WECC

Guideline for Protection System Loadability

Relay Work Group

March 2021

Table of Contents

Introduction

The Arizona-Southern California Outages on September 8, 2011 report identified transformers and lines that had protection system operations that impacted the Bulk Electric System (BES). These facilities did not appear to have been subjected to a severe overload and may have been within safe operating limits.

Purpose

This guideline recommends best practices for use by transmission entities in the Western Interconnection for the setting of load-responsive relays to avoid unnecessary operation due to loading during non-fault conditions. While NERC PRC-023 addresses this issue for some elements of the transmission system, there are many elements in the underlying systems that are not addressed where relay loadability can impact the reliability of the BES.

Guideline for Setting Load Responsive Relays

Load responsive relays on certain elements of the BES must be set to comply with the applicable revision of PRC-023. Relays on transformers and transmission lines that are operated in parallel with the BES, but are not subject to PRC-023, should also be set with an appropriate margin to ensure that the relays will allow the facility to be operated at the maximum established emergency rating.

It is important that Transmission Owners, Generator Owners, and Planning Coordinators assess elements operated in parallel with the BES to determine whether the status of the elements is used in the planning and operation of the BES. Facility ratings of those lower-voltage elements must be determined pursuant to FAC-008 and included in the submittals to their associated Reliability Coordinator(s), Planning Coordinator(s), Transmission Planner(s), Transmission Owner(s) and Transmission Operator(s) pursuant to requirement R8 of FAC-008-3.

The WECC Relay Work Group recommends that Transmission Owners of elements to which PRC-023 is not applicable, but that operate electrically in parallel with BES elements, should (where practicable) have load-responsive relays set in accordance with one of the setting criteria in PRC-023.

Guideline for Phase Angle Difference

Another condition associated with line loading is the phase angle difference that will exist between buses after a line trips. Where phase angle difference is used to supervise closing of a breaker, care should be taken to ensure closing is not unnecessarily blocked. For locations where system conditions may exceed settings, consideration should be given to provide visibility of the phase angle difference to the Transmission Operator. Sources of the data may include seasonal or day ahead planning studies, state estimator, real-time contingency analysis, Phasor Measurement Units (PMU) and synch check relays.

Disclaimer

WECC receives data used in its analyses from a wide variety of sources. WECC strives to source its data from reliable entities and undertakes reasonable efforts to validate the accuracy of the data used. WECC believes the data contained herein and used in its analyses is accurate and reliable. However, WECC disclaims any and all representations, guarantees, warranties, and liability for the information contained herein and any use thereof. Persons who use and rely on the information contained herein do so at their own risk.

Additional Resource Information

- None

Version History

Modified Date	Modified By	Description
November 29, 2012	Relay Work Group	Drafted
December 6, 2012	Technical Operations Subcommittee	Approved
February 7, 2013	Operating Committee	Approved
March 16, 2021	Relay Work Group	Updated branding and ensured relevancy