

April 24, 2018

VIA ELECTRONIC FILING

David Erickson
President and Chief Executive Officer
Alberta Electric System Operator
2500, 330 - 5 Avenue SW
Calgary, Alberta
T2P 0L4

RE: *North American Electric Reliability Corporation*

Dear Mr. Erickson:

The North American Electric Reliability Corporation hereby submits Revised Geomagnetic Disturbance Research Work Plan of the North American Electric Reliability Corporation. NERC requests, to the extent necessary, a waiver of any applicable filing requirements with respect to this filing.

Please contact the undersigned if you have any questions concerning this filing.

Respectfully submitted,

/s/ Shamai Elstein

Shamai Elstein
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Enclosure

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**BEFORE THE
ALBERTA ELECTRIC SYSTEM OPERATOR**

**NORTH AMERICAN ELECTRIC)
RELIABILITY CORPORATION)**

**REVISED GEOMAGNETIC DISTURBANCE RESEARCH WORK PLAN OF THE
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION**

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TABLE OF CONTENTS

I. THE REVISED GMD RESEARCH WORK PLAN 2

II. GMD RESEARCH WORK PLAN PROJECT MANAGEMENT 3

III. NEXT STEPS 4

ATTACHMENT 1: Order No. 830 GMD Research Work Plan (April 2018)

ATTACHMENT 2: Order No. 830 GMD Research Work Plan (redline to May 2017 preliminary plan)

**BEFORE THE
ALBERTA ELECTRIC SYSTEM OPERATOR**

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**REVISED GEOMAGNETIC DISTURBANCE RESEARCH WORK PLAN OF THE
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION**

Pursuant to paragraph 12 of the Federal Energy Regulatory Commission’s (“FERC”) October 19, 2017 order,¹ the North American Electric Reliability Corporation (“NERC”) hereby submits a revised work plan to conduct research on topics related to geomagnetic disturbances (“GMD”) and their impacts on the reliability of the Bulk-Power System (“BPS”) (the “GMD Research Work Plan”). In Order No. 830,² FERC approved Reliability Standard TPL-007-1 - Transmission System Planned Performance for Geomagnetic Disturbance Events and directed NERC to, among other things, submit a work plan within six months of the effective date of the Final Rule describing how NERC would conduct research on the GMD-related topics specified by FERC and any additional topics selected in NERC’s discretion. NERC submitted a preliminary GMD Research Work Plan to FERC on May 30, 2017,³ and filed the Work Plan with this governmental authority on June 5, 2017. On October 19, 2017, FERC accepted NERC’s preliminary work plan and directed NERC to file a final, or otherwise updated, plan

¹ *Order on GMD Research Work Plan*, 161 FERC ¶ 61,048 (2017) (“October 2017 Order”).

² Order No. 830, *Reliability Standard for Transmission System Planned Performance for Geomagnetic Disturbance Events*, 156 FERC ¶ 61,215 (2016), *reh’g denied*, Order No. 830-A, 158 FERC ¶ 61,041 (2017) (“Order No. 830”).

³ *Geomagnetic Disturbance Research Work Plan of the North American Electric Reliability Corporation*, Docket No. RM15-11-002 (May 30, 2017) (“May 2017 Filing”).

within six months.⁴ NERC's revised GMD Research Work Plan is attached hereto as

Attachment 1.

I. THE REVISED GMD RESEARCH WORK PLAN

In the months following the May 2017 submission to FERC and the June 2017 submission to this authority of NERC's preliminary work plan, NERC has worked diligently with the Electric Power Research Institute ("EPRI") and the NERC GMD Task Force⁵ to further develop and refine the research activities described in the plan. The revised GMD Research Work Plan, attached hereto as **Attachment 1**, provides an expansive and detailed framework for conducting research into the GMD-related research areas identified by FERC in Order No. 830. **Attachment 2** to this filing, which is a comparison of the revised GMD Research Work Plan to the May 2017 preliminary plan, demonstrates the improvements that have been made as a result of further work on the plan and with the benefit of early experience implementing some of the research activities.

As shown in Attachment 2, and as summarized briefly below, the revised plan addresses FERC's guidance from the October 2017 Order by:

- providing additional background information and specificity regarding the research activities that will be performed under the plan's nine broad work categories, referred to in the plan as "Tasks",⁶ and
- including an updated project timeline specifying the anticipated completion dates for each of the research activities.⁷

⁴ GMD Work Plan Order at PP 1 and 12.

⁵ The NERC GMD Task Force includes participants from the U.S. and Canadian governments, space weather researchers, representatives from the manufacturer and vendor community, and subject matter experts from both within and outside the electric power industry.

⁶ See October 2017 Order at PP 11 and 13 (stating that NERC's revised work plan should be "specific, particularly with respect to the content and timing of deliverables for each research task" and should directly address "whether new analyses and observations support modifying the use of single station readings around the earth to adjust the spatially averaged benchmark for latitude," in accordance with Order No. 830).

⁷ See *id.* at P 11.

For each of the nine main project Tasks, NERC has added a background section to provide discussion regarding the need for the identified activities and the overarching objectives of the Task. The revised plan adds specificity regarding the specific research activities under each Task. For example, the description under Task 2: *Further Analyze Latitude Scaling* now clearly identifies that the research will include determining whether new analyses and observations support modifying the use of single station readings to modify the latitude scaling factors used in the TPL-007 standard. This descriptions under this Task, as well under other Tasks such as Task 1: *Further Analyze Spatial Averaging Used in the Benchmark GMD Event* and Task 7: *Geoelectric Field Tool Evaluation and Calculation of Beta Factors*, are expanded to provide additional information regarding the data and assumptions to be considered under the specific research activities identified therein.

The revised GMD Research Work Plan also includes additional details regarding the expected deliverables for each of the plan's nine Tasks. A revised project schedule is included at the end of the revised plan that shows the estimated timeframes for each of the individual Tasks, including the estimated date of completion.

II. GMD RESEARCH WORK PLAN PROJECT MANAGEMENT

In addition to revising the work plan as described above, NERC collaborated with EPRI to develop a project management structure to oversee the completion of this important work. As NERC noted in its May 2017 Filing, executing a project of the magnitude of the GMD Research Work Plan will require an extensive, multi-year effort involving scientific and technical expertise from a variety of disciplines.⁸ NERC has determined that EPRI's expertise and experience in managing complex, multidisciplinary electric industry research and

⁸ May 2017 Filing at 2.

development projects and its assistance in developing the GMD Research Work Plan makes it exceptionally well-qualified to execute the research components of the plan.

In 2017, EPRI initiated a project to address GMD Research Work Plan activities.⁹ The project is supported by industry participants and involves the NERC GMD Task Force, U.S. national laboratories, equipment manufacturers, and other North American research partners. The estimated \$3.5 million cost to execute the research components of the plan are shared among NERC and the industry participants, alleviating many of the resource constraint concerns that prompted NERC to seek FERC's guidance on prioritizing research Tasks in the May 2017 Filing. To date, over twenty industry participants have joined the EPRI project, including utilities and Independent System Operators from across the United States. By leveraging EPRI's expertise, relationships, and experience with such projects, the plan's goal of producing insights that can be used to better understand the nature of GMD events and the risks they pose to reliability can be achieved much more expeditiously than would be possible otherwise. EPRI began work in late 2017 on several key research activities under the plan, and the research work is expected to proceed according to an aggressive three-year project schedule under which all plan research Tasks are expected to be funded and completed. GMD Research Work Plan project deliverables, such as technical reports, would be accessible free of charge on the EPRI website. More information is included in the following section.

III. NEXT STEPS

EPRI will update the NERC GMD Task Force regularly on the progress of the work plan. As noted in the previous section, work under the GMD Research Work Plan is currently

⁹ See EPRI, *Geomagnetic Disturbances (GMD) Grid Resiliency: Furthering the Research of GMD Impacts on the Bulk Power System*, <https://www.epri.com/#/pages/product/000000003002011467/>.

underway, and the first technical reports summarizing the results of research are expected by the end of 2018. Consistent with FERC's guidance,¹⁰ individuals and entities that are interested in commenting on research results before they are filed will have the opportunity to do so. EPRI will provide the technical reports to the GMD Task Force for broad technical and scientific review. (As an independent research organization, EPRI will make the final decision on format and findings in its research results.) NERC encourages anyone who is interested in NERC's GMD research activities to participate in GMD Task Force meetings. These meetings are open to the public, and remote participation is available.¹¹

To keep the applicable governmental authorities informed of the results of the research, NERC will submit one or more informational filings. NERC expects to submit these filing(s) approximately six months following EPRI's completion of the associated technical report(s). The associated technical reports will be available on to the public free of charge on the EPRI website.

NERC, with the assistance of the NERC GMD Task Force, will implement Task 6: *Section 1600 Data Request*, relating to the collection of GMD monitoring data from U.S. registered entities pursuant to Section 1600 of the NERC Rules of Procedure.¹² NERC posted a draft data request for public comment from February 6, 2018 through March 26, 2018 and is currently reviewing the comments and considering appropriate revisions. NERC intends to seek authorization from the NERC Board of Trustees to issue the data request to registered entities in August 2018. Work to develop the necessary processes and technology solutions to collect and host the GMD monitoring data is ongoing.

¹⁰ See October 2017 Order at P 17 ("The Commission also expects NERC to afford interested entities an opportunity to comment on GMD Work Plan deliverables before they are filed with the Commission.").

¹¹ Meeting materials and other information are available on the NERC website here: NERC GMD Task Force, [https://www.nerc.com/comm/PC/Pages/Geomagnetic-Disturbance-Task-Force-\(GMDTF\)-2013.aspx](https://www.nerc.com/comm/PC/Pages/Geomagnetic-Disturbance-Task-Force-(GMDTF)-2013.aspx).

¹² The NERC Rules of Procedure are available at <https://www.nerc.com/AboutNERC/Pages/Rules-of-Procedure.aspx>.

NERC notes that scientific research is, by its nature, uncertain. As some of the GMD Research Work Plan activities are at the forefront of evolving science and engineering capabilities, the anticipated, expected, or desired deliverable may not be attained on the expected timeline, or at all. Further, it may become necessary, in the course of implementation, to refine or more substantially alter the GMD Research Work Plan to pursue alternative activities or more promising avenues of research, or to amend the project timeline. Such revisions would be discussed through the NERC GMD Task Force. Lastly, NERC understands that EPRI has commitments to fully fund the project through completion. Should that change, a NERC would work with EPRI to adjust the work plan as necessary, using FERC's October 2017 order of Task prioritization as a guide.¹³ To maintain transparency, NERC will maintain an up-to-date copy of the GMD Research Work Plan on the GMD Task Force project page, along with an explanation of any changes that were determined to be necessary. NERC also commits to keep FERC staff apprised of GMD Research Work Plan project status until work is completed.

¹³ In the October 2017 Order, FERC offered the following guidance on prioritization (listed highest priority to lowest priority):

- Task 3: *Improve Earth Conductivity Models for GIC Studies*;
- Task 8: *Improve Harmonics Analysis Capability* and Task 9: *Harmonic Impact Studies*;
- Task 4: *Study GIC Field Orientation for Transformer Thermal Impact Assessments*
- Task 1: *Further Analyze Spatial Averaging Used in the Benchmark GMD Event* and Task 2: *Further Analyze Latitude Scaling*
- Task 5: *Further Analyze the 75 A per Phase Criterion Used for Transformer Thermal Impact Assessments* and Task 7: *Geoelectric Field Tool Evaluation and Beta Scaling Factors Calculations*

FERC did not address the prioritization of Task 6: *Section 1600 Data Request*, as it is not specifically a research task.

Respectfully submitted,

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ATTACHMENT 1 and ATTACHMENT 2