

**Definitions of Terms Used in Standard**

*This section includes all newly defined or revised terms used in the proposed standard. Terms already defined in the NERC Reliability Standards Glossary of Terms or the Midwest Reliability Organization (MRO) Reliability Standards Glossary of Terms are not repeated here. New or revised definitions listed below become approved when the proposed standard is approved. When the standard becomes effective, these defined terms will be removed from the individual standard and added to the MRO Glossary.*

No new definitions are required.

**A. Introduction**

**1. Title: System Performance Requirement**

**2. Number: MTPL-001-0**

**3. Purpose:**

To ensure adequate interconnected transmission system performance in the MRO.

**4. Applicability**

**4.1. Planning Authority**

**4.2. Transmission Planner**

**5. (Proposed) Effective Date: January 1, 2007**

**B. Requirements**

**R1.** The Planning Authority and Transmission Planner shall each demonstrate through valid assessment or assessments that its portion of the interconnected transmission system is planned such that the network can be operated to supply projected customer demands and projected Firm (non-recallable reserved) Transmission Services, at all demand levels over the range of forecast system demands, under the conditions defined in Category A of Table I of NERC TPL-001-000, the contingency conditions in Categories B and C of Table I of NERC TPL-002-000 and NERC TPL-003-000, and the contingency conditions as defined in the MRO System Performance Table (attached). To be valid, the Planning Authority and Transmission Planner assessment shall:

**R1.1** Be performed annually.

**R1.2** Be conducted for near-term (years one through five) and longer-term (years six through ten) planning horizons.

**R1.3** Be supported by a current or past study and/or system simulation testing associated with the categories shown in the MRO System Performance Table. The specific elements selected (from each of the categories) for inclusion in these studies and simulations shall be acceptable to the MRO. The studies and/or simulation testing shall:

**R1.3.1** Be performed and evaluated for those Category B and C contingencies that would produce the most severe system results or impacts. The rationale for the contingencies selected for evaluation shall be available as supporting information. An explanation of why the remaining simulations would produce less severe system results shall be available as supporting information.

**R1.3.2** Cover critical system conditions and study years as deemed appropriate by the responsible entity.

**R1.3.3** Be conducted annually unless changes to system conditions do not warrant such analyses.

**R1.3.4** Be conducted beyond the five-year horizon only as needed to address identified marginal conditions that may have longer lead-time solutions.

**R1.3.5** Have all projected firm transfers modeled.

**R1.3.6** Be performed and evaluated for selected demand levels over the range of forecast system demands.

- R1.3.7** Demonstrate that System Performance meets the MRO System Performance Table for Categories A through C.
- R1.3.8** Include existing and planned facilities.
- R1.3.9** Include the effects of existing and planned protection systems, including any backup or redundant systems.
- R1.3.10** Include the effects of existing and planned control devices.
- R1.3.11** Demonstrate that out-of-step relay margins are within applicable limits, as defined in the MRO System Performance Table.
- R1.3.12** Demonstrate that machine rotor angle oscillations are within damping limits as defined in the MRO System Performance Table.
- R1.3.13** Be performed with the applicable rating for each Category C disturbance that is the facility thermal rating and system voltage limit, as defined by the facility owner assuming acceptable loss of life, that protects against instability (including voltage instability), uncontrolled separation, or cascading outages, consistent with transient voltage deviation limits, power oscillation damping ratio limits, and relay trip limits as provided in the MRO System Performance Table. In setting the Applicable Rating, consideration must be given to the effects of high thermal loading, the effects of large steady-state voltage deviations, and the relay tripping values of all relay types.
- R1.3.14** Demonstrate that Normal Clearing of single line to ground (SLG) faults in Category B2 disturbances include both single pole tripping if enabled with successful reclosing and single pole tripping if enabled with unsuccessful reclosing due to permanent SLG fault followed by Normal Clearing.
- R1.4** Address any planned upgrades needed to meet the performance requirements of the MRO System Performance Table.
- R1.5** Demonstrate by a current or past study and/or system simulation testing that Systems are capable of readjustment within 30 minutes so that Interconnection Reliability Operating Limit (IROL) facility loadings are within Normal Facility Ratings and IROL facility voltage levels are within Normal system voltage limits following a NERC Category B or C disturbance in NERC TPL-002-0 and TPL-003-0, respectively. Permissible automatic and manual system readjustments are defined in the MRO System Performance Table (notes 2 and 3).
- R2.** When studies or system simulations indicate an inability to meet the performance requirements of the MRO System Performance Table, the Planning Authority and Transmission Planner shall determine corrective plans to achieve the required system performance as described above throughout the planning horizon.
- R3.** The Planning Authority and Transmission Planner shall each document the results of these Reliability Assessments and corrective plans and shall annually provide these assessments and plans to the MRO.

**C. Measures**

- M1.** The Planning Authority and Transmission Planner shall have valid assessments and corrective plans as specified in MTPL-001-0\_R1 and MTPL-001-0\_R2.

**M2.** The Planning Authority and Transmission Planner shall have evidence it reported documentation of results of its assessments and corrective plans per MTPL-001-0\_R3.

**D. Compliance**

**1. Compliance Monitoring Process**

**1.1. Compliance Monitoring Responsibility**

Midwest Reliability Organization

**1.2. Compliance Monitoring Period and Reset Timeframe**

Annually

**1.3. Data Retention**

None specified.

**1.4. Additional Compliance Information**

None.

**2. Levels of Non-Compliance**

**2.1. Level 1:** Not applicable.

**2.2. Level 2:** Valid assessments and corrective plans for the longer-term planning horizon are not available.

**2.3. Level 3:** Not applicable.

**2.4. Level 4:** Valid assessments and corrective plans for the near-term planning horizon are not available.

**Version History**

Version	Date	Action	Change Tracking

**MRO SYSTEM PERFORMANCE TABLE<sup>1</sup>**

NERC Categories	Transient Voltage Deviation Limits (Up to 20 seconds)	Post Transient Voltage Deviation Limits (20 seconds to 30 minutes)	Post Transient Facility Seasonal Loading Limits (20 seconds to 30 minutes)	Rotor Angle Oscillation Damping Ratio Limits (Up to 20 seconds)	Out-of-Step Relay Trip Margin Limits (Up to 20 seconds)
A	Nothing in addition to NERC Requirements (See Notes 10 and 11)				Not to be less than 110%.  (Canada – U.S. Interface) (See Note 9)
B (See Notes 2, 6, and 7)	Not to exceed 1.3 p.u. maximum or 0.68 p.u. minimum at any bus. (See Note 5)	Not to exceed 1.15 p.u. maximum or 0.85 p.u. minimum at any bus. (See Note 5)	Not to exceed 125% for lines/station equipment and 135% for transformers (See Note 5)	Not to be less than 0.0081633 for disturbances with faults or less than 0.0167660 for line trips. (See Notes 5 and 8)	Not to be less than 25% transiently (Canada – U.S. Interface) (See Note 9)
C (See Notes 3, 6, and 7)	Not to exceed 1.3 p.u. maximum or 0.68 p.u. minimum at any bus. (See Note 5)	Not to exceed 1.15 p.u. maximum or 0.85 p.u. minimum at any bus. (See Note 5)	Not to exceed 125% for lines/station equipment and 135% for transformers (See Note 5)	Not to be less than 0.0081633 for disturbances with faults or less than 0.0167660 for line trips. (See Notes 5 and 8)	Not to be less than 25% transiently (Canada – U.S. Interface) (See Note 9)
D (See Note 4)	Nothing in addition to NERC Requirements				

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### Notes:

1. The MRO System Performance Table applies to the initial transient period following the contingency (up to 20 seconds) and the post-disturbance period (20 seconds to 30 minutes).
2. The following summarizes the automatic and manual readjustments that are permissible for all NERC Category B disturbances.
  - A. Generation adjustments (Spinning and Non-Spinning Operating Reserve) - Reducing or increasing generation while keeping the units on-line or by bringing additional units on line. The amount of generation change is limited to that amount that can be accomplished within the readjustment period. Due consideration shall be given to start up time and ramp rates of the units.
  - B. Capacitor and reactor switching - The number of capacitors and reactors, which may be switched, is limited to those which could be switched during the readjustment period.

This includes those capacitors and reactors that would be switched by automatic controls within the same period.
  - C. Adjustment of Load Tap Changers (LTCs) to the extent possible within the readjustment period. This includes both LTCs which would automatically adjust and those under operator control which could be adjusted within the readjustment period.
  - D. Adjustment of phase shifters to the extent possible within the readjustment period. Agreement must be obtained from the owner(s).
  - E. Adjustment of the amount of the flow the HVDC can be increased or decreased within the readjustment period
  - F. Generation rejection – Generation may be rejected in one of two methods; tripping the generating unit or tripping generation-supported tie lines. For either method, the amount of effective generation rejection within the readjustment period shall not exceed the normal operating reserve of the generation reserve sharing pool of which the MRO Member belongs or of the MRO Member itself if the MRO Member self-provides generation reserves.
  - G. Transmission reconfiguration - Automatic and operator initiated tripping of transmission lines or transformers within the readjustment period.
  - H. Non-firm Load Shed – Automatic or manual tripping of Interruptible Load or curtailment of or pre-determined redispatching of Non-Firm Point-to-Point Transmission Service within the readjustment period.
3. The following additional readjustments may be considered for all NERC Category C contingencies.
  - A. Generation Rejection – One nuclear unit may be rejected as long as the loss is less than or equal to the normal operating reserve of the generation reserve sharing pool of which the MRO Member belongs or of the MRO Member itself if the MRO Member self-provides generation reserves .
  - B. Firm Load Shed – Automatic or manual tripping of firm Network or Native Load or curtailment of or predetermined redispatching of Firm Point-to-Point Transmission Service and Firm Transmission Network Service.
4. The following additional readjustments may be considered for all NERC Category D contingencies.

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- A. It is assumed that some planned and controlled islanding will occur for the most credible extreme disturbances. Automatic underfrequency load shedding as specified in NERC PRC-006-0 is expected to arrest declining frequency and generation rejection is expected to arrest increasing frequency in order to assure continued operation within the resulting islands.
  - B. Automatic undervoltage load shedding is permissible to arrest declining voltages and prevent widespread voltage collapse.
5. The criteria listed in the MRO System Performance Table are the least restrictive limits for buses within the MRO for conditions that do not require special qualifications such as maximum kV for fast switched capacitor buses or emergency ratings when pre-contingent loadings are less than 90%. Specific buses, Balancing Authority Areas or companies may have more restrictive criteria. Refer to the Planning Authority, Transmission Planner, Reliability Coordinator and/or the MRO Member for information about other specific reliability criteria.
  6. Apparent impedance transient swings into the inner two zones of distance relays are unacceptable for NERC Category B disturbances, unless documentation is provided showing the actual relays will not trip for the event. Apparent impedance transient swings into the inner two zones of distance relays are unacceptable for NERC Category C disturbances, unless documentation is provided that demonstrates that a relay trip will not result in instability (including voltage instability), uncontrolled separation, or cascading outages.
  7. A minimum of one-half cycle shall be added as a safety margin when as-built model data is used to determine the actual or planned fault clearing time. A minimum of one-cycle shall be added as a safety margin when estimated model data is used to determine the actual or planned fault clearing time.
  8. The machine rotor angle damping ratio is determined by modal analysis (e.g. Prony analysis or equivalent). Alternatively, the Rotor Angle Oscillation Damping Factor or Successive Positive Peak Ratio (SPPR) can be calculated directly from the rotor angle, where the rotor angle response allows such direct calculation. For a disturbance with a fault, the SPPR must be less than 0.95 or the damping factor must be greater than 5%. For a disturbance without a fault, the SPPR must be less than 0.90 or the damping factor must be greater than 10%. Refer to the Planning Authority, Transmission Planner, and/or the MRO Member for a description of the calculation methodology.
  9. The parameters listed in the MRO System Performance Table are the minimum limits on MRO's Canada-U.S. interface. Refer to the Planning Authority, Transmission Planner, and/or the MRO Member for other specific reliability criteria, detailed descriptions and margin definitions.
  10. Bulk transmission bus voltage levels between 0.95 P.U. and 1.05 P.U. of the nominal voltage base of the System. Refer to the Planning Authority, Transmission Planner, and/or the MRO Member for other reliability criteria.
  11. Facility loadings shall not exceed 100% of the Normal Rating (Rate A) for lines or 100% of the Normal Rating for transformers.