provided by the Lead MP for the dual-fuel Generator Asset when determining the dual-fuel Generator Assets that are required to perform a dual-fuel Generator Asset capability audit.

H. The dual-fuel Generator Asset Lead MP shall create and submit an audit plan to ISO, including opportune dates for testing.

I. ISO and the Lead MP for the dual-fuel Generator Asset shall agree on testing parameters and date for the audit. ISO shall take into account reliability and economic factors when working with the Lead MP for the dual-fuel Generator Asset to determine the auditing date.

J. The Lead MP for the dual-fuel Generator Asset may submit data that meets the audit parameters without previously scheduling the testing if the dual-fuel Generator Asset is otherwise committed and performs the testing.

K. At the conclusion of the testing, the Lead MP for the dual-fuel Generator Asset shall submit the following data to ISO for evaluation:

1. Time commenced startup or fuel swap;
2. Time synchronized on the specified fuel (as applicable);
3. Time fuel swap started (as applicable);
4. Time fuel swap completed (as applicable);
5. MW value reduced/raised to during fuel swap (as applicable);
6. Time reached maximum output;
7. Time completed operating at maximum output; and
8. Average output over the maximum output audit period.

L. Upon review of the submitted data and in consultation with the Lead MP for the dual-fuel Generator Asset, ISO shall determine if the dual-fuel Generator Asset successfully completed the audit.

1. If the audit was **not** successful:

a. The Lead MP for the dual-fuel Generator Asset may elect to remove the dual-fuel capability from the OP-14 NX-12 form until such time as operation on the specific fuel can be verified.

b. If the Lead MP for the dual-fuel Generator Asset does **not** elect to modify the OP-14 NX-12 form, then the Lead MP for the dual-fuel Generator Asset shall provide a plan to ISO describing the actions and timeline for resolving any issues with the audit.

M. Upon completion of the restoration plan, the Lead MP for the dual-fuel Generator Asset may be required to perform another fuel-specific audit as prescribed by ISO pursuant to Section V. of this OP.

N. Every year, ISO shall provide a report to the Reliability Committee, stating the number of dual-fuel Generator Assets and total summer SCC of the Generator Assets that will be required to perform these dual-fuel capability audits during the testing period.

OP-23 REVISION HISTORY

Document History:

Rev. No.	Date	Reason
- -	08/08/23	For previous revision history, refer to Rev 10 available through Ask ISO.
11	08/08/23	Update to Section II.A.2.a to change how Claim 10/30 Audit requests are submitted, modified and cancelled for Generator Assets; Retired Appendix A.