

NERC
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Industry Webinar

PRC-025-1 – Modifications to PRC-025-1

June 7, 2017

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Agenda

- Presenters
 - Standard Drafting Team
 - John Schmall, ERCOT
 - Mike Jensen, PG&E
 - NERC
 - Scott Barfield-McGinnis
- Administrative Items
- Background
- Revisions
- Q & A Session

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Administrative Items

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- **For the official record**
 - This presentation is not a part of the official project record
 - Comments must be submitted during the formal posting

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Standard Drafting Team Roster

| Member | Entity |
|-----------------------------|---|
| John Schmall, Chair | Electric Reliability Council of Texas, Inc. |
| Mike Jensen, Vice Chair | Pacific Gas and Electric Company |
| Juan Alvarez | Caithness Energy |
| S. Bryan Burch, P.E. | Southern Company |
| Walter Campbell | NextEra Energy Resources, LLC |
| Jason Espinosa | Seminole Electric Cooperative, Inc. |
| Charles Yeung, PMOS Liaison | Southwest Power Pool, Inc. |
| Scott Barfield-McGinnis, PE | North American Electric Reliability Corporation |
| Lauren Perotti, Counsel | North American Electric Reliability Corporation |

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Q & A Objectives

- Informal discussion
 - Via chat
 - Respond to stakeholder questions
- Help the team facilitate chat questions by
 - Prefacing comments with “Comment:”
 - Prefacing questions with “Question:”
- Other
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Background

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Background

- Approval - FERC Order No. 799 on July 17, 2014
- Effective on October 1, 2014
- Enforcement on October 1, 2019 (settings only)
- Enforcement on October 1, 2021 (Retire/Replace equipment)
- Issues revealed during implementation:
 1. Need alternative loadability option(s)
 2. Address whether IEEE 50 device element is in or out
 3. Clarify Table 1 applications where there is more than one
 4. Need alternative option where the interconnecting transmission line impedance may be a factor
 5. Consider an alternative to the term “pickup setting”
 6. Clarify identified miscellaneous items

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Not Changed

- Purpose statement
- Applicability
- Requirement
 - Except version reference
- Measure
- Violation Severity Levels

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Revisions

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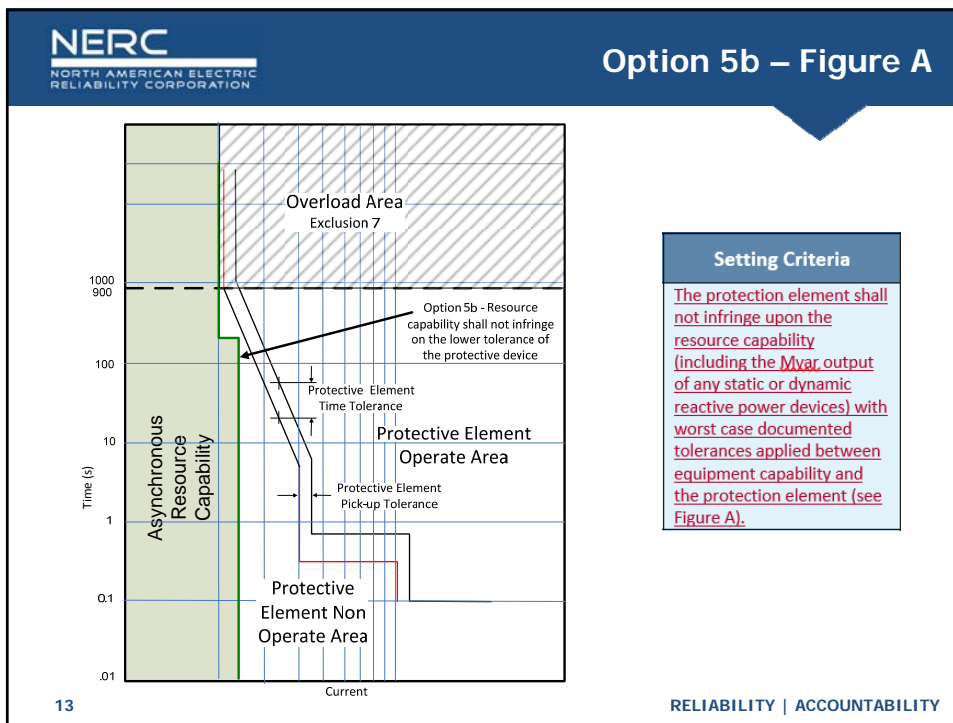
Alternative Loadability Option

Table 1. Relay Loadability Evaluation Criteria

| Application | Relay Type | Option | Bus Voltage ⁴ | Pickup-Setting Criteria |
|--|--|--------|--|--|
| Asynchronous generating unit(s) (including inverter-based installations), including or Elements utilized in the aggregation of dispersed power producing resources | Phase time overcurrent relay (e.g., 50, 51,) or (51V-R) – voltage-restrained) | 5a | Generator bus voltage corresponding to 1.0 per unit of the high-side nominal voltage times the turns ratio of the generator step-up transformer | The overcurrent element shall be set greater than 130% of the calculated current derived from the maximum aggregate nameplate MVA output at rated power factor (including the <i>Mvar</i> output of any static or dynamic reactive power devices) |
| | | 5b | <u>Generator bus voltage corresponding to 1.0 per unit of the high-side nominal voltage times the turns ratio of the generator step-up transformer</u> | <u>The protection element shall not infringe upon the resource capability (including the <i>Mvar</i> output of any static or dynamic reactive power devices) with worst case documented tolerances applied between equipment capability and the protection element (see Figure A).</u> |
| | | OR | | |

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Address IEEE "50" Device Element

Table 1. Relay Loadability Evaluation Criteria

| Application | Relay Type | Option | Bus Voltage |
|---------------------------------|---|-----------|--|
| Synchronous generating unit(s), | Phase time overcurrent relay (e.g., 50, 51 _T) or (51V-R) – voltage-restrained] | 2a | Generator bus voltage corresponding to 0.95 high-side nominal voltage turns ratio of the generator transformer |
| | | OR | |
| | | 2b | Calculated generator bus corresponding to 0.85 nominal voltage on the terminals of the generator transformer (including transformer turns ratio impedance) |

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Clarify Table 1 Applications

Table 1. Relay Loadability Evaluation Criteria

| Application | Relay Type | Option | |
|---|--|--------|---------------------------|
| Asynchronous generating unit(s) (including inverter-based installations), including or Elements utilized in the aggregation of dispersed power producing resources | Phase distance relay (e.g., 21) – directional toward the Transmission system | 4 | G cc hi tu tr |
| | Phase time overcurrent relay | 5a | G cc hi tu tr |

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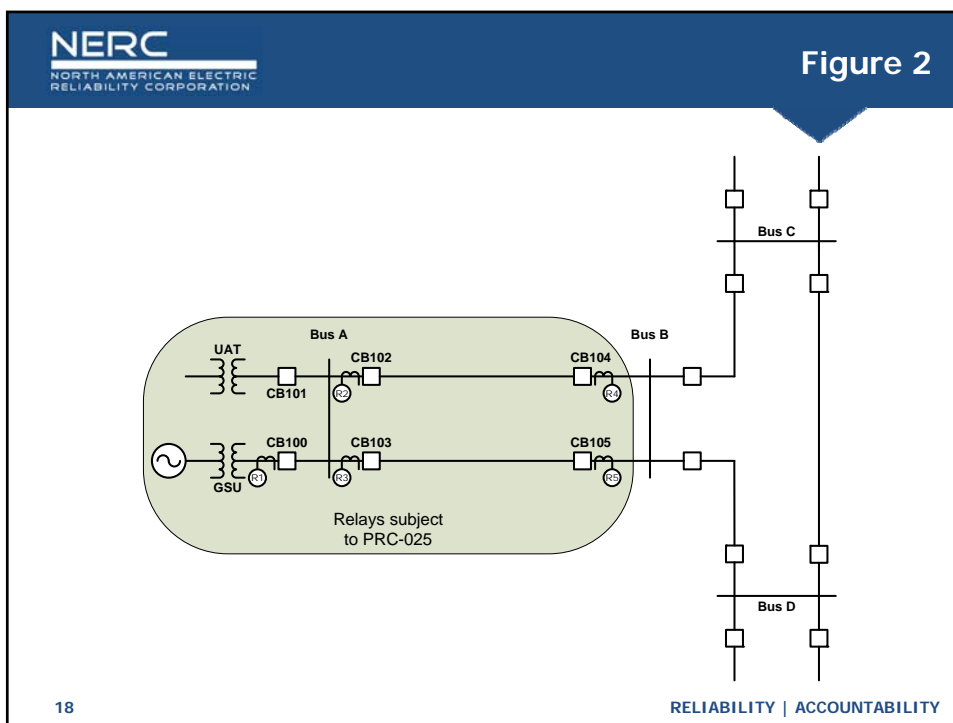
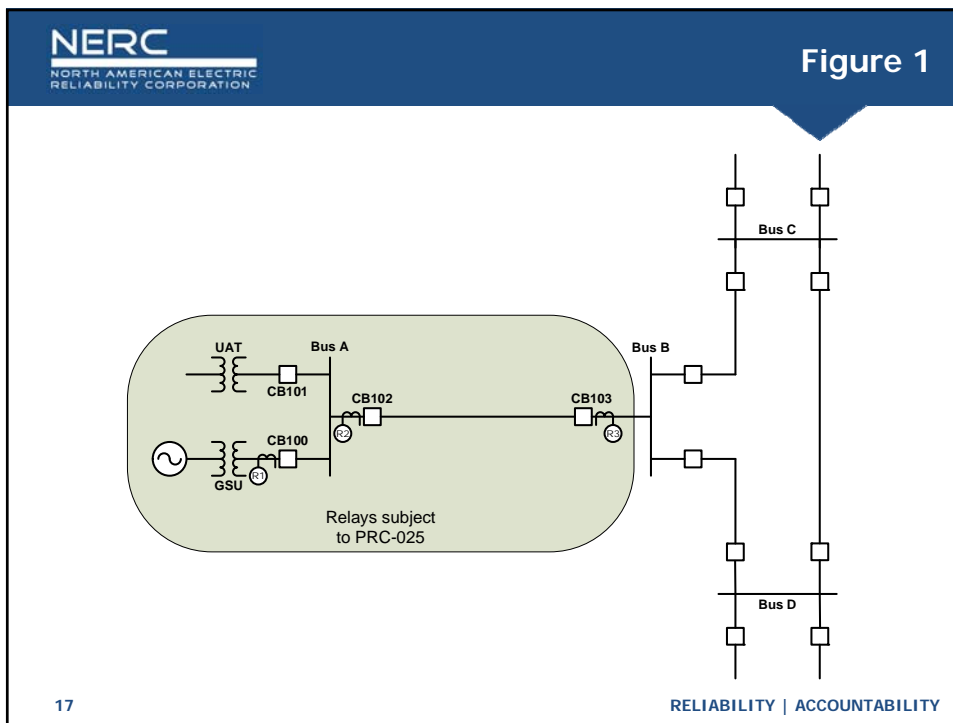
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Plants Remote to Transmission

Loadability Evaluation Criteria

| Relay Type | Option | Bus Voltage | |
|---|--------|---|---|
| Phase distance relay (e.g., 21) – directional toward the Transmission system – installed on the high-side of the GSU transformer and on the remote end of line | 14a | 0.85 per unit of the line nominal voltage at the relay location | The impedance (1) Real MW react (2) React MW value at rated |
| If the relay is installed on the generator side of the GSU transformer use Option 7 | 14b | Simulated line voltage coincident with the highest Reactive Power output achieved during field forcing in response to a 0.85 per unit nominal voltage on the high-side terminals of the generator step-up transformer at the remote end of the line prior to field forcing | The impedance (1) Real MW react (2) React maximum by simul |

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Pickup Setting

| Category | Pickup-Setting Criteria |
|---|---|
| Impedance per unit of the voltage times the generator step-up | The impedance element shall be set less than the calculated impedance derived from 115% of: (1) Real Power output – 100% of the gross MW capability reported to the Transmission Planner, and (2) Reactive Power output – 150% of the MW value, derived from the generator nameplate MVA rating at rated power factor |

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Miscellaneous Clarifications

- IEEE C37.17-2012 & IEEE C37.2-2008
- Asynchronous Generator Performance
 - Asynchronous generators, ~~however, do not have excitation systems and~~ will not respond to a disturbance with the same magnitude of apparent power that a synchronous generator will respond.
- Synchronous generator...
 - ...the maximum capability shall be used for the purposes of this standard as a minimum requirement. The Generator Owner may base settings on a capability that is higher than what is reported to the Transmission Planner.
- Asynchronous generator...
 - If different seasonal capabilities are reported, the maximum capability shall be used for the purposes of this standard as a minimum requirement. The Generator Owner may base settings on a capability that is higher than what is reported to the Transmission Planner.

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Questions & Answers

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- Standards Committee
 - July 19, 2017
- Initial comment period
 - 45-Days
 - Initial Ballot
- Respond to Comments
 - September 2017
- Point of contact
 - Scott Barfield-McGinnis, Senior Standard Developer
 - Scott.Barfield@nerc.net or call 404-446-9689
- Webinar posting
 - 48-72 hours