

Consideration of Comments

Project Name: 2020-02 Modifications to PRC-024-3 (Generator Ride-through) | Standard Authorization Request
Comment Period Start Date: 5/31/2022
Comment Period End Date: 7/14/2022

There were 40 sets of responses, including comments from approximately 103 different people from approximately 72 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, 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 Director, Standards Development [Latrice Harkness](#) (via email) or at (404) 858-8088.

Questions

1. [Do you agree with the proposed scope as described in the SAR? If you do not agree, or if you agree but have comments or suggestions for the project scope, please provide your recommendation and explanation.](#)
2. [Provide any additional comments for the drafting team to consider, if desired.](#)

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
DTE Energy - Detroit Edison Company	Adrian Raducea	3,5		DTE Energy - DTE Electric	Karie Barczak	DTE Energy - Detroit Edison Company	3	RF
					Adrian Raducea	DTE Energy - Detroit Edison	5	RF
					patricia ireland	DTE Energy	4	RF
WEC Energy Group, Inc.	Christine Kane	3,4,5,6		WEC Energy Group	Christine Kane	WEC Energy Group	3	RF
					Matthew Beilfuss	WEC Energy Group, Inc.	4	RF
					Clarice Zellmer	WEC Energy Group, Inc.	5	RF
					David Boeshaar	WEC Energy Group, Inc.	6	RF
Tacoma Public Utilities (Tacoma, WA)	Jennie Wike	1,3,4,5,6	WECC	Tacoma Power	Jennie Wike	Tacoma Public Utilities	1,3,4,5,6	WECC
					John Merrell	Tacoma Public Utilities (Tacoma, WA)	1	WECC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					Marc Donaldson	Tacoma Public Utilities (Tacoma, WA)	3	WECC
					Hien Ho	Tacoma Public Utilities (Tacoma, WA)	4	WECC
					Terry Gifford	Tacoma Public Utilities (Tacoma, WA)	6	WECC
					Ozan Ferrin	Tacoma Public Utilities (Tacoma, WA)	5	WECC
Duke Energy	Kim Thomas	1,3,5,6	FRCC,RF,SERC,Texas RE	Duke Energy	Laura Lee	Duke Energy	1	SERC
					Dale Goodwine	Duke Energy	5	SERC
					Greg Cecil	Duke Energy	6	RF
Florida Municipal	LaKenya VanNorman	3,4,5,6	SERC		Chris Gowder	Florida Municipal	5	SERC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
Power Agency				Florida Municipal Power Agency (FMPPA)		Power Agency		
					Dan O'Hagan	Florida Municipal Power Agency	4	SERC
					Carl Turner	Florida Municipal Power Agency	3	SERC
					Jade Bulitta	Florida Municipal Power Agency	6	SERC
FirstEnergy - FirstEnergy Corporation	Mark Garza	1,3,4,5,6		FE Voter	Julie Severino	FirstEnergy - FirstEnergy Corporation	1	RF
					Aaron Ghodooshim	FirstEnergy - FirstEnergy Corporation	3	RF
					Robert Loy	FirstEnergy - FirstEnergy Solutions	5	RF
					Tricia Bynum	FirstEnergy - FirstEnergy Corporation	6	RF

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					Mark Garza	FirstEnergy-FirstEnergy	4	RF
Pacific Gas and Electric Company	Michael Johnson	1,3,5	WECC	PG&E All Segments	Marco Rios	Pacific Gas and Electric Company	1	WECC
					Sandra Ellis	Pacific Gas and Electric Company	3	WECC
					James Mearns	Pacific Gas and Electric Company	5	WECC
Southern Company - Southern Company Services, Inc.	Pamela Hunter	1,3,5,6	SERC	Southern Company	Matt Carden	Southern Company - Southern Company Services, Inc.	1	SERC
					Joel Dembowski	Southern Company - Alabama Power Company	3	SERC
					Ron Carlsen	Southern Company - Southern Company Generation	6	SERC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					Jim Howell	Southern Company - Southern Company Services, Inc. - Gen	5	SERC
Northeast Power Coordinating Council	Ruida Shu	1,2,3,4,5,6,7,8,9,10	NPCC	NPCC Regional Standards Committee	Gerry Dunbar	Northeast Power Coordinating Council	10	NPCC
					Randy MacDonald	New Brunswick Power	2	NPCC
					Glen Smith	Entergy Services	4	NPCC
					Alan Adamson	New York State Reliability Council	7	NPCC
					David Burke	Orange & Rockland Utilities	3	NPCC
					Harish Vijay Kumar	IESO	2	NPCC
					David Kiguel	Independent	7	NPCC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					Nick Kowalczyk	Orange and Rockland	1	NPCC
					Joel Charlebois	AESI - Acumen Engineered Solutions International Inc.	5	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
					Deidre Altobell	Con Ed - Consolidated Edison	4	NPCC
					Dermot Smyth	Con Ed - Consolidated Edison Co. of New York	1	NPCC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					Peter Yost	Con Ed - Consolidated Edison Co. of New York	3	NPCC
					Cristhian Godoy	Con Ed - Consolidated Edison Co. of New York	6	NPCC
					Nurul Abser	NB Power Corporation	1	NPCC
					Randy MacDonald	NB Power Corporation	2	NPCC
					Michael Ridolfino	Central Hudson Gas and Electric	1	NPCC
					Vijay Puran	NYSPS	6	NPCC
					ALAN ADAMSON	New York State Reliability Council	10	NPCC
					Sean Cavote	PSEG - Public Service Electric and Gas Co.	1	NPCC
					Brian Robinson	Utility Services	5	NPCC

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
					Quintin Lee	Eversource Energy	1	NPCC
					John Pearson	ISONE	2	NPCC
					Nicolas Turcotte	Hydro-Quebec TransEnergie	1	NPCC
					Chantal Mazza	Hydro-Quebec	2	NPCC
					Michele Tondalo	United Illuminating Co.	1	NPCC
					Paul Malozewski	Hydro One Networks, Inc.	3	NPCC
Western Electricity Coordinating Council	Steven Rueckert	10		WECC Entity Monitoring	Steve Rueckert	WECC	10	WECC
					Phil O'Donnell	WECC	10	WECC

1. Do you agree with the proposed scope as described in the SAR? If you do not agree, or if you agree but have comments or suggestions for the project scope, please provide your recommendation and explanation.	
Brian Lindsey - Entergy - 1,3,6	
Answer	No
Document Name	
Comment	
Should add new R5 to PRC-024-3: "Generator Owners shall analyze and have a corrective action plan (if possible), and report to necessary entities any failure to ride through a system event."	
Likes	0
Dislikes	0
Response	
Thank you for the comment. The drafting team will take this into consideration when drafting the SAR.	
Adrian Raducea - DTE Energy - Detroit Edison Company - 3,5, Group Name DTE Energy - DTE Electric	
Answer	No
Document Name	
Comment	
The proposed standard should cover "tripping" and not include "reductions", as the specified level can be subjective.	
Likes	0
Dislikes	0
Response	
Thank you for the comment. The team has decided to not include synchronous generators in the SAR.	

Kimberly Turco - Constellation - 5,6	
Answer	No
Document Name	
Comment	
<p>Constellation does not agree with the proposed scope as the scope is far reaching into multiple standards not just PRC-024-3 and the impact to those standards is not clearly defined.</p> <p>Kimberly Turco on behalf of Constellation Segements 5 and 6</p>	
Likes	0
Dislikes	0
Response	
Thank you. This comment is vague and the team is unable to provide a response.	
Alison Mackellar - Constellation - 5,6	
Answer	No
Document Name	
Comment	
<p>Constellation does not agree with the proposed scope as the scope is far reaching into multiple standards not just PRC-024-3 and the impact to those standards is not clearly defined.</p> <p>Kimberly Turco on behalf of Constellation Segments 5 and 6</p>	
Likes	0
Dislikes	0
Response	
Thank you. This comment is vague and the team is unable to provide a response.	

Thomas Foltz - AEP - 3,5,6	
Answer	No
Document Name	
Comment	
<p>AEP agrees with the concerns related to IBRs and the performance issues that have been previously noted but we do not agree that PRC-024 should be revised or replaced with ride-through obligations added for synchronous generation. AEP recommends that PRC-024 be retained as it currently is, and recommends creation of a new standard containing ride-through obligations for IBRs only. AEP does not see a reliability justification for developing ride-through obligations for synchronous generation and advises against any efforts to do so since, as also noted by EEI, such units have been seen to perform well in the various cited events.</p> <p>The following comments are offered in the event that the SDT develops obligations for both synchronous generation and IBRs (contrary to our recommendation above).</p> <p>The fourth bullet of the SAR’s Project Scope states “protections and controls directly focused on the generator and its prime mover (e.g., overspeed, power-load imbalance, overvoltage, phase jump, overcurrent) or plant-level (e.g., voltage, current, frequency, phase, etc.) have posed notable risks to BES reliability.” AEP does not agree with the proposed inclusion of overspeed and power-load imbalance, as both must be present to protect against equipment damage. Even if their presence could at times pose a reliability risk to the system, these protective functions need to be retained for the unit’s own protection and continuing availability. AEP recommends removing overspeed and power-load imbalance from the SAR.</p> <p>Requirement R3 in the current version of PRC-024 requires the Generator Owner to “document each known regulatory or equipment limitation that prevents an applicable generating unit with generator frequency or voltage protective relays from meeting the relay setting criteria in Requirements R1 or R2 including (but not limited to) study results, experience from an actual event, or manufacturer’s advice.” Care should be taken to retain this provision in any new or revised standard.</p>	
Likes	0
Dislikes	0
Response	

Thank you for the comment. The SAR has the option to create a new standard. This (and R3) will be passed along for consideration by standard drafting team.

The team has addressed this comment in the redlined SAR to reflect the suggested changes.

Eric Sutlief - CMS Energy - Consumers Energy Company - 3,4,5 - RF

Answer No

Document Name

Comment

The scope states generator overcurrent and plant-level current should be addressed in this standard. Overcurrent is addressed by PRC-025. It does not seem right to also include current in this standard. Other than the inclusion of overcurrent, the scope seems reasonable.

Likes 0

Dislikes 0

Response

Thank you for the comment. The team agrees that there is possible overlap with PRC-025 if overcurrent related trips are included in the ride-through standard. As such, the team has modified the SAR to reflect the fact that PRC-025, and other selected relay setting standards, may be impacted by the new standard and may need to be revised.

Kendra Buesgens - MRO - 1,2,3,4,5,6 - MRO

Answer No

Document Name

Comment

The MRO NSRF in general agrees with both the concept and scope of this SAR. However, the MRO NSRF is voting no due to the following concerns:

1. A reporting requirement that all trips or reductions in power output are reported by the GO to the TOP, BA, and RC.

The MRO NSRF disagrees with this deliverable. The Reliability Coordinator (RC), Balancing Authority (BA) and Transmission Operator (TOP) should be responsible for determining the magnitude threshold and duration-of-time threshold for the Generator Owner (GO)/ Generator Operator (GOP) to report trips or reductions in power output. This will ensure that the RC, BA & TOP are not burdened by notifications for trips/reductions that do not affect the Bulk Electrical System (BES) and ultimately take the RC's, BA's & TOP's attention away from matters of higher priority for ensuring the reliability of the BES. In addition, it is the NSRF belief that the RC, BA & TOP currently has the ability request information about trips or reductions in power output from the GO/GOP under the regulatory framework of NERC Reliability Standard IRO-010-4 Reliability Coordinator Data Specification and Collection & NERC Reliability Standard TOP-003-4 - Operational Reliability Data.

Further, reductions in power will occur for a wide variety of reasons such as clouds passing over or the setting of the sun at a solar generation facility, a drop in wind speed at a wind generation facility, wet coal, changes in condenser circulating water temperature or discharge water temperature limits at a thermal plant, starting an additional large fan or pump, inlet air temperature changes to gas turbines, reduced water flow at a hydro plant – none of these causes of power reduction would have any relation to PRC requirements and no additional reporting other than that required by existing NERC Standard IRO-010 & TOP-003 requirements should be necessary. The MRO NSRF believes this deliverable should say “A reporting requirement that all trips or reductions in power output in response to grid disturbances are reported by the GO as required by the applicable TOP, BA, and RC.”

2. A requirement that abnormal reductions in active power (i.e., tripping from protections or notable reductions from controls) are analyzed by the GO to develop a corrective action plan, if possible. Situations where corrective action plans are not able to be developed shall be reported to the TOP, BA, and RC.

The MRO NSRF disagrees with this deliverable. The MRO NSRF believes that the ‘trip’ portion of this deliverable is already an enforceable requirement under the regulatory framework of NERC Reliability Standard PRC-004-6 - Protection System Misoperation Identification and Correction.

As written, ‘notable reductions from controls’, lacks the detail required to provide a standard drafting team (SDT) with proper direction to develop a requirement(s). As this Standard Authorization Request (SAR) relates to dynamic ride-through performance of generators the MRO NSRF would request that the SAR SDT add an example magnitude threshold and duration-of-time threshold for ‘notable reductions from controls’. Adding the additional information will prevent any developed requirement(s) from overreaching beyond the intention of this SAR.

3. A clear requirement that momentary cessation, or temporary ceasing of current injection during BPS fault events, is deemed unacceptable performance for BES generating resources. Inverter-based generating resources employing momentary cessation shall

develop a corrective action to mitigate its use. Legacy facilities prior to the effective date of the standard should receive an exemption; however, resources with a commercial operation date after the effective date of the standard (and possibly the PRC-024-3 implementation date) shall be required to eliminate the use of momentary cessation within “ride through envelopes” (e.g., the existing PRC-024 “No Trip Zone”).

The implementation date for NERC Reliability Standard PRC-024-3 — Frequency and Voltage Protection Settings for Generating Resources (NERC PRC-024-3) is October 01, 2022. As stated by the SAR requestors:

• “The existing PRC-024-3 is an equipment settings standard focused solely on voltage and frequency protection. However, this standard is serving little to no value for ensuring BPS-connected inverter-based resources remain connected and supporting the BPS during grid disturbances.”

• “The purpose of this SAR is to retire PRC-024-3 and replace it with a performance-based ride-through standard that ensures generators remain connected to the BPS during system disturbances.”

• “Retire PRC-024-3, and create a new PRC standard or completely overhaul and replace the existing PRC-024 standard.”

Based on these statements the MRO NSRF believes all generators with a commercial operation date prior to the effective date of requirements to be developed based on this SAR should not have to comply or retrofit. It is clear that any requirements developed based on this SAR will be different from the requirements of NERC PRC-024-3 and therefore the generators that need to comply should be adjusted accordingly.

4. The performance-based standard should include documented equipment limitation exemptions similar to NERC PRC-024-3 R3 and these should apply to all generator types rather than just carving out an exemption for the application of momentary cessation on legacy inverter-based resources (IBR) existing prior to the effective date of the standard (and possible the PRC-024-3 implementation date). For example, if an existing turbine has frequency limitations that do not meet the requirements of the new ride-through standard, no corrective action plan should be necessary should the turbine trip in response to a frequency excursion outside of its capability. There appears to be nothing in the SAR that addresses limitations of existing equipment other than that of legacy IBRs applying momentary cessation.

5. The MRO NSRF believes that there is little justification for retiring NERC PRC-024-3 for synchronous generators and that any new standard should be focused on IBR performance issues. If the scope is to “create a comprehensive, performance-based ride-through standard with the purpose of ensuring BES generating resources remain connected and providing essential reliability services during grid disturbances”, why would only PRC-024-3 be considered for retirement rather than to include the retirement of other relay setting

standards such as PRC-025-2, which has the purpose to assure that load responsive relays are set to prevent unnecessary tripping during system disturbances, and/or the elimination of GO applicability in PRC-026-1, which has the purpose to ensure that load-responsive relays are expected to not trip in response to stable power swings during non-Fault conditions? The MRO NSRF believes that if a truly comprehensive performance-based ride-through standard is created, then the regulatory burden of other relay setting standards pertaining to how generator protection responds to grid disturbances should be eliminated by retiring PRC-025-2 and eliminating the applicability of PRC-026-1 to Generator Owners. It seems that a comprehensive generator ride-through standard would apply to not only 24, 27, and 59 functions (PRC-024-3) but would also include trips of generating resources in response to 21, 50, 51, 51VR, 51VC, 67 (PRC-025-2) and/or 21, 40, ,50, 51, 78 (PRC-026-1) function operations in response to grid disturbances.

Further, and accounting for the aforementioned comments, the MRO NSRF recommends the drafting team consider whether retiring PRC-024-3 and replacing it with a performance-based ride-through standard may change, for example, the Generator no trip zones settings. This action would potentially affect PRC-006, and the SAR should open its scope to contemplate potential changes to that standard, and any other affected standard, if needed. This comment is to ensure the drafting team crafts a SAR with the necessary scoping parameters to make changes to associated standards as needed.

6. A clear requirement that prolonged plant controller interactions that impede the ability of the resource to dynamically respond to the grid disturbance and preclude the ability to fully provide essential reliability services are deemed unacceptable and should be addressed by a corrective action plan.

This requirement seems to be focused on eliminating some of the undesirable IBR performance issues, but the wording of this deliverable could be interpreted to apply to integrated plant or unit protection schemes that may indeed “impede the ability of the resource to dynamically respond to grid disturbances” but are designed to protect the boiler or nuclear reactor from pressure or level excursions, steam turbines from overspeed, operation at resonant frequencies or moisture intrusion, etc. GOs should be able to protect their equipment from catastrophic damage without having to implement a corrective action plan should these protection or control features impede dynamic response to grid disturbances.

Likes	1	Southern Indiana Gas and Electric Co., 3,5,6, Todd Anna
Dislikes	0	

Response

1. The applicability of the defining of a thresh hold will be considered where applicable when drafting the standard in the performance criteria. The SAR has been has been modified to reflect this quote. The information will be passed along to the standard drafting team.
2. The team will look at PRC-004 and make sure there is no overlap, this SAR focusing on performance criteria IBRs. Thank you for the proposal this will be reviewed in the standard drafting process when applicable.
3. This will be passed on to the drafting team, please refer to NAGF response to comment regarding legacy PRC-024 policy.
4. Refer to previous comment.
5. The team has considered the comments and have modified the SAR to reflect these specified standards and any other applicable standards.
6. Please refer to comment 3D in NAGF response to comment. The redlined SAR reflects this change.

Israel Perez - Salt River Project - 1,3,5,6 - WECC

Answer	No
Document Name	
Comment	

We do not agree with the proposed scope described in the SAR, as more clarification of expectations and deliverables are needed. The proposed scope is not clear if the changes would require the installation of additional protection devices to our generators or switchyards and if additional DCS/computer points need to be monitored. Would the changes require third-party generator studies and at what frequency? We are concerned that these changes, which are still unclear, will require additional preventative tasks and specialized personnel necessary to perform these tasks. If the disturbance in the grid is large enough, wouldn't it be better for our generators to disconnect and/or trip to prevent equipment damage? A unit/generator restart would have a faster turnover and would be more efficient than having a damaged generator that motored because we couldn't disconnect it from the large disturbance of the grid.

In addition, it seems that we must wait until "performance" metrics are outlined and how metrics meet baseline criteria. The reference documents outline some of the criteria for measurement and submittal methods but not the full metric. The "ride through" criteria is mentioned, as a "no trip zone" in the attached document but not a clear definition of achieving that target. The process for defining the performance characteristics of a generation resources is not specified other than a system strength specification which we believe would

require a separate criterion for each BES bus depending on the generation in the vicinity. It would be difficult to define and enforce and even more difficult to monitor.

The events in southern California revealed that generation went into a current cessation mode during a frequency/voltage excursion and PRC-024-3 covers this issue. The event would expand the scope from generation ride through to include any event where generation was reduced or removed from service for say auxiliary systems being removed from service. This subject might fall under PRC-004. If the tripping or reduction in generation is entirely unrelated to frequency or voltage, then we should have a separate standard that addresses this issue.

The deliverable noted is a requirement for reporting all trips and abnormal reductions in active power. In our experience most “abnormal” reductions are prime mover related. If it was intended to only require reporting an abnormal reduction or trip during a system disturbance only, it is not clear that this deliverable is being met. We agree that generation outages due to frequency and voltage excursions should be tracked but the scope of the SAR goes well beyond that point. Why take a perfectly fine standard that addresses a known system issue and expand the scope into something that is not clearly defined. Consider expanding the scope of PRC-004 instead and include operations that affect the output of a BES Generation source and leave PRC-024-3 as a frequency and voltage ride through standard.

Likes 0

Dislikes 0

Response

Thank you for the comment. The Project 2021-04 Modifications to PRC-002 drafting team is in charge of monitoring efforts. The drafting team will coordinate with the PRC-002 team in the future pertaining to the necessary recording devices.

The metrics will be forwarded to the drafting team for their consideration.

This SAR team has modified this requirement and is now only applied to grid system events. The SAR has also been modified and expanded to include IBR AUX systems.

Current cessation mode would be included under generation ride-through topic.

Joe Gatten - Xcel Energy, Inc. - 1,3,5,6 - MRO,WECC

Answer

No

Document Name	
Comment	
Xcel Energy supports the comments offered by EEI, NAGF, and MRO NSRF.	
Likes 0	
Dislikes 0	
Response	
Thank you for the comment. Please see response to MRO.	
Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company	
Answer	No
Document Name	
Comment	
Southern Company does not agree due to the following concerns:	
<ol style="list-style-type: none"> <i>1. A reporting requirement that all trips or reductions in power output are reported by the GO to the TOP, BA, and RC.</i> <p>Southern Company disagrees with this deliverable. The RC, BA, and TOP should be responsible parties for determining the magnitude threshold and duration-of-time thresholds GO/GOP to report trips or reductions in power output. This will ensure that the RC, BA & TOP are not burdened by notifications for trips/reductions that do not affect the Bulk Electrical System (BES) and ultimately take their attention away from matters of higher priority for ensuring the reliability of the BES. In addition, it is the belief of Southern Company that the RC, BA & TOP already has the ability request information about trips or reductions in power output from the GO/GOP under the regulatory framework of NERC Reliability Standard IRO-010-4 and TOP-003-4.</p> <ol style="list-style-type: none"> <i>2. A requirement that abnormal reductions in active power (i.e., tripping from protections or notable reductions from controls) are analyzed by the GO to develop a corrective action plan, if possible. Situations where corrective action plans are not able to be developed shall be reported to the TOP, BA, and RC.</i> 	

Southern Company disagrees with this deliverable. **Southern Company believes that the ‘trip’ portion of this deliverable is already an enforceable requirement under the regulatory framework of NERC Reliability Standard PRC-004-6.**

As written, *‘notable reductions from controls’*, lacks the detail required to provide a standard drafting team (SDT) with proper direction to develop a requirement(s). **As this Standard Authorization Request (SAR) relates to dynamic ride-through performance of generators Southern Company requests that the SAR SDT add an example magnitude threshold and duration-of-time threshold for ‘notable reductions from controls’.** Adding the additional information will prevent any developed requirement(s) from overreaching beyond the intention of this SAR. The communication of unit derates, where necessary for system operation, is likely already being communicated where specified by the RC/BA/TOP data specifications of IRO-010 and TOP-003.

3. *A clear requirement that momentary cessation, or temporary ceasing of current injection during BPS fault events, is deemed unacceptable performance for BES generating resources.* Inverter-based generating resources employing momentary cessation shall develop a corrective action to mitigate its use. Legacy facilities prior to the effective date of the standard should receive an exemption; however, resources with a commercial operation date after the effective date of the standard (and possibly the PRC-024-3 implementation date) shall be required to eliminate the use of momentary cessation within “ride through envelopes” (e.g., the existing PRC-024 “No Trip Zone”).

The opening statement is contrary to real world expectations that the generation resource is not allowed to protect its equipment for BES system events. If this is the expectation, then the BES system should not be allowed to have fault events in the first place.

The implementation date for NERC Reliability Standard PRC-024-3 — Frequency and Voltage Protection Settings for Generating Resources (NERC PRC-024-3) is October 01, 2022. As stated by the SAR requestors:

• “The existing PRC-024-3 is an equipment settings standard focused solely on voltage and frequency protection. However, this standard is serving little to no value for ensuring BPS-connected inverter-based resources remain connected and supporting the BPS during grid disturbances.”

• “The purpose of this SAR is to retire PRC-024-3 and replace it with a performance-based ride-through standard that ensures generators remain connected to the BPS during system disturbances.”

• “Retire PRC-024-3, and create a new PRC standard or completely overhaul and replace the existing PRC-024 standard.”

Based on these statements Southern Company believes all generators with a commercial operation date prior to the effective date of requirements to be developed based on this SAR should not have to comply or retrofit. It is clear that any requirements developed based

on this SAR will be different from the requirements of NERC PRC-024-3 and therefore the generators that need to comply should be adjusted accordingly.

4. The premise that there have been notable concurrent tripping or performance from synchronous generating resources due to frequency and voltage protection settings being too sensitive is flawed. There have not been increasing trends of synchronous machine protection system misoperations to justify that premise. The application of a ride through standard for synchronous machine generating plants was fully investigated during the original drafting effort of PRC-024 between 2008-2014. The conclusion of the standard drafting team, after multiple drafts, extended comment and consideration of comments from industry, direct consultation with FERC by standard drafting team members resulted in the realization that the standard could go no further than to specify a regions for restricting the tripping of those generators by protective relays for voltage-time and frequency-time areas that would cause the units to not be tripped for the majority of system events where the voltage or frequency was not normal. Further attempts to apply a ride through requirement should be abandoned for synchronous machines to avoid wasting everyone's time by having to restate why it is not feasible for that generation type.

5. Further, there are limited modifications that can be made to the existing equipment to achieve the goal of 100% ride-thru ability to any grid disturbance. Simply passing a regulation specifying it must be done does not change the ability of the equipment to do so. The replacement of existing inverters is not feasible – the power ratings and voltage/current specifications of existing installed invertors do not match the inverters offered today. The collection system of a PV plant cannot be reconfigured economically once it is in place.

6. Any additional ride through requirements should only be applicable to equipment placed in service after changes are made to this standard which may require additional ride-thru capabilities for IBR plants. We suggest that the transmission interconnection agreements be the proper method to assure that newly connected IBR facilities are built to maximize their ride through capability.

7. The lack of a specific grid disturbance for which generating resources are to be required to ride-through is problematic. If specific disturbance characteristics are specified, the generating community might have a fighting chance to design systems to achieve the goals. The application of global “you must ride through all grid disturbance” requirements to existing equipment not designed to do so is ludicrous.

8. The SAR states that auxiliary systems and their protection systems are explicitly excluded. The sub-systems of a conventional synchronous machine generating station are essential for the normal plant operation. Without many of those sub-systems, the main generator cannot run. The sub-system may be essential to the mechanical operation of the turbine too. Any system disturbance that causes any of those sub-systems to not be available will immediately affect the turbine/generator ability to run. The controls of the generator and turbine are interlaced and interlinked with the sub-systems. They cannot be removed from affecting the entire unit

operation. In effect, they cannot be separated from the generator and the unit availability. During system disturbances where sustained grid low voltage occurs, those sub-systems may or may not experience trouble. During the initial PRC-024 development, the Luminant company reported that some low voltage contactors dropped out for low voltage conditions, and others did not. In subsequent grid low voltage disturbances, it was observed that different sets of contactors dropped out. The indefinite response of magnetically sealed in contactor behavior for low voltage conditions was one of the problems with any meaningful successful application of ride-through standards to those types of facilities.

9. The SAR indicates that the desire of the standard revision is to address all possible causes of tripping and power reductions. Addressing ALL POSSIBLE CAUSES is indefinite and unachievable. No failsafe system can be built to withstand all possible causes.

10. With regard to the SAR question on alternatives, for which the SAR drafters included this text:

NERC has evaluated industry progress toward adopting the recommendations outlined in NERC guidelines, white papers, its prior Alerts, and other industry efforts. NERC believes that a nationwide standard for consistent requirements for generating resource ride-through is necessary to immediately address generating resource ride-through during grid disturbances moving forward.

Southern Company has implemented all possible inverter setting changes included in the two NERC alerts on the Loss of Solar Resources. We note that several of our units have continued to react to major grid disturbances by ceasing to generate. The communication of the adjustment of the settings, and the limitations to adjustments we have discerned, have been communicated to the parties included in the NERC alert recommendations. It is for this reason we implore the SDT to look forward rather than backward with change requirements. The electric grid is not in immediate imminent danger due to this current condition. The requirement of maximizing IBR equipment connectivity and grid disturbance resolution support is best addressed through the transmission interconnection requirements rather than through reliability standards.

Likes	0
Dislikes	0

Response

Thank you for the comment.

1. The applicability of defining a threshold will be considered where applicable when drafting the standard in the performance criteria.

2. The team will look at PRC-004 and make sure there is no overlap, this SAR focusing on performance criteria IBRs. This will be reviewed during the standard drafting process when applicable.
3. Please refer to MRO comment.
4. Concerns about the applicability of the proposed standards to synchronous generators will be passed along to standard drafting team. The SAR has the option to create a new standard.
5. The exemption will be considered based on existing facilities capability and limitations.
6. The SAR includes this. The drafting team cannot support the ride-through requirement was solely covered by interconnection agreement.
7. The performance requirements for disturbances will be determined by the standard drafting team when applicable.
8. The team agrees with the comments and recognizes the difficulty including auxiliary systems in this standard.
9. The SAR has been redlined to limit to trips or power reduction in response to grid events.
10. The standard is focused on performance and acknowledges grid disturbances.

Michael Johnson - Pacific Gas and Electric Company - 1,3,5 - WECC, Group Name PG&E All Segments

Answer	No
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Document Name	
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Comment

PG&E agrees with the comments provided by EEI that there have been performance issues with Solar PV Inverter Based Resources (IBRs) that need to be addressed, but as indicated by EEI, PG&E does not agree the replacement of PRC-024-3 is required to address those issues.

The current PRC-024-2 Requirements have worked well for synchronous generators, and it is expected that PRC-024-3 will improve the performance of those generators in maintaining the reliable operation of the Bulk Electric System (BES). As noted by EEI, there were losses of synchronous generator in some of the six disturbances noted in the SAR, but none of those appeared to be unexpected, unusual, or a result of non-compliance with the current PRC-024 Standard.

PG&E personnel responsible for PRC-024 believe trying to add an entire set of additional Requirements for IBRs on top of the current PRC-024 Requirements, or changing the Standard to be performance based for all generators would be extremely complex to implement and maintain, and would not improve the reliability for synchronous generators. PG&E recommends IBR performance should be covered under a new Standard specifically developed for the unique characteristics of IBRs.

Likes 0

Dislikes 0

Response

Thank you for the comment. Please see response to EEI.

Joseph Amato - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1,3

Answer

No

Document Name

Comment

MidAmerican supports MRO NSRF and EEI comments.

Likes 0

Dislikes 0

Response

Thank you for the comment. Please see response to EEI.

Alan Kloster - Eversource - 1,3,5,6 - MRO

Answer

No

Document Name

Comment

Eversource supports and incorporates by reference the comments of the Edison Electric Institute (EEI) for question #1.

Likes	0
Dislikes	0
Response	
Thank you for the comment. Please see response to EEI.	
Christine Kane - WEC Energy Group, Inc. - 3,4,5,6, Group Name WEC Energy Group	
Answer	No
Document Name	
Comment	
<p>WEC Energy Group is voting no due to the following concerns:</p> <ul style="list-style-type: none"> • “Purpose or Goal” section calls for complete replacement of PRC-024-3 to ensure generators remain connected during disturbances, but the “Industry Need” section clearly identifies this issue applies to IBR only. Industry can agree that current standard as is, is very well effective for traditional synchronous generating resources, therefore WEC believes that standard does not need to be rewritten but rather modified to cover specific IBR issues. WEC believes that statement “... notable concurrent tripping or performance from synchronous generating resources...” is not well supported by data from recent disturbances. • Proposed “performance based” term needs to be better defined within the SAR. • If industry recommendation is to include other protective elements or control systems, then it should be done separately and new standards should be developed. Good examples are PRC-025 and PRC-026. • Some of the “possible causes of tripping and power reductions” listed in SAR are load responsive in nature, therefore should be addressed within existing Standards that cover load-responsive requirements. • “Detailed Description” section indicates that momentary cessation is deemed unacceptable. Did the SAR requester confirm with all equipment manufacturers that momentary cessation can completely be eliminated? There are still inverter manufacturers that produce equipment with momentary cessation in their design because of current limiting components. The SAR suggest a corrective action plan to be developed to mitigate the issue. What if issue cannot be mitigated? 	
Likes	0
Dislikes	0
Response	

Thank you for the comment. Concerns about the applicability of the proposed standards to synchronous generators will be passed along to standard drafting team. The SAR has the option to create a new standard.

By “performance based” term this SAR extends the scope of NERC PRC-024-3 from a protective settings standard to defining performance requirements of BES generating resources remain connected and providing essential reliability services during grid disturbances, something stated within the project scope.

The drafting team does not think any “possible causes of tripping and power reductions” listed in this SAR are load driven. It is focused on BES Generating Resources. PRC-025 and PRC-026 have been added to the SAR for future review.

Momentary cessation of legacy units will also be considered by the standards drafting team.

Daniela Atanasovski - APS - Arizona Public Service Co. - 1,3,5,6

Answer	No
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Document Name	
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Comment

AZPS agrees with the following comments that were submitted by EEI on behalf of its members:

“The incidental operation of synchronous generators during some of the identified six NERC disturbance reports do not warrant the creation of a new ride through Reliability Standard replacing PRC-024-3 because the performance of most of the affected resources, outside of the solar PV resources, performed as designed and expected, and met the requirements of PRC-024-3.

While there were losses of synchronous generators in some of the six disturbance reports cited in the proposed SAR, none appear to be unexpected, unusual or the result of non-compliance with PRC-024”

“Additionally, if the intent of the SAR is to “create a comprehensive, performance-based ride-through standard,” development of a standard would need to account for retirement of other relay setting standards such as PRC-025-2 and PRC-026-1, to prevent duplicative requirements and compliance obligations.”

Likes	0
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Dislikes	0
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Response	
Thank you for the comment. Please see response to EEI.	
Jamie Monette - Allete - Minnesota Power, Inc. - 1	
Answer	No
Document Name	
Comment	
Minnesota Power supports EEI's comments for this question.	
Likes	0
Dislikes	0
Response	
Thank you for the comment. Please see response to EEI.	
John Pearson - ISO New England, Inc. - 2	
Answer	No
Document Name	
Comment	
<p>In describing the scope, the SAR states <i>"The scope of the ride-through standard shall explicitly exclude auxiliary systems and their protection systems. Abnormal performance or unexpected tripping of these protections do not pose a systemic BES reliability risk. However, protections and controls directly focused on the generator and its prime mover (e.g., overspeed, power-load imbalance, overvoltage, phase jump, overcurrent) or plant-level (e.g., voltage, current, frequency, phase, etc.) have posed notable risks to BES reliability and should be addressed directly in this standard."</i> However, auxiliary systems that in turn unexpectedly trip an entire plant pose a risk to reliability. While these systems should not be explicitly modeled, the OP, BA and RC should be in a position to understand when a facility will trip. As an absolute minimum, this information should be required from facilities currently being planned and installed.</p>	
Likes	0

Dislikes	0
Response	
Thank you for the comment. The updated SAR has resolved and addressed this comment.	
Wayne Sipperly - North American Generator Forum - 5 - MRO,WECC,Texas RE,NPCC,SERC,RF	
Answer	No
Document Name	
Comment	
<p>The NAGF provides the following comments for consideration:</p> <ol style="list-style-type: none"> 1. The NAGF believes that there is little justification for retiring PRC-024-3 for synchronous generators and that any new standard should be focused on IBR performance issues. Note that GOs have invested tremendous effort and money in achieving compliance with the PRC standards and are achieving the desired enhancement of BES reliability. Replacing them with something substantially different would require significant expenditures with no identifiable benefit. Any new standard should address only gaps in existing standards, as opposed to tearing down and rebuilding them. 2. Project Scope Comments: <ol style="list-style-type: none"> a) Second Bullet: “Creates a comprehensive, performance-based ride-through standard with the purpose of ensuring BES generating resources remain connected and providing essential reliability services during grid disturbances.” <p>The NAGF recommends that other relay-setting PRC standards be considered for retirement/modification beyond PRC-024-3. For example, PRC-025-2, which has the purpose to assure that load responsive relays are set to prevent unnecessary tripping during system disturbances, and PRC-026-1, which has the purpose to ensure that load-responsive relays are expected to not trip in response to stable power swings during non-Fault conditions. The NAGF believes that if a truly comprehensive performance-based ride-through standard is created, then the regulatory burden of other relay setting PRC standards pertaining to how generator protection responds to grid disturbances should be reviewed and incorporated. It seems that a comprehensive generator ride-through standard would apply to not only 24, 27, and 59 functions (PRC-024-3) but would also include trips of generating resources in response to 21, 50, 51, 51VR, 51VC, 67 (PRC-025-2) and/or 21, 40, ,50, 51, 78 (PRC-026-1) function operations in response to grid disturbances.</p> 3. Detailed Description of Project Deliverables Comments: 	

a) Bullet #3: “A reporting requirement that all trips or reductions in power output are reported by the GO to the TOP, BA, and RC.”

The NAGF believes that this statement is too vague or is stated imprecisely for this deliverable. Reductions in power will occur for a wide variety of reasons such as clouds passing over or the setting of the sun at a solar farm, a drop in wind speed, wet coal, changes in condenser circulating water temperature or discharge water temperature limits at a thermal plant, starting an additional large fan or pump, inlet air temperature changes to gas turbines, reduced water flow at a hydro plant – none of these causes of power reduction would have any relation to PRC requirements and no additional reporting other than that required by existing TOP requirements should be necessary. We believe this deliverable should be more focused, such as “A reporting requirement that all trips or reductions in power output in response to grid disturbances are reported by the GO to the TOP, BA, and RC.”

b) Bullet #4: “A requirement that abnormal reductions in active power (i.e., tripping from protections or notable reductions from controls) are analyzed by the GO to develop a corrective action plan, if possible. Situations where corrective action plans are not able to be developed shall be reported to the TOP, BA, and RC.”

The NAGF believes that such trip analysis and corrective actions are already addressed by PRC-004 and therefore this deliverable/requirement is redundant.

c) Bullet #5: “Legacy facilities prior to the effective date of the standard should receive an exemption; however, resources with a commercial operation date after the effective date of the standard (and possibly the PRC-024-3 implementation date) shall be required to eliminate the use of momentary cessation within “ride through envelopes” (e.g., the existing PRC-024 “No Trip Zone”).

The NAGF supports the exemption for legacy IBR facilities. The NAGF recommends that the performance-based standard include documented equipment limitation exemptions similar to PRC-024-3 R3 and these should apply to all generator types rather than just carving out an exemption for the application of momentary cessation on legacy IBRs existing prior to the effective date of the standard (and possible the PRC-024-3 implementation date). For example, if an existing turbine has frequency limitations that do not meet the requirements of the new ride-through standard, no corrective action plan should be necessary should the turbine trip in response to a frequency excursion outside of its capability. There appears to be nothing in the SAR that addresses limitations of existing equipment other than that of legacy IBRs applying momentary cessation.

d) Bullet #7: “A clear requirement that prolonged plant controller interactions that impede the ability of the resource to dynamically respond to the grid disturbance and preclude the ability to fully provide essential reliability services are deemed unacceptable and should be addressed by a corrective action plan.”

The NAGF is concerned with the potential ambiguity associated with this deliverable. This deliverable seems to be focused on eliminating some of the undesirable IBR performance issues, but the wording of this deliverable could be interpreted to apply to integrated plant or unit protection schemes that may indeed “impede the ability of the resource to dynamically respond to grid disturbances” but are designed to protect the boiler or nuclear reactor from pressure or level excursions, steam turbines from overspeed, operation at resonant frequencies or moisture intrusion, etc. Generator Owners should be able to protect their equipment from catastrophic damage without having to implement a corrective action plan should these protection or control features impede dynamic response to grid disturbances.

Likes	0
Dislikes	0

Response

Thank you for the comment. Concerns about the applicability of the proposed standards to synchronous generators will be passed along to standard drafting team. The SAR has the option to create a new standard.

The team has considered the comments and modified the SAR to reflect these specified standards and any other applicable standards.

The SAR has been modified to reflect the changes to 3A as suggested. Concerns regarding PRC-004 and PRC-024-3 legacy exemption retention will be passed along to the standard drafting team to be considered.

3D was reflected in redlines to SAR. This comment will be reviewed while drafting the standard.

Charles Yeung - Southwest Power Pool, Inc. (RTO) - 2

Answer	No
Document Name	

Comment

On the bottom of page 2, the SAR states: “The scope of protections and controls involved in this ride-through standard shall include all generator protections and controls that affect the electrical output of the BES generating resource or plant. To be clear, the project should specify the protections and controls in scope of the ride-through performance and define the term ride-through, as necessary.”

Will the scope include requirements that developers/GOs of any new interconnection projects be required to provide protection and control models to the TO or PC? The SRC recommends that the SDT indicate all “protection and control equipment, including auxiliary

equipment” that will affect the ride-through capabilities of the generator during disturbances. The SDT should identify the auxiliary systems that the ride-through should not affect.

On page 3, under Detailed Description, the SAR calls for “A requirement that abnormal reductions in active power (i.e., tripping from protections or notable reductions from controls) are analyzed by the GO to develop a corrective action plan, if possible. Situations where corrective action plans are not able to be developed shall be reported to the TOP, BA, and RC.”

This description reads much broader than what is described in the SAR purpose. In the purpose it is directed specifically towards “fail to ride through system events”. Is the intent of the SAR scope to create a requirement to report reductions in active energy which go beyond “fail to ride through system events” and include abnormal reductions of any cause? The SRC requests the SAR DT clarify the project scope.

On the bottom of page 3, the SAR states, “Legacy facilities prior to the effective date of the standard should receive an exemption; however, resources with a commercial operation date after the effective date of the standard.” We are concerned that there will be significant amounts of IBR facilities that will be exempt from these requirements. In addition, this seems to be at odds with the “all” language contained in the last bullet on the bottom of page 2 (and as mentioned in the SRC comments above).

In 2018, a SAR was introduced and denied by the Standards Committee to correct momentary cessation of IBRs that had no such exemption because of the risks existing facilities were causing on the BES. This SAR does not propose any solutions to address that risk. We recognize that there are some IBR installations which pre-date the technology to meet the SAR purpose. However there are already numerous amounts of IBRs in operation which can adopt new technology to meet the SAR’s purpose. A blanket exemption should not be a part of the standards and instead some form of exemption process should be utilized. Further between the time this standard may be complete and the time it takes effect due to the need for regulatory approval, which may be over two years. Numerous additional new installation of IBRs would become grandfathered which certainly can meet the ride through requirements. The SRC recommends exemptions be limited to technical infeasibility.

Likes 0

Dislikes 0

Response

Thank you for your comment. It will be considered when the standard is drafted. Models are not within the scope of this drafting team since this a performance standard. This question more refers to MOD-026 and MOD-027

The drafting team understands that the auxiliary systems are critical. However, considering that complexity of identifying the auxiliary equipment to be included in the standard, it has been decided not to include them in the scope. The team assumes that the equipment owner will take the necessary steps to make sure that the auxiliary systems will not trip unexpectedly to degrade the performance of the generation resources during systems events. The drafting team has discussed this point and will be discussing this more in-depth when drafting the standard.

The drafting team does not intend to create a requirement that goes beyond “riding through system events”. The team agrees with your concern and modified the SAR accordingly to only be for grid-related disturbances.

The team shares your concern related to legacy equipment and modified the SAR to reflect the comment regarding legacy systems and exemptions.

Mark Gray - Edison Electric Institute - NA - Not Applicable - NA - Not Applicable

Answer	No
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Document Name	
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Comment

While EEI agrees in principal that that there have been performance issues, primarily with Solar PV Inverter Based Resources (IBRs), that need to be addressed, we do not support the retirement of PRC-024.

While there were losses of synchronous generators in some of the six disturbance reports cited in the proposed SAR, none appear to be unexpected, unusual or the result of non-compliance with PRC-024. As noted below, all of these six events linked within this SAR indicate solar PV performance problems, not synchronous generator problems.

Additionally, if the intent of the SAR is to “create a comprehensive, performance-based ride-through standard,” development of a standard would need to account for retirement of other relay setting standards such as PRC-025-2 and PRC-026-1, to prevent duplicative requirements and compliance obligations.

For these reasons, we do not support the retirement of PRC-024-3. However, we offer an alternative approach in our response to question 2.

NERC 2021 California Disturbances Report ([2022](#))

- June 24, 2021 – **Loss of 765MW of solar PV resources** (27 facilities) and 145MW of DERs (no synchronous resources lost).
- July 4, 2021 – **Loss of 605MW of solar PV resources** (33 facilities) and 46MW of DERs; 125MW; additionally, a single 125MW CT tripped due to two defective sensors as reported by the GO.
- July 28, 2021 – **Loss of 511MW of solar PV resources** (27 facilities) and 46MW of DERs (no synchronous resources lost).
- August 25, 2021 – **Loss of 583MW of solar PV resources** (30 facilities) and 212MW gas turbine tripped as a result of a correct operation of a RAS scheme. An additional gas turbine tripped during this event due to the failure of the excitation system (failed diodes). As stated in the report, the diodes were redundant but can only be detected during manual inspection. It is speculated that the redundant diodes failed as a result of the event, GO has indicated they will increase their inspections to avoid future failures.

NERC Odessa Disturbance Report ([2021](#))

- May 9, 2021 Event – Initial fault occurred during CT startup testing when a surge arrester failed taking out one CT and causing another to run back for a total loss of 192MW. After this event **1112MW of solar PV output was lost**, in addition 36MW of output from 4 wind power plants.
- June 26, 2021 Event – Failed H-Frame structure causes the **loss of 518MW at 5 PV facilities**.

NERC San Fernando Disturbance Report ([2020](#)) July 7, 2020

- Static wire on a 230kV line failed causing the tripping of two lines on a double circuit tower. In addition, a nearby 230kV line relay mis operated. The result was the initial **loss of 205MW of solar PV output**. When trying to restore the lines, the second line tripped out causing the larger event, the **loss of 1000MW of solar PV output** (no synchronous resources lost).

NERC Palmdale Roost and Angeles Forest Disturbances Report ([2019](#))

- April 20, 2018 (Angeles Forest) – A splice on a 500kV line failed causing a B-C phase fault which was cleared within 2.6 cycles. The fault caused the **loss of 860MW of solar PV output** in CAISO and 17MW in LADWP. In addition, a natural gas turbine tripped as a result of the fault. The report indicates the plan tripped on low fuel pressure causing the natural gas turbine to trip and the reduced output of a combined cycle steam generator to reduce output to 75MW for a total loss of 200MW. There was an additional loss of 130MW of DER output.
- May 11, 2018 (Palmdale Roost) – The disturbance was caused by a bird nest on a 500kV line that caused a line flashover (B phase to ground fault). As a result, there was a loss of **630MW of solar PV output in CAISO**, 48MW in LADWP and 33MW in IID. Additionally, there was 100MW of DER output lost (no indication of any synchronous generation lost during this event).

NERC Canyon 2 Fire Disturbance Report ([2018](#))

- Canyon 2 Fire Disturbance, Oct. 9, 2017 – Two transmission lines faulted near Anaheim Hills, CA. The first fault occurred on a 220kV line at 12:12 PM and the second occurred at 12:14 PM on a 500kV line. The first fault resulted in the **reduction of 682MW of solar PV output**, which the second resulted in the **reduction of 937MW of solar PV output** (no indication that any synchronous generation was lost).

NERC Blue Cut Fire Disturbance Report ([2017](#))

- On Aug. 16, 2016 AM the Blue Cut fire began in Cajon Pass, CA. As a result of the widespread fire SCE experience thirteen 500kV line faults and LADWP experienced two 287kV faults. Four of the fault events resulted in the **loss of 1,200MW of solar PV output** (no indication any synchronous generation was lost).

Likes 0

Dislikes 0

Response

Thank you for the comment. Concerns about the applicability of the proposed standards to synchronous generators will be passed along to standard drafting team. The SAR has the option to create a new standard. The team has considered the comments and modified the SAR to reflect these specified standards and any other applicable standards.

Constantin Chitescu - Ontario Power Generation Inc. - 5

Answer

No

Document Name

Comment

Ride-through is not a defined term in the NERC Glossary of Terms nor NPCC Glossary of Terms. The objective of the SAR is commendable, however the specific characteristics of the disturbances addressed by the new standard needs to be carefully defined. Usually the magnitude and duration of grid disturbances should be defined. Particular contingencies should be specified and studied to ensure those applicable reasonable foreseeable disturbances can be assessed and addressed.

Likes 0

Dislikes	0
Response	
<p>Thank you for your comment. The existing SAR allows the standard drafting team to develop a term for the NERC Glossary to include the definition of "ride-through" as well as other relevant terms that might be used in the standard. The drafting team also agrees that specification of disturbance characteristics (e.g., type of fault, duration, voltage class, etc.) will be a critical part of the ride-through standard drafting process.</p>	
Dana Showalter - Electric Reliability Council of Texas, Inc. - 2	
Answer	No
Document Name	
Comment	
<p>Regarding the 4th bullet in the "Project Scope" section, ERCOT believes the SAR should not exclude auxiliary systems that could impact the facility's continued operation. The SDT should review the various types of auxiliary systems in use at in-scope facilities and determine whether to exclude any of them. ERCOT suggests revising the 4th bullet as follows:</p> <p>This standard should address protections and controls directly focused on the generator and its prime mover (e.g., overspeed, power-load imbalance, overvoltage, phase jump, overcurrent) or at the plant level (e.g., voltage, current, frequency, phase, etc.) because they pose notable risks to BES reliability. The SDT will determine whether this ride-through standard may exclude auxiliary systems that do not impact the facility's ability to maintain real and reactive power during a disturbance.</p> <p>Regarding the 2nd sub-bullet in the "Detailed Description" section, ERCOT suggests the standard contain a requirement for a GO to report only trips or reductions in real power or improper reactive power response (trips or reductions within some threshold of the performance parameters established in the standard).</p> <p>Regarding the 3rd sub-bullet in the "Detailed Description" section, ERCOT suggests clarifying the term "abnormal" to include trips and reductions in real power or improper reactive power response failing to meet the performance parameters established in the standard. Further, ERCOT suggests the SDT include a requirement for the GO to develop <i>and implement</i> a corrective action plan (CAP) or report to its TOP, BA and RC any CAP it cannot implement <i>due to technical infeasibility</i>. Finally, ERCOT suggests removing "if possible" because ERCOT's proposed language (above) addresses situations where the GO cannot implement the CAP due to technical infeasibility.</p>	

Accordingly, ERCOT suggests modifying the 2nd and 3rd sub-bullets as follows:

- The proposed deliverable is a new NERC standard (or significant overhaul and revision of PRC-024-3) that includes the following key elements:
- ...
- A requirement for a GO to report to its TOP, BA and RC trips or reductions in real power or improper reactive power response (i.e., trips or reductions within a threshold of the performance parameters established in the standard).
- A requirement for a GO to: (a) analyze abnormal trips or reductions in real power or improper reactive power response (i.e., tripping from protections, notable reductions from controls, trips or reductions in real power or improper reactive power response failing to meet performance standards established in this standard); and (b) develop and implement a corrective action plan (CAP). If a GO cannot implement a CAP because it is not technical feasible to do so, the GO must report that fact to its TOP, BA, and RC.
- ...

Regarding the 4th sub-bullet in the “Detailed Description” section, ERCOT agrees with the SRC that the project should not exempt legacy facilities. Exempting legacy facilities will not address the reliability-related need this project addresses.

Likes 0

Dislikes 0

Response

Thank you for the comments.

The Auxiliary Systems concern has been addressed in the redlined SAR.

The SAR has been modified to address reporting concerns. Thresholds may be addressed by the drafting team.

Legacy systems should only be exempt if, after engineering analysis, corrective action is not possible or practical (need to define practical). The language was modified to reflect the changes regarding implementation of a Corrective Action Plan and removed "if possible".

LaTroy Brumfield - American Transmission Company, LLC - 1

Answer

No

Document Name	
Comment	
<p>Please address and clearly explain the relationship between the two SARs (“Revision of relevant Reliability Standards to include applicability of transmission-connected dynamic reactive resources” approved in April, and “Generator Ride-Through Standard (PRC-024-3 Replacement)”. Failure to provide this clarification will result in confusion between intents and requirements for different types of devices and may not clearly align with the earlier whitepapers and recommendations.</p> <p>Additionally-please clarify that Synchronous Condensers, STATCOMs, SVCs and HVDC are not considered generator protection and control systems and should not be included in this standard. If Synchronous Condensers, STATCOMs, SVCs and HVDC are intended to be included in the standard, it needs to be revised to reflect that and include proper terminology, consideration of capability, and requirements specific to transmission-connected dynamic reactive power resources as opposed to generation resources.</p>	
Likes	0
Dislikes	0
Response	
<p>Thank you for the comment. The team has had an additional SAR added to the project to cover the Generation Ride-through. The original SAR will be included with the Ride-through SAR for the team to use when drafting the standard(s) for this project. Each of the two SARs will be used when addressing their respective aspects of this project.</p> <p>Devices that are only reactive devices are not included in the current SAR. This comment pertains to the first SAR of this project and not the current SAR.</p>	
Mark Garza - FirstEnergy - FirstEnergy Corporation - 1,3,4,5,6, Group Name FE Voter	
Answer	No
Document Name	
Comment	
<p>FirstEnergy supports EEI’s comments.</p>	

Likes	0
Dislikes	0
Response	
Thank you for the comment. Please see response to EEI.	
David Jendras - Ameren - Ameren Services - 1,3,6	
Answer	No
Document Name	
Comment	
Ameren agrees with EEI's comments. A new ride through standard should be created for IBR's only. The performance issues were with IBR's not synchronous generators.	
Likes	0
Dislikes	0
Response	
Thank you for the comment. Please see response to EEI.	
LaKenya VanNorman - Florida Municipal Power Agency - 3,4,5,6 - SERC, Group Name Florida Municipal Power Agency (FMPA)	
Answer	No
Document Name	
Comment	
Florida Municipal Power Agency (FMPA) supports comments submitted by NAGF.	
Likes	0
Dislikes	0
Response	

Thank you for the comment. Please see response to NAGF.	
Carl Pineault - Hydro-Quebec Production - 1,5	
Answer	Yes
Document Name	
Comment	
At this point, it is hard to disagree with this project since it is still broad and vague	
Likes	0
Dislikes	0
Response	
Thank you for the comment.	
Andrea Jessup - Bonneville Power Administration - 1,3,5,6 - WECC	
Answer	Yes
Document Name	
Comment	
BPA supports revision of the current PRC-024-3 rather than creation of a new reliability standard. BPA believes the project will raise the bar on protection of BPS-connected inverter-based resources.	
Likes	0
Dislikes	0
Response	
Thank you for the comment.	
Rachel Coyne - Texas Reliability Entity, Inc. - 10	
Answer	Yes

Document Name	
Comment	
<p>Texas RE agrees with the need for this project to develop a comprehensive generator “ride-through” standard in lieu of the current PRC-024’s focus solely on voltage and frequency protection settings. As the September 2021 Joint Odessa Disturbance Report for Texas Events on May 9, 2021 and June 26, 2021 (“Odessa Disturbance Report”) highlighted, “the systematic nature of [Inverter-Based Resource tripping or cessation] events across multiple interconnections and a wide range of facilities, many of which are recently energized, warrants significant enhancements to the NERC Reliability Standards to address gaps in BES inverter-based resources.” (Odessa Disturbance Report, at 29). These recommendations included the need for developing a new generator protection and control ride-through standard to replace the current PRC-024-3 to address continued examples of widespread tripping that are not addressed by the current PRC-024-3 requirements. Texas RE appreciates that the SAR provides an approach to capture the range of performance issues (PLL loss of synchronism, subcycle ac overvoltage protection, dc reverse current, and wind converter crowbar failures) that have resulted in widespread tripping incidents across a number of interconnections, including the ERCOT Interconnection.</p> <p>It further recommended that NERC do so on an expedited timeframe. Texas RE notes that this call of expedited action is even more pressing given the recent tripping of significant inverter-based resources in the ERCOT Interconnection earlier this year, continuing a pattern of generator performance issues in this area. NERC has highlighted grid transformation issues as the single greatest risk to grid reliability at the current time. Texas RE appreciates the SDT’s important role, care, and commitment to addressing these performance issues in this project.</p>	
Likes	0
Dislikes	0
Response	
Thank you for your comment and the timeline input recommendation.	
Ruida Shu - Northeast Power Coordinating Council - 1,2,3,4,5,6,7,8,9,10 - NPCC, Group Name NPCC Regional Standards Committee	
Answer	Yes
Document Name	
Comment	

The NPCC Regional Standards Committee agrees with the proposed scope as described in the SAR.	
Likes	0
Dislikes	0
Response	
Thank you for the comment.	
Kim Thomas - Duke Energy - 1,3,5,6 - SERC,RF, Group Name Duke Energy	
Answer	Yes
Document Name	
Comment	
None.	
Likes	0
Dislikes	0
Response	
Thank you for the response.	
Dennis Chastain - Tennessee Valley Authority - 1,3,5,6 - SERC	
Answer	Yes
Document Name	
Comment	
The Project 2020-02 webpage reflects that the initial project SAR, posted for industry comments on 3/30/2020, was revised and subsequently accepted by the NERC Standards Committee on 4/20/2022. A redline of the SAR accepted by the Standards Committee in April 2022 vs. the initial SAR posted in March 2020 is posted on the project page. It appears that a different Project 2020-02 SAR (prepared by NERC executives and staff) was presented to and accepted by the NERC Standards Committee a month later, on	

5/18/2022. We suggest that a redline of the SAR accepted by the Standards Committee in May 2022 vs. the SAR accepted by the Standards Committee in April 2022 (or the initial SAR posted in March 2020) be added to the project page. It is not clear why the SAR submitted by the Chair of the System Analysis & Modeling Subcommittee and accepted by the Standards Committee in April 2022 was “abandoned” a month later to be replaced by the SAR submitted by NERC.

Likes 0

Dislikes 0

Response

Thank you for your comment and support. The team will proceed with the two SARs assigned by the SC and will be considered when drafting the standards.

Nazra Gladu - Manitoba Hydro - 1,3,5,6

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response

Thank you for the response.

Leonard Kula - Independent Electricity System Operator - 2

Answer

Yes

Document Name

Comment

Likes 0

Dislikes 0

Response	
Thank you for the response.	
Steven Rueckert - Western Electricity Coordinating Council - 10, Group Name WECC Entity Monitoring	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Thank you for the response.	
Jennie Wike - Tacoma Public Utilities (Tacoma, WA) - 1,3,4,5,6 - WECC, Group Name Tacoma Power	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Thank you for the response.	
Isidoro Behar - Long Island Power Authority - 1	
Answer	Yes
Document Name	
Comment	

Likes	0
Dislikes	0
Response	
Thank you for the response.	
Gail Elliott - International Transmission Company Holdings Corporation - NA - Not Applicable - MRO,RF	
Answer	Yes
Document Name	
Comment	
Likes	0
Dislikes	0
Response	
Thank you for the response.	
Dwanique Spiller - Berkshire Hathaway - NV Energy - 5	
Answer	Yes
Document Name	
Comment	
Likes	0
Dislikes	0
Response	
Thank you for the response.	

2. Provide any additional comments for the drafting team to consider, if desired.	
LaKenya VanNorman - Florida Municipal Power Agency - 3,4,5,6 - SERC, Group Name Florida Municipal Power Agency (FMPA)	
Answer	
Document Name	
Comment	
Florida Municipal Power Agency (FMPA) supports comments submitted by NAGF.	
Likes 0	
Dislikes 0	
Response	
Thank you for the comment. Please see response to NAGF.	
Mark Garza - FirstEnergy - FirstEnergy Corporation - 1,3,4,5,6, Group Name FE Voter	
Answer	
Document Name	
Comment	
<p>While FirstEnergy does agree that an assessment needs to be conducted to ensure reliability of the BES due to the changing mix of generating resources, we do not agree that a reliability standard should result in additional penalties for a GO if generating capacity requirements are not met due to a fuel shortage caused by unforeseen events. FirstEnergy generators already participate in the PJM capacity market and are required to provide generating capacity based on summer ICAP testing results. A generator is assessed financial penalties by PJM if it cannot meet its generating capacity requirements and therefore, we caution against a double jeopardy situation.</p> <p>We also suggest the RC and BA, not the GO, should be responsible for developing a CAP if generation capacity demands are not met during periods of constrained resources. It is the responsibility of the Transmission Grid Operator (e.g., PJM), not the GO, to ensure that adequate generating resources are available during periods of constrained resources. Operating characteristics of IRBs are the cause of</p>	

constrained resources and mitigation actions over-and-above PJM generating capacity requirements should not be placed on fossil generation resources.

Further, FirstEnergy supports EEI's comments, which states:

As an alternative to the proposed PRC-024 SAR, EEI suggests that a new SAR be developed to address performance issues specifically affecting IBRs. This new SAR could leverage key scope items from this proposed SAR to create a new performance-based NERC Reliability Standard that is focused on IBRs. As a suggested scope, we propose modifying this SAR as follows:

-- Trips or reductions in active power that occur because the IBR does not operate as expected (excludes cloud cover, setting sun, etc.), but not associated with protection system trips, (PRC-004 already addresses protection system tripping) are to be analyzed by the GO to develop a corrective action plan. Situations where an issue cannot be corrected, the GO shall develop a report detailing the limitations of the IBR and provide it to the responsible TOP, BA, and RC.

-- Momentary cessation, or temporary ceasing of current injection in response to grid disturbances, is deemed unacceptable for BES generating resources. Inverter-based generating resources employing momentary cessation shall develop a corrective action to mitigate its use unless the issue cannot be corrected. Legacy facilities prior to the effective date of the standard should receive an exemption; however, resources with a commercial operation date after the effective date of the standard shall be required to eliminate the use of momentary cessation during system transient disturbances where the system voltage or frequency falls within the "No Trip Zone" provided in PRC-024-3, which is subject to enforcement October 1, 2022.

-- Include the development of new terms to address terms specific to IBRs or where commonly used industry terms have created some confusion for IBR owners. E.g., No Trip Zone, trip, momentary cessation, and any other relevant terms that may require clarification within the NERC Glossary of Terms.

-- Prolonged IBR controller interactions that impede the ability of the resource to respond dynamically to the grid disturbance and preclude the ability to provide essential reliability services are deemed unacceptable and should be addressed by a corrective action plan. In situation where the GO has determined the issue cannot be corrected, a report shall be developed detailing the IBR limitation and provide it to the responsible TOP, BA and RC.

--If the TOP, BA, or RC inform the GO/IBR owner of a tripping occurrence, cessation event, or IBR controller interactions that are not reported or otherwise identified by the GO/IBR Owner, the responsible GO shall be responsible for analyzing

the facility’s performance during the event, developing a corrective action plan, and making this available to the TOP, BA, and RC or in the situation where the issue cannot be corrected, informing the TOP, BA and RC.

Likes 0

Dislikes 0

Response

Thank you for the comment. The team has redlined to the SAR to only include systems disturbance or system electrical events. Please also see response to EEI.

Dennis Chastain - Tennessee Valley Authority - 1,3,5,6 - SERC

Answer

Document Name

Comment

The current PRC-024-2, “No Trip Zone” is very clear and easy to understand for frequency and voltage parameters. The SAR Requesters’ logic and SAR details appear to be pretty thorough, with the exception of replacing the “No Trip Zone” with “fault ride-through capabilities” as proposed in the revised SAR (dated 4/28/2022). We recommend the SAR Requesters/SAR Drafting Team expand on the proposal to eliminate “No Trip Zone” requirements, and expand the discussion regarding the replacement “fault ride-through capabilities”.

The revised SAR language seems to suggest that synchronous generating resources suffer from mis-trips and mis-application of the standard due to deficiencies identified in PRC-024-3 to the same degree that inverter-based resources do. None of the six disturbance reports cited as technical justification for the SAR reference loss of synchronous generation caused by an inadequate or missing requirement within PRC-024-3. From a reliability perspective, while GO/GOPs of IBRs stand to benefit from a replacement/overhaul of PRC-024-3, there is no clear benefit to GO/GOPs of traditional synchronous generating resources. We recommend that the SAR language be revised to clearly delineate the current issues with synchronous generation resources and the current issues with IBRs driving this proposed standard modification, and how the changes are impacting each technology.

The proposed scope explicitly excludes auxiliary systems with the rationale that “abnormal performance or unexpected tripping of these protections do not pose a systemic BES reliability risk” (Page 3, “Project Scope”, 4th bullet point). Components of auxiliary systems like unit auxiliary transformers (UATs) typically feature protection that are capable of taking a generator offline. Given this, there may be a

heightened reliability risk if auxiliary equipment are not subject to the same requirements of the proposed standard as generator protection and controls. Auxiliary transformers (and BES GSUs) were added to the applicable equipment scope in the revision from PRC-024-2 to PRC-024-3, so an explanation is requested for why this inclusion is not being preserved.

Likes 0

Dislikes 0

Response

Thank you for the comment. The team has added the language for IBR aux systems and excluded traditional generation.

LaTroy Brumfield - American Transmission Company, LLC - 1

Answer

Document Name

Comment

Please clarify momentary cessation of “current injection during BPS fault events.”

Re: this SAR please explain if current injection refers to active current, reactive current or both?

Likes 0

Dislikes 0

Response

Thank you for the comment. Please see response to EEI.

Dana Showalter - Electric Reliability Council of Texas, Inc. - 2

Answer

Document Name

Comment

ERCOT provides the following additional comments:

The SAR specifically identifies protections/controls posing risks to BES reliability. The proposed standard should not specify criteria for every potential quantity that may trigger a trip. Specifying voltage and frequency envelopes should suffice. Operating within those envelopes should not trigger any other plant control or protection to trip.

Not having high-resolution data limits the ability to identify the root cause of the events referenced in the SAR. High-resolution data, including data from phasor measurement units (PMUs), digital fault recorders (DFRs), and inverter-based oscillography, is critical to identify the root cause of disturbance events and, as such, necessary to develop a CAP. Additionally, high resolution data allows a better understanding of the interaction between local wind turbine ride-through control versus the facility plant controller. ERCOT believes this SAR should require data recording relating to voltage ride through and to add appropriate language to PRC-002-2.

Finally, ERCOT suggests the SDT consider IEEE 2800 when drafting a proposed standard.

Likes 0

Dislikes 0

Response

Thank you for the comment. The team has redlined the SAR to reflect these changes regarding data recording.

Gail Elliott - International Transmission Company Holdings Corporation - NA - Not Applicable - MRO,RF

Answer

Document Name

Comment

In place of GOs only notifying the PC and TP when they can't meet the ride-through requirement or upon request, GOs should be required to periodically (annually?) provide, or confirm no changes to, their generator protection trip settings to the PC and TP.

Likes 0

Dislikes 0

Response

Thank you for the comment. This will be passed to the standard drafting team for consideration.

Constantin Chitescu - Ontario Power Generation Inc. - 5

Answer	
Document Name	
Comment	
<p>If an attempt is made to define the ride through then it should consider the Bulk Electrical System (BES) as well as all the applicable/foreseeable generating resources that can potentially impact the BES.</p> <p>A suggestion is made to use, consistently, just the Bulk Electrical System (BES) acronym and not to loosely interchange with BPS whose meaning is different than BES in the NPCC region (Bulk Power System as determined by Directory #1/A#10 methodology)</p> <p>The SAR mentions that "Generator ride-through is a foundational essential reliability service.". To date the "ride-through" is not defined as a reliability service the same way we understand the following:</p> <ul style="list-style-type: none"> • Frequency support - provided through the combined interactions of synchronous inertia and frequency response, as services to arrest the decline in frequency and eventually return the frequency to the desired level • Ramping and Balancing – provided through dispatch by the generating units with active power management capability and ability to respond to dispatch signals • Voltage Support - provided through planning and confirmation testing of reactive power sufficiency per unique characteristics of their respective BA systems. <p>Having generating resources with ride-through capabilities are not a guarantee that the generating units will remain connected to the grid even less of a guarantee they will provide BES support (reliability services during BES disturbance) since BES support is also a:</p> <ul style="list-style-type: none"> • Function of static and dynamic reactive power reserve capabilities to regulate voltage at those respective points in the system • Function of levels of conventional synchronous inertia for respective balancing area/interconnection, and initial frequency deviation following the largest contingency event for the interconnection <p>This SAR should only be applicable to the protection/protective functions that trip the protected equipment in response to a BES disturbance, where the disturbance conditions do not pose a risk of damage to the associated equipment, whose protection must be prioritized (similar with PRC-025-2).</p> <p>Equipment protection does not amount nor have a simultaneous compounded effect on grid reliability.</p>	

The SAR statement related to the cost impact associated to this Project being expected to be minimal, should not be treated as an accurate statement as long as the entire scope of the project has not even been identified.

Likes 0

Dislikes 0

Response

Thank you for the comment. The team has redlined the SAR to reflect possible new costs. NERC has been specific when designating the terms BES vs BPS in the SAR, these will remain distinct and not all BES. The drafting team will determine specific ride-through requirements. This comment will be passed along to the standard drafting team.

Mark Gray - Edison Electric Institute - NA - Not Applicable - NA - Not Applicable

Answer

Document Name

Comment

As an alternative to the proposed PRC-024 SAR, EEI suggests that a new SAR be developed to address performance issues specifically affecting IBRs. This new SAR could leverage key scope items from this proposed SAR to create a new performance- based NERC Reliability Standard that is focused on IBRs. As a suggested scope, we propose modifying this SAR as follows:

- Trips or reductions in active power that occur because the IBR does not operate as expected (excludes cloud cover, setting sun, etc.), but not associated with protection system trips, (PRC-004 already addresses protection system tripping) are to be analyzed by the GO to develop a corrective action plan. Situations where an issue cannot be corrected, the GO shall develop a report detailing the limitations of the IBR and provide it to the responsible TOP, BA, and RC.
- Momentary cessation, or temporary ceasing of current injection in response to grid disturbances, is deemed unacceptable for BES generating resources. Inverter-based generating resources employing momentary cessation shall develop a corrective action to mitigate its use unless the issue cannot be corrected. Legacy facilities prior to the effective date of the standard should receive an exemption; however, resources with a commercial operation date after the effective date of the standard shall be required to eliminate the use of momentary cessation during system transient disturbances where the system voltage or frequency falls within the “No Trip Zone” provided in PRC-024-3, which is subject to enforcement October 1, 2022.

- Include the development of new terms to address terms specific to IBRs or where commonly used industry terms have created some confusion for IBR owners. E.g., No Trip Zone, trip, momentary cessation, and any other relevant terms that may require clarification within the NERC Glossary of Terms.
- Prolonged IBR controller interactions that impede the ability of the resource to respond dynamically to the grid disturbance and preclude the ability to provide essential reliability services are deemed unacceptable and should be addressed by a corrective action plan. In situation where the GO has determined the issue cannot be corrected, a report shall be developed detailing the IBR limitation and provide it to the responsible TOP, BA and RC.
- If the TOP, BA, or RC inform the GO/IBR owner of a tripping occurrence, cessation event, or IBR controller interactions that are not reported or otherwise identified by the GO/IBR Owner, the responsible GO shall be responsible for analyzing the facility’s performance during the event, developing a corrective action plan, and making this available to the TOP, BA, and RC or in the situation where the issue cannot be corrected, informing the TOP, BA and RC.

Likes 0

Dislikes 0

Response

Thank you for the comment.

The standard drafting team will take into consideration that IBR ride-through performance is the chief motivation behind the present PRC-024 SAR.

The points applicable to generation ride-through will be considered in the context of a revised or new generation ride-through standard. Momentary cessation is an aspect of ride-through performance. The final standard may not be specific to causes of unsatisfactory ride-through but only describe the system conditions and/or events during which generation must ride-through and what constitutes satisfactory ride-through performance. Exemptions for legacy generation and possibly other factors for which exemptions should be permitted will be considered. The team has redlined the SAR to address these concerns. The fourth point regarding interactions that affect reliability services in general may go beyond the scope of disturbance ride-through which the SAR is limited to. The SAR has been redlined to make it more specific, when the team starts to draft the standard this will be noted and considered.

Charles Yeung - Southwest Power Pool, Inc. (RTO) - 2

Answer

Document Name

Comment

The current PRC-024 standard was written with conventional (rotating) generators in mind. Conventional generators are quite sensitive to generator speed (frequency) and abnormal speeds can damage, i.e. lower the life of, turbine blades. Hence the further away the frequency deviates from 60 Hz, the shorter the duration allowed for “no-trip.” In contrast, Inverter-Based Resources (IBRs) don’t have rotating parts whose speed is tied to their connection to the grid. Since IBRs are not affected by deviations in system frequency as much as conventional (rotating) generators, the SRC requests the PRC-024 SAR be revised to include a recognition for this difference as there may be different ride-through requirements for IBRs than conventional generators within the same interconnection.

In addition, to aid in industry implementation, the SRC requests the SAR include the requirement to provide some real-world examples; e.g. in Technical Rationale, to illustrate how proposed standard requirements will ensure both IBRs and conventional generators are able to ride-through faults and how, had they been in place, would have addressed past issues of inadequate ride-through capability.

Finally, the SRC requests that the SAR ask to expand the requirement in selecting a Standards Drafting Team (SDT) that is stated in Question 5 on the SAR form. The SRC agrees it is important to include entities that the standard will apply to, but in addition, entities who have a need for the information or bear responsibility to reliably operate within the bounds of the standard (even if the standard does not directly apply to them from a requirement and compliance standpoint), should also be included. The requirements set in any standard are intended to ensure the reliability of the BES as a whole which all registered entity functions have an impact or interest in. This should apply to any and all SARs and the SRC would like to ask NERC to address a change in the SAR form in the future.

Likes 0

Dislikes 0

Response

Thank you. Your comments will be considered during the drafting of the standard. The team will review and provide real world examples if available/applicable.

Wayne Sipperly - North American Generator Forum - 5 - MRO,WECC,Texas RE,NPCC,SERC,RF

Answer

Document Name

Comment

The NAGF notes that the SAR references the term Bulk Power System (BPS) and Bulk Electric System (BES) through the SAR document. Recommend consistent use of the terms in the Purpose, Project Scope, and Deliverables sections.

In addition, the NAGF notes that the SAR is not consistent with regard to retiring and replacing PRC-024-3 (Purpose or Goal Section, first sentence). Bullet #1 of the Project Scope states “Retire PRC-024-3, and create a new PRC standard or completely overhaul and replace the existing PRC-024 standard.” Bullet #1 of the Detailed Description of the Project Deliverables states “The proposed deliverable is a new NERC standard (or significant overhaul and revision of PRC-024-3) that includes...).

Likes 0

Dislikes 0

Response

Thank you for the comment. The team will make sure to use terms consistently moving forward.

These terms are consistent, the scope allows these actions. The Purpose and Scope both articulate the retirement of the current PRC-024-3 and replacing it with a new or modified version.

John Pearson - ISO New England, Inc. - 2

Answer

Document Name

Comment

Below are proposed changes for the “proposed deliverable” section of the SAR.

The proposed deliverable is a new NERC standard (or significant overhaul and revision of PRC-024-3) that includes the following key elements:

A performance-based approach to generator ride-through rather than an equipment settings standard. The new standard shall include requirements that BES resources shall ride through grid disturbances and include quantitative measures (see below) on expectations for ride-through that address all possible causes of tripping and power reductions from BES generating resources (particularly generator, turbine, inverter, and all plant-level protection and controls, including auxiliary systems).

A reporting requirement that all trips or abnormal reductions in power output are reported by the GO to the TOP, BA, and RC.

A requirement that abnormal reductions in active power (i.e., tripping from protections or notable reductions from controls) are analyzed by the GO and shall be reported to the TOP, BA, and RC.

Likes 0

Dislikes 0

Response

Thank you for the comment. These concerns have been addressed in the redlined SAR.

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

Answer

Document Name

Comment

None.

Likes 0

Dislikes 0

Response

Thank you for the response.

Jamie Monette - Allete - Minnesota Power, Inc. - 1

Answer

Document Name

Comment

Minnesota Power supports EEI's comments for this question.

Likes 0	
Dislikes 0	
Response	
Thank you for the comment. Please see response to EEI (question 2).	
Daniela Atanasovski - APS - Arizona Public Service Co. - 1,3,5,6	
Answer	
Document Name	
Comment	
AZPS suggests PRC-024 should remain unchanged as it applies to synchronous generators and that a new SAR be developed to address performance issues specifically affecting IBR's that are interconnected to the BES.	
Likes 0	
Dislikes 0	
Response	
The standard drafting team will take into consideration that IBR ride-through performance is the chief motivation behind the present PRC-024 SAR.	
Alan Kloster - Evergy - 1,3,5,6 - MRO	
Answer	
Document Name	
Comment	
Evergy supports and incorporates by reference the comments of the Edison Electric Institute (EEI) for question #2.	
Likes 0	
Dislikes 0	

Response	
Thank you for the comment. Please see response to EEI (question 2).	
Isidoro Behar - Long Island Power Authority - 1	
Answer	
Document Name	
Comment	
<p>The stated purpose of this SAR is to retire PRC-024-3 and replace it with a performance-based ride-through standard that ensures generators remain connected to the BPS during system disturbances. Additionally, the SAR will focus on the generator protection and control systems that can result in the reduction or disconnection of generating resources during these events.</p> <p>As part of the development of the performance based standard or overhaul of PRC-024-3, it is recommended that the standard drafting team include and highlight specific references to the relevant IEEE Standard P2800-2022 clauses and to relevant FERC Orders (related to ride-through), where applicable. It will be important for stakeholders to discern similarities and differences between the new or revamped standard and these existing references.</p> <p>We can offer another comment, related to PRC-024-3, for consideration in the development of a performance based standard or overhaul of PRC-024-3.</p> <p>For PRC-024-3 applicability section 4.1.2, it mentions that it is for Transmission Owners in the Quebec Interconnection only. There are Transmission Owners outside the Quebec Interconnection that own BES generator step-up transformers (GSUs). Is PRC-024-3 intended to be applicable to Transmission Owners that own BES GSUs that are outside the Quebec Interconnection? If so, perhaps the “in the Quebec Interconnection only” should be removed from applicability section 4.1.2 in the next revision.</p>	
Likes	0
Dislikes	0
Response	
Thank you for the comment. This will be passed along to the drafting team along with consideration to IEEE-2800-2022 when drafting the standard.	
Joseph Amato - Berkshire Hathaway Energy - MidAmerican Energy Co. - 1,3	

Answer	
Document Name	
Comment	
MidAmerican supports MRO NSRF and EEI comments.	
Likes 0	
Dislikes 0	
Response	
Thank you for the comment. Please see response to EEI (comment 2).	
Michael Johnson - Pacific Gas and Electric Company - 1,3,5 - WECC, Group Name PG&E All Segments	
Answer	
Document Name	
Comment	
PG&E agrees with the comments and suggested scope provided by EEI; a new SAR should be developed to address the unique performance characteristics of IBRs.	
Likes 0	
Dislikes 0	
Response	
Thank you for the comment. Please see response to EEI (question 2).	
Anna Todd - Southern Indiana Gas and Electric Co. - 3,5,6 - RF	
Answer	
Document Name	
Comment	

N/A	
Likes	0
Dislikes	0
Response	
Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company	
Answer	
Document Name	
Comment	
<p>Southern Company disagrees with the “Cost Impact Assessment”. We feel that generation resources will need to install high speed recorders to capture data on electrical events that occur and the reaction of generation resources to said electrical event. These high speed recorders will be essential for any requirement for analysis and development of corrective action plans. Southern Company purports that it will be costly to engineer, procure and install this equipment.</p> <p>Noting that IBR components capable of providing the performance characteristics are just now beginning to be developed and offered by vendors coupled with regulatory requirements for providing that performance will certainly cause equipment suppliers to increase costs to the users.</p> <p>With the cause of the concern raised in this SAR being the system disturbance, perhaps a more beneficial result can be achieved by investigating the causes of the system disturbances that have been resulting in natural responses of the IBR and synchronous machine based generating stations. Our experience has been that most of the existing IBR systems that operate perfectly given a network with no disturbances.</p> <p>The recent development and adoption of IEEE P2800 (Standard for Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems) is nowhere to be found in the SAR as a resource. It is Southern Company’s opinion that IEEE P2800 be fully understood and used by the SDT as a resource of what operational capability limits exist for IBRs. P2800 goes into many of the aspects that IBRs face from a performance perspective. A common issue with IBRs is loss of synchronism because of the voltage phase angle jump that can occur with system disturbances. A voltage phase angle shift jump can</p>	

occur with the voltage magnitudes still within the no-trip zone, leading to momentary cessation because of loss synchronism of the IBRs synchronizing phase-locked loop control function.

The Functional Entities identified in the PRC-024 standard have no control what-so-ever of the design and performance characteristics of the Inverter Based Resource manufacturers equipment. This leads to GOs attempting to coerce the IBR manufactures after-the-fact to change equipment settings and parameters to comply with operational situations that they are either not designed to perform to or, due to the technical nature of the IBR generation process, cannot perform to. To move to a performance based standard and holding the GO accountable for the design performance of the IBRs is futile at best. The only performance criteria defined in the SAR so far is impossible for all situations, and that is “A clear requirement that momentary cessation, or temporary ceasing of current injection during BPS fault events, is deemed unacceptable performance for BES generating resources”.

Likes 0

Dislikes 0

Response

Thank you for comment. The SAR has been redlined to reflect the additional cost of high speed data recording devices, if or when required.

Joe Gatten - Xcel Energy, Inc. - 1,3,5,6 - MRO,WECC

Answer

Document Name

Comment

Xcel Energy supports the comments offered by EEI, NAGF, and MRO NSRF.

Likes 0

Dislikes 0

Response

Thank you for the comment. Please see responses to the respective entities (question 2).

Kendra Buesgens - MRO - 1,2,3,4,5,6 - MRO

Answer	
Document Name	
Comment	
<p>The MRO NSRF disagrees with the “Cost Impact Assessment”. The MRO NSRF feels that generation resources will need to install high speed recorders to capture data on electrical events that occur and the reaction of generation resources to said electrical event. These high speed recorders will be essential for any requirement for analysis and development of corrective action plans. The MRO NSRF believes it will be costly to engineer, procure and install this equipment.</p> <p>The MRO NSRF recommends replacing all instances of bulk power system (BPS) with Bulk Electrical System (BES) to ensure proper scoping of the SAR.</p>	
Likes 0	
Dislikes 0	
Response	
<p>Thank you for the response. The team has redlined and modified the SAR to address the concern.</p> <p>The team checked with NERC SAR authors to reconfirm the distinct differences between terms is intentional and it will be left as-is.</p>	
Rachel Coyne - Texas Reliability Entity, Inc. - 10	
Answer	
Document Name	
Comment	
<p>Momentary Cessation Requirements for Existing Generators</p> <p>While Texas RE appreciates the proposed SAR’s focus on generator performance issues in general and momentary cessation issues in particular, Texas RE is concerned that the current proposed SAR would exempt facilities in commercial operation prior to the effective date of the new PRC-024-3 requirements from “the use of momentary cessation within ‘ride through envelopes’ (e.g., the existing PRC-024 “No Trip Zone”). (PRC-024 Standard Authorization Request, at 3-4). The Odessa Disturbance Report observed that momentary</p>	

cessation issues resulted in generation loss, along with tripping issues inside of facilities during the event (Odessa Disturbance Report, at 7). In particular, the Odessa Disturbance Report noted: “legacy inverter momentary cessation setting with plant-level controller interactions prohibited quick active power recovery.” (Odessa Disturbance Report, at 33). The report also noted other forms of momentary cessation issues, including settings that produced fixed reactive power injection with “no ability to control voltage post-contingency.” (Odessa Disturbance Report, at 20). It further noted that “[t]his type of behavior was not known by ERCOT prior to the event analysis nor is this type of behavior supporting the BPS post-fault.” (Id.).

Given the significance of these momentary cessation issues during the Odessa Disturbance event and other events over the past six years, Texas RE encourages the SDT to not limit momentary cessation performance requirements exclusively to new generation facilities. While Texas RE expects the SDT to move expeditiously with this project, Texas RE notes that the final revised standard may not be effective for several years. As a result, not only would existing generators not be covered by any momentary cessation requirements, but a number of planned generation resources would be similarly exempt. Given the growing role of inverter-based resources in the ERCOT Interconnection and others, this could result in a significant reliability gap.

Texas RE notes that momentary cessation issues are currently documented in NERC Reliability Guidelines (E.g., Reliability Guideline: BPS-Connected Inverter-Based Resource Performance (Sept. 2018) (2018 IBR Performance Guidelines). These existing guidelines note that “Existing and newly interconnecting inverter-based resources should eliminate the use of momentary cessation to the greatest possible extent.” (2018 IBR Performance Guidelines, at 11). It is also important to note that one of the key findings in the Odessa Disturbance Report is that while these reliability guidelines are widely viewed and shared, entities are “not comprehensively adopting the recommendation(s) contained in those materials.” (Odessa Disturbance Report, at vi). In short, a new Reliability Standard is required.

Texas RE acknowledges it may take time to review and implement settings to avoid certain momentary cessation-type performance issues. As the 2018 IBR Performance Guidelines note, however: “Existing resources may have hardware and/or software limitations based on a design philosophy using momentary cessation, and it may not be feasible to eliminate its use. For equipment limitations that cannot be addressed, PRC-024-2 Requirement R3.1 states that “[t]he [GO] shall communicate the documented regulatory or equipment limitation, or the removal of a previously documented regulatory or equipment limitation, to its Planning Coordinator and Transmission Planner within 30 calendar days.” (2018 IBR Performance Guidelines, at 11-2). The drafting team could consider approaches that permit legacy systems lacking functionality to avoid momentary cessation issues to document those limitations for any new momentary cessation requirements developed in this project in a manner similar to the process currently provided in the existing PRC-024-3 Requirement R3.1.

Enhanced Communication Requirements

In addition to considering the incorporation of momentary cessation and other performance notification requirements as appropriate, Texas RE recommends the drafting team consider creating a new requirement for the GO to notify the GOP, in addition to the TOP, BA, and RC, regarding abnormal tripping. Since COM-001 and COM-002 do not include GO communications, an additional requirement for the GO to notify the GOP would be helpful for the GOP to have the information to communicate any GO issues via COM-001 and COM-002.

Likes 0

Dislikes 0

Response

Thank you for the comment. Please see response to EEI (comment 2).

Andrea Jessup - Bonneville Power Administration - 1,3,5,6 - WECC

Answer

Document Name

Comment

Although PRC-024-3 is not applicable to BPA by registration, the PRC-024-3 Requirements R3 and R4 do impact BPA as a Transmission Planner and Planning Coordinator and will have substantial impact to BPA's interconnection requirements. BPA encourages the drafting team to address the inconsistencies in format of how TPs and PCs receive the data. Data consistency will support more efficient and effective modeling of relay settings

Likes 0

Dislikes 0

Response

Thank you for the comment. The team will pass this on to the standard drafting team for consideration.

Steven Rueckert - Western Electricity Coordinating Council - 10, Group Name WECC Entity Monitoring

Answer

Document Name

Comment

No additional comments. Thank you for the opportunity to comment.

Likes 0

Dislikes 0

Response

Thank you for the response.

Alison Mackellar - Constellation - 5,6

Answer

Document Name

Comment

N/A

Likes 0

Dislikes 0

Response

Kimberly Turco - Constellation - 5,6

Answer

Document Name

Comment

N/A

Likes 0

Dislikes	0
Response	
Adrian Raducea - DTE Energy - Detroit Edison Company - 3,5, Group Name DTE Energy - DTE Electric	
Answer	
Document Name	
Comment	
<p>All protection and control system functions that will be in scope should be specifically listed in the standard. Guidance on complying with ride-through requirements should be provided by including detailed examples. A sufficient phase-in period should be part of the implementation plan to allow GOs time to achieve the additional coordination that will be required.</p> <p>Based on the defined project scope the new standard will enforce that unexpected trips, abnormal trips and reductions in power are reported to the pertinent entities. The term reduction of power needs to be defined since it is open for interpretation. Furthermore, this reporting-out could infringe on current standards like PRC-004.</p>	
Likes	0
Dislikes	0
Response	
Thank you for the comment. This will be passed along to the standard drafting team.	
Brian Lindsey - Entergy - 1,3,6	
Answer	
Document Name	
Comment	
The Cost Impact Assessment states incremental cost impact which is not correct. Additional analyses and design changes are likely based on the widespread loss of generating resources observed.	

Likes 0

Dislikes 0

Response

Thank you for comment. The SAR has been redlined to reflect the additional cost of high speed data recording devices, if or when required.

End of Report