Master/Local Control Center Procedure No. 8

(M/LCC 8)

Coordination of Generator Voltage Regulator and Power System Stabilizer Outages

1. References

ISO New England Inc. Transmission, Markets and Services Tariff, Section I, General Terms and Conditions, Section I.3.9, Review of Market Participant's Proposed Plans

ISO New England Inc. Transmission, Markets and Services Tariff, Section II, Schedule 22, Large Generator Interconnection Procedures

ISO New England Inc. Transmission, Markets and Services Tariff, Section II, Schedule 23, Small Generator Interconnection Procedures

NERC Reliability Standard TOP-001 - Transmission Operations

NERC Reliability Standard TOP-002 - Operations Planning

NERC Reliability Standard VAR-001 - Voltage and Reactive Control

ISO New England Planning Procedure No. 5-3 (PP5-3) - Guidelines for Conducting and Evaluating Proposed Plan Application Analysis

ISO New England Operating Procedure No. 12 - Voltage and Reactive Control (OP-12)

ISO New England Operating Procedure No. 12 - Voltage and Reactive Control , Appendix B - Voltage & Reactive Schedules (OP-12B)

ISO New England Operating Procedure No. 14 - Technical Requirements for Generators, Demand Response Resources, Asset Related Demands and Alternative Technology Regulation Resources (OP-14)

ISO New England Operating Procedure No. 19 - Transmission Operations (OP-19)

Master/Local Control Center Procedure No. 2 - Abnormal Conditions Alert (M/LCC 2)

2. Purpose

This is a procedure for approval/disapproval and coordination of outages for automatic voltage regulators (AVRs), power system stabilizers (PSSs) and reactive control systems (RCSs). It also establishes a procedure for reporting and tracking status of this equipment.

3. Introduction

ISO New England (ISO) Operating Procedure No. 12 - Voltage and Reactive Control (OP-12) and ISO Operating Procedure No. 14 Technical Requirements for Generators, Demand Response Resources, Asset Related Demands and Alternative Technology Regulation Resources (OP-14) establish the guidelines to ensure that reliable and desirable voltage levels are maintained on the New England Transmission System. The reliability of the system is dependent upon the automatic operation of Generator, as defined in OP-14, reactive controls. If these devices are removed from service, the ability of the power system to respond dynamically to normal power changes, unplanned events and abnormal conditions will be impacted. The ISO Control Room Staff must be notified immediately of any reduction in capability regarding automatic voltage control in order to conduct studies and formulate contingency actions.

4. Responsibilities

The following steps outline the task performance responsibilities of the Market Participant generating station operator (or designee), the LCC System Operator, and the ISO Control Room staff:

A. Each Market Participant generating station operator (or designee) is responsible for:

1. Monitoring the status of each AVR, PSS or RCS that is required to be in-service. If such equipment becomes inoperative unexpectedly, the generating station operator (or designee) is responsible for immediately notifying the ISO Control Room and creating an outage application in the ISO outage scheduling software, including an expected return-to-service time based upon initiated repairs.

2. Requesting ISO Operations Support Services (OSS) Outage Coordination and LCC System Operator approval if a planned outage of an AVR, PSS or RCS is required.

3. Notifying the ISO Control Room prior to the start or completion of an approved planned outage of an AVR, PSS or RCS for final review and approval.

4. Reporting any AVR, PSS or RCS related Generator Real-Time operating constraints, such as restricted availability, restricted response rates, or MW or MVAR output limitations, to the ISO Control Room and LCC System Operator.

5. Projecting the expected return-to-service time/date and reporting this information to the ISO Control Room.

6. Providing updates when the expected return-to-service time/date changes.

7. Controlling the Generator AVR to maintain the appropriate voltage schedule.

B. Each LCC System Operator is responsible for:

1. Coordinating, with ISO OSS Outage Coordination, each planned outage for a Generator AVR, PSS or RCS as required by Section 8, below.

2. Receiving notification from the ISO Control Room of each AVR, PSS and RCS outage covered by this procedure.

3. Reviewing each AVR, PSS or RCS related operating restriction and limitation imposed on the Generator and its impact on voltage and reactive control in the applicable LCC area of jurisdiction.

4. Instructing the Generator with the AVR outage to maintain or change either its voltage schedule or its reactive power schedule

5. Recording the outage and instruction in the appropriate LCC log.

C. ISO Control Room is responsible for:

1. Notifying the ISO OSS Real-Time Studies group (on-call engineer) immediately if a Generator AVR, PSS or RCS is to be removed from service or is to be returned to service.

2. Approving/disapproving any AVR, PSS or RCS planned outage based upon the ISO OSS Outage Coordination and OSS Real-Time Studies analysis during normal and abnormal operating conditions as required in Section 8, below.

3. Notifying the appropriate LCC of each AVR, PSS and RCS outage covered by this procedure.

4. Creating an application in the ISO outage scheduling software to track each AVR, PSS and RCS forced or emergency outages.

5. Definitions

Automatic Voltage Regulator (AVR):

A voltage-regulating device designed to hold a set voltage by comparing the Reactive Resource terminal voltage to the reference voltage. AVR equipment may include, but is **not** limited to any of the following: synchronous generator AVR, centralized voltage controller typically implemented in renewable power plants, and Distributed Control System (DCS).

Power System Stabilizer (PSS):

An electronic control system applied at a generator that helps to dampen out dynamic oscillations. Such devices, when installed at a generator, can be an integral component of the generator's ability to respond to dynamic disturbances of the power system.

Reactive Control System (RCS):

A comprehensive voltage regulation scheme or system at a generating station that maintains steady-state and/or transient voltage stability by deploying multiple reactive control devices including, but **not** limited to any of the following: capacitor/reactor bank, Flexible AC Transmission System (FACTS), Static Var Compensator (SVC), synchronous condenser, and load tap changing (LTC) transformer, etc. For example, the typical RCS in a renewable energy wind facility consisting of a STATCOM, a LTC transformer, shunt capacitors and online turbines which function simultaneously, in a specific coordinated fashion, to maintain the POI and collector system voltages within a predefined band. An RCS is typically required to be in-service for normal generator operation.

6. Applicability

This procedure applies to:

- All Market Participant Generators, which are required to have an AVR and operate it in the automatic voltage regulation mode. Generators exempted from the requirement to have an AVR in automatic are listed in Attachment A - Generators Exempted from AVR Requirements (M/LCC 8A).
- All Market Participant Generators required to have a PSS, as determined by and documented in their System Impact Study (SIS). Generators equipped with a PSS are required to maintain the state of that PSS as described in Attachment B - Generators Requiring PSS Devices In/Out of Service (M/LCC 8B).
- All Market Participant Generators required to have an RCS in service are listed in Attachment C - Generators Requiring a Reactive Control System (M/LCC 8C)

7. Exempting Generators from Automatic Voltage Control Requirements

Certain Generators, described in M/LCC 8A, within the New England RCA are exempted from the requirement to operate with an AVR in-service and controlling voltage because they either (1) do **not** have an AVR or (2) operation with the AVR in the automatic voltage control mode and controlling voltage may adversely impact reliability. For all such Generators, ISO and the LCC have reviewed the impact and have determined that the lack of automatic voltage control is acceptable or required.

A Generator is listed in M/LCC 8A, when the Market Participant submits an exemption request to ISO and if that Generator is: (1) **not** required to have an AVR by Schedule 22 Large Generator Interconnection Procedure (LGIP) / Schedule 23 Small Generator Interconnection Procedure (SGIP) processes or their predecessor or successor provisions, and (2) that request is evaluated by both the LCC and ISO in order to determine what type of exemption study is required. An exemption request determination by the LCC and ISO may require that the exemption request and study be performed and approved under Section I.3.9 Review of Market Participant's Proposed Plans of the ISO Tariff (PPA Process) and supported by reliability studies performed by ISO System Planning. Initial screening criteria for a Generator exemption request to determine if a full PPA Process is required are contained in Section 7.A of this M/LCC procedure. Regardless of whether or **not** a Generator AVR exemption request meets the initial screening exemption criteria, ISO reserves the right to determine if that request requires a full PPA Process application.

Inclusion of a Generator in the M/LCC 8A exemption list does **not** preclude re-evaluation required with changes processed through the LGIP or SGIP processes, or their predecessor or successor provisions, respectively, and an exemption may be precluded by Schedules 22 or 23 for Interconnection Requests under those processes. Inclusion in

the M/LCC 8A exemption list does **not** relieve a Generator from adhering to any other ISO New England Operating Document or program requirements.

A. Proposed Plan Application Process Exemption Criteria

Typically, an AVR exemption request for a Generator Reactive Resource that is **not** precluded for Interconnection Requests under Schedules 22 or 23 and that meets any one of the criteria contained in Section 7.A.1 of this M/LCC, does **not** require a full PPA Process in order to approve or deny the AVR exemption request.

1. The Generator shall:

- Be connected to the transmission or distribution system at a voltage level less than 69 kV
- Have a total plant gross output at a common point of connection, as described in OP-14, of less than 20 MW Summer or Winter Network Resource Capability (NRC), whichever is greater
- Have never been equipped with an AVR

Any Generator seeking an exemption shall provide to ISO a detailed description of how the plant will be operated in lieu of active AVR control (i.e., in manual control or constant power factor control mode), including the expected reactive capability (lagging and leading) the plant may utilize over the course of daily operation.

If the Generator for which the AVR exemption is sought has no prior PPA application with ISO and the AVR exemption request is submitted prior to being determined ready to respond to dispatch by ISO, the Lead MP shall:

1. Submit an AVR exemption request via the ISO Participant Support Ask ISO application. Such application shall include at a minimum the following documentation:

    a. A technical analysis supporting acceptable operation without the AVR operating in voltage control mode

    b. A valid technical reason, normally provided by the interconnecting transmission or distribution utility, stating the reason that the Generator cannot operate with its AVR in voltage control mode

ISO and the LCCs shall use this information in their review of the exemption request.

8. Request and Approve an AVR, PSS or RCS Outage

NOTE

AVR mode changes during normal start-up and shutdown of units are expected and need **not** be reported to ISO.

Planned Outages:

The Market Participant Generator Operator (GOP) shall notify the LCC of any planned maintenance of the AVR, PSS or RCS that reduces the capacity of the equipment or renders the equipment inoperable. The GOP shall submit an outage request for the AVR, PSS or RCS via the ISO outage scheduling software. The ISO OSS Outage Coordination group and the OSS Real-Time Studies group shall perform appropriate analysis and approve or disapprove the outage request with the concurrence of the LCC. Approved outage requests for AVR, PSS, or RCS equipment that limits generation in accordance with a Transmission Operating Guide (TOG), or other guidance from OSS, will be entered in the ISO outage scheduling software as a transmission outage application, in addition to the corresponding generation application. Prior to the start or completion of an approved planned outage of an AVR, PSS or RCS, the Market Participant GOP shall also contact both the ISO Control Room and the LCC for final review and approval.

Emergency or Forced Outages:

The Market Participant GOP shall notify the ISO Control Room staff of an emergency or forced outage of an AVR, PSS or RCS that reduces the capacity of the equipment or renders the equipment inoperable. The ISO shall notify the appropriate LCC of the AVR emergency or forced outage. The LCC shall instruct the Generator with the AVR outage to maintain or change either its voltage schedule or its reactive power. Any outage of an AVR, PSS or RCS shall be logged by the LCC and ISO Control Room staff. If an AVR, PSS is out-of-service or there is any reduction in RCS capability for more than 30 minutes, the ISO Control Room staff shall create an outage in the ISO outage scheduling software. ISO Control Room staff and the OSS Real-Time Studies group (on-call engineer) shall perform the necessary analysis to determine what, if any, corrective actions are required. Applications for AVR, PSS, or RCS equipment that limits generation in accordance with a TOG, or other guidance from OSS, will be entered in the ISO outage scheduling software as a transmission outage application in addition to the corresponding generation application. The ISO Control Room staff shall obtain concurrence from the LCC if any corrective actions are required.

Criteria for Evaluating the Impact of an AVR, PSS or RCS Outage:

The ISO OSS Real-Time Studies group shall perform the appropriate analysis or studies necessary to:

- Evaluate planned maintenance of any AVR, PSS or RCS that may result in the equipment capacity being reduced or being removed from service, determine if the

request for the planned outage shall be approved or disapproved, and obtain the concurrence of the LCC System Operator.

- Evaluate planned maintenance of any AVR, PSS or RCS that may result in the equipment capacity being reduced or being removed from service and determine the plant or system restrictions that exist for the planned maintenance condition(s).

- Re-evaluate a previously approved planned outage of an AVR, PSS or RCS at the time that the equipment is actually to be taken out-of-service, taking into account any changes to system conditions since the original evaluation and approval, and determine if the request for the equipment to be taken out-of-service shall be approved or disapproved.

In performing the appropriate analysis or studies in order to determine whether to approve or disapprove the planned outage of an AVR, PSS or RCS or to determine what, if any, corrective actions are required in the event of an emergency or forced outage of an AVR, PSS or RCS, the criteria considered by the ISO OSS Real-Time Studies group includes, but would **not** necessarily be limited to the following:

- Industry standards and guidelines for reliable system operation provided by NERC (notably, in NERC Reliability Standards TOP-001, TOP-002, and VAR-001) and NPCC.

- ISO requirements for reliable system operations as documented in ISO New England Operating Procedure No. 19 - Transmission Operations (OP-19).

- Impact of the change on the system's voltage performance, reactive reserves and/or stability behavior which may in turn impact system operability and reliability, reduce system transfer limits and degrade network stability performance.

In addition, there are certain situations where the removal from service of an AVR, PSS, or RCS should be avoided, including the following:

- An AVR, PSS, or RCS that is required to be in-service should **not** be removed from service when Master/Local Control Center Procedure No. 2 - Abnormal Conditions Alert (M/LCC 2) is implemented, unless the outage is unavoidable.

- The simultaneous removal from service of several AVRs, PSSs or RCSs in any one area should be avoided.

9. Logging Requirements

NOTE

All logging, as defined in this Section, is required to be retained for a minimum period of 12 rolling months to be consistent with NERC and NPCC Standards.

A. Each GOP (or designee) and the LCC System Operator are responsible for logging and tracking the status of each AVR, PSS and RCS.

B. During normal and abnormal operating conditions, the ISO Control Room shall maintain records of each AVR, PSS and RCS status.

10. Revision History

Rev. No.	Date	Reason
--	10/16/17	For previous revision history, refer to Rev 10 available through Ask ISO;
11	08/18/11	Updated procedure contact information; added note to Section 6 that acknowledges AVR mode changes during start-up and shutdown do not need reporting
12	04/03/12	Biennial review by procedure owner; Headers, updated copyright date, replaced the "#" with "No." in M/LCC procedure title; 1st page Footer, deleted 2nd paragraph of disclaimer; Section 2 added Reactive Control System (RCS) and modified as required; Globally replaced instances of AVR and/or PSS) with "reactive controls" as appropriate; Section 3 minor grammar changes to clarify information; Globally replaced "…AVR and (or) PSS…" with "…AVR, PSS and (or) RCS…" as applicable; Section 4 added definition for RCS; Section 5 added new 3rd bullet to address use of new Attachment C, deleted 2nd paragraph, modified 3rd paragraph; Section 6 modified title as required to add RCS and use singular in place of plural where possible; Globally made extensive modifications as required to add RCS and information required by the new Attachment C; Section 10 added new Attachment C to list of Attachments
12.1	03/12/14	Periodic review performed requiring no changes; Made administrative changes required to publish a Minor Revision per SOP-RTMKTS.0210.0010;
13	05/14/14	Biennial review by procedure owner; Globally removed the word "Survey" from the title of OP-12 App B to match the new title of OP-12 App B issued in January of 2014 and updated the title for OP-14 to include ATRRs per the Revision issued 5/2/14; Section 7.C.2 changed "Technical Studies" to "Real-Time Support"
13.1	02/29/16	Periodic review performed requiring no changes; Made administrative changes required to publish a Minor Revision per SOP-RTMKTS.0210.0010 and consistent with current practices and management expectations;
14	10/16/17	Biennial review completed by procedure owner; Added required corporate document identity to all page footers; Section 6, Emergency or Forced Outages was modified (deleted the 3rd paragraph relating to Generating Stations listed in App C); Truncated the Revision History per SOP-RTMKTS.0210.0010 Section 5.6;
14.1	10/02/19	Biennial review by procedure owner requiring no changes; Made administrative changes required to publish a Minor Revision;
15	12/04/19	Globally made editorial changes consistent with current conditions, practices and management expectations (including renaming and relocation of Responsibilities Section and renumbering remaining sections); Sections 1 (References) and 3 (Introduction), updated OP-14 title; Section 6 Applicability, updated language regarding required studies for AVR exemptions;
16	07/16/20	Section 7; provide instruction for new units seeking exemption status prior to commercial operation
17	10/05/20	Section 8: Added clarifying instructions for the generation of transmission outages.
18	09/23/21	Biennial review by procedure owner; Section 5: updated definitions;
18.1	09/20/23	Biennial review performed by procedure owner requiring no intent changes; Minor formatting changes; Made administrative changes required to publish a Minor Revision.

11. Attachments

Attachment A - Generators Exempted from AVR Requirements

Attachment B - Generators Requiring PSS Devices In/Out of Service

Attachment C - Generators Requiring a Reactive Control System