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P 2	Within 18 months of the effective date of this final rule, NERC must submit for approval one or more Reliability Standards that require owners and operators of the Bulk-Power System to conduct initial and on-going vulnerability assessments of the potential impact of benchmark GMD events on Bulk-Power System equipment and the Bulk-Power System as a whole.	The proposed standard requires applicable Planning Coordinators, Transmission Planners, Transmission Owners, and Generator Owners to conduct periodic assessments of the impacts of a 100-year benchmark GMD event on their systems.
P 2	The Second Stage GMD Reliability Standard must identify what severity GMD events (i.e. benchmark GMD events) that responsible entities will have to assess for potential impacts on the Bulk-Power System.	The benchmark GMD event is described in the drafting team's white paper available on the project page: http://www.nerc.com/pa/Stand/Pages/Project-2013-03-Geomagnetic-Disturbance-Mitigation.aspx The benchmark provides a defined event for assessing system performance as required by the proposed standard. It defines the geoelectric field values used to compute geomagnetically-induced current flows for a GMD Vulnerability Assessment.
P 28	We expect that NERC and industry will consider the costs and benefits of particular mitigation measures as NERC develops the technically-justified Second Stage GMD Reliability Standards.	The directive was met in the development of the proposed standard. The SDT chose a planning standard approach to meet the directives for the second stage GMD reliability standards, which allows responsible entities latitude to select mitigation from a variety of considerations which may include cost. Like other planning standards, TPL-007-1 does not prescribe specific mitigation measures or strategies. When mitigation is necessary to meet the performance requirements specified in the standard, responsible entities can evaluate options using criteria which can include cost considerations. Comments on mitigation costs were solicited from stakeholders during formal comments and considered by the SDT.

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P 51	The Commission accepts the proposal in NERC's May 21, 2012 post-Technical Conference comments and directs NERC to "identify facilities most at-risk from severe geomagnetic disturbance" and "conduct wide-area geomagnetic disturbance vulnerability assessment" as well as give special attention to those Bulk-Power System facilities that provide service to critical and priority loads. As noted...owners and operators of the Bulk-Power System will perform the assessments.	When fully implemented, the proposed standard will enable wide-area assessment of GMD impact by owners and operators. Through the standard development process, industry has provided projections on the time required for obtaining validated tools, models, and data necessary for conducting GMD Vulnerability Assessments. The five-year phased Implementation Plan has been tailored accordingly and reflects a realistic timeline for expecting owners and operators to perform GMD Vulnerability Assessments. Corrective Action Plans required by the proposed standard provide the means to address risk to all facilities from a benchmark GMD event, not only those determined to be most at-risk in wide-area assessments. The proposed standard enhances NERC's ability to further assess the reliability risks that geomagnetic disturbances pose to the Bulk-Power System through the reliability assessment functions described in Section 800 of the NERC Rules of Procedure. During the five-year implementation period, NERC will closely support industry preparations, monitor implementation, and assess progress and initial results. Once the proposed standard is fully implemented, NERC and the Regional Entities will be better able to further assess the potential impacts of GMD events on the Bulk-Power System as a whole and update the 2012 Interim Report.
P 67	Each responsible entity under the Second Stage GMD Reliability Standards would then be required to assess its vulnerability to the benchmark GMD events consistent with the five assessment parameters identified in the NOPR [P 28 - 32] and adopted in this Final Rule.	The proposed standard requires applicable entities to perform assessments that will identify the impacts from benchmark GMD events on the interconnected transmission system. • Evaluation criteria are uniformly established in Requirement R4, Table 1, and Attachment 1.

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	• First, the Reliability Standards should contain uniform evaluation criteria for owners and operators to follow when conducting their assessments... • Second, the assessments should, through studies and simulations, evaluate the primary and secondary effects of GICs on Bulk-Power System transformers[1], including the effects of GICs originating from and passing to other regions. • Third, the assessments should evaluate the effects of GICs on other Bulk-Power System equipment, system operations, and system stability, including the anticipated loss of critical or vulnerable devices or elements resulting from GIC-related issues • Fourth, in conjunction with assessments by owners and operators of their own Bulk-Power System components, wide-area or Regional assessments of GIC impacts should be performed... • Fifth, the assessments should be periodically updated, taking into account new facilities, modifications to existing facilities, and new information, including new research on GMDs, to determine whether there are resulting changes in GMD impacts that require modifications to Bulk-Power System mitigation schemes.	o Requirement R4 specifies system conditions. o Table 1 establishes uniform performance criteria. o Attachment 1 describes the procedure for calculating the benchmark GMD event for use in the GMD Vulnerability Assessment. • Requirements R4 and R6 address assessments of the effects of GIC on applicable transformers. o Requirement R4 specifies that responsible planning entities must conduct GMD Vulnerability Assessments that include steady state analysis to ensure transformer reactive losses from a benchmark GMD event do not produce voltage collapse, Cascading, and uncontrolled islanding. o Requirement R6 specifies that Transmission Owners and Generator Owners must conduct thermal impact assessments of applicable power transformers. • Requirements R4 and Table 1 address assessments of the effects of GIC on other Bulk-Power System equipment. Table 1 specifies that Reactive Power compensation devices and other Transmission Facilities are removed in the GMD study as a result of Protection System operation or Misoperation due to harmonics. Thus the GMD Vulnerability Assessment includes the system effects caused by GIC impacts on other BPS equipment. • The proposed standard accounts for wide-area impacts by requiring information exchange and involving appropriate applicable entities. Requirement R4 and Requirement R7 specify that GMD Vulnerability Assessments and Corrective Action Plans must be provided to Reliability Coordinators, adjacent planning entities, and functional entities

[1] The NOPR described damage to Bulk-Power System components as a primary effect of GICs and production of harmonics that are not present during normal Bulk-Power System operation and increased transformer absorption of reactive power as secondary effects of GICs. NOPR, 141 FERC ¶ 61,045 at P 13.

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		specifically referenced in the plans. Reliability Coordinators work together to maintain Real-time reliable operations in the Wide Area. The information in GMD Vulnerability Assessments and Corrective Action Plans from entities in the Reliability Coordinator Area will support this function. Planning Coordinators integrate plans within their areas and coordinate plans with adjacent Planning Coordinators as described in the NERC Functional Model. • The proposed standard requires GMD Vulnerability Assessments to be periodically updated, not to exceed every 60 calendar months.
P 67	The NERC standards development process should consider tasking planning coordinators, or another functional entity with a wide-area perspective, to coordinate assessments across Regions under the Second Stage GMD Reliability Standards to ensure consistency and regional effectiveness.	Planning Coordinators are included as applicable entities in the proposed standard to integrate plans within their areas and coordinate plans with adjacent Planning Coordinators as described in the NERC Functional Model. Requirement R1 in the proposed standard requires the Planning Coordinator to "identify the individual and joint responsibilities of the Planning Coordinator and each of the Transmission Planners in the Planning Coordinator's planning area for maintaining models and performing the studies needed to complete GMD Vulnerability Assessment(s)". Requirement R4 specifies that GMD Vulnerability Assessments are provided to adjacent Planning Coordinators. Requirement R7 specifies that Corrective Action Plans are provided to adjacent Planning Coordinators. These requirements provide the necessary information exchange for planning activities. In addition, the proposed standard designates Reliability Coordinators as a recipient of GMD Vulnerability Assessments and Corrective Action Plans. Reliability Coordinators work

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		together to maintain Real-time reliable operations in the Wide Area. The information in GMD Vulnerability Assessments and Corrective Action Plans from entities in the Reliability Coordinator Area will support this function.
P 68	NERC should consider developing Reliability Standards that can incorporate improvements in the scientific understanding of GMDs. When developing the Second Stage GMD Reliability Standards implementation schedule, NERC should consider the availability of validated tools, models, and data necessary to comply with the Requirements.	The requirements in the proposed standard are performance-based which allow applicable entities to use state of the art tools and methods to accomplish the specified reliability objectives. The standard does not contain prescriptive requirements for entities to use specific tools, models, or procedures which would limit the applicability of improvements in scientific understanding. Furthermore the use of modern magnetometer data and statistical methods in determining the benchmark GMD event supports reevaluation as additional magnetometer data is collected during future solar cycles. The 5-year phased implementation period was developed with consideration for the availability of validated tools, models, and data required by applicable entities.
P 79	If the assessments identify potential impacts from benchmark GMD events, owners and operators must develop and implement a plan to protect against instability, uncontrolled separation, or cascading failures of the Bulk-Power System, caused by damage to critical or vulnerable Bulk-Power System equipment, or otherwise, as a result of a benchmark GMD event. • Owners and operators of the Bulk-Power System cannot limit their plans to considering operational procedures or enhanced training alone, but must, subject to the vulnerabilities identified in the assessments, contain strategies for protecting against the potential impact of the benchmark GMD events	The directive is met by requiring an entity to develop a Corrective Action Plan in the event its system fails to meet specified performance criteria. Requirement 7 part 7.1 lists acceptable actions which are not limited to considering Operating Procedures or enhanced training.

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	based on factors such as the age, condition, technical specifications, system configuration, or location of specific equipment.	
P 82	As with the First Stage GMD Reliability Standards, the responsible entities should perform vulnerability assessments of their own systems and develop the plans for mitigating any identified vulnerabilities. We take no position in this Final Rule on which functional entities should be responsible for compliance under the Second Stage GMD Reliability Standards. However, the NERC standards development process should consider tasking planning coordinators, or another functional entity with a wide-area perspective, to coordinate mitigation plans across Regions under the Second Stage GMD Reliability Standards to ensure consistency and regional effectiveness. We clarify that if a responsible entity performs the required GMD vulnerability assessments and finds no potential GMD impacts, no plan is required under the Second Stage GMD Reliability Standards.	The proposed standard requires applicable entities to conduct assessments on their systems and develop plans to mitigate identified vulnerabilities. In Requirement R1, Planning Coordinators and Transmission Planners identify responsibilities for maintaining models and performing studies needed for GMD Vulnerability Assessments specified in Requirement R4. In Requirement R6, Transmission Owners and Generator Owners are required to conduct thermal impact assessments of applicable power transformers and, if necessary, specify mitigating actions. Requirement R7 specifies that the applicable planning entity must develop a Corrective Action Plan in the event that it concludes through the GMD Vulnerability Assessment that the system does not meet performance requirements. An entity that performs a GMD Vulnerability Assessment and does not identify a deficiency in system performance is not required to develop a Corrective Action Plan.
P 84	The Second Stage GMD Reliability Standards should not impose "strict liability" on responsible entities for failure to ensure the reliable operation of the Bulk-Power System in the face of a GMD event of unforeseen severity.	The proposed standard is a planning standard where the benchmark GMD event is the planning basis. The standard does not impose strict liability on failure to ensure reliable operation during a GMD event of unforeseen severity.
P 85	Given that some responsible entities have or may choose automatic blocking measures, the NERC standards development process should consider how to verify that selected blocking measures are effective and consistent with the reliable operation of the Bulk-Power System.	The GMD Vulnerability Assessment process considers all mitigation measures in modeling, assessment, and mitigation requirements. Requirement R2 specifies that responsible entities shall maintain system models for performing GMD Vulnerability

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		Assessments, which will include automatic blocking measures that are part of the system as described in the technical guidance. The responsible entity must perform studies based on these models as required in Requirement R4 to verify effectiveness and the reliable operation of the system. When a responsible entity identifies a need for mitigation actions such as blocking measures, Requirement R6 and R7 specify that information must be shared with planning entities to ensure that the mitigation actions are consistent with reliable operation.
P 86	While responsible entities will decide how to mitigate GMD vulnerabilities on their systems, the NERC standards development process should consider how the reliability goals of the proposed Reliability Standards can be achieved by a combination of automatic measures including, for example, some combination of blocking, improved "withstand" capability, instituting specification requirements for new equipment, inventory management, and isolating certain equipment that is not cost effective to retrofit.	The directive is met in Requirement R7. Responsible entities that conclude through the GMD Vulnerability Assessment that their System does not meet performance requirements are required to develop a Corrective Action Plan. The plan must list deficiencies and the associated actions needed to achieve required performance. Requirement R7 provides examples of such actions: installation or modification of equipment, use of Operating Procedures, and other actions specified in the requirement.
P 91	NERC must propose an implementation plan.	The implementation plan was developed through the standards development process.
P 91	We do not direct or suggest a specific implementation plan. As stated in the NOPR, in a proposed implementation plan, we expect that NERC will consider a multi-phased approach that requires owners and operators of the Bulk-Power System to prioritize implementation so that components considered vital to the reliable operation of the Bulk-Power System are protected first. We also expect, as discussed above, that the implementation plan will take into account the availability of validated tools, models, and data that are necessary for	Compliance with the proposed standard is to be implemented over a 5-year period as described in the Implementation Plan. Phased implementation provides • Necessary time for entities to obtain tools, models, and data required for GMD vulnerability assessments • Proper sequencing of system and equipment assessments performed by various applicable functional entities to build an overall assessment of GMD vulnerability.

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	responsible entities to perform the required GMD vulnerability assessments.	• Adequate time for development of viable Corrective Action Plans that detail actions and timelines necessary to achieve required performance. Development of Corrective Action Plans may require entities to develop, perform, and or validate new and/or modified studies, assessments, procedures, etc. to meet the TPL-007-1 requirements.