Comment Report

Project Name:	2020-02 Modifications to PRC-024 (Generator Ride-through) | Draft 4 - PRC-029-1
Comment Period Start Date:	9/17/2024
Comment Period End Date:	10/4/2024
Associated Ballots:	2020-02 Modifications to PRC-024 (Generator Ride-through) Implementation Plan AB 4 OT 2020-02 Modifications to PRC-024 (Generator Ride-through) PRC-029-1 AB 4 ST

There were 58 sets of responses, including comments from approximately 150 different people from approximately 100 companies representing 10 of the Industry Segments as shown in the table on the following pages.

Questions

1. Do you agree that the revisions accurately represent the changes discussed at the September Standards Committee and NERC Ride-through Technical Conference?

2. Provide any additional comments for consideration, if desired.

Organization Name	Name	Segment(s)	Region	Group Name	Group Member Name	Group Member Organization	Group Member Segment(s)	Group Member Region
MRO	Anna Martinson	1,2,3,4,5,6	MRO	MRO Group	Shonda McCain	Omaha Public Power District (OPPD)	1,3,5,6	MRO
					Michael Brytowski	Great River Energy	1,3,5,6	MRO
					Jamison Cawley	Nebraska Public Power District	1,3,5	MRO
					Jay Sethi	Manitoba Hydro (MH)	1,3,5,6	MRO
					Husam Al-Hadidi	Manitoba Hydro (System Preformance)	1,3,5,6	MRO
					Kimberly Bentley	Western Area Power Adminstration	1,6	MRO
					Jaimin Patal	Saskatchewan Power Coporation (SPC)	1	MRO
					George Brown	Pattern Operators LP	5	MRO
					Larry Heckert	Alliant Energy (ALTE)	4	MRO
					Terry Harbour	MidAmerican Energy Company (MEC)	1,3	MRO
					Dane Rogers	Oklahoma Gas and Electric (OG&E)	1,3,5,6	MRO
					Seth Shoemaker	Muscatine Power & Water	1,3,5,6	MRO
					Michael Ayotte	ITC Holdings	1	MRO
					Andrew Coffelt	Board of Public Utilities-Kansas (BPU)	1,3,5,6	MRO

					Peter Brown	Invenergy	5,6	MRO
					Angela Wheat	Southwestern Power Administration	1	MRO
					Bobbi Welch	Midcontinent ISO, Inc.	2	MRO
					Joshua Phillips	Southwest Power Pool	2	MRO
					Patrick Tuttle	Oklahoma Municipal Power Authority	4,5	MRO
WEC Energy Group, Inc.	Christine Kane	3		WEC Energy Group	Christine Kane	WEC Energy Group, Inc.	3	RF
					Michelle Hribar	WEC Energy Group, Inc.	5	RF
					David Boeshaar	WEC Energy Group, Inc.	6	RF
					Candace Morakinyo	WEC Energy Group, Inc.	4	RF
Dane Rogers	Dane Rogers			OG&E	Terri Pyle	OGE Energy - Oklahoma Gas and Electric Co.	1	MRO
					Donald Hargrove	OGE Energy - Oklahoma Gas and Electric Co.	3	MRO
					Patrick Wells	OGE Energy - Oklahoma Gas and Electric Co.	5	MRO
					Ashley F Stringer	OGE Energy - Oklahoma Gas and Electric Co.	6	MRO
ACES Power Marketing	Jodirah Green	1,3,4,5,6	MRO,NPCC,RF,SERC,Texas RE,WECC	ACES Collaborators	Bob Soloman	Hoosier Energy Electric Cooperative	1	RF
					Kevin Lyons	Central Iowa Power Cooperative	1	MRO
					Kris Carper	Arizona Electric Power	1	WECC

						Cooperative, Inc.		
					Jason Procuniar	Buckeye Power, Inc.	4	RF
					Jolly Hayden	East Texas Electric Cooperative, Inc.	NA - Not Applicable	Texas RE
Eversource Energy	Joshua London	1		Eversource	Joshua London	Eversource Energy	1	NPCC
					Vicki O'Leary	Eversource Energy	3	NPCC
FirstEnergy - FirstEnergy Corporation	Mark Garza	4		FE Voter	Julie Severino	FirstEnergy - FirstEnergy Corporation	1	RF
					Aaron Ghodooshim	FirstEnergy - FirstEnergy Corporation	3	RF
					Robert Loy	FirstEnergy - FirstEnergy Solutions	5	RF
					Mark Garza	FirstEnergy- FirstEnergy	1,3,4,5,6	RF
					Stacey Sheehan	FirstEnergy - FirstEnergy Corporation	6	RF
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
					Leslie Burke	Southern Company - Southern Company Generation	5	SERC

Black Hills Corporation	Rachel Schuldt	6		Black Hills Corporation - All Segments	Travis Grablander	Black Hills Corporation	1	WECC
					Josh Combs	Black Hills Corporation	3	WECC
					Rachel Schuldt	Black Hills Corporation	6	WECC
					Carly Miller	Black Hills Corporation	5	WECC
					Sheila Suurmeier	Black Hills Corporation	5	WECC
Northeast Power Coordinating Council	Ruida Shu	1,2,3,4,5,6,7,8,9,10	NPCC	NPCC RSC	Gerry Dunbar	Northeast Power Coordinating Council	10	NPCC
					Deidre Altobell	Con Edison	1	NPCC
					Michele Tondalo	United Illuminating Co.	1	NPCC
					Stephanie Ullah-Mazzuca	Orange and Rockland	1	NPCC
					Michael Ridolfino	Central Hudson Gas & Electric Corp.	1	NPCC
					Randy Buswell	Vermont Electric Power Company	1	NPCC
					James Grant	NYISO	2	NPCC
					Dermot Smyth	Con Ed - Consolidated Edison Co. of New York	1	NPCC
					David Burke	Orange and Rockland	3	NPCC
					Peter Yost	Con Ed - Consolidated Edison Co. of New York	3	NPCC
					Salvatore Spagnolo	New York Power Authority	1	NPCC
					Sean Bodkin	Dominion - Dominion Resources, Inc.	6	NPCC

David Kwan	Ontario Power Generation	4	NPCC
Silvia Mitchell	NextEra Energy - Florida Power and Light Co.	1	NPCC
Sean Cavote	PSEG	4	NPCC
Jason Chandler	Con Edison	5	NPCC
Tracy MacNicoll	Utility Services	5	NPCC
Shivaz Chopra	New York Power Authority	6	NPCC
Vijay Puran	New York State Department of Public Service	6	NPCC
David Kiguel	Independent	7	NPCC
Joel Charlebois	AESI	7	NPCC
Joshua London	Eversource Energy	1	NPCC
Jeffrey Streifling	NB Power Corporation	1,4,10	NPCC
Joel Charlebois	AESI	7	NPCC
John Hastings	National Grid	1	NPCC
Erin Wilson	NB Power	1	NPCC
James Grant	NYISO	2	NPCC
Michael Couchesne	ISO-NE	2	NPCC
Kurtis Chong	IESO	2	NPCC
Michele Pagano	Con Edison	4	NPCC
Bendong Sun	Bruce Power	4	NPCC
Carvers Powers	Utility Services	5	NPCC
Wes Yeomans	NYSRC	7	NPCC
Chantal Mazza	Hydro Quebec	1	NPCC

					Nicolas Turcotte	Hydro Quebec	2	NPCC
Dominion - Dominion Resources, Inc.	Sean Bodkin	6		Dominion	Victoria Crider	Dominion Energy	3	NA - Not Applicable
					Sean Bodkin	Dominion Energy	6	NA - Not Applicable
					Steven Belle	Dominion Energy	1	NA - Not Applicable
					Barbara Marion	Dominion Energy	5	NA - Not Applicable
Western Electricity Coordinating Council	Steven Rueckert	10		WECC	Steve Rueckert	WECC	10	WECC
					Curtis Crews	WECC	10	WECC
Tim Kelley	Tim Kelley		WECC	SMUD and BANC	Nicole Looney	Sacramento Municipal Utility District	3	WECC
					Charles Norton	Sacramento Municipal Utility District	6	WECC
					Wei Shao	Sacramento Municipal Utility District	1	WECC
					Foung Mua	Sacramento Municipal Utility District	4	WECC
					Nicole Goi	Sacramento Municipal Utility District	5	WECC
					Kevin Smith	Balancing Authority of Northern California	1	WECC

1. Do you agree that the revisions accurately represent the changes discussed at the September Standards Committee and NERC Ride-through Technical Conference?

Jeffrey Streifling - NB Power Corporation - 1

Answer	No
Document Name	

Comment

The broad alignment of the technical requirements of PRC-029-1 with IEEE-2800-2022 represents the changes discussed at the NERC Ride-through Technical Conference; however, the wording of Footnote 10 to Tables 1 and 2 in Attachment 1 of PRC-029-1 Draft 4 appears to disallow the subcycle transient overvoltage tripping permitted in Section 7.2.3 and Figure 11 of IEEE 2800-2022 in a manner that could unnecessarily complicate the process of overvoltage coordination.

Likes 0	
Dislikes 0	

Response

Mark Garza - FirstEnergy - FirstEnergy Corporation - 4, Group Name FE Voter

Answer	No
Document Name	

Comment

See FirstEnergy's Q2 response.

We feel there are still unclear intentions and obligations under this standard.

Likes 0	
Dislikes 0	

Response

Sean Bodkin - Dominion - Dominion Resources, Inc. - 6, Group Name Dominion

Answer	No
Document Name	

Comment

Dominion Energy’s view is that the Technical Conference reinforced stakeholder comments from the multiple previous comment periods for this project, which generally noted that an exception process was necessary due to the technical infeasibility of implementing the prescribed ride through criteria on

existing inverters. The common theme at the technical conference was that OEMs need sufficient time periods to design, engineer, and produce equipment that is compliant with new regulatory requirements. OEMs stated that they are currently in the process of integrating IEEE2800-2022 criteria into devices, but that this process takes on average five years or more. Accordingly, it is unclear when PRC-029-1-compliant devices will become commercially available. While Dominion Energy supports Project 2020-02's goal of mitigating disturbance ride-through performance issues, Generator Owners that are developing public policy mandated, reliability-enhancing, clean energy projects will not have a path to compliance until PRC-029-1 compliant devices become commercially available.

Dominion Energy recognizes the positive changes made by NERC staff in the current version of PRC-029-1, however, the new limited exceptions process for commissioned IBR devices does not address projects that are in active development, with already contracted inverters that are not technically capable of meeting the proposed PRC-029-1 criteria. For IBR projects with extended lead times, like large offshore wind projects, equipment was contracted for and designed multiple years ago and may not be commissioned until after the effective date of the proposed PRC-029-1. NERC's failure to address this technical feasibility issue in the current draft could result in large amounts of clean, reliable energy that has been mandated by public policy being put at risk.

Dominion Energy recommends that the NERC Board of Trustees adhere to its Section 321 mandate, which it exercised for this proposed Standard, and remand PRC-029-1 back for further revisions so that it can approve a version that, as required under Section 321, subsection 5.2, "is just, reasonable, not unduly discriminatory or preferential, and in the public interest, considering (among other things) whether it is practical, technically sound, technically feasible, cost-justified and serves the best interests of reliability of the Bulk Power System,…".

To achieve this goal, Dominion Energy recommends expanding the exception criteria set forth in Requirement 4 to include IBRs that are already contracted. Additionally, until PRC-029-1 compliant devices are readily available commercially for the applicable project (e.g. Solar vs. Wind), exceptions should be permitted for these projects.

Likes 0	
Dislikes 0	

Response

Rachel Schuldt - Black Hills Corporation - 6, Group Name Black Hills Corporation - All Segments

Answer	No
Document Name	

Comment

Black Hills Corporation agrees with both NAGF and EEI, in that: PRC-029 Draft 4 does not address important concerns identified during the Technical Conference regarding software limits, balance of plant equipment issues, and the need to consider exemptions for IBR facilities that are in the procurement process (i.e. "in flight"). Additionally, we are concerned that Requirement R4 overlooks the impacts to GOs who are developing large, multi-year IBR projects that may not be completed by the effective date of this Reliability Standard. Resource equipment specifications are typically locked down at the time the interconnection agreement is signed, and a change in requirements/specifications after that point can require changes in the design of the equipment that are impossible to achieve without triggering a material modification, resulting in interconnection restudies and delaying or potentially canceling the project

Likes 0	
Dislikes 0	

Response

Michael Goggin - Grid Strategies LLC - 5	
Answer	No
Document Name	

Comment

1. We appreciate the two significant changes in the latest draft of PRC-029-1: revision of R3 and R4 to add a hardware limitation exemption from frequency ride-through requirements for existing resources, and adoption of frequency ride-through curves in Attachment 2 that properly balance reliability needs with the capabilities of IBRs. As explained at length in the discussion of R3 in the updated Technical Rationale document, these changes properly balance reliability needs by ensuring resources will ride through disturbances while also avoiding resource adequacy concerns that could result from unnecessarily stringent requirements forcing the premature retirement of existing IBRs or preventing new IBRs from interconnecting.{C}[1] Retention of those two changes is essential for this standard to be workable, and for it to improve and not impede electric reliability. Because those two changes significantly improve the standard, we are voting for the revised standard, with the ask that the important clarifications and changes to the Implementation Plan discussed below be made. These changes are necessary to address serious concerns that were raised at the September 4-5, 2024, Ride-through Technical Conference regarding the effective date of the Standard and the evidence requirements for demonstrating a hardware limitation. These concerns are not adequately addressed in the current draft of the Standard or Implementation Plan.

2. We are seriously concerned that the revision to R4 we have requested in all three PRC-029-1 comment periods has not been adopted: R4 should allow hardware limitation exemptions for IBRs that have signed interconnection agreements, and not just IBRs that are in-service, as of the effective date of the standard. This change is needed because resource equipment decisions are typically locked down at the time the interconnection agreement is signed, and a change in requirements after that point can require a costly change in equipment or settings that may also trigger a material modification and resulting interconnection restudies. In certain cases, the IBR performance requirements referenced in the fully executed interconnection agreement contradict the NERC PRC-029 requirements.

The Implementation Plan for PRC-029 indicates that the effective date for the Standard will be the first day of the first quarter twelve months after FERC approval. Many resources take significantly longer than that to move from a signed interconnection agreement to being placed in service, so R4 should allow equipment limitation exemptions for resources that have a signed interconnection agreement as of the effective date of the Standard. This concern is explained at greater length in the comments Orsted submitted in this formal comment period on September 20, 2024.

This need can be most directly addressed by revising the first sentence of R4 to read “Each Generator Owner identifying an IBR that **has signed a Generator Interconnection Agreement** by the effective date of PRC-029-1…,” with the bolded language above replacing “is in-service.”

Alternatively, if NERC believes that there is no time for revisions to the draft of PRC-029-1, the Implementation Plan can be revised to make the effective date 48 months after regulatory approval of PRC-029-1 (and 36 months after the effective date for other BES resources) for offshore wind and other resources that can demonstrate that they require a long lead time between when equipment is procured and the plant is brought into service, instead of 12 months after regulatory approval as proposed for all BES resources in the Implementation Plan. The current draft of the Implementation Plan already proposes different compliance dates for BES and non-BES resources, so adding a third category for offshore wind and other Bulk Electric System IBRs with a long lead time for plant completion should not cause concern.

This change can be incorporated by adding language similar to the following in the Implementation Plan under the heading PRC-029-1 Phased-in Compliance Dates: “***Offshore wind and other Bulk Electric System IBRs with a long lead time for plant completion***: Entities shall comply with the portion of Requirements R1, R2, and R3 relating to the **design** of their BES IBRs to meet the requirements by 36 months after the effective date of the standard.”

In light of the significant improvements in this draft standard, and to draw attention to this important unresolved issue that can be addressed by revising the Implementation Plan, we are voting for the proposed standard but against the Implementation Plan.

We would note that the Implementation Plan needs revision anyway, due to the apparently inadvertent inclusion of the following section at the end of the document. This section is inconsistent with the revision of the standard to include a hardware exemption from frequency ride-through requirements for existing resources, and thus should be removed or significantly revised:

Equipment Limitations and Process for Requirement R4

Consistent with FERC Order No. 901, a limited and documented exemption for some legacy IBR with certain documented equipment limitations are acceptable. Per the Order, these IBRs are

"…typically older IBR technology with hardware that needs to be physically replaced and whose settings and configurations cannot be modified using software updates – may be unable to implement the voltage ride though performance requirements."

To ensure compliance with Requirement R4 and alignment with FERC Order No. 901, only those IBR that are in operation as of the effective date of PRC-029-1 may be considered for potential exemption. Further, only those IBR that are unable to meet voltage ride-through requirements due to their inability to modify their coordinated protection and control settings may be considered for potential exemption.

3. NERC should clarify that existing equipment that has received an exemption from ride-through requirements due to a hardware limitation will not lose that exemption if separate new equipment is added at that plant. For example, adding a battery to an existing solar or wind plant that has received a hardware limitation exemption would not remove the exemption for the existing solar or wind equipment, though the new battery and its associated power conversion equipment would not be exempt from PRC-029-1's ride-through requirements. In that example, the existing wind or solar equipment would only lose the exemption if it and its associated power conversion equipment were replaced with new equipment. If NERC adopts the solution proposed above to revise the first sentence of R4 PRC-029-1 to allow hardware limitation exemptions for IBRs that have signed interconnection agreements (and not just IBRs that are in-service) as of the effective date of the standard, it must also clarify that a subsequent amendment to the interconnection agreement to allow the addition of separate new equipment does not remove the exemption for the existing equipment. These clarifications are important to ensure that PRC-029-1 does not impede the addition of separate new equipment at existing sites to expand their capability to provide energy, capacity, and other reliability services. If a revision to PRC-029-1 is not feasible at this point, an addition to the Implementation Plan or issuance of a Compliance Guidance document could help clarify this point.

4. As documented in Section C of the comments Orsted submitted in this formal comment period on September 20, 2024, additional clarification and consideration is needed to respect hardware limitations that may prevent both new HVDC- and AC-connected offshore wind plants from meeting some aspects of PRC-029-1. The proposal above to provide offshore wind and other long lead-time resources 48 months following regulatory approval to meet PRC-029-1 may not provide sufficient time for the offshore wind industry to develop technology solutions to meet these aspects of the PRC-029-1 requirements, so additional consideration for these hardware limitations will likely be needed. While offshore wind manufacturers are working to improve ride-through capability to meet IEEE 2800 and PRC-029-1, at least some new HVDC-connected offshore wind plants cannot meet the cumulative voltage ride-through requirements because consecutive fault events can overheat the DC chopper, posing a safety concern. Similarly, some AC-connected IBRs cannot meet the voltage or frequency ride-through requirements because the plants include synchronous condensers, which are designed to meet PRC-024-3.

If a revision to PRC-029-1 is not feasible at this point, an addition to the Implementation Plan or issuance of a Compliance Guidance document could help clarify these issues. For example, NERC could clarify that for new and existing IBRs, plant-level hardware limitations to meeting PRC-029-1 due to use of synchronous condensers within a plant are allowed if the synchronous condenser meets PRC-024. Similarly, NERC could clarify that, until adequate technology is developed, hardware limitations will be respected for new and existing offshore wind plants that cannot meet the cumulative voltage ride-through requirements of PRC-029-1, if the Planning Coordinator and Transmission Provider interconnecting that plant are informed of that limitation and determine that the plant can be reliably interconnected and operated.

In light of the significant improvements in this draft standard, and to draw attention to this important unresolved issue that can likely be addressed by revising the Implementation Plan or issuing a Compliance Guidance document, we are voting for the proposed standard but against the Implementation Plan. As noted above, the section entitled **Equipment Limitations and Process for Requirement R4** of the Implementation Plan already requires significant revision or removal, so that section could be repurposed to provide these important clarifications.

5. NERC should clarify the evidence requirements for demonstrating a hardware limitation in R4 and M4, potentially through a revision to the standard, an addition to the Implementation Plan, or by issuing a Compliance Guidance document. NERC should clarify that a resource can demonstrate a hardware limitation with a declaration or attestation from a manufacturer stating that the equipment was designed to meet the standards in place at the time it was installed and was not designed to meet the more rigorous standard proposed in PRC-029-1. As manufacturers explained at length at the September Ride-through Technical Conference, it is often challenging if not impossible to prove the negative that a piece of equipment cannot meet a requirement it was not designed to meet. Physical testing of operating equipment outside of a laboratory is often impractical or excessively costly, particularly for resources that have been operating for many years with varying degrees of degradation. In many cases the manufacturer of IBR

equipment or its components no longer supports those legacy models, or the manufacturer may no longer be in business. Instead, it is much more practical for manufacturers to provide a positive attestation regarding the requirements the equipment was designed to meet.

Relatedly, NERC should clarify that the type of positive attestation discussed above is sufficient for meeting section 4.1.4 of R4, which calls for "Supporting Technical documentation verifying the limitation is due to hardware that would need to be physically replaced to meet all Ride- through criteria, and that the limitation cannot be removed by software updates or setting changes…". As discussed at the technical workshop, it is difficult to prove the negative that software or settings changes alone cannot remove a limitation.

In light of the significant improvements in this draft standard, and to draw attention to this important unresolved issue that can be addressed by revising the Implementation Plan or by issuing a Compliance Guidance document, we are voting for the proposed standard but against the Implementation Plan. As noted above, the section entitled **Equipment Limitations and Process for Requirement R4** of the Implementation Plan already requires significant revision or removal, so that section could be repurposed to provide these important clarifications.

{C}[1]{C} https://www.nerc.com/pa/Stand/202002_Transmissionconnected_Resources_DL/2020-02_PRC-029-1_Technical_Rationale_09172024.pdf, at 7: *When considering an expansion of Ride-through capability, it is important to balance the expansion with the feasibility of producing and installing equipment that can meet the newly proposed criteria. Failure to adequately consider this could result in resource adequacy deficiencies if expanded criteria lead to widespread non-compliance of legacy IBR due to hardware limitations. Further, for newly interconnecting IBR, expanded Ride-through criteria often result in significant design changes that have production time and cost implications. If proposed Ride-through criteria are too stringent and result in costly design changes, those costs could result in a slowing of IBR penetration on the BPS.*

For the reasons above, it is imperative that newly created Ride-through criteria are reasonable for both BPS reliability and for the IBR equipment. To date, NERC has analyzed numerous major events including both winter storms Uri and Elliot. No IBR tripped offline for frequency threshold criteria (because the system frequency caused a trip due to exceeding equipment frequency limits) and all frequency-related tripping observed were due to mis-parameterization or the use of instantaneous measurements in protection schemes. Additionally, the deviations in frequency observed during the events listed above did not exceed the PRC-024 criteria.

Likes 0	
Dislikes 0	

Response

Maozhong Gong - GE - GE Wind - NA - Not Applicable - NA - Not Applicable

Answer	No
Document Name	

Comment

GE Vernova's Onshore Wind business is a leading wind turbine original equipment manufacturer (OEM) with over 75GW of wind turbines installed in North America. We appreciate the opportunity NERC has provided to submit comments to PRC-029-1 Draft 4. We appreciated the opportunity to participate in the Technical Conference in Washington, DC, on September 4- 5. The discussions promoted by NERC are extremely critical to develop appropriate regulations to set minimum IBR performance requirements to support the needs of the electrical system. While GE Vernova's Onshore Wind Business recognizes that important changes were made in Draft 4 to reflect the comments discussed during the Technical Conference, including frequency ride-through requirement alignment with IEEE 2800-2020, allowance of exemption for frequency ride-through requirement and others, there are still concerns which we believe are important to restate through these comments. Please refer to comments on Question 2.

Likes 0	
Dislikes 0	

Response

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

Answer	No
Document Name	

Comment

The NAGF supports the proposed changes to PRC-029 Draft 4 Requirements R3 and R4 that provide the frequency ride-through exemption for hardware limitation associated with existing resources. In addition, the NAGF supports the revised of frequency ride-through curves in Attachment 2. However, the PRC-029 Draft 4 does not address important concerns identified during the Technical Conference regarding software limits, balance of plant equipment issues, and the need to consider exemptions for IBR facilities that are in the procurement process (i.e. "in flight").

Likes 0	
Dislikes 0	

Response

Christine Kane - WEC Energy Group, Inc. - 3, Group Name WEC Energy Group

Answer	No
Document Name	

Comment

The SDT failed to address industry concerns related to ROCOF capabilities. The SDT should be reminded of comments provided by industry and the equipment manufacturer panelists during the technical conference that ROCOF requirements listed in R3 may not be able to be met by the legacy equipment. As many pointed out, the ROCOF capability may not be known at the present time and that lab and field testing potentially must be done to prove the capabilities. Even though R3 is added to R4, it will be very difficult to provide evidence for hardware limitation related to ROCOF. In addition, past IBR disturbance reports did not identify rate of change of frequency being an issue during the disturbances, it is not part of FERC order 901. Therefore there is no technical rationale to include it.

The SDT failed to address concerns from equipment manufacturer panelists about phase jump requirement listed in R1. Panelists expressed concern about differences between IEEE-2800 wording and PRC-029 wording. As confirmed by panelist, the inverter cannot differentiate between a non-fault switching event and a fault event as both can trigger the phase jump angle to increase.

The SDT failed to address concerns from equipment manufacturer panelists about 1 cycle voltage measurement filtering requirements.

Likes 0	
Dislikes 0	

Response

Brian Lindsey - Entergy - 1	
Answer	No
Document Name	
Comment	
We concur with the comments NAGF provided.	
Likes 0	
Dislikes 0	
Response	

Martin Sidor - NRG - NRG Energy, Inc. - 6	
Answer	No
Document Name	
Comment	
NRG supports the proposed changes to PRC-029 Draft 4 Requirements R3 and R4 that provide the frequency ride-through exemption for hardware limitation associated with existing resources. In addition, NRG supports the revised of frequency ride-through curves in Attachment 2. However, the PRC-029 Draft 4 does not address important concerns identified during the Technical Conference regarding software limits, balance of plant equipment issues, and the need to consider exemptions for IBR facilities that are currently in the procurement process.	
Likes 0	
Dislikes 0	
Response	

Patricia Lynch - NRG - NRG Energy, Inc. - 5	
Answer	No
Document Name	
Comment	
NRG is in alignment with NAGF's comments regarding the changes discussed at the Technical Conference. Although we support the proposed changes, the PRC-029 Draft 4 does not address important concerns identified during the Technical Conference regarding software limits, balance of plant equipment issues, and the need to consider exemptions for IBR facilities that are in the procurement process (i.e. “in flight”).	
Likes 0	
Dislikes 0	
Response	

David Vickers - David Vickers On Behalf of: Daniel Roethemeyer, Vistra Energy, 5; - David Vickers	
Answer	No
Document Name	
Comment	
Vistra supports comments made by NRG Energy.	
Likes 0	
Dislikes 0	
Response	
Steven Taddeucci - NiSource - Northern Indiana Public Service Co. - 3	
Answer	No
Document Name	
Comment	
NIPSCO supports the proposed changes to PRC-029 Draft 4 Requirements R3 and R4 that provide the frequency ride-through exemption for hardware limitation associated with existing resources. In addition, NIPSCO supports the revised frequency ride-through curves in Attachment 2. However, NIPSCO also supports the comments of the NAGF that the PRC-029 Draft 4 does not address important concerns identified during the Technical Conference regarding software limits, balance of plant equipment issues, and the need to consider exemptions for IBR facilities that are in the procurement process (i.e. “in flight”).	
Likes 0	
Dislikes 0	
Response	
Keith Smith - Orsted Americas - 5	
Answer	No
Document Name	
Comment	
Orsted and associated vendors provided comments to NERC prior to the technical conference that were not discussed during the technical conference and are not addressed in the latest version of the Standard.	
Likes 0	
Dislikes 0	

Response	
Colin Chilcoat - Invenergy LLC - 6	
Answer	No
Document Name	
Comment	

Invenergy would like to thank the Standard Drafting Team (SDT), the Standards Committee, and NERC management for their work on this standard and the organization of the ride-through technical conference. The technical conference was an excellent example of the unique rulemaking collaboration between regulators and industry afforded by the NERC Rules of Procedure, and we are encouraged by the significant revisions made in response to discussions at the conference. That said, there remain some problematic requirements that don't reflect the understanding reached at the technical conference regarding the alignment of PRC-029-1 criteria with Generator Owner and OEM capabilities.

Requirement R4

Invenergy believes the most effective way to address remaining industry concerns surrounding limited exceptions and the exceptions process is to carry over the language from Requirement R3 of PRC-024-3 (now PRC-024-4). As we noted in our comments on previous ballots and at the technical conference, FERC recommend this path in paragraph 193 of Order 901, stating, "We encourage NERC's standard drafting team to consider currently effective Reliability Standard PRC-024-3, Requirement R3 as an example for establishing registered IBR technology exemptions." Absent adoption of the same or similar language, we have the following suggestions to implement to more accurately represent the changes discussed at the technical conference.

The revisions to Requirement R4 to include limited exemptions from the frequency ride-through requirements due to hardware limitations are greatly appreciated and introduce a path to compliance for legacy IBRs that may be unable to meet the ride-through criteria that was not provided in earlier drafts of PRC-029-1. Still, many aspects of Requirement R4, identified below, are overly prescriptive and cause the path to compliance to be unreasonable to impossible to fulfill.

- **"In-service":** The ability for an IBR to apply for a limited exemption should not be based on the in-service date of that IBR for a few reasons. 1) In-service is not a defined term in NERC's Glossary of Terms and is used inconsistently across various NERC materials. 2) It fails to consider the fact that equipment procurement occurs years, oftentimes many years, prior to an IBR being placed in-service or achieving commercial operations. If a threshold date must be established, Invenergy recommends using the execution date of the Generator Interconnection Agreement, which would ensure that equipment procured years before the effective date of PRC-029-1 is not held to ride-through requirements it may not have been designed to meet. Additionally, it should be clarified that any subsequent amendment to the Generator Interconnect Agreement that incorporates new generation resources does not void any previously approved exemption for the existing equipment associated with that Generator Interconnection Agreement.

- **R4.1:** 12 months may be insufficient time to collect all the required documentation, much of which cannot be independently provided by the Generator Owner. To the extent an OEM can identify the specific piece(s) of hardware causing the limitation, extensive analysis and/or laboratory testing may require more time than the currently allotted 12 months. Invenergy fails to see the benefit of requiring this documentation be provided within a prescribed timeframe – the limitation will still exist regardless of whether all the intricacies are documented within 12 months – and recommends this time requirement be removed or extended to a minimum of 24 months.

- **R4.1.3 & R4.1.4:** As attested by many OEMs at the technical conference, it may be exceedingly difficult to impossible to identify the specific piece(s) of hardware causing a ride-through capability limitation. The hardware limitation could be the result of a combination of factors with several unknowns and interdependencies on auxiliary equipment that could not be validated by either the Generator Owner or the OEM. Even in situations where the OEM still supports a legacy model, the necessary testing to validate its capabilities vis-a-vis the requirements of PRC-029-1 is unfeasible, cost prohibitive, and may divert resources away from current or future product lines designed to meet more stringent ride-through requirements. Simply put, existing IBRs were developed and installed to meet the ride-through standards effective at that time and

requirements, like R4.1.3 and R4.1.4, that effectively mandate a complete re-testing of the capabilities of each component and subcomponent should be removed.

- **R4.2:** Requirement R4.2 and the additional detail provided in Footnote 11 impose an unreasonable expectation that the Generator Owner share material it does not own and that is considered to be proprietary by the OEM. Invenergy recommends the removal of Footnote 11.

Attachment 1, Note 10: To date, Invenergy has not received any response from the SDT regarding our comments on Attachment 1, Note 10, which were submitted in response to Draft 2 and Draft 3 of PRC-029-1. Further, Invenergy and OEM comments on this matter at the technical conference are not reflected in Draft 4 of PRC-029-1.

Attachment 1 Note 10 is vague and subjects equipment to potential damage. Paragraphs 179 and 190 of FERC Order 901 establish that IBR tripping shall be permitted when necessary to protect the IBR equipment. Many protection decisions must be made in a matter of micro-seconds, and as drafted, Note 10 would adversely impact reliability by subjecting equipment to potentially damaging surges of current or voltage that near instantaneous protection settings are designed to mitigate. Can the SDT clarify if this requirement applies at the inverter level? If this requirement is to be applied at the plant level, note 10 should be amended to reflect that.

Likes 0	
Dislikes 0	

Response

Nick Leathers - Ameren - Ameren Services - 1,3,5,6 - MRO,SERC

Answer	No
Document Name	

Comment

Please correct the 1.1 per-unit voltage threshold row in table 1 to be greater than 1.1 rather than greater than or equal to match table 2.

The technical rationale states, "An IBR becomes noncompliant with PRC-029-1 when an event in the field occurs that shows that one or more requirements were not satisfied. This intent is clarified by the Operations Assessment as the Time Horizon designation of requirements R1-R3". This statement suggests that if a plant fails to ride through, it can become a self-report. Is it FERC's intent that entities are to self-report if a PRC-029 study of the design shows compliance, but field data indicates otherwise? We suggest updating the technical rationale to clarify this part.

Ameren also supports EEI and NAGF's comments.

Likes 0	
Dislikes 0	

Response

Rhonda Jones - Invenergy LLC - 5

Answer	No
Document Name	

Comment

Comments: Invenergy would like to thank the Standard Drafting Team (SDT), the Standards Committee, and NERC management for their work on this standard and the organization of the ride-through technical conference. The technical conference was an excellent example of the unique rulemaking collaboration between regulators and industry afforded by the NERC Rules of Procedure, and we are encouraged by the significant revisions made in response to discussions at the conference. That said, there remain some problematic requirements that don't reflect the understanding reached at the technical conference regarding the alignment of PRC-029-1 criteria with Generator Owner and OEM capabilities.

Requirement R4

Invenergy believes the most effective way to address remaining industry concerns surrounding limited exceptions and the exceptions process is to carry over the language from Requirement R3 of PRC-024-3 (now PRC-024-4). As we noted in our comments on previous ballots and at the technical conference, FERC recommend this path in paragraph 193 of Order 901, stating, "We encourage NERC's standard drafting team to consider currently effective Reliability Standard PRC-024-3, Requirement R3 as an example for establishing registered IBR technology exemptions." Absent adoption of the same or similar language, we have the following suggestions to implement to more accurately represent the changes discussed at the technical conference.

The revisions to Requirement R4 to include limited exemptions from the frequency ride-through requirements due to hardware limitations are greatly appreciated and introduce a path to compliance for legacy IBRs that may be unable to meet the ride-through criteria that was not provided in earlier drafts of PRC-029-1. Still, many aspects of Requirement R4, identified below, are overly prescriptive and cause the path to compliance to be unreasonable to impossible to fulfill.

- **"In-service":** The ability for an IBR to apply for a limited exemption should not be based on the in-service date of that IBR for a few reasons. 1) In-service is not a defined term in NERC's Glossary of Terms and is used inconsistently across various NERC materials. 2) It fails to consider the fact that equipment procurement occurs years, oftentimes many years, prior to an IBR being placed in-service or achieving commercial operations. If a threshold date must be established, Invenergy recommends using the execution date of the Generator Interconnection Agreement, which would ensure that equipment procured years before the effective date of PRC-029-1 is not held to ride-through requirements it may not have been designed to meet. Additionally, it should be clarified that any subsequent amendment to the Generator Interconnect Agreement that incorporates new generation resources does not void any previously approved exemption for the existing equipment associated with that Generator Interconnection Agreement.

- **R4.1:** 12 months may be insufficient time to collect all the required documentation, much of which cannot be independently provided by the Generator Owner. To the extent an OEM can identify the specific piece(s) of hardware causing the limitation, extensive analysis and/or laboratory testing may require more time than the currently allotted 12 months. Invenergy fails to see the benefit of requiring this documentation be provided within a prescribed timeframe – the limitation will still exist regardless of whether all the intricacies are documented within 12 months – and recommends this time requirement be removed or extended to a minimum of 24 months.

- **R4.1.3 & R4.1.4:** As attested by many OEMs at the technical conference, it may be exceedingly difficult to impossible to identify the specific piece(s) of hardware causing a ride-through capability limitation. The hardware limitation could be the result of a combination of factors with several unknowns and interdependencies on auxiliary equipment that could not be validated by either the Generator Owner or the OEM. Even in situations where the OEM still supports a legacy model, the necessary testing to validate its capabilities vis-a-vis the requirements of PRC-029-1 is unfeasible, cost prohibitive, and may divert resources away from current or future product lines designed to meet more stringent ride-through requirements. Simply put, existing IBRs were developed and installed to meet the ride-through standards effective at that time and requirements, like R4.1.3 and R4.1.4, that effectively mandate a complete re-testing of the capabilities of each component and subcomponent should be removed.

- **R4.2:** Requirement R4.2 and the additional detail provided in Footnote 11 impose an unreasonable expectation that the Generator Owner share material it does not own and that is considered to be proprietary by the OEM. Invenergy recommends the removal of Footnote 11.

Attachment 1, Note 10: To date, Invenergy has not received any response from the SDT regarding our comments on Attachment 1, Note 10, which were submitted in response to Draft 2 and Draft 3 of PRC-029-1. Further, Invenergy and OEM comments on this matter at the technical conference are not reflected in Draft 4 of PRC-029-1.

Attachment 1 Note 10 is vague and subjects equipment to potential damage. Paragraphs 179 and 190 of FERC Order 901 establish that IBR tripping shall be permitted when necessary to protect the IBR equipment. Many protection decisions must be made in a matter of micro-seconds, and as drafted, Note 10 would adversely impact reliability by subjecting equipment to potentially damaging surges of current or voltage that near instantaneous protection settings are designed to mitigate. Can the SDT clarify if this requirement applies at the inverter level? If this requirement is to be applied at the plant level, note 10 should be amended to reflect that.

Likes 0	
Dislikes 0	

Response

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

Answer	No
Document Name	

Comment

The broad alignment of the technical requirements of PRC-029-1 with IEEE-2800-2022 represents the changes discussed at the NERC Ride-through Technical Conference; however, the wording of Footnote 10 to Tables 1 and 2 in Attachment 1 of PRC-029-1 Draft 4 appears to disallow the sub cycle transient overvoltage tripping permitted in Section 7.2.3 and Figure 11 of IEEE 2800-2022 in a manner that could unnecessarily complicate the process of overvoltage coordination.

Likes 0	
Dislikes 0	

Response

Constantin Chitescu - Ontario Power Generation Inc. - 5

Answer	No
Document Name	

Comment

OPG supports NPCC Regional Standards Committee’s comments.

Likes 0	
Dislikes 0	

Response

Scott Thompson - PNM Resources - Public Service Company of New Mexico - 1,3,5 - WECC	
Answer	No
Document Name	
Comment	

PNM Agrees with comments of EEI:

- EEI appreciates the revisions to PRC-029-1 and generally agrees that the changes align with many aspects of the discussions held during the NERC Technical Ride-through Conference. However, we are concerned that Requirement R4 overlooks the impacts to GOs who are developing large, multi-year IBR projects that may not be completed by the effective date of this Reliability Standard. Resource equipment specifications are typically locked down at the time the recourse contracts are finalized, and a change in requirements/specifications after that point can require changes in the design of the equipment that are impossible to achieve without triggering a material modification, resulting interconnection restudies and delaying or potentially canceling the project. To address this concern, we suggest the following modifications be made to Requirement R4 (in boldface below).

R4. Each Generator Owner identifying an IBR that is in-service or has a contract for an IBR that is in effect by the effective date of PRC-029-1, has known hardware limitations that prevent the IBR from meeting Ride- through criteria as detailed in Requirements R1-R3, and requires an exemption from specific Ride-through criteria shall:10 *[Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

Likes 0	
Dislikes 0	
Response	

Kennedy Meier - Electric Reliability Council of Texas, Inc. - 2	
Answer	No
Document Name	
Comment	

The revisions appear to reflect some of the viewpoints presented at the conference, but not others.

Likes 0	
Dislikes 0	
Response	

Andy Thomas - Duke Energy - 1,3,5,6 - SERC,RF	
Answer	Yes
Document Name	
Comment	

Duke Energy endorses and requests the incorporation of EEI comments.

Likes 0	
Dislikes 0	

Response

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

Answer	Yes
Document Name	

Comment

The voltage ride-through requirements are more restrictive than PRC-024 and will require additional studies to determine whether existing IBR facilities are compliant. Both the standard and the implementation plan require compliance within 12 months after the effective date of PRC-029-1. This is not sufficient time to have studies completed and if needed, obtain additional documentation from IBR manufacturers, and submit that data to the Planning Coordinator, Transmission Planner, Transmission Operator, Reliability Coordinator and Compliance Enforcement Authority. A minimum of three years should be allowed.

Likes 0	
Dislikes 0	

Response

Karl Blaszkowski - CMS Energy - Consumers Energy Company - 3

Answer	Yes
Document Name	

Comment

The voltage ride-through requirements are more restrictive than PRC-024 and will require additional studies to determine whether existing IBR facilities are compliant. Both the standard and the implementation plan require compliance within 12 months after the effective date of PRC-029-1. This is not sufficient time to have studies completed and if needed, obtain additional documentation from IBR manufacturers, and submit that data to the Planning Coordinator, Transmission Planner, Transmission Operator, Reliability Coordinator and Compliance Enforcement Authority. A minimum of three years should be allowed.

Likes 0	
Dislikes 0	

Response

Natalie Johnson - Enel Green Power - 5

Answer	Yes
Document Name	
Comment	
Enel North America agrees with comments submitted by the MRO NSRF.	
Likes 0	
Dislikes 0	
Response	
Kimberly Turco - Constellation - 6	
Answer	Yes
Document Name	
Comment	
yes, Legacy inverters will not be able to ride through voltage and frequency events. It's important to include exemption for legacy inverters. Kimberly Turco on behalf of Constellation Segments 5 and 6.	
Likes 0	
Dislikes 0	
Response	
Alison MacKellar - Constellation - 5	
Answer	Yes
Document Name	
Comment	
Legacy inverters will not be able to ride through voltage and frequency events. It's important to include exemption for legacy inverters. Alison Mackellar on behalf of Constellation Segments 5 and 6.	
Likes 0	
Dislikes 0	
Response	

Dane Rogers - Dane Rogers On Behalf of: Donald Hargrove, OGE Energy - Oklahoma Gas and Electric Co., 3, 1, 5, 6; - Dane Rogers, Group Name OG&E	
Answer	Yes
Document Name	
Comment	
OG&E Supports comments submitted by MRO NSRF.	
Likes 0	
Dislikes 0	
Response	
Marcus Bortman - APS - Arizona Public Service Co. - 6	
Answer	Yes
Document Name	
Comment	
AZPS supports the following comments that were submitted by EEI on behalf of their members: EEI appreciates the revisions to PRC-029-1 and generally agrees that the changes align with many aspects of the discussions held during the NERC Technical Ride-through Conference. However, we are concerned that Requirement R4 overlooks the impacts to GOs who are developing large, multi-year IBR projects that may not be completed by the effective date of this Reliability Standard. Resource equipment specifications are typically locked down at the time the recourse contracts are finalized, and a change in requirements/specifications after that point can require changes in the design of the equipment that are impossible to achieve without triggering a material modification, resulting interconnection restudies and delaying or potentially canceling the project. To address this concern, we suggest the following modifications be made to Requirement R4 (in boldface below). **R4.** Each Generator Owner identifying an IBR that is in-service or has a contract for an IBR that is in effect by the effective date of PRC-029-1, has known hardware limitations that prevent the IBR from meeting Ride- through criteria as detailed in Requirements R1-R3, and requires an exemption from specific Ride-through criteria shall:*10 [Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*	
Likes 0	
Dislikes 0	
Response	
Ruchi Shah - AES - AES Corporation - 5	
Answer	Yes
Document Name	
Comment	

AES Clean Energy agrees that the major changes have been accurately represented. Some concerns on changes that have not been included are listed below.

Likes 0	
Dislikes 0	

Response

Anna Martinson - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO Group

Answer	Yes
Document Name	

Comment

MRO NSRF appreciates the work that the SC and SDT put in to drafting this standard and feel that much of what was covered at the technical conference was represented in the most recent draft, however we feel that there were some issues brought up during the conference which may have been overlooked and are addressed in question 2.

Likes 0	
Dislikes 0	

Response

Hillary Creurer - Allete - Minnesota Power, Inc. - 1

Answer	Yes
Document Name	

Comment

Minnesota Power (MP) supports EEI’s comments

Likes 0	
Dislikes 0	

Response

Stephanie Kenny - Edison International - Southern California Edison Company - 6

Answer	Yes
Document Name	

Comment

See EEI comments	
Likes 0	
Dislikes 0	
Response	
Bob Cardle - Bob Cardle On Behalf of: Marco Rios, Pacific Gas and Electric Company, 3, 1, 5; Sandra Ellis, Pacific Gas and Electric Company, 3, 1, 5; Tyler Brun, Pacific Gas and Electric Company, 3, 1, 5; - Bob Cardle	
Answer	Yes
Document Name	
Comment	
PG&E recommends the DT to consider development of a Implementation Guide and/or a Compliance Monitoring and Enforcement Program (CMEP) Practice Guide. Of particular benefit would be including examples of what would demonstrate compliance with Requirement R2.	
Likes 0	
Dislikes 0	
Response	
Selene Willis - Edison International - Southern California Edison Company - 5	
Answer	Yes
Document Name	
Comment	
see EEI comments	
Likes 0	
Dislikes 0	
Response	
Hayden Maples - Hayden Maples On Behalf of: Jeremy Harris, Evergy, 3, 5, 1, 6; Kevin Frick, Evergy, 3, 5, 1, 6; Marcus Moor, Evergy, 3, 5, 1, 6; Tiffany Lake, Evergy, 3, 5, 1, 6; - Hayden Maples	
Answer	Yes
Document Name	
Comment	

Evergy supports and incorporates by reference the comments of the Edison Electric Institute (EEI) and the Midwest Reliability Organization's NERC Standards Review Forum (MRO NSRF) on question 1	
Likes 0	
Dislikes 0	
Response	
Robert Blackney - Edison International - Southern California Edison Company - 1	
Answer	Yes
Document Name	
Comment	
See comments submitted by EEI.	
Likes 0	
Dislikes 0	
Response	
Pamela Hunter - Southern Company - Southern Company Services, Inc. - 1,3,5,6 - SERC, Group Name Southern Company	
Answer	Yes
Document Name	
Comment	
The PRC-024-4 and PRC-029-1 Implementation Plan should be amended to reflect both voltage and frequency Ride-through requirements as modified in PRC-029-1. This oversight should be made consistent with the revised standard. Accordingly, the following sections should be modified to remedy this concern: (1) General Considerations and (2) Equipment Limitations and Process for Requirement R4.	
Likes 0	
Dislikes 0	
Response	
Nazra Gladu - Manitoba Hydro - 1	
Answer	Yes
Document Name	
Comment	

MH appreciates the work that the SC and SDT put in to drafting PRC-029-1 and generally agrees that the changes align with aspects of the discussions held during the NERC Technical Ride-through Conference.

Likes 0	
Dislikes 0	

Response

Kyle Thomas - Elevate Energy Consulting - NA - Not Applicable - NA - Not Applicable

Answer	Yes
Document Name	

Comment

While two key important items from the Technical Conference were incorporated in the latest draft of the standard (hardware limitation exemptions for existing resources for frequency requirements; and aligned the frequency ride-through requirements with the IEEE 2800 standard), there were two additional key items from the Technical Conference that have not been captured in the latest draft of the standard:

1) Requirement R4 should be updated to allow hardware equipment limitations for any IBRs that already have a signed interconnection agreement (IA) as of the effective date of the standard. Given that equipment purchases/decisions and IBR plant designs are already locked down at the time the IA is signed, this will cause significant issues for these IBRs to meet the new requirements of PRC-029 if they were not designed that way. Reference comments submitted by SEIA and Orsted that explain this concern at greater length.

2) Further clarification of the evidence requirements for R4 hardware limitations. While the M4 measures were updated to add the damage curves from OEMs as possible evidence, during the Technical Conference the industry discussed that R4 evidence for PRC-029 should ultimately be aligned with the evidence requirements as detailed in the PRC-024 standard. Aligning the PRC-029 evidnece to the same as PRC-024 will support clarifty and efficiency of implementation/evidence gather of the standard by the industry.

Likes 0	
Dislikes 0	

Response

Donna Wood - Tri-State G and T Association, Inc. - 1

Answer	Yes
Document Name	

Comment

Likes 0	
Dislikes 0	

Response

Jennifer Bray - Arizona Electric Power Cooperative, Inc. - 1	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Steven Rueckert - Western Electricity Coordinating Council - 10, Group Name WECC	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Rachel Coyne - Texas Reliability Entity, Inc. - 10	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Tim Kelley - Tim Kelley On Behalf of: Charles Norton, Sacramento Municipal Utility District, 3, 6, 4, 1, 5; Foung Mua, Sacramento Municipal Utility District, 3, 6, 4, 1, 5; Kevin Smith, Balancing Authority of Northern California, 1; Nicole Looney, Sacramento Municipal Utility District, 3, 6, 4, 1, 5; Ryder Couch, Sacramento Municipal Utility District, 3, 6, 4, 1, 5; Wei Shao, Sacramento Municipal Utility District, 3, 6, 4, 1, 5; - Tim Kelley, Group Name SMUD and BANC	
Answer	Yes

Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Mike Magruder - Avista - Avista Corporation - 1	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Jodirah Green - ACES Power Marketing - 1,3,4,5,6 - MRO,WECC,Texas RE,SERC,RF, Group Name ACES Collaborators	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Kevin Conway - Western Power Pool - 4	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	

Response	
Carver Powers - Utility Services, Inc. - 4	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Israel Perez - Israel Perez On Behalf of: Laura Somak, Salt River Project, 3, 6, 5, 1; Mathew Weber, Salt River Project, 3, 6, 5, 1; Thomas Johnson, Salt River Project, 3, 6, 5, 1; Timothy Singh, Salt River Project, 3, 6, 5, 1; - Israel Perez	
Answer	Yes
Document Name	
Comment	
Likes 0	
Dislikes 0	
Response	
Joshua London - Eversource Energy - 1, Group Name Eversource	
Answer	
Document Name	
Comment	
Eversource supports the comments of EEI.	
Likes 0	
Dislikes 0	
Response	
Dwanique Spiller - Berkshire Hathaway - NV Energy - 5	
Answer	

Document Name	

Comment

NV Energy appreciates the revisions to PRC-029-1 and generally agrees that changes align with many aspects of the discussions held during the NERC Technical Ride-through Conference. However, we are concerned that Requirement R4 overlooks the impacts to GOs who are developing large, multi-year IBR projects that may not be completed by the effective date of this Reliability Standard. Resource equipment specifications are typically locked down at the time the interconnection agreement is signed, and a change in requirements/specifications after that point can require changes in the design of the equipment that are impossible to achieve without triggering a material modification, resulting interconnection restudies and delaying or potentially canceling the project. To address this concern, we suggest the following modifications be made to Requirement R4 (in boldface below).

R4. Each Generator Owner identifying an IBR that is in-service **or has signed a Large Generator Interconnection Agreement** by the effective date of PRC-029-1, has known hardware limitations that prevent the IBR from meeting Ride- through criteria as detailed in Requirements R1-R3, and requires an exemption from specific Ride-through criteria shall*:10 [Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

Likes 0	
Dislikes 0	

Response

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

Answer	
Document Name	

Comment

EEI appreciates the revisions to PRC-029-1 and generally agrees that the changes align with many aspects of the discussions held during the NERC Technical Ride-through Conference. However, we are concerned that Requirement R4 overlooks the impacts to GOs who are developing large, multi-year IBR projects that may not be completed by the effective date of this Reliability Standard. Resource equipment specifications are typically locked down at the time the recourse contracts are finalized, and a change in requirements/specifications after that point can require changes in the design of the equipment that are impossible to achieve without triggering a material modification, resulting interconnection restudies and delaying or potentially canceling the project. To address this concern, we suggest the following modifications be made to Requirement R4 (in boldface below).

R4. Each Generator Owner identifying an IBR that is in-service **or has a contract for an IBR that is in effect** by the effective date of PRC-029-1, has known hardware limitations that prevent the IBR from meeting Ride- through criteria as detailed in Requirements R1-R3, and requires an exemption from specific Ride-through criteria shall*:10 [Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]*

Likes 0	
Dislikes 0	

Response

Jens Boemer - Electric Power Research Institute - NA - Not Applicable - NA - Not Applicable

Answer	
Document Name	

Comment

The work and efforts of this standard drafting team are much appreciated. Thank you for considering EPRI comments on the previous drafts as submitted previously. The new Draft 4 appears to be improved based on discussions that took place at the Standards Committee and NERC Ride-through Technical Conference on September 4-5, 2024. However, further improvements and alignment could be considered as follows:

A. General comments:

- Aligned with the directives to NERC in FERC order 901, the draft PRC-029 standard and the Implementation Plan for Project 2020-02 propose that the requirements apply to all applicable IBRs upon the standard's revised effective date or the newly added phased-in compliance dates. Applicable IBRs include existing (Legacy) IBRs that are already in operation prior to the specified dates. Requirement R4 provides a path for each Generator Owner to request a limited and documented exemption of a legacy IBR from the voltage ride-through criteria specified in R1 and R2 and frequency ride-through criteria specified in R3. According to the Implementation Plan of Project 2020-02, "[o]ther NERC Standards Development projects will be pursued to address ongoing identification and mitigation of any potential reliability impacts to the BPS for such exemptions."
    - The proposed approach may require documentation of hardware limitations or reconfiguration for a significant number of legacy IBRs across North America. Neither the draft Technical Rationale nor the FERC record under RM22-12 present or cite sufficient technical evidence that supports this broad application of the proposed standard to existing IBRs in all applicable NERC regions.
    - International experience has shown that documentation of hardware limitations to support exemption from, or the retroactive application of similarly stringent ride-through capability requirements on legacy IBRs are associated with significant uncertainties, potential technical and procedural challenges, and costs. Justification of similarly ambitious regulations enforced in other countries required the production of evidence like post-mortem disturbance analysis or case studies that *quantified* the potential impact of non-compliant existing IBRs on the bulk power system stability and reliability.[1],[2]
    - Consequently, stakeholder concerns contribute to low approval rates for the draft PRC-029, possibly causing delays in moving the draft standard through the NERC process toward timely and effective enforcement for at least all new IBRs. Considering the approx. 2,600 GW of new IBRs in the interconnection queues across North America[3], these delays bear potentially significant risk for the BPS.
    - Furthermore, the proposed revised effective date and newly added phased-in compliance date of the capability-based elements of Requirements R1, R2, and R3 as specified in the draft PRC-029 are different from the transition periods found in international practice of similarly ambitious rule changes for new and legacy IBRs (see the comments on Implementation Plan below for further details).
- The term Inverter-based Resource (IBR) to which the draft standard is intended to apply refers to proposed definitions being developed under the Project 2020-06 Verifications of Models and Data for Generators. Although the new draft includes redlines that strike the explicit mentioning of VSC-HVDC transmission facilities that are dedicated connections for IBR to the BPS, the definition proposed by Project 2020-06 is sufficiently broad that it could cover such facilities. For further clarity on the scope and application of the proposed PRC-029 standard, it could be helpful to add a clarifying sentence or to copy parts of Footnote 2 that clarifies the location of the "main power transformer" in case of IBR connecting via a dedicated VSC-HVDC transmission facility into the terms section on page 2 of the standard.
- For the purpose of clarity, harmonization, and compliance of IBR across North America, proposed requirements could even further align with requirements that are testable and verifiable as specified in voluntary industry standards developed through an open process such as ANSI, CIGRE, IEC, or IEEE. The drafting team is encouraged to review these standards and where applicable further align, for example:
    - Requirement R1 and R2 relate to IEEE Std 2800™-2022, Clause 7.2.2 (Voltage disturbance ride-through requirements), with consideration of Clause 7.3.2.4 (Voltage phase angle changes ride-through) as a stated exception in R1.
    - Requirement R3 relates to IEEE Std 2800™-2022, Clause 7.3.2 (Frequency disturbance ride-through requirements), with consideration of Clause 7.3.2.3.5 (Rate of change of frequency (ROCOF) ride-through) as a stated exception in R3.
    - Measures M1–M3 relate to IEEE P2800.2 Draft 1.0a, Clause 5 (Type tests), Clause 6 (Validation procedures for IBR unit models and supplemental IBR device models), and Clause 7 (Design evaluations), Clause 8 (As-built installation evaluations), Clause 9 (Commissioning tests), Clause 10 (Post commission model validation), and Clause 11 (Post-commissioning monitoring).
    - Measure M4, additionally, relates to IEEE P2800.2 Draft 1.0a, Clause 12 (Periodic tests), and Clause 13 (Periodic verification).
- The draft standard does not specify grid conditions for which the specified ride-through requirements apply. During its lifetime, a plant may experience many different operational conditions, along with changes to the grid, and may fail to ride-through an event if the plant was operating in a grid condition vastly different from that which it was designed for. The standard could include an exception for such situations based on leading industry practices, or a requirement for the TP, PC, etc. to specify such an exception.

- IEEE 2800-2022 allows for an exception for “self-protection” when negative-sequence voltage is greater than specified duration and threshold within continuous operation region. There is no such exception in draft PRC-029. Such an exception may be necessary for type III wind turbine generator (WTG) based plants.
- Standard does not allow any flexibility for failure of ride-through resulting from misoperation of protection system. The misoperation of protection system may occur for many reasons over the life of a plant. For example, for a fault on a transmission system, if differential protection for the main step-up transformer misoperates due to environmental issues such as damage due to water from a leaking roof or animal intrusion, then plant would be considered out of compliance. If a synchronous machine based generating plant trips because of similar issue, it would not be out of compliance with PRC-024.
- Requirements R1–R4 call out both “design and operation”. If the plant is designed to ride-through, then is it necessary to specifically call out and include IBR “operation” into the scope of PRC-029?
    - The inclusion of “operation” in PRC-029 would put a Generator Owner out of compliance with the standard whenever one of their IBR plants fails to ride-through real world disturbances, including incidents where failure of ride-through within the specified abnormal voltage and frequency conditions was beyond the GO’s control.
    - An alternative approach could be to narrow the scope of PRC-029 to require a Generator Owner to adequately *design* each IBR *to have the capability* to ride-through the specified abnormal conditions. The GO could then be further required by PRC-028 and PRC-030 to monitor IBR performance during operations and for real world events. If an IBR was found to have failed ride-through during operations, then PRC-030 could require the GO to identify the underlying issues and to take corrective action.

B. Ride-through definition

· Consider adopting definition from IEEE 2800, which is from IEEE 1547, and well understood by the industry. This was supported by about 68% of the respondents to the Slido poll during the NERC Technical Conference.

C. Requirement R1:

- Requirement calls out “design and operation”. If the plant is designed to ride-through then is it necessary to specifically call out “operation”?
    - The Reliability Standard PRC-006, Requirement R3, requires PC to develop UFLS program. Several assumptions are made here. If an event occurs, then R11 requires assessment of an event and if deficiency in UFLS program is identified then PC is required to consider deficiencies in R12. If UFLS program was deficient then PC is not out of compliance with R3 (or any other requirements in the standard). This is a good-faith approach: Design UFLS program and if actual event shows deficiency in UFLS Program then fix it. No compliance issues, as far as UFLS program was designed per Requirement R3.
    - Same approach could be taken in PRC-029, where R1 could require that plant is designed to ride-through specified voltage disturbance. The PRC-028 and PRC-030 then requires monitoring of plant performance and take corrective actions when necessary.
    - The same approach could be extended to requirements R2 and R3.
- If IBR operation remains within the scope of PRC-029, then consider revising the beginning of the sentence as following for better readability: *Each Generator Owner shall design and operate each IBR to meet or exceed Ride-through requirements…*
    - The same changes could be extended to requirements R2 and R3.

D. Requirement R2

- Refer to comments on R1 that could be extended to requirement R2.

E. Requirement R2, Part 2.1

- Why is it necessary to specify a performance requirement when voltage is in the continuous operation region? The standard remains silent on performance expectation for frequency ride-through requirements. For performance requirement for voltage ride-through mandatory operation region is also very brief. The intent of this standard is to focus on ride-through during voltage and frequency disturbances. If there is a desire to

address performance then one option could be to simply state that performance shall be as specified by TP, PC, etc. That is in Part 2.1.3 anyway.

- Part 2.1.2: remove “and according to its controller settings”. It is not incorrect but “according to its controller settings” inherently apply to all performance requirements.
- Part 2.1.3: this requirement in IEEE 2800 was necessary and was tied to reactive power capability requirement as shown in Figure 8 of IEEE 2800. Given PRC-029 does not include reactive power capability requirements, perhaps PRC-029 could remain silent.

F. Requirement R2, Part 2.2

- Part 2.2 applies at the high-side of the main power transformer. The IBR is required to exchange current, up to the maximum capability. How is the “maximum capability” of an IBR determined? There could be some explanation, perhaps with examples, in the technical rationale document.
- The phrase “provide voltage support on affected phases during both symmetrical and unsymmetrical voltage disturbances” is confusing.
    - It is understood that intent is to require to inject “unbalanced current” or “negative-sequence” current during asymmetrical faults. However, as written, injection of balanced reactive current into an unbalanced fault meets the requirement to provide voltage support on affected phases, in addition to unaffected phase. The standard does not prohibit voltage support on unaffected phases. The voltage support on unaffected phase is usually problematic. But the requirement, as written, does not prohibit this.
    - During a L-G fault, current in a faulted phase is dependent on transformer winding configuration. Does this requirement, unintentionally, specify specific transformer configuration?
- During mandatory operation, voltage is abnormal and could be almost zero for close-in faults. As such, “current” over “power” is more appropriate. Power in faulted and unfaulted phases could be different as well. Replace real and reactive power with active (real) and reactive current respectively.

G. Requirement R2, Part 2.3.1

- Per language in attachment 1, permissive operation is allowed when line-to-ground or line-to-line voltage is below 10%. But per Part 2.3.1, IBR is required to restart current exchange when positive-sequence voltage enters continuous or mandatory operation region. This is conflicting. For example, for a line-to-ground fault on high-side terminals of main power transformer, the positive-sequence voltage would be more than 10%, i.e., in the mandatory operation region.

H. Requirement R2, Part 2.4

- The intent of this requirement is understood. However, if there are multiple plants in the area, then one plant misbehaving may cause overvoltage on high-side terminals of the main power transformer of other plants in the area. Also, the post-fault dynamics greatly depend on system operating condition (peak, shoulder, off-peak, etc.) along with transmission outages, status of capacitor banks, etc. The Generator Owner usually does not have system data to evaluate post-fault system dynamics and to determine if plant’s behavior is or not a contributing factor to overvoltage.

I. Requirement R3

- Refer to comments on R1 that could be extended to requirement R3.
- Footnote 9 could be simplified as following: *The ROCOF is an average rate of change of frequency over an averaging window of at least 0.1 second.*

J. Requirement R4

- We re-iterate the following observations related to the Effective Date and Phased-in Compliance Dates stated in the Implementation Plan of the project, as previously offered in our EPRI comments on the initial draft of PRC-029:

o Aligned with the directives to NERC in FERC order 901, the draft proposes that all requirements specified in PRC-029 apply to all applicable IBRs upon the standard's effective date, including Legacy IBRs that were already in operation prior to that date. This approach may require reconfiguration or documentation of hardware limitations for a significant number of existing IBRs across North America. In some cases, for example where the original equipment manufacturer (OEM) of hardware used in Legacy IBRs has gone out of business, or the OEM has ceased to support a legacy hardware product line, documentation of hardware limitations and development of models accurately representing Legacy IBR performance may be challenging. Additional exemptions to address these challenges could be included in R4 of the draft standard or the implementation plan.

o One example for an alternative approach to the one proposed in the draft PRC-029 could be that TOs and reliability coordinators were to discern on a regional or case-by-case basis about the application of PRC-029 to Legacy IBRs, preferably based on technical evidence like case studies assessing and quantifying the potential BPS reliability impacts from Legacy IBR in their regions.[4] If documentation of Legacy IBR hardware limitations was not available, worst-case assumptions could be made in these case studies. If such studies indicated a viable reliability risk, R4 could be applied to selected or all Legacy IBRs. This could produce documentation of hardware limitations to refine study assumptions to produce more realistic case study results. If refined results still indicated a viable reliability risk, R1-R3 could be applied to Legacy IBRs selectively.

- For further comments on the Effective Date and Phased-in Compliance Dates refer to below comments on the Implementation Plan.
- Parts 4.1 and 4.2 refers to exemption for a plant but part 4.3 refers to hardware in plant. If few of many wind-turbine generators in a plant are replaced, then plant still has limitation because most of the wind-turbine generators still have limited capability. Perhaps some clarification could be added that if "all hardware with documented capability limitation" is replaced, only then an exemption for a legacy IBR would not apply any longer.

K. Violation Risk Factors

- The language for the assignment of a VRF to Requirement R4 in the draft standard is truncated. Consider revising to: *[Violation Risk Factor: Lower]*
- Each Generator Owner is required per Requirement R4 to identify, document, and communicate about legacy IBRs that have hardware limitations related to the voltage ride-through criteria specified in R1 and R2. Why is a VRF of "Lower" assigned to R4 and not a VRF of "Medium"? Could the uncertainty related to the capability and performance of legacy IBRs associated with a violation of R4 (a requirement that is administrative in nature and a requirement in a planning time frame) by a Generator Owner not, under the abnormal conditions, be expected to directly and adversely affect the electrical state or capability of the Bulk-Power System, or the ability to effectively control the Bulk Power System?

L. Violation Severity Levels

- R1, R2, and R3: The lower VSL for each of these requirements is for failure to demonstrate the design capability to ride-through. There are two reasons for which this could arise:

(1) Plant is capable to ride-through but is not demonstrated in design evaluation or interconnection studies.

(2) Plant is not capable to ride-through and that is demonstrated in design evaluation or interconnection studies.

- Reason (1) is not a problem for grid reliability, it is just that studies are not adequate to demonstrate ride-through capability, and hence lower VSL is justified. But reason (2) is not any different from a case in severe VSL where an entity fails to demonstrate that IBR adhered to ride-through requirements (based on actual system disturbance event data).
- The VSLs could be rephrased to read:
    - Lower VSL: *The Generator Owner failed to produce adequate evidence demonstrating for each applicable IBR that it was designed to Ride-through in accordance with …*

- Severe VSL: *The Generator Owner either produced evidence demonstrating for any of their applicable IBR that it was not adequately designed to adhere to Ride-through, or the Generator Owner failed to produce evidence of actual disturbance monitoring data for a specific event that demonstrate each applicable IBR adhered to Ride-through requirements in accordance with …*

M. Attachment 1

- Tables 1 and 2 are inconsistent. Table 1 states “>= 1.10” whereas Table 2 states “>1.10”.
- Clarify that cumulative window, for voltage band where ride-through duration is 1800-second, is 3600-second. Also, consider clarifying that 1800-second ride-through duration is only applicable to nominal voltages other than 500 kV.
- Numbered item #3: states that applicable voltage is “… on the AC side of the transformer(s) that is (are) used to connect…..”. Both sides of transformer are AC, one is on DC-AC converter side and another on AC grid side. As written, voltage on either side of transformer is applicable. Please clarify that applicable voltage is on AC “grid” side of the transformer.
- Numbered item #5: Consider revising as following - *The applicable voltage for Tables 1 and 2 is identified as the voltage max/min of phase-to-[strike: neutral] [add: ground] or phase-to-phase fundamental [add: frequency] root mean square (RMS) voltage at the high-side of the main power transformer.*
- Numbered item #7: The interpretation of ride-through curves/points needs further clarification. Would a wind-based IBR plant be required to ride-through an event where at t=0 voltage drops from nominal to zero, then @t=0.16 s voltage rises to 25%, @t=1.2 s voltage rises to 50%, @t=2.5 s voltage rises to 70%, @t=3 s voltage rises to 90%? The item (8) is also tied to item (12), where a combined “area” is stated. Does must ride-through zone represent an “area” (represented by deviation in voltage multiplied by time duration)? Consider adding a few examples in the technical rationale.
  - Note that IEEE 2800-2022, informative Annex D, Section D.1 (Interpretation of voltage ride-through capability requirements specifies) states that the interpretation used in the standard is a “voltage versus time curve.” However, the same Annex includes a Figure D.4 that intends to show “a realistic and complex trajectory of a voltage during a disturbance” for which the informative annex then further states that an IBR plant “is required to ride through,” effectively interpreting the IEEE 2800-2022 ride-through curves as a “voltage versus time envelope.” Thus, there seems to be some ambiguity in IEEE 2800-2022 as to how to interpret its ride-through curves, a finding that could be considered and resolved in a potential future revision or amendment of IEEE 2800.
  - If the voltage ride-through requirements proposed in Attachment 1 were to be specified or interpreted as a “voltage versus time envelope,”, and considering that an unknown number of IEEE SA balloters that voted affirmatively on IEEE 2800-2022 may have interpreted the IEEE 2800-2022 requirements as the less stringent “voltage versus time curves” explained in Annex D of the standard, the proposed PRC-029 could be perceived as more stringent than IEEE 2800-2022.
  - Adding a few examples in the technical rationale could help clarify the correct interpretation of the voltage ride-through curves specified in Attachment 1.
- Numbered item 10: Please clarify if this statement applies to protection applied to high side of main power transformer only OR everywhere in the plant. An alternative could be to state that voltage protection of any type applied within the IBR shall not limit IBR from meeting the Ride-through requirements specified in this standard.

N. Attachment 2:

- Consider adding a statement that frequency ride-through requirements apply only when voltage is in the must ride-through zone.
- Numbered item 3: What is meant by control settings? Is the intent to state protection settings instead?

O. Implementation Plan

- The proposed effective date and phased-in compliance date of the capability-based elements of Requirements R1, R2, and R3 as specified in PRC-029-1 *for primarily new IBRs* of,

- "the first day of the first calendar quarter that is *twelve months [emphasis added by EPRI]* after" either "the effective date of the applicable governmental authority's order approving" or "the date the standard is adopted by the NERC Board of Trustees" for (primarily new) Bulk Electric System IBRs, and
- "until the later of: (1) January 1, 2027; or (2) the effective date of the standard" for (primarily new) Applicable Non-BES IBRs

are different from transition periods found in international practice of similarly significant rule changes for new IBRs. Examples for reference include, but are not limited to:

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  - (European) Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators, Article 72 (Entry into force) states, "the requirements of this Regulation shall apply from *three years [emphasis added by EPRI]* after publication." [5]
  - German Government, "Verordnung zu Systemdienstleistungen durch Windenergieanlagen (Systemdienstleistungsverordnung – SDLWindV) (Ordinance for Ancillary Services of Wind Power Plants (Ancillary Services Ordinance - SDLWindV),"[6]

- Mandatory requirement for new wind power plants to meet specified requirements by March 31, 2011, i.e., *19 months* after ordinance entered into force.

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  - ERCOT, "Issue NOGRR245. Inverter-Based Resource (IBR) Ride-Through Requirements. Report of Board Meeting on June 18, 2024,"[7] and ERCOT, "Nodal Operating Guide Revision Request (NOGRR) 245, Inverter-Based Resource (IBR) Ride-Through Requirements. ERCOT Update," August 8, 2024."[8]

- All new IBRs with a Standard Generation Interconnection Agreement (SGIA) after August 1, 2024, i.e., *immediately once the NOGRR enters into force* (subject to change until ERCOT board approval and until there is a non-appealable Public Utility Commission of Texas (PUCT) final order is in place)

- Extension of exemption from requirements new IBRs with a Standard Generation Interconnection Agreement (SGIA) after August 1, 2024, does not exceed December 31, 2028, i.e., *4 years and 4 months* (subject to change until ERCOT board approval and until there is a non-appealable Public Utility Commission of Texas (PUCT) final order is in place)

- The proposed effective date and phased-in compliance date of the Requirement R4 as specified in PRC-029-1 *for primarily legacy IBRs* of,
  - "the first day of the first calendar quarter that is *twelve months [emphasis added by EPRI]* after" either "the effective date of the applicable governmental authority's order approving" or "the date the standard is adopted by the NERC Board of Trustees" for (primarily legacy) Bulk Electric System IBRs, and
  - "until the later of: (1) January 1, 2027; or (2) the effective date of the standard" for (primarily legacy) Applicable Non-BES IBRs

are either not applicable, or—for re-configurations that do not require replacement of hardware—comparable—they are different from transition periods found in national and international practice of similarly significant retro-active enforcements for legacy IBRs. Examples for reference include, but are not limited to:

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  - (European) Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators, Article 4 (Application to existing power-generating modules) states, [9]

- "Existing power-generating modules are not subject to the requirements of this Regulation, except where: … ."

- "For the purposes of this Regulation, a power-generating module shall be considered existing if:

· (a) it is already connected to the network on the date of entry into force of this Regulation; or

· (b) the power-generating facility owner has concluded a final and binding contract for the purchase of the main generating plant by *two years [emphasis added by EPRI]* after the entry into force of the Regulation.

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    - German Government, “Verordnung zu Systemdienstleistungen durch Windenergieanlagen (Systemdienstleistungsverordnung – SDLWindV) (Ordinance for Ancillary Services of Wind Power Plants (Ancillary Services Ordinance – SDLWindV)),”[10]

- Financial incentive for voluntary retrofits of legacy wind power plants between July 11, 2009, and January 1, 2011, i.e., *1.5-years*.

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    - German Government, “Verordnung zur Gewährleistung der technischen Sicherheit und Systemstabilität des Elektrizitätsversorgungsnetzes (Systemstabilitätsverordnung - SysStabV) (System Stability Regulation – SysStabV)),“[11]

- Mandatory requirement for reconfiguration of legacy IBRs and distributed energy resources (DERs) larger than 100 kW by August 31, 2013, i.e., *13 months* after ordinance entered into force.

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    - ERCOT, “Issue NOGRR245. Inverter-Based Resource (IBR) Ride-Through Requirements. Report of Board Meeting on June 18, 2024,”[12] and ERCOT, “Nodal Operating Guide Revision Request (NOGRR) 245, Inverter-Based Resource (IBR) Ride-Through Requirements. ERCOT Update,” August 8, 2024.”[13]

- Mandatory requirement for legacy IBRs with an SGIA executed prior to August 1, 2024 to maximize the performance of their protection systems, controls, and other plant equipment (within equipment limitations) to achieve, as close as reasonably possible, the capability and performance set forth in IEEE 2800-2022 no later than December 31, 2025, i.e., *17 months* after NOGRR enters into force.

- Extension of exemption from requirements for legacy IBRs with a Standard Generation Interconnection Agreement (SGIA) prior to August 1, 2024, does not exceed December 31, 2027, i.e., *3 years and 4 months* (subject to change until ERCOT board approval and until there is a non-appealable Public Utility Commission of Texas (PUCT) final order is in place)

- Per the Implementation Plan, IBR plants under construction now and entering commercial operation after the effective date of this standard are required to fully comply with this standard. Such plants are not allowed an exemption as permitted by Requirement R4. Prior to FERC Order 2023, the development and design-freeze for IBR plants does not occur until months or years after an interconnection agreement is signed. Large IBR plants, especially wind plants, could need a few years for construction, testing, trail operation, etc., before entering commercial operation. The equipment for plants under construction currently may have been purchased a year or two before the construction began and typically soon after signing an interconnection agreement. Consider revising Requirement R4 to allow hardware limitation exemptions for IBRs that have signed interconnection agreements, and not just IBRs that are in-service, as of the effective date of the standard.
- The first use of the word “or” in the sentence under the section Effective Date and Phased-in Compliance Dates, PRC-029-1 Phased-in Compliance Dates, Requirement 4, Applicable Non-BES IBRs on page 5 of the Implementation Plan could be replaced for clarity with the word “for” to then read: *Entities shall not be required to comply with Requirement R4 for their non-BES IBRs until the later of: (1) January 1, 2027; or (2) the effective date of the standard.*

P. Technical Rationale

- IEEE Std 2800™-2022, a voluntary industry standard for *Interconnection and Interoperability of Inverter-Based Resources (IBRs) Interconnecting with Associated Transmission Electric Power Systems* is mentioned in the Technical Rationale document for PRC-029-1 but not cited properly. In all instances where the document refers to that IEEE standard, referencing could be improved by following our guidance offered below. Where appropriate, reference to and proper citation of IEEE P2800.2, an active IEEE Standards Association project for developing of a *Recommended Practice for Test and Verification Procedures for Inverter-based Resources (IBRs) Interconnecting with Bulk Power Systems*, may serve as an additional reference.
    - Suggested referencing of IEEE Std 2800™-2022:

- For the initial citation within any document, we suggest citing the standard as follows: IEEE Std 2800™, IEEE Standard for Interconnection and Interoperability of Inverter-Based Resources (IBRs) Interconnecting with Associated Transmission Electric Power Systems

- Subsequent mentions of the standard could refer to it as: IEEE 2800

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    - Similar guidelines could be applied to IEEE Std 2800.2™:

- We recommend citing the standard in full on first reference as: IEEE P2800.2, Draft Recommended Practice for Test and Verification Procedures for Inverter-based Resources (IBRs) Interconnecting with Bulk Power Systems

- Followed by subsequent mentions as: IEEE P2800.2

  - Considering the explicit statements in the "PRC-029-1_Technical_Rationale" document about the intended alignment with IEEE Std 2800™-2022 requirements in formulating the technical content of PRC-029-1 by the drafting team, references to specific clauses of IEEE Std 2800™-2022 could provide more clarity to industry stakeholders about which parts of the IEEE standard the PRC-029-1 aims to incorporate. It may also be helpful to identify areas where they are not aligned. Refer to the examples in our general comments above.
  - IEEE 2800-2022 may not be the only industry standard with scope that overlaps with the proposed PRC-029 standard. ANSI and CIGRE currently may not have related standards. While IEC does have standards and technical specifications with related scope, these documents tend to be less specific in their technical requirements compared to IEEE standards like IEEE 2800-2022.[14]

Q. Justifications

- The table for “VRF Justifications for PRC-029-1, Requirement R3” on page 11 of the Justifications lists a Proposed VRF of “Lower”; but the draft PRC-029 standard assigns R3 a “[Violation Risk Factor: High]”. Consider resolving inconsistency across the two documents.
- Refer further to the comment on the VRF assignment for Requirement R4 above.

[1] Grid Codes for Interconnection of Inverter-Based Distributed Energy Resources by Country: Recent Trends and Developments. EPRI. Palo Alto, CA: November 2014. 3002003283. [Online] https://www.epri.com/research/products/000000003002003283 (last accessed, January 24, 2023)

[2] Dispersed Generation Impact on CE Region Security: Dynamic Study. 2014 Report Update. European Network of Transmission System Operators for Electricity (ENTSO-E), ENTSO-E SPD Report, Brussels, Belgium: December 2014. [Online] https://eepublicdownloads.entsoe.eu/clean-documents/Publications/SOC/Continental_Europe/141113_Dispersed_Generation_Impact_on_Continental_Europe_Region_Security.pdf (last accessed, January 24, 2023)

[3] LBNL (2024) [Online] https://emp.lbl.gov/generation-storage-and-hybrid-capacity

[4] EPRI is currently working on case studies relevant to these topics and is also aware of others doing similar work.

[5] ENTSO-E: Requirements for Generators. [Online] https://www.entsoe.eu/network_codes/rfg/ (last accessed, August 6, 2024)

[6] Federal Law Gazette I (no. 39) (2009): 1734–46. [Online] https://www.clearingstelle-eeg-kwkg.de/gesetz/695 (last accessed, August 6, 2024)

[7] ERCOT, “Issue NOGRR245. [Online] https://www.ercot.com/mktrules/issues/NOGRR245 (last accessed, August 9, 2024)

[8] ERCOT, “Nodal Operating Guide Revision Request (NOGRR) 245, Inverter-Based Resource (IBR) Ride-Through Requirements. ERCOT Update,” August 8, 2024 [Online] https://www.ercot.com/calendar/08082024-NOGRR245-_-Review-of (last accessed, August 9, 2024)

[9] Ref. Footnote 10

[10] Federal Law Gazette I (no. 39) (2009): 1734–46. [Online] https://www.clearingstelle-eeg-kwkg.de/gesetz/695 (last accessed, August 6, 2024)

[11] Federal Law Gazette I (no. 40) (2012): 1635. [Online] https://www.gesetze-im-internet.de/sysstabv/BJNR163510012.html (last accessed, August 6, 2024)

[12] Ref. Footnote 16

[13] Ref. Footnote 17

[14] Example IEC standards and technical specifications with related scope may include IEC 61400-27, IEC 62934:2021, IEC TS 63102:2021, and IEC TR 63401-4:2022.

Likes 0	
Dislikes 0	

Response

2. Provide any additional comments for consideration, if desired.	
Kennedy Meier - Electric Reliability Council of Texas, Inc. - 2	
Answer	
Document Name	
Comment	

ERCOT generally supports incorporating as much of the IEEE 2800-2022 language and parameters into PRC-029-1 as possible, and commends NERC's and the Standards Committee's use of material drawn from IEEE 2800-2022. Consistent with the approach taken in IEEE 2800-2022, ERCOT encourages any future revisions to PRC-029-1 and its attachments that clarify that entities are not precluded from exceeding the minimum requirements of any ride-through curves and performance measures if their equipment is capable of doing so. Much progress has been made, however ERCOT is voting against this draft of PRC-029-1 due to the substantive issues raised in these comments and previous comments that have not been addressed. Nonetheless, ERCOT recognizes and appreciates NERC's, the Standards Committee's, and the Project 2020-02 drafting team's extraordinary level of effort in developing these critically needed ride-through performance requirements.

As an initial matter, the ride-through definition proposed in draft 4 of PRC-029-1 continues to only require a facility to remain connected and continue "to operate," which is inadequate; the definition needs to require the facility to maintain performance beneficial (or, at the very least, not detrimental) to overall grid reliability. The Standards Committee's response to previous comments on this topic stated that the definition cannot specify exact performance. ERCOT's comment was not intended to suggest that performance requirements be stated in the definition. Rather, ERCOT believes the definition of ride-through needs to include qualifications on what it means to operate in the context of ride-through, just as the existing defined term "Reliable Operation" places qualifications on what it means to reliably operate elements of the Bulk-Power System. ERCOT believes that similar qualifications are necessary in the context of ride-through because ERCOT has encountered arguments that IBRs that performed poorly during events where ride-through was needed were operational despite their poor response and poor performance simply because at least part of the plant did not trip during the event.

Similarly, the concept of ride-through also ought to recognize that the continued operation associated with ride-through must be maintained not only through the Disturbance but all the way through recovery to a new operating point. The existing Disturbance definition does not clearly include the recovery period.

In addition, ERCOT believes that partial trips are inconsistent with the concept of ride-through, not simply performance parameters to be addressed solely under PRC-030. The requirement to ride through should apply to both the IBR facility and the individual IBR units (inverters and turbines), and ERCOT is concerned that the removal of "in its entirety" from the ride-through definition in draft 4 of PRC-029-1 reduces the effectiveness of the definition. While the requirements in draft 4 of PRC-029-1 provide some indication that partial tripping is not permissible, specifying that ride-through includes individual inverters and turbines will provide clarity in PRC-029-1 and consistency if the definition is used in other places in the Standards. Most—if not all—IBR ride-through events observed in the ERCOT Region include some level of partial IBR tripping (i.e., some percentage of inverters/turbines tripping while the overall plant remains connected).

To address these concerns, ERCOT recommends the ride-through definition be revised as follows:

Definition Proposed in Draft 4 of PRC-029-1:

Ride-through: The plant/facility remains connected and continues to operate through voltage or frequency system disturbances.

ERCOT's Proposed Definition:

Ride-through: The entire plant/facility (including individual inverters and turbines) remains connected and injects current to the Bulk Power System and continues operating to support grid reliability through a System Disturbance, including the period of recovery to a normal operating condition.

Requirement R1 does not clarify whether partial trips (individual IBR unit trips) would be allowed. ERCOT believes Requirement R1 should not allow individual turbine/inverter trips and should clearly indicate "ride-through" does not occur when individual turbines or inverters trip offline during a Disturbance. Requirement R2 provides some level of clarity that partial tripping is not allowed if it would result in more than 10% loss of real power for voltage ride-through requirements, and revising Requirement R1 to indicate that ride-through precludes individual turbine/inverter trips would be consistent with Requirement R2.

ERCOT recommends replacing the term "adheres" in Requirement R2 with "meets or exceeds," which is used in Requirement R1, to clarify that protection and control settings can be configured to exceed the minimum requirements when the equipment in question is capable of better performance. This would be consistent with recommendations NERC has made through multiple channels for many years.

ERCOT also recommends reviewing and revising Requirement R2, Part 2.1 and the surrounding language to clarify the facility should continue to deliver the pre-disturbance level of current, as appropriate, because power depends on voltage. In principle, during a Disturbance, active power should only reduce proportionally to voltage such that active current is consistent unless needed for frequency response. Reactive current should adjust as needed to support voltage (lead or lag, as appropriate) up to its current limits. In general, the Requirement should neither incentivize entities to undersize inverters/converters nor impose onerous requirements to oversize the equipment. This lack of clarity may cause issues in enforcing this requirement and miss the reliability objective. Using "current" where appropriate also aligns with paragraph 209 of FERC Order 901.

In addition, requiring a facility to deliver reactive power "according to its controller settings" is impractical and misses the objective. The requirement should be designed to *ensure the proper response performance,* as each facility will always, by definition, "operate according to its controller settings," even if those settings happen to be incorrect. To make Requirement R2, Part 2.1 truly be a performance-based requirement, it should be revised to require generators to meet or exceed performance requirements instead of simply requiring them to operate according to their settings.

PRC-029-1 Requirement R2, Part 2.2, should not simply specify reactive/active power priority because not all priority implementations perform the same way. As proposed, Part 2.2 does not prohibit dropping active current to zero even for shallow voltage dips (e.g. 0.7-0.9 per unit), but seems to allow the Transmission Planner (TP), Planning Coordinator (PC), Reliability Coordinator (RC), or Transmission Operator (TOP) to specify the desired performance. ERCOT requests that Part 2.2 be revised as necessary to clarify that excessive or full momentary cessation of active current is not allowed or to specify the circumstances under which it is allowed (e.g., extremely low voltage deviations).

ERCOT also recommends that the Implementation Plan be revised to clarify what constitutes being "in operation" (unit synchronization, full commercial operations, or some other milestone) for purposes of determining whether an IBR may be considered for a potential exemption under the Implementation Plan.

ERCOT encourages NERC to consider defining the averaging window for Rate of Change of Frequency (RoCoF) because leaving the averaging window open-ended will result in measurement inconsistencies in protection systems and post-event analysis. Defining the averaging window will also ensure that the 5 Hz/second RoCoF proposed in Requirement R3 of draft 4 of PRC-029-1 is sufficient. For example, using the Odessa 2022 event as a benchmark, the minimum averaging window of IEEE 2800-2022 of 0.1 seconds yields a RoCoF between 5 – 12 Hz/second at some stations, suggesting 5 Hz/second is not sufficient and the Reliability Standard should contain a higher requirement as allowed by IEEE 2800-2022. However, if a longer averaging window—such as 0.5 seconds—is used, observed RoCoF for the Odessa 2022 event would have been under 5 Hz/second and the RoCoF requirement proposed in draft 4 of PRC-029-1 would suffice. Having a sufficient averaging window can also prevent transient measurements during the normal fault and fault clearing times from causing erroneous trips.

NERC should ensure the proposed 5 Hz/second RoCoF requirement does not conflict with footnote 3 in cases where the IBR does not monitor RoCoF in its protection settings, but its PLL controls are not properly set to ride-through.

ERCOT, as an RC, PC, and TOP, generally opposes PRC-029-1's broad approach of allowing hardware exemptions without some level of confirmation of the exemption's impact (such as an evaluation of the reliability impact of the exemption by a PC, RC, TP, or TOP). ERCOT believes reliability specifically requires that limitations be modeled and provided to the PC/RC/TP/TOP. Accurate modeling is important enough to be explicitly referenced in the Standard and should be required if a limitation is to be allowed/confirmed. There are a growing number of presentations and communications from generation owners regarding current models not reflecting all limitations. Reliability entities should not be required to accept models that do not reflect actual or expected performance. Instead, the Reliability Standard should require models (both positive sequence and EMT models) to be improved to include all limitations (e.g., inverter DC protections). Otherwise, the PC/RC/TP/TOP will be unable to model all of a facility's limitations and will incorrectly conclude that the facility demonstrates acceptable performance when, in fact, the IBR will not ride through. Reliability entities may not be able to assess a limitation that is merely described without also being modeled, which may limit their ability to perform determination studies, resulting in a gap that reliability entities must address. This places the burden on the PC/RC/TP/TOP instead of on Generator Owners (GOs), who should be responsible for removing the limitation or improving the model fidelity. Consequently, ERCOT believes the proposed approach in draft 4 of PRC-029-1 misses the objective of FERC's directive that the RC/PC/TP/TOP should ensure that reliability is maintained while any allowed exemptions are in effect. Additionally, ERCOT believes PRC-029-1 should incentivize facility owners to explore the availability of less expensive upgrades (including hardware upgrade kits) that can remove limitations rather than allowing them to pass the burden of unmodeled limitations onto reliability entities that do not have the means to secure the system against limitations they cannot properly model. ERCOT has received information from some OEMs that some less costly upgrades (e.g., communication speed capabilities, control card updates, etc.) are available that could efficiently and cost-effectively address some limitations.

ERCOT is also concerned that the language added to Requirement R4 that allows GOs to withhold information from PCs, TPs, TOPs, and RCs if the original equipment manufacturer considers the information to be proprietary could significantly hamper efforts by these reliability-focused functional entities to accurately assess the impact of an exemption under Requirement R4. As detailed in the preceding paragraph, properly understanding the impact of an exemption is essential to reliable system operations, and it is unclear what reliability purpose is served by allowing GOs to withhold information from PCs, TPs, TOPs, and RCs, especially when GOs are still required to provide that information to the Compliance Enforcement Authority (CEA). Furthermore, it is unclear what non-reliability purpose such withholding serves. PCs, TPs, TOPs, and RCs are not commercial competitors of IBR original equipment manufacturers, and, like the CEA, these functional entities routinely and necessarily handle confidential, commercially sensitive information in the course of their day-to-day operations and are no strangers to the systems and practices necessary to manage such information.

Additionally, ERCOT is concerned that the word "replaced" in PRC-029-1 Requirement R4, Part 4.3.1 may provide a pathway to circumvent the spirit of the Standard, as it does not clearly specify whether an exemption expires when equipment is refurbished, and an argument could be made that the refurbished equipment was not "replaced." ERCOT believes that an existing exemption should no longer be needed after the underlying equipment is refurbished, and recommends using "replaced, refurbished, or updated" in Requirement R4 to clarify this point.

In the course of the development process for ERCOT's ride-through requirements, some entities indicated that some software and firmware upgrades may also require memory upgrades and sought clarity as to whether such memory upgrades would be considered "hardware" upgrades. In response, ERCOT clarified that such upgrades would be considered part of the underlying software and firmware upgrades, and ERCOT encourages NERC to include this same clarification in PRC-029-1.

Likes 0	
Dislikes 0	

Response

Jens Boemer - Electric Power Research Institute - NA - Not Applicable - NA - Not Applicable

Answer	
Document Name	2020-02_EPRI Comments on Draft 4 of NERC PRC-029 (IBR ride-through) Reliability Standard.pdf

Comment

I. Introduction

1. The Electric Power Research Institute (EPRI)[1] respectfully submits these comments (This Response) in response to North American Electric Reliability Corporation (NERC)'s request for formal comment on Project 2020-02 Modifications to PRC-024 (Generator Ride-through), issued on September 24, 2024.

2. EPRI closely collaborates with its members inclusive of electric power utilities, Independent System Operators (ISOs), and Regional Transmission Organizations (RTOs), as well as numerous other stakeholders, domestically and internationally. In its role, EPRI conducts independent research and development relating to the generation, delivery, and use of electricity for public benefit by working to help make electricity more reliable, affordable and environmentally safe. EPRI's comments on this topic are technical in nature based upon EPRI's research, development, and demonstration experience over the last 50 years in planning, analyzing, and developing technologies for electric power.

3. EPRI research and technology transfer deliverables are generally accessible on its website to the public, either for free or for purchase, and occasionally subject to licensing, export control, and other requirements.[2] The publicly available and free-of-charge milestone reports from a U.S. Department of Energy (DOE)- and EPRI member-funded research project, Adaptive Protection and Validated Models to Enable Deployment of High Penetrations of Solar PV ("PV-MOD"), [3] and other research deliverables substantiate many of the comments made in This Response.

4. While not a standards development organization (SDO), EPRI conducts research and demonstration projects in relevant areas as well as facilitates knowledge transfer and collaboration that SDOs may, at times, use to inform technical and regulatory standards development, such as in Institute of Electrical and Electronics Engineers (IEEE), International Electrotechnical Commission (IEC), International Council on Large Electric Systems (CIGRE), and NERC.[4]

5. EPRI's comments in This Response address reliability and NERC's draft PRC-029 Reliability Standards for IBRs ride-through requirements developed under project 2020-02. All comments are aimed at providing independent technical information to respond to the draft published by NERC based on EPRI's research and development results and associated staff expertise and do not necessarily reflect the opinions of those supporting and working with EPRI to conduct collaborative research and development. Where appropriate, EPRI's comments do not only address the specific questions of the NOPR but also related scope that may help to inform a final order. Some of EPRI's comments presented in This Response have also been submitted in response to the previous Federal Energy Regulatory Commission's (FERC) Notice of Proposed Rulemaking (NOPR) to direct North American Electric Reliability Corporation (NERC) to develop Reliability Standards for inverter-based resources (IBRs) that cover data sharing, model validation, planning and operational studies, and performance requirements (RM22-12), issued on November 17, 2022.

6. EPRI also submitted comments on the initial draft of PRC-029 which was issued on March 27, 2024, on Draft 2 which was issued June 18, 2024, and on Draft 3 which was issued on July 22, 2024. This 4th set of EPRI comments supports the same direction as the previously submitted comments and offers a technical analysis based on the latest “Draft 4”.[5]

II. Conclusion

7. EPRI appreciates the opportunity to provide NERC with its technical recommendations and comments on these important topics related to Reliability Standards for IBRs. EPRI looks forward to working with its members, NERC, and other stakeholders on providing further independent technical information on these important questions.

III. Contact Information

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[1] EPRI is a nonprofit corporation organized under the laws of the District of Columbia Nonprofit Corporation Act and recognized as a tax-exempt organization under Section 501(c)(3) of the U.S. Internal Revenue Code of 1996, as amended, and acts in furtherance of its public benefit mission.

EPRI was established in 1972 and has principal offices and laboratories located in Palo Alto, Calif.; Charlotte, N.C.; Knoxville, Tenn.; and Lenox, Mass. EPRI conducts research and development relating to the generation, delivery, and use of electricity for the benefit of the public. An independent, nonprofit organization, EPRI brings together its scientists and engineers as well as experts from academia and industry to help address challenges in electricity, including reliability, efficiency, health, safety, and the environment. EPRI also provides technology, policy and economic analyses to inform long-range research and development planning, as well as supports research in emerging technologies.

[2] https://www.epri.com (last accessed, August 6, 2024)

[3] PV-MOD Project Website. EPRI. Palo Alto, CA: 2024. [Online] https://www.epri.com/pvmod (last accessed, August 6, 2024)

[4] For transparency, we would like to disclose that EPRI collaborates with other organizations such as IEEE, IEC, CIGRE, and NERC; however, EPRI is not a regulatory- or standard-setting organization. EPRI research is often considered in the development of recommendations, guidelines, and best practices that are not determinative.

[5] https://www.nerc.com/pa/Stand/Pages/Project_2020-02_Transmission-connected_Resources.aspx

Likes 0	
Dislikes 0	

Response

Scott Thompson - PNM Resources - Public Service Company of New Mexico - 1,3,5 - WECC

Answer	
Document Name	

Comment

- The exemptions are only for equipment that is in-service by the effective date of PRC-029-1. The concern remains that facilities under construction at the effective date might not meet the requirements. The time needed to perform studies of the ongoing projects would be limited. Without an exemption for new equipment, we may be at risk of having to sacrifice protection to meet requirements of the standard.

If an exemption is used, the standard requires “Identification of the specific piece(s) of hardware causing the limitation” and “Technical documentation verifying the limitation is due to hardware that would need to be physically replaced to meet all Ride-through criteria”. Our existing limitation memo from one of our suppliers is vague. We are not sure how successful we would be in obtaining the required detailed information. Further, the standard requires that we “Provide a copy of the acceptance of a hardware limitation by the CEA…”. I think this means we would need the Compliance Enforcement Authority to accept our statement that there is a hardware limitation, likely making a vague response from a manufacturer unacceptable.

Likes 0	
Dislikes 0	

Response

Constantin Chitescu - Ontario Power Generation Inc. - 5

Answer	
Document Name	

Comment

OPG supports NPCC Regional Standards Committee's comments.

Likes 0	
Dislikes 0	

Response

Kyle Thomas - Elevate Energy Consulting - NA - Not Applicable - NA - Not Applicable

Answer	
Document Name	

Comment

Elevate appreciates the opportunity to comment on the draft NERC standards, particularly those pertaining to future IBR NERC Reliability Standards, and FERC Order No. 901 directives. Elevate also appreciates the revisions in the latest draft of PRC-029-01 that include the hardware limitation exemptions for frequency ride-through requirements for existing resources, and the alignment of the frequency ride-through requirements in Attachment 2 with the IEEE 2800 standard that properly balances the capabilities of IBRs today with grid reliability.

Elevate continues to strongly encourage NERC to reconsider adoption of IEEE 2800-2022. The unwillingness to adopt IEEE 2800-2022 by NERC is leading to entirely duplicative efforts that are not serving any additional value as compared to the work conducted in the IEEE 2800-2022 developments. It does not appear that a holistic approach and strategy is being taken to meet the FERC Order No. 901 directives, which is leading to very low ballot scores, significant rework, and misalignment with industry recommended practices.

The draft NERC PRC-029 is duplicative with IEEE 2800-2022 Clause 7 yet only covers a small fraction of the IBR-specific capability and performance requirements and necessary equipment limitation details that are outlined in that clause. Therefore, there is no clear reliability benefit versus the cost of implementation PRC-029 as compared with IEEE 2800-2022 and the recommendations set forth in the NERC disturbance reports and guidelines.

Concerns with Draft PRC-029

If the draft PRC-029 standard is to be pursued as currently structured, Elevate would like to highlight the following concerns listed below. These should be addressed in a future version of the standard.

· **Inconsistencies with PRC-029 and IEEE 2800-2022:** There are numerous inconsistencies in the draft standard language and attachment 1 and 2 when compared to IEEE 2800-2022. These should be considered and reviewed for clarity and completeness in the standard.

o IEEE 2800 identifies the following items, but the standard does not support. Clarification/review should occur for each of these items:

*IEEE 2800 recognizes limitations with VSC-HVDC equipment in meeting consecutive votlage deviation ride-through capabilite, the PRC-029 standard does not.

*IEEE 2800 allows for an exception for "self-protection" when negative-sequence voltage is greater than specified duration and threshold. This may be required for Type III WTG based plants, and this exception does not exist in PRC-029

*IEEE 2800 recognizes 500kV system voltages are actually operated in the range of 525kV and therefore has equipment rated to 550kV. These 500kV operating conditions and corresponding updated voltage ride-through curves should be considered in the standard.

*IEEE 2800 allows for an exception for "self-protection" when negative-sequence voltage is greater than specified duration and threshold. This may be required for Type III WTG based plants, and this exception does not exist in PRC-029

*IEEE 2800 7.2.2.1 has an exception on IBR post-disturbance current limitations for voltage disturbances that reduce RPA voltage to less than 50% of nominal. PRC-029 does not have this exception.

*For V > 1.05 and ≤ 1.10, a ride-through duration of 1800 seconds is specified in both IEEE 2800 and draft PRC-029. The IEEE 2800-2022 specifies that this ride-through duration is cumulative over a 3600 second time period. Draft PRC-029 remains silent regarding applicable cumulative time-period.

*The standard should be updated to explicitly state that the voltage ride-through curves are to be interpreted as voltage vs time duration as is stated in IEEE 2800. This is to ensure that there is no incorrect interpretation that these curves are “envelope” curves. This could be done by adding a new note to explicitly call out the voltage vs time duration interpretation of the curves.

Likes 0	
Dislikes 0	

Response

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

Answer	
Document Name	

Comment

Attachment 1 to PRC-029-1 is a set of performance-based criteria for voltage ride-through. Footnote 10 to Tables 1 and 2 in Attachment 1 is a design consideration that does not belong in a set of performance requirements. It should be removed.

Likes 0	
Dislikes 0	

Response

Nazra Gladu - Manitoba Hydro - 1

Answer	
Document Name	

Comment

(1) The wording in Section 2.1.3 is unclear. MH recommends it be changed to “Prioritize Real Power or Reactive Power **delivery** when the voltage is less than 0.95 per unit, the voltage is within the continuous operating region, and the IBR cannot deliver both Real Power and Reactive Power due to a current limit or Reactive Power limit unless otherwise specified through other mechanisms by an associated Transmission Planner, Planning Coordinator, Reliability Coordinator, or Transmission Operator.”

(2) Facilities section 4.2.1. The Elements associated with (1) Bulk Electric System (BES) IBRs. What is the IBR aggregate nameplate capacity rating (greater than or equal to 20 MVA or 75MVA)? The IBR aggregate nameplate capacity rating need to be added to 4.2.1.

Likes 0	
Dislikes 0	

Response
Rhonda Jones - Invenergy LLC - 5
Answer	
Document Name	
Comment
None
Likes 0	
Dislikes 0	
Response
Nick Leathers - Ameren - Ameren Services - 1,3,5,6 - MRO,SERC
Answer	
Document Name	
Comment
N/A
Likes 0	
Dislikes 0	
Response
Colin Chilcoat - Invenergy LLC - 6
Answer	
Document Name	
Comment
None
Likes 0	
Dislikes 0	
Response

Steven Taddeucci - NiSource - Northern Indiana Public Service Co. - 3	
Answer	
Document Name	
Comment	

NIPSCO supports the following additional comments provided by the NAGF:

a. Revise the language to include exemptions for software limits and balance of plant issues. Alternatively, clarify that a hardware limitation includes software and balance of plant equipment limitations.
b. Requirement R4 and R4.1– current draft language only applies to IBRs that are in service before the effective date of PRC-029-1. Need to consider revising to address IBRs that will be in-service 2-3 years from now and are currently in design/procurement that potentially will not be able to meet PRC-029-1 requirements. Recommend that the R4.1 12-month exemption documentation reporting criteria be extended to 36 months to address this issue.
c. Requirement R4.2.2 – the NAGF is unclear as to what the Compliance Enforcement Authority (CEA) acceptance for an IBR hardware limitation exemption will consist of. Will the CEA provide an email response confirming acceptance to the Generator Owner submitting the exemption? How are such exemptions to be submitted and to whom within the CEA organization? The CEA process needs to be defined, otherwise this requirement is not enforceable.
d. Requirement R4.3 could be interpreted such that any Ride-through capability limiting component that is replaced with a like and kind component to fully meet R1-R3 is without the ability to obtain exemption from Ride-through criteria (i.e. the exemption no longer applies). This could force the retirement of IBRs which are in-service prior to the effective date of PRC-029-1 and that have hardware failures for which a replacement component that fully meets all Ride-through criteria is not available. The NAGF provides the following revised language for consideration:
4.3.1 When existing hardware causing the limitation(s) is replaced with hardware that changes the Ride-through capability of the IBR, the exemption for that Ride-through criteria no longer applies.
4.3.1.1 If the limitations requiring exemption from R1-R3 are still present, documentation must be updated and resubmitted as required.
The proposed modifications ensure that it is clearly understood that a Generator Owner can use like-in-kind replacements for hardware components that may fail on IBRs which are in-service prior to the effective date of PRC-029-1.

Likes 0	
Dislikes 0	
Response	

Robert Blackney - Edison International - Southern California Edison Company - 1	
Answer	
Document Name	
Comment	

See comments submitted by EEI.

Likes 0	
Dislikes 0	
Response	

Hayden Maples - Hayden Maples On Behalf of: Jeremy Harris, Evergy, 3, 5, 1, 6; Kevin Frick, Evergy, 3, 5, 1, 6; Marcus Moor, Evergy, 3, 5, 1, 6; Tiffany Lake, Evergy, 3, 5, 1, 6; - Hayden Maples	
Answer	
Document Name	
Comment	
Evergy supports and incorporates by reference the comments of the Edison Electric Institute (EEI) and the Midwest Reliability Organization's NERC Standards Review Forum (MRO NSRF) on question 2	
Likes 0	
Dislikes 0	
Response	
Mark Gray - Edison Electric Institute - NA - Not Applicable - NA - Not Applicable	
Answer	
Document Name	
Comment	
EEI is concerned that the language in R3 exceeds what a GO can provide. GO's do not design their resources. They develop specifications for procurement and operate those resources within their design capabilities, as specified by the OEM. In the case of legacy resources, they have not been designed to meet the requirements contained in PRC-029 or IEEE 2800-2020. Therefore, they cannot ensure, even if they conduct an EMT analysis of that resource that it will in all cases operate in a manner that meets or exceeds these standards. To address this concern, we ask that the language in R3 be changed to better align with what GOs can meet. To address our concern, we offer the following (in boldface): **R3.** Each Generator Owner shall **provide documentation** that each IBR **is configured to** meet or exceed Ride-through requirements during a frequency excursion event whereby the System frequency remains within the "must Ride-through zone" according to Attachment 2 and the absolute rate of change of frequency (RoCoF) magnitude is less than or equal to 5 Hz/second, unless a documented hardware limitation exists in accordance with Requirement R4. *[Violation Risk Factor: High] [Time Horizon: Operations Assessment]*	
Likes 0	
Dislikes 0	
Response	
Lindsay Wickizer - Berkshire Hathaway - PacifiCorp - 6	
Answer	
Document Name	
Comment	

PacifiCorp supports EEI and MRO NSRF comments on this Standard.	
Likes 0	
Dislikes 0	
Response	
Romel Aquino - Edison International - Southern California Edison Company - 3	
Answer	
Document Name	
Comment	
see EEI comments	
Likes 0	
Dislikes 0	
Response	
Selene Willis - Edison International - Southern California Edison Company - 5	
Answer	
Document Name	
Comment	
see EEI comments	
Likes 0	
Dislikes 0	
Response	
Patricia Lynch - NRG - NRG Energy, Inc. - 5	
Answer	
Document Name	
Comment	
NRG is in support of the additional comments for consideration provided by NAGF regarding the PRC_029 draft 4.	

Likes 0	
Dislikes 0	
Response	
Martin Sidor - NRG - NRG Energy, Inc. - 6	
Answer	
Document Name	
Comment	

NRG Provides the following comments that mirror those of the NAGF.

a. Revise the language to include exemptions for software limits and balance of plant issues. Alternatively, clarify that a hardware limitation includes software and balance of plant equipment limitations.

b. Requirement R4 and R4.1– current draft language only applies to IBRs that are in service before the effective date of PRC-029-1. Need to consider revising to address IBRs that will be in-service 2-3 years from now and are currently in design/procurement that potentially will not be able to meet PRC-029-1 requirements. Recommend that the R4.1 12-month exemption documentation reporting criteria be extended to 36 months to address this issue.

c. *Requirement R4.2.2 – NRG is unclear as to what the Compliance Enforcement Authority (CEA) acceptance for an IBR hardware limitation exemption will consist of. Will the CEA provide an email response confirming acceptance to the Generator Owner submitting the exemption? How are such exemptions to be submitted and to whom within the CEA organization? The CEA process needs to be defined, otherwise this requirement is not enforceable.*

d. Requirement R4.3 could be interpreted such that any Ride-through capability limiting component that is replaced with a like and kind component to fully meet R1-R3 is without the ability to obtain exemption from Ride-through criteria (i.e. the exemption no longer applies). This could force the retirement of IBRs which are in-service prior to the effective date of PRC-029-1 and that have hardware failures for which a replacement component that fully meets all Ride-through criteria is not available. NRG agrees with the proposed NAGF revised language for consideration:

4.3.1 When existing hardware causing the limitation(s) is replaced with hardware that changes the Ride-through capability of the IBR, the exemption for that Ride-through criteria no longer applies.

4.3.1.1 If the limitations requiring exemption from R1-R3 are still present, documentation must be updated and resubmitted as required.

The proposed modifications ensure that it is clearly understood that a Generator Owner can use like-in-kind replacements for hardware components that may fail on IBRs which are in-service prior to the effective date of PRC-029-1.

Likes 0	
Dislikes 0	
Response	

Stephanie Kenny - Edison International - Southern California Edison Company - 6	
Answer	
Document Name	
Comment	
See EEI comments	
Likes 0	
Dislikes 0	
Response	
Dwanique Spiller - Berkshire Hathaway - NV Energy - 5	
Answer	
Document Name	
Comment	
NV Energy is concerned that the language in R3 exceeds what a GO can provide. GO's do not design their resources. They develop specifications for procurement and operate those resources within their design capabilities, as specified by the OEM. In the case of legacy resources, they have not been designed to meet the requirements contained in PRC-029 or IEEE 2800-2020. Therefore, they cannot ensure, even if they conduct an EMT analysis of that resource that it will in all cases operate in a manner that meets or exceeds these standards. To address this concern, we ask that the language in R3 be changed to better align with what GOs can meet. To address our concern, we offer the following (in boldface): **R3.** Each Generator Owner shall **provide documentation ensure the design and operation is such** that each IBR **is configured to** meet**s** or exceed**s** Ride-through requirements during a frequency excursion event whereby the System frequency remains within the "must Ride-through zone" according to Attachment 2 and the absolute rate of change of frequency (RoCoF) magnitude is less than or equal to 5 Hz/second, unless a documented hardware limitation exists in accordance with Requirement R4. *[Violation Risk Factor: High] [Time Horizon: Operations Assessment]*	
Likes 0	
Dislikes 0	
Response	
Brian Lindsey - Entergy - 1	
Answer	
Document Name	
Comment	

It is unclear why the CEA needs to be included in the notification of limitations. What is the CEA's role, other than a reviewer/approver and why the does the CEA need to approve or accept these limitations. Without a defined process it is unclear how this requirement can be enforced.

Likes 0	
Dislikes 0	

Response

Christine Kane - WEC Energy Group, Inc. - 3, Group Name WEC Energy Group

Answer	
Document Name	

Comment

Sections 4.1 and 4.2 call for documenting hardware limitations and reporting the same within 12 months following the effective date of PRC-029-1. As the equipment manufacturer panelists stated, they will have to evaluate each site individually. Given the number of legacy units in service and the number of units that will connect to the grid before the effective date of the standard, evaluating all the data and providing necessary attestations within a 12 month period is not practical. The equipment manufacturer panelists also stated that resources will be an issue. More time is needed to document all this.

WEC Energy Group suggests that the SDT create and add graphs to support Tables 1 and 2 and the respective notes. Graphs should highlight "must Ride-through zone" and "may Ride-through zone" terms that are listed in note 11. One of the early revisions had a graph. Why was it removed?

WEC Energy Group requests that an Implementation Guidance document be created and published to help industry better understand this convoluted and unclear standard and how to implement it.

Likes 0	
Dislikes 0	

Response

Hillary Creurer - Allete - Minnesota Power, Inc. - 1

Answer	
Document Name	

Comment

MP supports the MRO NSRF comments regarding Requirement 4.3. MP also supports EEI's comments regarding Requirement 3

Likes 0	
Dislikes 0	

Response

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

Comment

The NAGF provides the following comments for consideration:

a. Revise the language to include exemptions for software limits and balance of plant issues. Alternatively, clarify that a hardware limitation includes software and balance of plant equipment limitations.

b. Requirement R4 and R4.1– current draft language only applies to IBRs that are in service before the effective date of PRC-029-1. Need to consider revising to address IBRs that will be in-service 2-3 years from now and are currently in design/procurement that potentially will not be able to meet PRC-029-1 requirements. Recommend that the R4.1 12-month exemption documentation reporting criteria be extended to 36 months to address this issue.

c. *Requirement R4.2.2 – the NAGF is unclear as to what the Compliance Enforcement Authority (CEA) acceptance for an IBR hardware limitation exemption will consist of. Will the CEA provide an email response confirming acceptance to the Generator Owner submitting the exemption? How are such exemptions to be submitted and to whom within the CEA organization? The CEA process needs to be defined, otherwise this requirement is not enforceable.*

d. Requirement R4.3 could be interpreted such that any Ride-through capability limiting component that is replaced with a like and kind component to fully meet R1-R3 is without the ability to obtain exemption from Ride-through criteria (i.e. the exemption no longer applies). This could force the retirement of IBRs which are in-service prior to the effective date of PRC-029-1 and that have hardware failures for which a replacement component that fully meets all Ride-through criteria is not available. The NAGF provides the following revised language for consideration:

4.3.1 When existing hardware causing the limitation(s) is replaced with hardware that changes the Ride-through capability of the IBR, the exemption for that Ride-through criteria no longer applies.

4.3.1.1 If the limitations requiring exemption from R1-R3 are still present, documentation must be updated and resubmitted as required.

The proposed modifications ensure that it is clearly understood that a Generator Owner can use like-in-kind replacements for hardware components that may fail on IBRs which are in-service prior to the effective date of PRC-029-1.

Likes 0	
Dislikes 0	

Response

Maozhong Gong - GE - GE Wind - NA - Not Applicable - NA - Not Applicable	
Answer	
Document Name	

Comment

Since the first wind turbine was installed in the U.S., product development across the industry has continued to evolve and advance. This evolution is a benefit for the industry because we have been able to install advanced technologies. However, this also means we have varying degrees of assets installed. For this reason, we strongly believe NERC needs to implement policies that recognize the distinctions between the operational fleet/assets

and newly deployed units and establish different/distinct regulations for each. During the Technical Conference, several participants, including individuals participating in the pool process, highlighted the need for this distinguishment. It was suggested the applicability of PRC-024-3 ride-through requirements for installed assets, while applicability of PRC-029-1, aligned with IEEE 2800-2020, for newly deployed assets. While we understand NERC's rationale to not "leave capability on the table", there will be significant administrative challenges to apply for exemptions putting asset owners and OEMs at risk of not being able to fulfill the request. As stated by Arne Koerber, Executive for GE Vernova's Wind Product Management, during the Technical Conference, proving that a capability is not possible is significantly more difficult than proving specific capability. A detailed system study for multiple product variants with multiple components configurations would be required to determine hardware limitations, which is unpractical and in certain cases unfeasible for older units. Some of the challenges with this effort could include: components' vendors may no longer be in business and/or, lab setups or prototypes may no longer be in service.

There are other items that were discussed in the Technical Conference which we would like to highlight:

• IEEE 2800-2022 standard was not developed with the intent to impact existing assets, but with the intent to standardize requirements applicable tonew IBRs installations to support the grid of the future.

• Retroactive requirements diverge the focus of OEMs from developing new and modern products to fulfill the most challenging grid needs of the future.

• OEMs stated the need of ~5 years cycle to develop new products with the advanced capabilities stated. Yet, the implementation plan schedule hasn't changed to allow the entire window suggested by FERC, which is by 2030.

We strongly recommend:

1. Proposing PRC-024-3 requirements to installed assets, while keeping PRC-029-1 aligned to IEEE 2800-2022 for new assets.

2. Developing an exemption process that is based on "product capabilities" and not focusing on "hardware limitations". This will better demonstrate what the industry can do to comply with the provision.

3. Timing for compliance to be extended to the maximum allowed period given by FERC, which is by 2030.

Furthermore, we are concerned that policies are becoming too complex that the much-needed focus on zero emitting technologies are being put at risk. We included the number of GE Vernova assets impacted in two sections below; however, we strongly urge NERC to conduct a thorough analysis across the industry of all generation assets that would have to comply, including timing of compliance, units that may be unable to comply, and most importantly impact to the system if certain units cannot comply.

Proposed requirements for new installations:

Requirements which we are concerned for new installations after PRC-029 compliance date:

o **Multiple fault ride-through from Attachment 1, item 9**:

PRC-029-1 Draft 4 Proposal: While IEEE 2800-2022 allows IBRs to trip for more than two deviations for voltage levels below 0.25pu, PRC-029-1 requires more than 4 deviations for any voltage level. Also, IEEE 2800 allows wind turbines to trip on multiple faults to self-protect against mechanical resonance that exceed equipment limits.

GE Vernova's ONW concerns: Riding-through multiple subsequent voltage excursions have significant mechanical and electrical stress on assets, specially at lower voltage levels (i.e. <0.25pu). It can significantly increase mechanical loads when multiple faults are spaced too close to the drive train frequency. Since the release and start of adoption of IEEE 2800-2022 requirements across North America, GE Vernova ONW is working on updating current products' design to meet or exceed proposed requirements. As an OEM, consistent requirements allow us to plan and execute product development cycles efficiently and supports offering products with a wide applicability.

GE Vernova's ONW recommendations: Align with IEEE 2800-2022, section 7.2.2.4, for consistency to IEEE 2800- 2022 efforts to harmonize requirements across North America.

o **Instantaneous trip settings from Attachment 1, item 10**:

PRC-029-1 Draft 4 Proposal: Instantaneous trip settings based on instantaneously calculated voltage measurements with less than filtering lengths of one cycle (16.6 millisecond) are not permissible.

GE Vernova's ONW concerns: The power electronics in individual inverter-based resources require sub-cycle overvoltage protection with fast filtering. It is infeasible to filter for a cycle to trip on extreme sub-cycle overvoltages that would cause equipment damage. The choice here is to protect generation by tripping followed by an auto-restart in a few minutes vs equipment damage followed by a trip (caused by equipment damage).

GE Vernova's ONW recommendations: Align with IEEE 2800-2022 which requires one cycle filtering for plant level disconnection and specify sub-cycle transient overvoltage requirements that IBRs have to ride through.

Proposed requirements for legacy installations:

Requirements which we are concerned for legacy installations prior PRC-029 compliance date:

o **Frequency ride-through from Attachment 2, Table 3:**

PRC-029-1 Draft Proposal: PRC-029-1 proposes frequency ride-through curve similar to IEEE 2800-2022, Section 7.3.2.1, retroactive for installed assets. GE Vernova's ONW concerns: While meeting this curve is not a concern for current products and legacy products since PRC-024-1 implementation, it is a concern however that a substantial number of turbines installed prior to 2014 do not fully meet the curve. These products represent over 20GW of units installed in North America. For type 3 wind turbines, grid frequency determines the synchronous speed which in turn determines the slip. Larger frequency deviations result in higher slip which results in higher voltages on the rotor side converter. Additionally auxiliary devices such as motors are impacted. Evaluation of potential design impact is ongoing; however, at this point GE Vernova's ONW cannot confirm whether such changes will impact hardware. These turbines meet or exceed the grid requirements that were in place at the time of installation.

GE Vernova's ONW recommendations: Apply PRC-024-3 requirements to installed assets. If frequency ride through capability of the product is higher than requirements, these assets are set to the maximum product capability. GE Vernova does not commission wind turbines to operate at the frequency ride-through requirement capability, but rather at the product capability, which meets or exceeds requirements that were enforced at the time assets were installed.

o **Voltage ride-through from Attachment 1, Table 1**:

PRC-029 proposal: PRC-029-1 proposes voltage ride-through curve similar to IEEE 2800-2022, Section 7.2.2.1.

GE Vernova's ONW concerns: For all installed GE Vernova ONW wind turbine variants with enabled Zero Voltage Ride-Through capability (ZVRT), voltage ride-through curve may potentially be met at POI due to the voltage drops across the wind plant collector system and the substation transformer, but only project specific evaluation can confirm it. Note that ZVRT is an available parametrization-only upgrade to GE Vernova's ONW legacy wind turbines. These products represent the entirety of the installed base in North America. Changes to the wind turbine voltage ride-through capability to meet the proposed curve, require the rotor to withstand additional mechanical loads during voltage excursions. Power path, critical auxiliary devices, rotor side converter and dynamic braking circuit might require re-design to handle energy dump from the generator. Evaluation of potential design impact is ongoing; however, at this point GE Vernova's ONW cannot confirm whether such changes will impact hardware. While a full assessment on a per product variant will take time, potential turbine modifications include replacement of auxiliaries (i.e. motors), changes to operating rotor RPM curves reducing turbine energy production, and full (in the case of the oldest turbines) or partial replacement of converters. These turbines meet or exceed the grid requirements that were in place at the time of installation.

GE Vernova's ONW Recommendations: Apply PRC-024-3 requirements to installed assets. GE Vernova offers ZVRT which helps legacy plants in meeting or exceeding voltage ride-through requirements of PRC-024-3.

o **Multiple fault ride-through from Attachment 1, item 9**:

PRC-029-1 Draft 4 proposal: While IEEE 2800-2022 allows IBR to trip for more than two deviations for voltage levels below 0.25pu, PRC-029-1 states more than 4 deviations for any voltage level. Also, IEEE 2800 allows wind turbines to trip on multiple faults to self-protect against mechanical resonance that exceed equipment limits.

GE Vernova's ONW concerns: Riding-through multiple subsequent voltage excursions have significant mechanical and electrical stress on assets, specially at lower voltage levels (i.e. <0.25pu). It can significantly increase mechanical loads when multiple faults are spaced too close to the drive train frequency, and in the worst case require significant upgrades to the mechanical drive train.

GE Vernova's ONW recommendations: We recommend turbines to be required to attempt to ride through multiple voltage events and not trip on number of subsequent voltage deviations alone but allowed to trip to protect the integrity of the mechanical system e.g. if using devices such as slip couplings.

o **Instantaneous trip settings from Attachment 1, item 10**:

PRC-029-1 Draft 4 Proposal: Instantaneous trip settings based on instantaneously calculated voltage measurements with less than filtering lengths of one cycle (16.6 millisecond) are not permissible.

GE Vernova's ONW concerns: The power electronics in individual inverter-based resources require sub-cycle overvoltage protection with fast filtering. It is infeasible to filter for a cycle to trip on extreme sub-cycle overvoltages that would cause equipment damage. The choice here is to protect generation by tripping followed by an auto-restart in a few minutes vs equipment damage followed by a trip (caused by equipment damage).

GE Vernova's ONW recommendations: Align with IEEE 2800-2022 which requires one cycle filtering for plant level disconnection and specify sub-cycle transient overvoltage requirements that IBRs have to ride through.

Likes 0	
Dislikes 0	

Response

John Pearson - ISO New England, Inc. - 2

Answer	
Document Name	

Comment

ISO New England supports the IBR requirements in this PRC-029-1 draft. R4 of this PRC-029-1 draft provides an exemption for IBRs in-service by the effective date of the standard that have hardware limitations that prevent them from meeting Ride-through criteria as detailed in Requirements R1-R3. ISO New England supports this exemption since the new requirements in PRC-029-1 were not applicable when developers procured and constructed such IBRs. ISO New England is concerned that this exemption is insufficient in scope. Specifically, R4 will become effective before projects that, at this time, have a) completed the required interconnection studies according to applicable standards at that time, and b) have procured equipment and are under construction, but c) will not yet be in-service at the time the standard becomes effective within approximately the next three years. Permitting, procurement and construction often take years after a project completes its interconnection studies (where the project is studied to ensure reliability per the standards in effect at the time), especially considering today's development timelines and supply chain issues. Imposing new requirements at later development stages can cause delays and introduce compliance burdens that were not possible to anticipate during the project analysis and equipment procurement phases to planned projects that are well on their way to completing their interconnection.

Likes 0	
Dislikes 0	

Response	
Jodirah Green - ACES Power Marketing - 1,3,4,5,6 - MRO,WECC,Texas RE,SERC,RF, Group Name ACES Collaborators	
Answer	
Document Name	
Comment	

It is the opinion of ACES that the language surrounding the applicability of the exemption criteria specified in Requirement R4 should be consistent in Requirements R1-R3. As written, both Requirements R2 and R3 contain the phrase “unless a documented hardware limitation exists in accordance with Requirement R4” whereas Requirement R1 only allows for an “accepted hardware limitation” for voltage at the “high-side of the main power transformer”.

Furthermore, we believe that the phrase “and is initiated by a non-fault switching event on the transmission system” should be struck from the 3rd bullet point of Requirement R1. We contend that, as written, Requirement R1 requires the IBR to meet or exceed Ride-through requirements during a fault event for any value of the instantaneous positive sequence voltage phase angle while simultaneously allowing the IBR to trip (or initiate current blocking) during a non-fault switching event. It is our opinion that the GO will likely be unable to differentiate between an event initiated by a fault or an event initiated by a “non-fault switching event” on the Transmission system. In short, Transmission switching events are outside the purview of the GO.

We recommend the following language for Requirement R1.

R1. Each Generator Owner shall ensure the design and operation is such that each IBR meets or exceeds Ride-through requirements, in accordance with the “must Ride-through zone” as specified in Attachment 1, except in the following conditions: [Violation Risk Factor: High] [Time Horizon: Operations Assessment]

• Unless a documented hardware limitation exists in accordance with Requirement R4;

• The IBR needed to electrically disconnect in order to clear a fault;

• The instantaneous positive sequence voltage phase angle change is more than 25 electrical degrees at the high-side of the main power transformer; or

• The Volts per Hz (V/Hz) at the high-side of the main power transformer exceed 1.1 per unit for longer than 45 seconds or exceed 1.18 per unit for longer than 2 seconds.

We at ACES appreciate the work put forth by the SDT and the SC to listen and respond to Industry comments, particularly with respect to the exemption process. However, we continue to have concerns surrounding the language or Requirement R4, specifically part 4.3. It is our opinion that, as written, R4 part 4.3 does not allow for “like in kind” replacement of failed hardware. We recommend using the following language for Requirement R4 part 4.3:

4.3. Except as specified in Requirement R4, Part 4.3.2 below, each Generator Owner with a previously accepted limitation that replaces the hardware causing the limitation shall document and communicate such a hardware change to the associated Planning Coordinator(s), Transmission Planner(s), Transmission Operator(s), and Reliability Coordinator(s) within 90 days of the hardware change.

4.3.1. Except as specified in Requirement R4, Part 4.3.2 below, when existing hardware causing the limitation is replaced, the exemption for that Ride-through criteria no longer applies.

4.3.2. Replacement hardware with the same capabilities and limitations of the existing hardware (commonly referred to as a “like-in-kind” replacement) shall be exempt from Requirement R4, Part 4.3.

Thank you for the opportunity to comment.

Likes 0	
Dislikes 0	

Response

Rachel Schuldt - Black Hills Corporation - 6, Group Name Black Hills Corporation - All Segments

Answer	
Document Name	

Comment

Black Hills Corporation agrees with what EEI has stated: "…EEI is concerned that the language in R3 exceeds what a GO can provide. GO's do not design their resources. They develop specifications for procurement and operate those resources within their design capabilities, as specified by the OEM. In the case of legacy resources, they have not been designed to meet the requirements contained in PRC-029 or IEEE 2800-2020. Therefore, they cannot ensure, even if they conduct an EMT analysis of that resource, that it will in all cases operate in a manner that meets or exceeds these standards."

Additionally, the NAGF in their additional comments made some great comments and modified change suggestions that Black Hills Corporation supports to help ensure clarity to this standard.

Likes 0	
Dislikes 0	

Response

Anna Martinson - MRO - 1,2,3,4,5,6 - MRO, Group Name MRO Group

Answer	
Document Name	2020-02_Unoffical_Comment_Form_09172024 - NSRF.docx

Comment

MRO NSRF would recommend the following modifications to Requirement 4.3.

4.3. Each Generator Owner with a previously accepted limitation that replaces the hardware causing the limitation shall document and communicate such a hardware change to the associated Planning Coordinator(s), Transmission Planner(s), Transmission Operator(s), and Reliability Coordinator(s) within 90 days of the hardware change.

4.3.1 When existing hardware causing the limitation(s) is replaced with hardware that changes the Ride-through capability of the IBR, the exemption for that Ride-through criteria no longer applies.

4.3.1.1 If the limitations requiring exemption from R1-R3 are still present, documentation must be updated and resubmitted as required.

These modifications ensure that it is clearly understood that a Generator Owner can use like-in-kind replacements for hardware components that may fail on IBRs which are in-service prior to the effective date of PRC-029-1.

As currently written, R4.3 could be interpreted such that if any Ride-through capability limiting component is replaced, the IBR would be required to fully meet R1-R3 without the ability to obtain exemption from Ride-through criteria. This could force the retirement of IBRs which are in-service prior to the

effective date of PRC-029-1 and that have hardware failures for which only like-in-kind replacements or replacement components that fully meets all Ride-through criteria are not available.

Additional MRO NSRF concerns include:

Frequency exemptions are currently limited to “hardware” only, MRO NSRF suggests that clarifying language be added to indicate that if “upgraded” software is not available the issue then then hardware exemption is acceptable.

Multiple manufacturers have indicated their inverters are capable, but they could not obtain specifications from supporting equipment manufacturers and that it would be extremely difficult to determine if the entire plant could ride through an excursion event and that facilities may trip due to ancillary equipment.

This issue with obtaining information for balance-of-plant equipment paired with the fact that all vendors at the NERC Technical conference agreed EMT studies would be required to verify facility level ride through capability leads to a great deal of concern regarding the ability to determine ride through capability for facilities in their entirety.

Additionally, the time required to develop EMT studies for the number of impacted facilities could be extremely challenging for GOs due to the limited resources available.

MRO NSRF is also concerned that the timeline for implementation could be extremely problematic if the effective date set forth by FERC is too soon. This could impact projects that are already under development and were not designed to IEEE 2800 requirements, providing many facilities that are coming online with no viable path to compliance.

Likes 0	
Dislikes 0	

Response

Ruchi Shah - AES - AES Corporation - 5

Answer	
Document Name	

Comment

AES Clean Energy strongly supports the revisions that have been made and we greatly appreciate the efforts of the Standard Drafting Team and Standards Committee. Throughout the NERC Ride-through Technical Conference and in formal comments we raised concerns that R4 exemptions do not consider out of business OEMs and the possibility that limitations may not be hardware-based. AES Clean Energy offers the following suggestions to address these concerns:

1. Update the following language that has recently been added to the PRC-028 Technical Rationale and include in the PRC-029 Technical Rationale:

PRC-028 Technical Rationale Excerpt

“It is recognized that the manufacturer of an IBR unit in commercial operation before the effective date of this standard may be out of business, acquired by, or merged with another manufacturer. In such cases, if the entity is not able to determine capability of IBR unit to record the required SER data, the SER data is not required. Documentation should be retained to demonstrate that entity is unable to determine IBR unit recording capability from available manufacturer data either from an original manufacturer or from an acquiring manufacturer.”

Suggested PRC-029 Technical Rationale Addition

"It is recognized that the manufacturer of an IBR unit in commercial operation before the effective date of this standard may be out of business, acquired by, or merged with another manufacturer. In such cases, if the entity is not able to determine capability of IBR to meet Ride-through criteria as detailed in Requirements R1-R3, the IBR will be exempt from PRC-029. Documentation should be retained to demonstrate that entity is unable to determine IBR performance capability from available manufacturer data either from an original manufacturer or from an acquiring manufacturer."

2. Update the language in R4 to allow exemptions that are not hardware-based.

R4. Each Generator Owner identifying an IBR that is in-service by the effective date of PRC-029-1, has known hardware limitations that prevent the IBR from meeting Ride-through criteria as detailed in Requirements R1-R3, and requires an exemption from specific Ride-through criteria shall*:10 [Violation Risk Factor:Lower] [Time Horizon: Long-term Planning]*

4.1. Document information supporting the identified hardware limitation no later than 12 months following the effective date of PRC-029-1. This documentation shall include:

4.1.1 Identifying information of the IBR (name and facility number);

4.1.2 Which aspects of Ride-through requirements that the IBR would be unable to meet and the capability of the hardware IBR due to the limitation;

4.1.3 Identify the specific cause of piece(s) of hardware causing the limitation;

4.1.4 For hardware-based limitations, Ttechnical documentation verifying the limitation is due to hardware that would need to be physically replaced to meet all Ride-through criteria, and that the limitation cannot be removed by software updates or setting changes, and;

4.1.5 Information regarding any plans to remedy the hardware limitation (such as an estimated date).

3. Some consideration should be given that projects being placed in-service shortly after the Standard effective date will have been designed and procured several years prior and may require exemptions under R4. The first sentence of the requirement can be revised as follows:

"R4. Each Generator Owner identifying an IBR that reaches commercial operation is in-service before or within 24 months of by the effective date of PRC-029-1,…"

The following footnote from PRC-028 on commercial operation should be included for consistency:

"Commercial operation means achievement of this designation indicating that the facility has received all approvals necessary for operation after completion of initial start-up testing."

Likes 0	
Dislikes 0	

Response

Marcus Bortman - APS - Arizona Public Service Co. - 6

Answer	
Document Name	

Comment

AZPS supports the following comments that were submitted by EEI on behalf of their members:

EEI is concerned that the language in R3 exceeds what a GO can provide. GO's do not design their resources. They develop specifications for procurement and operate those resources within their design capabilities, as specified by the OEM. In the case of legacy resources, they have not been designed to meet the requirements contained in PRC-029 or IEEE 2800-2020. Therefore, they cannot ensure, even if they conduct an EMT analysis of that resource that it will in all cases operate in a manner that meets or exceeds these standards. To address this concern, we ask that the language in R3 be changed to better align with what GOs can meet. To address our concern, we offer the following (in boldface):

R3. Each Generator Owner shall provide documentation that each IBR is configured to meet or exceed Ride-through requirements during a frequency excursion event whereby the System frequency remains within the "must Ride-through zone" according to Attachment 2 and the absolute rate of change of frequency (RoCoF) magnitude is less than or equal to 5 Hz/second, unless a documented hardware limitation exists in accordance with Requirement R4. *[Violation Risk Factor: High] [Time Horizon: Operations Assessment]*

Likes 0	
Dislikes 0	

Response

Joshua London - Eversource Energy - 1, Group Name Eversource

Answer	
Document Name	

Comment

Eversource supports the comments of EEI.

Likes 0	
Dislikes 0	

Response

Dane Rogers - Dane Rogers On Behalf of: Donald Hargrove, OGE Energy - Oklahoma Gas and Electric Co., 3, 1, 5, 6; - Dane Rogers, Group Name OG&E

Answer	
Document Name	

Comment

OG&E Supports comments submitted by MRO NSRF.

Likes 0	

Dislikes 0	

Response

Tim Kelley - Tim Kelley On Behalf of: Charles Norton, Sacramento Municipal Utility District, 3, 6, 4, 1, 5; Foung Mua, Sacramento Municipal Utility District, 3, 6, 4, 1, 5; Kevin Smith, Balancing Authority of Northern California, 1; Nicole Looney, Sacramento Municipal Utility District, 3, 6, 4, 1, 5; Ryder Couch, Sacramento Municipal Utility District, 3, 6, 4, 1, 5; Wei Shao, Sacramento Municipal Utility District, 3, 6, 4, 1, 5; - Tim Kelley, Group Name SMUD and BANC

Answer	
Document Name	

Comment

SMUD appreciates the actions taken by the Standard Drafting Team and the Steering Committee to revise the language in Section 4, Applicability so that it matches the Applicability language in PRC-028-1 and PRC-030-1. This was a minor but important change to ensure uniformity among this first set of IBR Standards.

SMUD is voting Affirmative on this draft #4 but believes that the term “in-service” in Requirement R4 is too vague and needs to be defined in either a future version of PRC-029, Implementation Guidance, or a CMEP Practice Guide. Entities who are planning, designing and constructing IBRs today with slightly older equipment could be caught in a Catch-22 if their project is delayed and the exemption from specific Ride-through criteria in Requirement R4 is dependent upon whether the project is “in-service” or not. The term in-service could be confused with the project’s energization date, commercial operation date, or other operational condition during construction and commissioning. For reference, Requirement R4 is listed here:

R4. Each Generator Owner identifying an IBR that is in-service [emphasis added] by the effective date of PRC-029-1, has known hardware limitations that prevent the IBR from meeting Ride-through criteria as detailed in Requirements R1-R3, and requires an exemption from specific Ride-through criteria shall: [Violation Risk Factor: Lower] [Time Horizon: Long-term Planning]

Likes 0	
Dislikes 0	

Response

Alison MacKellar - Constellation - 5

Answer	
Document Name	

Comment

1. The standard does not include exemption for instances when a transformer differential protection trip during a fault beyond our control. As written, IBR unit will be out of compliance.

2. The standard language in R4 mentions exception regarding hardware limitation but no mentions of software limitation. It should be added to avoid confusion.

3. Legacy sites may not be able to meet the new proposed FRT and VRT curves. Language in the standard needs to capture that and allow them to operate with max. capability without compliance repercussions.

4. Damage curve may not be an easy evidence document to get from OEM. It’s considered intellectual proprietary documentation.

Alison Mackellar on behalf of Constellation Segments 5 and 6

Likes 0	
Dislikes 0	

Response

Kimberly Turco - Constellation - 6

Answer	
Document Name	

Comment

1. The standard does not include exemption for instances when a transformer differential protection trip during a fault beyond our control. As written, IBR unit will be out of compliance.

2. The standard language in R4 mentions exception regarding hardware limitation but no mentions of software limitation. It should be added to avoid confusion.

3. Legacy sites may not be able to meet the new proposed FRT and VRT curves. Language in the standard needs to capture that and allow them to operate with max. capability without compliance repercussions.

4. Damage curve may not be an easy evidence document to get from OEM. It’s considered intellectual proprietary documentation.

Kimberly Turco on behalf of Constellation Segments 5 and 6.

Likes 0	
Dislikes 0	

Response

Natalie Johnson - Enel Green Power - 5

Answer	
Document Name	

Comment

The Implementation Plan mandates compliance within 12 months of the effective date. This timeframe is insufficient to complete necessary studies, acquire additional documentation from IBR manufacturers if required, and submit the data to the Planning Coordinator, Transmission Planner, Transmission Operator, Reliability Coordinator, and Compliance Enforcement Authority (CEA).

Moreover, the standard does not clearly specify a procedure nor a timeframe for the CEA to accept or deny a hardware limitation. Consequently, 12 months is insufficient for both the GO to collect the data required in Requirement R4.1 and for the CEA to evaluate and determine acceptance or denial of any hardware limitations needing an exemption from specific Ride-through criteria.

Likes 0	
Dislikes 0	

Response

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

Answer	
Document Name	

Comment

Althought WECC voted affirmative, WECC suggests the following for clarity, and believes these are all non-substantive changes and would not require reposting. WECC suggests adding (IBR) after "Inverter-Based Resource" in the title or identifying IBR in the "Purpose" (or in Requirement R1). Part 4.2 should say “manufacturer” for OEM not “manufacture”. Requirement R4 Part 4.2.1 needs rewritten for clarity (remove “shall be provided”) The word "Provide" was added at the beginning. In Requirement R4 Part 4.3, the CEA will not know if the limitation has been mitigated as there is no obligation to inform the CEA yet the VSLs include the CEA (last of the “Or” statements for each level.) Should Table 2 for 1.10 pu be shown as ”≥ 1.10” (as in Table 1) and not simply “> 1.10”?

Likes 0	
Dislikes 0	

Response

Mark Garza - FirstEnergy - FirstEnergy Corporation - 4, Group Name FE Voter

Answer	
Document Name	

Comment

FirstEnergy requests DT consider adding a range of return to pre-disturbance real power output. To satisfy R2.5 as written, IBR sites would need to operation in static VAR control rather than desired automatic voltage control (system actively adjusting VARs to control voltage). This would maintain a static power factor on the sties that would fail to provide effective voltage support due to manual intervention required to adjust VAR setpoint, not allowing for immediate response to voltage changes. This weakened response to voltage changes could result less stable grid voltage and increased potential for voltage trips, which does not align with the intent of the Standard. Changing this to provide a range from the pre-disturbance real power output would allow for change in setpoint for IBR operation during a transient such that this automatic voltage control could be utilized, improving voltage support from IBR generators and enhancing IBR stability and reliability.

In addition, the Standard uses the term “available power” in R2.5 for an acceptable return limit. This term is not defined and cannot be numerically determined at this time. FirstEnergy requests for DT to provide a definition for this term and a specific numerical methodology for determining “available power” at a solar site for given conditions.

Likes 0	
Dislikes 0	

Response

Jeffrey Streifling - NB Power Corporation - 1	
Answer	
Document Name	
Comment	
Attachment 1 to PRC-029-1 Draft 4 is a set of performance-based criteria for voltage ride-through. Footnote 10 to Tables 1 and 2 in said Attachment 1 is a design consideration that does not belong in the set of performance requirements. It should be removed.	
Likes 0	
Dislikes 0	
Response	
Jennifer Bray - Arizona Electric Power Cooperative, Inc. - 1	
Answer	
Document Name	
Comment	
AEPC signed on to ACES comments, please see their commments.	
Likes 0	
Dislikes 0	
Response	
Donna Wood - Tri-State G and T Association, Inc. - 1	
Answer	
Document Name	
Comment	
NA	
Likes 0	
Dislikes 0	
Response	
Karl Blaszkowski - CMS Energy - Consumers Energy Company - 3	

Answer	
Document Name	
Comment	

The exemptions are only for equipment that is in-service by the effective date of PRC-029-1. The concern remains that facilities under construction at the effective date might not meet the requirements. The time needed to perform studies of the ongoing projects would be limited. Without an exemption for new equipment, we may be at risk of having to sacrifice protection to meet requirements of the standard.

If an exemption is used, the standard requires “Identification of the specific piece(s) of hardware causing the limitation” and “Technical documentation verifying the limitation is due to hardware that would need to be physically replaced to meet all Ride-through criteria”. Our existing limitation memo from one of our suppliers is vague. We are not sure how successful we would be in obtaining the required detailed information. Further, the standard requires that we “Provide a copy of the acceptance of a hardware limitation by the CEA…”. I think this means we would need the Compliance Enforcement Authority to accept our statement that there is a hardware limitation, likely making a vague response from a manufacturer unacceptable.

Likes 0	
Dislikes 0	
Response	

Thomas Foltz - AEP - 5	
Answer	
Document Name	
Comment	

While AEP appreciates the revisions to R4.2 which limits the sharing of material deemed proprietary by the manufacturer, the obligations (including footnote 11) nonetheless assume that the GO will still be able to obtain that material. If a manufacturer considers such information to be proprietary, it would be unlikely they would be willing to share it with the GO, even if the GO is obligated to obtain it in the standard. AEP recommends the removal of footnote 11 or that exclusions be included to accommodate situations where the manufacturer refuses to provide proprietary information to the GO.

AEP recommends removing the phrase “demonstrate the design of each IBR” from the proposed standard and returning to the original event-based requirements. The phrase may prove difficult to fully comply with, as a Functional Entity would have to know the design of the collector system and parameters and run the models correctly to demonstrate this. Much of this needed information would need to be provided by the manufacturer, which may require non-disclosure agreements.

If the design aspect is retained, then AEP offers the following: R1, R2 and R3 state, “Each Generator Owner shall ensure the design and operation is such…” Operation of the equipment is the GOP’s responsibility, not the GO’s. If the SDT’s intention was regarding the design of the system, AEP recommends revising the language to instead state, “Each Generator Owner shall ensure the *operational design* is such…”.

AEP is concerned by the inclusion of the phrase “through other mechanisms” in this standard, and recommend it be removed from Requirements 2.1.3, 2.2, and 2.5 as we believe it could be misinterpreted or misunderstood. It is not clear how the obligations are or are-not met when “through other mechanisms” is introduced. For example, if the TOP would need the GO to do “X” instead of “Y”, and if the GO fails to do “X”, has the GO failed to comply with the obligation or does this put the requirement *outside* of the standard? AEP instead recommends using the language from the Technical Rationale which references “or according to requirements specified.”

AEP believes the text “Provide any response to additional information requested” in R 4.2.1 is confusing and should be clarified, as it is not clear what the intended meaning or purpose is of “any response.” AEP suggests it instead state “Provide any additional information requested by the

associated…”.

There needs to be an exemption for system-related causes of ride-through failure. IBRs should be exempt from ride-through requirements in R1 through R3 if tripping or failure to ride through is attributable to any of the following:
1. Sub-synchronous control interaction or ferro-resonance involving series compensation confirmed by the TOP, RC, TP, or PC
2. Unstable behavior of other nearby IBRs or dynamic devices such as FACTS or HVDC confirmed by the TOP, RC, TP, or PC
3. System short circuit levels during contingencies below the level of IBR stable operation confirmed by the TOP, RC, TP, or PC
4. System-level transient or oscillatory instabilities confirmed by the TOP, RC, TP, or PC

Likes 0	
Dislikes 0	

Response

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

Answer	
Document Name	

Comment

The exemptions are only for equipment that is in-service by the effective date of PRC-029-1. The concern remains that facilities under construction at the effective date might not meet the requirements. The time needed to perform studies of the ongoing projects would be limited. Without an exemption for new equipment, we may be at risk of having to sacrifice protection to meet requirements of the standard.

If an exemption is used, the standard requires “Identification of the specific piece(s) of hardware causing the limitation” and “Technical documentation verifying the limitation is due to hardware that would need to be physically replaced to meet all Ride-through criteria”. Our existing limitation memo from one of our suppliers is vague. We are not sure how successful we would be in obtaining the required detailed information. Further, the standard requires that we “Provide a copy of the acceptance of a hardware limitation by the CEA…”. I think this means we would need the Compliance Enforcement Authority to accept our statement that there is a hardware limitation, likely making a vague response from a manufacturer unacceptable.

Likes 0	
Dislikes 0	

Response

Andy Thomas - Duke Energy - 1,3,5,6 - SERC,RF

Answer	
Document Name	

Comment

Revise Standard Section A. Introduction, 4. Applicability, 4.2 Facilities, 4.2.2, for the phrase “connected through a system designed primarily for delivering such capacity to a common point of connection at a voltage greater than or equal to 60 kV.”. Most GO’s do not have the ability to assess the “common point of connection”. Either an action to ensure TO notifies GO of applicability or change to the “point of interconnect” is required.

Revise Technical Rationale to define the mechanism and associated parameters of an “event trigger” for the GO since it is not defined, and guidance is required. Revise Standard R4.2 to include a time limitation for the CEA to accept or reject a hardware limitation. Failure to define the time limitation leaves the GO subject to compliance risks and a possible noncompliance. Additionally, define process actions for a potential CEA denial, appeal process, etc. For Standard R4.1, define if month is “calendar” month, otherwise, define time-period for “Document information supporting the identified hardware limitation no later than 12 months following the effective date of PRC-029-1…”.

Likes 0	
Dislikes 0	

Response