

TPL-001-4

Request to RS for P5 stability contingencies and clearing times



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- **Standard TPL-001-4: Transmission System Planning Performance Requirements**
 - Requires PJM to study non-redundant relay failures for steady state and stability studies under category P5

Standard TPL-001-4 — Transmission System Planning Performance Requirements

Category	Initial Condition	Event ¹	Fault Type ²	BES Level ³	Interruption of Firm Transmission Service Allowed ⁴	Non-Consequential Load Loss Allowed
P5 Multiple Contingency (Fault plus relay failure to operate)	Normal System	Delayed Fault Clearing due to the failure of a non-redundant relay ¹³ 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 ⁵ 4. Shunt Device ⁶ 5. Bus Section 	SLG	EHV	No ⁹	No
				HV	Yes	Yes

- **Footnote 13:** Applies to the following relay functions or types:
 - pilot (#85), distance (#21), differential (#87), current (#50, 51, and 67), voltage (#27 & 59), directional (#32 & 67), tripping (#86 & 94)

- Current *PJM Fault Clearing Times* table does not specifically cover non-redundancy, only failure of primary relaying
- PJM is looking to add another fault category to the *PJM Fault Clearing Times* table
- PJM is requesting assistance from the Relay Subcommittee to identify P5 stability contingencies and clearing times

- SLG fault w/ Delayed Clearing - Due to Failure of a non-redundant relay (P5)
 - New category represents total clearing times (protective relay time + aux. tripping relay time + applicable timers + breaker time) by an adjacent zone of protection to clear a zone that has a non-redundant relay failure.
 - It is meant to capture clearing times (and facilities tripped) which differ from delayed clearing due to primary relay failure or delayed clearing due to stuck breaker scenario.
 - Zone 3 clearing times are to be considered where applicable.

- Information being requested:
 - Worst Case Fault Location
 - Non-Redundant Relays(s)
 - Tripped Facilities
 - Worst Case Total Clearing Times (cycles)
 - Fault Clearing Sequence and Times (cycles)
 - Close Generating Station(s)

- If the list of non-redundant locations is long, PJM would need guidance from a Transmission Owner's Planning department to help select which scenarios are worst case from a stability standpoint.

TPL-001-5

Potential changes that will impact Protection



- **Background**

- The SPCS¹ and the SAMS² conducted an assessment of protection system single points of failure in response to FERC Order No. 754, including analysis of data from the NERC Section 1600 Request for Data or Information.
- The assessment confirms the existence of a reliability risk associated with single points of failure in protection systems that warrants further action.

- **Result**

- TPL-001-5 (Standard NOT approved at this time)

¹NERC System Protection and Control Subcommittee

²NERC System Analysis and Modeling Subcommittee

<u>Category</u>	<u>Initial Condition</u>	<u>Event</u> ¹	<u>Fault Type</u> ²	<u>BES Level</u> ³	<u>Interruption of Firm Transmission Service Allowed</u> ⁴	<u>Non-Consequential Load Loss Allowed</u>
P5 Multiple Contingency (Fault plus relay-non-redundant component of a Protection System failure to operate)	Normal System	Delayed Fault Clearing due to the failure of a non-redundant relay component of a Protection System ¹³ protecting the Faulted element to operate as designed, for one of the following: 1. Generator 2. Transmission Circuit 3. Transformer ⁵ 4. Shunt Device ⁶ 5. Bus Section	SLG	EHV	No ⁹	No
				HV	Yes	Yes

13. For purposes of this standard, non-redundant components of a Protection System to consider are as follows:

- 1. A single protective relay**
- 2. A single communications system, necessary for correct operation of protective functions, which is not monitored or not reported**
- 3. 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**
- 4. A single control circuitry associated with protective functions through the trip coil(s) of the circuit breakers or other interrupting devices**
Applies to the following relay functions or types: pilot (#85), distance (#21), differential (#87), current (#50, 51, and 67), voltage (#27 & 59), directional (#32, & 67), and tripping (#86, & 94).



Questions?