GRIDSCALE X ADVANCED PROTECTION ASSESSMENT

Compliance Module

Perform automated protection reliability audits and studies
to support regulatory compliance

SIEMENS

At a glance

With the increasing number of regulatory requirements being imposed on protection departments within transmission and generation utilities, it is important to have a relay protection simulation software package to assist with meeting these voluminous requirements and help utilities understand the reliability of their protection system. The Advanced Protection Assessment Compliance Module will help make this process for compliance with North American Electric Reliability Corporation (NERC) regulatory requirements more efficient and effective.

The challenge

Power utilities are mandated to comply with NERC regulatory standards which seek to assure their protection systems prevent and abate catastrophic outages and cascading events, while still correctly clearing faulted conditions. Typically, the utility protection department is responsible for providing comprehensive reports showing evidence their system complies with these standard requirements. This task can be very time consuming and repetitive, including gathering, analyzing, maintaining, and preparing the data required for reporting.

Our solution

Leading the market for highly detailed protection simulation, Advanced Protection Assessment enables protection engineers around the world to be more effective and their power system to be more reliable. It is trusted by transmission and distribution protection engineers to support their entire workflow, including detailed protection data collection, electronic setting management, setting calculations and validation. The Advanced Protection Assessment Compliance Module enhanced features to help customers achieve compliance with specific NERC PRC standards, including:

- PRC-002 Identifying Required BES Buses for Events Recording (SER) and Fault Recording Data
- PRC-019: Coordination of Generator Voltage Regulator Controls with Unit Capabilities and Protection
- PRC-023: Transmission Relay Loadability
- PRC-024: Frequency and Voltage Protection Relay Settings for Generating Resource
- PRC-025: Generator Relay Loadability
- PRC-026: Stable Power Swing Relay Loadability
- PRC-027: Protection System Coordination for Performance During Faults

Compliance Module Key Benefits

- Setup, save and store study parameters in Advanced Protection Assessment to intuitively rerun the same compliant study in the future
- View colored coded study results to easily identify areas of non-compliance that require remedy actions
- Easily maintain and store study data in a database – allowing you to compare study results over time
- Supports with providing documentation to prepare compliance reports

Setup once, study anytime

Compliance is not a one-time event and utilities must continuously work to ensure that compliance is maintained on an ongoing basis. With the Advanced Protection Assessment Compliance Module, you can setup your compliance studies, save the settings parameters and then rerun these studies with just a few easy clicks. The ability to save and store the settings parameters ensures that your studies are run consistently and accurately every time. The data from each study is automatically stored in a database – where you can easily review and compare the results of your studies. Maintaining the data is an important aspect of being able to provide records of compliance during an audit.

Compliance standards reporting support

The Advanced Protection Assessment Compliance Module will provide protection engineers support for eight NERC PRC standards. With the increasing number of regulatory requirements being imposed on utilities, it is important to have one relay protection simulation software tool that can assist with meeting these voluminous requirements and support your protection engineers to conduct their daily job requirements. There is no need for a separate application when one solution can meet your needs.

Supported NERC PRC standards

PRC-002: Disturbance Monitoring and Reporting Requirements

The purpose of PRC-002 is to have adequate data available to facilitate analysis of Bulk Electric System (BES) Disturbances. To comply with NERC PRC-002, it is required that the Transmission Owners "identify BES buses for which sequence of events recording (SER) and fault recording (FR) data is required by using the methodology in PRC-002, Attachment 1," with the purpose of having adequate data available to facilitate analysis of Bulk Electric System (BES) disturbances.

The Advanced Protection Assessment Compliance Module offers the ability for quickly checking whether your BES system has the minimum number of fault recorder equipment and disturbance monitoring devices per standard. The Advanced Protection Assessment PRC-002 component of the Compliance Module delivers that number to you in just a few clicks.

PRC-019: Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls and Protection

The Compliance Module of Advanced Protection Assessment verifies that the generating unit facility or synchronous condenser voltage regulating controls, limit functions, equipment capabilities and protection system settings are properly coordinated. The capability curves, control and limit curves of the generators are easily stored in the Advanced Protection Assessment database. The protective devices modeled in Advanced Protection Assessment for coordination validation include loss-of-excitation, voltage, Volts/Hz, and over-excitation protection. Auditable compliance reports can be generated automatically.

PRC-023: Transmission Relay Loadability

Per standard, It is important that protective relay settings do not limit transmission loadability, or interfere with a system operators' ability to protect system reliability. Protective relays must be set to reliably detect all fault conditions and protect the electrical network from these faults.

Using the Compliance Module, users can perform transmission line loadability studies on one, several or all the BES lines of your system automatically. Once the data is prepared, Advanced Protection Assessment automatically identify your load-responsive protection and study them for loadability compliance. The user controls the studied contingency scenarios, are controlled by the user, as the Compliance Module provides summary reporting and detailed reporting at your fingertips.

PRC-024: Frequency and Voltage Protection Settings for Generating Resources

This standard defines the requirement for Generator Owners to set their generator protective relays to ensure that generating units remain connected during defined frequency and voltage excursions.

The PRC-024 Advanced Protection Assessment Compliance Module function simulates the performance of voltage, frequency and volts-per-hertz protective devices protecting generation units, transformer GSUs, high-side of UATs of the BES under voltage or frequency disturbance from the system. Their performance is then compared to the boundary curves defined in the NERC PRC-024 standard to check whether the studied protection meets the requirements. The protection studied may come from relay or control unit. Auditable compliance report data and auxiliary graphs are generated automatically.

PRC-025: Generator Relay Loadability

This function evaluates the generator relay loadability. Based on the system data, all load-responsive protections that need to comply with the standard are picked out automatically, as well as the PRC-025 Option that applies due to its location within the generation plant. Regardless of the complexity of the generation plant topology, the Compliance Modules determines the compliance using the standard's conservative calculation (Option A) and the special power flow solution specified by the standard (Option B). This latter is Advanced Protection Assessment determined with an in-house developed methodology which considers the special requirements of the standard regarding the real power and reactive power in the generators and voltage level at the point-of-interconnection. Summary reporting and detailed reporting of calculations steps are available by user's choice.

PRC-026: Relay Performance During Stable Power Swings

The Advanced Protection Assessment Compliance Module evaluates impedance-based protection and overcurrent protection under stable power swing conditions to ensure that load-responsive protective relays will not trip in response to these stable power swings under no fault conditions.

A unique power swing stability boundary is established for each impedance-based protective element in the Compliance Module based on the relay location and network parameters. Phase overcurrent relay pickup settings are compared with the maximum system current. Automatic batch study is enabled in the Compliance Module to reduce errors in the evaluation by decreasing manual intervention and human errors for repetitive tasks.

PRC-027: Coordination of Protection Systems for Performance During Faults, Requirement 2, Option 1

Advanced Protection Assessment is the pioneer in protection system simulation, developing through the years, multiples tools and applications, from those analyzing a single contingency, to those automizing thousands of coordination studies, each with great reporting capabilities.

The PRC-027 application in the Compliance Module goes straits ahead. It is a complete suite of tools that allows you to flexibly configure massive automated coordination studies of the part of the system you would like to evaluate for compliance. The amount of produced results may be staggering and thus difficult to manipulate. This is a problem that the Compliance Module help you managing, as these results are stored in a separate SQL database. The PRC-027 coordination studies result database may be tapped by the Compliance Module to extract, summarize and consolidate multiple reports, produce from different perspectives: you may choose reporting coordination/ miscoordination/coordination time interval violations, violating relays/elements, summarizing of performed study, etc. By tagging the dates of those studies, the Compliance Module allows you to easily track the status of your protection coordination compliance.

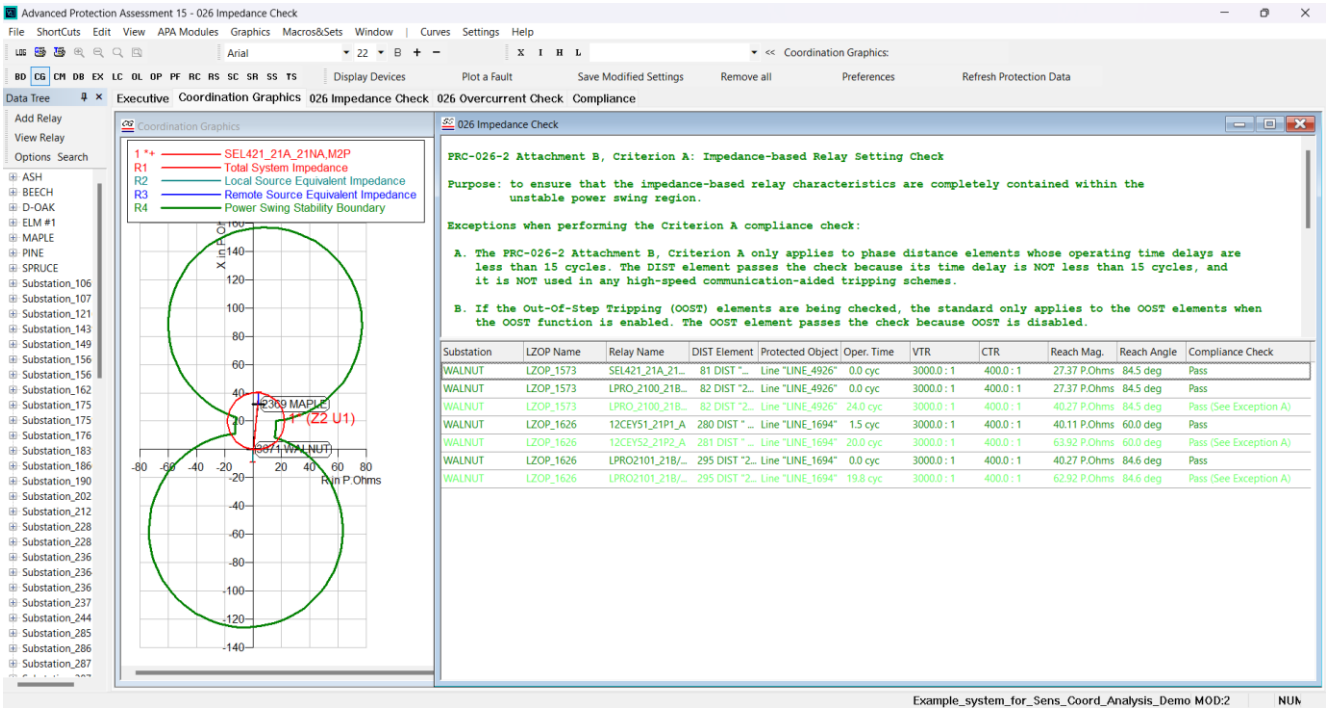

Figure 1: PRC-026 distance element evaluation results and Power Swing Boundary plot – Graphical and written color-coded results help you easily determine whether the distance protection under study is complaint with the Power Swing Boundary requirements of the NERC PRC-026 standard.

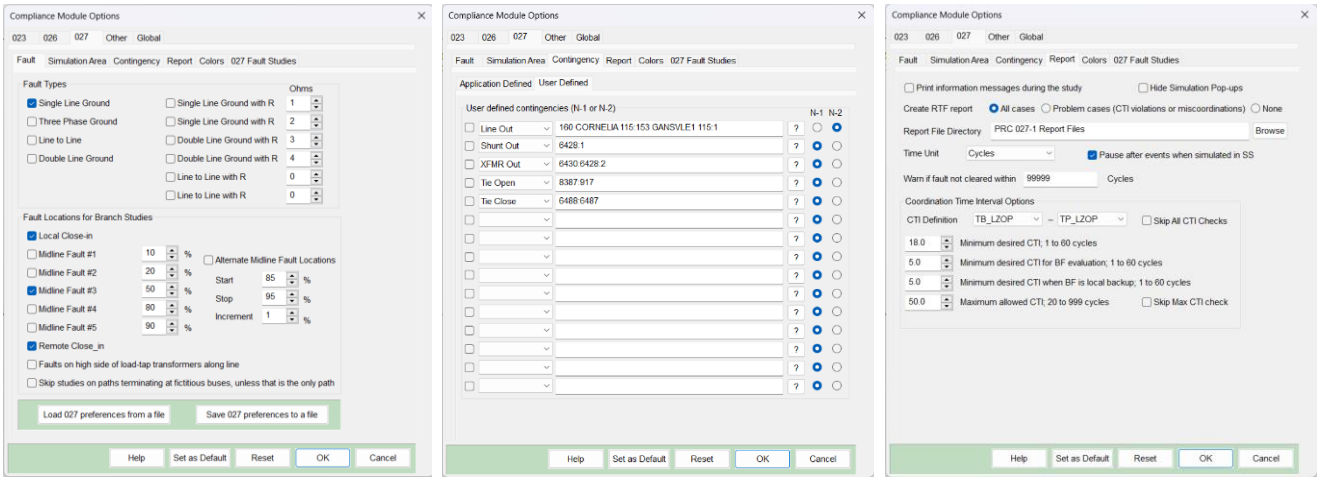

Figure 2: PRC-027 Requirement 2 Option 1: Coordination Study Setup Options – Define the types of faults, fault locations and N, N-1, N-2 contingencies for running automatic coordination studies for the line(s) of your preference. Reporting preferences and post-processing criteria are available for user customization.

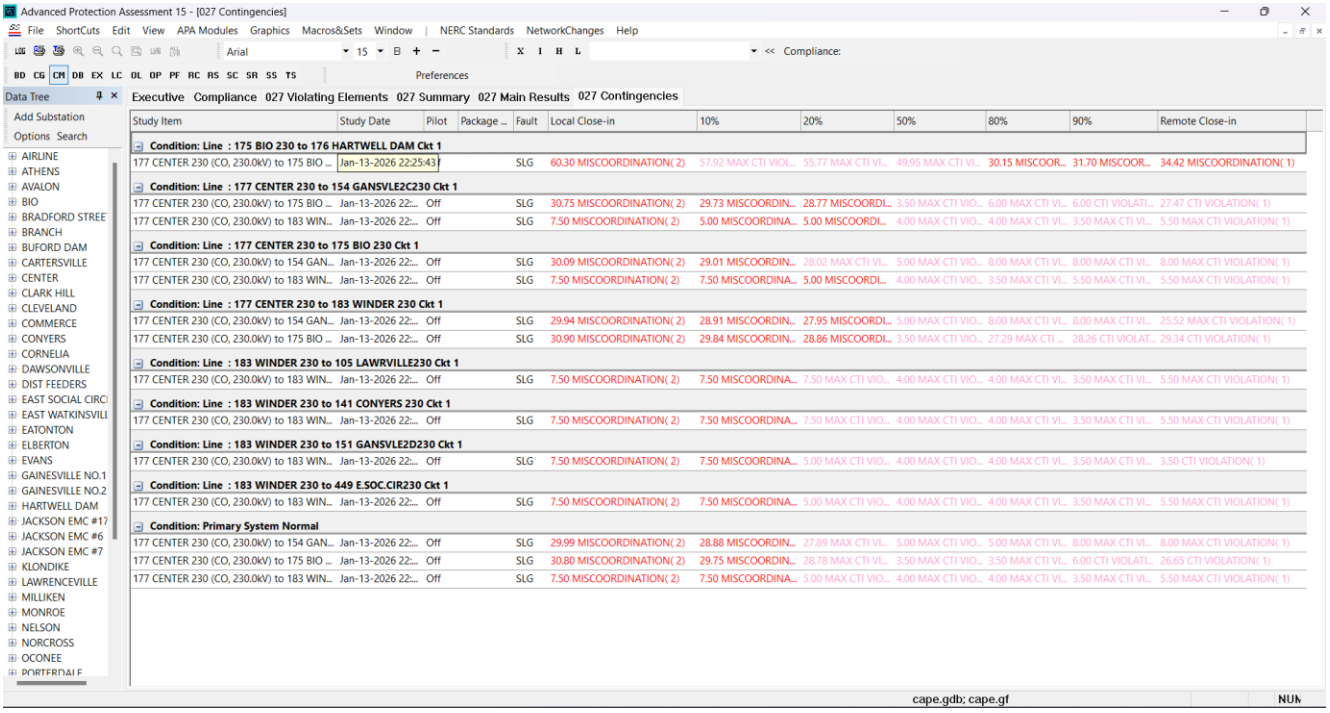

Figure 3: PRC-027 Requirement 2 Option 1: Coordination Study Contingency Report – The detailed, organized, color coded report information makes it straightforward to identify compliant coordination studies and the violating protection functions which require remedy actions.

PRC-027: Coordination of Protection Systems for Performance During Faults, Requirement 2, Option 2

PRC-027 requires utilities to maintain the coordination of protection devices to detect and isolate faults on Bulk Electric System (BES) Elements, such that those protective relays and systems operate in the intended sequence during faults.

Short-circuit studies of your BES buses are necessary to form a baseline and is easily done in the Compliance Module. These results are stored and historically tagged in your Advanced Protection Assessment production database. Identifying which BES buses in your system violate the PRC-027 Requirement 2, Option 1 threshold and performing coordination studies based on those buses, is readily available.

This identification may be made at different levels: by substation, by Local Zone of Protection (LZOP), etc.

Future compliance standards

Advanced Protection Assessment is constantly being updated to provide support for future NERC PRC standards and other regulatory requirements faced by our customers.

Contact the Siemens Advanced Protection Assessment team for the latest information on NERC PRC compliance support within Advanced Protection Assessment.

Outside North America, these standards may be utilized to evaluate the reliability of your protection system.

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