NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Recommendation to Industry

Cold Weather Preparations for Extreme Weather Events

Initial Distribution: August 18, 2021

Two[1] extreme cold weather[2] events have occurred in the past four winter seasons. The February 2021 extreme cold weather event stressed the need to ensure the safe, resilient, and reliable operation of the Bulk Electric System. The recent extreme cold weather events across large portions of North America have highlighted the need to assess current operating practices and identify some recommended improvements, so that system operations personnel are better prepared to address these challenges. The events have caused major interruptions to resources, transmission paths and ultimately, end-use customers. This alert will assist in determining the winter readiness of Reliability Coordinators (RCs), Balancing Authorities (BAs), Transmission Operators (TOPs), and Generator Owners (GOs).

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Status:	**Acknowledgement Required by Midnight Eastern on August 23, 2021** **Reporting Required by Midnight Eastern on September 17, 2021**
	**PUBLIC:** No Restrictions More on handling >>
Instructions:	This Level 2 NERC Alert provides specific recommended actions that NERC registered entities should consider in response to a particular issue. Pursuant to Rule 810 of NERC's Rules of Procedure[3], NERC registered entities shall (1) acknowledge receipt of this advisory within the NERC Alert System, and (2) report to NERC on the status of their activities in relation to this recommendation (as provided below). For U.S. entities, NERC will aggregate the responses and provide an anonymized report to the Federal Energy Regulatory Commission. This Level 2 NERC Alert is not the same as a Reliability Standard nor does it create a mandatory obligation to take the recommended actions. Your organization will not be subject to penalties for failure to implement the recommendations. Issuance of this recommendation, however, does not alter the requirements of any approved Reliability Standard nor excuse the failure to follow the practices discussed in the recommendation if such failure

[1] The two Extreme Cold Weather events are January 2018 and February 2021
[2] Extreme Cold Weather as define in the Polar Vortex Review dated September 2014; Extreme Cold Weather conditions occurred in lower latitudes than normal, resulting in temperatures 20 to 30° F below average.
[3] https://www.nerc.com/AboutNERC/Pages/Rules-of-Procedure.aspx

	constitutes a violation of a Reliability Standard. Registered entities must continue to comply with applicable Reliability Standards.
Distribution:	**Initial Distribution:** Balancing Authority, Generator Owner, Reliability Coordinator, Transmission Operator Who else will get this alert? >>
Primary Interest Groups:	Generation Engineering, Generation Operations, System Operations – Transmission Engineering, System Operators, Transmission Planning
Recommendation:	This Recommendation to Industry, a Level 2 NERC Alert requests NERC registered entities to: • Acknowledge receipt of this advisory within the NERC Alert System. • Review and complete the reporting instructions below. To the extent that Canadian jurisdictions have implemented laws or requirements that vary from Section 810 of the ROP, NERC requests that entities in such jurisdictions voluntarily participate in acknowledgement and reporting pursuant to this alert. **Recommendation #1:** RCs, BAs, and TOPs should create, or add to, seasonal operating plans for the upcoming winter season at least two months before their winter season, with special emphasis on meeting extreme cold weather energy requirements (while also considering resource limitations such as extreme cold temperatures for a prolonged period of time along with the effects that icing and snow impacts may have on equipment, etc.) Energy aspects of this plan should be informed and updated as per seasonal planning operating plans. RCs, BAs, and TOPs should communicate these plans to GOs within their operating area. Winter seasonal operating plans should include: a. Energy constraints for the upcoming season. Evaluate capacity impacts throughout extreme weather to consider overall energy needs, in addition to peak periods. b. Identification of resource startup time and variability concerns to improve response time related to ramping capability. c. Import capability of the system and resource availability constraints on external systems during extreme winter weather events. d. Load forecasting practices that consider extreme events.

e. Plans to utilize additional transmission capacity (by calculating transmission limits based on real-time system conditions)

f. Plans for weatherization of substations and equipment

g. Plans to seek temporary relief from local, state, and federal environmental regulations.

h. Communications protocols and requirements with government, media, and the public (as appropriate).

i. Plans for communicating with natural gas providers (suppliers and pipelines) to assess natural gas availability, and to coordinate gas/electric interactions during emergencies.

RCs, BAs, and TOPs should continue, in real-time, especially during periods of extreme cold weather, activities that promote a high-level of situational awareness related to regional energy. This includes, but is not limited to, maintaining awareness of fuel inventories and replenishment plans at critical facilities, status of dual fuel and demand response resources, and maintaining communications with neighboring areas, regulators, generating resources, and fuel suppliers. In the event emergency actions are required, attempts should be made to minimize duration and unintended consequences of more extreme actions, such as load shedding.

Recommendation #2: GOs should review RCs, BAs, and TOPs seasonal operating plans to ensure they contain the current generator availability, fuel supplies, and other related assumptions. Actions should be taken as appropriate based on weather forecasts, resulting capacity, and energy analyses to facilitate readiness while allowing adjustments to be made so there is time for GOs to make the necessary arrangements to maximize the availability of the resources, including, but not limited to, the replenishment of fuel, supplies, labor, and equipment. GOs should maintain communications with fuel suppliers and be prepared to manage resources with fuel switching.

GOs with wind and solar resources should communicate with RCs, BAs, and TOPs regarding units with cold weather packages, such as de-icing capability, to better assess generating unit availability.

Recommendation #3: GOs should communicate to their RCs, BAs, and TOPs, forecast and actual unit de-rates during extreme cold weather events and conditions considering the following factors: unavailability due to weather, fuel constraints (gas restrictions), de-rates for alternate fuels, and potential concerns with increased outages or delayed starts based on unit ambient

ratings and historical performance. These communications should be part of the seasonal, outage coordination, day-ahead, and real-time energy assessments.

RCs, BAs, and TOPs should incorporate the generation unit de-rate information into their generation capacity and energy analyses and operating plans. Factors to consider include unavailability due to weather, fuel constraints (gas restrictions and refueling limitations), de-rates for alternate fuels, potential concerns with increased outages or delayed starts based on unit ambient ratings (including accounting for the effect of precipitation and accelerated cooling effect of wind, etc.), and historical performance.

Recommendation #4: Manual and Automatic Load Shedding

a. RCs, BAs, and TOPs manual and automatic load shedding plans should review critical interdependent sub-sector electrical loads (as defined by each entity) to avoid being included as part of automatic (i.e. under-frequency) or manual load shedding. This review should be factored into seasonal preparation plans.

b. RCs, BAs, and TOPs should confirm and test manual load shedding processes and capability periodically. These processes and capabilities should be updated with the most recent load forecasts. If these load shedding processes are called upon during real time operations, they should be monitored during execution as well as recovery.

c. RCs, BAs, and TOPs should track demand response capability and verify that critical interdependent sub-sector loads are excluded. Operating plans should also take into consideration any limitations on the duration and magnitude of demand response capabilities.

Recommendation #5: GOs should conduct dual fuel assessments to ensure resources can switch to the alternate fuel and monitor how much alternate fuel is on site. GOs should also assess generating unit weatherization plans, the implementation of freeze protection measures and factors that could impact availability including minimum operating temperature, and application of heat tracing equipment and wind breaks. GOs should inspect and maintain their weatherization measures ahead of the upcoming winter season, before the onset of, and during extreme cold weather conditions.

Reporting Instructions:	Initial acknowledgement of receipt is required by August 23, 2021, Midnight Eastern via the NERC Alert System. Responses to the questions below are required to be submitted via the NERC Alert System by September 17, 2021, Midnight Eastern.

A valid response in the NERC Alert System consists of the following three steps by the submitting entity:

- Acknowledgement of Alert
- Submission of Response
- Approval of Response

The NERC Alert System contains menu options for each of the above commands that are available to authorized individuals upon login. A response will not be considered valid until all three steps have been completed.

All registered entities belonging to the RC, BA, TOP, and GO functional groups are required to acknowledge receipt of this alert and respond, as applicable.

All registered entities covered by this recommendation are required to provide an approved response as defined above to the following questions:

RC Questions

1. Has your organization developed Operating Plans that are closer to real-time (2-3 days ahead)?

   A. Yes

   B. No, however, we intend to develop such plans

   C. No, and we have no intention of developing such plans

   D. Not applicable – our organization is not registered as an RC

   1a) If your answer was A or B, does/will it include the following:

   - Detailed plans to address the operating conditions such as cancellation of outages, generator starting and operating forecasts as well as ramping requirements
   - The plans are communicated and coordinated with neighboring organizations
   - The plan has protocols for communication between your RC and neighboring BAs
   - Implementation plans are outlined in a forward-looking three week plan
   - The plans evaluate, and use, an after-action review to identify additional transfer capabilities for optimal dispatch of resources and energy management

- For stability-based import limits, the plans use real-time tools to determine import limits
- Operational limitations of the generation facilities in your area

A. Yes – we include/will include all of these points

B. Yes – we include/will include some of these points

C. No

D. Not applicable – our answer to Question (1) was not (A) or (B)

BA Questions

1. Does your organization conduct a seasonal energy and capacity assessment for normal and extreme cold scenarios at least two months prior to the winter season?

   A. Yes

   B. No, however we plan to conduct such an assessment

   C. No, and we have no plans to conduct such an assessment

   D. Not applicable – we are not registered as a BA

2. Has your organization analyzed electric import capability for widespread, extreme, multi-day weather events, and determined under what conditions emergency transfer capability can be used to increase imports into the deficient area ahead of the season, taking into account Balancing Authority Areas and RCs extreme weather capabilities and the ability to provide aid during extreme weather?

   A. Yes – we have performed this analysis

   B. No, however, we plan to perform this analysis

   C. No, and we have no plans to perform this analysis

   D. Not applicable – our organization is not registered as a BA

3. Has your organization developed Operating Plans that are closer to real-time (2-3 days ahead)?

   A. Yes

   B. No, however, we intend to develop such plans

   C. No, and we do not intend to develop such plans

   D. Not applicable – our organization is not registered as a BA

3a) If your answer was (A) or (B), does/will it include the following:

- Detailed plans to address the operating conditions such as cancellation of outages, generator starting and operating forecasts, as well as ramping requirements
- Plans that are communicated and coordinated with neighboring organizations
- Implementation of plans that are outlined in a forward looking three week plan
- Plans to meet any gap in energy between the forecast load in real-time and the day-ahead physical energy supply
- Plans containing details on Operating Reserves for fast-start and fast-ramping generation contingency response
- Plans to replace energy throughout a long-duration supply loss or unanticipated increase in demand
- Plans have protocols for communication between your RC and neighboring BAs
- Plans incorporate operational limitations of the generation facilities in your area

A. Yes – we include/will include all of these points

B. Yes – we include/will include some of these points

C. No

D. Not applicable-our answer to Question (3) was not (A) or (B)

TOP Questions

1. Has your organization analyzed electric import capability for widespread extreme multi-day weather events, and determined ahead of the season under what conditions emergency transfer capability can be used to increase imports into the deficient area, taking into account the following factors:

    - For stability-based import limits, use real-time tools to determine import limits
    - Understand neighboring Balancing Authority Areas and RCs extreme weather capabilities and the ability to provide aid during extreme weather

- Evaluate/consider the use of ambient temperature adjusted limits on all transmission facilities where the conductor rating is the limitation

A. Yes

B. No, however, we plan to perform this analysis

C. We have performed, or plan to perform, a partial analysis – taking into account some or all of these factors, and/or including some, or all of, the assets in our system

D. No, and we have no plans to perform this analysis

E. Not applicable – our organization is not registered as a TOP

2. Does your organization conduct transmission system seasonal assessments including weatherization of substations and equipment, maintenance and testing of voltage reduction equipment, assessment of transmission and generation outages and transfer capabilities during those outages that could limit transfer capability and/or resource availability?

A. Yes

B. No, however, we plan to conduct such an assessment

C. We have performed, or plan to perform, a partial assessment – taking into account some or all of these factors, and/or including some or all of the assets in our system

D. No, and we have no plans to conduct such an assessment

E. Not applicable – our organization is not registered as a TOP

3. Has your organization developed Operating Plans that are closer to real-time (2-3 days ahead)?

A. Yes

B. No, however we intend to develop such plans

C. No, and we have no intention of developing such plans

D. Not applicable – our organization is not registered as a TOP

3a) If your answer was (A) or (B), does/will it include the following:

- Detailed plans to address the operating conditions such as cancellation of outages, generator starting, and operating forecasts, as well as ramping requirements

- The plans are communicated and coordinated with neighboring organizations
- Implementation of plans that are outlined in a forward-looking three-week plan
- The plans evaluate and utilize the use of an after-action review to identify additional transfer capabilities, for optimal dispatch of resources and energy management
- For stability-based imports limits, the plans use real-time tools to determine import limits
- Plans have protocols for communication between your RC and neighboring BAs
- Plans incorporate operational limitations of the generation facilities in your area

A. Yes – we include/will include all of these points

B. Yes – we include/will include some of these points

C. No

D. Not applicable – our answer to Question (3) was not (A) or (B)

GO Questions

1. If your organization owns fossil-fired units, do you conduct surveys with fuel suppliers for delivery of fuel during extreme cold weather?

   A. Yes

   B. No, however, we plan to conduct such surveys

   C. We will conduct or plan to conduct such surveys for some of the assets we own but not all of them

   D. No, and we have no plans to conduct any such surveys

   E. Not applicable – our organization is not registered as a GO or we do not own any fossil-fired units

   1a) If your answer to (1) was (A), (B), or (C): Which entities do you or will you communicate the results with?

   A. RC only

   B. BA only

   C. Fuel supply companies only

   D. RC and BA

E. RC and fuel supply companies

F. BA and fuel supply companies

G. RC, BA, and fuel supply companies

H. Not applicable – our answer to Question (1) was not (A), (B), or (C)

1b) If your answer to (1) was (A), (B), or (C): Does your organization conduct dual fuel assessments to ensure resources can switch to the alternate fuel and monitor how much alternate fuel is on site?

A. Yes

B. No, we own dual fuel units but we do not conduct such assessments

C. We own dual fuel units and conduct such assessments for some of the units but not all of them

D. We do not own any dual fuel units

E. Not applicable – our answer to Question (1) was not (A), (B), or (C)

1c) If your answer to (1) was (A), (B), or (C): Do (or will) the surveys include an assessment under extreme weather scenarios for supply shrinkage?

A. Yes

B. No

C. We will conduct an assessment of such supply shrinkage for some of the assets we own but not all of them

D. Not applicable – our answer to Question (1) was not (A), (B), or (C)

2. Has your organization communicated with natural gas providers (suppliers and pipelines) on emergency plans and implemented actions from the NERC Reliability Guideline*: Gas and Electrical Operational Coordination Considerations*[4]?

A. Yes

B. No, however, we plan to connect with them

C. No, and we have no plans to connect with them

D. We do communicate or plan to communicate on behalf of some of the units we own but not all of them

[4] https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Gas_Electric_Guideline.pdf

E. Not applicable – our organization is not registered as a GO or we do not own any gas fired units

3. If your organization owns any fossil-fired units have you coordinated with fuel providers to evaluate the capability of the system to support ramping rates and durations to maintain electric load-supply balance during significant energy production swings, particularly in the areas of significant penetration of Variable Energy Resources (VERs)?

   A. Yes

   B. No, however, we plan to coordinate with them

   C. We will coordinate, or plan to coordinate, for some of the assets we own but not all of them

   D. No, and we have no plans to coordinate with them

   E. Not applicable – our organization is not registered as a GO, or we do not own any fossil-fired units

4. Has your organization coordinated with the appropriate entities to identify applicable natural gas system supply chain facilities' (i.e., facilities used for production, treating, processing, pressurizing, storing or transporting natural gas) vulnerabilities, such as:

   - Wellhead freezing history/projections
   - Compressor loss history/projections
   - Back-up options if electric service is dropped (e.g. propane heaters, battery/electric storage)
   - Processing plant and gas treatment facility performance history/projections

   A. Yes

   B. No, however, we plan to coordinate with them

   C. No, and we have no plans to coordinate with them

   D. We perform this coordination for some of our natural gas assets but not all of them

   E. Not applicable – our organization is not registered as a GO or we do not own any gas fired units

5. If you own fossil-fired units, has your organization surveyed the unit weatherization and availability for the following factors:

   - Minimum temperature and time needed for the resources to start

- Temperatures and other weather conditions that the units can operate through if on-line prior to the extreme conditions (cold, or extreme wind and precipitation)
- Consider pre-seasonal unit startup tests and unit scheduling for infrequently run or off-line resources, or resources that have been off-line for prolonged period of time[5]
- Seasonal emissions/environmental surveys
- Minimum alternate fuel burning procedures
- Water-related vulnerabilities

A. Yes
B. No, however, we plan to survey these factors
C. No, and we have no plans to survey these factors
D. We have performed, or plan to perform, a partial analysis – surveying some or all of these factors, and/or including some or all of the assets in our system
E. Not applicable – our organization is not registered as a GO, or we do not own any fossil-fired units

6. If you own solar-powered units, has your organization surveyed the unit weatherization and availability for the following factors:
   - De-icing capability
   - Low and High Ambient Temperature Constraints
   - Actions for snow cover
   - Unit maintenance schedule
   - Evaluate increasing likelihood of forced outages and de-rates under extreme conditions

   A. Yes – we include all of these factors
   B. Yes – we include some of these factors
   C. No, however, we plan to survey these factors
   D. No, and we have no plans to survey these factors
   E. We have collected or plan to collect this information for some of the assets that we own but not all of them
   F. Not applicable – our organization is not registered as a GO, or we do not own any solar facilities

[5] E.g., see PJM Manual 14D: Generator Operational Requirements, Section 7.5.1 Generation Resource Operational Exercise

7. Do you have a process in place to attempt to obtain an emissions waiver in the event one is needed to operate even if you have no guarantee that the waiver will be approved by federal, state, county, or other prevailing authorities?
   A. Yes
   B. No, however, we plan to develop such a process
   C. We have, or plan to have, this process for some of the assets that we own but not all of them
   D. No, and we have no plans to develop one
   E. Not applicable – our organization is not registered as a GO or we do not own any fossil-fired units

8. If you own wind-powered units, are the units equipped with cold weather packages?
   A. Yes
   B. No, however, we plan to equip our units with cold weather packages
   C. Some of our units are equipped with cold weather packages but not all of them
   D. No, and we have no plans to equip our units with cold weather packages
   E. Not applicable – our organization is not registered as a GO, or we do not own any wind facilities

9. If you own wind-powered units, do you have a procedure for mitigating blade icing?
   A. Yes
   B. No, however, we plan to develop such a procedure
   C. Some of our units have a procedure for mitigating blade icing but not all of them
   D. No, and we have no plans to develop one
   E. Not applicable – our organization is not registered as a GO, or we do not own any wind facilities

10. Please fill in the number of nameplate MW for each of the three questions below using the three free-text boxes. If you are not registered as a GO, please enter “NA” in each box.

- How many MW does your organization own, that in your assessment, **are currently capable or will be capable of operating** in extreme cold weather conditions?
- How many MW does your organization own that in your assessment **will be unavailable due to** extreme cold weather conditions?
- How many additional MW does your organization own that are currently operational and would not be categorized under (A) or (B). An example would be asset(s) that you have not assessed for operation in an extreme cold weather scenario. **Note**: The sum of (A), (B), and (C) should be the total operating MW owned by your entity

Additional Information:

The resource mix is undergoing significant changes. The system is becoming more reliant on variable resources and natural gas. Extreme weather events have stressed supply of traditional fuels and the dependability of new resources. Preparation of resources for operation during extreme cold weather and situational awareness in both planning and operations by applicable registered entities is necessary for optimal reliability. The following links provide additional information and best practices:

- Reliability Guideline: Generating Unit Winter Weather Readiness.
- Reliability Guideline: Gas and Electrical Operational Coordination Considerations
- Polar Vortex Review – September 2014
- Events Analysis Cold Weather Training Materials
- NERC's Project 2019-06 on Cold Weather

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