

Comment Form for SAR and Technical Paper for Reliability of Protection Systems (Project 2009-07).

PLEASE DO NOT USE THIS FORM TO SUBMIT COMMENTS. Please use the electronic form located at the link below to submit comments on the proposed SAR and Technical Paper for Reliability of Protection Systems. Comments must be submitted by **February 18, 2009**. If you have questions please contact David Taylor at david.taylor@nerc.net or by telephone at 609-651-5089.

Background Information:

While the current TPL-series of NERC Reliability Standards generally address system design considerations related to system contingencies, those considerations are not adequate to address the complexities of Protection System performance for equipment failures within the Protection System itself.

Three system disturbances since 2004 were each caused by failure of a single component of a protection system as noted below:

- Westwing outage June 14, 2004 — single auxiliary relay on 230 kV line failed
 - Tripped about 5,000 MW of generation
 - Could have collapsed Western Interconnection
- Broad River Disturbance — August 25, 2007
 - Single lockout relay used to trip and initiate breaker failure timers on a generator step up transformer
 - Loss of 7 generating units at 3 plants — 871 MW
 - Loss of 5 — 230 kV transmission lines
- PacifiCorp East Disturbance
 - Single lockout relay used to trip and initiate breaker failure timers on generator step up transformer
 - Loss of 8 generating units at 3 plants — 2,803 MW
 - Loss of 4 — 345 kV transmission lines
 - 274 MW interruptible and 200 MW firm load shed

Protection system component failures may render a protective scheme inoperative, which could result in N-1 transmission system contingencies evolving into more severe or even extreme events. The proposed standard specifies which protection system component failures should be analyzed: AC Current Source, AC Voltage Source, Protective Relay, Communication Channel, DC Circuitry, Auxiliary Trip Relay, Breaker Trip Coil, and Station DC Source.

The proposed standard would require Transmission Owners, Generation Owners, and Distribution Providers that own Protection Systems installed on the Bulk Electric System to assure that a failure or removal of any one of the following components of Protection Systems will not prevent achieving the BES performance requirements identified in the TPL standards:

- Any single AC current source and/or related input to the Protection System excluding the loss of multiple CT secondary windings.
- Any single secondary AC voltage source and/or related input to the Protection System when such voltage inputs are needed excluding the complete loss of an entire CCVT, VT, or similar device with multiple secondary windings.

- Any single protective relay that is used to measure electrical quantities, sense an abnormal condition such as a fault, and respond to the abnormal condition.
- Any single communication channel and/or any single piece of related communications equipment, as listed below, used for the Protection Systems when such communication between protective relays is needed to satisfy R1.
 - Communications functions for communications-aided protection functions (i.e., pilot relaying systems)
 - Communications functions for communications-directed protection functions (i.e., direct transfer trip)
- The failure or removal of any single element of the DC control circuitry that is used for the Protection System.
- The failure or removal of any single auxiliary relay that is used for any of the above functions.
- The failure or removal of any single breaker trip coil for any breaker operated by the Protection System (If a single trip coil is used, the breaker failure scheme DC must be independent of the breaker trip coil DC).
- The failure or removal of any single station battery, or single charger, or other single DC source, where such losses are not centrally monitored for low voltage and battery open.

Please read the SAR and the Technical Paper — *Protection System Reliability — Redundancy of Protection System Elements* before answering the questions that follow.

You do not have to answer all questions. Enter All Comments in Simple Text Format.

Insert a "check" mark in the appropriate boxes by double-clicking the gray areas.

1. Do you agree that there is a reliability-related need for the proposed standard? Please provide comments to assist the requesters in understanding your response.

- Yes
 No

Comments:

1. The MRO NSRS does not believe there is an adequately demonstrated need for this SAR. The MRO NSRS does not think the three events given as an example have enough information to determine if they did or did not meet the TPL standards or the proposed standard. Also, would have meeting these requirements prevented these events?
 2. Rather than creating a new standard, the drafting team should consider a SAR that folds these requirements into the current TPL standards category C & D on Table 1, specifically C.6 through C.9.
 3. The MRO NSRS believes that the "Technical Paper - Protection System Reliability" is a good idea. The Technical Paper could be attached by reference from the "new" Table 1 (& 2) of the "revised" TPL standard(s), and referred to as "Good Utility Practice" for protection system reliability conformance to the TPL standards. The object is adequate performance and not simply redundancy.
2. Do you agree with the scope of the proposed standard? If not, please identify what you believe should be added or deleted and provide your reasons in the comment area.
- Not applicable — disagree that there is a reliability-related need for the standard
 Yes
 No

Comments:

1. The MRO NSRS believes the scope of the standard should be narrowed to apply to selected voltage levels, for example, transmission lines 300kV and above or those facilities associated with IROLs.
 2. The broad nature of the proposed scope would engage a disproportionate amount of planning and system protection resources compared to the reliability benefit. Under the current wording, utilities must consider and meet all possible contingency permutations for all BES voltage levels. A simple narrow and deterministic scope would provide a more efficient resource to reliability benefit.
 3. The MRO NSRS would like the Drafting Team to clarify the applicability between using backup and redundant protection systems as a mitigation measure.
3. Do you agree that the proposed standard should apply to Transmission Owners, Generator Owners, and Distribution Providers? If not, please explain which functional entities you believe should have responsibility for the proposed requirements.

- Not applicable — disagree that there is a reliability-related need for the standard
- Yes
- No

Comments:

1. The MRO NSRS believes that as long as the scope of the proposed standard is linked to the TPL standards, the Transmission Planner and Planning Coordinator should also be listed in the 'Applicability'. The first step in this process would be for the TP/PC to provide a list of facilities where protection systems component failure or removal could prevent the achieving of BES performance requirements.
2. Conditional applicability to GO/DP depending on whether their protection systems component failure or removal could prevent the achieving of BES performance requirements.
3. The MRO NSRS believes the scope needs to be delineated better to define protection systems other than those typically studied in the transmission planning standards. The current transmission planning standards do apply to generator owners but their applicability is limited to generator outages, select single-line-to-ground faults, or select three phase faults. The planning standards (or the future new consolidated transmission planning standard) are limited in scope, where as the reliable operation of a generation facility exceeds generator outages or the aforementioned faults. Please explain how this SAR addresses the reliable operation of generator protection systems? Since the technical paper, which this SAR is based on, focuses on transmission planning standards as a foundation, this SAR does not appear to address the reliable operation of generation protection systems.
4. Do you agree that there should be a requirement to analyze the impact to the bulk electric system for the failure or removal of each of the following protection system components? If you disagree with this proposed requirement, please explain in the comment area. (See the technical paper for a detailed discussion of each.)
 - AC Current Source
 - AC Voltage Source
 - Protective Relay
 - Communication Channel
 - DC Circuitry
 - Auxiliary Trip Relay
 - Breaker Trip Coil
 - Station DC Source

- Not applicable — disagree that there is a reliability-related need for the standard
- Yes
- No

Comments:

1. The drafting team should consider the probability of failure for each element and only consider elements that have a higher probability of failure.
2. The MRO NSRS would like the drafting team to define what they mean by 'redundancy'. Separate power powers supplies, separate batteries, separate charging, separated locations, cooling/heating.

3. The MRO NSRS would like to know if these considerations will be considered N-2 scenarios?
4. In the case of micro-processor based relays, there is neither redundancy nor backup inherent within a single relay. If the microprocessor fails, the relay fails. If the power supply fails, that relay fails although some do have a dual power supply option. Generally speaking when micro-processor based relays are applied, two relays must be applied to cover the same zone. This represents a certain amount of backup depending up DC sources, AC current and potential sources, two trip coils operated, multiple control cables, etc. and if the two relays are equally capable, then a certain amount of redundancy is achieved.

Complete redundancy is not achieved unless two batteries, two battery chargers, and series high voltage circuit breakers are applied (extreme case). These things are mentioned in the NERC technical paper "Protection System Reliability - Redundancy of Protection System Elements". However the paper didn't mention anything about separation of control wiring or separating trip functions between separate control cables. The paper did mention the "Two fiber paths between terminals (two fibers in the same cable are not acceptable)", which is hard to achieve but is correct.

The MRO NSRS does not have a problem with making a certain level of "reliability" into an enforceable standard. The MRO NSRS is a proponent of a multi-tier levels of graded reliability based on voltage level and stability thresholds. The MRO NSRS would hate to see "redundancy" become the standard, or large degrees of redundancy be required at lower voltage levels without a clear necessity.

With electro-mechanical relays, if at least 4 relays are applied to a line, one per phase and 1 residual ground, for multi-phase faults at least 2 phase relays would be able to detect and operate for the fault.

This would be considered redundancy. For phase-to-ground faults that are within reach of instantaneous operating elements, the residual ground relay will operate, and a phase relay may or may not operate depending upon the particular capability of the phase relay. If the phase relay can operate at the same time as the residual ground relay, it is redundant. If the phase relay can detect the fault but it operates slower, then it is providing backup capability. If the phase relay cannot detect the fault then it provides neither redundancy nor backup and to achieve relay redundancy a second residual ground relay must be applied.

5. If you are aware of any Regional Variances or Business Practices that should be considered with this project, please identify them here.
 Not applicable — disagree that there is a reliability-related need for the standard
 Unaware of any needed Regional Variances or Business Practices

Regional Variance:

Business Practice:

6. If you have any other comments on the SAR or the technical paper that you haven't already provided in response to the first five questions on this form, please provide them here.

Comments:

1. This standard should follow the revision of the TPL standards (TPL-001-01) because of its identified close ties to that body of work.
2. From the Electricity Modernization Act of 2005 (which appends the Federal Power Act): *“(2) This section does not authorize the ERO or the Commission to order the construction of additional generation or transmission capacity or to set and enforce compliance with standards for adequacy or safety of electric facilities or services.”*
3. Because of the nature of the industry, many entities would need upgrades. The standard drafting team would need to investigate manufacturer availability of equipment in the implementation plan time line for this standard. For example, should there be a 3 year implementation, but a 5 year backlog for equipment, how would entities be able to meet the standard?
4. The Standards Drafting Team should include words in the SAR requiring the SDT to consider grandfathering existing facilities prior to the release of the proposed standard. If there are concerns about new multifunction relays versus older systems which had some redundancy due to individual components, then the standard should only apply to any new protection systems.
5. Since the criteria mentions meeting TPL criteria, The MRO NSRS assumes that means that you would have to consider two N-1 contingencies within the same system. Does that mean that you would have to install "triple" redundancy to account for two singular A and B failures of the same type of system such as both communications channels? If you can't install triple redundancy, then do you have to perform comprehensive planning analyses to account for maintenance conditions?
6. What about system maintenance and real time operations or planning? When you lose one of your redundant components does your real-time operations and planning department have to run analyses to verify that you aren't in an "unknown" unstable state? Will you be able to alarm for the loss of all redundant components and if so wouldn't this overwhelm your system operators with unnecessarily?
7. Some communication aided schemes, such as DCB schemes using ground over current relays or certain phase comparison schemes become armed for a large number of false trips for external faults during communication failures. Having six or seven redundant tripping schemes on the line will not prevent these types of schemes from mis-operating for external faults. These schemes typically reach many times as far beyond the remote terminals than do distance based schemes. Where there are multiple alternate paths for power to flow in a stable manner when a line trips, these types of relays can protect system stability when high speed fault clearing is essential. When no suitable paths are available, these systems can cause problems.
8. Most of us in protective relaying do not consider faults to be contingencies. They are in fact, normal occurrences to be expected on the power system.