

NERC

NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

TPL-008-1

Extreme Heat and Extreme Cold Temperature

2023-07 DT Members
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RELIABILITY | RESILIENCE | SECURITY



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- Definition
- TPL-008-1
 - Requirement R1 – R11
 - Table 1
 - Attachment 1
- Implementation Plan
- Timeline
- Q&A

Term(s):

Extreme Temperature Assessment – Documented evaluation of future Bulk Electric System performance for extreme heat and extreme cold benchmark temperature ~~benchmark~~ events.

- R1.** Each Planning Coordinator shall identify, in conjunction with its Transmission Planner(s), ~~shall identify~~ each entity's individual and joint responsibilities for completing the Extreme Temperature Assessment, which shall include each of the responsibilities described in Requirements R2 through R11. Each responsible entity shall complete its responsibilities such that the Extreme Temperature Assessment is completed at least once every five calendar years. *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

- R2.** ~~Each responsible entity, as~~ Each Planning Coordinator shall identify the zone(s) to which the Planning Coordinator belongs to under Attachment 1, and shall coordinate with all Planning Coordinators within each of its identified ~~in Requirement R1, shall~~ zone(s), to select ~~at least~~ one common extreme heat benchmark temperature event and ~~at least~~ one common extreme cold benchmark temperature event, ~~from the benchmark library, approved and maintained by the Electric Reliability Organization (ERO);~~ for each of its identified zone(s) when completing the Extreme Temperature Assessment.¹ Selected benchmark temperature events shall: [*Violation Risk Factor: High*] [*Time Horizon: Long-term Planning*]
- 2.1.** Consider no less than a 40-year period of temperature data ending no more than five years prior to the time the benchmark temperature events are selected; and
- 2.2.** Represent one of the 20 most extreme temperature conditions based on the three-day rolling average of daily maximum (heat) or daily minimum (cold) temperature across the zone.

¹ The Electric Reliability Organization (ERO) will maintain a library of benchmark temperature events that meet the criteria of Requirement R2.

Benchmark Event Data

The below provides extreme heat and extreme cold benchmark temperature event data per the zones identified in Attachment 1 of the TPL-008-1 Standard. Should entities not agree with the data provided below, you are welcome to coordinate with all Planning Coordinators within your zone to developing one common extreme heat benchmark temperature event and one common extreme cold benchmark temperature event per Requirement R2.

[California Daily Data](#) | [California Top 40 Hottest/Coldest 3 Day Average](#) | [California Hourly Data Selected Events](#)

[Canada Central Daily Data](#) | [Canada Central Top 40 Hottest/Coldest 3 Day Average](#)

[Canada East Daily Data](#) | [Canada East Top 40 Hottest/Coldest 3 Day Average](#)

[Canada West Daily Data](#) | [Canada West Top 40 Hottest/Coldest 3 Day Average](#)

[ERCOT Daily Data](#) | [ERCOT Top 40 Hottest/Coldest 3 Day Average](#) | [ERCOT Hourly Data Selected Events](#)

[Florida Daily Data](#) | [Florida Top 40 Hottest/Coldest 3 Day Average](#) | [Florida Hourly Data Selected Events](#)

[Great Basin Daily Data](#) | [Great Basin Top 40 Hottest/Coldest 3 Day Average](#) | [Great Basin Hourly Data Selected Events](#)

[ISONE Daily Data](#) | [ISONE Top 40 Hottest/Coldest 3 Day Average](#) | [ISONE Hourly Data Selected Events](#)

[MISO Daily Data](#) | [MISO Top 40 Hottest/Coldest 3 Day Average](#) | [MISO Hourly Data Selected Events](#)

[NYISO Daily Data](#) | [NYISO Top 40 Hottest/Coldest 3 Day Average](#) | [NYISO Hourly Data Selected Events](#)

[Pacific NW Daily Data](#) | [Pacific NW Top 40 Hottest/Coldest 3 Day Average](#) | [Pacific NW Hourly Data Selected Events](#)

[PJM Daily Data](#) | [PJM Top 40 Hottest/Coldest 3 Day Average](#) | [PJM Hourly Data Selected Events](#)

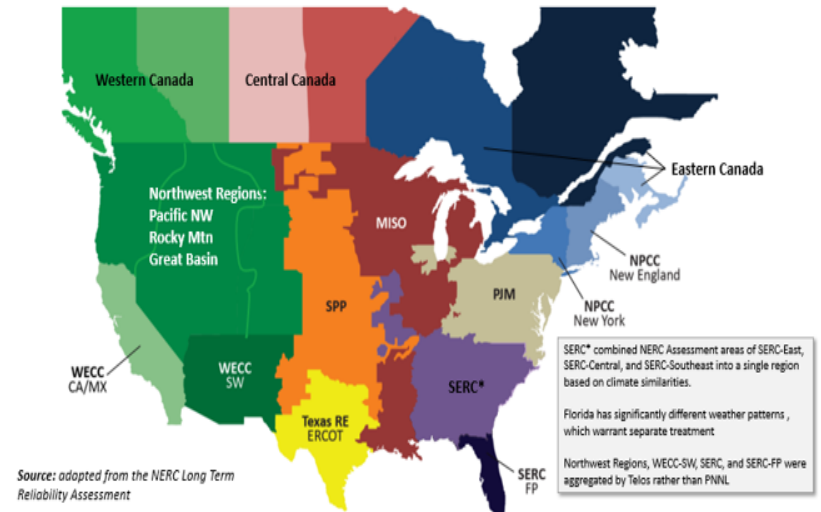
[Rocky Mtn Daily Data](#) | [Rocky Mtn Top 40 Hottest/Coldest 3 Day Average](#) | [Rocky Mtn Hourly Data Selected Events](#)

[Southeast Daily Data](#) | [Southeast Top 40 Hottest/Coldest 3 Day Average](#) | [Southeast Hourly Data Selected Events](#)

[Southwest Daily Data](#) | [Southwest Top 40 Hottest/Coldest 3 Day Average](#) | [Southwest Hourly Data Selected Events](#)

[SPP Daily Data](#) | [SPP Top 40 Hottest/Coldest 3 Day Average](#) | [SPP Hourly Data Selected Events](#)

The map below depicts an approximation of the zones to be used in the Extreme Temperature Assessment and is provided as a visual aid; to the extent that there is a conflict between the map and the table, the table controls. This map is not to be used for compliance purposes.



- R3.** Each Planning Coordinator shall ~~develop and coordinate with all Planning Coordinators within each of its zone(s) identified in Requirement R2, to~~ implement a process for ~~coordinating the development of~~ developing benchmark planning cases, ~~using for the selected Extreme Temperature Assessment that represent the~~ benchmark temperature events ~~identified~~ selected in Requirement R2, ~~Planning Coordinator(s), Transmission Planner(s), and other designated study entities, within an~~ and sensitivity cases to demonstrate the impact of changes to the basic assumptions used in the benchmark planning cases. This process shall include the following: *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*
- 3.1.** Selection of System models within the Long-Term Transmission Planning Horizon to form the basis for the benchmark planning cases.
 - 3.2.** Forecasted seasonal and temperature dependent adjustments for Load, generation, Transmission, and transfers ~~to represent the selected benchmark temperature events.~~ *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning] within the zone.*
 - 3.3.** Assumed seasonal and temperature dependent adjustments for Load, generation, Transmission, and transfers in areas outside the zone, as needed.
 - 3.4.** Identification of changes to at least one of the following conditions for sensitivity cases: generation, real and reactive forecasted Load, or transfers.

~~R3.R4.~~ Each responsible entity, as identified in Requirement R1, shall use the coordination process developed in ~~accordance with~~ Requirement R3 and data consistent with that provided in accordance with the MOD-032 standard, supplemented by other sources as needed, to develop ~~and maintain~~ the following ~~and establish category P0 as the normal System condition in Table 1:~~ *[Violation Risk Factor: High] [Time Horizon: Long-term Planning]*

~~3.1. Benchmark planning cases that include seasonal and temperature dependent adjustments for Load, generation, Transmission, and transfers to represent the System conditions of the selected benchmark temperature events as identified in Requirement R2 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. This establishes Category P0 as the normal System condition in Table 1.~~

~~3.2. Sensitivity cases to demonstrate the impact of changes to the basic assumptions used in the benchmark planning cases. To accomplish this, the sensitivity cases shall have changes to at least one of the following conditions:~~

- ~~● Generation;~~
- ~~● Real and reactive forecasted Load; or~~
- ~~● Transfers.~~

~~4.1. One common extreme heat and one common extreme cold benchmark planning case.~~

~~4.2. One common extreme heat and one common extreme cold sensitivity case.~~

R4-R5. Each responsible entity, as identified in Requirement R1, shall have criteria for acceptable System steady state voltage limits, and post-Contingency voltage deviations, ~~and applicable Facility Ratings~~ for completing the Extreme Temperature Assessment. *[Violation Risk Factor: ~~High~~Medium] [Time Horizon: Long-term Planning]*

R5-R6. Each responsible entity, as identified in Requirement R1, shall define and document the criteria or methodology to be used in the Extreme Temperature Assessment ~~analysis~~ to identify instability, uncontrolled separation, or Cascading within an Interconnection. *[Violation Risk Factor: High] [Time Horizon: Long-term Planning]*

R7. Each responsible entity, as identified in Requirement R1, shall identify the ~~planning events~~Contingencies for each category in Table 1 that are expected to produce more severe System impacts on its portion of the Bulk Electric System. The rationale for those Contingencies selected for evaluation shall be available as supporting information. *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

R7.R8. Each responsible entity, as identified in Requirement R1, shall complete steady state and transient stability analyses in ~~its~~the Extreme Temperature Assessment ~~at least once every five calendar years~~ using the Contingencies identified in Requirement R7, and shall document the assumptions and results ~~of the steady.~~ Steady state and transient stability analyses. ~~The Extreme Temperature Assessment shall include~~be performed for the following: *[Violation Risk Factor: High] [Time Horizon: Long-term Planning]*

7.1.8.1. ~~Analysis of the benchmark~~Benchmark planning cases developed in accordance with Requirement R4 Part 4.1.

7.2.8.2. ~~Analysis of the sensitivity~~Sensitivity cases developed in accordance with Requirement R4 Part 4.-2.

R8-R9. Each responsible entity, as identified in Requirement R1, shall develop a Corrective Action Plan(s) ~~(CAPs)~~ when the ~~assessment analysis~~ of a benchmark planning case, in accordance with Requirement R8 Part 8.1, indicates its portion of the Bulk Electric System is unable to meet performance requirements for ~~Table 1 category~~ P0 or P1 ~~Contingencies in Table 1~~. For each Corrective Action Plan, the responsible entity shall: *[Violation Risk Factor: High] [Time Horizon: Long-term Planning]*

8.1.9.1. Make ~~their CAPs~~ ~~Corrective Action Plan~~ available ~~to~~, and solicit feedback from ~~x~~ applicable regulatory authorities or governing bodies responsible for retail electric service issues.

8.2.9.2. Document ~~the~~ alternative(s) considered, and notify the applicable regulatory authorities or governing bodies responsible for retail electric service

issues when Non-Consequential Load Loss is utilized as an element of a ~~CAP~~ ~~Corrective Action Plan~~ for ~~the~~ Table 1 P1 Contingency.

8.3.9.3. Be permitted to utilize Non-Consequential Load Loss as an interim solution, which normally is not permitted in Table 1, in situations that are beyond the control of the Planning Coordinator or Transmission Planner that prevent the implementation of a Corrective Action Plan in the required timeframe. ~~The use of Non-Consequential Load Loss as an interim solution in this situation is permitted, provided that each, provided that the~~ responsible entity documents the situation causing the problem, alternatives evaluated, and takes actions to resolve the situation.

8.4.9.4. Be allowed to have revisions to the ~~CAP~~ ~~Corrective Action Plan~~ in subsequent Extreme Temperature Assessments, provided that the planned ~~BES~~ ~~Bulk Electric System~~ shall continue to meet the performance requirements of Table 1.

~~R9-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 of the event(s) if analyses conclude there could be instability, uncontrolled separation, or Cascading within an Interconnection, for the following: *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

~~**9.1.** Benchmark planning cases where possible actions are designed to mitigate the consequences and adverse impacts when the study results indicate the System could result in instability, uncontrolled separation, or Cascading for the Table 1 P2, P4, and P7 Contingencies.~~

~~**9.2.** Sensitivity cases where possible actions are designed to mitigate failures to meet the performance requirements in Table 1 for category P0, P1, P2, P4, and P7 Contingencies.~~

10.1. Table 1 P7 Contingencies in benchmark planning cases analyzed in accordance with Requirement R8 Part 8.1.

10.2. Categories P0, P1, and P7 in Table 1 in sensitivity cases analyzed in accordance with Requirement R8 Part 8.2.

R10-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. *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

Table 1 – Steady State & Stability Performance Events

Steady State & Stability:

- a. Instability, uncontrolled separation, or Cascading within an Interconnection, defined in accordance with Requirement R6, shall not occur.
- b. Consequential Load Loss as well as generation loss is acceptable as a consequence of any event excluding P0.
- c. Simulate the removal of all elements that Protection Systems and other controls are expected to automatically disconnect for each event.
- d. Simulate Normal Clearing unless otherwise specified.
- e. Planned System adjustments such as Transmission configuration changes and re-dispatch of generation are allowed if such adjustments are executable within the time duration applicable to the Facility Ratings.

Steady State Only:

- f. Applicable Facility Ratings shall not be exceeded.
- g. System steady state voltages and post-Contingency voltage deviations shall meet the criteria identified in Requirement R5.

Table 1 – Steady State & Stability Performance Events							
Category	Initial Condition	Event ¹	Fault Type ²	Contingency BES Level	Interruption of Firm Transmission Service Allowed	Non-Consequential Load Loss Allowed	
						Benchmark Planning Cases	Sensitivity Cases
P0 No Contingency	Normal System	None	N/A	≥ 200 kV	Yes	No ⁵	Yes
P1 Single Contingency	Normal System	Loss of one of the following: 1. Generator 2. Transmission Circuit 3. Transformer ³ 4. Shunt Device ⁴	3∅	≥ 200 kV	Yes	Yes ⁶	Yes
		5. Single Pole of a DC line	SLG				
P7 Multiple Contingency (Common Structure)	Normal System	The loss of: 1. Any two adjacent (vertically or horizontally) circuits on common structure ⁵ 2. Loss of a bipolar DC line	SLG	≥ 200 kV	Yes	Yes	Yes

Table 1 – Steady State & Stability Performance Events

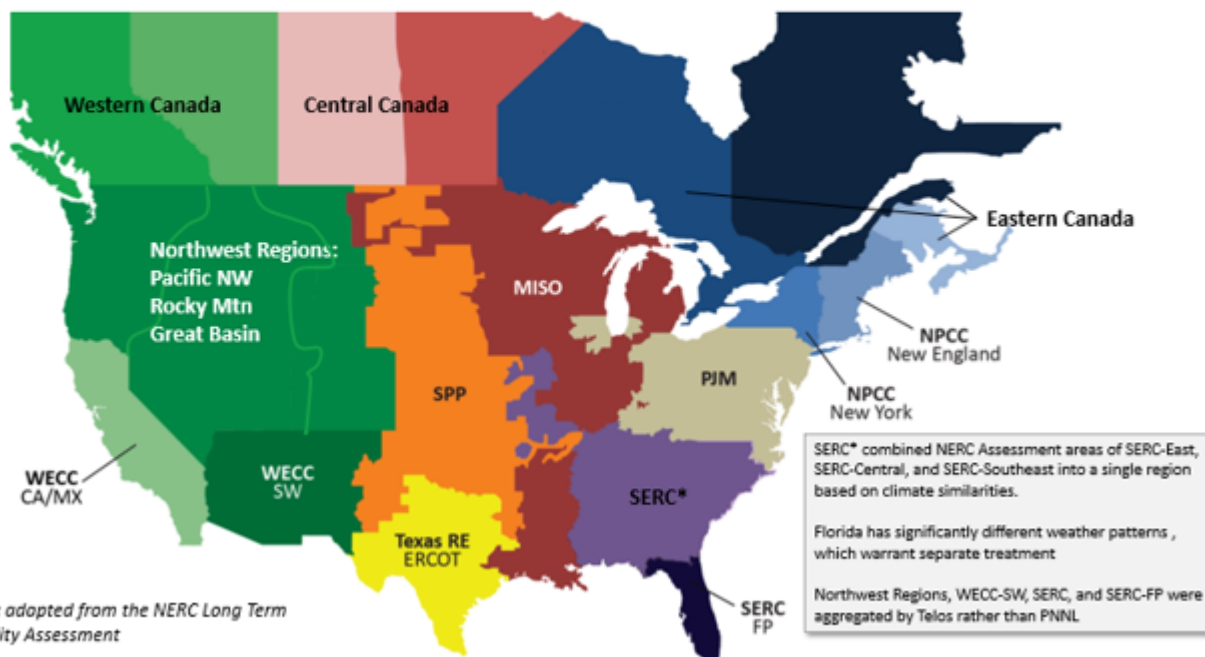
1. If the event analyzed involves BES elements at multiple System voltage levels, the lowest System voltage level of the element(s) removed for the analyzed event determines the BES level of the event. For P7 events, the BES level of the event is the highest System voltage level of the element(s) removed for the analyzed event. [No Title]
2. Unless specified otherwise, simulate Normal Clearing of faults. Single line to ground (SLG) or three-phase (3 \emptyset) are the fault types that must be evaluated in Stability simulations for the event described. A 3 \emptyset or a double line to ground fault study indicating the criteria are being met is sufficient evidence that a SLG condition would also meet the criteria.
3. For non-generator step up transformer outage events, the reference voltage, as used in footnote 1, applies to the low-side winding (excluding tertiary windings). For generator and Generator Step Up transformer outage events, the reference voltage applies to the BES connected voltage (high-side of the Generator Step Up transformer). Requirements which are applicable to transformers also apply to variable frequency transformers and phase shifting transformers.
4. Requirements which are applicable to shunt devices also apply to FACTS devices that are connected to ground.
5. Excludes circuits that share a common structure for 1 mile or less.
6. Benchmark planning cases require the development of a Corrective Action Plan when the responsible entity's portion of the BES is unable to meet the performance requirements for categories P0 or P1. Additionally, in benchmark planning cases, Non-Consequential Load Loss is not permitted for category P0 and requires notification of applicable regulatory authorities or governing bodies responsible for retail electric service issues when utilized as an element of a Corrective Action Plan for P1 Contingencies. See Requirement R9 for the relevant requirements.

Attachment 1: Extreme Temperature Assessment Zones

The table below lists the zones to be used in the Extreme Temperature Assessment and identifies the Planning Coordinators that belong to each zone. In accordance with Requirement R2, each Planning Coordinator is required to identify the zone(s) to which it belongs.

Zone	Planning Coordinators
<i>Eastern Interconnection</i>	
MISO	MISO
SPP	SPP
PJM	PJM
NPCC (New England)	Planning Coordinators in NPCC that primarily serve the six New England States
NPCC (New York)	Planning Coordinators in NPCC that primarily serve New York
SERC	Planning Coordinators in SERC excluding those that primarily serve Florida and those in MISO, SPP, or PJM
SERC (Florida)	Planning Coordinators in SERC that primarily serve Florida
Central Canada	Planning Coordinators that primarily serve Saskatchewan and/or Manitoba region of MRO
Eastern Canada	Planning Coordinators in NPCC that primarily serve Ontario, New Brunswick, and Nova Scotia
<i>Western Interconnection</i>	
WECC Southwest	Planning Coordinators in the Southwest region of WECC, including El Paso in West Texas
Pacific Northwest	Planning Coordinators in the Pacific Northwest region of WECC
Great Basin	Planning Coordinators in the Great Basin region of WECC
Rocky Mountain	Planning Coordinators in the Rocky Mountain region of WECC
California/Mexico	Planning Coordinators in the California/Mexico region of WECC
Western Canada	Planning Coordinators that primarily serve British Columbia and/or Alberta region of WECC
<i>ERCOT Interconnection</i>	
ERCOT	Areas in Texas subject to ERCOT's jurisdiction.
<i>Quebec Interconnection</i>	
Quebec	Planning Coordinators that primarily serve Quebec in the NPCC Region.

The map below depicts an approximation of the zones to be used in the Extreme Temperature Assessment and is provided as a visual aid; to the extent that there is a conflict between the map and the table, the table controls. This map is not to be used for compliance purposes.



Source: adapted from the NERC Long Term Reliability Assessment

Effective Date

The effective date for the proposed Reliability Standard is provided below. Where the standard drafting team identified the need for a longer implementation period for compliance with a particular section of the proposed Reliability Standard (e.g., an entire Requirement or a portion thereof), the additional time for compliance with that section is specified below. These phased-in compliance dates represent the dates that entities must begin to comply with that particular section of the Reliability Standard, even where the Reliability Standard goes into effect at an earlier date.

TPL-008-1 and Definition

Where approval by an applicable governmental authority is required, the standard and definition of Extreme Temperature Assessment shall become effective on the first day of the first calendar quarter that is twelve (12) months after the effective date of the applicable governmental authority's order approving the standard, or as otherwise provided for by the applicable governmental authority.

Where approval by an applicable governmental authority is not required, the standard shall become effective on the first day of the first calendar quarter that is twelve (12) months after the date the standard and definition of Extreme Temperature Assessment is adopted by the NERC Board of Trustees, or as otherwise provided for in that jurisdiction.

Initial Performance of Periodic Requirements

Entities shall complete the Extreme Temperature Assessment no later than forty-eight (48) months after the effective date of Reliability Standard TPL-008-1. Subsequent Extreme Temperature Assessments shall be completed by no later than five calendar years following the completion of the previous Extreme Temperature Assessment.

Phased-In Compliance Dates

Compliance Date for TPL-008-1 Requirement R1

Entities shall be required to comply with Requirement R1, pertaining to the identification of individual and joint responsibilities for completing the Extreme Temperature Assessment, 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 Requirements R2, R3, R4, R5, and R6 until twenty-four (24) 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 Requirements R7, R8, R9, R10, R11 until forty-eight (48) months after the effective date of Reliability Standard TPL-008-1.

- Draft 3 15-day Comment and Ballot Period
 - October 7 – 21, 2024
- Draft 4 15-day Comment and Ballot Period
 - November 7 – 21, 2024
- 5-day Final Ballot
 - December 1 – 5, 2024
- NERC Board Adoption
 - December 11, 2024



Questions and Answers