Name (34 Responses)
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Group Name (21 Responses)
Lead Contact (21 Responses)
IF YOU WISH TO EXPRESS SUPPORT FOR ANOTHER ENTITY'S COMMENTS WITHOUT ENTERING ANY ADDITIONAL COMMENTS, YOU MAY DO SO HERE. (9 Responses)
Comments (55 Responses)
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Question 6 Comments (46 Responses)

Group
Pepco Holdings Inc & Affiliates
David Thorne
Yes
The proposed changes to PRC-023-2 are appropriate and necessary to provide a bright line between the two standards. However, the new term “Generator Interconnection Facilities” is not defined in the NERC Glossary of terms, nor is it defined in the body of the standard. This term needs to be defined within the body of the standard, perhaps as a footnote similar to that used to define Unit Auxiliary Transformers. A proposed definition might be “Generator Interconnection Facility(ies) comprise those Elements owned by the Generator Owner located between the high voltage terminals of the Generator Step-up Transformer and the point of interconnection with Transmission Owner Facilities.”
No
1) In order to properly calculate the appropriate relay pick-up setting it is important to know where the CTs and VT’s supplying the relay are located. Options 1 through 12 (excluding 11b) “imply” that the CT’s and VT’s are located on the generator bus (i.e. the low voltage side of the GSU transformer) since the Bus Voltage criteria requires determining the generator bus voltage, which in turn is used to calculate the relay pick-up quantities. Options 11b, and 14 through 19 “imply” that the CT’s and VT’s are located on the high voltage side of the GSU transformer since the transmission line voltage is used in the determination of the relay pick-up quantities. Since the CT and VT location is such an important consideration in correctly calculating the appropriate relay pick-up values, the location must be specifically identified in Table 1. This could be done either via appropriate use of footnotes, a separate column in Table 1, or appending the location to the information contained in the column labeled Relay Type. For example, Option 14 could be re-labeled “ Phase distance relay (21) – direction toward the Transmission system with CT’s and VT’s supplying the relay located on the high side of the GSU transformer.” Confusion as to where the relay CT’s and VT’s are located is evidenced by some of the errors made in the Example Calculations provided in the Guidelines and Technical Basis document. See comments on the Example Calculations in our response to Question 3. 2) If the use of blinders, or load encroachment elements, are permitted to achieve compliance with the setting criteria listed in Table 1, as was discussed in the recent NERC Webinar on PRC-025-1, then specific criteria on the application of these load encroachment devices must be included in the standard. The Guidelines and Technical basis states that “it is important to consider the potential implications of revising the shape of the relay characteristic to obtain a longer relay reach, as this practice may restrict the capability of the generating unit…” The document goes on to refer the reader to Appendix E of the Power Plant and Transmission system Protection Coordination technical reference document

for further reference. However, the standard itself is silent on whether these devices are permitted, and if so, what criteria is appropriate. If the SDT has concluded that the use of load encroachment devices are not permitted to satisfy Table 1 criteria, than the standard should so state. If, on the other hand, these devices are permitted, then the standard should state: " If blinders, or other load encroachment elements are employed to extend the relay reach while satisfying the loading criteria identified in Table 1 then a requirement must be included in the standard to ensure "the relay operating characteristic also be checked to ensure it will not operate when the generator is supplying power (as measured at the generator terminals) within its published capability curve." This is extremely important since in the latest draft of PRC-019 their SDT specifically eliminated coordination of the phase distance relay with the generator reactive capability curve, implying that it would be covered in the PRC-025 loadability standard. If load encroachment is not employed, a mho characteristic set in accordance with Table 1 criteria will automatically satisfy the steady state capability curve criteria. However if load encroachment is employed an extended reach along the +X axis could cause the relay to restrict generator capability. As such, this loadability criteria needs to be addressed in this standard.

No

All of the following comments refer to the Example Calculations included in the Guidelines and Technical Basis document. 1) A single line drawing would be helpful to illustrate where the CT's and VT's which supply the relay are located for the various examples. At the very least, a description of where the CT's and VT's are located should appear in the blue box heading describing each example calculation. 2) In all the examples, P (reported) is equal to the P (rated). To avoid confusion between the two and to demonstrate when to use which value in the calculations, a different P reported should be used in the examples. 3) There should be one corresponding example for each option, with the exception of those requiring simulations (i.e., 1c, 2c, 7c, 8c, 9c, 14b, 15b, and 16b). At present, there is no example calculation for Option 7a. 4) Equations 14, 16, 36 and 38 and the subsequent results in the Example Calculations are in error. They were derived from the power transfer equation. When this equation is re-arranged to solve for the angle, the arcsin function should apply to both the numerator and denominator, not just to the numerator. The correct equation should be angle = arcsin [(P x Xt)/(V1 x V2)]. Reference Equation 6 in Appendix E of the NERC SPCS Power Plant and Transmission System Protection Coordination technical reference document. 5) There is a syntax error in Equations 15, 17, 37, and 39 in the Example Calculations. The cosine term within the radical expression shows the angle being squared rather than the cosine function being squared. The equation should mirror that of Equation 7 in Appendix E of the NERC SPCS Power Plant and Transmission System Protection Coordination technical reference document. 6) All examples should be reviewed for simple math errors. For example Equation 21 shows that 0.3458 x 25 = 8.6462. However, 0.3458 x 25 actually equals 8.645. Although this is a small error, it is confusing for someone trying to follow along with the calculations. 7) Equations 45 and 46 are unnecessarily included in the Example Calculations for Option 3 and Option 6. Options 3 and 6 only require a voltage setting criteria and do not require a calculation of generator P and Q. 8) There is a typographical error in the line following Equation 50 in the Example Calculations. The 100 Mvar and 475.7 Mvar values should be added together not multiplied. 9) The Example Calculation for Options 8a, 8b, 9a, 9b, 15a, and 16a is extremely confusing and we believe in error. Options 8a, 8b, 9a, and 9b are for applications where the CT's and VT's supplying the relay are located on the low voltage side of the GSU transformer. As such, the generator low side bus voltage must be calculated. The example provided was supposed to be for Option 8b, which should use GSU low side quantities. However the high side voltage (293.25 kV) was calculated and then used to calculate the high side primary current. This was then divided by the low side CT ratio to obtain secondary quantities to the relay. This does not make sense. This example should be re-worked for Options 8a, 8b, 9a and 9b only, and should utilize V and I quantities on the low side of the GSU transformer. Options 15a and 16a should be broken out into a separate Example Calculation. That is because they are for applications where the CT's and VT's are located on the high voltage side of the GSU transformer. This requires the calculation of V and I quantities on the high side of the transformer. 10) The blue box describing the Example Calculation for Option 14a incorrectly describes Option 14a as a phase directional time overcurrent (67) element instead of a phase distance relay (21). 11) The Example Calculation for Option 14a assumes the CT's and VT's supplying the relay are located on the high voltage side of the GSU transformer. As such, the system voltage was correctly calculated as 0.85 pu (293kV) on the high side of the transformer. However, using the low side apparent power and the high side voltage in Equation 85 is incorrect. The P+jQ complex power used in Equation 85 is the power at the terminals

of the generator (i.e., the same as was used in all the previous examples when the relay was located on the low side of the GSU). The power used in Equation 85 should be the apparent power as seen on the high side of the GSU, which would be the P+jQ seen on the low side, minus the I squared Xt Mvar loss in the transformer. In addition, since the relay is located on the high side of the GSU transformer, the CT and VT ratios used in Equation 86 should be the high side instrument transformer ratios, not those on the low side. 12) The Example Calculation for Options 11b, 18, and 19 assumes the CT's and VT's supplying the relay are located on the high voltage side of the GSU transformer. As such, the system voltage was correctly calculated as 1.0 pu (345kV) on the high side of the transformer. However, using the low side apparent power and the high side voltage in Equation 93 is incorrect. The P+jQ complex power derived from Equations 89 and 90 is the power on the low side of the GSU transformer (i.e., the same as was used in all the previous examples when the relay was located on the low side of the GSU). The example does not indicate where the additional Mvar source is located, but presumably it is located on the low side of the GSU since it is directly added to the generator Mvar rating. The power used in Equation 93 should be the apparent power as seen on the high side of the GSU, which would be the total P+jQ seen on the low side of the GSU from Equation 92, minus the I squared Xt Mvar loss in the transformer. As was discussed in Comment 1, a single line diagram showing where the CT's and VT's are located; what the apparent power is (both on the low and high side); and where the added Mvar source is located; would be extremely helpful in understanding the example calculation.
Yes
Yes
Yes
There appears to be a typo on page 2 of the Implementation Plan for the retirement of PRC-023-2. The plan for the retirement of PRC-023-2 should read "Midnight of the day immediately prior to the Effective Date of PRC-023-3 …"
Group
Duke Energy
Colby Bellville
No
It is possible to have a load resoponsive relay at the terminals of a circuit which is also the terminal of a GSU.
Yes
Yes
Yes
Yes
No
Group
Northeast Power Coordinating Council
Guy Zito
No
The applicability to the Generator Owner in PRC-023-3 overlaps the applicability to the Generator Owner in PRC-025-1. The draft SAR and proposed standards PRC-023-3, PRC-025-1 fail to provide a clear distinction as to whether the standard is meant to apply to the owner of a protection system

designed to protect transmission elements (which we believe is the intent of PRC-023-3) or the owner of a protection system designed to protect generation elements (which we believe is the intent of PRC-025-1). An approach that could be considered is one similar to that used in PRC-006-1 where the SDT chose to create a 'standard specific entity'; UFLS entities. Alternatively, the applicability could be modified to more closely match the intent as indicated in the Applicability section of the Guideline and Technical Basis document, and in wording of the Supplemental SAR for Project 2010-13.2 Relay Loadability Order 733 Phase 2 (Relay Loadability: Generation). Because there are instances where a Transmission Owner owns relays within a plant, combining these two Standards into one Relay Loadability standard would allow for wording to eliminate the overlap, and eliminate the double jeopardy possibility. The standard should be applied to the owner of the particular type of protection system, not applied to a particular function. There are circumstances where an entiy registered as a Transmission Owner owns the protection system that protects for faults on the element(s) owned by an entity registered as a Generator Owner which are solely used to interconnect their generator to the bulk power system. There are also circumstances where the Generator Owner owns not only the element(s) which are solely used to interconnect their generator to the bulk power system, but the protection system that protects for faults on those generator interconnection element(s) as well. In both of these cases, the protection system is designed to protect the bulk power system from the fault, not the generator itself. The changes in the proposed PRC-023-3 and PRC-025-1 attempt to establish a bright line, but the functional entity of Generator Owners is still included in PRC-023-3 so this results in confusion as to which standard applies for the elements that connect the generator to the BES. Some Transmission Owners own GSU assets, but in the new standard, and as stated on the Webinar, "leads assets" will fall under PRC-025-1. There is still confusion in this area so a bright line still has not been established.
Yes
Attachment 1 is a good guideline for relay setting philosophy. However, Table 1 is is too detailed and prescriptive to be in a standard. As is, the wording in Requirement 1 and Attachment 1 should be revised to allow for relay setting exceptions. The exceptions should allow for relay settings that do not exceed the safe operating range of the generator as determined by the generator manufacturer.
No
In the Guidelines and Technical Basis document under Applicability the terms transmission Facilities and generator leads are mentioned. It should be noted that some companies use different terms when referring to the leads connecting the generator Facility to the BES facility. The leads connection between the generator Facility GSU transformer and the BES Facility breakers may be referred to GSU leads and not Generator leads. Generator leads may be those located inside the generator Facility between the GSU low side and the generator itself. The terminology should be clarified.
No
Suggested changes to the Implementation Plan: Each Generator Owner that owns load-responsive protective relays applicable to this standard shall be 100% compliant for the following: • For each load-responsive protective relay, where determined by the Generator Owner that replacement is not necessary, 60 months beyond the effective date of this standard. • For each load-responsive protective relay, where determined by the Generator Owner that replacement is necessary, 84 months beyond the effective date of this standard.
Yes
• Section 3.1.1 – Change to: "Generator Owner that applies load-responsive protective relays at the terminals of BES facilities." • Section 3.2 – remove the entire section (3.2, 3.2.1, 3.2.2, 3.2.3, and 3.2.4), the revised Section 3.1.1 now will cover this section. • R1 – remove the following words: "while maintaining reliable fault protection." – it is not possible to measure or prove this statement. • In Section C., the Table of Compliance Elements there should be Lower, Moderate, and High VSL's. The "all or nothing" approach does not reflect an entity's success at achieving compliance. • Table 1. Relay Loadability Evaluation Criteria, 1a, (1): "Real Power output – 100% of the MW capability reported to the Planning Coordinator or Transmission Planner", this should be generator nameplate rating. The MW capability reported can change. • Table 1. Relay Loadability Evaluation Criteria, 14a or 14b: What is the definition of "Generator interconnection Facilities"?
Individual
Michael Falvo

Independent Electricity System Operator
Yes
Yes
The January 2012 date under the “Anticipated Date” column in the “Description of Current Draft” Section on Page 1 should read January 2013.
Individual
Nazra Gladu
Manitoba Hydro
No
(1) In PRC-023-3 section 4.1.1, 4.1.2 and 4.1.3, the redlined part “at the terminals of” should be changed to “at the Transmission Owner terminals of”, “at the generator owner terminals of” and “at the Distribution Owner terminals of”. Also, PRC-023-2 in section 4.1.2 should be changed to PRC-023-3. (2) Under Section 3, “Applicability”, the term “Generator Interconnection Facilities” is capitalized, yet not defined in the NERC Glossary. Although this term may be defined in the U.S. pro forma tariff, this term should be defined in the NERC Glossary, as not all Generator Owners are FERC jurisdictional or use similar tariffs in their Canadian jurisdictions.
No
(1) Attachment 1, footnote 3: This footnote contains extraneous statements that do not impose obligations, and therefore should be removed. The phrase “on-load tap changers are rarely used” is a statement of fact and therefore unnecessary. The statement should be revised to simply say “If on-load tap changers are used, the calculations shall reflect …”. Otherwise, the wording may create the impression that use of on-load tap changers is restricted by the standard. Similarly, the last sentence of the footnote uses the word “may” rather than “shall”. If the statement is not a requirement, it should be removed. If it is mandatory, the word “may” should be replaced with “shall”. (2) In attachment 1 in the column entitled “Relay Type”, the term “Transmission system” is used several times and its meaning is unclear. It is not clear how this term differs from “Transmission” as defined in the NERC Glossary. If “transmission system” is retained in the attachment, the word “transmission” should not be capitalized, as “Transmission” and “transmission system” are two distinct terms. (3) For option 3 in Table 1, the statement “(51V-C) – voltage controlled (Enabled to operate as a function of voltage)” is confusing. It should read something like “(51V-C) – voltage controlled (Operates with undervoltage supervision)”. (4) The statement in “Bus voltage” does not make sense. It contradicts the voltage setting criteria (75%) on the right side of the table.
Yes
(1) Based on the Technical Guidelines, it appears that the determination of whether the Generator Owner is “maintaining reliable fault protection” with the applied setting is a matter to be determined by the Generator Owner in its discretion. No objective criteria are specified for this determination. Accordingly, if the CEA will not be assessing this part of the requirement, it should be excluded from the standard. At a minimum, it should be specified that Generator Owner makes this determination. (2) The “Guidelines and Technical Basis” document should be included as an attachment or appendix of the standard.
Yes
No comment.
Yes
(1) Why are Violation Severity Levels not defined for Lower, Moderate and High VSL for both PRC-025 and PRC-023?
Yes

(1) The meaning of a reliability standard should be clear from a reading of the standard alone, rather than being dependent on external documents. It is not clear from a simple reading of the standard that what appears to be a single requirement is actually three sequential requirements. Based on a review of the Implementation Plan and RSAW, R1 requires the Generator Owner to: (i) Assess its load-responsive protective relays to determine if application of the settings prescribed in Attachment 1 maintain reliable fault protection; (ii) after the assessment is completed, either replace those load-responsive relays that will not maintain reliable fault protection with the prescribed settings or change the Generator Owner's protection philosophy; (iii) after all necessary replacements or protection philosophy changes have been made, the prescribed settings in Attachment 1 shall be applied. Requirement 1 should be redrafted as three separate requirements in order to clarify its meaning and to avoid inconsistencies with supporting documents such as the RSAW. At present, the RSAW refers to relay replacement, while the standard does not. (2) Based on the drafting team's response to Manitoba Hydro's comment regarding the vagueness of the phrase "while maintaining reliable fault protection" and the Technical Guidelines, it appears that NERC intends for this element of the requirement to be determined by the Generator in its sole discretion, rather than being subject to audit. Therefore, the standard should be clarified by adding the phrase "as determined by the Generator Owner, in its sole discretion" after the phrase "while maintaining reliable fault protection". (3) For the 51 relays on the step-up transformers (Option 10): Following this setting criteria could mean that the pickup setting could be 175% of nameplate rating of the transformers. Should there be any concern with the transformer overload and mechanical damage as a result? Also, the 175% setting is not consistent with the 150% number in the Transmission Relay Loadability standard.
Group
ISO RTO Council Standards Review Committee
Charles Yeung
Yes
SRC is not providing any comment or response to this question as it applies directly to GOs.
No
NERC in its filing in response to the FERC directives in Order 733 should note to FERC that by pro-scribing a specific technical solution in its Orders, there can be significant cost and compliance repercussions and not allow the stakeholder process to develop alternative innovative solutions. For example, if there are two alternate solutions to mitigate for a reliability risk, one which would require significant capital expense for entities to comply and one which would allow entities to configure or operate their network to mitigate that same risk, the industry should be allowed to do so. We are concerned about the outcome of PRC-025 in particular in reference to this paragraph in the Guidelines and Technical Basis: For example, if the intended protection purpose is to provide backup protection for a failed Transmission breaker, it may not be possible to achieve this purpose while complying with this standard if a simple mho relay is being used. In this case, it may be necessary to replace the legacy relay with a modern advanced-technology relay that can be set using functions such as load encroachment. It may otherwise be necessary to reconsider whether this is an appropriate method of achieving protection for the failed Transmission breaker, and whether this protection can be better provided by, for example, applying a breaker failure relay with a transfer trip system.
SRC is not providing any comment or response to this question.
Yes
No
Group
PacifiCorp
Ryan Millard
No
PacifiCorp agrees with the addition of "Generator interconnection Facility(ies)" but affirms that

verbiage should be added to PRC-023-3 that more clearly states that Generator Step-up transformers are only applicable to PRC-025-1.
Yes
Yes
PacifiCorp appreciates the work that went into the Guidelines and Technical Basis document, particularly with respect to the example calculations provided for each of the options referenced in Table 1 of Attachment 1. The detailed explanation of each option for a given load-responsive protective relay added a level of depth and clarity that was missing from the previous draft.
Yes
Yes
Group
Luminant
Brenda Hampton
Yes
No
The Table does not provide any guidance for loadability relays that may be installed on generators tied to an 345/138/20kV auto-transformer. Luminant recommends adding this operating scenario to the list.
No
The example calculations for UAT overload relays should indicate that this applies only to protective relays installed on the high side of the transformer that are connected to trip the generator lockout.
Yes
Yes
Yes
Luminant recommends that language be added to the Table (Relay Loadability Evaluation Criteria - Options 13a and b) explaining that only relays that act to trip the generator directly or via lockout or auxiliary tripping relay are included.
Group
Southwest Power Pool Standards Development Team
Jonathan Hayes
Yes
Yes
Yes
Yes
Yes
No

Group
Arizona Public Service Company
Janet Smith, Regulatory Affairs Supervisor
Yes
Yes
Yes
No
A VRF of “High” is unjustified since it applies to each individual unit and a single individual unit has limited impact on the BES, particularly the small units. The VRF value of “Low” is more appropriate on each unit basis.
Individual
Patrick Brown
Essential Power, LLC
No
Load-responsive protective relays installed on the high side terminals of the Generator Step-Up transformer looking towards the Transmission system appear to be clearly in scope for PRC-023-3 but are not clearly excluded from being applicable to PRC-025-1.
No
An allowance should be made in PRC-025 for unusual operating conditions, provided that the TO and TOP are notified of such circumstances. Generators that have compromised cooling (e.g. temporarily limited to below-rated hydrogen pressure) will experience a commensurate reduction in the field forcing that can be accommodated, for example, and units with a thermal stability issue can be knocked-offline by vibration and potentially damaged if massively above-rated reactive power flow is attempted. Regarding in particular voltage-restrained overcurrent relays, this type of device is notorious for not having a predictable operation time under fault conditions. If they did mis-operate in the August 2003 blackout they should be changed-out rather than requiring that the settings be set as high as specified in the draft standard.
No
During the 2/13 webinar it was stated that start-up transformers that provide power when the unit is not on-line are out of scope for PRC-025-1. When questioned as to whether PRC-025-1 would become applicable to the transformer if the failure of the normal UAT resulted in the entity utilizing the start-up transformer for running power, the SDT responded yes, at that time the transformer would be applicable to PRC-025-1. If UATs are to remain in scope, an exemption should be included to allow an entity to operate in an emergency configuration without being in violation of PRC-025-1. It is unclear from the wording in the Guidelines and Technical Basis whether the following is in scope: a transformer with high-side windings directly connected to the transmission grid whose phase time overcurrent relaying operates to remove only plant process load but loss of this load would result in a process trip and loss of the unit. Transformers that provide power to auxiliary loads not directly related to the generation of power should be excluded. This includes coal/lime stone unloading, chemical and water processing, some environmental processes etc. The Guidelines and Technical Basis does not adequately address the protection of the generator, and is narrow in scope by basing the settings criteria on one event and simulation rather than real world event data and historical performance. The number of generators that have tripped for loadability does not constitute a statistically significant value of concern based on the overall number of generators that did trip during the Aug 2003 event. (Approx 25/290 = 8.6%) Part of the Rational statement for R1 is flawed - it is

not currently possible to both "comply with the draft standard and achieve (an entity's) desired protection goals".

No

Many units have a brief "mini-outage" every year but the interval between planned outages of sufficient duration to replace relays, apply settings and test them can be as large as five years. We therefore ask that the replacement-needed interval be extended to 84 months.

No

Deeming any and all violations of this standard to have a high violation risk factor and a severe violation severity level seems overly harsh, given the compliance feasibility uncertainties expressed herein.

Yes

1. We had thought in commenting on earlier drafts of PRC-025 that the toleration of extremely high current mandated by this standard would apply only for typical field-forcing periods, i.e. the few seconds it takes for the excitation limiter to respond. The present version of PRC-025 states in the 4th bull-dot of the introduction to Att. 1 however that protection systems must allow units to run for 15 minutes at the current levels stipulated in Table 1, which (as shown in the Guidelines and technical Basis document for this standard) can be on the order of 200% of rated current for generators and GSUs. This is far in excess of the thermal capability of such equipment. A cylindrical-rotor synchronous generator built to the present edition of ANSI C50.13 can withstand an armature current of 226% for 10 sec (208% in earlier editions), and 116% for 120 sec. The situation is similar for GSUs. ETAP studies of selected GSUs show that 200% current might be tolerated in many cases for a few minutes, but not a quarter hour. There should be a time frame defined in PRC-025 after which the generator owner is allowed to trip their equipment. Requiring the generator to operate at the specified overload conditions indefinitely will damage the generator. The draft standard setting specifications of Table 1 conflict with IEEE C37.102 Guide to Generator Protection. This guide (1995 revision) recomments setting the generator overcurrent relaying (51) so that it operates at 115% of rated current and trips in 7 seconds at 226% of full-load current. The fundamental issue appears to be that the Application Guidelines are patterned on transmission line-loading practices, but GSUs and (especially) auxiliary transformers are not used and short-term-overloaded like transmission transformers, so requiring a minimum allowable trip pickup threshold based on IEEE C37.91 alone is not appropriate. Entities should be allowed to protect their equipment from overload, rather than being forced to allow a specific amount of overload. The result is that, despite the statement in R1 that protection must be maintained, prohibiting the use of multiple definite-time or continuous inverse-time load-responsive relays for any time period less than 15 minutes can degrade the quality of existing protection while doing nothing to improve ride-through for actual field-forcing periods. There are many cases in which overload pickups set at approximately 115% to 130% of the rated current saved units with a low-level fault or exciter malfunction that caused an extended, moderate overload. Such protection would no longer be allowed, and we are skeptical of vague assurances to the effect that somehow something just as good can (and must) be developed. We believe in summary that PRC-025 as presently written would degrade rather than enhance BES reliability, experience has revealed that the pickup settings of generator protection systems can be set much lower than the values specified in Table 1 and not result in undesirable nuisance tripping. and 15 minutes is vastly inappropriate as a one-size-fits-all field-forcing interval. 2. The portions of PRC-025 dealing with auxiliary transformers should be expunged in their entirety; since, aside from the considerations stated above (which apply for aux transformers as well), there is no reliability benefit to be gained. The standard cites generation unit trip records during blackouts as constituting its reason for existence; but, in response to a question posed in the webinar of Dec. 13, 2012, it was stated that there are no examples of plants being taken offline in such events by tripping of load-responsive aux transformer relays. If there's no "bang" to be had then there's no justification for the "bucks" that GOs are being asked to spend. This issue of there being no record of aux transformer loadability relay trips contributing to blackouts was raised again in the 2/13/2013 webinar, and there was no direct answer given. It appears that this equipment is being included in PRC-025 simply because the SDT was directed to do so. This does not constitute a valid justification; and, in accordance with the cost effectiveness discussions in the 2/13/2013 webinar, any requirements that lack justification should be removed. The Facilities sections 3.2.2 and 3.2.3 seem to be out of scope given the purpose statement "generator protective relays." We believe that Facilities section 3.2.3 does not belong in this standard as the equipment itemized does not relate directly to the generator

loadability. Addressing generating plant station service transformers does not have to translate into creating a standard requirement for that equipment. An investigation and evaluation of the protection system for unit auxiliary transformers should be considered by the standard drafting team and deemed to be not related to generator loadability Providing a description of this dis-associated functionality fulfills the FERC order to address this subject. Further, there is confusion over which station service transformers are included in the scope. In footnote 1, is the concern immediate or eventual trips of the generator with the loss of a station service transformer? Are station service bus overcurrent relays subject to minimum setting criteria specified in Table 1? 3. Equipment limitations may exist that have not been considered thus far in drafting PRC-025. Not all units include high initial response AVRs, and PRC-025 states in fact that only 20% of units examined were able to generate MVARS at the 150% of rated MW level mandated in the draft standard. A GSU sized to cover a generator with lesser field-forcing capability would be suitably specified for the application, but left exposed to damage by the PRC-025 settings criteria. Older transformers, designed to standards different from those in force today (and having incurred some degradation of condition), may incur mechanical damage upon being subjected to excessive current. This can take the form of buckling of inner windings, stretching of outer windings, spiraling of end turns in helical windings, collapse of yoke insulation, press rings, press plates and core clamps, conductor tilting, conductor axial bending between spacers, and dielectric failures. PRC-025 should accordingly be revised to grandfather existing major equipment, similar to the approach used in PRC-024. Relaying changes may be necessary in some cases, but scaling-back the criteria in table 1 of the standard to respect the limitations of existing equipment should be permitted. 4. The applicability of PRC-025 should exclude small gensets that are NERC-registered solely due to being black start-capable, the tripping of which would not meaningfully affect the ability of the system to ride through Disturbances. It would be best to allow such units to maintain their present loadability relay settings, if they are consistent with a reasonable coordination study, rather than mandate upgrades that augment the degree to which NERC requirements have already eliminated any economic rationale for having black-start facilities. The inclusion of generating units and generating plants identified as Blackstart Resources in the Transmission Operator's system restoration plan is unnecessary and inappropriate. These units typically are the smaller units in a generating fleet and, alone, would not impact the ability to ride through the type of system excursion that is the concern of this standard. Further, allowing protection system settings that are more conservative than these proposed in this standard will better protect these resources that are essential to recovering from a system blackout.
Individual
Roger Dufresne
Hydro-Québec Production
No
Comments: The references of the applicability of the GO in PRC-023-3 are confusing with the references to this standard.
Yes
Comments: As per the intent of the paragraph 81, the detailed criteria should not be incorporated in the standard.
Yes
Comments: As per the intent of the paragraph 81, the detailed criteria should not be incorporated in the standard.
Yes
Yes
Comments: HQP (Generation) doesn't own the following components detailed in the proposed standard: 1) the asynchronous generator, 2) the GSU transformer, 3) The load-responsive protective relay (21); 4) the phase time overcurrent relay – Voltage control (51C). HQP recommends moving all of these components to the Transmission Relay Loadability standard PRC-023-3.
Individual

Wryan Feil
Northeast Utilities
Yes
Yes
Yes
No
No
No
Group
Salt River Project
Bob Steiger
Yes
Yes
Yes
Yes
No
Yes
The standard is attempting to define relay settings for the generator from a pure electrical perspective in optimal operating conditions without taking into account other plant situations that could be impacted in a transient system event. Plant situations may be scheduled for resolution during future outages. However, equipment age/operating condition, changes in operational parameters, and overall operating environment may suggest that lower relay settings would be best to protect the plant for the greater good of the BES. Would the team consider parameters and/or situations wherein the suggested settings in the standard might be modified to take plant environments/situations into consideration?
Individual
John Yale
Chelan County PUD No. 1
Agree
North American Generator Forum Essential power, LLC
Individual
Oliver Burke
Entergy Services, Inc. (Transmission)
No
The proposed revision of PRC-023-3 provides a clear line of separation. In PRC-025, 3.2.4 actually creates confusion. The SDT should define exactly where PRC-025 stops (example High side of the

GSU or generator lead line connection) to provide a lot more clarity. This addition provides no value other that unsuccessfully trying to bridge the “potential overlap” with PRC-023-2.
No
The SDT should provide more reference as of how MOD-025 and PRC-019 will play a role into the loadability standards especially how reactive capability verification will provide an input to the calculations on Table 1. A clear path shall be established between PRC-019, MOD-025 and PRC-025 and perhaps cross reference the Power Plant and Transmission System Protection Coordination technical document. The terms MVAR output determined by simulation should also be replaced with the new approved requirements of MOD-025.
Yes
The Guideline and Technical basis provides a lot of information but the fundamental issue about the clarity of the standards is the ability of merge the PRC-025 criteria with the Power Plant and Transmission System Protection Coordination technical reference document. The standard fails to combine those two document(s) into a single clear guideline.
Yes
Yes
Yes
The SDT may want to consider creating a new revision of the Power Plant and Transmission System Protection Coordination, Technical Reference Document Revision 1 – July 2010 to include the principles of PRC-025 and create a single source for compliance.
Individual
Mace Hunter
Lakeland Electric
Yes
Yes
The Effective date for the standard is on the first page of the PRC-025-1 Generator Relay Loadability project document but is not included in the draft 2 of the Standard. The effective date is normally included as section 5. of the Introduction. The Guidelines and Technical Basis document needs to have “PRC-025-2” included on page title as it is in the footnotes starting on page 2. PRC-025-1 is not included anywhere on page one of the document.
Individual
NICOLE BUCKMAN
ATLANTIC CITY ELECTRIC
Agree
Pepco Holdings Inc and Affiliates.
Individual
David Ramkalawan
Ontario Power Generation
No
The wording of section 3.2.4 of the draft standard PRC-025-1 should make it clear that in the case where the generator is the owner of both the Generator Interconnection Facility (GIF) and the relays that protect the GIF then the generator is responsible for setting the relays in accordance with Table 1

of PRC-025-1. In the case where the GIF and relays are owned by the Transmitter then the transmitter is responsible. There may be cases where the GIF is owned by one entity and the relays by another entity in such cases the relay owner shall have the responsibility.
Individual
Michelle D'Antuono
Ingleside Cogeneration LP
No
Ingleside Cogeneration, LP (“ICLP”) believes that in order to eliminate all confusion, it would be much more effective to include PRC-023-2 R1, criterion #6 in PRC-025-1. Based on our reading of the SAR, it is the only item in PRC-023-2 which still applies to Generator Owners. It seems that the modifications would be relatively minor and would clearly dileneate responsibilities between TOs in PRC-023-3 and GOs in PRC-025-1.
Yes
Yes
No
ICLP does not believe that sufficient justification for a capital expense has been provided. We understand the direction that FERC expects the industry proceed, but there is no data showing the extent of replacement costs – nor of the expected benefit. That is the intended purpose of the Cost Effective Analysis Procedure (CEAP), which has just been initiated. A reasonable implementation plan that involves relay replacement can begin only after a cost justification can be derived from the CEAP data. A premature assumption that one exists takes scarce dollars away from other initiatives which may return a far greater benefit.
Yes
No
Individual
Dale Fredrickson
Wisconsin Electric Power Company
No
Generator Owners need to have assurance that load responsive relays connected on the high voltage side of the GSU transformer looking towards the transmission system are not within the scope of both PRC-023 and PRC-025. We recommend that Protection Systems for Generator Interconnection Facilities be more specifically identified as NOT APPLICABLE to PRC-023. For example, the exclusion in PRC-023 Attachment A item 2.4 could be modified to include generators, GSU’s, and Generator Interconnection Facilities.
Yes
No
We propose that station auxiliary transformers (startup transformers) that are not normally used for supplying auxiliary loads should be specifically exempted from applicability to this standard. The reasoning is the same as that used to exclude relay elements that are only in-service when other Protection System components fail (see Introduction, 5th paragraph).

No
We do not agree that all violations of the requirements necessarily constitute a HIGH VRF or a SEVERE VSL. We believe there needs to be flexibility for cases where the actual risk to the BES may warrant a lower degree of sanction.
Yes
1. The 2nd paragraph in Attachment 1 Introduction should be revised for clarity. We suggest: “Criteria for synchronous generator relay setting values are derived from the unit’s maximum gross Real Power capability in megawatts (MW), as reported to the Planning Coordinator or Transmission Planner. The unit’s Reactive Power capability in megavoltampere-reactive (Mvar) is determined by calculating the MW value based on the unit’s nameplate megavoltampere (MVA) rating at rated power factor…” 2. We are concerned that the protection of transformers from damage due to through-faults will be sacrificed by the setting constraints in this standard. The requirements and examples should be revised to assure that transformer protection will be able to be applied which meets the criteria in the IEEE C37.91 through-fault protection curves. 3. A similar concern may apply to generators and the need to set protection that protects the generator from conditions which may exceed the stator winding short-time thermal requirements given in IEEE C50.13 Section 4.2.1.
Group
Operational Compliance
Ed Croft
Yes
For PRC-023-3, Section 4 - Applicability - take the Generator Owner out of the Functional Entity section
Yes
a. For Option 13 in Table 1., the value of 150% is higher than the NEC Maximum rating shown in the 2011 NEC, Article 450, Table 450-3(a) for "Secondary Protection, 600 Volts or Less, Circuit Brkr or Fuse Rating". The value in the table is 125%. b. For Option 14 in Table 1., "Generator Interconnection Facilities - synchronous generators, Phase Distance relay (21) directional twds Trans. System" - this might better be based on line limitations, not generator limitations.
Yes
Yes
Group
SERC Protection and Controls Subcommittee
David Greene
No
Facilities sections 3.2.2 and 3.2.3 seem to be out of scope given the purpose statement "generator protective relays". We believe that Facilities section 3.2.3 does not belong in this standard, as they do not relate directly to the generator loadability. Addressing generating plant station service transformers does not have to translate into creating a standard requirement for that equipment. An investigation and evaluation of the protection system for unit auxiliary transformers should be considered by the standard drafting team and deemed to be not related to generator loadability. Providing a description of this dis-associated functionality fulfills the FERC order to address this subject. Further, there is confusion over which station service transformers, start-up transformers, or other auxilary transformers are included in the scope. In footnote 1, is the concern immediate or eventual trips of the generator with the loss of a station service transformer? Are station service bus overcurrent relays subject to minimum setting criteria specified in Table 1? The inclusion of generating units and generating plants identified as Blackstart Resources in the Transmission

Operator's system restoration plan is unnecessary and inappropriate. These units typically are the smaller units in a generating fleet and, alone, would not impact the ability to ride through the type of system excursion that is the concern of this standard. Further, providing protection system settings that are more conservative than these proposed in this standard will better protect these resources that are essential to recovering from a system blackout.

No

The Table 1 settings force generators to operate up to 200% load continuously with no possibility to trip, thereby removing the effectiveness of the protection function altogether. ANSI C50.13 (and IEEE Std c50.13-2005 - Revision of ANSI C50.13-1989) defines the generator overload design criteria used by many generator manufacturers. It specifies an overload capability at 208% armature current of 10 seconds. This ANSI standard provides an inverse time characteristic to which most synchronous generators are built. It is unacceptable for the tables of PRC-025 to require sustained operation at the load levels specified. There should be a time frame defined in PRC-025 after which the generator owner is allowed to trip their equipment. Requiring the generator to operate at the specified overload conditions indefinitely will damage the generator. Protection of the generator should be the top concern of the protection device settings. Constraining generators to values specified in the draft standard compromise protection. Protection System settings have been proven through experience to provide a level of protection to their equipment. If all generators are forced to relax their current protection settings to the values specified, then it is much more likely that generators will be damaged and out of commission for an extended period of time. Consideration should be given to the impact of having multiple generators unavailable to the reliability of the system. Overload and fault damage to a generator is not always visibly apparent and often requires visual inspection or testing. This inspection can take days to accomplish. Transmission line loading practices do not apply to generating plant equipment. Generator Owners must be allowed to protect their equipment from overloads. PRC-025, as currently drafted, will degrade BES reliability rather than enhance it. The draft standard setting specifications of Table 1 conflict with IEEE C37.102 Guide to Generator Protection. This guide (1995 revision) recommends setting the generator overcurrent relaying (51) so that it operates at 115% of rated current and trips in 7 seconds at 226% of full-load current.

No

The technical basis 1) does not adequately address the protection of the generator, and 2) is narrow in scope by basing the settings criteria on one event and simulation rather than real world event data and historical performance. The number of generators that have tripped for loadability does not constitute a statistically significant value of concern based on the overall number of generators that did trip during the Aug 2003 event. (Approx 25/290 = 8.6%)

No

Regarding General Consideration #2, many units have a brief “mini-outage” every year but the interval between planned (longer) outages of sufficient duration to replace relays, apply settings, and test them can be as large as five years. We therefore suggest that the replacement-needed interval be extended to 84 months.

No

The high VRF and severe VSL is not appropriate for a single instance of failure to comply with one component of the many requirements contained within Table 1.

Yes

The purpose statement should be modified from "prevent unnecessary tripping" to "minimize unnecessary tripping" of generators. Part of the Rational statement for R1 is flawed - it is not currently possible to both comply with the PRC-025 draft standard and achieve desired protection goals. Generation systems that were not designed to provide 150% field forcing capabilities may contain other equipment (GSU's, for example) that may incur overload damage if subjected to periods of generator over-loads at the power flow magnitudes specified in Table 1. Abnormal operating conditions (reduced generator or GSU cooling ability, generator vibration problems at high VAR production levels, etc.) must be considered in the standard development to allow for exceptions to Table 1 for equipment protection. It is acknowledged that voltage restrained overcurrent relays are known for not having predictable operating times during fault conditions. If the voltage restrained overcurrent relay mis-operations were a significant contributor to the Aug 2003 blackout , then the standard should address voltage restrained relay types rather than specifying such high (liberal) allowable thresholds for pickup of all types of generator load responsive protective relays. In the

Guidelines and Technical Basis document under Applicability the terms transmission Facilities and generator leads are mentioned. It should be noted that some companies use different terms when referring to the leads connecting the generator Facility to the BES facility. The leads connection between the generator Facility GSU transformer and the BES Facility breakers may be referred to GSU leads and not Generator leads. Generator leads may be those located inside the generator Facility between the GSU lowside and the generator itself. The comments expressed herein (Qiestions 1-6) represent a consensus of the views of the above-named members of the SERC EC Protection and Control Subcommittee only and should not be construed as the position of SERC Reliability Corporation, its board, or its officers.

Group

MRO NERC Standards Review Forum

Joseph DePoorter

No

The NSRF believes that the standard is well written and developed, being based on existing IEEE guidelines and understood industry practices. However, the recent addition of individual wind turbines in the new BES definition could pose issues with individual wind turbines or solar units. The NSRF suggests that the drafting team consider revising the applicability criteria to clearly state that PRC-025-1 was not meant to apply to individual wind turbines or solar units themselves but to the aggregated generation associated . It is suggested that the following be added to the applicability section: 3.2.5 Elements utilized in the aggregation of dispersed power producing resources at the point where the gross individual name plate ratings of generation total greater than 75 MVA in aggregate to the common point of connection at 100kV or above, and not the individual dispursed resources. (Note: this would exclude individual dispursed power producing resources).

No

During the 2/13/13 PRC-025-1 Webinar, we understood the SDT to say that the requirement for verifying the settings of 51 relays for station auxiliary transformers only applied to those overcurrent relays applied on the high voltage side of the transformer such that operation of relay would result in a trip of the transformer. Furthermore, we understood the SDT to indicate the 51 relays applied on the source breaker(s) from the transformer secondary winding(s) to medium voltage bus(es) were not included in scope. If this is indeed the intent of the drafting team, we recommend the SDT clarify its intent by changing the field on the Table 1 entry for UAT for 51 relays to say "Phase time overcurrent relay (51) whose actuation results in a trip of the UAT transformer".

No

During the 2/13/13 PRC-025-1 Webinar, we understood the SDT to say that the requirement for verifying the settings of 51 relays for station auxiliary transformers only applied to those overcurrent relays applied on the high voltage side of the transformer such that operation of relay would result in a trip of the transformer. Furthermore, we understood the SDT to indicate the 51 relays applied on the source breaker(s) from the transformer secondary winding(s) to medium voltage bus(es) were not included in scope. If this is indeed the intent of the drafting team, we recommend the SDT clarify its intent by including a paragraph to the Option 13A/B discussion on pages 15-17 explaining that this requirement only applies to phase overcurrent 51 relays whose actuation would result in a trip of the transformer itself and not to 51 relays monitoring the low side source breaker from the transformer to low side medium voltage bus.

No

The NSRF would suggest additional clarification that indicates the standard applies only when an entity has such relays present and enabled. That the standard does not require that entities install additional relaying or enable further relay functionality. In PRC-024 there is a foot note explaining this.

Yes

The NSRF believes that this is a well written, well based, and focused NERC standard. The NSRF appreciates that the standard is solidly based on existing industry understood IEEE guidelines and practices. The NSRF would suggest that the structure of having one requirement with multiple application s to relays is clear and should support the reliable operation of the BPS.

Individual
Mark Yerger
Potomac Electric Power Company
Agree
Pepco Holdings, Inc. and Affiliates
Individual
Kayleigh Wilkerson
Lincoln Electric System
MRO NSRF
No
LES recommends additional clarity be added to Applicability Section 3.2.4 to account for possible differences in configurations. As currently proposed, section 3.2.4 does not provide sufficient detail for entities to delineate which breakers and associated relaying constitute the Generator interconnection Facility(ies). As an example, in a typical unit-connected generator, the substation breakers would clearly be included as part of the interconnection Facility(ies). However, in a scenario in which the generator is separated from the GSU by a breaker and the GSU separated from the substation by a plant site transmission breaker, the substation breakers would not typically be considered as part of the interconnection Facility(ies). For auditors unfamiliar with the difference in configurations, this could lead to confusion in terms of why an entity may include the substation breakers in one case but not the other. Additionally, in relation to the unit-connected generator scenario, another consideration would be if the substation breakers were in a ring bus configuration and would also be tripped by relays for an adjacent transmission line that are set as phase distance (21) relays – directional toward the Transmission System. Although these relays would not be associated with the generator, they could trip breakers considered to be a part of the interconnection Facility(ies). To alleviate the concern of which Facility(ies) should be included, recommend that at a minimum the drafting team incorporate additional guidance and/or diagrams within the Guidelines and Technical Basis document to further clarify the intent of Applicability Section 3.2.4.
Individual
John Bee
Exelon Corporation and its affiliates
No
Deeming any and all violations of this standard to have a high violation risk factor and a severe violation severity level seems overly harsh. Suggest that a graded approach to the Violation Severity Level based on % of non-compliance be used.
No
Individual
Thad Ness
American Electric Power
No

The proposed changes in the draft PRC-023-3 create a bright line identifying the scope of PRC-023-3. However, the proposed draft of PRC-025-1 does not create a bright line identifying the scope of PRC-025-1. Load-responsive protective relays installed on the high side terminals of the Generator Step-Up transformer looking towards the Transmission system are clearly in scope for PRC-023-3 but are not clearly excluded from being applicable to PRC-025-1. AEP recommends including in PRC-025-1 verbiage clearly excluding load-responsive protective relays applicable to PRC-023-3 from PRC-025-1.
No
To improve the clarity of Table 1 AEP recommends providing separate tables for each application. The application column should be revised to remove the use of dashes " – " and to instead use the words "connected to". For examples: revise "GSU – synchronous generators" to read "GSU connected to synchronous generators". Table 1 and the Guidelines and Technical Basis document should be revised to clearly indicate which options are applicable to a Generator interconnection Facility that is connected to both synchronous and asynchronous generators. For this situation, the options currently provided for a Generator interconnection Facility that is connected to an asynchronous generator should be used in this case.
No
Does the drafting team have plans to re-incorporate the Guidelines and Technical Basis document back into the standard itself (as it was originally), and if so, when would this occur? If not and this document is to remain separate from the standard, the drafting team needs to establish a clear, strong relationship between the standard and guideline document and one which would allow entities to cite the guideline as evidence during an audit. A single footnote is not a sufficient reference to an external guidance document, especially one as detailed as the one proposed. Table 1 and the Guidelines and Technical Basis document should be revised to clearly indicate which options are applicable to a Generator interconnection Facility that is connected to both synchronous and asynchronous generators. It is not clear from the Unit Auxiliary Transformer section of Guidelines and Technical Basis document how this standard would apply to a transformer with high-side windings directly connected to the transmission grid whose phase time overcurrent relaying operating would remove only plant process load but loss of this load would result in a process trip and loss of the unit. (i.e. loss of the ID fan resulting in a furnace pressure trip on the unit). This scenario needs to be added to the list of examples included in the guideline, and explicitly included or excluded. During the 2/13 webinar it was stated that start-up transformers providing power when the unit is not on-line are out of scope for PRC-025-1. When questioned as to whether PRC-025-1 would become applicable to the transformer if the failure of the normal UAT resulted in the entity utilizing the start-up transformer for running power, the SDT responded that yes, the transformer would be applicable to PRC-025-1 during the time that occurs. If UATs are to remain in scope, an exemption should be included to allow an entity to operate in an emergency configuration without being in violation of PRC-025-1. Section 3.2.3 of the standard and the Unit Auxiliary Transformer section of the Guidelines and Technical Basis should be revised to clearly exclude transformers that feed process loads that are needed for generating unit operation but would not result in an immediate unit trip or runback. Examples include coal unloading, lime stone unloading, environmental process etc. that provide ample time for system reconfiguration or alternative feeds to be established before the generating unit operation is impacted. These would not immediately impact the output cabability of the unit to "supply overall auxiliary power necessary to keep generating unit(s) online" , and should be excluded as a result.
No
The implementation plan proposed by the drafting team will still require the majority of the research, calculations and implementation to be completed within 48 months. We do not believe this is sufficient time for entities with a large generating fleet. As an alternative, AEP suggests a phased implementation plan that requires entities to show that a minimum percentage of their applicable relays are compliant within a specified time frame. For example: * Entities shall demonstrate that 30% of their applicable load-responsive protective relays are fully compliant with R1 within 48 months of the effective date of this standard. * Entities shall demonstrate that 60% of their applicable load-responsive protective relays are fully compliant with R1 within 60 months of the effective date of this standard. * Entities shall demonstrate that 100% of their applicable load-responsive protective relays are fully compliant with R1 within 72 months of the effective date of this standard.
Yes

Yes
As stated in our earlier comments, the scope of this draft is inconsistent with the title and purpose with respect to generator protective relays as opposed to generation relays. The phrase “generator relay” has a specific meaning to a relay engineer, and encompasses only a subset of the generation relays covered under this standard. AEP disagrees with the removal of the PRC-023-2 effective date tables in their entirety because the PRC-023-2 tables include provisions allowing the TO, GO and DP 39 months following the notification by the planning coordinator of a new inclusion to the list of circuits subject to R6 to come into compliance with R1, R2, and R3. AEP requests than a definitive time frame for evaluations of new inclusions be included in PRC-023-3.
Individual
Gregory LeGrave
WPS
Yes
Placing a blanket restriction on generator phase-responsive protective element settings could reduce protection in certain situations. Rather, this decision should be left to the Professional Protection Engineers who consider technical resources, such as the IEEE Guide for AC Generator Protection, and individual unit characteristics when applying protection element settings. The guideline & technical basis document states “…it is suggested that the responsible entity consider both the requirement within this standard and its desired protection goals, and perform modifications to its protective relays or protection philosophies as necessary to achieve both.” The document continues on further stating “…it may be necessary to replace the legacy relay with a modern advanced-technology relay…”. These comments are of concern since several BES generator protection schemes consist of legacy protective relays which may require a wholesale change out to comply with this reliability standard. This standard speaks specifically to asynchronous phase-responsive protective elements. These protective elements are usually associated with wind turbines which could pose protection issues. The standard drafting team should consider revising the applicability criteria to clearly state that PRC-025 is not meant to apply to individual wind turbines but to aggregated generation greater than 75MVA connected at a common point at 100kV or above. Clarification should be added to the standard indicating that PRC-025 only applies to those relays that are present and enabled and does not require entities to add additional protective relays.
Individual
Chris Plante
Wisconsin Public Service Corp
Agree
Wisconsin Public Service Corp - Greg LeGrave
Individual
Michael Mayer
Delmarva Power & Light Company
Agree
Pepco Holdings Inc. and Affiliates
Group
Dominion
Mike Garton
No

The draft SAR and proposed standards PRC-023-3, PRC-025-1 fail to provide a clear distinction as to whether the standard is meant to apply to the owner of a protection system designed to protect transmission elements (which we believe is the intent of PRC-023) or the owner of a protection system designed to protect generation elements (which we believe is the intent of PRC-025). We believe this was the intent of the SDT but we don't believe the applicability section of either of the proposed standards clearly articulates that intent. We suggest the SDT consider an approach similar to that used in PRC-006-1 where the SDT chose to create a 'standard specific entity'; UFLS entities. Alternatively, the applicability could be modified to more closely match the intent as indicated in the Applicability section of the Guideline and Technical Basis document and the Supplemental SAR for Project 2010-13.2 Relay Loadability Order 733 Phase 2 (Relay Loadability: Generation). We believe the standard should be applied to the owner of the particular type of protection system, not applied to a particular function. We are aware of circumstances whereby an entiy registered as TO owns the protection system that protects for faults on the element(s) owned by an entity registered as a GO which are solely used to interconnect their generator to the bulk power system. We are also aware of circumstances whereby the GO owns both the element(s) which are solely used to interconnect their generator to the bulk power system as well as the protection system that protects for faults on those generator interconnection element(s). In both of these, the protection system is designed to protect the bulk power system from the fault, not the generator itself. Changes to proposed PRC 023-2 and PRC 025-1 attempts to establish a bright line but the functional entity of Generator Owners is still included in PRC 023 so this results in confusion as to what standard applies for the elements that connect the generator to the BES as some Transmission Owners own GSU assets but the new standard and as stated on the Webinar it implies that "leads assets" will fall under PRC 025. There is still confusion in this area so a bright line still has not been established.

No

• Table 1. Relay Loadability Evaluation Criteria, 1a, (1): "Real Power output – 100% of the MW capability reported to the Planning Coordinator or Transmission Planner,: This should be generator nameplate rating. The MW capability reported can change. • Table 1. Relay Loadability Evaluation Criteria, 14a or 14b: What is the definition of "Generator interconnection Facilities"?

No

: In the Guidelines and Technical Basis document under Applicability the terms transmission Facilities and generator leads are mentioned. It should be noted that some companies use different terms when referring to the leads connecting the generator Facility to the BES facility. The leads connection between the generator Facility GSU transformer and the BES Facility breakers may be referred to GSU leads and not Generator leads. Generator leads may be those located inside the generator Facility between the GSU lowside and the generator itself. Clarity should be provided with respect to this issue.

No

Dominion suggest the following changes to the implementation plan: Each Generator Owner that owns load-responsive protective relays applicable to this standard shall be 100% compliant for the following: • For each load-responsive protective relay, where determined by the Generator Owner that replacement is not necessary, 60 months beyond the effective date of this standard. • For each load-responsive protective relay, where determined by the Generator Owner that replacement is necessary, 84 months beyond the effective date of this standard."

No

• Page 6 of 18, Table of Compliance Elements: there should be Lower, Moderate, and High VSL's. We disagree with the "all or nothing" approach to VSL's.

Yes

• Section 3.1.1 – Change to: "Generator Owner that applies load-responsive protective relays at the terminals of BES facilities." • Section 3.2 – remove the entire section (3.2, 3.2.1, 3.2.2, 3.2.3, and 3.2.4), the revised Section 3.1.1 now will cover this section. • R1 – remove the following words: "while maintaining reliable fault protection." – it is not possible to measure or prove this statement.

Group

Tennessee Valley Authority

Brandy Spraker

No
We understand that the intent of PRC-023-3 is to ensure that protective relay settings shall not limit transmission loadability, however, it might be worth qualifying that this does not include generator step up units.
Yes
Yes
No
We would ask that you consider 72 months to apply load-responsive protective relay settings where relay replacement is not required. This change would allow adequate time to perform the required review and implementation, taking into account the shortage of relay engineers in the utility industry.
Yes
No
Individual
David Jendras
Ameren
No
(1) Introducing ‘at the terminals of the’ before ‘circuits’ is superfluous because each owner (TO, GO) is already responsible for the Protection System they own. Since PRC-023-3 is still applicable to the GO in your proposal, we see little value or clarity realized. (2) Generator interconnection Facilities is not a defined term, so before it is used in PRC-025 the SDT needs to define it for the NERC Glossary or it needs to be carried with this standard.
No
(1) Attachment 1 is much improved, however we request that R1 clearly state that the GO can use any one of the options, and that the GO is not required to use any of these relay types (protective functions), such as the language in PRC-023 R1. (2) System-connected auxiliary transformers are load serving and do not belong in a Generator Loadability standard. Please refer to the recently approved BES Definition which shows they are clearly outside the BES definition criteria. Early drafts of PRC-005-2 also attempted to include them, but they are correctly excluded in industry and NERC BOT approved version recently filed with FERC.
No
(1) Resetting generator protective relays as advocated in this proposed standard will exceed ANSI C50.13 and IEEE C37.102 which we believe is a greater threat to BES reliability than the very rare instances of generators being tripped during an extreme disturbance. The examples of pre-mature generator trips cited as basis for this proposed standard occurred during events that are well beyond design basis.
Yes
(1) For load-responsive protective relays that become applicable to this standard, we request the 48 and 72 month implementation should be allowed based on the same distinction regarding relay replacement.
No
The binary approach used exaggerates both the risk and its severity.
Yes

(1) The MW capability reported to the PC or TP changes by a minute amount from time to time. As written this could trigger a significant amount of documentation. Please include a tolerance of 2% increase from the originally documented value before triggering such a review. (2) Is a declaration or just documentation required if an owner uses none of these 'Relay types' for these 'Applications' on a particular generating unit? (3) In addition to our comments, we also agree with the SERC Protection & Control Subcommittee (PCS) comments and include them by reference.
Individual
Anthony Jablonski
ReliabilityFirst
No
It is not clear where the dividing line is between the "Generator interconnecting Facilities" in PRC-025-1 and certain transmission lines and transformers in PRC-023-2. Perhaps the "Generator interconnecting Facilities" should be limited by specific parameters such as the high side GSU leads up to 1 mile. Perhaps a drawing or additional words would help clarify the dividing line.
No
Table 1 would be clearer if a relay functional drawing(s) was inserted that indicated the location of the installation of the relays and instrument transformers indicated in Options 1 through 19. The drawing(s) would make it clearer the differences between options such as options 1a, 1b & 1c and options 7a, 7b & 7c and whether the instrument transformers are on one side or the other of a device.
No
ReliabilityFirst offers the following comments related to the Guidelines and Technical Basis: 1. The Guidelines and Technical Basis document seems rather complex. In particular, the calculations for options 1b and 7b show the difficulty in applying the criteria to this type of protection. The example calculations for these options are over three pages long due to the iterative process needed to estimate the low-side voltage on the generator side of the GSU. It is not clear from the example as to the point where the estimate is good enough. The Guidelines should provide criteria such as the iterations can stop once the difference in the low-side voltage estimates are < 1%. 2. It might be better to simply drop the more difficult application options like these and defer to the easier or simulation options such as those in 1a, 1c, 7a and 7c. 3. The guidelines do not make it clear when the gross or net generator output should be used for the calculations. Presumably, the gross output is only used for the generator options 1-6.
Yes
Yes
More clarity is needed to identify the differences between the different protection applications for GSUs, Generator interconnection Facilities and generators. Some of the options appear to be almost identical and could possibly be combined in the table as they are in the calculations within the Guidelines and Technical Basis document.
Individual
Spencer
Tacke
Yes
Yes
Yes

Yes
In section 3.2 "Facilities". I think it is critical that the following phrase be added at the end of the first paragraph: "..., and any generator, regardless of size or connected voltage, that has been shown to be material to the reliability of the BES". The “bright line” of 100 kV and 20 MVA is fine in general, but when it is known that a generator connected at less than 100 kV is material to the reliability of the BES, it should be included as an applicable facility for this standard. Please remember that WECC requires dynamic model verification for all units 20 MVA or larger connected at voltages 60 kV and above. This is because WECC members have learned over the years to recognize the significant role that smaller size generators play in system response and stability. Also, past WECC studies of major outages have shown that generators connected at less than 100 kV, have played a major role in the impact of outages. In fact, the most accurate duplication of the 1996 outage and more recent outages that the WECC MVWG has simulated, have shown that the accuracy of the simulated results of actual system outages is highly affected by the accuracy of the modeled system below 100 kV.
Individual
Timothy Brown
Idaho Power Co.
Yes
Yes
Yes
The document is very helpful.
Yes
Yes
No
Individual
Brett Holland
Kansas City Power & Light
Yes
No
Table 1 in and of itself does not provide enough detail. Table 1 is only clear after reading the examples in the "Guidelines and Technical basis" document.
Yes
Yes
Yes
Yes
Generators and Generator step up transformers are critical elements of the BES and have very long lead times for replacement or major repair. However, the Transmission Relay load ability standard has less stringent load ability requirements than the Generator load ability standard. Transmission lines are allowed to trip at 150% of four hour rating or 115% of 15 minute rating. This standard requires generators to stay on line up to 180% of their rating for distance element settings and requires GSU's

to stay on line up to 200% of their rating for phase over current elements. The relay setting limits in this standard are not based on protection of the generator or GSU and risk damaging this equipment under extreme operating conditions. The suggestion is to reduce the load ability requirements for generators and GSU's to coordinate better with the Transmission Relay Load ability standard.
Individual
Travis Metcalfe
Tacoma Power
No
The phrase “at the terminals of the” used in PRC-023-3 does not seem to mitigate the potential overlap. Furthermore, it appears to be inconsistent with the term “generator interconnection Facility(ies)” used in PRC-025-1. Should not the distinction be drawn for generation interconnection Facility(ies) in both standards? In other words, it seems that transmission lines only connecting generation would be subject to PRC-025-1 and that transmission lines that are part of the more interconnected transmission system would be subject to PRC-023-3. If the drafting team disagrees that the phrasing/terminology should be the same in both standards, additional clarification is requested.
No
The table is generally clear. However, there were at least three areas for improvement. For 51V – voltage-restrained relay types, the overcurrent pickup is reduced in proportion to the voltage. Should the overcurrent element pickup be evaluated relative to 115% of the calculated current, or should the reduced overcurrent pickup be evaluated relative to 115% of the calculated current? In Table 1, Options 2c and 15b, Pickup Setting Criteria column, change “…115% o…” to “…115% of…” In Table 1, Pickup Setting Criteria column, sometimes the term ‘connected’ is used when describing the Reactive Power output calculation, and sometimes the term ‘aggregate’ is used. Is a distinction intended? If so, what is the distinction? If not, it is suggested that these terms be made consistent.
No
The guidelines generally help. However, there were at least two areas for improvement. Referring to Equation 66 in the Guidelines and Technical Basis, two cases of ‘Vgen’ should be relabeled ‘Vbus.’ For 51V – voltage-restrained relay types, the overcurrent pickup is reduced in proportion to the voltage. Should the overcurrent element pickup be evaluated relative to 115% of the calculated current, or should the reduced overcurrent pickup be evaluated relative to 115% of the calculated current?
Yes
No
A graduated structure for VSL is recommended based upon the percentage of load-responsive protective relays for which the Generator Owner failed to apply settings that are in accordance with Attachment 1: Relay Settings. According to the Violation Risk Factor and Violation Severity Level Justification, FERC’s VSL Guideline 2 suggests that a “binary” type requirement must have a Severe VSL. PRC-025-1 R1 is not a “binary” type requirement in the sense that failing to apply settings in accordance with Attachment 1: Relay Settings for only one load-responsive protective relay would generally not pose the same impact to the BES as would be the case if all load-responsive protective relays did not have settings applied in accordance with Attachment 1: Relay Settings. Furthermore, according to the Violation Risk Factor and Violation Severity Level Justification, FERC’s VSL Guideline 4 states that VSL “assignment should be based on a single violation, not on a cumulative number of violations.” It should be noted that PRC-005-2 R3 has a graduated VSL structure based upon the percentage of Protection System Components, included within a time-based maintenance program, that were not maintained in accordance with the minimum maintenance activities and maximum maintenance intervals. In what sense would PRC-025-1 R1 differ from PRC-005-2 R3?
Yes
The IEEE standards for transformers no longer use the terms “no-load tap changers,” “off-load tap changers” or “on-load tap changers.” The preferred terms are “deenergized tap changer” and “load tap changer” per IEEE Standard C57.12.00. The preferred term of “deenergized tap changer” emphasizes that the transformer must be deenergized, not simply unloaded before moving the tap. Attachment 1, paragraph 4 and footnote 3 should be revised to read: “Calculations using the

generator step-up (GSU) transformer turns ratio shall use the actual tap that is applied (i.e., in service) for GSU transformers with deenergized tap changers (DETC). Load tap changers (LTC) are rarely used for GSU transformers; when used, the calculations shall reflect the tap that results in the lowest generator bus voltage."
Group
ACES Standards Collaborators
Ben Engelby
No
(1) We disagree with including GOs as an applicable entity to PRC-023. In order to create a "bright line," the drafting teams should have separate standards. Have PRC-023 apply to transmission owners and PRC-025 to generators owners. It is a simple dividing line. If the team feels that any of the loadability criteria from the transmission loadability standard should be included in PRC-025, then do so, but do not leave any reference to GOs in PRC- 023.
Yes
(1) The table is much improved and we appreciate the clear delineation to which relay and which equipment type the setting criteria apply.
No
(1) We believe there is still some confusion that needs be removed. It is unclear to us what differentiation is intended by "calculated generator bus voltage" and "simulate generator bus voltage" in options 1b, 1c, 2b, 2c, 7b, 7c, 8b, 8c, 9b, and 9c. One would presume that the "calculated" language is intended for the calculation to be performed assuming the high side bus voltage is 0.85 pu. What is particularly confusing is how does one assume that the high side bus voltage is 0.85 pu on a simulation. Do we put an artificial reactor in the simulation as the high side bus to force the voltage to 0.85 pu? An application guidelines section should be developed to explain this difference and further augment the understanding and rationale of the criteria settings in Table 1.
No
(1) We disagree with the approach of requiring a registered entity to replace all electromechanical relays that cannot meet the settings of PRC-025-1 in order to comply with this standard. The standard should provide enough flexibility that registered entities reevaluate their settings to ensure that generators will not trip offline prematurely, but registered entity should make that determination. (2) We disagree with the approach of requiring all relays to meet the setting criteria and believe there are other alternatives that for the draft standard. One approach could be for the GO to receive written confirmation or approval from the PC that the relay settings are satisfactory, with existing equipment. This would be similar to the role of the PC in PRC-023, where the PC must determine which low side terminals are subject to the standard. Further, in PRC-024 allows for equipment limits without requiring replacing equipment for voltage excursions. We recommend the drafting team explore other alternatives that would meet the reliability objective of PRC-025-1, without requiring replacement of equipment that cannot meet the criteria. (3) Another approach could be to require the Regional Entity to make an assessment of the settings on a case-by-case approach, and require certain settings are maintained for the particular region and entity. Not all entities, especially smaller entities, would have as big of an impact on the reliability of the BES and should not be required to replace relays when the impact is minimal. The regions, PC, or even the RC should be able to determine which generators are vital to reliability and could then make an assessment of those relay settings.
No
(1) We disagree with the High VRFs for Requirement R1. Contrary to the explanation provided in the VRF justification for FERC Guideline 4, violation of either of these requirements by a single generator could not be construed as directly causing or contributing to BES instability, separation or cascading within any time frame. Thus, the VRF is not consistent with NERC guideline for a High VRF and is not consistent with FERC guideline 4. For a single violation to lead to BES instability, separation or cascading would require other standards requirements to be violated. NERC VRFs must be assigned by applying the criteria to a single violation of the requirement at a time and not multiple violations. Thus, the case where multiple trips of generators occurred cannot raise this to a High VRF.
Yes
(1) We would like to see a more straight-forward approach to this standard. The requirement and the

table should allow for setting capabilities of existing equipment and not require registered entities to replace relays in order to comply. Also we have concerns that the bright line is not clear enough and compliance with loadability should be separated by standards. Finally, we would like to see a compare/contrast assessment of PRC-023-3 and PRC-025-1 to better understand the separation of responsibilities. This assessment could be in the technical or application guidelines. (2) This standard exceeds NERC's jurisdictional bounds as the FERC-approved Electric Reliability Organization (ERO). According to the Energy Policy Act of 2005, a reliability standard includes requirements for the operation of existing bulk-power system facilities, and the design of planned additions or modifications to such facilities to the extent necessary to provide for reliable operation of the bulk-power system, but a reliability standard does not include any requirement to enlarge such facilities or to construct new transmission capacity or generation capacity. Further, the Act "does not authorize the ERO or the Commission to order the construction of additional generation or transmission capacity or to set and enforce compliance with standards for adequacy or safety of electric facilities or services." This standard is proposing new construction of Protection System relaying schemes that could be interpreted as enlarging the facility, where electro-mechanical relays may exist. This replacement of equipment goes beyond the intent of the EPA 2005. (3) There is already tremendous pressure to retire units based on environmental and other regulations. Given that many older units already experience significant cost pressures any increase in their operating costs could have the unintended consequence of force retiring plants which will degrade reliability particularly in areas with marginally adequate levels of planning reserve. These older plants are most likely to have electro-mechanical relays that may have to be replaced to meet the settings criteria in the standard and the cost of replacing the relays could exceed the benefits of staying in service. Having fewer plants online would have an adverse impact on reliability. If a relay is functioning properly, but it is not capable of meeting compliance with PRC-025-1, the introduction of the standard itself becomes a threat to reliability. We suggest rethinking the replacement of equipment and propose to have exceptions for equipment that cannot meet the requirements for new technology. (4) This standard is unduly discriminatory to smaller utilities that do not have unlimited resources to replace fully-functioning equipment that cannot meet the requirements of the proposed standard. This standard assumes that all registered entities have a budget of an IOU, and budgets to replace equipment within three years after implementation is enough time. As stated above, compliance with this standard may have unintended consequences of units being retired, which could have adverse impacts on reliability. (5) The introduction section on page 7 uses "relay element." Because element is a NERC defined term, we suggest avoiding its use here as it is inconsistent with the meaning. We suggest using "component" instead of "element." (6) Thank you for the opportunity to comment.

Group

PPL Corporation NERC Registered Affiliates

Stephen J. Berger

No

The PPL Companies do not agree that a bright line has been established between the two standards. The PPL companies agree with the comments below from the North American Generators Forum standard review team: Load-responsive protective relays installed on the high side terminals of the Generator Step-Up transformer looking towards the Transmission system appear to be clearly in scope for PRC-023-3 but are not clearly excluded from being applicable to PRC-025-1.

No

The PPL Companies do not agree that the criteria is clearly identified for setting load-responsive protective relays. The PPL Companies agree with the comments below from the North American Generators Forum standard review team: An allowance should be made in PRC-025 for unusual operating conditions, provided that the TO and TOP are notified of such circumstances. Generators that have compromised cooling (e.g. temporarily limited to below-rated hydrogen pressure) will experience a commensurate reduction in the field forcing that can be accommodated, for example, and units with a thermal stability issue can be knocked-offline by vibration and potentially damaged if massively above-rated reactive power flow is attempted. Regarding in particular voltage-restrained overcurrent relays, this type of device is known for not having a predictable operation time under fault conditions. If they did mis-operate in the August 2003 blackout they should be changed-out rather than requiring that the settings be set as high as specified in the draft standard.

No
The PPL Companies do not agree that the Guidelines and Technical Basis provide a clear understanding of the various criteria. The PPL Companies agree with the comments below from the North American Generators Forum standard review team: During the 2/13 webinar it was stated that start-up transformers that provide power when the unit is not on-line are out of scope for PRC-025-1. When questioned as to whether PRC-025-1 would become applicable to the transformer if the failure of the normal UAT resulted in the entity utilizing the start-up transformer for running power, the SDT responded yes, at that time the transformer would be applicable to PRC-025-1. If UATs are to remain in scope, an exemption should be included to allow an entity to operate in an emergency configuration without being in violation of PRC-025-1. It is unclear from the wording in the Guidelines and Technical Basis whether the following is in scope: a transformer with high-side windings directly connected to the transmission grid whose phase time overcurrent relaying operates to remove only plant process load but loss of this load would result in a process trip and loss of the unit. Transformers that provide power to auxiliary loads not directly related to the generation of power should be excluded. This includes coal/lime stone unloading, chemical and water processing, some environmental processes etc. The Guidelines and Technical Basis does not adequately address the protection of the generator, and is narrow in scope by basing the settings criteria on one event and simulation rather than real world event data and historical performance. The number of generators that have tripped for loadability does not constitute a statistically significant value of concern based on the overall number of generators that did trip during the Aug 2003 event. (Approx 25/290 = 8.6%) Part of the Rational statement for R1 is flawed - it is not currently possible to both "comply with the draft standard and achieve (an entity's) desired protection goals".
No
The PPL Companies believe that the Implementation Plan does not address necessary scenarios. The PPL Companies agree with the comments below from the North American Generators Forum standard review team: Many units have a brief “mini-outage” every year but the interval between planned outages of sufficient duration to replace relays, apply settings and test them can be as large as five years. We therefore ask that the replacement-needed interval be extended to 84 months.
No
The PPL Companies agree with the comments below from the North American Generators Forum standard review team: Deeming any and all violations of this standard to have a high violation risk factor and a severe violation severity level seems overly harsh, given the compliance feasibility uncertainties expressed herein.
Yes
The PPL Companies believe that the proposed changes would reduce the reliability of the BES. The PPL Companies concerns are in concert with comments below from the North American Generators Forum standard review team: 1. We had thought in commenting on earlier drafts of PRC-025 that the toleration of extremely high current mandated by this standard would apply only for typical field-forcing periods, i.e. the few seconds it takes for the excitation limiter to respond. The present version of PRC-025 states in the 4th bull-dot of the introduction to Att. 1 however that protection systems must allow units to run for 15 minutes at the current levels stipulated in Table 1, which (as shown in the Guidelines and technical Basis document for this standard) can be on the order of 200% of rated current for generators and GSUs. This is far in excess of the thermal capability of such equipment. A cylindrical-rotor synchronous generator built to the present edition of ANSI C50.13 can withstand an armature current of 226% for 10 sec (208% in earlier editions), and 116% for 120 sec. The situation is similar for GSUs. ETAP studies of selected GSUs show that 200% current might be tolerated in many cases for a few minutes, but not a quarter hour. There should be a time frame defined in PRC-025 after which the generator owner is allowed to trip their equipment. Requiring the generator to operate at the specified overload conditions indefinitely will damage the generator. The draft standard setting specifications of Table 1 conflict with IEEE C37.102 Guide to Generator Protection. This guide (1995 revision) recommends setting the generator overcurrent relaying (51) so that it operates at 115% of rated current and trips in 7 seconds at 226% of full-load current. The fundamental issue appears to be that the Application Guidelines are patterned on transmission line-loading practices, but GSUs and (especially) auxiliary transformers are not used and short-term-overloaded like transmission transformers, so requiring a minimum allowable trip pickup threshold based on IEEE C37.91 alone is not appropriate. Entities should be allowed to protect their equipment from overload, rather than being forced to allow a specific amount of overload. The result is that, despite the

statement in R1 that protection must be maintained, prohibiting the use of multiple definite-time or continuous inverse-time load-responsive relays for any time period less than 15 minutes can degrade the quality of existing protection while doing nothing to improve ride-through for actual field-forcing periods. There are many cases in which overload pickups set at approximately 115% to 130% of the rated current saved units with a low-level fault or exciter malfunction that caused an extended, moderate overload. Such protection would no longer be allowed, and we are skeptical of vague assurances to the effect that somehow something just as good can (and must) be developed. We believe in summary that PRC-025 as presently written would degrade rather than enhance BES reliability, experience has revealed that the pickup settings of generator protection systems can be set much lower than the values specified in Table 1 and not result in undesirable nuisance tripping. and 15 minutes is vastly inappropriate as a one-size-fits-all field-forcing interval. 2. The portions of PRC-025 dealing with auxiliary transformers should be deleted in their entirety; since, aside from the considerations stated above (which apply for aux transformers as well), there is no reliability benefit to be gained. The standard cites generation unit trip records during blackouts as constituting its reason for existence; but, in response to a question posed in the webinar of Dec. 13, 2012, it was stated that there are no examples of plants being taken offline in such events by tripping of load-responsive aux transformer relays. There's no justification for the costthat GOs are being asked to spend. This issue of there being no record of aux transformer loadability relay trips contributing to blackouts was raised again in the 2/13/2013 webinar, and there was no direct answer given. It appears that this equipment is being included in PRC-025 simply because the SDT was directed to do so. This does not constitute a valid justification; and, in accordance with the cost effectiveness discussions in the 2/13/2013 webinar, any requirements that lack justification should be removed. The Facilities sections 3.2.2 and 3.2.3 seem to be out of scope given the purpose statement “generator protective relays.” We believe that Facilities section 3.2.3 does not belong in this standard as the equipment itemized does not relate directly to the generator loadability. Addressing generating plant station service transformers does not have to translate into creating a standard requirement for that equipment. An investigation and evaluation of the protection system for unit auxiliary transformers should be considered by the standard drafting team and deemed to be not related to generator loadability Providing a description of this dis-associated functionality fulfills the FERC order to address this subject. Further, there is confusion over which station service transformers are included in the scope. In footnote 1, is the concern immediate or eventual trips of the generator with the loss of a station service transformer? Are station service bus overcurrent relays subject to minimum setting criteria specified in Table 1? 3. Equipment limitations may exist that have not been considered thus far in drafting PRC-025. Not all units include high initial response AVRs, and PRC-025 states in fact that only 20% of units examined were able to generate MVARS at the 150% of rated MW level mandated in the draft standard. A GSU sized to cover a generator with lesser field-forcing capability would be suitably specified for the application, but left exposed to damage by the PRC-025 settings criteria. Older transformers, designed to standards different from those in force today (and having incurred some degradation of condition), may incur mechanical damage upon being subjected to excessive current. This can take the form of buckling of inner windings, stretching of outer windings, spiraling of end turns in helical windings, collapse of yoke insulation, press rings, press plates and core clamps, conductor tilting, conductor axial bending between spacers, and dielectric failures. PRC-025 should accordingly be revised to grandfather existing major equipment, similar to the approach used in PRC-024. Relaying changes may be necessary in some cases, but scaling-back the criteria in table 1 of the standard to respect the limitations of existing equipment should be permitted. 4. The applicability of PRC-025 should exclude small gensets that are NERC-registered solely due to being black start-capable, the tripping of which would not meaningfully affect the ability of the system to ride through Disturbances. It would be best to allow such units to maintain their present loadability relay settings, if they are consistent with a reasonable coordination study, rather than mandate upgrades that augment the degree to which NERC requirements have already eliminated any economic rationale for having black-start facilities. The inclusion of generating units and generating plants identified as Blackstart Resources in the Transmission Operator's system restoration plan is unnecessary and inappropriate. These units typically are the smaller units in a generating fleet and, alone, would not impact the ability to ride through the type of system excursion that is the concern of this standard. Further, allowing protection system settings that are more conservative than these proposed in this standard will better protect these resources that are essential to recovering from a system blackout.

Group

FirstEnergy
Larry Raczkowski
North American Generator Forum
No
FirstEnergy (FE) believes an overlap exists in applicable entity-assets related to “generator interconnection facilities” between the proposed PRC-025-1 standard and the proposed PRC-023-3 standard. The changes proposed in the applicability statements of PRC-023-3 to add the text “at the terminals” does not alleviate the confusion. For example, a generator that may own sole use 230kV “generator lead” a.k.a. “generator interconnection facility” that extends from the high-side of its GSU to a point of interconnection on the transmission owner’s system (maybe even a few miles away) appears to be subject to PRC-023-3 applicability section 4.2.1.1 as well as PRC-025-1 applicability section 3.2.4. In FE’s opinion, the best path forward is to completely remove the generator owner applicability in PRC-023-2 and allow PRC-025-1 to be the sole NERC standard concerned with relay loadability settings for all generator owner facilities.
Yes
Yes
FE feels that the time parameters of 48 and 72 months are acceptable.
Yes
Group
Santee Cooper
Terry L. Blackwell
No
We agree with the SERC Protection and Control Subcommittes’s comments about auxiliary transformers and blackstart units. The Standard is Titled “Generator Relay Loadability” and the purpose states “to set load-responsive generator protective relays…” Unit auxiliary, station service, startup, and other auxiliary transformers go beyond what should be titled as “generator protective relays.” If concerns over this equipment need to be addressed, they should be addressed separately from the “generator protective relays.”
No
We agree with the SERC Protection and Control Subcommittes’s comments.
No
We agree with the SERC Protection and Control Subcommittes’s comments
No
We agree with the SERC Protection and Control Subcommittes’s comments.
No
We agree with the SERC Protection and Control Subcommittes’s comments.
Yes
We agree with the SERC Protection and Control Subcommittes’s comments.
Individual
John Seelke
Public Service Enterprise Group
Yes

Yes
1. The draft standard does not take into consideration situations where a GO cannot meet the setting requirements of the standard due to equipment limitations (e.g. generator and transformer withstanding limitations). The standard should have some means for a GO to provide technical justification in the event they cannot meet the setting requirements without compromising the generator's protection. 2. The guideline and technical basis document describes cases during the 8/14/2003 event where generator units tripped offline when they shouldn't have. However, it makes no reference to the transmission protection schemes that should have operated prior to a generator's relays operating, thus preventing the generator from tripping offline. The document gives no justification of how having generator overload relays set in the manner described in the draft standard would prevent another 8/14/2003. There would have had to been several transmission relay misoperations before a generator relay would have the opportunity to operate and worsen a system event.
Individual
Mike Hirst
Cogentrix Energy Power Management, LLC
No
Load-responsive protective relays installed on the high side terminals of the Generator Step-Up transformer looking towards the Transmission system appear to be clearly in scope for PRC-023-3 but are not clearly excluded from being applicable to PRC-025-1.
No
An allowance should be made in PRC-025 for unusual operating conditions, provided that the TO and TOP are notified of such circumstances. Generators that have compromised cooling (e.g. temporarily limited to below-rated hydrogen pressure) will experience a commensurate reduction in the field forcing that can be accommodated, for example, and units with a thermal stability issue can be knocked-offline by vibration and potentially damaged if massively above-rated reactive power flow is attempted. Regarding in particular voltage-restrained overcurrent relays, this type of device is notorious for not having a predictable operation time under fault conditions. If they did mis-operate in the August 2003 blackout they should be changed-out rather than requiring that the settings be set as high as specified in the draft standard.
No
During the 2/13 webinar it was stated that start-up transformers that provide power when the unit is not on-line are out of scope for PRC-025-1. When questioned as to whether PRC-025-1 would become applicable to the transformer if the failure of the normal UAT resulted in the entity utilizing the start-up transformer for running power, the SDT responded yes, at that time the transformer would be applicable to PRC-025-1. If UATs are to remain in scope, an exemption should be included to allow an entity to operate in an emergency configuration without being in violation of PRC-025-1. It is unclear from the wording in the Guidelines and Technical Basis whether the following is in scope: a transformer with high-side windings directly connected to the transmission grid whose phase time overcurrent relaying operates to remove only plant process load but loss of this load would result in a process trip and loss of the unit. Transformers that provide power to auxiliary loads not directly related to the generation of power should be excluded. This includes coal/lime stone unloading, chemical and water processing, some environmental processes etc. The Guidelines and Technical Basis does not adequately address the protection of the generator, and is narrow in scope by basing the settings criteria on one event and simulation rather than real world event data and historical performance. The number of generators that have tripped for loadability does not constitute a statistically significant value of concern based on the overall number of generators that did trip during the Aug 2003 event. (Approx 25/290 = 8.6%) Part of the Rational statement for R1 is flawed - it is not currently possible to both "comply with the draft standard and achieve (an entity's) desired protection goals".
No
Many units have a brief "mini-outage" every year but the interval between planned outages of

sufficient duration to replace relays, apply settings and test them can be as large as five years. We therefore ask that the replacement-needed interval be extended to 84 months.
No
Deeming any and all violations of this standard to have a high violation risk factor and a severe violation severity level seems overly harsh, given the compliance feasibility uncertainties expressed herein.
Yes
1. We had thought in commenting on earlier drafts of PRC-025 that the toleration of extremely high current mandated by this standard would apply only for typical field-forcing periods, i.e. the few seconds it takes for the excitation limiter to respond. The present version of PRC-025 states in the 4th bull-dot of the introduction to Att. 1 however that protection systems must allow units to run for 15 minutes at the current levels stipulated in Table 1, which (as shown in the Guidelines and technical Basis document for this standard) can be on the order of 200% of rated current for generators and GSUs. This is far in excess of the thermal capability of such equipment. A cylindrical-rotor synchronous generator built to the present edition of ANSI C50.13 can withstand an armature current of 226% for 10 sec (208% in earlier editions), and 116% for 120 sec. The situation is similar for GSUs. ETAP studies of selected GSUs show that 200% current might be tolerated in many cases for a few minutes, but not a quarter hour. There should be a time frame defined in PRC-025 after which the generator owner is allowed to trip their equipment. Requiring the generator to operate at the specified overload conditions indefinitely will damage the generator. The draft standard setting specifications of Table 1 conflict with IEEE C37.102 Guide to Generator Protection. This guide (1995 revision) recomments setting the generator overcurrent relaying (51) so that it operates at 115% of rated current and trips in 7 seconds at 226% of full-load current. The fundamental issue appears to be that the Application Guidelines are patterned on transmission line-loading practices, but GSUs and (especially) auxiliary transformers are not used and short-term-overloaded like transmission transformers, so requiring a minimum allowable trip pickup threshold based on IEEE C37.91 alone is not appropriate. Entities should be allowed to protect their equipment from overload, rather than being forced to allow a specific amount of overload. The result is that, despite the statement in R1 that protection must be maintained, prohibiting the use of multiple definite-time or continuous inverse-time load-responsive relays for any time period less than 15 minutes can degrade the quality of existing protection while doing nothing to improve ride-through for actual field-forcing periods. There are many cases in which overload pickups set at approximately 115% to 130% of the rated current saved units with a low-level fault or exciter malfunction that caused an extended, moderate overload. Such protection would no longer be allowed, and we are skeptical of vague assurances to the effect that somehow something just as good can (and must) be developed. We believe in summary that PRC-025 as presently written would degrade rather than enhance BES reliability, experience has revealed that the pickup settings of generator protection systems can be set much lower than the values specified in Table 1 and not result in undesirable nuisance tripping. and 15 minutes is vastly inappropriate as a one-size-fits-all field-forcing interval. 2. The portions of PRC-025 dealing with auxiliary transformers should be expunged in their entirety; since, aside from the considerations stated above (which apply for aux transformers as well), there is no reliability benefit to be gained. The standard cites generation unit trip records during blackouts as constituting its reason for existence; but, in response to a question posed in the webinar of Dec. 13, 2012, it was stated that there are no examples of plants being taken offline in such events by tripping of load-responsive aux transformer relays. If there's no "bang" to be had then there's no justification for the "bucks" that GOs are being asked to spend. This issue of there being no record of aux transformer loadability relay trips contributing to blackouts was raised again in the 2/13/2013 webinar, and there was no direct answer given. It appears that this equipment is being included in PRC-025 simply because the SDT was directed to do so. This does not constitute a valid justification; and, in accordance with the cost effectiveness discussions in the 2/13/2013 webinar, any requirements that lack justification should be removed. The Facilities sections 3.2.2 and 3.2.3 seem to be out of scope given the purpose statement "generator protective relays." We believe that Facilities section 3.2.3 does not belong in this standard as the equipment itemized does not relate directly to the generator loadability. Addressing generating plant station service transformers does not have to translate into creating a standard requirement for that equipment. An investigation and evaluation of the protection system for unit auxiliary transformers should be considered by the standard drafting team and deemed to be not related to generator loadability Providing a description of this dis-associated

functionality fulfills the FERC order to address this subject. Further, there is confusion over which station service transformers are included in the scope. In footnote 1, is the concern immediate or eventual trips of the generator with the loss of a station service transformer? Are station service bus overcurrent relays subject to minimum setting criteria specified in Table 1? 3. Equipment limitations may exist that have not been considered thus far in drafting PRC-025. Not all units include high initial response AVRs, and PRC-025 states in fact that only 20% of units examined were able to generate MVARS at the 150% of rated MW level mandated in the draft standard. A GSU sized to cover a generator with lesser field-forcing capability would be suitably specified for the application, but left exposed to damage by the PRC-025 settings criteria. Older transformers, designed to standards different from those in force today (and having incurred some degradation of condition), may incur mechanical damage upon being subjected to excessive current. This can take the form of buckling of inner windings, stretching of outer windings, spiraling of end turns in helical windings, collapse of yoke insulation, press rings, press plates and core clamps, conductor tilting, conductor axial bending between spacers, and dielectric failures. PRC-025 should accordingly be revised to grandfather existing major equipment, similar to the approach used in PRC-024. Relaying changes may be necessary in some cases, but scaling-back the criteria in table 1 of the standard to respect the limitations of existing equipment should be permitted. 4. The applicability of PRC-025 should exclude small gensets that are NERC-registered solely due to being black start-capable, the tripping of which would not meaningfully affect the ability of the system to ride through Disturbances. It would be best to allow such units to maintain their present loadability relay settings, if they are consistent with a reasonable coordination study, rather than mandate upgrades that augment the degree to which NERC requirements have already eliminated any economic rationale for having black-start facilities. The inclusion of generating units and generating plants identified as Blackstart Resources in the Transmission Operator's system restoration plan is unnecessary and inappropriate. These units typically are the smaller units in a generating fleet and, alone, would not impact the ability to ride through the type of system excursion that is the concern of this standard. Further, allowing protection system settings that are more conservative than these proposed in this standard will better protect these resources that are essential to recovering from a system blackout.

Individual

Jonathan Appelbaum

The United Illuminating Company

Agree

NPCC comments

Group

Southern Company: Southern Company Services, Inc; Alabama Power Company; Georgia Power Company; Gulf Power Company; Mississippi Power Company; Southern Company Generation; Southern Company Generation and Energy Marketing

Pamela R. Hunter

No

There is no confusion in our company concerning the scope of PRC-023-2 and the interconnect facilities that we own. Facilities sections 3.2.2 and 3.2.3 seem to be out of scope given the purpose statement "generator protective relays". We believe that Facilities section 3.2.3 does not belong in this standard, as they do not relate directly to the generator loadability. Addressing generating plant station service transformers does not have to translate into creating a standard requirement for that equipment. An investigation and evaluation of the protection system for unit auxiliary transformers should be considered by the standard drafting teamd and deemed to be not related to generator loadability. Providing a description of this dis-associated functionality fulfills the FERC order to address this subject. Further, there is confusion over which station service transformers are included in the scope. In footnote 1, is the concern immediate or eventual trips of the generator with the loss of a station service transformer? Are station service bus overcurrent relays subject to minimum setting criteria specified in Table 1? The inclusion of generating units and generating plants identified as Blackstart Resources in the Transmission Operator's system restoration plan is unnecessary and inappropriate. These units typically are the smaller units in a generating fleet and, alone, would not impact the ability to ride through the type of system excursion that is the concern of this standard. Further, providing protection system settings that are more conservative than these proposed in this

standard will better protect these resources that are essential to recovering from a system blackout.
No
Please modify the last sentence of the Introduction to Attachment 1 section just before the bullet listing by changing "Examples include" to "Examples of exclusions include" to emphasize that the bulleted list is a list of exclusions. To follow the specified table separation protocol outlined, Options 4, 5, and 6 should have the light blue separator with no text. The commas appearing before the word "derived" in the "pickup setting criteria" column for many of the options of Table 1 is not needed and should be removed. The Table 1 settings force generators to operate up to 200% load continuously with no possibility to trip, thereby removing the effectiveness of the protection function altogether. ANSI C50.13 defines the generator overload design criteria used by many generator manufacturers. It specifies an overload capability at 208% armature current of 10 seconds. This ANSI standard provides an inverse time characteristic to which most synchronous generators are built. It is unacceptable for the tables of PRC-025 to require sustained operation at the load levels specified. There should be a time frame defined in PRC-025 after which the generator owner is allowed to trip their equipment. Requiring the generator to operate at the specified overload conditions indefinitely will damage the generator. Protection of the generator should be the top concern of the protection device settings. Constraining generators to values specified in the draft standard compromise protection. Protection System settings have been proven through experience to provide a level of protection to their equipment. If all generators are forced to relax their current protection settings to the values specified, then it is much more likely that generators will be damaged and out of commission for an extended period of time. Consideration should be given to the impact of having multiple generators unavailable to the reliability of the system. Overload and fault damage to a generator is not always visibly apparent and often requires visual inspection or testing. This inspection can take days to accomplish. Transmission line loading practices do not apply to generating plant equipment. Generators must be allowed to protect their equipment from overloads. PRC-025, as currently drafted, will degrade BES reliability rather than enhance it. The draft standard setting specifications of Table 1 conflict with IEEE C37.102 Guide to Generator Protection. This guide (1995 revision) recommends setting the generator overcurrent relaying (51) so that it operates at 115% of rated current and trips in 7 seconds at 226% of full-load current.
No
The technical basis 1) does not adequately address the protection of the generator, and 2) is narrow in scope by basing the settings criteria on one event and simulation rather than real world event data and historical performance. The number of generators that have tripped for loadability does not constitute a statistically significant value of concern based on the overall number of generators that did trip during the Aug 2003 event. (Approx 25/290 = 8.6%)
No
Regarding General Consideration #2, many units have a brief “mini-outage” every year but the interval between planned (longer) outages of sufficient duration to replace relays, apply settings, and test them can be as large as five years. We therefore suggest that the replacement-needed interval be extended to 84 months.
Yes
The purpose statement should be modified from "prevent unnecessary tripping" to "minimize unnecessary tripping" of generators. Part of the Rational statement for R1 is flawed - it is not currently possible to both "comply with the draft standard and achieve our desired protection goals". Generation systems that were not designed to provide 150% field forcing capabilities may contain other equipment (GSU's, for example) that may incur overload damage if subjected to periods of generator over-loads at the power flow magnitudes specified in Table 1. Abnormal operating conditions (reduced generator or GSU cooling ability, generator vibration problems at high VAR production levels, etc.) must be considered in the standard development to allow for exceptions to Table 1 for equipment protection. The high VRF and severe VSL is not appropriate for a single instance of failure to comply with one component of the many requirements contained within Table 1. It is acknowledged that voltage restrained overcurrent relays are known for not having predictable operating times during fault conditions. If the voltage constrained overcurrent relay mis-operations were a significant contributor to the Aug 2003 blackout, then those types of relays should be required to be replaced rather than specifying such high (liberal) allowable thresholds for pickup of all types of

generator load responsive protective relays.
Individual
Clay Young
SCE&G
Agree
SERC PCS
Individual
Scott Berry
Indiana Municipal Power Agency
Agree
Indiana Municipal Power Agency agrees with the comments submitted by the Generator Forum Group or Patrick Brown of Essential Power, LLC. We also have one additional comment that we would like to submit under the last question of the comment form and will submit it here since the form does not allow for additional comments if we agree with other comments. For question 6 on the comment form, we would like to submit the following comment: The pick up setting criteria for 51V-R on synchronous generators (Pickup Setting Criteria column number (2)– Reactive Power Output) will probably be the one IMPA will be using to set its relays for its combustion turbines. We are very concerned about the current level setting that could be reached by using this pickup setting criteria (2) and if we are forced to use this setting, it would definitely overload our equipment (ie. Generator breaker) and our generator; causing generator and equipment damage with no possible restoration in the near future. IMPA believes it might be more realistic to use criteria (1) only for combustion turbines and doing away with (2) critiera that uses nameplate MVA rating – see page 10 of 18 on the draft standard. IMPA also feels that the same comment can be applied to the Phase time overcurrent relay (51)on the GSU.
Individual
Kenneth A Goldsmith
Alliant Energy
No
We believe that there will likely be gaps between PRC-025-1 and PRC-023-3 on facilities rated between 100 to 200kV. PRC-025-1 will require GO's to perform the loadability calc's on every registered generator connected at this voltage. A transmission line at this voltage level is only going to be verified for loadability if the Planning Coordinator determines it is necessary according to PRC-023-3. Therefore, you may have the GO's spending dollars on compliance activities that are not matched by the TO's. It doesn't make sense to increase the loadability of a generator if the corresponding transmission element is not also checked for loadability. Why not synchronize PRC-025-1 to PRC-023-3 and only mandate generators connected at 200kV or higher and then any generator between 100-200kV if selected by the Planning Coordinator?
No
Attachment 1 has exemptions regarding which load responsive relays are exempt from the standard, however there is no discussion regarding any distance element that may employ load encroachment techniques to improve loadability while still trying to maximize protection. This standard appears to require the entity to pull back the reach of the distance protection regardless, which does not seem reasonable. The guideline may discuss encroachment, however it is not part of the standard, and the auditors only rely on the standard regarding what is enforceable.
Yes
Yes
The bright line is extremely dull and blurry when it comes to auxiliary transformers. Each standard appears to treat auxiliary transformers different and confuses the user regarding auxiliary transformers. The standard is not clear if the terminals referred to in 3.1.1 are only the high voltage

side or farther down into the auxiliary system such as the low voltage terminals plus low side breaker and bus, etc. Please clarify the stopping point for this standard. ############################## Requiring the calculations of PRC-025 using the gross MW numbers submitted from MOD-024 might create a lot of unnecessary re-work if MOD-024 submittals are regularly updated with minor MW changes. This will drastically increase costs of compliance and the entities risk of non-compliance with very little reliability benefit. We would like to see an option that would be based upon the nameplate MW or some other static number even if it means the entity has to use a higher margin in their calculation. Tweaking a generator setting every year is not desirable and will open more risk for the BES in the end. ############################## We are concerned that the proposed calculations for the distance relays will adversely affect reliability of the BES by requiring GO entities to pull back their distance reaches too far and conflict with itself since R1 language also requires the utility to maintain reliable fault protection. Because of the combination of MW, MVAR ratings specified, 115% margin, reduced voltage and approximate 56 degrees power factor angle used in PRC-025-1, the user realizes over a 30% reduction in equivalent reach for a distance relay when compared to other equivalent standards listed below: 1. PRC-023-2 options which uses: 150% facility rating @ 0.85 pu voltage and a power factor angle of 30 degrees. 2. IEEE C37.102-2006, “Guide for AC Generator Protection”, Section 4.6.1.1: “Generally, a distance relay setting of 150% to 200% of the generator MVA rating at its rated power factor has been shown to provide good coordination for stable swings, system faults involving in-feed, and normal loading conditions.” Therefore, it appears that the GO must maintain higher equivalent loadability on a generator than a TO relative to a transmission line. This may work when a generator is connected to multiple lines but doesn’t make sense for radial connections or if you become radial due to maintenance or line outages. Many of our generator relays will require distance relay setting changes based upon this proposed standard and we will no longer be able to back up all of the lines leaving our generating stations. This will put a much higher risk and responsibility on the TO too have extremely reliable protection for the lines. We will no longer be able to trip the generator off in a backup mode if the TO does not clear the phase fault at end of line. We believe this has gone a little too far in that R1 still requires the entity to maintain reliable fault protection which the formulas are starting to tread on. With this standard, as written, remote backup protection will likely no longer be an option.
Individual
Ed
O'Brien
Yes
Yes
Yes
Yes
Yes
Yes
MID is generally in agreement with the proposed standard requirements. However MID disagrees with applicability to only BES connected geneators. In section 3.2 "Facilities", MID proposes the following phrase be added at the end of the first paragraph: "..., and any generator, regardless of size or connected voltage, that has been shown to be material to the reliability of the BES". The “bright line” of 100 kV and 20 MVA is fine in general, but when it is known that a generator connected at less than 100 kV is material to the reliability of the nearby BES, it should be included as an applicable facility for this standard. WECC requires dynamic model verification for all units 20 MVA or larger connected at voltages 60 kV and above. This is because WECC members have learned over the years to recognize the significant role that smaller size generators play in system response and stability.

Group
Bonneville Power Administration
Jamison Dye
No
BPA suggests that the drafting team define the term “Generator interconnection Facility(ies)” to clear up any confusion between the two standards. For example, can a line be both a Generator interconnection facility and a transmission line, thus making it subject to both standards? If so, which standard would apply? BPA believes that the definition should be written in such a way that a given facility is subject to one standard or the other, not both.
Yes
Yes
Yes
No
BPA believes that the VRF should be set to Medium because this standard addresses the setting of a relay. Because of this, BPA believes that an error in settings does not affect the BES, it is only when an event occurs that an error in settings would then have an effect and may not cause a cascade.
No
Individual
Rich Salgo
NV Energy
Yes
No
To apply a voltage test to distance relays is not meaningful. A distance relay responds to apparent impedance, regardless of terminal voltage.
Yes
Yes, except for the voltage measure for distance relays.
No
The time periods seem too long. Most standards have a lengthy proposed effective dates (sometimes as long as two years). For a relay replacement, the effective application time frame could well be seven years. Even for a relay replacement the normal budgeting/design/installation/unit outage cycle is substantially less than seven years. For the locations where just a relay setting change is necessary, six years is too long.
Yes
Yes
1. What difference does the type of generator make to the relay settings, especially for transformer over-current protection? The supporting materials do not have a technical justification for treating synchronous and asynchronous generators differently. We do not see any rationale for any difference in settings. 2. The relay Pickup Setting Criteria should be simpler: based upon a percentage of the unit MVA alone. For example option #1a, Test #1 states the relay should allow at least 115% of 100% rated MW output, then test #2 states 150% of 100% of MW output. Which one is to be used? The criteria are confusing. The real goal here is to allow full machine output within the generator capability curves (meaning both real and reactive power output) to support the interconnection during a disturbance. Therefore, the settings should be based on the unit MVA capability alone. 3. What difference does the unit GSU make? The goal here is to ensure the unit stays on-line during a

disturbance, while the relays continue to adequately protect the unit and GSU. The test should be unit MVA alone 4. All the criteria can be simplified into one: relays should allow at least 150% unit MVA.
Individual
Daniel Duff
Liberty Electric Power LLC
Agree
Essential Power
Group
SDG&E Generation
Annamay Luyun
The Purpose states, Purpose: To set load-responsive generator protective relays at a level to prevent unnecessary tripping of generators during a system disturbance for conditions that do not pose a risk of damaging the generator. The phrase, “for conditions that do not pose a risk of damaging the generator”, is not reflected anywhere else in the standard. There needs to be a statement either in the applicability section or requirements section that allows a generator owner or operator to take exception to the requirement if damage to the machinery is possible. Without additional clarification, the standard does not reflect the stated Purpose.