NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Order 754 – System Protection Reliability Issues

Background on the NERC Industry Advisory

October 24, 2011

RELIABILITY | ACCOUNTABILITY




About NERC Alerts

- As part of its normal course of business, NERC often either discovers, identifies, or is provided with information that is critical to ensuring the reliability of the bulk power system in North America
- NERC utilizes e-mail based “alerts” designed to provide concise, actionable information to the electricity industry

More at: http://www.nerc.com/page.php?cid=5|63|253

About NERC Alerts

- As defined in its Rules of Procedure, NERC alerts are divided into three distinct levels, as follows:
  1. Industry Advisory - Purely informational, intended to alert registered entities to issues or potential problems. A response to NERC is not necessary.
  2. Recommendation to Industry - Recommend specific action be taken by registered entities. Require a response from recipients as defined in the alert.
  3. Essential Action - Identify actions deemed to be "essential" to bulk power system reliability. Require NERC Board of Trustees approval prior to issuance. Like recommendations, essential actions also require recipients to respond as defined in the alert.

Industry Advisory

- An Industry Advisory (lowest level of NERC Alert) was distributed on March 30, 2009 addressing the issue of protection system single point of failure
- Transmission Owners, Generator Owners, and Distribution Providers owning protection systems installed on the Bulk Electric System were advised to address single points of failure on their protection systems when identified in routine system evaluations to prevent N-1 transmission system contingencies from evolving into more severe or even extreme events

Industry Advisory available at:

http://www.nerc.com/fileUploads/File/Events%20Analysis/A-2009-03-30-01.pdf

Background

- The Industry Advisory was based on observations from NERC analysis of system events
- Three system disturbances were caused by failure of a single component (lockout or auxiliary relay) of a protection system in the 5 year period 2004 through 2008
- Protection system component failures may render a protective system inoperative, potentially causing:
  - Protection systems on adjacent elements to operate to clear a fault
  - Longer fault clearing times and tripping additional elements
  - N-1 transmission system contingencies to evolve into more severe or extreme events

Westwing Outage

- June 14, 2004 (Category 3 outage)
  - A single auxiliary relay on a 230 kV transmission line protection system failed
  - The auxiliary relay failure prevented a 230 kV circuit breaker from operating to clear the fault and also prevented initiation of the breaker failure protection
  - The event resulted in the loss of approximately 5,000 MW of generation and the potential for collapse of the Western Interconnection

Broad River Disturbance

- Aug. 25, 2007 (Category 2 outage)
  - A single lockout relay on a generator step up (GSU) transformer protection system failed
  - The lockout relay failure prevented tripping breakers and also prevented initiating breaker failure protection
  - The event resulted in the loss of seven generating units at three plants (totaling 871 MW) and the loss of five 230 kV transmission lines

PacifiCorp East Disturbance

- Feb. 14, 2008 (Category 3 outage)
  - A single lockout relay on a generator step up (GSU) transformer protection system failed
  - The lockout relay failure prevented tripping breakers and also prevented initiating breaker failure protection
  - The event resulted in the loss of eight generating units at three plants (totaling 2,803 MW), four 345 kV transmission lines, and the shedding of 247 MW of interruptible and 200 MW of firm load

Metric Data

- For the period 2004 through 2010, NERC analyzed 133 events
- These 133 events were disturbances with Category 1 through Category 5 system impact (the categories used to determine the level of analysis to be conducted)
  - In 5 of the 133 events a single point of failure was causal
  - In none of the 133 events was a single point of failure contributory or incidental