

Information documents are not authoritative. Information documents are for information purposes only and are intended to provide guidance. In the event of any discrepancy between this information document or supplemental documents referenced in this information document and any authoritative documents in effect, the authoritative documents governs.

1 Purpose

This information document relates to the following authoritative document¹:

- PRC-019-AB-2 *Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection* (“PRC-019-AB-2”).

The purpose of this information document is to provide information on the use of the North American Electric Reliability Corporation’s PRC-019-2 *Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection* (“NERC PRC-019-AB-2”).

2 Use of NERC Supplementary Reference and FAQ document for PRC-019-AB-2

As with every reliability standard, each responsible entity is responsible for determining what actions are necessary to meet the requirements in PRC-019-AB-2 for each of their facilities.

The AESO generally agrees with the information contained within NERC PRC-019-2 section “F. Associated Documents” and section “G. Reference – Examples of Coordination” and recognizes that those sections may be a useful reference for market participants as they implement PRC-019-AB-2. In addition, the AESO may use NERC PRC-019-2 section “G. Reference – Examples of Coordination” as reference material in assessing compliance with PRC-019-AB-2 where it determines that these examples are applicable.

3 Guidance on Requirement R1:

The term “in-service”, in reference to limiters and protection system devices, means those limiters or protection functions that are installed and activated on the generator or synchronous condenser.

The phrase “at a maximum of every 5 calendar years” means that from the year in which the last coordination of voltage regulating system controls occurred, the applicable entity has until the end of the following 5th calendar year to complete the next coordination of voltage regulating system controls. For example, if an entity performed coordination on May 15, 2018, they would then need to perform coordination again by December 31, 2023.

The following diagrams are included in this document as examples of coordination among generator/synchronous condenser’s capability, generator protection relays, and voltage regulation controls and limiters.

¹ “Authoritative documents” is the general name given by the AESO to categories of documents made by the AESO under the authority of the *Electric Utilities Act* and regulations, and that contain binding legal requirements for either market participants or the AESO, or both. AESO authoritative documents include: the ISO rules, the reliability standards, and the ISO tariff.



Figure 1- Example of generator/synchronous condenser field winding thermal capability coordination

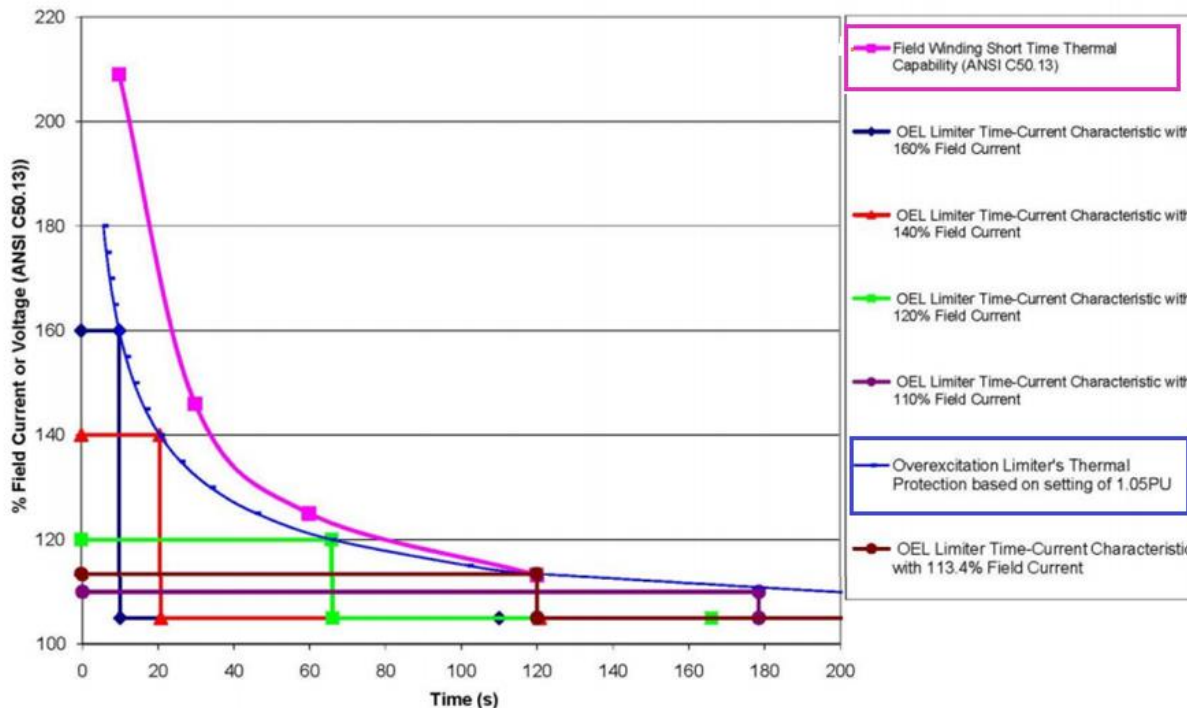


Figure 2- Example of over excitation capability coordination

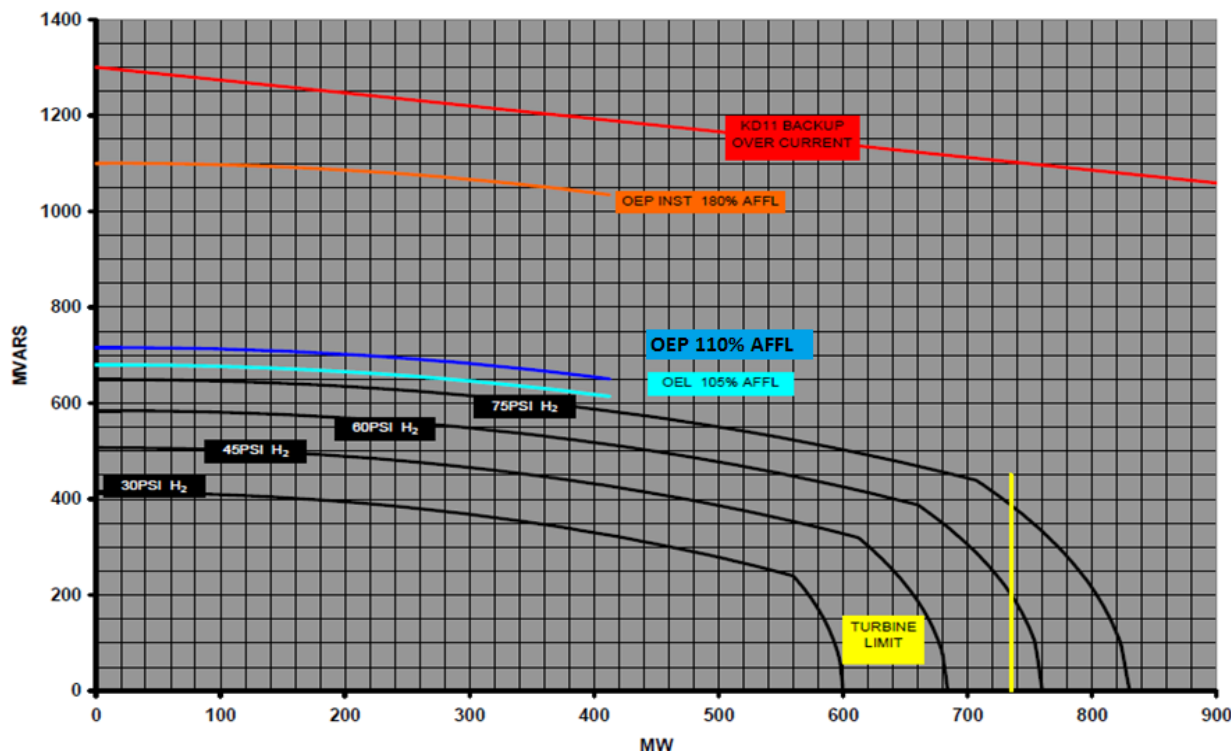


Figure 3- Example of over excitation capability coordination

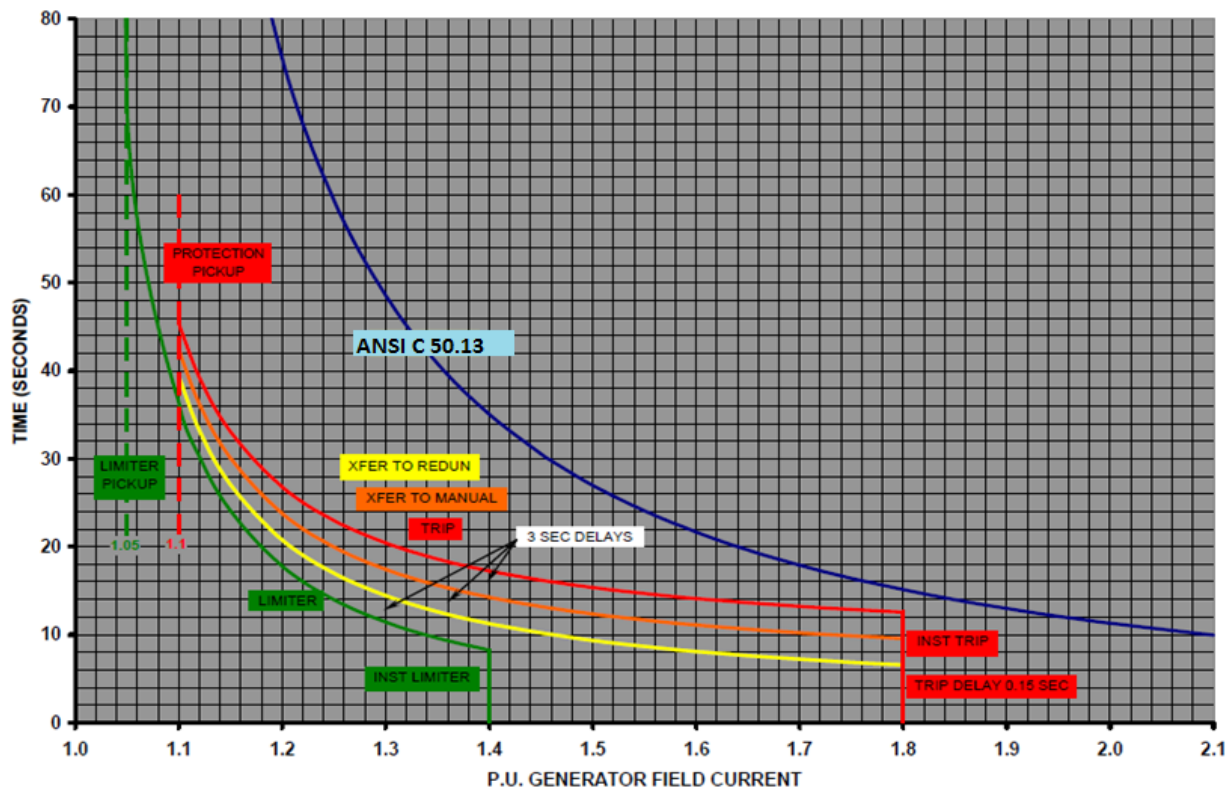


Figure 4- Example of under excitation zone coordination

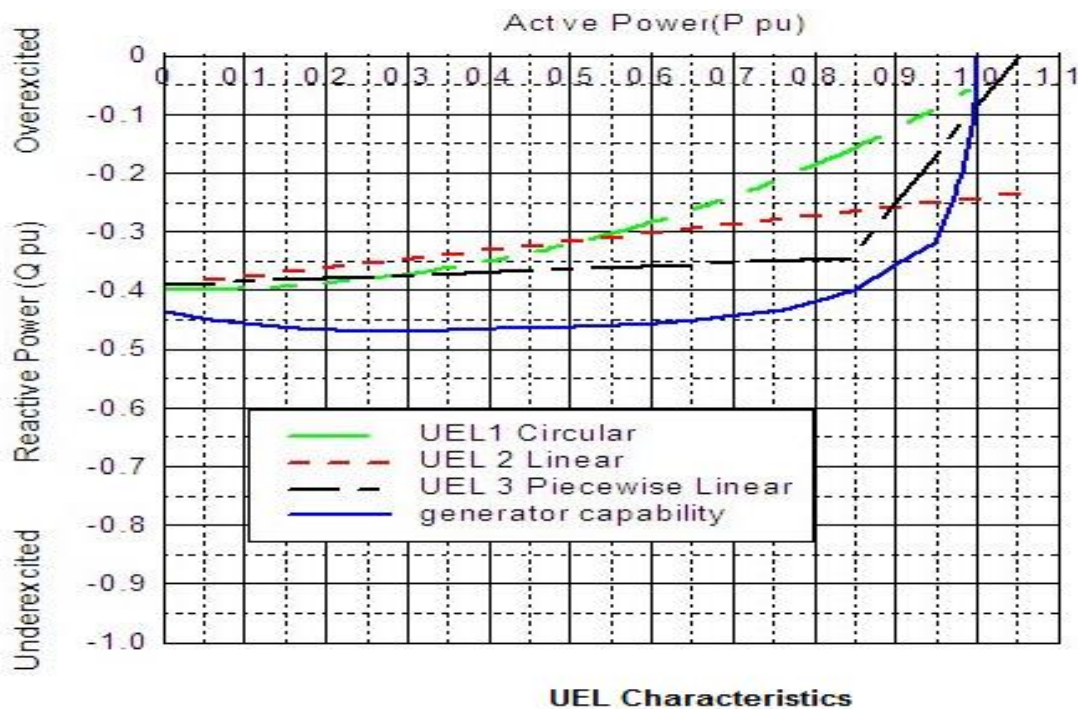
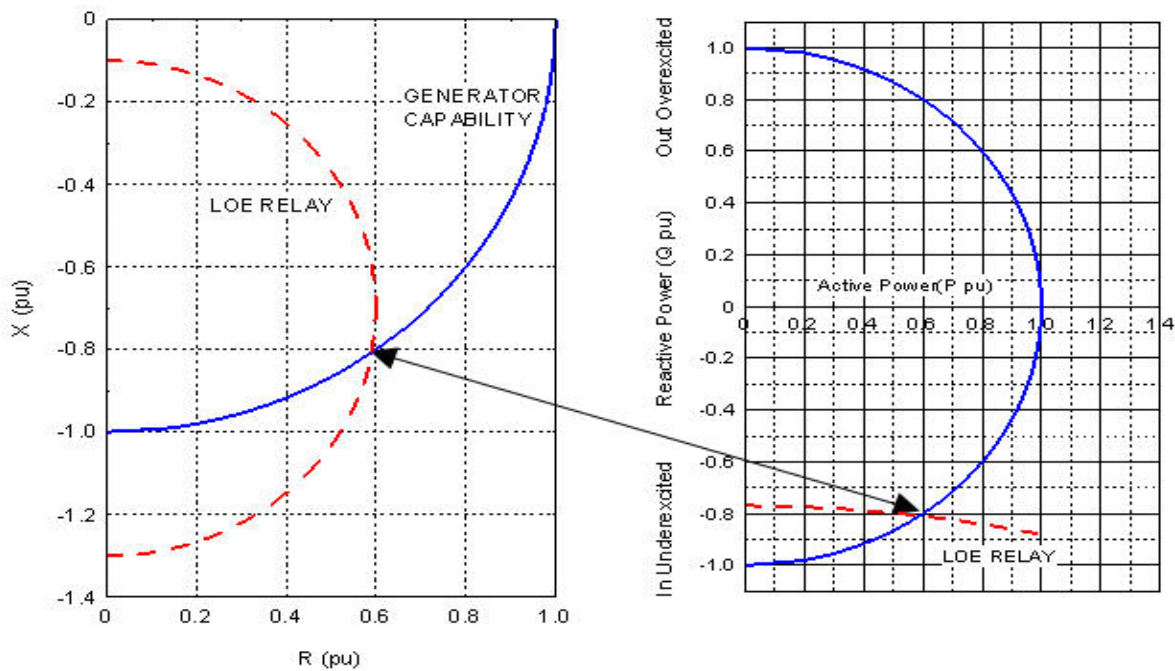


Figure 5- Example of under excitation zone coordination



LOE in RX and PQ Planes

Figure 6- Example of under excitation zone coordination

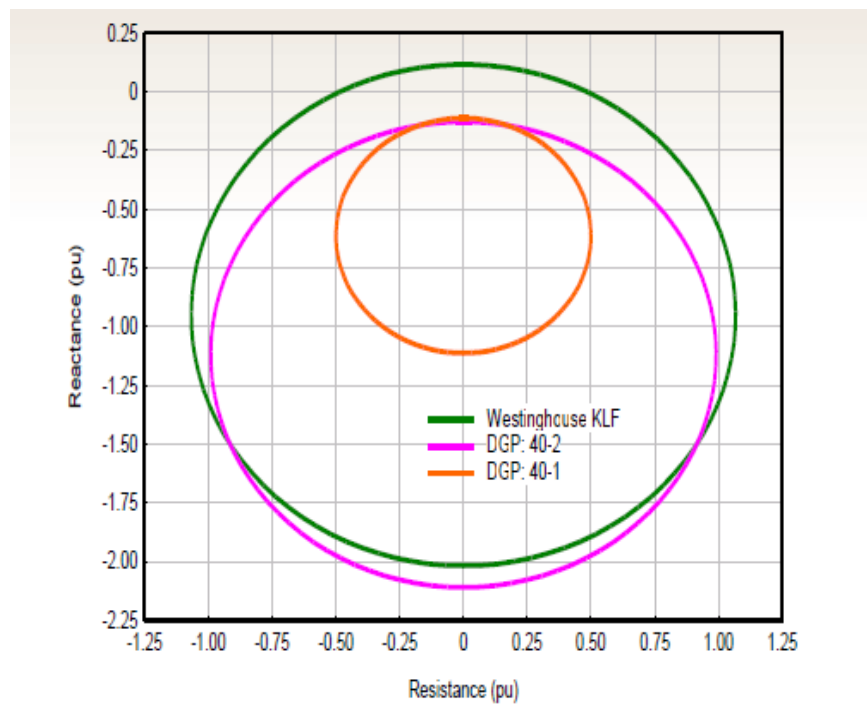




Figure 7- Example of under excitation zone coordination

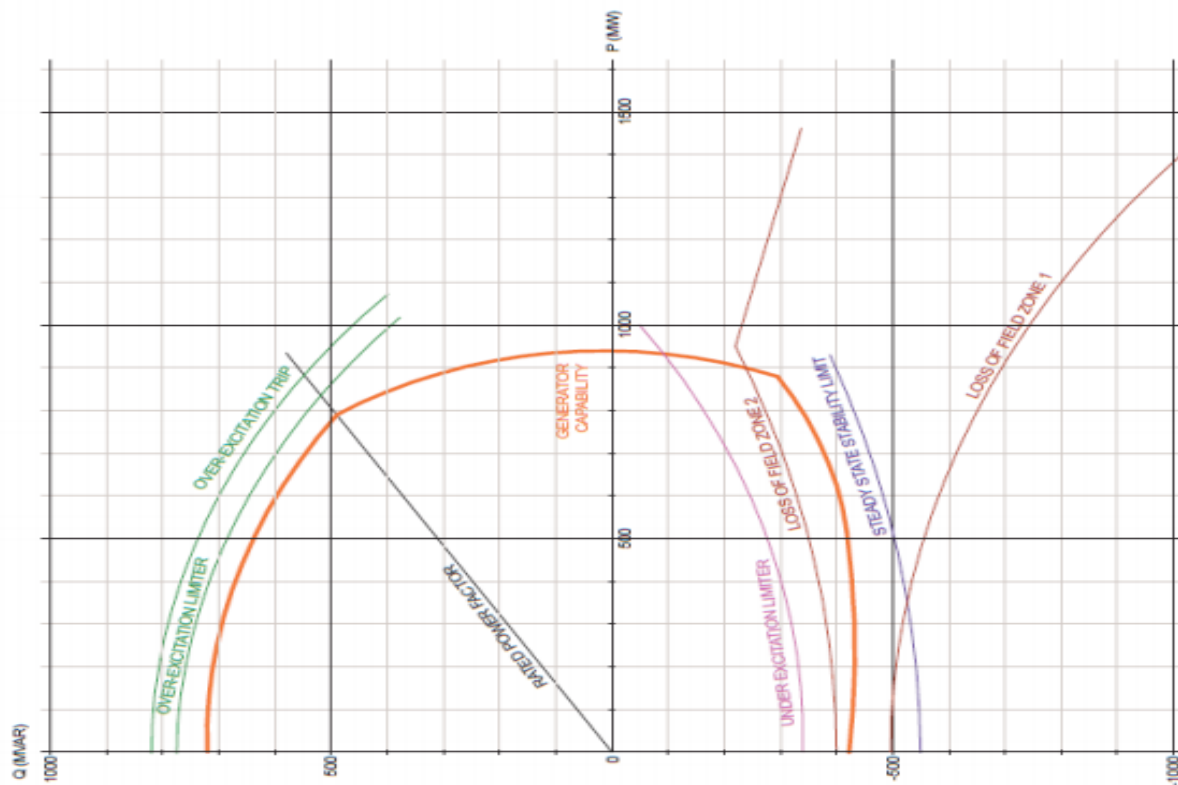


Figure 8- Example of V/Hz capability, limiter and protection coordination

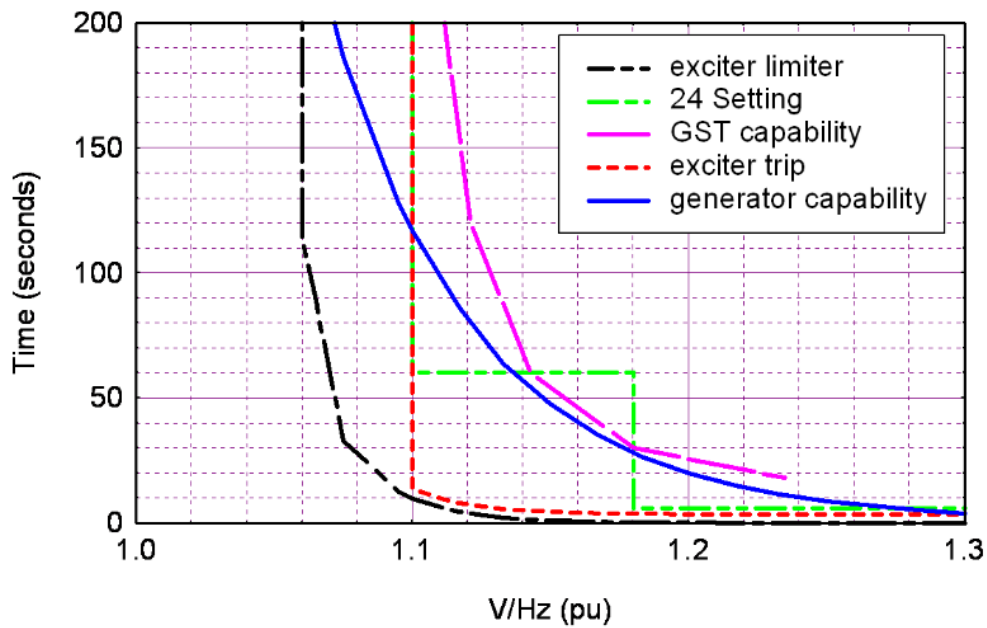




Figure 9- Example of overall coordination capability, limiters and protections

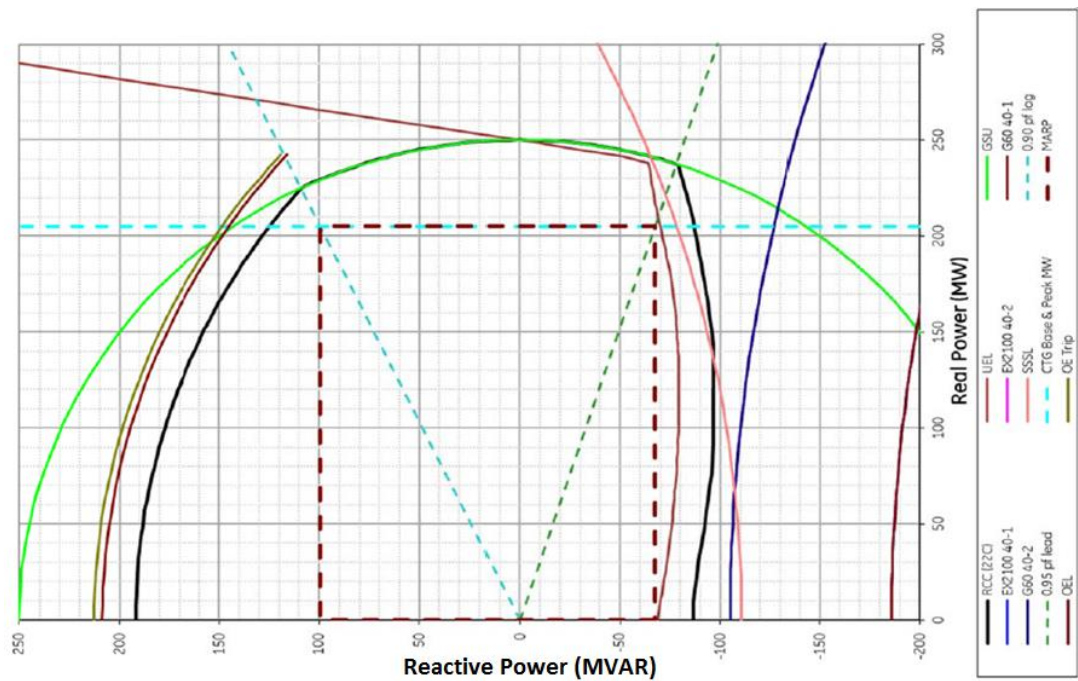


Figure 10- Example of coordination table

Limiters / Protection Function	Enabled in Exciter System	Enabled in Protection Relay
Over Excitation Limiter OEL	Limiters -Yes Protection -Yes	No
Under Excitation Limiter UEL	Limiters-Yes	Protection -Yes (e.g. Beckwith & SEL)
V/Hz Limiter	Limiters- Yes	No
24 - V/Hz	No	Protection -Yes (e.g. Beckwith & SEL)
40 - Loss of Field	No	Protection -Yes (e.g. Beckwith & SEL)
78 - Out of Step	No	Protection -Yes (e.g. Beckwith & SEL)
Excitation Transformer 50/51	No	Protection -Yes (e.g. Beckwith & Siemens)
59 - Overvoltage	No	Protection -Yes (eg. Beckwith & SEL)

4 Guidance for Requirement R2(a):

Requirement R2(a) of PRC-019-AB-2 refers to possible “unplanned systems, equipment or settings changes”, which may include the following:

- (a) voltage regulating settings or equipment changes;
- (b) protection system settings or component changes;
- (c) generating unit, individual generating units that are part of an aggregated generating facility, or synchronous condenser equipment capability changes; and
- (d) generating unit, aggregated generating facility, or synchronous condenser step-up transformer changes.

5 Reference Materials

The AESO recommends NERC PRC-019-2 section “G. Reference – Examples of Coordination”, as reference material. In addition, the AESO also recommends referring to the following documents:

- (a) NERC Standard PRC-019-2 — *Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection*
<https://www.nerc.com/pa/Stand/Reliability%20Standards/PRC-019-2.pdf>
- (b) NERC Project 2007-09 Generator verification
<https://www.nerc.com/pa/Stand/Pages/Project2007-09-Generator-Verification.aspx>
- (c) *IEEE Recommended Practice for Excitation System Models for Power System Stability Studies, IEEE Std 421.5.*
- (d) *Requirements for Cylindrical-Rotor 50 and 60 Hz Synchronous Generators Rated 10 MVA and Above, ANSI/IEEE Std. C50.13.*
- (e) *IEEE Guide for AC Generator Protection, IEEE Standard C37.102.*

6 Appendix

Appendix 1 *List of Generating Units, Synchronous Condensers, and Aggregated Generating Facilities*

Revision History

Posting Date	Description of Changes
2020-12-16	Added Appendix 1 - List of Generating Units, Synchronous Condensers, and Aggregated Generating Facilities; minor changes like adding Figure numbers to align with AESO drafting principles.
2019-07-30	Initial release.

Appendix 1

List of Generating Units, Synchronous Condensers, and Aggregated Generating Facilities

The following is the list of resources, referenced in Applicability subsection 2(f) of reliability standard *PRC-019-AB-2 Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection*, which the AESO includes in accordance with the process set out in Appendix 1 of that reliability standard:

Table 1: List of Generating Units, Synchronous Condensers, and Aggregated Generating Facilities

Generating Units, Synchronous Condensers, and Aggregated Generating Facilities	Effective date
NULL	NULL