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| **NOGRR Number** | [**245**](https://www.ercot.com/mktrules/issues/NOGRR245) | **NOGRR Title** | **Inverter-Based Resource (IBR) Ride-Through Requirements** |
| **Date of Decision** | June 7, 2024 |
| **Action** | Recommended Approval |
| **Timeline** | Urgent  |
| **Estimated Impacts** | Cost/Budgetary: Between $150k and $250k; Between $1.3M and $1.8M (Annual Recurring O&M); Between $0.5M and $0.8M (Short term contract labor O&M) Project Duration: 6 to 9 months  |
| **Proposed Effective Date**  | First of the month following Public Utility Commission of Texas (PUCT) approval for all sections, with the exception of the grey-boxed paragraph (4)(c) of Section 2.12.1, which will be effective no earlier than March 1, 2025 |
| **Priority and Rank Assigned** | To be determined |
| **Nodal Operating Guide Sections Requiring Revision**  | 2.6.2, Generators and Energy Storage Resources2.6.2.1, Frequency Ride-Through Requirements for Distribution Generation Resources (DGRs) and Distribution Energy Storage Resources (DESRs)2.6.2.1.1, Temporary Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs (new)2.6.4, Commercially Reasonable Efforts2.9, Voltage Ride-Through Requirements for Generation Resources and Energy Storage Resources2.9.1, Voltage Ride-Through Requirements for Intermittent Renewable Resources Connected to the ERCOT Transmission Grid2.9.1.1, Preferred Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) (new)2.9.1.2, Legacy Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs (new)2.11, Commercially Reasonable Efforts (new)2.11, Ride-Through Reporting Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs (new) 2.11.1, Initial Frequency Ride-Through Capability Documentation and Reporting Requirements (new)2.11.2, Initial Voltage Ride-Through Capability Documentation and Reporting Requirements (new)2.12.3, Use of Initial Reports and Requirements for Recurring Ride-Through Reports (new)2.12, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions, and Appeals for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs (new) 2.12.1, Exemptions and Extensions Process (new) 2.12.1.1, Submission of Exemption Requests (new) 2.12.1.2, Submission of Extension Requests (new) 2.12.1.3, Timeline for Submission and Determination of Exemption and Extension Requests (new)2.12.1.4, Procedure for Appealing an ERCOT Decision to Reject an Exemption or Extension Request (new)2.13, Actions Following a Transmission-Connected Inverter-Based Resource (IBR), Type 1 Wind-Powered Generation Resource (WGR) or Type 2 WGR Apparent Failure to Ride-through (new)2.13.1.4.1, Appeal Process and Timeline (new) |
| **Related Documents Requiring Revision/Related Revision Requests** | None |
| **Revision Description** | This Nodal Operating Guide Revision Request (NOGRR) replaces the current voltage ride-through requirements for Intermittent Renewable Resources (IRRs) with voltage ride-through requirements for Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-powered Generation Resources (WGRs) and provides new frequency ride-through requirements for IBRs and Type 1 and 2 WGRs consistent with or beyond requirements identified in the new 2800-2022 - Institute of Electrical and Electronics Engineers (IEEE) Standard for Interconnection and Interoperability of Inverter-Based Resources (IBRs) Interconnecting with Associated Transmission Electric Power Systems (“IEEE 2800-2022 standard”). |
| **Reason for Revision** |  [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 1 – Be an industry leader for grid reliability and resilience [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 2 - Enhance the ERCOT region’s economic competitiveness with respect to trends in wholesale power rates and retail electricity prices to consumers [Strategic Plan](https://www.ercot.com/files/docs/2023/08/25/ERCOT-Strategic-Plan-2024-2028.pdf) Objective 3 - Advance ERCOT, Inc. as an independent leading industry expert and an employer of choice by fostering innovation, investing in our people, and emphasizing the importance of our mission General system and/or process improvement(s) Regulatory requirements ERCOT Board/PUCT Directive*(please select ONLY ONE – if more than one apply, please select the ONE that is most relevant)* |
| **Justification of Reason for Revision and Market Impacts** | ERCOT submits this NOGRR based on reliability issues associated with the inability of some IBRs to ride-through system disturbances, and in light of the IEEE 2800-2022 standard. In its recently issued guidance document *Inverter-Based Resource Strategy*, theNorth American Reliability Corporation (NERC) noted it has supported the development of the IEEE 2800-2022 standard (and continues to support the IEEE P2800.2, Recommended Practice for Test and Verification Procedures for Inverter-based Resources (IBRs) Interconnecting with Bulk Power Systems, standards development efforts). Among other things, the document also highlights that:* New technology can introduce significant risks if not integrated properlywhich could result in high impact and high likelihood events that require substantive action;
* Inverter and plant controls and protection systems must support the reliable operation of the bulk power system during system disturbances;
* Disturbance reports, alerts, guidelines, and other deliverables have shown that abnormal IBR performance issues pose a significant risk to bulk power system reliability;
* Analyzed events identified new performance issues such as momentary cessation, unwarranted inverter or plant-level tripping issues, controller interactions and instabilities, and other critical performance risks that must be mitigated; and
* Generation ride-through and provision of essential reliability services is a core principle for reliable operation of the bulk power system.

Consequently, this NOGRR proposes ride-through requirements for IBRs and Type 1 and Type 2 WGRs with specificity consistent with or beyond the IEEE 2800-2022 standard where appropriate (e.g., applying to the Point of Interconnection Bus (POIB) instead of the “Resource Point of Applicability”). The revisions specify the ride-through requirements for IBRs rather than IRRs or Energy Storage Resources (ESRs) because some ESRs may not be IBRs and the IBR attributes create unique ride-through requirements. Additionally, due to Type 1 and 2 WGRs failing to ride through normal system disturbances, ERCOT proposes to apply several of the new requirements to these Resources. Some clarifications included from the IEEE 2800-2022 standard may not require additional “capability” but provide additional specificity for settings that can prevent failures rather than adjustments being made after a failure occurs.Failure of IBRs to ride-through normal frequency and voltage deviations on the ERCOT System can lead to severe consequences such as instability, cascading outages, or triggering an Under-Frequency Load Shed (UFLS) event which would result in the uncontrolled loss of firm Load. As such, this NOGRR does not propose to grandfather existing IBRs and Type 1 and Type 2 WGRs indefinitely. Rather, this NOGRR proposes that all IBRs and Type 1 and Type 2 WGRs with a Standard Generation Interconnection Agreement (SGIA) executed prior to August 1, 2024 (“existing IBRs”), maximize ride-through capability to meet or exceed the new voltage ride-through profile and the new frequency ride-through profile as soon as practicable with all available and known commercially reasonable upgrades. IBRs and Type 1 and Type 2 WGRs that cannot meet the new ride-through requirements will need to submit a report by April 1, 2025 documenting such and provide a report to give ERCOT an accurate understanding of the physical limitations and maximum ride-through capability. An IBR or Type 1 WGR or Type 2 WGR that will be replaced or retrofitted and has documented technical exemptions granted, must meet the latest IEEE 2800 standard and preferred voltage ride-through requirements and will no longer be granted exemptions. The proposed requirements will help improve several of the major failure modes identified in the Odessa disturbances in 2021 and 2022. Many of the Odessa related issues have been addressed with software and settings changes, which this NOGRR will require to be implemented. Market Participants in the Inverter Based Resource Task Force (IBRTF) encouraged ERCOT to focus on enhancements adopting portions of the IEEE 2800-2022 standard or NERC Reliability Guidelines that would provide the most reliability benefit in the short-term rather than a holistic approach. As such, additional requirements on IBRs may be necessary based on additional event analyses, lessons learned, recommendations contained in the NERC Odessa 2022 report, IEEE requirements, and NERC Reliability Standard revisions. |
| **ROS Decision** | On 2/8/23, ROS voted unanimously to table NOGRR245 and refer the issue to the Operations Working Group (OWG), Dynamics Working Group (DWG) and Inverter-Based Resource Task Force (IBRTF). All Market Segments participated in the vote. On 9/14/23, ROS voted to grant NOGRR245 Urgent status; to recommend approval of NOGRR245 as amended by the 9/13/23 NextEra comments as revised by ROS; and to forward to TAC NOGRR245 and the 1/11/23 Impact Analysis. There were 11 opposing votes from the Consumer (OPUC), Cooperative (3) (STEC, GVEC, LCRA), Independent Generator (Calpine), Independent Power Marketer (IPM) (NG Renewables), Independent Retail Electric Provider (IREP) (Reliant), Investor Owned Utility (IOU) (4) (Oncor, CNP, AEPSC, TNMP) Market Segments and two abstentions from the Consumer (Air Liquide) and IPM (SENA) Market Segments. All Market Segments participated in the vote. |
| **Summary of ROS Discussion** | On 2/8/23, ERCOT reviewed NOGRR245. Market Participants discussed whether it was appropriate to apply the new frequency ride-through requirements to certain existing IBRs, noting technical limitations of equipment and financial implications as concerns, and requested that ERCOT explore incorporating provisions that would allow for exemptions under some circumstances. ERCOT requested that Market Participants provide, for consideration, detailed information supporting their concerns, including specifics from original equipment manufacturers (“OEMs”) identifying technical limitations. On 9/14/23, ERCOT reviewed the 8/18/23 ERCOT comments, and responded to comments submitted by stakeholders and explained its reasoning for not supporting alternative frameworks. Participants debated the merits of the 8/18/23 ERCOT comments against the 9/13/23 NextEra comments and 9/5/23 Southern Power comments. Concerns expressed by certain participants on the 8/18/23 ERCOT comments focused on the technical feasibility of complying with the new requirements, timelines, associated costs, and commercial viability of Resources and future investment and the negative impact this may have on Resource adequacy in the ERCOT Region. Proponents of the 8/18/23 ERCOT comments highlighted reliability concerns and risk associated with IBRs and Type 1 and 2 WGRs inability to ride through system disturbances, and noted that the 9/13/23 NextEra comments and 9/5/23 Southern Power comments prioritize commercial needs over reliability.  |
| **TAC Decision** | On 9/27/23, TAC voted unanimously to table NOGRR245. All Market Segments participated in the vote.On 3/27/24, TAC voted to recommend approval of NOGRR245 as recommended by ROS in the 9/14/23 ROS Report as amended by the 3/22/24 Joint Commenters 2 comments as revised by TAC. There were eight opposing votes from the Cooperative (4) (GSEC, LCRA, PEC, STEC) and IOU (4) (TNMP, CNP, Oncor, AEPSC) Market Segments and three abstentions from the Consumer (2) (OPUC, Residential Consumer) and Independent Generator (Calpine) Market Segments. All Market Segments participated in the vote.On 5/22/24, TAC voted unanimously to table NOGRR245. All Market Segments participated in the vote. On 6/7/24, TAC voted to recommend approval of NOGRR245 as recommended by TAC in the 3/27/24 TAC Report as amended by the 6/5/24 ERCOT comments as revised by TAC. There was one opposing vote from the IREP (Demand Control 2) Market Segment and ten abstentions from the Independent Generator (Luminant), IPM (2) (Morgan Stanley, SENA), IREP (3) (Reliant, Rhythm Ops, APG&E), and Municipal (4) (GP&L, DME, CPS Energy, Austin Energy) Market Segments. All Market Segments participated in the vote.  |
| **Summary of TAC Discussion** | On 9/26/23, TAC reviewed the ERCOT Opinion, ERCOT Market Impact Statement, and Independent Market Monitor (IMM) Opinion for NOGRR245. ERCOT addressed questions on the requests for information (RFIs) it will be issuing to Resource Entities and questions to OEMs regarding the feasibility of meeting the new ride-through requirements. Participants debated the appropriate path for NOGRR245; options discussed included remanding NOGRR245 to ROS for additional discussion, and bifurcating NOGRR245 to separately address requirements for existing and new IBRs.On 3/27/24, participants debated the merits of the 3/20/24 ERCOT comments versus the 3/22/24 Joint Commenters 2 comments. Proponents of the 3/20/24 ERCOT comments reiterated concerns that the 3/22/24 Joint Commenters 2 comments fall short of addressing the reliability risk associated with IBRs failing to ride through system disturbances and highlighted potential consequences including uncontrolled Outages up to potential system-wide Blackouts and increased costs to Customers. Proponents of the 3/22/24 Joint Commenters 2 comments expressed concern that the 3/20/24 ERCOT comments would negatively affect investor confidence in the ERCOT Region and emphasized that the 3/22/24 Joint Commenters 2 comments is a more balanced approach and promotes investor confidence while protecting reliability. To address certain participant concerns, edits were incorporated revising Section 2.14 in the 3/22/24 Joint Commenters 2 comments that would require ERCOT approval as a condition for allowing existing IBR, Type 1 and Type 2 WGR replacements and modifications that would reduce capability, or reductions in capability without a documented limited exemption to the applicable requirements.On 5/22/24, ERCOT reviewed its draft revisions to the proposed Operating Guide language in the 3/24/24 TAC Report. TAC discussed concepts and potential areas of agreement. On 6/7/24, TAC reviewed the 6/5/24 ERCOT comments and the 6/6/24 Joint Commenters 2 comments. Some participants and ERCOT expressed there was not sufficient time to thoroughly review the 6/6/24 Joint Commenters 2 comments noting the revisions significantly deviates from the redlines previously reviewed at the 5/31/24 TAC meeting and warned certain changes proposed by the Joint Commenters 2 would require analysis to understand the implications. The discussion highlighted areas of compromise in the 6/5/24 ERCOT comments and 6/6/24 Joint Commenters 2 comments, and areas of disagreement that largely focused on provisions related to physical/ hardware changes to equipment and the exemption process, including the conditions under which exemptions would be denied. ERCOT and certain participants expressed concern that the 6/6/24 Joint Commenters 2 comments fail to address the reliability risk, and the ERCOT Board and PUCT concerns. Edits to the 6/5/24 ERCOT comments incorporated language revisions reflected in the 6/6/24 Luminant comments, deferred the implementation of provisions related to physical/ hardware changes to 3/1/25 to provide additional time for continued discussions on these provisions in the stakeholder process, and a revision to paragraph (8) of Section 2.9.1 to replace a placeholder with “August 1, 2024”.  |
| **Explanation of Opposing TAC Votes** | **Cooperative/GSEC** – The reason GSEC opposes NOGRR245 as recommended for approval by TAC in the 3/27/24 TAC Report is that ERCOT alone has the responsibility and is accountable for maintaining grid reliability.  ERCOT’s concerns must have priority over Market Participants’ desires in these areas of disagreement.**Cooperative/LCRA** – LCRA could not, in good conscience, ignore the reliability risks communicated in the 3/20/24 ERCOT comments and 3/26/24 ERCOT comments on NOGRR245. We appreciate the extensive collaboration between ERCOT and the Joint Commenters 2 which involved concessions on both sides; however, ERCOT communicated it could go no further in negotiations without significant risks to reliability. Ultimately, our decision to support the version of NOGRR245 reflected in the 3/20/24 ERCOT comments was made with this thought in mind: LCRA desires to ensure the most reliable grid for the State of Texas while limiting the cost borne by our customers. LCRA did have concerns about backdating the effective date for new requirements. Investors in new projects make their decisions based on the rules of the game at the time. Changing those rules for in-flight projects can create regulatory uncertainty for future investment. In the 3/20/24 ERCOT comments, IBRs with an SGIA effective date of 6/1/2023 will fall under the new requirements and might potentially have to explore retrofitting an in-flight project. For justification, ERCOT states that moving the 6/1/2023 date any further out will cause at least 20-30 GW of projects to avoid the new requirements. However, ERCOT has created a path for these projects to be granted temporary exemptions out to 12/1/2028. We view this as a reasonable path to compliance while also ensuring system security. **Cooperative/PEC** – The opposing vote on NOGRR245 was due to ERCOT’s strong concern that NOGRR245 as recommended for approval by TAC in the 3/27/24 TAC Report incorporates the 3/22/24 Joint Commenter~~’~~s 2 revised proposal which does not meet reliability expectations, and could lead to major outages.  **Cooperative/STEC** – STEC opposes NOGRR245 as recommended for approval by TAC in the 3/27/24 TAC Report because of the potentially significant and negative reliability risks that ERCOT has articulated, if implemented, would pose.**IOU/TNMP** – TNMP opposes NOGRR245 as recommended for approval by TAC in the 3/27/24 TAC Report because of the potentially significant and negative reliability risks that ERCOT has articulated, if implemented, would pose.**IOU/CNP** – CNP shares the same concern as others have expressed in the IOU Market Segment and opposes NOGRR245 as recommended for approval by TAC in the 3/27/24 TAC Report because of the potentially significant and negative reliability risks that ERCOT has articulated, if implemented, would pose.**IOU/Oncor** – Oncor opposes NOGRR245 as recommended for approval by TAC in the 3/27/24 TAC Report because of the potentially significant and negative reliability risks that ERCOT has articulated, if implemented, would pose.**IOU/AEPSC** – AEPSC opposes NOGRR245 as recommended for approval by TAC in the 3/27/24 TAC Report because of the potentially significant and negative reliability risks that ERCOT has articulated, if implemented, would pose.**IREP/ Demand Control 2** – Demand Control 2 opposed NOGRR245 recommend for approval by TAC in the 6/7/24 TAC Report because: (1) TAC members were not provided adequate time to give the 6/6/24 Joint Commenters 2 comments full consideration since the comments were not available until late evening on 6/6/24, and the 40 percent cost threshold proposed by ERCOT is arbitrary, extremely high and does not take into account the plant life of generating units or existing offtake contracts (i.e., either the threshold should be much lower or some aspect of commercial reasonableness added).  |
| **TAC Review/Justification of Recommendation** |  Revision Request ties to Reason for Revision as explained in Justification  Impact Analysis reviewed and impacts are justified as explained in Justification Opinions were reviewed and discussed Comments were reviewed and discussed (if applicable) Other: (explain) |
| **ERCOT Board Decision** | On 4/23/24, the ERCOT Board remanded NOGRR245 to TAC. There was one abstention.  |
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| **Opinions** |
| **Credit Review** | Not applicable |
| **Independent Market Monitor Opinion** | IMM has no opinion of NOGRR245. |
| **ERCOT Opinion** | ERCOT supports approval of NOGRR245. |
| **ERCOT Market Impact Statement** | ERCOT has reviewed NOGRR245 as recommended for approval by TAC in the 6/7/24 TAC Report and believes the rate and severity of ride-through failures will be reduced as Resource Entities maximize their ride-through capability and implement the modified performance failure mitigation process.  This version of NOGRR245 is a reasonable compromise that is responsive to most stakeholder concerns while addressing the reliability concerns ERCOT had with the version of NOGRR245 in the 3/27/24 TAC Report. Customers will likely continue to face exposure to the current high risk of instability and uncontrolled Outages until improvements are implemented by the Resource Entities of IBRs and Type 1 and Type 2 WGRs.  As improved models are submitted as part of maximization efforts, ERCOT may discover limitations that had not been previously modeled leading to transmission congestion or transmission project needs as well.  |

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| **Market Segment** | Not Applicable |
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| **Comments Received** |
| **Comment Author** | **Comment Summary** |
| Brazos Electric 021623 | Provided summary of impacts NOGRR245 would have on Brazos Electric |
| GE Renewable Energy 021723 | Sought clarification on active and reactive response requirements during ride through events and the definition and requirement for phase angle jump, and specify IBR plants are not expected to ride through radial opening and reclosing of tie lines  |
| Oncor 030723 | Proposed revisions to clarify the interconnecting Transmission Service Provider’s (TSP’s) role in event analysis  |
| Advanced Power Alliance 032023 | Proposed revisions reinstating voltage ride-through exemptions removed in the NOGRR245 as submitted, and established temporary and permanent good cause exemptions for Resource owners  |
| ERCOT 040523 | Revised language to address stakeholder comments related to settings and adjusted timelines |
| RWE 042623 | Argued NOGRR245 should be severed to allow rapid adoption of the proposed voltage and frequency ride-through components for new Resources and a new separate NOGRR be developed to address older operational Generation Resources |
| Invenergy 050123 | Suggested all Resources with an SGIA dated before January 1, 2023 be exempted from the new requirements, a good cause exception process be created for extenuating circumstances, and a staged implementation process for new standards to allow OEMs time to comply |
| Southern Power 050123 | Highlighted technical concerns for certain existing IBRs and proposed an exemption process to account for existing IBRs’ limitations |
| EDFR 050223 | Requested the new requirements apply to projects with an SGIA executed after the effective date of NOGRR245, and for legacy projects adopt a phased-in approach to comply with the new standards  |
| GE Renewable Energy 050323 | Listed the challenges related to the implementation of the proposed requirements for the GE fleet in ERCOT  |
| Advanced Power Alliance 050323 | Recommended ERCOT continue to work with IBRs and manufacturers to identify a set of requirements for new Resources and a separate set of requirements may be developed for existing Resources after a technical feasibility review is completed  |
| Clearway Renew 050323 | Recommended ERCOT separate NOGRR245 into two NOGRRs - one set of requirements for new Resources with SGIAs signed after the effective date of NOGRR245, and a separate set of requirements for existing Resources |
| Pattern Energy 050323 | Requested NOGRR245 remain tabled to provide time for further analysis by the OEMs |
| TSPA 051723 | Submitted concepts for an alternative framework that would extend the compliance date and adopt a phased-in approach to implementation of the new ride-through requirements  |
| Siemen Gamesa Renewable Energy 060623 | Indicated it does not support applying the new performance standards to existing wind turbines  |
| Avangrid Renewables 060723 | Requested ERCOT undertake a study to determine the amount of capacity at risk of becoming unavailable under NOGRR245; and supported a bifurcated approach for implementation for existing and new IBRs and recommended ERCOT explore alternative methods for strengthening the transmission grid  |
| AES CE 061623 | Recommended NOGRR245 be applied only to new generation with a SGIA executed on or after the effective date of NOGRR245, and supported that ERCOT divide NOGRR245 into two NOGRRs for legacy and new projects |
| ERCOT 062223 | Modified the 4/5/23 ERCOT comments to include revised compliance dates and requirements  |
| Vestas 062223 | Encouraged ERCOT to reassess the retroactive application of new requirements on certain existing Resources; and expressed compliance concerns |
| Engie 072623 | Recommended ERCOT to continue to work OEMs to work on an agreeable and feasible timeline for implementation  |
| NextEra 072823 | Requested NOGRR245 remain tabled at ROS, and noted specific concerns were not addressed by 6/22/23 ERCOT comments, and expressed additional concerns regarding implementation timelines and compliance  |
| Advanced Power Alliance 072823 | Recommended ERCOT continue working with IBRs and OEMs to identify a set of requirements based on timelines that can be met, and suggested the Impact Analysis needs to be corrected to reflect the changes to grid operations and practices that will be necessary when NOGRR245 is adopted |
| Sierra Club 073123 | Agreed with the 7/26/23 Engie comments and suggested meetings continue to be held to continue discussion regarding timelines for implementation  |
| TAEBA 073123 | Recommended NOGRR245 remain tabled and that ERCOT revise the 6/22/23 ERCOT comments and develop deadlines with stakeholders to ensure the timeline to comply with the IEEE 2800 -2022 standard is practically achievable |
| GE Vernova 073123 | Expressed concern that the timelines proposed in NOGRR245 are too aggressive and outlined expected timelines associated with new installations and legacy units |
| Invenergy 073123 | Discussed the feasibility of retrofitting older IBRs to meet the new requirements, expressed concern that the retroactive application of NOGRR245 will have a negative impact on Resource adequacy in the ERCOT Region, argued NOGRR245 should not retroactively apply to existing IBRs, NOGRR245 should be bifurcated to address new and existing IBR requirements separately, and the new specific requirements for existing projects should be eliminated |
| TSPA 080223 | Encouraged ERCOT to continue discussions with OEMs and Resource owners to identify workable solutions and appropriate timelines and to explore the implementation of other technologies and transmission solutions, and recommended incorporating a good cause exception process  |
| RWE 080223 | Commented that any proposed standard needs to be strictly forward looking with an adequate lead time for the industry as a whole and outlined reasoning for not supporting the retroactive application of the standards on older operational IBRs |
| Orsted 080323 | Recommended ERCOT establish a good cause exemption provision for IBRs that demonstrate they cannot practically comply with the IEEE 2800-2022 standard, and emphasized the importance of proper test guidelines and NOGRR245 accounting for the time needed to develop testing standards  |
| Advanced Power Alliance 081123 | Requested ERCOT revise the 6/22/23 ERCOT comments by August 31, 2023 to provide stakeholders adequate time ahead of the September 7th ROS meeting to review the proposal and respond with comments  |
| ERCOT 081823 | Incorporated Type 1 and Type 2 WGRs into the 6/22/23 ERCOT comments |
| Invenergy 090423 | Expressed concern that the 8/18/23 ERCOT comments do not fully address the OEM and Market Participant concerns about technical and timing feasibility, cost, and overall impact the proposal would have on system reliability  |
| Southern Power 090523 | Proposed revisions to the 8/18/23 ERCOT comments to consider capabilities and limitations of existing Resources |
| GE Vernova 090523 | Suggested modifying the ERCOT proposal to incorporate an additional qualifier regarding the disabling of features and replace references to “zone” with “range”  |
| NextEra 090523 | Provided alternative language that would require IBRs to comply with ERCOT's new reliability requirements if it is commercially reasonable to do so, and provided a new compliance framework |
| ERCOT 090623 | Highlighted ERCOT’s reliability concerns expressed in various stakeholder forums over the past several months regarding the inability of IBRs and Type 1 and Type 2 WGRs to ride-through system disturbance |
| Sierra Club 091123 | Noted it largely supports the 9/5/23 Southern Power comments, 9/4/23 Invenergy comments and 9/5/23 NextEra comments on existing Resources but believes that the June 1, 2026 date is unreasonable and suggests a date of June 1, 2024 for any Resource with a signed and executed SGIA of that date or later with a compliance date of June 1, 2026 for new Resources with the new IBR standards |
| NextEra 091323 | Proposed revisions to partially conform with the 8/18/23 ERCOT comments, clarified “behind the meter” co-located discussion at ROS, refined the reporting requirements, and incorporated the 9/5/23 GE Vernova comments |
| RWE 091323 | Supported bifurcating NOGRR245 into two NOGRRs to retain more IBRs and deliver better ride through performance from existing Resources; rather than a NOGRR approved with the limited information available at this time |
| NextEra 091323 | Responded to the 9/6/23 ERCOT comments and requested that the actual reliability risk and data be fully considered before implementing a performance-based standard for WGRs that have been reliably serving Texans for many years |
| Siemens Gamesa Renewable Energy 092223 | Raised objections to retroactively applying new standard requirements and provided a preliminary assessment of Siemens Gamesa Renewable Energy’s legacy turbines ability to meet the proposed requirements reflected in the 8/18/23 ERCOT comments  |
| ERCOT 092423 | Requested NOGRR245 be tabled to provide ERCOT sufficient time to update the Impact Analysis and gather information from Resource Entities and OEMs  |
| Avangrid Renewables 092523 | Supported 9/13/23 NextEra comments incorporated into the 9/14/23 ROS Report and suggested bifurcating the issues in NOGRR245 to separately address requirements for existing and new IBRs  |
| ERCOT 092923 | Provided information contained in the ERCOT-issued requests for information sent to Resource Entities and questions submitted to OEMs on September 27, 2023 |
| Tesla 101623 | Supported NOGRR245 as recommended for approval by ROS in the 9/14/23 ROS Report |
| ERCOT 102323 | Proposed alternative schedule for developing an Impact Analysis and noted ERCOT intended to complete the Impact Analysis prior to the December 4, 2023 TAC meeting |
| Advanced Power Alliance 102323 | Noted concerns and questions related to ERCOT’s 9/29/23 RFI to IBR owners and questions issued by ERCOT to OEMs  |
| Siemens Gamesa Renewable Energy 103023 | Provided a summary of WGRs on the ERCOT System manufactured by Siemens Gamesa and its comments in response to ERCOT’s 9/29/23 RFI |
| Vestas 110123 | Presented Vesta’s findings from the evaluation of its turbines’ ability to meet the NOGRR245 requirements as outlined in ERCOT’s 9/29/23 RFI |
| GE Vernova 110723 | Presented results from its preliminary assessment of its wind turbines’ ability to meet the NOGRR245 requirements as outlined in ERCOT’s 9/29/23 RFI |
| ERCOT 120223 | Summarized the 12/2/23 Revised Impact Analysis and highlighted ERCOT’s concern that NOGRR245 as recommended for approval by ROS in the 9/14/23 ROS Report prioritizes commercial consideration over reliability impacts |
| ERCOT 010824 | Reiterated ERCOT’s concerns with NOGRR245 as recommended for approval by ROS in the 9/14/23 ROS Report, proposed language revisions restoring key elements intended to mitigate reliability risk while accounting for technical feasibility based on information received from OEMs and Resource Entities in response to ERCOT’s 9/29/23 RFI  |
| Texas RE 011124 | Encouraged ERCOT stakeholders to move forward with enhancing the reliability and security of the ERCOT System by adopting improved IBR ride through standards along the lines of the 1/8/24 ERCOT comments as soon as possible |
| GE Vernova 011924 | Proposed revisions modifying language in the 1/8/24 ERCOT comments reinstating a specific frequency ride-through exception, eliminating paragraph (7) of Section 2.9.1.2 until specific criteria can be provided by TSPs, and added the wording “or if required based on physical limitations of IBR unit” in paragraph (4) of Sections 2.9.1.1 and 2.9.1.2  |
| Advanced Power Alliance 012324 | Supported NOGRR245 as recommended for approval by ROS in the 9/14/23 ROS Report and expressed concern the 1/8/24 ERCOT comments will increase costs for customers and discourage generation capacity investment in the ERCOT Region  |
| Joint Commenters 012324 | Proposed revisions to the language contained in the 1/8/24 ERCOT comments to address their concern that the new technical requirements will cause IBR owners to incur significant capital investments  |
| Avangrid Renewables 012324 | Agreed with the concerns outlined in the 1/23/24 Joint Commenters comments and suggested a phased-in approach for implementation of new requirements and exceptions for legacy IBRs where solutions are technically infeasible or commercially unreasonable  |
| ERCOT 021224 | Requested TAC continue to table NOGRR245 to provide additional time for discussions between ERCOT and the Joint Commenters |
| ERCOT 032024 | Proposed revisions to the language contained in the 1/8/24 ERCOT comments to address certain concerns expressed by Joint Commenters during discussions |
| Joint Commenters 2 032224 | Proposed revisions to the language contained in the 1/8/24 ERCOT comments reflecting convergence on issues and summarized remaining differences between Joint Commenters 2 and ERCOT positions |
| ERCOT 032624 | Reiterated concerns regarding the reliability risk associated with IBRs’ failure to ride through system disturbances and responded to the 3/22/24 Joint Commenters 2 comments  |
| Joint Commenters 041524 | Described how NOGRR245 as recommended for approval by TAC in the 3/27/24 TAC Report contains the most rigorous ride-through requirements on IBRs in the country to date; provides Market Participants, investors, OEMs, and regulators with clearly defined rules; safeguards private property and due process rights of Resource owners; bolsters the reliability and stability of the ERCOT System |
| Elevate Energy Consulting 041524 | Supported NOGRR245 as recommended for approval by TAC in the 3/27/24 TAC Report; and offered alternatives |
| ERCOT 041524 | Highlighted concerns with NOGRR245 as recommended for approval by TAC in the 3/27/24 TAC Report and proposed revised guide language that would address critical reliability risk |
| ERCOT 060524 | Proposed revisions to the language contained in the 5/22/24 TAC Report that focused on being responsive to stakeholder concerns identified at recent TAC meetings and sentiments expressed by the ERCOT Board and PUCT |
| Luminant 060624 | Proposed revisions to the 6/5/24 ERCOT comments replacing “respectively” with “as appropriate” in paragraph 3 of Section 2.9.1 |
| Joint Commenters 2 060624 | Proposed revisions to the language contained in the 5/22/24 TAC Report to allow for immediate implementation of standards consistent with the IEEE2800-2022 standard for new Resources, maximize the ride-through capabilities for existing Resources that can be accomplished with software modifications, and decouple software and hardware ride-through considerations |
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| **Market Rules Notes** |

Administrative changes to the language were made and authored as “ERCOT Market Rules.”

Please note the baseline Nodal Operating Guide language in the following sections have been updated to reflect the incorporation of the following NOGRRs into the Nodal Operating Guides:

* NOGRR196, Related to NPRR973, Add Definitions for Generator Step-Up and Main Power Transformer (unboxed 2/1/23)
	+ Section 2.9
* NOGRR204, Related to NPRR989, BESTF-1 Energy Storage Resource Technical Requirements (partially unboxed 4/1/24)
* Section 2.9
* Section 2.9.1

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| **Revised Proposed Guide Language** |

***2.6.2 Frequency Ride-Through Requirements for Generation Resources and Energy Storage Resources***

(1) Except for Generation Resources and Energy Storage Resources (ESRs) subject to Sections 2.6.2.1, Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources and Type 2 WGRs or 2.6.2.2, Frequency Ride-Through Requirements for Distribution Generation Resources (DGRs) and Distribution Energy Storage Resources (DESRs), if under-frequency relays are installed and activated to trip the Generation Resource or ESR, these relays shall perform such that the automatic removal of the Resource from the ERCOT System meets or exceeds the following requirements:

|  |  |
| --- | --- |
| **Frequency Range** | **Delay to Trip** |
| Above 59.4 Hz | No automatic tripping(continuous operation) |
| Above 58.4 Hz up toand including 59.4 Hz | Not less than 9 minutes |
| Above 58.0 Hz up toand including 58.4 Hz | Not less than 30 seconds |
| Above 57.5 Hz up toand including 58.0 Hz | Not less than 2 seconds |
| 57.5 Hz or below | No time delay required |

(2) Except for Generation Resources subject to Sections 2.6.2.1 or 2.6.2.2, if over-frequency relays are installed and activated to trip the Resource, the Resource shall perform such that the automatic removal of the Resource from the ERCOT System meets or exceeds the following requirements:

|  |  |
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| **Frequency Range** | **Delay to Trip** |
| Below 60.6 Hz down to and including 60 Hz | No automatic tripping (continuous operation) |
| Below 61.6 Hz down to and including 60.6 Hz | Not less than 9 minutes |
| Below 61.8 Hz down to and including 61.6 Hz | Not less than 30 seconds |
| 61.8 Hz or above | No time delay required |

(3) If frequency protection schemes are installed and activated to trip a Generation Resource or ESR, they shall use filtered quantities or add sufficient time delays to prevent misoperations while providing the desired equipment protection. Protection schemes shall not trip a Generation Resource or ESR based on an instantaneous frequency measurement.

(4) This Section shall not affect the Resource Entity’s responsibility to protect Generation Resources or ESRs from damaging operating conditions. The Resource Entity for a Generation Resource or ESR subject to paragraphs (1) and (2) above that is unable to remain reliably connected to the ERCOT System as set forth in paragraphs (1) and (2), shall provide to ERCOT the reason(s) for the Resource’s limitation, including available study results or manufacturer recommendations, and the Resource’s frequency ride-through capability in the format shown in the tables in paragraphs (1) and (2) above.

***2.6.2.1 Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs***

(1) This Section applies to all IBRs, Type 1 Wind-powered Generation Resources (WGRs) and Type 2 WGRs connected to the ERCOT Transmission Grid. Such Resources shall ride through the frequency conditions at the Resource’s Point of Interconnection Bus (POIB) specified in the following table:

|  |  |
| --- | --- |
| Frequency (f) in (Hz) | Minimum Ride-Through Time(seconds) |
| f > 61.8 | May ride-through or trip |
| 61.6 < f ≤ 61.8 | 299 |
| 61.2 < f ≤ 61.6 | 540 |
| 58.8 ≤ f ≤ 61.2 | continuous |
| 58.4 ≤ f < 58.8 | 540 |
| 57.0 ≤ f < 58.4 | 299 |
| f < 57.0 | May ride-through or trip |

(2) Nothing in paragraph (1) above shall be interpreted to require an IBR, Type 1 WGR or Type 2 WGR to trip for frequency conditions beyond those for which ride-through is required.

(3) If protection systems (including, but not limited to protection for over-/under-frequency, rate-of-change-of-frequency, anti-islanding, and phase angle jump) are installed and activated to trip the IBR, Type 1 WGR or Type 2 WGR, they shall enable the Resource to ride through frequency conditions beyond those defined in paragraph (1) above to the maximum level the equipment allows.

(4) An IBR, Type 1 WGR or Type 2 WGR shall inject electric current when required to ride-through frequency conditions.

(5) IBR, Type 1 WGR and Type 2 WGR plant controls, turbine controls and/or inverter controls shall not disconnect the Resource from the ERCOT Transmission Grid during frequency conditions where ride-through is required. IBR, Type 1 WGR and Type 2 WGR plant controls, turbine controls, and/ or inverter controls shall not reduce the Resource output during frequency conditions requiring ride-through unless necessary for providing appropriate frequency response.

(6) The Resource Entity or IE of an IBR, Type 1 WGR or Type 2 WGR, shall ensure the Resource’s frequency ride-through capability is set to the maximum level the equipment allows to meet or exceed the requirements of paragraphs (1) through (5) above as soon as practicable but no later than December 31, 2025 or at the time of its synchronization with the ERCOT Transmission Grid for new IBRs synchronizing after December 31, 2025.

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(7) If an IBR, Type 1 WGR or Type 2 WGR with an SGIA executed prior to August 1, 2024 cannot comply with paragraphs (1) through (6) above by December 31, 2025, the Resource Entity or IE shall, by April 1, 2025, request an exemption pursuant to Section 2.11, Ride-Through Reporting Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs.

(8) If an IBR, Type 1 WGR or Type 2 WGR fails to perform in accordance with the applicable frequency ride-through requirements, the Resource Entity shall take the actions described in Section 2.13, Actions Following a Transmission-Connected Inverter-Based Resource (IBR), Type 1 Wind-Powered Generation Resource (WGR) or Type 2 WGR Apparent Failure to Ride-Through.

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***2.6.2.1.1*** ***Temporary Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs),*** ***Type 1 Wind-Powered Generation Resources (WGRs)and Type 2 WGRs***

(1) This Section applies to IBRs, Type 1 WGRs and Type 2 WGRs with an SGIA executed prior to August 1, 2024 that have not implemented modifications to satisfy paragraphs (1) through (5) of Section 2.6.2.1, Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs.

(2) Such Resources shall ride through the frequency conditions at the POIB specified in the following table:

|  |  |
| --- | --- |
| **Frequency Range** | **Delay to Trip** |
| 61.8 Hz or above | No time delay required |
| Below 61.8 Hz down to and including 61.6 Hz | Not less than 30 seconds |
| Below 61.6 Hz down to and including 60.6 Hz | Not less than 9 minutes |
| Above 59.4 Hz up to 60.6 Hz | No automatic tripping(continuous operation) |
| Above 58.4 Hz up toand including 59.4 Hz | Not less than 9 minutes |
| Above 58.0 Hz up toand including 58.4 Hz | Not less than 30 seconds |
| Above 57.5 Hz up toand including 58.0 Hz | Not less than 2 seconds |
| 57.5 Hz or below | No time delay required |
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(3) This Section shall not affect the Resource Entity’s responsibility to protect equipment from damaging operating conditions. The Resource Entity for an IBR, Type 1 WGR or Type 2 WGR subject to paragraph (2) above that is unable to remain reliably connected to the ERCOT Transmission Grid as set forth in paragraph (2), shall provide to ERCOT the information required in Section 2.11, Ride-Through Reporting Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs.

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***2.6.2.2 Frequency Ride-Through Requirements for Distribution Generation Resources (DGRs) and Distribution Energy Storage Resources (DESRs)***

(1) For any short-circuit fault or open-phase condition that occurs on the circuit to which the DGR or DESR is connected, the DGR or DESR will cease to energize and trip offline, and this will take priority over the frequency ride-through function.

(2) DGRs and DESRs must have over-/under-frequency relays set to ride through frequency conditions as specified in the following table:

|  |  |  |
| --- | --- | --- |
| Frequency (Hz) | Ride-Through Mode | Minimum Ride-through Time(seconds) |
|  *f > 61.8* | No ride-through requirements |
| 61.2 < f ≤ 61.8 | Mandatory Operation | 299 |
| 58.8 ≤ f ≤ 61.2 | Continuous Operation | continuous |
| 57.0 ≤ f < 58.8 | Mandatory Operation | 299 |
| *f < 57.0* | No ride-through requirements |

(3) Any Resource Entity with a DGR or DESR utilizing inverter-based generation that achieved Initial Synchronization before April 1, 2020 that is not capable of complying with the requirements of paragraph (2) above may request an exemption from those requirements. Such a request shall be submitted by November 2, 2020 and shall include documentation that demonstrates the DGR’s or DESR’s frequency ride-through capability to ERCOT’s satisfaction. If, after reviewing the request and documentation, ERCOT determines the DGR or DESR is not capable of complying with the requirements of paragraph (2), then the DGR or DESR shall be exempt from those requirements, but shall be required to comply with those requirements to the greatest degree possible within its capability, as determined in writing by ERCOT. Upon replacement or retirement of the inverter, the DGR or DESR shall no longer be exempt and shall at that time be required to comply with the requirements of paragraph (2) or other applicable requirement.

(4) Section 2.12, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, does not apply to exemptions to frequency ride-through requirements for DGRs and DESRs.

**2.9 Voltage Ride-Through Requirements for Generation Resources and Energy Storage Resources**

(1) Except for Generation Resources and Energy Storage Resources (ESRs) subject to Sections 2.9.1, Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, or 2.9.2, Voltage Ride-Through Requirements for Distribution Generation Resources (DGRs) and Distribution Energy Storage Resources (DESRs), each Generation Resource or ESR must remain reliably connected to the ERCOT Transmission Grid during the following:

(a) Generator or inverter terminal voltages are within 5% of the rated design voltage and volts per hertz are less than 105% of generator rated design voltage and frequency;

(b) Generator or inverter terminal voltage deviations exceed 5% but are within 10% of the rated design voltage and persist for less than ten seconds;

(c) Generator or inverter volts per hertz conditions are less than 116% of rated design voltage and frequency and last for less than 1.5 seconds; and

(d) A transmission system fault (three-phase, single-phase or phase-to-phase), but not a unit bus fault, is cleared by the protection scheme coordinated between the Resource Entity and the Transmission Service Provider (TSP) on any line connected to the Resource’s Point of Interconnection (POI), provided such lines are not connected to induction generators described in paragraph (12) of Protocol Section 3.15, Voltage Support.

(2) In the case of a unit bus fault or a primary transmission system relay failure, the unit protective relaying may clear the unit independent of the operation of any transmission protective relaying.

(3) During operating conditions listed in paragraph (1) above, each Generation Resource and ESR subject to paragraph (1) shall not, during and following a transient voltage disturbance, cease providing real or reactive current except to the extent needed to provide frequency support or aid in voltage recovery. Each ESR, if consuming active power from the ERCOT System when operating in the charging mode, shall reduce or cease power consumption as necessary to aid in voltage recovery during and following transient voltage disturbances.

(4) Synchronous Generation Resources required to provide Voltage Support Service (VSS) shall have and maintain the following capability:

(a) Over-excitation limiters shall be provided and coordinated with the thermal capability of the generator field winding and protective relays in order to permit short-term reactive capability that allows at least 80% of the unit design standard (ANSI C50.13-1989), as follows:

Time (seconds) 10 30 60 120

Field Voltage % 208 146 125 112

After allowing temporary field current overload, the limiter shall operate through the automatic AC voltage regulator to reduce field current to the continuous rating. Return to normal AC voltage regulation after current reduction shall be automatic. The over-excitation limiter shall be coordinated with the over-excitation protection so over-excitation protection operates only for failure of the voltage regulator/limiter.

(b) Under-excitation limiters shall be provided and coordinated with loss-of-field protection to eliminate unnecessary generating unit disconnection as a result of operator error or equipment malfunction.

(5) Generation Resources and ESRs shall have protective relaying necessary to protect equipment from abnormal conditions and be consistent with protective relaying criteria described in Section 6.2.6.3.4, Generator and Energy Storage Resource Protection and Relay Requirements.

(6) The voltage ride-through requirements, including Section 2.9.1, do not apply to faults at or behind the Point of Interconnection (POI) when clearing the fault effectively disconnects the Generation Resource from the ERCOT System.

(7) A Generation Resource or ESR may be tripped Off-Line or curtailed after the fault clearing period if part of an approved Remedial Action Scheme (RAS).

(8) The Resource Entity of each Generation Resource or ESR shall provide to ERCOT technical documentation of voltage ride-through capability upon request.

***2.9.1 Voltage Ride-Through Requirements for Transmission-Connected*** ***Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs)and Type 2 WGRs***

(1) All Inverter-Based Resources (IBRs) and Type 1 Wind-powered Generation Resources (WGRs) and Type 2 WGRs interconnected to the ERCOT Transmission Grid shall comply with voltage ride-through requirements as follows:

(a) Section 2.9.1.1, Preferred Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) shall apply to:

(i) An IBR with a Standard Generation Interconnection Agreement (SGIA) executed on or after August 1, 2024.

(ii) An IBR that implements any modification, as described in paragraph (1)(c) of Planning Guide Section 5.2.1, Applicability, for which upgrades or facilities under a Generator Interconnection or Modification (GIM) was initiated on or after August 1, 2024, unless the modification was fully implemented prior to January 1, 2028.

(b) Section 2.9.1.2, Legacy Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, shall apply to IBRs not subject to Section 2.9.1.1, and Type 1 WGRs and Type 2 WGRs.

(2) An IBR with an SGIA executed on or after August 1, 2024 or that implements a modification, as described in paragraph (1)(c) of Planning Guide Section 5.2.1 for which a GIM was initiated on or after August 1, 2024, shall meet or exceed the capability and performance requirements in the following sections of Institute of Electrical and Electronics Engineers (IEEE) 2800-2022, Standard for Interconnection and Interoperability of Inverter-Based Resources (IBRs) Interconnecting with Associated Transmission Electric Power Systems (“IEEE 2800-2022 standard”), including any intra-standard cross references or definitions, unless otherwise clarified, modified, or exempted in the Protocols, these Operating Guides, or the Planning Guide:

(a) Section 5, Reactive power-voltage control requirements within the continuous operation region;

 (b) Section 7, Response to TS abnormal conditions; and

 (c) Section 9, Protection.

(3) All IBR plant requirements and IBR unit requirements described in the IEEE 2800-2022 standard apply at the Point of Interconnection Bus (POIB) and the individual IBR unit terminal, as appropriate, unless otherwise clarified, modified, or exempted in the Protocols, these Operating Guides, or the Planning Guide.

(4) An IBR, Type 1 WGR or Type 2 WGR with an original SGIA executed before August 1, 2024, that implements modifications complying with Section 2.9.1.2 prior to January 1, 2028, is not required to meet or exceed the capability and performance requirements in sections 5, 7 and 9 of the IEEE 2800-2022 standard. Any IBR modifications implemented on or after January 1, 2028 do not qualify for this exception.

(5) If a Type 3 WGR with an original SGIA executed before August 1, 2024, cannot fully meet the requirements in Table 11 of the IEEE 2800-2022 standard and implements a modification as described in paragraph (1)(c) of Planning Guide Section 5.2.1, for which upgrades to equipment or facilities under a GIM are completed, the Resource Entity may request an exemption from meeting the voltage ride-through requirements in Table 11 of the IEEE 2800-2022 standard pursuant to Section 2.12, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2WGRs.

(6) If an IBR with an SGIA executed on or after August 1, 2024, cannot meet or exceed the capability and performance requirements in sections 5, 7 and 9 of the IEEE 2800-2022 standard by its synchronization date, the Resource Entity or IE may request a temporary extension to meet those requirements by submitting an extension request pursuant to Section 2.12. Any temporary extensions shall be minimized and not extend beyond December 31, 2028 or 24 months after the Commercial Operations Date, whichever is earlier.

(7) Type 1 and Type 2 WGRs are not required to meet or exceed the capability and performance requirements in sections 5, 7 and 9 of the IEEE 2800-2022 standard but must meet or exceed the capability and performance requirements in Section 2.9.1.2 unless an extension or exemption applies under this Section or Section 2.12.

(8) The Resource Entity or IE for each IBR shall maximize the performance of its protection systems, controls, and other plant equipment (within equipment limitations) to meet and, if possible, exceed the capability and performance set forth in sections 5, 7 and 9 of the IEEE 2800-2022 standard. If an IBR with an SGIA executed prior to August 1, 2024 cannot fully meet the requirements of sections 5, 7, and 9 of the IEEE 2800-2022 standard, the Resource Entity shall maximize the performance of its protection systems, controls, and other plant equipment (within equipment limitations) to achieve, as close as reasonably possible, the capability and performance set forth in sections 5, 7 and 9 of the IEEE 2800-2022 standard as soon as practicable but no later than December 31, 2025 or by its Commercial Operations Date, whichever is later.

(9) The addition of co-located Load as a modification, as described in paragraph (1)(c) of Planning Guide Section 5.2.1, for which a GIM was initiated, shall not trigger a change in ride-through requirements so long as the IBR, Type 1 WGR or Type 2 WGR has an original SGIA executed prior to August 1, 2024 unless the converters, inverters, supplemental dynamic reactive devices, or any other equipment that alters frequency or voltage ride-through capability are materially modified or replaced to meet any reliability requirements because of the co-located Load, in which case the Resource Entity shall continue to be subject to Section 2.9.1.2.

***2.9.1.1 Preferred Voltage Ride-Through Requirements for Transmission-Connected*** ***Inverter-Based Resources (IBRs)***

(1) All IBRs subject to this Section shall ride through the root-mean-square voltage conditions in Tables A or B below, as applicable, and the instantaneous phase voltage conditions in Table C below, as measured at the IBR’s POIB:

**Table A: Applicable to WGR IBRs**

|  |  |
| --- | --- |
| Root-Mean-Square Voltage (p.u. of nominal) | Minimum Ride-Through Time(seconds) |
| V > 1.20 | May ride-through or trip |
| 1.10 < V ≤ 1.20 | 1.0 |
| 0.90 ≤ V ≤ 1.10 | continuous |
| 0.70 ≤ V < 0.90 | 3.0 |
| 0.50 ≤ V < 0.70 | 2.5 |
| 0.25 ≤ V < 0.50 | 1.2 |
| 0.005625 ≤ V < 0.25 | 0.16(V+0.084375)/0.5625 |
|  V < 0.005625 | 0.16 |

**Table B: Applicable to PhotoVoltaic Generation Resources (PVGRs) and ESR IBRs**

|  |  |
| --- | --- |
| Root-Mean-Square Voltage (p.u. of nominal) | Minimum Ride-Through Time(seconds) |
| V > 1.20 | May ride-through or trip |
| 1.10 < V ≤ 1.20 | 1.0 |
| 0.90 ≤ V ≤ 1.10 | continuous |
| 0.70 ≤ V < 0.90 | 6.0 |
| 0.50 ≤ V < 0.70 | 3.0 |
| 0.25 ≤ V < 0.50 | 1.2 |
| 0.095625 ≤ V < 0.25 | 0.32(V+0.084375)/0.5625 |
|  V < 0.095625 | 0.32 |

The minimum ride-through time in Tables A and B for voltage below the continuous operating range is inclusive of any amount of time the POIB voltage is below the specified voltage range. In the event of multiple excursions, the minimum ride-through time in Tables A or B is a cumulative time over a ten-second time window. For voltage between 0.005625 p.u. and 0.25 p.u. in Table A above and 0.095625 p.u. and 0.25 p.u. in Table B above, the minimum ride-through time is defined by a straight-line mathematical function where the duration is 0.15 seconds at zero voltage and 1.75 seconds at 0.9 p.u. voltage.

**Table C: Applicable to all IBRs**

|  |  |
| --- | --- |
| Instantaneous Peak Phase-to-Phase or Phase-to-Ground Voltage(p.u. of nominal instantaneous peak voltage) | Minimum Ride-Through Time(milliseconds) |
| V > 1.80 | May ride-through or trip |
| 1.70 < V ≤ 1.80 | 0.2 |
| 1.60 < V ≤ 1.70 | 1.0 |
| 1.40 < V ≤ 1.60 | 3.0 |
| 1.20 < V ≤ 1.40 | 15.0 |

The instantaneous voltages in Table C above are the residual voltages with surge arrestors, if applied. During the conditions identified in Table C, an IBR should continue injecting current, but need not respond to the sub-cycle transient overvoltage. If required by equipment limitations, the IBR may operate in current blocking mode when instantaneous voltage exceeds 1.20 p.u. at the POIB. If the IBR operates in current blocking mode, it shall restart current exchange in less than or equal to five cycles following instantaneous voltage falling below, and remaining below, 1.2 p.u. at the POIB. In the event of multiple excursions, the minimum ride through time in Table C is a cumulative time over a one-minute time window. If the applicable root-mean-square voltage thresholds identified in Tables A or B above are not exceeded, ride-through is required for any level of instantaneous voltage.

(2) Nothing in paragraph (1) above shall be interpreted to require an IBR to trip for voltage conditions beyond those for which ride-through is required.

(3) If protection systems (including, but not limited to protection for over-/under-voltage, rate-of-change-of-frequency, anti-islanding, and phase angle jump) are installed and activated to trip the IBR, they shall enable the IBR to ride through voltage conditions beyond those defined in paragraph (1) above to the maximum level the equipment allows.

(4) An IBR shall inject electric current when required to ride-through voltage conditions. When the POIB voltage is outside the continuous operating voltage range, an IBR shall continue to deliver pre-disturbance active current unless reduction is needed to allow for voltage support or otherwise specified by ERCOT or the interconnecting TSP. Any necessary reductions in active current to prioritize reactive current shall be relative to the voltage change at the POIB. Typically, more aggressive reductions in active current to allow for additional reactive current (if needed to stay within its current limitations) will occur at lower voltages (e.g., 0.4 p.u. or lower) but settings should be made based on the local needs of the ERCOT System where the IBR interconnects and ensures sufficient active current is available for protection system sensing. An IBR shall return to its pre-disturbance level of real power injection as soon as possible but no more than one second after POIB voltage recovers to normal operating range. ERCOT, in its reasonable discretion, may allow slower real power injection recovery rates if necessary for reliability as determined by the impacted TSP or ERCOT.

(5) IBR plant controls, turbine controls and/or inverter controls shall not disconnect the IBR from the ERCOT Transmission Grid during voltage conditions where ride-through is required. IBR plant controls, turbine controls and/or inverter controls shall not reduce the IBR output during voltage conditions requiring ride-through unless necessary to provide appropriate frequency response.

(6) If instantaneous over-current or over-voltage protection systems are installed and activated to trip the IBR, they shall use filtered quantities or time delays to prevent misoperation while providing the desired equipment protection. Any instantaneous over-voltage protection that could disrupt IBR power output shall use a measurement window of at least one cycle of fundamental frequency.

(7) The IBR shall ride through multiple excursions outside the continuous operation range in Tables A or B in paragraph (1) above as applicable, unless the conditions and situations specified below exist, in which case the IBR may trip to protect equipment from the cumulative effect of successive voltage deviations:

(a) More than four voltage deviations at the POIB outside the continuous operation range within any ten second period;

(b) More than six voltage deviations at the POIB outside the continuous operation range within any 120 second period;

(c) More than ten voltage deviations at the POIB outside the continuous operation range within any 1,800 second period;

(d) Voltage deviations outside of continuous operation range following the end of a previous deviation outside of continuous operation range by less than 20 cycles of system fundamental frequency;

(e) More than two individual voltage deviations at the POIB below 50% of the nominal voltage (including zero voltage) within any ten second period;

(f) More than three individual voltage deviations at the POIB below 50% of the nominal voltage (including zero voltage) within any 120 second period; or

(g) A WGR may trip for consecutive voltage deviations resulting in stimulation of mechanical resonances exceeding equipment limits.

 Any IBR that monitors and actively protects against multiple excursions outside of the continuous operation range in Tables A and B in paragraph (1) above, shall ensure its parameters to ride-through multiple voltage excursions are set to the maximum level the equipment allows to meet and, if possible, exceed the performance requirements in paragraph (1) above. Individual voltage deviations begin when the voltage at the POIB drops below the lower limit of the continuous operation range or exceeds the upper limit of the continuous operation range. Individual voltage deviations end when the root-mean-square voltage magnitude at the POIB, for the previous one-cycle period of fundamental frequency, returns to the continuous operation region.

(8) An IBR shall ride-through any fault disturbance where the POIB voltage remains within the ride-through profiles specified in paragraph (1) above. Measurements of quantities such as phase angle jump and rate-of-change-of-frequency during fault conditions are not meaningful and shall not be used to trip or reduce the output of the IBR during fault conditions.

(9) The Resource Entity or IE for each IBR shall maximize the performance of its protection systems, controls, and other plant equipment (within equipment limitations) to meet and, if possible, exceed the requirements of paragraphs (1) through (8) above. A Resource Entity or IE may request an extension for upgrades or retrofits to confirm capability specified in paragraph (7) above by following the extension process set forth in Section 2.12, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2WGRs. The Resource Entity or IE shall maximize the rate-of-change-of-frequency, phase angle jump and multiple excursion ride-through capability within known equipment limitations as soon as practicable. Any temporary extensions under this paragraph shall be minimized and not extend beyond December 31, 2028.

(10) A Resource Entity of a Type 3 WGR may seek an extension for completing modifications to meet the voltage ride-through performance Tables A and C in paragraph (1) above by following the extension process set forth in Section 2.12. During any extension, the Resource Entity shall ensure the WGR’s voltage ride-through capability is set to the maximum level the equipment allows as soon as practicable.

(11) Any temporary extensions for IBRs with SGIAs on or after August 1, 2024 shall be minimized and not extend beyond December 31, 2028. Temporary extensions for performance that do not meet the voltage ride-through performance in Table A in paragraph (1) of Section 2.9.1.2, Legacy Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, are not allowed.

(12) If an IBR fails to perform in accordance with the applicable voltage ride-through requirements, the Resource Entity for the IBR shall take the actions described in Section 2.13, Actions Following a Transmission-Connected Inverter-Based Resource (IBR), Type 1 Wind-Powered Generation Resource (WGR) or Type 2 WGR Apparent Failure to Ride-Through.

***2.9.1.2*** ***Legacy Voltage Ride-Through Requirements for Transmission-Connected*** ***Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs***

(1) All IBRs, Type 1 WGRs and Type 2 WGRs subject to this Section in accordance with paragraph (1) of Section 2.9.1, Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, shall ride through the root-mean-square voltage conditions in Table A below as measured at the Resource’s POIB:

**Table A**

|  |  |
| --- | --- |
| Root-Mean-Square Voltage (p.u. of nominal) | Minimum Ride-Through Time(seconds) |
| V > 1.20 | May ride-through or may trip |
| 1.175 < V ≤ 1.2 | 0.2 |
| 1.15 < V ≤ 1.175 | 0.5 |
| 1.10 < V ≤ 1.15 | 1.0 |
| 0.90 ≤ V ≤ 1.10 | continuous |
| 0.0 < V < 0.90 | (V+0.084375)/0.5625 |
| V = 0.0 | 0.15 |

For voltage between zero and 0.9 p.u. the minimum ride-through time in Table A above is defined by a straight line mathematical function where the duration is 0.15 seconds at zero voltage and 1.75 seconds at 0.9 p.u. voltage.

(2) Nothing in paragraph (1) above shall be interpreted to require an IBR, Type 1 WGR or Type 2 WGR to trip for voltage conditions beyond those for which ride-through is required.

(3) If protection systems (including, but not limited to protection for over-/under-voltage, rate-of-change of frequency, anti-islanding, and phase angle jump) are installed and activated to trip the IBR, Type 1 WGR or Type 2 WGR, they shall enable the IBR, Type 1 WGR or Type 2 WGR to ride through voltage conditions beyond those defined in paragraph (1) above to the maximum level the equipment allows.

(4) An IBR, Type 1 WGR or Type 2 WGR shall inject electric current when required to ride-through voltage conditions. When the POIB voltage is outside the continuous operating voltage range, an IBR shall continue to deliver pre-disturbance active current unless reduction is needed for voltage support or otherwise specified by ERCOT or the interconnecting TSP. Any necessary reductions in active current to prioritize reactive current shall be relative to the voltage change at the POIB. Typically, more aggressive reductions in active current to allow for additional reactive current (if needed to stay within its current limitations) will occur at lower voltages (e.g., 0.4 p.u. or lower) but settings shall be based on the local needs of the area of the ERCOT System to which the IBR interconnects and ensure sufficient active current is available for protection system sensing. An IBR, Type 1 WGR or Type 2 WGR shall return to its pre-disturbance level of real power injection as soon as possible but no more than one second after POIB voltage recovers to normal operating range. Slower real power injection recovery rates may be allowed if necessary for reliability as documented by the impacted TSP or ERCOT.

(5) IBR, Type I WGR and Type 2 WGR plant controls, turbine controls, and/or inverter controls shall not disconnect the Resource from the ERCOT Transmission Grid during voltage conditions where ride-through is required. IBR, Type 1 WGR and Type 2 WGR plant controls, turbine controls, and/or inverter controls shall not reduce the Resource’s output during voltage conditions requiring ride-through unless necessary for providing appropriate frequency response.

(6) If instantaneous over-current or over-voltage protection systems are installed and activated to trip the IBR, Type 1 WGR or Type 2 WGR, they shall use filtered quantities or sufficient time delays to prevent misoperation while providing the desired equipment protection. Any instantaneous over-voltage protection that could disrupt power output shall use a measurement period of at least one cycle (of fundamental frequency).

(7) IBRs, Type 1 WGRs or Type 2 WGRs shall ride-through any fault disturbance where the POIB voltage remains within the ride-through profiles specified in paragraph (1) above. Measurements of quantities such as phase angle jump and rate-of-change-of-frequency during fault conditions are not meaningful and shall not be used to trip or reduce the output of the Resource during fault conditions.

(8) The Resource Entity for each IBR, Type 1 WGR or Type 2 WGR shall maximize the performance of its protection systems, controls, and other plant equipment (within equipment limitations) to meet and, if possible, exceed the performance requirements in paragraphs (1) through (7) above as soon as practicable but no later than December 31, 2025 or by its Commercial Operations Date, whichever is later.

(9) If an IBR, Type 1 WGR or Type 2 WGR with an SGIA executed prior to August 1, 2024 cannot comply with paragraphs (1) through (8) above by December 31, 2025, the Resource Entity shall, by April 1, 2025, request an exemption pursuant to Section 2.12.

(10) If an IBR, Type 1 WGR or Type 2 WGR fails to perform in accordance with the applicable voltage ride-through requirements, the Resource Entity shall take the actions described in Section 2.13, Actions Following a Transmission-Connected Inverter-Based Resource (IBR), Type 1 Wind-Powered Generation Resource (WGR) or Type 2 WGR Apparent Failure to Ride-Through.

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**2.11 Ride-Through Reporting Requirements for Transmission-Connected** **Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs**

***2.11.1*** ***Initial Frequency Ride-Through Capability Documentation and Reporting Requirements***

(1) The Resource Entity of an Inverter-Based Resource (IBR), Type 1 Wind-powered Generation Resource (WGR) or Type 2 WGR with a Standard Generation Interconnection Agreement (SGIA) executed prior to August 1, 2024 that cannot comply with paragraphs (1) through (6) of 2.6.2.1, Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs by December 31, 2025 shall, by April 1, 2025, submit to ERCOT via the Resource Integration and Ongoing Operations (RIOO) system, or as otherwise directed by ERCOT, a report with supporting information or documentation and request an exemption or extension containing the following:

(a) Current frequency ride-through capability in a format similar to the table in paragraph (1) of Section 2.6.2.1;

(b) Known frequency ride-through limitations of the IBR, Type 1 WGR or Type 2 WGR as compared to the requirements in paragraphs (1) through (5) of Section 2.6.2.1;

(c) For known and available technically feasible modifications evaluated by the Resource Entity to meet the applicable ride-through requirements, the cost of implementing the modification(s) to meet the applicable ride-through requirement(s) on a per inverter or turbine basis. ERCOT will treat all financial and proprietary information provided under this Section or Section 2.12, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, as Protected Information;

(d) Modifications the Resource Entity will implement to maximize the frequency ride-through capability of the IBR, Type 1 WGR or Type 2 WGR within known equipment limitations, to the greatest extent possible;

(e) Expected post-modification Resource capability in a format similar to the table in paragraph (1) of Section 2.6.2.1 and documentation of any expected remaining limitation(s) following implementation of such modifications;

(f) A schedule for implementing the modification(s);

(g) For any documented technical limitation that can be accurately represented in a model: (i) a model accurately representing all technical limitations, or (ii) where such model is not available or reasonably obtainable by the time the report is submitted, a schedule for providing the model as soon as practicable; and

(h) A description of any limitation that cannot be accurately represented in a model.

***2.11.2*** ***Initial Voltage Ride-Through Capability Documentation and Reporting Requirements***

(1) The Resource Entity of an IBR, Type 1 WGR or Type 2 WGR with an SGIA executed prior to August 1, 2024, that cannot comply with paragraphs (1) through (9) of Section 2.9.1.2, Legacy Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs by December 31, 2025 shall, by April 1, 2025, submit to ERCOT via the RIOO system, or as otherwise directed by ERCOT, a report with supporting information or documentation and request an exemption or extension containing the following:

(a) Current voltage ride-through capability in a format similar to the table in paragraph (1) of Section 2.9.1.2;

(b) Known voltage ride-through limitations of the IBR, Type 1 WGR or Type 2 WGR as compared to the requirements in paragraphs (1) through (9) of Section 2.9.1.2;

(c) For known and available technically feasible modifications evaluated by the Resource Entity to meet the applicable ride-through requirements, the cost of implementing the modification(s) to meet the applicable ride-through requirement(s) on a per inverter or turbine basis. ERCOT will treat all financial and proprietary information provided under this Section or Section 2.12, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, as Protected Information;

(d) Modifications the Resource Entity will implement to maximize the voltage ride-through capability of the IBR, Type 1 WGR or Type 2 WGR to approach or meet the voltage ride-through requirements in paragraphs (1) through (9) of Section 2.9.1.2 within known equipment limitations, to the greatest extent possible;

(e) Expected post-modification Resource capability in a format similar to the table in paragraph (1) of Section 2.9.1.2 and documentation of any expected remaining limitation(s) following implementation of such modifications;

(f) A schedule for implementing the modification(s);

(g) For any documented technical limitation that can be accurately represented in a model: (i) a model accurately representing all technical limitations, or (ii) where such model is not available or reasonably obtainable by the time the report is submitted, a schedule for providing such a model as soon as practicable; and

(h) A description of any limitation that cannot be accurately represented in a model.

**2.12** **Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs**

***2.12.1******Exemptions and Extensions Process***

(1) If an Inverter-Based Resource (IBR), Type 1 Wind-Powered Generation Resource (WGR) or Type 2 WGR has a technical limitation preventing it from fully meeting the frequency ride-through requirements in paragraphs (1) through (5) of Section 2.6.2.1, Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, or the voltage ride-through requirements in paragraphs (1) through (8) of Section 2.9.1.2, Legacy Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs; or as otherwise specified in paragraphs (5) through (7) of Section 2.9.1, Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, or certain voltage ride-through requirements in accordance with paragraph (10) of Section 2.9.1.1, Preferred Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), the Resource Entity or Interconnecting Entity (IE) (“Requesting Entity”) may request from ERCOT, under this Section, an exemption from meeting, or extension to meet, such applicable requirements.

(2) For any IBR, Type 1 WGR or Type 2 WGR with a Standard Generation Interconnection Agreement (SGIA) dated before August 1, 2024, exemption requests must be submitted to ERCOT on or before April 1, 2025.

(3) When seeking an exemption, a Requesting Entity shall provide to ERCOT:

(a) A detailed description of the technical limitation preventing the Resource from meeting the ride-through requirement(s), including a letter signed by an officer or executive of the original equipment manufacturer (or subsequent support company if the original equipment manufacturer is no longer in business) or an engineering consulting firm verifying the need for an exemption;

(b) Documentation describing any technically feasible modifications the Requesting Entity has implemented or will implement to meet the requirements;

(c) Documentation describing any technically feasible modification(s) the Requesting Entity will not implement due to being cost prohibitive;

(d) Models that accurately represent expected performance reflecting the technical limitations before and after any modifications to improve performance, including a description of any limitation that cannot be accurately represented in a model;

(e) The cost of implementing each technically feasible Resource modification or upgrade to meet the applicable ride-through requirement(s) on a per inverter or turbine basis;

(f) The cost of full in-kind replacement for all inverters or turbines/converters in the plant; and

 (g) Any other financial information the Resource Entity believes ERCOT should consider.

(4) When determining whether to grant an exemption, ERCOT will, in its sole and reasonable discretion, grant the exemption unless one or more of the conditions below exists:

(a) The risk to ERCOT System reliability posed by the individually requested exemption/extension or, in aggregate, all requested exemptions/extensions are unacceptable to ERCOT. Unacceptable reliability risks include but are not limited to:

(i) Instability, cascading outages or uncontrolled separation;

(ii) Loss of generation capacity from multiple Resources equal to or greater than 500 MW;

(iii) Loss of Load equal to or greater than 75 MW;

(iv) Safety of or damage to neighboring equipment;

(v) Unknown or unverified limitation(s); or

(vi) Phase angle jump or rate-of-change-of-frequency tripping during faults.

(b) The Requesting Entity has not implemented all available software, firmware, settings or parameterization modifications to meet or provide material improvement to meeting the applicable ride-through requirements.

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| ***[NOGRR245: Insert paragraph (c) below no sooner than March 1, 2025:]***(c) The Requesting Entity has not implemented a technically feasible modification to meet or provide significant improvement to meet the applicable ride-through requirements where the cost to the Requesting Entity of upgrading or modifying the Resource is less than 40 percent of the cost of full in-kind replacement for all inverters or turbines/converters in the plant. Potential modifications to meet or provide material improvement to meet the applicable ride-through requirements include, but are not limited to, the following:(i) Protection system upgrades or replacements; (ii) Communication upgrades;(iii) Controller card upgrade kits; (iv) Component upgrades (e.g., DC chopper, Phase-Locked Loop (PLL) controller, vibration monitoring, DC controller, Uninterrupted Power Supply (UPS), etc.); or(v) Plant equipment upgrades (transformers, dynamic reactive devices, etc.). |

(5) ERCOT, in its sole and reasonable discretion, will grant an extension if all of the following conditions exist:

(a) Circumstances beyond the Requesting Entity’s reasonable control prevented it from meeting the deadline;

(b) The extension request demonstrates the Requesting Entity’s good faith efforts to minimize the extension’s duration;

(c) The Requesting Entity has provided accurate models that include all limitations and describes all limitations the Requesting Entity cannot model and represents to ERCOT the model is accurate;

(d) The date for the requested extension for a Resource with an SGIA before August 1, 2024 does not exceed December 31, 2027; and

 (e) The date for the requested extension for a Resource with an SGIA after August 1, 2024 does not exceed December 31, 2028.

(6) For any IBR, Type 1 WGR or Type 2 WGR with an approved exemption or extension, the documented maximum capabilities will become the new performance requirements until the exemption or extension has ended.

(7) Exemptions and extensions under this Section take effect immediately upon approval by ERCOT and apply only to the extent approved by ERCOT.

(8) Exemptions under Section 2.12, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, continue until:

(i) The IBR, Type 1 WGR or Type 2 WGR fully implements a modification as described in paragraph (1)(c) of Planning Guide Section 5.2.1, Applicability, that is synchronized after January 1, 2028, except for exemptions that continue as contemplated in paragraph (9) of Section 2.9.1;

(ii) If ERCOT determines one of the conditions described in paragraph (4)(a) above arises after ERCOT previously granted an exemption to a Resource, ERCOT may revoke that exemption; or

(iii) If ERCOT or the Resource Entity becomes aware of a new modification for a Resource with an exemption that is determined to not be cost prohibitive to implement, the Resource Entity shall: (i) submit an implementation plan to ERCOT for approval within 90 days, and (ii) if ERCOT approves the plan, implement the plan within 180 days, unless ERCOT approves a longer timeline.

(9) Extensions under Section 2.12 shall end in accordance with Section 2.12.1.2, Submission of Extension Requests.

(10) Except for the provisions of Section 2.12.1.1, Submission of Exemption Requests and Section 2.13.1.2, the deadlines in Section 2.12 may be modified by mutual written agreement of ERCOT and the Requesting Entity.

(11) During the pendency of an exemption, extension, or appeal process, the IBR, Type 1 WGR or Type 2 WGR that is the subject of the exemption or extension request is required to meet the greater of: (i) its documented maximum capability, or (ii) its performance requirements in effect on May 1, 2024 until there is a non-appealable Public Utility Commission of Texas (PUCT) final order. If ERCOT:

(a) Grants the exemption or extension, the documented maximum ride-through capability becomes the Resource’s compliance obligation; or

 (b) Denies the exemption or extension and the Requesting Entity appeals ERCOT’s decision to the PUCT, the Resource’s compliance obligation shall be the greater of: (i) its documented maximum capability, or (ii) its performance requirements in effect on the day prior to August 1, 2024 until there is a non-appealable PUCT final order.

(12) ERCOT shall not refer to the Reliability Monitor any Requesting Entity’s request for an exemption or extension. ERCOT may refer to the Reliability Monitor for investigation, any performance failure of the IBR, Type 1 WGR or Type 2 WGR as contemplated Section in 2.13, Actions Following a Transmission-Connected Inverter-Based Resource (IBR), Type 1 Wind-Powered Generation Resource (WGR) or Type 2 WGR Apparent Failure to Ride-Through relating to frequency or voltage ride-through requirements.

(13) All information submitted under Section 2.12 shall be considered Protected Information.

***2.12.1.1 Submission of Exemption Requests***

(1) A Requesting Entity may seek an exemption for an IBR, Type 1 WGR or Type 2 WGR as follows:

(a) A Requesting Entity for an IBR, Type 1 WGR or Type 2 WGR with an SGIA executed prior to August 1, 2024 may seek exemptions from ride-through requirements in paragraphs (1) through (5) of Section 2.6.2.1, Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs or Section 2.9.1.2, Legacy Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs.

(b) A Requesting Entity for a Type 3 WGR with an original SGIA executed prior to August 1, 2024, that meets the criteria in paragraph (5) of Section 2.9.1, Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, may seek an exemption as described in that Section.

(2) A Requesting Entity, through its Authorized Representative, may initiate a request for an exemption under this Section by submitting written notice of the request to ERCOT through the Resource Integration and Ongoing Operations (RIOO) system (or as otherwise specified by ERCOT), with the following information:

(a) Requesting Entity Name;

(b) Requesting Entity DUNS Number;

(c) IBR/WGR Site Name;

(d) IBR/WGR Unit Name(s);

(e) Nodal Operating Guide Section(s) under which the exemption is requested;

(f) A detailed description of the grounds for the exemption and the basis for each request;

(g) Documentation describing all known limitations associated with the exemption request;

(h) A statement from the equipment manufacturer supporting the need for the exemption; and

(i) Any remaining information required in the reports in Section 2.11, Ride-Through Reporting Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, applicable to the request or paragraph (2) of Section 2.12.1, Exemptions and Extensions Process.

***2.12.1.2 Submission of Extension Requests***

(1) A Requesting Entity may seek an extension for an IBR, Type 1 WGR or Type 2 WGR as follows:

(a) A Requesting Entity for an IBR, Type 1 WGR or Type 2 WGR with an SGIA executed prior to August 1, 2024, may seek extensions for ride-through requirements in paragraphs (1) through (5) of Section 2.6.2.1, Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs or Section 2.9.1.2, Legacy Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs.

(b) A Requesting Entity for an IBR with an SGIA executed on or after August 1, 2024 may seek extensions as contemplated in paragraph (6) of Section 2.9.1, Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, paragraphs (9) or (10) of Section 2.9.1.1, Preferred Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs).

(2) A Requesting Entity, through its Authorized Representative, may initiate a request for an extension under this Section by submitting written notice of the request to ERCOT through the RIOO system (or as otherwise specified by ERCOT), with the following information:

(a) Requesting Entity Name;

(b) Requesting Entity DUNS Number;

(c) IBR/WGR Site Name;

(d) IBR/WGR Unit Name(s);

(e) Nodal Operating Guide Section(s) under which the extension is requested;

(f) A detailed description of the grounds for the extension and the basis for each request;

(g) Documentation from the equipment manufacturer describing any known limitations associated with the extension request, a description of proposed modifications, and a schedule for implementing modifications; and

(h) Other information specified in this Section.

(3) The Requesting Entity for an IBR with an SGIA executed on or after August 1, 2024, seeking an extension contemplated in paragraph (6) of Section 2.9.1, or paragraph (10) of Section 2.9.1.1 shall, at a minimum, submit the following information to ERCOT:

(a) Documentation describing the justification for granting the extension;

(b) A model accurately representing all technical limitations and expected performance;

(c) A description of any limitation that cannot be accurately represented in a model;

(d) Data and information identified in paragraphs (5) through (7) below, as applicable; and

(e) Any other data or information ERCOT reasonably deems necessary to evaluate granting the extension.

(5) If a Requesting Entity submits a request for an extension to meet the performance requirements in sections 5, 7, and 9 of the Institute of Electrical and Electronics Engineers (IEEE) 2800-2022, Standard for Interconnection and Interoperability of Inverter-Based Resources (IBRs) Interconnecting with Associated Transmission Electric Power Systems (“IEEE 2800-2022 standard”) as described in paragraph (6) of Section 2.9.1, it must provide to ERCOT:

(a) Evidence from its original equipment manufacturer (or subsequent inverter/turbine vendor support company if the original equipment manufacturer is no longer in business) of technical infeasibility to comply with any of the performance requirements in sections 5, 7, and 9 of the IEEE 2800-2022 standard by its synchronization date;

(b) A description of proposed modifications; and

(c) The schedule for implementing those modifications. Any temporary extension shall be minimized and not extend beyond December 31, 2028 or 24 months after the Resource’s Commercial Operations Date, whichever is earlier.

(6) If a Requesting Entity submits a request for an extension to meet the performance requirements in paragraph (7) as contemplated in paragraph (9) of Section 2.9.1.1, it must provide to ERCOT:

(a) Evidence from its equipment manufacturer of technical infeasibility to comply with the performance requirements in paragraph (7) of Section 2.9.1.1 by its synchronization date;

(b) A description of proposed modifications; and

(c) The schedule for implementing those modifications. Any extensions under this paragraph shall be minimized and not extend beyond December 31, 2028.

(7) If a Requesting Entity submits a request for an extension to meeting the performance requirements in Tables A or C in paragraph (1) as contemplated in paragraph (10) of Section 2.9.1.1, it must provide to ERCOT:

(a) Documented evidence from its equipment manufacturer of technical infeasibility to comply with the performance requirements in paragraph (1) of Section 2.9.1.1 by the IBR’s/WGR’s synchronization date;

(b) A description of proposed modifications; and

(c) The schedule for implementing those modifications. Any extensions under this paragraph shall be minimized and not extend beyond December 31, 2028. ERCOT will not grant any temporary extensions for performance that do not meet the voltage ride-through performance requirements in Table A in paragraph (1) of Section 2.9.1.2.

(8) Extensions will terminate according to their terms at the time granted or at another date approved by ERCOT in writing.

***2.12.1.3 Timeline for Submission and Determination of Exemption and Extension Requests***

(1) As soon as practicable after receiving a request for an exemption or extension, ERCOT shall provide the Requesting Entity with written confirmation of receipt and notification that either:

(a) The submission was complete and ERCOT is reviewing the request; or

(b) The submission was incomplete. For incomplete submissions, ERCOT will:

(i) Identify the missing information; and

(ii) Provide instructions for the Requesting Entity to submit the missing information (e.g., to ERCOT Legal at MPRegistration@ercot.com or through the RIOO system).

(2) Unless otherwise agreed by ERCOT, not later than ten Business Days of receiving a notice of an incomplete submission, the Requesting Entity shall submit the missing information to ERCOT through the RIOO system or as otherwise directed by ERCOT that it needs additional time to provide the additional information, along with an explanation for the delay.

(3) Within seven days after ERCOT acknowledges receiving a complete request for exemption or extension, ERCOT shall designate an ERCOT senior representative with decision-making authority to participate in discussions with the Requesting Entity regarding the exemption or extension request.

(4) During the time ERCOT considers an exemption or extension request, ERCOT and the Requesting Entity will cooperate in requesting and providing relevant information to develop a complete record to allow an effective and efficient review process.

(5) ERCOT shall make reasonable efforts to complete an exemption or extension request process within 180 days after receiving a complete request for an exemption or extension. If ERCOT cannot complete its review of the request within that time period, ERCOT shall provide the Requesting Entity an estimate of the additional time needed to complete its review. ERCOT shall provide the Requesting Entity with written notification that ERCOT has completed its review and ERCOT’s determination that the exemption or extension is:

(a) Approved;

(b) Approved in part, along with details of the approved part of the exemption or extension, and a detailed explanation for denying part of the exemption or extension request; or

(c) Rejected, along with details explaining the grounds upon which ERCOT rejected the exemption or extension request.

***2.12.1.4 Procedure for Appealing an ERCOT Decision to Reject an Exemption or Extension Request***

(1) Upon issuance of ERCOT’s decision on the exemption or extension request, the Requesting Entity adversely affected may appeal ERCOT’s decision to the Public Utility Commission of Texas (PUCT) pursuant to P.U.C. PROC. R. 22.251, Review of Electric Reliability Council of Texas (ERCOT) Conduct. For such an appeal, the Requesting Entity is not required to comply with Protocol Section 20, Alternative Dispute Resolution Procedure and Procedure for Return of Settlement Funds.

(2) A Requesting Entity that does not submit a notice of appeal to ERCOT within the required time period after receiving ERCOT’s notice rejecting the exemption or extension request is deemed to have accepted ERCOT’s decision.

***2.13*** ***Actions Following* *a Transmission-Connected******Inverter-Based Resource (IBR), Type 1 Wind-Powered Generation Resource (WGR)******or Type 2 WGR Apparent Failure to Ride-Through***

(1) The required ride-through performance criteria (“Required Criteria”) are defined in Section 2.6.2.1, Frequency Ride-through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, and Section 2.9.1, Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs. For any Inverter-Based Resource (IBR), Type 1 Wind-powered Generation Resource (WGR) or Type 2 WGR with an approved exemption or extension for the ride-through requirements, the Resource’s documented maximum ride-through capabilities are the ride-through performance requirements for compliance purposes for the duration of the exemption or extension unless otherwise indicated by Governmental Authority rules or regulations. All IBRs, Type 1 WGRs and Type 2 WGRs shall strive to meet or exceed the Required Criteria to the fullest extent their equipment allows.

(2) For any IBR, Type 1 WGR or Type 2 WGR with an approved exemption or extension for the ride-through requirements, the Resource’s documented maximum ride-through capabilities are the ride-through performance requirements for compliance purposes for the duration of the exemption or extension unless otherwise indicated by Governmental Authority rules or regulations. Any IBR with documented maximized ride-through capabilities that exceed the applicable Required Criteria and fails to ride-through a disturbance within the IBR’s documented maximized capabilities is also subject to this Section.

(3) If an IBR, Type 1 WGR or Type 2 WGR does not ride-through in accordance with the applicable ride-through performance requirements, including its maximized capabilities (an “Apparent Performance Failure”), the Resource Entity shall, as soon as practicable:

(a) Investigate the Apparent Performance Failure;

(b) Report to ERCOT the cause of the Apparent Performance Failure; and

(c) Perform model validation and report the results to ERCOT.

(4) Following an Apparent Performance Failure, Transmission Service Providers (TSPs) directly impacted by the Apparent Performance Failure shall provide available information to ERCOT to assist with event analysis.

(5) The Resource Entity for an IBR, Type 1 WGR, or Type 2 WGR that experiences an Apparent Performance Failure shall:

(a) Develop a plan to ensure the IBR, Type 1 WGR, or Type 2 WGR meets the applicable ride-through performance requirements (whether documented maximized capability or Required Criteria, whichever applies);

(b) Submit the plan to ERCOT for approval within 90 days; and

(c) If ERCOT approves the plan, implement the plan within 180 days, unless ERCOT approves a longer timeline.

(6) To encourage all Resources to maximize all equipment frequency and voltage ride-through parameters to the maximum level the equipment allows and all new Resources to also design the plant to the utilize the inverter or converter capabilities to the fullest extent, any Apparent Performance Failure where system conditions at the Point of Interconnection Bus (POIB) exceeded the Required Criteria but remained below documented maximized frequency or voltage ride-through capabilities exceeding the applicable requirements in Sections 2.6.2, Frequency Ride-Through Requirements for Generation Resources and Energy Storage Resources, 2.9.1, 2.9.1.1, Preferred Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) or 2.9.1.2, Legacy Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs), Type 1 Wind-Powered Generation Resources (WGRs) and Type 2 WGRs, shall be reported to the Reliability Monitor only if the Resource Entity does not fully meet the requirements in paragraphs (3) and (5) above.