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Commission sets forth two possible proposals regarding proposed TPL-007-2 Requirement R7 Part 7.4, which relates to the circumstances under which an entity may extend Corrective Action Plan deadlines.

NERC supports the Commission's proposal to approve Reliability Standard TPL-007-2. The proposed standard raises the bar for reliability. It provides a flexible process for maintaining timeliness and accountability in the development and completion of Corrective Action Plans to mitigate identified GMD vulnerabilities. Further, the proposed standard addresses the Commission's directives from Order No. 830³ to account for the localized peak effects of GMDs in planning studies.

As discussed in its Petition,⁴ NERC's approach to accounting for localized peak effects of GMD is sound and reasonable based on currently-available information. Research is currently underway under NERC's GMD Research Work Plan to improve understanding of the characteristics and spatial scales of localized peak GMD effects.⁵ To ensure that NERC's GMD Reliability Standard continues to reflect the best available information, NERC commits to initiate a review of TPL-007-2 following the completion of the work plan. As the research work described in NERC's GMD Research Work Plan is directly relevant to the standard modification proposals discussed in the NOPR, NERC encourages the Commission to allow NERC to complete this work and its subsequent review prior to issuing any further standard modification directives.

³ *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) ("Order No. 830").

⁴ *Petition of the North American Electric Reliability Corporation for Approval of Proposed Reliability Standard TPL-007-2*, Docket No. RM18-8-000 (filed Jan. 22, 2018) ("Petition").

⁵ *See Revised Geomagnetic Disturbance Research Work Plan of the North American Electric Reliability Corporation*, Docket No. RM15-11-003 (filed Apr. 19, 2018) ("GMD Research Work Plan").

For these reasons, which are explained more fully herein, NERC respectfully requests that the Commission approve Reliability Standard TPL-007-2 as proposed by NERC.

I. BACKGROUND

On January 22, 2018, NERC filed proposed Reliability Standard TPL-007-2 for Commission approval. The proposed standard was developed in response to the Commission's directives from Order No. 830, in which the Commission approved currently-effective Reliability Standard TPL-007-1. As explained in further detail in NERC's Petition, the proposed standard improves upon the currently-effective version of the standard and addresses the Commission's directives from Order No. 830 by:

- requiring entities to assess their vulnerabilities to the supplemental GMD event, a second defined event that accounts for the localized peak effects of severe GMD events and which is not based solely on spatially-averaged data;⁶
- requiring entities to perform supplemental thermal impact assessments of applicable power transformers based on geomagnetically-induced current ("GIC") information for the supplemental GMD event;⁷
- requiring entities to implement process(es) to obtain GIC monitor and magnetometer data;⁸ and
- requiring entities to meet requirements for timeliness and accountability in implementing

⁶ See Order No. 830 at P 44 ("[T]he Commission . . . directs 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.") and P 47 ("Without pre-judging how NERC proposes to address the Commission's directive, NERC's response . . . should satisfy the NOPR's concern that reliance on spatially-averaged data alone does not address localized peaks that could potentially affect the reliable operation of the Bulk-Power System.").

⁷ See *id.* at P 65 ("[T]he Commission directs NERC to revise Requirement R6 to require registered entities to apply spatially averaged and non-spatially averaged peak geoelectric field values, or some equally efficient and effective alternative, when conducting thermal impact assessments.").

⁸ See *id.* at P 88 (directing NERC to modify TPL-007-1 "to require responsible entities to collect GIC monitoring and magnetometer data as necessary to enable model validation and situational awareness"). Additionally, the Commission directed NERC to collect GIC monitoring and magnetometer data from entities for the period beginning May 2013 going forward, and to make that information available. *Id.* at P 89.

Corrective Action Plans for addressing identified benchmark GMD vulnerabilities.⁹

Like its predecessor version TPL-007-1, the proposed standard is based on the latest in scientific and technical understanding of severe GMD events and the potential risks these events may pose to reliability.

Since completing development of the proposed standard, NERC has continued its work on GMD issues. On April 19, 2018, NERC filed a revised GMD Research Work Plan with the Commission.¹⁰ This plan provides a detailed framework for researching the specific GMD areas of concern noted by the Commission in Order No. 830. Later this year, NERC anticipates issuing a request to registered entities for GMD monitoring data under its authority in Section 1600 of the NERC Rules of Procedure.¹¹ These projects are expected to increase understanding of GMDs and provide useful information for continued evaluation of the technical aspects underpinning the proposed standard. To take advantage of these insights, NERC will initiate a formal review of the proposed TPL-007-2 standard following the conclusion of the GMD Research Work Plan. The purpose of this review will be to ensure that the GMD planning standard and the underlying GMD planning events are supported by the latest in scientific and technical understanding, identify any adjustments or refinements that may be necessary, and account for any other considerations that arise during the course of implementing the TPL-007 standard.

On May 17, 2018, the Commission issued a NOPR proposing to approve Reliability Standard TPL-007-2. In the NOPR, the Commission also proposes to direct NERC to modify the

⁹ See *id.* at PP 101-102 (directing NERC to modify TPL-007-1 to include a one-year deadline for the development of any required Corrective Action Plans, a two-year deadline to complete the implementation of non-hardware mitigation, and a four-year deadline to complete the implementation of hardware mitigation).

¹⁰ GMD Research Work Plan, *supra* note 5.

¹¹ The NERC Rules of Procedure (“NERC ROP”) are available at <https://www.nerc.com/AboutNERC/Pages/Rules-of-Procedure.aspx>.

standard's requirements for Corrective Action Plans. Specifically, the Commission proposes to direct NERC to modify the standard "to require applicable entities to develop and implement corrective action plans to mitigate supplemental GMD event vulnerabilities."¹² With respect to proposed Reliability Standard TPL-007-2 Requirement R7 Part 7.4, which relates to extension of Corrective Action Plan deadlines, the Commission proposes adopting one of two possible proposals. Under the first option, the Commission proposes to direct NERC to modify the standard to require "NERC and the Regional Entities, as appropriate, consider requests for extension of time [to complete Corrective Action Plan activities] on a case-by-case basis."¹³ NERC would also be directed to prepare and submit a report regarding the circumstances under which such requests have been made and NERC's disposition of such requests. Under the second option, the Commission would approve TPL-007-2 Requirement R7 Part 7.4 as proposed by NERC and would direct NERC to submit a report on the use of the provision.¹⁴ The Commission seeks comments on its proposals.

II. COMMENTS

NERC supports the Commission's proposal to approve Reliability Standard TPL-007-2. Proposed Reliability Standard TPL-007-2 addresses the Commission's directives as set forth in Order No. 830 and represents another milestone in NERC's efforts to harden the grid against the potential reliability risks posed by severe GMD events, including the risks posed by severe,

¹² NOPR at P 24.

¹³ *Id.* at P 50.

¹⁴ *Id.* at P 51.

localized effects. NERC does not, however, support the Commission's proposals to further modify the standard.

As discussed below, the proposed standard provides strong protections against the potential reliability risks of a severe GMD event and provides a reasonable approach for mitigating vulnerabilities identified through the benchmark and supplemental GMD Vulnerability Assessments. NERC, therefore, does not support the Commission's first standard modification proposal, which is to direct NERC to modify the standard to require entities to develop Corrective Action Plans to address vulnerabilities identified through supplemental GMD Vulnerability Assessments. With respect to the second set of proposals regarding TPL-007-2 Requirement R7 Part 7.4, NERC supports the second option described by the Commission, which would be to approve the provision as proposed by NERC. As described herein, the proposed provision helps to ensure timely mitigation of GMD vulnerabilities in accordance with Order No. 830 while accounting for the circumstances under which Corrective Action Plan deadlines cannot be met. NERC provides the following comments on the proposals discussed in the NOPR.

A. Corrective Action Plans for Supplemental GMD Vulnerability Assessments

1. NOPR

In the NOPR, the Commission stated that proposed Reliability Standard TPL-007-2 addresses the Commission's directive in Order No. 830 in that it requires entities to assess their systems' vulnerabilities to the supplemental GMD event, a second planning event that is not based solely on spatially-averaged data and which is intended to capture the localized peak effects of GMDs.¹⁵ The Commission, however, expresses concern that the proposed standard

¹⁵ *Id.* at PP 23-24.

does not require entities to develop and implement a formal Corrective Action Plan to mitigate such vulnerabilities.¹⁶ Specifically, the Commission stated:

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.” 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.¹⁷

While expressing support for the technical basis underlying the proposed supplemental GMD event, the Commission nevertheless expresses skepticism regarding NERC’s assertion that requiring mandatory Corrective Action Plans would be premature at this time.¹⁸ The Commission therefore proposes to direct NERC to modify proposed Reliability Standard TPL-007-2 to establish requirements for entities to develop and complete Corrective Action Plans for vulnerabilities identified through supplemental GMD Vulnerability Assessments.¹⁹ The Commission proposes to direct NERC to file the revised standard within 12 months of the effective date of Reliability Standard TPL-007-2.

2. Comments

NERC supports the Commission’s proposal to approve the proposed standard and the new supplemental GMD event. As the Commission states in the NOPR, the proposed

¹⁶ *Id.* at P 24. Proposed Reliability Standard TPL-007-2 Requirement R8 Part 8.3 provides that, if the analysis concludes there is Cascading caused by the event, the entity shall conduct an evaluation of possible actions designed to reduce the likelihood or mitigate the consequences and adverse impacts of the event(s).

¹⁷ *Id.* at P 33 (internal citation omitted).

¹⁸ *See id.* at PP 35-39.

¹⁹ *Id.* at P 24.

supplemental GMD event builds on the same framework as the approved benchmark GMD event, but with some modifications to account for localized peak effects of GMDs. The proposed standard offers a reasonable approach for meeting the Commission’s Order No. 830 directive to develop a GMD planning event that is not based solely on spatially-averaged data. NERC, however, has several concerns regarding the basis for the Commission’s proposal to require entities to develop and implement formal Corrective Action Plans for vulnerabilities identified through GMD Vulnerability Assessments based on the supplemental GMD event. For these reasons, which are explained below, NERC does not support the Commission’s NOPR proposal to modify the standard. NERC respectfully requests that the Commission accept NERC’s commitment to conduct a formal review of the standard following the completion of the GMD Research Work Plan in lieu of including any standard modification directives in a final rule in this proceeding.

a) As Proposed, Reliability Standard TPL-007-2 Provides Strong Protection against the Reliability Risks of GMDs

Proposed Reliability Standard TPL-007-2 provides strong protection against the potential system-wide impacts of a severe GMD event consistent with both Order No. 779²⁰ and Order No. 830.²¹ The proposed standard requires entities to assess their vulnerabilities using two defined GMD planning events intended to model the system-wide and potential localized impacts of a severe GMD storm. Using the approved benchmark GMD event, entities will

²⁰ *Reliability Standards for Geomagnetic Disturbances*, Order No. 779, 143 FERC ¶ 61,147, *reh’g denied*, 144 FERC ¶ 61,113 (2013) (directing NERC to develop one or more Reliability Standard “that require owners and operators of the Bulk-Power System to conduct initial and on-going assessments of the potential impact of benchmark GMD events on Bulk-Power System equipment and the Bulk-Power System as a whole”); *and* Order No. 830 at P 44 (approving Reliability Standard TPL-007-1, but directing NERC to revise the benchmark GMD event definition so that the reference peak geoelectric field amplitude component is not based solely on spatially-averaged data).

²¹ Order No. 830 at P 44.

identify the potential system-wide impacts of a severe, 1-in-100 year GMD event. The proposed supplemental GMD event is intended to “supplement” the benchmark GMD event by providing a means to evaluate localized enhancements of a geomagnetic field during a severe GMD event that could potentially affect the reliable operation of the Bulk-Power System. It has been observed that severe GMD events may include peak geomagnetic fields of limited duration in a given local area, which decrease in intensity over distance.²² The associated impacts could include increased reactive power loss and hot spot heating in some power transformers or voltage depressions in a local area.

If vulnerabilities are identified through either one of these assessments, entities are required to take action. Entities must develop Corrective Action Plans if their studies based on the benchmark GMD event identify potential voltage collapse, Cascading, or uncontrolled islanding. Under proposed Reliability Standard TPL-007-2, entities would be required to implement their selected mitigation measures on the timeline provided by the Commission in Order No. 830. If an entity determines, through its supplemental GMD Vulnerability Assessment, that a severe GMD event with localized enhancements of the geomagnetic field could impact a selected location and cause Cascading, then the entity’s supplemental GMD Vulnerability Assessment must include an evaluation of “possible actions designed to reduce the likelihood or mitigate the consequences and adverse impacts of the event(s).”²³ This evaluation is not merely advisory, but rather supports a range of potential mitigating actions, such as additional hardware mitigation, operating procedures, or other resilience actions to enhance recovery and restoration.

²² See Petition, Ex. I (Supplemental GMD Event Description White Paper) at 8.

²³ Petition, Attachment A, Proposed Reliability Standard TPL-007-2 Requirement R8 Part 8.3.

Furthermore, some of the mitigating actions identified through this evaluation would directly support mitigation that is required by other NERC Reliability Standards. Proposed Reliability Standard TPL-007-2 Requirement R8 Part 8.4 would require each applicable planning entity to convey information from its GMD planning studies to its Reliability Coordinator. Reliability Standard EOP-010-1 Requirement R1 Part 1.1 requires the Reliability Coordinator to implement GMD Operating Plans that include “activities designed to mitigate the effects of GMD events on the reliable operation of the interconnected transmission system within the Reliability Coordinator Area.”²⁴ Such activities could include posturing the system to minimize GIC flows or tolerate increased reactive power losses, increasing operator situational awareness to respond to abnormal conditions, or preparing emergency or restoration plans for effective restoration following the event.²⁵ A supplemental GMD Vulnerability Assessment could, for example, identify load shedding plans that would prevent Cascading or identify additional at-risk transformers not identified through the benchmark GMD Vulnerability Assessment that should be protected with operating measures during a severe GMD event with localized peak geoelectric fields. The proposed standard would thus require the exchange of information to support the development of GMD Operating Plans that are based on detailed system studies and risk analysis.

Taken together, the GMD Vulnerability Assessments and Corrective Action Plans required by TPL-007-2 and the Operating Procedure requirements contained in EOP-010-1 provide a layered and effective approach to addressing the risks from severe GMD events. Given

²⁴ Reliability Standard EOP-010-1 Requirement R1 Part 1.1, <https://www.nerc.com/pa/Stand/Reliability%20Standards/EOP-010-1.pdf>.

²⁵ Examples of possible actions to include in Operating Procedures are described in the NERC GMD Task Force Phase 2, Operating Procedure Template (Jan. 16, 2013), https://www.nerc.com/comm/PC/Geomagnetic%20Disturbance%20Task%20Force%20GMDTF%202013/GMDTF_Phase_2-Operating_Procedure_Template-Transmission%20Generation.pdf.

the relationship between the supplemental and benchmark GMD events, NERC anticipates that that Corrective Action Plans, when needed to address performance requirements for the benchmark GMD event, will also provide a large degree of protection to the Bulk-Power System for events with locally-enhanced geomagnetic fields. Operating Procedures based on analysis of the supplemental GMD event would help prepare operators for specific localized effects of severe GMD events that have the potential to impact the reliable operation of the Bulk-Power System.

In summary, the proposed standard provides a conservative and rigorous approach for assessing the known characteristics of a severe GMD event on the reliable operation of the Bulk-Power System and for taking appropriate measures to mitigate the effects of such an event. NERC believes that the proposed standard addresses the Commission's concerns from Order No. 779 and Order No. 830, and requests that the standard be approved without modification.

b) The Proposed Standard Provides a Reasonable Approach for Addressing Extreme Localized GMD Peak Effects

As described in the previous section, proposed Reliability Standard TPL-007-2 provides strong protection against the potential reliability risks of severe GMD events, consistent with both Order No. 779 and Order No. 830. The Commission has nevertheless expressed concern in the NOPR with NERC's proposed approach for addressing vulnerabilities to the supplemental GMD event. NERC maintains that the standard provides a reasonable approach for evaluating and mitigating the potential reliability impacts of peak GMD effects. This approach is based on, and accounts for limitations in, the current state of scientific and technical knowledge.

NERC is concerned that the Commission's proposal to require the development and implementation of Corrective Action Plans for the supplemental GMD Vulnerability Assessment would result in the *de facto* replacement of the benchmark GMD event with the proposed

supplemental GMD event. The proposed supplemental GMD event was neither developed nor intended to replace the benchmark GMD event in this manner. Further, should the proposed supplemental GMD event be applied to an overly-large area, it would represent an event significantly more extreme than a 1-in-100 year GMD event. Unlike the benchmark GMD event, which is intended to represent the impacts of a 1-in-100 year storm on the Bulk-Power System, the supplemental GMD event is meant solely to simulate the impacts from an extreme localized GMD effect if local turbulent solar activity amplifies the local voltages centered on a particular select area identified by the planner. There are several reasons why replacing the benchmark GMD event for the proposed supplemental GMD event would not promote prudent, cost-effective, risk-based system planning. In light of these concerns, which are described more fully below, NERC does not support the Commission's proposed directive. NERC maintains that the better approach would be to continue the scientific and engineering evaluation of geoelectric field enhancements, as outlined in the GMD Research Plan and further described below, before considering further revisions to the mandatory and enforceable requirements in the TPL-007 standard.

Proposed Reliability Standard TPL-007-2 carries forward the approach of approved Reliability Standard TPL-007-1 of requiring entities to assess their vulnerabilities to the benchmark GMD event and to develop and implement Corrective Action Plans to address identified system vulnerabilities. Since its development, the approved benchmark GMD event remains strongly supported as representative of a severe 1-in-100 year GMD event for assessing impacts on the Bulk-Power System.²⁶ The proposed supplemental GMD event can be thought of

²⁶ Since NERC filed its petition for approval of TPL-007-1 and the benchmark GMD event in 2014 in Docket No. RM15-11-000, similar extreme value analysis of magnetometer data has been performed by researchers at the Geomagnetic Laboratory, Natural Resources Canada. This analysis affirms the selection of the peak geoelectric field

as the benchmark GMD event, but with an amplified magnetic field in a localized area and with a finite time duration to simulate extreme localized GMD effects. It was developed, in response to Order No. 830, to provide a means to model the type of localized enhancement observed during some severe GMD events. An entity's supplemental GMD Vulnerability Assessment would be similar to its benchmark GMD Vulnerability Assessment, but it would employ a higher peak geoelectric field in all or part of the area studied, depending on the size of the enhanced area that the entity assumes and the modeling capabilities and approach it employs. While the supplemental GMD event is strongly supported by data and analysis in ways that mirror the benchmark GMD event, there are aspects of it that are less definitive than the benchmark GMD event and less appropriate as the basis for requiring Corrective Action Plans.

Specifically, while the geoelectric field magnitudes for both the benchmark and supplemental GMD events are rigorously defined using similar data sets and statistical analysis techniques, the added dimension of geographic size associated with the locally-enhanced magnetic field in the supplemental GMD event is only generally characterized due to the limited number of events and data available to characterize the phenomenon. For this reason, the TPL-007-2 standard drafting team included general guidance for assessing enhancements in areas occupying "a relatively narrow band of geomagnetic latitude (on the order of 100 km) and wider longitudinal width (on the order of 500 km)" but noted that these values are "reasonable but not

values for the benchmark GMD event. Results of the study using over 40 years of geomagnetic field data from Canadian observatories estimate the 100-year peak geoelectric field at reference location to be slightly less than the 8 V/km specified in the benchmark GMD event. Furthermore, the researchers used individual station geomagnetic field data without averaging over areas (i.e., the research was not based on spatial averaging). See L. Nikitina et al., *Assessment of extreme values in geomagnetic and geoelectric field variations for Canada*. 14 SPACE WEATHER 481-494 (2016) (the 100-year geoelectric field value for Ottawa is 2.8 V/km, which is 5 V/km at the reference latitude of 60 degrees geomagnetic latitude). Research being performed as part of the GMD Research Work Plan and by other organizations such as Natural Resources Canada continue to be useful in evaluating the benchmark GMD event used in the TPL-007 standard.

definitive.”²⁷ As the Commission notes, the proposed standard affords flexibility to entities to determine the geographic size of the supplemental GMD event.²⁸ The type of mitigation that may be required for the supplemental GMD event could vary significantly, however, depending on how and where the planner models the localized enhancement. Further, based on its extensive experience in system planning and the relative immaturity of tools and methods for modeling localized enhancements, the TPL-007-2 standard drafting team determined that many entities would likely employ the most conservative approach for conducting supplemental GMD Vulnerability Assessments, which would be to apply extreme peak values uniformly over an entire planning area.²⁹ By assuming that the localized extremes would be expansive, and not confined in area and impact, entities would be assessing their vulnerabilities to an event estimated to be highly unlikely, more extreme than a 1-in-200 year event. NERC does not believe that the Commission intended in Order No. 830 for a NERC Reliability Standard to require entities to develop Corrective Action Plans to provide complete mitigation for all potential vulnerabilities identified by applying localized peak values over an entire planning area in this way,³⁰ nor would such an approach necessarily promote the interests of prudent system planning.

²⁷ Petition at 11-13 and Ex. I (Supplemental GMD Event Description White Paper) at 13.

²⁸ NOPR at P 36.

²⁹ See Petition, Exhibit I (Supplemental GMD Event Description White Paper) at 13.

³⁰ See Order No. 830 at P 36, in which the Commission explained the NOPR proposal underlying its directive as follows (emphasis added):

Specifically, the NOPR proposed to direct NERC to modify the reference peak geoelectric field amplitude component of the benchmark GMD event definition so that it is not calculated based solely on spatially-averaged data. The NOPR explained that this could be achieved, for example, by requiring applicable entities to conduct GMD Vulnerability Assessments (and, as discussed below, thermal impact assessments) using two different benchmark GMD events: the first benchmark GMD event using the spatially-averaged reference peak geoelectric field value (8 V/km) and the second using the non-spatially averaged peak

NERC does not believe that concerns regarding the uncertainty of the geographic size of the supplemental GMD event could be addressed adequately by sensitivity analysis or through other methods in planning studies.³¹ Sensitivity analysis can be useful component of planning studies. However, as many entities are performing GMD studies using complex engineering and geophysical models for the first time, there are inherent sources of modeling uncertainty (e.g., earth conductivity model, substation grounding grid resistance values, transformer thermal and magnetic response models) that may be subject to sensitivity analysis and would produce differences in GMD Vulnerability Assessment results. NERC believes introducing additional variables for sensitivity analysis, such as the size of the localized enhancement, may not improve the accuracy of GMD Vulnerability Assessments. Such issues would be better addressed through research.

Further, while some commercially-available modeling tools now advertise capabilities that could be used to model localized GMD enhancements,³² to NERC's knowledge these capabilities have not been used extensively by planners, nor have the different software tools

geoelectric field value cited in the GMD Interim Report (20 V/km). The NOPR stated that the revised Reliability Standard could then require applicable entities to take corrective actions, using engineering judgment, based on the results of both assessments. **The NOPR explained that applicable entities would not always be required to mitigate to the level of risk identified by the non-spatially averaged analysis; instead, the selection of mitigation would reflect the range of risks bounded by the two analyses, and be based on engineering judgment within this range, considering all relevant information.** The NOPR stated that, alternatively, NERC could propose an equally efficient and effective modification that does not rely exclusively on the spatially-averaged reference peak geoelectric field value.

See also NOPR at P 40 (“[W]e 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.”).

³¹ *See Id.* at P 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. 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 planning studies.”).

³² *See Id.* at P 38 and n.47 (citing two examples of modeling suites that advertise this capability).

been benchmarked for consistency in results. Furthermore, underlying assumptions related to the size and spatial characteristics of the enhancement are the subject of ongoing research. NERC anticipates that these tools and capabilities will continue to evolve and mature, and it will continue to support such efforts through the NERC GMD Task Force. Given the variations in modeling localized peak enhancements, it is appropriate for the TPL-007 standard to continue to require the development of Corrective Action Plans, plans which could call for extensive planning and capital expenditures, only for the benchmark GMD Vulnerability Assessments.

To conclude, NERC maintains that the proposed standard strikes the appropriate balance between the urgency to address GMD-related vulnerabilities and providing flexibility consistent with principles of prudent, cost-effective, risk-based system planning. By requiring the entity to evaluate which actions can be taken to address vulnerabilities to the supplemental GMD event, the standard maintains a high bar for reliability. At the same time, the standard affords the entity sufficient flexibility to determine whether to supplement an existing Corrective Action Plan based on the benchmark GMD event with additional measures based on its engineering judgment and in light of any other relevant considerations. The proposed standard thus addresses the Commission's concerns from Order No. 830 in a clear, rigorous, results-based Reliability Standard.

c) NERC's Review of the TPL-007-2 Standard Provides the Proper Forum for Evaluating the Standard in Light of New Technical and Scientific Understanding

In Order No. 830, the Commission directed NERC to perform activities to improve scientific and technical understanding of GMD events. In response, NERC developed and submitted to the Commission its Order No. 830 GMD Research Work Plan. NERC is currently executing this plan, which includes several Tasks relevant to the issues identified in this NOPR. Specifically, Task 1 – *Further Analyze Spatial Averaging Used in the Benchmark GMD Event*

consists of two main research components: (i) research 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 assumptions on BPS reliability.³³ One aim of the research is to improve understanding of characteristics and spatial scales of localized geoelectric field enhancements, which could inform the supplemental GMD event.

NERC is concerned that the timing of the Commission's proposed directive (i.e., to submit a revised standard 12 months following the effective date of TPL-007-2) could, depending on the effective date of a final rule in this proceeding, require NERC to initiate development of a revised standard prior to the completion of its important and directly relevant GMD research work. As explained in more detail in NERC's GMD Research Work Plan filing, NERC expects that the last of the project's deliverables will be ready by early 2020. Any scientific research project schedule, however, must account for the possibility that additional time may be needed to explore potential findings or amend project approaches to provide more useful results. NERC also needs to account for additional time, following delivery of the technical reports and other project deliverables, to allow interested entities an opportunity to review and provide comments consistent with the Commission's guidance.³⁴ These comments could provide additional insights and further areas for consideration. For these reasons, NERC does not anticipate that the GMD Research Work Plan would be fully completed before late 2020, even assuming that the work proceeds generally as scheduled. NERC believes that it is important that this work be completed in full prior to considering further revisions to the TPL-007 standard.

³³ See GMD Research Work Plan, *supra* note 5, at 2-7.

³⁴ In its Order accepting NERC's preliminary plan, the Commission stated that it "expects NERC to afford interested entities an opportunity to comment on GMD Work Plan deliverables before they are filed with the Commission." *Order on GMD Research Work Plan*, 161 FERC ¶ 61,048, at P 17 (2017).

As noted earlier in these comments, NERC commits to initiate a review of TPL-007-2 following the completion of the GMD Research Work Plan to evaluate whether the standard continues to be supported by the available knowledge or whether additional refinements are necessary. This review could result in modifications to, or additional support for, the proposed supplemental GMD event, and thereby inform what the TPL-007 standard should require in terms of mitigation based on supplemental GMD Vulnerability Assessments. To promote the efficient use of standard development resources and to avoid the burden associated with implementing multiple successive versions of a standard, NERC respectfully requests that the Commission await the completion of NERC’s GMD research work and NERC’s subsequent review prior to issuing any directives requiring further modifications to the standard.

B. Extending Corrective Action Plan Deadlines

1. NOPR

In the NOPR, the Commission expressed concern that proposed Reliability Standard TPL-007-2 Requirement R7 Part 7.4, which allows entities to extend their Corrective Action Plan deadlines in limited circumstances, “contrasts with the Commission’s guidance in Order No. 830 that ‘NERC should consider extensions of time on a case-by-case basis.’”³⁵ The Commission stated that it “agree[s] with NERC that there should be a mechanism for allowing extensions of ... deadlines,” but that it would like to “avoid unnecessary delay in implementing protection against GMD threats.”³⁶ The Commission, therefore, seeks comments on two proposals to address the situation where an entity cannot complete the implementation of a

³⁵ NOPR at P 45 (citing Order No. 830 at P 102).

³⁶ *Id.* at P 46.

Corrective Action Plan to address GMD vulnerabilities within the timetable specified by proposed Reliability Standard TPL-007-2 Requirement R7 Part 7.3.³⁷

Under the first option, the Commission proposes to direct NERC to modify the standard to require NERC and the Regional Entities to consider any requests for extension of time on a case-by-case basis. Entities seeking an extension of Corrective Action Plan deadlines would be required to submit a request to NERC and the Regional Entities containing the information that would be required by proposed TPL-007-2 Requirement R7 Part 7.4. In addition, the Commission would direct NERC to submit a report addressing the disposition of any such requests and the circumstances under which entities are exceeding Corrective Action Plan deadlines within 12 months from the date on which applicable entities must comply with the last requirement of TPL-007-2, following which the Commission would determine whether further action is necessary.³⁸

Under the second option, the Commission would approve proposed TPL-007-2 Requirement R7 Part 7.4 as proposed by NERC. The Commission would also direct NERC to submit a report regarding how often and why entities are exceeding Corrective Action Plan deadlines within 12 months from the date on which applicable entities must comply with the last requirement of Reliability Standard TPL-007-2, following which the Commission would determine whether further action is necessary.³⁹

³⁷ As directed by the Commission in Order No. 830, proposed Reliability Standard TPL-007-2 Requirement R7 Part 7.3 provides that each Corrective Action Plan required by the standard shall include a timetable that specifies completion of non-hardware mitigation within two years of from the development of the Corrective Action Plan and completion of hardware mitigation within four years from the development of the Corrective Action Plan.

³⁸ NOPR at P 50.

³⁹ *Id.* at P 51.

2. Comments

NERC supports the Commission's second proposal; that is, to approve Reliability Standard TPL-007-2 Requirement R7 Part 7.4 as proposed by NERC. Proposed Reliability Standard TPL-007-2 Requirement R7 Part 7.3 accomplishes the Commission's overarching goal from Order No. 830 of assuring timely mitigation of GMD vulnerabilities in accordance with the Commission's specified deadlines. Proposed Requirement R7 Part 7.4 accounts for the circumstances under which meeting those deadlines may not be achievable. Placing these requirements into the standard provides clarity and certainty regarding when an entity may extend a Corrective Action Plan mitigation deadline and what steps must be followed to maintain accountability and thus compliance with the standard. This standards-based approach also avoids the administrative burden, uncertainty, and further delay that could be associated with implementing a new ERO adjudication process, such as one that would be dedicated to evaluating GMD Corrective Action Plan deadline extensions on a case-by-case basis.

NERC shares the Commission's concern, as stated in Order No. 830 and reiterated in the NOPR, that entities should not unnecessarily delay efforts to mitigate identified GMD vulnerabilities. NERC submits that proposed Requirement R7 Part 7.4 accounts for this concern. Under the proposed provision, an entity may extend a Corrective Action Plan deadline only where "situations beyond the control of the responsible entity" are the cause for delay. Such situations could include lengthy legal or regulatory processes, stakeholder processes required by tariff, or long equipment lead times, to cite a few examples. The proposed provision was drafted with the goal of providing entities with sufficient flexibility to choose the optimal mitigation strategies for their areas; it is not so flexible, however, as to allow entities to extend Corrective Action Plan deadlines indefinitely or for any reason whatsoever. As part of the compliance monitoring and enforcement activities for the proposed standard, NERC and Regional Entity

staff would exercise their authority to review the reasonableness of any Corrective Action Plan delay, including reviewing the “situations beyond the control of the responsible entity” that are cited as causing the delay.

The proposed provision also contains requirements to maintain accountability when entities extend Corrective Action Plan deadlines. These steps include documenting, in the Corrective Action Plan itself, the circumstances that are causing the delay in implementing the selected mitigation, a description of any changes to the original plan or prior revised plan(s), and revisions to the selected actions in Part 7.1, if any, including utilization of Operating Procedures if applicable, and the updated timetable for implementing the selected options. The entity would be required to update its plan at least every 12 months until implemented. Additionally, under Requirement R7 Part 7.5, an entity would be required to provide the revised plan to its Reliability Coordinator as well as other recipients of the original plan within 90 days of the revision.

Both NERC’s proposed standard-based approach and the Commission’s proposed “case by case” determination approach would promote timely mitigation of GMD vulnerabilities subject only to reasonable and limited exceptions. The standard-based approach, however, would provide several benefits a case-by-case adjudication model would not. First, if approved, the proposed provision would be monitored through well-established ERO Enterprise Compliance Monitoring and Enforcement Program processes, along with the other Requirements of the proposed TPL-007 standard. If the Commission adopted its first proposal and required NERC to pre-approve individual Corrective Action Plan extensions and plan updates instead, NERC may need to develop and implement a new ERO adjudication process specifically for evaluating

GMD Corrective Action Plan extension requests.⁴⁰ Second, the standard-based approach imposes no more administrative burden than is necessary for reliability. In this particular context, a case-by-case adjudication model would likely result in a greater administrative burden to registered entities and NERC and the Regional Entities alike, for no additional reliability benefit. Lastly, the standard-based approach prioritizes timely completion of the actions entities have chosen to mitigate their GMD vulnerabilities. NERC is concerned that the uncertainty associated with a case-by-case adjudication model could result in entities further delaying action to implement their selected GMD mitigation actions while they await the results of a NERC or Regional Entity determination or appeal.

While NERC maintains that proposed Requirement R7 Part 7.4 accomplishes the reliability goal of timely GMD mitigation efficiently and effectively, NERC agrees that a report describing the results of NERC's monitoring of this provision could provide useful information. NERC therefore commits to file the report proposed by the Commission in the NOPR.⁴¹ Specifically, NERC commits to prepare and submit to the Commission a report that describes how often and the reasons why entities in the United States are exceeding Corrective Action Plan deadlines. NERC commits to file this report within 12 months from the date on which applicable entities must comply with the last requirement of Reliability Standard TPL-007-2.

⁴⁰ One model for such a process could be the Procedure for Requesting and Receiving an Exception from the Application of the NERC Definition of Bulk Electric System, Appendix 5C to the NERC ROP.

⁴¹ See NOPR at P 51.

III. Conclusion

For the reasons set forth above, NERC respectfully requests that the Commission accept these comments for consideration.

Respectfully submitted,

/s/ Lauren A. Perotti

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Date: July 23, 2018

CERTIFICATE OF SERVICE

I hereby certify that I have served a copy of the foregoing document upon all parties listed on the official service list compiled by the Secretary in this proceeding. Dated at Washington, D.C. this 23rd day of July, 2018.

/s/ Lauren A. Perotti

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