

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

NERC Project 2023-07

Transmission Planning System Performance Requirements for Extreme Heat and Extreme Cold Weather

Project 2023-07 Leadership
Industry Webinar

RELIABILITY | RESILIENCE | SECURITY



- **NERC Antitrust Guidelines**

- It is NERC's policy and practice to obey the antitrust laws and to avoid all conduct that unreasonably restrains competition. This policy requires the avoidance of any conduct that violates, or that might appear to violate, the antitrust laws. Among other things, the antitrust laws forbid any agreement between or among competitors regarding prices, availability of service, product design, terms of sale, division of markets, allocation of customers or any other activity that unreasonably restrains competition.

- **Notice of Open Meeting**

- Participants are reminded that this webinar is public. The access number was widely distributed. Speakers on the call should keep in mind that the listening audience may include members of the press and representatives of various governmental authorities, in addition to the expected participation by industry stakeholders.

- FERC Order 896 Overview
- TPL-008-1
 - Outline
 - Requirements R1 – R11
 - Table 1
 - Implementation Plan
- Next Steps
- Outreach Opportunities
- Q&A

Drafting Team Member	Member Company
Evan Wilcox (Chair)	American Electric Power
Jared Shaw (Vice Chair)	Entergy Services
Josie Daggett	Western Area Power Administration
David Duhart	Southwest Power Pool
Michael Herman	PJM Interconnection
Tracy Judson	Florida Power & Light
Sun Wook Kang	ERCOT
Andrew Kniska	ISO New England
Dmitry Kosterev	Bonneville Power Administration
David Le	California ISO
Karl Perman	CIP CORPS
Meenakshi Saravanan	ISO New England
Kurtis Toews	Manitoba Hydro
Hayk Zargaryan	Southern California Edison

- FERC Issued Order No. 896 on June 15, 2023
- Around 30 directives
 - Regulatory deadline: December 15, 2024
 - Develop New or Modified Standard
 - Develop Benchmark Events and Planning Cases Based on Major Prior Extreme Heat and Cold Weather Events and/or Meteorological Projections
 - Define “Wide-Area”
 - Identify Entities Responsible for Developing Benchmark Events and Planning Cases, and for Conducting Transmission Planning Studies of Wide-Area Events
 - Entity Responsible for Establishing Benchmark Events
 - Entities Responsible for Development of Planning Cases and Conducting Transmission Planning Studies of Wide-Area Events

- Directives continued
 - Coordination Among Registered Entities and Sharing of Data and Study
 - Concurrent/Correlated Generator and Transmission Outages
 - Conduct Transmission System Planning Studies for Extreme Heat and Cold Weather Events
 - Steady State and Transient Stability Analyses
 - Sensitivity Analysis
 - Modifications to the Traditional Planning Approach
 - Implement a Corrective Action Plan if Performance Standards Are Not Met

- Directed NERC to develop a new or modified Reliability Standard
 - TPL-008-1 clean approach to address all directives in a single location.
 - Difficult to address all directives through the currently drafted TPL-001-5.1
 - TPL-001-5.1 does not just focus on extreme heat and extreme cold weather
 - TPL-001-5.1 focuses on annual assessment

- NERC staff is required to develop benchmark events and will maintain these events within a ERO library.
- NERC staff will continue to engage EPRI, NOAA, other DOE agencies, and Planning Coordinators to develop statistical analyses and criteria to be used in developing benchmark events on an ongoing basis.
- NERC staff is committed to providing an initial set of events and will be establishing an open, transparent, and collaborative process for criteria evolution and continual improvements.

- PCs and TPs to identify individual and joint responsibilities
- Responsible entity to select one extreme heat and extreme cold benchmark event
- Responsible entity to develop and maintain system models (consistent with MOD-032)
- PCs to implement a process for coordinating benchmark planning cases (e.g., define study area boundary and modify case to include seasonal and temperature dependent adjustments)
- Responsible entities to have performance criteria, as well as criteria or methodology for identifying instability, uncontrolled separation, or cascading

- Responsible entities to identify contingencies and provide rationale
- Responsible entities to perform Extreme Temperature Assessments in the Long-Term Planning Horizon at least once every 5 calendar years (including sensitivity analysis)
- Responsible entities to develop CAPs (for P0 or P1 events) or possible actions (for P2, P4, P5, and P7 events)
- Responsible entities to provide Extreme Temperature Assessment results to any functional entity that has a reliability related need and submits a written request

- **Title:**
 - Transmission System Planning Performance Requirements for Extreme Temperature Events
- **Purpose:**
 - Establish requirements for Transmission system planning performance for extreme heat and extreme cold temperature events
- **Applicable:**
 - Transmission Planner
 - Planning Coordinator
- **New Proposed Definition**
 - **Extreme Temperature Assessment** – Documented evaluation of future Transmission System performance for extreme heat and extreme cold temperature benchmark events.

R1. Each Planning Coordinator, in conjunction with its Transmission Planner(s), shall determine and identify each entity's individual and joint responsibilities for performing the studies needed to complete the Extreme Temperature Assessment.

R2. Each responsible entity, as identified in Requirement R1, shall select one extreme heat benchmark event and one extreme cold benchmark event, from the approved benchmark library maintained by the Electric Reliability Organization (ERO), for performing the Extreme Temperature Assessment.

- R3.** Each Planning Coordinator shall develop and implement a process for coordinating the development of benchmark planning cases among impacted Planning Coordinator(s), Transmission Planner(s), and other designated study entities based on the selected benchmark events as identified in Requirement R2. This process shall:
- 3.1.** Define the planning study area boundary based on the selected benchmark events.
 - 3.2.** Modify the benchmark planning cases to include seasonal and temperature dependent adjustment for Load, generation, Transmission, and transfers which represents the selected benchmark events.

R4. Each responsible entity, as identified in Requirement R1, shall develop and maintain System models within its planning area for performing the Extreme Temperature Assessment. The System models shall use data consistent with that provided in accordance with the MOD-032 standard, supplemented by other sources as needed, and shall represent projected System conditions based on the selected benchmark events as identified in Requirement R2.

R5. Each responsible entity, as identified in Requirement R1, shall have criteria for acceptable System steady state voltage limits and post-Contingency voltage deviations for performing the Extreme Temperature Assessment in accordance with Requirement R3.

R6. Each responsible entity, as identified in Requirement R1, shall define and document the criteria or methodology used in the Extreme Temperature Assessment analysis to identify instability, uncontrolled separation, or Cascading.

R7. Each responsible entity, as identified in Requirement R1, shall identify Contingencies used in performing the Extreme Temperature Assessment for each of the event categories in Table 1 that are expected to produce more severe System impacts within its planning area. The rationale for those Contingencies selected for evaluation shall be available as supporting information.

R8. Each responsible entity, as identified in Requirement R1, shall complete an Extreme Temperature Assessment of the Long-Term Transmission Planning Horizon at least once every five calendar years, using the benchmark planning cases and the System models identified in Requirement R3 and R4, and the Contingencies identified in Requirement R7 for each of the event categories in Table 1, and document assumptions and results of the steady state and stability analyses. The Extreme Temperature Assessment shall include the following.

Part 8.1. Assessment of the benchmark planning cases developed under Requirement R4, for one of the years in the Long-Term Transmission Planning Horizon. The rationale for the year selected for evaluation shall be available as supporting information.

Part 8.2. Sensitivity analysis to demonstrate the impact of changes Part to the basic assumptions used in the model. To accomplish this, the sensitivity analysis in the Extreme Temperature Assessment shall include, at a minimum, changes to one of the following conditions:

- Generation;
- Real and reactive forecasted Load; or
- Transfers

R9. Each responsible entity, as identified in Requirement R1, shall develop a Corrective Action Plan(s) (CAPs) when the benchmark planning case study results indicate the System is unable to meet performance requirements for Table 1 P0 or P1 Contingencies. The responsible entities shall share their CAPs with, and solicit feedback from, applicable regulatory authorities or governing bodies responsible for retail electric service issues. In addition, where Load shed is allowed as an element of a CAP for the Table 1 P1 Contingency, the responsible entity shall document the alternative(s) considered, as mentioned in Requirement R10, and notify the applicable regulatory authorities or governing bodies responsible for retail electric service issues. Revisions to the CAP(s) are allowed in subsequent Extreme Temperature Assessments, but the planned System shall continue to meet the performance requirements.

R10. Each responsible entity, as identified in Requirement R1, shall evaluate and document possible actions designed to reduce the likelihood or mitigate the consequences and adverse impacts when the benchmark planning case study results indicate the System could result in instability, uncontrolled separation, or Cascading for the Table 1 P2, P4, P5, and P7 Contingencies.

R11. Each responsible entity, as identified in Requirement R1, shall provide its Extreme Temperature Assessment results within 60 calendar days of a request to any functional entity that has a reliability related need and submits a written request for the information.

Table 1: Contingencies and Performance Criteria

Event	P0	P1	P2	P4	P5	P7
Facility Voltage Level of Contingency	<p>Applicable to:</p> <ul style="list-style-type: none"> BES level 200 kV and above Any common structure that includes a Facility 200kV and above <p>Reference Voltages:</p> <ul style="list-style-type: none"> Non-generator step up transformer outage events, the reference voltage applies to the low-side winding. Generator and generator step-up transformer outage events, the reference voltage applies to the BES connected voltage (high-side of the step-up transformer). 					
Steady State Performance Criteria	<ul style="list-style-type: none"> Applicable Facility Ratings shall not be exceeded. System steady state voltages shall be within acceptable limits as defined in Requirement R5. 	<ul style="list-style-type: none"> Applicable Facility ratings shall not be exceeded System steady state voltages shall be within acceptable limits as defined in Requirement R5. 	Evaluation for uncontrolled separation or Cascading, as defined in Requirement R6.			
Stability Performance Criteria	Initialization without oscillation	Instability, uncontrolled separation, or Cascading, as defined in Requirement R6, shall not occur.	Evaluation for instability, uncontrolled separation, or Cascading, as defined in Requirement R6.			
Corrective Action Plan Required	Yes (See Requirement R9)	Yes (See Requirement R9)	No (See Requirement R10)			
Non-Consequential Load Loss Allowed	No (See Requirement R9)	Yes (See Requirement R9)	Yes			

Table 1: Contingencies and Performance Criteria

Category	Initial Condition	Event	Fault Type ¹
P0 No Contingency	Normal System	None	N/A
P1 Single Contingency	Normal System	Loss of one of the following: 1. Generator 2. Transmission Circuit 3. Transformer 4. Shunt Device ²	3 ϕ
		5. Single Pole of a DC line	SLG
P2 Single Contingency	Normal System	1. Opening of a line section w/o a fault ³	N/A
		2. Bus Section Fault	SLG
		3. Internal Breaker Fault ⁴ (non-Bus-tie Breaker)	SLG
		4. Internal Breaker Fault (Bus-tie Breaker) ⁴	SLG

Table 1: Contingencies and Performance Criteria

Category	Initial Condition	Event	Fault Type ¹
P4 Multiple Contingency (<i>Fault plus stuck breaker¹⁰</i>)	Normal System	Loss of multiple elements caused by a stuck breaker ⁵ (non-Bus-tie Breaker) attempting to clear a Fault on one of the following: <ol style="list-style-type: none"> 1. Generator 2. Transmission Circuit 3. Transformer 4. Shunt Device² 5. Bus Section 	SLG
		6. Loss of multiple elements caused by a stuck breaker ⁵ (Bus-tie Breaker) attempting to clear a Fault on the associated bus	SLG
P5 Multiple Contingency (<i>Fault plus non-redundant component of a Protection System failure to operate</i>)	Normal System	Delayed Fault Clearing due to the failure of a non-redundant component of a Protection System ⁷ protecting the Faulted element to operate as designed, for one of the following: <ol style="list-style-type: none"> 1. Generator 2. Transmission Circuit 3. Transformer 4. Shunt Device² 5. Bus Section 	
P7 Multiple Contingency (<i>Common Structure</i>)	Normal System	The loss of: <ol style="list-style-type: none"> 1. Any two adjacent (vertically or horizontally) circuits on common structure ⁶ 2. Loss of a bipolar DC line 	SLG

Phased-In Compliance Dates

Compliance Date for TPL-008-1 Requirements R1

Entities shall be required to comply with Requirements R1 upon the effective date of Reliability Standard TPL-008-1.

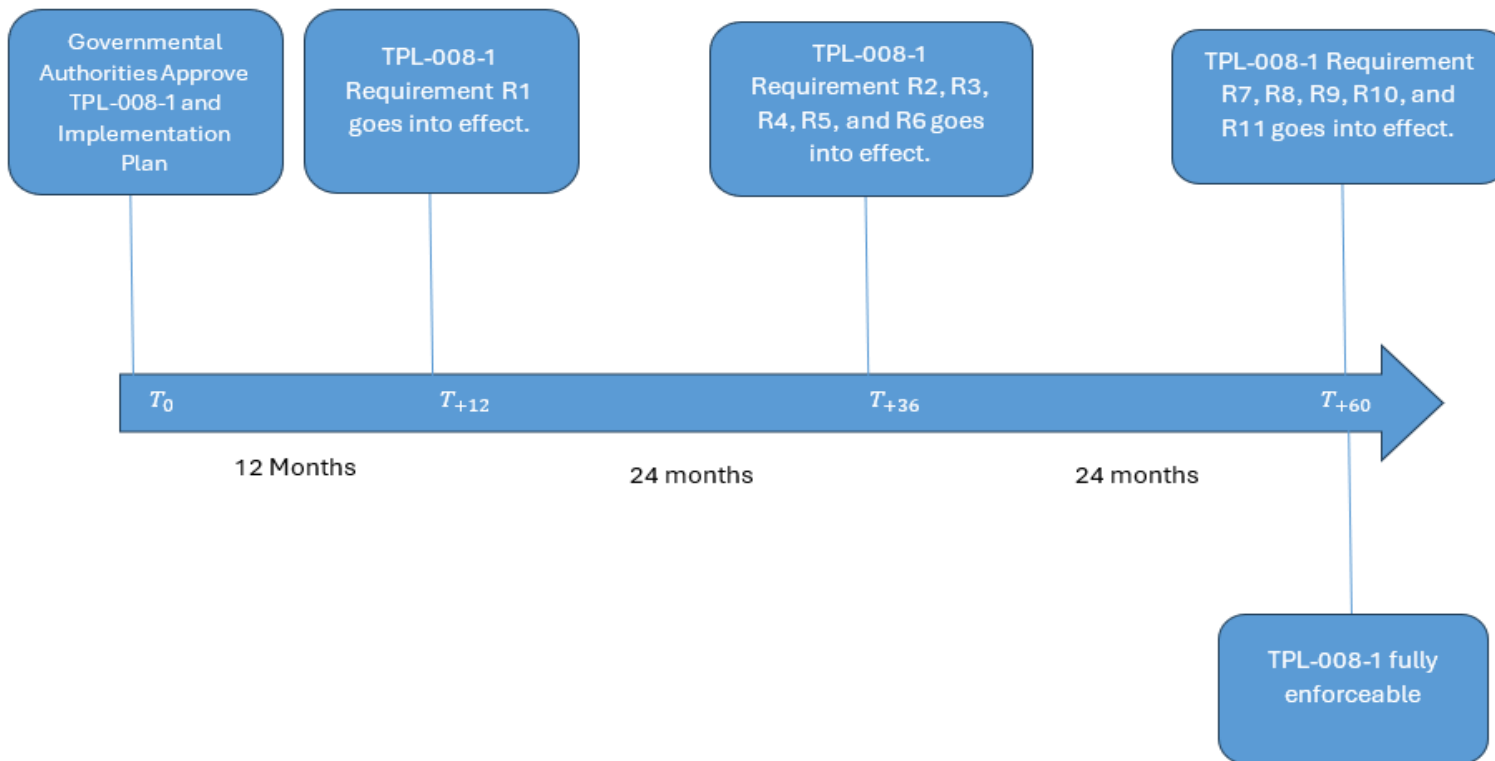
Compliance Date for TPL-008-1 Requirements R2, R3, R4, R5, R6

Entities shall not be required to comply with Requirement R2, R3, R4, R5, and R6 until thirty-six (36) months after the effective date of Reliability Standard TPL-008-1.

Compliance Date for TPL-008-1 Requirements R7, R8, R9, R10, R11

Entities shall not be required to comply with Requirement R7, R8, R9, R10, R11 until sixty (60) months after the effective date of Reliability Standard TPL-008-1.

Implementation Plan Diagram



- Initial Posting:
 - March 20 – April 29, 2024 (45-day comment and ballot period)
- Additional Postings:
 - July 9 – August 6, 2024 (35-day comment and ballot period)
 - September 17 – October 15, 2024 (35-day comment and ballot period, if needed)
- Final Ballot period:
 - November 5 – 15, 2024
- NERC Board Adoption:
 - December 13, 2024
- File with Regulatory Authorities:
 - December 15, 2024 (Regulatory Deadline – FERC Order 896)

Industry Workshop

2024 NERC-NATF-EPRI Extreme Weather Transmission Planning and Modeling Workshop (In-Person)

Hilton Dallas Lincoln Centre

5410 Lyndon B Johnson Fwy
Dallas, TX 75240

May 29, 2024 | 9:00 am – 4:30 p.m. Central

May 30, 2024 | 9:00 am – 1:00 p.m. Central

Click here for: [Registration link](#)

Click here for: [Hotel Information \[hilton.com\]](#) *(The room block for the hotel expires Tuesday, May 7, 2024.)*

A map of North America is shown in a light blue color. A dark blue horizontal band runs across the middle of the map, partially overlapping the text. The text "Questions and Answers" is centered within this band.

Questions and Answers