

Consideration of Comments

Project Name:	2013-03 Geomagnetic Disturbance Mitigation TPL-007-2
Comment Period Start Date:	6/28/2017
Comment Period End Date:	8/11/2017
Associated Ballots:	2013-03 Geomagnetic Disturbance Mitigation TPL-007-2 IN 1 NB 2013-03 Geomagnetic Disturbance Mitigation TPL-007-2 IN 1 ST

There were 58 sets of responses, including comments from approximately 147 different people from approximately 106 companies representing 10 of the Industry Segments as shown in the table on the following pages.

All comments submitted can be reviewed in their original format on the [project page](#).

If you feel that your comment has been overlooked, please let us know immediately. Our goal is to give every comment serious consideration in this process. If you feel there has been an error or omission, you can contact the Senior Director of Standards and Education, [Howard Gugel](#) (via email) or at (404) 446-9693.

Summary Consideration

The standard drafting team (SDT) made non-substantive revisions to Measures M5 and M9, Rationales for Requirements R7, R11, and R12, including a correction to a chapter reference. Additionally, the singular use of “study” in the Violation Severity Levels (VSL) for Requirement R2 was deleted because there will be at least two studies (i.e., benchmark and supplemental), and the missing word “the” was added in the Moderate VSL for Requirement R4. For Requirement R8 in the VSLs, the text in the Lower VSL column was moved to be consistent with the order of the text in the other three columns.

The heading for Attachment 1 was corrected to properly link as a part of the standard and not to identify it as supplemental material. Other non-substantive revisions addressed punctuation, formatting, and conforming the document(s) to the NERC style guide, which included properly footnoting webpage links to reference documents.

Other supporting documents, such as, the Supplemental GMD Event white paper, Thermal Screening Criterion White Paper, and Transformer Thermal Impact Assessment White Paper all received non-substantive revisions addressed punctuation, formatting, and conforming the document(s) to the NERC style guide. A few clarifying revisions were made to address comments by stakeholders.

In the Implementation Plan, the SDT clarified the phase-in compliance dates for those Requirements that were tacitly incorporated into the effective date language by adding additional items under the phase-in compliance date section. Also, the SDT corrected a technical error regarding Requirement R6. For example, if the standard happens to be approved quickly by governmental authorities, Requirement R6 could become effective prior to the TPL-007-1 effective date. To correct this condition, the SDT provided a six-month phased-in implementation for Requirement R6.

Questions

- 1. The SDT developed proposed Requirements R8 – R10 and the supplemental GMD event to address FERC concerns with the benchmark GMD event used in GMD Vulnerability Assessments. (Order No. 830 P.44, P.47-49, P.65). The requirements will obligate responsible entities to perform a supplemental GMD Vulnerability Assessment based on the supplemental GMD event that accounts for potential impacts of localized peak geoelectric fields. Do you agree with the proposed requirements? If you do not agree, or if you agree but have comments or suggestions for the proposed requirements provide your recommendation and explanation.**
- 2. The SDT developed the Supplemental GMD Event Description white paper to provide technical justification for the supplemental GMD event. The purpose of the supplemental GMD event description is to provide a defined event for assessing system performance for a GMD event which includes a local enhancement of the geomagnetic field. Do you agree with the proposed supplemental GMD event and the description in the white paper? If you do not agree, or if you agree but have comments or suggestions for the supplemental GMD event and the description in the white paper provide your recommendation and explanation.**
- 3. The SDT established an 85 A per phase screening criterion for determining which power transformers are required to be assessed for thermal impacts from a supplemental GMD event in Requirement R10. Justification for this threshold is provided in the revised Screening Criterion for Transformer Thermal Impact Assessment white paper. Do you agree with the proposed 85 A per phase screening criterion and the technical justification for this criterion that has been added to the white paper? If you do not agree, or if you agree but have comments or suggestions for the screening criterion and revisions to the white paper provide your recommendation and explanation.**
- 4. The SDT revised the Transformer Thermal Impact Assessment white paper to include the supplemental GMD event. Do you agree with the revisions to the white paper? If you do not agree, or if you agree but have comments or suggestions on the revisions to the white paper provide your recommendation and explanation.**
- 5. The SDT developed proposed Requirement R7 to address FERC directives in Order No. 830 for establishing Corrective Action Plan (CAP) deadlines associated with GMD Vulnerability Assessments (P. 101, 102). Do you agree with the proposed requirement? If you do not agree, or if you agree but have comments or suggestions for the proposed requirement provide your recommendation and explanation.**

- 6. The SDT developed Requirements R11 and R12 to address FERC directives in Order No. 830 for requiring responsible entities to collect GIC monitoring and magnetometer data (P. 88; P. 90-92). Do you agree with the proposed requirements? If you do not agree, or if you agree but have comments or suggestions for the proposed requirements provide your recommendation and explanation.**
- 7. Do you agree with the proposed Implementation Plan for TPL-007-2? If you do not agree, or if you agree but have comments or suggestions for the Implementation Plan provide your recommendation and explanation.**
- 8. Do you agree with the Violation Risk Factors (VRFs) and Violation Severity Levels (VSLs) for the requirements in proposed TPL-007-2? If you do not agree, or if you agree but have comments or suggestions for the VRFs and VSLs provide your recommendation and explanation.**
- 9. The SDT believes proposed TPL-007-2 provide entities with flexibility to meet the reliability objectives in the project Standards Authorization Request (SAR) in a cost effective manner. Do you agree? If you do not agree, or if you agree but have suggestions for improvement to enable additional cost effective approaches to meet the reliability objectives, please provide your recommendation and, if appropriate, technical justification.**
- 10. Provide any additional comments for the SDT to consider, if desired.**

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
Brandon McCormick	Brandon McCormick		FRCC	FMPPA	Tim Beyrle	City of New Smyrna Beach Utilities Commission	4	FRCC
					Jim Howard	Lakeland Electric	5	FRCC
					Lynne Mila	City of Clewiston	4	FRCC
					Javier Cisneros	Fort Pierce Utilities Authority	3	FRCC
					Randy Hahn	Ocala Utility Services	3	FRCC
					Don Cuevas	Beaches Energy Services	1	FRCC
					Jeffrey Partington	Keys Energy Services	4	FRCC
					Tom Reedy	Florida Municipal Power Pool	6	FRCC
					Steven Lancaster	Beaches Energy Services	3	FRCC

					Mike Blough	Kissimmee Utility Authority	5	FRCC
					Chris Adkins	City of Leesburg	3	FRCC
					Ginny Beigel	City of Vero Beach	3	FRCC
ACES Power Marketing	Brian Van Gheem	6	NA - Not Applicable	ACES Standards Collaborators	Greg Froehling	Rayburn Country Electric Cooperative, Inc.	3	SPP RE
					Bob Solomon	Hoosier Energy Rural Electric Cooperative, Inc.	1	RF
					Ginger Mercier	Prairie Power, Inc.	1	SERC
					Shari Heino	Brazos Electric Power Cooperative, Inc.	1,5	Texas RE
					Mark Ringhausen	Old Dominion Electric Cooperative	4	SERC

					Tara Lightner	Sunflower Electric Power Corporation	1	SPP RE
					Ryan Strom	Buckeye Power, Inc.	4	RF
					Scott Brame	North Carolina Electric Membership Corporation	3,4,5	SERC
Colby Bellville	Colby Bellville		FRCC,RF,SERC	Duke Energy	Doug Hils	Duke Energy	1	RF
					Lee Schuster	Duke Energy	3	FRCC
					Dale Goodwine	Duke Energy	5	SERC
					Greg Cecil	Duke Energy	6	RF
MRO	Dana Klem	1,2,3,4,5,6	MRO	MRO NSRF	Joseph DePoorter	Madison Gas & Electric	3,4,5,6	MRO
					Larry Heckert	Alliant Energy	4	MRO
					Amy Casucelli	Xcel Energy	1,3,5,6	MRO
					Michael Brytowski	Great River Energy	1,3,5,6	MRO
					Jodi Jensen	Western Area Power Administration	1,6	MRO

					Kayleigh Wilkerson	Lincoln Electric System	1,3,5,6	MRO
					Mahmood Safi	Omaha Public Power District	1,3,5,6	MRO
					Brad Parret	Minnesota Powert	1,5	MRO
					Terry Harbour	MidAmerican Energy Company	1,3	MRO
					Tom Breene	Wisconsin Public Service Corporation	3,5,6	MRO
					Jeremy Voll	Basin Electric Power Cooperative	1	MRO
					Kevin Lyons	Central Iowa Power Cooperative	1	MRO
					Mike Morrow	Midcontinent ISO	2	MRO
Electric Reliability Council of Texas, Inc.	Elizabeth Axson	2		IRC Standards Review Committee	Elizabeth Axson	ERCOT	2	Texas RE
					Ben Li	IESO	2	NPCC
					Mark Holman	PJM	2	RF

					Greg Campoli	NYISO	2	NPCC
					Terry Blilke	Midcontinent ISO, Inc.	2	MRO
					Ali Miremadi	California ISO	2	WECC
					Matthew Goldberg	ISO NE	2	NPCC
					Charles Yeung	Southwest Power Pool, Inc. (RTO)	2	SPP RE
Lower Colorado River Authority	Michael Shaw	6		LCRA Compliance	Teresa Cantwell	LCRA	1	Texas RE
					Dixie Wells	LCRA	5	Texas RE
					Michael Shaw	LCRA	6	Texas RE
Manitoba Hydro	Mike Smith	1		Manitoba Hydro	Yuguang Xiao	Manitoba Hydro	5	MRO
					Karim Abdel-Hadi	Manitoba Hydro	3	MRO
					Blair Mukanik	Manitoba Hydro	6	MRO
					Mike Smith	Manitoba Hydro	1	MRO
Southern Company - Southern	Pamela Hunter	1,3,5,6	SERC	Southern Company	Katherine Prewitt	Southern Company Services, Inc.	1	SERC

Company Services, Inc.					R. Scott Moore	Alabama Power Company	3	SERC
					William D. Shultz	Southern Company Generation	5	SERC
					Jennifer G. Sykes	Southern Company Generation and Energy Marketing	6	SERC
Northeast Power Coordinating Council	Ruida Shu	1,2,3,4,5,6,7,8,9,10	NPCC	RSC no Hydro One, HQ and IESO	Guy Zito	Northeast Power Coordinating Council	NA - Not Applicable	NPCC
					Randy MacDonald	New Brunswick Power	2	NPCC
					Wayne Sipperly	New York Power Authority	4	NPCC
					Glen Smith	Entergy Services	4	NPCC
					Brian Robinson	Utility Services	5	NPCC

Bruce Metruck	New York Power Authority	6	NPCC
Alan Adamson	New York State Reliability Council	7	NPCC
Edward Bedder	Orange & Rockland Utilities	1	NPCC
David Burke	Orange & Rockland Utilities	3	NPCC
Michele Tondalo	UI	1	NPCC
Laura Mcleod	NB Power	1	NPCC
Michael Forte	Con Edison	1	NPCC
Kelly Silver	Con Edison	3	NPCC
Peter Yost	Con Edison	4	NPCC
Brian O'Boyle	Con Edison	5	NPCC
Michael Schiavone	National Grid	1	NPCC

						Michael Jones	National Grid	3	NPCC
						David Ramkalawan	Ontario Power Generation Inc.	5	NPCC
						Quintin Lee	Eversource Energy	1	NPCC
						Kathleen Goodman	ISO-NE	2	NPCC
						Greg Campoli	NYISO	2	NPCC
						Silvia Mitchell	NextEra Energy - Florida Power and Light Co.	6	NPCC
						Sean Bodkin	Dominion - Dominion Resources, Inc.	6	NPCC
Southwest Power Pool, Inc. (RTO)	Shannon Mickens	2	SPP RE	SPP Standards Review Group	Shannon Mickens	Southwest Power Pool Inc.	2	SPP RE	
					Amy Casuscelli	Xcel Energy	1,3,5,6	SPP RE	
					Louis Guidry	Cleco	1,3,5,6	SPP RE	
					Don Schmit	Nebraska Public Power District	5	SPP RE	

					Jamison Cawley	Nebraska Public Power District	1	SPP RE
					Scott Jordan	Southwest Power Pool	2	SPP RE
					Kevin Giles	Westar Energy	1	SPP RE
					Jonathan Hayes	Southwest Power Pool	2	SPP RE
					Allan George	Sunflower Electric Power Corporation	1	SPP RE
Santee Cooper	Shawn Abrams	1		Santee Cooper	Tom Abrams	Santee Cooper	1	SERC
					Rene' Free	Santee Cooper	1	SERC
					Chris Wagner	Santee Cooper	1	SERC

Question 1

1. The SDT developed proposed Requirements R8 – R10 and the supplemental GMD event to address FERC concerns with the benchmark GMD event used in GMD Vulnerability Assessments. (Order No. 830 P.44, P.47-49, P.65). The requirements will obligate responsible entities to perform a supplemental GMD Vulnerability Assessment based on the supplemental GMD event that accounts for potential impacts of localized peak geoelectric fields. Do you agree with the proposed requirements? If you do not agree, or if you agree but have comments or suggestions for the proposed requirements provide your recommendation and explanation.

Thomas Foltz - AEP - 5

Answer No

Document Name

Comment

AEP is concerned by the potential duplication of efforts for any assets that are brought into scope by both the Benchmark and Supplemental Vulnerability Assessments (R6 and R10). While it may not be the drafting team's intent that multiple thermal impact assessments be conducted for the same assets, nor that two sets of suggested actions be developed to mitigate the impact of any GICs, the current draft does not make this explicitly clear. AEP requests that additional clarity be added so that duplicative efforts would not be necessary for any assets that are brought into scope under both the Benchmark and Supplemental Vulnerability Assessments. In general, the SDT should look for opportunities to minimize the potential duplication of work and evidence requirements throughout the drafted standard.

Likes 0

Dislikes 0

Response

Thank you for your comment. It is conceivable that two separate thermal assessments may need to be done for transformers that exceed both GIC thresholds: One for the benchmark event and one for the supplemental event. The distinction between the benchmark and supplemental thermal assessments is that the benchmark assessment may result in a Corrective Action Plan, but the supplemental assessment does not.

Mike Smith - Manitoba Hydro - 1, Group Name Manitoba Hydro

Answer No

Document Name

Question 1

Comment

It is not clear how complying with Requirements R8 to R10 will mitigate GMD risk to BES reliability. This proposal does not address the FERC concerns of developing a GMD benchmark not solely based on a spatially averaged magnetometer data. Manitoba Hydro (MH) believes that specifying a one methodology in the standard is not appropriate because of the diversity of the BES across the continent and different level of risk tolerances among the responsible entities. Instead of asking to follow a specific GMD Vulnerability Assessment methodology, MH would like to propose the SDT to consider providing an option in the standard where the responsible entities can develop their own GMD Assessment Methodology based on the technical knowledge obtained through the research work performed on GMD Vulnerability Assessments in their system.

In Manitoba, for example, NRCAN has calculated the 1/100 year geoelectric field to be roughly 5 V/km at the northernmost magnetometer site in Manitoba (Churchill) using specific model of the earth resistivity in Manitoba. NRCAN has done similar calculations for Alberta and has also found the field to be much lower than 8 V/km as well. Rather than spatial averaging, NRCAN used extreme value mathematics to calculate the fields.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request (SAR). The existing standard already has a vulnerability assessment requirement that is approved and effective and subject to compliance by applicable registered entities. Any proposed revisions to this requirement should be addressed in a new SAR.

Michelle Amarantos - APS - Arizona Public Service Co. - 1

Answer

No

Document Name

Comment

AZPS agrees with the requirements as written, but has concerns regarding the inconsistent treatment of deadline or time-related requirements or sub-requirements in the Table of Compliance Elements. More specifically, both Requirement R8 and R9 contain 90 day deadlines for administrative activities. However, these requirements/sub-requirements are treated differently with respect to the violation

Question 1

severity levels (VSLs). In particular, Requirement R8 treats the failure to timely provide/respond within 90 days as one element and does not increase the VSL based on the duration of the delay beyond the 90 day time period. Conversely, Requirement R9 ties the VSL directly to the duration of the delay beyond the 90 day time period. AZPS notes that the activities associated with the 90 day time periods are administrative in nature, e.g., providing a report or a response, and, therefore, will have a minimal (if any) impact on the reliability of the Bulk Electric System (BES). For this reason, AZPS recommends that the SDT conform Requirement R9 to the form provided in Requirement R8. Such revision will provide consistency and more accurately reflect the actual or potential impact on the BES.

Likes	0
Dislikes	0

Response

Thank you for your comment. The timelines for the VSLs are consistent with the VSLs for Requirements R4 (benchmark) and R8 (supplemental) as is Requirements R5 and R9. Requirements R4 and R8 cover the days tardy as an element of the requirement and its subpart and Requirements R5 and R9 do not.

Chantal Mazza - Hydro-Québec TransEnergie - 1,2 - NPCC

Answer	No
Document Name	

Comment

Hydro-Quebec considers that because of the specificity of its network, (on a wide area, with long transmission lines and northern location) the benchmark event is sufficiently severe and covers the possible impact of the localized enhancement on our grid. These requirements burden the responsible entities to perform additional assessments that are both costly and ineffective.

Based on prior real measurements done on geomagnetic local disturbances in Abitibi (see reference below), we think that it would be preferable to wait for further analysis that takes into account real electric fields and current measures and not only magnetic measurements and calculated electric fields. Therefore adding a supplemental event on the already severe and pessimistic benchmark event should wait. Hydro Québec is currently in discussion with Natural Resources Canada to complete an analysis using Canadian magnetometer data in the province of Québec.

Hydro-Quebec acknowledges that the requirements address the FERC concerns.

Question 1

Reference: *A study of geoelectromagnetic disturbances in Quebec.* ([IEEE Transactions on Power Delivery](#) in 1998 and in 2000)¹

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request (SAR) and FERC directives. The SDT appreciates Hydro Québec’s research in this area and how its findings might enhance the standard in the future.

Nicolas Turcotte - Hydro-Québec TransEnergie - 1

Answer No

Document Name

Comment

Hydro-Quebec considers that because of the specificity of its network, (on a wide area, with long transmission lines and northern location) the benchmark event is sufficiently severe and covers the possible impact of the localized enhancement on our grid. These requirements burden the responsible entities to perform additional assessments that are both Costly and uneffective. Based on prior real measurements done on geomagnetic local disturbances in Abitibi (see reference below), we think that it would be preferable to wait for further analysis that takes into account real electric fields and current measures and not only magnetic measurements and calculated electric fields. Therefore adding a supplemental event on the already severe and pessimistic benchmark event should wait. Hydro Québec is currently in discussion with Natural Ressources Canada to complete an analysis using Canadian magnetometer data in the province of Québec. Hydro-Quebec acknowledges that the requirements address the FERC concerns. Reference: *A study of geoelectromagnetic disturbances in Quebec.* ([IEEE Transactions on Power Delivery](#) in 1998 and in 2000)²

Likes 0

¹¹ <http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=61>

² <http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=61>

Question 1

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request. The existing standard already has a vulnerability assessment requirement that is approved and effective and subject to compliance by applicable registered entities. The commenter is suggesting an alternative methodology to the existing standard which is outside the scope of the SDT and should be addressed in a new SAR.

Payam Farahbakhsh - Hydro One Networks, Inc. - 1

Answer

No

Document Name

Comment

The intent of requirements R8 to R10 is not clear. It is understood that the intent is to address the directive in FERC Order No 830; however, it is not clear how complying with requirements 8-10 will mitigate GMD imposed risk to BES reliability.

Requirement R4 requires responsible entities to perform Benchmark GMD Vulnerability Assessments (based on a benchmark GMD event) to identify risk to BES reliability. Requirement R7 requires responsible entities to mitigate the identified risk by developing a corrective action plan.

The new requirements R8 to R10 are asking for additional assessments and evaluations to identify risk to BES reliability. The additional assessments required in R8 is arguably repeating what is required in R4 based on an amplified GMD event called supplemental GMD benchmark event.

It is arguable that performing the GMD vulnerability assessments based on the supplemental GMD benchmark event will result in identification of a higher risk to BES reliability in comparison with risk identified by performing GMD assessments using the GMD benchmark event currently in TPL-007-1.

Based on the current wording of the standard, the responsible entity is not required to consider the elevated risk (based on the supplemental GMD assessments) in their corrective action plans. Requirement 8.3 states:

"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."

Question 1

The word “evaluation” suggests further assessments but not necessarily any further mitigations of risk. So the real question is why would responsible entities be required to perform a supplemental assessment? And how is this additional assessment designed to mitigate risk to BES reliability?

The Standard Drafting Team has not revised the GMD benchmark event definition rather they introduced a new supplemental GMD event to account for potential impacts of localized peak geoelectric field.

In paragraph 44, FERC Order No. 830 directed NERC to revise the GMD benchmark event definition so that the reference peak geoelectric field amplitude component is not solely based on spatially-averaged data. This approach will burden the responsible entities to perform additional assessments without a clear outcome.

We recommend that the Standard Drafting Team follow the results based standard development concept. The requirements should be focused on required actions or results (the "what") and not necessarily the methods by which to accomplish those actions or results (the "how").

Paragraph 65 in FERC Order No. 830 suggests that NERC could propose “some equally efficient and effective alternative”. An alternative approach is to move away from specifying a methodology as the only option to perform GMD assessments in the standard. Instead, create an option for the entities to develop their own GMD assessment methodology based on their own research of GMD risks to and impact on BES reliability.

Responsible entities across the continent have diverse systems, equipment, resources, and risk tolerance. Specifying a one approach fits-all does not seem to be appropriate.

The benchmark GMD event and the supplemental GMD event described in the whitepapers (and currently referenced within the standard requirements) can each be used to perform GMD assessments; however, the standard should not limit the entities to only use these prescribed GMD events. Instead, the standard should allow entities to perform GMD assessments based on alternative GMD events as justified by the responsible entities based on their own research and methodology.

Ultimately, whichever GMD assessment methodology the responsible entity chooses to use, the system-wide impact and transformer thermal impact should be assessed.

Likes 1	Hydro One Networks, Inc., 3, Malozewski Paul
Dislikes 0	

Response

Question 1

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request and FERC directives. The existing standard already has a vulnerability assessment requirement that is approved, and effective and subject to compliance by applicable registered entities. The supplemental assessment has been added to address local enhancements, but without the requirement of a Corrective Action Plan. Any proposed revisions to this requirement should be addressed in a new SAR. The Transformer Thermal Impact Assessment White Paper and Screening Criterion for Transformer Thermal Impact Assessment documents have provided the technical foundation and methodologies that can be used to conduct transformer temperature rise calculations for both the benchmark case and the supplemental case.

Joel Robles - Omaha Public Power District - 1,3,5,6

Answer	No
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Document Name	
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Comment

. OPPD will be supporting MRO NSRF comments. Please note this on your ballot when you vote.

Likes	0
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Dislikes	0
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Response

Thank you for supporting the MRO NSRF comments.

David Ramkalawan - Ontario Power Generation Inc. - 5

Answer	No
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Document Name	
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Comment

OPG agrees that proposed Requirements R8 – R10 and the supplemental GMD event **attempts** to address FERC concerns with the benchmark GMD event used in GMD Vulnerability Assessments, however they fell short of mitigating GMD risk to the reliability of BES. Requirement R10 – “**10.3. Describe suggested actions** and supporting analysis to mitigate the impact of GICs, if any; ..” is just a good intention and cannot account for a Corrective Action Plan.

Question 1

Moreover we now have two type of GMD events the Benchmark and the Supplemental; OPG is of the opinion that they should be amalgamated in one GMD type of events (albeit this may require GMD benchmark event definition revision). OPG believes that Supplemental GMD event assessment will render the Benchmark GMD event assessment obsolete (based on the more stringent condition) and thus will be an unnecessary budgetary burden.

Only Requirement R4 based on the benchmark GMD event VA is leading to a CAP via R7, and this does not happen for the Supplemental GMD event VA based on the new R8 – R10

Likes 0

Dislikes 0

Response

The SDT is being responsive to the Standards Authorization Request. The existing standard already has a vulnerability assessment requirement that is approved, and effective and subject to compliance by applicable registered entities. The supplemental assessment has been added to address local enhancements, but without the requirement of a Corrective Action Plan. The comment is suggesting an alternative threshold or benchmark to the existing standard which is outside the scope of the SDT and should be addressed in a new SAR. The Transformer Thermal Impact Assessment White Paper and Screening Criterion for Transformer Thermal Impact Assessment documents have provided the technical foundation and methodologies that can be used to conduct transformer temperature rise calculations for both the benchmark case and the supplemental case.

Marty Hostler - Northern California Power Agency - 5

Answer

No

Document Name

Comment

NCPA disagrees with having to perform supplemental GMD assessments. If it is to be required, then there should be a TRF MVA threshold of 500 MVA or greater. NCPA also disagrees with having to provide any assessment to any registered entity, other than our TP or RC.

Likes 0

Dislikes 0

Response

Question 1

The SDT is being responsive to the Standards Authorization Request and FERC directives. The existing standard already has a vulnerability assessment requirement that is approved, and effective and subject to compliance by applicable registered entities. The supplemental assessment has been added to address local enhancements, but without the requirement of a Corrective Action Plan. The comment is suggesting an alternative threshold or benchmark to the existing standard which is outside the scope of the SDT and should be addressed in a new SAR. The Transformer Thermal Impact Assessment White Paper and Screening Criterion for Transformer Thermal Impact Assessment documents have provided the technical foundation and methodologies that can be used to conduct transformer temperature rise calculations for both the benchmark case and the supplemental case. Providing the assessment to others has a reliability benefit.

Dennis Sismaet - Northern California Power Agency - 6**Answer**

No

Document Name**Comment**

NCPA disagrees with having to perform supplemental GMD assessments. If it is to be required, then there should be a TRF MVA threshold of 500 MVA or greater. NCPA also disagrees with having to provide any assessment to any registered entity, other than our TP or RC.

Likes 0

Dislikes 0

Response

The SDT is being responsive to the Standards Authorization Request. The existing standard already has a vulnerability assessment requirement that is approved, and effective and subject to compliance by applicable registered entities. The supplemental assessment has been added to address local enhancements, but without the requirement of a Corrective Action Plan. The comment is suggesting an alternative threshold or benchmark to the existing standard which is outside the scope of the SDT and should be addressed in a new SAR. The Transformer Thermal Impact Assessment White Paper and Screening Criterion for Transformer Thermal Impact Assessment documents have provided the technical foundation and methodologies that can be used to conduct transformer temperature rise calculations for both the benchmark case and the supplemental case.

Since GMD events are likely to be wide-area, it is necessary to share the information with other entities.

Question 1

William Harris - Foundation for Resilient Societies - 8

Answer	No
Document Name	Foundation for Resilient Societies on NERC Project 2013 081117_Submitted.docx

Comment

Resilient Societies has concerns that the relevant classes of GMD events are not fully addressed; that the 75 amps per phase threshold is imprudent and not science based, and that a complementary effort is needed to test equipment under load and to test long replacement time equipment types to destruction. See attached Comments.

Likes 0

Dislikes 0

Response

Thank you for your comment. Please see the responses at the end of this document referencing the attached comments.

Randy Buswell - VELCO -Vermont Electric Power Company, Inc. - 1

Answer	Yes
Document Name	

Comment

This will place considerably more of a burden on the entities performing the GMD Vulnerability Assessments with the need to perform another whole assessment, but also, presumably, with the need to collect the data needed for creation of a "localized peak geoelectric field".

Likes 0

Dislikes 0

Response

Thank you for your comment. The supplemental assessment is additional work, but it is necessary to account for the impacts of local enhancements. No additional system data are required.

Joe O'Brien - NiSource - Northern Indiana Public Service Co. - 6

Question 1

Answer	Yes
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Document Name	
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Comment

NIPSCO agrees that supplemental GMD vulnerability assessment accounts for potential impact of localized peak geo-electric fields. However, instead of its own set of requirements, we feel it is appropriate to consider the supplemental GMD vulnerability assessment as a sensitivity case to the benchmark GMD vulnerability assessment. In addition, Requirement R8 requires conducting analysis for any potential cascading due to supplemental GMD event. However, R4 (Benchmark GMD vulnerability assessment) does not require such potential cascading evaluation. A uniformity in requirement would be desirable.

Likes	0
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Dislikes	0
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Response

Thank you for your comment. Requirement R8 focuses on Cascading because the supplemental event is a more extreme event than the benchmark event.

Lauren Price - American Transmission Company, LLC - 1

Answer	Yes
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Document Name	
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Comment

The supplemental GMD vulnerability assessment does not appear to be an overly onerous burden on the responsible entities as it is an enhancement based on the already required benchmark assessment. The potential impacts of localized peaks are necessary to evaluate due to the short time constant of the windings and structures affected by stray fields resulting from part cycle saturation.

Likes	0
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Dislikes	0
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Response

Question 1

Thank you for your comment. The SDT agrees that the impacts of local enhancements need to be considered in network analysis and transformer assessment.

Aaron Cavanaugh - Bonneville Power Administration - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

For R8.4 and R9 and their associated measures, BPA proposes rather than “shall be provided/shall provide” that the wording be changed to “shall make available.” For the western interconnection, a separate entity may be collecting interconnection-wide data.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT does not agree with revising the language as it would affect the responsibilities as proposed in the standard.

Michael Shaw - Lower Colorado River Authority - 6, Group Name LCRA Compliance

Answer Yes

Document Name

Comment

The ability to perform a system-wide study at the supplemental GMD level is helpful in cases where software cannot support a localized event. It is not overly clear why 85 A is acceptable for the supplemental assessment vs. 75 A for the benchmark assessment. The distinction between the two should be made clearer (e.g. “85 A is acceptable even as a higher value because the local (higher magnitude) field is assumed to be applied for a shorter duration”)

Likes 0

Dislikes 0

Question 1

Response

Thank you for your comment. From a hot spot temperature rise point of view, 75 A/phase and 85 A/phase are equivalent. A more detailed explanation has been added to the Screening Criterion for Transformer Thermal Impact Assessment white paper above Table 2.

sean erickson - Western Area Power Administration - 1

Answer

Yes

Document Name

Comment

[TPLTF](#)³ Discussion: The group agrees with the SDT approach to addressing FERC Order No. 830 Paragraph 44. In effect, the SDT has specified an extreme value for geoelectric field, called the supplemental GMD event, intended to represent a locally-enhanced geoelectric field experienced by a limited geographic area. In other words, the SDT has proposed a means by which Planning Coordinators and Transmission Planners can approximate a non-geospatially-averaged peak geoelectric field, thus meeting the intent of the FERC Order No. 830 directive. While determining peak geoelectric field amplitudes not based solely on spatially-averaged data is a significant challenge to meeting the FERC directive, primarily because of the lack of North American data, as well as analytical tools available to Planning Coordinators and Transmission Planners, the group believes the SDT has found a workable approach.

The group would like to note that it will be non-trivial to apply the localized peak geoelectric field in the supplemental GMD event to a spatially-limited area, described in the proposed TPL-007-2 Attachment 1, given available software tools and available personnel resources. This will be especially pronounced for Planning Coordinators and Transmission Planners with large geographical footprints. Many planning entities will be forced to apply the supplemental peak geoelectric field over their entire area, in effect simply studying a higher magnitude benchmark GMD event. While the group believes this is prominently conservative, as stated above, we understand and support the SDT approach to this directive. It is likewise noted that the definition of a spatially-limited area is absent in the materials published by the SDT, but this vagary supports better analytical flexibility for Planning Coordinators and Transmission Planners and should not be defined in the draft standard.

Likes 0

³ TPLTF document is found at the end of this document in Attachment 1.

Question 1

Dislikes 0

Response

Thank you for your comment. The comment is an excellent summary of the intent of the SDT relative to accounting for the impacts of local enhancements. The SDT provides considerable flexibility to the planners as to how to reflect the supplemental event into their assessments. The SDT believes that this is especially appropriate for the planners who are dealing with very large systems.

Neil Swearingen - Salt River Project - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

SRP supports the response provided by WAPA on behalf of [TPLTF](#)⁴ for question 1

Likes 0

Dislikes 0

Response

Thank you for your comment. The comment is an excellent summary of the intent of the SDT relative to accounting for the impacts of local enhancements. The SDT provides considerable flexibility to the planners as to how to reflect the supplemental event into their assessments. The SDT believes that this is especially appropriate for the planners who are dealing with very large systems.

Larisa Loyferman - CenterPoint Energy Houston Electric, LLC - 1 - Texas RE

Answer Yes

Document Name

Comment

⁴ TPLTF document is found at the end of this document in Attachment 1.

Question 1

CenterPoint Energy Houston Electric, LLC (“CenterPoint Energy”) commends the efforts of the SDT and believes Requirements R8 – R10 address FERC concerns with the benchmark GMD event used in GMD Vulnerability Assessments. Additionally, CenterPoint Energy agrees that the supplemental GMD Vulnerability Assessment accounts for potential impact of localized peak geo-electric fields”.

CenterPoint Energy shares AEP’s concern with the potential duplication of efforts for any assets that are brought into scope by both the Benchmark and Supplemental Vulnerability Assessments (R6 and R10). While it may not be the drafting team’s intent that multiple thermal impact assessments be conducted for the same assets, nor that two sets of suggested actions be developed to mitigate the impact of any GICs, the current draft does not make this explicitly clear. CenterPoint Energy supports AEP’s request that additional clarity be added so that duplicative efforts would not be necessary for any assets that are brought into scope under both the Benchmark and Supplemental Vulnerability Assessments.

Likes	0
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Dislikes	0
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Response

The SDT is being responsive to the Standards Authorization Request. The existing standard already has a vulnerability assessment requirement that is approved, and effective and subject to compliance by applicable registered entities. The supplemental assessment has been added to address local enhancements, but without the requirement of a Corrective Action Plan. The comment is suggesting an alternative threshold or benchmark to the existing standard which is outside the scope of the SDT and should be addressed in a new SAR. The Transformer Thermal Impact Assessment White Paper and Screening Criterion for Transformer Thermal Impact Assessment documents have provided the technical foundation and methodologies that can be used to conduct transformer temperature rise calculations for both the benchmark case and the supplemental case.

Stephanie Burns - Stephanie Burns On Behalf of: Michael Moltane, International Transmission Company Holdings Corporation, 1; - Stephanie Burns

Answer	Yes
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Document Name	
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Comment

While disagreeing with the original FERC determination requiring the modification to the benchmark GMD event so that the assessments are not based solely on spatially-averaged data using the determined reference 8 V/km peak geoelectric field amplitude, we do agree on the

Question 1

SDT's proposal of conducting a supplemental assessment using 12 V/km as the reference non-spatially averaged peak geoelectric field amplitude (as opposed to using the alternative 20 V/km non-spatially averaged peak value noted by FERC in the GMD Interim Report which would have overestimated the severity of a 1-in-100 year GMD event).

Likes 0

Dislikes 0

Response

Thank you for your comment.

Shannon Mickens - Southwest Power Pool, Inc. (RTO) - 2 - SPP RE, Group Name SPP Standards Review Group

Answer

Yes

Document Name

Comment

The SPP Standards Review Group agrees with the SDT approach to addressing FERC Order No. 830 Paragraph 44. In effect, the SDT has specified an extreme value for geoelectric field, called the supplemental GMD event, intended to represent a locally-enhanced geoelectric field experienced by a limited geographic area. In other words, the SDT has proposed a means by which Planning Coordinators and Transmission Planners can approximate a non-geospatially-averaged peak geoelectric field, thus meeting the intent of the FERC Order No. 830 directive. While determining peak geoelectric field amplitudes not based solely on spatially-averaged data is a significant challenge to meeting the FERC directive, primarily because of the lack of North American data, as well as analytical tools available to Planning Coordinators and Transmission Planners, the group believes the SDT has found a workable approach.

The group would like to note that it will be non-trivial to apply the localized peak geoelectric field in the supplemental GMD event to a spatially-limited area, described in the proposed TPL-007-2

Attachment 1, given available software tools and available personnel resources. This will be especially pronounced for Planning Coordinators and Transmission Planners with large geographical footprints. Many planning entities will be forced to apply the supplemental peak geoelectric field over their entire area, in effect simply studying a higher magnitude benchmark GMD event. While the group believes this is prominently conservative, as stated above, we understand and support the SDT approach to this directive. It is likewise noted that the definition of a spatially-limited area is absent in the materials published by the SDT, but this vagary supports better analytical flexibility for Planning Coordinators and Transmission Planners and should not be defined in the draft standard.

Question 1

Likes 0

Dislikes 0

Response

Thank you for your comment. The comment is an excellent summary of the intent of the SDT relative to accounting for the impacts of local enhancements. The SDT provides considerable flexibility to the planners as to how to reflect the supplemental event into their assessments. The SDT believes that this is especially appropriate for the planners who are dealing with very large systems.

Chris Scanlon - Exelon - 1

Answer

Yes

Document Name

Comment

See comment to Q 3.

Likes 0

Dislikes 0

Response

RoLynda Shumpert - SCANA - South Carolina Electric and Gas Co. - 1,3,5,6 - SERC

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 1

Response

Ann Ivanc - FirstEnergy - FirstEnergy Solutions - 6

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Daniel Grinkevich - Con Ed - Consolidated Edison Co. of New York - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Robert Blackney - Edison International - Southern California Edison Company - 1,3,5,6 - WECC

Answer Yes

Question 1

Document Name

Comment

Likes 0

Dislikes 0

Response

Gerry Huitt - Xcel Energy, Inc. - 5

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laura Nelson - IDACORP - Idaho Power Company - 1

Answer

Yes

Document Name

Comment

Likes 0

Question 1

Dislikes 0

Response

Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Karie Barczak - DTE Energy - Detroit Edison Company - 3

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laurie Williams - PNM Resources - Public Service Company of New Mexico - 1

Question 1

Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Joshua Eason - Joshua Eason On Behalf of: Michael Puscas, ISO New England, Inc., 2; - Joshua Eason	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Eric Shaw - Eric Shaw On Behalf of: Lee Maurer, Oncor Electric Delivery, 1; - Eric Shaw	
Answer	Yes
Document Name	
Comment	

Question 1	
Likes 0	
Dislikes 0	
Response	
Jeffrey Watkins - Jeffrey Watkins On Behalf of: Eric Schwarzrock, Berkshire Hathaway - NV Energy, 5; - Jeffrey Watkins	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Colby Bellville - Colby Bellville On Behalf of: Dale Goodwine, Duke Energy , 6, 5, 3, 1; - Colby Bellville, Group Name Duke Energy	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	

Question 1

Glen Farmer - Avista - Avista Corporation - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Donald Lock - Talen Generation, LLC - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Douglas Webb - Douglas Webb On Behalf of: Chris Bridges, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Harold Wyble, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; James McBee, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Jessica Tucker, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; - Douglas Webb

Answer Yes

Question 1

Document Name

Comment

Likes 0

Dislikes 0

Response

Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Quintin Lee - Eversource Energy - 1

Answer

Yes

Document Name

Comment

Likes 0

Question 1

Dislikes 0

Response

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name RSC no Hydro One, HQ and IESO

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Brian Van Gheem - ACES Power Marketing - 6 - NA - Not Applicable, Group Name ACES Standards Collaborators

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

James Anderson - CMS Energy - Consumers Energy Company - 1,3,4,5

Question 1	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Michael Buyce - City Utilities of Springfield, Missouri - 1	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Elizabeth Axson - Electric Reliability Council of Texas, Inc. - 2, Group Name IRC Standards Review Committee	
Answer	Yes
Document Name	
Comment	

Question 1

Likes 0

Dislikes 0

Response

Sergio Banuelos - Tri-State G and T Association, Inc. - 1,3,5 - MRO,WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Terry Harbour - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 1

Sarah Gasienica - NiSource - Northern Indiana Public Service Co. - 5

Answer

Document Name

Comment

Please see comments of Joesph N. O'Brien.

Likes 0

Dislikes 0

Response

Romel Aquino - Edison International - Southern California Edison Company - 3

Answer

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison.

Likes 0

Dislikes 0

Response

No comments were submitted.

Kenya Streeter - Edison International - Southern California Edison Company - 6

Answer

Document Name

Comment

Question 1

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison.

Likes 0

Dislikes 0

Response

No comments were submitted.

Rachel Coyne - Texas Reliability Entity, Inc. - 10

Answer

Document Name

Comment

Texas RE does not have comments on this question.

Likes 0

Dislikes 0

Response

Thomas Rafferty - Edison International - Southern California Edison Company - 5

Answer

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison

Likes 0

Dislikes 0

Response

Question 1

No comments were submitted.

Richard Vine - California ISO - 2

Answer

Document Name

Comment

The California ISO supports the joint comments of the ISO/RTO Standards Review Committee

Likes 0

Dislikes 0

Response

Thank you for supporting the comments of the IRC Standards Review Committee (i.e., ISO/RTO Standards Review Committee).

Question 2

2. The SDT developed the *Supplemental GMD Event Description* white paper to provide technical justification for the supplemental GMD event. The purpose of the supplemental GMD event description is to provide a defined event for assessing system performance for a GMD event which includes a local enhancement of the geomagnetic field. Do you agree with the proposed supplemental GMD event and the description in the white paper? If you do not agree, or if you agree but have comments or suggestions for the supplemental GMD event and the description in the white paper provide your recommendation and explanation.

William Harris - Foundation for Resilient Societies - 8

Answer No

Document Name

Comment

This is duplicative, but worse, both thresholds are likely to be above actual thresholds at which transformers catch fire, explode, or both.

Likes 0

Dislikes 0

Response

Thank you for your comment. Different screening thresholds were selected because benchmark and supplemental benchmark waveforms are different and their effects on healthy transformers are different for the same peak current. The temperature thresholds are consistent, i.e., the thermal effects on a transformer are characterized by peak temperatures.

Dennis Sismaet - Northern California Power Agency - 6

Answer No

Document Name

Comment

Increased costs do not justify the low, if any, reliability benefits.

Likes 0

Question 2

Dislikes 0

Response

Thank you for your comment. In the development of the TPL-007-2: Transmission System Planned Performance for Geomagnetic Disturbance Events standard with supplemental GMD event, the SDT is being responsive to the Standards Authorization Request. The consensus of the SDT is that the supplemental GMD Vulnerability Assessment provides a reliability benefit.

Marty Hostler - Northern California Power Agency - 5

Answer No

Document Name

Comment

Increased costs do not justify the low, if any, reliability benefits.

Likes 0

Dislikes 0

Response

Thank you for your comment. The Transformer Thermal Impact Assessment White Paper and Screening Criterion for Transformer Thermal Impact Assessment documents have provided the technical foundation and methodologies that can be used to conduct transformer temperature rise calculations for both the benchmark case and the supplemental case.

Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company

Answer No

Document Name

Comment

1. Paragraph 2, page 12 of the Supplemental GMD Event Description White Paper – the Drafting Team briefly discusses that the geographic area of the local enhancement is on the order of 100 km in N-S (latitude) and on the order of 500 km E-W (longitude). We

Question 2

recommend the SDT to provide additional information on the selection of ‘on the order of 500 km’ for longitudinal width. It is not clear why and how a width of 500 km(s) was selected. Why **not** consider a **longitudinal width** on the order of 100 km?

2. Figure II-1, page 17 – we recommend the Drafting Team to include a legend that clearly shows what each line means. This figure shows numerous lines (e.g., vertical, horizontal, etc.) that can lead to confusion.
3. Equation II.3, page 18, is missing the equal ‘=’ sign (E_{peak} = ...)

Likes 0

Dislikes 0

Response

Thank you for your comment.

1. The geographic dimensions of local enhancements are based on a very limited set of events; therefore, flexibility is provided in the requirements in how to apply the dimensions in the analysis. A minor change was made in the reference to Figure II-1 in the Supplemental GMD Event Description document.
2. Correction made to the Supplemental GMD Event Description document.

Joshua Eason - Joshua Eason On Behalf of: Michael Puscas, ISO New England, Inc., 2; - Joshua Eason

Answer

No

Document Name

Comment

While ISO-NE supports the supplemental event, it believes that the probability of the event occurring in the lower 48 state portion of the United States is far less than once in one hundred years. The magnitude of enhancement is based on measurements from the IMAGE magnetometer stations which are located in northern Europe, rather than observations in the United States. Also, the four examples in the Supplemental Geomagnetic Event Description in Figures I-4,5,6 & 7 all occur in far northern latitudes and it is not clear that these events will occur in more southern latitudes.

Likes 0

Dislikes 0

Response

Question 2

Thank you for your comment. The IMAGE dataset is the most complete and comprehensive data available and is therefore the best data source available to support the development of the standard.

Although the four events mentioned in the Supplemental Geomagnetic Event Description document all occurred in northern latitudes, there is no evidence that the local enhancement effect only occurs in high latitudes.

Nicolas Turcotte - Hydro-Québec TransEnergie - 1

Answer No

Document Name

Comment

see comments to Question 1.

Likes 0

Dislikes 0

Response

Thank you for your comment. See response in Question 1.

Chantal Mazza - Hydro-Québec TransEnergie - 1,2 - NPCC

Answer No

Document Name

Comment

See comments to Question 1.

Likes 0

Dislikes 0

Response

Thank you for your comment. See response in Question 1.

Question 2

Mike Smith - Manitoba Hydro - 1, Group Name Manitoba Hydro

Answer No

Document Name

Comment

We think that we are still at the infancy of understanding the nature and mechanism of these local enhancements. The Geophysics need more time to study this phenomenon and figure out how to simulate it in our GIC Simulator.

Are the current state of the art assessment tools capable of modeling a “local” enhancement? Given the tools limitations, Transmission Planners will likely model the supplemental GMD event as a uniform field over the entire assessment area. It is not clear whether this is acceptable or whether this stress transformers in a similar way as a non-uniform field analysis.

Likes 0

Dislikes 0

Response

Thank you for your comment. The TPL-007-2 does not restrict the technically justified methodology for the industry to perform the local enhancement GMD event assessment due to the evolving understanding of local enhancements.

sean erickson - Western Area Power Administration - 1

Answer No

Document Name

Comment

[TPLTF](#)⁵ Discussion: The group recognizes that there are multiple methods to approach revisions to the benchmark GMD event definition so that the reference peak geoelectric field amplitude component is not based solely on spatially-averaged data (FERC Order No. 830 Paragraph 44). However, given a wide diversity in available data, analytical tools, and personnel expertise, the group believes that the SDT has found a

⁵ TPLTF document is found at the end of this document in Attachment 1.

Question 2

practical approach to meeting the objective of the FERC directive. Moreover, the *Supplemental GMD Event Description* white paper presents a reasoned justification for the use of the geoelectric field amplitude of 12 V/km.

The group recommends that the SDT consider a less ambiguous name for the Supplemental GMD Event; the group believes *Extreme Value GMD Event* would be more appropriate for the following reasons:

{C}a. {C}Implies a closer relationship to the extreme events of TPL-001-4 for which Planning Coordinators and Transmission Planners are familiar.

{C}b. {C}Is better aligned with the extreme value statistical analysis that was conducted to produce the subject reference peak geoelectric field amplitude.

{C}c. {C}Indicates a measure of how rare the extreme value for the 1-in-100 year peak geoelectric field amplitude may be, based upon the 95% confidence interval of the extreme value.

While the group agrees that the application of extreme value statistical methods presented in the *Supplemental GMD Event Description* white paper is sound, three clarifying statements should be made in the white paper. Firstly, in short, the group agrees that by using the 23 years of daily maximum geoelectric field amplitudes from IMAGE magnetometers, a proxy of higher magnitude events can be characterized. It is noted that the southernmost magnetometer in the IMAGE chain resides in Suwałki, Poland at 54.01°N, whose geographic latitude places it roughly 500 miles north of Quebec. Given that geoelectric field is highly correlated with geomagnetic latitude rather than geographic latitude, the IMAGE data should still be referred to as a loose approximation for estimated North American geoelectric field magnitudes (Suwałki, Poland geomagnetic dipole latitude 52°N, Quebec geomagnetic dipole latitude 56°N). In other words, the group believes it is appropriate to qualify that the extreme value analysis performed in the white paper is based upon maximum data points obtained from an array of northern geomagnetically-biased latitudes, further inflated by using the high earth conductivity of Quebec. Secondly, it is well known that coastal geological conditions can lead to locally-enhanced geoelectric fields, not observed in regions more distant from the coast. Given that nearly all of the IMAGE chain magnetometers reside within 100 miles of the northern Atlantic Ocean or Baltic Sea coasts, it is reasonable to conclude that the geoelectric field amplitudes derived from the corresponding IMAGE data may have suffered from geoelectric field enhancement along conductivity boundaries. With respect to serving as a proxy for mainland North American peak geoelectric field amplitude, the SDT should consider further qualifying the appropriateness of the IMAGE data which served as the foundation of the extreme value analysis. Finally, the group agrees that the use of more resolute point over threshold (POT) methods was indicated over generalized extreme value (GEV). For clarity, however, it should be emphasized that the geoelectric field amplitude of 12 V/km represents the *extreme value* of the upper limit of the 95 percent confidence interval for a 100-year return interval. In other words, the statistical significance of the extreme value confidence interval is not equivalent to the statistic expressed by the confidence interval for the data set consisting of 23 years

Question 2

of all sampled geoelectric field amplitudes (not shown). Each of these considerations, if addressed, can strengthen the conclusions of the white paper by emphasizing its conservative approach.

Likes 0

Dislikes 0

Response

Thank you for supporting the [SPP TPLTF](#) comments⁶ on the TPL-007-2 standard. The IMAGE dataset is the most complete and comprehensive data available and is therefore the best data source available to support the development of the standard.

Although the four events mentioned in the Supplemental Geomagnetic Event Description document all occurred in northern latitudes, there is no evidence that the local enhancement effect only occurs in high latitudes. Based on the past experiences with the IMAGE data, it is not expected that the coastal effect has a significant effect on the geomagnetic fields that were used in the extreme value analysis.

Elizabeth Axson - Electric Reliability Council of Texas, Inc. - 2, Group Name IRC Standards Review Committee

Answer Yes

Document Name

Comment

While IRC supports the supplemental event description, it believes that the probability of this event occurring in the lower 48 state portion of the United States is far less than once in one hundred years. The magnitude of enhancement is based on measurements from the IMAGE magnetometer stations which are located in northern Europe, rather than observations in the United States. Also, the four examples in the Supplemental Geomagnetic Event Description in Figures I-4, 5, 6 & 7 all occur in far northern latitudes and it is not clear that these events will occur in more southern latitudes.

Likes 0

Dislikes 0

⁶ TPLTF document is found at the end of this document in Attachment 1.

Question 2

Response

Thank you for your comment. The IMAGE dataset is the most complete and comprehensive data available and is therefore the best data source available to support the development of the standard.

Although the four events mentioned in the Supplemental Geomagnetic Event Description document all occurred in northern latitudes, there is no evidence that the local enhancement effect only occurs in high latitudes.

Shannon Mickens - Southwest Power Pool, Inc. (RTO) - 2 - SPP RE, Group Name SPP Standards Review Group

Answer	Yes
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Document Name	
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Comment

The SPP Standards Review Group recognizes that there are multiple methods to approach revisions to the benchmark GMD event definition so that the reference peak geoelectric field amplitude component is not based solely on spatially-averaged data (FERC Order No. 830 Paragraph 44). However, given a wide diversity in available data, analytical tools, and personnel expertise, the group believes that the SDT has found a practical approach to meeting the objective of the FERC directive. Moreover, the Supplemental GMD Event Description white paper presents a reasoned justification for the use of the geoelectric field amplitude of 12 V/km.

We recommend that the SDT consider a less ambiguous name for the Supplemental GMD Event; the group believes Extreme Value GMD Event would be more appropriate for the following reasons:

1. Implies a closer relationship to the extreme events of TPL-001-4 for which Planning Coordinators and Transmission Planners are familiar.
2. Is better aligned with the extreme value statistical analysis that was conducted to produce the subject reference peak geoelectric field amplitude.
3. Indicates a measure of how rare the extreme value for the 1-in-100 year peak geoelectric field amplitude may be, based upon the 95% confidence interval of the extreme value.

While we agree that the application of extreme value statistical methods presented in the Supplemental GMD Event Description white paper is sound, three clarifying statements should be made in the white paper. Firstly, in short, the group agrees that by using the 23 years of daily maximum geoelectric field amplitudes from IMAGE magnetometers, a proxy of higher magnitude events can be characterized. It is noted that the southernmost magnetometer in the IMAGE chain resides in Suwałki, Poland at 54.01°N, whose geographic latitude places it roughly 500 miles north of Quebec. Given that geoelectric field is highly correlated with geomagnetic latitude rather than geographic latitude, the IMAGE

Question 2

data should still be referred to as a loose approximation for estimated North American geoelectric field magnitudes (Suwałki, Poland geomagnetic dipole latitude 52°N, Quebec geomagnetic dipole latitude 56°N). In other words, the group believes it is appropriate to qualify that the extreme value analysis performed in the white paper is based upon maximum data points obtained from an array of northern geomagnetically-biased latitudes, further inflated by using the high earth conductivity of Quebec. Secondly, it is well known that coastal geological conditions can lead to locally-enhanced geoelectric fields, not observed in regions more distant from the coast. Given that nearly all of the IMAGE chain magnetometers reside within 100 miles of the northern Atlantic Ocean or Baltic Sea coasts, it is reasonable to conclude that the geoelectric field amplitudes derived from the corresponding IMAGE data may have suffered from geoelectric field enhancement along conductivity boundaries. With respect to serving as a proxy for mainland North American peak geoelectric field amplitude, the SDT should consider further qualifying the appropriateness of the IMAGE data which served as the foundation of the extreme value analysis. Finally, the group agrees that the use of more resolute point over threshold (POT) methods was indicated over generalized extreme value (GEV). For clarity, however, it should be emphasized that the geoelectric field amplitude of 12 V/km represents the extreme value of the upper limit of the 95 percent confidence interval for a 100-year return interval. In other words, the statistical significance of the extreme value confidence interval is not equivalent to the statistic expressed by the confidence interval for the data set consisting of 23 years of all sampled geoelectric field amplitudes (not shown). Each of these considerations, if addressed, can strengthen the conclusions of the white paper by emphasizing its conservative approach.

Likes 0

Dislikes 0

Response

Thank you for supporting the [SPP TPLTF](#) comments⁷ on the TPL-007-2 standard. The IMAGE dataset is the most complete and comprehensive data available and is therefore the best data source available to support the development of the standard.

Although the four events mentioned in the Supplemental Geomagnetic Event Description document all occurred in northern latitudes, there is no evidence that the local enhancement effect only occurs in high latitudes. Based on the past experiences with the IMAGE data, it is not expected that the coastal effect has a significant effect on the geomagnetic fields that were used in the extreme value analysis.

⁷ TPLTF document is found at the end of this document in Attachment 1.

Question 2

Stephanie Burns - Stephanie Burns On Behalf of: Michael Moltane, International Transmission Company Holdings Corporation, 1; - Stephanie Burns

Answer Yes

Document Name

Comment

The supplemental GMD event definition was determined through statistical analysis of available geomagnetic field data and corresponding calculations. The same data set and similar techniques were used in defining the benchmark GMD event with the exception that the supplemental definition was based on observations at each individual station vs. spatially averaging.

Likes 0

Dislikes 0

Response

Thank you for your comment. The IMAGE array data does represent high geomagnetic latitude observations and this is why (alpha) scaling of the determined geoelectric field amplitudes is necessary for carrying out analyses at lower latitude locations. Based on the past experiences with the IMAGE data, it is not expected that the coast effect has a significant effect on geomagnetic fields that were used in the extreme value analysis.

Larisa Loyferman - CenterPoint Energy Houston Electric, LLC - 1 - Texas RE

Answer Yes

Document Name

Comment

CenterPoint Energy agrees with the proposed supplemental GMD event and the description in the white paper. CenterPoint Energy believes the conservative approach is appropriate and reasonable and is the result of successful collaboration between GMD research experts, the space agency experts, and modeling experts from the power industry.

Likes 0

Dislikes 0

Question 2

Response

Thank you for your comment.

Michael Shaw - Lower Colorado River Authority - 6, Group Name LCRA Compliance

Answer Yes

Document Name

Comment

Applying a higher magnitude, localized event would seem to be prudent for assessing that type of phenomenon per FERC's request.

Likes 0

Dislikes 0

Response

Thank you for your comment.

Thomas Foltz - AEP - 5

Answer Yes

Document Name

Comment

AEP agrees with the methodology behind the *Supplemental GMD Event Description*, but has concerns with how the standard has been revised to perform two separate assessments.

Likes 0

Dislikes 0

Response

Question 2

Thank you for your comment. The SDT purposely is requesting two separate thermal assessments be done for transformers that exceed the GIC thresholds: One for the benchmark event and one for the supplemental event. The supplemental assessment is intended to address local enhancements. The benchmark assessment may result in a Corrective Action Plan, but the supplemental assessment does not.

Terry Harbour - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1

Answer	Yes
Document Name	
Comment	
Likes	0
Dislikes	0

Response

Sergio Banuelos - Tri-State G and T Association, Inc. - 1,3,5 - MRO,WECC

Answer	Yes
Document Name	
Comment	
Likes	0
Dislikes	0

Response

Chris Scanlon - Exelon - 1

Question 2

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Michael Buyce - City Utilities of Springfield, Missouri - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

James Anderson - CMS Energy - Consumers Energy Company - 1,3,4,5

Answer Yes

Document Name

Comment

Question 2

Likes 0

Dislikes 0

Response

Brian Van Gheem - ACES Power Marketing - 6 - NA - Not Applicable, Group Name ACES Standards Collaborators

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name RSC no Hydro One, HQ and IESO

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 2

Quintin Lee - Eversource Energy - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Douglas Webb - Douglas Webb On Behalf of: Chris Bridges, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Harold Wyble, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; James McBee, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Jessica Tucker, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; - Douglas Webb

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Donald Lock - Talen Generation, LLC - 5

Answer Yes

Question 2

Document Name

Comment

Likes 0

Dislikes 0

Response

Glen Farmer - Avista - Avista Corporation - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Colby Bellville - Colby Bellville On Behalf of: Dale Goodwine, Duke Energy , 6, 5, 3, 1; - Colby Bellville, Group Name Duke Energy

Answer Yes

Document Name

Comment

Likes 0

Question 2

Dislikes 0

Response

Jeffrey Watkins - Jeffrey Watkins On Behalf of: Eric Schwarzrock, Berkshire Hathaway - NV Energy, 5; - Jeffrey Watkins

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Eric Shaw - Eric Shaw On Behalf of: Lee Maurer, Oncor Electric Delivery, 1; - Eric Shaw

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laurie Williams - PNM Resources - Public Service Company of New Mexico - 1

Question 2

Answer	Yes
Document Name	
Comment	
Likes	0
Dislikes	0
Response	
Karie Barczak - DTE Energy - Detroit Edison Company - 3	
Answer	Yes
Document Name	
Comment	
Likes	0
Dislikes	0
Response	
Neil Swearingen - Salt River Project - 1,3,5,6 - WECC	
Answer	Yes
Document Name	
Comment	

Question 2

Likes 0

Dislikes 0

Response

Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laura Nelson - IDACORP - Idaho Power Company - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 2

Michelle Amarantos - APS - Arizona Public Service Co. - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Gerry Huitt - Xcel Energy, Inc. - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Robert Blackney - Edison International - Southern California Edison Company - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Question 2

Likes 0

Dislikes 0

Response

Daniel Grinkevich - Con Ed - Consolidated Edison Co. of New York - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Aaron Cavanaugh - Bonneville Power Administration - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 2

Ann Ivanc - FirstEnergy - FirstEnergy Solutions - 6

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

RoLynda Shumpert - SCANA - South Carolina Electric and Gas Co. - 1,3,5,6 - SERC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Lauren Price - American Transmission Company, LLC - 1

Answer Yes

Document Name

Question 2

Comment

Likes 0

Dislikes 0

Response

Joe O'Brien - NiSource - Northern Indiana Public Service Co. - 6

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Randy Buswell - VELCO -Vermont Electric Power Company, Inc. - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 2

Response

Richard Vine - California ISO - 2

Answer

Document Name

Comment

The California ISO supports the joint comments of the ISO/RTO Standards Review Committee

Likes 0

Dislikes 0

Response

Thank you for supporting the comments of the IRC Standards Review Committee (i.e., ISO/RTO Standards Review Committee).

Thomas Rafferty - Edison International - Southern California Edison Company - 5

Answer

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison

Likes 0

Dislikes 0

Response

No comments were submitted.

David Ramkalawan - Ontario Power Generation Inc. - 5

Answer

Question 2

Document Name

Comment

While OPG agrees with the technical content of the Supplemental GMD Event Description white paper the SDT approach ends up with two type of GMD events the Benchmark and the Supplemental; OPG is of the opinion that they should be amalgamated in one GMD type of events (albeit this may require GMD benchmark event definition revision). As stated in question #1 OPG believes that Supplemental GMD event assessment will render the Benchmark GMD event assessment obsolete (based on the more stringent condition) and thus will be an unnecessary budgetary burden.

Likes 0

Dislikes 0

Response

The SDT is being responsive to the Standards Authorization Request. The existing standard already has a vulnerability assessment requirement that is approved, and effective and subject to compliance by applicable registered entities. The supplemental assessment has been added to address local enhancements, but without the requirement of a Corrective Action Plan. The comment is suggesting an alternative threshold or benchmark to the existing standard which is outside the scope of the SDT and should be addressed in a new SAR.

Payam Farahbakhsh - Hydro One Networks, Inc. - 1

Answer

Document Name

Comment

We do not agree or disagree with the white paper. We believe that our industry's experience with GMD is not mature enough to adopt one specific approach to GMD assessment. The existing and recently developed assessment methodologies can be eventually verified by allowing the industry to collect GMD monitoring data and do further research.

Again, we disagree with the standard specifying methodologies for the responsible entities. We believe that this approach should be an option (in the guidelines or documented as an implementation guidance) but not the only option.

Likes 1

Hydro One Networks, Inc., 3, Malozewski Paul

Question 2

Dislikes 0

Response

The SDT is being responsive to the Standards Authorization Request. The existing standard already has a vulnerability assessment requirement that is approved, and effective and subject to compliance by applicable registered entities. The supplemental assessment has been added to address local enhancements, but without the requirement of a Corrective Action Plan. The comment is suggesting an alternative threshold or benchmark to the existing standard which is outside the scope of the SDT and should be addressed in a new SAR. The Transformer Thermal Impact Assessment White Paper and Screening Criterion for Transformer Thermal Impact Assessment documents have provided the technical foundation and methodologies that can be used to conduct transformer temperature rise calculations for both the benchmark case and the supplemental case.

Rachel Coyne - Texas Reliability Entity, Inc. - 10

Answer

Document Name

Comment

Texas RE does not have comments on this question.

Likes 0

Dislikes 0

Response

Question 3

3. The SDT established an 85 A per phase screening criterion for determining which power transformers are required to be assessed for thermal impacts from a supplemental GMD event in Requirement R10. Justification for this threshold is provided in the revised *Screening Criterion for Transformer Thermal Impact Assessment* white paper. Do you agree with the proposed 85 A per phase screening criterion and the technical justification for this criterion that has been added to the white paper? If you do not agree, or if you agree but have comments or suggestions for the screening criterion and revisions to the white paper provide your recommendation and explanation.

Michael Shaw - Lower Colorado River Authority - 6, Group Name LCRA Compliance

Answer No

Document Name

Comment

The technical basis is not clear. The standard references 2-5 minutes for the supplemental event, but this timeframe is not clearly referenced within the thermal impact assessment white paper.

Likes 0

Dislikes 0

Response

Thank you for your comment. The thermal impact assessment white paper describes possible ways to carry out a thermal impact assessment for any given GIC(t) waveform, whether it corresponds to the benchmark or supplemental benchmark waveforms. The description of the GIC(t) waveforms can be found in the benchmark and supplemental benchmark GMD event white papers.

Mike Smith - Manitoba Hydro - 1, Group Name Manitoba Hydro

Answer No

Document Name

Comment

Question 3

Both benchmarked and supplemental GMD calculations attempt to limit the hot spot to 172 degrees as a screening criterion. Given the lower probability of the local 12 V/km GMD enhancements, perhaps the full 200C could be utilized and a screening criteria closer to 150 A used before a full thermal assessment is undertaken.

Likes 0

Dislikes 0

Response

Thank you for your comment. The probability of occurrence of a local 12 V/peak is the same as the probability of occurrence of spatially averaged 8 V/km. The impact to the system would be different (local as opposed to wide-scale). The screening criteria are intended to flag instances where additional consideration should be given to specific transformers.

Michelle Amarantos - APS - Arizona Public Service Co. - 1

Answer No

Document Name

Comment

Requirement R6 requires a thermal impact assessment for applicable BES power transformers where the maximum effective GIC value required in Requirement 5, Part 5.1 is 75 A per phase or greater. Requirement R10 requires a supplemental thermal impact assessment for applicable BES power transformers where the maximum effective GIC value provided in Requirement R9, Part 9.1 is 85 A per phase or greater. AZPS is concerned that the use of two (2) different thresholds in different analyses (benchmark and supplemental) increases the potential for inconsistency in the results of the assessments. Accordingly, AZPS suggests using a consistent value per phase in both the primary and the supplemental assessments. While AZPS would recommend a single 85 A per phase or greater for consistency, its request is primarily for consistency, which could be achieved at either value.

Likes 0

Dislikes 0

Response

Question 3

Thank you for your comment. Different screening thresholds were selected because benchmark and supplemental benchmark waveforms are different and their effects on transformers are different. The temperature thresholds are consistent, i.e., the thermal effects on a transformer are characterized by peak temperatures.

Eric Shaw - Eric Shaw On Behalf of: Lee Maurer, Oncor Electric Delivery, 1; - Eric Shaw

Answer No

Document Name

Comment

The screening threshold of 75 A per phase used in the benchmark GMD event should also be used in the thermal impact assessment for the supplemental GMD event because it was determined to be the appropriate value to ensure protection of the transformer.

Likes 0

Dislikes 0

Response

Thank you for your comment. Different screening thresholds were selected because benchmark and supplemental benchmark waveforms are different and their effects on transformers are different. The temperature thresholds are consistent, i.e., the thermal effects on a transformer are characterized by peak temperatures.

Chris Scanlon - Exelon - 1

Answer No

Document Name

Comment

The supplemental GMD waveform used as a justification to develop the 85A screening criteria is not provided, similar to that which is provided in Figure 2 for the benchmark event in the "Screening Criterion for Transformer Thermal Impact Assessment" white paper. Therefore, the relationship between the supplemental waveform and hot-spot results shown in Figure 3 cannot be fully understood. Additionally, it is not stated which geo-electric scaling factor (B) was used for the supplemental event.

Likes 0

Question 3

Dislikes 0

Response

Thank you for your comment. The supplemental GMD waveform is described in the Supplemental GMD Event Description white paper. Figure 2 is produced as an illustrative example corresponding to a small portion of the benchmark GMD event. The curves shown in Figure 3 of the screening criterion white paper were obtained by carrying out thousands of thermal simulations considering every possible combination of GIC_E and GIC_N as described in Equation (5) of the Thermal Impact Assessment white paper. Beta factors are imbedded in GIC_E and GIC_N and the results in Figure 3 are not specific to any beta factor.

Marty Hostler - Northern California Power Agency - 5

Answer No

Document Name

Comment

. There should be a threshold of greater than 500 MVA, similar to CIP standards: High, Medium, and Low impact rating criteria.

Likes 0

Dislikes 0

Response

Thank you for your comment. The applicability for the TPL-007 standard is to BES transformers that have a high-side wye-grounded connection that is 200 kV and above.

Dennis Sismaet - Northern California Power Agency - 6

Answer No

Document Name

Comment

There should be a threshold of greater than 500 MVA, similar to CIP standards: High, Medium, and Low impact rating criteria.

Likes 0

Question 3

Dislikes 0

Response

Thank you for your comment. The applicability for the TPL-007 standard is to BES transformers that have a high-side wye-grounded connection that is 200 kV and above.

William Harris - Foundation for Resilient Societies - 8

Answer	No
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Document Name	
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Comment

Sudden reversal events can occur at far lower thresholds. A high dB/dT can occur during a relatively weak GMD event. Perhaps sensible to have two types of hazard, but if the thresholds are too high, the grid will not be protected. 20 amps per phase would be consistent with INL testing of 138 kV transformer in year 2013,. Generator equipment is also susceptible to GMD damage well below 75 amps per phase.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has used consistent geomagnetic field measurements to estimate benchmark events the details of which are found in the white papers. The thresholds of 75 A/phase and 85 A/phase for transformer impact screening were selected on the basis of conservative thermal models. For additional explanation please see the response to Resilient Societies at the end of this document.

Lauren Price - American Transmission Company, LLC - 1

Answer	Yes
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Document Name	
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Comment

Agree with the proposed screening criteria of 85 A per phase for the Supplemental Event as the threshold for assessing power transformers since it is consistent with the screening criteria used to establish the 75 A per phase threshold for the Benchmark Event.

Question 3

Likes 0

Dislikes 0

Response

Thank you for your comment.

Thomas Foltz - AEP - 5

Answer Yes

Document Name

Comment

AEP agrees with the 85A criterion, but is concerned about the potential duplication of work driven by the need to perform two separate assessments.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT purposely is requesting two separate thermal assessments be done for transformers that exceed the GIC thresholds: One for the benchmark event and one for the supplemental event. The supplemental assessment is intended to address local enhancements. The benchmark assessment may result in a Corrective Action Plan, but the supplemental assessment does not.

Daniel Grinkevich - Con Ed - Consolidated Edison Co. of New York - 1

Answer Yes

Document Name

Comment

While the 85 Amps per phase screening criterion is acceptable, it should be noted that the GIC flow values are dependent on the accuracy of the modeling program from which they are derived. For test cases that have been run using the latest version of GIC modeling and software, there were significant large currents in excess of 85 Amps in the boundary areas of observation. This behavior is analogous with

Question 3

the slack or swing buses that are used in AC power flow analysis. Specifically, the boundary buses take on whatever resulting flows will enable a solution for the GIC model flow, without taking into regard any structures that exist beyond these points. As a result, the boundary current flow conditions are not an accurate representation of the anticipated neutral and phase flow conditions, and if taken at face value, would result in unnecessary corrective actions to be taken. It is therefore critical that all modeling efforts anticipate these conditions to occur and ensure that the models are sufficiently adequate in size and scope to provide accurate results within the regions of interest, as well as to interpret any anomalies that might arise from artificial limitations of the GIC modeling programs.

Likes	0
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Dislikes	0
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Response

Thank you for your comment. The SDT agrees that accuracy of models and tools is very important and that their improvement and validation are the main drivers for the research plan.

sean erickson - Western Area Power Administration - 1

Answer	Yes
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Document Name	08_SPP_TPLTF_Discussion_Summary_on_1st_Release_TPL-007-2.docx ⁸
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Comment

please see attached form completed by the [TPL-Task Force](#)⁹

Likes	0
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Dislikes	0
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Response

Thank you for providing the TPL-Task Force information.

⁸ TPLTF document is found at the end of this document in Attachment 1.

⁹ TPLTF document is found at the end of this document in Attachment 1.

Question 3

Larisa Loyferman - CenterPoint Energy Houston Electric, LLC - 1 - Texas RE**Answer** Yes**Document Name****Comment**

CenterPoint Energy agrees with the approach used by the SDT to arrive at 85 A per phase as a screening criterion for determining which power transformers are required to be assessed for thermal impacts from a supplemental GMD event in R10. CenterPoint Energy appreciates the diligent efforts of the SDT in ensuring consistency between the approach used to develop the screening criterion in R10 and the approach used to develop the screening criterion in R6.

Likes 0

Dislikes 0

Response

Thank you for your comment.

Joshua Eason - Joshua Eason On Behalf of: Michael Puscas, ISO New England, Inc., 2; - Joshua Eason**Answer** Yes**Document Name****Comment**

Based on comparing Tables 1 and 2 in the Screen Criterion for Transformer Thermal Impact Assessment, the 85 Ampere screening criteria is as conservative as the 75 Ampere screening criteria associated with the benchmark event.

Likes 0

Dislikes 0

Response

Thank you for your comment.

Question 3

Stephanie Burns - Stephanie Burns On Behalf of: Michael Moltane, International Transmission Company Holdings Corporation, 1; - Stephanie Burns

Answer Yes

Document Name

Comment

As the supplemental event is more severe than the benchmark event, we agree that the threshold for transformer thermal assessment should correspondingly be raised as well. Through analysis, the SDT determined that 85 A per phase was a conservative threshold to apply for the supplemental event.

Likes 0

Dislikes 0

Response

Thank you for your comment.

Quintin Lee - Eversource Energy - 1

Answer Yes

Document Name

Comment

Just a question, but have transformer manufacturers been asked if they agree that 85 A is an acceptable threshold for all of their transformer designs (core-form, shell-form), configurations (3-phase autotransformers, 1-phase autotransformers, 3-phase delta-wye transformers, etc.), and vintages (old, new)?

Likes 0

Dislikes 0

Response

Question 3

Thank you for your comment. Transformer manufacturers have been involved with the Geomagnetic Disturbance Task Force (GMDTF) and their input has informed the development of TPL-007. The thresholds used in the standard assume single-phase construction and a healthy transformer.

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name RSC no Hydro One, HQ and IESO

Answer Yes

Document Name

Comment

While the 85 Amps per phase screening criterion is acceptable, it should be noted that the GIC flow values are dependent on the accuracy of the modeling program from which they are derived. For test cases that have been run using the latest version of GIC modeling and software, there were significant large currents in excess of 85 Amps in the boundary areas of observation. This behavior is analogous with the slack or swing buses that are used in AC power flow analysis. Specifically, the boundary buses take on whatever resulting flows will enable a solution for the GIC model flow, without taking into regard any structures that exist beyond these points. As a result, the boundary current flow conditions are not an accurate representation of the anticipated neutral and phase flow conditions, and if taken at face value, would result in unnecessary corrective actions to be taken. It is therefore critical that all modeling efforts anticipate these conditions to occur and ensure that the models are sufficiently adequate in size and scope to provide accurate results within the regions of interest, as well as to interpret any anomalies that might arise from artificial limitations of the GIC modeling programs.

“Figure 2: Metallic hot spot temperatures calculated using the benchmark GMD event” from the screening criterion document provides a useful visual, can the drafting team additionally provide a similar chart and the data for the supplemental GMD event?

Likes 0

Dislikes 0

Response

Thank you for your comment. The results of the NERC GMD research plan associated with FERC Order No. 830 may provide more granularity. The SDT agrees that accuracy of models and tools is very important and that their improvement and validation are the main drivers for the research plan. The upper bound of hot spot temperatures are provided in Figure 3 of the Screening Criterion for Transformer Thermal Impact Assessment white paper and in Tables 1 and 2 of Appendix 1 of the same document.

Question 3

Shannon Mickens - Southwest Power Pool, Inc. (RTO) - 2 - SPP RE, Group Name SPP Standards Review Group

Answer Yes

Document Name 2013-03_IB_Comment_Form_June_2017_svm.docx

Comment

Given the use of the 12 V/km geoelectric field amplitude for the supplemental GMD event, the SPP Standards Review Group agrees with the proposed 85 Amp threshold justified in the *Screening Criterion for Transformer Thermal Impact Assessment* white paper. We suggest that the proposed change on page 11 of the white paper stating “because the supplemental waveform has a sharper peak, the peak metallic hot spot temperatures associated with the supplemental waveform are slightly lower than those associated with the benchmark waveform” be clarified. In other words, this statement is counterintuitive given that the increased supplemental time-series waveform peak value implies higher GIC flows that, when experienced by a transformer will lead potentially higher metallic hot spot temperatures.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT agrees with the comment and has modified the explanation in the white paper as follows: Because the supplemental waveform has a sharper peak, the peak metallic hot spot temperatures associated with the supplemental waveform for the same peak current are slightly lower than those associated with the benchmark waveform. In other words, for the same peak current value, the duration is relatively shorter with the supplemental waveform, and shorter duration means lower temperature. However, higher peak currents will occur with the supplemental benchmark, therefore, higher peak hot spot temperatures will occur.

Elizabeth Axson - Electric Reliability Council of Texas, Inc. - 2, Group Name IRC Standards Review Committee

Answer Yes

Document Name

Comment

Based on comparing Tables 1 and 2 in the Screen Criterion for Transformer Thermal Impact Assessment, the 85 Ampere screening criterion is as conservative as the 75 Ampere screening criteria associated with the benchmark event.

Question 3

Likes 0

Dislikes 0

Response

Thank you for your comment.

Randy Buswell - VELCO -Vermont Electric Power Company, Inc. - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Joe O'Brien - NiSource - Northern Indiana Public Service Co. - 6

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 3

RoLynda Shumpert - SCANA - South Carolina Electric and Gas Co. - 1,3,5,6 - SERC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Ann Ivanc - FirstEnergy - FirstEnergy Solutions - 6

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Aaron Cavanaugh - Bonneville Power Administration - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Question 3

Likes 0

Dislikes 0

Response

Robert Blackney - Edison International - Southern California Edison Company - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Gerry Huitt - Xcel Energy, Inc. - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 3

Chantal Mazza - Hydro-Québec TransEnergie - 1,2 - NPCC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laura Nelson - IDACORP - Idaho Power Company - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF

Answer Yes

Document Name

Question 3

Comment

Likes 0

Dislikes 0

Response

Neil Swearingen - Salt River Project - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Nicolas Turcotte - Hydro-Québec TransEnergie - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 3

Response

Karie Barczak - DTE Energy - Detroit Edison Company - 3

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laurie Williams - PNM Resources - Public Service Company of New Mexico - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Jeffrey Watkins - Jeffrey Watkins On Behalf of: Eric Schwarzrock, Berkshire Hathaway - NV Energy, 5; - Jeffrey Watkins

Answer Yes

Question 3

Document Name

Comment

Likes 0

Dislikes 0

Response

Colby Bellville - Colby Bellville On Behalf of: Dale Goodwine, Duke Energy , 6, 5, 3, 1; - Colby Bellville, Group Name Duke Energy

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Glen Farmer - Avista - Avista Corporation - 5

Answer

Yes

Document Name

Comment

Likes 0

Question 3

Dislikes 0

Response

Donald Lock - Talen Generation, LLC - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Douglas Webb - Douglas Webb On Behalf of: Chris Bridges, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Harold Wyble, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; James McBee, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Jessica Tucker, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; - Douglas Webb

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 3

Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

David Ramkalawan - Ontario Power Generation Inc. - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Brian Van Gheem - ACES Power Marketing - 6 - NA - Not Applicable, Group Name ACES Standards Collaborators

Answer Yes

Document Name

Question 3

Comment

Likes 0

Dislikes 0

Response

James Anderson - CMS Energy - Consumers Energy Company - 1,3,4,5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Michael Buyce - City Utilities of Springfield, Missouri - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 3

Response

Sergio Banuelos - Tri-State G and T Association, Inc. - 1,3,5 - MRO,WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Terry Harbour - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Rachel Coyne - Texas Reliability Entity, Inc. - 10

Answer

Question 3

Document Name

Comment

Texas RE does not have comments on this question.

Likes 0

Dislikes 0

Response

Payam Farahbakhsh - Hydro One Networks, Inc. - 1

Answer

Document Name

Comment

Consistent with our comments above, it should be up to the responsible entity to decide what the appropriate threshold is based on the responsible entities justification, risk assessment, and risk tolerance level. The whitepapers or any other research can be used to support the justification.

Likes 1

Hydro One Networks, Inc., 3, Malozewski Paul

Dislikes 0

Response

Thank you for your comment. The standard provides the flexibility to use technically-justified technologies and models to carry out transformer thermal assessments. The temperature thresholds in IEEE STD. 57.91, which inform the 75 A/phase and 85 A/phase screening thresholds, are prudent industry recommendations that apply to healthy transformers. Applicable entities should ensure that asset condition and other factors are taken into account in the thermal assessment.

Thomas Rafferty - Edison International - Southern California Edison Company - 5

Answer

Question 3

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison

Likes 0

Dislikes 0

Response

No comments were submitted.

Richard Vine - California ISO - 2

Answer

Document Name

Comment

The California ISO supports the joint comments of the ISO/RTO Standards Review Committee

Likes 0

Dislikes 0

Response

Thank you for supporting the comments of the IRC Standards Review Committee (i.e., ISO/RTO Standards Review Committee).

Question 4

4. The SDT revised the *Transformer Thermal Impact Assessment* white paper to include the supplemental GMD event. Do you agree with the revisions to the white paper? If you do not agree, or if you agree but have comments or suggestions on the revisions to the white paper provide your recommendation and explanation.

Dennis Sismaet - Northern California Power Agency - 6

Answer No

Document Name

Comment

There should be a threshold of greater than 500 MVA, similar to CIP standards: High, Medium, and Low impact rating criteria.

Likes 0

Dislikes 0

Response

Thank you for your comment. The applicability for the TPL-007 standard is to BES transformers that have a high-side wye-grounded connection that is 200 kV and above.

Marty Hostler - Northern California Power Agency - 5

Answer No

Document Name

Comment

There should be a threshold of greater than 500 MVA, similar to CIP standards: High, Medium, and Low impact rating criteria.

Likes 0

Dislikes 0

Response

Question 4

Thank you for your comment. The applicability for the TPL-007 standard is to BES transformers that have a high-side wye-grounded connection that is 200 kV and above.

Donald Lock - Talen Generation, LLC - 5

Answer No

Document Name

Comment

NERC’s Screening Criterion for Transformer Thermal Impact Assessment and Transformer Thermal Impact Assessment White Paper state that TPL-007-2 R6 and R10 analyses can in some cases be addressed simply by comparing Screening Criterion for Transformer Thermal Impact Assessment Table 1 and 2 values to IEEE emergency loading criteria. The statement in footnote 5 of the Transformer Thermal Impact Assessment White Paper that the “peak GIC(t)” value is to be used in this exercise may cause some confusion, however. This appears to be the “maximum effective GIC” reported in R5.1 and R9.1 of TPL-007-2, given that the Screening Criterion for Transformer Thermal Impact Assessment uses the term “effective GIC” in discussing Tables 1 and 2, but it’s difficult to be certain without a clarification or (better) harmonization of terms between the standard and its supporting material.

NERC should provide default tables by transformer type (single phase, 5-legged core 3-phase, etc) similar to Table 1 and 2 for cases in which the first-cut process discussed above does not demonstrate that transformers are acceptable as-is, since the alternatives in the Thermal Impact Assessment and Transformer Thermal Impact Assessment White Paper will often prove impractical. OEM GIC capability curves are seldom available, and the same is true for the input data needed for thermal response simulations. Rather than making every GO and TO in North America seek out consultants with generic information in these respects (if there are any) it would be better to simply present the best available OK/not-OK boundaries up-front.

Likes 0

Dislikes 0

Response

Thank you for your comment. Current knowledge does not allow for generalized tables for different construction types. The tables used in the standard assume single-phase construction and a healthy unit. The assessment(s) can use other technically-justified assumptions.

Question 4

Tables 1 and 2 of the screening criterion white paper represent the best available upper boundaries. The results of the NERC GMD research plan associated with FERC Order No. 830 may provide more granularity. The SDT agrees that accuracy of models and tools is very important and that their improvement and validation are the main drivers for the research plan.

Mike Smith - Manitoba Hydro - 1, Group Name Manitoba Hydro

Answer No

Document Name

Comment

We believe that we need more experience with GMD before moving on to include more time consuming analysis. We also noticed that, Figure 1 and Figure 3 in the *Screening Criterion for Transformer Thermal Impact Assessment* are on different temperature scales (80-300 vs 0-300) so they are difficult to compare.

Likes 0

Dislikes 0

Response

Thank you for your comment. The Figure 3 y-axis has been updated. The SDT purposely is requesting two separate thermal assessments be done for transformers that exceed the GIC thresholds: One for the benchmark event and one for the supplemental event. The distinction between the benchmark and supplemental thermal assessments is the amplitudes and waveforms of the geoelectric field are different.

Michael Shaw - Lower Colorado River Authority - 6, Group Name LCRA Compliance

Answer No

Document Name

Comment

The standard references 2-5 minutes for the supplemental event, but this timeframe is not clearly referenced within the thermal impact assessment white paper.

Likes 0

Question 4

Dislikes 0

Response

Thank you for your comment. The thermal impact assessment white paper describes possible ways to carry out a thermal impact assessment for any given GIC(t) waveform, whether it corresponds to the benchmark or supplemental benchmark waveforms. The description of the GIC(t) waveforms can be found in the benchmark and supplemental benchmark GMD event white papers.

Chris Scanlon - Exelon - 1

Answer Yes

Document Name

Comment

Figure 17 indicates that the load is at the 70% level, but the previous paragraph states that the load is at the 75% level. It is unclear whether the chart or just the description needs to be revised.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has updated the Figure caption.

Shannon Mickens - Southwest Power Pool, Inc. (RTO) - 2 - SPP RE, Group Name SPP Standards Review Group

Answer Yes

Document Name

Comment

The SPP Standards Review Group agrees with the changes in the *Transformer Thermal Impact Assessment* white paper, with the exception of the explanation provided for Table 2 on page 5. Similar to the comment made regarding the counterintuitive language in the *Screening Criterion for Transformer Thermal Impact Assessment* white paper, it is not clear why metallic hot spot temperatures are reduced for the supplemental GMD event for the same effective GIC and transformer bulk oil temperature. Additional clarity on this point would improve the

Question 4

ability of applicable entities to rely upon the reference data provided. The group recommends adding white paper language similar to that suggested in Question Q3.

The group would like to highlight that the study of supplemental GMD event conditions may cause a significantly larger number of transformers to be added for assessed by Transmission Owners and Generator Owners. Given that the analytical tools and modeling software available for this type of analysis are limited, as well as the fact that most manufacturers supplying power transformers to U.S. customers do not include data necessary to complete detailed thermal modeling with transformer test reports, the additional effort to satisfy the supplemental GMD event analysis will be arduous. The group recommends that the SDT consider the reality that these tools are merely in their infancy across the industry, and additional time to develop, deploy, and train on them should be included in the TPL-007-2 implementation plan to complete transformer thermal assessments for the supplemental GMD event.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT agrees with the comment regarding counter intuitive language in the first paragraph and has modified the explanation in the white paper as follows: Because the supplemental waveform has a sharper peak, the peak metallic hot spot temperatures associated with the supplemental waveform for the same peak current are slightly lower than those associated with the benchmark waveform.

The SDT is aware of the current limitations in knowledge and tools.

The supplemental assessment is additional work, but it is necessary to account for the impacts of local enhancements.

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name RSC no Hydro One, HQ and IESO

Answer

Yes

Document Name

Comment

Table 1 and 2 are useful to show the differences between the benchmark event and the supplemental, but some of the figures are not clear which GMD event was used to generate the GIC(t) time series. Can some additional language be added to clarify the GMD event of the figures in this document?

Question 4

Also, there was some inconsistency in axis labels and units between the various figures, which makes it difficult to draw conclusions when comparing the charts. For example: A/phase versus Amps, minutes versus hours for the time scale. Can these charts be updated with uniform axis labels and units for comparative purposes?

Likes 0

Dislikes 0

Response

Thank you for your comment. This version of the white paper is intended to illustrate different ways to carry out thermal transformer assessments. The time series used in the white paper are based on portions of the benchmark time series and are intended for illustrative purposes only. The Figures in the white papers are sufficiently clear for their intended use.

Stephanie Burns - Stephanie Burns On Behalf of: Michael Moltane, International Transmission Company Holdings Corporation, 1; - Stephanie Burns

Answer Yes

Document Name

Comment

Per FERC's directive, the transformer thermal assessment was revised to not rely solely on spatially-averaged data and the SDT modified the standard to utilize the supplemental GMD event definition for the additional analysis requested by FERC.

Likes 0

Dislikes 0

Response

Thank you for your comment.

Eric Shaw - Eric Shaw On Behalf of: Lee Maurer, Oncor Electric Delivery, 1; - Eric Shaw

Answer Yes

Document Name

Question 4

Comment

We agree with the revisions to the white paper but disagree with the 85 A screening criterion as this may cause damage to the transformers because a thermal assessment will not be performed until 85 A.

Likes 0

Dislikes 0

Response

Thank you for your comment. Thermal impact on a transformer is quantified against temperature rise, which depends on the peak GIC(t) and its waveform. The 75 A/phase and 85 A/phase are equivalent in terms of hot spot temperature rise.

Larisa Loyferman - CenterPoint Energy Houston Electric, LLC - 1 - Texas RE

Answer Yes

Document Name

Comment

CenterPoint Energy agrees with the revisions to include the supplemental GMD event in the Transformer Thermal Impact Assessment white paper.

Likes 0

Dislikes 0

Response

Thank you for your comment.

sean erickson - Western Area Power Administration - 1

Answer Yes

Document Name

Comment

Question 4

[TPLTF](#)¹⁰ Discussion: The group agrees with the changes in the *Transformer Thermal Impact Assessment* white paper, with the exception of the explanation provided for Table 2 on page 5. Similar to the comment made regarding the counterintuitive language in the *Screening Criterion for Transformer Thermal Impact Assessment* white paper, it is not clear why metallic hot spot temperatures are reduced for the supplemental GMD event for the same effective GIC and transformer bulk oil temperature. Additional clarity on this point would improve the ability of applicable entities to rely upon the reference data provided. The group recommends adding white paper language similar to that suggested in Question Q3.

The group would like to highlight that the study of supplemental GMD event conditions may cause a significantly larger number of transformers to be added for assessed by Transmission Owners and Generator Owners. Given that the analytical tools and modeling software available for this type of analysis are limited, as well as the fact that most manufacturers supplying power transformers to U.S. customers do not include data necessary to complete detailed thermal modeling with transformer test reports, the additional effort to satisfy the supplemental GMD event analysis will be arduous. The group recommends that the SDT consider the reality that these tools are merely in their infancy across the industry, and additional time to develop, deploy, and train on them should be included in the TPL-007-2 implementation plan to complete transformer thermal assessments for the supplemental GMD event.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request. The existing standard already has a vulnerability assessment requirement that is approved, and effective and subject to compliance by applicable registered entities. The supplemental assessment has been added to address local enhancements, but without the requirement of a Corrective Action Plan.

Terry Harbour - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1

Answer Yes

Document Name

Comment

¹⁰ TPLTF document is found at the end of this document in Attachment 1.

Question 4

Likes 0

Dislikes 0

Response

Sergio Banuelos - Tri-State G and T Association, Inc. - 1,3,5 - MRO,WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Elizabeth Axson - Electric Reliability Council of Texas, Inc. - 2, Group Name IRC Standards Review Committee

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 4

Michael Buyce - City Utilities of Springfield, Missouri - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

James Anderson - CMS Energy - Consumers Energy Company - 1,3,4,5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Brian Van Gheem - ACES Power Marketing - 6 - NA - Not Applicable, Group Name ACES Standards Collaborators

Answer Yes

Document Name

Question 4

Comment

Likes 0

Dislikes 0

Response

David Ramkalawan - Ontario Power Generation Inc. - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Quintin Lee - Eversource Energy - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 4

Response

Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Douglas Webb - Douglas Webb On Behalf of: Chris Bridges, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Harold Wyble, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; James McBee, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Jessica Tucker, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; - Douglas Webb

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 4

Glen Farmer - Avista - Avista Corporation - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Colby Bellville - Colby Bellville On Behalf of: Dale Goodwine, Duke Energy , 6, 5, 3, 1; - Colby Bellville, Group Name Duke Energy

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Jeffrey Watkins - Jeffrey Watkins On Behalf of: Eric Schwarzrock, Berkshire Hathaway - NV Energy, 5; - Jeffrey Watkins

Answer Yes

Document Name

Comment

Question 4

Likes 0

Dislikes 0

Response

Joshua Eason - Joshua Eason On Behalf of: Michael Puscas, ISO New England, Inc., 2; - Joshua Eason

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laurie Williams - PNM Resources - Public Service Company of New Mexico - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 4

Karie Barczak - DTE Energy - Detroit Edison Company - 3

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Nicolas Turcotte - Hydro-Québec TransEnergie - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Neil Swearingen - Salt River Project - 1,3,5,6 - WECC

Answer Yes

Document Name

Question 4

Comment

Likes 0

Dislikes 0

Response

Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laura Nelson - IDACORP - Idaho Power Company - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 4

Response

Chantal Mazza - Hydro-Québec TransEnergie - 1,2 - NPCC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Michelle Amarantos - APS - Arizona Public Service Co. - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Gerry Huitt - Xcel Energy, Inc. - 5

Answer Yes

Question 4

Document Name

Comment

Likes 0

Dislikes 0

Response

Robert Blackney - Edison International - Southern California Edison Company - 1,3,5,6 - WECC

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Daniel Grinkevich - Con Ed - Consolidated Edison Co. of New York - 1

Answer

Yes

Document Name

Comment

Likes 0

Question 4

Dislikes 0

Response

Aaron Cavanaugh - Bonneville Power Administration - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Ann Ivanc - FirstEnergy - FirstEnergy Solutions - 6

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Thomas Foltz - AEP - 5

Question 4

Answer	Yes
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Document Name	
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Comment	
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Likes	0
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Dislikes	0
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Response

RoLynda Shumpert - SCANA - South Carolina Electric and Gas Co. - 1,3,5,6 - SERC

Answer	Yes
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Document Name	
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Comment	
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Likes	0
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Dislikes	0
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Response

Lauren Price - American Transmission Company, LLC - 1

Answer	Yes
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Document Name	
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Comment	
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Question 4

Likes 0

Dislikes 0

Response

Randy Buswell - VELCO -Vermont Electric Power Company, Inc. - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Richard Vine - California ISO - 2

Answer

Document Name

Comment

The California ISO supports the joint comments of the ISO/RTO Standards Review Committee

Likes 0

Dislikes 0

Response

Thank you for supporting the comments of the IRC Standards Review Committee (i.e., ISO/RTO Standards Review Committee).

Question 4

Thomas Rafferty - Edison International - Southern California Edison Company - 5

Answer

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison

Likes 0

Dislikes 0

Response

No comments were submitted.

Payam Farahbakhsh - Hydro One Networks, Inc. - 1

Answer

Document Name

Comment

Consistent with our comments above, it should be up to the responsible entity to decide what the appropriate threshold is based on the responsible entities justification, risk assessment, and risk tolerance level. The whitepapers or any other research can be used to support the justification.

Likes 1

Hydro One Networks, Inc., 3, Malozewski Paul

Dislikes 0

Response

Thank you for your comment. See response in Q3.

Rachel Coyne - Texas Reliability Entity, Inc. - 10

Answer

Question 4

Document Name	
Comment	
Texas RE does not have comments on this question.	
Likes	0
Dislikes	0
Response	

Question 5

5. The SDT developed proposed Requirement R7 to address FERC directives in Order No. 830 for establishing Corrective Action Plan (CAP) deadlines associated with GMD Vulnerability Assessments (P. 101, 102). Do you agree with the proposed requirement? If you do not agree, or if you agree but have comments or suggestions for the proposed requirement provide your recommendation and explanation.

Thomas Foltz - AEP - 5

Answer No

Document Name

Comment

The language used in R7 needs to clarify the type of “year” used in the deadlines of the CAP. Is this “Calendar Year” or “Calendar Months”? Please clarify. Also, AEP seeks clarification on whether a CAP is required or expected in response to the Thermal Impact Assessments from R6. If it is, then there may be a conflict in the timelines for the execution of R4 and R6 and the timeline for the development of a CAP as per R7.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT notes that the use of the term “one year” is sufficiently clear. A CAP is not required for individual transformers that do not meet the requirements of Requirement R6.

Shawn Abrams - Santee Cooper - 1, Group Name Santee Cooper

Answer No

Document Name

Comment

Santee Cooper has concerns that NERC/FERC is in essence directing entities to implement Corrective Action Plans which violates the Energy Policy Act of 2005. This revision of TPL-007 actually has a requirement to implement Corrective Action Plans within a specified period after their development.

Likes 0

Question 5

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request to include deadlines for the CAP as a requirement in the standard.

Mike Smith - Manitoba Hydro - 1, Group Name Manitoba Hydro

Answer No

Document Name

Comment

Manitoba Hydro cannot adopt R7 as is as it violates *The Manitoba Hydro Act*. Manitoba Hydro does not support hard coding the timelines for implementing a corrective action plan in the standard. The timelines are a function of a large number of factors that are out of the control of the Transmission Planner – including securing the necessary resources. Corporate annual capital spending is limited and is prioritized based on a number of factors. Securing funding to protect for a 1/100 year event could have lower associated risks to BES reliability than other projects, meaning timeline discretion for the Transmission Planner to address risks is important.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request, where in Order 830, FERC directed NERC “to include a deadline of one year from the completion of the GMD Vulnerability Assessments to complete the development of corrective action plans....[and] to modify Reliability Standard TPL-007-1 to include a two-year deadline after the development of the corrective action plan to complete the implementation of non-hardware mitigation and four-year deadline to complete hardware mitigation.” (FERC Order 830, PP 101-102.) The SDT understands the complexity of implementing the CAP and has addressed the situation where the CAP cannot be completed by the deadline due to conditions beyond the control of the responsible entities (See R7.4).

Chantal Mazza - Hydro-Québec TransEnergie - 1,2 - NPCC

Answer No

Question 5

Document Name

Comment

We have concerns that the first time the evaluation of the TPL-007 will take place, the corrective action plans may take more time than the R7 requirements. We agree with the deadlines for the second time the evaluation will be done.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request to include deadlines for the CAP as a requirement in the standard. The SDT understands the complexity of implementing the CAP and has addressed the situation where the CAP cannot be completed by the deadline due to conditions beyond the control of the responsible entities (See R7.4).

Nicolas Turcotte - Hydro-Québec TransEnergie - 1

Answer

No

Document Name

Comment

We have concerns that the first time the evaluation of the TPL-007 will take place, the corrective action plans may take more time than the R7 requirements. We agree with the deadlines for the second time the evaluation will be done.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request to include deadlines for the CAP as a requirement in the standard. The SDT understands the complexity of implementing the CAP and has addressed the situation where the CAP cannot be completed by the deadline due to conditions beyond the control of the responsible entities (See R7.4).

Karie Barczak - DTE Energy - Detroit Edison Company - 3

Question 5

Answer No

Document Name

Comment

Will the TO and GO have any input in the selection of the mitigation actions?

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT expects that the development of the CAP would be a joint effort among the applicable entities. Requirement 7.5.1 provides a feedback loop for those functional entities who are referenced in the CAP.

Laurie Williams - PNM Resources - Public Service Company of New Mexico - 1

Answer No

Document Name

Comment

There are specific timetable for implementing the CAP and additional administrative burden placed on the responsible entity if the timetable is not met; therefore, an additional requirement should be added to the standard to require any functional entity referenced in a CAP to implement the CAP identified by the responsible entity.

Likes 0

Dislikes 0

Response

Thank you for your comment. An additional requirement is not necessary. The CAP requirements allow for revisions to the CAP if situations beyond the control of the responsible entity prevent the implementation of the CAP within the stated timetable.

Larisa Loyferman - CenterPoint Energy Houston Electric, LLC - 1 - Texas RE

Answer No

Question 5

Document Name

Comment

CenterPoint Energy disagrees with the prescriptive timeframes identified in R7.3.1 and R7.3.2. and recommends eliminating R7.3 in its entirety. Requiring a specific timeframe for mitigation implementation is overly prescriptive and unprecedented for a NERC standard. The specifics of an implementation timeline should be developed by the responsible entities with more intimate knowledge and understanding of their systems. The compliance burden of this requirement does not provide commensurate reliability benefits.

If R7.3 is not eliminated as recommended above, CenterPoint Energy supports R7.4 but recommends that the first sentence of R7.4 be reworded as follows:

R7.4 Be revised if responsible entity cannot implement the CAP within the timetable provided in R7.3.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request to include deadlines for the CAP as a requirement in the standard. The SDT understands the complexity of implementing the CAP and has addressed the situation where the CAP cannot be completed by the deadline due to conditions beyond the control of the responsible entities (See R7.4).

Joshua Eason - Joshua Eason On Behalf of: Michael Puscas, ISO New England, Inc., 2; - Joshua Eason

Answer No

Document Name

Comment

ISO-NE is supportive of the proposed R7 as long as any delays with implementing a CAP due to tariff requirements for engaging a stakeholder planning process when developing system upgrades associated with a CAP are considered to be “beyond the control of the responsible entity.” Further, ISO-NE is encouraged that the implementation plan for TPL-007-2 includes a one year period between the completion of the vulnerability assessment in R4 and the completion of any needed CAPs according to R7. ISO-NE believes that this is in acknowledgement that the analysis in R4 (and possible in R6) may need to be repeated during the development of CAPs due to the iterative nature of the CAP development process.

Question 5

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has added additional language to the end of the “Rationale for Requirement R7.”

Eric Shaw - Eric Shaw On Behalf of: Lee Maurer, Oncor Electric Delivery, 1; - Eric Shaw

Answer No

Document Name

Comment

The hardware mitigation timeline mentioned in the requirement R7 does not address the complexities in building the project like regulatory approvals, construction clearances on existing equipment, Right of Way requirements, etc.

Likes 0

Dislikes 0

Response

The SDT is responding to a FERC directive in Order 830 to include deadlines for the CAP as a requirement in the standard. The SDT understands the complexity of implementing the CAP and has addressed the situation where the CAP cannot be completed by the deadline due to conditions beyond the control of the responsible entities (See R7.4).

Donald Lock - Talen Generation, LLC - 5

Answer No

Document Name

Comment

The four-year hardware implementation deadline in R7.3.2 may be impractical, especially if need for a large number of entities to install GIC blocking devices leads to extended lead-times for this equipment. The same issue was thoroughly investigated by the PRC-025 SDT (see the Implementation Plan for this standard), leading to an 84-months deadline, and we recommend that the TPL-007-2 SDT follow this precedent.

Question 5

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request to include deadlines for the CAP as a requirement in the standard. The SDT understands the complexity of implementing the CAP and has addressed the situation where the CAP cannot be completed by the deadline due to conditions beyond the control of the responsible entities (See R7.4).

Quintin Lee - Eversource Energy - 1**Answer** No**Document Name****Comment**

We agree with the addition of the proposed Requirement R7 to TPL-007-2, however we are concerned with the possible required timeframe for implementation. Determining appropriate mitigations involves iterative evaluations and solutions. The solutions may involve a number of TOs and various stakeholder (ISOs/RTOs, governmental bodies, market participants) input may be required as well. The timing requirements should recognize and allow for delays out of the control of the good-faith effort of the responsible entity. Given that GIC assessment and mitigation is a new topic, it is likely that significant time will be required to achieve regional consensus on the appropriate mitigation plan.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request to include deadlines for the CAP as a requirement in the standard. The SDT understands the complexity of implementing the CAP and has addressed the situation where the CAP cannot be completed by the deadline due to conditions beyond the control of the responsible entities (See R7.4).

David Ramkalawan - Ontario Power Generation Inc. - 5**Answer** No**Document Name**

Question 5

Comment

OPG does not agree with the implementation deadlines:

R7.2 provides one year for the CAP; this has not been performed before and the timeline may not be realistic.

As stated in the additional comments:

- The four years deadline to implement all the hardware mitigation action may provide unfair market advantage to the unaffected/ less affected TOP, GOP due to the time/resources/financial effort involved. Continued operation should be allowed if there is a shortage of hardware, or the lead time to design/procure/implement complete hardware solution exceeds the four years duration.

- The two years deadline to implement all the non-hardware solution may provide unfair market advantage to the unaffected/less affected TOP, GOP, as the implementation for a large scale TOP, GOP will take more time, resources/financial effort and may require commissioning and studies.

Likes 0

Dislikes 0

Response

Thank you for your comment. It is anticipated that the actual implementation (trigger to activate) of the CAP that includes operational procedure would only occur during a GMD/GIC event of sufficient size as determined by the assessment. Since GMD events are very rare, there is less likelihood that market impacts would occur as compared to a 'regular' transmission outage or constraint not related to GMD mitigation.

The SDT understands the complexity of implementing the CAP and has addressed the situation where the CAP cannot be completed by the deadline due to conditions beyond the control of the responsible entities (See R7.4).

Brian Van Gheem - ACES Power Marketing - 6 - NA - Not Applicable, Group Name ACES Standards Collaborators

Answer

No

Document Name

Comment

The revision identifies the need to have implementation of non-hardware and hardware mitigations within two and four years of CAP development, respectively. However, there is no technical guidance within the standard that identifies the difference between these

Question 5

mitigations. According to the FERC Order, GIC blocking or monitoring devices are identified as hardware mitigations. Similar references are listed within the NERC Geomagnetic Disturbance Planning Guide. We believe these references should be directly incorporated into the requirement, and replace hardware with GIC reduction or similar devices.

Likes 0

Dislikes 0

Response

Thank you for your comment. The standard is not prescriptive in listing the various hardware and non-hardware options. Some hardware and non-hardware options are listed in Requirement R7.1.

Chris Scanlon - Exelon - 1

Answer

No

Document Name

Comment

The deadlines specified in R7.3.1 and R7.3.2 are ambiguous. Using the term “development” does not offer a specified date to measure the 2- or 4-year installation requirements. To provide clarity for those needing to implement the mitigation, please consider replacing “development of CAP” with “final approval of CAP by the Planning Coordinator or Transmission Planner.”

R7 does not provide a method to address situations where the responsible entity knows that the selected mitigation cannot meet the 2- or 4-year deadline during the development of the CAP. As the standard currently states, a CAP would need to be developed with the specified deadlines in R7.3 and then immediately revised to address the known situations instead of identifying the appropriate timeline during the development of the CAP. Consider revising R7.4 such that it is not specific to revisions to a CAP only to address these situations.

Likes 0

Dislikes 0

Response

Question 5

Thank you for your comment. The standard is not prescriptive in providing additional detail to what is essentially an internal process. Entities may each have different internal processes for the issuance of documents.

The SDT understands the complexity of implementing the CAP and has addressed the situation where the CAP cannot be completed by the deadline due to conditions beyond the control of the responsible entities (See R7.4).

Marty Hostler - Northern California Power Agency - 5

Answer No

Document Name

Comment

Increased costs do not justify the low, if any, reliability benefits. There should be a threshold of greater than 500 MVA, similar to CIP standards: High, Medium, and Low impact rating criteria.

Likes 0

Dislikes 0

Response

Thank you for your comment. Whether a particular transformer is relevant to the reliability of the BES is independent of the size of the transformer and is be determined by the entity responsible for the reliability of the BES in that area. The applicability for the TPL-007 standard is to BES transformers that have a high-side wye-grounded connection that is 200 kV and above.

Sergio Banuelos - Tri-State G and T Association, Inc. - 1,3,5 - MRO,WECC

Answer No

Document Name

Comment

Tri-State has concern that as written, the TP/PC can create a CAP that the implementing entity (another TO/GO) may have issues with. It seems the TP/PC has ultimate control on what the CAP is without taking into account that the implementing entity may have other thoughts or differing opinions. In a situation where a TO/GO states that they are unable to implement a CAP given to them by another TP/PC, what

Question 5

recourse does the TP/PC have? If an agreement cannot be reached amongst the planning and implementing entities, then what are the next steps to be taken?

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT expects that the development of the CAP would be a joint effort among the applicable entities. Requirement 7.5.1 provides a feedback loop for those functional entities who are referenced in the CAP.

Dennis Sismaet - Northern California Power Agency - 6

Answer No

Document Name

Comment

Increased costs do not justify the low, if any, reliability benefits. There should be a threshold of greater than 500 MVA, similar to CIP standards: High, Medium, and Low impact rating criteria.

Likes 0

Dislikes 0

Response

Thank you for your comment. Whether a particular transformer is relevant to the reliability of the BES is independent of the size of the transformer and is determined by the entity responsible for the reliability of the BES in that area. The applicability for the TPL-007 standard is to BES transformers that have a high-side wye-grounded connection that is 200 kV and above.

Terry Harbour - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1

Answer No

Document Name

Comment

Question 5

The NSRF believes a definition/example of what “hardware” means in this context is needed. Order 830 in P 82. Says: *NERC states that Reliability Standard TPL-007-1 contains “requirements to develop the models, studies, and assessments necessary to build a picture of overall GMD vulnerability and identify where mitigation measures may be necessary.” NERC explains that mitigating strategies “may include installation of hardware (e.g., GIC blocking or monitoring devices), equipment upgrades, training, or enhanced Operating Procedures.* Therefore, hardware may only mean GIC blocking or monitoring devices, but it can also include equipment upgrades.

Likes	0
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Dislikes	0
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Response

Thank you for your comment. The standard is not prescriptive in listing the various hardware and non-hardware options. Some hardware and non-hardware options are listed in Requirement R7.1.

sean erickson - Western Area Power Administration - 1

Answer	Yes
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Document Name	
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Comment

[TPLTF](#)¹¹ Discussion: Given the specificity of the Paragraphs 101 and 102 directives of FERC Order No. 830 Paragraph 44, the group believes that the SDT had little flexibility when developing the proposed language of Requirement R7. The group agrees with the proposed Requirement R7, as presented. The group would like to reiterate the suggestion that the Supplemental GMD Event nomenclature be changed to Extreme Value GMD Event, as explained in the group’s discussion of Question Q2.

Likes	0
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Dislikes	0
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Response

¹¹ TPLTF document is found at the end of this document in Attachment 1.

Question 5

Thank you for supporting the [SPP TPLTF](#) comments¹² on the TPL-007-2 standard. The IMAGE dataset is the most complete and comprehensive data available and is therefore the best data source available to support the development of the standard.

Although the four events mentioned in the Supplemental Geomagnetic Event Description document all occurred in northern latitudes, there is no evidence that the local enhancement effect only occurs in high latitudes. Based on the past experiences with the IMAGE data, it is not expected that the coastal effect has a significant effect on the geomagnetic fields that were used in the extreme value analysis.

Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF

Answer

Yes

Document Name

Comment

The NSRF believes a definition/example of what “hardware” means in this context is needed. Order 830 in P 82. Says: *NERC states that Reliability Standard TPL-007-1 contains “requirements to develop the models, studies, and assessments necessary to build a picture of overall GMD vulnerability and identify where mitigation measures may be necessary.” NERC explains that mitigating strategies “may include **installation of hardware (e.g., GIC blocking or monitoring devices)**, equipment upgrades, training, or enhanced Operating Procedures.* Therefore, hardware may only mean GIC blocking or monitoring devices, but it can also include equipment upgrades.

Likes 1

Darnez Gresham, N/A, Gresham Darnez

Dislikes 0

Response

Thank you for your comment. The standard is not prescriptive in listing the various hardware and non-hardware options. Some hardware and non-hardware options are listed in Requirement R7.1.

Neil Swearingen - Salt River Project - 1,3,5,6 - WECC

Answer

Yes

¹² TPLTF document is found at the end of this document in Attachment 1.

Question 5

Document Name

Comment

SRP requests clarification of the phrase "one year" used in 7.2, such as "one calendar year" or "15 months".

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT notes that the use of the term "one year" is sufficiently clear.

Stephanie Burns - Stephanie Burns On Behalf of: Michael Moltane, International Transmission Company Holdings Corporation, 1; - Stephanie Burns

Answer

Yes

Document Name

Comment

The deadlines appear to be reasonable (1 year to come up with a CAP when required; 2-years from CAP determination to implement any non-hardware related solutions; 4-years from CAP determination to implement any hardware related solutions; and exceptions for not meeting deadlines for factors beyond the control of the responsible entity)

Likes 0

Dislikes 0

Response

Thank you for your comments.

Shannon Mickens - Southwest Power Pool, Inc. (RTO) - 2 - SPP RE, Group Name SPP Standards Review Group

Answer

Yes

Document Name

Question 5

Comment

Given the specificity of the Paragraphs 101 and 102 directives of FERC Order No. 830 Paragraph 44, the SPP Standards Review Group believes that the SDT had little flexibility when developing the proposed language of Requirement R7. We agree with the proposed Requirement R7, as presented.

The group would like to reiterate the suggestion that the Supplemental GMD Event nomenclature be changed to Extreme Value GMD Event, as explained in the group's discussion of Question Q2.

Likes	0
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Dislikes	0
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Response

Thank you for supporting the [SPP TPLTF](#) comments¹³ on the TPL-007-2 standard. The IMAGE dataset is the most complete and comprehensive data available and is therefore the best data source available to support the development of the standard.

Although the four events mentioned in the Supplemental Geomagnetic Event Description document all occurred in northern latitudes, there is no evidence that the local enhancement effect only occurs in high latitudes. Based on the past experiences with the IMAGE data, it is not expected that the coastal effect has a significant effect on the geomagnetic fields that were used in the extreme value analysis.

Elizabeth Axson - Electric Reliability Council of Texas, Inc. - 2, Group Name IRC Standards Review Committee

Answer	Yes
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Document Name	
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Comment

IRC agrees with the proposed deadlines as long as any delays with implementing a CAP due to tariff or regional requirements for conducting a stakeholder planning process when developing system upgrades associated with a CAP are considered to be "beyond the control of the responsible entity." Further, IRC is encouraged that the implementation plan for TPL-007-2 includes a one year period between the completion of the vulnerability assessment in R4 and the completion of any needed CAPs according to R7. IRC believes that this is in

¹³ TPLTF document is found at the end of this document in Attachment 1.

Question 5

acknowledgement that the analysis in R4 (and possibly R6) may need to be repeated during the development of CAPs due to the iterative nature of the CAP development process.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has added additional language to the end of the “Rationale for Requirement R7.”

Randy Buswell - VELCO -Vermont Electric Power Company, Inc. - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Lauren Price - American Transmission Company, LLC - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 5

Response

Rolynda Shumpert - SCANA - South Carolina Electric and Gas Co. - 1,3,5,6 - SERC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Ann Ivanc - FirstEnergy - FirstEnergy Solutions - 6

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Aaron Cavanaugh - Bonneville Power Administration - 1,3,5,6 - WECC

Answer Yes

Question 5

Document Name

Comment

Likes 0

Dislikes 0

Response

Daniel Grinkevich - Con Ed - Consolidated Edison Co. of New York - 1

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Michael Shaw - Lower Colorado River Authority - 6, Group Name LCRA Compliance

Answer

Yes

Document Name

Comment

Likes 0

Question 5

Dislikes 0

Response

Robert Blackney - Edison International - Southern California Edison Company - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Gerry Huitt - Xcel Energy, Inc. - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Michelle Amarantos - APS - Arizona Public Service Co. - 1

Question 5

Answer	Yes
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Document Name	
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Comment	
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Likes 0	
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Dislikes 0	
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Response

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Laura Nelson - IDACORP - Idaho Power Company - 1

Answer	Yes
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Document Name	
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Comment	
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Likes 0	
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Dislikes 0	
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Response

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Jeffrey Watkins - Jeffrey Watkins On Behalf of: Eric Schwarzrock, Berkshire Hathaway - NV Energy, 5; - Jeffrey Watkins

Answer	Yes
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Document Name	
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Comment	
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Question 5

Likes 0

Dislikes 0

Response

Colby Bellville - Colby Bellville On Behalf of: Dale Goodwine, Duke Energy , 6, 5, 3, 1; - Colby Bellville, Group Name Duke Energy

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Payam Farahbakhsh - Hydro One Networks, Inc. - 1

Answer Yes

Document Name

Comment

Likes 1 Hydro One Networks, Inc., 3, Malozewski Paul

Dislikes 0

Response

Question 5

Glen Farmer - Avista - Avista Corporation - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Douglas Webb - Douglas Webb On Behalf of: Chris Bridges, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Harold Wyble, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; James McBee, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Jessica Tucker, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; - Douglas Webb

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company

Answer Yes

Question 5

Document Name

Comment

Likes 0

Dislikes 0

Response

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name RSC no Hydro One, HQ and IESO

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

James Anderson - CMS Energy - Consumers Energy Company - 1,3,4,5

Answer Yes

Document Name

Comment

Likes 0

Question 5

Dislikes 0

Response

Michael Buyce - City Utilities of Springfield, Missouri - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Rachel Coyne - Texas Reliability Entity, Inc. - 10

Answer

Document Name

Comment

Texas RE acknowledges the SDT made the decision to not require entities have a Corrective Action Plan for the supplemental GMD Vulnerability Assessment if the System does not meet the performance requirements indicated in Attachment 1. Requirement R8 Part 8.3 requires that if the supplemental GMD Vulnerability Assessment concludes there is Cascading, an evaluation of possible actions designed to reduce the likelihood or mitigate the consequences and adverse impacts of the event(s) shall be conducted. Texas RE recommends the responsible entity also conduct an evaluation of possible actions designed to reduce the likelihood or mitigation the consequences and adverse impacts of voltage collapse and uncontrolled islanding.

Likes 0

Question 5

Dislikes 0

Response

Thank you for your comment. The SDT notes that Requirement R8.3 is sufficiently clear.

Thomas Rafferty - Edison International - Southern California Edison Company - 5

Answer

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison

Likes 0

Dislikes 0

Response

No comments were submitted.

Richard Vine - California ISO - 2

Answer

Document Name

Comment

The California ISO supports the joint comments of the ISO/RTO Standards Review Committee

Likes 0

Dislikes 0

Response

Thank you for supporting the comments of the IRC Standards Review Committee (i.e., ISO/RTO Standards Review Committee).

Question 6

6. The SDT developed Requirements R11 and R12 to address FERC directives in Order No. 830 for requiring responsible entities to collect GIC monitoring and magnetometer data (P. 88; P. 90-92). Do you agree with the proposed requirements? If you do not agree, or if you agree but have comments or suggestions for the proposed requirements provide your recommendation and explanation.

Terry Harbour - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1

Answer No

Document Name

Comment

Comment #1:

Modify R11 and R12 to replace “Planning Coordinator Area” with the term “respective area” or “responsible area”. This is consistent with TPL-007-1 and TPL-001-4. See example below:

R12. Each responsible entity, as determined in Requirement R1, shall implement a process to obtain geomagnetic field data for its respective Planning Coordinator’s planning area.

Comment #2:

NSRF believes that the reference to “GMD measurement data” in R1 should be changed to align with the language in requirements R11 and R12. The term GMD measurement data is general and could be interpreted to include data that is outside the scope of the standard. The NSRF suggest the following changes to R1:

R1. Each Planning Coordinator, in conjunction with its Transmission Planner(s), shall identify the individual and joint responsibilities of the Planning Coordinator and Transmission Planner(s) in the Planning Coordinator’s planning area for maintaining models, performing the study or studies needed to complete benchmark and supplemental GMD Vulnerability Assessments, and implementing process(es) to obtain GIC monitor data and geomagnetic field data GMD measurement data as specified in this standard.

Likes 0

Dislikes 0

Response

Thank you for your comment.

Question 6

#1. The SDT considers the Planning Coordinators to be the most applicable entity, covering the appropriate area, for implementing processes related to Requirements R11 and R12 to obtain GIC monitor data from at least one GIC monitor and geomagnetic field data, respectively.

#2. The benchmark and supplemental GMD vulnerability assessments in Requirement R1 refers to Requirements R4-R7 and R8-R10, respectively, while the GMD measurement data refers to Requirements R11-R12, i.e., GMD monitor data and geomagnetic field data. The SDT has added text in the Rationale for Requirements R11 and R12 that GMD measurement data refers to GMD monitor data and geomagnetic field data.

Dennis Sismaet - Northern California Power Agency - 6

Answer	No
Document Name	
Comment	
Increased costs do not justify the low, if any, reliability benefits	
Likes	0
Dislikes	0

Response

Thank you for your comment. The SDT believes that the requirements to implement processes to obtain GIC monitor data and geomagnetic field data are needed for model validation. The SDT is being responsive to the Standards Authorization Request.

Marty Hostler - Northern California Power Agency - 5

Answer	No
Document Name	
Comment	
Increased costs do not justify the low, if any, reliability benefits.	
Likes	0

Question 6

Dislikes 0

Response

Thank you for your comment. The SDT believes that the requirements to implement processes to obtain GIC monitor data and geomagnetic field data are needed for model validation. The SDT is being responsive to the Standards Authorization Request.

Chris Scanlon - Exelon - 1

Answer

No

Document Name

Comment

The Rationale section for R11 and R12 and the Application Guidelines section for R11 include a statement about using Hall Effect transducers on the transformer neutrals. There are many technically correct approaches for monitoring geomagnetically induced currents and the standard should not inadvertently advocate for one method of monitoring over another. The statement should be removed and if necessary, include a reference to IEEE C57.163 which discusses monitoring.

The R11 and R12 rationale section makes reference to the terms “geomagnetic field data” and “geomagnetic field data product”. What is the difference? The term “product” should be clarified.

Likes 0

Dislikes 0

Response

Thank you for your comment. The rationale box is intended to provide guidance and not to necessarily advocate a particular method. The phrase “geomagnetic field data product” is an estimate of the geomagnetic field for a particular geographic location.

Brian Van Gheem - ACES Power Marketing - 6 - NA - Not Applicable, Group Name ACES Standards Collaborators

Answer

No

Document Name

Comment

Question 6

1. We believe the requirements should clarify expected processes once GIC monitoring and magnetometer data is collected. Are responsible entities expected to include this information in their models that are required for Requirement R2? Are they expected to provide this information to their Reliability Coordinator for inclusion in its GMD Operating Plan in NERC Reliability Standard EOP-010-1? We believe the associated FERC directives could be incorporated into Requirement R1, which already requires an entity-coordinated process to identify the collection of GMD data measurements. We see benefits in enhancing Requirement R1 to include subparts for maintaining models, performing studies for GMD Vulnerability Assessments, and GIC monitoring and magnetometer data collection, including within its associated Violation Severity Limits.
2. The reference to the collection of data for the entire Planning Coordination Area is too broad and burdensome for the applicability of these requirements. We believe the identified collection area should be reflective of the applicability, to that of the responsible entity's planning area.

Likes 0

Dislikes 0

Response

Thank you for your comment.

1. The SDT is being responsive to the Standards Authorization Request to collect geomagnetically induced current monitoring and magnetometer data as necessary to enable model validation and situational awareness. The commenter is suggesting changes to EOP-010-1, which is an existing standard and outside the scope of the SAR.
2. The SDT considers the Planning Coordinators to be the most applicable entity, covering the appropriate area, for implementing processes related to requirements R11 and R12 to obtain GIC monitor data from at least one GIC monitor and geomagnetic field data.

Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company

Answer

No

Document Name

Comment

1. Paragraph 2, page 11 of 42 of proposed TPL-007-2, under GMD Measurement Data Process (blue box) – the Drafting Team states that “ Technical considerations for GIC monitoring are contained in Chapter 6 of the 2012 Special Reliability...” This information is

Question 6

contained in Chapter 9 and not in Chapter 6 of the Interim Report. Please update this section as well as the first sentence immediately under R11 in page 38 of 42. In addition, we recommend that the Drafting Team includes a link to the report as it is difficult to find.

2. Requirement 12, page 12 or 42, requires that “Each responsible entity...shall implement a process to obtain geomagnetic field data for its Planning Coordinator’s planning area.” This requirement appears to be in direct contradiction to the last sentence contained inside the ‘blue box’ same page; which states: “The geomagnetic field data product does not need to be derived from a magnetometer or observatory within the Planning Coordinator’s planning area”. We request clarification. And, if the magnetometer data needs to be extrapolated, we recommend that the drafting team provides guidance.
3. Draft 1 of TPL-007-2, page 38 of 42, under Monitor specifications –
 - i. monitor data range (i.e., -500 A to +500 A CT), will this monitor specification be a recommendation or requirement? We recommend the Drafting Team to provide clarification. Note this section references the NERC 2012 GMD report and in the 2012 report it is stated “The DC sensor should accommodate at least +/- 500 amps of DC current...”. Referencing the 2012 GMD Report creates confusion.
 - ii. ambient temperature ratings, we recommend the SDT to provide clarification; i.e., does the monitor need to include the ability to measure ambient temperature and should we log the station ambient temperatures.

Likes 0

Dislikes 0

Response

Thank you for your comment.

1. The SDT would like to express our thanks for pointing out the typo in the rationale box for requirements R11 and R12 with respect to chapter number in the 2012 Special Reliability Assessment Interim Report: Effects of Geomagnetic Disturbances on the Bulk-Power System (NERC 2012 GMD Report).
2. The SDT considers the Planning Coordinators to be the most applicable entity, covering the appropriate area, for implementing processes related to requirements R11 and R12 to obtain GIC monitor data from at least one GIC monitor and geomagnetic field data. The phrase “geomagnetic field data product” is an estimate of the geomagnetic field for a particular geographic location. The standard allows flexibility to collect the geomagnetic field data or use the geomagnetic field data product to obtain the data as necessary.
3. The text in the Guidelines and Technical Basis related to requirement R11, which refers to the technical considerations for GIC monitoring based on the NERC 2012 GMD Report [Chapter 9] as well as the Intermagnet Technical Reference Manual, provides

Question 6

guidelines and recommendations that are not part of the TPL-007-2 requirements. The “monitor” specifications only need to consider the ambient ratings of the monitoring equipment based on their location.

Jeffrey Watkins - Jeffrey Watkins On Behalf of: Eric Schwarzrock, Berkshire Hathaway - NV Energy, 5; - Jeffrey Watkins

Answer No

Document Name

Comment

Depending on the size of the planning area, one GIC and magnetometer value may not provide sufficient data to accurately provide model validation. Some additional guidance would also be helpful for determining where to place monitoring equipment so that the equipment is installed in a location that can provide meaningful data. NV Energy would prefer the SDT consider adding additional details on determining the placement of equipment and consider adding detail to add more than one monitoring equipment when appropriate. R11 and R12 requires data to be collected, but does not require anything to be done with the data. With no requirement to do anything with data collected, it seems like these two requirements place an unnecessary task on entities. Additionally, R12 allows entities to collect geomagnetic from sources such as observatories operated by the US Geological Survey. With no requirements to do anything with the data, R12 is asking entities to log onto a website and periodically collect data. NV Energy would like to see these standards expanded upon to require this data to be collected and then used for GMD model validation.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request to require responsible entities to collect geomagnetically induced current monitoring and magnetometer data as necessary to enable model validation and situational awareness. The NERC 2012 GMD Report and the Intermagnet Technical Reference Manual provide considerations for developing a process to obtain GIC monitor data and are summarized under Requirement R11 in the Guidelines and Technical Basis section of the TPL-007-2 standard.

Eric Shaw - Eric Shaw On Behalf of: Lee Maurer, Oncor Electric Delivery, 1; - Eric Shaw

Answer No

Document Name

Question 6

Comment

One GIC monitor and magnetometer value in the Planning Coordinator's planning area does not provide enough data to enable model validation and situational awareness

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT considers the Planning Coordinators to be the most applicable entity, covering the appropriate area, for implementing processes related to requirements R11 and R12 to obtain GIC monitor data from at least one GIC monitor and geomagnetic field data.

Nicolas Turcotte - Hydro-Québec TransEnergie - 1

Answer

No

Document Name

Comment

Magnetometers data are already available from Natural Resources Canada and from Universities research groups, therefore, there is no need to collect them.

In the control room, Hydro-Quebec monitors and collects the impact of GMDs by using voltage distortion level. GIC currents are also collected at different location on the network but they are not used in the control room. The acquisition of these data should be added to the EOP-010-1 reliability standard under the RC supervision and the RC shall transmit them as requested by the PC.

Hydro-Quebec supports initiatives that can be used to monitor and validate, with real measures, the GMD's impact on the network.

Likes 0

Dislikes 0

Response

Thank you for your comment. As described in the Rationale Box (blue box) on Rationale for Requirements R11 and R12, sources of geomagnetic field data include: Observatories such as those operated by U.S. Geological Survey, Natural Resources Canada, research

Question 6

organizations, or university research facilities; Installed magnetometers; and Commercial or third-party sources of geomagnetic field data. The SDT is being responsive to the Standards Authorization Request. The comment is suggesting changes to EOP-010-1, which is an existing standard and outside the scope of the SAR.

Neil Swearingen - Salt River Project - 1,3,5,6 - WECC

Answer	No
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Document Name	
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Comment

SRP supports AZPS's response to question 6.

Likes	0
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Dislikes	0
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Response

Thank you for your comment. Since the GIC monitoring data collection requirement is to have at least one GIC monitor located in the Planning Coordinator's planning area, and not each transmission owner being required to collect GIC monitoring data, the SDT does not believe the exemption from the GIC monitoring data collection requirement discussed in Paragraph 91 of FERC Order No. 830 is applicable. The SDT considers the Planning Coordinators to be the most applicable entity, covering the appropriate area, for implementing processes related to requirements R11 and R12 to obtain GIC monitor data from at least one GIC monitor and geomagnetic field data, and hence the SDT sees no need for a threshold. The SDT supports use of different thresholds for the benchmark and the supplemental GMD Vulnerability Assessments. The collection of GIC monitor data and geomagnetic field data per Requirements R11 and R12 provide a basis for enabling model validation and situational awareness, as discussed in FERC order 830. As such, GIC data collection is necessary regardless of any GIC threshold.

Chantal Mazza - Hydro-Québec TransEnergie - 1,2 - NPCC

Answer	No
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Document Name	
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Comment

Question 6

Magnetometers data are already available from Natural Resources Canada and from Universities research groups, therefore, there is no need to collect them.

In the control room, Hydro-Quebec monitors and collects the impact of GMDs by using voltage distortion level. GIC currents are also collected at different location on the network but they are not used in the control room. The acquisition of these data should be added to the EOP-010-1 reliability standard under the RC supervision and the RC shall transmit them as requested by the PC.

Hydro-Quebec supports initiatives that can be used to monitor and validate, with real measures, the GMD's impact on the network.

Likes 0

Dislikes 0

Response

Thank you for your comment. As described in the Rationale Box (blue box) on Rationale for Requirements R11 and R12, sources of geomagnetic field data include: Observatories such as those operated by U.S. Geological Survey, Natural Resources Canada, research organizations, or university research facilities; Installed magnetometers; and Commercial or third-party sources of geomagnetic field data. The SDT is being responsive to the Standards Authorization Request. The comment is suggesting changes to EOP-010-1, which is an existing standard and outside the scope of the SAR.

Michelle Amarantos - APS - Arizona Public Service Co. - 1

Answer

No

Document Name

Comment

Per Paragraph 91 of FERC Order No. 830, a transmission owner should be able to apply for an exemption from the GIC monitoring data collection requirement if it demonstrates that no or little value would be added to Planning and Operations. The capability to request such exemption is not, however, clearly indicated within Requirements R11 and R12. AZPS respectfully recommends that such language be included.

AZPS further recommends that the SDT utilize language similar to that included in Requirement R10, which includes language that limits the need to [conduct a supplemental thermal impact assessment for applicable BES power transformers where the maximum effective GIC value provided in R9, Part 9.1 is 85 A per phase or greater]. AZPS proposes that similar language be added in Requirements R11 and R12 so that these requirements only apply where the maximum effective GIC value of applicable BES power transformers provided in R9, Part 9.1 is 85 A

Question 6

per phase or greater. Such would ensure that the same operational threshold is applied throughout these related requirements, providing consistency and an established threshold for determining need from the operational/planning perspective.

Additionally, as noted in AZPS's comments to question 3 above, AZPS's request here is primarily for consistency and, while it recommends a threshold of 85 A per phase or greater, its recommendation could be achieved through the consistent application of that value or the 75 A per phase or greater.

Likes	0
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Dislikes	0
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Response

Thank you for your comment. Since the GIC monitoring data collection requirement is to have at least one GIC monitor located in the Planning Coordinator's planning area, and not each transmission owner being required to collect GIC monitoring data, the SDT does not believe the exemption from the GIC monitoring data collection requirement discussed in Paragraph 91 of FERC Order No. 830 is applicable. The SDT considers the Planning Coordinators to be the most applicable entity, covering the appropriate area, for implementing processes related to requirements R11 and R12 to obtain GIC monitor data from at least one GIC monitor and geomagnetic field data, and hence the SDT sees no need for a threshold. The SDT supports use of different thresholds for the benchmark and the supplemental GMD Vulnerability Assessments. The collection of GIC monitor data and geomagnetic field data per Requirements R11 and R12 provide a basis for enabling model validation and situational awareness, as discussed in FERC order 830. As such, GIC data collection is necessary regardless of any GIC threshold. Different screening thresholds were selected because benchmark and supplemental benchmark waveforms are different and their effects on transformers are different. The temperature thresholds are consistent, i.e., the thermal effects on a transformer are characterized by peak temperatures.

Mike Smith - Manitoba Hydro - 1, Group Name Manitoba Hydro

Answer	No
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Document Name	
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Comment

It's nice to collect data but there's no requirement to do anything with the data, like perform model benchmarking. Collecting data from a single transformer and a single magnetometer may be insufficient to perform any reasonable benchmarking of GMD models. Perhaps this

Question 6

could be written in a style closer to MOD-033, for GMD model validation. The Transmission Planner would document their model validation process.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request to collect geomagnetically induced current monitoring and magnetometer data as necessary to enable model validation and situational awareness. The NERC 2012 GMD Report and the Intermagnet Technical Reference Manual provide considerations for developing a process to obtain GIC monitor data and are summarized under Requirement R11 in the Guidelines and Technical Basis section of the TPL-007-2 standard.

Michael Shaw - Lower Colorado River Authority - 6, Group Name LCRA Compliance

Answer No

Document Name

Comment

The SDT should consider additional details on placement of the monitoring equipment to help guide the installations, similar to PRC-002 and DME. Or, the responsibility for equipment placement guidelines could be delegated (assigned) to the PC to develop at a more local level. Having wide-open equipment monitoring requirements may lead to a lot of wasted investment or inefficient monitoring.

Likes 0

Dislikes 0

Response

Thank you for your comment. Technical considerations for GIC monitoring are contained in the NERC 2012 GMD Report as well as the Intermagnet Technical Reference Manual provide considerations to address during the development of a process for obtaining GIC monitor are provided under Requirement R11 in the Guidelines and Technical Basis section.

Thomas Foltz - AEP - 5

Answer No

Question 6

Document Name

Comment

American Electric Power does not believe R11 and R12 are explicitly clear in their intent, or state exactly who is required to meet the obligations. The latter may perhaps be inferred by R1, however AEP requests clarity and specificity within R11 and R12 themselves.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request to develop revisions to the standard to require responsible entities to collect geomagnetically induced current monitoring and magnetometer data as necessary to enable model validation and situational awareness.

The NERC 2012 GMD Report and the Intermagnet Technical Reference Manual provide considerations for developing a process to obtain GIC monitor data and are summarized under Requirement R11 in the Guidelines and Technical Basis section of the TPL-007-2 standard.

The individual or joint responsibilities of the applicable entities are defined per Requirement R1.

Shannon Mickens - Southwest Power Pool, Inc. (RTO) - 2 - SPP RE, Group Name SPP Standards Review Group

Answer

Yes

Document Name

Comment

Despite the added cost to implement additional monitoring and data collection, the SPP Standards Review Group agrees that the SDT developed a reasonable approach to the FERC directives in Order No. 830 Paragraph 88.

Likes 0

Dislikes 0

Response

Thank you for your comment.

Question 6

Stephanie Burns - Stephanie Burns On Behalf of: Michael Moltane, International Transmission Company Holdings Corporation, 1; - Stephanie Burns

Answer Yes

Document Name

Comment

FERC required additional data for model validation and situational awareness purposes. The SDT developed requirements allow for the collection of GIC data and magnetometer data (which could come from existing monitoring equipment where available and appropriate) as opposed to necessarily mandating installation of new equipment to obtain the specified data. Responsible entities can thus partner with government agencies or research facilities that operate magnetometers to obtain some of the required data.

Likes 0

Dislikes 0

Response

Thank you for your comment.

Larisa Loyferman - CenterPoint Energy Houston Electric, LLC - 1 - Texas RE

Answer Yes

Document Name

Comment

CenterPoint Energy agrees with the proposed requirement as written. Furthermore, CenterPoint Energy supports the Commission's determination in P. 92 that requiring data rather than requiring installation of GIC monitors and magnetometers affords greater flexibility while still obtaining benefits. However CenterPoint Energy would not support any revisions that would require installation of devices or the release of entity's protected information.

Likes 0

Dislikes 0

Question 6

Response

Thank you for your comment.

Karie Barczak - DTE Energy - Detroit Edison Company - 3

Answer Yes

Document Name

Comment

Will this result in a directive for a GO or TO to install GIC monitoring, or will the responsible entity simply get data from existing monitors in its area?

Likes 0

Dislikes 0

Response

Thank you for your comment. The individual or joint responsibilities of the applicable entities are defined in Requirement R1 and a process to obtain GIC monitor data in Requirement R11.

Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF

Answer Yes

Document Name

Comment

Comment #1:

Modify R11 and R12 to replace "Planning Coordinator Area" with the term "respective area" or "responsible area". This is consistent with TPL-007-1 and TPL-001-4. See example below:

R12. Each responsible entity, as determined in Requirement R1, shall implement a process to obtain geomagnetic field data for its respective Planning Coordinator's planning area.

Comment #2:

Question 6

NSFR believes that the reference to “GMD measurement data” in R1 should be changed to align with the language in requirements R11 and R12. The term GMD measurement data is general and could be interpreted to include data that is outside the scope of the standard. The NSRF suggest the following changes to R1:

R1. Each Planning Coordinator, in conjunction with its Transmission Planner(s), shall identify the individual and joint responsibilities of the Planning Coordinator and Transmission Planner(s) in the Planning Coordinator’s planning area for maintaining models, performing the study or studies needed to complete benchmark and supplemental GMD Vulnerability Assessments, and implementing process(es) to obtain GIC monitor data and geomagnetic field data GMD measurement data as specified in this standard.

Likes	1	Darnez Gresham, N/A, Gresham Darnez
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Dislikes	0	
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Response

Thank you for your comment.

#1. The SDT considers the Planning Coordinator’s planning area to be the most appropriate area for implementing processes related to Requirements R11 and R12 to obtain GIC monitor data from at least one GIC monitor and geomagnetic field data, respectively.

#2. Requirement R1 is sufficiently clear. The benchmark and supplemental GMD vulnerability assessments in Requirement R1 refers to Requirements R4-R7 and R8-R10, respectively, while the GMD measurement data refers to Requirements R11-R12, i.e., GIC monitor data and geomagnetic field data. The SDT has added text in the Rationale for Requirements R11 and R12 that GMD measurement data refers to GIC monitor data and geomagnetic field data.

Laura Nelson - IDACORP - Idaho Power Company - 1

Answer	Yes
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Document Name	
---------------	--

Comment

In R12, it is not clear how much geomagnetic field data, from a time & space perspective, the responsible entity would be required to obtain for its Planning Coordinator Planning Area.

Question 6

Likes 0

Dislikes 0

Response

Thank you for your comment. Requirement R12 does not specify how geomagnetic field data is to be collected from a time and space perspective. The individual or joint responsibilities of the applicable entities are defined in Requirement R1, including responsibilities related to implementation of a process for obtaining geomagnetic field data in Requirement R12.

sean erickson - Western Area Power Administration - 1

Answer Yes

Document Name

Comment

[TPLTF](#)¹⁴ Discussion: Despite the added cost to implement additional monitoring and data collection, the group agrees that the SDT developed a reasonable approach to the FERC directives in Order No. 830 Paragraph 88.

Likes 0

Dislikes 0

Response

Thank you for your comment.

Lauren Price - American Transmission Company, LLC - 1

Answer Yes

Document Name

Comment

¹⁴ TPLTF document is found at the end of this document in Attachment 1.

Question 6

This will help refine future assessment requirements as to how applicable the Benchmark and Supplemental Event screening criteria are in comparison compared to actual recorded GMD events.

Likes 0

Dislikes 0

Response

Thank you for your comment.

William Harris - Foundation for Resilient Societies - 8

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Sergio Banuelos - Tri-State G and T Association, Inc. - 1,3,5 - MRO,WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 6

Response

Elizabeth Axson - Electric Reliability Council of Texas, Inc. - 2, Group Name IRC Standards Review Committee

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Michael Buyce - City Utilities of Springfield, Missouri - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

James Anderson - CMS Energy - Consumers Energy Company - 1,3,4,5

Answer Yes

Question 6

Document Name

Comment

Likes 0

Dislikes 0

Response

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name RSC no Hydro One, HQ and IESO

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

David Ramkalawan - Ontario Power Generation Inc. - 5

Answer

Yes

Document Name

Comment

Likes 0

Question 6

Dislikes 0

Response

Quintin Lee - Eversource Energy - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Douglas Webb - Douglas Webb On Behalf of: Chris Bridges, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Harold Wyble, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; James McBee, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Jessica Tucker, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; - Douglas Webb

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 6

Donald Lock - Talen Generation, LLC - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Glen Farmer - Avista - Avista Corporation - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Payam Farahbakhsh - Hydro One Networks, Inc. - 1

Answer Yes

Document Name

Question 6

Comment

Likes 1 Hydro One Networks, Inc., 3, Malozewski Paul

Dislikes 0

Response

Joshua Eason - Joshua Eason On Behalf of: Michael Puscas, ISO New England, Inc., 2; - Joshua Eason

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laurie Williams - PNM Resources - Public Service Company of New Mexico - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 6

Response

Gerry Huitt - Xcel Energy, Inc. - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Robert Blackney - Edison International - Southern California Edison Company - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Daniel Grinkevich - Con Ed - Consolidated Edison Co. of New York - 1

Answer Yes

Question 6

Document Name

Comment

Likes 0

Dislikes 0

Response

Aaron Cavanaugh - Bonneville Power Administration - 1,3,5,6 - WECC

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Ann Ivanc - FirstEnergy - FirstEnergy Solutions - 6

Answer

Yes

Document Name

Comment

Likes 0

Question 6

Dislikes 0

Response

RoLynda Shumpert - SCANA - South Carolina Electric and Gas Co. - 1,3,5,6 - SERC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Randy Buswell - VELCO -Vermont Electric Power Company, Inc. - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Richard Vine - California ISO - 2

Question 6

Answer

Document Name

Comment

The California ISO supports the joint comments of the ISO/RTO Standards Review Committee

Likes 0

Dislikes 0

Response

Thank you for supporting the comments of the IRC Standards Review Committee (i.e., ISO/RTO Standards Review Committee).

Thomas Rafferty - Edison International - Southern California Edison Company - 5

Answer

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison

Likes 0

Dislikes 0

Response

No comments were submitted.

Brandon McCormick - Brandon McCormick On Behalf of: Carol Chinn, Florida Municipal Power Agency, 5, 6, 4, 3; David Schumann, Florida Municipal Power Agency, 5, 6, 4, 3; Ginny Beigel, City of Vero Beach, 3; Jeffrey Partington, Keys Energy Services, 4; Joe McKinney, Florida Municipal Power Agency, 5, 6, 4, 3; Mike Blough, Kissimmee Utility Authority, 5, 3; Richard Montgomery, Florida Municipal Power Agency, 5, 6, 4, 3; Tom Reedy, Florida Municipal Power Pool, 6; - Brandon McCormick, Group Name FMPA

Answer

Question 6

Document Name

Comment

We appreciate the SDT effort to satisfy the requirement of FERC Order No. 830 for the collection of GIC and Magnetometer Data. Currently, R11 and R12 only say to collect the data. We would encourage the drafting team to add language to R11 and R12 that the process document developed by the responsible entity point to the amount of data required, who collects it, who to give it to, and how long to maintain it.

Likes 0

Dislikes 0

Response

Thank you for your comment. The individual or joint responsibilities of the applicable entities are defined in Requirement R1 and to implement a process for obtaining GIC monitoring data and geomagnetic field data in Requirements R11 and R12, respectively.

Rachel Coyne - Texas Reliability Entity, Inc. - 10

Answer

Document Name

Comment

Since the Rationale for Requirements R11 and R12 use the term “as necessary”, Texas RE recommends adding the term “as necessary” as a periodicity to the language of Requirements R11 and R12.

Requirement R11 requires a GIC monitor located in the Planning Coordinator’s planning area. The map showing the USGS observatories (<https://geomag.usgs.gov/monitoring/observatories/>) indicates that there is not a USGS monitor in each PC’s planning area. There may be monitoring data available for GIC in the PC’s planning area that is not located within the planning area. Texas RE recommends revising the language to say “Each responsible entity.....from at least one GIC monitor that is monitoring equipment within the Planning Coordinator’s planning area for each earth model represented.....”.

Likes 0

Dislikes 0

Question 6

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request to require responsible entities to collect geomagnetically induced current monitoring and magnetometer data as necessary to enable model validation and situational awareness.

The standard requires data to be obtained from at least one GIC monitor located in the Planning Coordinator's planning area or other part of the system included in the Planning Coordinator's GIC System model (Requirement R11) and geomagnetic field data for its Planning Coordinator's planning area (Requirement R12).

Question 7

7. Do you agree with the proposed Implementation Plan for TPL-007-2? If you do not agree, or if you agree but have comments or suggestions for the Implementation Plan provide your recommendation and explanation.

Kristine Ward - Seminole Electric Cooperative, Inc. - 1,3,4,5,6 - FRCC

Answer No

Document Name

Comment

Comments: The effective date of the revised Standard being only 3 months after FERC's approval is too short. There is no need to rush this new Standard as there are substantial revisions. Seminole recommends a minimum of 12 months after approval

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has revised the Implementation Plan based on comments received. See the revised Implementation Plan.

Mike Smith - Manitoba Hydro - 1, Group Name Manitoba Hydro

Answer No

Document Name

Comment

There should be trial period for industry to gain understanding and knowledge of GMD before implementing a standard.

Likes 0

Dislikes 0

Response

Question 7

Thank you for your comment. The existing standard is already approved and the SDT is being responsive to the Standards Authorization Request. Requiring a trial period is outside the scope of this SDT.

Michelle Amarantos - APS - Arizona Public Service Co. - 1

Answer No

Document Name

Comment

AZPS requests more clarity regarding the due date of the supplemental assessment (TPL-007-2 Requirement R8). If the effective date of TPL-007-2 is before the January 1, 2021 and the studies are performed concurrently, what is the due date of the supplemental assessment (TPL-007-2 Requirement R8)? According to the implementation plan, both assessments would be due 42 months after the effective date of TPL-007-2. If such is an accurate statement of the appropriate study deadlines, AZPS requests that the SDT clarify this in its guidance, FAQs, or other document.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has revised the Implementation Plan based on comments received. See the revised Implementation Plan.

Chantal Mazza - Hydro-Québec TransEnergie - 1,2 - NPCC

Answer No

Document Name

Comment

See comments for Question 1.

Likes 0

Dislikes 0

Question 7

Response

Thank you for your comment, see response in Q1.

Laura Nelson - IDACORP - Idaho Power Company - 1

Answer

No

Document Name

Comment

It is not clear why there is a difference in compliance implementation dates for the various requirements between the two Implementation Plan options. It would seem logical that they both would have the same compliance implementation date with respect to the effective date of the Standard.

There does not appear to be a compliance date for R6 if TPL-007-2 becomes effective on or after January 1, 2021.

TPL-007-1 has a compliance date for R5 on January 1, 2019. It is not clear what this date would be if the new standard becomes effective before that date.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has revised the Implementation Plan based on comments received. See the revised Implementation Plan.

Nicolas Turcotte - Hydro-Québec TransEnergie - 1

Answer

No

Document Name

Comment

See comments for Question 1.

Likes 0

Question 7

Dislikes 0

Response

Laurie Williams - PNM Resources - Public Service Company of New Mexico - 1

Answer No

Document Name

Comment

The current implementation plan doesn't contain an implementation date for R1 which implies an effective date of the first day of the first calendar quarter that is three month after FERC approval. Planning Coordinators will need time to update their document identifying individual and joint responsibility to include the supplemental GMD Vulnerability Assessment and a process to obtain GMD measurement data. Entities should be given a minimum of 6 months after the approval of the standard to update R1 documentation since it does require coordination with Transmission Planners.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has revised the Implementation Plan based on comments received. See the revised Implementation Plan.

Larisa Loyferman - CenterPoint Energy Houston Electric, LLC - 1 - Texas RE

Answer No

Document Name

Comment

Question 7

CenterPoint Energy disagrees with the proposed Implementation Plan for TPL-007-2. CenterPoint Energy recommends delaying the implementation of Requirement 8 through 10 until after one complete cycle of Requirements R4 through R6. CenterPoint Energy's recommendation is based on the following:

- The efforts already required for compliance with TPL-007-1 that necessitate data sharing, model building, process creation, and first-of-its-kind analysis are already significant. The analysis tools needed for completion of the Vulnerability Assessment required by TPL-007-1 are not available in the industry at this time. The NERC GMD Task Force identified Task 7 to develop tools for system-wide harmonic assessment; however, this task is not scheduled to be complete until the fourth quarter of 2019.
- The additional efforts necessary to comply with Requirements R8 – R10 within the same timeline will result in an unreasonable resource burden that does not provide commensurate reliability benefits.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has proposed the phasing-in of version 2 into the timing of the implementation of version 1, depending on the timing of approval of the revised standard by FERC.

Joshua Eason - Joshua Eason On Behalf of: Michael Puscas, ISO New England, Inc., 2; - Joshua Eason

Answer

No

Document Name

Comment

ISO-NE does not agree with the January 2021 transition date in the implementation plan. The concern is that the base case used for TPL-007-01 will be obsolete by January 2023 according to the requirement to use a case within the Near-Term Transmission Planning Horizon. Note that the timing for meeting R2 and R4 in TPL-007-1 and the desire to model an as known system as possible (e.g. minimizing the need for case changes as new projects will have been approved and retirements have been announced) has driven ISO-NE to select a study year of 2023. This will create issues when stakeholders review the results and may cause additional study and case building efforts during the first cycle for meeting the new TPL-007-1 reliability standard. ISO-NE proposes that the transition deadline date should be changed from January 2021 to January 2019 or July 2019 so that the base case used for testing with the benchmark waveform according to the known timing for TPL-007-1 can be used for testing the supplemental waveform.

Question 7

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has revised the Implementation Plan based on comments received. See the revised Implementation Plan.

Payam Farahbakhsh - Hydro One Networks, Inc. - 1**Answer**

No

Document Name**Comment**

Consistent with our comments above

Likes 1

Hydro One Networks, Inc., 3, Malozewski Paul

Dislikes 0

Response**Donald Lock - Talen Generation, LLC - 5****Answer**

No

Document Name**Comment**

The four-year hardware implementation deadline in R7.3.2 may be impractical, especially if need for a large number of entities to install GIC blocking devices leads to extended lead-times for this equipment. The same issue was thoroughly investigated by the PRC-025 SDT (see the Implementation Plan for this standard), leading to an 84-months deadline, and we recommend that the TPL-007-2 SDT follow this precedent.

Likes 0

Question 7

Dislikes 0

Response

Thank you for your comment. The SDT notes that the development of the CAP allows one year and four years for completing the hardware mitigation. The standard has included a process for reporting delays in implementation beyond the deadline due to factors outside of the entity's control (R7.4).

Quintin Lee - Eversource Energy - 1

Answer No

Document Name

Comment

The compliance date for Requirement R9 (if TPL-007-2 becomes effective before January 1, 2021) is too short. We would propose a compliance date of 12 months after the effective date of Reliability Standard TPL-007-2 if it becomes effective before January 1, 2021.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has revised the Implementation Plan based on comments received. See the revised Implementation Plan.

Chris Scanlon - Exelon - 1

Answer No

Document Name

Comment

Question 7

The implementation plan is not clear on whether the Standard Drafting Team intends on replacing the effective dates of TPL-007-1 for all requirements with the effective date and compliance dates for TPL-007-2 or carrying forward the TPL-007-1 effective dates. Please provide additional language to outline the SDT's intent with the timing between TPL-007-1 effective dates and TPL-007-2 effective dates. Similarly, as the implementation plan is written, under certain situations, the effective dates for performing the assessments for the supplemental event may not necessarily align with the periodicity for performing the assessments for the benchmark event currently required under TPL-007-1, which may create an unnecessary burden for performing assessments on separate cycles.

Likes	0
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Dislikes	0
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Response

Thank you for your comment. The intent of the TPL-007-2 implementation plan is to integrate the new requirements with the GMD assessment process that is being implemented through TPL-007-1. The implementation plan phases in the new requirements based on the effective dates of TPL-007-1 and the earliest possible date that the FERC approval dates of the new revised standard could occur.

Marty Hostler - Northern California Power Agency - 5

Answer	No
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Document Name	
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Comment

Current implementation dates for requirements 2-6 are January 1, 2021. The implementation plan for TOP-007-2 is confusing. In one bullet it says the effective date is on or before January 1, 2021, and the bullet below it says the effective date is after January 1, 2021.

Likes	0
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Dislikes	0
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Response

Thank you for your comment. The SDT has revised the Implementation Plan based on comments received. See the revised Implementation Plan. Current implementation dates for requirements R2, R3, and R4 is January 2022 and R5 is January 2019 and R6 is January 2021. The intent of the TPL-007-2 implementation plan is to integrate the new requirements with the GMD assessment process that is being

Question 7

implemented through TPL-007-1. The implementation plan phases in the new requirements based on the probable FERC approval dates of the new revised standard.

Sergio Banelos - Tri-State G and T Association, Inc. - 1,3,5 - MRO,WECC

Answer No

Document Name

Comment

As currently written, the implementation plan can actually shorten the current timeframes to become compliant with TPL-007 requirements. It seems that if TPL-007-2 was approved and became effective 7/1/18, then R1, R2, and R5 would also be effective 7/1/18. However, TPL-007-1 R5 isn't supposed to go into effect until 7/1/19. The TPL-007-2 implementation plan should be revised so that entities have at least until the TPL-007-1 effective dates to comply with requirements R1-R7. Tri-State recommends adding language similar to the commonly used "shall become effective on the later of XXXX or the first day of the XX calendar quarter". That would prevent entities from losing time they might have already planned on having to become complaint with R2-R7.

Likes 0

Dislikes 0

Response

Thank you for your comment. The intent of the TPL-007-2 implementation plan is to integrate the new requirements with the GMD assessment process that is being implemented through TPL-007-1. The implementation plan phases in the new requirements based on the effective dates of TPL-007-1 and the earliest possible date that the FERC approval dates of the new revised standard could occur. If so, the effective dates to be compliant with Requirements R1 and R2 would be extended by six months and Requirement R5 would be the same as the effective date. Although possible, it is not likely.

Dennis Sismaet - Northern California Power Agency - 6

Answer No

Document Name

Comment

Question 7

Current implementation dates for requirements 2-6 are January 1, 2021. The implementation plan for TOP-007-2 is confusing. In one bullet, it says the effective date is on or before January 1, 2021, and the bullet below it says the effective date is after January 1, 2021.

Likes 0

Dislikes 0

Response

Thank you for your comment. The intent of the TPL-007-2 implementation plan is to integrate the new requirements with the GMD assessment process that is being implemented through TPL-007-1. The implementation plan phases in the new requirements based on the effective dates of TPL-007-1 and the earliest possible date that the FERC approval dates of the new revised standard could occur. The current compliance dates for TPL-007-1 are not as stated. Please refer to the NERC website for the enforcement dates.

William Harris - Foundation for Resilient Societies - 8

Answer No

Document Name

Comment

We favor a combined standard for GMD and HEMP events, so that the U.S. electric grid is actually protected against severe solar storms and so it can aid in deterrence, protection and recovery from both natural and manmade electromagnetic pulse hazards.

Likes 0

Dislikes 0

Response

Thank you for your comment. Combining GMD with HEMP is outside the scope of this SDT.

Thomas Foltz - AEP - 5

Answer Yes

Document Name

Comment

Question 7

AEP would like clarity on the type of duration (e.g. Calendar Year or Calendar Month) being proposed. This is not explicit in the current draft of the implementation plan.

Likes 0

Dislikes 0

Response

Thank you for your comment. The referenced months that do not use “calendar month” are simply a count of the months following approval.

sean erickson - Western Area Power Administration - 1

Answer Yes

Document Name

Comment

[TPLTF](#)¹⁵ Discussion: The group agrees with the proposed Implementation Plan for TPL-007-2 and does not see any conflicts with the order by which the phased requirements become effective. However, given the lack of available tools, absence of thermal modeling-related data from transformer manufacturers, and the significant training that will be necessary to properly execute transformer thermal assessments, the group believes that the implementation period for Requirement R10 should be at least 48 months after the standard is approved. This suggested implementation period is consistent with the existing implementation period for Requirement R6 (transformer thermal assessment for benchmark GMD event) and should allow sufficient time for many more transformers that may be observed to exceed the supplemental GMD event screening criterion.

Likes 0

Dislikes 0

Response

Thank you for your comment.

¹⁵ TPLTF document is found at the end of this document in Attachment 1.

Question 7

Elizabeth Axson - Electric Reliability Council of Texas, Inc. - 2, Group Name IRC Standards Review Committee

Answer Yes

Document Name

Comment

ISO-NE does not join this response.

Likes 0

Dislikes 0

Response

Randy Buswell - VELCO -Vermont Electric Power Company, Inc. - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Lauren Price - American Transmission Company, LLC - 1

Answer Yes

Document Name

Comment

Question 7

Likes 0

Dislikes 0

Response

RoLynda Shumpert - SCANA - South Carolina Electric and Gas Co. - 1,3,5,6 - SERC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Ann Ivanc - FirstEnergy - FirstEnergy Solutions - 6

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 7

Aaron Cavanaugh - Bonneville Power Administration - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Daniel Grinkevich - Con Ed - Consolidated Edison Co. of New York - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Michael Shaw - Lower Colorado River Authority - 6, Group Name LCRA Compliance

Answer Yes

Document Name

Question 7

Comment

Likes 0

Dislikes 0

Response

Robert Blackney - Edison International - Southern California Edison Company - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Gerry Huitt - Xcel Energy, Inc. - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 7

Response

Neil Swearingen - Salt River Project - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Karie Barczak - DTE Energy - Detroit Edison Company - 3

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Eric Shaw - Eric Shaw On Behalf of: Lee Maurer, Oncor Electric Delivery, 1; - Eric Shaw

Answer Yes

Question 7

Document Name

Comment

Likes 0

Dislikes 0

Response

Jeffrey Watkins - Jeffrey Watkins On Behalf of: Eric Schwarzrock, Berkshire Hathaway - NV Energy, 5; - Jeffrey Watkins

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Glen Farmer - Avista - Avista Corporation - 5

Answer

Yes

Document Name

Comment

Likes 0

Question 7

Dislikes 0

Response

Douglas Webb - Douglas Webb On Behalf of: Chris Bridges, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Harold Wyble, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; James McBee, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Jessica Tucker, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; - Douglas Webb

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Stephanie Burns - Stephanie Burns On Behalf of: Michael Moltane, International Transmission Company Holdings Corporation, 1; - Stephanie Burns

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 7

Response

David Ramkalawan - Ontario Power Generation Inc. - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name RSC no Hydro One, HQ and IESO

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Brian Van Gheem - ACES Power Marketing - 6 - NA - Not Applicable, Group Name ACES Standards Collaborators

Answer Yes

Question 7

Document Name

Comment

Likes 0

Dislikes 0

Response

James Anderson - CMS Energy - Consumers Energy Company - 1,3,4,5

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Shannon Mickens - Southwest Power Pool, Inc. (RTO) - 2 - SPP RE, Group Name SPP Standards Review Group

Answer

Yes

Document Name

Comment

The SPP Standards Review Group agrees with the proposed Implementation Plan for TPL-007-2 and does not see any conflicts with the order by which the phased requirements become effective. However, given the lack of available tools, absence of thermal modeling-related data

Question 7

from transformer manufacturers, and the significant training that will be necessary to properly execute transformer thermal assessments, the group believes that the implementation period for Requirement R10 should be at least 48 months after the standard is approved. This suggested implementation period is consistent with the existing implementation period for Requirement R6 (transformer thermal assessment for benchmark GMD event) and should allow sufficient time for many more transformers that may be observed to exceed the supplemental GMD event screening criterion.

Likes 0

Dislikes 0

Response

Thank you for your comment.

Michael Buyce - City Utilities of Springfield, Missouri - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Terry Harbour - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1

Answer Yes

Document Name

Comment

Question 7

Likes 0

Dislikes 0

Response

Rachel Coyne - Texas Reliability Entity, Inc. - 10

Answer

Document Name

Comment

Texas RE appreciates the SDT's efforts to develop a workable Implementation Plan (IP) for TPL-007-2 that reflects the modifications required by FERC's directives in Order No. 830 while attempting to maintain the original five-year phased implementation timeframe established for TPL-007-1. As presently drafted, however, the proposed TPL-007-1 IP attempts to coordinate the existing TPL-007-1 deadlines with the new TPL-007-2 requirements by shortening the compliance dates under the version 2 standard by 18 months in circumstances in which FERC approves the new version before January 1, 2021. This appears roughly coordinated with the May 2018 filing deadline established in Order No. 830.

While Texas RE does not object to this approach, Texas RE notes that the TPL-007-2 IP, as currently drafted, is complex and could produce several unintended consequences as entities interpret their layered compliance obligation timelines. In particular, the proposed IP requires entities to now potentially track two IPs. For instance, the TPL-007-2 IP is drafted such that the enforceable dates for TPL-007-1 R2, presently July 1, 2018, remain under the original IP. While this is a reasonable approach, the SDT should consider explicitly incorporating the deadlines from the TPL-007-1 IP into the TPL-007-2 IP, at least by reference. By taking this approach, the SDT can ensure that responsible entities clearly understand the relevant compliance dates for each Standard requirement and eliminate confusion regarding which compliance dates are subject to revision and which are not.

Such additional clarity may be particularly important in connection with the enforceable dates for TPL-007-2 R5. Under the TPL-007-1 IP, TPL-007-1 R5 is enforceable on January 1, 2019. The proposed TPL-007-2 IP does not address the enforceable date for TPL-007-2 R5. As such, entities are presumably required to comply with TPL-007-2 R5 on the effective date of the Standard. Texas RE presumes that the SDT anticipates that TPL-007-2 will not be effective and enforceable prior to January 1, 2019 given the May 2018 filing deadline, the period for FERC approval, the 60-day period for the FERC order to become final, and the fact that the Standard does not become effective until the first

Question 7

day of the calendar quarter three months after the FERC order is final. However, given the status of this project, it is possible that NERC may wish to submit a revised TPL-007-2 prior to May 2018. For instance, suppose NERC submits a proposal in January 2018 and FERC issues its order in April 2018. The FERC order would become final by July 1, 2018. As such, TPL-007-2 would become enforceable on October 1, 2018. As a result, entities' compliance deadlines would be inadvertently accelerated from January 1, 2019 to October 1, 2018. The SDT should avoid this possibility by clearly delineating within the TPL-007-2 IP which TPL-007-1 enforceable dates remain applicable. Conversely, the proposed TPL-007-2 IP can be interpreted to extend the compliance deadline for the Benchmark GMD study required under TPL-007 R4 by five years. In particular, the TPL-007-2 IP does not specify an Initial Performance date for the 60-month periodic requirement set forth in TPL-007-2 R4. As such, a plausible reading of the IP is that TPL-007-2 R4 does not become enforceable for 42 months and then, when enforceable, entities have an additional 60 months to complete the Benchmark GMD study under TPL-007-2 R4's periodic performance requirement. This is consistent with NERC's IP guidance in Compliance Application Notice (CAN) No. 12, which states: "[I]n the event the Standard or interpretation is silent with regard to completing a periodic activity, CEAs are to verify that the registered entity has performed the periodic activity within the Standard's timeframe after the enforceable date." (CAN 12 at 1-2). Here, TPL-007-2 R4's enforceable date is set at 42 months from the effective date of the overall Standard. No initial performance date is specified. As such, a responsible entity may reasonably conclude that it has the full 60 month window specified in TPL-007-2 R4 to complete the Benchmark GMD Vulnerability Assessment. This result appears to run counter to the SDT's intent. Texas RE therefore recommends the SDT clearly specify that the initial performance of the TPL-007-2 R4 Benchmark GMD Vulnerability Assessment is due on the enforceable date of that requirement or 42 months from the TPL-007-2 effective date. The same logic can be applied to Requirement R8 as well.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has revised the Implementation Plan based on comments received. See the revised Implementation Plan.

Brandon McCormick - Brandon McCormick On Behalf of: Carol Chinn, Florida Municipal Power Agency, 5, 6, 4, 3; David Schumann, Florida Municipal Power Agency, 5, 6, 4, 3; Ginny Beigel, City of Vero Beach, 3; Jeffrey Partington, Keys Energy Services, 4; Joe McKinney, Florida Municipal Power Agency, 5, 6, 4, 3; Mike Blough, Kissimmee Utility Authority, 5, 3; Richard Montgomery, Florida Municipal Power Agency, 5, 6, 4, 3; Tom Reedy, Florida Municipal Power Pool, 6; - Brandon McCormick, Group Name FMPA

Answer

Question 7

Document Name

Comment

We would ask that the implementation plan for TPL-007-2 be clearer than it is, especially since the implementation plan for TPL-007-1 is currently underway. We appreciate the efforts of the drafting team in developing the implementation plan for TPL-007-2. However, while it may make perfect sense to the drafting team, it is not clear enough to be used for a compliance standard. Please consider providing some examples, a timeline chart, or providing an acknowledgement of the current dates that entities will be working towards. For example, the selection of the January 2021 date as the “dividing line” between “concurrent implementation” and apparently “non-current” implementation, of the Supplemental and Benchmark events seems to imply the SDT believes one year is sufficient time to add the supplemental event to the benchmark Vulnerability Assessments that are already underway and required to be complete for TPL-007-1 by January of 2022. However, the “more specific” dates offered for Requirements R3, R4 and R8 are 42 months out, which is not January of 2022...so what exactly is intended by “concurrent” and what benefit is gained?

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has revised the Implementation Plan based on comments received. See the revised Implementation Plan.

Thomas Rafferty - Edison International - Southern California Edison Company - 5

Answer

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison

Likes 0

Dislikes 0

Response

Question 7

No comments were submitted.

Richard Vine - California ISO - 2

Answer

Document Name

Comment

The California ISO supports the joint comments of the ISO/RTO Standards Review Committee

Likes 0

Dislikes 0

Response

Thank you for supporting the comments of the IRC Standards Review Committee (i.e., ISO/RTO Standards Review Committee).

Question 8

8. Do you agree with the Violation Risk Factors (VRFs) and Violation Severity Levels (VSLs) for the requirements in proposed TPL-007-2? If you do not agree, or if you agree but have comments or suggestions for the VRFs and VSLs provide your recommendation and explanation.

Dennis Sismaet - Northern California Power Agency - 6

Answer No

Document Name

Comment

They should be low or medium violation severity levels and risk factors at the most.

Likes 0

Dislikes 0

Response

Thank you for your comment. All VSLs¹⁶ and VRFs¹⁷ are consistent with NERC guidelines.

Marty Hostler - Northern California Power Agency - 5

Answer No

Document Name

Comment

They should be low or medium violaton severity levels and risk factors at the most.

Likes 0

Dislikes 0

Response

¹⁶ http://www.nerc.com/pa/Stand/Resources/Documents/VSL_Guidelines.PDF

¹⁷ http://www.nerc.com/pa/Stand/Resources/Documents/Violation_Risk_Factors.pdf

Question 8

Thank you for your comment. All VSLs¹⁸ and VRFs¹⁹ are consistent with NERC guidelines.

Brian Van Gheem - ACES Power Marketing - 6 - NA - Not Applicable, Group Name ACES Standards Collaborators

Answer No

Document Name

Comment

Since the standard clearly identifies separate GMD Vulnerability Assessments for benchmark and supplemental GMD events, we believe an entity could define separate acceptable System steady state voltage performance criteria for each study. Hence, the Violation Severity Limit for Requirement R3 should be expanded with stair-step severity limits that account for an entity having one criteria for one type of event and not the other.

Likes 0

Dislikes 0

Response

Thank you for your comment. The VSL is binary because to address criteria as a single item.

Payam Farahbakhsh - Hydro One Networks, Inc. - 1

Answer No

Document Name

Comment

Consistent with our comments above

Likes 1 Hydro One Networks, Inc., 3, Malozewski Paul

Dislikes 0

¹⁸ http://www.nerc.com/pa/Stand/Resources/Documents/VSL_Guidelines.PDF

¹⁹ http://www.nerc.com/pa/Stand/Resources/Documents/Violation_Risk_Factors.pdf

Question 8

Response

Thank you for your comment. The SDT did not find Hydro One comments above pertaining to VRF or VSL.

Colby Bellville - Colby Bellville On Behalf of: Dale Goodwine, Duke Energy , 6, 5, 3, 1; - Colby Bellville, Group Name Duke Energy

Answer No

Document Name

Comment

Duke Energy recommends that the drafting team revisit the order used for the Lower VSL for R8. The first statement in the Lower VSL section regarding the responsible entity completing a supplemental GMD Vulnerability Assessment in more than 60 calendar months, should actually swap positions with the second clause regarding the entity failing to satisfy one of the elements in R8. Having these two clauses swap places, would align with the order of language used in the Moderate, High, and Severe VSL(s).

Likes 0

Dislikes 0

Response

Thank you for your comment The SDT has swapped the clauses in the Lower VSL to make it consistent with the Moderate, High, and Serve VSL for Requirement R8.

Michelle Amarantos - APS - Arizona Public Service Co. - 1

Answer No

Document Name

Comment

As discussed above, AZPS has identified inconsistency in the treatment of a failure of registered entities to meet the deadline set forth for certain administrative requirements. In some instances, the VSL is simply a binary element and does not increase based on duration of delay or other factors. In other instances, the VSL increases as the duration of the delay increases. Such inconsistency alone is problematic, but, when the administrative nature of and horizon within which these requirements occur are considered, it becomes clear that the VSLs are out of sync with the actual or potential impact that would result from an entity's failure to comply. As these are administrative requirements

Question 8

(provision of documents and/or responses) occurring in the planning horizon, AZPS respectfully asserts that all such VSLs should be considered “low” and should not increase beyond that level, which is similar to the treatment in Requirement R8. AZPS recommends that the SDT review not only the new requirements, but the existing requirements to ensure that the VSLs accurately reflect their administrative nature and the fact that the horizon within which these activities are occurring is the Planning Horizon. Specific requirements that should be reviewed for consistency regarding the applicable VSLs include all requirement/sub-requirements with a 90 day timeframe for compliance, e.g., Requirements R4.3, R4.3.1, R5, R7.5, R7.5.1, R8.4, R8.4.1, and R9.2. Again, AZPS respectfully recommends that the SDT treat all 90-day time frame administrative requirements as binary requirements with a low VSL.

Likes 0

Dislikes 0

Response

Thank you for your comment. The gradation of the VSLs for Requirements with a timing component is consistent with the [guideline for developing VSLs](#).²⁰ Regardless of whether a Requirement is administrative or not, a binary Requirement (i.e., met or not met) can only have a single Severe category. Not performing the Requirement is the most severe violation of the Requirement.

Mike Smith - Manitoba Hydro - 1, Group Name Manitoba Hydro

Answer

No

Document Name

Comment

There should be trial period for industry to gain understanding and knowledge of GMD before implementing a standard.

Likes 0

Dislikes 0

Response

Thank you for your comment.

²⁰ http://www.nerc.com/pa/Stand/Resources/Documents/VSL_Guidelines.PDF

Question 8

Thomas Foltz - AEP - 5

Answer No

Document Name

Comment

The VSL for R2 is based on the maintenance of a System Model that is already required by other reliability standards (MOD-032). It is unclear why this is a basis for the VSL for this requirement. The VSL for requirement R2 should pertain to the unique information required by the GIC vulnerability assessments contained in this standard. AEP recommends having only one Severe VSL for not maintaining GIC model data.

Likes 0

Dislikes 0

Response

Thank you for your comment. The maintenance of models in MOD-032 is different from the models used for GMD assessments. The SDT proposed a High and Severe VSL to account for partial failure where only one model was maintained, but not both.

Shannon Mickens - Southwest Power Pool, Inc. (RTO) - 2 - SPP RE, Group Name SPP Standards Review Group

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Nicolas Turcotte - Hydro-Québec TransEnergie - 1

Question 8

Answer	Yes
Document Name	
Comment	
<p>We suggest adding the following High VSL. "The Planning Coordinator, in conjunction with its Transmission Planner(s), failed to determine and identify individual or joint responsibilities of the Planning Coordinator and Transmission Planner(s) in the Planning Coordinator’s planning area for maintaining models and, performing the study or studies needed to complete benchmark and supplemental GMD Vulnerability Assessment(s).), Or implementing process(es) to obtain GMD measurement data as specified in this standard."</p>	
Likes	0
Dislikes	0

Response

Thank you for your comment. The above suggestion does not provide additional clarity. The performance of Requirement R1 is to “identify the individual and joint responsibilities” and the additional information outlines what individual and joint responsibilities are being identified by the applicable entities.

Chantal Mazza - Hydro-Québec TransEnergie - 1,2 - NPCC

Answer	Yes
Document Name	
Comment	
<p>We suggest adding the following High VSL. "The Planning Coordinator, in conjunction with its Transmission Planner(s), failed to determine and identify individual or joint responsibilities of the Planning Coordinator and Transmission Planner(s) in the Planning Coordinator’s planning area for maintaining models and, performing the study or studies needed to complete benchmark and supplemental GMD Vulnerability Assessment(s).), Or implementing process(es) to obtain GMD measurement data as specified in this standard."</p>	

Question 8

Likes 0

Dislikes 0

Response

Thank you for your comment. The above suggestion does not provide additional clarity. The performance of Requirement R1 is to “identify the individual and joint responsibilities” and the additional information outlines what individual and joint responsibilities are being identified by the applicable entities.

Michael Shaw - Lower Colorado River Authority - 6, Group Name LCRA Compliance

Answer Yes

Document Name

Comment

The VRFs should be included in the VSL table within the standard. It isn't clear why they were struck.

Likes 0

Dislikes 0

Response

Thank you for your comment. The Time Horizons and VRF items were removed from the Results-based Standard (RBS) template to increase the space for writing VSL language and to eliminate the potential for errors to be introduced when they do not match the Requirement(s).

Terry Harbour - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1

Answer Yes

Document Name

Comment

Likes 0

Question 8

Dislikes 0

Response

Sergio Banuelos - Tri-State G and T Association, Inc. - 1,3,5 - MRO,WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Elizabeth Axson - Electric Reliability Council of Texas, Inc. - 2, Group Name IRC Standards Review Committee

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Chris Scanlon - Exelon - 1

Question 8

Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Michael Buyce - City Utilities of Springfield, Missouri - 1	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
James Anderson - CMS Energy - Consumers Energy Company - 1,3,4,5	
Answer	Yes
Document Name	
Comment	

Question 8

Likes 0

Dislikes 0

Response

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name RSC no Hydro One, HQ and IESO

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

David Ramkalawan - Ontario Power Generation Inc. - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 8

Quintin Lee - Eversource Energy - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Stephanie Burns - Stephanie Burns On Behalf of: Michael Moltane, International Transmission Company Holdings Corporation, 1; - Stephanie Burns

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Douglas Webb - Douglas Webb On Behalf of: Chris Bridges, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Harold Wyble, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; James McBee, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Jessica Tucker, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; - Douglas Webb

Question 8

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Donald Lock - Talen Generation, LLC - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Glen Farmer - Avista - Avista Corporation - 5

Answer Yes

Document Name

Comment

Question 8

Likes 0

Dislikes 0

Response

Jeffrey Watkins - Jeffrey Watkins On Behalf of: Eric Schwarzrock, Berkshire Hathaway - NV Energy, 5; - Jeffrey Watkins

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Eric Shaw - Eric Shaw On Behalf of: Lee Maurer, Oncor Electric Delivery, 1; - Eric Shaw

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 8

Joshua Eason - Joshua Eason On Behalf of: Michael Puscas, ISO New England, Inc., 2; - Joshua Eason

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Rachel Coyne - Texas Reliability Entity, Inc. - 10

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laurie Williams - PNM Resources - Public Service Company of New Mexico - 1

Answer Yes

Document Name

Comment

Question 8

Likes 0

Dislikes 0

Response

Karie Barczak - DTE Energy - Detroit Edison Company - 3

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Neil Swearingen - Salt River Project - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 8

Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laura Nelson - IDACORP - Idaho Power Company - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Gerry Huitt - Xcel Energy, Inc. - 5

Answer Yes

Document Name

Question 8

Comment

Likes 0

Dislikes 0

Response

Robert Blackney - Edison International - Southern California Edison Company - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

sean erickson - Western Area Power Administration - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Question 8

Response

Daniel Grinkevich - Con Ed - Consolidated Edison Co. of New York - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Aaron Cavanaugh - Bonneville Power Administration - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Ann Ivanc - FirstEnergy - FirstEnergy Solutions - 6

Answer Yes

Question 8

Document Name

Comment

Likes 0

Dislikes 0

Response

RoLynda Shumpert - SCANA - South Carolina Electric and Gas Co. - 1,3,5,6 - SERC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Randy Buswell - VELCO -Vermont Electric Power Company, Inc. - 1

Answer Yes

Document Name

Comment

Likes 0

Question 8

Dislikes 0

Response**Richard Vine - California ISO - 2****Answer****Document Name****Comment**

The California ISO supports the joint comments of the ISO/RTO Standards Review Committee

Likes 0

Dislikes 0

Response

Thank you for supporting the comments of the IRC Standards Review Committee (i.e., ISO/RTO Standards Review Committee).

Thomas Rafferty - Edison International - Southern California Edison Company - 5**Answer****Document Name****Comment**

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison

Likes 0

Dislikes 0

Response

No comments were submitted.

Question 9

9. The SDT believes proposed TPL-007-2 provide entities with flexibility to meet the reliability objectives in the project Standards Authorization Request (SAR) in a cost effective manner. Do you agree? If you do not agree, or if you agree but have suggestions for improvement to enable additional cost effective approaches to meet the reliability objectives, please provide your recommendation and, if appropriate, technical justification.

Thomas Foltz - AEP - 5

Answer No

Document Name

Comment

While AEP agrees with the scope and direction of the revised standard, the incremental costs and resources required to comply with the proposed revisions may not be commensurate with the resulting impact to the improved reliability of the BES. Adding the Supplemental GMD Vulnerability obligations may substantially increase the resources involved, without a corresponding increase in the reliability of the BES.

Likes 0

Dislikes 0

Response

Thank you for your comment. The supplemental assessment is additional work, but it is necessary to account for the impacts of local enhancements. No additional system data is required.

Michael Shaw - Lower Colorado River Authority - 6, Group Name LCRA Compliance

Answer No

Document Name

Comment

This revision calls for even more assessment of an already rare condition that has historically not been very impactful at lower latitudes. I question the cost-benefit of this standard relative to other grid reliability needs.

Likes 0

Question 9

Dislikes 0

Response

Thank you for your comment. The SDT cannot comment on the priority of compliance with TPL-007-2 with respect to other needs that require attention on the system.

Mike Smith - Manitoba Hydro - 1, Group Name Manitoba Hydro

Answer

No

Document Name

Comment

There should be trial period for industry to gain understanding and knowledge of GMD before implementing a standard. Until initial assessments are completed, there's no idea of what a corrective action plan might look like, for example.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request. The existing standard already has a vulnerability assessment requirement that is approved and effective and subject to compliance by applicable registered entities. The comment is suggesting an alternative methodology to the existing standard which is outside the scope of the SDT and should be addressed in a new SAR.

Chantal Mazza - Hydro-Québec TransEnergie - 1,2 - NPCC

Answer

No

Document Name

Comment

For the Hydro-Quebec power grid it would be already covered by the benchmark event.

Likes 0

Question 9

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request.

Nicolas Turcotte - Hydro-Québec TransEnergie - 1

Answer No

Document Name

Comment

For the Hydro-Quebec power grid it would be already covered by the benchmark event.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT is being responsive to the Standards Authorization Request.

Karie Barczak - DTE Energy - Detroit Edison Company - 3

Answer No

Document Name

Comment

Cost effectiveness can't be fully evaluated until more details are provided concerning how mitigation measures and GIC monitoring will be handled. Any required hardware mitigation and GIC monitoring could potentially be costly.

Likes 0

Dislikes 0

Response

Question 9

Thank you for your comment. The SDT agrees that the cost cannot be evaluated until we have gone through a cycle of the implementation plan.

Laurie Williams - PNM Resources - Public Service Company of New Mexico - 1

Answer	No
Document Name	
Comment	
Requirement R12 placed responsible entities an additional cost responsibility to collect magnetometer data which would be used just for model validation purpose. Collection of magnetometer data from government agencies or other appropriate agencies directly by NERC would avoid responsible entities' additional cost burden.	
Likes	0
Dislikes	0

Response

Thank you for your comment. The standard allows for obtaining a data product from sources like the USGS or NRCAn.

Larisa Loyfer The technical basis is not clear **man - CenterPoint Energy Houston Electric, LLC - 1 - Texas RE**

Answer	No
Document Name	
Comment	
CenterPoint Energy disagrees that the proposed TPL-007-2 provides entities with flexibility to meet the reliability objectives in the project Standards Authorization Request (SAR) in a cost effective manner. CenterPoint Energy's disagreement is based on the following:	
<ul style="list-style-type: none"> • The proposed Implementation Plan for TPL-007-2 lacks the flexibility to complete the first-of-its-kind modeling and analysis before adding on additional enhanced analysis required to comply with Requirements R8 – R10. • The prescriptive implementation timelines required by revisions to Requirement R7 do not provide sufficient flexibility for entities to weigh competing system reliability goals in a cost effective manner. 	

Question 9

- Adding the Supplemental GMD Vulnerability obligations may substantially increase the resources involved, without a corresponding increase in the reliability of the BES.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has proposed the phasing-in of version 2 into the timing of the implementation of version 1, depending on the timing of approval of the revised standard by FERC.

The supplemental assessment is additional work, but it is necessary to account for the impacts of local enhancements.

Payam Farahbakhsh - Hydro One Networks, Inc. - 1

Answer

No

Document Name

Comment

Consistent with our comments above

Likes 1

Hydro One Networks, Inc., 3, Malozewski Paul

Dislikes 0

Response

Donald Lock - Talen Generation, LLC - 5

Answer

No

Document Name

Comment

Question 9

TPL-007-2 continues the error of TPL-007-1 in allowing GOs to only suggest corrective actions (in R6.3), and giving the responsible entity in R7 sole authority to make establish CAPs without having to consult with GOs on the options available or (for competitive markets) demonstrate that all competitors are treated equally. This could be a significant issue, in that CAPs may include directives for, “Installation, modification, retirement or removal,” of multi-million-dollar equipment.

Likes	0
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Dislikes	0
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Response

Thank you for your comment. The SDT expects that the development of the CAP would be a joint effort among the applicable entities. Requirement 7.5.1 provides a feedback loop for those functional entities who are referenced in the CAP.

David Ramkalawan - Ontario Power Generation Inc. - 5

Answer	No
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Document Name	
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Comment

OPG is of the opinion that the SDT can improve the cost effectiveness of the standard by combining the Benchmark and the Supplemental GMD events under one definition, thus eliminating duplicate/unnecessary work.

Likes	0
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Dislikes	0
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Response

Thank you for your comment. The Transformer Thermal Impact Assessment White Paper and Screening Criterion for Transformer Thermal Impact Assessment documents have provided the technical foundation and methodologies that can be used to conduct transformer temperature rise calculations for both the benchmark case and the supplemental case.

Chris Scanlon - Exelon - 1

Answer	No
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Question 9

Document Name

Comment

It is not clear whether the newly established supplemental event will have the effect of increasing the scope of transformers that meet the screening criteria, when compared to the benchmark event and if so, by how much. It does seem possible that an entity which has had no transformers identified as meeting the benchmark event screening criteria could have multiple or all transformers included within the scope of the supplemental event if it is located within the area of a localized enhancement. The technical justification for the supplemental event screening criteria does not substantiate what appears to be a disproportional increase in the intensity of the event compared to the increase in the screening threshold from 75A to 85A. Note that the approach to the thermal assessments required under R6 and R10 are the same, and therefore the proposed supplemental event screening criteria has the ability to impact the financial obligation of the TO and GO.

Likes 0

Dislikes 0

Response

Thank you for your comment. Different screening thresholds were selected because benchmark and supplemental benchmark waveforms are different and their effects on transformers are different. The temperature thresholds are consistent, i.e., the thermal effects on a transformer are characterized by peak temperatures.

Marty Hostler - Northern California Power Agency - 5

Answer

No

Document Name

Comment

Increased costs do not justify the low, if any, reliability benefits.

Likes 0

Dislikes 0

Response

Question 9

Thank you for your comment. In the development of the TPL-007-2: Transmission System Planned Performance for Geomagnetic Disturbance Events standard with supplemental GMD event, the SDT is being responsive to the Standards Authorization Request. The consensus of the SDT is that the supplemental GMD Vulnerability Assessment provides a reliability benefit.

Dennis Sismaet - Northern California Power Agency - 6

Answer	No
Document Name	
Comment	
Increased costs do not justify the low, if any, reliability benefits.	
Likes 0	
Dislikes 0	

Response

Thank you for your comment. In the development of the TPL-007-2: Transmission System Planned Performance for Geomagnetic Disturbance Events standard with supplemental GMD event, the SDT is being responsive to the Standards Authorization Request. The consensus of the SDT is that the supplemental GMD Vulnerability Assessment provides a reliability benefit.

William Harris - Foundation for Resilient Societies - 8

Answer	No
Document Name	Foundation for Resilient Societies on NERC Project 2013 081117_Submitted.docx
Comment	
The only cost-effective approach for grid protecton is to design for severe GMD hazards and manmade EMP hazards concurrently. This is not a cost effective method, and results in a needlessly vulnerable electric grid. See general comments.	
Likes 0	
Dislikes 0	

Response

Question 9

Thank you for your comment. Protection of the BES for EMP hazards is outside the scope of the SDT.

sean erickson - Western Area Power Administration - 1

Answer Yes

Document Name

Comment

[TPLTF](#)²¹ Discussion: The group agrees that the SDT has done a good job of considering cost in time, resources, and personnel commitment in meeting the objectives of the SAR, which were heavily prescribed by FERC Order No. 830. The group may not agree with the perceived benefit to reliability that the additional effort to analyze the supplemental GMD event will yield, but the SDT has proposed a solid means of addressing the FERC directives without relying on tools or methods that do not exist widely in industry today. The group also supports the SDT cost-effective approach to the proposed Requirement R7 which does not mention GIC blocking devices as an integral part of a hardware mitigation. The group remains concerned with the perception that GIC mitigation hardware is presently a viable solution. Given its cost, effects on Protection System design, as well as potential compromises to existing BES reliability, GIC blocking devices may prove undesirable. The flexibility that the SDT has proposed in the development of Corrective Action Plans is workable.

Likes 0

Dislikes 0

Response

The SDT appreciates the supportive comment.

Stephanie Burns - Stephanie Burns On Behalf of: Michael Moltane, International Transmission Company Holdings Corporation, 1; - Stephanie Burns

Answer Yes

Document Name

Comment

²¹ TPLTF document is found at the end of this document in Attachment 1.

Question 9

Considering the additional supplemental GMD event analysis doesn't require a CAP to be developed and that data collection is allowed as opposed to having to install new monitoring equipment on the system to acquire the required data, the proposed revisions are flexible and potentially more cost effective for some entities.

Likes 0

Dislikes 0

Response

The SDT appreciates the supportive comment.

Shannon Mickens - Southwest Power Pool, Inc. (RTO) - 2 - SPP RE, Group Name SPP Standards Review Group

Answer

Yes

Document Name

Comment

The SPP Standards Review Group agrees that the SDT has done a good job of considering cost in time, resources, and personnel commitment in meeting the objectives of the SAR, which were heavily prescribed by FERC Order No. 830. The group may not agree with the perceived benefit to reliability that the additional effort to analyze the supplemental GMD event will yield, but the SDT has proposed a solid means of addressing the FERC directives without relying on tools or methods that do not exist widely in industry today. We also support the SDT cost-effective approach to the proposed Requirement R7 which does not mention GIC blocking devices as an integral part of a hardware mitigation. The group remains concerned with the perception that GIC mitigation hardware is presently a viable solution. Given its cost, effects on Protection System design, as well as potential compromises to existing BES reliability, GIC blocking devices may prove undesirable. The flexibility that the SDT has proposed in the development of Corrective Action Plans is workable.

Likes 0

Dislikes 0

Response

The SDT appreciates the supportive comment.

Randy Buswell - VELCO -Vermont Electric Power Company, Inc. - 1

Question 9

Answer	Yes
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Document Name	
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Comment	
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Likes 0	
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Dislikes 0	
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Response	
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Lauren Price - American Transmission Company, LLC - 1	
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Answer	Yes
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Document Name	
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Comment	
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Likes 0	
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Dislikes 0	
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Response	
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RoLynda Shumpert - SCANA - South Carolina Electric and Gas Co. - 1,3,5,6 - SERC	
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Answer	Yes
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Document Name	
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Comment	
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Question 9

Likes 0

Dislikes 0

Response

Ann Ivanc - FirstEnergy - FirstEnergy Solutions - 6

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Daniel Grinkevich - Con Ed - Consolidated Edison Co. of New York - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 9

Robert Blackney - Edison International - Southern California Edison Company - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Gerry Huitt - Xcel Energy, Inc. - 5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Laura Nelson - IDACORP - Idaho Power Company - 1

Answer Yes

Document Name

Comment

Question 9

Likes 0

Dislikes 0

Response

Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Neil Swearingen - Salt River Project - 1,3,5,6 - WECC

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 9

Eric Shaw - Eric Shaw On Behalf of: Lee Maurer, Oncor Electric Delivery, 1; - Eric Shaw

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Jeffrey Watkins - Jeffrey Watkins On Behalf of: Eric Schwarzrock, Berkshire Hathaway - NV Energy, 5; - Jeffrey Watkins

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Glen Farmer - Avista - Avista Corporation - 5

Answer Yes

Document Name

Question 9

Comment

Likes 0

Dislikes 0

Response

Douglas Webb - Douglas Webb On Behalf of: Chris Bridges, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Harold Wyble, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; James McBee, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; Jessica Tucker, Great Plains Energy - Kansas City Power and Light Co., 3, 6, 5, 1; - Douglas Webb

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Quintin Lee - Eversource Energy - 1

Answer

Yes

Document Name

Comment

Question 9

Likes 0

Dislikes 0

Response

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name RSC no Hydro One, HQ and IESO

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Brian Van Gheem - ACES Power Marketing - 6 - NA - Not Applicable, Group Name ACES Standards Collaborators

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Question 9

James Anderson - CMS Energy - Consumers Energy Company - 1,3,4,5

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Michael Buyce - City Utilities of Springfield, Missouri - 1

Answer Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Sergio Banuelos - Tri-State G and T Association, Inc. - 1,3,5 - MRO,WECC

Answer Yes

Document Name

Comment

Question 9

Likes 0

Dislikes 0

Response

Terry Harbour - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Rachel Coyne - Texas Reliability Entity, Inc. - 10

Answer

Document Name

Comment

Texas RE does not have comments on this questions.

Likes 0

Dislikes 0

Response

Question 9

Thomas Rafferty - Edison International - Southern California Edison Company - 5

Answer

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison

Likes 0

Dislikes 0

Response

No comments were submitted.

Richard Vine - California ISO - 2

Answer

Document Name

Comment

The California ISO supports the joint comments of the ISO/RTO Standards Review Committee

Likes 0

Dislikes 0

Response

Thank you for supporting the comments of the IRC Standards Review Committee (i.e., ISO/RTO Standards Review Committee).

Question 10

10. Provide any additional comments for the SDT to consider, if desired.

Terry Harbour - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1

Answer

Document Name

Comment

The approved TPL-007-1 and the current draft of TPL-007-2 includes a flowchart diagram in the Application Guides section that provides and overall view of the GMD Vulnerability Assessment process (*and the requirements in TPL-007*). There has been confusion as to which requirements are represented in the diagram. The NSRF suggest the SDT update this diagram to include annotations that identify the requirements in TPL-007-2. Please see the NSRF example which includes requirements for the benchmark and supplemental assessment.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT did not add references to the flowchart in the Application Guidelines as the flowchart is not a one-to-one relationship with the standard requirements.

Dennis Sismaet - Northern California Power Agency - 6

Answer

Document Name

Comment

None. Thank you.

Likes 0

Dislikes 0

Response

Question 10

Sergio Banuelos - Tri-State G and T Association, Inc. - 1,3,5 - MRO,WECC

Answer

Document Name

Comment

Tri-State would like for some additional guidance or examples on what the SDT meant by "hardware" and "non-hardware".

Likes 0

Dislikes 0

Response

Thank you for your comment. The standard is not prescriptive in listing the various hardware and non-hardware options. Some hardware and non-hardware options are listed in Requirement R7.1.

Marty Hostler - Northern California Power Agency - 5

Answer

Document Name

Comment

No additional comments.

Likes 0

Dislikes 0

Response

Richard Vine - California ISO - 2

Answer

Question 10

Document Name

Comment

The California ISO supports the joint comments of the ISO/RTO Standards Review Committee

Likes 0

Dislikes 0

Response

Thank you for supporting the comments of the IRC Standards Review Committee (i.e., ISO/RTO Standards Review Committee).

Brian Van Gheem - ACES Power Marketing - 6 - NA - Not Applicable, Group Name ACES Standards Collaborators

Answer

Document Name

Comment

1. Add a comma after the “Table 1” reference within Requirement R7, as the lengthy description within the requirement describes the responsible entity and not the development of a CAP.
2. The evidence retention period demonstrating the implementation of a process to obtain GIC monitor and geomagnetic field data, as listed within R11 and R12, is identified as three calendar years. We do not see how this should be different than the evidence retention period identified for the requirements of NERC Reliability Standard TPL-001-4, which is based on the last compliance audit.
3. We thank you for this opportunity to provide these comments.

Likes 0

Dislikes 0

Response

Thank you for your comment.

1. The SDT added a comma after “Table 1” in Requirement R7.
2. The evidence retention period meets the NERC Guidelines.

Question 10

Scott Downey - Peak Reliability - 1

Answer

Document Name

Comment

While Peak supports the SDTs effort, we believe that consideration should be given to making TOPs applicable to the standard as well. Applicable TOPs are required to have operating plans for GMDs to comply with EOP-010 but without direct evaluation of TPL-007 vulnerability assessments, the plans would seem to be incomplete. Peak recognizes the requirement for proposed applicable functions to provide their vulnerability assessments to the RC but believes a more direct coordination role with the TOP should be required.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT does not agree with the suggestion to make TOPs applicable entities in the standard. TPL-007 is a planning standard and applies to registered planning entities and selected asset owners. The comment is suggesting an alternative methodology to the existing standard which is outside the scope of the SDT and should be addressed in a new SAR.

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name RSC no Hydro One, HQ and IESO

Answer

Document Name

Comment

On page 11 Table 1 – Note 3 should be also applicable to the row entitled “Supplemental GMD Event – GMD Event with Outages” as it relates to columns “Interruption of Firm Transmission Service Allowed” and “Load Loss Allowed”.

Likes 0

Dislikes 0

Response

Question 10

Thank you for your comment. The SDT asserts that because a CAP is not required, the additional footnote is not applicable.

Thomas Rafferty - Edison International - Southern California Edison Company - 5

Answer

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison

Likes 0

Dislikes 0

Response

No comments were submitted.

David Ramkalawan - Ontario Power Generation Inc. - 5

Answer

Document Name

Comment

OPG does not agree with the implementation deadlines:

- 1) The four years deadline to implement all the hardware mitigation action may provide unfair market advantage to the unaffected/ less affected TOP, GOP due to the time/resources/financial effort involved. Continued operation should be allowed if there is a shortage of hardware, or the lead time to design/procure/implement complete hardware solution exceeds the four years duration.
- 2) TPL-007-2 should also be applicable as a Functional Entity to Generator Operator (GOP). The implementation of hardware mitigating actions may require the revision of the existing approved GIC mitigation operating procedure instructions (same if the non-hardware mitigation requires operating procedures revisions). The commissioning of the mitigating actions will also require coordination's between the TOP and GOP. GOP should be a stakeholder regarding the configuration impact and determination of affected transformers. Additionally alternative operating configuration may requires design studies involving/requiring GOP support before implementation.

Question 10

3) The two years deadline to implement all the non-hardware solution may provide unfair market advantage to the unaffected/less affected TOP, GOP, as the implementation for a large scale TOP, GOP will take more time, resources/financial effort and may require commissioning and studies.

Likes 0

Dislikes 0

Response

Thank you for your comment.

1. It is anticipated that the actual implementation (trigger to activate) of the CAP that includes operational procedure would only occur during a GMD/GIC event of sufficient size as determined by the assessment. Since GMD events are very rare, there is less likelihood that market impacts would occur as compared to a 'regular' transmission outage or constraint not related to GMD mitigation.
2. The GOPs may be involved with the execution of the CAP, as suggested in the comment, but that does not mean that the GOP should be an applicable entity in the standard.
3. See response to 1 above.

Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company

Answer

Document Name

Comment

Table 1 in the standard, under the "Steady State:" heading, part a, the sentence should be expanded as follows: "Voltage collapse, Cascading, and uncontrolled islanding shall not occur for the Benchmark GMD event, but can occur for the Supplemental GMD event subject to additional analysis specified in R8.3.

Also, verbiage in R8.3 should be expanded to include references to Voltage collapse and uncontrolled islanding

Likes 0

Dislikes 0

Response

Question 10

Thank you for your comment. The SDT does not agree with the suggestion. Voltage collapse, Cascading, and uncontrolled is not allowed in either the benchmark or supplemental assessments. The distinction in R8.3 is that a CAP is not required in the case of the supplemental assessment.

Colby Bellville - Colby Bellville On Behalf of: Dale Goodwine, Duke Energy , 6, 5, 3, 1; - Colby Bellville, Group Name Duke Energy

Answer

Document Name

Comment

Duke Energy requests further clarification regarding the 90 calendar day timeframe outlined in R4. The current language states that the Responsible Entity must provide its benchmark GMD Vulnerability Assessment to the RC, adjacent PC, and adjacent TP within 90 calendar days of completion. Clarification is needed as to what date the term “completion” is referring to. Many entities may have 3rd parties conduct these studies, and in doing so, the Responsible Entity will review the study and make corrections where necessary. Is the completion date referred to in the requirement referring to the date the initial study (by the 3rd party) is completed, or is it referring to the date that the Responsible Entity has completed its internal review and obtained signoff by management? If the drafting team’s intent was for the completion date to refer to the date that the initial study was performed, we cannot agree with the 90 calendar day timeframe. Additional time would be needed for the Responsible Entity to perform its review of the 3rd party study, and obtain management signoff.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT believes that the completion date is the date when the Responsible Entity considers it complete; that is, it has completed all internal reviews and management approvals.

Eric Shaw - Eric Shaw On Behalf of: Lee Maurer, Oncor Electric Delivery, 1; - Eric Shaw

Answer

Document Name

Comment

Question 10

None

Likes 0

Dislikes 0

Response

Rachel Coyne - Texas Reliability Entity, Inc. - 10

Answer

Document Name

Comment

Although not necessarily in the scope of this project, Texas RE noticed a few other things.

- There could be some clarity in which earth models are supposed to be used. The “earth model” physiographic regional maps supplied and referenced are not detailed enough to indicate the physical locations of the regional conductivity map boundaries. This lack of detail will be a source of confusion if a transformer is located near a conductivity boundary. What earth model value does the responsible entity use? If there are 3 regional conductivity areas in one responsible entity’s planning area, what earth model value does the responsible entity use?
- Texas RE is concerned the lack of a timeframe to provide GIC flow information in Requirements R5 and R9 could lead to an entity not providing GIC flow information when that information is necessary for the thermal impact assessments. Texas RE requests the SDT add a timeframe for providing the data.
- Although R1 states the PCs and TPs will identify the individual and joint responsibilities for maintaining models and performing the studies needed to complete the benchmark and supplemental GMD Vulnerability Assessments, there does not appear to be any coordination while actually performing these tasks. Texas RE is concerned this could lead to TPs each doing their own studies and coming to different conclusions, which would not allow entities to recognize vulnerabilities effectively. Texas RE recommends the PC do an overall assessment every 60 calendar months.

Likes 0

Question 10

Dislikes 0

Response

Thank you for your comment. The NERC GMD Task Force whitepaper, GIC Application Guide, published December 2013, ([http://www.nerc.com/comm/PC/Pages/Geomagnetic-Disturbance-Task-Force-\(GMDTF\)-2013.aspx](http://www.nerc.com/comm/PC/Pages/Geomagnetic-Disturbance-Task-Force-(GMDTF)-2013.aspx)) discusses the use of available earth conductivity models in performing the required calculations.

The SDT is reluctant to set deadlines for the issuance of GIC calculations because the level of effort will vary widely in the various systems in North America. As an alternative, significant time has been allowed in the implementation plan to do the assessments required by R6 and R10.

The purpose of R1 is to ensure that the roles and responsibilities are clear to all, including how the PC will fit the pieces together if there are a number of entities contributing to an overall assessment.

Kenya Streeter - Edison International - Southern California Edison Company - 6

Answer

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison.

Likes 0

Dislikes 0

Response

No comments were submitted.

Karie Barczak - DTE Energy - Detroit Edison Company - 3

Answer

Document Name

Comment

Question 10

no

Likes 0

Dislikes 0

Response

Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF

Answer

Document Name

Comment

The approved TPL-007-1 and the current draft of TPL-007-2 includes a flowchart diagram in the Application Guides section that provides and overall view of the GMD Vulnerability Assessment process (*and the requirements in TPL-007*). There has been confusion as to which requirements are represented in the diagram. The NSRF suggest the SDT update this diagram to include annotations that identify the requirements in TPL-007-2. Please see example below which includes requirements for the benchmark and supplemental assessment.

Likes 1

Darnez Gresham, N/A, Gresham Darnez

Dislikes 0

Response

Thank you for your comment. The SDT did not add references to the flowchart in the Application Guidelines as the flowchart is not a one-to-one relationship with the standard requirements.

Sandra Shaffer - Berkshire Hathaway - PacifiCorp - 6

Answer

Document Name

Comment

Question 10

“PacifiCorp requests the drafting team add to the white paper links to the resources where geomagnetic field data from the magnetometers inside NERC footprint is publicly available.”

Likes 0

Dislikes 0

Response

Thank you for your comment. The government entity magnetometer station data is available at: US-- <https://geomag.usgs.gov/>; Canada-- <http://geomag.nrcan.gc.ca/lab/default-en.php>. The SDT will add those links to the whitepaper as the comment suggests.

Romel Aquino - Edison International - Southern California Edison Company - 3

Answer

Document Name

Comment

Please refer to comments submitted by Robert Blackney on behalf of Southern California Edison.

Likes 0

Dislikes 0

Response

No comments were submitted.

Michelle Amarantos - APS - Arizona Public Service Co. - 1

Answer

Document Name

Comment

AZPS is concerned that the proposed revisions to Requirement R1 to add references to the need for processes related to obtaining GMD data is inconsistent with respect to how such data is defined in later requirements, e.g., Requirements R11 and R12, and creates confusion relative

Question 10

to the need and use of such data and to which data-related actions and requirements Requirement R1 applies. For these reasons, AZPS proposes the following revisions to ensure clarity:

R1. Each Planning Coordinator, in conjunction with its Transmission Planner(s), shall identify the individual and joint responsibilities of the Planning Coordinator and Transmission Planner(s) in the Planning Coordinator’s planning area for maintaining models, **including the data-related processes identified in Requirements R9, R11, and R12 in this standard, and**, performing the study or studies needed to complete benchmark and supplemental GMD Vulnerability Assessments. *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT has revised the blue rationale box for Requirements R11 and R12 to raise awareness of the differences in the data.

Mike Smith - Manitoba Hydro - 1, Group Name Manitoba Hydro

Answer

Document Name

Comment

The standard doesn’t talk about how to develop equivalents of neighbouring systems and what assumptions to make. Is there only a GMD event impacting your assessment area and none in neighbouring areas?

Likes 0

Dislikes 0

Response

Thank you for your comment. Guidance on modeling is contained in the following guides published by the NERC GMD Task Force: GIC Application Guide, September 2013 and GMD Planning Guide, December 2013 (see: [http://www.nerc.com/comm/PC/Pages/Geomagnetic-Disturbance-Task-Force-\(GMDTF\)-2013.aspx](http://www.nerc.com/comm/PC/Pages/Geomagnetic-Disturbance-Task-Force-(GMDTF)-2013.aspx))

Daniel Grinkevich - Con Ed - Consolidated Edison Co. of New York - 1

Question 10

Answer

Document Name

Comment

On page 11 Table 1 – Note 3 should be also applicable to the row entitled “Supplemental GMD Event – GMD Event with Outages” as it relates to columns “Interruption of Firm Transmission Service Allowed” and “Load Loss Allowed”.

Likes 0

Dislikes 0

Response

Thank you for your comment. The SDT asserts that because a CAP is not required, the additional footnote is not applicable.

Thomas Foltz - AEP - 5

Answer

Document Name

Comment

The language used for Measure M5 was adjusted incorrectly as it currently states “... *that it has provided the maximum effective **benchmark** GIC value to the Transmission Owner and Generator.....* “. This is an incorrect statement and should instead state “...*that it has provided the maximum effective GIC value **under the benchmark event** to the Transmission Owner and Generator.....*”

While AEP supports the overall effort of the drafting team, AEP has chosen to vote "no" driven by the lack of clarity related to the potential duplication of efforts related to assets which are in-scope for both the benchmark and supplemental assessments. Similarly, AEP is concerned by the overall burden associated with having a secondary suite of “parallel requirements” to accommodate the supplemental assessment.

Likes 0

Dislikes 0

Response

Question 10

Thank you for your comment. The SDT removed “benchmark” in Measure M5 and a conforming change by removing “supplemental” in Measure M9. The SDT purposely is requesting two separate thermal assessments be done for transformers that exceed the GIC thresholds: One for the benchmark event and one for the supplemental event. The supplemental assessment is intended to address local enhancements. The benchmark assessment may result in a Corrective Action Plan, but the supplemental assessment does not.

Kristine Ward - Seminole Electric Cooperative, Inc. - 1,3,4,5,6 - FRCC

Answer

Document Name

Comment

Comments:

1. Parallels between R4 and R8:

It appears that the standard is now requiring applicable entities to perform two GMD Vulnerability assessments (benchmark and supplemental), either at the same time, or within 5 years or less of each other. This seems to be duplicative and should be characterized as a sensitivity to the benchmark and done at the same time if required or be performed as part of “subsequent” assessments. Also on that note, the supplemental assessment has an additional requirement (R8.3) to determine if Cascading occurs, where the benchmark assessment does not. Cascading is often required to be determined via stability analysis which is outside the scope of TPL-007-2 because the standard as written only requires steady state/load flow analysis. Can the SDT please elaborate on this shift in requiring entities to evaluate Cascading in the supplemental assessment and not in the benchmark assessment, as well as elaborate on the need to evaluate Cascading as a whole? Also, the requirement of having to provide the completed assessment to the applicable entities, rather than just making it available (as originally drafted), is not providing any reliability benefit other than paperwork for the entities, I thought Paragraph 81 was initiated to get away from such requirements and here we are putting them right back in.

1. R7.3.1,7.3.2:

What does the SDT envision as a “non-hardware” mitigation vs. a hardware mitigation?

1. R4, R8

Why does the SDT feel it necessary to add the phrase “at least” in the requirements associated with subsequent GMD assessments? The existing language, without the insert, does not preclude an entity from performing an assessment sooner than the 60 calendar months if the entity determines it necessary, the insert of “at least” provides no added benefit or clarity to the existing language.

1. Applicable Facilities:

Question 10

Has the SDT given any consideration to clarifying the applicable Facilities within TPL-007-2? The standard is only applicable to PCs, TOs, and GOs; however, there are transformers that are wye-grounded on the high-voltage terminals, operated at greater than 200 kV but are not owned by registered TOs or have been excluded from the BES, pursuant the BES Definition. How does the SDT plan to address those? For example, a GO can provide their respective PC with GSU information for the GMD model; however, their auxiliary transformer(s) which are connected on the high-side at 200 kV or greater and are wye-grounded are not considered BES Facilities and therefore are not required to be provided to the PC as part of their evaluation, even though the unit auxiliary transformers have the potential of tripping the entire plant.

1. Cost Study

Seminole requests the SDT perform a CEAP (Cost Effective Analysis Process) for this Standard. TPL-007 is a great candidate as the costs of all of the studies is substantial and the frequency of an event causing catastrophic consequences is low.

2. FRCC Specific TPL-007-2

Seminole requests that the SDT develop an initial low cost study that would allow for entities in the very far south to be excluded from performing further compliance measures. In the alternative, Seminole requests the SDT to note that the SDT is open to the idea of reduced requirement FRCC-specific TPL-007-2.

1. 7.3.1

Change the time value to 24 months instead of 2 years to stay consistent. Same with 7.3.2.

1. R11 Note

The Note for R11 states that the data collected via magnetometers and GIC monitoring is necessary for “situational awareness”. Does the SDT believe that the data collected for situational awareness could classify this collection equipment as BES Cyber Assets if system operators make decisions based off of this equipment within 15 minutes?

Likes	0
Dislikes	0

Response

Thank you for your comment. The revised standard is requiring a second (supplemental) assessment to be performed coincident with the original (benchmark) assessment to explicitly account for the impacts associated with local enhancements. Since the SDT is not requiring a CAP for the supplemental assessment, it can be thought of as a sensitivity to the benchmark assessment. Cascading is not allowed in either assessment and to the degree that there is inconsistency in the wording, the SDT will make corrections. The assessments are steady state and not intended to imply dynamics analysis.

Question 10

The reliability benefit comes from performing a GMD vulnerability assessment using an enhanced GMD event.

Examples of hardware mitigation include equipment replacement or modification, GIC blocking devices, protection systems, etc. Examples of non-hardware mitigation include operating procedures, etc.

The SDT did not remove the phrase “at least” as suggested.

The intent of the standard is to protect the BES and therefore, the SDT does not intend to address non-BES facilities in the standard. Planning entities can choose to address other facilities in their assessments if they conclude that those facilities can have a meaningful impact to the results.

The SDT believes that it has addressed the concerns of the low latitude entities through the use of geomagnetic latitude scaling, which does not exempt entities from the requirements of performing the analyses. The state of the scientific knowledge on GMD is such that a blanket exemption from performing the analyses below certain latitudes is not prudent.

The SDT does not agree with the change from “two years” to “24 months” in 7.3.1 and 7.3.2 as suggested.

The statement in the information box associated with R11 comes from the FERC Order No. 830. It is included for information and not intended to imply any requirements in this standard. Situational awareness is a term used in operations and not applicable here.

Resilient Societies

Comments of the Foundation for Resilient Societies on **NERC Project 2013-03 Geomagnetic Disturbance Mitigation, Transmission System Planned Performance for Geomagnetic Disturbance Events, Draft of TPL-007-2.**

We provide brief comments on the Draft Standard, Draft Implementation Plan, and Research Work Plan of NERC.

Draft **Reliability Standard TPL-007-2** is based on modeling that is substantially divorced from the empirical evidence of bulk power system equipment susceptibility to damage or total losses during moderate geomagnetic disturbances during just the past three decades.

NERC's GMD Vulnerability Assessment process lacks scientific rigor. A rigorous standard would include:

Collection of all known or likely bulk power system equipment damage or loss during all three known classes of geomagnetic disturbance: (1) **coronal mass ejections (CMEs)**, upon which NERC has concentrated; (2) more extended duration but less intense **coronal hole proton streams (CHs)**, associated with a substantially larger set of EHV transformer fires and explosions during the past three decades; and (3) **sudden commencement** or **sudden reversal GMDs**, such as occurred at Seabrook Station between November 8 and 10, 1998, with resulting meltdown of lower voltage windings in the Phase A 345 kV transformer.

Transformer thermal impact assessments, if performed only if the maximum effective geomagnetically induced current (GIC) in the transformer is equal or greater than 75 amps per phase for the benchmark GMD event, and 85 amps per phase for the supplemental GMD event, are imprudent and needlessly risky, for a class of equipment with replacement times measured in months or years.

Idaho National Laboratory suspended injection of quasi-DC currents into a 138 kV transformer during tests with and without attachment of a neutral ground blocker in year 2013. Why was it necessary for INL test managers to suspend the DC current injections at a level of 22 amps per phase, to avert transmission system damage, if the standard's threshold is "prudently" set at 75 amps per phase?

What is needed is a more comprehensive set of GMD classes of hazard, a sharing of data on equipment losses since at least year 1989, not year 2013, improved modeling, and widespread testing of vulnerable BES equipment both under load and to destruction. Geomagnetically Induced Current (GIC) data should be retained indefinitely, not for the 3 years specified in the draft standard, because the return period for severe solar storms can be in excess of 100 years.

NERC claims that "the respective screening criteria are **conservative...**" (NERC Thermal Screening Criterion White Paper, 2017). We dispute this claim and see no scientific foundation for it. As a result of these deficiencies, the bulk electric system remains highly

vulnerable to natural occurring geomagnetic disturbances, and more powerful high altitude electromagnetic pulse (EMP) hazards that are manmade.

Respectfully submitted by:

William R. Harris

SDT Response:

TPL-007 requires two distinct types of assessment. The first one is a system assessment which is determined by the largest geoelectric field estimated to occur once in 100 years. This assessment evaluates effects such as reactive power loss, voltage depression and harmonics due to the interaction of a dc (peak) geoelectric field with the power system. The second assessment looks at the thermal effects of time-varying GIC(t) on transformers. The GIC(t) waveform depends on the static GIC distribution obtained from the system assessment. The 75 A/phase and 85 A/phase screening thresholds are calculated using the benchmark and supplemental benchmark waveforms, respectively. Comparing the screening current thresholds with the constant dc injected in the INL tests is inappropriate and incorrect.

The INL tests did not monitor transformer hot spots, therefore the SDT cannot comment on conjectures regarding testing parameters used.

The NERC 1600 Data Request will address the data retention of the GIC monitor data and geomagnetic field data collected by NERC. The 3-year retention period relates to the time frame that an applicable entity must retain evidence of their processes for compliance with Requirements R11 and R12.

The SDT has used 20 years of consistent geomagnetic field measurements to estimate 1 in 100 year benchmark events regardless of the physical processes captured by the measurements.

The SDT agrees with the need to improve modelling and testing, which will be addressed with NERC's research plan.

Comments from Avangrid

1. The SDT developed proposed **Requirements R8 – R10** and the supplemental GMD event to address FERC concerns with the benchmark GMD event used in GMD Vulnerability Assessments. (Order No. 830 P.44, P.47-49, P.65). The requirements will obligate responsible entities to perform a supplemental GMD Vulnerability Assessment based on the supplemental GMD event that accounts for potential impacts of localized peak geoelectric fields. Do you agree with the proposed requirements? If you do not agree, or if you agree but have comments or suggestions for the proposed requirements provide your recommendation and explanation.

Yes

No

Comments:

2. The SDT developed the **Supplemental GMD Event Description white paper** to provide technical justification for the supplemental GMD event. The purpose of the supplemental GMD event description is to provide a defined event for assessing system performance for a GMD event which includes a local enhancement of the geomagnetic field. Do you agree with the proposed supplemental GMD event and the description in the white paper? If you do not agree, or if you agree but have comments or suggestions for the supplemental GMD event and the description in the white paper provide your recommendation and explanation.

Yes

No

Comments:

3. The SDT established an 85 A per phase screening criterion for determining which power transformers are required to be assessed for thermal impacts from a supplemental GMD event in Requirement R10. Justification for this threshold is provided in the revised **Screening Criterion for Transformer Thermal Impact Assessment** white paper. Do you agree with the proposed 85 A per phase screening criterion and the technical justification for this criterion that has been added to the white paper? If you do not agree, or if you agree but have comments or suggestions for the screening criterion and revisions to the white paper provide your recommendation and explanation.

Yes
 No

Comments: “Figure 2: Metallic hot spot temperatures calculated using the benchmark GMD event” from the screening criterion document provides a useful visual, can the drafting team additionally provide a similar chart and the data for the supplemental GMD event?

SDT Response:

Thank you for your comment. Figure 2 in the Screening Criteria document is only an illustrative example of a GIC(t) waveform and thermal response time series would look like for the particular level of GIC and event.

The SDT agrees that accuracy of models and tools is very important and that their improvement and validation are the main drivers for the research plan. The upper bound of hot spot temperatures are provided in Figure 3 of the Screening Criterion for Transformer Thermal Impact Assessment white paper and in Tables 1 and 2 of Appendix 1 of the same document.

4. The SDT revised the **Transformer Thermal Impact Assessment white paper** to include the supplemental GMD event. Do you agree with the revisions to the white paper? If you do not agree, or if you agree but have comments or suggestions on the revisions to the white paper provide your recommendation and explanation.

Yes
 No

Comments: Table 1 and 2 are useful to show the differences between the benchmark event and the supplemental, but some of the figures are not clear which GMD event was used to generate the gic(t) time series. Can some additional language be added to clarify the GMD event of the figures in this document?

Also, there was some inconsistency in axis labels and units between the various figures, which makes it difficult to draw conclusions when comparing the charts. For example A/phase versus Amps, minutes versus hours for the time scale. Can these charts be updated with uniform axis labels and units for comparative purposes?

SDT Response:

Thank you for your comment. This version of the white paper is intended to illustrate different ways to carry out thermal transformer assessments. The time series used in the white paper are based on portions of the benchmark time series and are intended for illustrative purposes only. The Figures in the white papers are sufficiently clear for their intended use.

5. The SDT developed proposed **Requirement R7** to address FERC directives in Order No. 830 for establishing **Corrective Action Plan (CAP) deadlines** associated with GMD Vulnerability Assessments (P. 101, 102). Do you agree with the proposed requirement? If you do not agree, or if you agree but have comments or suggestions for the proposed requirement provide your recommendation and explanation.

Yes

No

Comments:

6. The SDT developed Requirements **R11 and R12** to address FERC directives in Order No. 830 for requiring responsible entities to collect GIC monitoring and magnetometer data (P. 88; P. 90-92). Do you agree with the proposed requirements? If you do not agree, or if you agree but have comments or suggestions for the proposed requirements provide your recommendation and explanation.

Yes

No

Comments: Neutral current measurements are not sufficient to benchmark autotransformer performance in a GMD event; TOs would need at least two out of three leg measurements to do this. Additionally, the proxy magnetometer data leaves flexibility for the TO, but may not prove to be effective for benchmarking without other additional considerations. While the intent of the R11 requirement is to benchmark the model, without accurate magnetometer installations in each TOs footprint, it may be difficult to do so; particularly where no nearby proxy data can be leveraged. Can the drafting team consider increasing R11 further and require TOs to either install measuring devices in their area, and/or to prove the accuracy of the proxy data? Also, can the drafting team consider a requirement for additional measurements on autotransformers?

SDT Response:

Thank you for your comment. Requirement R11 addresses the process for data collection. The standard does not address the appropriateness of magnetometer site installation and validity of data.

7. Do you agree with the proposed **Implementation Plan for TPL-007-2**? If you do not agree, or if you agree but have comments or suggestions for the Implementation Plan provide your recommendation and explanation.

Yes

No

Comments:

8. Do you agree with the **Violation Risk Factors (VRFs) and Violation Severity Levels (VSLs)** for the requirements in proposed TPL-007-2? If you do not agree, or if you agree but have comments or suggestions for the VRFs and VSLs provide your recommendation and explanation.

Yes

No

Comments:

9. The SDT believes proposed TPL-007-2 provide entities with flexibility to meet the reliability objectives in the project Standards Authorization Request (SAR) in a cost effective manner. Do you agree? If you do not agree, or if you agree but have suggestions for improvement to enable additional cost effective approaches to meet the reliability objectives, please provide your recommendation and, if appropriate, technical justification.

Yes

No

Comments:

10. Provide any additional comments for the SDT to consider, if desired.

Comments:

Attachment 1

SPP TPLTF Review of TPL-007-2 Comment Questions published by Project 2013-03 (Geomagnetic Disturbance Mitigation)

In July 2017, the Project 2013-03 Standard Drafting Team (SDT) released an unofficial comment form to allow the industry to provide feedback on the proposed TPL-007-2 – Transmission System Planned Performance for Geomagnetic Disturbance Events standard. It is noted that the industry comment period is brief and all comments must be submitted by Friday, August 11, 2017. Given that the SPP TPLTF has been actively developing guidance and processes for SPP and its members to address the approved TPL-007-1 standard, this open comment period offered an opportunity for the TPLTF to collectively review the proposed standard. Further, the TPLTF assessed the TPL-007-2 official comment questionnaire and discussed potential industry responses. The following represents a summary of the informal discussion conducted by the TPLTF and is provided to add value to those SPP members who choose to submit comments during the open period. The information given here should be considered non-binding and is intended to supplement independent reviews of the proposed TPL-007-2, thereby adding the value of a TPLTF perspective.

If you have any questions, please contact the SPP TPLTF secretary Scott Jordan (SPP staff, sjordan@spp.org) or the SPP TPLTF chairperson Chris Colson (WAPA-UGPR, colson@wapa.gov).

General comment: Upon the TPLTF review of FERC Order No. 830, released in September 2016, it is clear that the FERC directives are very prescriptive. The group felt that there was little leeway offered the Project 2013-03 in drafting the proposed TPL-007-2 changes. Knowing this, the TPLTF review focused on the SDT approach to meeting the directives of FERC Order No. 830 and its impact upon the SPP Planning Coordinator, as well as SPP member Transmission Planners, Transmission Owners, and Generator Owners. The TPLTF took particular care to focus upon the draft requirements of TPL-007-2 and attempted to omit any discussion of the FERC directives themselves, given that they are established in Order No. 830.

Questions from the TPL-007-2 Comment Form

1. The SDT developed proposed Requirements R8 – R10 and the supplemental GMD event to address FERC concerns with the benchmark GMD event used in GMD Vulnerability Assessments. (Order No. 830 P.44, P.47-49, P.65). The requirements will obligate

responsible entities to perform a supplemental GMD Vulnerability Assessment based on the supplemental GMD event that accounts for potential impacts of localized peak geoelectric fields. Do you agree with the proposed requirements? If you do not agree, or if you agree but have comments or suggestions for the proposed requirements provide your recommendation and explanation.

TPLTF Discussion: The group agrees with the SDT approach to addressing FERC Order No. 830

Paragraph 44. In effect, the SDT has specified an extreme value for geoelectric field, called the supplemental GMD event, intended to represent a locally-enhanced geoelectric field experienced by a limited geographic area. In other words, the SDT has proposed a means by which Planning Coordinators and Transmission Planners can approximate a non-geospatially-averaged peak geoelectric field, thus meeting the intent of the FERC Order No. 830 directive. While determining peak geoelectric field amplitudes not based solely on spatially-averaged data is a significant challenge to meeting the FERC directive, primarily because of the lack of North American data, as well as analytical tools available to Planning Coordinators and Transmission Planners, the group believes the SDT has found a workable approach.

The group would like to note that it will be non-trivial to apply the localized peak geoelectric field in the supplemental GMD event to a spatially-limited area, described in the proposed TPL-007-2

Attachment 1, given available software tools and available personnel resources. This will be especially pronounced for Planning Coordinators and Transmission Planners with large geographical footprints. Many planning entities will be forced to apply the supplemental peak geoelectric field over their entire area, in effect simply studying a higher magnitude benchmark GMD event. While the group believes this is prominently conservative, as stated above, we understand and support the SDT approach to this directive. It is likewise noted that the definition of a spatially-limited area is absent in the materials published by the SDT, but this vagary supports better analytical flexibility for Planning Coordinators and Transmission Planners and should not be defined in the draft standard.

2. The SDT developed the *Supplemental GMD Event Description* white paper to provide technical justification for the supplemental GMD event. The purpose of the supplemental GMD event description is to provide a defined event for assessing system performance for a GMD event which includes a local enhancement of the geomagnetic field. Do you agree with the proposed supplemental GMD event and the description in the white paper? If you do not agree, or if you agree but have comments or suggestions for the supplemental GMD event and the description in the white paper provide your recommendation and explanation.

TPLTF Discussion: The group recognizes that there are multiple methods to approach revisions to the benchmark GMD event definition so that the reference peak geoelectric field amplitude component is not based solely on spatially-averaged data (FERC Order No. 830 Paragraph 44). However, given a wide diversity in available data, analytical tools, and personnel expertise, the group believes that the SDT has found a practical approach to meeting the objective of the FERC directive. Moreover, the *Supplemental GMD Event Description* white paper presents a reasoned justification for the use of the geoelectric field amplitude of 12 V/km.

The group recommends that the SDT consider a less ambiguous name for the Supplemental GMD Event; the group believes *Extreme Value GMD Event* would be more appropriate for the following reasons:

- a. Implies a closer relationship to the extreme events of TPL-001-4 for which Planning Coordinators and Transmission Planners are familiar.
- b. Is better aligned with the extreme value statistical analysis that was conducted to produce the subject reference peak geoelectric field amplitude.
- c. Indicates a measure of how rare the extreme value for the 1-in-100 year peak geoelectric field amplitude may be, based upon the 95% confidence interval of the extreme value.

While the group agrees that the application of extreme value statistical methods presented in the *Supplemental GMD Event Description* white paper is sound, three clarifying statements should be made in the white paper. Firstly, in short, the group agrees that by using the 23 years of daily maximum geoelectric field amplitudes from IMAGE magnetometers, a proxy of higher magnitude events can be characterized. It is noted that the southernmost magnetometer in the IMAGE chain resides in Suwałki, Poland at 54.01°N, whose geographic latitude places it roughly 500 miles north of Quebec. Given that geoelectric field is highly correlated with geomagnetic latitude rather than geographic latitude, the IMAGE data should still be referred to as a loose approximation for estimated North American geoelectric field magnitudes (Suwałki, Poland geomagnetic dipole latitude 52°N, Quebec geomagnetic dipole latitude 56°N). In other words, the group believes it is appropriate to qualify that the extreme value analysis performed in the white paper is based upon maximum data points obtained from an array of northern geomagnetically-biased latitudes, further inflated by using the high earth conductivity of Quebec. Secondly, it is well known that coastal geological conditions can lead to locally-enhanced geoelectric fields, not observed in regions more distant from the coast. Given that nearly all of the IMAGE chain

magnetometers reside within 100 miles of the northern Atlantic Ocean or Baltic Sea coasts, it is reasonable to conclude that the geoelectric field amplitudes derived from the corresponding IMAGE data may have suffered from geoelectric field enhancement along conductivity boundaries. With respect to serving as a proxy for mainland North American peak geoelectric field amplitude, the SDT should consider further qualifying the appropriateness of the IMAGE data which served as the foundation of the extreme value analysis. Finally, the group agrees that the use of more resolute point over threshold (POT) methods was indicated over generalized extreme value (GEV). For clarity, however, it should be emphasized that the geoelectric field amplitude of 12 V/km represents the *extreme value* of the upper limit of the 95 percent confidence interval for a 100-year return interval. In other words, the statistical significance of the extreme value confidence interval is not equivalent to the statistic expressed by the confidence interval for the data set consisting of 23 years of all sampled geoelectric field amplitudes (not shown). Each of these considerations, if addressed, can strengthen the conclusions of the white paper by emphasizing its conservative approach.

3. The SDT established an 85 A per phase screening criterion for determining which power transformers are required to be assessed for thermal impacts from a supplemental GMD event in Requirement R10. Justification for this threshold is provided in the revised *Screening Criterion for Transformer Thermal Impact Assessment* white paper. Do you agree with the proposed 85 A per phase screening criterion and the technical justification for this criterion that has been added to the white paper? If you do not agree, or if you agree but have comments or suggestions for the screening criterion and revisions to the white paper provide your recommendation and explanation.

TPLTF Discussion: Given the use of the 12 V/km geoelectric field amplitude for the supplemental GMD event, the group agrees with the proposed 85 Amp threshold justified in the *Screening Criterion for Transformer Thermal Impact Assessment* white paper. The group suggests that the proposed change on page 11 of the white paper stating “because the supplemental waveform has a sharper peak, the peak metallic hot spot temperatures associated with the supplemental waveform are slightly lower than those associated with the benchmark waveform” be clarified. In other words, this statement is counterintuitive given that the increased supplemental time-series waveform peak value implies higher GIC flows that, when experienced by a transformer will lead potentially higher metallic hot spot temperatures. A suggested approach to better communicate this point is as follows:

Given that GICs are proportional to the time-varying electric field, according to:

$$GIC(t) = |E(t)| \cdot [GIC_{Easterly} \sin \varphi(t) + GIC_{Northerly} \cos \varphi(t)] \quad (1)$$

The joule heating effect in transformers is proportional to the time-varying GIC, as:

$$\frac{dQ}{dt} \propto GIC(t)^2, \text{ where } P(t) = I(t)^2 R, Q = \int P(t) dt \quad (2)$$

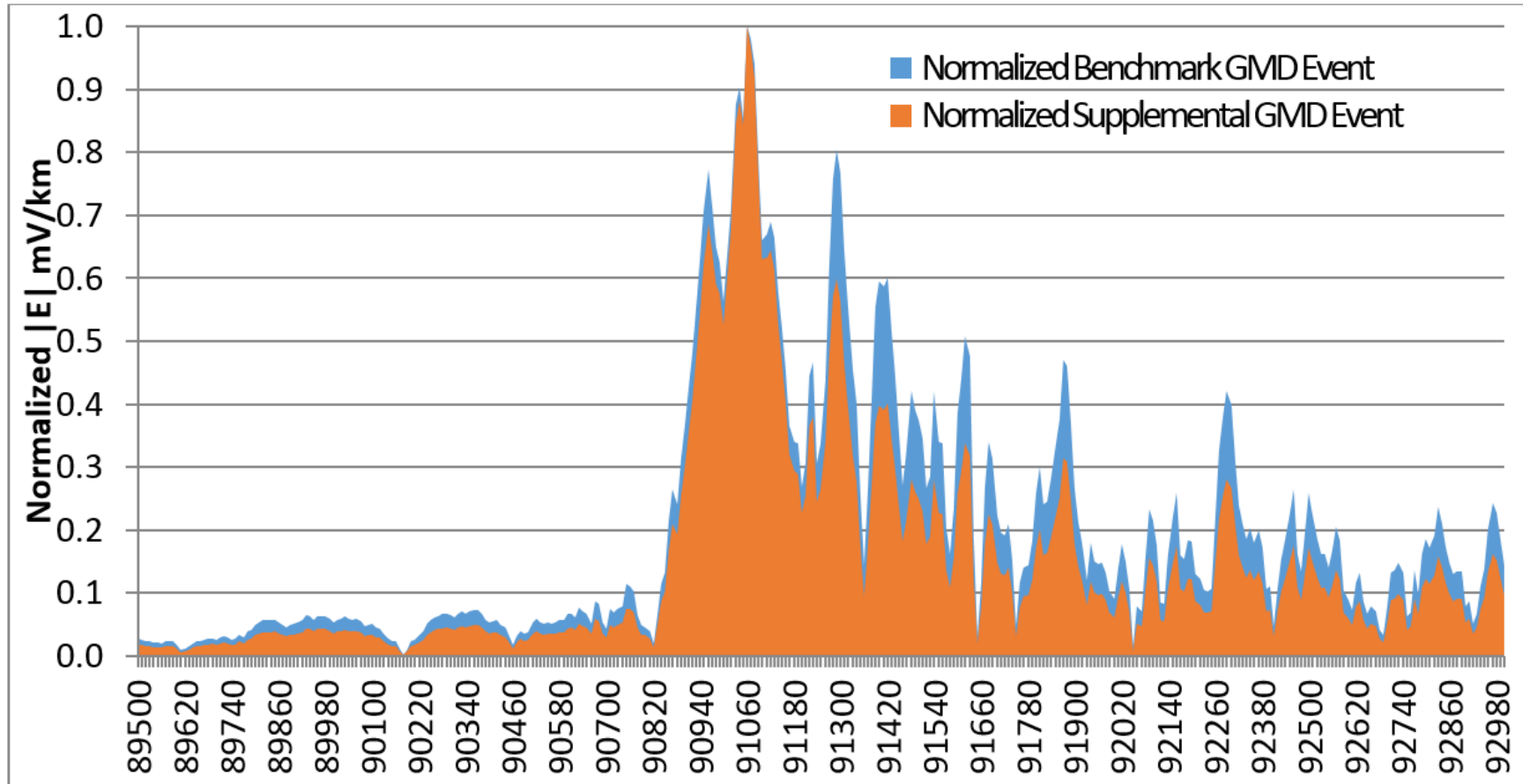
It follows that the transformer metallic hot spot temperature is proportional to the time-varying GIC, as:

$$T_F \propto \int GIC(t) dt, \text{ given } T_0 \quad \text{where } \frac{dQ}{dt} = c_P m \frac{dT}{dt} \quad (3)$$

Therefore, the corresponding proportion that relates the transformer metallic hot spot temperature to time-varying geoelectric field amplitude is expressed by:

$$T_{\text{metallic hot spot}} \propto \int E(t) dt \quad (4)$$

The figure below shows the benchmark GMD and supplemental GMD event waveforms normalized to their respective geoelectric field peak amplitudes. By portraying the two events in this manner, it is evident that the relationship given in (4) leads to a proxy heating quantity for the benchmark GMD event approximately 32% more than the supplemental GMD event. Even though the peak GIC induced by the supplemental GMD is higher than the benchmark, the total heating is less (integral).



In other words, if the peak transformer GIC screening threshold were 75 A/phase for both events, the transformer suffering a supplemental GMD event would experience less overall heating; the aggregated effects of the Supplemental geoelectric field “intensity” is not sustained. Thus, the screening threshold for supplemental GMD event transformer GIC is established at a slightly higher, but conservative, 85A/phase.

4. The SDT revised the *Transformer Thermal Impact Assessment* white paper to include the supplemental GMD event. Do you agree with the revisions to the white paper? If you do not agree, or if you agree but have comments or suggestions on the revisions to the white paper provide your recommendation and explanation.

TPLTF Discussion: The group agrees with the changes in the *Transformer Thermal Impact Assessment* white paper, with the exception of the explanation provided for Table 2 on page 5. Similar to the comment made regarding the counterintuitive language in the *Screening Criterion for Transformer Thermal Impact Assessment* white paper, it is not clear why metallic hot spot temperatures are reduced for the supplemental GMD event for the same effective GIC and transformer bulk oil temperature. Additional clarity on this point would improve the ability of applicable entities to rely upon the reference data provided. The group recommends adding white paper language similar to that suggested in Question Q3.

The group would like to highlight that the study of supplemental GMD event conditions may cause a significantly larger number of transformers to be added for assessed by Transmission Owners and Generator Owners. Given that the analytical tools and modeling software available for this type of analysis are limited, as well as the fact that most manufacturers supplying power transformers to U.S. customers do not include data necessary to complete detailed thermal modeling with transformer test reports, the additional effort to satisfy the supplemental GMD event analysis will be arduous. The group recommends that the SDT consider the reality that these tools are merely in their infancy across the industry, and additional time to develop, deploy, and train on them should be included in the TPL-007-2 implementation plan to complete transformer thermal assessments for the supplemental GMD event.

5. The SDT developed proposed Requirement R7 to address FERC directives in Order No. 830 for establishing Corrective Action Plan (CAP) deadlines associated with GMD Vulnerability Assessments (P. 101, 102). Do you agree with the proposed requirement? If you do not agree, or if you agree but have comments or suggestions for the proposed requirement provide your recommendation and explanation.

TPLTF Discussion: Given the specificity of the Paragraphs 101 and 102 directives of FERC Order No. 830 Paragraph 44, the group believes that the SDT had little flexibility when developing the proposed language of Requirement R7. The group agrees with the proposed Requirement R7, as presented. The group would like to reiterate the suggestion that the

Supplemental GMD Event nomenclature be changed to Extreme Value GMD Event, as explained in the group's discussion of Question Q2.

6. The SDT developed Requirements R11 and R12 to address FERC directives in Order No. 830 for requiring responsible entities to collect GIC monitoring and magnetometer data (P. 88; P. 90-92). Do you agree with the proposed requirements? If you do not agree, or if you agree but have comments or suggestions for the proposed requirements provide your recommendation and explanation.

TPLTF Discussion: Despite the added cost to implement additional monitoring and data collection, the group agrees that the SDT developed a reasonable approach to the FERC directives in Order No. 830 Paragraph 88.

7. Do you agree with the proposed Implementation Plan for TPL-007-2? If you do not agree, or if you agree but have comments or suggestions for the Implementation Plan provide your recommendation and explanation.

TPLTF Discussion: The group agrees with the proposed Implementation Plan for TPL-007-2 and does not see any conflicts with the order by which the phased requirements become effective. However, given the lack of available tools, absence of thermal modeling-related data from transformer manufacturers, and the significant training that will be necessary to properly execute transformer thermal assessments, the group believes that the implementation period for Requirement R10 should be at least 48 months after the standard is approved. This suggested implementation period is consistent with the existing implementation period for Requirement R6 (transformer thermal assessment for benchmark GMD event) and should allow sufficient time for many more transformers that may be observed to exceed the supplemental GMD event screening criterion.

8. Do you agree with the Violation Risk Factors (VRFs) and Violation Severity Levels (VSLs) for the requirements in proposed TPL-007-2? If you do not agree, or if you agree but have comments or suggestions for the VRFs and VSLs provide your recommendation and explanation.

TPLTF Discussion: The group agrees with the apportionment of the VRFs and VSLs.

9. The SDT believes proposed TPL-007-2 provide entities with flexibility to meet the reliability objectives in the project Standards Authorization Request (SAR) in a cost effective manner. Do you agree? If you do not agree, or if you agree but have suggestions for improvement to enable additional cost effective approaches to meet the reliability objectives, please provide your recommendation and, if appropriate, technical justification.

TPLTF Discussion: The group agrees that the SDT has done a good job of considering cost in time, resources, and personnel commitment in meeting the objectives of the SAR, which were heavily prescribed by FERC Order No. 830. The group may not agree with the perceived benefit to reliability that the additional effort to analyze the supplemental GMD event will yield, but the SDT has proposed a solid means of addressing the FERC directives without relying on tools or methods that do not exist widely in industry today. The group also supports the SDT cost-effective approach to the proposed Requirement R7 which does not mention GIC blocking devices as an integral part of a hardware mitigation. The group remains concerned with the perception that GIC mitigation hardware is presently a viable solution. Given its cost, effects on Protection System design, as well as potential compromises to existing BES reliability, GIC blocking devices may prove undesirable. The flexibility that the SDT has proposed in the development of Corrective Action Plans is workable.

10. Provide any additional comments for the SDT to consider, if desired.

TPLTF Discussion: None additional.