

Reliability Standard Audit Worksheet¹

TPL-007-1 – Transmission System Planned Performance for Geomagnetic Disturbance Events

This section to be completed by the Compliance Enforcement Authority.

Audit ID: Audit ID if available; or REG-NCRnnnnn-YYYYMMDD
Registered Entity: Registered name of entity being audited
NCR Number: NCRnnnnn
Compliance Enforcement Authority: Region or NERC performing audit
Compliance Assessment Date(s)²: Month DD, YYYY, to Month DD, YYYY
Compliance Monitoring Method: [On-site Audit | Off-site Audit | Spot Check]
Names of Auditors: Supplied by CEA

Applicability of Requirements *[RSAW developer to insert correct applicability]*

	BA	DP	GO	GOP	IA	LSE	PA	PC	PSE	RC	RP	RSG	TO	TOP	TP	TSP
R1								X							X	
R2								X							X	
R3								X							X	
R4								X							X	
R5								X							X	
R6			X										X			
R7								X							X	

Legend:

Text with blue background:	Fixed text – do not edit
Text entry area with Green background:	Entity-supplied information
Text entry area with white background:	Auditor-supplied information

¹ NERC developed this Reliability Standard Audit Worksheet (RSAW) language in order to facilitate NERC’s and the Regional Entities’ assessment of a registered entity’s compliance with this Reliability Standard. The NERC RSAW language is written to specific versions of each NERC Reliability Standard. Entities using this RSAW should choose the version of the RSAW applicable to the Reliability Standard being assessed. While the information included in this RSAW provides some of the methodology that NERC has elected to use to assess compliance with the requirements of the Reliability Standard, this document should not be treated as a substitute for the Reliability Standard or viewed as additional Reliability Standard requirements. In all cases, the Regional Entity should rely on the language contained in the Reliability Standard itself, and not on the language contained in this RSAW, to determine compliance with the Reliability Standard. NERC’s Reliability Standards can be found on NERC’s website. Additionally, NERC Reliability Standards are updated frequently, and this RSAW may not necessarily be updated with the same frequency. Therefore, it is imperative that entities treat this RSAW as a reference document only, and not as a substitute or replacement for the Reliability Standard. It is the responsibility of the registered entity to verify its compliance with the latest approved version of the Reliability Standards, by the applicable governmental authority, relevant to its registration status.

The NERC RSAW language contained within this document provides a non-exclusive list, for informational purposes only, of examples of the types of evidence a registered entity may produce or may be asked to produce to demonstrate compliance with the Reliability Standard. A registered entity’s adherence to the examples contained within this RSAW does not necessarily constitute compliance with the applicable Reliability Standard, and NERC and the Regional Entity using this RSAW reserves the right to request additional evidence from the registered entity that is not included in this RSAW. Additionally, this RSAW includes excerpts from FERC Orders and other regulatory references. The FERC Order cites are provided for ease of reference only, and this document does not necessarily include all applicable Order provisions. In the event of a discrepancy between FERC Orders, and the language included in this document, FERC Orders shall prevail.

² Compliance Assessment Date(s): The date(s) the actual compliance assessment (on-site audit, off-site spot check, etc.) occurs.

Facilities

The Applicability Section, 4.2 Facilities, of TPL-007-1 states, “Facilities that include power transformer(s) with high side, wye-grounded winding with terminal voltage greater than 200 kV.” Refer to Standard for further detail on the applicability of Requirements.

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Findings

(This section to be completed by the Compliance Enforcement Authority)

Req.	Finding	Summary and Documentation	Functions Monitored
R1			
R2			
R3			
R4			
R5			
R6			
R7			

Req.	Areas of Concern

Req.	Recommendations

Req.	Positive Observations

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Subject Matter Experts

Identify the Subject Matter Expert(s) responsible for this Reliability Standard.

Registered Entity Response (Required; Insert additional rows if needed):

SME Name	Title	Organization	Requirement(s)

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R1 Supporting Evidence and Documentation

- R1** Each Planning Coordinator, in conjunction with each of its Transmission Planners, shall 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).
- M1.** Each Planning Coordinator, in conjunction with each of its Transmission Planners, shall provide documentation on roles and responsibilities, such as meeting minutes, agreements, and email correspondence that identifies that agreement has been reached on individual and joint responsibilities for maintaining models and performing the studies needed to complete GMD Vulnerability Assessment(s) in accordance with Requirement R1.

Registered Entity Response (Required):

Compliance Narrative:

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Evidence Requested¹:

Provide the following evidence, or other evidence to demonstrate compliance.
Copies of meeting minutes, phone records, notes, or other evidence that document roles and responsibilities of entities in the planning area for maintaining models and performing the studies needed to complete GMD Vulnerability Assessments.

Registered Entity Evidence (Required):

The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.					
File Name	Document Title	Revision or Version	Document Date	Relevant Page(s) or Section(s)	Description of Applicability of Document

Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

Compliance Assessment Approach Specific to TPL-007-1, R1

This section to be completed by the Compliance Enforcement Authority

	Confirm existence of documentation on the individual and joint responsibilities for the responsible entities, defined in Requirement R1, for maintaining models and performing studies needed to complete GMD Vulnerability Assessment(s).
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Note to Auditor:

Auditor Notes:

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R2 Supporting Evidence and Documentation

- R2.** Responsible entities as determined in Requirement R1 shall maintain System models and geomagnetically-induced current (GIC) System models of the responsible entity’s planning area for performing the studies needed to complete GMD Vulnerability Assessment(s).
- M2.** Responsible entities as determined in Requirement R1 shall have evidence in either electronic or hard copy format that it is maintaining System models and geomagnetically-induced current (GIC) System models of the responsible entity’s planning area for performing the studies needed to complete GMD Vulnerability Assessment(s).

Registered Entity Response (Required):

Compliance Narrative:

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Evidence Requested:

Provide the following evidence, or other evidence to demonstrate compliance.
Evidence to demonstrate existence of ac System models and dc GIC System models for the responsible entity’s planning area.

Registered Entity Evidence (Required):

The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.

File Name	Document Title	Revision or Version	Document Date	Relevant Page(s) or Section(s)	Description of Applicability of Document

Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

Compliance Assessment Approach Specific to TPL-007-7, R2

This section to be completed by the Compliance Enforcement Authority

	Confirm responsible entity possesses System models and GIC System models for performing studies for GMD Vulnerability Assessments.
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Note to Auditor:

Auditor Notes:

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R3 Supporting Evidence and Documentation

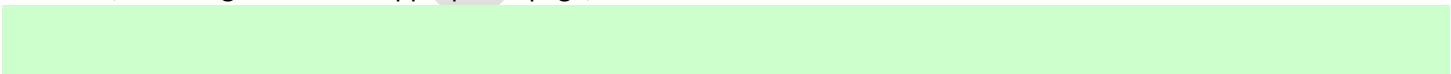
- R3.** Responsible entities as determined in Requirement R1 shall complete a GMD Vulnerability Assessment of the Near-Term Transmission Planning Horizon once every 60 calendar months. This GMD Vulnerability Assessment shall use studies based on models identified in Requirement R2, document assumptions, and document summarized results of the steady state analysis.
 - 3.1.** Studies shall include the following conditions:
 - 3.1.1.** System peak Load for at least one year within the Near-Term Transmission Planning Horizon;
 - 3.1.2.** System Off-Peak Load for at least one year within the Near-Term Transmission Planning Horizon.
 - 3.2.** Studies shall be conducted based on the benchmark GMD event described in Attachment 1 to determine whether the system meets the performance requirements in Table 1.
 - 3.3.** The GMD Vulnerability Assessment shall be provided within 90 days of completion to the responsible entity’s Reliability Coordinator, adjacent Planning Coordinators, adjacent Transmission Planners, and to any functional entity that submits a written request and has a reliability related need.
 - 3.3.1.** If a recipient of the GMD Vulnerability Assessment provides documented comments on the results, the responsible entity shall provide a documented response to that recipient within 90 calendar days of receipt of those comments.

- M3.** Responsible entities as determined in Requirement R1 shall have dated evidence such as electronic or hard copies of its GMD Vulnerability Assessment meeting all of the requirements in Requirement R3. Responsible entities as determined in Requirement R1 shall also provide evidence, such as email records, web postings with an electronic notice of posting, or postal receipts showing recipient and date, that it has distributed its GMD Vulnerability Assessment within 90 calendar days of its completion to its Reliability Coordinator, adjacent Planning Coordinators, adjacent Transmission Planners, and to any functional entity who has indicated a reliability related need as specified in Requirement R3. Responsible entities as determined in Requirement R1 shall also provide evidence, such as email notices or postal receipts showing recipient and date, that it has provided a documented response to comments received on its GMD Vulnerability Assessment within 90 calendar days of receipt of those comments in accordance with Requirement R3.

Registered Entity Response (Required):

Compliance Narrative:

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.



Evidence Requested¹:

Provide the following evidence, or other evidence to demonstrate compliance.
Dated copy of completed GMD Vulnerability Assessment of Near-Term Transmission Planning Horizon completed during the audit period, or within the last 60 calendar months.
Dated evidence that the responsible entity provided the GMD Vulnerability Assessment to entities as outlined in Requirement R3 Part 3.3.

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Dated evidence of the responsible entity's response to all comments received from recipients of the GMD Vulnerability Assessment identified in Requirement R3 Part R3.3.

Registered Entity Evidence (Required):

The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.

File Name	Document Title	Revision or Version	Document Date	Relevant Page(s) or Section(s)	Description of Applicability of Document

Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

Compliance Assessment Approach Specific to TPL-007-1, R3

This section to be completed by the Compliance Enforcement Authority

	Confirm the responsible entity completed the GMD Vulnerability Assessment within 60 calendar months, as required in R3.
	Confirm the use of studies to complete the GMD Vulnerability Assessment based on models evidenced in R2.
	Confirm studies used meet the requirements of R3 Part 3.1.1 and R3 Part 3.1.2 for peak and off-peak load conditions.
	Confirm studies were conducted based on the benchmark GMD event as described in Attachment 1 to determine whether the system meets the performance requirements in TPL-007-1 Table 1.
	Confirm the GMD Vulnerability Assessment was provided to entities as described in Requirement R3 Part 3.3.
	Determine whether the responsible entity received comments from any recipients identified in Requirement R3 Part 3.3, and confirm that the responsible entity responded to comments as described in Requirement R3 part 3.3.1.

Note to Auditor:

Auditor Notes:

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R4 Supporting Evidence and Documentation

- R4.** Responsible entities as determined in Requirement R1 shall have criteria for acceptable System steady state voltage limits for its System during the benchmark GMD event described in Attachment 1.
- M4.** Responsible entities as determined in Requirement R1 shall have evidence such as electronic or hard copies of the criteria for acceptable System steady state voltage limits for its System in accordance with Requirement R4.

Registered Entity Response (Required):

Compliance Narrative:

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Evidence Requested¹:

Provide the following evidence, or other evidence to demonstrate compliance.
Copy of criteria used for acceptable System steady state voltage limits for its System.

Registered Entity Evidence (Required):

The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.

File Name	Document Title	Revision or Version	Document Date	Relevant Page(s) or Section(s)	Description of Applicability of Document

Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

Compliance Assessment Approach Specific to TPL-007-1, R4

This section to be completed by the Compliance Enforcement Authority

<input type="checkbox"/>	Confirm responsible entity has criteria for acceptable System steady state voltage limits for its System during benchmark GMD event described in TPL-007 Attachment 1.
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Note to Auditor:

Auditor Notes:

R5 Supporting Evidence and Documentation

- R5.** Responsible entities as determined in Requirement R1 shall provide geomagnetically-induced current (GIC) flow information to be used for the transformer thermal impact assessment specified in Requirement R6 to each Transmission Owner and Generator Owner in the planning area that owns an applicable power transformer. The GIC flow information shall include for each applicable power transformer:
- 5.1** Maximum effective GIC value for the worst case geoelectric field orientation for the benchmark GMD event described in Attachment 1; and
 - 5.2** Effective GIC time series, GIC(t), calculated using the benchmark GMD event described in Attachment 1 for each applicable power transformer where the Maximum effective GIC value for the worst case geoelectric field orientation exceeds 15 Amperes per phase.
- M5.** Responsible entities as determined in Requirement R1 shall provide evidence, such as email records, web postings with an electronic notice of posting, or postal receipts showing recipient and date, that it has provided geomagnetically-induced current (GIC) flow information to each Transmission Owner and Generator Owner that owns an applicable power transformer as specified in Requirement R5.

Registered Entity Response (Required):

Compliance Narrative:

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Evidence Requested:

Provide the following evidence, or other evidence to demonstrate compliance.
Evidence demonstrating responsible entity provided GIC flow information to each Transmission Owner and Generator Owner in the planning area that owns an applicable power transformer. Evidence should include what specific GIC flow information was provided for each applicable transformer.

Registered Entity Evidence (Required):

The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.

File Name	Document Title	Revision or Version	Document Date	Relevant Page(s) or Section(s)	Description of Applicability of Document

Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to TPL-007-1, R5

This section to be completed by the Compliance Enforcement Authority

	Confirm responsible entity provided GIC flow information to each Transmission Owner and Generator Owner identified by the responsible entity to own applicable power transformers.
	(R5 Part 5.1) Confirm the GIC flow information provided by the responsible entity includes information required in R5 Part 5.1 for each applicable power transformer.
	(R5 Part 5.2) Confirm the GIC flow information provided by the responsible entity includes information required in R5 Part 5.2 for each applicable power transformer where the maximum effective GIC value in R5 part 5.1 is 15 Amperes or greater per phase.
Note to Auditor: Above confirmations may be obtained by reviewing evidence for a sample of applicable power transformers in the planning area.	

Auditor Notes:



R6 Supporting Evidence and Documentation

R6 Each Transmission Owner and Generator Owner shall conduct a thermal impact assessment for each of its solely and jointly owned applicable power transformers where the maximum effective geomagnetically-induced current (GIC) value provided in Requirement R5 part 5.1 is 15 Amperes or greater per phase. The thermal impact assessment shall:

- 6.1.** Be based on the effective GIC flow information provided in Requirement R5; and
- 6.2.** Document assumptions used in the analysis; and
- 6.3.** Describe suggested actions and supporting analysis to mitigate the impact of GICs, if any; and
- 6.4.** Be performed and provided to the responsible entities as determined in Requirement R1 within 12 calendar months of receiving GIC flow information specified in Requirement R5.

M6. Each Transmission Owner and Generator Owner shall have evidence such as electronic or hard copies of its thermal impact assessment for all of its applicable solely and jointly owned power transformers where maximum effective geomagnetically-induced current (GIC) value provided in Requirement R5 part 5.1 is 15 Amperes or greater per phase as specified in Requirement R6

Registered Entity Response (Required):

Compliance Narrative:

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Evidence Requested¹:

Provide the following evidence, or other evidence to demonstrate compliance.
Dated evidence demonstrating the completion of the thermal impact assessment for each of the entity's solely and jointly owned applicable power transformers.

Registered Entity Evidence (Required):

The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.

File Name	Document Title	Revision or Version	Document Date	Relevant Page(s) or Section(s)	Description of Applicability of Document

Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

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Compliance Assessment Approach Specific to TPL-007-1, R6

This section to be completed by the Compliance Enforcement Authority

	Confirm that the Registered Entity conducted a thermal impact assessment for each applicable power transformer.
	Review thermal impact assessments for applicable power transformers and confirm the thermal impact assessment meets the requirements identified in Requirement R6 Part R6.1 through Part R6.4.
Note to Auditor: Confirmation may be obtained by reviewing evidence from a sample of applicable power transformers solely or jointly owned by the entity.	

Auditor Notes:

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R7 Supporting Evidence and Documentation

R7 Responsible entities as determined in Requirement R1 that conclude through the GMD Vulnerability Assessment conducted in Requirement R3 that their System does not meet the performance requirements of Table 1 shall develop a Corrective Action Plan addressing how the performance requirements will be met. The Corrective Action Plan shall:

7.1 List System deficiencies and the associated actions needed to achieve required System performance. Examples of such actions include:

- Installation, modification, retirement, or removal of Transmission and generation Facilities and any associated equipment.
- Installation, modification, or removal of Protection Systems or Special Protection Systems.
- Use of Operating Procedures specifying how long they will be needed as part of the Corrective Action Plan.
- Use of Demand-Side Management, new technologies, or other initiatives.

7.2 Be reviewed in subsequent GMD Vulnerability Assessments until it is determined that the System meets the performance requirements contained in Table 1.

7.3 Be provided within 90 days of completion to the responsible entity’s Reliability Coordinator, adjacent Planning Coordinators, adjacent Transmission Planners, and to any functional entity that submits a written request and has a reliability related need.

7.3.1 If a recipient of the Corrective Action Plan provides documented comments on the results, the responsible entity shall provide a documented response to that recipient within 90 calendar days of receipt of those comments.

M7. Responsible entities as determined in Requirement R1 that conclude through the GMD Vulnerability Assessment conducted in Requirement R3 that the responsible entity’s System does not meet the performance requirements of Table 1 shall have evidence such as electronic or hard copies of its Corrective Action Plan as specified in Requirement R7. Responsible entities as determined in Requirement R1 shall also provide evidence, such as email records, web postings with an electronic notice of posting, or postal receipts showing recipient and date, that it has distributed its Corrective Action Plan, if any, within 90 calendar days of its completion to its Reliability Coordinator, adjacent Planning Coordinators, adjacent Transmission Planners, and to any functional entity who has indicated a reliability related need as specified in Requirement R7. Responsible entities as determined in Requirement R1 shall also provide evidence, such as email notices or postal receipts showing recipient and date, that it has provided a documented response to comments received on its Corrective Action Plan within 90 calendar days of receipt of those comments in accordance with Requirement R7.

Registered Entity Response (Required):

Question: Did the responsible entity conclude through the GMD Vulnerability Assessment conducted in R3 that their System does not meet the performance requirements of Table 1? Yes No

If yes, refer to the Evidence Requested section of the RSAW below.

If no, Requirement R7 in not applicable.

[Note: A separate spreadsheet or other document may be used. If so, provide the document reference below.]

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Registered Entity Response (Required):

Compliance Narrative:

Provide a brief explanation, in your own words, of how you comply with this Requirement. References to supplied evidence, including links to the appropriate page, are recommended.

Evidence Requested¹:

Provide the following evidence, or other evidence to demonstrate compliance.
Dated copy of the responsible entity's Corrective Action Plan.
Dated evidence that the Corrective Action Plan was provided to entities as outlined in Requirement R7 Part 7.3.
Dated evidence of the responsible entity's responses to all comments received from a recipient of the Corrective Action Plan identified in Requirement R7 Part R7.3.

Registered Entity Evidence (Required):

The following information is requested for each document submitted as evidence. Also, evidence submitted should be highlighted and bookmarked, as appropriate, to identify the exact location where evidence of compliance may be found.					
File Name	Document Title	Revision or Version	Document Date	Relevant Page(s) or Section(s)	Description of Applicability of Document

Audit Team Evidence Reviewed (This section to be completed by the Compliance Enforcement Authority):

Compliance Assessment Approach Specific to TPL-007-1, R7

This section to be completed by the Compliance Enforcement Authority

	Review Entity's response to RSAW Question above.
	Confirm the responsible entity's Correction Action Plan meets the specifications outlined in Requirement R7 Parts 7.1 and 7.2
	Confirm the responsible entity provided the completed Corrective Action Plan as described in Requirement R7 Part 7.3.
	Determine whether the responsible entity received comments from any recipients identified in Requirement R7 Part 7.3, and confirm that the responsible entity responded to comments as described in Requirement R7 part 7.3.1.

Note to Auditor:

Auditor Notes:

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Additional Information:

Reliability Standard

The full text of TPL-007-1 may be found on the NERC Web Site (www.nerc.com) under “Program Areas & Departments”, “Reliability Standards.”

In addition to the Reliability Standard, there is an applicable Implementation Plan available on the NERC Web Site.

In addition to the Reliability Standard, there is background information available on the NERC Web Site.

Capitalized terms in the Reliability Standard refer to terms in the NERC Glossary, which may be found on the NERC Web Site.

Regulatory Language

Order 779

May 16, 2013

P 54. We direct NERC to submit for approval, one or more Reliability Standards that require owners and operators of the Bulk-Power System to conduct initial and on-going assessments of the potential impact of benchmark GMD events on Bulk-Power System equipment and the Bulk-Power System as a whole. 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. 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 based on factors such as the age, condition, technical specifications, system configuration, or location of specific equipment.

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Revision History for RSAW

Version	Date	Reviewers	Revision Description
1	06/27/2014	NERC Compliance, Standards	New Document

¹ Items in the Evidence Requested section are suggested evidence that may, but will not necessarily, demonstrate compliance. These items are not mandatory and other forms and types of evidence may be submitted at the entity's discretion.

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