NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Winter Weather Preparation

2020 Webinar

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

RELIABILITY | RESILIENCE | SECURITY




Request for Comments

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

Three-Year Document Review

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

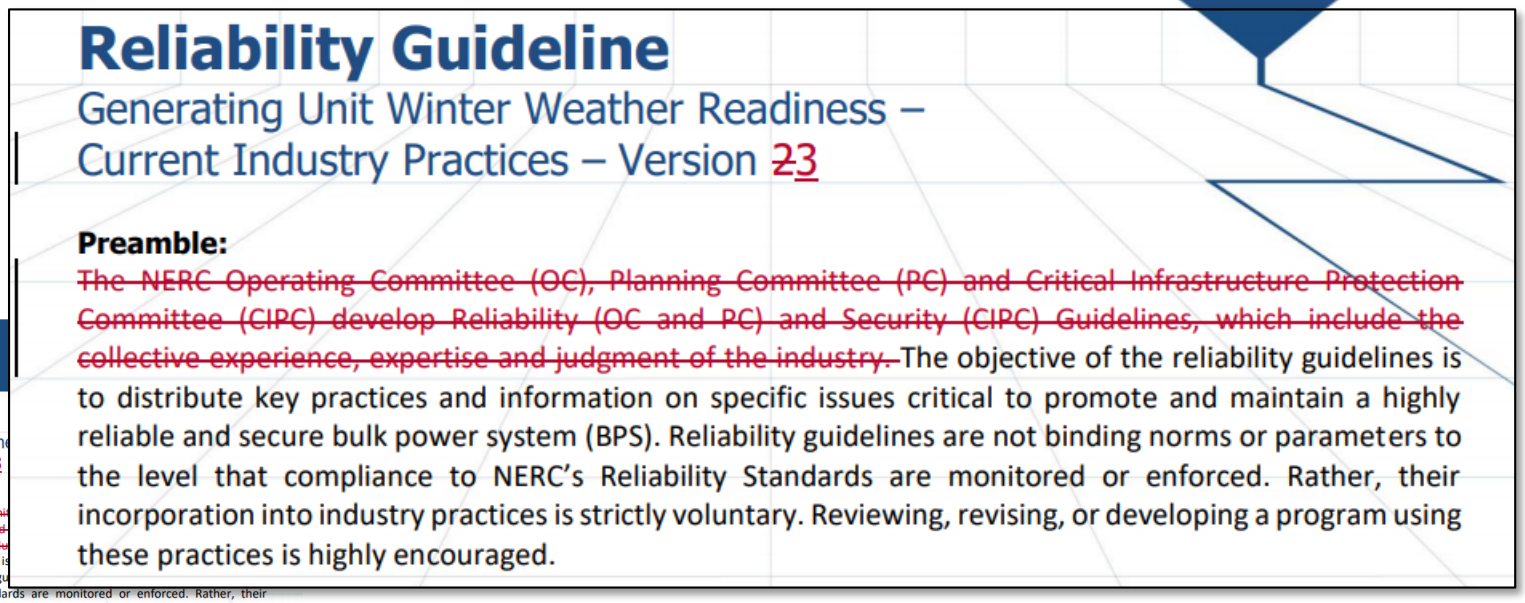
In accordance with current NERC practices, all Reliability Guidelines must undergo a review every three years. The Reliability Guideline: Generating Unit Winter Weather Readiness – Current Industry Practices – Version 3 has been reviewed and revisions have been made to keep the information current.

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 email 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 Sandy Shiflett (via email) or at 404-446-2575.

Reliability Guideline Generating Unit Winter Weather Readiness V3

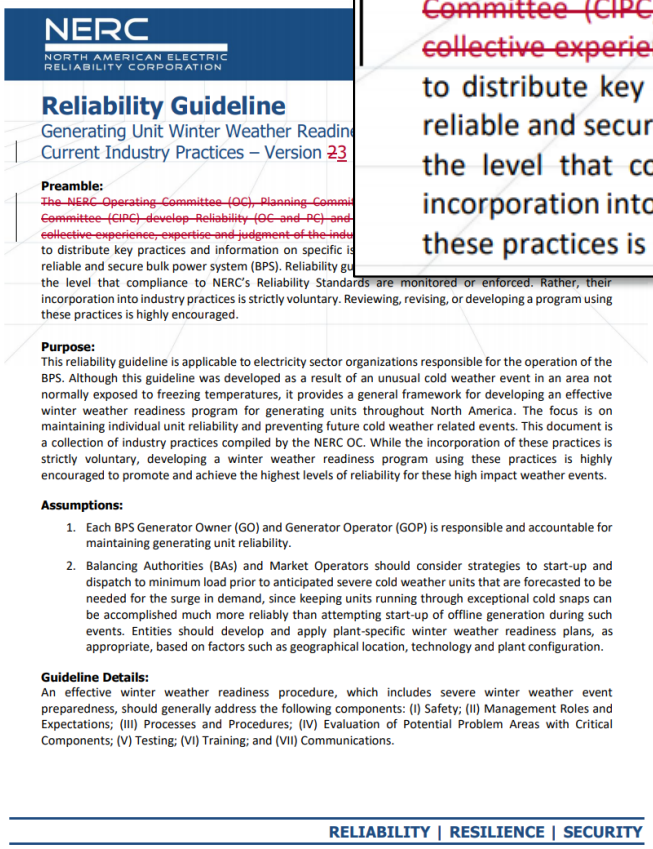


Reliability Guideline

Generating Unit Winter Weather Readiness – Current Industry Practices – Version ~~2~~3

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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Reliability Guideline

Generating Unit Winter Weather Readin
Current Industry Practices – Version ~~2~~3

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Purpose:

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 compiled by the NERC OC. 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.

Assumptions:

1. 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; (III) Processes and Procedures; (IV) Evaluation of Potential Problem Areas with Critical Components; (V) Testing; (VI) Training; and (VII) Communications.

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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.
   f. 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 p

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Reliability Guideline: Generating Unit Winter Weather Readiness – Current Industry Practices – Version ~~2~~3
Approved by the ~~Operating C~~Reliability and Security Technical Committee on ~~August 24~~XX XX, 20~~17~~20

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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. Schedule any needed cold weather related 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
4. Cause damage to the unit,
5. Adversely affect environmental
6. Adversely affect the delivery of
7. Cause operational problems su
8. Create a weather-related safety hazard

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. Schedule any needed cold weather related 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.

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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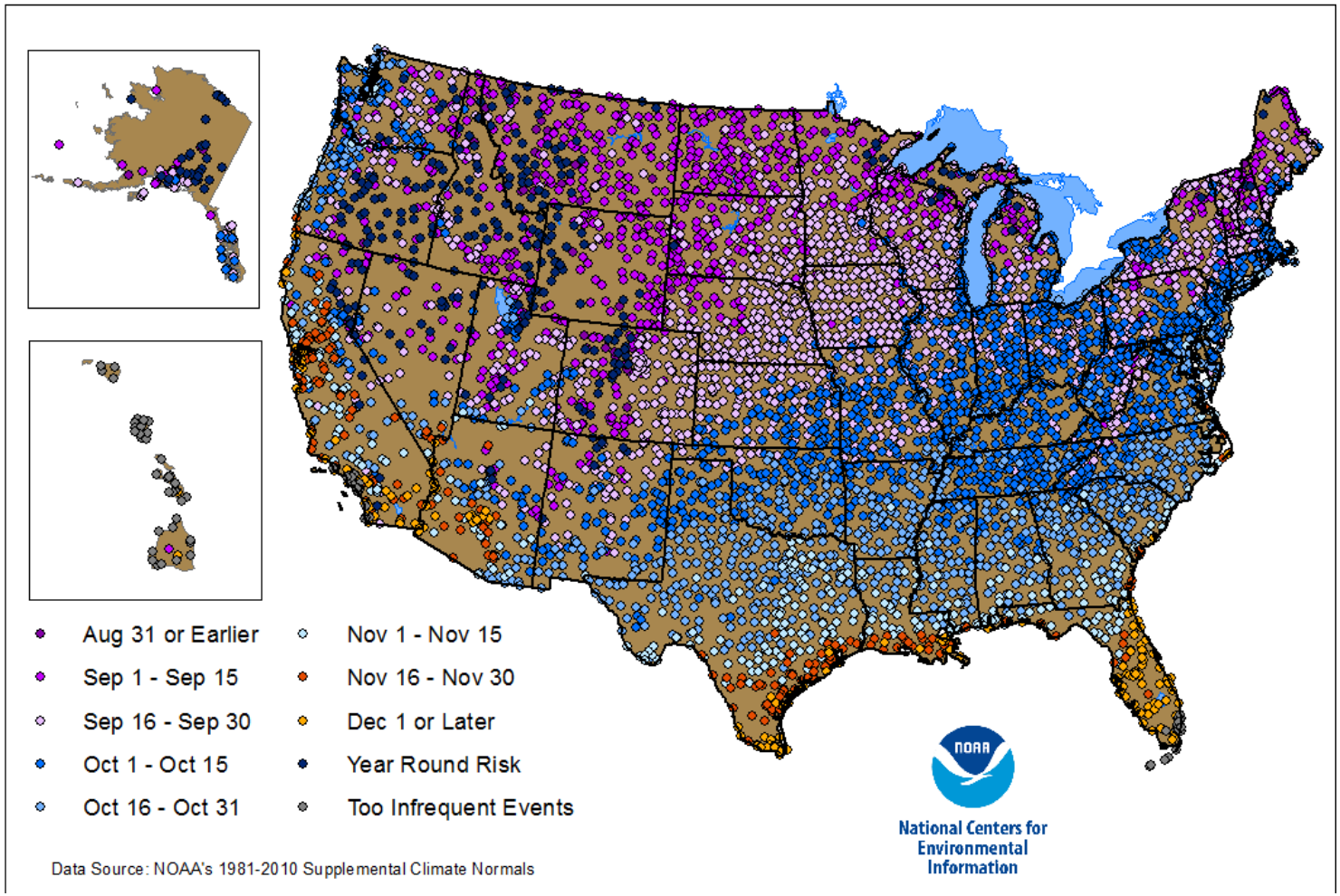
What is your Winterization procedure schedule date?



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

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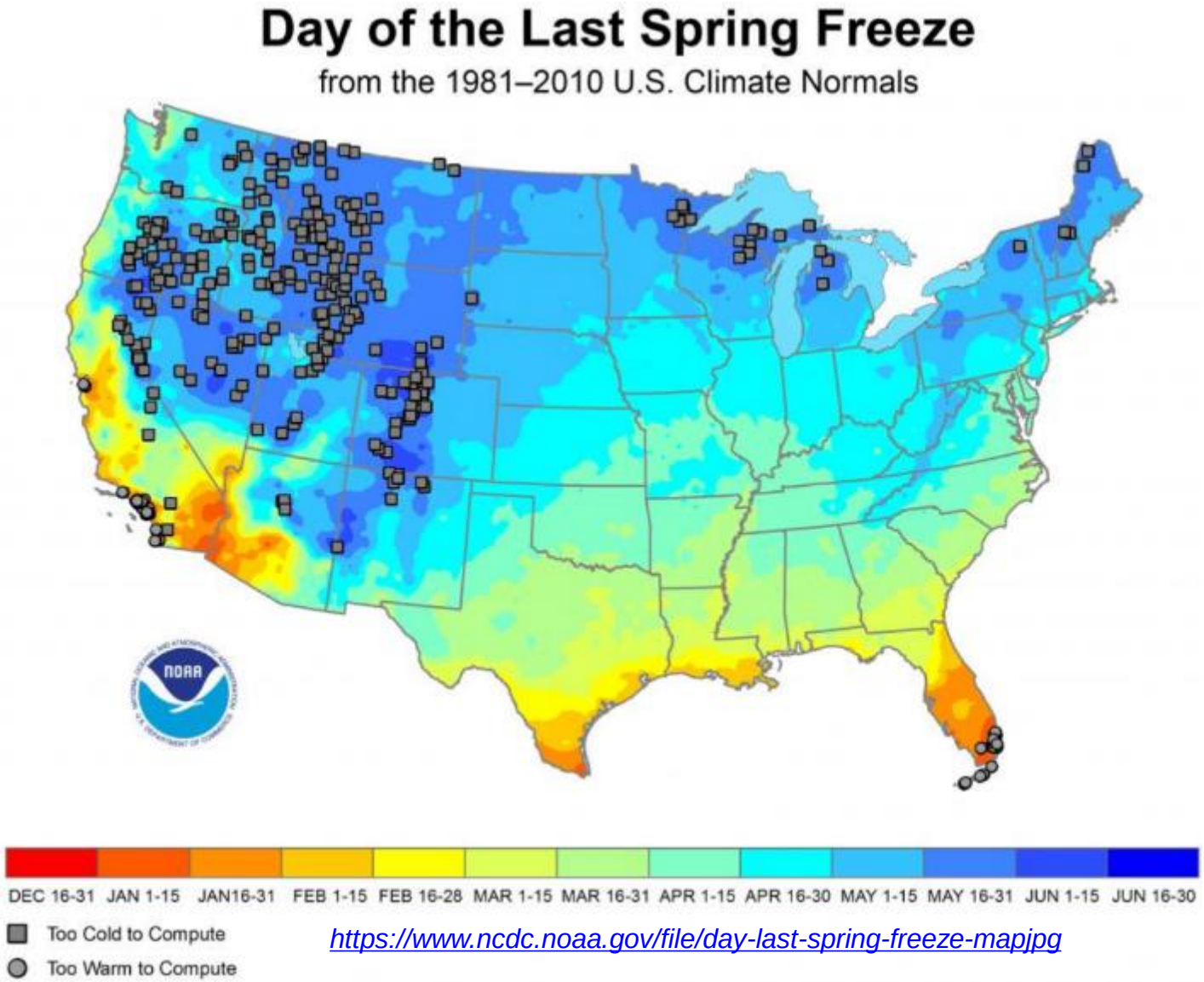
When can you de-Winterize?
(Begin "Summerization" procedure)



https://www.ncdc.noaa.gov/file/day-last-spring-freeze-mapjpg

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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 ~~attemperator~~at temperator flow transmitters and sensing lines
4. Instrument Air System
   a. 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.
5. Motor-Operated Valves, Valve Positioners, and Solenoid Va
6. Drain Lines, Steam Vents, and Intake Screens
7. Water Pipes and Fire Suppression Systems[1]
   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
   c. Record current tanks indicators for SBS injection syst
      dibasic acid additives, mercury control additives, etc
10. 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).

[1] For safety reasons, fire protection systems should also be included in this identifica
site specific winter weather preparation procedure.

c. High pressure steam ~~attemperator~~at temperator flow transmitters and sensing lines

4. Instrument Air System
   a. Automatic blow downs, traps, dew point monitoring, and instrument air dryers have been recently calibrated and are functioning correctly.

Page 4

10. Lube oil and greases for mechanical equipment necessary to support generation in locations that may be exposed to weather.
11. Lead acid batteries or other batteries and UPS systems in locations that need protected from weather.
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[2]

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.

1. Consider holding a winter readiness meeting on an annual basis to highlight preparations and expectations for severe cold weather.
2. Operations personnel should review cold weather scenarios affecting instrumentation readings, alarms, and other indications on plant control systems.
3. 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:

1. Before a severe winter weather event, plant mar
appropriate senior management that the site speci
checklists, and readiness reviews have been complete
2. 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.
3. Before and during a severe winter weather event, ~~the~~ affected ~~entity(ies)~~entities will keep ~~the~~their 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.

[2] See Attachment 1, Section 8 "Special Operations Instruction" for more information

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3. Before and during a severe winter weather event, ~~the~~ affected ~~entity(ies)~~entities will keep ~~the~~their 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.

Reliability Guideline Generating Unit Winter Weather Readiness V3

Related Documents and Links:

- *Report on Outages and Curtailments during the Southwest Cold Weather Event of February 1-5, 2011*, 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"
- *Winter Weather Readiness for Texas Generators*, dated April 13, 2011, Calpine, CPS Energy, LCRA, Luminant, and NRG Energy
- *Electric Reliability Organization Event Analysis Process*, dated January 2017, ERO Event Analysis Process and associated Lessons Learned
- 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/staff-reports/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 Failures"
- 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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~~Attachment 1~~

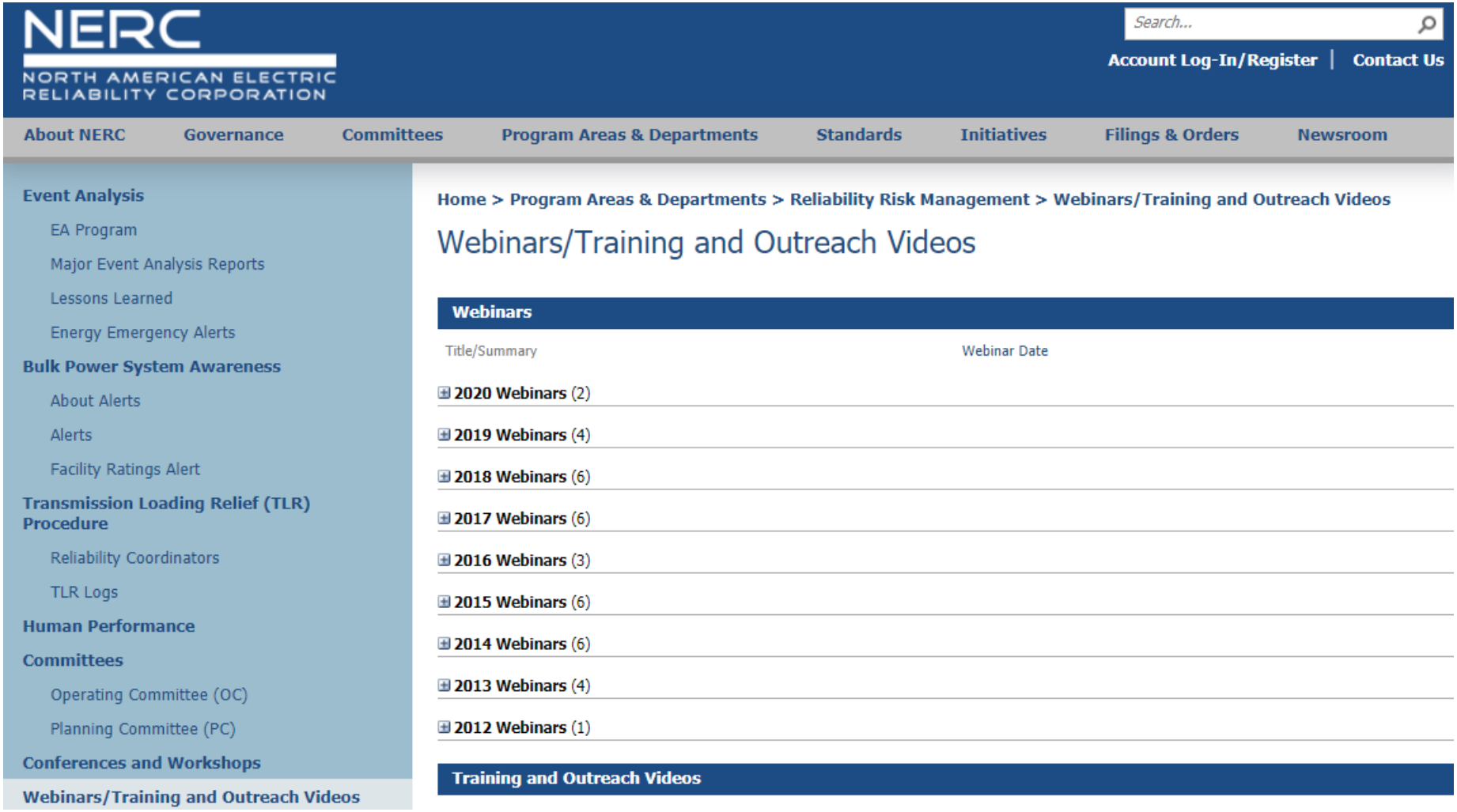
Attachment 1
Elements of a Winter Weather Preparation Procedure[3]

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.
    b. 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

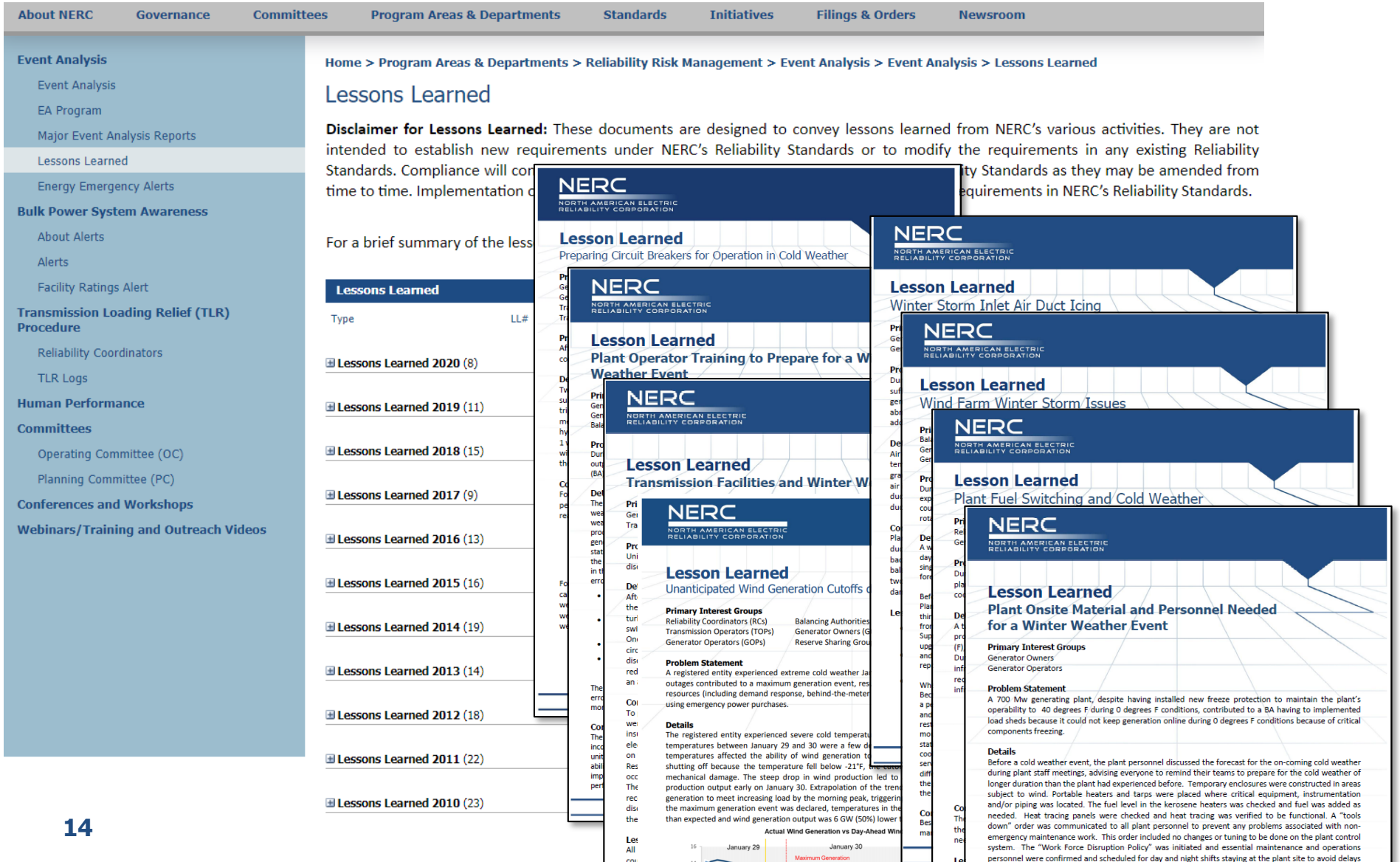


NERC Annual Winter Webinars

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

NERC Cold Weather Lessons Learned

https://www.nerc.com/pa/rrm/ea/Pages/Lessons-Learned.aspx



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NERC Winter Reliability Assessment

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

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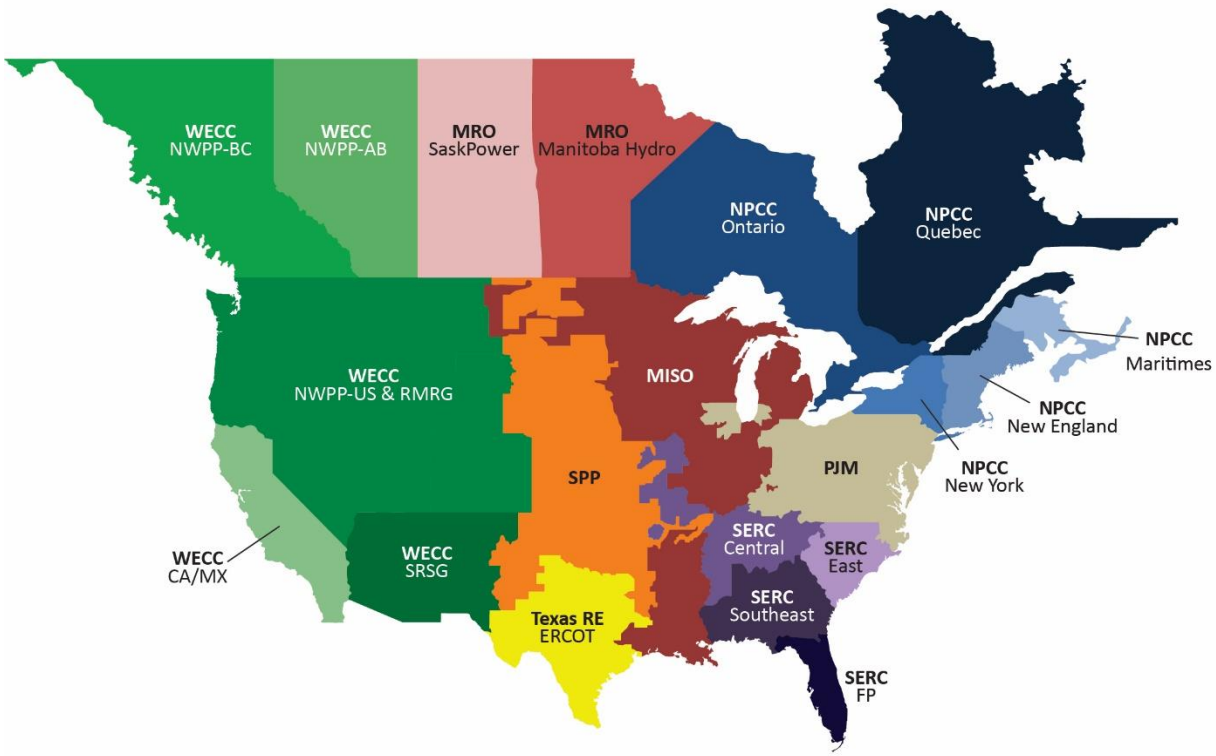
NERC Assessment Areas



MRO – Midwest Reliability Organization
- MISO
- MRO-Manitoba Hydro
- MRO-SaskPower

SPP– Southwest Power Pool
- SPP

NPCC – Northeast Power Coordinating Council
- NPCC-Maritimes
- NPCC-New England
- NPCC-New York
- NPCC-Ontario
- NPCC-Québec

RF – ReliabilityFirst
- PJM

SERC – SERC Reliability Corporation
- SERC-East
- SERC-Central
- SERC-Southeast
- SERC - Florida Penninsula

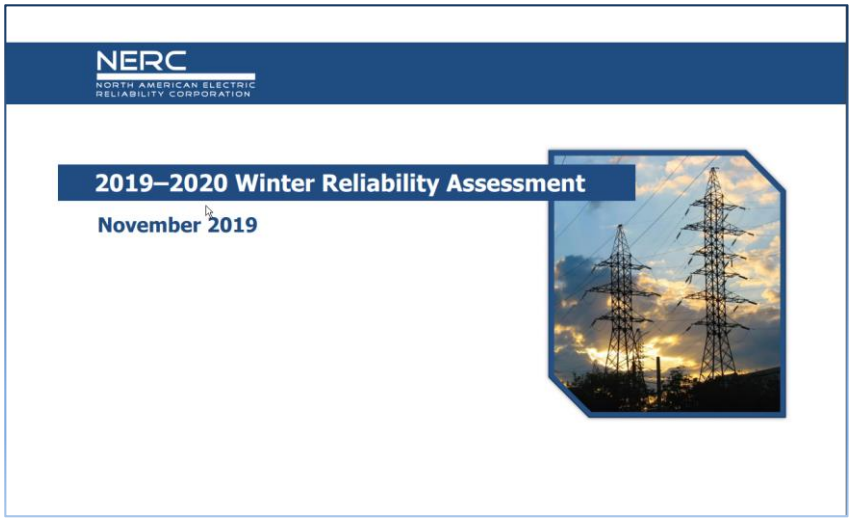
Texas RE – Texas Reliability Entity
- Texas RE-ERCOT

WECC – Western Electricity Coordinating Council
- WECC-CA/MX
- WECC-NWPP-AB
- WECC-NWPP-BC
- WECC-NWPP-US & RMRG
- WECC-SRSG

Winter Season Assessment

In 2019, NERC Reported:

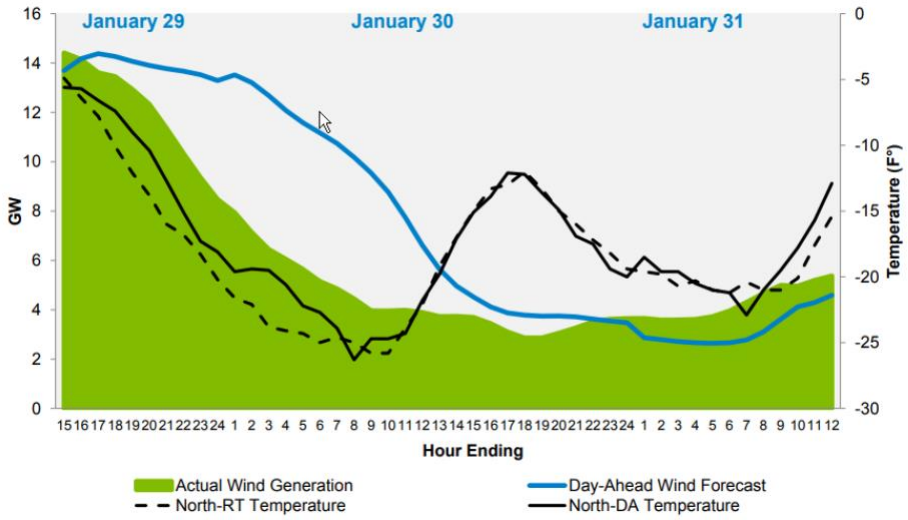
- Anticipated resources meet or exceed reference margin in all areas
- Extreme prolonged cold weather can stress resources and pose a risk to BPS reliability
- Regional experience from prior winter events is being used by operators and planners to reduce risk



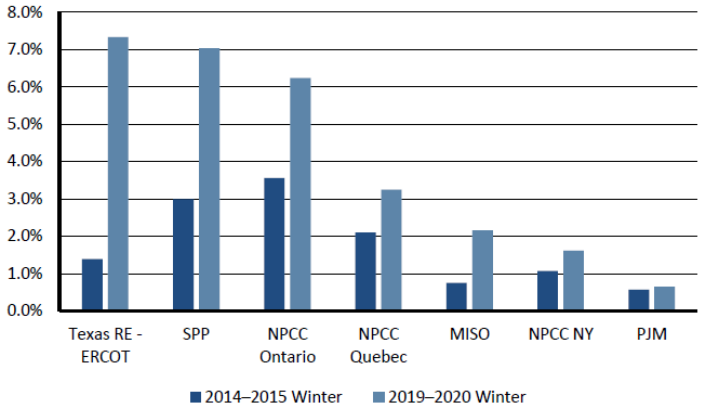
Posted to NERC website

Risks from Resource Forecast Uncertainty

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



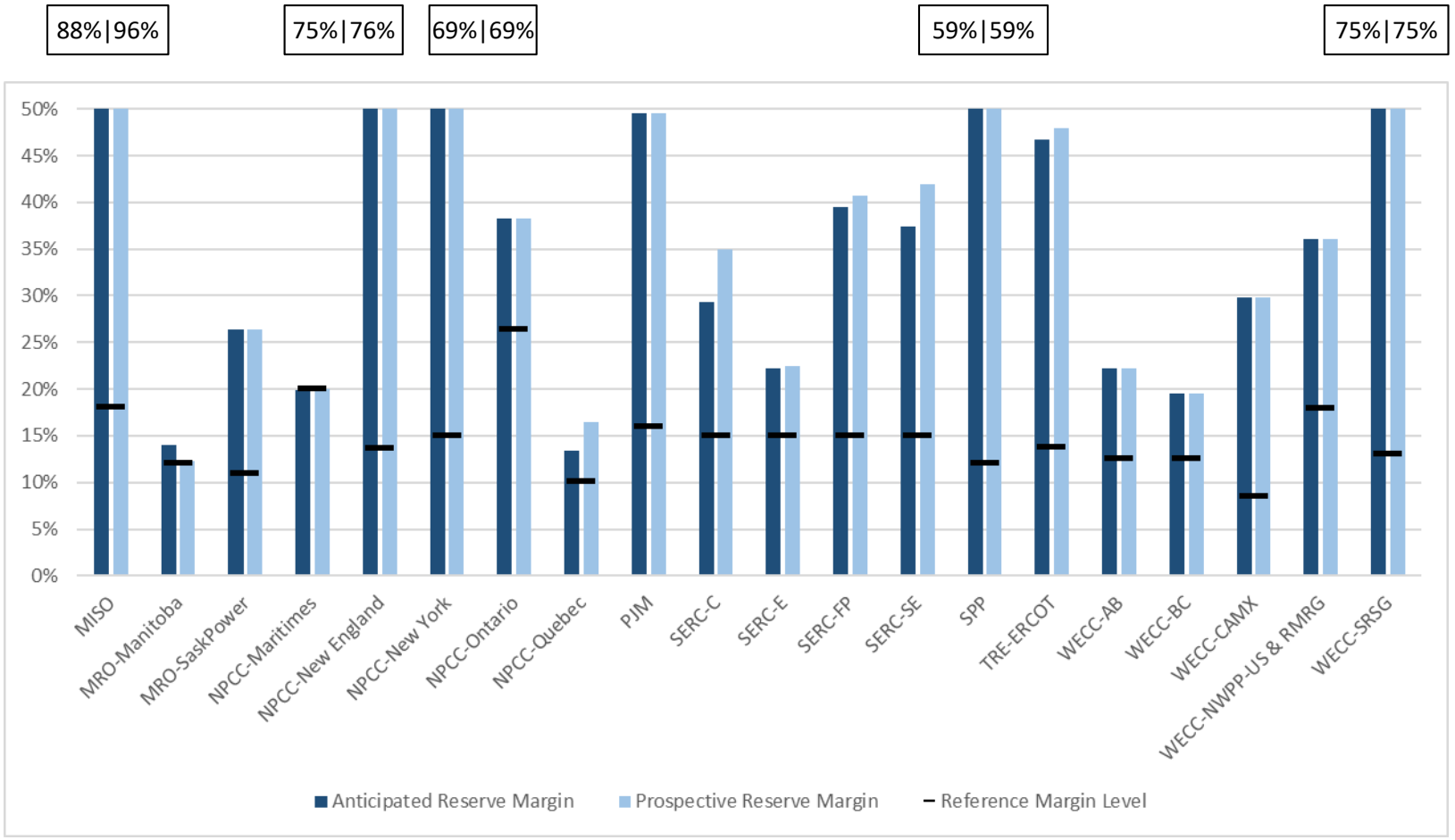
MISO Wind Generation during January 2019 Cold Snap [MISO]



Wind Generation Contribution to On-Peak Winter Capacity

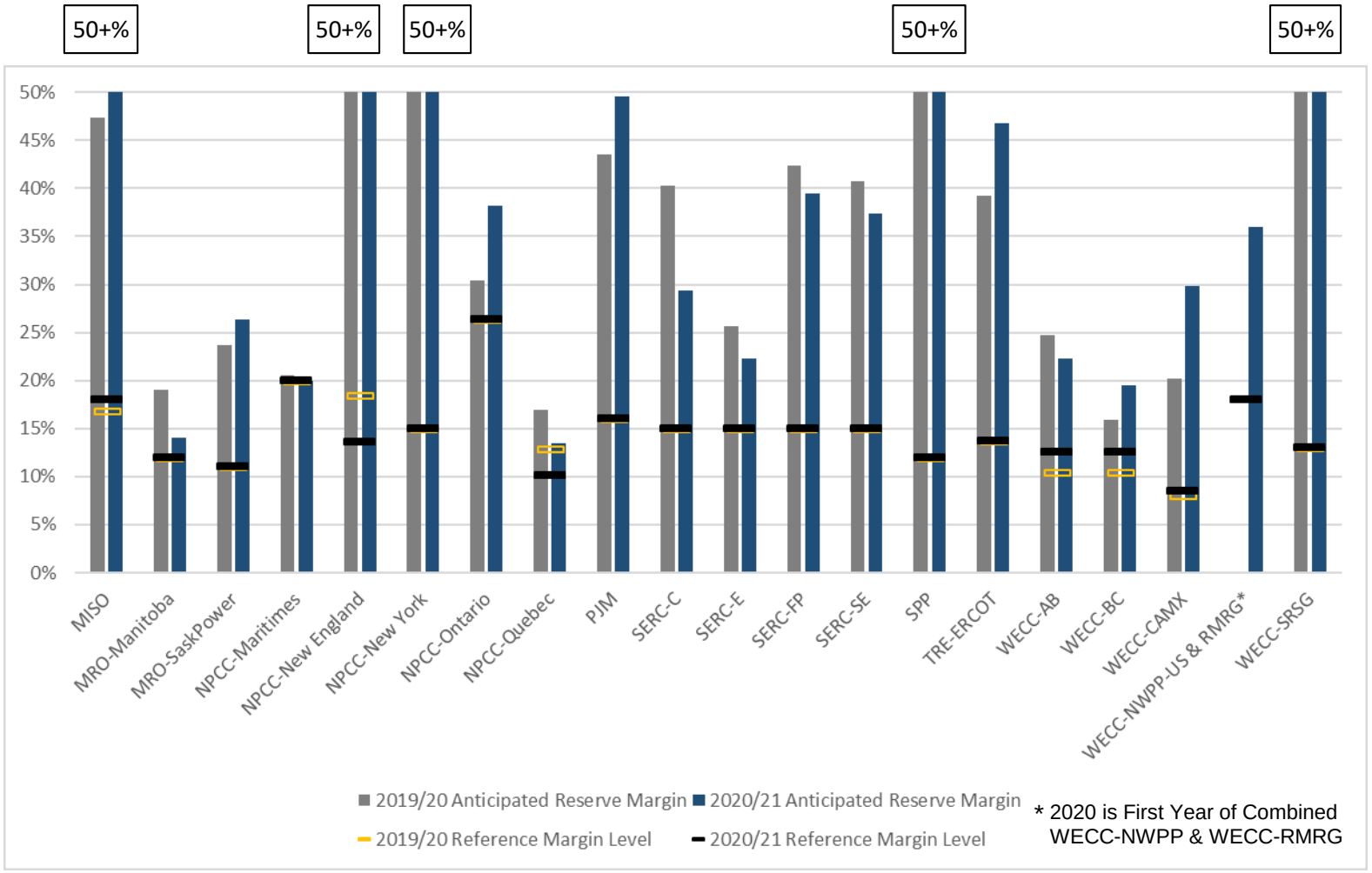
- Risk requires continued focus as variable generation provides increasing contribution to on-peak winter capacity

2020-21 Winter Reserve Margins



Preliminary Data Indicates Capacity Resources will be Adequate for Winter

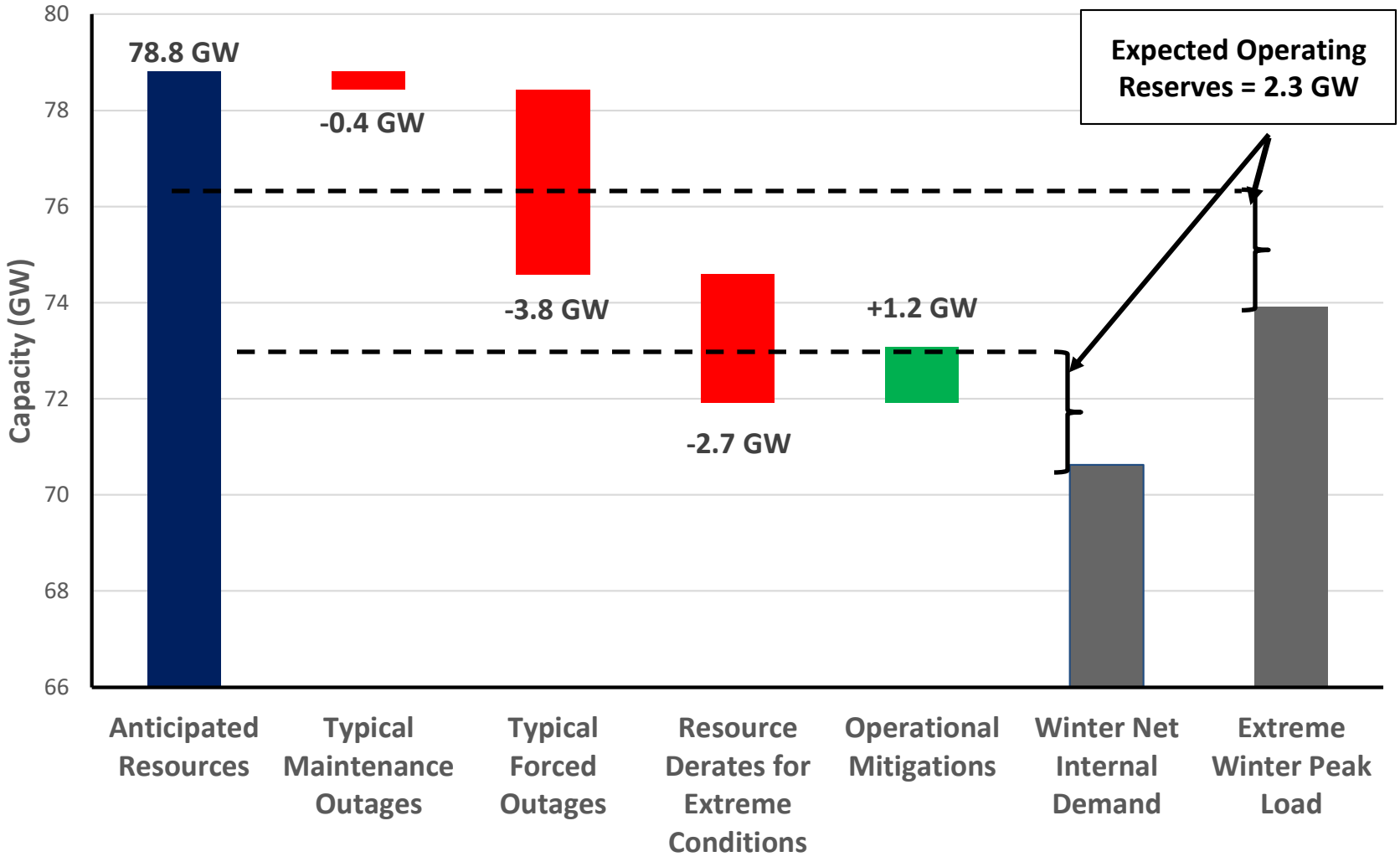
Preliminary Reserve Margin Year-on-Year Comparison



WRA will examine extreme weather event risks

- 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