

#### **Technical Session**

Extreme Winter Weather Preparedness June 10, 2025

#### Background

The increased frequency of extreme winter weather events now poses significant reliability risks to the Bulk Power System and requires heightened vigilance and preparedness. Recent winter storms like Uri and Elliott in 2021 and 2022, alongside Geri and Heather in 2024, and the arctic events of January 2025 have underscored the criticality of winter weather preparation. These events revealed how challenges like freezing infrastructure, fuel shortages, resource unavailability, mechanical difficulties, and electrical issues affect the system. WECC has made winter readiness a priority, listing extreme weather among its primary risks. In partnership with the ERO Enterprise, WECC is actively studying and understanding these winter weather events. WECC has addressed winter weather preparations through two primary channels: assurance work and standards development.

#### Assurance Work

Following Winter Storm Elliott in 2022, FERC and the ERO Enterprise conducted an inquiry to understand what occurred during the event, which caused unprecedented amounts of generation outages in the Eastern Interconnection. The severity of generation outages during the storm, combined with the recurrence of reliability issues during extreme weather events over the last decade, led the inquiry team to issue several recommendations to improve the readiness of generation facilities for winter weather.<sup>1</sup> Although winter storms Uri and Elliott occurred in the Texas and Eastern Interconnections, WECC undertook work to evaluate the readiness of generation resources in the West. WECC issued data requests and conducted several on-site assurance visits to understand what actions generation owners were taking to prepare for extreme cold. WECC shared tailored feedback with the generation owners. In addition, WECC has shared best practices and improvement opportunities broadly with stakeholders.

The success of WECC's winter readiness assurance work in 2024 and 2025 led WECC to decide to allocate time and resources to create an extreme weather preparedness assurance program in 2025. The program is in development and, once complete, will facilitate the assessment of interconnection-wide readiness and sharing of best practices for all types of extreme weather scenarios.

#### Standards Development

WECC partnered with industry and the ERO Enterprise to revise and develop reliability standards that help ensure the power system is equipped, prepared for, and operates reliably during extreme weather. Four standards were recently revised or developed:

<sup>&</sup>lt;sup>1</sup> See the <u>Inquiry into Bulk-Power System Operations During December 2022 Winter Storm Elliott Report</u>.

- Revised standard: <u>EOP-011-4</u> requires Transmission Operators and Balancing Authorities to develop plans to mitigate operating emergencies, which can include extreme weather, and implement those plans in coordination with their Reliability Coordinator.
- Revised standard: <u>EOP-012-2</u> requires Generator Owners to develop and implement plans to mitigate the reliability impacts of extreme cold weather on generating units.
- New standard: <u>TPL-008-1</u> improves the way Planning Coordinators and Transmission Planners prepare for the potential impacts of extreme temperatures on the transmission system.
- New standard: <u>BAL-007-1</u> requires Balancing Authorities to perform reliability assessments in preparation for emergencies, including extreme weather events, and develop corrective action plans to address identified risks.

#### **Technical Session**

During the technical session, the panel will discuss insights from past winter weather events, share information gained from follow-up work related to the recommendations stemming from Winter Storm Elliott, and address work plans to maintain extreme weather preparedness.







# Technical Session Extreme Winter Weather Preparedness

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# Extreme Winter Weather Preparedness Background



# **WECC Response to Extreme Winter Events**





# **Response to Extreme Winter Weather**



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# **Timeline: Notable Winter Storms**









#### Feb. 1–5, 2011: Southwest U.S. Event

· Impacted: Texas and Southwest

#### Jan. 6–8, 2014: Polar Vortex

• Impacted: Midwest, South Central, East Coast

#### Jan. 15-16, 2018: 2018 Event

• Impacted: South Central U.S.

#### Feb. 9–20, 2021: Winter Storm Uri

· Impacted: Texas and South Central

#### Dec. 11–26, 2022: Winter Storm Elliott

• Impacted: Central, Midwest, Southeast, Northeast

#### Jan. 10–13, 2024: Winter Storm Gerri

• Impacted: Northwest, Rockies, Great Lakes, Canada

#### Jan. 13–17, 2024: Winter Storm Heather

• Impacted: Northwest, Rockies, Texas, Midwest, MidAtlantic, Northeast, Canada

#### Jan. 2025: Arctic Event

• Impacted: Most of Continental U.S., Canada

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# **ERO Enterprise Approach**

## **Collaborative Inquiry**

- Investigation of unprecedented generation outages in the Eastern Interconnection during Winter Storm Elliott (2022)
- Conducted by FERC and the ERO Enterprise

## **Key Findings**

- Severity of outages highlighted the need for improved readiness
- Recurring reliability issues during extreme weather observed over the last decade

## Recommendations

 Several strategies proposed to enhance winter weather preparedness of generation facilities



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# WECC Approach



<Public>

### Assessment

- Assessment of resource readiness in the Western Interconnection
- · Data requests and on-site assurance visits
- Direct feedback to generation owners
- Shared best practices and opportunities for improvement

### Assurance

- Winter Readiness Assurance work in 2024/2025
- Development of extreme weather preparedness assurance program in 2025 to assess interconnection readiness and promote best practices

## **Standards Revision and Development**

- Revised 2 standards to require plans to mitigate cold weather effects
- Developed 2 new standards to address planning for cold weather



# WECC's Assurance Work

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## WECC's Assurance Work

- Developed in 2014 to evaluate state of operational practices in Western Interconnection
  - Operational practices of TOPs (2014–2018)
  - Winter preparedness visits (2024–2025)
- Includes
  - Data requests
  - On-site visits
- Immediate feedback to entities
  - Broad sharing of best practices and opportunities for improvement
- New Holistic approach
  - Formalizing and reimagining in 2025: Extreme Weather Preparedness Assurance Program

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# Winter Weather Preparedness Assurance Work: 2024/2025 Results

- Strengths
  - · Mature cold weather readiness programs
  - Control room alarming/displays
  - Preemptive actions
    - Additional readiness checks when a cold weather storm is forecast
    - Cold weather work orders prior to cold weather season
  - Self-preparation (not relying on third party for all measures)
- Ongoing improvement efforts
  - Incorporating insights from reports, lessons learned, and industry forums and groups (SGAS, WICF, NAGF, etc.)
  - End-of-season review focused on identifying additional strengthening actions
  - · Fleet experience reviewed and applied
- Areas for Improvement
  - Focus cold weather readiness programs and plans beyond Reliability Standards
  - · Identify cold weather critical component

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# **Assurance Program Components**





# Assurance Visit: Black Hills Corporation



# **PAGS Overview**

## **Key Milestones**

01/2010: Construction started on Phase 1

01/2012: Initial commissioning of units

02/2016: Construction started on Phase 2

01/2017: Commissioning of Unit 6



# **PAGS Overview**

## **Plant Configuration**

- 2 Combined Cycle Plants (2x1)
- 2 Simple Cycle LMS100
- 1 Simple Cycle LM6000



# Winter Readiness at PAGS

**Commitment to Reliability & Safety** 

Started in 2012: PAGS first winter

**Pre-Season:** Comprehensive checklist and review procedure

**Pre-Event:** Plant-wide meeting to address risks

**Post-Season:** Debrief to analyze issues, prioritize critical fixes

**Ongoing:** Monthly fleet-wide compliance meetings

Focus: Unit reliability and employee safety

## **Plant improvements**



# **WECC** Assurance Visit

## Why entertain a WECC Assurance Visit?

- Aligns with Black Hills Energy's commitment to improvement
- Partnership with WECC and governing bodies to enhance operations
- Opportunity to learn and adopt industry best practices



# **WECC** Assurance Visit

## How Did It Go?

- Initial nerves due to WECC and FERC presence
- WECC focused on cold weather preparedness plans and execution
- FERC had different focal points
- Collaborative discussions provided valuable insights



# WECC Assurance Visit

## Value and Opportunities

## Value:

• Industry knowledge sharing, feedback on best practices

## **Improvements Suggested:**

- Clearer communication that visit is not an audit
- Generalized feedback on industry strengths/weaknesses
- Better timing coordination
- Transparency on attendees (WECC, FERC, others)

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# **PAGS Lessons Learned**

## Key Takeaways

## **Documentation:**

Emphasize thorough documentation for knowledge transfer

## **Corrective Action Plans:**

Formalized tracking for post-winter improvements

## New Employee Process:

• Integrate cold weather preparedness into onboarding



# **Extreme Cold Weather Standards**



# **Questions After Winter Storm Uri**



Winter Storm Uri–Austin, Texas



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# **Key Recommendations**

- 1. Identify critical components and have cold weather plans and training
- 2. Identify and protect critical circuits from load shedding
- Improve planning and communication for cold weather reserves and operating plans



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# **Revised Standards**

### Project 2021-07 Extreme Cold Weather Grid Operations, Preparedness, and Coordination

#### EOP-011-4

 Requires Transmission Operators and Balancing Authorities to develop and implement plans for mitigating operating emergencies, including extreme weather, in coordination with Reliability Coordinators.

#### EOP-012-2

• Mandates Generator Owners to create and execute plans addressing the reliability impacts of extreme cold weather on generating units.

#### TOP-002-5

• Addresses extreme cold weather operating processes. Updates to determine adequate reserve margin and forecasting.





# **EOP-012-3 Modifications**

1-Address ambiguity in the term "Generator Cold Weather Constraint"

2—Designate NERC as the entity responsible for receiving, reviewing, evaluating, and validating each Generator Cold Weather Constraint issued by a Generation Operator (GO)





4—Any extension of a corrective action plan deadline beyond the maximum implementation time frame requires preapproval by NERC



5-Increase the frequency of reviews of Generator Cold Weather Constraint declarations

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# **New Standards**



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#### TPL-008-1

 Enhances preparation for potential impacts of extreme temperatures on the transmission system for Planning Coordinators and Transmission Planners.

#### BAL-007-1

• Requires Balancing Authorities to conduct reliability assessments for emergencies, including extreme weather, and to develop corrective action plans for identified risks.

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