



# ISO NEW ENGLAND ANCILLARY SERVICE SCHEDULE 2 BUSINESS PROCEDURE

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## 1.0 Introduction

### 1.1 Purpose

This ISO New England Ancillary Service Schedule 2 Business Procedure (Business Procedure) describes the detailed requirements for the qualification of Reactive Resources for capacity cost (CC) payment under Section II of the ISO New England Inc. Transmission, Markets, and Services Tariff (Tariff), Schedule 2 - Reactive Supply and Voltage Control Service (Schedule 2).

### 1.2 Scope

Providing adequate reactive supply and voltage control service (VAR Service) from Reactive Resources, as defined in Section I.2.2 of the Tariff, is necessary to maintain reliable voltage levels on the New England Transmission System. All Reactive Resources within the New England Reliability Control Area that are under the ISO's operational control are required to provide VAR Service regardless of whether the resource receives CC compensation. Accordingly, as system conditions dictate, a Reactive Resource may be directed by the ISO or a Local Control Center (LCC) to provide VAR Service by producing or absorbing reactive power.

Schedule 2 defines the extent to which (a) Reactive Resources are compensated for providing VAR Service and (b) transmission customers are charged for utilizing VAR Service. Reactive Resources may recover their variable Lost Opportunity Cost (LOC), Cost of Energy Consumed (CEC) and Cost of Energy Produced (CEP) costs pursuant to Schedule 2.

In addition, a Reactive Resource that qualifies as a Qualified Reactive Resource (QRR) may receive CC compensation and be included in the Capacity Cost compensation program (CCCP). The QRR may continue to receive CC compensation as long as it continues to meet the qualification requirements, including performing periodic auditing of its reactive capability, of Schedule 2.

All QRRs are subject to the requirements of this Business Procedure. Where necessary, this Business Procedure describes specific requirements for each type of Reactive Resource to be designated as a QRR and to receive CC compensation.

### 1.3 Applicability

This Business Procedure is applicable to the following: (1) all Transmission Customers under the Tariff; (2) all entities owning or controlling the reactive power capability of Reactive Resources (Reactive Resource Providers) within the New England Control Area that are under the ISO's operational control and that are eligible to receive CC compensation; (3) the LCCs; and (4) the ISO.

## 2.0 Responsibilities

### 2.1 Reactive Resource Provider

A Reactive Resource Provider's responsibilities include, but are not limited to:

- a. Following ISO direction to provide VAR Service by producing or absorbing reactive power to control system voltage as required in ISO New England Operating Procedure No. 12 – Voltage and Reactive Control (OP-12) and ISO New England Operating Procedure No. 14 – Technical Requirements for Generators, Demand Response Resources, Asset Related Demands and Alternative Technology Regulation Resources (OP-14);

- b. Providing the ISO with up-to-date reactive capability data, as required in ISO New England Operating Procedure No. 14 Appendix B – Generator and Asset Related Demand Reactive Data Explanation of Terms and Instructions for Data Preparation for ISO Form NX-12D (OP-14B), for its Reactive Resource(s) with all limitation settings shown (including but not limited to: maximum excitation limiter (MEL), under-excitation limiter (UEL), and volts-hertz limiters (V/Hz)), and associated one-line diagram as required in OP-14 and ISO New England Operating Procedure No. 16 – Transmission System Data (OP-16);
- c. Submitting to the ISO, as appropriate:
  - i. An application for its Reactive Resource to be designated as a QRR in order to receive CC compensation;
  - ii. Reactive Capability Audit requests in the ISO Facility Outage Scheduling System;
  - iii. Offers in the Day-Ahead and Real-Time Energy Markets, when required, in order to perform a Reactive Capability Audit;
  - iv. Reactive Capability Audit data; and
  - v. A completed Ancillary Service Schedule 2 Business Procedure - Appendix C - QRR Termination Request Form (QRR Termination Request Form).

## 2.2 Local Control Centers

The LCCs' responsibilities include, but are not limited to:

- a. Supporting a Reactive Capability Audit request as described in ISO New England Operating Procedure No. 23 – Resource Auditing (OP-23);
- b. Providing to the ISO any requested Reactive Capability Audit supporting data and explanation regarding the successful completion of a QRR's leading or lagging Reactive Capability Audit; and
- c. Providing input into the decision to grant a waiver for calculating the leading or lagging QVARs of a QRR based upon the results of a Reactive Capability Audit (QVAR Waiver) (as described in Section 3.2.5.2 of this Business Procedure).

## 2.3 ISO New England

The ISO's responsibilities include, but are not limited to:

- a. Reviewing and approving/rejecting requests from Reactive Resource Providers for Reactive Resources to be designated as QRRs;
- b. Reviewing and approving/rejecting requests submitted by Reactive Resource Providers for either QRR Short-term or Prolonged Termination (as defined in this Business Procedure);
- c. Supporting a Reactive Capability Audit request as described in OP-23;
- d. Reviewing Reactive Capability Audit data submitted by Reactive Resource Providers;
- e. Reviewing and approving/rejecting requests for QVAR Waivers;
- f. On a monthly basis, posting on the ISO website a report that contains information on all QRRs participating in the CCCP;
- g. On an annual basis, providing the NEPOOL Reliability Committee with a CCCP summary; and

- h. Calculating monthly charges and credits associated with VAR Service in accordance with Schedule 2 and this Business Procedure.

## **2.4 NEPOOL Reliability Committee**

The NEPOOL Reliability Committee is responsible for:

- a. Reviewing and providing advisory input on the ISO's recommendation of a request from a Reactive Resource Provider to have its Reactive Resource designated as a QRR and included in the CCCP; and
- b. Providing advisory input on a Reactive Resource Provider's appeal of a denial of a request for QVAR Waiver.

## **3.0 Capacity Cost Compensation Procedures**

### **3.1 Eligibility – Capacity Cost Compensation Program**

In order for a Reactive Resource to be designated as a QRR and receive CC compensation, the Reactive Resource Provider shall submit a request, including any necessary documentation, to the ISO. The ISO shall verify that the Reactive Resource meets all Schedule 2 qualification requirements and, if appropriate, approve the resource's QRR designation.

Once designated, the QRR shall continue to meet all Schedule 2 qualification requirements (including the periodic auditing of its leading and lagging reactive capability) in order to maintain its QRR designation. QRRs receive CC compensation based on their verified leading and lagging reactive capability (Qualified VARs). Qualified VARs are the amounts of leading and lagging reactive capability that the ISO, with advisory input from the NEPOOL Reliability Committee, initially approves for each Reactive Resource. If available, a currently valid Reactive Capability Audit performed prior to a QRR designation shall be used to set initial CC Compensation; otherwise, initial CC compensation is based upon provided reactive capability data. Upon completion of a leading or lagging Reactive Capability Audit, the Qualified VARs are adjusted according to the audit results. Reactive Resources that do not request to be designated as QRRs or do not meet Schedule 2 QRR requirements are not eligible to receive CC compensation.

If more than one Reactive Resource utilizes the same dynamic reactive equipment to produce or absorb reactive power, only one of those Reactive Resources is eligible to utilize the dynamic reactive equipment in order to receive CC compensation. For a Reactive Resource that is an Electric Storage Facility, CC compensation shall be calculated based upon the Generator Asset capability.

ISO will credit CC compensation to the Reactive Resource Provider that is associated with the QRR. If the QRR has multiple owners, ISO will distribute all CC compensation payments to the multiple owners based on Ownership Share of the QRR.

### **3.2 CC Compensation Program**

#### **3.2.1 QRR Designation Request**

To request that a Reactive Resource be included in the CCCP, the Reactive Resource Provider shall submit to ISO a completed Ancillary Service Schedule 2 Business Procedure Appendix A - Qualified

Reactive Resource Request Form (QRR Request Form) for that resource by email to [mvarcapttest@iso-ne.com](mailto:mvarcapttest@iso-ne.com).

In addition to submitting a QRR Request Form, the Reactive Resource Provider shall also ensure that accurate reactive capability data and a one-line diagram is on file with ISO.

### **3.2.1.1 Requirements to be designated as a QRR**

To qualify for designation as a QRR, a Reactive Resource shall satisfy the requirements for participation in Schedule 2. Those requirements have been broken down into greater detail for implementation in the lists contained in Section 3.2.1.1.1 and 3.2.1.1.2 of this Business Procedure.

#### **3.2.1.1.1 Generator Reactive Resources**

To qualify for designation as a QRR, a generator shall:

- a. Be registered with the ISO by a Market Participant;
- b. Be an active Generator Asset;
- c. Be interconnected to the New England Transmission System; or be interconnected to the New England distribution system and participating in the New England Markets;
- d. Have current reactive capability data and one-line diagram on file with ISO;
- e. Have its Real-Time telemetered MW and MVAR data available to be displayed within the ISO and LCC control rooms;
- f. Have functioning automatic voltage regulating (AVR) equipment and have the Real-Time AVR status telemetered to the ISO and LCC. AVR equipment may include, but is not limited to, synchronous generator AVRs, wind plant controllers, and distributed control systems (DCSs). ISO, in consultation with the LCC(s), shall make the final determination as to whether a control system meets the requirements to be considered an AVR;
- g. Have a voltage schedule assigned by ISO and the LCC;
- h. Have its AVR in automatic, automatically maintain the voltage schedule, and adjust its reactive output as directed by ISO and the LCC as required in OP-12 and OP-14;
- i. Have its AVR status telemetered to the ISO and LCC;
- j. Have separate and distinct OP-18 compliant metering that is telemetered to the ISO for any load (other than station service load) behind the generator step-up (GSU) transformer or the metering point where reactive capability is measured; and
- k. Have been interconnected in accordance with Section I.3.9 of the Tariff (or its predecessor or successor), and Schedules 22, 23, or 25 of Section II of the Tariff, as applicable, for generator Reactive Resources that interconnected after the effective dates of those schedules.

#### **3.2.1.1.2 Non-generator Reactive Resources**

To qualify for designation as a QRR, a non-generator Reactive Resource shall:

- a. Be registered with the ISO by a Market Participant;
- b. Be registered with the ISO as an active a non-generator Reactive Resource asset;
- c. Be interconnected to the New England Transmission System;
- d. Have a current reactive capability data and one-line diagram on file with the ISO (see Sections 0 and **Error! Reference source not found.**);

- e. Have its telemetered MVAR data displayed within the ISO and LCC control rooms;
- f. Have a functioning AVR (or equivalent device) and, have the Real-Time AVR status telemetered to the ISO and LCC. ISO, in consultation with the LCC(s), shall make the final determination as to whether a control system meets the requirements to be considered an AVR;
- g. Have a voltage schedule assigned by ISO and the LCC;
- h. Have its AVR in automatic, automatically maintain the voltage schedule, and adjust its reactive output as directed by ISO and the LCC as required in OP-12 and OP-14;
- i. Have its AVR status telemetered to the ISO and LCC;
- j. Have separate and distinct OP-18 compliant metering that is telemetered to the ISO for is any load (other than station service load) behind the step-up transformer or the metering point where reactive capability is measured;
- k. Have been interconnected in accordance with Section I.3.9 of the Tariff (or its predecessor or successor);
- l. Be covered by an operating agreement or protocol if required by ISO. Such operating agreement or protocol shall include language that defines the leading and lagging Reactive Capability Audit requirements and any special operational requirements;
- m. Be of a type of dynamic reactive power equipment that is within a category of equipment approved by ISO (with advisory input from the LCC and NEPOOL Reliability Committee); and
- n. Not be compensated for its dynamic reactive power capability costs under any other ISO Tariff cost recovery mechanism.

### **3.2.1.2 Reactive Capability Data**

The reactive capability data for a Reactive Resource that the Reactive Resource Provider shall submit with the QRR Request Form is described in OP-14B and OP-16. In addition, the submittal shall include the following, as applicable:

#### **3.2.1.2.1 Non-Intermittent and Binary Storage Facility Generator Reactive Resources**

Reactive Resource Providers shall provide the reactive capability of non-intermittent and Binary Storage Facility generator Reactive Resources for the composite generator at the Point(s) of Interconnection in the QRR Request Form. The submitted QRR Request Form shall contain the generator Reactive Resource's lagging reactive capability at its summer Seasonal Claimed Capability (S-SCC) MW value as well as the leading reactive capability at the Economic Min MW value as described in OP-14B. The associated reactive capability data shall reflect the MVAR capability at all output levels between the Economic Min and unity points on the MW/MVAR capability curve adjusted to recognize any limitations to the generator reactive output including but not limited to: under-/over-excitation limiters, volts/hertz limiters, and auxiliary bus voltage limits. When appropriate, the reactive capability data shall include a hydrogen pressure-based or temperature-based reactive capability curve(s) and a statement of the hydrogen pressure at which the generator normally operates.

#### **3.2.1.2.2 Intermittent and Continuous Storage Facility Generator Reactive Resources**

Reactive Resource Providers shall provide the reactive capability of intermittent and Continuous Storage Facility generator Reactive Resources for the composite generator at the Point(s) of Interconnection in the QRR Request Form. The submitted QRR Request Form shall contain the Reactive Resource's lagging reactive capability at 90% of the summer Network Resource Capability MW value as well as the leading reactive capability at Economic Min MW output as described in OP-14B. The associated reactive capability data shall reflect the MVAR capability at all output levels between the zero MW and unity MW points on the MW/MVAR capability curve adjusted to recognize any generator limitations.

### **3.2.1.2.3 Non-Generator Reactive Resources**

Reactive Resource Providers shall provide the reactive capability of a non-generator Reactive Resource, at the point where the Reactive Resource interconnected with the existing Administered Transmission System, in the QRR Request Form. The QRR Request Form shall contain the non-generator Reactive Resource's lagging reactive capability at its maximum MW loading level (if applicable), as well as the leading reactive capability at its minimum MW loading level (if applicable). The reactive capability data shall reflect any limitations which may affect the Reactive Resource's reactive capability. When appropriate, the reactive capability data shall include a hydrogen pressure-based or temperature-based reactive capability curve(s) and a statement of the hydrogen pressure at which the resource normally operates.

#### **3.2.1.2.3.1 CSC**

The CSC shall submit a QRR Request Form containing reactive capability data reflecting its reactive capability at the Halvarsson converter terminal over the full MW transfer loading range. The CSC's full MW transfer loading range covers the CSC external node (.I.SHOREHAM138 99 (Location ID 4014)) being loaded between (a) 330 MWs of energy flowing from New England to New York; and (b) 346 MWs of energy flowing from New York to New England. The reactive capability data and MW/MVAR capability curve shall contain the CSC's lagging reactive capability at its full MW transfer loading of 330 MW in the southerly direction (which corresponds to the S-SCC point for generator Reactive Resources), as well as its leading reactive capability at 0 MW flow (which corresponds to the Economic Min point for generator Reactive Resources).

### **3.2.2 ISO Review of QRR Designation Request**

The ISO shall review the QRR Request Form submitted by the Reactive Resource Provider. If needed, the ISO shall seek input from the Reactive Resource Provider and the associated LCC to verify that the information contained in the QRR Request Form is accurate. Once the ISO is satisfied that the application is complete and accurate, the ISO shall: (i) make a determination as to whether the Reactive Resource meets all of the QRR requirements as specified in Section 3.2.1.1 of this Business Procedure; and (ii) develop a recommendation for the NEPOOL Reliability Committee's advisory vote on whether the Reactive Resource should be designated as a QRR.

### **3.2.3 QRR Designation Determination**

Once the steps in Section 3.2.2 of this Business Procedure are complete, the ISO shall present the submitted QRR Request Form at the next available regularly scheduled meeting of the NEPOOL Reliability Committee, along with its recommendation on whether the Reactive Resource should be designated as a QRR. The ISO shall seek advisory input from the NEPOOL Reliability Committee on its recommendation. After the NEPOOL Reliability Committee has provided its advisory input, the ISO shall make a final determination on whether to designate the Reactive Resource as a QRR to be included in the CCCP. The ISO shall notify the Reactive Resource Provider of the final determination.



### 3.2.4 CC Compensation

The CC compensation for a Reactive Resource designated as a QRR shall (a) begin on the first day of the month following the month in which the ISO designates the resource as a QRR, and (b) initially be based on its approved reactive capability data (which may include data from a previously performed Reactive Capability Audit that meets the requirements of OP-23), and, following that, the results of its leading and lagging Reactive Capability Audits. CC compensation shall be adjusted to reflect reactive losses between the dynamic reactive device and the interconnection point(s). Reactive losses between the Reactive Resource and the interconnection point shall be added to the QRR's leading reactive capability, but subtracted from its lagging reactive capability when establishing the Qualified VARs of a QRR. All modifications shall be implemented on a prospective basis starting on the following month.

ISO shall credit CC compensation to the owner of the QRR. If the QRR has multiple owners, ISO shall distribute any and all CC compensation payments to the multiple owners based on their ownership shares in the QRR.

#### 3.2.4.1 Modifications to CC compensation without being terminated as a QRR

Modifications to the Qualified VARs of a QRR shall be effective on the first of the month following the month in which the ISO accepted the modification.

As specified in Section IV.A.12.(a) of Schedule 2, the Qualified VARs for a QRR shall be modified when:

- a. Submitted and approved reactive capability data indicates a reactive capability that is lower than the current reactive capability on file with the ISO.
- b. Submitted and approved reactive capability data indicates a reactive capability that is greater than the current reactive capability on file with the ISO. The QRR is required to perform a Reactive Capability Audit prior to modification of the QRRs Qualified VARs.
- c. The QRR performs a valid leading or lagging Reactive Capability Audit;
- d. The QRR fails to complete a valid Reactive Capability Audit for one operating mode (e.g., leading) within the allotted timeframe (or its associated QVAR Waiver expires). The Qualified VARs for the Reactive Capability Audit that was not performed shall be set to zero.
- e. The reactive power output or absorption by a QRR is less than the Qualified VARs from that QRR and the QRR is failing to meet the voltage schedule set by the ISO or the LCC. The Qualified VARs (lagging or leading, as appropriate) for calculating CC payments shall be reduced to the maximum value observed in historical data since the previous Reactive Capability Audit until the QRR has performed a Reactive Capability Audit.

#### 3.2.4.2 Termination of QRR designation

##### 3.2.4.2.1 Short-term Termination of QRR designation

The QRR designation of a Reactive Resource may be terminated for a period of up to 30 consecutive months (Short-term Termination) by the ISO or at the request of the Reactive Resource Provider.

A Reactive Resource in Short-term Termination status is no longer designated as a QRR and, accordingly, it shall not receive CC compensation (i.e., its Qualified VARs are set to '0'). This change

in QRR status does not relieve that Reactive Resource from complying with all other applicable requirements of the ISO New England Operating Documents (e.g., OP-12).

The dynamic Reactive Resource shall remain in Short-term Termination status until the earlier of the following:

- a. The ISO determines that (i) the Reactive Resource Provider has corrected the reason for not meeting the Schedule 2 qualification requirements, (ii) the Reactive Resource performs a valid leading or lagging Reactive Capability Audit that results in a non-zero Qualified VARs value, or (iii) the ISO grants a QVAR Waiver;
- b. The Reactive Resource Provider requests that the Reactive Resource's designation as a QRR be reinstated; or
- c. The Reactive Resource is terminated for a prolonged period as provided in Section 3.2.4.2.2.

#### **3.2.4.2.1.1 Short-term Termination as a QRR by the ISO**

A Reactive Resource's QRR designation shall be placed in Short-term Termination status by the ISO when:

- a. A QRR fails to meet Schedule 2 qualification requirements;
- b. A QRR that receives CC compensation does not have a valid Reactive Capability Audit or QVAR Waiver for both lagging and leading modes of operation;
- c. A QRR has been modified (e.g., due to overhaul, rewinding or any other type of electromechanical alteration) in a manner that impacts its reactive power capability and the Reactive Resource Provider does not provide updated reactive capability data to ISO within 30 calendar days.

#### **3.2.4.2.1.2 Short-term Termination as a QRR by the Reactive Resource Provider**

A Reactive Resource's QRR designation may also be placed in Short-term Termination status at the request of the Reactive Resource Provider. To accomplish this, the Reactive Resource Provider shall submit a completed Ancillary Service Schedule 2 Business Procedure Appendix C – Qualified Reactive Resource Termination Request Form (QRR Termination Request Form) to the ISO at [mvarcapttest@iso-ne.com](mailto:mvarcapttest@iso-ne.com). A Reactive Resource Provider may also complete and submit a QRR Termination Request Form to extend a Short-term Termination if the original request was for less than thirty months, or to end a Short-term Termination earlier than originally requested.

The completed form shall be sent to the ISO at [mvarcapttest@iso-ne.com](mailto:mvarcapttest@iso-ne.com) on or before the 15<sup>th</sup> day of the month preceding the start of or the 15<sup>th</sup> day of the month of the end of the Short-term Termination.

The Short-term Termination shall:

- a. start on the first day of a future month;
- b. end on the last day of the current or a future month;
- c. be no less than one month in duration; and
- d. be no greater than thirty months in duration.

ISO shall review the completed QRR Termination Request Form received from the Reactive Resource Provider. A submitted QRR Termination Request Form shall only be rejected by the ISO if the ISO determines that the required information is incomplete or invalid. If the required information is determined to be incomplete or invalid, the ISO shall work with the Reactive Resource Provider to attempt to resolve the discrepancy. The ISO shall notify the Reactive Resource Provider via e-mail and indicate whether the submitted request has (i) been approved and the QRR designation has been placed on Short-term Termination, or (ii) has been rejected because of incomplete or invalid data. A Reactive Resource that has had its QRR termination placed on Short-term Termination shall not receive CC compensation (i.e., its Qualified VARs set to '0') for the requested duration of the Short-term Termination.

At the conclusion of the Short-term Termination period, ISO shall reinstate the Reactive Resource's QRR designation without additional NEPOOL Reliability Committee review and advisory vote. Unless otherwise superseded, the Qualified VARs of the Reactive Resource that has had its QRR designation reinstated shall be set to the values that were in effect immediately prior to the Short-term Termination period; provided that, if the QRR designation had been placed in Short-term Termination status by the ISO prior to the Reactive Resource Provider's request for Short-term Termination, the Qualified VARs of the QRR shall continue to be set to '0' until the reasons for which the ISO placed the QRR designation on Short-term Termination have been corrected. A Reactive Resource that has its QRR designation reinstated shall: (a) meet the requirements of Schedule 2 and this Business Procedure; and (b) perform its next regularly scheduled leading and lagging Reactive Capability Audits within its current 5 year auditing window.

#### **3.2.4.2.2 Prolonged Termination of QRR Designation**

A Reactive Resource's QRR designation shall be terminated for a prolonged period (Prolonged Termination) by the ISO for the following reasons:

- a. At the request of the Reactive Resource Provider:  
A Reactive Resource Provider may voluntarily request that the QRR designation of its Reactive Resource and its participation in the CCCP be terminated for a prolonged period of time. To accomplish this, the Reactive Resource Provider shall submit a completed QRR Termination Request Form to the ISO. Such form shall be (a) sent to the ISO at [mvarcptest@iso-ne.com](mailto:mvarcptest@iso-ne.com) on or before the 15<sup>th</sup> day of the month preceding the start of the QRR designation termination and (b) effective on the first day of a future month;
- b. If the Reactive Resource's QRR designation is on Short-term Termination for a period greater than 30 consecutive months; or
- c. When the Reactive Resource is retired.

A Reactive Resource whose QRR designation is in Prolonged Termination is no longer considered a QRR and shall be removed from the CCCP. The Reactive Resource shall no longer receive CC compensation. This change in QRR designation does not relieve the Reactive Resource from complying with all other applicable requirements of the ISO New England Operating Document. (e.g., OP-12).

A Reactive Resource Provider may re-apply for QRR designation for its Reactive Resource with a QRR designation in Prolonged Termination Reactive Resource and request participation in the CCCP by following the steps in this Business Procedure.

### 3.2.5 Qualified VAR Determination

#### 3.2.5.1 Leading and Lagging Qualified VAR Determination for CC Compensation

If a Reactive Resource that has been designated as a QRR does not have a currently valid lagging or leading Reactive Capability Audit, the Reactive Resource Provider shall perform the required Reactive Capability Audit for that Reactive Resource within six months of being granted a QRR designation.

A Reactive Resource Provider shall perform leading and lagging Reactive Capability Audits on a QRR at least once every five years in order to maintain eligibility for continued participation in the CCCP. The Reactive Resource Provider may elect to perform a Reactive Capability Audit on the QRR at any time within the allowed leading and lagging Reactive Capability Audit periods as described in OP-23. The most recent valid Reactive Capability Audit shall be used to determine the Qualified VARs of a QRR.

A QRR that has undergone a modification (e.g., due to overhaul, rewinding or any other type of electromechanical alteration) in a manner that impacts its reactive power capability shall perform any Reactive Capability Audit required by ISO as described in Section IV.B of OP-23.

A Reactive Resource Provider may submit audit data for its QRR that was obtained through normal economic dispatch and meets the requirements of OP-23 in order to substantiate its reactive capability and meet its leading or lagging Reactive Capability Audit requirement.

The Reactive Resource Provider assumes the responsibility for all costs incurred while performing a Reactive Capability Audit.

The ISO and the LCCs reserve the right to require that a QRR with a valid Reactive Capability Audit perform a leading or lagging Reactive Capability Audit as reliability needs dictate or if the QRR has failed to meet its voltage schedule while producing or absorbing fewer MVARs than the most recent audited reactive capability.

Reactive Capability Audits of QRRs shall be performed by following the procedure described in OP-23.

The ISO shall review the submitted Reactive Capability Audit data and verify that the information is consistent with data collected from the ISO's Energy Management System and other sources as needed. Any issues found in the submitted audit data shall be discussed with the Reactive Resource Provider. The ISO shall give the Reactive Resource Provider a reasonable opportunity to address any audit data issues. The ISO shall have the ability to reject submitted audit data that can reasonably be considered as an attempt to receive more credit for Qualified VARs than the resource can provide over the course of an entire hour. Upon the ISO's verification of the accuracy of the audit data, the ISO shall notify the Reactive Resource Provider in writing of the acceptance of the audit data.

The Reactive Resource Provider shall submit revised reactive capability data as required in OP-14 and OP-16; except that, if the Reactive Capability Audit was limited by system conditions, the Reactive Resource Provider is not required to update the MW/MVAR curve reactive capability data.

### **3.2.5.1.1 Lagging Qualified VARs**

#### **3.2.5.1.1.1 Non-Intermittent Generator QRRs**

The average of the 5-minute interval MVAR values achieved over the course of the audit shall be utilized to determine the Qualified VARs. If the minimum of any recorded 5-minute interval MVAR value is less than 75% of the average of the recorded values, the lagging Qualified VARs shall be based upon that minimum value.

##### **3.2.5.1.1.1.1 Ambient-Limited Generator QRRs**

An ambient-limited generator QRR that is not capable of achieving S-SCC during the lagging Reactive Capability Audit because of ambient limitations (e.g. temperature) shall conduct the Reactive Capability Audit as described in OP-23.

The average of the 5-minute interval MVAR values achieved over the course of the audit shall be utilized to determine the Qualified VARs. If the minimum of any recorded 5-minute interval MVAR value is less than 75% of the average of the recorded values, the lagging Qualified VARs minimum value shall be used instead of the average value to compare to the MW/MVAR curve.

The audit results shall then be compared to the corresponding curve data as supplied in the reactive capability data. If the audit results cannot be plotted on the existing curve, then the Qualified VARs shall be taken from a point on the MW/MVAR curve at the S-SCC MW value for the lagging reactive capability, plus or minus the amount of MVAR that the audit results deviated from the curve.

##### **3.2.5.1.1.2 Intermittent Generator QRRs**

The lagging Reactive Capability Audit shall be conducted at the maximum allowable MW output for a minimum duration of sixty (60) consecutive minutes as described in OP-23. The average of the 5-minute interval MVAR values achieved over the course of the audit shall be utilized to determine the Qualified VARs. If the minimum of any recorded 5-minute interval MVAR value is less than 75% of the average of the recorded values, the lagging Qualified VARs minimum value shall be used instead of the average value to compare to the MW/MVAR curve.

The audit results shall then be compared to the corresponding curve data as supplied in the reactive capability data. If the audit results can be plotted on the existing MW/MVAR curve, then the Qualified VARs shall be taken from the curve at the 90% of the Summer Network Resource Capability MW level for the lagging Reactive Capability. If the audit results cannot be plotted on the existing curve, then the Qualified VARs shall be taken from a point on the MW/MVAR curve at 90% of the Summer Network Resource Capability MW value for the lagging reactive capability, plus or minus the amount of MVAR that the audit results deviated from the curve.

For resources where the collector system losses significantly affect the reactive power absorbed or produced at the interconnection point relative to the generator terminal, a steady-state equivalent model shall be utilized to determine the additional reactive losses incurred because of the MW adjustment.

##### **3.2.5.1.1.3 Non-Generator QRRs**

The average of the 5-minute interval MVAR values achieved over the course of the Reactive Capability Audit shall be utilized to determine the Qualified VARs. If the minimum of any recorded 5-minute interval MVAR value is less than 75% of the average of the recorded values, the lagging Qualified VARs shall be based upon that minimum value.

**3.2.5.1.1.4 CSC**

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's full MW transfer loading in the southward direction is achieved when the total net sum of external transactions submitted by Market Participants and scheduled by the ISO in the ISO Real-Time Energy Market at the CSC external node (.I.SHOREHAM138 99 (Location ID 4014)) results in 330 MWs of energy flowing from New England to New York. The 330 MWs flow shall be considered to be the equivalent of the S-SCC value used by generator QRRs.

**3.2.5.1.2 Leading Qualified VARs**

The average of the 5-minute interval MVAR values achieved over the course of the audit shall be utilized to determine the Qualified VARs. If the minimum (absolute value) of any recorded 5-minute interval MVAR value is less than 75% of the average of the recorded values, then the leading Qualified VARs shall be based upon that minimum value.

**3.2.5.1.2.1 CSC**

CSC shall perform its leading Reactive Capability Audit of the Halvarsson converter terminal during hours in which the Halvarsson Converter Station is de-blocked and the total net sum of external transactions submitted by Market Participants and scheduled by the ISO in the ISO Real-Time Energy Market at the CSC external node (.I.SHOREHAM138 99 (Location ID 4014)) results in zero ('0') MWs of energy flowing on the CSC. The 0 MW flow shall be considered to be the equivalent of the Economic Min value used by generator QRRs.

**3.2.5.2 Waivers for the Calculation of QVARs Based on a Reactive Capability Audit**

ISO may grant a waiver for calculating the leading or lagging QVARs of a QRR based upon the results of a Reactive Capability Audit. In the event that a QVAR Waiver is granted, the QRR's reactive capability data shall be used to determine the QVARs in lieu of using the results of a Reactive Capability Audit. In order to request a QVAR Waiver, the Reactive Resource Provider shall submit a completed Ancillary Service Schedule 2 Business Procedure - Appendix B – CCCP QVAR Waiver Request Form (Waiver Request Form) to [mvarcaptest@iso-ne.com](mailto:mvarcaptest@iso-ne.com).

**3.2.5.2.1.1 Eligibility to receive a QVAR Waiver**

The ISO may grant a QVAR Waiver if:

- a. The Reactive Resource Provider submits at least two valid Reactive Capability Audit requests for its QRR during the appropriate Reactive Capability Audit period;
- b. The QRR performs at least one Reactive Capability Audit to the maximum achievable reactive capability of the Reactive Resource at the time of the audit, meeting the requirements of OP-23. A Reactive Capability Audit that is not completed because of a Real-Time contingency is not considered a valid audit; and
- c. The QRR is limited by system conditions (as described in OP-23) during a Reactive Capability Audit on either the requested audit dates or the alternate audit dates proposed by the ISO or LCC.

The ISO may also grant a QVAR Waiver if a Reactive Capability Audit cannot be accommodated due to limited reactive and voltage metering in the area where the QRR is located. Generally, this condition applies to small generators with a total MW output of less than five (5) MW that would be very difficult to monitor or audit in Real-Time. The ISO and the LCC shall determine the cases where these exceptions may be applied.

The ISO, in consultation with the LCC, shall review the conditions of the system during the Reactive Capability Audit, or the conditions which may warrant a QVAR Waiver because of limited metering, and determine whether the requested QVAR Waiver may be granted. The ISO shall grant or deny a QVAR Waiver request within 30 calendar days of receiving a valid QVAR Waiver request. The effective date for a granted QVAR Waiver shall be the first day of the month following the end of the applicable Reactive Capability Audit period. If the QVAR Waiver request is denied, then the submitted Reactive Capability Audit data, which shall be submitted and reviewed in accordance with OP-23 and this Business Procedure, shall be used to establish the QVARs for the QRR.

A QVAR Waiver may not be requested on the basis of data obtained through normal economic dispatch if the MW and MVAR during the dispatch: (i) did not meet the requirements of OP-23; or (ii) was not limited by system conditions.

#### **3.2.5.2.1.2 QVAR Waiver Duration**

The ISO may grant a QVAR Waiver for a duration of no less than one year and no more than five years. The reasons that justify the QVAR Waiver shall determine its duration. If the ISO and the LCC determine that there are transmission system conditions that: (i) limit the QRR from fully demonstrating its reactive capability, (ii) are expected to continue, and (iii) do not impact the ability of the QRR to provide VAR Service, then the ISO may grant a QVAR Waiver for a duration greater than one year.

If ISO or the LCC determine that the limiting transmission system conditions have changed during the active period of a multi-year QVAR Waiver, then the ISO shall require the QRR to conduct a leading or lagging Reactive Capability Audit within six months of the determination. The ISO shall notify the Reactive Resource Provider of the need to conduct a Reactive Capability Audit. If analysis of the Reactive Capability Audit data shows that system conditions are no longer limiting the QRR from fully demonstrating its reactive capability, then the ISO shall terminate the QVAR Waiver on the first day of the month following the date of the audit. The Reactive Capability Audit data shall establish the Qualified VARs for the QRR for the month following the date of the QVAR Waiver termination.

#### **3.2.5.2.1.3 Appeals for QVAR Waiver Denials**

If the ISO denies the Reactive Resource Provider's request that its QRR receive a QVAR Waiver for its leading or lagging Qualified VARs, then the Reactive Resource Provider may request an appeal recommendation from the NEPOOL Reliability Committee. In order for the ISO to consider reversing its decision to deny a QVAR Waiver to the QRR, the NEPOOL Reliability Committee shall support the Reactive Resource Provider's request with a vote that is equal to or greater than two thirds of the aggregate Sector Voting Shares. The Reactive Resource Provider may not pursue an appeal of a QVAR Waiver denial if it did not meet the requirements of Section 3.5.3.1.1.a of this Business Procedure or any of the exemptions from auditing allowed under the verification of reactive power capability criteria within applicable NERC or NPCC standards. It is the responsibility of the Reactive Resource Provider to pursue an appeal recommendation from the NEPOOL Reliability Committee. If,

based upon the NEPOOL Reliability Committee support of the Reactive Resource Provider's request for a QVAR Waiver, the ISO decides to reverse its denial of a QVAR Waiver, then the granted QVAR Waiver shall become effective on the later of (a) the first day of the month following the end of the applicable audit period or (b) the first day of the month following the ISO's decision to grant the QVAR Waiver.

## **4.0 Lost Opportunity Cost (LOC) Procedures**

### **4.1 LOC Defined**

The LOC for generators that are dispatched down by, or at the request of, the ISO or a LCC for the purpose of providing VAR Service shall be calculated pursuant to the ISO Tariff.

### **4.2 LOC Data Submissions and Communication of Status**

4.2.1 The LCC shall notify the ISO control room staff when a generator has been dispatched down by the LCC for the purpose of providing VAR Service.

4.2.2 The ISO control room staff shall log all instances of a generator having been dispatched down by ISO or a LCC for the purpose of providing VAR Service.

4.2.3 The ISO staff shall retrieve the appropriate data as outlined in the ISO Tariff for each hour that the generator was dispatched down for the purpose of providing VAR Service.

## **5.0 Cost of Energy Consumed (CEC) Procedures**

### **5.1 CEC Defined**

The CEC associated with resources that are producing or absorbing reactive power at zero real power output at the request of the ISO or an LCC for the purpose of providing VAR Service shall equal the cost of additional energy to produce or absorb reactive power at zero real power output that would not have been consumed if the resource were not dispatched to provide VAR Service and shall be calculated in each hour as follows:

$CEC = (MWhUnit * (LMP \text{ or actual energy cost}))$ , where the MWhUnit is calculated in accordance with Section 4.2.4a. of this Business Procedure, and the actual energy cost shall apply only when the energy is purchased through a retail power contract.

### **5.2 CEC Data Submissions and Communication of Status**

5.2.1 The appropriate LCC shall notify the ISO control room staff of a Reactive Resource having been instructed by the LCC to produce or absorb reactive power at zero real power output for the purpose of providing VAR Service.

5.2.2 ISO control room staff shall log all instances of a Reactive Resource having been instructed by ISO or an LCC to produce or absorb reactive power at zero real power output for the purpose of providing VAR Service.



5.2.3 ISO Settlements staff shall collect the flags set by ISO control room staff in the ISO control room logs to determine which Reactive Resources had been instructed to produce or absorb reactive power at zero real power output for the purpose of providing VAR Service.

5.2.4 ISO settlements staff shall collect the following data for each hour that a resource was producing or absorbing reactive power at zero real power output for the purpose of providing VAR Service:

The hourly incremental MWh from the resource reflecting the energy in each hour required to support VAR Service while producing or absorbing reactive power at zero real power output above that which is required when not providing VAR Service;

If the energy to supply the resource is being met by the hourly energy market, the hourly Locational Marginal Price (LMP);

If the energy to supply the resource is being met by a retail power agreement, the actual cost of energy associated with the retail power agreement along with supporting contractual documentation; and

An invoice for the resource that describes a total net cost and an hourly cost detail that includes the hourly data noted in Section 4.2.4(a) of this Business Procedure.

### **5.3 Reporting of Reactive Resource's Required Energy**

The energy (MWh) required by a resource that is producing or absorbing reactive power at zero real power output for the purpose of providing VAR Service shall be reported under a distinct and unique Load Asset pursuant to the time constraints set forth in the ISO Tariff.

### **5.4 CEC Data submissions by Reactive Resource Providers**

Reactive Resource Providers that have resources that produce or absorb reactive power at zero real power output at the request of the ISO or an LCC for the purpose of providing VAR Service shall provide the following data to the ISO:

Direction as to whether the LMP of the resource or the actual energy cost shall be applied to the CEC calculation (the LMP is to be selected only if the Reactive Resource Provider does not have a retail power agreement to supply the resource's station service requirements) shall be submitted by the Reactive Resource Provider, with supporting contractual documentation, to ISO settlements staff prior to the month in which the resource is called upon to provide VAR Service. The Reactive Resource Provider does not have the option to alternate between LMP and actual energy cost.

If the energy to supply the resource is being provided under a retail power agreement, the actual cost of energy associated with the retail power agreement shall be provided to the ISO by the Reactive Resource Provider by 1300 on the second Business Day after the Operating Day of the resource having been called upon to provide VAR Service;

The hourly incremental MWh for the resource reflecting the energy in each hour required to support VAR Service above that which is required when not providing VAR Service shall be provided to the ISO by the Reactive Resource Provider by 1300 on the second Business Day after the Operating Day of the resource having been called upon to provide VAR Service; and

An invoice for the resource that includes a total net cost and an hourly cost detail shall be provided to the ISO by the Reactive Resource Provider by 1300 on the second Business Day after the Operating Day of the resource having been called upon to provide VAR Service.

A Reactive Resource Provider shall submit any revised meter data reflecting the hourly incremental MWh for the resource reflecting the energy in each hour required to support VAR Service prior to

the Correction Limit as described in of the ISO New England Manual for Market Rule 1 Accounting (M-28).

### **5.5 Power system modeling of Reactive Resources that can produce or absorb reactive power at zero real power output for the purpose of providing VAR Service**

The energy (MWh) required by a resource that is producing or absorbing reactive power at zero real power output for the purpose of providing VAR Service shall be reported under a distinct and unique Load Asset. Reactive Resource Providers shall register the resource as a unique Load Asset.

### **5.6 Impact of resources producing or absorbing reactive power at zero real power output for the purpose of providing VAR Service on the calculation of Load Obligation.**

The MWh reported under a distinct and unique Load Asset for the production or absorption of reactive power at zero real power output of a resource shall be excluded from the calculation of Load Obligation. The MWh that have not been reported under a distinct and unique Load Asset for the production or absorption of reactive power at zero real power output of a resource shall be neither excluded from the calculation of Load Obligation nor compensated under Schedule 2.

## **6.0 Cost of Energy Produced (CEP) Procedures**

### **6.1 CEP Defined**

The CEP associated with generators that are brought on-line by the ISO or an LCC for the purpose of providing VAR Service shall equal the portion of the total NCPC to be paid to that resource for a day that is attributed to the hour(s) during which the resource is run to provide VAR Service in accordance with the ISO Tariff.

### **6.2 CEP Data Submissions and Communication of Status**

6.2.1 The associated LCC shall notify the ISO control room staff of a generator having been brought on-line by the LCC for the purpose of providing VAR Service.

6.2.2 The ISO control room staff shall log all instances of a generator having been brought on-line by ISO or a LCC for the purpose of providing VAR Service.

6.2.3 The ISO staff shall retrieve the appropriate data as outlined in the ISO Tariff for each hour that the generator was brought on-line for the purpose of providing VAR Service.

## **7.0 References**

1. ISO New England Inc. Transmission, Markets and Services Tariff (Tariff), Schedule 2 – Reactive Supply and Voltage Control Service
2. ISO New England Operating Procedure No. 23 – Resource Auditing (OP-23)

## Approval

Approval Date: Draft
Effective Date: Draft

## Revision History

<u>Revision No.</u>	<u>Approval Date</u>
Revision 6	Added Electric Storage Resource references Global rewrite for clarity and consistency
Revision 5	NPC: 6 May, 2016
Global Change	Added requirements for Intermittent Power Resources Added requirements for Synchronous Condensers and FACTS devices Moved Testing Procedures into OP-23 Generating Resource Auditing
<u>Revision No.</u>	<u>Approval Date</u>
Revision 4	NPC: April 1, 2011
<u>Section No.</u>	<u>Revision Summary</u>
Global Change	Ministerial formatting and punctuation changes
Table 1.1	Removed to be consistent with other ISO Manuals
1.4	Reorganized and added further detail to Responsibilities, shifted location of NRC responsibilities
2.2.4.1	Clarified and added language defining effective dates of data submittal and test information
2.2.4.2	Further defined Termination as a QRR (including incorporation of existing suspension provisions)
2.2.5.1	Added further definition to testing requirements, added a reference to following "voltage dispatch instructions", and added language describing testing requirements for non-QRRs
2.2.5.2	Removed Lagging test requirement during On Peak hours and eliminated "strongly recommended" language for off peak hours for leading tests
2.2.5.3	Updated form name and ISO software system name
2.2.5.4	Added language allowing for the proposal of an alternative test date
2.2.5.5	Added clarification for testing of composite units
2.2.5.10	Modified language to be consistent with 2.2.4.2 changes
<u>Revision No.</u>	<u>Approval Date</u>
Revision 3	NPC: 8/6/10
<u>Section No.</u>	<u>Revision Summary</u>
Global Change	Replaced the term Qualified Reactive Resource with QRR after its initial use
2.2.1.1	Removal of expired 01/01/09 AVR Requirements implementation date
2.2.4.2.1.1	Removal of entire section related to expired transitional implementation language

2.2.4.2.1.a	Removal of expired 01/01/09 AVR Requirements implementation date
2.2.5.1	Added reference to following "voltage dispatch instructions"
2.2.5.2	Removal of entire section related to expired transitional implementation language
2.2.5.3	Added footnote allowing for the consideration of shorter test request submittal lead times
2.2.5.5	Added clarification for testing of composite units
2.2.6.2	Modified waiver process
2.2.6.2.1	Added new section addressing waiver duration
2.2.6.2.2	Modified waiver appeal requirements
2.2.7	Removal of expired 01/01/09 AVR Requirements implementation date
3, 4 and 5	Referenced ISO Tariff wherever applicable, standardized language, and specified Reactive Resource Provider CEC Data submissions.
Attachment 1	Deleted expired Attachment 1 - Transitional Leading Reactive Capability Test Dates
<u>Revision No.</u>	<u>Approval Date</u>
Revision 2	NPC: November 30, 2007
<u>Section No.</u>	<u>Revision Summary</u>
Table 1.1	Ministerial update to Table 1.1 to reflect current procedures.
Section 2	General ministerial cleanup, and modifications to the Capacity Cost Compensation Procedures to recognize the qualification and testing requirements of the Cross Sound Cable (CSC), which is a non-Generator Reactive Resource.
Section 2.1.3	Modified the entity to which CC compensation is distribution from the "Lead Participant or a designated entity" to the Qualified Reactive Resource's owners based on Ownership Share
Section 2.2.1	Added requirements that must be met prior to being recognized as a Qualified Reactive Resource to align with new Schedule 2 requirements
Sections 2.2.2 and 2.2.3	Clarified ISO's review and recommendation responsibilities and NEPOOL stakeholder advisory input language
Attachment 1	Updated Table. Moved FPL Unit 328 (Gulf Isle) from 2007 to 2008, Unit 621 (Williams) from 2008 to 2007, and Unit 1187 (Stony Brook GT1C) from 2009 to 2008.
<u>Revision No.</u>	<u>Approval Date</u>
Revision 1	NPC: October 12, 2007
<u>Section No.</u>	<u>Revision Summary</u>
Section 2.2.5.6	Added detail on the testing requirements for Combined Cycle Units or Pseudo Combined Cycle Generator Pseudo Combined Cycle
<u>Revision No.</u>	<u>Approval Date</u>
Revision 0	NPC: March 2, 2007
<u>Section No.</u>	<u>Revision Summary</u>

Entire Document

The *ISO New England Ancillary Service Schedule 2 Business Procedure* was developed to reflect the ISO New England Inc. and NEPOOL Participants Committee Amendments to Schedule 2 – Reactive Power Supply and Voltage Control of the ISO New England Inc. Open Access Transmission Tariff; Docket No. ER07-397-000, dated December 29, 2006