

# NERC

NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION

# Project 2015-10 Single Points of Failure

Bill Harm, NERC & Regional Coordination  
OC meeting  
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**RELIABILITY | ACCOUNTABILITY**



- Drafting Team Members
- Project 2015-10 Background
- Proposed Revisions
- Implementation Plan
- Next Steps

Name	Organization/ Company
Jonathan Hayes (Chair)	Southwest Power Pool
Delyn Kilpack (Vice Chair)	Louisville Gas & Electric and Kentucky Utilities
Chris Colson	Western Area Power Administration
Bill Harm	PJM
Baj Agrawal	Arizona Public Service Company
Liqin Jiang	Duke Energy
Rich Kowalski	ISO New England
Prabhu Gnanam	ERCOT
Manuela Dobrescu Dobritoiu	Hydro-Quebec
Ruth Kloecker	ITC Holdings

- Addresses reliability issues concerning the study of single points of failure on Protection Systems from FERC Order No. 754
- Addresses directives from FERC Order No. 786
- Replaces references to the MOD-010 and MOD-012 standards with the MOD-032 Reliability Standard
- The threat to BES reliability from single point-of-failure (SPF) of a Protection System component established well before this draft standard

- **Project 2015-010 Single Points of Failure**
  - March 30, 2009: NERC issued a advisory report notifying the industry that a single point of failure issue had caused three significant system disturbances in five years.
  - October 24-25, 2011: FERC technical conference titled Staff meeting on Single Points of Failure on Protection Systems concerning Commission's Order No. 754.
  - December 6-8, 2011: NERC System Protection and Control Subcommittee (SPSC) agreed to sponsor a Request for Interpretation (RFI) which was accepted on February 3, 2012.
  - September 2015 Report of Analysis on NERC Section 1600 Request for Data made a recommendation that TPL-001-4 Table 1 P5 event be revised to include protection system failure instead of a relay failure.

- Project 2015-010 Single Points of Failure
  - Requirement R1 – Updated for MOD-032-1 standard.
  - Requirement R1 – Modified how known outages are selected for study.
  - Requirement R2 – Modified the P1 contingency events simulated (steady state) for known outages.
  - Requirement R2 – Added model conditions for stability analysis of P1 events for known outages.
  - Requirement R2 – Added stability analysis requirement for long lead time equipment unavailability.
  - Requirement R4 – Added documentation requirement if Cascading observed given 3-phase fault SPF.

- Project 2015-010 Single Points of Failure
  - Table 1 – Modified Category P5 event to include SPF.
  - Table 1 – Modified Extreme Events, Stability column to differentiate SPF from stuck breaker.
  - Table 1 – Modified Footnote 13 to specify SPF.
  - Implementation Plan (R1 & R2 36-months; R4 60-months).

- Key Concepts – Addressing FERC Order No. 786
  - Planned outages are **not “hypothetical outages”** and should not be treated as multiple contingencies in the planning standard (should be addressed in N-0 base case) (P 42);
  - Relying on **Category P3 and P6 is not sufficient** and does not cover maintenance outages (P 44);
  - Near-Term Transmission Planning Horizon requires annual assessments using Year One or year two, and year five, and known planned facility outages of less than six months should be addressed so long as their **planned start times and durations may be anticipated as occurring for some period of time during the planning time horizon** (P 45).



- Proposed Change to Requirement R1, Part 1.1.2 – Study of Known Outages
  - TPL-001-4 only requires study of outages lasting longer than six months.
  - FERC Order No. 786 directed NERC to address outages that may be excluded.
    - Revised Requirement R2, Part 2.1.3 will reference Requirement R1, Part 1.1.2 (steady state Near-Term).
    - New Requirement R2, Part 2.4.3 will reference Requirement R1, Part 1.1.2 (stability Near-Term).
  - Proposed coordination with Reliability Coordinator.
    - Pursuant to IRO-017 (Outage Coordination).
    - “as selected in consultation with the RC for the Near Term Planning Horizon”.

- Don't confuse **duration of outage** with when **outage is planned**
  - Duration can be of any length of time.
  - Outage must still fall within the Near-Term Planning Horizon (“The transmission planning period that covers Year One through five.”).

- Proposed Change to Spare Equipment
  - TPL-001-4 Requirement R2, Part 2.1.4 requires steady state study of removed long lead equipment from model if long lead equipment does not have a spare (example transformers).
  - Proposed addition of Requirement R2, Part 2.4.5 requires stability study be performed for long lead equipment that does not have a spare.
    - Only have to study P1 and P2 events .

- Proposed Change to P5 and Extreme Event
  - Existing TPL-001-4 Table 1 P5 and extreme event (3-phase fault) refers to a fault and a failure of a non-redundant relay.
  - The proposal changes event to a fault and a failure of a non-redundant component of a Protection System.
  - For extreme event (Stability column), breaker failure and failure of a non-redundant component of a Protection System are differentiated.
    - Recognizes that sequence of Protection System action leading to Delayed Clearing may be quite different between two causalities.

- Footnote 13

- Expands Protection System components to be considered:
  - A single protective relay which responds to electrical quantities, without an alternative that provides comparable Normal Clearing times, e.g. sudden pressure relaying;
  - A single communications system, necessary for correct operation of a communication-aided protection scheme required for Normal Clearing, which is not monitored or not reported;
  - A single dc supply associated with protective functions, and that single station dc supply is not monitored or not reported for both low voltage and open circuit;
  - A single control circuitry associated with protective functions including the trip coil(s) of the circuit breakers or other interrupting devices.
- Proposed TPL-001-5 clarifies subset of components of Protection System relevant to assessing Delayed Clearing.
  - PTs and CTs are excluded; single failed device unlikely to prevent tripping.
  - All other components addressed.

- **P5 Events**
  - Pursuant to Requirement R2, Part 2.7, failure to meet performance requires the development of a Corrective Action Plan
- **Extreme Events 2e-2h Stability column**
  - Pursuant to Requirement R4, Part 4.2.2, if analysis concludes there is Cascading, an evaluation of possible actions designed to prevent the System from Cascading shall:
    - List System deficiencies, the associated actions needed to prevent the System from Cascading, and the associated timetable for implementation.
    - Be reviewed in subsequent annual Planning Assessments for continued validity and implementation status.

- The SDT recognizes the need to have a phased-in approach to be able to study and develop a CAP for the failure of a “Component of a Protection System”
- In summary:
  - R1 and R2 enforceable in **36-months** after FERC approval (and alignment time).
  - R4 enforceable in **60-months** after FERC approval (and alignment time).
  - CAPs addressing P5 changes enforceable in **60-months** after FERC approval.
  - Planning Assessments addressing all provisions of TPL-001-5 required by **36-months** after FERC approval.

- Provides drafting teams a mechanism to:
  - Explain the technical basis for Reliability Standard
  - Provide technical guidance to help support effective application
- Moving forward a separate document to explain technical basis will be developed.
  - Focus on understanding technology and the technical requirements
  - No compliance approaches or compliance guidance
  - Encourage use of NERC Compliance Guidance Policy
- Begin implementing for all projects going forward
  - TPL-001-5 will not have rationale boxes in the standard
- [Technical Rationale in Reliability Standards](#)
- [Compliance Guidance Policy](#)



- At the September 2017 Standards Committee meeting, the SDT will seek authorization to post for a 45-day comment period and initial ballot
- An SDT meeting will be held to consider comments received
- Point of contact
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# Questions and Answers