Reliability Standard TPL-008-1

Sun Wook Kang
Dynamic Studies – ERCOT Grid Planning

November 13, 2025

Antitrust Admonition

Because this event brings together market participants who may be viewed as actual or potential competitors, we must be mindful to conduct it in a manner that is consistent with the antitrust and competition laws. Participants should not disclose non-public, proprietary, or competitively sensitive information.

Attendees should exercise independent judgment and avoid even the appearance of discussions of agreements or concerted actions that may be viewed as restraining competition. Any questions on Texas RE's Antitrust Compliance Corporate Policy may be directed to Texas RE's General Counsel.

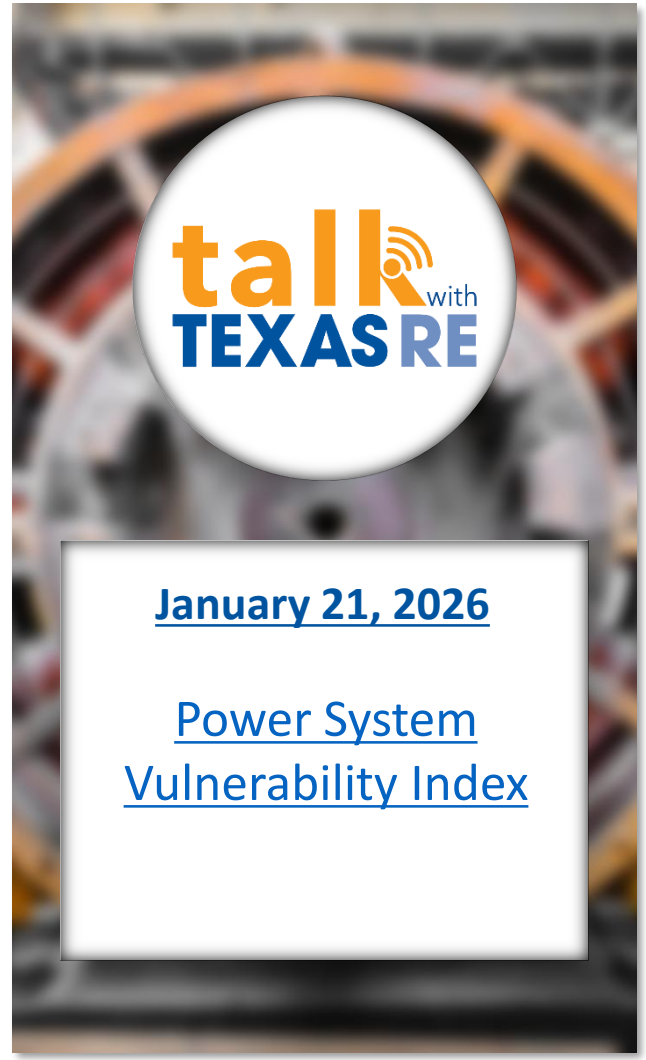
Upcoming Texas RE Events

December 2, 2025

Securing Together: ISAC and Industry Collaboration for National Resilience

December 10, 2025

Q4 MRC, AGR&F, and Board Meetings and Annual Membership Meeting



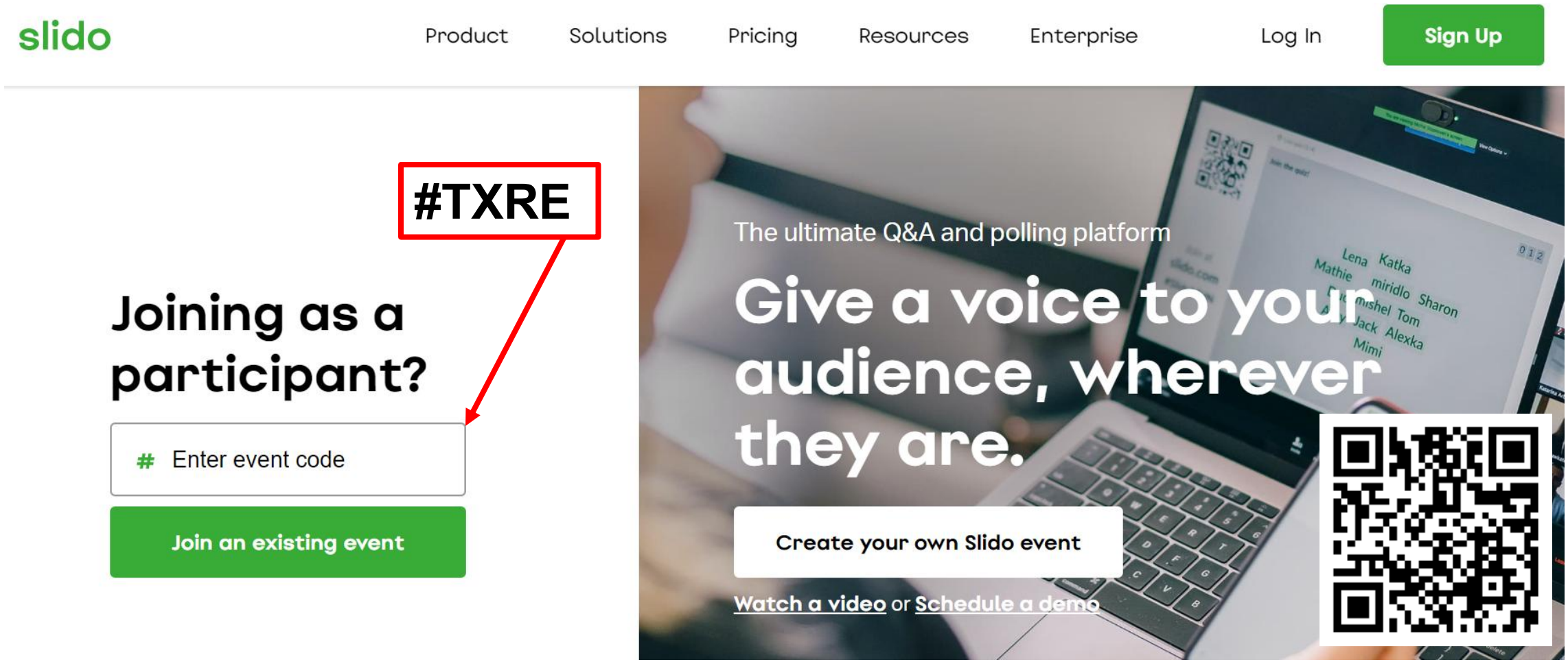
January 21, 2026

Power System Vulnerability Index

Upcoming ERO Enterprise Events

Date	Event
November 17, 2025	Technical Talk with RF
November 18-19, 2025	GridEx VIII
February 23-25, 2026	Internal Controls Workshop
February 25-26, 2026	2026 ERO Women's Leadership Conference

Slido.com


slido
Product
Solutions
Pricing
Resources
Enterprise
Log In
Sign Up
#TXRE
Joining as a participant?
Enter event code
Join an existing event
The ultimate Q&A and polling platform
Give a voice to your audience, wherever they are.
Create your own Slido event
Watch a video or Schedule a demo

NERC Reliability Standard TPL-008-1:

Transmission System Planning Performance Requirements for Extreme Temperature Events

Sun Wook Kang
Dynamic Studies – ERCOT Grid Planning

November 13, 2025, Talk with Texas RE

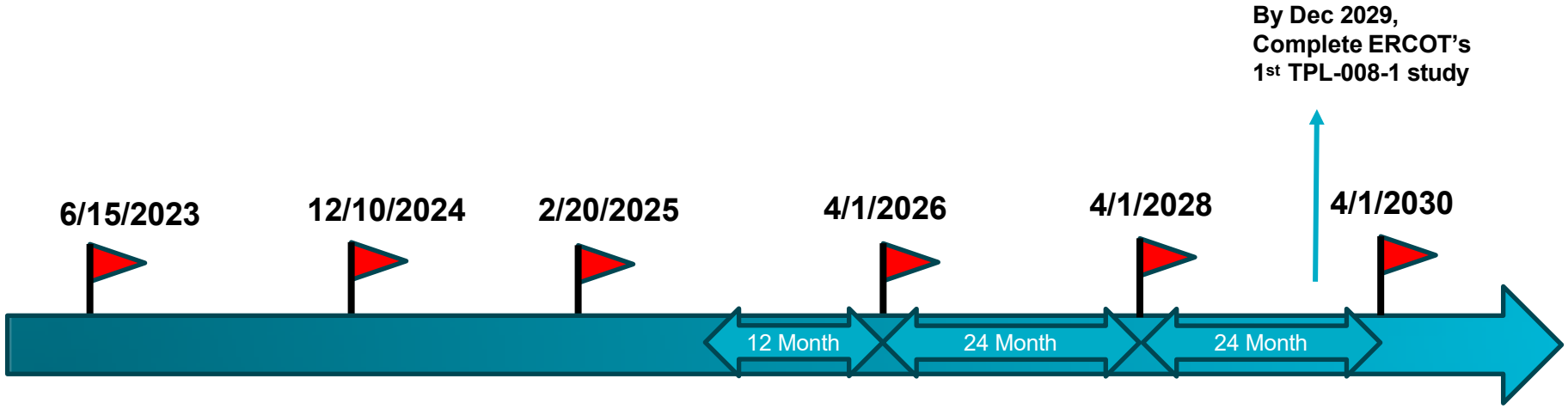
NERC Project 2023-07

- FERC Order No. 896 was issued in June 2023
- NERC Project 2023-07 was initiated “as high priority” to address approximately 35 firm directives in the Order No. 896
  - Purpose and Need:
    - Gap in the existing TPL 001-5.1 and to minimize reliability risk due to extreme hear and cold weather events
  - Directives:
    - 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”
    - 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
    - Coordination among registered entities and sharing of data and study
    - Concurrent/correlated generator and transmission outages

NERC Project 2023-07 (Continued)

- Directives Continued:
  - Conduct transmission system planning studies for extreme heat and cold weather events
    - Steady-state analysis
    - Transient stability analyses
    - Sensitivity analysis
    - Modifications to the traditional planning approach
  - Implement a Corrective Action Plan if performance requirements in the TPL-008-1 standard are not met

Implementation Plan



On June 15, 2023, FERC Issued Order 896

NERC Board Adoption

FERC Orders (Issued date)

Effective Date of Standard of R1

Effective Date of Standard of R2, R3, R4, R5, and R6

Effective Date of Standard of R7, R8, R9, R10, and R11

TPL-008-1 fully enforceable

https://www.nerc.com/pa/Stand/Pages/Project-2023-07-Mod-to-TPL00151.aspx

High Level Overview of TPL-008-1 Process

Collection of Benchmark Events

Temperature Event Selection, Identification of Zones for each PC

Development of Benchmark Planning Cases and Sensitivity Cases

Extreme Temperature Assessment and Sharing

NERC-ERO or PC(s)

- *A set of extreme cold and heat temperature events. Events can be developed by PC(s) per R2*

See the references:

- *TPL-008-1 ERO Benchmark Weather Event Development and Maintenance Process*
- *TPL-008 Data Library Read Me*

PC(s)

R2 and R3

- *Identify zone(s) applicable to your PC*
- *Coordinate with all PC(s) within each identified zone and identify temperature events*
- *Coordinate to create cases*

See ETAZ in Attachment 1

PC(s) and/or TP(s)

R4

- *Develop benchmark planning and sensitivity cases for the extreme heat and cold temperature events*

- *MOD-032-2*
- *Load adjustment*
- *Concurrent generation and transmission outage*
- *Derate of temperature dependent resources*

PC(s) and/or TP(s)

R5 through R11

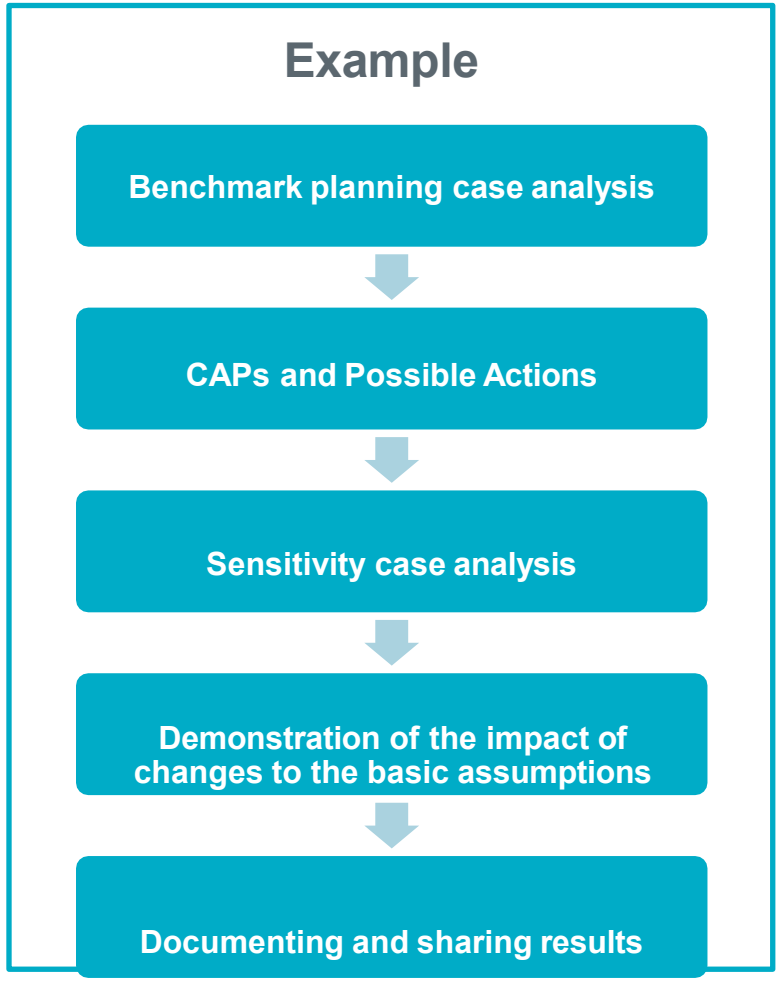
- *Criteria and Contingencies*
- *Steady-state analysis*
- *Transient stability analysis*
- *Corrective Action Plan*
- *Mitigation Action*
- *Report*
- *Sharing*

Study Interval: Every five calendar year

High Level Overview of TPL-008-1 Process

- **R5, R6, and Table 1:**
  - Criteria for steady-state voltage, monitor thermal issue
  - Criteria or methodology for instability, uncontrolled separation, and Cascading
- **R7 and Table 1**
  - Contingencies with more severe impact
- **R8**
  - Steady-state and transient stability analyses
  - Benchmark planning cases and sensitivity cases
- **R9 and Table 1**
  - Corrective Action Plan (CAP) development for P0 and P1
- **R10 and Table 1**
  - Possible action development for P7 in benchmark planning cases and P0/P1/P7 in sensitivity cases

Note: TPL-008 sets the baseline requirements. Entities can exceed these standards if needed.



High Level Overview of TPL-008-1 Process

- **Table 1 – Steady State & Stability Performance Events**

Table 1 – Steady State & Stability Performance Events							
Category	Initial Condition	Event[1]	Fault Type[3]	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	N/A	Yes	No[6]	Yes
P1 Single Contingency	Normal System	Loss of one of the following: 1. Generator 2. Transmission Circuit 3. Transformer[2] 4. Shunt Device[4]	3Ø	≥ 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

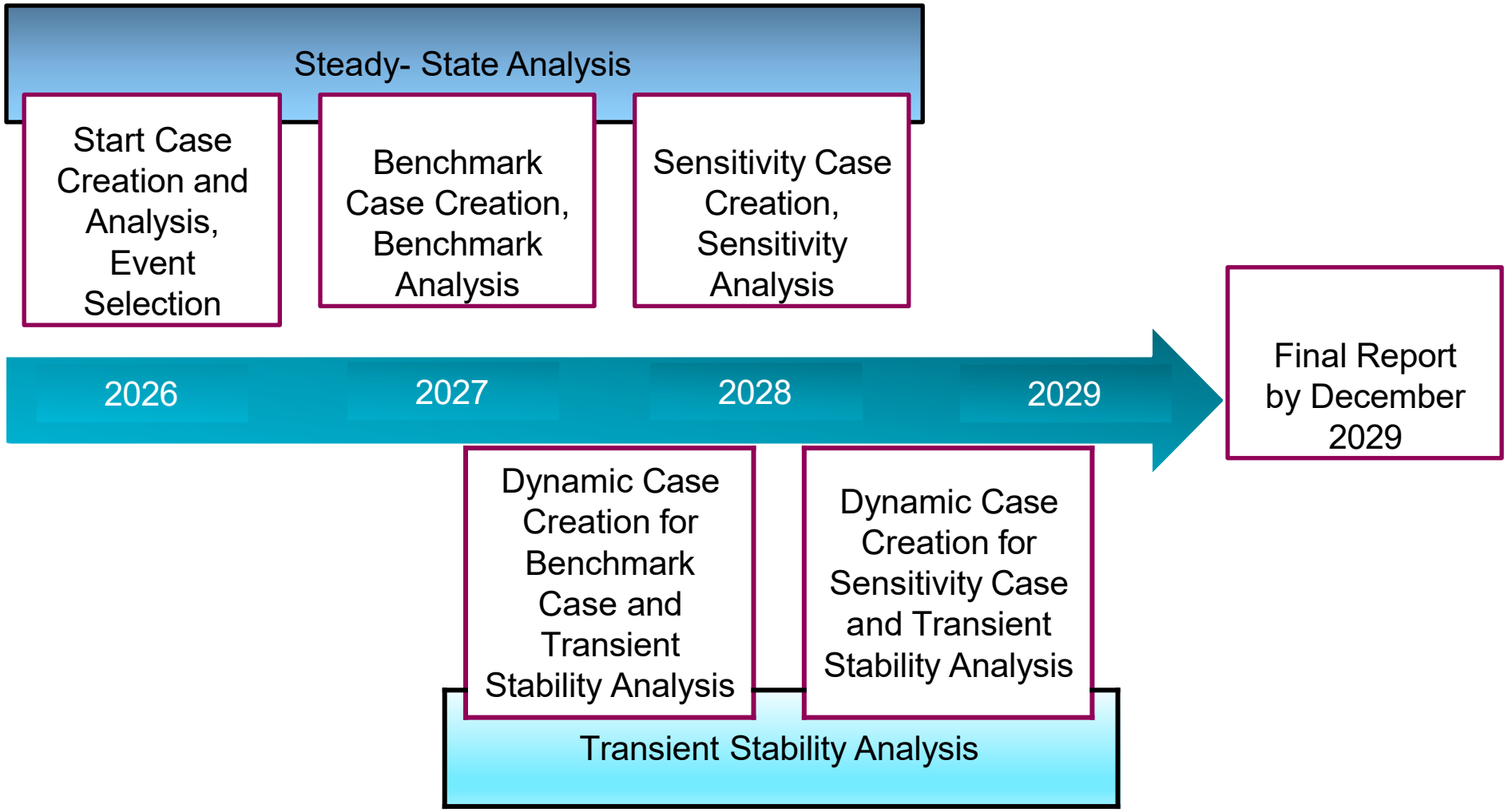
Key Difference: TPL-008-1 vs TPL-001-5.1

	TPL-008-1	TPL-001-5.1
System Condition and Modeling	Select extreme heat and cold temperature events from the data library maintained by NERC-ERO Adjustment for temperature dependent facilities (load, generation, transmission): Concurrent generation and transmission outages, de-rate of generation and transmission capacities	More probable and broad spectrum of System conditions
Coordination	Coordination among the PC(s) within each zone under Attachment 1 and implement process in developing cases	Collaboration within PC or TP
Study Cycle	Once every 5 year	Once every year
Planning Horizon	**Long-Term Planning** - Benchmark Planning Cases (heat and cold) - Sensitivity cases (heat and cold)	**Near-Term Planning**: - Peak cases for year 1 or 2, and for year 5 - Off-Peak case for one of the five years - Sensitivity cases - Cases with known outage assessment - Cases for spare equipment strategy assessment **Long-Term Planning**: Year 6 to 10 years or more depending on longer lead time projects

Key Difference: TPL-008-1 vs TPL-001-5.1 (Cont.)

	TPL-008-1	TPL-001-5.1
Type of Study	Steady-State and Transient Stability Analyses	Steady-State, Transient Stability, and Short Circuit Analyses
Reference Voltage of Contingencies	200 kV and above (also see footnotes in Table 1 for details)	HV and EHV (i.e., 100 kV and above)
Contingencies	P0, P1, and P7	Planning Events: - P0, P1, P2, P3, P4, P5, P6, and P7 Extreme Events: - e.g., wildfire, gas pipeline outage, severe weather like hurricane or tornadoes
Monitored Facilities	All BES Facilities within the applicable zone (see Attachment 1 for zones) Note: it is not for local instability issue, rather system-wide instability issue	All BES Facilities within the study area
Performance Requirement	See Table 1 in TPL-008-1, - Benchmark event case: Corrective Action Plan (CAP) under P0 and P1 (see footnote under Table 1) and possible action under P7 - Sensitivity case: Possible actions for P0, P1, and P7	See Table 1 in TPL-001-5.1, - CAPs for various issues under Planning Events - CAPs for instability, uncontrolled separation, or Cascading identified under all Planning Events - Possible actions for Extreme Events

ERCOT ETA Process and Tentative Timeline



R1: Determination of Responsible Entities

R1. Each Planning Coordinator shall identify, in conjunction with its Transmission Planner(s), 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]*

- Identify responsibility of PC and TP. This is currently in progress, and the table below is tentative.

Requirements	Responsible Entities (Tentative as of Nov 2025)
R1 : Assignment of Responsibilities & 5-Year Assessment Cycle	ERCOT and TPs
R2 and R3 : Identification of Zones and Benchmark Temperature Events, Coordination for Developing Benchmark and Sensitivity Planning Cases	ERCOT
R4 : Creation of Benchmark and Sensitivity Cases	ERCOT and TPs
R5 and R6: Criteria for Acceptable Voltage Limits, Post-Contingency Deviations, Instability, Uncontrolled Separation, Cascading	ERCOT
R7: Identification and Documentation of Critical Contingencies	ERCOT and TPs
R8: Completion of Steady State and Transient Stability Analyses	ERCOT
R9 and R10: Collective Action Plan and Possible Mitigation Actions	ERCOT and TPs
R11: Timely Provision of Extreme Temperature Assessment Results Upon Request	ERCOT

R2

R2. 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 zone(s), to identify one common extreme heat benchmark temperature event and one common extreme cold benchmark temperature event for each of its identified zone(s) when completing the Extreme Temperature Assessment. The benchmark temperature events shall be obtained from the benchmark library maintained by the ERO or developed by the Planning Coordinators. Each benchmark temperature event identified by the Planning Coordinators shall: *[Violation Risk Factor: High] [Time Horizon: Long-term Planning]*

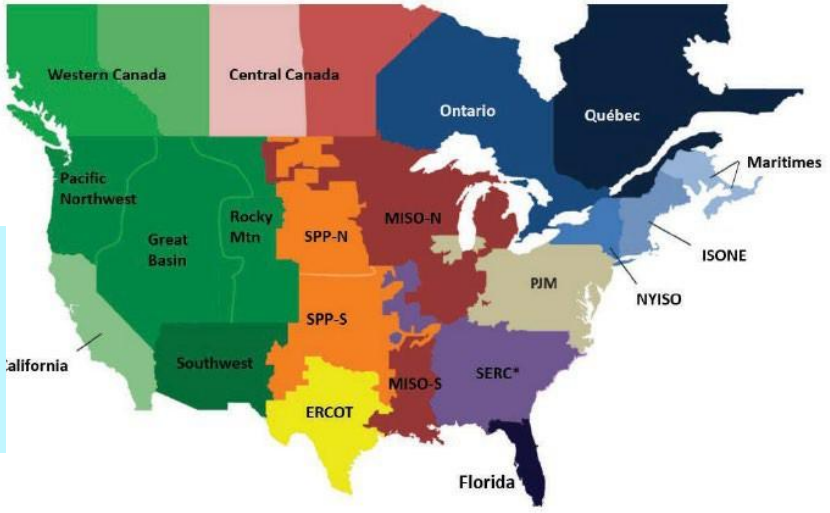
2.1. Consider no less than a 40-year period of temperature data ending no more than five years prior to the time the benchmark temperature events are selected; and

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.

Criteria for qualifying extreme temperature events

- Identify your zone(s) as outlined in Attachment 1,
- Select Extreme Temperature (ET) events from the NERC library or those developed by the Planning Coordinator (PC).

TPL-008-1 Weather Zones Map



R3

R3. Each Planning Coordinator shall coordinate with all Planning Coordinators within each of its zone(s) identified in Requirement R2, to implement a process for developing benchmark planning cases for the Extreme Temperature Assessment that represent the benchmark temperature events selected in Requirement R2 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 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.

- Coordinate among PCs within each zone and develop a process for study base and sensitivity cases, taking into account key assumptions and consideration factors.

R4, R5, and R6

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

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.

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 completing the Extreme Temperature Assessment. *[Violation Risk Factor: Medium] [Time Horizon: Long-term Planning]*

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 to identify instability, uncontrolled separation, or Cascading within an Interconnection. *[Violation Risk Factor: High] [Time Horizon: Long-term Planning]*

- Develop P0 cases for the study base and sensitivity cases, utilizing the coordination process in R3, data consistent with MOD-032, and additional data
- Establish criteria for steady-state voltage performance
- Define and document the criteria or method for the evil three (**note**: TPL-008-1 addresses wide-area issues, not localized concerns such as local voltage recovery or collapse)

R7 and R8

R7. Each responsible entity, as identified in Requirement R1, shall identify the 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]*

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

8.1. Benchmark planning cases developed in accordance with Requirement R4 Part 4.1.

8.2. Sensitivity cases developed in accordance with Requirement R4 Part 4.2.

- Identify contingencies to be tested, and perform steady-state and stability analyses using the contingencies from R7 and the cases developed under R4

R9

R9. Each responsible entity, as identified in Requirement R1, shall develop a Corrective Action Plan(s) when the 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 category P0 or P1 in Table 1. For each Corrective Action Plan, the responsible entity shall: *[Violation Risk Factor: High] [Time Horizon: Long-term Planning]*

9.1. Document alternative(s) considered when Non-Consequential Load Loss is utilized as an element of a Corrective Action Plan for a Table 1 P1 Contingency.

9.2. Be permitted to utilize Non-Consequential Load Loss as an interim solution, which normally is not permitted for category P0 in Table 1 for situations that are beyond ¹ System shall continue to meet the performance requirements of Table 1. prevent the implementation of a Corrective Action Plan in the required timeframe, provided that the responsible entity documents the situation causing the problem, alternatives evaluated, and takes actions to resolve the situation.

9.3. Make its Corrective Action Plan available to, and solicit feedback from, applicable regulatory authorities or governing bodies responsible for retail electric service issues.

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

- Develop a Corrective Action Plan for P0 and P1. Load shedding may be used under P1 only as a last resort. If used, alternatives considered must be documented.

R10 and R11

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]*

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.

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]*

- Develop potential mitigation actions for P7 in the study base cases, and for P0, P1, and P7 in the sensitivity cases, to reduce likelihood or impact.
- Share the results.

Questions

Any Questions?

sunwook.kang@ercot.com