

A. Introduction

1. Title: Power System Stabilizer Requirement

2. Number: MPRC-018-0

3. Purpose:

To ensure that power system stabilizers are installed, designed and tuned as required to dampen small signal oscillations in the Midwest Reliability Organization (MRO)

4. Applicability

4.1. Planning Authority

4.2. Transmission Planner

4.3. Generator Owner

5. (Proposed) Effective Date: January 1, 2006

B. Requirements

R1. Unless exempted by the Midwest Reliability Organization, the Generator Owner shall install power system stabilizers on all generator units 100 MVA or larger, prior to the generator's in-service date or as required by changes in system conditions, when one or more of the conditions given in R1.1 through R1.3 exist. The Midwest Reliability Organization exemption criteria shall, at a minimum, include consideration of the type of generator (e.g. peaking vs. base load), age of unit, economic justification, outage time required to add a power system stabilizer, and location. The power system stabilizer is to be kept in-service except for normal maintenance and testing purposes. The Generator Owner shall make provision to allow for the future addition of a power system stabilizer on all generator units 100 MVA or larger, prior to the generator's in-service date, if none of the following conditions exist:

R1.1. Small signal stability assessments periodically conducted, by the Planning Authority or Transmission Planner, as required in Reliability Standard MPRC-018-0, R2, provide evidence of high generator relative participation (relative participation factors greater than 10%) in a range of local, inter-plant and inter-area modes (i.e. 0.1 to 2.0 Hz) that show instability or inadequate damping. The minimum damping ratio standard is defined in the MRO System Performance Table in Reliability Standard MTPL-001-0. A more restrictive damping ratio may be determined by the Planning Authority.

R1.2. Automatic voltage regulator (AVR) open-circuit 2% and/or 5% step-response field tests performed by the Generator Owner, as required in Reliability Standard MPRC-018-0 R6, show instability or inadequate damping at the expected AVR gain settings. The minimum damping ratio standard is defined in the MRO System Performance Table in Reliability Standard MTPL-001-0. A more restrictive damping ratio may be determined by the Planning Authority.

R1.3. System performance assessments performed by the Planning Authority or Transmission Planner for disturbances defined in Categories A, B, and C of Table 1 in Reliability Standard TPL-001-0, TPL-002-0, TPL-003-0 and MTPL-001-0 show instability or inadequate damping.

R2. Small signal stability assessments shall be performed by the Planning Authority or Transmission Planner, based upon their responsibilities. The assessments shall be conducted at least every five years unless it can be demonstrated that significant system

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changes have not occurred since the last assessment. In the event a study is not conducted after five years, system conditions will be reviewed annually until a new small signal stability assessment is conducted. The initial system conditions for small signal stability assessments shall include:

R2.1. The effect of different system loading conditions (light load and peak load).

R2.2. The effect of transmission contingencies (defined in Categories B and C of Table 1 in Reliability Standard TPL-002-0 and TPL-003-0) prior to the implementation of any post-contingency system adjustments that may be manually implemented by the System Operator.

R2.3. The effect of increasing the power transfer to the TTC on constrained interfaces.

R3. The Planning Authority or Transmission Planner, based upon their responsibilities, shall demonstrate through valid assessment that any power system stabilizer required in accordance with MPRC-018-0_R2 has been designed and tuned to have a positive damping effect on local generator oscillations as well as inter-plant and inter-area oscillations without deteriorating turbine-generator shaft torsional oscillation damping. To be valid, the Planning Authority or Transmission Planner assessments shall:

R3.1. Be made prior to the in-service date of the generator and as required by changes in system conditions.

R3.2. Ensure system performance as defined in Categories A, B, and C of Table 1 in Reliability Standard TPL-001-0, TPL-002-0, TPL-003-0 and MTPL-001-0.

R3.3. Provide results from small signal stability model data verification tests as prescribed in Reliability Standard MPRC-018-0_R6 and other dynamic model data verification tests prescribed by NERC and the MRO.

R3.4. Provide results from any small signal stability studies required in the design of the power system stabilizer.

R4. When System simulations indicate an inability of the power system stabilizer to respond as prescribed in Reliability Standard MPRC-018-0_R3.2, the Planning Authority or Transmission Planner, based upon their responsibilities, shall provide a written summary of its corrective plan to achieve the required system performance.

R5. The Planning Authority or Transmission Planner, based upon their responsibilities, shall, within thirty (30) calendar days of a request, provide to the Midwest Reliability Organization the results of its small signal stability and system performance assessments, power system stabilizer plans and corrective plans.

R6. Where a power system stabilizer is required on a generating unit(s) in accordance with MPRC-018-0_R1, the Generator Owner shall perform small signal stability model verification tests for excitation systems (including voltage regulator controls and power system stabilizers) on the unit(s) that require the power system stabilizer in accordance with Midwest Reliability Organization requirements. The Generator Owner shall, within thirty (30) calendar days of a request, provide to the Midwest Reliability Organization and applicable Planning Authority(s) and Transmission Planner(s) the results of its most recent excitation system small signal stability model data verification tests for excitation systems (including voltage regulator controls and power system stabilizers) in accordance with Midwest Reliability Organization requirements. The excitation system small signal stability model data verification tests shall include at minimum:

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R6.1.1. Open-circuit frequency-response test to verify the linear characteristics of excitation systems (including voltage regulator controls and power system stabilizers).

R6.1.2. Open-circuit step-response test to verify the gains and time constants of excitation systems (including voltage regulator controls and power system stabilizers).

R6.1.3. The tests should be conducted within the first year of service and repeated every five years thereafter or as specified by MRO testing requirements.

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C. Measures

M1. The Generator Owner shall have evidence it has installed or made provisions to install a power system stabilizer as specified in Reliability Standard MPRC-018-0_R1.

M2. The Planning Authority shall have a valid small signal stability assessment as specified in Reliability Standard MPRC-018-0_R2.

M3. The Planning Authority shall have a valid assessment and corrective plan as specified in Reliability Standard MPRC-018-0_R3 and MPRC-018-0_R4.

M4. The Planning Authority shall have evidence it reported documentation of results of its assessments and power system stabilizer and corrective plans per Reliability Standard MPRC-018-0_R5.

M5. The Generator Owner shall have evidence it provided the Regional Reliability Organization and applicable Planning Authority(s) and Transmission Planner(s) with small signal stability model data verification test results for excitation systems (including voltage regulator controls and power system stabilizers) per Reliability Standard MPRC-018_R6.

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D. Compliance

1. Compliance Monitoring Process

1.1. Compliance Monitoring Responsibility

Midwest Reliability Organization

1.2. Compliance Monitoring Period and Reset Timeframe

The Performance-Reset period shall be one calendar year from the last finding of non-compliance.

1.3. Data Retention

The Planning Authority or Transmission Planner shall, based upon their responsibilities, retain assessments for five years.

The Generator Owner shall retain information from the most current and prior small signal stability model data verification tests.

In addition, entities found non-compliant shall keep information related to the non-compliance until found compliant.

The Compliance Monitor shall retain the last audit and all subsequent compliance records.

1.4. Additional Compliance Information

The Planning Authority, Transmission Planner and Generator Owner shall demonstrate compliance through the following methods, as determined by the compliance monitor: Self certification or Audit (periodic, as part of targeted monitoring or initiated by complaint or event).

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2. Levels of Non-Compliance

- 2.1. Level 1: Assessment and/or corrective plan was supplied to the MRO but was incomplete in one or more areas.
- 2.2. Level 2: Generator Owner did not verify the data used in small signal stability models for excitation systems (including voltage regulator controls and power system stabilizers).
- 2.3. Level 3: A valid assessment and corrective plan were not provided.
- 2.4. Level 4: A power system stabilizer was not installed and kept in-service under normal conditions in accordance with a corrective plan.

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will periodically be conducted by the Planning Authority, Transmission Planner and Generator Owner on all generating units larger than 70 MVA prior to the generator in-service date.

The Planning Authority, the Transmission Planner, and the Generation Owner shall also at least every five years thereafter review system condition changes to determine if an additional small signal stability assessment is required.

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the MRO Disturbance-Performance

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by NERC and the MRO such as:

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Frequency response test to verify the linear characteristics of the Power System Stabilizer or equivalent device.

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(e.g. install an equivalent device (e.g. power system stabilizer) to an existing Transmission Control Device)

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Transmission Planner and Generator Owner

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and shall provide the results to the Midwest Reliability Organization within thirty (30) days upon completion of the assessment.