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White Paper

Understanding PRC-023-6: Ensuring Transmission Relay Loadability and System Reliability

What is NERC PRC-023-6?

NERC PRC-023-6 regulation, effective as of February 2024, is a regulatory standard aimed at managing the complex relationship between transmission relay settings, loadability, and system reliability. It provides guidelines for setting protective relay parameters, with the goal of striking a delicate balance between maximizing transmission line capacity and ensuring robust protection against faults and disturbances.

The primary objective of PRC-023-6 is to safeguard the integrity of the electrical network by ensuring that protective relay settings do not limit transmission loadability while still providing reliable protection against fault conditions. The regulation emphasizes meticulous evaluation and setting of relay parameters to achieve a balance between loadability and system protection. By establishing clear guidelines for relay settings and fostering collaboration among transmission stakeholders, PRC-023-6 serves as a cornerstone for maintaining the reliability and resilience of the Bulk Electric System (BES).

Key requirements of PRC-023-6 include criteria for relay settings, circuit capability assessment, reporting obligations, and planning coordination responsibilities.

Criteria for Relay Settings

R1 outlines specific criteria that transmission owners, generator owners, and distribution providers must adhere to when configuring relay parameters. These criteria are meticulously designed to prevent phase protective relay settings from limiting transmission system loadability while ensuring efficient detection and mitigation of fault conditions. Stakeholders are required to evaluate relay loadability at 0.85 per unit voltage and a power factor angle of 30 degrees. Moreover, R1 offers a range of criterion options, including seasonal facility ratings, theoretical power transfer capability, series compensation considerations, and characteristics of weak source systems. This flexibility allows stakeholders to tailor relay settings according to the unique circumstances of the transmission line or transformer, striking an optimal balance between loadability and protection requirements.

Circuit Capability Assessment

In addressing scenarios where practical limitations may affect circuit capability, R3 mandates stakeholders to calculate and collaborate on the circuit's capability with neighboring utilities. This involves identifying and assessing practical limitations that may impact the circuit's ability to carry load or withstand fault conditions effectively. Transmission owners, generator owners, and distribution providers are required to work closely with planning coordinators, transmission operators, and reliability coordinators to determine and agree upon the circuit's capability under these limitations. The calculated circuit capability serves as the foundation for determining the facility rating of the circuit, promoting transparency and accountability in assessing system reliability.

Reporting Obligations

R4 and R5 emphasize the importance of transparent reporting to monitor compliance with PRC-023-6 requirements and ensure system reliability. Transmission stakeholders are mandated to provide updated lists of circuits associated with relay settings to planning coordinators, regional entities, and neighboring utilities at least once each calendar year. These regular updates facilitate oversight by regulatory bodies and ensure that relay settings do not compromise system reliability. Transparency in reporting fosters trust and collaboration among stakeholders, ultimately contributing to the resilience of the Bulk Electric System.

Planning Coordinator Responsibilities

Lastly, R6 outlines the responsibilities of planning coordinators in identifying circuits subject to PRC-023-6 requirements and disseminating relevant information to stakeholders. Planning coordinators are required to conduct assessments at least once each calendar year to identify circuits subject to PRC-023-6 requirements, ensuring ongoing monitoring of compliance. Identified circuits, along with relevant details, must be promptly communicated to all relevant stakeholders, including regional entities, reliability coordinators, transmission owners, generator owners, and distribution providers. This proactive approach facilitates collaboration and ensures

consistent understanding of compliance obligations across the board, thereby enhancing the reliability and resilience of the Bulk Electric System.

PRC-023-6 is essential for ensuring the robustness of transmission systems amidst evolving grid dynamics. By prioritizing both loadability and protection, it establishes a framework for maintaining a resilient and efficient electrical infrastructure, crucial for meeting the energy needs of society while mitigating potential risks.

How can SynchroGrid help?

SynchroGrid has a proven track record of providing comprehensive support in navigating and complying with NERC PRC-023 standards. Through our extensive experience in conducting PRC-023 studies, we have assisted numerous clients in evaluating the loadability of their transmission systems and ensuring compliance with regulatory requirements.

For instance, in one project encompassing approximately 180 terminals, we meticulously evaluated all transmission line and transformer relays to check for compliance with NERC PRC-023-4, specifically focusing on R1. Our team conducted thorough calculations to assess the load-responsive phase protection elements within the client's system, identifying areas where adjustments were needed to align with the latest NERC guidelines.

Through our expertise and attention to detail, SynchroGrid assists clients in optimizing relay settings, enhancing system reliability, and ensuring compliance with regulatory standards NERC PRC-002 through PRC-027.

***Reference**:*

https://www.nerc.com/pa/Stand/Reliability%20Standards/PRC-023-6.pdf