



MIDWEST
RELIABILITY
ORGANIZATION

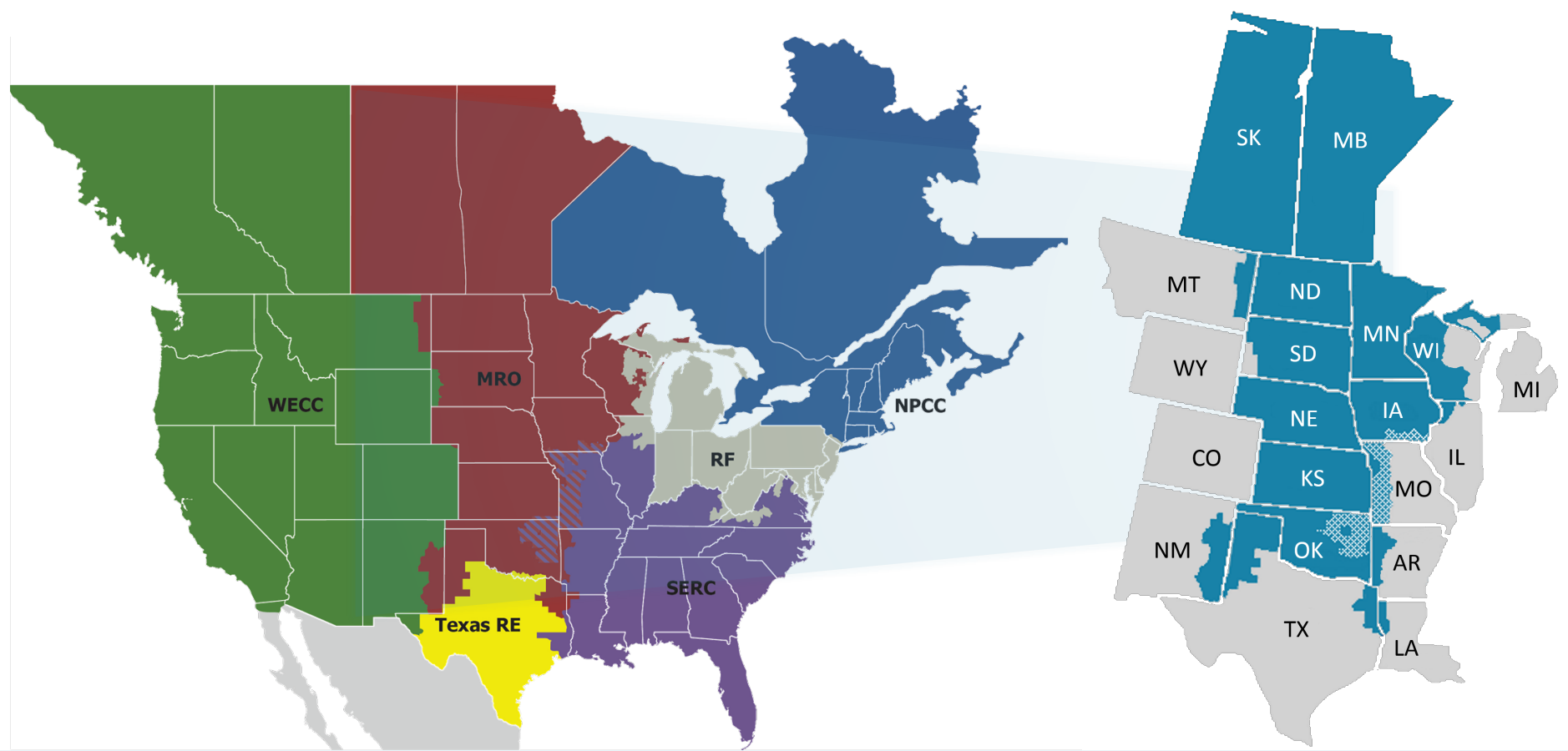
Generator Winterization Program 2022

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July 26, 2022

CLARITY

ASSURANCE

RESULTS



The ERO Enterprise and MRO

2018 Cold Weather Event

- **January 15-19, 2018**
 - South Central States
 - Including MISO and SPP
 - 14,000 MW
 - Curtailments
 - Outages
 - Failure to Start
 - 33,500 MW total generation unavailable



Three-Pronged Approach

- **Development or enhancement of one or more NERC Reliability Standards**
- **Enhanced outreach to Generator Owners and Generator Operators**
- **Market rules where appropriate**





Reliability Guideline

Suggested approaches or behavior in a given technical area for the purpose of improving reliability. Guidelines are not enforceable, but may be adopted by a responsible entity in accordance with its own policies, practices, and conditions.



NERC Alert: Level 2-3

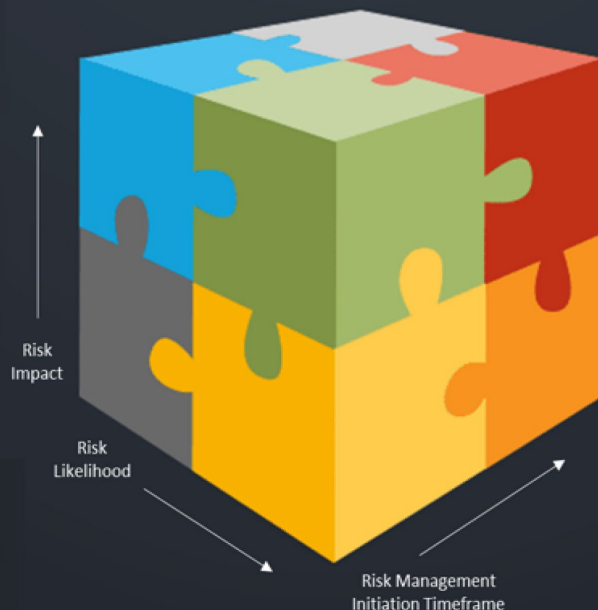
NERC alerts are divided into three distinct levels, 1) Industry Advisory, 2) Recommendation to Industry, and 3) Essential Action, which identifies actions to be taken and require the industry to respond to the ERO.



Technical Engagement

Technical Engagement is a catch-all for a variety of technical activity that is conducted between the ERO and entities. This includes, technical committee activities, technical reference documents, workshops and conferences, assist visits, joint and special studies, etc.

Electric Reliability Organization: Reliability Risk Mitigation Toolkit



Reliability Standards



NERC Reliability Standards define the mandatory reliability requirements for planning and operating the North American BPS and are developed using a results-based approach focusing on performance, risk management, and entity capabilities.

Reliability Assessment



NERC independently assesses and reports on the overall reliability, adequacy, and associated risks that could impact BPS reliability. Long-term assessments identify emerging reliability issues that support public policy input, improved planning and operations, and general public awareness.

NERC Alert: Level 1



NERC Alerts are divided into three distinct levels, 1) Industry Advisory, 2) Recommendation to Industry, and 3) Essential Action, which identifies actions to be taken and require the industry to respond to the ERO.



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2021 Timeline

- **Review previous year's GADS Data**
- **Identify sites to visit and survey**
- **Site visits beginning in Q3 and ending in Q4**



2021 Cold Weather Event

- **Largest controlled firm load shed event in U.S. history (23,418 MW)**
- **Fourth event in the past 10 years which jeopardized bulk-power system reliability due to unplanned generating outages which escalated due to cold weather**



2021 GWP Results

- **Completed 4 Site Visits**
 - 2 visits in September, 2 visits in October
- **Provided entities with 4 Site Reports**
- **Reviewed 10 entity Cold Weather Survey Responses and met with all 10 entities to discuss the survey**
- **Published newsletter article in Q2 with general findings**



GWP Survey

Generator Winterization Program

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Program Overview

Periodically, North America experiences severe cold weather events that result in unexpected operating constraints on facilities, including fuel resource limitations and both scheduled and unscheduled outages. The ERO Enterprise has increased its focus on reducing severe cold weather-related risks. As part of these efforts, MRO developed and implemented its Generator Winterization Program (GWP).

All forms of generation, regardless of location, are susceptible to the impacts of cold weather. While units in the northern portions of the MRO regional footprint may have been designed for sub-zero temperatures, there are still critical components that can be affected by climate. The units in the south were not always designed for exposure to colder temperatures, so processes and procedures need to be in place to minimize the impact of cold weather on performance.

The purpose of the GWP is to identify generator winterization best practices and areas for improvement that can be shared with stakeholders across MRO's regional footprint.

Program Implementation

MRO will send the [GWP Survey](#) to select entities each year to collect information on individual winterization plans for review. Outside of this review, all generating facilities are encouraged to download a copy of the survey to perform their own self-assessment of plans for winterization.



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MRO GWP 2022 Focus Areas

- **Focus Areas during visit and surveys**
 - NERC Generating Unit Winter Weather Readiness Guideline
 - Winterization Plan with seven components: (1) Safety, (2) Management Roles & Expectations, (3) Processes and Procedures, (4) Evaluation of Potential Problem Areas with Critical Components, (5) Testing, (6) Training, (7) Communications
 - FERC/NERC Inquiry Recommendations
 - NERC Alert Recommendations





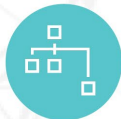
MRO 2022 Regional Risk Assessment

Top risks to the reliable and secure operation of the North American bulk power system in MRO's regional footprint.

Top Reliability Risks

Uncertainty of Winter Planning Reserve Margins

Analyses of recent system events indicate that actual system conditions can and have exceeded forecast winter reserve margins, particularly during cold weather conditions in the south central U.S.



Generation Availability During Severe Cold Weather

Generation availability assumed during cold weather in the southern U.S. has been shown to be unrealistically high due to a lack of generator winterization and natural gas curtailments.



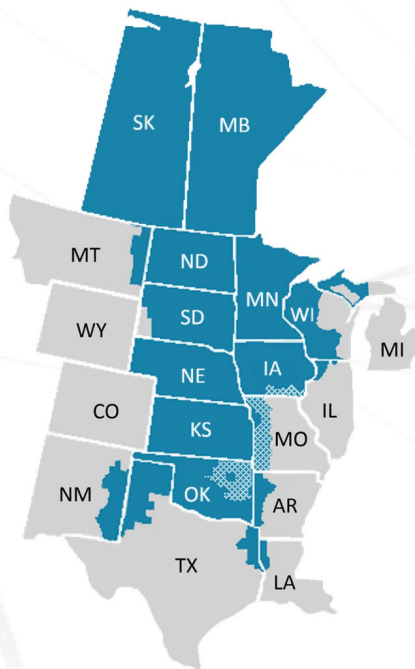
Lack of Energy Assurance Assessments

The rapidly changing resource mix requires rethinking the way in which generating capacity, energy supply, and load serving needs are studied. Energy assurance will need to be accurately assessed for all hours of the year with increasing reliance on wind and solar as a fuel source.



Bulk Power System Modeling Accuracy

The rapid increase in inverter-based resources, along with the changing characteristics and magnitude of load related to distributed energy resources (DER), is challenging current bulk power models.



Top Security Risks

Supply Chain Compromise

The risk of a cybersecurity event carried out through the vendor supply chain and possibly impacting reliability of the bulk power system remains high.



Insider Threats

The threat of an employee or a contractor using authorized access, wittingly or unwittingly, to do harm to the security of the bulk power system has increased given remote connectivity during the pandemic.



Malware and/or Ransomware

Vulnerability to a malware and/or ransomware attack on the bulk power system continues to increase with modernization and the deployment of new technologies.



More information on these risks along with mitigation recommendations can be found in the full report here: www.mro.net



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2022 GWP Plan

- **Expand program from 4 to 6 site visits**
- **Determine and confirm site visits by end of Q2**
- **Begin site visits in Q3/Q4**



Potential 2023 Deliverables

- **Work towards developing a general report with best practices available to all registered entities**
- **Outreach to discuss general findings and the progress**
- **Annual update to specific councils if requested**



**Questions regarding the
program can be submitted to:**
GWP@MRO.net



Questions