

Standard Authorization Request Form

Title of Proposed Standard Reliability of Protection Systems
Request Date: January 7, 2009
Authorized by Standards Committee: January 14, 2009

SAR Requester Information	SAR Type <i>(Check a box for each one that applies.)</i>
Name NERC System Protection and Control Task Force – See Attachment A	<input checked="" type="checkbox"/> New Standard
Primary Contact John Ciufu	<input type="checkbox"/> Revision to existing Standard
Telephone 416-345-5258 Fax 416-345-5406	<input type="checkbox"/> Withdrawal of existing Standard
E-mail john.ciufu@hydroOne.com	<input type="checkbox"/> Urgent Action

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Purpose (Describe what the standard action will achieve in support of bulk power system reliability.)

To ensure that Protection Systems are applied in such a manner that Bulk Electric System (BES) performance goals are achieved.

Industry Need (Provide a justification for the development or revision of the standard, including an assessment of the reliability and market interface impacts of implementing or not implementing the standard action.)

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.

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, Aux Trip Relay, Breaker Trip Coil, and Station DC Source.

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

- Westwing outage June 14, 2004 – single aux. relay on 230 kV line failed
 - Tripped about 5,000 MW of generation
 - Could have collapsed Western Interconnection
- Broad River Disturbance – Aug. 25, 2007
 - Single lockout relay used to trip and initiate breaker failure timers on GSU
 - 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 GSU
 - 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

The proposed standard would require facility owners to have protection systems installed such that the failure of one of the specified components of a protection system would not prevent meeting the BES performance specified in the TPL standards.

Mitigation of specified protection system vulnerabilities would have prevented each of the three identified disturbances from being more than an N-1 contingency.

Brief Description (Provide a paragraph that describes the scope of this standard action.)

The proposed standard requires facility owners to have protection system equipment installed such that, if there were a failure to a specified component of that protection system, the failure would not prevent meeting the BES performance identified in the TPL standards.

Detailed Description (Provide a description of the proposed project with sufficient details for the standard drafting team to execute the SAR.)

Please see the attached Technical Reference Document "Protection System Reliability –

Redundancy of Protection System Elements," which provides technical background for the proposed redundancy standard. The proposed requirements would require the following:

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.

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Reliability Functions

The Standard will Apply to the Following Functions <i>(Check box for each one that applies.)</i>		
<input type="checkbox"/>	Regional Reliability Organization	Conducts the regional activities related to planning and operations, and coordinates activities of Responsible Entities to secure the reliability of the Bulk Electric System within the region and adjacent regions.
<input type="checkbox"/>	Reliability Coordinator	Responsible for the real-time operating reliability of its Reliability Coordinator Area in coordination with its neighboring Reliability Coordinator's wide area view.
<input type="checkbox"/>	Balancing Authority	Integrates resource plans ahead of time, and maintains load-interchange-resource balance within a Balancing Authority Area and supports Interconnection frequency in real time.
<input type="checkbox"/>	Interchange Authority	Ensures communication of interchange transactions for reliability evaluation purposes and coordinates implementation of valid and balanced interchange schedules between Balancing Authority Areas.
<input type="checkbox"/>	Planning Coordinator	Assesses the longer-term reliability of its Planning Coordinator Area.
<input type="checkbox"/>	Resource Planner	Develops a >one year plan for the resource adequacy of its specific loads within a Planning Coordinator area.
<input type="checkbox"/>	Transmission Planner	Develops a >one year plan for the reliability of the interconnected Bulk Electric System within its portion of the Planning Coordinator area.
<input type="checkbox"/>	Transmission Service Provider	Administers the transmission tariff and provides transmission services under applicable transmission service agreements (e.g., the pro forma tariff).
<input checked="" type="checkbox"/>	Transmission Owner	Owns and maintains transmission facilities.
<input type="checkbox"/>	Transmission Operator	Ensures the real-time operating reliability of the transmission assets within a Transmission Operator Area.
<input checked="" type="checkbox"/>	Distribution Provider	Delivers electrical energy to the End-use customer.
<input checked="" type="checkbox"/>	Generator Owner	Owns and maintains generation facilities.
<input type="checkbox"/>	Generator Operator	Operates generation unit(s) to provide real and reactive power.
<input type="checkbox"/>	Purchasing-Selling Entity	Purchases or sells energy, capacity, and necessary reliability-related services as required.
<input type="checkbox"/>	Market Operator	Interface point for reliability functions with commercial functions.
<input type="checkbox"/>	Load-Serving Entity	Secures energy and transmission service (and reliability-related services) to serve the End-use Customer.

Reliability and Market Interface Principles

Applicable Reliability Principles <i>(Check box for all that apply.)</i>	
<input checked="" type="checkbox"/>	1. Interconnected bulk power systems shall be planned and operated in a coordinated manner to perform reliably under normal and abnormal conditions as defined in the NERC Standards.
<input checked="" type="checkbox"/>	2. The frequency and voltage of interconnected bulk power systems shall be controlled within defined limits through the balancing of real and reactive power supply and demand.
<input type="checkbox"/>	3. Information necessary for the planning and operation of interconnected bulk power systems shall be made available to those entities responsible for planning and operating the systems reliably.
<input type="checkbox"/>	4. Plans for emergency operation and system restoration of interconnected bulk power systems shall be developed, coordinated, maintained and implemented.
<input checked="" type="checkbox"/>	5. Facilities for communication, monitoring and control shall be provided, used and maintained for the reliability of interconnected bulk power systems.
<input type="checkbox"/>	6. Personnel responsible for planning and operating interconnected bulk power systems shall be trained, qualified, and have the responsibility and authority to implement actions.
<input checked="" type="checkbox"/>	7. The security of the interconnected bulk power systems shall be assessed, monitored and maintained on a wide area basis.
<input type="checkbox"/>	8. Bulk power systems shall be protected from malicious physical or cyber attacks.
Does the proposed Standard comply with all of the following Market Interface Principles? <i>(Select 'yes' or 'no' from the drop-down box.)</i>	
1. A reliability standard shall not give any market participant an unfair competitive advantage. Yes	
2. A reliability standard shall neither mandate nor prohibit any specific market structure. Yes	
3. A reliability standard shall not preclude market solutions to achieving compliance with that standard. Yes	
4. A reliability standard shall not require the public disclosure of commercially sensitive information. All market participants shall have equal opportunity to access commercially non-sensitive information that is required for compliance with reliability standards. Yes	

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Related Standards

Standard No.	Explanation
TPL-001-1, TPL-002, TPL-003, and TPL-004	The proposed protection system redundancy standard is intended to provide system protection performance that matches the BES system performance requirements of the TPL standards. Those standards are currently under revision.

Related SARs

SAR ID	Explanation

Regional Variances

Region	Explanation
ERCOT	
FRCC	
MRO	
NPCC	
SERC	
RFC	
SPP	
WECC	

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