

## Evaluation of Midwest Reliability Organization (MRO) Regional Standards

### Executive Summary

The MRO submitted four Regional Standards for NERC Evaluation:

- RES-501-MRO-01 — Planned Resource Adequacy Assessment,
- PRC-502-MRO-01 — Power System Stabilizer Requirement,
- TPL-503-MRO-01 — System Performance, and
- TPL-504-MRO-01 — Subsynchronous Resonance (“SSR”) Assessment

MRO submitted these standards for NERC Evaluation on February 11, 2008 prior to NERC 45-day posting. NERC acknowledged receipt of the proposed standards and associated documentation on February 11, 2008. NERC began a cursory review of the standards in tandem with the 45-day public posting period. The standards were posted beginning March 6–April 19, 2008. The four MRO proposed standards received several comments during the NERC public posting. MRO supplied NERC with their responses to the comments on May 29, 2008. No conforming changes were made to the standards. The responses to comments are posted on the NERC website.

The Regional Reliability Standards Evaluation Procedure indicates that NERC is to evaluate requests to approve regional standards. NERC performed an evaluation of the four proposed MRO regional reliability standards as required in the procedure and identified several shortcomings and issues with the proposed standards. In addition, NERC identified inconsistencies with the continent-wide standards under development.

### Summary of Findings

The NERC evaluation of the proposed standards revealed several shortcomings and issues. This following section summarizes these findings.

#### Inconsistencies with NERC Standards Under Development

All four proposed regional reliability standards are inconsistent with the current standards under development. The standards do not contain:

- Time Horizons
- Effective dates that conform to the NERC template (first day of first quarter after...)
- Violation Severity Levels in clear table format

The VSLs contained in TPL-503-MRO-01 are particularly inconsistent because they do not make specific reference to the requirements but rather are general in nature.

In addition, while the standards contain measures for each requirement the measures are not clear and indicative of what is expected to be produced as evidence that the referred to requirement was met. The measures are all written in the same format. The functional entity shall demonstrate it has met the requirement as stated in RXX. The lack of clear, concise and consistent compliance elements will be impediment to meeting the FERC criteria that a standard must include clear and understandable consequences and a range of penalties (monetary and/or non-monetary) for a violation. Also, that the proposed reliability standard must identify clear and objective criterion or measures for compliance, so that it can be enforced in a consistent and non-preferential manner (criteria five and six).

### **Poorly Written Requirements**

The requirements for all the proposed standards are not free of explanatory text, examples and other extraneous information. They suffer from lack of clarity by being lengthy in nature whereas they could be concise and explicit in stating expectations.

Requirement R1, for example, in the proposed regional standard TPL-503-MRO-01 makes references to the continent wide TPL standards without referencing the version numbers. This exacerbates the issues with lack of clarity within the requirements.

Issue/Concern	MRO Standard	Example	Comments
Missing <b>Time Horizons</b>	All standards	N/A	
<b>Effective Date</b> – Does not conform To NERC Suggested language	PRC-502-MRO-01	Upon MRO Board Approval compliance monitoring for PRC-502-MRO-01 will begin. One year after Canadian provincial agency exercising regulatory authority over an MRO member and FERC approval, financial sanctions for PRC-502-MRO-01 sanctions for PRC-502-MRO-01 will become effective.	This same effective date format is used for all four MRO standards. I would Like MRO to provide an explanation for the year provision in the standards.
<b>Violation Severity Levels</b>	TPL-503-MRO-01	<b>Violation Severity Levels</b>  <b>Lower:</b> Not applicable.  <b>Moderate:</b> Valid assessments and corrective plans for the longer-term planning horizon are not available.  <b>High:</b> Not applicable.  <b>Severe:</b> Valid assessments and corrective plans for the near-term planning horizon are not available.	All of the proposed Standards contain VSLs that are ambiguous and not in the NERC table format. This first example provided is the most ambiguous of all the standards. <b>The TPL-503-MRO-01 standard contains three requirements but none are referenced in these VSLs.</b>
	PRC-502-MRO-01	<b>Violation Severity Levels</b>  <b>Lower:</b> Transmission Planner or Planning Coordinator assessment(s) and/or corrective plan(s) for its portion of the interconnected transmission system was supplied to the MRO in accordance with R5 but was incomplete in one or more areas of R2, R3 or R4.  <b>Moderate:</b> Transmission Planner or Planning	

		<p>Coordinator did perform a small signal stability assessment in accordance with R2 and determined a corrective plan in accordance with R3 for its portion of the interconnected transmission system but did not provide documentation to the MRO in accordance with R5.</p> <p>Transmission Planner or Planning Coordinator did perform a PSS assessment for its portion of the interconnected transmission system in accordance with R4 but did not provide documentation to the MRO in accordance with R5.</p> <p>Generator Owner did not make provisions for the future addition of a PSS in accordance with R1.</p> <p>Planning Coordinator did not develop and document a rotor angle damping criteria and calculation methodology in accordance with R8.</p> <p><b>High:</b> Transmission Planner or Planning Coordinator did not perform a small signal stability assessment and determine a corrective plan for its portion of the interconnected transmission system in accordance with R2 and R3. The Transmission Planner or Planning Coordinator did not perform a PSS assessment for its portion of the interconnected transmission system in</p>	
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		<p>accordance with R4.</p> <p>Generator Owner did not verify the small signal model data for the excitation systems (including automatic voltage regulator controls and PSSs) and performance of the excitation systems in accordance with R6.</p> <p>Generator Owner did not maintain a PSS operational log in accordance with R7.</p> <p><b>Severe:</b> Generator Owner did not install or retune a PSS or keep the PSS in-service under normal conditions in accordance with a corrective plan in accordance with R3 and R7.</p>	
	RES-501-MRO-01	<p><b>Violation Severity Levels</b></p> <p><b>Lower</b> The reporting requirement of RES-501-MRO-01_R3 was not met.</p> <p><b>Moderate</b> A valid assessment was not performed in accordance with RES-501-MRO-01_R2.</p> <p><b>High</b> Not Applicable.</p> <p><b>Severe</b> A valid assessment was not performed in accordance with RES-501-MRO-01_R1.</p>	
	TPL-504-MRO-01	<p><b>Violation Severity Levels</b></p> <p><b>Lower:</b> Transmission Planner provided an SSR</p>	

		<p>assessment and corrective plan to the MRO per R3, but the assessment and/or corrective plan was incomplete in one or more areas of R1 and R2.</p> <p><b>Moderate:</b> Transmission Planner performed a SSR assessment and corrective plan per R1 and R2 but documentation was not provided to the MRO or any impacted Transmission Owner(s) or Generator Owner(s) per R3.</p> <p>Generator Owner gathered and/or developed generator manufacturer data and/or results from field tests but did not provide to the Transmission Planner per R5.</p> <p><b>High:</b> Transmission Planner did not perform a SSR assessment and/or corrective plan per R1 and R2.</p> <p>Generator Owner did not gather and/or develop generator manufacturer data and/or results from field tests per R5.</p> <p>Transmission Owner, Generator Owner or Generator Operator, as applicable, did not report operational status changes of SSR countermeasures within thirty (30) minutes to the Transmission Operator per R4.</p> <p><b>Severe:</b> Transmission Planner did not determine and implement a corrective plan per R2 where a SSR assessment indicated a need for a corrective plan or a SSR event was reported.</p>	
Poorly written	PRC-502-MRO-01	<b>M1.</b> The Generator Owner shall have evidence it has installed or made	All Measures provide no

<b>Measures</b>		provisions to install a power system stabilizer as specified in MRO Regional Reliability Standard PRC-502-MRO-01_R1.	additional clarity as to what is expected to be produced as evidence that a requirement has been met.
	TPL-504-MRO-01	<b>M1.</b> The Transmission Planner shall have a valid SSR assessment and corrective plan as specified in MRO Regional Reliability Standard(s) TPL-504-MRO-01_R1 and TPL-504-MRO-01_R2.	
	RES-501-MRO-01	<b>M1.</b> The LSE and/or its delegate(s) shall have a valid planned Resource Adequacy assessment covering the 10 year planning horizon per RES-501-MRO-01_R1.	
	TPL-503-MRO-01	<b>M1.</b> The Planning Coordinator and Transmission Planner shall have valid assessments and corrective plans as specified in MRO Regional Reliability Standards TPL-503-MRO-01_R1 and TPL-503-MRO-01_R2.	
<b>Poorly written Requirements</b>	PRC-502-MRO-01	<b>R1.</b> <i>[Violation Risk Factor: Medium]</i> . The Generator Owner shall install power system stabilizers on all new <sup>1</sup> or substantially modified <sup>2</sup> generator units with a nameplate rating 100 MVA or larger, prior to the generator's in-service date or as required by changes in system conditions, when	Several points: There is a lot of extra information that is not needed.  There are references to

<sup>1</sup> A new generator is a generator that receives Planning Coordinator agreement to interconnect to the Bulk Electric System after the effective date of this standard.

<sup>2</sup> A generator modification is considered substantial if it results in a change in the real power output by more than 10% of the original nameplate rating or more than 20 MW, whichever is less or includes any of the following: generator rewind, rotor replacement, new or refurbished excitation system, or turbine replacement. A substantially modified generator is a generator that receives Planning Coordinator agreement to make the generator modification after the effective date of this standard.

		<p>all of the following conditions exist:</p> <ul style="list-style-type: none"> <li>a. Small signal stability assessments performed by the Transmission Planner or Planning Coordinator as required in MRO Regional Reliability Standard PRC-502-MRO-01_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 small signal instability or inadequate damping. Inadequate damping is defined as a violation of the minimum acceptable damping criteria determined by the Planning Coordinator for local and inter-plant modes as defined in MRO Regional Reliability Standard <b>PRC-502-MRO-01_R8</b> and determined by the MRO for inter-area modes as defined in MRO Regional Reliability Standard TPL-503-MRO-01.</li> <li>b. System performance assessments performed by the Transmission Planner or Planning Coordinator, for disturbances defined in Categories B and C of Table 1 in Reliability Standard TPL-002-0, TPL-003-0 and MRO Regional Reliability Standard TPL-503-MRO-01, show inadequate damping. Inadequate damping is as previously defined above in R1(a).</li> <li>c. The generator is equipped with a suitable exciter that is able to enhance the effectiveness of the Power System Stabilizer (“PSS”) in providing positive damping to local, inter-plant and inter-area modes. The Transmission Planner shall determine whether the Generator Owner’s exciter is suitable for a PSS installation. The exciter assessment shall consider the measured or calculated closed-loop phase response of the generator, exciter and power system and the ability</li> </ul>	<p>other Requirements within the standard making the requirement very confusing.</p> <p>You could argue that this requirement could be broken out into several requirements.</p>
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		<p>of the PSS to overcome the combined phase lag.</p> <p>When conditions (a) and (b) do not exist but (c) does exist, the Generator Owner, at minimum, shall make provisions to allow for the future addition of a PSS on all new generator units 100 MVA or larger, prior to the generator's in-service date. The automatic voltage regulator shall be designed capable of accepting a PSS input signal and the appropriate PSS input signal transducers determined by the Planning Coordinator shall be installed.</p>	
	RES-501-MRO-01	<p><b>R3.</b> <i>[Violation Risk Factor: Lower].</i> Each LSE shall report to the MRO within 90 days of the effective date of RES-501-MRO-01_R3, for each portion of its load whether the LSE or its delegate will be performing the studies, providing the results, or reporting, as required, in order to meet Reliability Standards RES-501-MRO-01_R1 and R2 for that portion of its load. If the LSE delegates the tasks for RES-501-MRO-01_R1 and R2 for a portion of its load, the LSE will also indicate which Planned Reserve Sharing Group, or Resource Planner is delegated the tasks for Reliability Standard RES-501-MRO-01_R1 and R2 for that portion of its load. If a LSE changes the party to which the tasks were delegated, the LSE shall notify the MRO at least 90 days prior to the proposed change or 180 days prior to the planning period under review, whichever is greater. The LSE does not have to delegate all of the tasks in Reliability Standards RES-501-MRO-01_R1 and R2 to the same party. The LSE shall provide the MRO with evidence of acceptance of the delegation by the applicable party. All delegations are subject to</p>	<p>Same observations regarding the requirements in this standard.</p>

		<p>verification by the MRO.</p> <p>A LSE can meet this requirement for a portion of its load by providing confirmation in accordance with the reporting time requirements outlined in RES-501-MRO-01_R3 that, for that portion of its load, the LSE's load is in a Balancing Authority Area that accounts for the LSE's load in its planning process and that the Balancing Authority is a member of a Planned Reserve Sharing Group.</p>	
	<p>TPL-503-MRO-01</p>	<p><b>R1.</b> The Planning Coordinator 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-001-0, the contingency conditions in Categories B and C of Table I of NERC TPL-002-0 and NERC TPL-003-0, and the contingency conditions as defined in the MRO System Performance Table (attached). To be valid, the Planning Coordinator and Transmission Planner annual assessment being performed to meet the NERC TPL-001-0 through NERC TPL-004-0 that is conducted for near-term (years one through five) and longer-term (years six through ten) shall also: <i>[Violation Risk Factor: Lower]</i></p> <p style="padding-left: 40px;"><b>R1.1</b> Include current or past studies and/or simulation testing that:</p> <p style="padding-left: 80px;"><b>R1.1.1</b> Demonstrate that System Performance meets the MRO System</p>	

Performance Table for Categories A through C in the same way that the Planning Coordinator and Transmission Planner demonstrates it meets NERC TPL-001 through NERC TPL-004, such as:

**R1.1.1.1** Be performed annually unless changes to system conditions do not warrant such analyses.

**R1.1.1.2** Be conducted beyond the five-year horizon only as needed to address identified marginal conditions that may have longer lead-time solutions.

**R1.1.2** Demonstrate that machine rotor angle oscillations are within damping limits as defined in the MRO System Performance Table.

**R1.1.3** Be performed with the applicable rating for each Category C disturbance that is the facility thermal rating or system voltage limit as defined by the system or facility owner in compliance with NERC FAC-008.

**R1.1.3.1** Assuming acceptable loss of life, that protects against instability (including voltage instability), uncontrolled separation, or cascading outages, consistent with transient voltage deviation limits and rotor angle oscillation damping ratio limits as

		<p>provided in the MRO System Performance Table.</p> <p><b>R1.1.3.2</b> In setting the applicable rating, consideration must be given to the effects of high loading, the effects of large steady-state voltage deviations, and the relay tripping values of all relay types.</p> <p><b>R1.1.4</b> Include for Normal Clearing of single line to ground (SLG) faults in Category B2 disturbances consideration of 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.</p> <p><b>R1.2</b> Any two circuits of a multiple circuit towerline excludes transmission circuits where multiple circuit towers are used over a cumulative distance of 1 mile or less in length. Planning Coordinator and/or Transmission Planner may ask for a variance to the multiple circuit towerline exclusion from the MRO on a case by case basis for short distances that are longer than 1 mile (e.g., station entrance, river crossings).</p> <p><b>R1.3</b> Address any planned upgrades needed to meet the performance requirements of the MRO System Performance Table.</p> <p><b>R1.4</b> Demonstrate by a current or past study</p>	
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		<p>and/or system simulation testing that Systems are capable of readjustment within the readjustment period required by NERC standards so that facility loadings are within Normal Facility Ratings and 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).</p> <p>R1.5 A safety margin shall be added when estimated model data is used to determine the actual or planned fault clearing time. The Planning Coordinator and/or the Transmission Planner shall document the basis for the safety margin.</p>	
	<p>TPL-504-MRO-01</p>	<p><b>R4.</b> <i>[Violation Risk Factor: Medium]</i>. Each Transmission Owner, Generator Owner or Generator Operator that owns or operates a SSR countermeasure shall provide information to its Transmission Operator on a change in operational status of the SSR countermeasure within thirty (30) minutes, if the SSR countermeasure is critical to preventing subsynchronous resonance for any contingencies defined in Category B or Category C of Table I of Reliability Standard TPL-002-0 and TPL-003-0.</p>	<p>Use of phrases like “xx shall provide information” is not specific as to what information is to be provided. A clear example of unnecessary ambiguity.</p>