

SPCS Response to Standards Committee Request for Research

Project 2012-04

Protection System Commissioning Testing

March 5, 2013

Background

The NERC Standards Committee requested the NERC Planning Committee to provide research to support the Standard Development Process on the subject of “Protection System Commissioning Testing.” The Planning Committee assigned the NERC System Protection and Control Subcommittee (SPCS) responsibility for responding to this request. Specifically, the Standards Committee provided a draft need (problem) statement, goal (solution), and objectives (actions necessary to achieve the goal) and asked for the following information:

- “An updated Need/Problem Statement (or a statement of concurrence with the draft presented here)
- A statement indicating whether or not you believe this problem is one which needs to be addressed
- If you agree the problem needs to be addressed, a suggestion for how to address the problem
- If you suggest a standard be developed to address the problem, then please provide
 - An updated goal (or a statement of concurrence with the draft presented here)
 - An updated set of objectives in support of that goal (or a statement of concurrence with the draft presented here)
 - If you have specific recommendations for requirements language or additional information, please include them”

The Standards Committee request stems from a Reliability Standard Suggestions Form submitted in response to an event where an entity did not perform in-service testing as part of commissioning a new protection system. Specifically, the NERC suggestion paper states:

“An entity failed to employ proper commissioning testing practices during the installation of a new transformer. As a result, associated line relays were placed in service with the incorrect CT ratio. The defect remained undetected until the occurrence of a severe system disturbance when the relaying operated incorrectly, greatly increasing the magnitude and scope of the disturbance.”

The request for research proposed the following need statement.

Need (Problem)

Protection Systems can be set up to misoperate if not adequately tested during commissioning.

The request for research also proposed the following goal and objectives for consideration if development of a standard is appropriate.

Goal (Solution)

Require the creation and implementation of commissioning testing practices.

Objectives (Actions necessary to achieve the goal)

Require all applicable entities to have documented commission testing practices, which meet a certain minimum criteria

Require all entities to implement their commissioning testing practices prior to putting any protection system into service

The SPCS has assessed the request from the Standards Committee and provides below its responses to the specific questions asked, recommendations to address this issue, and supporting information.

Need (Problem) Statement

The SPCS agrees with the problem statement. It is clear that “Protection Systems can be set up to misoperate if not adequately tested during commissioning.” Inadequate or improper testing of protection systems during any time in the life cycle of a protection system may lead to a future misoperation.

The SPCS considers misoperations due to commissioning testing errors to be a relatively small subset of misoperations overall, and believes they are often, but not always, discovered upon initial energization. Further, it is the consensus of the SPCS that the event cited is not typical because commissioning testing that includes in-service tests to verify current and potential circuits are properly connected is a common practice throughout the industry. Regardless, the SPCS believes that addressing this problem could be beneficial for some entities.

Goal (Solution) Statement

The SPCS believes that establishing a goal to “Require the creation and implementation of commissioning testing practices” will increase burden on entities without a commensurate reliability benefit. The SPCS believes a more beneficial goal would be to “Improve existing commissioning practices through (i) analysis of protection system misoperations, (ii) sharing of lessons learned, and (iii) development of an industry reference document on protection system commissioning practices.”

Most Entities have effective commissioning processes currently in place, so the occurrence of these types of events is limited. Entities have developed commissioning processes from years of experience with their own particular variations in construction and protection practices. These processes are unlikely to be improved by a new reliability standard; only burdened by it. A reliability standard with broad requirements (e.g., entities must create and implement commissioning testing practices) would introduce additional documentation burden without providing real guidance to entities for improving their processes. Conversely, a standard with detailed requirements prescribing how to commission protection systems would undermine the various methods that entities have developed specific to their circumstances and could have an unintended, negative impact on reliability.

The existence of industry-wide commissioning processes is acknowledged in Compliance Application Notice (CAN) – 0043 which states “CEAs are to use commissioning test records to verify compliance with PRC-005 R2. These records establish an origin for testing and maintenance intervals (R2.1), as well as the date each Protection System device was last tested and maintained (R2.2).”

Objectives (Actions necessary to achieve the goal)

The SPCS believes a combination of reactive and proactive actions will assist entities in improving their existing commissioning practices and will alert entities regarding emerging issues related to new protection system equipment.

Analysis of Protection System Misoperations

One of the objectives of PRC-004 is to identify and address common causes of misoperations. Weak commissioning methods are a subset of these. The PRC-004 corrective action plan process has proven to cause entities to change their practices to avoid future misoperations. The presently effective version, PRC-004-2a, requires entities to “develop and implement a Corrective Action Plan to avoid future Misoperations of a similar nature.”¹ When misoperations are identified related to weak commissioning practices, revising commissioning practices is an effective method of preventing similar reoccurrences. Carrying out the requirements of PRC-004 as one action to address this need is particularly effective and fair in that it targets entities with weak commissioning practices, without increasing requirements for those who already have effective commissioning practices. The NERC events analysis process also targets and effects positive change in an entity in a similar manner for misoperation-related events with a larger scope. Although both of these approaches are effective and necessary, they are also reactive in that they require an event to occur and be analyzed prior to effecting change.

Sharing of Lessons Learned

A proactive approach would also be beneficial for those entities with inadequate commissioning practices. The complexities involved in creating a new standard to address commissioning testing would necessitate an effort likely to span many years. The SPCS believes this effort would ultimately

¹ This intent is carried forward with similar language in the present draft of PRC-004-3.

result in very little change in practices for most entities other than the added burden of documenting commissioning testing actions above what is already required for compliance with PRC-005. The SPCS believes that a more balanced and expedient approach to convey best practices and emerging issues in commissioning testing is via the issuance of NERC Lessons Learned documents. Lessons Learned documents are distributed throughout the industry. Entities generally have a process to review and incorporate the recommendations in NERC Lessons Learned documents where they apply to their existing practices. Using Lessons Learned as a proactive approach to monitoring and improving commissioning testing practices will not drain resources from entities that already have strong commissioning testing practices in place.

The SPCS recommends:

- The SPCS should draft a Lessons Learned document related to the proper verification of AC quantities as part of protection system commissioning.
- NERC should continue to use the Lessons Learned process to provide feedback so that industry is alerted of issues identified by entities through analysis of protection system misoperations and the event analysis process.

Development of an Industry Reference Document on Protection System Commissioning Practices

In addition, the SPCS believes that it would be beneficial to have a document on commissioning testing and that the IEEE Power System Relaying Committee (PSRC) is the appropriate body to create such a document. SPCS is prepared to submit a formal request to PSRC upon approval of this report.

This technical document was approved by the NERC Planning Committee on March 5, 2013.