

163 FERC ¶ 61,126
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

18 CFR Part 40

[Docket No. RM18-8-000]

Geomagnetic Disturbance Reliability Standard

(May 17, 2018)

AGENCY: Federal Energy Regulatory Commission.

ACTION: Notice of proposed rulemaking.

SUMMARY: The Federal Energy Regulatory Commission (Commission) proposes to approve Reliability Standard TPL-007-2 (Transmission System Planned Performance for Geomagnetic Disturbance Events). The North American Electric Reliability Corporation (NERC), the Commission-certified Electric Reliability Organization, submitted proposed Reliability Standard TPL-007-2 for Commission approval. Geomagnetic disturbance events (GMDs) occur when the sun ejects charged particles that interact with and cause changes in the earth's magnetic fields. Proposed Reliability Standard TPL-007-2 modifies currently-effective Reliability Standard TPL-007-1 by requiring applicable entities to: conduct supplemental GMD vulnerability assessments and thermal impact assessments; obtain geomagnetically induced current and magnetometer data; and meet certain deadlines for the development and completion of tasks in corrective action plans. In addition, the Commission proposes to direct NERC to develop and submit modifications to the Reliability Standard to require applicable entities to develop and

implement corrective action plans to mitigate supplemental GMD event vulnerabilities.

DATES: Comments are due **[INSERT DATE 60 days after date of publication in the FEDERAL REGISTER]**.

ADDRESSES: Comments, identified by docket number, may be filed electronically at <http://www.ferc.gov> in acceptable native applications and print-to-PDF, but not in scanned or picture format. For those unable to file electronically, comments may be filed by mail or hand-delivery to: Federal Energy Regulatory Commission, Secretary of the Commission, 888 First Street, NE, Washington, DC 20426. The Comment Procedures Section of this document contains more detailed filing procedures.

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SUPPLEMENTARY INFORMATION:

163 FERC ¶ 61,126
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Geomagnetic Disturbance Reliability Standard

Docket No. RM18-8-000

NOTICE OF PROPOSED RULEMAKING

(May 17, 2018)

1. Pursuant to section 215 of the Federal Power Act (FPA), the Commission proposes to approve Reliability Standard TPL-007-2 (Transmission System Planned Performance for Geomagnetic Disturbance Events).¹ The Commission also proposes to approve the associated violation risk factors and violation severity levels, implementation plan, and effective date for proposed Reliability Standard TPL-007-2. The North American Electric Reliability Corporation (NERC), the Commission-certified Electric Reliability Organization (ERO), submitted proposed Reliability Standard TPL-007-2 for approval in response to a Commission directive in Order No. 830.² Geomagnetic disturbance events (GMDs) occur when the sun ejects charged particles that interact with and cause changes in the earth's magnetic fields. This interaction can cause

¹ 16 U.S.C. 824o (2012).

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

geomagnetically induced currents (GICs) to flow in an electric power system and, depending on various factors affecting the intensity of the current, can result in a risk of voltage instability or voltage collapse, as well as equipment loss or failure.

2. Proposed Reliability Standard TPL-007-2 modifies currently-effective Reliability Standard TPL-007-1 (Transmission System Planned Performance for Geomagnetic Disturbance Events) by requiring applicable entities to: (1) conduct supplemental GMD vulnerability assessments and thermal impact assessments; (2) obtain GIC and magnetometer data; and (3) meet certain deadlines for the development and completion of tasks in corrective action plans.

3. The Commission proposes to approve proposed Reliability Standard TPL-007-2 as it largely addresses (with one exception discussed below) the directives in Order No. 830 to modify currently-effective Reliability Standard TPL-007-1: (1) to revise the benchmark GMD event definition, as it pertains to the required GMD Vulnerability Assessments and transformer thermal impact assessments, so that the definition is not based solely on spatially-averaged data; (2) to require the collection of necessary GIC monitoring and magnetometer data; and (3) to include a one-year deadline for the completion of corrective action plans and two- and four-year deadlines to complete mitigation actions involving non-hardware and hardware mitigation, respectively.

4. While proposed Reliability Standard TPL-007-2 addresses the first directive in Order No. 830 by requiring applicable entities to conduct supplemental GMD vulnerability and thermal impact assessments, which do not rely solely upon on spatially-averaged data, the proposed Reliability Standard does not require applicable entities to

mitigate vulnerabilities identified pursuant to such a supplemental assessment.³ NERC's proposal to modify the benchmark, but then allow entities the discretion to take corrective action based solely on the results of the spatially-averaged data while taking under advisement ("an evaluation of possible actions") the results of the supplemental assessment, does not satisfy the clear intent of the Commission's directive. Moreover, Order No. 830 reiterated the directive in Order No. 779 that NERC develop a second stage GMD Reliability Standard requiring GMD vulnerability assessments and that "owners and operators [] develop and implement a plan to protect against instability, uncontrolled separation, or cascading failures of the Bulk-Power System."⁴ Accordingly, as discussed below, the Commission proposes to direct that NERC, pursuant to section 215(d)(5) of the FPA, develop and submit modifications to the Reliability Standard to require applicable entities to develop and implement corrective action plans to mitigate vulnerabilities revealed by conducting supplemental GMD vulnerability assessments.⁵ The Commission proposes to direct NERC to submit the modified Reliability Standard for approval within 12 months from the effective date of Reliability Standard TPL-007-2.

³ See Order No. 830, 156 FERC ¶ 61,215 at P 44 (directing NERC to "develop revisions to the benchmark GMD event definition so that the reference peak geoelectric field amplitude component is not based solely on spatially-averaged data").

⁴ Order No. 830, 156 FERC ¶ 61,215 at P 7.

⁵ 16 U.S.C. 824o(d)(5).

5. In addition, while proposed Reliability Standard TPL-007-2 imposes deadlines for the preparation and completion of tasks in corrective action plans, Requirement R7.4 of the proposed Reliability Standard also permits applicable entities to exceed deadlines for completing corrective action plan tasks when “situations beyond the control of the responsible entity [arise].” As discussed below, the Commission seeks comment on two options that it is considering regarding proposed Requirement R7.4. Under the first option, the Commission would, pursuant to section 215(d)(5) of the FPA, direct NERC to modify the Reliability Standard to bring the proposed standard into alignment with the Commission’s direction in Order No. 830, through a process whereby NERC considers extensions on a case-by-case basis informed by proposed Requirement R7.4.⁶ Under the second option, the Commission would approve proposed Requirement R7.4. Under both options, the Commission would direct NERC to prepare and submit a report regarding how often and why applicable entities are exceeding corrective action plan deadlines following implementation of the proposed Reliability Standard. Under such a directive, NERC would submit the report within 12 months from the date on which applicable entities must comply with the last requirement of Reliability Standard TPL-007-2.⁷

⁶ Order No. 830, 156 FERC ¶ 61,215 at P 102.

⁷ NERC’s proposed implementation plan provides that, depending on the effective date of Reliability Standard TPL-007-2, applicable entities will be required to comply with the requirements of the proposed Reliability Standard on a staggered schedule. For example, if proposed Reliability Standard TPL-007-2 becomes effective before January 1, 2021, the last requirement applicable entities will be required to comply with (*continued ...*)

I. Background**A. Section 215 and Mandatory Reliability Standards**

6. Section 215 of the FPA requires the Commission to certify an ERO to develop mandatory and enforceable Reliability Standards, subject to Commission review and approval. Once approved, the Reliability Standards may be enforced in the United States by the ERO, subject to Commission oversight, or by the Commission independently.⁸

B. GMD Primer

7. GMD events occur when the sun ejects charged particles that interact and cause changes in the earth's magnetic fields.⁹ Once a solar particle is ejected, it can take between 17 to 96 hours (depending on its energy level) to reach earth.¹⁰ A geoelectric field is the electric potential (measured in volts per kilometer (V/km)) on the earth's surface and is directly related to the rate of change of the magnetic fields.¹¹ The geoelectric field has an amplitude and direction and acts as a voltage source that can

is Requirement R7 54 months following the effective date of Reliability Standard TPL-007-2. If proposed Reliability Standard TPL-007-2 becomes effective after January 1, 2021, the last requirement applicable entities will be required to comply with is Requirement R8 72 months following the effective date of Reliability Standard TPL-007-2.

⁸ 16 U.S.C. 824o(e).

⁹ See NERC, 2012 Special Reliability Assessment Interim Report: Effects of Geomagnetic Disturbances on the Bulk Power System at i-ii (February 2012), <http://www.nerc.com/files/2012GMD.pdf>.

¹⁰ *Id.* at ii.

¹¹ *Id.*

cause GICs to flow on long conductors, such as transmission lines.¹² The magnitude of the geoelectric field amplitude is impacted by local factors such as geomagnetic latitude and local earth conductivity.¹³ Geomagnetic latitude is the proximity to earth's magnetic north and south poles, as opposed to earth's geographic poles.¹⁴ Local earth conductivity is the ability of the earth's crust to conduct electricity at a certain location to depths of hundreds of kilometers down to the earth's mantle. Local earth conductivity impacts the magnitude (i.e., severity) of the geoelectric fields that are formed during a GMD event by, all else being equal, a lower earth conductivity resulting in higher geoelectric fields.¹⁵

8. GICs can flow in an electric power system with varying intensity depending on the various factors discussed above. As explained in the Background section of the proposed Reliability Standard, “[d]uring a GMD event, geomagnetically-induced currents (GIC) may cause transformer hot-spot heating or damage, loss of Reactive Power sources, increased Reactive Power demand, and Misoperation(s), the combination of which may result in voltage collapse and blackout.”

¹² *Id.*

¹³ NERC, Benchmark Geomagnetic Disturbance Event Description, Docket No. 15-11-000, at 4 (filed June 28, 2016) (2016 NERC White Paper).

¹⁴ *Id.*

¹⁵ *Id.*

C. Currently-Effective Reliability Standard TPL-007-1 and Order No. 830

1. Currently-Effective Reliability Standard TPL-007-1

9. Reliability Standard TPL-007-1 consists of seven requirements and applies to planning coordinators, transmission planners, transmission owners and generation owners who own or whose planning coordinator area or transmission planning area includes a power transformer with a high side, wye-grounded winding connected at 200 kV or higher.

10. Requirement R1 requires planning coordinators and transmission planners (i.e., “responsible entities”) to determine the individual and joint responsibilities in the planning coordinator’s planning area for maintaining models and performing studies needed to complete the GMD vulnerability assessment required in Requirement R4. Requirement R2 requires responsible entities to maintain system models and GIC system models needed to complete the GMD vulnerability assessment required in Requirement R4. Requirement R3 requires each responsible entity to have criteria for acceptable system steady state voltage performance for its system during the GMD conditions described in Attachment 1 of Reliability Standard TPL-007-1. Requirement R4 requires responsible entities to conduct a GMD vulnerability assessment every 60 months using the benchmark GMD event described in Attachment 1. Requirement R5 requires responsible entities to provide GIC flow information, based on the benchmark GMD event definition, to be used in the transformer thermal impact assessments required in Requirement R6, to each transmission owner and generator owner that owns an applicable transformer within the applicable planning area. Requirement R6 requires

transmission owners and generator owners to conduct thermal impact assessments on solely and jointly owned applicable transformers where the maximum effective GIC value provided in Requirement R5 is 75 amps per phase (A/phase) or greater.

Requirement R7 requires responsible entities to develop corrective action plans if the GMD vulnerability assessment concludes that the system does not meet the performance requirements in Table 1 of Reliability Standard TPL-007-1.

11. Calculation of the benchmark GMD event, against which applicable entities must assess their facilities, is fundamental to compliance with Reliability Standard TPL-007-1. Reliability Standard TPL-007-1, Requirement R3 states that “[e]ach responsible entity, as determined in Requirement R1, shall have criteria for acceptable System steady state voltage performance for its System during the benchmark GMD event described in Attachment 1.”

Reliability Standard TPL-007-1, Attachment 1 states that the benchmark GMD event is composed of four elements: (1) a reference peak geoelectric field amplitude of 8 V/km derived from statistical analysis of historical magnetometer data; (2) a scaling factor to account for local geomagnetic latitude; (3) a scaling factor to account for local earth conductivity; and (4) a reference geomagnetic field time series or wave shape to facilitate time-domain analysis of GMD impact on equipment. The product of the first three elements is referred to as the regional peak geoelectric field amplitude. The benchmark GMD event defines the geoelectric field values used to compute GIC

flows for a GMD vulnerability assessment, which is required in Reliability Standard TPL-007-1.¹⁶

12. For the purpose of determining a benchmark event that specifies what severity GMD events a responsible entity must assess for potential impacts on the Bulk-Power System, NERC determined that a 1-in-100 year GMD event would cause an 8 V/km reference peak geoelectric field amplitude at 60 degree north geomagnetic latitude using Québec's earth conductivity.¹⁷ Scaling factors (i.e., multiplying values) are applied to this reference peak geoelectric field amplitude to adjust the 8 V/km value for different geomagnetic latitudes (scaling factors between 0.1 and 1.0) and earth conductivities (scaling factors between 0.21 and 1.17). NERC identified a reference geomagnetic field time series from an Ottawa, Ontario magnetic observatory during a 1989 GMD storm affecting Québec. NERC used this to estimate a time series (i.e., 10-second values over a period of days) of the geoelectric field that is representative of what is expected to occur at 60 degree geomagnetic latitude during a 1-in-100 year GMD event. Such a time series

¹⁶ See Reliability Standard TPL-007-1, Requirements R4 and R5. Reliability Standard TPL-007-1 does not set a threshold amount of GIC flow that would constitute a vulnerable transformer. However, if a transformer is calculated to experience a maximum effective GIC flow during a benchmark GMD event of a least 75 A/phase, a thermal impact assessment of that transformer is required. See Reliability Standard TPL-007-1, Requirement R6.

¹⁷ NERC used Québec as the location for the reference peak 1-in-100 year GMD event because of its proximity to 60 degree geomagnetic latitude and its well understood earth model. By creating scaling factors, each entity can scale this reference peak geoelectric field and geoelectric field time series values to match its own expected field conditions.

is used in some methods of calculating the vulnerability of a transformer to damage from heating caused by GIC.

13. NERC used field measurements taken from the International Monitor for Auroral Geomagnetic Effects (IMAGE) magnetometer chain, which consists of 39 magnetometer stations in Northern Europe, for the period 1993-2013 to calculate the reference peak geoelectric field amplitude. As described in the 2016 NERC White Paper, to arrive at a reference peak geoelectric field amplitude of 8 V/km, NERC “spatially averaged” four different station groups each spanning a square area of approximately 500 km (roughly 310 miles) in width.¹⁸

2. Order No. 830

14. On January 21, 2015, NERC submitted for Commission approval Reliability Standard TPL-007-1 in response to a directive in Order No. 779, which directed NERC to develop one or more Reliability Standards to address the effects of GMD events on the electric grid.¹⁹ In Order No. 830, the Commission approved Reliability Standard TPL-007-1, concluding that Reliability Standard TPL-007-1 addressed the Commission’s directive by requiring applicable Bulk-Power System owners and operators to conduct, on a recurring five-year cycle, initial and ongoing vulnerability assessments regarding the

¹⁸ “Spatial Averaging” refers to the averaging of magnetometer readings over a geographic area. The standard drafting team averaged several (but not all) geomagnetic field readings taken by magnetometers located within square geographical areas of 500 km per side.

¹⁹ *Reliability Standards for Geomagnetic Disturbances*, Order No. 779, 143 FERC ¶ 61,147, *reh’g denied*, 144 FERC ¶ 61,113 (2013).

potential impact of a benchmark GMD event on the Bulk-Power System as a whole and on Bulk-Power System components. In addition, the Commission determined that Reliability Standard TPL-007-1 requires applicable entities to develop and implement corrective action plans to mitigate vulnerabilities identified through those recurring vulnerability assessments and that potential mitigation strategies identified in Reliability Standard TPL-007-1 include, but are not limited to, the installation, modification or removal of transmission and generation facilities and associated equipment.

15. In Order No. 830, the Commission also determined that Reliability Standard TPL-007-1 should be modified. Specifically, Order No. 830 directed NERC to develop and submit modifications to Reliability Standard TPL-007-1 concerning: (1) the calculation of the reference peak geoelectric field amplitude component of the benchmark GMD event definition; (2) the collection and public availability of necessary GIC monitoring and magnetometer data; and (3) deadlines for completing corrective action plans and the mitigation measures called for in corrective action plans. Order No. 830 directed NERC to develop and submit these revisions for Commission approval within 18 months of the effective date of Order No. 830.

16. With respect to the calculation of the reference peak geoelectric field amplitude component of the benchmark GMD event definition, Order No. 830 expressed concern with relying solely on spatial averaging in Reliability Standard TPL-007-1 because “the use of spatial averaging in this context is new, and thus there is a dearth of information or

research regarding its application or appropriate scale.”²⁰ While Order No. 830 directed that the peak geoelectric field amplitude should not be based solely on spatially-averaged data, the Commission indicated that this “directive should not be construed to prohibit the use of spatial averaging in some capacity, particularly if more research results in a better understanding of how spatial averaging can be used to reflect actual GMD events.”²¹

D. NERC Petition and Proposed Reliability Standard TPL-007-2

17. NERC states that proposed Reliability Standard TPL-007-2 enhances currently-effective Reliability Standard TPL-007-1 by addressing reliability risks posed by GMDs more effectively and implementing the directives in Order No. 830.²² NERC asserts that proposed Reliability Standard TPL-007-2 reflects the latest in GMD understanding and provides a technically sound and flexible approach to addressing the concerns discussed in Order No. 830. NERC contends that the proposed modifications enhance reliability by expanding GMD vulnerability assessments to include severe, localized impacts and by implementing deadlines and processes to maintain accountability in the development, completion, and revision of corrective action plans developed to address identified vulnerabilities. Further, NERC states that the proposed modifications improve the

²⁰ Order No. 830, 156 FERC ¶ 61,215 at P 45.

²¹ *Id.* P 46.

²² Proposed Reliability Standard TPL-007-2 is not attached to this Notice of Proposed Rulemaking (NOPR). Proposed Reliability Standard TPL-007-2 is available on the Commission’s eLibrary document retrieval system in Docket No. RM18-8-000 and on the NERC website, www.nerc.com.

availability of GMD monitoring data that may be used to inform GMD vulnerability assessments.

18. Proposed Reliability Standard TPL-007-2 modifies currently-effective Reliability Standard TPL-007-1 by requiring applicable entities to: (1) conduct supplemental GMD vulnerability and transformer thermal impact assessments in addition to the existing benchmark GMD vulnerability and transformer thermal impact assessments required in Reliability Standard TPL-007-1; (2) collect data from GIC monitors and magnetometers as necessary to enable model validation and situational awareness; and (3) develop necessary corrective action plans within one year from the completion of the benchmark GMD vulnerability assessment, include a two-year deadline for the implementation of non-hardware mitigation, and include a four-year deadline to complete hardware mitigation.²³

19. In particular, proposed Reliability Standard TPL-007-2 modifies Requirements R1 (identification of responsibilities) and R2 (system and GIC system models) to extend the existing requirements pertaining to benchmark GMD assessments to the proposed supplemental GMD assessments. Proposed Reliability Standard TPL-007-2 adds the newly mandated supplemental GMD vulnerability and transformer thermal impact assessments in new Requirements R8 (supplemental GMD vulnerability assessment),

²³ Unless otherwise indicated, the requirements of proposed Reliability Standard TPL-007-2 are substantively the same as the requirements in currently-effective Reliability Standard TPL-007-1. Proposed Reliability Standard TPL-007-2 contains conforming and other non-substantive modifications that are not addressed in this NOPR.

R9 (GIC flow information needed for supplemental GMD thermal impact assessments) and R10 (supplemental GMD thermal impact assessments). The supplemental GMD event definition contains a higher, non-spatially-averaged reference peak geoelectric field amplitude component than the benchmark GMD event definition (12 V/km versus 8 V/km). These three new requirements largely mirror existing Requirements R4, R5, and R6 that currently apply, and would continue to apply, only to benchmark GMD vulnerability and transformer thermal impact assessments.²⁴

20. In addition, proposed Reliability Standard TPL-007-2 includes two other new requirements, Requirements R11 and R12, that require applicable entities to gather GIC monitored data (Requirement R11) and magnetometer data (Requirement R12).

21. Proposed Reliability Standard TPL-007-2 modifies existing Requirement R7 (corrective action plans) to create a one-year deadline for the development of corrective action plans and two and four-year deadlines to complete actions involving non-hardware and hardware mitigation, respectively, for vulnerabilities identified in the benchmark GMD assessment. The proposed modifications to Requirement R7 include a provision allowing for extension of deadlines if “situations beyond the control of the responsible entity determined in Requirement R1 prevent implementation of the [corrective action plan] within the timetable for implementation.”

²⁴ An exception is the qualifying threshold for transformers required to undergo thermal impact assessments: for the supplemental GMD assessment the qualifying threshold for transformers is a maximum effective GIC value of 85 A/phase while the threshold for benchmark GMD event assessments is 75 A/phase.

II. Discussion

22. Pursuant to section 215(d) of the FPA, the Commission proposes to approve Reliability Standard TPL-007-2 as just, reasonable, not unduly discriminatory or preferential, and in the public interest. Proposed Reliability Standard TPL-007-2 addresses the directives in Order No. 830 to modify currently-effective Reliability Standard TPL-007-1: (1) to revise the benchmark GMD event definition, as it pertains to the required GMD Vulnerability Assessments and transformer thermal impact assessments, so that the definition is not based solely on spatially-averaged data; (2) to require the collection of necessary GIC monitoring and magnetometer data; and (3) to include a one-year deadline for the completion of corrective action plans and two and four-year deadlines to complete mitigation actions involving non-hardware and hardware mitigation, respectively.²⁵

23. Proposed Reliability Standard TPL-007-2 complies with the directives in Order No. 830 by requiring, in addition to the benchmark GMD event vulnerability and thermal impact assessments, supplemental GMD vulnerability and thermal impact assessments. The supplemental GMD event definition in proposed Reliability Standard TPL-007-2 contains a non-spatially-averaged reference peak geoelectric field amplitude component

²⁵ NERC states that it will address the directive in Order No. 830 on public dissemination of GIC monitoring and magnetometer data through a forthcoming NERC data request to applicable entities pursuant to Section 1600 of the NERC Rules of Procedure rather than through a Reliability Standard requirement. On February 7, 2018, NERC released a draft data request for a 45-day comment period. After reviewing the comments, NERC indicates that it intends to seek authorization from the NERC Board of Trustees to issue the data request in August 2018. NERC Petition at 27.

of 12 V/km, in contrast to the 8 V/km figure in the spatially-averaged benchmark GMD event definition. As NERC explains in its petition, the supplemental GMD event will be used to “represent conditions associated with localized enhancement of the geomagnetic field during a severe GMD event for use in assessing GMD impacts.”²⁶ Proposed Reliability Standard TPL-007-2 therefore addresses the Commission’s directive to modify currently-effective Reliability Standard TPL-007-1 so that the benchmark GMD event does not rely solely on spatially-averaged data to calculate the reference peak geoelectric field amplitude.

24. While proposed Reliability Standard TPL-007-2 addresses the first directive in Order No. 830 by requiring applicable entities to conduct supplemental GMD vulnerability and thermal impact assessments, the proposed Reliability Standard does not require applicable entities to mitigate such vulnerabilities. Instead, proposed Reliability Standard TPL-007-2, Requirement R8.3 only requires applicable entities to make “an evaluation of possible actions designed to reduce the likelihood or mitigate the consequences and adverse impacts of the event(s)” if a supplemental GMD event is assessed to result in Cascading.²⁷ As discussed below, NERC’s proposal differs significantly from Order No. 830 because the intent of the directive was not only to

²⁶ NERC Petition at 12.

²⁷ The NERC Glossary defines Cascading as “uncontrolled successive loss of System Elements triggered by an incident at any location ... [c]ascading results in widespread electric service interruption that cannot be restrained from sequentially spreading beyond an area predetermined by studies.” Glossary of Terms Used in NERC Reliability Standards (January 31, 2018).

identify vulnerabilities arising from localized GMD events but also to mitigate such vulnerabilities. Moreover, Order No. 830 reiterated the directive in Order No. 779 that NERC develop a second stage GMD Reliability Standard requiring GMD vulnerability assessments and that “owners and operators [] develop and implement a plan to protect against instability, uncontrolled separation, or cascading failures of the Bulk-Power System.”²⁸ Accordingly, the Commission proposes to direct NERC, pursuant to section 215(d)(5) of the FPA, to develop and submit modifications to the Reliability Standard to require applicable entities to develop and implement corrective action plans to mitigate supplemental GMD event vulnerabilities. The Commission proposes to direct NERC to submit the modified Reliability Standard for approval within 12 months from the effective date of Reliability Standard TPL-007-2.

25. In addition, as discussed below, the Commission seeks comment on the need for Requirement R7.4 of proposed Reliability Standard TPL-007-2, which allows applicable entities to extend corrective action plan implementation deadlines, as compared to a process whereby NERC considers extensions on a case-by-case basis, as suggested in Order No. 830.²⁹ After reviewing the comments, the Commission may approve the requirement but direct NERC to prepare and submit a report concerning the use of corrective action plan deadline extensions as allowed under proposed Reliability Standard TPL-007-2, Requirement R7.4. Under such a directive, NERC would submit the

²⁸ Order No. 830, 156 FERC ¶ 61,215 at P 7.

²⁹ *Id.* P 102.

report within 12 months from the date on which applicable entities must comply with the last requirement of Reliability Standard TPL-007-2. Alternatively, pursuant to section 215(d)(5) of the FPA, the Commission may direct NERC to modify the Reliability Standard to remove Requirement R7.4.

A. Corrective Action Plan for Supplemental GMD Event Vulnerabilities
NERC Petition

26. In requiring applicable entities to assess their vulnerabilities to a supplemental GMD event, NERC states that geomagnetic fields during severe GMD events can be spatially non-uniform with higher and lower strengths across a geographic region. NERC explains that the supplemental GMD event was derived using individual station measurements rather than spatially-averaged measurements, and thus includes localized enhancement of field strength above the average value found in the benchmark GMD event. NERC contends that the supplemental GMD event thus addresses the directive in Order No. 830 to revise Reliability Standard TPL-007-1 to account for the effects of localized peaks that could potentially affect reliable operations.

27. NERC maintains that the benchmark GMD event and supplemental GMD event are similar in structure but the supplemental GMD event contains differences to account for localized impacts. NERC explains that, like the benchmark GMD event, the supplemental GMD event defines the geomagnetic and geoelectric field values used to compute GIC flows for use in a GMD vulnerability assessment and is composed of four elements: (1) reference peak geoelectric field amplitude of 12 V/km derived from statistical analysis of historical magnetometer data; (2) scaling factors to account for local

geomagnetic latitude; (3) scaling factors to account for local earth conductivity; and (4) a locally-enhanced reference geomagnetic field time series or waveform to facilitate time-domain analysis of GMD impact on equipment.

28. NERC states that the higher reference peak geoelectric field amplitude (12 V/km compared to 8 V/km used in the benchmark GMD event) and local enhancements to the geomagnetic field time series or waveform are distinguishing characteristics of the supplemental GMD event and are intended to represent conditions associated with localized enhancement of the geomagnetic field during a severe GMD event for use in assessing GMD impacts.³⁰

29. In developing the supplemental GMD event, NERC indicates that the standard drafting team ensured that the peak geoelectric field does not rely on spatial averaging of geomagnetic field data. NERC states that, like the value in the existing benchmark GMD event, the supplemental GMD event peak geoelectric field is a 1-in-100 year extreme value determined using statistical analysis of historical geomagnetic field data. NERC explains that the fundamental difference in the supplemental GMD event amplitude is that it is based on geomagnetic field observations taken at individual observation stations

³⁰ NERC states that the supplemental GMD event waveform is more severe than the benchmark GMD event waveform because it includes a five-minute duration enhanced peak up to 12 V/km for the reference earth model and 60 degree geomagnetic latitude. NERC Petition at 13. NERC explains that this synthetic enhancement represents the observed localized, rapid magnetic field variation periods associated with ionospheric sources during some severe GMD events. *Id.* NERC observes that such GMD conditions could result in increased transformer heating for short durations during a severe GMD event due to increased GIC flows. *Id.*

(i.e., localized measurements), instead of the spatially-averaged geoelectric fields used in the benchmark GMD event. NERC states that the result of the extreme value analysis shows that the supplemental GMD event peak of 12 V/km is above the upper limit of the 95 percent confidence interval for a 100-year interval, while the same confidence interval with spatially-averaged data (i.e., the benchmark GMD event) is 8 V/km.

30. NERC indicates that the corrective action plans mandated in Requirement R7 continue to apply only if an entity has identified system performance issues through the benchmark GMD vulnerability assessments. NERC explains that mitigation for assessed supplemental GMD vulnerabilities are addressed in proposed Requirement R8.3, which states that if a responsible entity concludes that there would be “Cascading” caused by the supplemental GMD event, the entity shall conduct an analysis of possible actions to reduce the likelihood or mitigate the impacts of the event.³¹

31. NERC states that the standard drafting team determined that requiring corrective action plans in response to assessed supplemental GMD event vulnerabilities would not be appropriate at this time because the supplemental GMD event definition uses a small number of observed localized enhanced geoelectric field events that provide only general insight into the geographic size of localized events during severe solar storms.³² NERC also contends that currently available modeling tools do not provide entities with

³¹ NERC Petition at 23.

³² *Id.*

capabilities to model localized enhancements within a severe GMD event realistically.³³ As a result, NERC claims that applicable entities may need to employ conservative approaches when performing the supplemental GMD vulnerability assessment, such as applying the localized peak geoelectric field over an entire planning area.³⁴ NERC states that, for these reasons, “requiring mandatory mitigation may not provide effective reliability benefit or use resources optimally.”³⁵ NERC contends that the approach used in proposed Reliability Standard TPL-007-2 for the supplemental GMD event provides entities with flexibility to consider and select mitigation actions based on their circumstances and is similar to the approach used in Reliability Standard TPL-001-4, Requirement R3.5 for extreme events.³⁶

Commission Proposal

32. NERC’s proposal not to require corrective action plans for supplemental GMD event vulnerabilities differs significantly from Order No. 830 because the intent and clear meaning of the directive was not only to identify vulnerabilities arising from localized GMD events but also to mitigate such vulnerabilities. Order No. 830 reiterated the directive in Order No. 779 that NERC develop a second stage GMD Reliability Standard requiring GMD vulnerability assessments and that “owners and operators [] develop

³³ *Id.*

³⁴ *Id.* at 24.

³⁵ *Id.*

³⁶ *Id.*

and implement a plan to protect against instability, uncontrolled separation, or cascading failures of the Bulk-Power System.”³⁷ By contrast, proposed Reliability Standard TPL-007-2 allows supplemental GMD event vulnerabilities to potentially go unmitigated even, for example, if an applicable entity assesses that the supplemental GMD event causes Cascading.³⁸

33. Moreover, in Order No. 830, the Commission directed NERC to “develop revisions to the benchmark GMD event definition so that the reference peak geoelectric field amplitude component is not based solely on spatially-averaged data.”³⁹ NERC’s proposal to modify the benchmark, but then allow applicable entities the discretion to take corrective action based solely on the results of the spatially-averaged benchmark analysis while taking under advisement (“an evaluation of possible actions”) the results of the supplemental assessment, does not satisfy the clear intent of the Commission’s directive.

34. Further, we are not persuaded by NERC’s reasoning that: (1) existing technical limitations, specifically the limited number of observations used to define the supplemental GMD event and the availability of modeling tools to assist entities

³⁷ Order No. 830, 156 FERC ¶ 61,215 at P 7.

³⁸ Proposed Reliability Standard TPL-007-2, Requirement R8.3 (“If the analysis concludes there is Cascading caused by the supplemental GMD event described in Attachment 1, an evaluation of possible actions designed to reduce the likelihood or mitigate the consequences and adverse impacts of the event(s) shall be conducted.”).

³⁹ *Id.* at 44.

in assessing vulnerabilities, make requiring mitigation premature at this time; and (2) requiring only an evaluation of possible actions for supplemental GMD events that result in Cascading is similar to the treatment of extreme events in Reliability Standard TPL-001-4 (Transmission System Planning Performance Requirements).

35. We believe, based on the information before us, that it is reasonable to require applicable entities to mitigate supplemental GMD event vulnerabilities because, as NERC contends, the supplemental GMD event “provides a technically justified method of assessing vulnerabilities to the localized peak effects of severe GMD events.”⁴⁰ While the supplemental GMD event possesses characteristics that differentiate it from the benchmark GMD event (i.e., geographic area, peak amplitude, duration, and geoelectric field waveform), both events were developed by the standard drafting team using a common framework. The standard drafting team determined the peak amplitude of the supplemental GMD event using generalized extreme value statistical analysis methods, as it did for the benchmark GMD event, and found a consistent result of 12 V/km with a 95 percent confidence interval. Generalized extreme value analysis is well-supported in the technical literature and, in approving the benchmark GMD event, was previously accepted in Order No. 830. The basic waveform used for the supplemental GMD event is the same waveform used in the benchmark GMD event.⁴¹ Similar to the methodology for

⁴⁰ NERC Petition at 13.

⁴¹ *Id.* (“Both the benchmark and supplemental GMD event waveforms are based on 10-second sampling interval magnetic field data from the Ottawa observatory recorded during the March 13-14, 1989 GMD event.”).

determining peak amplitude, the benchmark GMD event waveform was previously considered appropriate in Order No. 830. While the supplemental GMD event waveform includes a “five-minute duration enhanced peak up to 12 V/km,” NERC does not suggest that the duration of the enhanced peak is unrepresentative of the behavior of localized enhancements.

36. NERC contends that the low number of real-world observations on which the supplemental GMD event is based calls into question the accuracy of its geographic size.⁴² However, any uncertainty regarding the size of the geographic footprint of the supplemental GMD event could be addressed by applicable entities through sensitivity analysis and other methods within the planning studies. The proposed Reliability Standard does not prescribe how applicable entities must perform such studies; so applicable entities may incorporate this uncertainty into their studies. Indeed, Attachment 1 (Calculating Geoelectric Fields for the Benchmark and Supplemental GMD Events) of proposed Reliability Standard TPL-007-2 states that “Planners have flexibility to determine how to apply the localized peak geoelectric field over the planning area in performing GIC calculations.”⁴³ Attachment 1 provides that an applicable entity may apply the supplemental GMD event definition over the entire planning area; apply some

⁴² *Id.* at 23 (“[the] small number of observed localized enhanced geoelectric field events ... provide only general insight into the geographic size of localized events during severe solar storms”).

⁴³ Proposed Reliability Standard TPL-007-2, Attachment 1, Applying the Localized Peak Geoelectric Field in the Supplemental GMD Event.

combination of the benchmark GMD event and supplemental GMD event over portions of a planning area; or use “[o]ther methods to adjust the benchmark GMD event analysis to account for the localized geoelectric field enhancement of the supplemental GMD event.”⁴⁴ The flexibility afforded to applicable entities by proposed Reliability Standard TPL-007-2 to determine the geographic size of the supplemental GMD event, in our view, addresses NERC’s concern.

37. The Supplemental Geomagnetic Disturbance Event Description appended to NERC’s petition further supports the supplemental GMD event definition by stating that “[b]ased on the above analysis and the previous work associated with the benchmark GMD event, it is reasonable to incorporate a second (or supplemental) assessment into TPL-007-2 to account for the potential impact of a local enhancement in both the network analysis and the transformer thermal assessment(s).”⁴⁵ The Supplemental GMD Event White Paper also states that “[g]iven the current state of knowledge regarding the spatial extent of a local geomagnetic field enhancements, upper geographic boundaries, such as the values used in the approaches above, are reasonable but are not definitive.”⁴⁶

38. With respect to NERC’s contention regarding the unavailability of modeling tools, we are not persuaded. We understand that there are commercially available tools that

⁴⁴ *Id.*

⁴⁵ NERC Petition, Exhibit I (Supplemental Geomagnetic Disturbance Event Description) at 12 (Supplemental GMD Event White Paper).

⁴⁶ *Id.* at 13.

could allow for modeling of supplemental GMD events.⁴⁷ In addition to these modeling tools, other methods could be used within the framework of the Reliability Standard to study planning areas (e.g., superposition or sensitivity studies) in conjunction with other power system modeling tools. However, we will consider any comments that substantiate NERC's position.

39. In addition, the Commission recognized in Order No. 830 that an improved understanding of GMDs is necessary and directed NERC to conduct certain GMD-related research. The GMD research directed in Order No. 830 is meant to address technical limitations regarding GMD mitigation, among other areas. In the preliminary GMD research work plan submitted by NERC on May 30, 2017, NERC stated that the Commission in Order No. 830 “noted its concern that a spatially-averaged benchmark may not adequately account for localized peak geoelectric fields that could potentially affect reliable operations.”⁴⁸ In response, NERC indicated that it will conduct “(i) research [Task 1 of the GMD research work plan] to improve understanding of the characteristics and spatial scales of localized geoelectric field enhancements caused by severe GMD events; and (ii) research to determine the impacts of spatial averaging

⁴⁷ See, e.g., Siemens Power Technologies International, GIC Module to Analyze Geomagnetic Disturbances on the Grid, Features Summary, http://w3.usa.siemens.com/smartgrid/us/en/transmission-grid/products/grid-analysis-tools/transmission-system-planning/Documents/PTI_FF_EN_SWPE_GIC_1412.pdf; PowerWorld, Simulator, Geomagnetically Induced Current (GIC), <https://www.powerworld.com/products/simulator/add-ons-2/simulator-gic>.

⁴⁸ NERC, Geomagnetic Disturbance Research Work Plan of the North American Electric Reliability Corporation, Docket No. RM15-11-002, at 8 (filed May 30, 2017).

assumptions on [Bulk-Power System] reliability.”⁴⁹ NERC estimated that Task 1, which includes the development of better models, will require approximately 24-36 months to complete from start of work. Such GMD research on localized events should inform the standard development process and aid applicable entities when implementing a modified Reliability Standard.⁵⁰

40. We are also not persuaded by NERC’s reliance on Reliability Standard TPL-001-4 to justify only requiring an evaluation of possible actions for supplemental GMD events that result in Cascading in light of the directive in Order No. 830. In Order No. 830, the Commission directed NERC to modify the proposed Reliability Standard to assess and address the risks posed by enhanced localized GMD events to the Bulk-Power System. In contrast, in approving Reliability Standard TPL-001-4, the Commission did not direct NERC to further modify the Reliability Standard to address the risks posed by extreme events. Accordingly, the treatment of extreme events under Reliability Standard TPL-001-4 does not support the notion here that applicable entities should, as NERC suggests, have the “the flexibility to ... *consider* mitigation.”⁵¹ However, as with the mitigation of

⁴⁹ *Id.*

⁵⁰ On April 19, 2018, NERC submitted a revised GMD Work Plan that is currently pending before the Commission. NERC, Revised Geomagnetic Disturbance Research Work Plan of the North American Electric Reliability Corporation, Docket No. 15-11-003 (filed April 19, 2018). The revised GMD Work Plan provides additional detail to the previous version. NERC now estimates that Task 1 deliverables will be completed in 2019. *Id.*, Attachment 1 (Order No. 830 GMD Research Work Plan (April 2018)) at 7.

⁵¹ NERC Petition at 24 (emphasis added).

benchmark GMD event vulnerabilities, we agree with NERC that any required mitigation of supplemental GMD event vulnerabilities should be flexible in terms of how applicable entities choose to mitigate such vulnerabilities. NERC's petition already stresses that proposed Reliability Standard TPL-007-2 affords flexibility as to how applicable entities apply the supplemental GMD event to their planning areas.⁵²

41. Accordingly, the Commission proposes to direct NERC, pursuant to section 215(d)(5) of the FPA, to develop and submit modifications to the Reliability Standard to require applicable entities to develop and implement corrective action plans to mitigate supplemental GMD event vulnerabilities. The Commission proposes to direct NERC to submit the modified Reliability Standard for approval within 12 months from the effective date of Reliability Standard TPL-007-2. The Commission seeks comments from NERC and other interested entities on this proposal.

B. Corrective Action Plan Deadline Extensions

NERC Petition

42. NERC states that proposed Reliability Standard TPL-007-2, Requirement R7.2 requires responsible entities to develop a corrective action plan within one year of the benchmark GMD vulnerability assessment, if the entity concludes that its System does not meet the performance requirements for the steady state planning benchmark GMD event. NERC indicates that under Requirement R7.3, the corrective action plan shall

⁵² NERC Petition, Exhibit I at 13 (“Proposed TPL-007-2 provides flexibility for planners to determine how to apply the supplemental GMD event to the planning area.”).

include a timeline that specifies the completion of non-hardware and hardware mitigation within two and four years of development of the corrective action plan, respectively.

43. NERC maintains that proposed Reliability Standard TPL-007-2 also recognizes that there may be circumstances outside of a responsible entity's control that could prevent the completion of a mitigation activity within the specified timetable. NERC cites as examples delays due to regulatory or legal processes, such as permitting; delays from stakeholder processes required by tariffs; delays resulting from equipment lead times; or delays resulting from the inability to acquire necessary right-of-way. NERC explains that in such circumstances, a responsible entity may maintain compliance by revising its corrective action plan in accordance with Requirement R7.4. NERC states that under Requirement R7.4, the responsible entity shall revise its corrective action plan if events beyond its control prevent implementation within the original timetable. NERC explains that in the revised corrective action plan, the responsible entity must provide justification for its revised timetable by documenting: (1) the circumstances causing the delay; (2) description of the original corrective action plan and any changes; and (3) revisions to selected actions, including the use of any operating procedures if applicable, along with an updated timetable for completion. NERC states that the revised corrective action plan shall be updated at least annually and the responsible entity must then provide its revised corrective action plan to recipients of the original corrective action plan (i.e., reliability coordinator, adjacent planning coordinator(s), adjacent transmission planner(s), functional entities referenced in the corrective action plan, and

any functional entity that submits a written request and has a reliability related need for the information).

44. NERC contends that this proposal is consistent with other Commission-approved Reliability Standards. NERC cites Reliability Standard FAC-003-4, Requirement R7 and asserts that it provides that an entity may modify its annual vegetation work plan in light of circumstances beyond the entity's control, such as a natural disaster or other circumstance. NERC also cites Reliability Standard PRC-004-5(i), Requirement R5 and contends that under that Reliability Standard a responsible entity that owns a protection system component that caused a misoperation shall either develop a corrective action plan or explain in a declaration why corrective actions are beyond the entity's control or would not improve reliability.

Commission Proposal

45. Proposed Reliability Standard TPL-007-2 satisfies Order No. 830 by incorporating the deadlines set out by the Commission for the development and implementation of corrective action plans. However, Requirement R7.4 of the proposed Reliability Standard differs from Order No. 830 by allowing applicable entities to “revise” or “update” corrective action plans to extend deadlines. This provision contrasts with the Commission’s guidance in Order No. 830 that “NERC should consider extensions of time on a case-by-case basis.”⁵³

46. NERC contends that the proposed Reliability Standard “would implement the Commission directed deadlines for Corrective Action Plans and mitigation, along with a process to maintain accountability and communication with affected entities when circumstances beyond a responsible entity’s control affect the entity’s ability to complete implementation within the original deadlines.”⁵⁴ Given the complexities and potential novelty of steps applicable entities may take to mitigate the risks of GMDs, we agree with NERC that there should be a mechanism for allowing extensions of corrective action plan implementation deadlines. However, we would like to avoid unnecessary delay in implementing protection against GMD threats. Moreover, we are not persuaded that the proposal is supported by the precedent cited by NERC because the Reliability Standards NERC cites are distinguishable.

⁵³ Order No. 830, 156 FERC ¶ 61,215 at P 102.

⁵⁴ NERC Petition at 22.

47. NERC maintains that provisions similar to Requirement R7.4 are found in two Reliability Standards. NERC states that Reliability Standard FAC-003-4, Requirement R7, allows a registered entity to modify its annual vegetation work plan in light of circumstances beyond the entity's control. While Reliability Standard FAC-003-4, Requirement R7 permits modifications to annual vegetation work plans, the modifications cannot result in a registered entity's failure to avoid the damage contemplated by Requirement R7—vegetation encroachment: "Modifications to the work plan in response to changing conditions or to findings from vegetation inspections may be made (provided they do not allow encroachment of vegetation into the [minimum vegetation clearance distance]) and must be documented." In contrast, proposed Requirement R7.4 could enable applicable entities to delay mitigation that would avoid the damage of known GMD vulnerabilities. Accordingly, the extensions of time permitted by Reliability Standard FAC-003-4, because they may not result in the damage contemplated by the Reliability Standard, are not comparable, as NERC asserts, to failure to mitigate an existing GMD vulnerability in a timely manner.

48. NERC also compares the corrective action plan provision in proposed Reliability Standard TPL-007-2 with Reliability Standard PRC-004-5(i), Requirement R5, which allows "a responsible entity that owns a Protection System component that caused a Misoperation ... [to] either develop a Corrective Action Plan or explain in a declaration why corrective actions are beyond the entity's control or would not improve reliability." We are not persuaded that NERC's proposal to allow self-declared extensions of time in Requirement R7.4 is supported by the quoted language in Reliability Standard

PRC-004-5(i), Requirement R5 because Requirement R5 does not allow for extensions of time. Rather, Requirement R5 permits the registered entity to declare that it cannot carry out corrective actions (e.g., because the misoperation occurred on facilities it does not own or control) or because the corrective action would not improve Bulk-Power System reliability. Moreover, the Guidelines and Technical Basis document accompanying Reliability Standard PRC-004-5(i) concludes by stating that a “declaration that no further corrective actions will be taken is expected to be used sparingly.”

49. Given these concerns, the Commission is considering two options in response to Requirement R7.4 of the proposed Reliability Standard. The Commission seeks comment from NERC and other interested entities on each of these proposals.

50. Under the first option, the Commission would, pursuant to section 215(d)(5) of the FPA, direct NERC to modify the proposed Reliability Standard to comport with Order No. 830, by requiring that NERC and the Regional Entities, as appropriate, consider requests for extension of time on a case-by-case basis.⁵⁵ Under this option, responsible entities seeking an extension would submit the information required by proposed Requirement R7.4 to NERC and the Regional Entities for their consideration of the request. The Commission would also direct NERC to prepare and submit a report addressing the disposition of any such requests, as well as information regarding how often and why applicable entities are exceeding corrective action plan deadlines

⁵⁵ Order No. 830, 156 FERC ¶ 61,215 at P 102.

following implementation of the proposed Reliability Standard.⁵⁶ Under such a directive, NERC would submit the report within 12 months from the date on which applicable entities must comply with the last requirement of Reliability Standard TPL-007-2.

Following receipt of the report, the Commission would determine whether further action is necessary.

51. Under the second option, the Commission would approve proposed Requirement R7.4 but also direct NERC to prepare and submit a report regarding how often and why applicable entities are exceeding corrective action plan deadlines following implementation of the proposed Reliability Standard. Under such a directive, NERC would submit the report within 12 months from the date on which applicable entities must comply with the last requirement of Reliability Standard TPL-007-2. Following receipt of the report, the Commission would determine whether further action is necessary.

III. Information Collection Statement

52. The collection of information contained in this Notice of Proposed Rulemaking is subject to review by the Office of Management and Budget (OMB) under section 3507(d) of the Paperwork Reduction Act of 1995.⁵⁷ OMB's regulations require review and

⁵⁶ Under proposed Requirement R7.4, when an applicable entity extends a corrective action plan deadline, it must revise the corrective action plan to explain the “[c]ircumstances causing the delay for fully or partially implementing the selected actions.” NERC could use this information to populate the proposed report.

⁵⁷ 44 U.S.C. 3507(d) (2012).

approval of certain information collection requirements imposed by agency rules.⁵⁸ Upon approval of a collection of information, OMB will assign an OMB control number and an expiration date. Respondents subject to the information collection requirements of a rule will not be penalized for failing to respond to the collection of information unless the collection of information displays a valid OMB control number.

53. We solicit comments on the Commission's need for this information, whether the information will have practical utility, the accuracy of the burden estimates, ways to enhance the quality, utility, and clarity of the information to be collected or retained, and any suggested methods for minimizing respondents' burden, including the use of automated information techniques. Specifically, the Commission asks that any revised burden or cost estimates submitted by commenters be supported by sufficient detail to understand how the estimates are generated.

54. The Commission proposes to approve proposed Reliability Standard TPL-007-2, which would replace currently-effective Reliability Standard TPL-007-1. When compared to Reliability Standard TPL-007-1, proposed Reliability Standard TPL-007-2 maintains the current information collection requirements, modifies existing Requirement R7 and adds new requirements in Requirements R8 through R12.

55. Proposed Reliability Standard TPL-007-2 includes new corrective action plan development and implementation deadlines in Requirement R7, new supplemental GMD vulnerability and transformer thermal impact assessments in Requirements R8 through

⁵⁸ 5 CFR 1320 (2017).

R10, and requirements for applicable entities to gather magnetometer and GIC monitored data in Requirements R11 and R12. Deadlines in Requirement R7 for the development and implementation of corrective action plans would only change the timeline of such documentation and are not expected to revise the burden to applicable entities. The burden estimates for new Requirements R8 through R10 are expected to be similar to the burden estimates for Requirements R4 through R6 in currently-effective Reliability Standard TPL-007-1 due to the closely-mirrored requirements.⁵⁹ The Commission expects that only 25 percent or fewer of transmission owners and generator owners would have to complete a supplemental transformer thermal impact assessment per Requirement R10. Requirements R11 and R12 require applicable entities to have a process to collect GIC and magnetometer data from meters in planning coordinator planning areas.

Public Reporting Burden: The burden and cost estimates below are based on the changes to the reporting and recordkeeping burden imposed by proposed Reliability Standard TPL-007-2. Our estimates for the number of respondents are based on the NERC Compliance Registry as of 3/9/2018, which indicates there are 183 entities registered as transmission planner (TP), 65 planning coordinators (PC), 330 transmission owners (TO), 944 generator owners (GO) within the United States. However, due to significant overlap, the total number of unique affected entities (i.e., entities registered as a transmission planner, planning coordinator, transmission owner or generator owner, or some combination of these functional entities) is 1,130 entities. This includes

⁵⁹ NERC Petition at 15-17.

188 entities that are registered as a transmission planner or planning coordinator (applicability for Requirements R7 to R9 and R11 to R12), and 1,119 entities registered as a transmission or generation owner (applicability for Requirement R10). Given the assumption above, there is an expectation that at most only 25 percent of the 1,119 entities (or 280 entities) will have to complete compliance activities for Requirement R10. The estimated burden and cost are as follow.⁶⁰

FERC-725N, Changes Proposed in NOPR in Docket No. RM18-8^{61, 62}						
Requirement (R)	Number and Type of Respondents (1)	Annual Number of Responses Per Respondent (2)	Total No. of Responses (1)X(2)=(3)	Average Burden Hrs. & Cost per Response (4)	Total Annual Burden Hrs. & Total Annual Cost (rounded)	Cost per Respondent (\$) (5)÷(3)

⁶⁰ Hourly costs are based on the Bureau of Labor Statistics (BLS) figures for May 2017 (Sector 22, Utilities) for wages (https://www.bls.gov/oes/current/naics2_22.htm) and benefits for December 2017 (<https://www.bls.gov/news.release/ecec.nr0.htm>). We estimate that an Electrical Engineer (NAICS code 17-2071) would perform the functions associated with reporting requirements, at an average hourly cost (for wages and benefits) of \$66.90. The functions associated with recordkeeping requirements, we estimate, would be performed by a File Clerk (NAICS code 43-4071) at an average hourly cost of \$32.04 for wages and benefits.

The estimated burden and cost are in addition to the burden and cost that are associated with the existing requirements in Reliability Standard TPL-007-1 (and in the current OMB-approved inventory), which would continue under proposed Reliability Standard TPL-007-2.

⁶¹ Rep.=reporting requirements; RK =recordkeeping requirements.

⁶² For each Reliability Standard, the Measure shows the acceptable evidence (Reporting Requirement) for the associated Requirement (R numbers), and the Compliance section details the related Recordkeeping Requirement.

					(3)X(4)=(5)	
R1 through R6	No change	No change	No change	No change	No change	No change
R7	188 (PC and TP)	1/5 (once for every five year study)	37.6	Rep. 5 hrs., \$334.5; RK 5 hrs., \$160.2	Rep. 188 hrs., \$12,577; RK 188 hrs., \$6,023	Rep. 1 hr., \$66.9; RK 1 hr., \$32.04
R8	188 (PC and TP)	1/5 (once for every five year study)	37.6	Rep., 27 hrs., \$1,806.30; RK, 21 hrs., \$672.84	Rep. 1,015 hrs., \$67,917; RK 790 hrs., \$25,299	Rep., 5.4 hrs., \$361.26; RK 4.2 hrs., \$134.57
R9	188 (PC and TP)	1/5 (once for every five year study)	37.6	Rep. 9 hrs., \$602.10; RK 7 hrs., \$224.28	Rep. 338 hrs., \$22,639; RK 263 hrs., \$8,432	Rep. 1.8 hrs., \$120.42; RK 1.4 hrs., \$44.85
R10	280 (25% of 1,119) (GO and TO)	1/5 (once for every five year study)	56	Rep. 22 hrs., \$1,471.8; RK 18 hrs., \$576.72	Rep. 1,232 hrs., \$82,421; RK 1,008 hrs., \$32,296	Rep. ;4.4 hrs., \$294.36; RK 3.6 hrs., \$115.34
R11	188 (PC and TP)	1 (on-going reporting)	188	Rep. 10 hrs., \$669; RK. 10 hrs., \$320.40	Rep. 1,880 hrs., \$125,772; RK 1,880 hrs., \$60,235	Rep. 10 hrs., \$669; RK 10 hrs., \$320.40
R12	188 (PC and TP)	1 (on-going reporting)	188	Rep. 10 hrs., \$669; RK. hrs 320.4	Rep. 1,880 hrs., \$125,772; RK 1,880 hrs., \$60,235	Rep. 10 hrs., \$669; RK 10 hrs., \$320.40
Total Additional Hrs. and					Rep., 6,533 hrs.,	

Cost (rounded), due to NOPR in RM18-8					\$437,057; RK 6,009 hrs., \$192,528	
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Title: FERC-725N, Mandatory Reliability Standards: TPL Reliability Standards.

Action: Proposed revisions to an existing collection of information.

OMB Control No: 1902-0264.

Respondents: Business or other for profit, and not for profit institutions.

Frequency of Responses:⁶³ Every five years (for Requirement R7-R10), annually (for Requirement R11 and R12).

Necessity of the Information: Proposed Reliability Standard TPL-007-2, if adopted, would implement the Congressional mandate of the Energy Policy Act of 2005 to develop mandatory and enforceable Reliability Standards to better ensure the reliability of the nation's Bulk-Power System. Specifically, these requirements address the threat posed by GMD events to the Bulk-Power System and conform to the Commission's directives to modify Reliability Standard TPL-007-1 as directed in Order No. 830.

Internal review: The Commission has reviewed proposed Reliability Standard TPL-007-2, and made a determination that its action is necessary to implement

⁶³ The frequency of Requirements R1 through R6 in proposed Reliability Standard TPL-007-2 is unchanged from the existing requirements in Reliability Standard TPL-007-1.

section 215 of the FPA. The Commission has assured itself, by means of its internal review, that there is specific, objective support for the burden estimates associated with the information requirements.

56. Interested persons may obtain information on the reporting requirements by contacting the Federal Energy Regulatory Commission, Office of the Executive Director, 888 First Street, NE, Washington, DC 20426 [Attention: Ellen Brown, e-mail: DataClearance@ferc.gov, phone: (202) 502-8663, fax: (202) 273-0873].

Comments concerning the proposed collection of information and the associated burden estimate should be sent to the Commission in this docket and may also be sent to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW, Washington, DC 20503 [Attention: Desk Officer for the Federal Energy Regulatory Commission]. Due to security concerns, comments should be sent electronically to the following e-mail address: oira_submission@omb.eop.gov.

Comments submitted to OMB should refer to FERC-725N and OMB Control No. 1902-0264.

IV. Environmental Analysis

57. The Commission is required to prepare an Environmental Assessment or an Environmental Impact Statement for any action that may have a significant adverse effect on the human environment.⁶⁴ The Commission has categorically excluded certain actions

⁶⁴ Regulations Implementing the National Environmental Policy Act of 1969, Order No. 486, FERC Stats. & Regs. ¶ 30,783 (1987).

from this requirement as not having a significant effect on the human environment.

Included in the exclusion are rules that are clarifying, corrective, or procedural or that do not substantially change the effect of the regulations being amended.⁶⁵ The actions proposed here fall within this categorical exclusion in the Commission's regulations.

V. Regulatory Flexibility Act

58. The Regulatory Flexibility Act of 1980 (RFA)⁶⁶ generally requires a description and analysis of proposed rules that will have significant economic impact on a substantial number of small entities. The definition of small business is provided by the Small Business Administration (SBA) at 13 CFR 121.201. The threshold for a small utility (using SBA's sub-sector 221) is based on the number of employees for a concern and its affiliates. As discussed above, proposed Reliability Standard TPL-007-2 would apply to a total of 1,130 unique planning coordinators, transmission planners, transmission owners, and generation owners.⁶⁷ A small utility (and its affiliates) is defined as having no more than the following number of employees:

- for planning coordinators, transmission planners, and transmission owners (NAICS code 221121, Electric Bulk Power Transmission and Control), a maximum of 500 employees

⁶⁵ 18 CFR 380.4(a)(2)(ii) (2017).

⁶⁶ 5 U.S.C. 601-12 (2012).

⁶⁷ In the NERC Registry, there are approximately 65 PCs, 188 TPs, 944 GOs, and 330 TOs (in the United States), which will be affected by this NOPR. Because some entities serve in more than one role, these figures involve some double counting.

- for generator owners, a maximum of 750 employees.⁶⁸

59. The total cost to all entities (large and small) is \$629,585 annually (or an average of \$1,345.27 for each of the estimated 468 entities affected annually). For the estimated 280 generator owners and transmission owners affected annually, the average cost would be \$409.70 per year. For the estimated 188 planning coordinators and transmission planners, the estimated average annual cost would be \$2,738.84. The estimated annual cost to each affected entity varies from \$409.70 to \$2,738.84 and is not considered significant.

60. Accordingly, the Commission certifies that the proposals contained in this NOPR will not have a significant economic impact on a substantial number of small entities. The Commission seeks comment on this certification.

VI. Comment Procedures

61. The Commission invites interested persons to submit comments on the matters and issues proposed in this notice to be adopted, including any related matters or alternative proposals that commenters may wish to discuss. Comments are due **[INSERT DATE 60 days after date of publication in the FEDERAL REGISTER]**. Comments must refer to Docket No. RM18-8-000, and must include the commenter's name, the organization they represent, if applicable, and their address in their comments.

⁶⁸ The maximum number of employees for a generator owner (and its affiliates) to be “small” varies from 250 to 750 employees, depending on the type of generation (e.g., hydroelectric, nuclear, fossil fuel, wind). For this analysis, we use the most conservative threshold of 750 employees.

62. The Commission encourages comments to be filed electronically via the eFiling link on the Commission's web site at <http://www.ferc.gov>. The Commission accepts most standard word processing formats. Documents created electronically using word processing software should be filed in native applications or print-to-PDF format and not in a scanned format. Commenters filing electronically do not need to make a paper filing.

63. Commenters that are not able to file comments electronically must send an original of their comments to: Federal Energy Regulatory Commission, Secretary of the Commission, 888 First Street NE, Washington, DC, 20426.

64. All comments will be placed in the Commission's public files and may be viewed, printed, or downloaded remotely as described in the Document Availability section below. Commenters on this proposal are not required to serve copies of their comments on other commenters.

VII. Document Availability

65. In addition to publishing the full text of this document in the Federal Register, the Commission provides all interested persons an opportunity to view and/or print the contents of this document via the Internet through the Commission's Home Page (<http://www.ferc.gov>) and in the Commission's Public Reference Room during normal business hours (8:30 a.m. to 5:00 p.m. Eastern time) at 888 First Street, NE, Room 2A, Washington DC 20426.

66. From the Commission's Home Page on the Internet, this information is available on eLibrary. The full text of this document is available on eLibrary in PDF and

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By direction of the Commission.

(S E A L)

Nathaniel J. Davis, Sr.,
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