



White Paper

PRC-027-1 Solution for Power Plants

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Introduction:

On June 7, 2018, FERC approved the NERC Reliability Standard PRC-027-1: Coordination of Protection System Performance During Faults. This standard mandates that generator, transmission, and distribution owners *establish a process for developing new and revised protection settings* and are properly coordinated with interconnected utilities as part of Requirement 1. This requirement must be completed by October 1, 2020. The standard also mandates that generator, transmission, and distribution owners *perform a relay coordination study* over a period not to exceed six years. The standard will primarily affect transmission systems due to their inherently large systems. This is where automation programs like Settings Automation Relay Assistant (SARA) can help by streamlining the entire relay setting development process. Unlike transmission systems where there is an entire department full of protection engineers and automation programs, power plants may or may not have the expertise and technology to implement a solid and concise process that is NERC Audit worthy. Therefore, unique expertise will be crucial in putting together a process which power plant owners can easily implement and apply.

Standard Requirements:

R1: Each transmission owner, generator owner, and distribution provider shall establish a process for developing new and revised protection system settings for BES elements, such that the protection systems operate in the intended sequence during faults. The process of relay setting development should be a series of steps that guides the settings engineer to achieve reliable and properly coordinated settings. First, any power plant should have a solid protection philosophy that establishes the guidelines for setting the functionality of protective relays. When developing a protection philosophy, clear indication should be given for special cases where the normal procedures are not most suitable for certain applications. Next, a set of calculation sheet templates embedded in a spreadsheet or automation program should be implemented in order to maintain consistency and uniformity throughout the company. In this way, multiple engineers or consulting parties can follow the same standard procedures, preventing an inconsistent set of settings and formats.

R1.1: A review and update of the short-circuit model data for the BES elements under consideration. Generator owners must verify that the generator and step-up transformer parameters are correctly modeled in the short circuit program before any faults or coordination is performed. Much of this information will be found in the transformer and generator test report and nameplate data. Incorrect information in the model will result in erroneous faults and settings.

R1.2: A review of the developed protection system settings. As part of the setting development process, generator owners can implement a peer review process that guarantees that the relay settings have been reviewed by a medium other than the original setter. A peer review process can include separate engineers or an automation program that performs the same calculations as the original setter. This provides an additional layer of verification that can uncover errors before final settings are issued to the field.

R1.3: For facilities that are electrically owned and interconnected with different entities, generator owners must provide, respond, and communicate any relay setting changes prior to any implementation.

R2: Each transmission owner, generator owner, and distribution provider shall:

1. Perform a protection system coordination study in a time interval not to exceed six calendar years;
2. Compare present fault current values to an established fault current baseline when the comparison identifies a 15 percent or greater deviation in fault current values; or
3. Combination of the two.

Depending on the level of resources, the first option is the most straight forward since it does not require continuous checking of fault currents and it simplifies documentation and planning.

SynchroGrid’s Offering:

SynchroGrid has been performing manual and automated relay settings development processes for many years. These automated processes are flexible enough that they can easily be adopted by generator owners to help them meet the standard criteria. These proven and innovative processes provide protection function calculations templates embedded with PRC-019, PRC-024, PRC-025, and PRC-026 procedure verification. They also include routine scripts that automate repetitive tasks and, above all, automated reports for NERC auditing.

Once these procedures have been determined and solidified, generator owners will not have to “recreate the wheel” every time they develop new or revised relay settings. The processes can be followed by protection engineers within the power plant or by outside consultants. As a result, consistency and uniformity will be established throughout the entire company, especially if there are fleets of units located in multiple areas or if settings are developed by multiple parties. The importance of this standard cannot be overemphasized since tripping a crucial generator unintentionally can have catastrophic and expensive consequences. Therefore, careful consideration of the right solution should be made when implementing this standard.

