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		Revision Number: 8 Revision Date: April 15, 2010
Contact: ISO Director, Operations		Approved by: M/LCC Heads
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Master/Local Control Center Procedure No. 8 (M/LCC 8)


Coordination of Generator Voltage Regulator and Power System Stabilizer Outages

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1. References

- Master/Local Control Center Procedure No. 2 - Abnormal Conditions Alert (M/LCC 2)
- 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 and Surveys (OP-12B)
- ISO New England Operating Procedure No. 14 - Technical Requirements for Generators, Demand Resources and Asset Related Demands (OP-14)
- ISO New England Operating Procedure No. 19 - Transmission Operations (OP-19)
- NERC Reliability Standard TOP-001 - Reliability Responsibilities and Authorities
- NERC Reliability Standard TOP-002 - Normal Operations Planning
- NERC Reliability Standard TOP-004 - Transmission Operations
- NERC Reliability Standard VAR-001 - Voltage and Reactive Control


2. Purpose

This is a procedure for approval/disapproval and coordination of outages for generator automatic voltage regulators (AVRs) and power system stabilizers (PSSs). It also establishes a procedure for reporting and tracking their in/out of service status.

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 Resources and Asset Related Demands (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 controls, such as AVRs and PSSs. 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. If an AVR or PSS must be removed from service at any time, the ISO Control Room Staff must be notified immediately so that studies can be conducted and contingency actions can be developed, as necessary (as described in more detail in Section 5, below).

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4. Definitions

Automatic Voltage Regulator (AVR):

A voltage-regulating device designed to hold a set voltage by comparing the generator terminal voltage to the reference voltage. The set voltage is maintained by varying the excitation current to the generator field.

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 ability to respond to dynamic disturbances of the power system.


5. 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 on all generating units comprising a Generator unless such Generator has been previously grandfathered and/or has received exception under the Proposed Plan Application Process (under Section I.3.9 of the ISO Tariff), as supported by reliability studies. Generators exempted from the requirement to have an AVR are listed in a confidential Attachment to this procedure (Attachment A – Generators without an AVR and are Grandfathered).
- All Market Participant Generators required to have a PSS, as determined by and documented in their System Impact Study (SIS). Generators required to have a PSS are listed in a confidential Attachment to this procedure (Attachment B – Generators Requiring PSS devices in/out of Service).

The ISO System Operations Support group annually notifies the Generator Operators of the generators listed on the confidential M/LCC 8, Attachment A to confirm that they are listed therein and are thus exempted from having an AVR in service and to remind them of their obligation to follow a reactive power schedule by operating the identified generator(s) at near unity power factor at the point of interconnection (typically at the high side of the GSU). The ISO System Operations Support group also annually notifies the Generator Operators of the generators listed on the confidential M/LCC 8, Attachment B to confirm that they are listed therein and are thus required to have a PSS in-service and operational.


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ISO provides the voltage schedules for major generating stations throughout the New England Reliability Coordinator Area (RCA) to the associated Generator Operator by posting OP-12, Appendix B – Voltage & Reactive Schedules and Surveys on its public Web site. All dynamic reactive resources (e.g., generating units, SVCs, STATCOMs) within the ISO RCA that are under ISO operational control are required to provide voltage support to the system and follow voltage schedules according to OP-12, Appendix B. As system conditions dictate, a dynamic reactive resource may be directed by ISO or a Local Control Center (LCC) to deviate from OP-12, Appendix B voltage schedules to produce or absorb reactive power. All Generators in the New England RCA (except those that have been exempted) are required to operate the facility with an AVR in the automatic voltage regulation mode, in service and controlling voltage, unless directed otherwise. The AVR is expected to control voltage at the Point(s) of Receipt consistent with the range of voltage scheduled by ISO. Units not listed in OP-12, Appendix B are instructed to follow local voltage schedules in accordance with LCC requirements or Interconnection Agreements. LCCs have operating instructions for each generator (including voltage schedules). Under normal conditions all units are expected to be capable of maintaining scheduled voltage. Generator Operators are expected to maintain these voltage schedules as closely as possible in system operations and to maintain the voltage schedule with the AVR in the automatic voltage control mode, in service and controlling voltage.

Criteria for Exempting Generators from Certain Voltage and Reactive Requirements:

All generators within the ISO RCA provide reactive support to the New England transmission system. Neither ISO nor the LCCs exempt any generators from following voltage schedules developed by ISO or the LCC. However, a relatively small number of generators within the New England RCA are exempted from the general ISO requirement to operate with an AVR in service and controlling voltage. These generators are listed in Attachment A to this procedure. A generator listed in Attachment A either does not have an AVR or does not operate in the AVR in the automatic voltage control mode, in service and controlling voltage. For all such generators, ISO has reviewed the impact of this and has determined that this status is acceptable from a reliability perspective. For a generator to be added to the list in Attachment A, the generator would have to be evaluated and approved under the Proposed Plan Application Process (under Section I.3.9 of the ISO Tariff) and this exemption would need to be supported by reliability studies performed by the ISO System Planning group.

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6. Requesting and Approving Outages of AVR's and PSS's

Planned Outages:

The Market Participant Generating Station Operator is responsible for notifying the LCC of any planned maintenance of the AVR or PSS that will result in the equipment being removed from service. The LCC will submit an outage request for the AVR or PSS via the ISO Outage Scheduling software. The ISO Outage Coordination staff and the Operations Support Services Real-time Support group are responsible for performing appropriate analysis and for approving or disapproving the outage request with the concurrence of the LCC System Operator. Prior to the start or completion of an approved planned outage of an AVR or PSS, the Market Participant Generating Station Operator must also contact both the ISO Control Room and the LCC for final review and approval.


Emergency or Forced Outages:

The Market Participant Generating Station Operator is responsible for notifying the ISO Control Room Staff of an emergency or forced outage of an AVR or PSS that renders the equipment inoperable. ISO Control Room Staff and the ISO Operations Support Services Real-time Support group (on-call engineer) will perform the necessary analysis to determine what if any corrective actions are required. The ISO Control Room Staff will seek concurrence of the LCC should any corrective actions be required.

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

The ISO Operations Support Services Real-time Support group is responsible for performing the appropriate analysis or studies necessary to:

- Evaluate planned maintenance of any AVR or PSS that will result in the equipment being removed from service, to determine whether to approve or disapprove the request for the planned outage, with the concurrence of the LCC System Operator.
- Re-evaluate a previously approved planned outage of an AVR or PSS 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, to determine whether to approve or disapprove the request for the equipment to be taken out of service.


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In performing the appropriate analysis or studies in order to determine whether to approve or disapprove the planned outage of an AVR or PSS or to determine what if any corrective actions are required in the event of an emergency or forced outage of an AVR or PSS, the criteria considered by the ISO Operations Support Services Real-time Support 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, TOP-004 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 AVRs or PSSs should be avoided, including the following:

- An AVR or PSS 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 and PSSs in any one area should be avoided.
- The removal from service of any PSS that is required to be in service (as listed in Attachment B of this procedure) should be avoided.


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7. Specific Responsibilities

The following steps outline the specific responsibilities of the Market Participant Generating Station Operator or their designee, the LCC Operator, and the ISO Control Room Staff:


- A. Market Participant Generating Station Operator or their Designee are responsible to:
1. Monitor the status of all AVR's and PSS's that are required to be in service. If such equipment becomes inoperative unexpectedly, the Generating Station Operator or their designee shall log the status of the device, notify the ISO Control Room Staff immediately, and initiate a request for repairs.
 2. Request ISO Outage Coordination Staff and LCC Operator approval if a planned outage of an AVR or PSS is required.
 3. Notify the ISO Control Room Staff prior to the start or completion of an approved planned outage of an AVR or PSS for final review and approval.
 4. Report any AVR or PSS related generator real-time operating constraints, such as restricted availability, restricted response rates, or MW or MVAR output limitations to the ISO Control Room Staff and LCC Operator.
 5. Project the expected return to service--time/date and report this information to the ISO Control Room Staff.
 6. Provide updates should the expected return time/date change.
 7. Manually control the generator exciter to maintain the appropriate voltage schedule.
- B. LCC Operators are Responsible to:
1. Coordinate with the ISO Outage Coordination Staff, planned outages for generator AVR's and PSS's as required by Section 5, above.
 2. Receive notification from ISO Control Room Staff of all AVR and PSS outages covered by this procedure.
 3. Review the AVR- or PSS-related operating restrictions and limitations imposed on the Generator and its impact on voltage and reactive control in your area of jurisdiction.
 4. Note the notification on the appropriate LCC log.

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C. ISO Control Room Staff are responsible to:

1. Notify the ISO Operations Support Services Real-time Support group (on-call engineer) immediately if a generator AVR or PSS is to be removed from service or is to be returned to service.
2. Approve/disapprove AVR or PSS planned outages based upon the ISO Outage Coordination and Technical Studies group analysis during normal and abnormal operating conditions as required in Section 5, above.
3. Develop contingency actions, as appropriate, and alert the appropriate LCC Operator of the contingent actions required to ensure system reliability and voltage control.
4. Notify the appropriate LCC of all AVR and PSS outages covered by this procedure.


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8. Logging Requirements

NOTE

All logging, as defined in this Section, shall be retained for a minimum period of 12 rolling months for consistency with NERC and NPCC standards.


- A. The Market Participant Generating Station Operator (or designee) and the LCC Operator are responsible for logging and tracking the status of AVRs and PSSs.
- B. During normal and abnormal operating conditions, the ISO Control Room Staff shall maintain records of AVR and PSS status.

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9. Revision History

Rev. No.	Date	Reason
1	06/01/90	
2	09/07/01	
3	09/01/04	Standardize procedure format and incorporate RTO language changes
4	03/24/05	Update to NERC Version 0 Standards
5	5/19/05	Added notification to the ISO Technical Studies group immediately if a generator automatic voltage regulator or power system stabilizer is to be removed from service or is to be returned to service
6	11/16/06	Revised procedure titles and nomenclature as part of the annual review
7	03/16/09	Biennial Review by Procedure Owner; Globally: Replaced Manager, Operations with Director, Operations in Header; Changed Header Review Due Date: from a fixed calendar date to be 24 months from the Revision Date;; Defined the following Terms and their acronyms: ISO New England (ISO), Local Control Center (LCC), System Control And Data Acquisition (SCADA); Minor reformat for consistency: use of dash in between OP & the number (e.g. OP-4); Complete rewrite of Section 6.0; Globally replaced Local Control Center/SCADA Center System Operator with LCC Operator; In steps 7.1.B.,7.2.A and 7.3.C. replaced ISO New England Control Room Staff with ISO Outage Coordination Staff; Step 7.1.C added "...real-time..."; Step 7.2.A added "...planned..."; Step 7.2.B. added "...for planned outages."; Step 7.3.A changed "...Technical Studies..." to "...Real-time Support..."added "...(on-call engineer..."; Step 7.3.B. added "...planned..." and "...Outage Coordination and..."
8	04/15/10	Biennial review by procedure owner; Added disclaimer to title page footer; Global minor format changes, changed text font to Arial Updated reference section Used acronyms for AVR, PSS, ISO, LCC, etc. as applicable throughout document; Overall objective of changes is to add/clarify language to more clearly and fully express how ISO meets certain NERC VAR-001 Requirements; Clarified language pertaining to the conduct of studies; Added requirement for the ISO System Operations Support group to annually notify the Generator Operators of the generators listed on the confidential M/LCC 8, Attachments A & B that their generators are listed therein; Added description of ISO criteria for exempting generators from Certain Voltage and Reactive Requirements; Added requirement for generators to contact ISO/LCC prior to taking AVR/PSS out of service to request evaluation/approval; Added criteria for evaluating the impact of an AVR or PSS outage;

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10. Attachments

Attachment A – Generators without an AVR and are Grandfathered

Attachment B – Generators Requiring PSS devices in/out of Service