

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Extreme Cold Weather Preparedness

Technical Rationale and Justification for
TOP-002-5

February 2023

RELIABILITY | RESILIENCE | SECURITY



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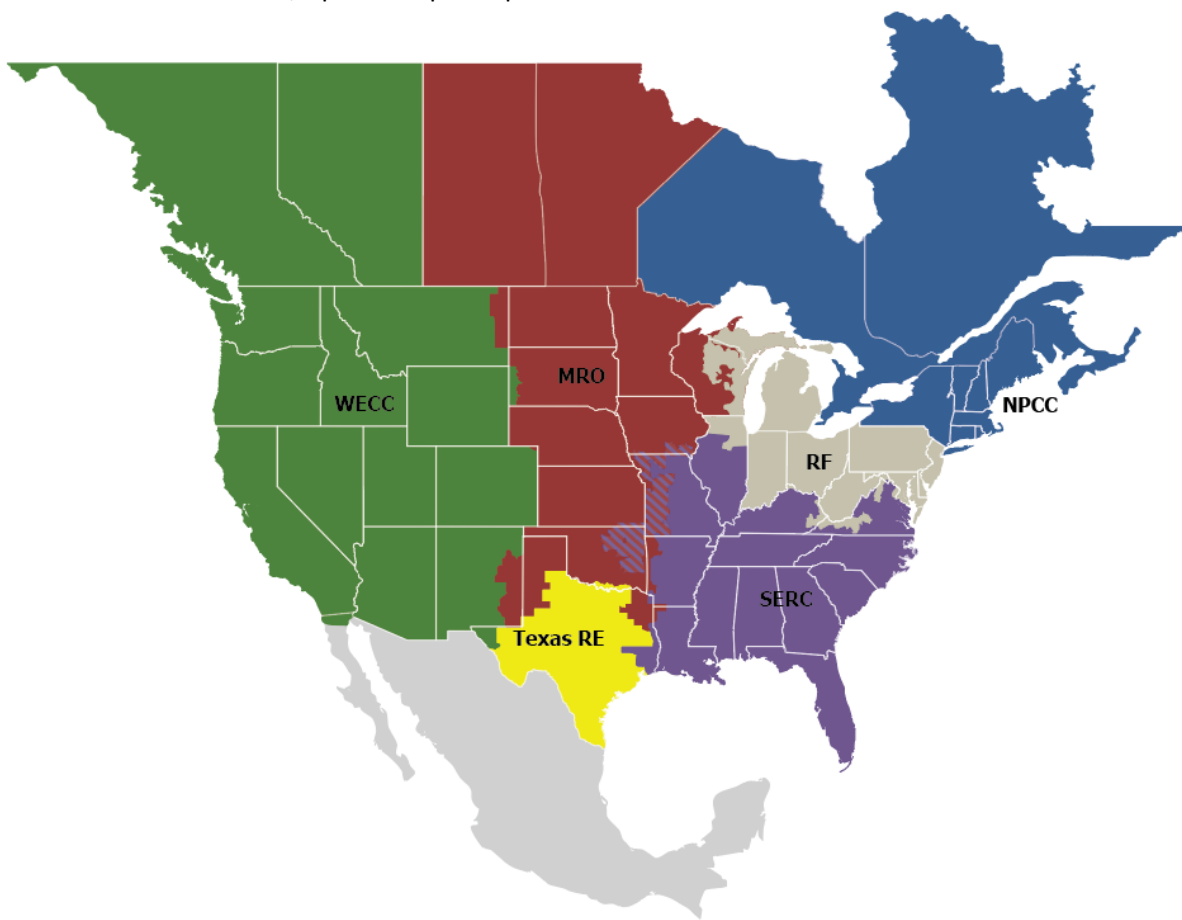
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Preface

Electricity is a key component of the fabric of modern society and the Electric Reliability Organization (ERO) Enterprise serves to strengthen that fabric. The vision for the ERO Enterprise, which is comprised of the North American Electric Reliability Corporation (NERC) and the six Regional Entities, is a highly reliable and secure North American bulk power system (BPS). Our mission is to assure the effective and efficient reduction of risks to the reliability and security of the grid.

Reliability | Resilience | Security
Because nearly 400 million citizens in North America are counting on us

The North American BPS is made up of six Regional Entity boundaries as shown in the map and corresponding table below. The multicolored area denotes overlap as some load-serving entities participate in one Regional Entity while associated Transmission Owners/Operators participate in another.



MRO	Midwest Reliability Organization
NPCC	Northeast Power Coordinating Council
RF	ReliabilityFirst
SERC	SERC Reliability Corporation
Texas RE	Texas Reliability Entity
WECC	WECC

Introduction

This document explains the technical rationale and justification for the proposed Reliability Standard TOP-002-5. It provides stakeholders and the ERO Enterprise with an understanding of the technology and technical requirements in the Reliability Standard. This Technical Rationale and Justification for TOP-002-5 is not a Reliability Standard and should not be considered mandatory and enforceable.

Background

From February 8 through February 20, 2021, extreme cold weather and precipitation caused large numbers of generating units to experience outages, derates or failures to start, resulting in energy and transmission emergencies (referred to as “the Event”). The total Event firm load shed was the largest controlled firm load shed event in U.S. history and was the third largest in quantity of outaged megawatts (MW) of load after the August 2003 Northeast blackout and the August 1996 West Coast blackout. The Event was most severe from February 15 through February 18, 2021, and it contributed to power outages affecting millions of electricity customers throughout the regions of ERCOT, SPP, and MISO South. Additionally, the February 2021 event is the fourth cold weather event in the past 10 years, which jeopardized bulk-power system reliability. A joint inquiry was conducted to discover reliability-related findings and develop recommendations from FERC, NERC, and Regional Entity staff. The FERC, NERC, and Regional Entity Staff Report into the February 2021 Cold Weather Outages (“Joint Inquiry Report”) was published on November 16, 2021.

The scope of the proposed project is to address the ten recommendations for new or enhanced NERC Reliability Standards proposed by the Joint Inquiry Report. In November 2021, the NERC Board of Trustees (Board) approved a Board Resolution directing that new or revised Reliability Standards addressing these recommendations be completed in accordance with the timelines recommended by the joint inquiry team, as follows:

- New and revised Reliability Standards to be submitted for regulatory approval before Winter 2022/2023: development completed by September 30, 2022, for the Board’s consideration in October 2022 to address Key Recommendations 1d, 1e, 1f, and 1j;
- New and revised Reliability Standards to be submitted for regulatory approval before Winter 2023/2024: development completed by September 30, 2023, for the Board’s consideration in October 2023 to address Key Recommendations 1a, 1b, 1c, 1g, 1h, and 1i.

Requirement R8

R8. *Each Balancing Authority shall have an extreme cold weather Operating Process, as part of its Operating Plan developed in Requirement R4, addressing preparations for and operations during extreme cold weather periods. The extreme cold weather Operating Process shall include: [Violation Risk Factor: Medium] [Time Horizon: Operations Planning]*

- 8.1** *A methodology for identifying an extreme cold weather period within each Balancing Authority Area;*
- 8.2** *A methodology that determines an appropriate reserve margin during the extreme cold weather period considering the generating unit(s) operating limitations in previous extreme cold weather periods including:*
 - 8.2.1** *Capability and availability;*
 - 8.2.2** *Fuel supply and inventory concerns;*
 - 8.2.3** *Start-up issues;*
 - 8.2.4** *Fuel switching capabilities; and*
 - 8.2.5** *Environmental constraints.*
- 8.3** *A methodology to determine a five-day hourly forecast during the identified extreme cold weather periods that includes:*
 - 8.3.1** *Expected generation resource commitment and dispatch;*
 - 8.3.2** *Interchange scheduling;*
 - 8.3.3** *Demand patterns;*
 - 8.3.4** *Capacity and energy reserve requirements, including deliverability capability; and*
 - 8.3.5** *Weather forecast.*

Key Recommendation 1g: The Reliability Standards should be revised to provide greater specificity about the relative roles of the Generator Owners, Generator Operators, and Balancing Authorities in determining the generating unit capacity that can be relied upon during “local forecasted cold weather,” in TOP-003-5:

- Based on its understanding of the “full reliability risks related to the contracts and other arrangements [Generator Owners/Generator Operators] have made to obtain natural gas commodity and transportation for generating units,” each Generator Owner/Generator Operator should be required to provide the Balancing Authority with data on the percentage of the generating unit’s capacity that the Generator Owner/Generator Operator reasonably believes the Balancing Authority can rely upon during the “local forecasted cold weather”.
- Each Balancing Authority should be required to use the data provided by the Generator Owner/Generator Operator, combined with its evaluation, based on experience, to calculate the percentage of total generating capacity that it can rely upon during the “local forecasted cold weather,” and share its calculation with the Reliability Coordinator.

- Each Balancing Authority should be required to use its calculation of the percentage of total generating capacity that it can rely upon to “prepare its analysis functions and Real-time monitoring,” and to “manage generating resources in its Balancing Authority Area to address fuel supply and inventory concerns” as part of its Capacity and Energy Emergency Operating Plans.

General Considerations

In reviewing TOP-003, the SDT determined that the current standards provide Transmission Operators and Balancing Authorities with sufficient flexibility to request whatever data is needed from the Generator Owners to fulfill their operational and planning responsibilities. As such, the SDT focused their edits on TOP-002 to ensure the Balancing Authority had an appropriate extreme cold weather Operating Process in place to ensure reliability during these extreme events.

There have been several past events during extreme cold weather where Load and resource balancing issues have occurred, due to both unexpected generator trips and higher Loads than forecasted. A proactive Operating Process required prior to the onset of extreme cold weather events would formalize the Balancing Authority’s extreme cold weather preparations within their Operating Plan for those periods, including forecasting Load needs and reserve requirements. The Operating Process is specific to extreme cold weather operations to formalize the process to review and respond to oncoming conditions that may affect generation availability and capability, forecasted Load, and determining whether additional capability/reserves should be ready to serve Loads during extreme cold weather.

The SDT does not believe that prescriptive processes must be used for every Balancing Authority to develop their methodology. This is based in part on the differences in the size of Balancing Authorities (for reference, in 2020, 14 Balancing Authorities had peak Loads of less than 200 MWs, while two had peak Loads of more than 100,000 MWs¹). The differences between Balancing Authority footprints, Loads, and market structures or lack thereof, make a single consistent methodology inappropriate.

The SDT developed the proposed requirement to ensure that the Balancing Authorities address the increased uncertainty related to these extreme weather events in a manner appropriate for their Balancing Authority Area. Each Balancing Authority can develop a methodology consistent with the Requirement they feel provides the best solutions to sustain an adequate level of reliability during an upcoming extreme cold weather event.

¹ Source: OY 2022 BAL-003 Frequency Bias Settings 01 Jun 2022
https://www.nerc.com/comm/OC/RS%20Landing%20Page%20DL/Frequency%20Response%20Standard%20Resources/OY_2022_Frequency_Bias_Annual_Calculations_REVISION_4.26.22.pdf

Technical Rationale through TOP-002-4

Rationale for Definitions:

Changes made to the proposed definitions were made in order to respond to issues raised in NOPR paragraphs 55, 73, and 74 dealing with analysis of SOLs in all time horizons, questions on Protection Systems and Special Protection Systems in NOPR paragraph 78, and recommendations on phase angles from the SW Outage Report (recommendation 27). The intent of such changes is to ensure that Real-time Assessments contain sufficient details to result in an appropriate level of situational awareness. Some examples include: 1) analyzing phase angles which may result in the implementation of an Operating Plan to adjust generation or curtail transactions so that a Transmission facility may be returned to service, or 2) evaluating the impact of a modified Contingency resulting from the status change of a Special Protection Scheme from enabled/in-service to disabled/out-of-service.

Rationale for R1:

Terms deleted in Requirement R1 as they are now contained in the revised definition of Operational Planning Analysis

Rationale for R2:

The change to Requirement R2 is in response to NOPR paragraph 42 and in concert with proposed changes made to proposed TOP-001-4

Rationale for R3:

Changes in response to Independent Experts Review Project (IERP) recommendation

Rationale for R4 and R5:

These Requirements were added to address IERP recommendations

Rationale for R6 and R7:

Added in response to SW Outage Report recommendation 1