

# Winter Weather Preparation

2020 Webinar

### Richard Hackman, Sr. Event Analysis Advisor September 3, 2020





### Reliability Guideline Generating Unit Winter Weather Readiness V3

# **Request for Comments**

Draft Reliability Guideline: Generating Unit Winter Weather Readiness – Current Industry Practices – Version 3

Click here for: <u>Draft Guideline (Clean)</u> | <u>Draft Guideline (Redline)</u> Click here for: <u>Comment Form</u> Comment Period: August 7, 2020 – September 21, 2020

### **Three-Year Document Review**

In accordance with current NERC practices, all Reliability Guidelines must undergo a review every three years. The Reliability Guideline: Generating Unit Winter Weather Readiness – Current Industry Practices – Version 3 has been reviewed and revisions have been made to keep the information current.

This reliability guideline is applicable to electricity sector organizations responsible for the operation of the BPS. Although this guideline was developed as a result of an unusual cold weather event in an area not normally exposed to freezing temperatures, it provides a general framework for developing an effective winter weather readiness program for generating units throughout North America. The focus is on maintaining individual unit reliability and preventing future cold weather related events. This document is a collection of industry practices and while the incorporation of these practices is strictly voluntary, developing a winter weather readiness program using these practices is highly encouraged to promote and achieve the highest levels of reliability for these high impact weather events.

The Reliability and Security Technical Committee reviewed Version 3 of the guideline and approved a 45-day posting for industry comment. Comments should be submitted via <u>email</u> by 5:00 p.m. Eastern on September 21, 2020, using the comment form at the link above.

For more information or assistance, please contact <u>Sandy Shiflett</u> (via email) or at 404-446-2575.

3353 Peachtree Road NE Suite 600, North Tower Atlanta, GA 30326 404-446-2560 | <u>www.nerc.com</u> **RELIABILITY | RESILIENCE | SECURITY** 



### Reliability Guideline Generating Unit Winter Weather Readiness V3

### **Reliability Guideline**

Generating Unit Winter Weather Readiness – Current Industry Practices – Version 23

### Preamble:

The NERC Operating Committee (OC), Planning Committee (PC) and Critical Infrastructure Protection Committee (CIPC) develop Reliability (OC and PC) and Security (CIPC) Guidelines, which include the collective experience, expertise and judgment of the industry. The objective of the reliability guidelines is to distribute key practices and information on specific issues critical to promote and maintain a highly reliable and secure bulk power system (BPS). Reliability guidelines are not binding norms or parameters to the level that compliance to NERC's Reliability Standards are monitored or enforced. Rather, their incorporation into industry practices is strictly voluntary. Reviewing, revising, or developing a program using these practices is highly encouraged.

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#### Purpose:

Preamble

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**Reliability Guideline** 

Generating Unit Winter Weather Readin Current Industry Practices – Version 23

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#### Assumptions

- Each BPS Generator Owner (GO) and Generator Operator (GOP) is responsible and accountable for maintaining generating unit reliability.
- 2. Balancing Authorities (BAs) and Market Operators should consider strategies to start-up and dispatch to minimum load prior to anticipated severe cold weather units that are forecasted to be needed for the surge in demand, since keeping units running through exceptional cold snaps can be accomplished much more reliably than attempting start-up of offline generation during such events. Entities should develop and apply plant-specific winter weather readiness plans, as appropriate, based on factors such as geographical location, technology and plant configuration.

#### **Guideline Details:**

An effective winter weather readiness procedure, which includes severe winter weather event preparedness, should generally address the following components: (I) Safety; (II) Management Roles and Expectations; (II) Processes and Procedure;; (IV) Evaluation of Potential Problem Areas with Critical Components; (V) Testing; (VI) Training; and (VII) Communications. Page 1

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#### I. Safety

Safety remains the top priority during winter weather events. Job safety briefings should be conducted during preparation for and in response to these events. Robust safety programs to reduce risk to personnel include identifying hazards involving cold weather such as personnel exposure risk, travel conditions, and slip/fall issues due to icing. A Job Safety Analysis (JSA) should be completed to address the exposure risks, travel conditions and slips/falls related to icing conditions. Winter weather Alerts should be communicated to all impacted entities. A Business Continuity and Emergency Response Plan should also be available and communicated in the event of a severe winter weather event.

#### II. Management Roles and Expectations

Management plays an important role in maintaining effective winter weather programs. The management roles and expectations below provide a high-level overview of the core management responsibilities related to winter weather preparation. Each entity should tailor these roles and expectations to fit within their own corporate structure.

- 1. Senior Management
- a. Set expectations for safety, reliability, and operational performance.
- b. Ensure that a winter weather preparation procedure exists for each operating location.
- c. Consider a fleet-wide annual winter preparation meeting, training exercise, or both to share best practices and lessons learned.
- d. Share insights across the fleet and through industry associations (formal groups or other informal networking forums).
- 2. Plant Management
- a. Develop a winter weather preparation procedure and consider appointing a designee responsible for keeping this procedure updated with industry identified best practices and lessons learned.
- b. Ensure the site specific winter weather preparation procedure includes processes, staffing plans, and timelines that direct all key activities before, during, and after severe winter weather events.
- c. Ensure proper execution of the winter weather preparation procedure.
- d. Conduct a plant readiness review prior to an anticipated severe winter weather event.
- e. Encourage plant staff to look for areas at risk due to winter conditions and bring up opportunities to improve readiness and response.
- Following each winter, conduct an evaluation of the effectiveness of the winter weather preparation procedure and incorporate lessons learned.

#### III. Processes and Procedures

A winter weather preparation procedure should be developed for seasonal winter preparedness. Components of an effective winter weather d

sempenents of an effective writer weath

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### Reliability Guideline Generating Unit Winter Weather Readiness V3

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After a severe winter weather event, entities should utilize a review process to formally recognize procedural strengths, evaluate improvement opportunities, and identify and incorporate lessons learned within applicable procedures. Changes to the procedure and lessons learned must be communicated to the appropriate personnel.

#### **IV. Evaluation of Potential Problem Areas with Critical Components**

Identify and prioritize critical components, systems, and other areas of vulnerability which may experience freezing problems or other cold weather operational issues. <u>Schedule any needed cold weather related</u> inspections, repairs, and 'winterization' work to occur prior to the local NOAA First Frost Date. Un-doing winterization should wait until after the NOAA Last Frost Date and be completed prior to summer heat.

#### This includes critical instrumentation or

- 1. Initiate an automatic unit trip,
- 2. Impact unit start-up,
- 3. Initiate automatic unit runback freezing problems or other cold weather operational issues. Schedule any needed cold weather related
- 4. Cause damage to the unit,
- 5. Adversely affect environmenta
- 6. Adversely affect the delivery of
- 7. Cause operational problems su
- 8. Create a weather-related safety nazard

Based on previous cold weather events, a list of typical problem areas are identified below. This is not meant to be an all-inclusive list. Individual entities should review their plant design and configuration, identify areas with critical components' potential exposure to the elements, ambient temperatures, or both and tailor their plans to address them accordingly.

- 1. Critical Level Transmitters
  - a. Drum level transmitters and sensing lines
  - b. Condensate tank level transmitters and sensing lines
  - c. De-aerator tank level transmitters and sensing lines
  - d. Hotwell level transmitters and sensing lines
  - e. Fuel oil tank level transmitters/indicators
- 2. Critical Pressure Transmitters
  - a. Gas turbine combustor pressure transmitters and sensing lines
  - b. Feed water pump pressure transmitters and sensing lines
  - c. Condensate pump pressure transmitters and sensing lines

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inspections, repairs, and 'winterization' work to occur prior to the local NOAA First Frost Date. Un-doing

winterization should wait until after the NOAA Last Frost Date and be completed prior to summer heat.



# What is your Winterization procedure schedule date?

### **Historical Date of First Freeze: Earliest 10%**

Date by which 10% of years have experienced their first instance of <= 32F temperatures



https://www.ncdc.noaa.gov/monitoring-content/sotc/national/2014/sep/earliest-first.png



## When can you de-Winterize? (Begin "Summerization" procedure)

### **Day of the Last Spring Freeze**

from the 1981-2010 U.S. Climate Normals



## Reliability Guideline Generating Unit Winter Weather Readiness V3

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- d. Steam pressure transmitters and sensing lines
- 3. Critical Flow Transmitters
  - a. Steam flow transmitters and sensing lines
  - b. Feed water pump flow transmitters and sensing lines
- c. High pressure steam attemperatorat temperator flow transmitters and sensing lines
- 4. Instrument Air System
- Automatic blow downs, traps, dew point monitoring, and recently calibrated and are functioning correctly.
- b. Low point drain lines are periodically drained by operato cold weather. 4. Instrument Air System
- 5. Motor-Operated Valves, Valve Positioners, and Solenoid Va
- 6. Drain Lines, Steam Vents, and Intake Screens
- 7. Water Pipes and Fire Suppression Systems<sup>1</sup>
  - a. Low/no water flow piping systems
- 8. Fuel Supply and Ash Handling
- a. Coal piles and coal handling equipment
- b. Transfer systems for backup fuel supply
- c. Gas supply regulators, other valves, and instrumentation (may require coordination with gas pipeline operator)
- d. Ash disposal systems and associated equipment
- 9. Tank Heaters
- a. Conduct initial tests
- b. Check availability of spare heaters
- Record current tanks indicators for SBS injection syst dibasic acid additives, mercury control additives, etc
- Lube oil and greases for mechanical equipment necessa may be exposed to weather.
- 11. Lead acid batteries or other batteries and UPS systems weather.
- 12. Adequacy and functionally of heat tracing, insulation, a (heaters, fans, dampers, & louvers).

<sup>1</sup> For safety reasons, fire protection systems should also be included in this identific site specific winter weather preparation procedure. <u>10. Lube oil and greases for mechanical equipment necessary to support generation in locations that</u> <u>may be exposed to weather.</u>

c. High pressure steam attemperatorat temperator flow transmitters and sensing lines

recently calibrated and are functioning correctly.

a. Automatic blow downs, traps, dew point monitoring, and instrument air dryers have been

11. Lead acid batteries or other batteries and UPS systems in locations that need protected from weather.

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12. Adequacy and functionally of heat tracing, insulation, and temperature responsive ventilation (heaters, fans, dampers, & louvers).

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Potential vulnerabilities associated with emergency generators, including Blackstart Resources, should be evaluated when developing the site specific winter weather preparation procedure, as they may provide critical system(s) backup.

#### V. Testing<sup>2</sup>

In addition to the typical problem areas identified above, emphasis should be placed on the testing of low frequency tasks such as startup of emergency generators, where applicable.

#### VI. Training

Coordinate annual training in winter specific and plant specific awareness and maintenance training. This may include response to freeze protection panel alarms, troubleshooting and repair of freeze protection circuitry, identification of plant areas most affected by winter conditions, review of special inspections or rounds implemented during severe weather, fuel switching procedures, knowledge of the ambient temperature for which the freeze protection system is designed, and lessons learned from previous experiences or the NERC Lessons Learned program.

- Consider holding a winter readiness meeting on an annual basis to highlight preparations and expectations for severe cold weather.
- Operations personnel should review cold weather scenarios affecting instrumentation readings, alarms, and other indications on plant control systems.
- Ensure appropriate NERC Generation Availability Data Systems (GADS) coding for unit derates or trips as a result of severe winter weather events to promote lessons learned, knowledge retention, and consistency. Examples may include NERC GADS code 9036 "Storms (ice, snow, etc.)" or code 9040 "Other Catastrophe."

#### **VII. Winter Event Communications**

Clear and timely communication is essential to an effective include the following:

- Before a severe winter weather event, plant mai appropriate senior management that the site speci checklists, and readiness reviews have been complete
- Before and during a severe winter weather event, the affected entity(ies)entities will keep thetheir BA up to date on changes to plant availability, capacity, <u>low temperature cut-offs</u> or other operating limitations. Depending on regional structure and market design, notification to the Reliability Coordinator (RC) and Transmission Operator (TOP) may also be necessary.
- Before and during a severe winter weather event, communicate with all personnel about changing conditions and potential areas of concern to heighten awareness around safe and reliable operations.
- Before and during a severe winter weather event, the affected entity(ies)entities will keep thetheir BA up to date on changes to plant availability, capacity, low temperature cut-offs, or other operating limitations. Depending on regional structure and market design, notification to the Reliability Coordinator (RC) and Transmission Operator (TOP) may also be necessary.

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<sup>&</sup>lt;sup>2</sup> See Attachment 1, Section 8 "Special Operations Instruction" for more information

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#### **Related Documents and Links:**

- <u>Report on Outages and Curtailments during the Southwest Cold Weather Event of February 1-5,</u> <u>2011</u>, dated August 2011, Federal Energy Regulatory Commission and North American Electric Reliability Corporation
- 2019 FERC and NERC Staff Report: "The South Central United States Cold Weather Bulk Electric System Event of January 17, 2018"
- <u>Winter Weather Readiness for Texas Generators</u>, dated April 13, 2011, Calpine, CPS Energy, LCRA, Luminant, and NRG Energy
- <u>Electric Reliability Organization Event Analysis Process</u>, dated January 2017, ERO Event Analysis Process and associated <u>Lessons Learned</u>
- Previous Cold Weather Reports and Training Materials
- There are a number of 'sound practices' from the industry that are detailed in the Southcentral cold weather report, starting on page 100. Link to the report: https://www.ferc.gov/legal/staffreports/2019/07-18-19-ferc-nerc-report.pdf

#### **Cold weather related Lessons Learned:**

- LL20110902 "Adequate Maintenance and Inspection of Generator Freeze Protection"
- LL20110903 "Generating Unit Temperature Design Parameters and Extreme Winter Conditions"
- LL20111001 "Plant Instrument and Sensing Equipment Freezing Due to Heat Trace and Insulation <u>Failures"</u>
- LL20120101 "Plant Onsite Material and Personnel Needed for a Winter Weather Event"
- LL20120102 "Plant Operator Training to Prepare for a Winter Weather Event"
- LL20120103 "Transmission Facilities and Winter Weather Operations"
- LL20120901 "Wind Farm Winter Storm Issues"
- LL20120902 "Transformer Oil Level Issues During Cold Weather"
- LL20120903 "Winter Storm Inlet Air Duct Icing"
- LL20120904 "Capacity Awareness During an Energy Emergency Event"
- LL20120905 "Gas and Electricity Interdependency"
- LL20180702 "Preparing Circuit Breakers for Operation in Cold Weather"
- LL20200601 "Unanticipated Wind Generation Cutoffs during a Cold Weather Event"

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## Reliability Guideline Generating Unit Winter Weather Readiness V3





NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION Attachment 1

### Attachment 1 Elements of a Winter Weather Preparation Procedure<sup>3</sup>

This Attachment provides some key points to address in each of the winter weather preparation procedure elements, including severe winter weather event preparedness. These are not all inclusive lists. Individual entities should review their plant design and configuration, identify areas of potential exposure to the elements and ambient temperatures, and tailor their plans to address them accordingly.

- 1. Work Management System
  - a. Review Work Management System to ensure adequate annual preventative work orders exist for freeze protection and winter weather preparedness.
  - Ensure all freeze protection and winter weather preparedness preventative work orders are completed prior to the onset of the winter season.
  - c. Review Work Management System for open corrective maintenance items that could affect plant operation and reliability in winter weather, and ensure that they are completed prior to the onset of the winter season.

## **NERC Annual Winter Webinars**

### https://www.nerc.com/pa/rrm/Pages/Webinars.aspx

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TLR Logs		±.	2015 Webinars (6)				
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Planning Committee	e (PC)	± :	2012 Webinars (1)				
Conferences and Wo	orkshops		Fraining and Outreach Video <u>s</u>				
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## **NERC Annual Winter Webinars**

### https://www.nerc.com/pa/rrm/ea/Pages/Major-Event-Reports.aspx

About NERC	Governance	Committee	s Program Areas & Departments	Standards	Initiatives	Filings & Orders	Newsroom
<b>Event Analysis</b> Event Analysis			Home > Program Areas & Departments : Analysis Reports	> Reliability Risk M	anagement > Eve	ent Analysis > Event A	nalysis > Major Event
EA Program			Major Event Analysis Rep	orts			
Major Event An	alysis Reports						
Lessons Learne	d		Major Event Analysis Reports				
Energy Emerge	ncy Alerts		January 2019 Eastern Interconnection F	orced Oscillation E	vent Report		
Bulk Power Syste	em Awareness		January 2018 South Central Cold Weath	er Event Report			
About Alerts			April and May 2018 Fault Induced Solar	Photovoltaic Resou	Irce Interruption	Disturbances Report	
Alerts			Sontombor 2017 Hurricano Irma Evont A	nalysis Report			
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Procedure	ading Relief (TLR)		August 2017 Hurricane Harvey Event An	alysis Report			
Reliability Coor	dinators		October 2017 Canyon 2 Fire Disturbance	Report			
TLR Logs			August 2016 1200 MW Fault Induced So	lar Photovoltaic Re	sources Interrup	tion Disturbance Repo	rt
Human Performa	ance		April 2015 Washington D.C. Area Low-Vo	oltage Disturbance	Event		
Committees			Cold Weather Training Materials				
Operating Com	mittee (OC)		January 2014 Polar Vortex Review				
Planning Comm	nittee (PC)						
Conferences and	Workshops		October 2012 Hurricane Sandy Event An	alysis Report			
Webinars/Traini	ng and Outreach Vi	ideos	October 2011 Northeast Snowstorm Eve	nt			
			September 2011 Southwest Blackout Ev	ent			
			February 2011 Southwest Cold Weather	Event			
			August 2003 Northeast Blackout Event				

## **NERC Cold Weather Lessons Learned**

bout NERC C	Governance Com	mittees Program Areas & Departments	Standards	Initiatives	Filings & Ord	ers	Newsroom
vent Analysis Event Analysis EA Program Major Event Analys	is Reports	Home > Program Areas & Department Lessons Learned Disclaimer for Lessons Learned: T intended to establish new require	s > Reliability Ris hese documents ments under N	k Management > Events are designed to a IERC's Reliability S	ent Analysis > Ev convey lessons tandards or to	ent Analy learned modify	ysis > Lessons Learned from NERC's various activities. They are not the requirements in any existing Reliability
Lessons Learned Energy Emergency ulk Power System	Alerts Awareness	Standards. Compliance will cor time to time. Implementation c	NERC	10 7			ity Standards as they may be amended from equirements in NERC's Reliability Standards.
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		Lessons Learned 2013 (14)	The control of the co	roblem Statement . registered entity experienced extre utages contributed to a maximum g esources (including demand respon: ising emergency power purchases.	eme cold weather Jar generation event, res se, behind-the-meter	and p rep i Wh r Bec a p	Du Generator Owners' Generator Operators et Problem Statement A 700 Mw generating plant, depite having installed new freeze protection to maintain the neurobility of difference Educing Didenters Econolitions, contributed to 3.80 Aviants to low
		Lessons Learned 2012 (18)     Lessons Learned 2011 (22)	To Cor wei D The insi T inco ele tr unit on tr abili Res ele	etails he registered entity experienced se emperatures between January 29 a emperatures affected the ability o butting off bacause the temporativ	evere cold temperatu ind 30 were a few de f wind generation to re fell below -21°5	and rest mo stat coo sen	load shead because it could not keep generation online during 0 degrees F conditions because components freezing. Details Before a cold weather event, the plant personnel discussed the forecast for the on-coming cold
14		Lessons Learned 2010 (23)	imp occ n per The p rec g disi ti the ti	echanical damage. The steep drop roduction output early on January eneration to meet increasing load b he maximum generation event was han expected and wind generation c Actual Wi	p in wind production led to 30. Extrapolation of the tren by the morning peak, triggerin declared, temperatures in th butput was 6 GW (50%) lower and Generation vs Day-Ahead Wir	diff the the Coi 0 Bes 1 mai t	during plant staff meetings, advising everyone to remind their teams to prepare for the cold w longer duration than the plant had experienced before. Temporary enclosures were constructe subject to wind. Portable heaters and tarps were placed where critical equipment, instru- ton and/or piping was located. The fuel level in the kerssene heaters was checked and huel was needed. Heat tracing penels were checked and heat tracing was verified to be functional, down" order was communicated to all plant personnel to prevent any problems associated emergency maintenance work. This confer included on changes or tunist to be done on the full



# NERC Winter Reliability Assessment

Stephen Coterillo, Engineer Reliability Assessments Winter Readiness Webinar September 3, 2020





### **NERC Assessment Areas**





### Winter Season Assessment

### In 2019, NERC Reported:

- Anticipated resources meet or exceed reference margin in all areas
- Extreme prolonged cold weather can stress resources and pose a risk to BPS reliability
- Regional experience from prior winter events is being used by operators and planners to reduce risk



Posted to <u>NERC website</u>



## **Risks from Resource Forecast Uncertainty**

- Generator forecasts can become less accurate as variable generation increases
- System operators have worked with vendors to improve tools



Wind Generation Contribution to On-Peak Winter Capacity

18



 Cold Snap [MISO]
 Risk requires continued focus as variable generation provides increasing contribution to on-

peak winter capacity



## **2020-21 Winter Reserve Margins**



Preliminary Data Indicates Capacity Resources will be Adequate for Winter





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- Each assessment area is providing data for operational risk scenario
- Scenarios provide additional insight into winter reliability risks
  - Consider extreme winter peak loads
  - Account for resource derates and outages due to extreme winter conditions
  - Compare resources with expected operating reserve requirements provided by NERC assessment areas
- Data can be used for an operational risk waterfall chart



### **Example Area Risk Scenario**







# **Questions and Answers**

