
**ONTARIO ENERGY BOARD
OF THE PROVINCE OF ONTARIO**

**NORTH AMERICAN ELECTRIC)
RELIABILITY CORPORATION)**

**PETITION OF THE
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION
FOR APPROVAL OF AN INTERPRETATION TO
RELIABILITY STANDARDS TPL-003-0a AND TPL-004-0**

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The North American Electric Reliability Corporation (“NERC”) hereby requests approval of a proposed interpretation to certain Requirements of two Reliability Standards:¹

- TPL-003-0a (System Performance Following Loss of Two or More Bulk Electric System Elements (Category C)); and
- TPL-004-0 (System Performance Following Extreme Events Resulting in the Loss of Two or More Bulk Electric System Elements (Category D)).

The interpretation, requested by the NERC Planning Committee’s System Protection & Control Subcommittee (“SPCS”),² was approved by the NERC Board of Trustees on February 7, 2013.

The interpretation request and response are included as **Exhibits A and B** respectively. **Exhibit H** contains the complete development record of the interpretation to the Reliability Standard requirement. **Exhibit I** contains the interpretation development team roster. The Reliability Standards with the appended interpretation are contained in **Exhibits C and D**.

¹ Unless otherwise designated, all capitalized terms shall have the meaning set forth in the *Glossary of Terms Used in NERC Reliability Standards*, available at http://www.nerc.com/files/Glossary_of_Terms.pdf.

² The purpose of the SPCS is to promote the reliable and efficient operation of the North American power system through technical excellence in protection system and control system design, coordination, and practices. See *System Protection and Control Subcommittee (SPCS) Scope*, available at http://www.nerc.com/docs/pc/spctf/Scope_SPCS_revised_20111214.pdf.

I. EXECUTIVE SUMMARY

The interpretation response in **Exhibit B** addresses Federal Energy Regulatory Commission (“FERC”) concerns documented in FERC Order No. 754 regarding protection system single points of failure. The interpretation involves two Reliability Standards – TPL-003-0a and TPL-004-0. The interpretation responds to two questions. The first question asks if an entity has the option of evaluating either of two conditions presented in Table 1 of the standards that are separated by “or.” The interpretation response states that an entity must evaluate both conditions on the basis of a structured reading of the text and information found in an associated footnote. The second question asks to what extent an entity must model a single point of failure of a protection system. To this question, the interpretation response states that an entity is permitted to use “engineering judgment” to select the protection system component failures for evaluation, which includes addressing all protection systems affected by the selected component.

The interpretation represents a reasonable reading of the Requirements and associated reference materials attached to the Reliability Standard and is just, reasonable, not unduly discriminatory or preferential, and in the public interest. The interpretation supports the stated purpose of the TPL-003 and TPL-004 Reliability Standards, which is to periodically conduct “[s]ystem simulations and associated assessments needed to ensure that reliable systems are developed that meet specified performance requirements, with sufficient lead time and continue to be modified or upgraded as necessary to meet present and future System needs.”

II. NOTICES AND COMMUNICATIONS

Notices and communications with respect to this filing may be addressed to the following:

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III. BACKGROUND

A. NERC Reliability Standards Development Procedure

NERC develops Reliability Standards in accordance with Section 300 (Reliability Standards Development) of its Rules of Procedure and the NERC Standard Processes Manual.³ NERC's proposed rules provide for reasonable notice and opportunity for public comment, due process, openness, and a balance of interests in developing Reliability Standards and thus satisfies certain of the criteria for approving Reliability Standards. The development process is open to any person or entity with a legitimate interest in the reliability of the Bulk-Power System. NERC considers the comments of all stakeholders, and a vote of stakeholders and the NERC Board of Trustees is required to approve a Reliability Standard before the Reliability Standard is submitted to the Applicable Governmental Authorities.

³ The NERC Rules of Procedure are available at <http://www.nerc.com/page.php?cid=1%7C8%7C169>. The current NERC Standard Processes Manual is available at http://www.nerc.com/files/Appendix_3A_StandardsProcessesManual_20120131.pdf.

B. Interpretations of Reliability Standards

All persons who are directly or materially affected by the reliability of the North American Bulk-Power System are permitted to request an interpretation of a Reliability Standard, as discussed in NERC's *Reliability Standards Development Procedure*, which is incorporated into the Rules of Procedure as Appendix 3A. Upon request, NERC will assemble a team with the relevant expertise to address the interpretation request and present an interpretation for industry ballot. If approved by the ballot pool and the NERC Board of Trustees, the interpretation is appended to the Reliability Standard and filed with the Applicable Governmental Authorities. When the affected Reliability Standard is next revised using the *Reliability Standards Development Procedure*, the interpretation will then be incorporated into the Reliability Standard.

C. Historical Background

In a December 8, 2009 filing, NERC submitted a proposed interpretation to Requirement R1.3.10 in Reliability Standard TPL-002-0 (System Performance Following Loss of a Single Bulk Electric System Element (Category B)). In a subsequent Notice of Proposed Rulemaking ("NOPR") issued on March 18, 2010, FERC proposed to remand NERC's interpretation.⁴ In Order No. 754,⁵ and in response to comments received, FERC reversed its NOPR proposal and approved NERC's proposed interpretation of Requirement R1.3.10 of TPL-002-0. However, in the final rule, FERC also directed NERC to submit an informational filing explaining "whether there is a further system protection issue that needs to be addressed and, if so, what forum and

⁴ *Interpretation of Transmission Planning Reliability Standard*, Notice of Proposed Rulemaking, 130 FERC ¶ 61,208 (2010).

⁵ *Interpretation of Transmission Planning Reliability Standard*, Order No. 754, 136 FERC ¶ 61,186 (2011).

process should be used to address that issue and what priority it should be accorded relative to other reliability initiatives planned by NERC.”⁶

A technical conference, titled “Staff Meeting on Single Point of Failure on Protection Systems”, was held by FERC on October 24-25, 2011 to discuss the issue. The technical conference was attended by representatives of FERC staff, NERC staff, and industry stakeholders with subject matter expertise in system protection and planning. The attendees focused on FERC’s concern in Order No. 754 regarding assessment of protection system failures.

Presentations given at the Technical Conference addressed: the voluntary transmission planning Reliability Standards from 1997 (pre-version 0 NERC Reliability Standards); the 2009 NERC Advisory to Industry;⁷ current mandatory Reliability Standards; an account of a June 14, 2004 outage event; and practices applied by entities in the Reliability *First* Corporation, Midwest Reliability Organization, Southwest Power Pool, Inc., Northeast Power Coordinating Council and Western Electricity Coordinating Council Regions. Altogether, NERC identified five events between 2004 and 2010 in which a single point of failure on a protection system caused, in whole or in part, an event on the Bulk-Power System.

At the technical conference, the attendees narrowed their concerns into four (4) consensus points:

- the concern with the study of a single point of failure is a performance-based issue, not a full redundancy issue;
- the existing approved Reliability Standards address assessments of single points of failure;

⁶ Order No. 754 at P 20.

⁷ *Industry Advisory, Protection System Single Point of Failure*, (Mar. 30, 2009), available at <http://www.nerc.com/fileUploads/File/Events%20Analysis/A-2009-03-30-01.pdf>.

- the assessments need to be sufficiently comprehensive regarding single points of failure of non-redundant primary protection (including backup) systems; and
- the lack of sufficiently comprehensive assessments of non-redundant primary protection systems is a reliability concern.

From the four consensus points, the technical conference attendees developed a problem statement to be used to address FERC's concern and "next steps" were determined for NERC to be responsive to FERC's directive.

Three individual processes were identified to address FERC's concern:

- a request for interpretation of the applicable and currently enforceable transmission planning standard(s), potentially including Reliability Standards TPL-001, TPL-002, TPL-003, and TPL-004;
- a request for data or information, as allowed by the NERC Rules of Procedure, Section 1600, that could be used to determine the potential exposure to and reliability risk associated with the single point of failure concern; and
- use of NERC's Project 2009-07, Reliability of Protection Systems, as necessary, to develop an appropriate new reliability standard that addresses the single point of failure concern.

D. Interpretation 2012-INT-02

A request for interpretation, as noted above, was prepared with input from FERC staff and industry stakeholders, which identified Reliability Standards TPL-003-0a and TPL-004-0 as the Standards that address potential single points of failure issues. More specifically, Requirements R1.3.7, R1.3.10, and R1.5 in TPL-003-0a and Requirements R1.3.7 and R1.4 in TPL-004-0 were identified as the specific Requirements that pertain to the issue of protection

system failure. The request for interpretation was brought before the SPCS and the Transmission Issues Subcommittee at a joint meeting on December 6-8, 2011. The two groups jointly reviewed the work of the interpretation team. The SPCS agreed to sponsor the request for interpretation in accordance with the NERC Standards Process Manual. The finalized request for interpretation was submitted to NERC on January 27, 2012, and subsequently accepted by the NERC Standards Committee Executive Committee on February 3, 2012. The Standards Committee Executive Committee directed NERC staff to assemble an interpretation drafting team and designate the request for interpretation as a high priority. By directing NERC staff to address the request for interpretation as a “high priority,” the Standards Committee Executive Committee addressed FERC’s directive to determine the appropriate priority for responding to the single point of failure concern.⁸

The request for interpretation sought to address the second and fourth consensus points from the technical conference, described above. Specifically, the SPCS requested clarification of Requirements R1.3.1, R1.3.10, and R1.5 of TPL-003-0a and Requirements R1.3.7 and R1.4 of TPL-004-0. The interpretation request reads as follows and is also included in **Exhibit A**:

This interpretation request has been developed to address Commission concerns related to the term “Single Point of Failure” and how it relates to system performance and contingency planning clarification regarding the following questions about the listed standards, requirements and terms. More specifically, clarification is needed about the comprehensive study of system performance relating to Table 1’s, Category C and D contingency of a “protection system failure” and specifically the impact of failed components (i.e., “Single Point of Failure”). It is not entirely clear whether a valid assessment of a protection system failure includes evaluation of shared or non-redundant protection system components. Protection systems that have a shared protection system component are not two independent protection systems, because both protection systems will be mutually impacted for a failure of a single shared component. A protection

⁸ See Order No. 754 at P 20.

system component evaluation would include the evaluation of the consequences on system performance for the failure of any protection system component that is integral to the operation of the protection system being evaluated and to the operation of another protection system.

On March 30, 2009, NERC issued an Industry Advisory — Protection System Single Point of Failure (i.e., NERC Alert) for three significant events. One of which, the Westwing outage (June 14, 2004) was caused by failure of a single auxiliary relay that initiated both breaker tripping and the breaker failure protection. Since breaker tripping and breaker failure protection both shared the same auxiliary relay, there was no independence between breaker tripping and breaker failure protection systems, therefore causing both protection systems to not operate for the single component failure of the auxiliary relay. The failure of this auxiliary relay is known as a “single point of failure.” It is not clear whether this situation is comprehensively addressed by the applicable entities when making a valid assessment of system performance for both Category C and D contingencies.

Question 1: For the parenthetical “(stuck breaker or protection system failure)” in TPL-003-0a (Category C contingencies 6-9) and TPL-004-0 (Category D contingencies 1-4), does an entity have the option of evaluating the effects of either “stuck breaker” or “protection system failure” contingency, or does an applicable entity have to evaluate the contingency that produces the more severe system results or impacts as identified in R1.3.1 of both standards?

There is a lack of clarity whether R1.3.1 requires an entity to assess which contingency causes the most severe system results or impacts (R1.3.1) and this ambiguity could result in a potential reliability gap. Whether the simulation of a stuck breaker or protection system failure will produce the worst result depends on the protection system design. For example when a protection system is fully redundant, a protection system failure will not affect fault clearing; therefore, a stuck breaker would result in more severe system results or impacts. However, when a protection system failure affects fault clearing, the fault clearing time may be longer than the breaker failure protection clearing time for a stuck breaker contingency and may result in tripping of additional system elements, resulting in a more severe system response.

Question 2: For the phrase “Delayed Clearing” used in Category C contingencies 6-9 and Category D contingencies 1-4, to what extent does the description in Table 1, footnote (e) require an entity to model a single point of failure of a protection system component that may prevent correct operation of a protection system, including other protection systems impacted by that failed component based on the as-built design of that protection system? There is a lack of clarity whether footnote (e) in Table 1 requires the study and/or simulation of a failure of a protection system component (i.e., single point of failure) that may prevent correct operation of the protection system(s) impacted by the component failure. Protection systems that share a protection system component are fully dependent upon the correct operation of that single shared component and do not perform as two independent protection systems. This lack of clarity may result in a potential reliability gap.

Clarity is necessary as to whether (1) a valid assessment should include evaluation of delayed clearing due to failure of the protection system component (i.e., single point of failure), such as the failure of a shared protection system component, that produces the more severe system results or impacts; and (2) the study and/or simulation of the fault clearing sequence and protection system(s) operation should be based on the protection system(s) as-built design.

The lack of clarity is compounded by the similarity between the phrase “Delayed Clearing” used in TPL-003-0a and TPL-004-0, footnote (e), and the NERC glossary term “Delayed Fault Clearing.” While TPL-003-0a and TPL-004-0 do not use the glossary term, the similarity may lead to confusion and inconsistency in how entities apply footnote (e) to “stuck breaker” or “protection system failure” contingency assessments.⁹

In its interpretation request, the SPCS states that there is a material impact to the entities required to perform transmission planning assessments and to the entities that may rely on these assessments. The SPCS states that lack of clarity in defining the required studies impacts entities by causing:

- potential non-compliance if the correct contingencies are not studied;

⁹ See **Exhibit A** (footnotes omitted).

- inefficient use of resources if contingencies are studied that are not required and mitigation plans are implemented that are not required; and
- potential negative impact to grid reliability if the correct contingencies are not assessed.

IV. JUSTIFICATION FOR APPROVAL

A. Basis for Approval of the Interpretation and Purpose of Reliability Standards TPL-003-0a and TPL-004-0

The interpretation was developed by members of the Assess Transmission Future Needs Standard Drafting Team, Protection System Misoperations Standard Development Team, and Protection System Maintenance and Testing Standard Drafting Team (collectively, the “Interpretation Drafting Team”). This section presents and explains the responses to both questions posed by the SPCS. NERC requests a finding that the interpretation is just, reasonable, not unduly discriminatory or preferential, and in the public interest. The interpretation is consistent with the purposes of both TPL-003 and TPL-004, which is to periodically conduct system simulations and associated assessments needed to ensure that reliable systems are developed that meet specified performance requirements, with sufficient lead time and continue to be modified or upgraded as necessary to meet present and future System needs. The interpretation also reasonably reads the text of the Reliability Standards to provide clarity to entities complying with the currently effective Reliability Standards.

1. Response to SPCS Question #1

In response to Question 1 above from the SPCS, the interpretation response reads:

The interpretation drafting team concludes that the Planning Authority and Transmission Planner must evaluate the situation that produces the more severe system results or impacts (i.e., TPL-003-0a, R1.3.1 and TPL-004-0, R1.3.1) due to a delayed clearing condition regardless of whether the condition resulted from a stuck

breaker or protection system failure. The Reliability Standards TPL-003-0a (Table I, Category C contingencies 6-9) and TPL-004-0 (Table I, Category D contingencies 1-4) involve an assessment of the effects of either a stuck breaker or a protection system failure. The single line ground (SLG) (TPL-003-0a, Table I, Category C) Fault and 3-phase (3 ϕ) (TPL-004-0, Table I, Category D) Fault contingencies with delayed clearing are further defined by footnote (e) and the parenthetical phrase “(stuck breaker or protection system failure).” Footnote (e) explains that “Delayed clearing of a Fault is due to failure of any protection system component such as a relay, circuit breaker, or current transformer, and not because of an intentional design delay.” The parenthetical further emphasizes that the failure may be a “stuck breaker or protection system failure” that causes the delayed clearing of the fault. The text in Table 1 in either standard explains that when selecting delayed clearing contingencies to evaluate, both conditions “(stuck breaker or protection system failure)” must be considered.

To explain the conclusion above that the Planning Authority and Transmission Planner must evaluate the situation that produces the more severe system results or impacts, NERC provides the following explanatory “walk through” of the Requirements in TPL-003-0a. Requirement R1 of TPL-003-0a requires that the Planning Authority and Transmission Planner each demonstrate, through a valid assessment, that its portion of the interconnected transmission systems is planned to meet specific operation needs. To be valid, the assessment must meet a list of sub-Requirements within Requirement R1 (*see* R1.1-R1.5). Requirement R1.3 states that a valid assessment must “[b]e supported by a current or past study and/or system simulation testing that addresses each of the following categories, showing system performance following Category C of Table 1 (multiple contingencies).” There are twelve subcategories in Requirement R1.3 that explain what the current or past study must address. Subcategory R1.3.1 requires the study:

Be performed and evaluated only for those Category C contingencies that would produce the more 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.

Turning to the Category C contingencies in Table 1 of the Reliability Standard, Table I, Category C contingencies 6-9 involve an assessment of the effects of a single line ground fault with delayed clearing due to a stuck breaker or a protection system failure. Because the study must be performed and *evaluated* only for those Category C contingencies that would produce the more severe system results or impacts, both conditions (*i.e.* a stuck breaker or protection system failure) must be considered for evaluation when selecting delayed clearing contingencies to evaluate. The one which creates the more severe system result or impact must be evaluated. The same sequence and conclusion follows for the identical Requirements in TPL-004-0 for category D contingencies.

2. Response to SPCS Question #2

In response to Question 2 above from the SPCS, the interpretation response reads:

The term “Delayed Clearing” that is described in Table I, footnote (e) refers to fault clearing that results from a failure to achieve the protection system’s normally expected clearing time. For Category C or D contingencies, each Planning Authority and Transmission Planner is permitted engineering judgment in its selection of the protection system component failures for evaluation that would produce the more severe system results or impact (*i.e.*, TPL-003-0a, R1.3.1 and TPL-004-0, R1.3.1). The evaluation would include addressing all protection systems affected by the selected component. A protection system component failure that impacts one or more protection systems and increases the total fault clearing time requires the Planning Authority and Transmission Planner to simulate the full impact (clearing time and facilities removed) on the Bulk Electric System performance.

The interpretation drafting team bases this conclusion on the footnote (e) example “...any protection system component such as, relay, circuit breaker, or current transformer...” because the component “circuit breaker” is not addressed in the current or previously defined NERC glossary term. The interpretation drafting team initially believed the lowercase usage of “protection system” inferred the NERC glossary term and the components described therein; however, based on the interpretation drafting

team's further assessment of footnote (e), it concludes that the existing TPL standards (TPL-003-0a and TPL-004-0) do not implicitly use the NERC glossary term. Without an explicit reference to the NERC glossary term, "Protection System," the two standards do not prescribe the specific protection system components that must be addressed by the Planning Authority and Transmission Planner in performing the studies required in TPL-003-0a and TPL-004-0.

In short, the interpretation asked whether footnote (e) requires an entity to model a single point of failure of a protection system component that may prevent correct operation of a protection system, including other protection systems impacted by that failed component based on the as-built design of that protection system. The interpretation answer is yes. A protection system component failure that impacts one or more protection systems and increases the total fault clearing time requires the Planning Authority and Transmission Planner to simulate the full impact (clearing time and facilities removed) on the Bulk Electric System performance. Had the definition of "Protection System" been referenced, a specific set of protection system components would have had to be addressed. Because the examples given in footnote (e) include a component not mentioned in the defined term, the lowercase use of protection system was determined to be intentional and the conclusion of the interpretation team follows from this determination. Therefore, studying of faults with delayed clearing includes "failure of any protection system component such as a relay, circuit breaker, or current transformer, and not because of an intentional design delay" as noted in footnote (e).

B. Timing of Approval and Version Numbering

On March 19, 2013, NERC submitted a filing of certain modified Transmission Planning Reliability Standards. In the March 19 filing, NERC requests the approval of a proposed consolidated TPL Reliability Standard, TPL-001-4, and the retirement of four Version 0 TPL Reliability Standards including, TPL-003-0a and TPL-004-0, which are the subject of this

interpretation. If the proposed consolidated TPL Reliability Standard is not approved, NERC alternatively requests approval in the March 19 filing of, among other things, Version 2 of TPL-003 and TPL-004 (TPL-003-2a and TPL-004-2).

NERC asks for approval of the interpretation as appended to the Version 0 Reliability Standards in **Exhibits C and D**. If the this interpretation is approved prior to ruling on the March 19 filing, the Reliability Standards will be referred to as TPL-003-0b¹⁰ and TPL-004-0a. If the March 19 filing is approved first and either the consolidated TPL Reliability Standard or the proposed Version 2 TPL-003 and -004 Reliability Standards are approved, and Version 0 of TPL-003 and TPL-004 are retired, NERC still asks for approval of the interpretation as appended to the Version 0 Reliability Standards in **Exhibits C and D** for use in determining compliance with the Version 0 Reliability Standards until the retirements are effective. Because the interpretation is not subsumed into the succeeding Version 2 Reliability Standards, the interpretation would be carried forward and appended to the Version 2 Standards proposed in the March 19 filing as shown in **Exhibits E and F** if the consolidated TPL Reliability Standard are not approved and instead the proposed Version 2 TPL-003 and -004 Reliability Standards in the March 19 filing are approved.

V. SUMMARY OF THE RELIABILITY STANDARD DEVELOPMENT PROCEEDINGS

A. Development History

The development record for the proposed interpretation to TPL-003-0a and TPL-004-0 is summarized below. **Exhibit H** contains the complete record of development for the proposed interpretation.

¹⁰ See NERC Standards Numbering Convention at 2 (“If a standard has an approved Interpretation, the standard identification will also have a lower case letter after the version number.”), available at http://www.nerc.com/files/NERC_Standards_Numbering_Convention_2009Sept14.pdf.

1. The First Posting

The initial draft response of the request for interpretation was posted from June 20, 2012 to July 19, 2012 for a 30-day public comment period. Thirty-one sets of comments were received from 102 different individuals representing 69 companies and 9 of the 10 industry segments. In response to comments, the Interpretation Drafting Team made several changes to the draft interpretation including:

- clarifying references to Table 1 to show that the reference encompasses both standards;
- adding “Planning Authority” to the interpretation to ensure that the interpretation identifies both registered entities to which the Standards apply;
- providing additional clarity about the failure of a protection system component that impacts one or more protection systems where the total fault clearing time increases to address confusion on phrase “Delayed Clearing”;
- adding substantive language for clarity on what protection system components are to be evaluated; and
- noting that applicable entities are permitted to use “engineering judgment” in their evaluation of Category C and D assessments on those components that would produce the more severe system impacts.

2. The Second Posting- Formal Comment Period and Initial Ballot

The second draft of the interpretation response was posted for a 30-day formal comment period from October 22, 2012 to December 5, 2012, with an initial ballot held from November 26, 2012 to December 5, 2012. The initial ballot achieved 84.81% quorum, and an approval percentage of 72.75%. The Interpretation Drafting Team received 39 sets of comments from 103 different individuals representing approximately 69 companies and 8 of the 10 industry

segments. The Interpretation Drafting Team made minor, non-substantive clarifications to the draft interpretation, including:

- clarifying that “engineering judgment” is permitted;
- addressing the minority concern that an implementation plan would be needed; and
- making minor wording changes to reflect the Requirements being addressed in Response 2.

3. The Third Posting – Recirculation Ballot

The third draft of the interpretation was posted for a recirculation ballot from January 22, 2013 to January 31, 2013. The recirculation ballot achieved 85.67% quorum of and an approval percentage of 77.61%.

4. Board of Trustees Approval of Interpretation to TPL-003-0a and TPL-004-0

The final proposed interpretation to TPL-003-0a and TPL-004-0 was presented to the NERC Board of Trustees on February 7, 2013. NERC staff provided a summary of the proposed interpretation, as well as a summary of minority issues and associated drafting team responses. The NERC Board of Trustees approved the interpretation, and NERC staff recommended that it be filed with applicable governmental authorities.

B. Overview of the Interpretation Drafting Team

A detailed set of biographical information for each of the members of the Interpretation Drafting Team is included in **Exhibit I**.

VI. CONCLUSION

For the reasons set forth above, NERC respectfully requests approval of the interpretation as set forth in **Exhibit B** and appended to the Reliability Standards in **Exhibits C and D**, effective upon approval.

Respectfully submitted,

/s/ William H. Edwards

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May 14, 2013

EXHIBITS A – I

(Available on the NERC Website at
http://www.nerc.com/fileUploads/File/Filings/Attachments_TPL_interpretation_filing)