ISO New England Operating Procedure No. 23 - Resource Auditing

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Appendices:

1. Appendix A - Off-line Reserve Audit Request Form
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)
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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:

7. ISO New England Ancillary Service Schedule No. 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)


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 offline reserve capability
- Seasonal Claimed Capability
- 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 utilized 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 the form contained in OP-23, Appendix A - Off-line Reserve Audit Request Form (OP-23A), to ISO by email to Claim1030AuditRequest@iso-ne.com.
         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 reserve audit the following shall be performed:
         i. DE: inform the ISO control room of the request modification or cancellation
         ii. Lead MP/DE: send a modified OP-23A form by email to Claim1030AuditRequest@iso-ne.com.
   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’s 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 startup Dispatch Instruction, a report shall be provided stating:
   i. time and date of the dispatch
   ii. the target value for the dispatch
   iii. the 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 startup Dispatch Instruction by entering an issue in the ISO customer 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 utilizing 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 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 startup 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 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 utilize 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:


   a. In order to establish and maintain accurate records of Generator Asset real power capabilities, all Generator Assets registered with ISO shall perform capability auditing in accordance with 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 utilizing 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).

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 (ECC) Audit

   a. To change a Generator Asset Establish Claimed Capability (ECC) Audit value, an audit shall be conducted. The ECC 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 ECC Audit 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 by the ISO, but for which an ECC Audit 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.

(2) CCAs are not normally conducted for Intermittent Power Resources, however, an ECC Audit may be performed upon request by the Lead MP.

4. Seasonal Claimed Capability (SCC) Audit

a. A Seasonal Claimed Capability (SCC) Audit 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 an SCC Audit 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 utilized to determine whether a Generator Asset meets the temperature requirements of an SCC Audit 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 also be required to perform Reactive Capability Audits.

2. Reactive Resources that are required to perform Reactive Capability Audits in accordance 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 New England 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 because of 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

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

3. Reactive Capability Audits for non-ESF Reactive Resources shall be performed at maximum leading or lagging capability, as applicable, for a minimum of sixty (60) consecutive minutes.

4. Reactive Capability Audits for ESF Reactive Resources shall be performed at maximum leading or lagging capability, as applicable, for a minimum of sixty (60) consecutive minutes. If the Reactive Resource cannot operate at full MW consumption or 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 consumption or production time at the required MW output given that, at the start of the Reactive Capability Audit, the ESF Reactive Resource is, respectively, at its minimum or maximum available energy.

5. In the event that the Reactive Resource is not able to attain the desired reactive capability as shown on the most recent reactive capability curve, the MP shall provide ISO and the LCC an explanation as to why the resource was limited. These limitations may be internal to the Reactive Resource (e.g., maximum excitation limiters (MEL), under excitation limiters (UEL), volts/hertz limiters, terminal voltage or external to the Reactive Resource (e.g., transmission bus voltage).

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

8. Reactive Capability Audits for Reactive Resources listed in OP-23G shall be performed by the end of the calendar year listed in OP-23G.

9. Reactive Capability Audit data shall be submitted 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.

10. 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.

11. For Reactive Capability Audits performed before ISO determines that the magnitude of the reactive capability required to demonstrate during the audit. ISO, the LCC, and the MP shall work together to determine an advantageous auditing window.
Reactive Resource is ready to follow Real-Time dispatch:

a. For Reactive Resources that are **not** an ESF or intermittent resource:
   summer Seasonal Claimed Capability (SCC) shall equal 90% of summer
   Network Resource Capability (NRC) and Economic Min shall equal the
   expected Economic Min for the Reactive Resource.

b. For ESF Reactive Resources: these Reactive Resources shall utilize the
   requirements for MW output/consumption described in Sections IV.F and
   IV.G of this OP without modification during the duration of the Reactive
   Capability Audit.

c. For intermittent Reactive Resources: these Reactive Resources shall
   utilize the requirements for MW output/consumption described in Section
   IV.F of this OP without modification during the duration of the Reactive
   Capability Audit.

12. Unless otherwise directed by ISO or the LCC, Reactive Resources comprised
   of multiple dynamic devices (e.g., combined cycle, hydro, wind) shall audit all
   components at full lagging or full leading at the same time. In the event that
   reactive equipment or elements that may limit reactive capability (e.g.,
   transformers, feeders, etc.) are shared between multiple resources (e.g.,
   pseudo-combined cycle assets), multiple Reactive Resources may be required
   to test at the same time in order to determine resource limitations. This
   includes, but is **not** limited to, machines at the same combined cycle facility
   and Reactive Resources that share the same interconnection transformer.

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

14. 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 owner test 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).

15. 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.

**D. Scheduling the Audit**

1. 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 an owner test request as
   prescribed in ISO New England Operating Procedure No. 5 - Resource
   Maintenance and Outage Scheduling (OP-5).
2. The outage or owner test 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, unless otherwise agreed to by ISO and the LCC
   b. Shall contain a completed OP-23, Appendix H - Reactive Capability Audit Request Form (OP-23H)

3. The LCC shall conduct area studies to ensure that system reliability is not jeopardized during the Reactive Capability Audit. The LCC may deny the Reactive Capability Audit request based upon these studies.

4. ISO shall conduct area studies to ensure that system reliability is not jeopardized during the Reactive Capability Audit. ISO shall approve or deny the Reactive Capability Audit request based upon these studies.

5. In the event that ISO or the LCC deny the Reactive Capability Audit, a reason for denial, subject to the ISO Information Policy (Attachment D to the Tariff), shall be provided along with 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

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:

1. The DE or TO shall request permission from the ISO control room to conduct the Reactive Capability Audit.

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

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

4. The LCC shall adjust system voltage prior to the Reactive Capability Audit.
   a. 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.
   b. 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. Data Requirements:
   a. Reactive Capability Audit data shall be recorded at five (5) minute intervals and submitted to ISO using OP-23, Appendix I - Reactive Capability Audit Data Recording Form (OP-23I). All audit data required in OP-23I shall be submitted or ISO shall declare the audit invalid.
   
b. ISO, the LCC, and the MP shall work together to determine whether any additional data is required to properly model the auditing conditions.
   
c. 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.

2. The LCC shall adjust system voltage during the Reactive Capability Audit:
   a. For a leading Reactive Capability Audit, the LCC shall adjust voltage (to the best of its ability) to maintain voltage between the high end of the tolerance band (or the voltage schedule maximum for those Reactive Resources with no tolerance band provided) and the voltage schedule minimum as provided on the Reactive Resource’s reactive capability data form.
   
b. For a lagging Reactive Capability Audit, the LCC shall adjust voltage (to the best of its ability) to maintain voltage between the low end of the tolerance band (or the voltage schedule minimum for those resources with no tolerance band provided) and voltage schedule maximum as provided on the Reactive Resource’s reactive capability data form.

3. General Requirements:
   a. All reactive devices (e.g., capacitors, reactors, statcoms, etc) at the Reactive Resource shall have their statuses (in/out, etc.) and reactive loading during the Reactive Capability Audit documented on a five (5) minute basis and provided with the Reactive Capability Audit data.
   
b. ISO, in consultation with the LCC and the MP, shall determine whether reactive compensation equipment associated with a Reactive Resource should be audited concurrently or separately from the real power generating or consuming equipment.
   
c. During the leading Reactive Capability Audit:
      (1) A Generator Asset (other than one associated with a Continuous Storage Facility) 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.
      
      (2) A Continuous Storage Facility shall be neither generating nor consuming, taking into account losses, during the entire duration of the
leading Reactive Capability Audit.

(3) 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) for the period during which the leading Reactive Capability Audit is conducted.

d. During the lagging Reactive Capability Audit:

(1) A Generator Asset (other than one associated with a Continuous Storage Facility) 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.

(2) A Continuous Storage Facility 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.

(3) 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) for the period during which the lagging Reactive Capability Audit is conducted.

4. Ambient-limited Generator Assets not capable of meeting the real power requirements of Section IV.F.3 (including but not limited to combustion turbines)

a. Real power output shall be within 5% of the initial output for the entire Reactive Capability Audit.

b. During the leading Reactive Capability Audit, the Generator Asset shall be generating between 105%-95% of its Economic Min in effect at the start of the audit.

c. During the lagging Reactive Capability Audit, the Generator Asset shall be generating at the maximum real power capability at the time of the audit.

5. Intermittent Generator Assets:

a. Reactive Capability Audits shall be performed with at least 90% of the turbines or inverters at the Generator Asset on-line.

b. Leading and lagging Reactive Capability Audits shall be performed at the maximum allowable real power output at the time of the audit.

c. Real power output shall be within 10% of the initial output for the entire Reactive Capability Audit.

d. MW and MVAR values (if available and as required by ISO New England Operating Procedure No. 18 - Metering and Telemetering Criteria (OP-18)) shall be provided on the low and high side of the interconnection.
transformer (if installed).

e. Because of the unique nature of each installation, ISO, the LCC, and the Lead MP shall work together prior to the Reactive Capability Audit to determine whether additional data is required for the audit.

G. Performing Reactive Capability Auditing for Non-Generators

1. The LCC shall adjust system voltage during the Reactive Capability Audit:

a. For a leading Reactive Capability Audit, the LCC shall adjust voltage (to the best of its ability) to maintain voltage between the high end of the tolerance band (or the voltage schedule maximum for those Reactive Resources with no tolerance band provided) and the voltage schedule minimum as provided on the Reactive Resource’s reactive capability data form.

b. For a lagging Reactive Capability Audit, the LCC shall adjust voltage (to the best of its ability) to maintain voltage between the low end of the tolerance band (or the voltage schedule minimum for those Reactive Resources with no tolerance band provided) and voltage schedule maximum as provided on the Reactive Resource’s reactive capability data form.

2. Data Requirements:

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

b. ISO, the LCC, and the MP shall work together to determine whether any additional data is required to properly model the auditing conditions.

c. 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.

3. Cross-Sound Cable (CSC):

a. 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.

b. 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.

4. Synchronous Condensers:
   a. Reactive Capability Audits shall be performed at maximum leading or maximum lagging capability, as applicable, for sixty (60) consecutive minutes.

5. Flexible Alternating Current Transmission System (FACTS) Devices:
   a. Reactive Capability Audits shall be performed at maximum leading or maximum lagging capability, as applicable, for sixty (60) consecutive minutes.
   b. FACTS devices with special capabilities (e.g., short-term overload, etc.) may be required by ISO or the LCC to perform Reactive Capability Audits or show appropriate manufacturer or commissioning test data to verify that the capabilities match provided data.

6. Continuous Storage DARD
   a. Reactive Capability Audits shall be performed with at least 90% of the energy conversion equipment (e.g. inverters and batteries) in service.
   b. For both lagging and leading Reactive Capability Audits, the Continuous Storage Facility 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.

7. Binary Storage DARD
   a. Reactive Capability Audits shall be performed with at least 90% of the energy conversion equipment (e.g. inverters or turbines) in service.
   b. For both lagging and leading Reactive Capability Audits, the Binary Storage DARD shall be consuming at the maximum consumption level achievable during the entire duration of the Reactive Capability Audit.

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.

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. An on-going audit process of dual-fuel Generator Asset capability shall be conducted as follows:

1. Each year, prior to June 1, ISO shall determine:
   a. The current list of dual-fuel Generator Assets
   b. The operating history of those dual-fuel Generator Assets since December 1 of the previous year, including which fuel those dual-fuel Generator Assets used to operate.

C. In the event that ISO determines a dual-fuel Generator Asset is ready to follow ISO Dispatch Instructions after June 1 or the Lead MP modifies the OP-14 NX-12 form for that Generator Asset after June 1, ISO may still require an audit on a specific fuel for that dual-fuel Generator Asset.

D. 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.

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

F. 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

G. 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.

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

J. 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.

K. 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.

L. 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.

M. 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.

N. 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.9 of this OP.

O. Every year, ISO shall provide a report 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 to the Reliability Committee.
## OP-23 REVISION HISTORY

### Document History:

<table>
<thead>
<tr>
<th>Rev. No.</th>
<th>Date</th>
<th>Reason</th>
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<tbody>
<tr>
<td>0</td>
<td>06/11/13</td>
<td>Initial document</td>
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<tr>
<td>1</td>
<td>09/01/13</td>
<td>Biennial review completed by procedure owner; Appendices section, added new Appendices B-F; References section, added OP-14, App A; Section II. F. 1, modified; Section III, replaced entire Section III content; Section IV, corrected OP-12 title</td>
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<tr>
<td>2</td>
<td>09/15/14</td>
<td>Added Section V for Dual Fuel Generator Capability Audits;</td>
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<tr>
<td>3</td>
<td>12/09/14</td>
<td>Globally editorial changes consistent with current practices and management expectations; Appendices Section added new Attachment G; References Section added NPCC Directory #10; Replaced Section IV for Reactive Capability Testing Program requirements with text from OP-12; Modified Reactive Capability Testing Program units to be a list vs. criteria;</td>
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<td>4</td>
<td>12/01/15</td>
<td>List of Appendices, modified Appendix G title; List of References, deleted Directory #9 and Directory#10; List of LCC Instructions, replace “REMVEC II” with “REMVEC/NGRID”; Globally, minor grammar changes to be consistent throughout; Section IV, modified reactive capability auditing to remove reference to NPCC Directory 10 and added reactive capability auditing waiver provisions.</td>
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<td>5</td>
<td>07/26/16</td>
<td>Made required administrative changes for corporate identity to footers; List of Appendices, added Appendices H and I; Modified step IV.A.1.; Added sub-section IV.B Changes to the Reactive Capability of a Resource; Added sub-section IV.C. General Auditing Instructions; Added sub-section IV.D. Scheduling the Audit; Added sub-section IV.E. Requesting Permission to Perform the Audit in Real Time ; Added sub-section IV.F. Performing Reactive Capability Auditing for Generator Assets; Added sub-section IV.G. Performing Reactive Capability Auditing for Non-Generators ; Added sub-section IV.H. Operational Data In Lieu of an Audit ; Added sub-section IV.I. Reactive Capability Auditing Waivers;</td>
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<td>09/28/16</td>
<td>Periodic review performed requiring no changes;</td>
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<td>07/13/17</td>
<td>Added new sub-Section IV.C.3 (making it explicit that testing is at Maximum Capability for the hour) and renumbered remaining sub-section steps; Deleted sub-Section IV.E.5 (applicable content moved to new sub-Section step IV.C.3); Global, minor editorial clarifications and cleanup;</td>
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<td>7</td>
<td>05/04/18</td>
<td>Biennial review completed by procedure owner; Globally, the document title or Generator Resource Auditing” was replaced with “Resource Auditing”; Globally editorial changes to be consistent with current conditions and to be consistent with current practices and management expectations in terminology, grammar, etc.; Appendices Section added Appendix J; References Section, updated titles of OP-5 and OP-14; Section II added DRR Offline auditing; Section II.B, added new sub-section for response rate auditing; Section III added Seasonal DR auditing; Section IV added clarifying language that testing can be performed up to kV max for lagging and down to kV min for leading; Section IV.I.1 added reference to Appendix J waiver request form;</td>
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<td>01/04/19</td>
<td>Appendices section, added Appendix K;</td>
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<td>LCC Instructions section , deleted;</td>
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<td>Globally, made editorial changes to be consistent with current conditions and to be consistent with current practices and management expectations in terminology, grammar, etc. including the following;</td>
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<td>Section II.A.2.a.(1), defined acronym for OP-23A</td>
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<td>Section II.B.2, added reference to Appendix K and defined acronym OP-23K;</td>
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<td>Section III.A.1.b.(1), defined acronym for OP-23B;</td>
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<td>Section IV.D.2.b, defined acronym for OP-23H;</td>
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