

May 11, 2012

**VIA OVERNIGHT MAIL**

Anne-Marie Erickson, Secretary of the Board  
National Energy Board  
444 Seventh Avenue SW  
Calgary, Alberta  
T2P 0X8

Re: *North American Electric Reliability Corporation*

Dear Ms. Erickson:

The North American Electric Reliability Corporation (“NERC”) hereby submits this petition seeking approval of proposed Regional Reliability Standard PRC-006-NPCC-1 — Automatic Underfrequency Load Shedding, associated Violation Risk Factors (“VRF”) and Violations Severity Levels (“VSL”), and an implementation plan for PRC-006-NPCC-1. Upon approval, this standard will only be effective within the Northeast Power Coordinating Council (“NPCC”) footprint.

The purpose of PRC-006-NPCC-1 is to provide a Regional Reliability Standard that ensures the development of an effective automatic underfrequency load shedding (“UFLS”) program in order to preserve the security and integrity of the bulk power system during declining system frequency events, in coordination with the NERC UFLS reliability standard characteristics, PRC-006-1.

The proposed Regional Reliability Standard was approved by the NERC Board of Trustees during its February 9, 2012 meeting. NERC is proposing dual effective dates for the standard. NERC proposes that for the Eastern Interconnection and Québec

Interconnection portions of NPCC excluding the Independent Electricity System

Operator (“IESO”) Planning Coordinator area of NPCC in Ontario, Canada:

The effective date for Requirements R1, R2, R3, R4, R5, R6, and R7 is the first day of the first calendar quarter following applicable regulatory approval but no earlier than January 1, 2016. The effective date for Requirements R8 through R23 is the first day of the first calendar quarter two years following applicable governmental and regulatory approval.

NERC is proposing the following for the IESO Planning Coordinator’s area of NPCC in Ontario, Canada:

All requirements are effective the first day of the first calendar quarter following applicable governmental and regulatory approval but no earlier than April 1, 2017.

This petition consists of the following:

- this transmittal letter;
- a table of contents for the entire petition;
- a narrative description justifying the proposed Regional Reliability Standard;
- Regional Reliability Standard PRC-006-NPCC-1 — Automatic Underfrequency Load Shedding and implementation plan, submitted for approval (**Exhibit A**);
- the complete development record of the proposed Regional Reliability Standard (**Exhibit B**);
- the standard drafting team roster (**Exhibit C**); and
- the Violation Severity Level and Violation Risk Factor Guideline Analysis (**Exhibit D**).

Please contact the undersigned if you have any questions.

Respectfully submitted,

*/s/ Andrew M. Dressel*

Andrew M. Dressel

*Attorney for North American Electric  
Reliability Corporation*

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**BEFORE THE  
NATIONAL ENERGY BOARD**

**NORTH AMERICAN ELECTRIC )  
RELIABILITY CORPORATION )**

**PETITION OF THE  
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION  
FOR APPROVAL OF PROPOSED NPCC REGIONAL RELIABILITY  
STANDARD PRC-006-NPCC-1 — AUTOMATIC UNDERFREQUENCY LOAD  
SHEDDING**

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May 11, 2012

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**Exhibit A** — PRC-006-NPCC-1 — Automatic Underfrequency Load Shedding Regional Reliability Standard Proposed and Implementation Plan for Approval

**Exhibit B** — Complete Development Record of Proposed PRC-006-NPCC-1 Automatic Underfrequency Load Shedding Regional Reliability Standard

**Exhibit C** — Standard Drafting Team Roster

**Exhibit D** — PRC-006-NPCC-1 Violation Severity Level and Violation Risk Factor Analysis

## **I. INTRODUCTION**

The North American Electric Reliability Corporation (“NERC”) hereby requests approval of proposed Regional Reliability Standard, PRC-006-NPCC-1 included in Exhibit A.

The purpose of PRC-006-NPCC-1 — Automatic Underfrequency Load Shedding is to provide a Regional Reliability Standard that ensures the development of an effective automatic underfrequency load shedding (“UFLS”) program in order to preserve the security and integrity of the bulk power system during declining system frequency events, in coordination with the NERC UFLS Reliability Standard characteristics. UFLS requirements have been in place at a continent-wide level and within Northeast Power Coordinating Council, Inc. (“NPCC”) for many years prior to implementation of mandatory reliability standards in 2007.

NERC and NPCC believe that a region-wide and fully coordinated single set of UFLS requirements is of benefit to achieving an effective and efficient UFLS program, and their experience has supported that belief. Regional UFLS programs serve “as a last resort to preserve the Bulk-Power System during a major system failure that could cause system frequency to collapse.”<sup>1</sup> The NPCC standard adds specificity not contained in the NERC standard for development and implementation of a UFLS program in the NPCC region that effectively arrests declining frequency, assists recovery following underfrequency events, and provides last resort system preservation measures.

This petition is the first request by NERC for approval of this proposed Regional Reliability Standard. The Regional Reliability Standard proposed will be in effect only

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<sup>1</sup> See *Mandatory Reliability Standards for the Bulk-Power System*, Order No. 693, FERC Stats. & Regs. ¶ 31,242 at P 1476, *order on reh'g*, Order No. 693-A, 120 FERC ¶ 61,053 (2007).

for applicable registered entities within the NPCC. NERC continent-wide Reliability Standards do not presently address all of the issues covered in this proposed Regional Reliability Standard.

NERC specifically requests approval of:

- Regional Reliability Standard PRC-006-NPCC-1;
- Associated Violations Risk Factors (“VRF”) and Violation Severity Levels (“VSL”); and
- Implementation Plan for PRC-006-NPCC-1.

On February 9, 2012 the NERC Board of Trustees approved PRC-006-NPCC-1 — Automatic Underfrequency Load Shedding. NERC requests approval of this Regional Reliability Standard, to be made effective upon approval, consistent with the proposed implementation plan. **Exhibit A** to this filing sets forth the proposed Regional Reliability Standard and implementation plan. **Exhibit B** contains the complete Development Record for the proposed Regional Reliability Standard. **Exhibit C** includes the standard drafting team roster. **Exhibit D** is the Violation Severity Level (“VSL”) and Violation Risk Factor (“VRF”) guideline analysis.

NERC filed the proposed PRC-006-NPCC-1 Regional Reliability Standard and associated documents with the Federal Energy Regulatory Commission (“FERC”), and is also filing this proposed Reliability Standards and associated documents with the other applicable governmental authorities in Canada.

## 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. Basis for Approval of Proposed Regional Reliability Standard

NPCC is not an “interconnection-wide” Regional Entity and its standards are intended to apply only to that part of the Eastern Interconnection within the NPCC geographical footprint and Québec. As discussed in the *Northeast Power Coordinating Council, Inc. Regional Reliability Standard Development Procedure*,<sup>2</sup> NPCC’s standards are developed according to the following characteristic attributes:

- **Open** — The NPCC Regional Reliability Standards Development Procedure provides any person the ability to participate in the development of a standard. Any entity that is directly and materially affected by the reliability of the NPCC’s Bulk Power System has the ability to participate in the development and approval of reliability standards. There are no undue

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<sup>2</sup> The *Northeast Power Coordinating Council, Inc. Regional Reliability Standard Development Procedure* is available at <http://www.npcc.org/regStandards/Overview.aspx>

financial barriers to participation. Participation in the open comment process is not conditional upon membership in the ERO, NPCC or any organization, and participation is not unreasonably restricted on the basis of technical qualifications or other such requirements. NPCC utilizes a website to accomplish this. Online posting and review of standards and the real time sharing of comments uploaded to the website allow complete transparency.

- **Inclusive** — The NPCC Regional Reliability Standards Development Procedure provides any person with a direct and material interest the right to participate by expressing an opinion and its basis, have that position considered, and appealed through an established appeals process if adversely affected.
- **Balanced** — The NPCC Regional Reliability Standards Development Procedure has a balance of interests and all those entities that are directly and materially affected by the reliability of the NPCC's Bulk Power System are welcome to participate and shall not be dominated by any two interest categories and no single interest category shall be able to defeat a matter. This will be accomplished through the NPCC Bylaws defining eight sectors (categories) for voting.
- **Fair Due Process** — The NPCC Regional Reliability Standards Development Procedure provides for reasonable notice and opportunity for public comment. The procedure includes public notice of the intent to develop a standard, a 45 calendar day public comment period on the proposed standard request, or standard with due consideration of those public comments, and responses to those comments will be posted on the NPCC website. A final draft will be posted for a 30 calendar day pre-balloting period, and then a ballot of NPCC Members will be conducted. Upon approval by the NPCC Members, the NPCC Board then votes to approve submittal of the Regional Standard to NERC.
- **Transparent** — All actions material to the development of Regional Reliability Standards are transparent and information regarding the progress is posted on the NPCC website as well as through extensive email lists.

Proposed NPCC standards are subject to approval by NERC, as the ERO, and the applicable governmental authorities. As shown above, the NPCC Regional Reliability Standard was developed in an open, transparent, and inclusive fashion. During development of the standard, workshops were conducted jointly with other Regional Entities and NPCC members. The proposed standard is widely supported by the NPCC ballot body and regulatory agencies that see this as a meaningful and necessary step forward in solving a longstanding problem. As a condition of NPCC membership, all



NPCC Members<sup>3</sup> agree to adhere to the NERC Reliability Standards in addition to the NPCC Regional Reliability Standards. NERC Reliability Standards and the NPCC Regional Reliability Standards are both enforced through the NPCC Compliance Program.

The NPCC drafting team worked closely with its technical committee on UFLS, the SS-38 Working Group on Inter-Area Dynamics Analysis, as it considered the technical issues and justifications surrounding the standard.

Additionally, NPCC conducted a number of regional workshops aimed at informing NPCC Members on the status and background of the standard's development. The draft of the standard was posted for a 45 day comment period three times during its development and the drafting team responded to all comments and technical concerns that were raised.

NERC conducted two quality reviews of the standard during which formatting and content issues were corrected. NERC also posted the draft for public consideration on two occasions after which the drafting team responded to all comments received.

As previously noted, NPCC is a Regional Entity not organized on an Interconnection-wide basis. Therefore, NERC is not required to rebuttably presume the proposed standard is just, reasonable, not unduly discriminatory or preferential and in the public interest.

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<sup>3</sup> As defined in Section IV.B of the NPCC Corporation By-laws. Available at: <http://www.npcc.org/documents/aboutus/BusPlanBylaws.aspx>.

#### **IV. JUSTIFICATION FOR APPROVAL OF PROPOSED REGIONAL RELIABILITY STANDARD**

This section summarizes the development of the proposed Regional Reliability Standard PRC-006-NPCC-1 — Automatic Underfrequency Load Shedding; describes the reliability objectives to be achieved by the Regional Reliability Standard; explains the development history of the Regional Reliability Standard; and demonstrates how the standard meets the criteria for approval. NERC, in its analysis and approval of the proposed Regional Reliability Standard, determined that the standard is just, reasonable, not unduly discriminatory or preferential, and in the public interest.

The complete development record for the proposed Regional Reliability Standard is provided in **Exhibit C** and includes the development and approval process, comments received during the industry-wide comment period, responses to those comments, ballot information, and NERC's evaluation of the proposed standard.

##### **a. Basis and Purpose of Standard PRC-006-NPCC-1 — Automatic Underfrequency Load Shedding**

The proposed Regional Reliability standard, PRC-006-NPCC-1 — Automatic Underfrequency Load Shedding, will provide regional requirements for Automatic Underfrequency Load Shedding to applicable entities in NPCC. UFLS requirements have been in place at a continent-wide level and within NPCC for many years prior to the implementation of mandatory reliability standards in 2007. NPCC and its members believe that a region-wide, fully coordinated single set of UFLS requirements is necessary to create an effective and efficient UFLS program, and their experience has supported that belief.

The proposed standard contains 23 requirements that establish UFLS obligations for entities within the NPCC region. The proposed standard is included in **Exhibit A** to this filing.

**b. Demonstration that Proposed Reliability Standard is just, reasonable, not unduly discriminatory or preferential, and in the public interest**

**1. Proposed Reliability Standard is designed to achieve a specified reliability goal**

The proposed Regional Reliability Standard, PRC-006-NPCC-1 — Automatic Underfrequency Load Shedding, was developed to provide a Regional Reliability Standard that ensures the development of an effective UFLS program that preserves the security and integrity of the bulk power system during declining system frequency events in coordination with the continent-wide PRC-006-1 Reliability Standard's requirements.

**2. Proposed Reliability Standard is applicable to users, owners, and operators of the bulk power system, and not others.**

The proposed Regional Reliability Standard is only applicable to Generator Owners, Planning Coordinators, Distribution Providers, and Transmission Owners within the NPCC region. These entities are users, owners, or operators of the bulk power system.

**3. Proposed Reliability Standard considers any other relevant factors.**

All comments and concerns were addressed using the *Northeast Power Coordinating Council Standards Development Procedure* which is consensus-based, technically sound, and open to the public and bordering entities that may be impacted by a Regional Reliability Standard. No other factors were identified as necessary for consideration by the standard drafting team in the development of the proposed Regional Reliability Standard.

**4. Proposed Reliability Standard contains a technically sound method to achieve the goal.**

The proposed Regional Reliability Standard contains a technically sound means to achieve this goal. The PRC-006-NPCC-1 drafting team was comprised of power system engineers with experience in power system protection system design, power system operations, transmission, and generation. The proposed Regional Reliability Standard used as its basis the program characteristics defined within NPCC Directory #12 Underfrequency Load Shedding Program Requirements,<sup>4</sup> which contains the criteria that govern the NPCC Automatic UFLS program as designed by the NPCC Working Group on Inter-Area Dynamic Analysis (SS-38) and was approved by NPCC's highest level technical committee, the Reliability Coordinating Committee (RCC).

The proposed Regional Reliability Standard PRC-006-NPCC-1 was posted for industry technical comment three times and responses to these comments were evaluated and incorporated by the drafting team into the standard as appropriate.

**5. Proposed Reliability Standard is clear and unambiguous as to what is required and who is required to comply.**

The proposed Regional Reliability Standard establishes clear and unambiguous requirements for Generator Owners, Planning Coordinators, Distribution Providers, and Transmission Owners within the NPCC region as detailed below.

Requirement R1 requires each Planning Coordinator within the NPCC region to establish requirements for entities aggregating their UFLS programs for each anticipated island and requirements for compensatory load shedding as required by the islanding criteria requirements of the NERC continent-wide Standard PRC-006-1.

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<sup>4</sup> NPCC Regional Reliability Reference Directory # 12 Underfrequency Load Shedding Program Requirements (2009) ("NPCC Directory # 12"). Available at [http://www.theimo.com/imoweb/pubs/ircp/NPCC/Directory\\_12.pdf](http://www.theimo.com/imoweb/pubs/ircp/NPCC/Directory_12.pdf).

Requirement R2 requires each Planning Coordinator to identify to NPCC the generation facilities within its Planning Coordinator Area necessary to support the UFLS program performance characteristics within 30 days of completion of its system studies required by the NERC continent-wide Standard PRC-006-1.

Requirement R3 requires each Planning Coordinator to provide to the Transmission Owner, Distribution Provider, and Generator Owner within 30 days upon written request the requirements for entities aggregating the UFLS programs and requirements for compensatory load shedding program derived from each Planning Coordinator's system studies as determined by Requirement R1.

Requirement R4 requires each Distribution Provider and Transmission Owner in the Eastern Interconnection portion of NPCC to implement an automatic UFLS program reflecting normal operating conditions excluding outages for its Facilities based on frequency thresholds, total nominal operating time and amounts specified in PRC-006-NPCC-1 Attachment C, Tables 1 through 3, or to collectively implement by mutual agreement with one or more Distribution Providers and Transmission Owners within the same island identified in Requirement R1 and acting as a single entity, provide an aggregated automatic UFLS program that sheds their coincident peak aggregated net Load, based on frequency thresholds, total nominal operating time and amounts specified in PRC-006-NPCC-1 Attachment C, Tables 1 through 3.

Requirement R5 requires each Distribution Provider or Transmission Owner that must arm its load to trip on underfrequency in order to meet its requirements as specified and by doing so exceeds the tolerances and/or deviates from the number of stages and

frequency set points of the UFLS program as specified in the tables contained in Requirement R4 to:

- 5.1 Inform its Planning Coordinator of the need to exceed the stated tolerances or the number of stages as shown in PRC-006-NPCC-1 Attachment C, Table 1 if applicable and
- 5.2 Provide its Planning Coordinator with a technical study that demonstrates that the Distribution Providers or Transmission Owners specific deviations from the requirements of PRC-006-NPCC-1 Attachment C, Table 1 will not have a significant adverse impact on the bulk power system.
- 5.3 Inform its Planning Coordinator of the need to exceed the stated tolerances of PRC-006-NPCC-1 Attachment C, Table 2 or Table 3, and in the case of PRC-006-NPCC-1 Attachment C, Table 2 only, the need to deviate from providing two stages of UFLS, if applicable, and
- 5.4 Provide its Planning Coordinator with an analysis demonstrating that no alternative load shedding solution is available that would allow the Distribution Provider or Transmission Owner to comply with PRC-006-NPCC-1 Attachment C Table 2 or PRC-006-NPCC-1 Attachment C Table 3.

Requirement R6 requires each Distribution Provider and Transmission Owner in the Québec Interconnection portion of NPCC to implement an automatic UFLS program for its Facilities based on the frequency thresholds, slopes, total nominal operating time and amounts specified in PRC-006-NPCC-1 Attachment C, Table 4 or to collectively

implement by mutual agreement with one or more Distribution Providers and Transmission Owners within the same island, identified in Requirement R1, an aggregated automatic UFLS program that sheds Load based on the frequency thresholds, slopes, total nominal operating time and amounts specified in PRC-006-NPCC-1 Attachment C, Table 4.

Requirement R7 requires each Distribution Provider and Transmission Owner to set each underfrequency relay that is part of its region's UFLS program with a minimum time delay of 100 ms in the Eastern Interconnection and 200 ms in the Quebec Interconnection.

Requirement R8 requires each Planning Coordinator to develop and review once per calendar year settings for the inhibit thresholds to be utilized within its region's UFLS program.

Requirement R9 requires each Planning Coordinator to provide each Transmission Owner and Distribution Provider within its Planning Coordinator area the applicable inhibit thresholds within 30 days of the initial determination of those inhibit thresholds and within 30 days of any changes to those thresholds.

Requirement R10 requires each Distribution Provider and Transmission Owner to implement the inhibit threshold settings based on the notification provided by the Planning Coordinator in accordance with Requirement R9.

Requirement R11 requires each Distribution Provider and Transmission Owner to develop and submit an implementation plan within 90 days of the request from the Planning Coordinator for approval by the Planning Coordinator in accordance with Requirement R9.

Requirement R12 requires each Transmission Owner and Distribution Provider to annually provide documentation, with no more than 15 months between updates, to its Planning Coordinator of the actual net Load that would have been shed by the UFLS relays at each UFLS stage coincident with their integrated hourly peak net Load during the previous year, as determined by measuring actual metered Load through the switches that would be opened by the UFLS relays.

Requirement R13 requires each Generator Owner to set each generator underfrequency trip relay, if so equipped, below the appropriate generator underfrequency trip protection settings threshold curve in PRC-006-NPCC-1 Figure 1, except as otherwise exempted in Requirements R16 and R19.

Requirement R14 requires each Generator Owner to transmit the generator underfrequency trip setting and time delay to its Planning Coordinator within 45 days of the Planning Coordinator's request.

Requirement R15 requires each Generator Owner with a new generating unit, scheduled to be in service on or after the effective date of this Standard, or an existing generator increasing its net capability by greater than 10% to:

- 15.1 Design measures to prevent the generating unit from tripping directly or indirectly for underfrequency conditions above the appropriate generator tripping threshold curve in PRC-006-NPCC-1 Figure 1.
- 15.2 Design auxiliary system(s) or devices used for the control and protection of auxiliary system(s), necessary for the generating unit operation such that they will not trip the generating unit during underfrequency conditions



above the appropriate generator underfrequency trip protection settings threshold curve in PRC-006-NPCC-1 Figure 1.

Requirement R16 requires each Generator Owner of existing non-nuclear units in service prior to the effective date of this standard that have underfrequency protections set to trip above the appropriate curve in PRC-006-NPCC-1 Figure 1 to:

- 16.1 Set the underfrequency protection to operate at the lowest frequency allowed by the plant design and licensing limitations.
- 16.2 Transmit the existing underfrequency settings and any changes to the underfrequency settings along with the technical basis for the settings to the Planning Coordinator.
- 16.3 Have compensatory load shedding, as provided by a Distribution Provider or Transmission Owner that is adequate to compensate for the loss of their generator due to early tripping.

Requirement R17 requires each Planning Coordinator in Ontario, Quebec, and the Maritime provinces to apply the criteria described in PRC-006-NPCC-1 Attachment A to determine the compensatory load shedding that is required in Requirement R16 part 16.3 for generating units in its respective NPCC area.

Requirement R18 requires each Generator Owner, Distribution Provider, or Transmission Owner within the Planning Coordinator area of ISO-NE or the New York ISO to apply the criteria described in PRC-006-NPCC-1 Attachment B to determine the compensatory load shedding that is required in Requirement R16 part 16.3 for generating units in its respective NPCC area.

Requirement R19 requires each Generator Owner of existing nuclear generating plants with units that have underfrequency relay threshold settings above the Eastern Interconnection generator tripping curve in PRC-006-NPCC-1 Figure 1, based on their licensing design basis, to:

- 19.1 Set the underfrequency protection to operate at as low a frequency as possible in accordance with the plant design and licensing limitations but not greater than 57.8Hz.
- 19.2 Set the frequency trip setting upper tolerance to no greater than + 0.1 Hz.
- 19.3 Transmit the initial frequency trip setting and any changes to the setting and the technical basis for the settings to the Planning Coordinator.

Requirement R20 requires each Planning Coordinator to update its UFLS program database as specified by the NERC UFLS Reliability Standard on UFLS (currently PRC-006-1). This database shall include the following information:

- 20.1 For each UFLS relay, including those used for compensatory load shedding, the amount and location of load shed at peak, the corresponding frequency threshold and time delay settings.
- 20.2 The buses at which the Load is modeled in the NPCC library power flow case.
- 20.3 A list of all generating units that may be tripped for underfrequency conditions above the appropriate generator underfrequency trip protection settings threshold curve in PRC-006-NPCC-1 Figure 1, including the frequency trip threshold and time delay for each protection system.

20.4 The location and amount of additional elements to be switched for voltage control that are coordinated with UFLS program tripping.

20.5 A list of all UFLS relay inhibit functions along with the corresponding settings and locations of these relays.

Requirement R21 requires each Planning Coordinator to notify each Distribution Provider, Transmission Owner, and Generator Owner within its Planning Coordinator area of changes to load distribution needed to satisfy UFLS program performance characteristics as specified by the NERC PRC Standard on UFLS, which is currently PRC-006-1.

Requirement R22 requires each Distribution Provider, Transmission Owner and Generator Owner to implement the load distribution changes based on the notification provided by the Planning Coordinator in accordance with Requirement R21.

Requirement R23 requires each Distribution Provider, Transmission Owner and Generator Owner to develop and submit an implementation plan within 90 days of the request from the Planning Coordinator for approval by the Planning Coordinator in accordance with Requirement R21.

**6. Proposed Reliability Standard includes clear and understandable consequences and a range of penalties (monetary and/or non-monetary) for a violation**

The proposed Regional Reliability Standard includes a Violation Risk Factor (“VRF”) and at least one Violation Severity Level (“VSL”) for each requirement. The ranges of penalties for violations will be based on the applicable VRF and VSL and will be administered based on the sanctions table and supporting penalty determination process described in the NERC Sanction Guidelines.<sup>5</sup>

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<sup>5</sup> NERC Rules of Procedure Appendix 4B. Available at: <http://www.nerc.com/page.php?cid=1|8|169>.

NPCC developed the VSLs and VRFs proposed for assignment to PRC-006-NPCC-1 following applicable guidance. **Exhibit E** to this filing contains the VSL and VRF guideline analysis for PRC-006-NPCC-1.

**7. Proposed Reliability Standard identifies clear and objective criterion or measure for compliance, so that it can be enforced in a consistent and non-preferential manner.**

Each requirement of PRC-006-NPCC-1 has an associated measure of compliance that will assist those enforcing the standard in enforcing it in a consistent and non-preferential manner. The proposed measures are as follows:

**M1.** Each Planning Coordinator shall have evidence such as reports, system studies and/or real time power flow data captured from actual system events and other dated documentation that demonstrates it meets Requirement R1.

**M2.** Each Planning Coordinator shall have evidence such as dated documentation that demonstrates that it meets requirement R2.

**M3.** Each Planning Coordinator shall have evidence such as dated documentation that demonstrates that it meets Requirement R3.

**M4.** Each Distribution Provider and Transmission Owner in the Eastern Interconnection portion of NPCC shall have evidence such as documentation or reports containing the location and amount of load to be tripped, and the corresponding frequency thresholds, on those circuits included in its UFLS program to achieve the individual and cumulative percentages identified in Requirement R4. (PRC-006-NPCC-1 Attachment C Tables 1-3).

**M5.** Each Distribution Provider or Transmission Owner shall have evidence such as reports, analysis, system studies and dated documentation that demonstrates that it meets Requirement R5.

**M6.** Each Distribution Provider and Transmission Owner in the Québec Interconnection shall have evidence such as documentation or reports containing the location and amount of load to be tripped and the corresponding frequency thresholds on those circuits included in its UFLS program to achieve the load values identified in Table 4 of Requirement R6. (PRC-006-NPCC-1 Attachment C Table 4).

**M7.** Each Distribution Provider and Transmission Owner shall have evidence such as documentation or reports that their underfrequency relays have been set with the minimum time delay, in accordance with Requirement R7.

**M8.** Each Planning Coordinator shall have evidence such as reports, system studies or analysis that demonstrates that it meets Requirement R8.

**M9.** Each Planning Coordinator shall provide evidence such as letters, emails, or other dated documentation that demonstrates that it meets Requirement R9.

**M10.** Each Distribution Provider and Transmission Owner shall provide evidence such as test reports, data sheets or other documentation that demonstrates that it meets Requirement R10.

**M11.** Each Distribution Provider and Transmission Owner shall provide evidence such as letters, emails or other dated documentation that demonstrates that it meets Requirement R11.

**M12.** Each Distribution Provider and Transmission Owner shall provide evidence such as reports, spreadsheets or other dated documentation submitted to its Planning Coordinator that indicates the frequency set point, the net amount of load shed and the percentage of its peak load at each stage of its UFLS program coincident with the integrated hourly peak of the previous year that demonstrates that it meets Requirement R12.

**M13.** Each Generator Owner shall provide evidence such as reports, data sheets, spreadsheets or other documentation that demonstrates that it meets Requirement R13.

**M14.** Each Generator Owner shall provide evidence such as emails, letters or other dated documentation that demonstrates that it meets Requirement R14.

**M15.** Each Generator Owner shall provide evidence such as reports, data sheets, specifications, memorandum or other documentation that demonstrates that it meets Requirement R15.

**M16.** Each Generator Owner with existing non-nuclear units in service prior to the effective date of this Standard which have underfrequency tripping that is not compliant with Requirement R13 shall provide evidence such as reports, spreadsheets, memorandum or dated documentation demonstrating that it meets Requirement R16.

**M17.** Each Planning Coordinator in Ontario, Quebec and the Maritime provinces shall provide evidence such as emails, memorandum or other documentation that demonstrates that it followed the methodology described in PRC-006-NPCC-1 Attachment A and meets Requirement R17.

**M18.** Each Generator Owner, Distribution Provider or Transmission Owner within the Planning Coordinator area of ISO-NE or the New York ISO shall provide evidence such as emails, memorandum, or other documentation that demonstrates that it followed the methodology described in PRC-006-NPCC-1 Attachment B and meets Requirement R18.

**M19.** Each Generator Owner of nuclear units that have been specifically identified by NPCC as having generator trip settings above the generator trip curve in PRC-006-NPCC-1 Figure 1 shall provide evidence such as letters, reports and dated documentation that demonstrates that it meets Requirement R19.

**M20.** Each Planning Coordinator shall provide evidence such as spreadsheets, system studies, or other documentation that demonstrates that it meets the requirements of Requirement R20.

**M21.** Each Planning Coordinator shall provide evidence such as emails, memorandum or other dated documentation that it meets Requirement R21.

**M22.** Each Distribution Provider, Transmission Owner and Generator Owner shall provide evidence such as reports, spreadsheets or other documentation that demonstrates that it meets Requirement R22.

**M23.** Each Distribution Provider, Transmission Owner and Generator Owner shall provide evidence such as letters, emails or other dated documentation that demonstrates it meets Requirement R23.

**8. Proposed Reliability Standard achieves a reliability goal effectively and efficiently — but do not necessarily reflect “best practices” without regard to implementation cost.**

Regional Reliability Standard PRC-006-NPCC-1 achieves its reliability goal effectively and efficiently. The standard accomplishes the reliability goal of ensuring the development of an effective UFLS program in the NPCC region that preserves the security and integrity of the bulk power system during declining system frequency events in coordination with the NERC UFLS Reliability Standard characteristics, which is currently contained in PRC-006-1.

The implementation plan for PRC-006- NPCC-1 (included in **Exhibit A**) specifies a six year implementation schedule and provides for annual improvement over that period in the system performance expected following UFLS operation for an island condition. Modifications to the program in the first two years are limited to relay setting changes only. Modifications requiring capital improvements are scheduled to begin in the third year of the program to provide sufficient time for including expenditures in capital budgets and procuring equipment.

**9. Proposed Reliability Standards is not “lowest common denominator,” i.e., does not reflect a compromise that does not adequately protect bulk power system reliability.**

This proposed Regional Reliability Standard does not reflect a “lowest common denominator” approach. PRC-006-NPCC-1 incorporates the UFLS program recommendations set forth by the SS-38 Working Group on Inter-Area Dynamic Analysis in assessment studies that were performed after the 2003 Blackout. Contrary to a “lowest common denominator” approach, the Standard attempts to provide a bridge between the recommendations of the SS-38 Working Group and the current Registry



Criteria by requiring the Planning Coordinator to identify those generators deemed critical to the performance of the UFLS program in order for the Regional Entity to review the status of such units.

**10. Proposed Reliability Standard considers costs to implement for smaller entities but not at consequence of less than excellence in operating system reliability.**

PRC-006-NPCC-1 provides an opportunity for smaller entities to aggregate their load with other such entities in the same electrical island. This allows each smaller entity's respective Planning Coordinator to achieve the desired aggregate outcome within that island according to the program characteristics.

**11. Proposed Reliability Standard is designed to apply on a regional basis.**

The proposed Regional Reliability Standard is designed on a regional basis and will only apply to the NPCC region. It is not intended to be applied throughout North America.

**12. Proposed Reliability Standard will cause no undue negative effect on competition or restriction of the grid.**

This proposed Regional Reliability Standard will not cause undue negative effects on competition or restriction of the grid. Because this standard will be applied equally across the NPCC region, PRC-006-NPCC-1 will not negatively affect competition, or restrict available transmission capability within the NPCC footprint.

**13. The implementation time for the proposed Reliability Standard is reasonable.**

The implementation plan for the Regional Reliability Standard proposes a phased in implementation schedule as follows:

For the Eastern Interconnection and Québec Interconnection Portions of NPCC excluding the Independent Electricity System Operator (“IESO”) Planning Coordinator Area of NPCC in Ontario, Canada:

The effective date for requirements R1, R2, R3, R4, R5, R6, and R7 is the first day of the first calendar quarter following applicable regulatory approval but no earlier than Jan 1, 2016. The effective date for requirements R8 through R23 is the first day of the first calendar quarter two years following applicable governmental and regulatory approval.

For the IESO Planning Coordinator’s Area of NPCC in Ontario, Canada:

All requirements are effective the first day of the first calendar quarter following applicable governmental and regulatory approval but no earlier than April 1, 2017.

The information submitted by NPCC supports the implementation schedule presented.

#### **14. The Reliability Standard development process was open and fair.**

NPCC develops Regional Reliability Standards in accordance with **Exhibit C** (*Regional Reliability Standards Development Procedure*) of its Regional Delegation Agreement with NERC. The development process is open to any person or entity with a legitimate interest in the reliability of the bulk power system. NPCC considers the comments of all stakeholders and an affirmative vote of the stakeholders and the NPCC Board of Directors are both required to approve a Regional Reliability Standard for submission to NERC and the applicable governmental authorities.

The proposed Regional Reliability Standard has been developed and approved by industry stakeholders using NPCC's *Regional Reliability Standards Development Procedure* and was approved by the NPCC Board of Directors on November 20, 2011. The standard was subsequently presented to and approved by the NERC Board of Trustees February 9, 2012. Therefore, NPCC has utilized its standard development process in good faith and in a manner that is open and fair. No commenters disagreed with the open and fair implementation of the NPCC process.

**15. Proposed Reliability Standard does not need to be balanced with other vital public interests.**

Neither NERC nor NPCC believes there are competing public interests with the request for approval of this proposed Regional Reliability Standard. No comments were received that indicated the proposed standard conflicts with other vital public interests. Therefore it is not necessary to balance this Regional Reliability Standard against any other competing public interests.

NERC has therefore determined that the proposed standard meets the criteria for consideration and approval as a Reliability Standard.

**c. Additional FERC Criteria for Regional Reliability Standards**

FERC's Order No. 672 establishes additional criteria that a Regional Reliability Standard must satisfy: "A regional difference from a continent-wide Reliability Standard must either be (1) more stringent than the continent-wide Reliability Standard including a regional difference that addresses matters the continent-wide Reliability Standard does

not, or (2) a Regional Reliability Standard that is necessitated by a physical difference in the Bulk-Power System.”<sup>6</sup> The proposed standard satisfies these additional criteria.

The existing NERC continent-wide standard, PRC-006-1 – Automatic Underfrequency Load Shedding applies only to Planning Coordinators, Transmission Owners, and Distribution Providers. The proposed standard, PRC-006-NPCC-1, includes Generator Owners as applicable entities. The NPCC standard adds specificity not contained in the NERC standard for development and implementation of a UFLS program in the NPCC region that effectively arrests declining frequency, assists recovery following underfrequency events, and provides last resort system preservation measures. PRC-006-NPCC-1 achieves a coordinated, comprehensive UFLS region-wide consistent program within the NPCC Region and provides the regional requirements necessary to achieve and facilitate the broader program characteristics contained in the requirements of the NERC UFLS standard. It is designed to work in conjunction with, and augment the NERC standard by mitigating the consequences of an underfrequency event, while accommodating differences in system transmission and distribution topology among NPCC Planning Coordinators due to historical design criteria, makeup of load demands, and generation resources. The standard also facilitates uniformity, compliance, and clearly delineates what the applicable entities’ requirements are within the region to achieve a robust, reliable and effective UFLS program. Thus, the proposed standard satisfies the additional FERC Order No. 672 criteria for Regional Reliability Standards.

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<sup>6</sup> Order No. 672 at P 291.

V. **SUMMARY OF THE REGIONAL RELIABILITY STANDARD DEVELOPMENT PROCEEDINGS**

**NERC Evaluation:** On November 21, 2011, NPCC submitted the proposed Regional Reliability Standard for evaluation and approval to NERC in accordance with NERC's *Rules of Procedure* and *Regional Reliability Standards Evaluation Procedure*<sup>7</sup> that was approved by NERC's Regional Reliability Standards Working Group. NERC provided its evaluation of the proposed PRC-006-NPCC-1 standard to NPCC on December 23, 2011, included in **Exhibit B**, after NERC concluded its 45-day posting of the standard.

**Key Issues:**

The NPCC drafting team for PRC-006-NPCC-1 considered and resolved a number of issues concerning the regional UFLS program and incorporated those outcomes into the requirements of this standard. The drafting team sought the recommendations of the NPCC SS-38 Working Group in order to ensure that its solutions to the issues brought forth by commenters and drafting team members were consistent with maintaining a regional effective program for all of the scenarios considered.

Among the issues resolved were: 1) generator coordination and the administration of compensatory load shedding for non-conforming generators, 2) participation of small entities in the regional UFLS program, 3) program tolerances 4) inhibit settings, 5) generator applicability, and 6) NERC PRC-006-1 coordination.

**1) Generator Coordination and Compensatory Load Shedding:**

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<sup>7</sup> Regional Reliability Standards Evaluation Procedure, Version 1 (2009). Available at: [http://www.nerc.com/docs/sac/rswg/NERC\\_Regional\\_Reliability\\_Evaluation\\_Procedure.pdf](http://www.nerc.com/docs/sac/rswg/NERC_Regional_Reliability_Evaluation_Procedure.pdf).

The drafting team established a requirement for all new generators to conform to the generator tripping curve in the standard, thereby eliminating the problem of non-conforming generators in the future. Existing units that are already interconnected and in commercial operations that do not conform to the generator tripping curve in the standard currently obtain compensatory load shedding in accordance with existing NPCC procedures currently in effect and contained within NPCC Directory#12 Underfrequency Load Shedding Program Requirements.<sup>8</sup> These procedures are appended to the standard as attachments and provide the instructions for a non-conforming generator to obtain compensatory load shedding.

The drafting team also considered the existing nuclear units within NPCC with under-frequency threshold settings above the generator tripping curve. A requirement was developed that instructs these units to set the frequency trip setting upper tolerance as low as possible in accordance with the plant design and licensing limitations and to transmit the settings and any changes to settings to the Planning Coordinator.

## 2) Small Entity Participation:

The NPCC UFLS program characteristics as developed by the NPCC SS-38 Working Group and implemented by NPCC area Planning Coordinators is designed with five discrete stages of load shedding (including an anti-stall stage) with approximately 7% of load shedding at each of the program stages. However, many smaller entities (typically those with less than 100MW) are constrained by facility design but with the technical support of the NPCC SS-38 group the drafting team developed modified program stages and tolerances for these smaller entities. The NPCC SS-38 Working

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<sup>8</sup> NPCC Directory # 12, *supra* note 12.

Group modeled these small entity parameters to ensure that the overall regional program converged using these attributes. Furthermore, these small entity characteristics have already been incorporated within the regional UFLS criteria and included in NPCC Directory#12 Underfrequency Load Shedding Program Requirements.<sup>9</sup>

3) Program Tolerances:

The drafting team with the support of the NPCC SS-38 Working Group examined the tolerances that could be permitted when implementing the individual program stages of load shedding in 7% blocks. NPCC SS-38 recommended that the upper and lower program tolerances at each stage should be bounded by +/- 0.5% surrounding a nominal amount of load shed at each stage (7%). This recommendation was incorporated into the standard and provides entities designing their UFLS programs with some degree of flexibility when assigning the amount of load to be shed on declining frequency.

4) Inhibit Settings:

The drafting team recognized during the development of the standard that various inhibit thresholds designed to prevent the misoperation of UFLS relays are employed throughout the region. Although the most common feature is a voltage inhibit, other inhibit schemes utilizing current and time were also revealed. Additionally, the application of the voltage inhibit function was not consistent across the region.

Accordingly, the drafting team developed a requirement for each Planning Coordinator to review and coordinate the development of these thresholds to insure that they are consistent with the goal of an effective regional UFLS program.

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<sup>9</sup> NPCC Directory # 12, *supra* note 12.

5) Generator Applicability:

The drafting team considered the unique nature of UFLS with respect to the critical issue of maintaining proper generator coordination for all units determined to be critical to the support of the UFLS program performance characteristics. The NPCC SS-38 Working Group's assessments and recommendations were developed into a requirement that will allow the Planning Coordinators to identify generation facilities within its Planning Coordinator Area that are considered critical to the program's performance.

6) Coordination with NERC PRC-006-1.

The NPCC drafting team developed PRC-006-NPCC-1 in a manner that coordinated with NERC Reliability Standard PRC-006-1 — Automatic Underfrequency Load Shedding. In some cases, draft requirements were eliminated from the Regional Reliability Standard since PRC-006-1 already includes a requirement in place for these program attributes (e.g. perform a program design assessment every 5 years). In other cases the requirements in the Regional Standard enhance the existing requirements in the NERC Standard as a necessary requirement for the Regional program. For example, NERC PRC- 006-1 has a requirement to “establish islands” and PRC -006-NPCC-1 has a requirement to “use islands to aggregate load.” In still other cases, the drafting team developed requirements to be included in the Regional Standard that were not covered in NERC's PRC-006-1 and which were critical to the performance of the Regional program, such as inhibit thresholds and time delay characteristics on UFLS relays.



**Violation Risk Factors and Violation Severity Levels:**

The proposed Regional Reliability Standard contains both VRFs and VSLs. VRFs and VSLs are assigned to each requirement in the standard. The VRFs and VSLs for this standard were developed and reviewed for consistency with applicable guidelines. Analyses of the assigned VRFs and VSLs to this standard are included in **Exhibit E**.

**VI. CONCLUSION**

For the reasons stated above, NERC respectfully requests approval of the proposed PRC-006-NPCC-1 Regional Reliability Standard and the associated proposed VRFs and VSLs included in **Exhibit A** to this filing. NERC requests that these approvals be made effective in accordance with the implementation plan for PRC-006-NPCC-1 included in **Exhibit A** to this filing.

Respectfully submitted,

*/s/ Andrew M. Dressel*  
Andrew M. Dressel  
*Attorney for North American Electric  
Reliability Corporation*

## **Exhibits A - D**

(Available on the NERC Website at  
[http://www.nerc.com/fileUploads/File/Filings/Attachments\\_PRC-006-NPCC-1.pdf](http://www.nerc.com/fileUploads/File/Filings/Attachments_PRC-006-NPCC-1.pdf))