NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Directives from June 2024 Order Approving EOP-012-2

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Project 2024-03 Technical Conference
November 12, 2024

RELIABILITY | RESILIENCE | SECURITY




EOP-012-1

- Oct. 2022: NERC submits EOP-012-1 and EOP-011-3
- Feb. 2023: FERC approves EOP-012-1, with directives for modifications
  - Clarify constraints preventing implementation:
    - Include objective criteria on permissible technical, commercial, and operational constraints preventing freeze protection measures
    - Identify the appropriate entity that would receive the generator owners' constraint declarations, to describe how that entity would confirm that the generator owners comply with the objective criteria
    - describe the consequences of providing a constraint declaration
  - Include deadlines for implementing corrective action plans
  - Shorten the implementation plan to fewer than 60 months
  - Clarifications of applicability, as directed

EOP-012-2

- Feb 2024: NERC submits EOP-012-2
  - Clarifies applicability
  - Shortens implementation timeline
  - Replaces “technical, commercial, and operational constraints” with definition – Generator Cold Weather Constraint
  - Addresses reporting of the reliability-related impacts of constraints as part of reporting cold weather data
  - Adds deadlines for completing Corrective Action Plans, with self-declared flexibility to extend if unable to complete
- June 2024: FERC approves EOP-012-2, with directives for further modifications

June 2024 Directives

P 47: Address Concerns Related to the Ambiguity of the term Generator Cold Weather Constraint and Criteria:

Accordingly, we direct NERC, pursuant to section 215(d)(5) of the FPA, to develop and submit to the Commission for approval modifications to proposed Reliability Standard EOP-012-2 that address concerns related to the ambiguity of the newly defined Generator Cold Weather Constraint term and criteria.

Specifically, we direct NERC to ensure that the Generator Cold Weather Constraint declaration criteria included within the proposed Reliability Standard are objective and sufficiently detailed so that applicable entities understand what is required of them.

One approach to satisfy this directive could be to incorporate into the proposed Reliability Standard a limited and discrete list of circumstances that would qualify as acceptable constraints. We note that NERC's technical rationale document, created by NERC's Standard Drafting Team and included in NERC's filing, includes a list of technical constraints that could serve as a starting point for a list of circumstances that would qualify as acceptable constraints.

To the extent that NERC continues to believe that the extent of industry adoption for winterization technologies should be a criterion for declaring a constraint, NERC should clearly explain in its filing how it will assess the extent of such adoption in a way that provides for consistent compliance and enforcement outcomes.

Alternatively, NERC could establish a pre-approval process for all Generator Cold Weather Constraint declarations. While a clearly defined list may be preferable, a pre-approval process could be established to ensure entities' declared Generator Cold Weather Constraints are appropriate and can be supported and defended.

June 2024 Directives

P 47: Address Concerns Related to the Ambiguity of the term Generator Cold Weather Constraint and Criteria, ct'd:

Further, as part of the directive to develop and submit modifications to the Generator Cold Weather Constraint definition of proposed Reliability Standard EOP-012-2, **we direct NERC, pursuant to section 215(d)(5) of the FPA, to remove the references to "cost," "reasonable cost," "unreasonable cost," and "good business practices" and replace them with criteria that are objective, unambiguous, and auditable.**

NERC may propose to develop modifications that address the Commission's concerns in an equally efficient and effective manner, however, NERC must explain how its proposal addresses the Commission's concerns.

June 2024 Directives

P 54: Address ERO Review of Generator Cold Weather Constraints

Accordingly, we again direct NERC…**to modify proposed Reliability Standard so that NERC receives, reviews, evaluates, and confirms for validity the Generator Cold Weather Constraint declarations in a timely manner**.

We also direct NERC to include in its compliance filing, a plan to timely review such declarations to verify compliance with proposed Reliability Standard EOP-012-2 and its successors or obligations in a corrective action plan and take corrective action where necessary. For example, modifying Standard to require the generator owners to provide declarations (or changes to the declarations) to NERC within 45 days. It is up to NERC whether it would like to delegate this task to the relevant Regional Entities.

NERC may propose to develop modifications that address the Commission's concerns in an equally efficient and effective manner, however, NERC must explain how its proposal addresses the Commission's concerns.

June 2024 Directives

P 68: Shorter Deadlines to Implement Corrective Action Plans for Generator Cold Weather Reliability Events

Accordingly, we direct NERC…**to develop and submit modifications to Requirement R7 of proposed Reliability Standard EOP-012-2 to require shorter deadlines to implement corrective actions for existing or new equipment or the freeze protection measures for those generating units that experience a Generator Cold Weather Reliability Event**.

Based on compliance with Requirements R2 and R3, those generating units should have already had appropriate freeze protection measures implemented to be capable of operating at the generating units' respective Extreme Cold Weather Temperature. Therefore, we find that a shorter timeframe to implement corrective actions that address existing or new equipment or freeze protection measures is appropriate.

For example, to satisfy this directive, NERC could require generator owners to implement corrective actions prior to the next winter season for generating units that experience a Cold Weather Reliability Event and to complete freeze protection measures on similar equipment on all of its fleet within 24 months of becoming aware of the freeze issue. For corrective action plans that involve larger and more complicated implementations, NERC could incorporate a staggered 48-month corrective action plan implementation deadline.

June 2024 Directives

P 70: Require ERO Pre-Approval of Corrective Action Plan Implementation Extensions

[W]e direct NERC, pursuant to section 215(d)(5) of the FPA, to develop and submit modifications to Requirement R7 of proposed Reliability Standard EOP-012-2 to ensure that any extension of a corrective action plan implementation deadline beyond the maximum implementation timeframe required by the proposed Reliability Standard is pre-approved by NERC…

June 2024 Directives

P 72: Require Completion of Corrective Action Plans for New Units Prior to Commercial Operation

We…find that generators that are commercially operational after October 1, 2027, should have freeze protection measures either designed into their generating systems, or, if a corrective action plan is needed, then it should be completed by the time that such generating units go into commercial operation.

Accordingly, we **direct NERC, pursuant to section 215(d)(5) of the FPA, to develop and submit modifications to Requirement R7 of proposed Reliability Standard EOP-012-2 to clarify that any Requirement R2 corrective action plans must be completed prior to the generating unit's commercial operation date.**

June 2024 Directives

P 76: Clarify Corrective Action Plan Implementation Deadlines

We believe that proposed Reliability Standard EOP-012-2, Requirement R7's corrective action plan implementation deadlines have remaining ambiguities that need to be addressed…

[W]e agree with the concerns raised by the ISO/RTO Council that Requirement R7 of proposed Reliability Standard EOP-012-2 does not provide clear direction as to the required corrective action plan implementation timeline that applies to certain generator owners. For example, it is unclear how the corrective action plan implementation timeline would apply if a generator owner had combinations of both existing and new equipment for freeze protection measures.

Accordingly, we direct NERC, pursuant to section 215(d)(5) of the FPA, **to develop and submit modifications to Requirement R7 of proposed Reliability Standard EOP-012-2 to address these ambiguities by expanding on Requirement R7.1.1 and 7.1.2 to make it clear which corrective action plan implementation deadline applies to which generator owner.**

P 94: Require More Frequent Reviews of Generator Cold Weather Constraint Declarations than Once Every Five Years

We agree with the ISO/RTO Council that the proposed five-year review period for the declared Generator Cold Weather Constraints in Requirement R8.1 could delay the identification and adoption of new freeze protection measures and does not represent the current pace of technological advancements.

We acknowledge that a more frequent review does impose some additional administrative burden to the generator owner to review the technological advancements that hindered its ability to winterize; nonetheless, a lengthy period between a Generator Cold Weather Constraint declaration review by the generator owner offers little incentive to timely adopt new freeze protection technologies.

Accordingly, we direct NERC, pursuant to section 215(d)(5) of the FPA, **to develop and submit modifications to Requirement R8, Part 8.1 of proposed Reliability Standard EOP 012-2 to implement more frequent reviews of Generator Cold Weather Constraint declarations to verify that the declaration remains valid.**

NERC may propose to develop modifications that address the Commission's concerns in an equally efficient and effective manner, however, NERC must explain how its proposal addresses the Commission's concerns.

Deadline

- FERC directed that NERC submit the modifications within 9 months of the date of the order, or by **March 27, 2025**.

Questions and Answers

SMA Large Scale Energy Solutions

Environmental Options

Scott Karpiel, November 12, 2024

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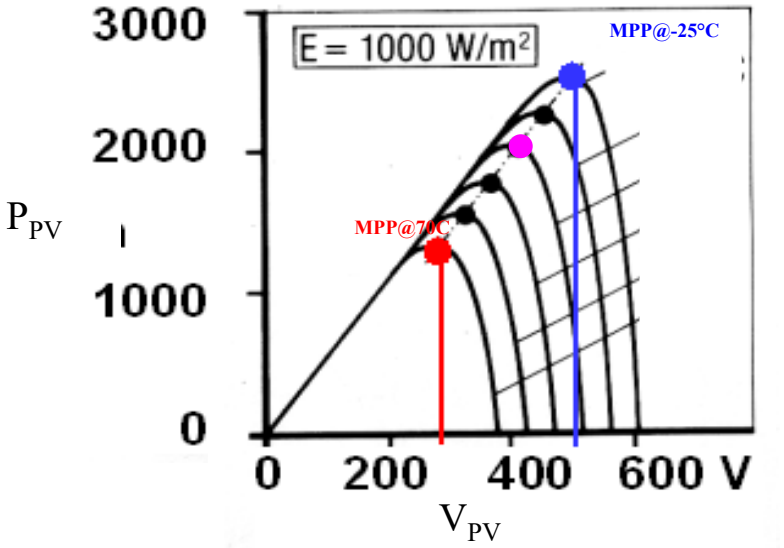
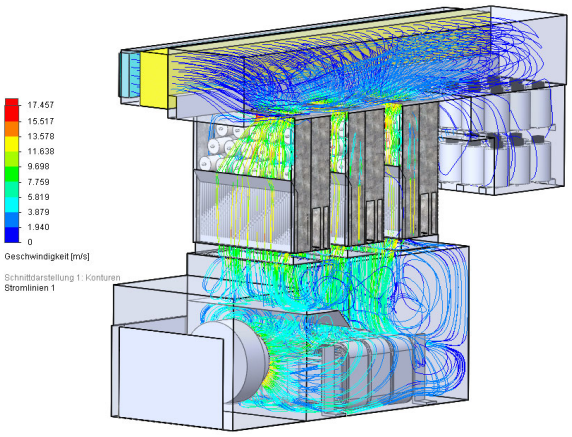
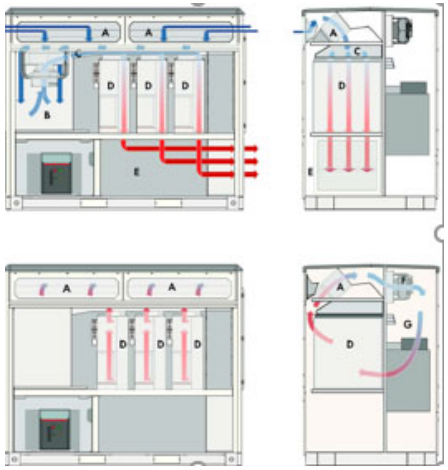
PV Module



J – solar cell temperature

Updated Hardware
Cooling system



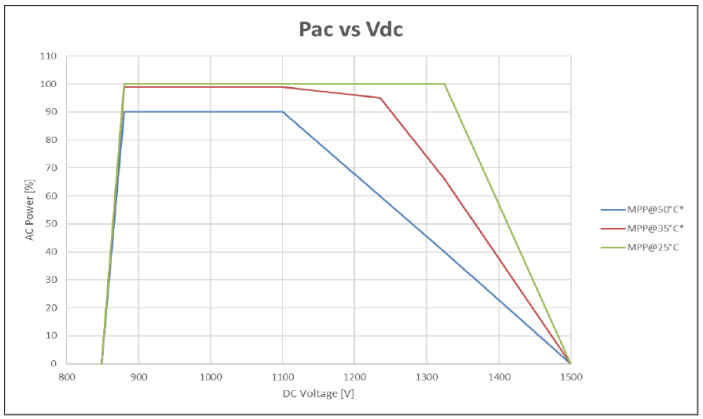


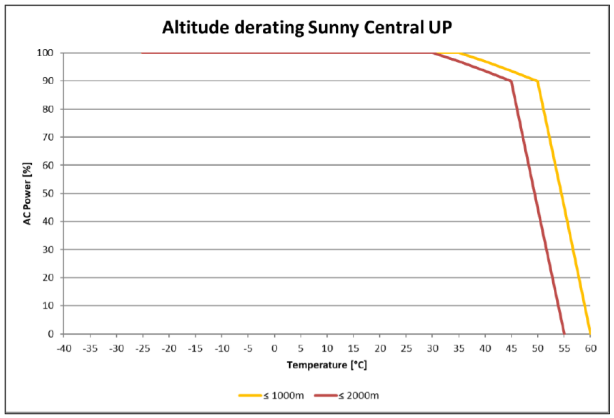
Improved cooling system

- More efficient air channel design to allow cooling of up to 4.6 MVA system
- Protected air channel to avoid ingress of water and heavy dust particles
- More efficient heatsink to keep stacks at operating temperatures
- Improved air flow so that no additional or bigger fans are required → same low self-consumption as with previous inverter
- Protected power electronics cabinet for outdoor use even at harsh environments

Derating 4xxx-UP

Due to temperature, altitude and DC Voltage





Temperature range

-40°C to 60°C

0% below -37C

100% of nominal power from -37C to +35°C

90% of nominal power at 50°C

0% at 60°C

Uses additional heaters to ensure internal components are kept at a temperature above -25C.

The inverter will go into standby mode if the ambient temperature falls below -37C and will not enter feed in operation until the internal temperature is greater than -25C

-25°C to 60°C

100% of nominal power from -25C to 35°C
90% of nominal power at 50°C
0% at 60°C

If ambient temperature falls below -25 inverter will not got to feed in operation until the internal temperature is greater than -20C

6.18	Temperature Range
2	-25...60C (35C)
3	-40...60C (35C)*

*Requires Q@Night

MVPS Ambient Temperature

- 25°C to + 45°C with AE Approval

- **No** hardware changes to the inverter
- Inverter is programed to follow the assigned load curve
- Ambient temperature is measured at the temperature sensor at the air intake

- 25°C to + 55°C SMA Recommended

- Inverter is programed to follow the assigned load curve
- Ambient temperature is measured at the temperature sensor at the air intake

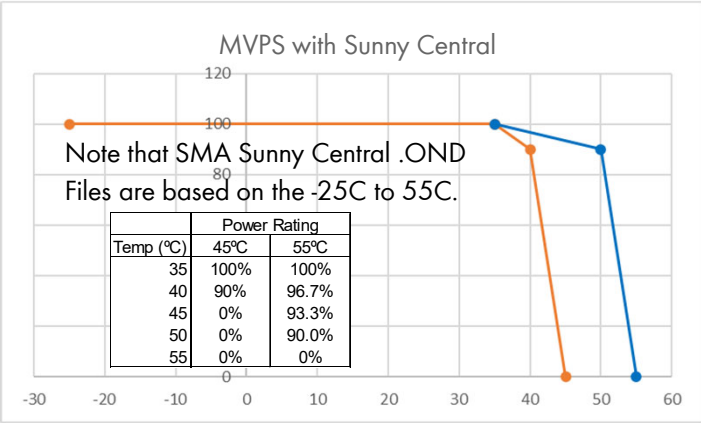
- 40°C to + 45°C Cold Weather Package with AE Approval

- Additional equipment required
  - Reference System Manual for 120V load consumed by the MVPS and 120V power available for customer connected equipment.
- Inverter is programed to follow the assigned load curve
  - Standby between ambient temperature of **-37°C and -40°C**
  - Loss of control Power.....Off or loss of Grid
  - Grid Feed In resumes once power is restored and increases internal temperature greater than -25C
- Ambient temperature is measured at the temperature sensor at the air intake

- 35°C to + 55°C Cold Weather Package with AE Approval

- Additional equipment required
  - Reference System Manual for 120V load consumed by the MVPS and 120V power available for customer connected equipment.
- Inverter is programed to follow the assigned load curve
  - Standby between ambient temperature of **-35°C and -40°C**
  - Loss of control Power.....Off or loss of Grid
  - Grid Feed In resumes once power is restored and increases internal temperature greater than -25C
- Ambient temperature is measured at the temperature sensor at the air intake

17	Ambient Temperature
0	-25C to 45C (with AE Approval)
1	-25C to 55C
2	-40 to 45C (with AE Approval)
3	-35 to 55C (with AE Approval)



	Power Rating	
Temp (°C)	45°C	55°C
35	100%	100%
40	90%	96.7%
45	0%	93.3%
50	0%	90.0%
55	0%	0%

Medium Voltage Transformer

- MVT is a passive device. it doesn't control the power (inverter does), only a step up in voltage
- Transformers have different design with different cooling channels and different losses
- 45°C transformer heat rise is higher (85k) compared with 55°C transformer (75K)

MVPS Ambient Temperature

Ambient temperature -25°C to 45°C	Ambient temperature -25°C to 55°C	Ambient temperature –40°C to 45°C	Ambient temperature –35°C to 55°C
MVPS with SC-UP (-US) • 100 % power from -25°C to +35°C • 90 % power at +40°C • 0 % at +45°C **MVPS with SCS UP (-XT) (-US)** • 100 % power from -25°C to +25°C • 85 % power at +40°C • 0 % at +45°C	**MVPS with SC-UP (-US)** • 100 % power from -25°C to +35°C • 90 % power at +50°C • 0 % at +55°C **MVPS with SCS UP (-XT) (-US)** • 100 % power from -25°C to +25°C • 85 % power at +50°C • 0 % at +55°C	**MVPS with SC-UP (-US)** • 100 % power from -37°C to +35°C • 90 % power at +40°C • 0 % at +45°C **MVPS with SCS UP (-XT) (-US)** • 100 % power from -37°C to +25°C • 85 % power at +40°C • 0 % at +45°C	**MVPS with SC-UP (-US)** • 100 % power from -35°C to +35°C • 90 % power at +50°C • 0 % at +55°C **MVPS with SCS UP (-XT) (-US)** • 100 % power from -35°C to +25°C • 85 % power at +50°C • 0 % at +55°C

MVPS Environment

18	Environment
0	Standard
1	Harsh

Environment	Environment IEC 60721-3-4 / ISO9223	Skid Galvanized ISO 14713-1	MVT Coating ISO 12944-5	Additional Equipment
Standard	C3 / 4S12	C4 VH	C3 H	No
Harsh*	C5 / 4S13	C4VH	C5-M H	Yes*

***Harsh for chemically active and dusty areas or less than 200km to coast**

Now Galvanized Skidtainer Frame!

- **Reduced rust issues**
- **Reduced transport damages**
- **Without additional cost**
- **Skid Coating is C5 for all projects**

- MV- and LV- compartment doors with filter fleece in the ventilation grids
- Active fan in the MV-compartment

MVPS Earthquake and Storm Package

Standard

- Roof load: 2500 N/m²
- Wind speed: 44 m/s = 98 mph
- ASCE 7-16 Seismic Site Class D

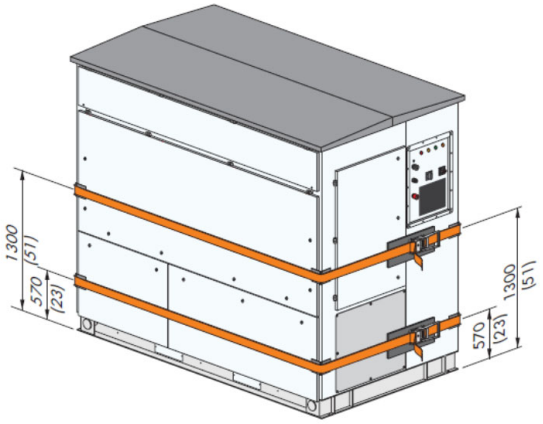
With Earthquake and Storm

- Roof load 4500 N/m²
- Wind speed: 62,5 m/s = 140 mph
- No changes to the inverter
- ASCE 7-16 Seismic Site Class D

Earthquake and Storm Special

- Roof load 4500 N/m²
- Wind speed: 89,4 m/s = 200 mph
- Inverter to be equipped with lashings straps
- Reinforced MV and LV Compartments
- ASCE 7-16 Seismic Site Class D

19	Earthquake and Storm Package
0	Without
1	With
2	E&S Special



In front of a hurricane the MVPS has to be switched off. A plate for the air exhaust and two lashing straps must be mounted horizontally around the inverter as a further safety measure.

Grids for the MVT room are recommended due to flying objects.

US Standards

Questions

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SMA Large Scale Energy Solutions

Thank you

Project 2024-03 Revisions to EOP-012-2 Technical Conference Working Session

Panel discussion on Defining Generator Cold Weather constraints

John-Erik Nelson

Principal Technical Engineer

BELD
BRAINTREE ELECTRIC LIGHT DEPARTMENT

- John-Erik Nelson -

John-Erik Nelson is the Principal Technical Engineer at Braintree Electric's Thomas A. Watson Generating Station in Braintree, MA, where he oversees the electrical infrastructure, instrumentation and controls, and chemical controls systems for the plant. In this leadership role, he coordinates, directs, and supervises all activities related to these areas, ensuring the plant operates smoothly, safely, and efficiently.

John-Erik is responsible for monitoring the overall performance and operation of the plant, conducting reliability reviews, and ensuring accurate environmental reporting. He collaborates closely with Braintree Electric's NERC Compliance team, external consultants, and the Generations' Operation and Maintenance staff to ensure the plant meets regulatory standards.

With over 35 years of experience at Braintree Electric, John-Erik began his career as a co-op student and has since developed a deep expertise in power generation systems. He holds a Master's degree in Mechanical Engineering from Northeastern University in Boston, MA, and a Second Class Engineers License from the state of Massachusetts.

Beyond his technical responsibilities, John-Erik is an active participant in industry groups and has been a longstanding member of the Generation Users community. For over 20 years, he has contributed to the *Combustion Turbine Operations Technical Forum (CTOTF)*, where he currently serves as the Senior Chair of the Aeroderivative Gas Turbine Roundtables.

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Braintree Electric Light Department

- BELD:
  - Muncipal Electric Utility in Braintree, Massachusetts
  - Established in 1892 by Thomas A. Watson, co-inventor of the telephone.
  - Since 1892, BELD is known for its Reliable Electric Service; including power during the Great Black out of 1965.
- Background : Watson Station –
  - Commercial Operation: June 2009
  - Two (2) Trent 60 (SGT-A65) Simple cycle units - 58 Mw each
  - Original OEM: Rolls-Royce / Siemens-Energy
  - Design Temperature: 107 deg F
    - Max. Extreme: 107 deg F
    - Summer Design performance: 91 deg F, 42.6% RH
    - Winter Design performance: 9 deg F, 65% RH
    - Min Extreme: negative 20 deg F
  - As with most Simple cycle, quick start units are being called on for no notice, short run (<2 hrs) with load following capability. (TMNSR Market – 1 hr run w/50 minute downtime between runs). Cold Metal to full power < 10 minutes.

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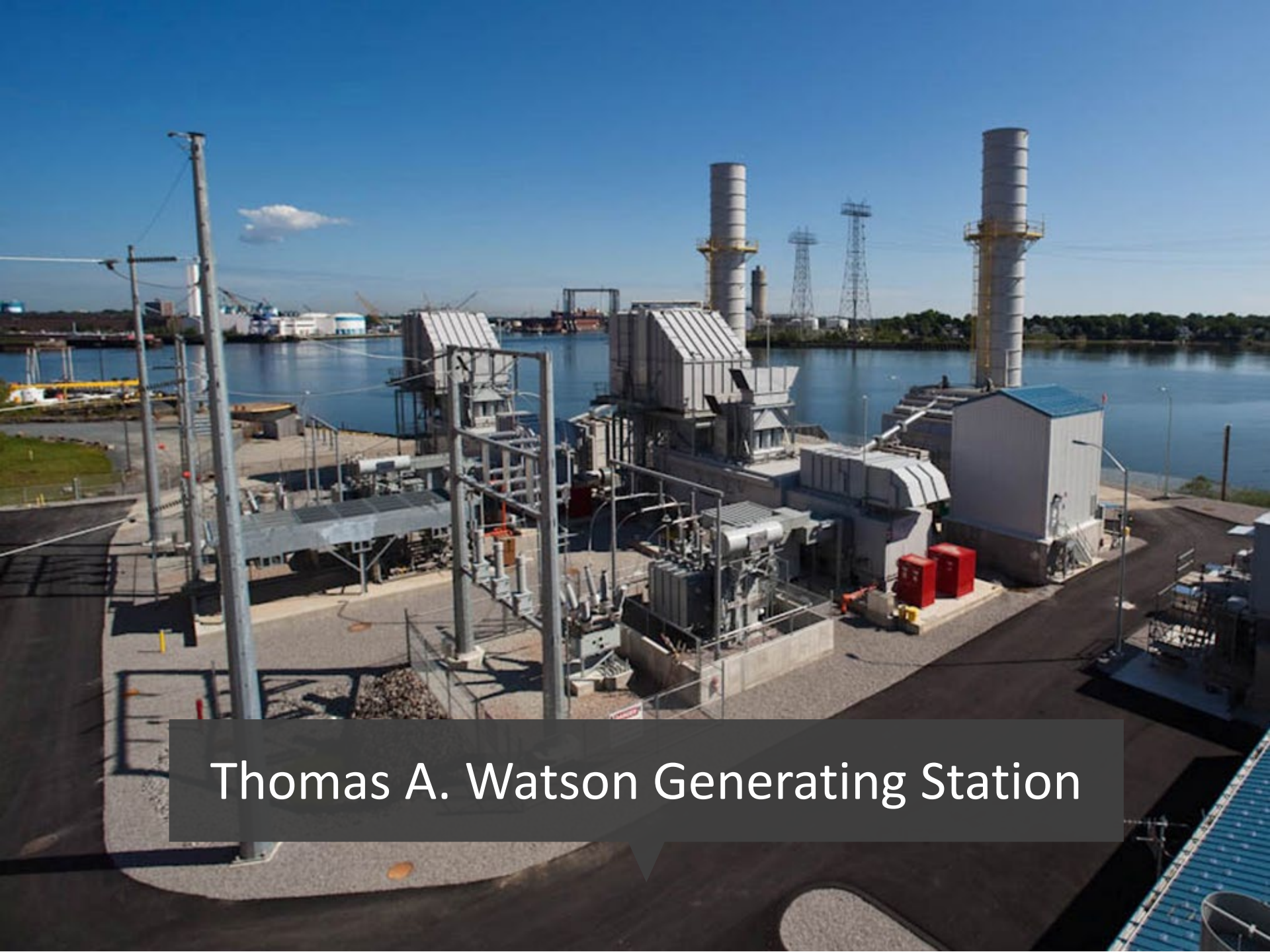
Thomas A. Watson Generating Station

Generator Cold Weather Constraints

as written EOP-012-3 Attachment 1

- Pre-Approved Constraint
  - *Applying heat upstream of inlet air filters…*
    - Electric –
      - > 4 Mw's worth of electric heat per unit (ECWT to 33 deg F)
    - Recycling waste heat from enclosure –
      - Increased monitoring and controls
    - Bleed Valves
      - Decreased output
  - Each of these require discussion with the EOM and Consultants.
- Case by Case –
  - #4 – *The application of a specific freeze protection measure would introduce the risk of noncompliance with other statutory, regulator, or health and safety requirements…..*
    - With respect to NFPA requirements, BELD has worked with the OEM on applying mitigation measures to the Package Ventilation Control for cold weather by adjusting the timing of the package ventilation fans.

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BRAINTREE ELECTRIC LIGHT DEPARTMENT

Freeze protection Measures

- Processes and procedures developed with Lessons learned.
- Plan of the Day meeting – discussion on weather concerns; Increased walkdowns of Critical Component checklists.
- Annunciation of low temp alarms and heat trace issues on Balance of Plant alarm screens.
- Insulation – Annual checks to ensure weather tight and address areas of concern. Ensure integrity, replace with custom made wraps vs. installing metal covers. Sealing gaps & cracks
- Installation of wind breaks – Unistrut and sliding plexiglass has worked well.
- Supplies –
    - Heaters, tarps, snow blowers/shovels, ice melt, extension cords, fluids and PPE.

Video from Nor-Easter

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Wind Walls/Breaks

Water injection Skid

Low Pressure Fuel Oil Skid
Strategic Sliding Plexiglass panels

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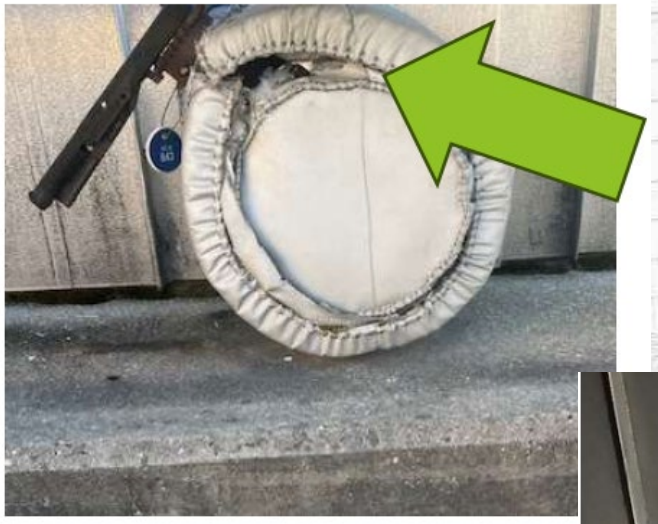
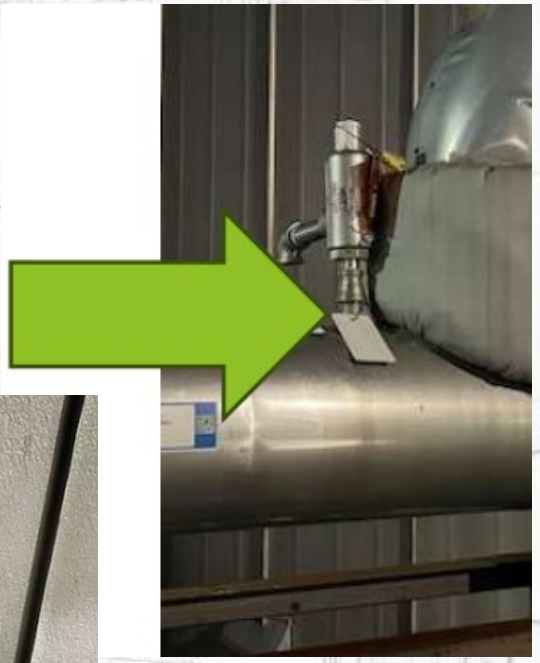
Sealing Gaps and Cracks





Project 2024-03 Revision to EOP-012 Technical Conference

Defining Generator Cold Weather Constraints

David Lemmons
Chair, NAGF Cold Weather Preparation Working Group
DavidL@GreybeardCS.com

Who/What is the NAGF?

The NAGF is an independent, member-driven, non-profit organization of generator owners and operators, focused on NERC and other grid reliability issues.

The NAGF's mission is to promote the safe, reliable operation of the generator segment of the bulk power system through generator owner and operator collaboration with others who have a vested interest in the reliable operation of the bulk power system.

NAGF Comment Summary

- NAGF Comments identified several areas that need additional modifications before the standard is clear, unambiguous and enforceable.
- The Constraint processes are vague and allow for significant variation between Regional Entities.

Constraints and Costs

- FERC order required removal of cost; SDT has removed the word, but not the impact.
- Section 3 of Attachment 1 list several potential constraints that are all based on cost.
- Constraint Approval document does not provide any additional details and confuses the issue further.
- Generator Owners need to know what is allowed as a constraint and what will need to be provided to support the declaration (or CAP extension).

Attachment 1 Section 3

- The freeze protection measure would reduce the reliability of the BES that outweighs the benefits, such as:
  - Premature retirement of dispatchable resources
  - Unit plans to retire in three years or less
  - Cancel generator construction
  - Reduce real or reactive power output by 3 percent or more
  - Other circumstances as determined by experience

Possible Constraint Example 1

- Wind plant receives a quote from OEM for heated turbine blades
- Cost of blades: ~$1.1 million per blade, $3.3 million per tower.
- Disclaimer from OEM – May not address weather seen at your location.
- Is this a valid constraint?

Possible Constraint Example 2

- Five-year-old ~ $200M solar facility cannot meet their ECWT because tracking system battery misses ECWT by 5 degrees
- Engineers think there may be three possible fixes:
  - Replace with system that meets the ECWT; this requires complete rebuild of every array, cost estimated to be close to original cost of plant, time to complete not determined
  - Replace the battery and enclosure with larger, more robust battery
    - 5,200 trackers, total cost ~$7M, a year to install depending on crew size
  - Find same size battery with lower operating temperature
    - 5,200 trackers, total cost of ~$1.7M, half year to install depending on crew size

Compliance Resolutions

- Heat the battery compartment, O'Brien Box style
  - Will requires significant routing of electricity to heaters
- Turn off the plant when it gets cold
  - If the plant does not run in the cold, the requirement does not apply.
  - Will reduce total output from the plant, variable impact based on weather.
- Permanently disconnect the tracking system
  - If the tracking system never operates, the battery is not an issue; reduces output by ~15 percent.
- Decommission the plant
  - As written, this does not qualify for constraint declaration.

Which Option = Constraint

- First three options have costs between $1.7m to ~$200m
  - Can any of these be a Constraint since there are costs involved?
- If replacing the battery/tracker system is not feasible, which of the other options qualifies as a Constraint?
  - What “proof” is needed to meet the CEA data requirement?
- What information needs to be provided to the CEA related to options considered when creating the CAP and determining the CAP is not feasible?

CAP Deadline Issue

- Unit 1 with very limited utilization must fix an issue due to a GCWRE.
- With restrictions on allowed maintenance periods, scheduling outage for this plant will displace planned outage on Unit 2.
- Unit 2, with high utilization, needs maintenance to continue operating with a high level of reliability.

Questions

- Under proposed EOP-012, who determines the outage priorities for the two units?
- If BA determines Unit 2 is priority, can the CEA refuse extending the CAP deadline?
- If the two units are owned by different GOs, will information requested by CEA be available?
- Unplanned maintenance outages can have significant costs that are passed on to end users.
  - 600 MW coal unit estimates the cost to shut down and restart is between $300k-$500k.
  - Changing contractor schedules can have significant costs

Other Concerns to Address

- "Repetitive" CAP and declaration issue.
  - Snow will cover solar panels every year.
- RMR units' constraints are limited.
- Compliance requirements for when a Constraint is no longer valid.
- Process to add/remove items on list of pre-approved Constraints or situations that cause declarations.

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Generator Cold Weather CAP Extension and Constraint Process

Project 2024-03 – Technical Conference

Derek Kassimer, NERC
Curtis Crews, WECC
November 12, 2024

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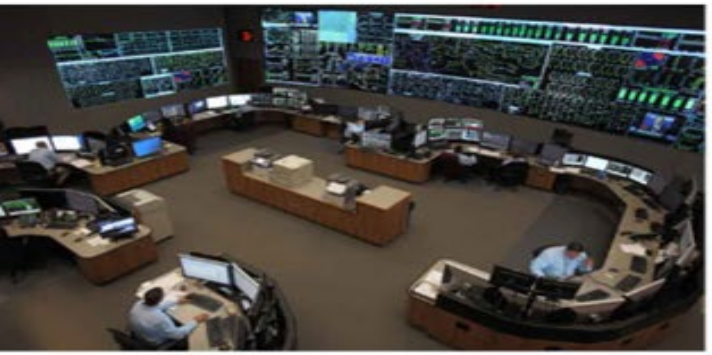


Agenda

- Overview of Generator Cold Weather CAP Extension Request Process
- Overview of Generator Cold Weather Constraint Review Process
- Comments received from initial ballot
- Questions and Answers

Generator Cold Weather CAP Extension Request Process

- FERC directed the NERC pre-approval of CAP extensions
- An extension request is required when timetables are projected to exceed timelines which includes:
  - Circumstances causing delay and how those circumstances are beyond the control of Generator Owner
  - Revisions to actions including any Operating Procedures
  - Updated timetable

Generator Cold Weather CAP Extension Request Process

- Submittal of the CAP Extension
  - As soon as aware, no later than 60 days prior
- Review by the Compliance Enforcement Authority (CEA)
  - Acknowledge receipt within 15 days
  - Completion of review within 45 of acknowledgement
- Notification
  - Approval/denial/continuation of review with rationale
  - If denied, CAP must be completed under original timelines
- Reporting
  - Quarterly reports by the CEA to NERC

Generator Cold Weather Constraint Review Process

- FERC directed NERC to receive, review, evaluation and confirm the validity of GCWCs
- Generator Cold Weather Constraint (GCWC) – SDT revised the definition:
  - Any condition that would preclude a Generator Owner from implementing freeze protection measures on one or more Generator Cold Weather Critical Components.
- SDT also developed Attachment 1 to provide clarity on GCWCs
- EOP-012-3 Requirement R8, details submittal
  - Within 45 days of determining or for R2 units no later than 15 days after commercial operation

Generator Cold Weather Constraint Review Process

- Submittal of the GCWC
  - As soon as aware, no later than Requirement R8 (within 45 days of determining applicability or no later than 15 days after commercial operations (Requirement R2 caveat)
  - Identify type of GCWC (per Attachment 1, pre-approved or case-by-case)
- Review by the Compliance Enforcement Authority (CEA)
  - Acknowledge receipt within 15 days
  - Completion of review within 10 business days of acknowledgement for pre-approved
  - Completion of review within 45 business days of acknowledgement for case-by-case
- Notification
  - Approval/denial/continuation of review with rationale
  - If denied, CAP to be updated to reflect review time (corrective actions begin from date entity is notified the GCWC is invalid – Requirement R8 Part 8.4.)
- Quarterly reports by the CEA to NERC

Discussion Points

- Generator Cold Weather CAP Extension and Constraint Process:
  - Not a SDT deliverable or responsibility. NERC Compliance Assurance is leading this effort
  - Not a voting item. Entities cannot approve/deny the Process that is ultimately developed
  - Why not directly embedded in the Standard?
  - ALIGN/SEL will be primarily used, however, other means of communication may be utilized if the need arises

Discussion Points

- What if I fail to provide all necessary data?
- What if I do not get acknowledgement within 15 days? Review in 10/45 business days?
- What is NERC's role in the Process?

Comments Received from Initial Ballot

- Circumstances beyond the control of the Generator Owner – added
- Step 1 included “contact their CEA to coordinate…” – removed
- Update to reflect Canadian-specific language – added
- Removal of Footnotes 11 and 12 from EOP-012-3 – discussions to be held with the SDT in the following days
- GCWC declaration for the same recurring event – discussions to be held with the SDT in the following days

Comments Received from Initial Ballot

- Appeals process for a denial of a CAP extension/GCWC – This will not be added to the Generator Cold Weather CAP Extension and Constraint Process. An appeals process is already defined within the NERC Rules of Procedure, described in Sections 408 through 410.
- Reporting to industry – NERC will not provide a report from the output of this process, however, there are other avenues, such as the Section 1600 Cold Weather Generator Data Collection, which will include CAPs and GCWC.

Questions and Answers

Project 2024-03 Revisions to EOP-012-2 Technical Conference – Generator Winterization Best Practices

November 12, 2024

ERCOT – Austin, Texas

Michael Kuhl
Manager, Operations and Planning Monitoring

Agenda

- Origin of Best Practices – Elliot Report Recommendation 1 Activity
- Common Challenges
- Winter Weather Readiness Best Practices

Elliot Report – Recommendation 1

- Recommendation Verification – Risk-based Approach
  - 1(b) - Monitored “top 20” Registered Entities subject to *currently effective* (April 1, 2023) cold weather Reliability Standards
    - Completed combination of on-site monitoring, off-site review of cold weather plans and off-site monitoring of certain Registered Entities via Self-Certification
  - 1(c) - Combination of generator readiness verifications and future monitoring of cold weather standards effective October 1, 2024
    - Completed review of Registered Entities via On-site Readiness Verification and Off-site readiness discussions
    - Ongoing monitoring
      - Audit and Spot-Check in 2025
      - Self-Certification 4th qtr 2024/1st qtr 2025

Common Challenges with Plant Winterization

Sensing lines and instrumentation with no permanent enclosures	Temporary enclosures can be problematic during summer months
Cold startup during an extreme cold weather event	
Completion and documentation of training the “right” personnel	
Integration into plant CMMS and work management process	Winterization PMs Equipment criticality (identifier for Cold Weather Critical)
Fuel supply	Gas pipeline availability Fuel oil backup / Transportation of fuel
Heat Trace Issues	Installation errors Damaged during maintenance Insulation problems

Winter Readiness Best Practices

- **USE** permanent solutions vs temporary ones where possible.
- **UPDATE** CMMS to generate seasonal readiness tasks & track their completion.
- **USE** CMMS to give priority status to seasonal deficiencies entered as future jobs.
- **CHANGE** lagging, heat trace and enclosures as required components for completion of other maintenance tasks
- **VERIFY** building penetrations properly insulated and sealed from elements (doors, windows, louvers, dampers, etc.)
- **DEVELOP** cold weather fleet operating plans that include actions with respect to varying temperatures as a fleet (who does what, communications, status updates, etc.) Equipment impacts vary by temperature so action change) - #2 Diesel begins gelling at 15F
- **DEVELOP** contingency plans or actions for cold weather and incorporate into emergency action planning
- **REVIEW** material condition of plant equipment, enclosures and barriers with respect to cold weather

Winter Readiness Best Practices cont.

- **TRAIN** plant staff on plan updates/lessons learned from previous events
- **CONDUCT** event reviews immediately following an event.
- **ADD** work steps to existing job aids to prevent maintenance activities from defeating protective functions (e.g. heat trace de-energized during freezing conditions, insulation removed and left off for extended periods)
- **UTILIZE** alternative fuel sources to help prevent fuel supply emergencies.
  - Coal plants – gas/oil
  - On site fuel oil storage
  - If possible, obtain multiple pipeline connections
  - Test swaps before winter.
- **CONTINUOUSLY** monitor heat tracing systems and sensors - assign someone for this function.
- **INCREASE** operator rounds during cold weather event - more cold, more frequent.
- **ESTABLISH** close timely contact with NG pipeline companies during event to be aware of current and future conditions.

Winter Readiness Best Practices cont.

- **ESTABLISH** dedicated system update periods to minimize staff distractions.
- **BE AWARE** of supply chain issues.
- **OBTAIN** temperature-hardened sensors (-49F to 149F)
- **INSTALL** permanent enclosures (PM)
  - Sliding walls, roll down doors, etc.
- **INSTALL** temporary enclosures (PM)
- Securely **PLACE** temporary heaters (PM)
- **DEVELOP** a WINTER readiness supply list and dedicated location (PM)
  - Tarps, heaters-electric and fueled, winter clothing, cots, blankets, food, ice melt, crampons, etc.
- **REQUEST** periodic starts to heat units
- **VEHICLES** winterized (PM)
  - Support items – snowplow, ice melt spreader


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TEXAS RE

Generator Winterization Best Practices

Project 2024-03 Revisions to EOP-012-2 Technical Conference

Mark Henry

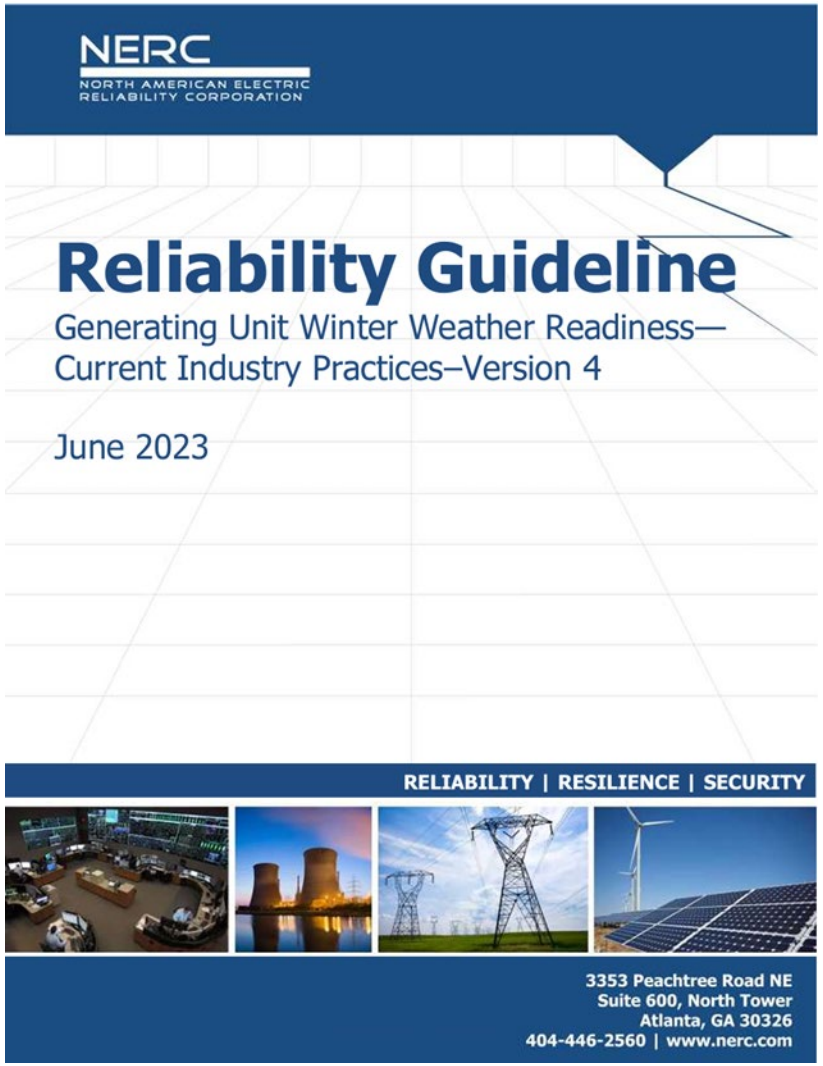
November 12, 2024

Winter Lessons Learned from ERCOT ISO's inspections

- Annual inspections of thermal insulation and water-proofing are important
- Protection of Transmitters and Instrumentation systems is critical
- Seasonally replaceable wind blocks are very effective
- Frequent monitoring of freeze protection and instrument air drying systems increases confidence
- Assuring adequate quantities of supplies, chemicals, fuels, personnel, food, sleeping quarters, etc. is increasingly important for longer duration storms or those that inhibit travel/transport of resupply
- Monitoring of all cold weather critical components is vital. Accountability mechanisms are valuable
- For additional information see ERCOT Best Practices & NERC Lessons Learned

NERC's Generator Winter Readiness Guideline

- Safety
- Management Roles and Expectations
- Processes and Procedures
- Evaluation of Potential Problem Areas with Critical Components
- Testing
- Training
- Communications



Learning from the past and other's experiences

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NERC Information Resources (as of 11/7/2023) on Cold Weather Preparation and BPS Impacts

NERC has collected and shared information on cold weather preparation and BPS impacts for years via Webinars, Special Reports, Lessons Learned, Failure Modes & Mechanisms, and other resources.

Here are links to some cold weather resources:

Reports on major BPS-impacting Cold Weather events

- Outages and Curtailments during the Southwest Cold Weather Event of February 1-5, 2011
- January 2014 Polar Vortex Review
- FERC - NERC Report: The South Central United States Cold Weather Bulk Electric System Event of January 17, 2018
  (There are a number of 'sound practices' from the industry, starting on page 100.)
- The Generating Unit Winter Weather Readiness - Current Industry Practices - Version 4 (June 2023) is a resource for helping develop generator cold weather preparation plans.
- FERC - NERC - Regional Entity Staff Report: The February 2021 Cold Weather Outages in Texas and the South Central United States
- FERC - NERC - Regional Staff Winter Storm Elliott Report: Inquiry into Bulk-Power System Operations During December 2022
- Other Cold Weather Reports and Training Materials can be found on this site.

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 & Sensing Equipment Freezing Due to Heat Trace & 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 (also 2018 Webinar w/FMM)
- LL20200601 Unanticipated Wind Generation Cutoffs during a Cold Weather Event
- LL20201101 Cold Weather Operation of SF6 Circuit Breakers
- LL20220301 Managing UFLS Obligations and Service to Critical Loads during an Energy Emergency

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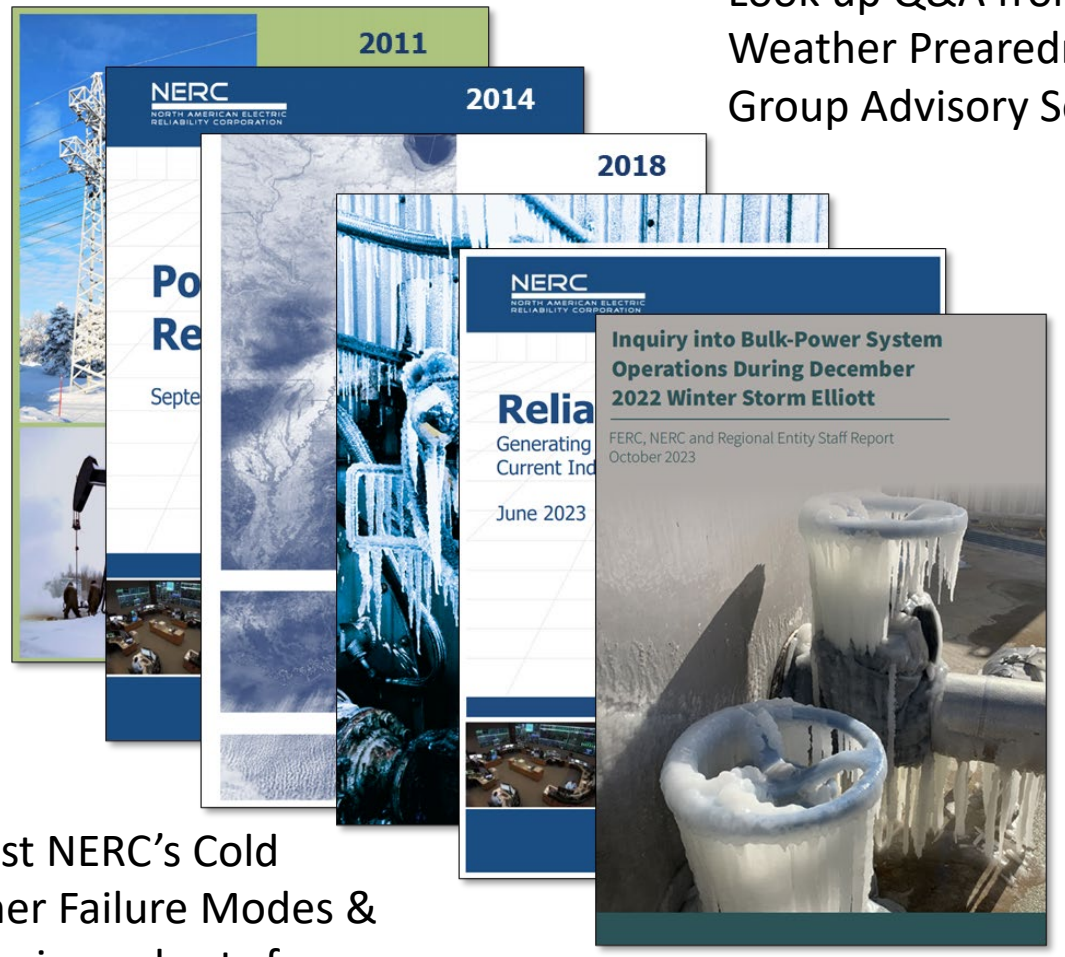

Look up Q&A from 2024 Cold Weather Preparedness Small Group Advisory Sessions

Request NERC's Cold Weather Failure Modes & Mechanisms charts from your Regional Entity

Observed habits for success in winterization

- Set up a winterization project leader for each facility, possibly fleet-wide as well
- Understand critical components and their vulnerabilities
- Engage plant staff through training, incentivization/recognition, post-season reviews
- Embrace new ways to monitor and protect equipment
- Look beyond the “usual suspects” for problem areas
- Maintain awareness of winterization in the off-seasons, too

TEXAS RE
Ensuring electric reliability for Texans

Winterization Good Practices

Matt Forrest
Sr. Entity Risk Assessment Engineer
November 12, 2024

Suggested Good Practices

- Know the basis for generator operating limitations day to day
- Take advantage of affiliates and industry forums.
  - North American Generator Forum
  - North American Transmission Forum
- Protective measures and efforts should be prioritized based on equipment that has the potential to:
  - Cause unit trip or partial outages
  - Impact unit start-up or plant monitoring and automation
  - Cause equipment or plant damage
  - Adversely impact the environment
  - Cause fuel disruption
  - Reduce plant safety

Suggested Good Practices

- Split up winter preparation and planning rather than trying to accomplish it just prior to winter.
  - Review the following prior winter:
    - Effectiveness of the cold weather strategy
    - Trouble areas
    - Complete corrective actions and document
  - Prioritize work orders:
    - Consider a cold weather code
    - Ensure work is scheduled to complete prior to a specific date
  - Keep a winterization items list year-round.
  - Keep things as simple as possibl
  - Enhancements do not have to break the bank
  - Ensure personnel are trained and aware

Suggested Good Practices

- Developing a plan - Prioritize your review and preparation.
- Building doors, Building Louvers, Building Heat, GT intake, and boiler stack area
- External Piping, insulation, traps, and heat trace.
- Vital instrumentation
- Fuel Supply, fuel switching, fuel delivery
- Plant cooling basins, tank heat
- Main plant condensate, feed, and boiler system, aux boiler
- Emergency Generator and fuel supply, key loads.
- Station service power
- Other systems – instrument air, fire protection, water treatment
- Lessons learned from prior winter events.
- Corrective Action Plans, Mitigation results, Extent of condition

Helpful References

- 2019-06 Project Page
- ERO Enterprise CMEP Practice Guide Cold Weather Preparedness
- Major Events Reports
- Lessons Learned
- Reliability and Security Guidelines
- Reliability Guideline: Generating Unit Winter Weather Readiness - Version 4 (nerc.com)
- NERC Information Resources on Cold Weather Preparation
- Cold Weather Preparedness FAQ (nerc.com)

Questions