

Consideration of Comments

Project Name: 2019-04 Modifications to PRC-005-6 | Standard Authorization Request

Comment Period Start Date: 7/30/2019

Comment Period End Date: 8/28/2019

There were 35 sets of responses, including comments from approximately 119 different people from approximately 92 companies representing 10 of the Industry Segments as shown in the table on the following pages.

All comments submitted can be reviewed in their original format on the [project page](#).

If you feel that your comment has been overlooked, please let us know immediately. Our goal is to give every comment serious consideration in this process. If you feel there has been an error or omission, contact Vice President of Engineering and Standards [Howard Gugel](#) (via email) or at (404) 446-9693.

Questions

1. [Do you agree with the project scope as outlined in the SAR? If you do not agree, or if you agree but have comments or suggestions, provide your recommendation or proposed modification.](#)
2. [If you have any other comments on this SAR that you haven't already mentioned above, provide them here:](#)

The Industry Segments are:

- 1 — Transmission Owners
- 2 — RTOs, ISOs
- 3 — Load-serving Entities
- 4 — Transmission-dependent Utilities
- 5 — Electric Generators
- 6 — Electricity Brokers, Aggregators, and Marketers
- 7 — Large Electricity End Users
- 8 — Small Electricity End Users
- 9 — Federal, State, Provincial Regulatory or other Government Entities
- 10 — Regional Reliability Organizations, Regional Entities

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
BC Hydro and Power Authority	Adrian Andreoiu	1,3,5	WECC	BC Hydro	Hootan Jarollahi	BC Hydro and Power Authority	3	WECC
					Helen Hamilton Harding	BC Hydro and Power Authority	5	WECC
					Adrian Andreoiu	BC Hydro and Power Authority	1	WECC
FirstEnergy - FirstEnergy Corporation	Aubrey Short	1,3,4		FE VOTER	Ann Carey	FirstEnergy	6	RF
					Robert Loy	FirstEnergy - FirstEnergy Solutions	5	RF
					Aaron Ghodooshim	FirstEnergy - FirstEnergy Corporation	3	RF
					Julie Severino	FirstEnergy - FirstEnergy Corporation	1	RF
					Aubrey Short	FirstEnergy	4	RF
Southwest Power Pool, Inc. (RTO)	Charles Yeung	2	SPP RE	SRC PRC005	Helen Lainis	IESO	2	NPCC
					Greg Campoli	NYISO	2	NPCC
					Dave Zwergel	MISO	2	MRO

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					Ali Miremadi	CAISO	1	WECC
					Charles Yeung	SPP	1	MRO
MRO	Dana Klem	1,2,3,4,5,6	MRO	MRO NSRF	Joseph DePoorter	Madison Gas & Electric	3,4,5,6	MRO
					Larry Heckert	Alliant Energy	4	MRO
					Michael Brytowski	Great River Energy	1,3,5,6	MRO
					Jodi Jensen	Western Area Power Administration	1,6	MRO
					Andy Crooks	SaskPower Corporation	1	MRO
					Bryan Sherrow	Kansas City Board of Public Utilities	1	MRO
					David Heins	Omaha Public Power District	1,3,5,6	MRO
					Jeremy Voll	Basin Electric Power Cooperative	1	MRO
					David Zwergel	Midcontinent ISO	2	MRO
					Douglas Webb	Kansas City Power & Light	1,3,5,6	MRO

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					Fred Meyer	Algonquin Power Co.	1	MRO
					James Nail	Independence Power & Light (Independence Missouri)	1,3,5	MRO
					James Williams	Southwest Power Pool, Inc.	2	MRO
					Jamie Monette	Minnesota Power / ALLETE	1	MRO
					Jamison Cawley	Nebraska Public Power	1,3,5	MRO
					Sing Tay	Oklahoma Gas & Electric	1,3,5,6	MRO
					Terry Harbour	MidAmerican Energy	1,3	MRO
					Troy Brumfield	American Transmission Company	1	MRO
PPL - Louisville	Devin Shines	3,5,6	RF,SERC	Louisville Gas and Electric Company and	Charles Freibert	PPL - Louisville Gas and Electric Co.	3	SERC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
Gas and Electric Co.				Kentucky Utilities Company	JULIE HOSTRANDER	PPL - Louisville Gas and Electric Co.	5	SERC
					Linn Oelker	PPL - Louisville Gas and Electric Co.	6	SERC
ACES Power Marketing	Jodirah Green	1,3,4,5,6	MRO,NA - Not Applicable,RF,SERC,Texas RE,WECC	ACES Standard Collaborations	Bob Solomon	Hoosier Energy Rural Electric Cooperative, Inc.	1	SERC
					Kevin Lyons	Central Iowa Power Cooperative	1	MRO
					John Shaver	Arizona Electric Power Cooperative	1	WECC
					Bill Hutchison	Southern Illinois Power Cooperative	1	SERC
					Kagen DelRio	NC Electric Membership Cooperation	3,4,5	SERC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					Amber Skillern	East Kentucky Power Cooperative	1	SERC
					Tara Lightner	Sunflower Electric Power Corporation	1	MRO
DTE Energy - Detroit Edison Company	Karie Barczak	3,4,5		DTE Energy - DTE Electric	Jeffrey Depriest	DTE Energy - DTE Electric	5	RF
					Daniel Herring	DTE Energy - DTE Electric	4	RF
					Karie Barczak	DTE Energy - DTE Electric	3	RF
Duke Energy	Kim Thomas	1,3,5,6	FRCC,RF,SERC	Duke Energy	Laura Lee	Duke Energy	1	SERC
					Dale Goodwine	Duke Energy	5	SERC
					Greg Cecil	Duke Energy	6	RF
Southern Company - Southern Company Services, Inc.	Marsha Morgan	1,3,5,6	SERC	Southern Company	Katherine Prewitt	Southern Company Services, Inc	1	SERC
					Jennifer Sykes	Southern Company Generation and Energy Marketing	6	SERC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					R Scott Moore	Alabama Power Company	3	SERC
					William Shultz	Southern Company Generation	5	SERC
Northeast Power Coordinating Council	Ruida Shu	1,2,3,4,5,6,7,8,9,10	NPCC	RSC	Guy V. Zito	Northeast Power Coordinating Council	10	NPCC
					Randy MacDonald	New Brunswick Power	2	NPCC
					Glen Smith	Entergy Services	4	NPCC
					Brian Robinson	Utility Services	5	NPCC
					Alan Adamson	New York State Reliability Council	7	NPCC
					David Burke	Orange & Rockland Utilities	3	NPCC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					Michele Tondalo	UI	1	NPCC
					Helen Lainis	IESO	2	NPCC
					Michael Jones	National Grid	3	NPCC
					Sean Cavote	PSEG	4	NPCC
					Kathleen Goodman	ISO-NE	2	NPCC
					David Kiguel	Independent	NA - Not Applicable	NPCC
					Silvia Mitchell	NextEra Energy - Florida Power and Light Co.	6	NPCC
					Paul Malozewski	Hydro One Networks, Inc.	3	NPCC
					Gregory Campoli	New York Independent System Operator	2	NPCC
					Laura McLeod	NB Power Corporation	5	NPCC
					Nick Kowalczyk	Orange and Rockland	1	NPCC
					John Hastings	National Grid	1	NPCC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					Joel Charlebois	AESI - Acumen Engineered Solutions International Inc.	5	NPCC
					Quintin Lee	Eversource Energy	1	NPCC
					Mike Cooke	Ontario Power Generation, Inc.	4	NPCC
					Salvatore Spagnolo	New York Power Authority	1	NPCC
					Shivaz Chopra	New York Power Authority	5	NPCC
					Mike Forte	Con Ed - Consolidated Edison	4	NPCC
					Dermot Smyth	Con Ed - Consolidated Edison Co. of New York	1	NPCC
					Peter Yost	Con Ed - Consolidated	3	NPCC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
						Edison Co. of New York		
					Ashmeet Kaur	Con Ed - Consolidated Edison	5	NPCC
					Caroline Dupuis	Hydro Quebec	1	NPCC
					Chantal Mazza	Hydro Quebec	2	NPCC
					Sean Bodkin	Dominion - Dominion Resources, Inc.	6	NPCC
Lower Colorado River Authority	Teresa Cantwell	1,5		LCRA Compliance	Michael Shaw	LCRA	6	Texas RE
					Dixie Wells	LCRA	5	Texas RE
					Teresa Cantwell	LCRA	1	Texas RE

1. Do you agree with the project scope as outlined in the SAR? If you do not agree, or if you agree but have comments or suggestions, provide your recommendation or proposed modification.

Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF

Answer	No
Document Name	
Comment	
<p>Industry understands that protective relaying elements within the excitation control systems are included in the original scope of PRC-005 and no modifications are needed to PRC-005. NERC should pursue an interpretation of the scope versus modifying a NERC standard.</p> <p>If a PRC-005 standard revision cannot avoided at this stage, the extent of the revision does not need to expand beyond either footnoting that "Protection Systems" includes protective relaying functions contained within the program logic of the excitation control system or by adding Facilities section 4.2.5.4 to indicate the same.</p> <p>The appropriate maintenance activities should match those for microprocessor relays found in the existing Table 1-1 of PRC-005-6. No revision to the Supplementary Reference and FAQ document is needed because the existing sections addressing microprocessor-based protective relaying already covers that functionality which <i>may exist within</i> excitation control systems <i>rather than within</i> free-standing, discrete, multi-function, microprocessor-based protective relaying solutions</p>	
Likes	0
Dislikes	0
Response	
<p>Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.</p>	

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.

Matthew Nutsch - Seattle City Light - 1,3,4,5,6 – WECC

Answer No

Document Name

Comment

Seattle City Light believes that the project scope of this SAR is unclear and likely unnecessary. The generator AVR’s are already hedged by excitation limiters to prevent under excitation from occurring. The following points are in response to the SAR:

1. The occasion in which an AVR trips a generator offline is not likely to have a significant impact on the BES. Even the biggest generator going offline will not greatly impact the BES in a meaningful way. Since each unit has its own AVR the likelihood of major generator tripping is very small.
2. Other standards already account for this by setting generator limitations for excitation – Excitation system limiters are set in PRC-025-2 to prevent the under excitation of the generator field. In essence there is already a line of defense in place to prevent such occurrences of the AVR tripping the generator offline.
3. The implementation of testing AVR tripping is not likely to be cost effective to implement. As mentioned before there are already methods in place to prevent tripping of the generator via the AVR. The cost to test these would likely be diminished by the rarity of such a trip occurring and the minor impact it will have on the BES.
4. Seattle City Light was unclear on which protective functions are being considered in this SAR. Due to lack of specificity we believe that a change to PRC-005-6 is unnecessary. If industry is confused on the matter it would be best to revise the FAQ documents, provide industry training at regional/national events or develop an additional white paper on the topic to explore it in greater detail.

Likes 0

Dislikes	0
Response	
<p>Thank you for your comments. Some AVRs have protective functions enabled that directly trip the generator, thus potentially impacting BES reliability as much or more than other protective functions already included in the scope of PRC-005. The SAR drafting team has determined that any enabled protective functions that operate in a manner similar to a protective relay should be maintained in accordance with PRC-005.</p> <p>The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.</p> <p>The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.</p> <p>While other NERC standards address the coordination of such functions, the SAR drafting team determined that the maintenance of applicable control system enabled protective functions belong in PRC-005.</p> <p>Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.</p>	
Thomas Breene - WEC Energy Group, Inc. - 3,4,5,6	
Answer	No
Document Name	
Comment	
<p>Under Detailed Description section of the SAR:</p>	

Other sections of the standard also need to be revised accordingly. In PRC-005-6 section 6 the definition for AVR and AVR protective function need to be added as AVR does not appear anywhere in the NERC glossary.

The PRC-005-6 table section needs to be revised and a table added to clearly identify AVR protective functions and their testing requirements.

Likes	0
Dislikes	0

Response

Thank you for your comments. The SAR drafting team agrees. And as such, the SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.

Ginette Lacasse - Public Utility District No. 1 of Chelan County - 1,3,5,6 – WECC

Answer	No
Document Name	

Comment

Submitted on behalf of CHPD:

The scope appears to presume that PRC-005 is applicable to the AVR. We do not agree. WECC has provided guidance that voltage regulators are not within scope of PRC-005. Voltage Regulators are not Protective Relays which is the applicability of PRC-005.

While we disagree, if it is determined an AVR falls within the scope of PRC-005, the specific AVR protective functions that are included in the scope should be limited to those functions that are similar to electrical protective relay functions, not internal AVR or exciter functions not detected by conventional protective relays, regardless if these functions cause shutdown of excitation and the opening of a breaker.

Likes	1	JEA, 1, Hobson Ted
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Dislikes	0	
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Response

Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Glenn Barry - Los Angeles Department of Water and Power - 1,3,5,6

Answer	No
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Document Name	
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Comment

The primary function of AVRs is to control/regulate unit voltage. Although some AVRs can be set to trip generators, they are not primary protective relays. AVR protective functions do not affect the reliability of the Bulk Electric System with respect to faults or system disturbances, as the items currently listed in PRC-005-6 do. The inclusion of AVR protective functions goes beyond the scope of the NERC

definition for Protection Systems and would establish a worrying precedent for including numerous other equipment for which the primary function is not protective; for this reason, PRC-005 should have a scope limit. Maintenance of AVR functions would be better suited to the VAR Standard family, which addresses AVR performance.

Likes 0

Dislikes 0

Response

Thank you for your comments. Some AVRs have protective functions enabled that directly trip the generator, thus potentially impacting BES reliability. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

The SAR drafting team determined that the AVR-enabled protective functions belong in PRC-005.

Marsha Morgan - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company

Answer

No

Document Name

Comment

In so much as the protective relaying elements are standard or optional sections of a generator's excitation control system and since the functionality and purpose of such protection elements within excitation control systems are equivalent to standalone, traditional, multi-function microprocessor-based protective relays, it is clear to protection relay engineers that those protection elements within the

excitation control systems are included in the original scope of PRC-005, whether or not they currently are explicitly delineated or identified. Furthermore, the execution of any programmed unit tripping logic sourced from protection elements which may be used with excitation control systems very often use the same dc control circuitry for tripping of the generating unit as do the external microprocessor-based and electromechanical protective relays. It is our belief that no modifications are needed to PRC-005, and that the scope of applicability already includes these elements. An interpretation of the scope, in our opinion, would provide clear, unambiguous, an adequate indication of the inclusion of these protective elements of excitation control equipment, and no modification to PRC-005-6 is needed.

If a PRC-005 standard revision cannot be restrained and avoided at this stage, the extent of the revision does not need to expand beyond either footnoting that "Protection Systems" to indicate that this includes any used protective relaying functions contained within the program logic of the excitation control system or by adding Facilities section 4.2.5.4 to indicate the same. The following action is recommended to address the maintenance activity request in the SAR: Since the programming, testing, and functionality of generator protective relaying elements in use within excitation control systems is essentially identical to that provided by multi-function microprocessor-based discrete protective relaying, the appropriate maintenance activities match those for microprocessor relays found in the existing Table 1-1 of PRC-005-6. These 6 calendar year activities are: 1) verify that the settings in the device, 2) verify the digital inputs & outputs are functional, 3) verify that the analog inputs are transduced properly (analog/digital conversion). We believe that no additional discussion or specification of the myriad of possible protective relaying functionality and testing methods is necessary or needed. The test methods are similar to those used for microprocessor-based protective relays. As with other discrete multi-function microprocessor-based protective relaying, only those elements that are chosen to be used in the protective device should be in the scope of maintenance activities required by PRC-005. No revision to the Supplementary Reference and FAQ document is needed because the existing sections addressing microprocessor-based protective relaying already covers that functionality which *may exist within* excitation control systems *rather than within* free-standing, discrete, multi-function, microprocessor-based protective relaying solutions.

Likes	0
Dislikes	0

Response

Thank you for your comments.

The SAR drafting team agrees that AVR protective functions are already included; however, due to confusion within the industry and some regulatory entities, clarity is needed. And as such, the SAR drafting team has determined that the scope of the SAR should allow the

team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.

Richard Jackson - U.S. Bureau of Reclamation - 1,5

Answer	No
Document Name	
Comment	
<p>Reclamation supports the existing content of the SAR. In addition, Reclamation recommends expanding the scope of the SAR. The SAR should address a course of action for PRC-005 to specify a process for carrying out maintenance that is missed during equipment overhauls or other unavailability during the required maintenance interval. The revised standard should address the allowable timelines to perform the required maintenance. The timelines should permit the missed maintenance to be performed either prior to returning the equipment to Commercial Operation or prior to closing in the breaker. The measure for Requirement R3 should be updated to include documentation that allows for the extension of the interval while the equipment is not connected to the BES.</p> <p>Reclamation also recommends adjusting the scope of the SAR to include clarification of the language used in R5 for corrective maintenance activities. Specifically, Reclamation recommends clarifying the information required to be documented for each Unresolved Maintenance Issue. Examples of documentation may include, but are not limited to: work orders, invoices, project schedules with completed milestones, purchase orders, procedure and/or test results.</p>	
Likes	0

Dislikes	0
Response	
Thank you for your comments. The SAR drafting team declines to modify the scope of the SAR to include this request.	
Maryanne Darling-Reich - Black Hills Corporation - 1,3,5,6 - MRO,WECC	
Answer	No
Document Name	
Comment	
Black Hills is comfortable with the current language of the standard in terms of how to treat protection function testing/maintenance relating to PRC-005-6 and AVR systems.	
Likes	0
Dislikes	0
Response	
Thank you for your comment.	
The SAR drafting team agrees that AVR protective functions are already included; however, due to confusion within the industry and some regulatory entities, clarity is needed. And as such, the SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.	
The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.	

Ted Hobson - JEA - 1,3,5	
Answer	No
Document Name	
Comment	
We agree with CHPD's comments.	
Likes	0
Dislikes	0
Response	
Thank you for your comment. Please see response to CHPD's comment.	
Charles Yeung - Southwest Power Pool, Inc. (RTO) - 2, Group Name SRC PRC005	
Answer	No
Document Name	
Comment	
<p>Since the digital AVR has capabilities electromechanical based AVRs do not have, the SAR needs to specify which functions employed by the digital AVR it seeks to address. The Project Scope should state the functions of the digital AVR applicable to the PRC-005 standard. The underlined text should be added:</p> <p><i>“Only applicable to a Generator Owner that owns a synchronous generating unit with an installed digital AVR, which is used to disconnect the generator during certain voltage excursions.”</i></p>	
Likes	0
Dislikes	0
Response	

Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

brian robinson - Utility Services, Inc. - 5 - NPCC

Answer	No
Document Name	
Comment	
<p>In the Detailed Description Section, the first point specifies “Revise PRC-005-6 to add a new section under Facilities to clearly delineate the applicability of Protection Systems associated with AVR protective functions.” It is unclear if the intent is to revise the definition of Protection System, or to add a section to the “Facilities” section of the Standard for AVR protective functions (similar to Sudden Pressure Relaying). The SAR should be revised to clarify. Suggested revision: “Revise PRC-005-6 to add a new section under Facilities to clearly delineate the applicability of Automatic Voltage Regulators and their associated protective functions. This new section needs to clearly limit the scope of the AVR protective functions to those elements that open a breaker directly or via lockout or tripping auxiliary relays.”</p> <p>PRC-024 SDT is already modifying language to address this for inverter-based resources and the “momentary cessation” issue, so this may be in conflict what with the PRC-005 SAR team does: “Frequency, voltage, and volts per hertz protections (whether provided by protective relaying or protective functions imbedded within associated control systems) that respond to electrical signals and: (i) directly trip the generating resource(s); or (ii) provide signals to the generating resource(s) to either trip or cease injecting current; and are applied on any of the following.....”</p>	
Likes	0

Dislikes	0
Response	
<p>Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.</p> <p>The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.</p> <p>The SAR drafting team is aware of the PRC-024 changes and is monitoring that project to ensure there are no conflicts. The SAR drafting team determined that the maintenance activities of the applicable control system enabled protective functions belong in PRC-005.</p>	
Michael Godbout - Hydro-Québec TransEnergie - 1 - NPCC	
Answer	Yes
Document Name	
Comment	
<p>Hydro-Québec TransÉnergie (HQT - RC function) would suggest the following to the SDT:</p> <ol style="list-style-type: none"> clarify which protective functions in AVR are relevant protective functions that open a breaker directly or via lockout or tripping auxiliary relays, e.g. should diode failure, field over temperature or field overvoltage protections be included versus loss of field or generator overvoltage protection; confirm that external devices e.g. field ground relay, electromechanical field overvoltage are excluded from the scope; 	

3. evaluate the possibility of modifying the Protection System definition (NERC Board of Trustees Approved Definition) by including relevant AVR protection functions in the definition, thus table 1-1 will be applicable to AVR with relevant protection functions.

In addition to the proposed project scope, even if no aforementioned (step 1) AVR protective functions are used, the SDT should consider if there will be a benefit to the reliable operation of the BES to verify that settings are as specified (no relevant protection functions are enabled) and that measurement of power system input and output values are acceptable. Acceptable AC/DC voltage and current measurements are essential to proper AVR control and verification is not specifically covered in MOD-026-1. The settings changes are covered by R4 of MOD-026-1, as it is in R3 of PRC-001-1.1(ii) for protection relays. MOD-026-1 verification is performed every 10 years whereas PRC-005-6 tables 1-1 is 12 years, SDT should consider coordinating time interval with MOD-026-1 period if a new table is added specifically for the AVR.

Likes 0

Dislikes 0

Response

Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.

Aubrey Short - FirstEnergy - FirstEnergy Corporation - 1,3,4, Group Name FE VOTER

Answer

Yes

Document Name

Comment	
<p>Consider adding Phased Implementation Period for AVRs that provide protection functions to account for outages needed to perform testing.</p>	
Likes	0
Dislikes	0
Response	
<p>Thank you for your comment. Any future Implementation Plan would be a function of a SDT during development of the standard and would not be included within the SAR specifically.</p>	
<p>Karie Barczak - DTE Energy - Detroit Edison Company - 3,4,5, Group Name DTE Energy - DTE Electric</p>	
Answer	Yes
Document Name	
Comment	
<p>We agree with the scope of the SAR. We do encourage some discussion and consideration of the challenges in “calibrating” the AVR trip settings and forcing the output contacts. This is the only difference between the AVR and a SEL relay and the industry might end up with very restrictive and possibly hard to implement clarifications on the testing requirements.</p>	
Likes	0
Dislikes	0
Response	
<p>Thank you for your comment. Any future maintenance activities would be a function of a SDT during development of the standard and would not be included within the SAR specifically.</p>	
<p>Chris Scanlon - Exelon - 1,3,5,6</p>	

Answer	Yes
Document Name	
Comment	
Exelon supports the NAGF decision to revise PRC-005-6 to specifically address applicability to, and maintenance of, AVR protective functions.	
Likes 0	
Dislikes 0	
Response	
<p>Thank you for your supportive comment. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.</p> <p>The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.</p>	
John Bee - Exelon - 1,3,5,6	
Answer	Yes
Document Name	
Comment	
Exelon supports the NAGF decision to revise PRC-005-6 to specifically address applicability to, and maintenance of, AVR protective functions.	

Likes	0
Dislikes	0
Response	
<p>Thank you for your supportive comment. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.</p> <p>The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.</p>	
Ruth Miller - Exelon - 1,3,5,6	
Answer	Yes
Document Name	
Comment	
<p>Exelon supports the NAGF decision to revise PRC-005-6 to specifically address applicability to, and maintenance of, AVR protective functions.</p>	
Likes	0
Dislikes	0
Response	
<p>Thank you for your supportive comment. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or</p>	

greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Becky Webb - Exelon - 1,3,5,6

Answer	Yes
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Document Name	
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Comment

Exelon supports the NAGF decision to revise PRC-005-6 to specifically address applicability to, and maintenance of, AVR protective functions.

Likes	0
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Dislikes	0
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Response

Thank you for your supportive comment. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Amy Casuscelli - Xcel Energy, Inc. - 1,3,5,6 - MRO,WECC

Answer Yes

Document Name

Comment

Xcel Energy agrees this is a necessary addition to PRC-005-6 to clarify the applicability and limit the scope. We believe the standard should be neutral to type of generating resource and question why PRC-005-6 should not also apply to electrical protective functions implemented on control systems of inverter-based resources that can cause tripping of BES generating resources.

Further, we note the scope of 2017-07 - Standards Alignment with Registration also includes modifications to the applicability section of PRC-005 related to UFLS Only Distribution Providers. We encourage the teams to work together to most efficiently make the necessary modifications.

Likes 0

Dislikes 0

Response

Thank you for your supportive comment. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

The SAR drafting team has collaborated with the Project 2017-07 SDT and this minor modification to the Applicability Section of the standard to add UFLS-only DP, as well as updating any references to DP, has been added to the SAR for Project 2019-04 Modifications to PRC-005-6.

Devin Shines - PPL - Louisville Gas and Electric Co. - 3,5,6 - SERC, Group Name Louisville Gas and Electric Company and Kentucky Utilities Company

Answer Yes

Document Name

Comment

LG&E/KU believes that the standard is already explicit on Point 1, and that only elements that open a breaker directly or via a lockout or tripping relay are applicable. Guidance should be requested that specifically excludes control devices which perform protective tripping as an accessory (digital excitation controllers, programmable logic controllers, distributed controllers, etc.) from the requirements of Table 1-1. If these devices *are* in scope, a test methodology and criteria should be provided. Guidance and/or a methodology should also be provided regarding the applicability of Table 1-3 to field sensing via DC shunt circuits

Likes 0

Dislikes 0

Response

Thank you for your comments.

The SAR drafting team agrees that AVR protective functions are already included; however, due to confusion within the industry and some regulatory entities, clarity is needed. And as such, the SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.

Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name RSC

Answer Yes

Document Name

Comment

We would suggest the following to SDT:

1. Clarify which protective functions in AVR are relevant protective functions that open a breaker directly or via lockout or tripping auxiliary relays, e.g. should diode failure, field over temperature or field overvoltage protections be included versus loss of field or generator overvoltage protection;
2. Confirm that external devices e.g. field ground relay, electromechanical field overvoltage are excluded from the scope;
3. Evaluate the possibility of modifying the Protection System definition (NERC Board of Trustees Approved Definition) by including relevant AVR protection functions in the definition, thus table 1-1 will be applicable to AVR with relevant protection functions.

In addition to the proposed project scope, even if no aforementioned (step 1) AVR protective functions are used, the SDT should consider if there will be a benefit to the reliable operation of the BES to verify that settings are as specified (no relevant protection functions are enables) and that measurement of power system input and output values are acceptable. Acceptable AC/DC voltage and current measurements are essential to proper AVR control and verification is not specifically covered in MOD-026-1. The settings changes are covered by R4 of MOD-026-1, as it is in R3 of PRC-001-1.1(ii) for protection relays. MOD-026-1 verification is performed every 10 years whereas PRC-005-6 tables 1-1 is 12 years, SDT should consider coordinating time interval with MOD-026-1 period if a new table is added specifically for the AVR.

Likes 0

Dislikes	0
Response	
<p>Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.</p> <p>The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.</p> <p>Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.</p>	
Mark Gray - Edison Electric Institute - NA - Not Applicable - NA - Not Applicable	
Answer	Yes
Document Name	
Comment	
<p>Comments: EEI member companies support the SAR but offer clarifying language for NERC consideration. Using the term “synchronous” as contained within the SAR scope section (i.e., Detailed Description/Unique Characteristics part of the SAR) by itself may unintentionally add ambiguity for some entities and BES resource owners. This term, as used within the SAR, is unbounded and may incorrectly cause some entities or auditors to include some aggregate variable resources and diesel resources that are connected to the BES and have digital AVRs that directly trip individual units.</p> <p>Suggested Modifications:</p> <p>EEI asks that additional language be added to the SAR to more clearly define which resources are to be included within the applicability section of PRC-005-6. One possible solution would be to simply state within the Scope that changes intended to address digital AVR</p>	

systems are to be limited to “Large” synchronous generating units with installed digital AVR. (EEI notes that the SDT should define what constitutes “Large” within the applicability section of the revised standard.) Alternatively, the scope could be modified to add language that limits AVR applicability to units that have a single shaft rating of 20 MVA, and greater, and if the units are smaller than 20 MVA, they should be excluded altogether. We also suggest adding language that limits the applicability of aggregated plant level AVRs, or equivalent controllers, to those that trip the entire aggregate plant of 75 MVA, not individual units AVR.

Likes	0
Dislikes	0

Response

Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.

Thomas Savin - New York Power Authority - 1,3,5,6

Answer	Yes
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Document Name	
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Comment

NYP&A supports this SAR. However, the project scope may need to consider AVR applicability under other NERC PRC standards applicable to Protection Systems (e.g., PRC-004-5 Protection System Misoperation Identification and Correction).

Likes	0
Dislikes	0
Response	
Thank you for your comment.	
Teresa Cantwell - Lower Colorado River Authority - 1,5, Group Name LCRA Compliance	
Answer	Yes
Document Name	
Comment	
<p>The AVR protective settings should be coordinated with Protection System settings and configuration. The BES Protection System devices should be separate from the AVR. The AVR should not be used as a substitute to BES Protection System devices. While the AVR may trip the unit from the BES it may not be used to protect the BES in the event of an AVR failure.</p>	
Likes	0
Dislikes	0
Response	
<p>Thank you for your comments. Some AVRs have protective functions enabled that directly trip the generator, thus potentially impacting BES reliability. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.</p> <p>The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.</p>	

The SAR drafting team determined that the AVR-enabled protective functions belong in PRC-005.

Jodirah Green - ACES Power Marketing - 1,3,4,5,6 - MRO,WECC,Texas RE,SERC,RF, Group Name ACES Standard Collaborations

Answer Yes

Document Name

Comment

In addition to the project scope outlined in the SAR, it is recommended that a revision to PRC-005-6 be added to the scope to clearly define the applicability found in Section 4.2.1 to state BES Lines, transformers, and buses including breakers associated with each of those elements. This language would clarify the exact items Regional Entities are requesting during requests for information. The inclusion of "etc." in the standard does not provide the desired clarity.

Likes 0

Dislikes 0

Response

Thank you for your comments. The SAR drafting team declines to modify the scope of the SAR to include this request.

David Jendras - Ameren - Ameren Services - 1,3,6

Answer Yes

Document Name

Comment

In our opinion NERC should add additional comments in the FAQ about applicability. We believe that the goal is to include functions of the AVR which provide protection for the generator field (i.e. field overcurrent, over-excitation, or V/Hz. We also believe that the field shunt qualifies as a current input to the protective device. Ideally NERC will clarify this in the FAQ. We also concluded the part of the DC circuit which goes to the generator lockout falls under the DC circuitry covered by PRC-005-6. We believe that it is correct to follow the same rules for classifying microprocessor vs non-microprocessor relays when considering AVR's.

Likes	0
Dislikes	0
Response	
<p>Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.</p> <p>The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.</p> <p>Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.</p>	
Kjersti Drott - Tri-State G and T Association, Inc. - 1,3,5	
Answer	Yes
Document Name	
Comment	
Likes	0
Dislikes	0
Response	
<p>Thank you for your support.</p>	
Thomas Foltz - AEP - 3,5	

Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Thank you for your support.	
Adrian Andreoiu - BC Hydro and Power Authority - 1,3,5, Group Name BC Hydro	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Thank you for your support.	
Dennis Sismaet - Northern California Power Agency - 5,6	
Answer	Yes
Document Name	
Comment	

Likes	0
Dislikes	0
Response	
Thank you for your support.	
Bruce Reimer - Manitoba Hydro - 1,3,5,6	
Answer	Yes
Document Name	
Comment	
Likes	0
Dislikes	0
Response	
Thank you for your support.	
Kim Thomas - Duke Energy - 1,3,5,6 - SERC,RF, Group Name Duke Energy	
Answer	Yes
Document Name	
Comment	
Likes	0
Dislikes	0
Response	

Thank you for your support.	
Jeanne Kurzynowski - CMS Energy - Consumers Energy Company - 1,3,4,5 - RF	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Thank you for your support.	
Sandra Shaffer - Berkshire Hathaway - PacifiCorp - 6	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Thank you for your support.	
Rachel Coyne - Texas Reliability Entity, Inc. - 10	
Answer	Yes

Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Thank you for your support.	

2. If you have any other comments on this SAR that you haven't already mentioned above, provide them here:

David Jendras - Ameren - Ameren Services - 1,3,6

Answer

Document Name

Comment

In our opinion it would helpful for NERC to provide guidance on approaches and methods to meet compliance with the AVR portion of requirements of PRC-005. In our opinion the drafting team needs to make it clear that the owner does not have to test the control functions of the AVR to meet these requirements. NERC has already stated that the field breaker is not covered under the standard. It would also be beneficial to give some examples for various types of excitation and AVR's.

Likes 0

Dislikes 0

Response

Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.

Jodirah Green - ACES Power Marketing - 1,3,4,5,6 - MRO,WECC,Texas RE,SERC,RF, Group Name ACES Standard Collaborations	
Answer	
Document Name	
Comment	
Thank you for the opportunity to comment.	
Likes 0	
Dislikes 0	
Response	
Thank you.	
Teresa Cantwell - Lower Colorado River Authority - 1,5, Group Name LCRA Compliance	
Answer	
Document Name	
Comment	
BES Protection System devices should be utility grade protective devices with the ability to withstand voltage transients according to (but not limited to) ANSI/IEEE C37.90.x and include surge protection according to ANSI/IEEE C62.41.x.	
Likes 0	
Dislikes 0	
Response	
Thank you for your comment. The SAR drafting team has determined that specifying equipment grades is outside the scope of PRC-005.	
Mark Gray - Edison Electric Institute - NA - Not Applicable - NA - Not Applicable	

Answer	
Document Name	
Comment	
Comments: EEI understands that North American Generator Forum was instrumental in studying this issue and developing this SAR. As a result, if there are any whitepapers that have been written in support of this effort, we ask that they be added and references within SAR.	
Likes 0	
Dislikes 0	
Response	
Thank you for your comment. There is not a white paper that was developed by NAGF that was submitted with the SAR.	
Charles Yeung - Southwest Power Pool, Inc. (RTO) - 2, Group Name SRC PRC005	
Answer	
Document Name	
Comment	
Southwest Power Pool understands that newer technology may raise questions on how existing NERC standards apply to it. We see a trend with this SAR and recent projects to address performance of digital based equipment. In moving forward, the drafting team should be aware that technology will change and standards should be as technology neutral as possible. If the requirements focus on the reliability intent or “what”, we believe that would accommodate as many different technologies as possible and avoid frequent updates to address how new technologies apply.	
Likes 0	
Dislikes 0	
Response	

or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Richard Jackson - U.S. Bureau of Reclamation - 1,5

Answer

Document Name

Comment

Reclamation recommends the SDT also evaluate the validity of the 12-year interval for PT and CT tests, with specific consideration to shortening the interval. The long interval has the result of only identifying failure of this equipment when it happens, rather than offering a preventive window to implement corrections before failure. The effect of such a lengthy interval is more of an administrative exercise, rather than improving BES reliability.

Likes 0

Dislikes 0

Response

Thank you for your comments. The SAR drafting team declines to modify the scope of the SAR to include this request.

Sandra Shaffer - Berkshire Hathaway - PacifiCorp - 6

Answer

Document Name

Comment

No comments at this time.	
Likes	0
Dislikes	0
Response	
Amy Casuscelli - Xcel Energy, Inc. - 1,3,5,6 - MRO,WECC	
Answer	
Document Name	
Comment	
We also suggest including shunts to the Voltage & Current Sensing Devices section of the PRC-005-6 Supplementary Reference and FAQ documents.	
Likes	0
Dislikes	0
Response	
Thank you for your comments. Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.	
Thomas Breene - WEC Energy Group, Inc. - 3,4,5,6	
Answer	
Document Name	
Comment	

WEC Energy Group suggests that the SAR authors consider reviewing NERC definition of Protection System and identify if the AVR is part of Protection Systems.

WEC Energy Group further suggests that the AVR is not a protective relay but a controls system. The AVR controls will trip the unit off if it detects malfunctions in the AVR which would cause it to cease operating.

Therefore, the project scope should be: Revise PRC-005-6 to clearly state that PRC-005-6 does not apply to AVRs.

Likes 0

Dislikes 0

Response

Thank you for your comments. Some AVRs have protective functions enabled that directly trip the generator, thus potentially impacting BES reliability. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

The SAR drafting team determined that the AVR-enabled protective functions belong in PRC-005.

Becky Webb - Exelon - 1,3,5,6

Answer

Document Name

Comment

No additional comments.

Likes 0

Dislikes 0

Response

Thank you.

Ruth Miller - Exelon - 1,3,5,6

Answer

Document Name

Comment

No additional comments.

Likes 0

Dislikes 0

Response

Thank you.

John Bee - Exelon - 1,3,5,6

Answer

Document Name

Comment

No additional comments.

Likes 0	
Dislikes 0	
Response	
Thank you.	
Chris Scanlon - Exelon - 1,3,5,6	
Answer	
Document Name	
Comment	
No additional comments.	
Likes 0	
Dislikes 0	
Response	
Thank you.	
Karie Barczak - DTE Energy - Detroit Edison Company - 3,4,5, Group Name DTE Energy - DTE Electric	
Answer	
Document Name	
Comment	
Guidance is needed in order to insure that AVR protective functions comply with PRC-005-6.	
Likes 0	
Dislikes 0	

Response

Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.

Kim Thomas - Duke Energy - 1,3,5,6 - SERC,RF, Group Name Duke Energy

Answer

Document Name

Comment

Duke Energy agrees with scope of proposed SAR. Duke Energy requests confirmation that protective functions from other control systems are not included in Standard scope (e.g., turbine frequency and overspeed trips). Additionally, request confirmation that SAR is only applicable to digital AVR's and control systems.

Duke Energy notes that the term protective function is referenced in several NERC Standards and other Region documentation but is not defined in the NERC Glossary – suggest adding Protective Function definition to NERC Glossary. Some regions (e.g., SERC and RF) have provided AVR protective function guidance. Duke Energy requests that the ERO develop consistent documentation.

Likes 0

Dislikes 0

Response

Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

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Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.

Matthew Nutsch - Seattle City Light - 1,3,4,5,6 - WECC

Answer	
Document Name	
Comment	
None	
Likes 0	
Dislikes 0	

Response

Dana Klem - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO NSRF

Answer	
Document Name	Project 2019-04_SAR_PRC-005-6 Final.docx
Comment	

Key Issue:

Using synchronous in the SAR scope by itself leaves a gap and ambiguity for some units. Synchronous isn't sufficient as some small aggregate variable or diesel plants can have synchronous connected units with digital AVRs that directly trip the individual units. Type 1 wind generators or squirrel cage induction generators can still be considered synchronous. Type 3 Doubly Fed Induction Units can be considered synchronous.

Suggested SAR Scope Change:

Further define what is in and out-of-scope in the applicability section of PRC-005-6. Limit scope to units with a single shaft of 20 MVA and greater consistent with PRC-002-2 R5 and the NERC registration criteria. If the units are smaller than 20 MVA, they are excluded. Include aggregate plant level AVRs or equivalent controllers that trip the entire aggregate plant of 75 MVA or more

Suggested PRC-005 Applicability Revision or Addition:

Synchronous Generating resource(s) with digital AVR protective functions that trip the plant directly or via lockout or tripping auxiliary relays where:

- Gross individual single-shaft nameplate rating greater than or equal to 20 MVA.
- Gross individual nameplate rating greater than or equal to 20 MVA where the gross plant/facility aggregate nameplate rating is greater than or equal to 75 MVA or greater.

Supporting Material:

See the NREL descriptions of both Type 1 and Type 3 wind turbines:

<https://www.nrel.gov/docs/fy12osti/52780.pdf>

Key Issue:

Using synchronous in the SAR scope by itself leaves a gap and ambiguity for some units. Synchronous isn't sufficient as some small aggregate variable or diesel plants can have synchronous connected units with digital AVRs that directly trip the individual units. Type 1

wind generators or squirrel cage induction generators can still be considered synchronous. Type 3 Doubly Fed Induction Units can be considered synchronous.

Suggested SAR Scope Change:

Further define what is in and out-of-scope in the applicability section of PRC-005-6. Limit scope to units with a single shaft of 20 MVA and greater consistent with PRC-002-2 R5 and the NERC registration criteria. If the units are smaller than 20 MVA, they are excluded. Include aggregate plant level AVRs or equivalent controllers that trip the entire aggregate plant of 75 MVA or more

Suggested PRC-005 Applicability Revision or Addition:

Synchronous Generating resource(s) with digital AVR protective functions that trip the plant directly or via lockout or tripping auxiliary relays where:

- -
 - - Gross individual single-shaft nameplate rating greater than or equal to 20 MVA.
 - Gross individual nameplate rating greater than or equal to 20 MVA where the gross plant/facility aggregate nameplate rating is greater than or equal to 75 MVA or greater.

Supporting Material:

See the NREL descriptions of both Type 1 and Type 3 wind turbines:

<https://www.nrel.gov/docs/fy12osti/52780.pdf>

Type 1 induction generators are synchronously connected and generate power when spun faster than 60 Hz. Type 3 doubly fed induction generators have two power paths, a real power path that goes through an inverter / converter which is asynchronous and a reactive power path that is synchronously connected to the grid, hence DFIG (Doubly Fed Induction Generator)

Type 1 – Induction Units:

This chapter describes the development of a generic dynamic model for a fixed-speed wind turbine, the most basic type of utility-scale wind turbine in operation today. Fixed-speed wind turbines are called so because they operate with less than 1% variation in rotor speed.

They employ squirrel-cage induction machines directly connected to the power grid. A large number of fixed-speed wind turbines have been installed over the past decade and a half, and more continue to be installed.

Type 3 – DFIG Induction Units:

The model for the Type-3 wind turbine generator is built using PSCAD/EMTDC software. It is based on the WECC general model, developed by the Wind Generator Modeling Group of the WECC [24].

4.3.1 Doubly-Fed Induction Generators: Basic Concepts

A rotating machine is said to be a generator when it is converting mechanical input power to electrical output power. When induction machines are operated at speeds greater than their synchronous speeds, they act as generators. DFIGs operate on the same principles as conventional wound-rotor induction generators with additional external power electronic circuits on the rotor and stator windings to optimize the wind turbine operation. These circuits help extract and regulate mechanical power from the available wind resource better than would be possible with simpler squirrel-cage induction generators. A schematic representation of a DFIG wind turbine system is shown in Figure 4.1.

Likes	0
Dislikes	0

Response

Thank you for your comments. The SAR drafting team has determined that the scope of the SAR should allow the team to modify PRC-005-6 to provide clarity that the protective functions enabled within excitation systems (including analog/digital Automatic Voltage Regulators (AVRs)), and other control systems, that respond to electrical quantities and act to cease injecting current (75 MVA or greater) or trip BES elements either directly or via lockout or auxiliary tripping. Modifications to PRC-005 could include defining terms, either standard specific or within the NERC Glossary of Terms.

The clarifying changes would apply to BES Protection Systems and protective functions applied on generators, dispersed power-producing resources from the point of aggregation (greater than 75 MVA) to the point of Interconnection, static and synchronous condensers and other BES elements as defined.

Details of the specific devices in scope, maintenance activities and intervals will be determined by the future SDT.

Michael Godbout - Hydro-Québec TransEnergie - 1 - NPCC

Answer

Document Name

[PRC-005-6 - SAR.secure-updated 2019-08-21.docx](#)

Comment

Hydro-Québec TransÉnergie (RC function) is about to file a SAR on PRC-005 as well. It would be opportune to consider integrate this second SAR into the current proposed SAR. This second SAR proposes to make the Standard technology neutral and allow performance-based maintenance practices for batteries.

Current standard PRC-005-6 requires time-based maintenance program for technology-specific batteries in tables 1-4. Certain entities have identified that current prescribed time-based maintenance programs in tables 1-4 for the batteries did not achieve the desirable outcome. That is, the batteries would not perform as designed when called upon by the protection systems.

A comparison of maintenance intervals and activities prescribed by the Standard with recommended practices in standards IEEE 450-2010, 1188-2005 and 1106-2015 (maintenance and test sections) confirm that the prescribed maintenance intervals and activities are less stringent. These IEEE references also recommend the adjustment of maintenance intervals so that batteries perform as expected when needed. This finding is further supported by the EPRI technical report “Stationary Battery Guide: Design, Application, and Maintenance”. Therefore, extending the performance-based approach allowed for all the non-battery components to include the batteries would ensure adequate maintenance frequencies for their components and conform with section 2.4 of the NERC Standards Processes Manual. This is important for all technologies, including new technologies for which operating experience is insufficient to establish a time-based maintenance.

Currently, Hydro-Quebec and other entities are considering the replacement of existing batteries with batteries using a new battery technology based on Lithium that is cost-effective and more reliable. These new batteries are not identified in PRC-005-6 and compliance concerns due to technology-specific tables are causing undue restrictions and adverse impact on the competitiveness as defined in section 2.3 of the NERC Standards Processes Manual.

While adding a performance-based approach for the batteries, the PRC-005-6 Reliability Standard can also benefit by revising its performance-based approach in line with the performance-based approaches documented in EPRI technical report “Reliability and

Preventive Maintenance: Balancing Risk and Reliability”. The maintenance intervals in the tables could be moved to a guideline for compliance with the standard and appendix A could be revised to better reflect the EPRI report.

See attached the proposed second SAR.

Likes	0
Dislikes	0

Response

Thank you for your comments. The SAR drafting team agrees that the current maintenance intervals and activities for batteries are technology-specific and will consider including provisions for batteries and/or DC supply technologies not specifically called out in the standard.

End of Report