Description of document:	Western Area Power Administration (WAPA) procedures re threats to the electric grid system from solar electromagnetic storm activity. 2015-2016
Requested date:	2016
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Source of document:	FOIA Request Western Area Power Administration FOIA Officer - A0200 PO Box 281213 Lakewood, CO 80228 Fax: 720-962-7009

Department of Energy
Western Area Power Administration
Freedom of Information Act Office
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DEC 20 2016

CERTIFIED MAIL – 7010 1870 0003 0050 3939 – RETURN RECEIPT REQUESTED

FOIA Number: WAPA-2017-00213-F

This is in response to the request for information received by the Western Area Power Administration (WAPA), pursuant to the Freedom of Information Act (FOIA), 5 U.S.C. § 552. In your request you asked for a copy of any unpublished WAPA reports or memoranda concerning threats to the electric grid system from solar electromagnetic storm activity such as a Carrington Event type phenomenon, and/or any steps being taken by WAPA to address this potential problem.

Enclosed are three documents responsive to your request. However, the signatures have been withheld pursuant to Exemption 6. Exemption 6 of the FOIA, 5 U.S.C. § 552(b)(6), 10 C.F.R. § 1004.10(b)(6), protects from mandatory disclosure "personal and medical files and similar files the disclosure of which would constitute a clearly unwarranted invasion of personal privacy."

In applying Exemption 6, WAPA considered (1) whether a significant privacy interest would be invaded; (2) whether release of the information would further the public interest by shedding light on the operations or activities of the Government; and (3) whether in balancing the privacy interests against the public interest, disclosure would constitute a clearly unwarranted invasion of privacy.

Disclosure of the signatures could subject the individuals to unwanted attention that would intrude into their personal lives. Moreover, disclosure of this information will not reveal any aspect about the operations or activities of the Government that would outweigh an invasion of privacy.

You may challenge the denial of the withheld information by submitting a written appeal to the Director, Office of Hearings and Appeals, at HG-1/L'Enfant Plaza Building, Department of Energy, 1000 Independence Avenue, SW, Washington, D.C. 20585-1615. You may also submit your appeal by e-mail to OHA.filings@hq.doe.gov, including the phrase "Freedom of Information Appeal" in the subject-line. You should submit the appeal within 90 calendar days

of receipt of this determination. The written appeal, including the envelope, must clearly indicate that a FOIA appeal is being made. The appeal must contain elements required by 10 C.F.R. § 1004.8, including a copy of this letter. Judicial review will thereafter be available in the Federal District Court either (1) in the district where you reside; (2) in the district where you have your principal place of business; (3) in the district where the WAPA records are located; or (4) in the District of Columbia.

You may contact WAPA's FOIA Public Liaison, John D. Bremer, General Counsel, FOIA and Privacy Act Liaison, at 720-962-7010 or by mail at Office of General Counsel, P. O. Box 281213, Lakewood, CO 80228, for any further assistance and to discuss any aspect of your request. Additionally, you may contact the Office of Government Information Services (OGIS) at the National Archives and Records Administration to inquire about the FOIA mediation services they offer. The contact information for OGIS is as follows: Office of Government Information Services, National Archives and Records Administration, 8601 Adelphi Road-OGIS, College Park, Maryland 20740-6001, e-mail at ogis@nara.gov; telephone at 202-741-5770; toll free at 1-877-684-6448; or facsimile at 202-741-5769.

For purposes of assessment of fees, you have been categorized under the Department of Energy regulations at 10 C.F.R. § 1004.9(b)(4), as an "other" requester. In this category, you are entitled to two free hours of search time and 100 pages of duplication at no cost. The search for the documents did not exceed the two free hours; therefore, fees will not be charged.

The above referenced number has been assigned to your FOIA request and should be referred to in correspondence with this office. If you have any questions concerning this matter, please feel free to contact me at 720-962-7014.

Sincerely,

Patricia S. Land
FOIA Officer

Enclosures

	WAPA-UGPR Operating Procedure	Procedure No.	EOP-010-1
		Revision Date	12/14/15
	Geomagnetic Disturbance EOP-010-1	Revision No.	3

1. PURPOSE

a. To direct UGP power system dispatchers to mitigate the effects of geomagnetic disturbance events that may affect the reliable operation of the WAPA-UGPR portion of the BES.

2. APPLIES TO:

a. TSO Dispatch Personnel

b. AGC Dispatch Personnel

3. REFERENCES:

a. EOP-010-1

b. PEAK RC letter to TOPs

c. SPP RC Geomagnetic Disturbances Guide

4. ACRONYMS/DEFINITIONS

WAPA-UGPR	Western Area Power Administration – Upper Great Plains Region
GMD	Geomagnetic Disturbance
RC	Reliability Coordinator
TSO	Transmission System Operations
AGC	Automatic Generation Control
SPP RC	Southwest Power Pool, Reliability Coordinator
WECCnet	Western Electricity Coordinating Council, Communication Site

5. BACKGROUND

a. Geomagnetic Disturbance (GMD) events have the potential to adversely impact the reliable operation of interconnected transmission systems. During a GMD event, geomagnetically-induced currents may cause transformer hot-spot heating or damage, loss of reactive power sources, increased reactive power demand and protection system mis-operation. The combination of which may result in voltage collapse and blackout.

6. PROCESS

The WAPA-UGPR GMD Operating Procedure will be implemented upon receiving a GMD Alert from the SPP RC or Peak Reliability RC of a potential GMD event.

a. The TSO and AGC dispatcher on duty shall:

i. Monitor the WECCNet and the SPP Email for GMD Watch reliability message from the RC issued 1-3 days in advanced of potential storm.

ii. Notify the U.S. Army Corps of Engineers Operator at the Gavins Point Dam and the Dispatcher at Basin Electric Power Cooperative Headquarters of potential storm.

iii. Verify and log Black Start unit availability at Fort Peck, Garrison, and Oahe.(FP Units 1 &4, OA Units 2 & 3, GA Units 1& 2)

iv. Assess & monitor reactive resources.

v. Prepare for return of out of service equipment especially series capacitors.

vi. Prepare for possible delay of planned outages.

vii. Prepare for removal of shunt reactors as needed.

b. The TSO and AGC dispatcher on duty the day of event, hours in advance of imminent storm shall:

i. Monitor WECCNet and SPP Email for GMD Warning reliability message.

ii. Notify Gavins Point Dam and Basin Headquarters of imminent storm.

iii. TSO to verify series capacitors are in-service (UGP has none at this time).

iv. Monitor reactive reserves.

v. Monitor system for unusual voltage and/or MVAR swings.

vi. Prepare for unplanned capacitor bank and HVDC tripping.

vii. Prepare for possible false SCADA indications if communication equipment is interrupted.

c. The TSO and AGC dispatcher on duty, in real-time during the GMD event shall:

i. Monitor the WECCNet and SPP Email for GMD Alert reliability message from the RC.

ii. Monitor transformers for heating issues, coordinate with other entities and remove from service as necessary.

iii. Report to the RC's any unusual operating conditions in real-time due to the GMD event.

iv. Coordinate with LSEs for manual load shedding if needed.

d. WAPA-UGPR GMD Procedure will terminate after receiving the alert expiration time provided on the WECCNet and SPP Email GMD Alert. At that time, the proper notifications will be made and all system operations will be returned to normal. In the event the RC GMD Alert has been extended or cancelled, the WAPA-UGPR GMD Procedure will also be extended or cancelled as appropriate.

7. DISTRIBUTION:

a. A copy of this updated Operating Procedure is to be sent to:

i. Reliability Coordinator

1. RCTOPGMDProcedures@peakrc.com

2. Restorationplans@spp.org

Version History

Revision	Change	By	Date
0	Original Draft	B4100	2/15/15
1	Update RC information	B4100	06/03/15
2	Update SPP GMD Procedure reference	B4100	09/08/15
3	Update to 6.a.iii language	B4100	12/14/15

Technical Review

Reviewed by (Position/Level)	Signature	Date
NDA Outage Coordinator	[redacted]	12/22/15
SDA Outage Coordinator		12/22/15

Reviewed by	Signature	Date
Transmission Ops Manager	[redacted]	12/22/15
Generation Ops Manager		12-22-15

WACM WALC	GMD OPERATING PROCEDURE (WACM and WALC)	Approved Date	11/03/2016
		Effective Date	11/03/2016
	Loveland Phoenix	Contact Name	Dake, John
		Applies To	TSO-Loveland, TSO-Phoenix

1 PURPOSE

This procedure provides a description and the required response the WALC and WACM System Operators are to take after receiving notifications from the RC involving a Geomagnetic Disturbance (GMD) involving their individual Transmission Footprints in accordance with EOP-010-1.

2 CONTENTS

3 OVERVIEW

Geomagnetic Disturbance (GMD) event notifications require a response or mitigation by WACM or WALC System Operators following receipt from the Reliability Coordinator (RC for PeakRC or SPP RC) in accordance with NERC Standard EOP-010-1. The RC receives GMD notices from the Space Weather Prediction Center (SWPC) in Boulder, CO. through the SWPC forecasting service in real-time. GMD notifications of merit will be forwarded per the RCs GMP Operating Plan to TOPs within its RC Area. The Southwest Power Pool (SPP) GMD Operating Plan requires the SPP RCSO to coordinate GMD notices with SPP entities, including WACM.

GMD events coordinated by the RC (RC representing Peak RC and SPP RC) *potentially may cause* protection system mis-operations, transformer hot-spot damage, loss of compensating devices, fluctuations in reactive demand, voltage collapse and sub-regional blackouts.

WACM or WALC System Operator response to GMD notices from the RC is provided in section 6 this procedure. WACM applies a procedure to respond to SPP GMD notices in PPM.

4 RESPONSIBILITIES

4.1 RC

The RC is responsible for coordinating all GMD notifications, updates and cancellations of alerts and messages to TOPS in their area of responsibility via:

- RMT messaging system (addressed to "ALL WECC" by PeakRC)
- Reliability Coordinator Information System (RCIS) or AVTEC phone with ForumCom

4.2 SPP (non-WALC)

The SPP RC is responsible to coordinate all SWPC GMD levels with SPP entities.

4.3 WACM

System Operators are responsible to respond to the GMD Notices from the PeakRC or SPP RC as the situation applies to the WACM BA/TOP. The WACM System Operators will apply the response steps in Section 6 to protect the BES equipment and reliable operations.

4.4 WALC

WALC Transmission System Operators (TSO) is responsible to respond to the GMD Notices from the PeakRC as the situation applies to the WALC BA/TOP. The WALC TSO will apply the response steps in Section 6 to protect the BES equipment and reliable operations.

5 GMD - WATCHES – WARNINGS – ALERTS – CANCELLATIONS

The RC monitors SWPC GMD messages that issue "Watches", "Warnings", "Alerts" and "Cancellations" notifications. The RC then disseminates the GMD notices to the TOPs via RMT Messaging (PeakRC) or SPP system.

5.1 WATCHES (See RMT Messaging examples or templates in Appendix A)

SWPC issues "Watches", which are typically well in advance (up to 3 days) of a GMD storm, to the RC (PeakRC or SPP RC) based on the highest expected "K-index" or "G Scale" for a calendar day to determine the "Watch" level. A Watch issued may replace previous Watches.

5.2 WARNINGS (See RMT Messaging examples or templates in Appendix A)

SWPC "Warnings" are issued with a given duration in UTC Time to the RC,15 minutes to 1 hour before the GMD. Updates may be issued by SWPC during the storm and disseminated by the RC. If a Warning lasts longer than the initial Warning period, an Extended Warning is issued with a revised "now valid until" time. Extended Warnings are changed from "onset" to "persistent".

5.3 ALERTS (See RMT Messaging examples or templates in Appendix A)

PeakRCs GMD Operating plan states the RC will issue a reliability message for K-index 7 or above. Most GMD related mitigation actions by the TSO are executed during an Alert.

5.4 CANCELLATIONS (See RMT Messaging Templates in Appendix A)

The RC will issue a reliability message for GMD cancellations as defined in the RC GMD Operating Plan.

6 WACM AND WALC GMD PROCEDURE

The WACM and WALC System Operator will perform the listed steps in this section for the following RC GMD notifications if said notices are geographically within the TOPs footprint. If the applicability of a GMD notice is in question the System Operator should obtain a study for the given BA/TOP to validate the level of impact and mitigation necessary.

6.1 WATCHES ((K-index ≥7 or G-scale ≥3) - 1 to 3 days in advance of potential storm)

1. Check to see if the Geomagnetic latitude, geographical description, or specific instruction from the RC message includes the WACM TOP or WALC TOP footprints. If not then do not continue to the next step.
2. Increase awareness by logging the RC GMD Watch, include G Scale/duration
3. Respond to PeakRC or SPP RC verbal recommendations
4. Review this procedure
5. Check availability of black start generators and cranking paths
6. Perform a Study to obtain the support for the following *preparatory* actions • *Be prepared* to return of Series Capacitors to service (if possible) • *Be prepared* to open Shunt Reactors (do not do so if an SOL is exceeded) • *Be prepared* to delay planned outages in the impacted region
7. Log the *preparatory* recommendations.
8. Log the GMD Watch extension/cancellation.
Note: Any GMD escalated to a Warning or Alert will auto-cancel any given Watch.

6.2 WARNING ((K-index ≥7 or G-scale ≥3) – day of the event, hours in advance)

1. Check to see if the Geomagnetic lattiude, geographic description, or specific instruction from the RC message includes the WACM TOP or WALC TOP footprints. If not then do not continue to the next step.
2. Increase awareness by logging the RC GMD Alert, include G Scale/duration and perform the following monitoring and preparation steps in this section.
3. Respond to PeakRC or SPP RC recommendations.
4. Check availability of black start generators and cranking paths.
5. Check or perform a Study to obtain support for the following actions • *Monitor* Reactive Reserves • *Monitor unusual voltage or MVAR swings* • *Prepare* for unplanned tripping (cap. Banks, SVE or HVDC) • *Prepare* for false SCADA (ICCP) from telecomm. disruptions
6. Confirm BOR (GOP) is ready to start off-line units due to GMD.
7. Check any Series Capacitors are in-service within WACM Transmission Footprint
8. Log the GMD Warning extension/cancellation.
Note: Any GMD escalated to an Alert will auto-cancel any given Warning.

6.3 ALERT ((K-index ≥7 or G-scale ≥3) – REAL-TIME conditions, during the storm)

WACM or WALC System Operators, as may apply, will respond by applying the steps in this table based on the presence of:

- Receipt of the RC GMD Alert Notification
- GMD Latitude or Area description must include WACM or WALC TOP Footprint
- Study results with supporting mitigation or evidence of Actual GMD effects

1. Increase awareness by logging the RC GMD Alert, include G Scale/duration.
2. Respond to PeakRC or SPP RC recommendations to Western System Operators
3. Advise BOR Power plant Operators (GC – WACM and HVR – WALC) that the due to the GMD Alert *be ready* to: • Add units upon System Operator request o For re-dispatching generation o For voltage support
4. Assess the federal transmission system for these conditions: • Voltage fluctuations (look for kV abnormal swings greater than 3 kV) • MW and MVAR power swings (look for abnormal flow levels) • Rapid changes/Hunting of LTC Transformers • Drop out of RTU data and microwave telecommunication is given areas • False alarms or incorrect alarming • Negative sequence relay alarms • Loss of power or transmission in areas within the TOP • System Separation and blackouts • Unusual noise from transformers (if reported)
5. WALC will Send RMT message to 'ALL RELIABILITY" to notify the RC, APS, NVE, PNM, etc. if Hoover or Glen Canyon Blackstart units or associated cranking paths to PV are impacted in responding to this GMD Alert.
6. WACM will coordinate with PeakRC, SPP RC, impacted entities, and RMR Blackstart participants if Blackstart Units or cranking paths are impacted.
7. Request internal transmission operators, such as TSGT, FEUS, SWTCO, relate any operating conditions attributed to GMD and coordinate these with the RC.
8. If the Study supports manual load shedding or actual Transmission system voltage or loading issues are persistent, as identified in step 4, coordinate with the involved entities to shed load. Advise TSS/AGC desks of the load shed.
9. If the Study supports removing transformers that are in danger from overheating, or recommends removal of Transmission Lines to alleviate an SOL exceedance or an actual overload or exceedance persists, coordinate with the RC and entities prior to removing the element from service. Assure the TSS and AGC desks are aware of any outages so OASIS postings are made and Etags are adjusted.
10. Send RMT Message to "ALL RELIABILTY" upon Load shedding or the opening of BES Transformers or Transmission Lines in response to GMD Alert.
11. After receiving the RC RMT message that the Alert has expired or is cancelled, return the system to normal and coordinate with RC, BOR, entities.
12. Log the GMD Warning extension/cancellation and pertinent actions.

6.4 CANCELLATION – (REAL-TIME conditions, GMD has concluded)

NOAA and SWPC cancels GMDs and the RC will issue a reliability message for active SWPC cancellations, that is the coordination with the TOPs. The BES system should be returned to normal operation following a GMD cancellation or may be returned to normal anytime if the RC makes such a determination or direction to WALC or WACM.

WACM and WALC System Operators, following a GMD cancellation and the return to normal service of the BES shall confirm all three Western desks (TSO, TSS and AGC desks) are aware and shall verify a RMT Message has been sent to "ALL RELIABILITY" or that phone contact has been made to impacted entities.

6.5 DURATION – (The length of Alerts)

GMD Alerts are in effect until their expiration time frame. The RCs GMD Operating Plan states that the recommended return to normal time frame is two to four hours after the last GMD activity is noticed in a TOP's area. Following a GMD cancellation the WACM and WALC System Operators should return to service all impacted BES equipment unless there is a reliability reason to delay the return.

7 BACKGROUND

Procedure has been put into effect to meet EOP-010 NERC Standard effective in 2015.

8 DEFINITIONS

Term	Definition
Watches	NOAA identifies an Earth Directed Coronal Mass Ejection, and a storm is possible, a GMD "Watch" is issued by SWPC and coordinated by the RC. Typically issued with a 1-3 day lead time.
Warning	NOAA identifies the strength of a GMD using the K4-K9 index, SWPC issues the "Warning" and it is coordinated by the RC to BA/TOPs. Usually issued 15-60 minutes before the storm and updated during the storm.
Alert	NOAA issues and identifies the K-Index (K4-K9) in near Real-Time (depending on the length of the storm) and the Alert may be re-issued with different K-Index or may be issued as a Warning depending on the intensity and length of the Storm before a cancellation is issued.
Cancellation	NOAA identifies a GMD no longer meets notice criteria, SWPC issues the cancellation notice and RC Coordinates with BA/TOPs.

9 ACRONYMS

Acronym	Long Name
Alerts	GMD notification issued for
BOR	U.S. Bureau of Reclamation (GOP)
FEUS	Farmington, City of (TOP)
GMD	Geomagnetic Disturbance
G Scale	NOAA Space Weather Scale of GMD Storm severity – example G1-G5
K index	NOAA predicted index that physically measures nu. of storms in a cycle
NOAA	National Oceanic and Atmospheric Administration
PeakRC	Peak Reliability Coordinator
RC	Reliability Coordinator
RCSO	Reliability Coordinator System Operator
RMT	Reliability Messaging Tool
SPP RC	Southwest Power Pool Reliability Coordinator
SWPC	Space Weather Prediction Center in Boulder CO
SWTCO	Southwest Transmission Cooperative (TOP)
TSGT	Tri-State GNT
WACM	Western Area Colorado Missouri
WALC	Western Area Lower Colorado
Warning	GMD notification issued 15-minutes before a GMD Storm
Watches	GMD notification issued 1-3 days in advance of event by SWTC

10 REFERENCES

This document takes references from the PeakRC and SPP GMD Operating Plans and is consistent with both of these plans and correctly reflects NOAA and SWPC Alert processes currently being used. For more details on the NOAA, SWPC, Use of K-Index and G-Scales in GMD notices and templates use reference Appendix 1 and 2.

Appendix	Title
Appendix 1	PeakRC GMD Operating Plan
Appendix 2	SPP Southwest Power Pool GMD Operating PlanDraft

11 ACKNOWLEDGEMENT

This operating procedure set forth herein has been reviewed and implemented by the authorized reliability power system operating representatives of Western and serves as an internal power system operating guide for the Western System Operator. This document is not intended to be a bi-lateral or binding agreement between any entity and Western. This document is not intended to replace any other entity's operating procedures.

12 LIABILITY

The Western Area Power Administration in no manner warrants the contents of this operating procedure. Any entity or person accessing this Standard Operating Procedure shall release, hold harmless, and indemnify the Western Area Power Administration, Department of Energy and United States from any and all liability with regards to any use of the steps, descriptions, guides, or attachments included or associated with this document.

13 NON-DISCLOSURE

All entities and persons accessing this Standard Operating Procedure agree to use such information only for its contemplated purposes and not to disclose any of the portions or attachments of this document without the express written consent of the Western Area Power Administration, Operations, TSO / AGC / TSS / OSG Manager(s).

	WASN Operating Procedure	Procedure No.	OP-067
		Revision Date	03/31/2016
	OP-067 Geomagnetic Disturbance	Revision No.	3

1. PURPOSE

a. To direct WASN power system dispatchers during geomagnetic disturbance events that may affect the WASN portion of the BES.

2. APPLIES TO:

a. WASN Dispatchers; TSO, AGC, TSS

3. REFERENCES:

a. EOP-010-1

b. PEAK RC GMD Operating Plan

4. ACRONYMS/DEFINITIONS

WASN	Western Area Power Administration – Sierra Nevada Region
SNR	Sierra Nevada Region
GMD	Geomagnetic Disturbance
RC	Reliability Coordinator
RMT	Reliability Messaging Tool
PPM	Policy Procedure Manager - Western's procedure management program

5. BACKGROUND

a. Geomagnetic Disturbance (GMD) events have the potential to adversely impact the reliable operation of interconnected transmission systems. During a GMD event, geomagnetically-induced currents may cause transformer hot-spot heating or damage, loss of reactive power sources, increased reactive power demand and protection system mis-operation. The combination of which may result in voltage collapse and blackout.

b. Peak RC Geomagnetic Disturbance operating plan can be accessed in PPM for additional information.

6. PROCESS

a. The TSO, AGC and TSS dispatcher on duty shall:

i. Monitor the Peak RC RMT for GMD Watch reliability message which will be issued 1-3 days in advanced of potential storm.

1. The TSO dispatcher shall increase situational awareness by logging RC GMD Watches, Warnings or Alerts once per shift, if such have been issued.

2. Verify with AGC & USBR black start unit availability. If black start units are unavailable see Restoration Strategies in OP-010 System Restoration.

3. Assess & monitor reactive resources.

4. Prepare for return of out of service equipment especially series capacitors.

5. Prepare for possible delay of planned outages.

6. Prepare for removal of shunt reactors as needed.

b. The TSO, AGC and TSS dispatcher on duty the day of event, hours in advance of imminent storm shall:

i. Monitor Peak RC RMT for GMD Warning reliability message.

1. TSO:

a. Monitor reactive reserves.

b. Monitor system for unusual voltage and/or MVAR swings.

c. Prepare for unplanned capacitor bank and HVDC tripping.

d. TSO to verify series capacitors are in-service.

2. TSO & AGC Prepare for possible false SCADA indications if communication equipment is interrupted.

3. TSS to coordinate with other entities for possible transfer limit reductions.

c. The TSO, AGC and TSS dispatcher on duty, in real-time during the GMD event shall:

i. All monitor the Peak RC RMT for GMD Alert reliability message from the RC.

ii. TSO shall monitor transformers for heating issues, coordinate with other entities and remove from service as necessary.

iii. All report unusual operating conditions in real-time due to the GMD event.

iv. All coordinate with LSEs for manual load shedding if needed.

d. The TSO, AGC and TSS dispatcher on duty return to normal operation after the original time listed on the Peak RC RMT unless extended or cancelled. TSO shall log the end of GMD events per Peak RC RMT messages.

7. DISTRIBUTION:

a. A copy of this updated Operating Procedure is to be sent to:

i. Reliability Coordinator

1. RCTOPGMDProcedures@peakrc.com

DOCUMENT CONTROL

Version #	Revision Date	Details of Revision		Reason
		Page Number	Paragraph Number	
1	01-07-2015			New Document
2	07-02-2015	2 - 3	6	Added logging guidelines and performed other minor cleanup
3	03-31-2016	All 1	Throughout 5.b	Updated WECCNet to RMT Added location of RC GMD plan