UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Reliability Standard for Transmission System Planned Performance for Geomagnetic Disturbance Events — Docket No. RM15-11-000

SUPPLEMENTAL NOTICE OF AGENDA AND DISCUSSION TOPICS FOR STAFF TECHNICAL CONFERENCE

(February 4, 2016)

This notice establishes the agenda and topics for discussion at the technical conference to be held on March 1, 2016, to discuss issues related to the proposed Reliability Standard for Transmission System Planned Performance for Geomagnetic Disturbance Events. [1] The technical conference will start at 9:00 am and end at approximately 5:00 pm (Eastern Time) in the Commission Meeting Room at the Commission's Headquarters, 888 First Street, NE, Washington, DC. The technical conference will be led by Commission staff. Commissioners may attend and participate. All interested parties are invited to attend, and registration is not required.

The topics and related questions to be discussed during this conference are provided as an attachment to this Notice. The purpose of the technical conference is to facilitate a structured dialogue on issues identified by the Commission in the Notice of Proposed Rulemaking (NOPR) in this proceeding and raised in public comments to the NOPR. Prepared remarks will be presented by invited panelists.

This event will be webcast and transcribed. The free webcast allows listening only. Anyone with internet access who desires to listen to this event can do so by navigating to the "FERC Calendar" at www.ferc.gov, and locating the technical conference in the Calendar of Events. Opening the technical conference in the Calendar of Events will reveal a link to its webcast. The Capitol Connection provides technical support for the webcast and offers the option of listening to the meeting via phone-bridge for a fee. If you have any questions, visit www.CapitolConnection.org or call 703-993-3100. The webcast will be available on the Calendar of Events at www.ferc.gov for three

[1] On April 30, 2012, Commission staff held a technical conference to discuss "issues related to the reliability of the Bulk-Power System as affected by geomagnetic disturbances," and "the risks and impacts from geomagnetically induced currents to transformers and other equipment on the Bulk-Power System, as well as options for addressing or mitigating the risks and impacts." http://www.ferc.gov/eventcalendar/Files/20120420162925-AD12-13-000a.pdf

months after the conference. Transcripts of the conference will be available for a fee from Ace-Federal Reporters, Inc. (202-347-3700).

FERC conferences are accessible under section 508 of the Rehabilitation Act of 1973. For accessibility accommodations, please send an email to accessibility@ferc.gov or call toll free (866) 208-3372 (voice) or (202) 502-8659 (TTY), or send a fax to (202) 208-2106 with the requested accommodations.

There is no fee for attendance. However, members of the public are encouraged to preregister online at:

https://www.ferc.gov/whats-new/registration/03-01-16-form.asp

For more information about the technical conference, please contact:

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Deputy Secretary.

Transmission System Planned Performance for Geomagnetic Disturbance Events
RM15-11-000
March 1, 2016

Agenda

Welcome and Opening Remarks by Commission Staff
9:00 – 9:15 a.m.

Introduction

In a May 14, 2015 Notice of Proposed Rulemaking (NOPR) in the above-captioned docket, the Commission proposed to approve Reliability Standard TPL-007-1 (Transmission System Planned Performance for Geomagnetic Disturbance (GMD) Events). In addition, the Commission proposed to direct the North American Electric Reliability Corporation (NERC): (1) to develop certain revisions to proposed Reliability Standard TPL-007-1; and (2) to submit a work plan, and subsequently one or more informational filings, that address specific GMD-related research areas. The Commission sought and received comments on these proposals, including the NOPR proposal: (1) to develop modifications to the benchmark GMD event definition set forth in Attachment 1 of the proposed Reliability Standard so that the definition is not based solely on spatially-averaged data; and (2) to revise proposed Reliability Standard TPL-007-1 to require the installation of monitoring equipment (i.e., geomagnetically-induced current (GIC) monitors and magnetometers) to the extent there are any gaps in existing GIC monitoring and magnetometer networks. The purpose of this conference is to clarify issues, share information, and determine appropriate ways to address the issues raised in the NOPR and NOPR comments, in light of the Oak Ridge National Lab study[2], the NERC study[3], and various other studies on these issues.

[2] http://www.ferc.gov/industries/electric/indus-act/reliability/cybersecurity/ferc_meta-r-319.pdf.
[3] http://www.nerc.com/pa/Stand/Project201303GeomagneticDisturbanceMitigation/Benchmark_GMD_Event_Dec5_clean.pdf

Panel 1: **Benchmark GMD Event(s) Definition**
9:15 - 11:45 a.m.

The Commission staff seeks information, including next steps and timing of future work and/or research, concerning the benchmark GMD event definition in proposed Reliability Standard TPL-007-1. Panelists are encouraged to address the following:

- Geomagnetic fields:
    - Discuss the statistical methods used to develop the benchmark event.
    - Describe the advantages and disadvantages of using the proposed spatial-averaging method for amplitude scaling of the geoelectric field.
    - Describe the characteristics of non-spatially averaged geomagnetic fields (e.g., magnitude(s), size of affected region(s)) and how they could be developed.
    - Describe potential changes to proposed Reliability Standard TPL-007-1 that might be appropriate due to incorporating non-spatially averaged geomagnetic fields.
    - Is the proposed adjustment for latitude scaling supported by the available data and analysis?
- Earth Conductivity
    - Explain how 3-D magnetotelluric readings are taken and discuss the current availability of data.
    - Describe some of the main characteristics of the data to date, including:
        1. Whether there are regions of uniform data and if interpolations are made between reading locations.
        2. Margins of error associated with USGS data.
    - Explain the obstacles to, and potential timeline for, completing 3-D magnetotelluric readings in the contiguous 48 states.
    - Explain whether the partially completed 3-D magnetotelluric readings data can be used in GIC calculations now.
    - Discuss efforts to validate the proposed benchmark model using GIC data from actual events in the contiguous 48 states.

Panelists:

1. Mark Lauby (Senior Vice President and Chief Reliability Officer, North American Electric Reliability Corporation)
2. Antti Pulkkinen (Standard Drafting Team, NASA Research Astrophysicist)
3. Dr. Scott Backhaus (Los Alamos National Laboratory)
4. Dr. Jeffrey Love (Research Geophysicist, U.S. Geological Survey)

5. Prof. Adam Schultz (Professor, Oregon State University)
6. David Boteler (Head, Space Weather Group, Natural Resources Canada)
7. David Roodman (Senior Advisor at the Open Philanthropy Project)
8. John Kappenman (Principal Consultant, Storm Analysis Consultants)

Lunch
11:45 a.m. - 12:45 p.m.

Panel 2: **Vulnerability Assessments**
12:45 p.m. - 2:30 p.m.

The Commission staff seeks information, including next steps and timing of future work and/or research, about the GMD Vulnerability Assessments and transformer thermal impact assessments in proposed Reliability Standard TPL-007-1. Panelists are encouraged to address the following:

- Harmonics and vibrational effects during benchmark GMD events.
    - Describe the state of knowledge and modeling capabilities regarding the harmonics and vibrational effects during benchmark GMD events.
    - Describe the impacts of such effects on equipment (e.g., protection equipment, reactive sources, generators).
    - Describe power system impacts related to the reactive power demand associated with GMD events.
- Describe the state of knowledge and modeling capabilities regarding transformer thermal assessments.
    - Discuss the use of a threshold level of GIC to trigger a requirement to perform a thermal impact assessment of a transformer, including the appropriateness of a 75 ampere/phase GIC threshold.
    - Describe the state of knowledge and modeling capabilities regarding system assessments, including interaction with equipment vulnerabilities (e.g., harmonics).
- Non-uniform geoelectric fields
    - Describe the modeling capabilities to use non-uniform geoelectric fields to calculate grid GIC flows now and if any changes are expected soon.
    - Describe the advantages and disadvantages of using non-uniform geoelectric fields in modeling to calculate grid GIC flows.

Panelists:

1. Mark Lauby (Senior Vice President and Chief Reliability Officer, North American Electric Reliability Corporation)

2. Dr. Luis Marti (Standard Drafting Team, Director of Reliability Studies, Standards and Compliance at Hydro One Networks)
3. Michael Steckelberg (Senior Transmission Planning Engineer, Great River Energy)
4. Randy Horton (Standard Drafting Team, Planning Manager, Southern Company Services, Inc.)
5. Prof. Thomas Overbye (Fox Family Professor, University of Illinois)
6. Prof. Trevor Gaunt (University of Cape Town, Cape Town, South Africa)
7. Terry Volkmann (President, Volkmann Consulting, Inc.)

Break
2:30 p.m. - 2:45 p.m.

Panel 3: Monitoring and Future Work
2:45 – 4:45 p.m.

The Commission staff seeks information, including next steps and timing of future work and/or research, about GIC monitoring and magnetometers. Panelists are encouraged to address the following:

- Current State of Monitoring.
    - Describe the extent of existing monitoring and monitoring in development, including GIC, geomagnetic fields, and geoelectric fields.
    - Describe the uses of monitored data (e.g., model validation, near-real time situational awareness).
- Potential for Additional Monitoring.
    - Describe the amount of additional monitoring that would be useful and the process of selecting monitoring locations.
    - Describe the proper techniques to ensure maximum benefit of monitoring data (e.g., cadence).
    - Describe the costs and other factors to consider in installing, operating and maintaining monitoring devices for GIC, geomagnetic fields and geoelectric fields, including opportunities to collaborate.
- Discuss the availability of monitored data (e.g., availability today and in the future, any needs for protection, methods for sharing).

Panelists:

1. Mark Lauby (Senior Vice President and Chief Reliability Officer, North American Electric Reliability Corporation)
2. David Boteler (Head, Space Weather Group, Natural Resources Canada)

3. Dr. Jeffrey Love (Research Geophysicist, U.S. Geological Survey)
4. Prof. Trevor Gaunt (University of Cape Town, Cape Town, South Africa)
5. Dr. Luis Marti (Standard Drafting Team, Director of Reliability Studies, Standards and Compliance at Hydro One Networks)
6. Frank Koza (Standard Drafting Team Chair, Executive Director, PJM Interconnection, L.L.C.)
7. Jerry Schuman (PingThings, Inc.)
8. Thomas Popik (Chairman, Foundation for Resilient Societies)

4:45 p.m. - 5 p.m. Closing Remarks