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NERC Cold Weather Reliability Standard Requirements

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NERC Cold Weather Standard Requirements Approved

On August 24, 2021, FERC approved new cold weather reliability standard requirements proposed by NERC.

The modified standard include:

- EOP-011-2
- IRO-010-4
- TOP-003-5

The new standards will come into effect in the US and Ontario on April 1, 2023, but FERC strongly encouraged US entities capable of complying to do so as soon as possible.

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- The modifications to the Reliability Standards are consistent with Recommendation 1 of the 2018 Cold Weather Event Report – that require
  - generators to implement plans to prepare for cold weather and
  - exchange of certain generator cold weather operating parameters that would help enhance situational awareness in the operational planning and Real-time operations timeframes
- EOP-011-1:
  - Adds two new requirements, Requirement R7 and Requirement R8, related to generator cold weather preparedness, including freeze protection and training.
  - Revises two requirement parts, Requirements R1.2.6 and R2.2.9, related to the consideration of the reliability impacts of cold weather conditions in TOP and BA emergency operating plans.
  - Revises the currently-effective title of Reliability Standard EOP-011-1 from "Emergency Operations" to "Emergency Preparedness and Operations"
  - Modifies the purpose statement to reflect the addition of the generator owner as an applicable entity

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- IRO-010-4 and TOP-003-5:

- Revises the data requirements for RCs, ~~and~~ BAs and TOPs to include cold weather data developed by the generator owner under Reliability Standard EOP-011-2, Requirement R7.

- Replaces the term "Special Protection System" with "Remedial Action Scheme" (RAS) throughout IRO-010-4 and TOP-003-5 to align with the revised NERC Glossary definition of RAS.

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- Implementation Plan

- FERC also approved NERC's proposed implementation plan for these changes with an effective date of April 1, 2023.
- This implementation plan was deemed reasonable by FERC because it accommodates those entities that may need time to perform various engineering analyses; provide the required training; and develop the necessary capabilities to satisfy revised cold weather-related data specifications.
- FERC strongly encourages US utilities that can comply with the new requirements of the three standards that were modified to do so before the effective date.
- On August 18, 2021, NERC issued a Level 2 Alert regarding Cold Weather Preparations for Extreme Weather Events under its NERC Alert process.
- The Alert called for NERC registered entities to acknowledge receipt of the cold weather~~s~~ advisory within the NERC Alert System, and report to NERC on the status of their activities in relation to the recommendations in the Alert.

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February 2021 Cold Weather Grid Operations: Preliminary Findings and Recommendations

FERC, NERC and Regional Entity Joint Staff Inquiry

Inquiry Commencement: Cold Weather Week of February 14, 2021

- Unprecedented electric generation outages
- Affected Balancing Authorities (BAs) who declared Energy Emergencies and ordered firm load shed at different points of time within their respective footprints, in total exceeding 23,400MW during severely cold weather to avoid entire system blackouts.
- ERCOT BA: nearly three consecutive days and at its worst point, 20,000MW
- SPP BA: approximately five hours total and at its worst point, 2,700MW
- MISO BA (MISO South): over two hours and at its worst point, 700MW
- Effect on Natural Gas System - System experienced largest U.S. monthly decline of natural gas production on record

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What Went Wrong - Preliminary Key Findings

1. Generation Freezing Issues

-Largest cause: freezing issues

-Largest sub-causes were frozen instrumentation and wind turbine blade icing.

-Analysis of Mechanical/ Electrical Issues revealed a relationship between generating unit outages and decreasing temperatures.

2. Natural Gas Fuel Supply Issues

-Second-largest cause: natural gas fuel supply issues

-Out of all outages and de-rates caused by Fuel Issues, 87% were natural gas fuel supply issues.

-In the SPP footprint, natural gas fuel supply issues greatly exceeded the number of freezing issues experienced by natural gas-fired generating units (458 versus 86).

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What Went Wrong - Preliminary Key Findings

3. Natural Gas and Electric Reliability Interdependency

- Natural gas production facility loss of power was primarily due to weather-related power line outages and firm load shed.
- 60% of natural gas-fired generating units affected by fuel supply issues had outages, de-rates, or failures to start by February 14, and 32% had fuel supply issues before and after February

4. ERCOT Firm Load Shed Affected Natural Gas Facilities

- Most natural gas production and processing facilities surveyed were not identified as critical load or otherwise protected from load shedding.
- As a result, firm load shed implemented by TOPs to preserve bulk-power system reliability partially contributed to the decline in production of natural gas.
- Because many critical natural gas infrastructure loads are not identified, and both weather-caused and firm-load-shed-caused power outages were coincident, the exact extent of power outages to critical natural gas infrastructure loads due to firm load shed is unknown.

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What Went Wrong - Preliminary Key Findings

5. Manual and Automatic Load Shed Coordination

- From February 15 through 16, 2021, manual firm load shed varied from 10,000-20,000 MW, 14%-28% of ERCOT's peak load.
- ERCOT's manual load shed spanned nearly three days in order to maintain bulk-power system reliability.
- The magnitude and duration of manual load shed needed, made it difficult to rotate the outages and required system operators to use automatic/UFLS load shed circuits (configured for 25% of ERCOT's peak load) for manual load shed instead, thereby reducing the circuits available for UFLS.

What Went Right - Preliminary Key Findings

6. Electric Reliability Coordination

- SPP, MISO and ERCOT RCs coordinated and communicated well with each other

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Key Preliminary Recommendations

1. Revise the Reliability Standards to require:

- GOs to identify and protect cold-weather-critical components
- GOs to build new generating units, and retrofit existing units, to operate to specific ambient temperatures and weather based on extreme temperature and weather data, and account for effects of precipitation and cooling effect of wind
- Annual training on winterization plans
- GOs that experience freeze-related outages to develop Corrective Action Plans
- Each GO/GOP to provide the BA with the percentage of the total generating unit capacity that the BA can rely upon during the "local forecasted cold weather," including reliability risks related to natural gas fuel contracts.
- Each BA to use the data provided by the GO/GOP, combined with its evaluation, based on experience, to calculate the percentage of each individual generating unit's total capacity that it can rely upon during the forecasted cold weather for its operating plans (season-ahead, day(s)-ahead) and real-time monitoring, and share with the RC.

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Key Preliminary Recommendations

1. Revise the Reliability Standards to require: (cont'd)

- GOs to account for effects of precipitation and accelerated cooling effect of wind when providing temperature data.
- BAs' and TOPs' manual load shed provisions to include processes for identifying and protecting critical natural gas infrastructure loads from firm load shed to avoid adversely affecting bulk-power system reliability.
- BAs' operating plans for contingency reserves and to mitigate capacity and energy emergencies to prohibit use of critical natural gas infrastructure loads for demand response.
- The load shed procedures of TOPs, TOs and DPs to separate circuits that will be used for manual load shed from circuits used for UFLS or serving critical load, use UFLS circuits only as a last resort, and if necessary, start with the final stage (lowest frequency) to minimize the overlap of manual and automatic load shed.

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Key Preliminary Recommendations

2. Funding for Generator Winterization

- GOs should have the opportunity to be compensated for the costs of building or retrofitting their units to operate to a specified ambient temperature and weather conditions through markets or through cost recovery approved by state public utility commissions (e.g., as a reliability surcharge) to be included in end-users' electric service rates.
- The applicable ISOs/RTOs and/or public utility commissions should identify how best to ensure GOs have the opportunity to be compensated for making these infrastructure investments.

3. Natural Gas Infrastructure Winterization
4. Natural Gas-Electric Reliability Forum

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Other Key Preliminary Recommendation Areas

5. GO/GOPs should identify reliability risks of natural gas fuel contracts and communicate these risks to BAs.
6. FERC, NERC, and Regional Entities should host joint technical conference to discuss how to improve generator winter readiness.
7. GOs' plans should include performing inspection/maintenance of freeze protection measures prior to and during the winter season, and pre-event when specific cold weather events are forecast.
8. Planning Coordinators should reconsider some of the inputs to their publicly-reported winter season anticipated reserve margin calculations for their respective BA footprints so that the reported reserve margins will better predict the reserve levels that the BAs could experience during winter peak conditions.

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Other Preliminary Recommendation Areas

Fourteen additional recommendations covering issues including:

- Effects of cold weather on mechanical fatigue
- Increasing the flexibility of manual load shedding
- GO/GOP use of weather forecasts
- Coordination of protective relay settings associated with generator under-frequency relays
- Coordination of UFLS relay settings with generating unit time-delay protection systems
- Increase real-time monitoring of gas well-heads
- Emergency response centers for severe weather events
- Improve near-term load forecasts for extreme weather conditions
- Analyze intermittent generation effects to improve load forecasts
- Rapidly-deploying demand response
- Additional load shed training for system operators
- Retail incentives for energy efficiency improvements
- Studies of large power transfers during stressed conditions
- Reducing the time for reporting generation or transmission outages

For Further Study

- Black start unit reliability
- Additional ERCOT connections
- Potential measures to address natural gas supply shortfalls
- Potential effect of low-frequency events on generators in the Western and Eastern Interconnections
- Guidelines for identifying critical natural gas infrastructure loads

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