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| **NOGRR Number** | [**245**](https://www.ercot.com/mktrules/issues/NOGRR245) | **NOGRR Title** | **Inverter-Based Resource (IBR) Ride-Through Requirements** |

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| **Date** | April 15, 2024 |

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| **Submitter’s Information** | |
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| **Market Segment** | Not applicable |

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| **Comments** |

ERCOT respectfully submits to the ERCOT Board of Directors (Board) these comments on top of the March 27, 2024 Technical Advisory Committee (TAC) Report. ERCOT has further provided for Reliability & Markets (R&M) Committee and Board discussion a PowerPoint presentation for the April 22-23, 2024 meetings highlighting some of the concerns with the TAC-recommended version of NOGRR 245.

Fundamentally, after 18 months of discussions with stakeholders (including original equipment manufacturers (OEMs)), ERCOT opposes the TAC-recommended version because it does not address ***the current, critical reliability risk*** NOGRR 245 sought to mitigate when ERCOT sponsored the Revision Request back in January 2023. The ERCOT PowerPoint presentation goes into more detail around that risk. Over time, the TAC-recommended version in front of the Board decreases reliability to even less than the current Nodal Operating Guides require.

After two failed votes on March 27, 2024, TAC inserted a paragraph from the March 20, 2024 ERCOT Comments that did nothing to address ERCOT’s concerns, yet TAC approved a new version of NOGRR 245 (after advocacy from the Joint Commenters that the change was a compromise to work towards additional support from ERCOT) at a 69% vote – meaning TAC barely had enough affirmative votes to pass the version sent to the Board. The policy rationale supporting the 69% approval remains unclear considering two Corporate Member Segments (Cooperatives and Investor-Owned Utilities) with Transmission Operator responsibilities voted against the TAC version. At the TAC meeting, ERCOT explicitly stated the revision did nothing to address ***the current, critical reliability risk*** on the ERCOT System. The R&M Committee, Board and, ultimately, the Public Utility Commission of Texas (PUCT) deserve more information from TAC on why it presented this version to the Board for consideration and recommendation to the PUCT.

As stated by the Joint Commenters (a group of IBR owners with whom ERCOT has worked for months on this NOGRR in an attempt to find a balance) in their last comments, the proposal must work for the generators supporting and operating these resources and it must work for driving the reliability and resiliency of the ERCOT System needed through the changes in these new standards. ERCOT submits these comments to find the *right balance* between risk mitigation and the economic cost and impact of achieving that risk mitigation to IBR owners. The TAC-recommended version does not assign an appropriate level of economic cost commensurate with the significant risk of a catastrophic grid failure currently faced due to the significant penetration of wind, solar and battery resources (IBRs) in the ERCOT Region. The ERCOT Region has ~70,000 MWs of IBRs and that number continues to grow based upon the data in the interconnection queue. TAC discussed, as way of a hypothetical question, possibly exempting 8% of IBRs through the exemption process laid out in the NOGRR. However, even 8% is material to the ERCOT System, representing approximately 5,600 MWs. The instantaneous loss of 5,600 MWs of generation (or even less) at one time due to ride-through failures would likely trigger automated Under-Frequency Load Shedding and may collapse the entire ERCOT System.

The policy issues associated with NOGRR 245 are substantial, complicated, and far reaching and ERCOT appreciates the work done by all stakeholders to get us to this point. However, make no mistake, Texas is first to address this critical reliability issue associated with IBRs – which will be followed by a national standard directed by the Federal Energy Regulatory Commission (FERC). That national standard is likely several years away from approval (and further for implementation). Consistent with Strategic Plan Objective 1, ERCOT wants to be an industry leader for grid reliability and resiliency and put forward a Texas standard that addresses that risk and protects the Texas power grid. Without further policy rationale from TAC, ERCOT does not believe the TAC-recommended version of NOGRR 245 achieves Strategic Plan Objective 1.

The TAC-recommended version of NOGRR 245 does the following:

* Takes ERCOT’s attempts to compromise, adds far-reaching policy changes, and eviscerates ERCOT’s ability to assure reliability.
* Adopts concepts such as “commercially reasonable” modifications, no requirements to mitigate performance failures, a continued lowering of requirements after performance failures, and an ever-growing list of exemptions.
* Pushes out the effective date from 6/1/23 to 6/1/24, which lowers the requirements on potentially 20-30 GWs of new IBRs capable of meeting new requirements (or that can have exemptions for the small differences between their technical capabilities and the performance requirements).

ERCOT wants to clearly state the following:

* ERCOT staff has desired – and continues to desire – to collaborate with IBR owners to solve the current critical reliability issues created by IBR ride-through failures. Collaboration solves problems. ERCOT simply cannot, however, sacrifice reliability to accommodate some Market Participants’ desire to avoid compliance risk or emphasize *their* commercial interest over others, especially with respect to a critical reliability risk.
* ERCOT’s proposed changes are necessary and assume other changes will occur without delay, such as NOGRR 255 (High Resolution Data Requirements), the additional West Texas synchronous condensers, Grid-Forming adoption, and continued improvements to model quality and testing.
* ERCOT staff is committed to continuous improvement. If additional changes are needed to improve the requirements or remove unnecessary compliance burden, ERCOT staff is committed to improving requirements as necessary to minimize impact, so long as reliability is assured and not materially reduced.
* ERCOT has no desire to “disconnect” Resources, but, rather, has tried to be transparent by disclosing the fact that ERCOT may have to restrict some Resources that cannot meet a fundamental tenet of grid reliability – riding through voltage and frequency disturbances. ERCOT is keenly aware any decision to restrict or disconnect load, generation, or transmission equipment is heavily scrutinized. ERCOT wants all grid assets to perform according to requirements and maintain reliability of the ERCOT System.
* ERCOT staff is committed to reasonable and collaborative evaluation of improvements to ride-through capability. ERCOT does not want Resource Entities to incur extreme costs for little-to-no-improvement to reliability, nor does it seek to forgo significant improvements for relatively low cost. ERCOT believes most assessments will be mutually agreeable if applied with reason by ERCOT and Resource Entities. ERCOT can assess the risk and reliability improvement value while Resource Entities assess cost impacts. Both parties must collaborate to succeed.
* The electric system is transitioning at a pace and complexity never before seen. ERCOT believes it and all stakeholders must work together to solve associated problems to succeed. With IBRs becoming the dominant generation technology, ERCOT must take steps to address critical reliability risks. We all fail if we do not assure reliability and a system-wide blackout occurs.

Briefly, ERCOT has revised the TAC-recommended version of NOGRR 245 as follows:

1. **Removed commercially reasonable modifications language and references.** ERCOT removed Section 2.11, Commercially Reasonable Efforts, and any references to it. Determining what is commercially reasonable (for exemptions) is better suited for the PUCT than ERCOT or IBR owners. ERCOT addresses the underlying concern in new Section 2.11.1, Exemptions, which allows a balancing of risk and cost. ERCOT is committed to assuring reliability while working with generators to minimize the impact by evaluating the amount of improvement against cost to the Resource Entity of fully meeting requirements.

2. **Replaced Sections 2.12, Ride-Through Reporting Requirements; 2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions, and Appeals; and 2.14, Actions Following an Apparent Failure to Ride-through with a new Section 2.11, Exemptions and Extensions.** ERCOT replaced and greatly simplified the language with a new “exemptions and extensions” section to remove the effect in the TAC-recommended version of continually lowering requirements by creating new exemptions after ride-through performance failures. The ERCOT proposal removes the unreasonable requirement for ERCOT to review submissions within 10 days and the need for annual reports. Instead, ERCOT’s proposal allows for exemption reviews as needed if a new technically feasible solution becomes available. It also requires mitigation plans after performance failures and allows for an assessment of risk and cost when ERCOT considers whether to grant an exemption.

3. **Reinstituted ERCOT’s timeline for implementing ride-through improvements.** ERCOT reinserted the December 31, 2025 and December 31, 2027 (extension) dates and requires compliance by 12/31/25 as originally proposed and provides for an extension of that deadline rather than granting an exemption. ERCOT staff recognizes that, in implementation, schedule challenges may require it to afford some entities additional time to implement improvements.

4. **Reinstituted operational restrictions language for performance failures.** ERCOT reinserted language regarding the potential for operational restrictions for ride-through performance failures creating an unacceptable reliability risk. ERCOT will not take such actions lightly but has exercised (and continues to exercise) that authority to address risks to the ERCOT System (whether generation, transmission, load, *etc*.) until the risk can be mitigated to a level not causing unacceptable reliability risk. For clarity, ERCOT intends the operational restrictions to address performance failures and not when it denies an IBR or WGR an exemption. ERCOT proposes this language to clarify its existing authority and to set a clear expectation that it may be necessary to disconnect an IBR or restrict its output when it fails to perform through a ride-through event. Allowing an IBR to stay connected to the ERCOT System may jeopardize other grid assets and ultimately the entire ERCOT System.

5. **Added language to address multiple excursion ride-through but continues to defer additional detail for phase angle jump and rate-of-change-of-frequency (ROCOF) requirements.** ERCOT retained the requirement for legacy IBRs and WGRs to maximize multiple excursion ride through capabilities when possible. ERCOT also inserted language addressing a recent language change in the IEEE P2800-2 standard to address another limitation. Rather than have exemptions to IEEE 2800 requirements, ERCOT proposes to require only that Resource Entities maximize that capability, if possible. Transmission Service Providers (TSPs) are evaluating criteria regarding reclosing schemes near IBRs and WGRs to help minimize risk. ERCOT does, however, continue to recommend a separate NOGRR to address phase angle and RoCoF requirements as soon as possible after NOGRR 245. The IEEE P2800-2 drafting team has encouraged transmission and generation entities to determine how to commonly measure those parameters and evaluate appropriate limits. This will require additional technical discussions and evaluation making a separate NOGRR appropriate. In the interim, consistent with draft language in P2800-2, ERCOT maintains the status quo that, during a fault, those parameters are not accurate and should not be used to trip an IBR. Doing so helps assure reliability. ERCOT staff is committed to working with IBR owners to reach an expedient and proper determination of appropriate language to assure reliability while minimizing the impact on generators.

6**. ERCOT set the date for new IBR requirements to June 1, 2023.** ERCOT continues to recommend the changes become effective for IBRs with an SGIA on or after June 1, 2023 to prevent possibly 20-30 GWs of IBRs from not having to perform to standards most can already meet. For those IBRs that cannot fully meet the new requirements, ERCOT proposes exemptions and extensions to allow a phase-in period. Having fewer ride-through failures and more robust mitigation will ultimately encourage investment in the ERCOT Region. Continued ride-through failures and attention to IBR performance failures will undermine investor confidence. Requiring IBRs to perform at the new requirements (or a level better than the current legacy requirements) is good for reliability and helps assure consistent testing to the higher levels. Not requiring certain elements (like negative sequence current injection as IEEE 2800 requires) can result in additional protection system failures. In fact, Oncor Electric Delivery Co. raised this issue in its March 7, 2023 comments on NOGRR 245. Modern IBRs can readily meet those capabilities.

7. **ERCOT continues to recommend deferring specific Sub-Synchronous Resonance (SSR) mitigation and current response timing language changes into a separate NPRR and NOGRR.** The TAC-recommended version requires that SSR mitigation that slows down control response must be allowed without regard to reliability impact. ERCOT continues to recognize that, sometimes, slowing the controls down slightly is best for stability and reliability *within limits*. Inverters can typically respond to a disturbance in milliseconds with Type 3 WGRs taking a little longer. If an IBR developer chooses to interconnect in an area requiring mitigation of SSR risk, a lower cost SSR mitigation method of slowing down control response *could* be acceptable *when it does not negatively impact system reliability*. However, slowing control response effectively means less transient voltage and frequency support (typically within 3 seconds) and a voltage disturbance will dip lower and further which then triggers more IBRs to enter ride-through mode, which can further drop active current and lower the frequency dip. In other words, the tradeoff for slower controls must be evaluated for its system impact and, when that evaluation shows little-to-no-support to the system and contributes to a risk of more severe consequences, a different SSR mitigation method should be utilized (even if more costly to appropriately balance risk and cost). ERCOT has modified the TAC-recommended language to align with those principles until an additional NPRR or NOGRR can address the issue.

8. **Other language changes.** ERCOT made several other less substantive edits to minimize additional changes to sections not part of the current focus such as those that deal with synchronous generators. ERCOT would recommend such changes are addressed in a future NOGRR. ERCOT reinstituted the portion of Section 2.9.1.1 Table A and B that makes the ride-through region below .25 pu consistent with current legacy IBR requirements.

**Summary**

ERCOT’s preference is to continue to work with TAC to address its concerns and, hopefully, better inform the R&M Committee and Board at its June meetings around the policy rationale of a TAC-recommended version whether changed to address ERCOT’s concerns or not. As such, ERCOT primarily recommends that the R&M Committee recommend the Board remand the TAC-recommended version of NOGRR 245. Alternatively, ERCOT recommends that the R&M Committee recommend to the Board the 3/27/24 TAC-recommended version of NOGRR 245 as amended by these ERCOT Comments.

In addition, if the R&M Committee/Board move to remand, then ERCOT recommends the Board present at least the following questions to TAC:

* Why are exemptions necessary under the "legacy" requirements for 2014 and newer Inverter Based Resources (IBRs)?
* Why are *additional* exemptions needed for the same IBR after ERCOT has approved an initial exemption? In other words, what value does a standard have if an entity can request an exemption to that standard after it has failed to meet the standard?
* Why does delaying implementation of Section 2.9.1.1 and IEEE 2800 from June 1, 2023 to June 1, 2024 help ensure reliability of the ERCOT System with respect to the current, critical reliability risk ERCOT has identified (cascading outages, uncontrolled separation, or instability due to IBR ride-through failures)?
  + In other words, why can’t units installed on or after 6/1/23 meet the IEEE 2800 requirements (or come close to meeting those requirements)?
* Were cost impacts on other generators, transmission operators and consumers that may be caused by additional congestion and new stability limitations considered in the discussion? If so, please explain TAC’s conclusions in this regard.

Lastly, ERCOT continues to strongly recommend all IBR owners implement readily available software and parameterization changes to maximize their ride-through capability without delay due to the current, critical reliability risk to the ERCOT System. A NOGRR is not needed for IBR owners to step-up now and implement those changes and work with ERCOT.

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|  | and Energy Storage Resources |
| **Revised Cover Page Language** | |
| **Nodal Operating Guide Sections Requiring Revision** | 2.6.2, Generators and Energy Storage Resources  2.6.2.1, Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs) (new)  2.6.2.1, 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) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs) (new)  2.9, Voltage Ride-Through Requirements for Generation Resources and Energy Storage Resources  2.9.1, Voltage Ride-Through Requirements for Intermittent Renewable Resources Connected to the ERCOT Transmission Grid  2.9.1.1, 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) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs) (new)  2.11, Exemptions and Extensions  2.11.1, Exemptions  2.11.2, Extensions  2.11.3, Actions on Exemption and Extension Requests |
| **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 with Standard Generation Interconnection Agreements (SGIAs) dated after 6/1/24 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”). IBRs and Type 1/Type 2 WGRs that fail to ride-through routine system disturbances will be eligible for exemptions to even the existing ride-through requirements, which will erode the ride-through requirements over time. All IBRs and Type 1/Type 2 WGRs with SGIAs before 6/1/24 must only implement “commercially reasonable” modifications (as defined by the Resource Entity) and may remain connected to the ERCOT System even if they fail to ride-through routing system disturbances. As proposed, the revision does nothing to improve ERCOT System reliability with respect to existing IBRs and Type 1/Type 2 WGRs and actually decreases ERCOT System reliability. |
| **Justification of Reason for Revision and Market Impacts** | ERCOT originally submitted this NOGRR based on reliability issues associated with the inability of some IBRs and Type 1/Type 2 WGRs 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, the original version of this NOGRR proposed 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 proposed 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 originally did not propose to grandfather existing IBRs and Type 1 and Type 2 WGRs indefinitely. Rather, the original version of the NOGRR proposed that all IBRs and Type 1 and Type 2 WGRs with a Standard Generation Interconnection Agreement (SGIA) executed prior to January 1, 2023 (“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. The TAC-recommended version of this NOGRR changed that date to June 1, 2024, which effectively removes 20-30 GWs of IBRs from having to comply with the IEEE 2800-2022 requirements. IBRs and Type 1 and Type 2 WGRs that cannot meet the new ride-through requirements must submit a report by February 1, 2025 documenting that fact and provide ERCOT an accurate understanding of the physical limitations and maximum ride-through capability. No later than February 1st of each subsequent year, such Resources must update this evaluation if there have been any material changes, or alternatively submit an attestation signed by an officer or executive with authority to bind the Resource that there have been no material changes since the prior report submission. 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 because those Resources must implement software, firmware and parametrization changes that do not require physical equipment modifications. Many of the Odessa-related issues have already 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. ERCOT’s original version of this NOGRR accomplished that goal; the current version does not. 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. |

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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) and Type 1 and Type 2 Wind-Powered Generation Resources (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 individual Generation Resources or ESRs from the ERCOT System meets or exceeds the following requirements:

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| **Frequency Range** | **Delay to Trip** |
| Above 59.4 Hz | No automatic tripping  (continuous operation) |
| Above 58.4 Hz up to  and including 59.4 Hz | Not less than 9 minutes |
| Above 58.0 Hz up to  and including 58.4 Hz | Not less than 30 seconds |
| Above 57.5 Hz up to  and 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 Generation Resource or ESR, they shall perform such that the automatic removal of individual Generation Resources or ESRs 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 installed and activated to trip a Generation Resource or ESR, frequency protection schemes 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 that inability, including study results or manufacturer documentation. The limitation description shall include the Generation Resource’s or ESR’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) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs)***

(1) This Section applies to all IBRs, Type 1 Wind-powered Generation Resources (WGRs) and Type 2 WGRs interconnected 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:

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| 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 Resource, they shall enable the Resource to ride through frequency conditions beyond those defined in paragraph (1) above to the maximum extent the equipment allows.

(4) An IBR, Type 1 WGR or Type 2 WGR shall inject electric current during all periods requiring ride-through.

(5) Plant controls or inverter controls of an IBR, Type 1 WGR or Type 2 WGR shall not disconnect the Resource from the ERCOT System or reduce the Resource’s output during frequency conditions where ride-through is required unless necessary for providing appropriate frequency response.

(6) The Resource Entity or Interconnecting Entity (IE) of an IBR, Type 1 WGR or Type 2 WGR with a Standard Generation Interconnection Agreement (SGIA) executed prior to June 1, 2023, shall ensure the Resource’s frequency ride-through capability is set to the maximum level the equipment allows to meet, and if possible exceed, the requirements of paragraphs (1) through (5) above as soon as practicable but no later than December 31, 2025. Such IBRs, Type 1 WGRs and Type 2 WGRs shall comply with the frequency ride-through requirements specified in Section 2.6.2.1.1, Temporary Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs), until the Resource Entity implements changes to comply with paragraphs (1) through (5) above or until December 31, 2025, whichever is sooner, at which time the Resource must comply with this Section.

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| and reasonable discretion, ERCOT may allow adocumented technical exceEvidence from paragraph (7) above must sufficiently demonstrate that the Resource’s ride-through capability has been maximized and: (i) can meet the ride-through curves specified in Section 2.6.2.1.1, Temporary Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs); (ii) does not create any risk of instability, uncontrolled separation or cascading outages for the ERCOT System;, and (iii) the limitation is accurately represented in models provided to ERCOT. Any eExcemptions will expire when the IBR, Type 1 WGR or Type 2 WGR implements a modification as described in paragraph (1)(c) of Planning Guide Section 5.2.1, for which a Generator Interconnection or Modification (GIM) was initiated or when ERCOT is notified that the technical limitation no longer exists. Software, firmware and parameterization changes needed to achieve the required and do performance are required and not qualify allowed for an excemption. ERCOT may not grant an excemptions are not allowed that would effectively be lower than the current frequency ride-through requirements below those in effect as onf December 1, 2023. For any IBR or Type 1 WGR or Type 2 WGR that receives with a documented technical excemption, the documented maximum capabilities that do not meeting the capabilities in paragraphs (1) through (5) above will become the new performance requirements until the excemption is removed. |
| ***[NOGRR245: Replace paragraph (6) above with the following on January 1, 2026.]***  (6) The Resource Entity of an IBR, Type 1 WGR or Type 2 WGR shall ensure its frequency ride-through capability is set to the maximum level the equipment allows to meet, and if possible exceed, the requirements of paragraphs (1) through (5) above. |

(7) If an IBR, Type 1 WGR or Type 2 WGR with an SGIA executed prior to June 1, 2023 cannot fully meet the performance requirements in paragraphs (1) through (5) above by December 31, 2025, ERCOT may grant an extension to the deadline so long as the Resource Entity or IE, by February 1, 2025, meets the requirements of paragraph (1) of Section 2.11.2, Extensions. The Resource Entity or IE shall update that information by February 1 of each year if any material changes occur or submit an attestation signed by an officer or executive with authority to bind the Resource Entity stating no changes have occurred.

(8) In its sole discretion, ERCOT may allow an exemption to an existing IBR, Type 1 WGR or Type 2 WGR with an SGIA executed prior to June 1, 2023, if the Resource Entity or IE meets the requirements in paragraph (1) of Section 2.11.1, Exemptions, and demonstrates the Resource can meet the ride-through curves specified in Section 2.6.2.1.1. This exemption will expire when the IBR, Type 1 WGR or Type 2 WGR implements a modification as described in paragraph (1)(c) of Planning Guide Section 5.2.1, Applicability, for which a Generator Interconnection or Modification (GIM) was initiated or when ERCOT is notified the technical limitation no longer exists. Software, firmware, and parameterization changes to achieve the required performance are required and do not qualify for an exemption. ERCOT may not grant an exemption that would materially lower the frequency ride-through requirements below those in effect on December 31, 2023. For any IBR, Type 1 WGR or Type 2 WGR with an exemption, the maximum capabilities not meeting the requirements in paragraphs (1) through (5) above, become the new performance requirements until the exemption is removed. Based on the information provided by the Resource Entity or IE, if ERCOT determines an IBR, Type 1 WGR or Type 2 WGR cannot comply with all applicable frequency ride-through requirements, ERCOT may limit the Resource’s operation as set forth in paragraph (10) below, or grant a temporary exemption, provided the exemption does not affect the Resource Entity’s or IE’s duty to comply with the frequency ride-through requirements in effect on December 31, 2023. During any temporary exemption, the Resource Entity or IE shall implement any technically feasible modifications to achieve the maximum frequency ride-through capability as soon as practicable but no later than December 31, 2025. All temporary exemptions from this requirement shall terminate no later than December 31, 2025.



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| and reasonable discretion, ERCOT may allow adocumented technical exceEvidence from paragraph (7) above must sufficiently demonstrate that the Resource’s ride-through capability has been maximized and: (i) can meet the ride-through curves specified in Section 2.6.2.1.1, Temporary Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs); (ii) does not create any risk of instability, uncontrolled separation or cascading outages for the ERCOT System;, and (iii) the limitation is accurately represented in models provided to ERCOT. Any eExcemptions will expire when the IBR, Type 1 WGR or Type 2 WGR implements a modification as described in paragraph (1)(c) of Planning Guide Section 5.2.1, for which a Generator Interconnection or Modification (GIM) was initiated or when ERCOT is notified that the technical limitation no longer exists. Software, firmware and parameterization changes needed to achieve the required and do performance are required and not qualify allowed for an excemption. ERCOT may not grant an excemptions are not allowed that would effectively be lower than the current frequency ride-through requirements below those in effect as onf December 1, 2023. For any IBR or Type 1 WGR or Type 2 WGR that receives with a documented technical excemption, the documented maximum capabilities that do not meeting the capabilities in paragraphs (1) through (5) above will become the new performance requirements until the excemption is removed. |
| ***[NOGRR245: Replace paragraph (8) above with the following on January 1, 2026.]***  (8) In its sole discretion, ERCOT may allow an exemption to an existing IBR, Type 1 WGR or Type 2 WGR with an SGIA executed prior to June 1, 2023 that provides the information required in paragraph (1) of Section 2.11.1, Exemptions, and demonstrates that the Resource’s ride-through capability has been maximized and can meet the ride-through curves specified in Section 2.6.2.1.1. This exemption will expire when the IBR, Type 1 WGR or Type 2 WGR implements a modification as described in paragraph (1)(c) of Planning Guide Section 5.2.1, Applicability, for which a Generator Interconnection or Modification (GIM) was initiated or when ERCOT is notified the technical limitation no longer exists. Software, firmware, and parameterization changes to achieve the required performance are required and do not qualify for an exemption. ERCOT may not grant an exemption that would materially lower the frequency ride-through requirements below those in effect on December 31, 2023. For any IBR, Type 1 WGR or Type 2 WGR with an exemption, the maximum capabilities not meeting the required capabilities in paragraphs (1) through (5) above, become the new performance requirements until the exemption is removed. |

(9) If an IBR, Type 1 WGR or Type 2 WGR fails to meet the frequency ride-through requirements of this Section, the Resource Entity shall investigate the event and report to ERCOT the cause of the Resource’s failure. The Resource Entity shall, as part of its investigation: (i) perform model validation; (ii) within 90 days of the failure, provide to ERCOT a mitigation plan to meet the applicable frequency ride-through requirements as soon as practicable but no longer than 12 months from the date the mitigation plan is submitted unless ERCOT allows a longer timeframe; and (iii) timely implement the mitigation plan. All impacted Transmission Service Providers (TSPs) shall provide available information to ERCOT to assist with event analysis.

(10) In its sole discretion, ERCOT, in fulfilling its duties as the Independent Organization, and North American Electric Reliability Corporation (NERC) Reliability Coordinator and Transmission Operator, ERCOT may restrict or not permit to operate any IBR, Type 1 WGR or Type 2 WGR that has one or more performance failures in complying with the applicable frequency ride-through requirements. ERCOT shall assess the risk of a performance failure to determine whether to implement restrictions. If the assessment determines the cause of the performance failure cannot be mitigated (*i.e*., fully implemented corrective actions) within 90 calendar days, the greatest real power loss was greater than 20 MW, and if any one of the below criteria is met, ERCOT may impose restrictions on the IBR, Type 1 WGR or Type 2 WGR, or portions thereof, that experienced or has the potential to experience a performance failure:

(a) The actual or potential severity of an event on the ERCOT System is greater than the most severe single contingency using the Resource’s nameplate capacity;

(b) The location of the performance failure did affect or has the potential to materially affect known stability limits on the ERCOT System;

(c) The IBR, Type 1 WGR or Type 2 WGR experienced more than one failure in the prior 36 calendar months; or

(d) The potential performance failure presents an imminent safety or equipment risk to the ERCOT System.

(11) The Qualified Scheduling Entity (QSE) for each IBR, Type 1 WGR or Type 2 WGR not permitted to operate shall reflect in its Current Operating Plan (COP) and Real-Time telemetry, a Resource Status of OFF, OUT, or EMR in accordance with Protocol Sections 3.9.1, Current Operating Plan (COP) Criteria, and 6.5.5.1, Changes in Resource Status, as appropriate. If the Resource Entity can implement modifications to resolve the technical limitation(s) or performance failure(s), it shall submit to ERCOT a report and supporting documentation containing the following:

(a) The current technical limitation(s) and frequency ride-through capability in a format similar to the table in paragraph (1) above or in an alternative format appropriate for the technical limitation(s);

(b) The proposed modifications and frequency ride-through capability allowing the IBR, Type 1 WGR or Type 2 WGR to comply with the applicable frequency ride-through requirements in a format similar to the table in paragraph (1) above or in an alternative format appropriate for the technical limitation(s); and

(c) A schedule for implementing those modifications.

(12) In its sole discretion, ERCOT may accept the proposed modification plan from paragraph (11) above. ERCOT may allow the Resource to operate at reduced output prior to implementing an accepted modification plan if the reduced output allows the Resource to comply with the applicable ride-through requirements. Upon completion of an accepted modification plan, ERCOT will remove the restriction(s) unless the IBR, Type 1 WGR or Type 2 WGR experiences additional unresolved technical limitation(s) or performance failure(s). ERCOT may temporarily lift operational restrictions for any IBR, Type 1 WGR or Type 2 WGR to prevent or mitigate an actual or anticipated emergency condition. During such instances, ERCOT shall inform each affected QSE that it has lifted the restriction(s) temporarily and the start time and proposed end time for lifting the restriction(s). Each QSE shall update the COP, Outage Scheduler, and Real-time telemetry to appropriately reflect the availability and capability of the IBR or Type 1 WGR or Type 2 WGR during the timeframe for which ERCOT lifted the restriction(s). Each Resource Entity shall update its models and any information in the Resource Integration and Ongoing Operations (RIOO) system as needed to reflect the changes.

(13) If the Resource Entity or IE does not agree with ERCOT’s decision in paragraph (10) or (12) above, it may appeal the 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 purposes of such an appeal, the Resource Entity or IE is not required to comply with Protocol Section 20, Alternative Dispute Resolution Procedure and Procedure for Return of Settlement Funds.

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

(1) This Section applies to only certain IBRs, Type 1 WGRs and Type 2 WGRs with an SGIA executed prior to June 1, 2023 in accordance with paragraph (6) of Section 2.6.2.1, Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs).

(2) IBRs, Type 1 WGRs and Type 2 WGRs 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 to  and including 59.4 Hz | Not less than 9 minutes |
| Above 58.0 Hz up to  and including 58.4 Hz | Not less than 30 seconds |
| Above 57.5 Hz up to  and including 58.0 Hz | Not less than 2 seconds |
| 57.5 Hz or below | No time delay required |



(3) 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 System as set forth in paragraph (2), shall provide to ERCOT the reason(s) for that inability, including study results or manufacturer documentation. The limitation description shall include the IBR, Type 1 WGR or Type 2 WGR frequency ride-through capability in the format shown in the table in paragraph (2) above. The limitation description is independent of any obligations required in paragraph (6) of Section 2.6.2.1.















***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.

**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) and Type 1 and Type 2 Wind-Powered Generation Resources (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 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 terminal voltage deviations exceed 5% but are within 10% of the rated design voltage and persist for less than ten seconds;

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

(d) A transmission system fault (three-phase, single-phase or phase-to-phase) but not a generator 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 generator’s transmission interconnect bus, 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 generator bus fault or a primary transmission system relay failure, the generator protective relaying may clear the generator 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 Inverter-Based Resource (IBR) ESR and non-IBR 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, Generation Resource 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 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) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs)***

(1) All IBRs, 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 June 1, 2023.

(ii) An IBR that implements any modification 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 June 1, 2023 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) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs), shall apply to IBRs, Type 1 WGRs and Type 2 WGRs not subject to Section 2.9.1.1.

(2) An IBR with an SGIA executed on or after June 1, 2023 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 June 1, 2023, 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, the Planning Guide or Other Binding Documents:

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

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

(c) Section 9, Protection.

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

(4) An IBR, Type 1 WGR or Type 2 WGR with an original SGIA executed before June 1, 2023, that implements modifications complying with Section 2.9.1.2 prior to January 1, 2028, is not required to meet or exceed the requirements in sections 5, 7 and 9 of the IEEE 2800-2022 standard not required in the Protocols, these Operating Guides, the Planning Guide or Other Binding Documents. Any IBR modifications implemented on after January 1, 2028 do not qualify for this exception.

(5) In its sole discretion, ERCOT may allow limited exemptions to the voltage ride-through requirements in Table 11 of the IEEE 2800-2022 standard for Type 3 WGRs with an original SGIA executed before June 1, 2023 that implements a modification as described in paragraph (1)(c) of Planning Guide Section 5.2.1, for which a GIM was initiated. The Resource Entity or Interconnecting Entity (IE) must meet the requirements in paragraph (1) of Section 2.11.1, Exemptions, as well as demonstrate to ERCOT’s satisfaction it substantially meets all the low voltage ride-through curve portions in Table 11 of the IEEE 2800-2022 standard as part of the modification.

(6) In its sole discretion, ERCOT may allow a temporary extension for an IBR with an SGIA executed on or after June 1, 2023, to meet or exceed the capability and performance requirements in sections 5, 7 and 9 of the IEEE 2800-2022 standard if the Resource Entity or IE meets the requirements in paragraph (1) of Section 2.11.2, Extensions. During any temporary extension, the Resource Entity or IE shall maximize its ride-through capability to the fullest level the equipment allows as soon as practicable. 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) In its sole discretion, ERCOT may allow a limited exemption for a new IBR with an SGIA executed on or after June 1, 2023 with a Commercial Operations Date prior to December 31, 2026 if the Resource Entity or IE meets the requirements in paragraph (1) of Section 2.11.1. This exemption expires when the IBR is modified as described in paragraph (1)(c) of Planning Guide Section 5.2.1, for which a GIM was initiated or when ERCOT is notified or confirms with the Resource Entity that the technical limitation no longer exists. Software, firmware, and parameterization changes to achieve the required performance are required and do not qualify for an exemption. Exemptions are not allowed that would effectively lower the voltage ride-through requirements below those in effect on December 31, 2023. For any IBR with a documented exemption, the ERCOT-approved maximum capabilities not meeting the required capabilities will become the performance requirements until the exemption is removed.

(8) Existing Type 1 WGRs 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 they must meet or exceed the capability and performance requirements in Section 2.9.1.2 unless ERCOT allows an exemption for documented technical limitations as identified in paragraph (11) of Section 2.9.1.2.

(9) ERCOT and the interconnecting TSP may allow a documented technical exemption for an IBR from section 7.2.2.3.5, including Table 13, of the IEEE 2800-2022 standard when studies indicate a slower response time is required for system stability in the opinion of ERCOT or the interconnecting TSP. If allowed, the slower rates from the generator must still provide sufficient support for transient frequency and voltage support (i.e., typically less than three seconds). Such slower response times and settling times must have mutual agreement among the Resource Entity or IE, ERCOT and the interconnecting TSP.

(10) The addition of co-located Load as a modification governed by paragraph (1)(c) of Planning Guide Section 5.2.1 for which a GIM was initiated, shall not require the IBR to meet or exceed the requirements in Section 2.9.1.1 or the IEEE 2800-2022 standard 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 requirement due to the co-located Load.

(11) Unless approved by ERCOT, no existing IBR, Type 1 WGR or Type 2 WGR with a documented exemption shall reduce the ride-through capability of the unit below its capability prior to the replacement or modification. Unless approved by ERCOT, no existing IBR, Type 1 WGR or Type 2 WGR without a documented limited technical exemption to applicable requirements shall reduce the ride-through capability of the unit below the required ride-through capability.

***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 | (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 | (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 and 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 and 0.095625 p.u. and 0.25 p.u. in Table B, 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.

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

(4) An IBR shall inject electric current during all periods requiring ride-through. 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 Resource Entities should implement settings based on the local needs of the ERCOT System where the IBR interconnects and ensure 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, at its sole discretion, may allow slower real power injection recovery or reactive current response rates if necessary for reliability as determined by the impacted TSP or ERCOT. If allowed, the slower rates must still provide support for transient frequency and voltage support (i.e., typically less than three seconds).

(5) IBR plant controls or inverter controls shall not disconnect the IBR from the ERCOT System or reduce IBR output during voltage conditions where ride-through is required unless necessary to provide appropriate frequency response or prevent equipment damage. If an IBR requires any setting that would prevent it from riding through the voltage conditions required in paragraph (1) above, ERCOT, at its sole discretion, may restrict its operations.

(6) If installed and activated to trip the IBR, instantaneous over-current or over-voltage protection systems 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 the 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;

(g) Individual wind turbines may trip for consecutive voltage deviations resulting in stimulation of mechanical resonances exceeding equipment limits; or

(h) Individual wind turbines may trip for consecutive voltage deviations resulting in energy dissipation greater than thermal capability of the dc-chopper which is typically the individual turbine’s rating for 2 seconds.

Any IBR or Type 1 WGR or Type 2 WGR 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 range.

(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 IBR output during fault conditions.

(9) The Resource Entity or IE for each IBR shall ensure its voltage ride-through capability is set to the maximum level the equipment allows to meet, and if possible exceed, the requirements of paragraphs (1) through (8) above. In its sole discretion, ERCOT may allow a temporary extension for upgrades or retrofits if the Resource Entity or IE meets the requirements of paragraph (1) of Section 2.11.2, Extensions. 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) In its sole discretion, ERCOT may allow temporary extensions to meet the voltage ride-through performance in Table A or C in paragraph (1) above for Type 3 WGRs if the Resource Entity or IE meets the requirements of paragraph (1) of Section 2.11.2. Temporary extensions shall be minimized and not extend beyond December 31, 2028. Temporary extensions for performance that does 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) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs) are not allowed.

(11) If an IBR fails to perform in accordance with the applicable voltage ride-through requirements, the Resource Entity for the IBR shall investigate the event and report to ERCOT the cause of the IBR failure. The Resource Entity shall, as part of its investigation: (i) perform model validation; (ii) within 90 days of the failure, provide to ERCOT a mitigation plan to meet the applicable voltage ride-through requirements as soon as practicable but no longer than 12 months from the date the mitigation plan is submitted unless ERCOT allows a longer timeframe; and (iii) timely implement the mitigation plan. All impacted TSPs shall provide available information to ERCOT to assist with event analysis.

(12) In its sole discretion, ERCOT, in fulfilling its duties as the Independent Organization, and North American Electric Reliability Corporation (NERC) Reliability Coordinator and Transmission Operator, may restrict or not permit to operate any IBR that has one or more performance failures in complying with the applicable voltage ride-through requirements. ERCOT shall assess the risk of the performance failure to determine whether to implement restrictions. If the assessment determines the cause of the performance failure cannot be mitigated (i.e., fully implemented corrective actions) within 90 calendar days, the greatest real power loss was greater than 20 MW, and any one of the below criteria is met, ERCOT may impose restrictions on the IBR, or portions thereof, that experienced or has the potential to experience a performance failure:

(a) The actual or potential severity of the event on the ERCOT System is greater than the most severe single contingency using the Resource’s nameplate capacity;

(b) The location of the performance failure did affect or has the potential to materially affect known stability limits on the ERCOT System;

(c) The IBR experienced more than one failure in the prior 36 calendar months; or

(d) The potential performance failure presents an imminent safety or equipment risk to the ERCOT System.

(13) The Qualified Scheduling Entity (QSE) for each IBR not permitted to operate shall reflect in its Current Operating Plan (COP) and Real-Time telemetry a Resource Status of OFF, OUT, or EMR in accordance with Protocol Sections 3.9.1, Current Operating Plan (COP) Criteria and 6.5.5.1, Changes in Resource Status, as appropriate. If the Resource Entity can implement IBR modifications to resolve the technical limitation(s) or performance failure(s), it shall submit to ERCOT a report and supporting documentation containing:

(a) The current technical limitation(s) and voltage ride-through capability in a format similar to the tables in paragraph (1) above or in an alternative format appropriate for the technical limitation(s);

(b) The proposed modifications and voltage ride-through capability allowing the IBR to comply with the applicable voltage ride-through requirements in a format similar to the tables in paragraph (1) above or in an alternative format appropriate for the technical limitation(s); and

(c) A schedule for implementing those modifications.

(14) In its sole discretion, ERCOT may accept the proposed modification plan from paragraph (13) above. ERCOT may allow the Resource to operate at reduced output prior to implementing an accepted modification plan if the reduced output allows the Resource to comply with the applicable ride-through requirements. Upon completion of the accepted modification plan, ERCOT will remove the restriction(s) unless the IBR experiences additional unresolved technical limitation(s) or performance failure(s). ERCOT may temporarily lift operational restrictions for any IBR to prevent or mitigate an actual or anticipated emergency condition. During such instances, ERCOT shall inform each affected QSE it has lifted the restriction(s) temporarily and the start time and proposed end time for lifting the restriction(s). Each QSE shall update the COP, Outage Scheduler, and Real-Time telemetry to appropriately reflect the availability and capability of the IBR during the timeframe for which ERCOT lifted the restriction(s). Each Resource Entity shall update its models and any information in the Resource Integration and Ongoing Operations (RIOO) system as needed to reflect the changes.

(15) If the Resource Entity or IE does not agree with ERCOT’s decision in paragraph (12) or (14) above, it may appeal the 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 purposes of such an appeal, the Resource Entity or IE is not required to comply with Protocol Section 20, Alternative Dispute Resolution Procedure and Procedure for Return of Settlement Funds.

***2.9.1.2*** ***Legacy Voltage Ride-Through Requirements for Transmission-Connected*** ***Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (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) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs), shall ride through the root-mean-square voltage conditions in Table A below as measured at the 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 or Type 1 WGR or Type 2 WGR to trip for voltage conditions beyond those for which ride-through is required.

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

(4) An IBR, Type 1 WGR or Type 2 WGR shall inject electric current during all periods requiring ride-through. When the POIB voltage is outside the continuous operating voltage range, the Resource 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 near the Resource’s interconnection 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 or reactive current response rates may be allowed if necessary for reliability as documented by the impacted TSP or ERCOT. If allowed, the slower rates must still provide support for transient frequency and voltage support (i.e., typically less than three seconds).

(5) An IBR, Type 1 WGR or Type 2 WGR plant controls, turbine controls, or inverter controls shall not disconnect the IBR, Type 1 WGR or Type 2 WGR from the ERCOT System or reduce its output during voltage conditions where ride-through is required unless necessary for providing appropriate frequency response or to prevent equipment damage. If an IBR, Type 1 WGR or Type 2 WGR requires any setting that would prevent it from riding through the voltage conditions required in paragraph (1) above, ERCOT may restrict its operations unless a documented technical exemption pursuant to paragraph (11) below provides the basis for such setting.

(6) If installed and activated to trip the IBR, Type 1 WGR or Type 2 WGR, instantaneous over-current or over-voltage protection systems 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) Any IBR or Type 1 WGR or Type 2 WGR that monitors and actively protects against multiple excursions outside the continuous operation range in Table A 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 requirements in paragraph (7) of Section 2.9.1.1, Preferred Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) unless the conditions and situations specified below exist, in which case, it may trip to protect equipment from the cumulative effect of successive voltage deviations:

(a) A physical equipment limitation prevents the Resource from meeting paragraph (7) of Section 2.9.1.1. in which case, the capability shall be maximized to the extent the equipment allows;

(b) Individual wind turbines may trip for consecutive voltage deviations resulting in stimulation of mechanical resonances exceeding equipment limits; or

(c) Individual wind turbines may trip for consecutive voltage deviations resulting in energy dissipation greater than thermal capability of the dc-chopper which is typically the individual turbine’s rating for 2 seconds.

(8) An IBR, Type 1 WGR or Type 2 WGR 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, Type 1 WGR or Type 2 WGR during fault conditions.

(9) The Resource Entity or IE for each IBR, Type 1 WGR or Type 2 WGR with an SGIA executed prior to June 1, 2023, shall ensure its voltage ride-through capability is set to the maximum level the equipment allows to meet, and if possible exceed, the requirements of paragraphs (1) through (8) above as soon as practicable but no later than December 31, 2025.

(10) If an IBR, Type 1 WGR or Type 2 WGR with an SGIA executed prior to June 1, 2023 cannot comply with paragraphs (1) through (9) above by December 31, 2025, the Resource Entity or IE shall, by February 1, 2025, request a temporary extension from ERCOT. ERCOT may, at its sole discretion, grant a temporary extension to a date no later than December 31, 2027. To obtain an extension, the Resource Entity or IE must meet, on or before February 1, 2025, the requirements in of paragraph (1) of Section 2.11.2, Extensions.

(11) In its sole discretion, ERCOT may allow an exemption to an existing IBR, Type 1 WGR or Type 2 WGR with an SGIA executed prior to June 1, 2023, if the Resource Entity meets the requirements in paragraph (1) of Section 2.11.1, Exemptions. This exemption will expire when: (i) the IBR implements a modification as described in paragraph (1)(c) of Planning Guide Section 5.2.1, Applicability, for which a GIM was initiated or (ii) ERCOT is notified or confirms with the Resource Entity the technical limitation no longer exists. Software, firmware, and parameterization changes to achieve the required performance or maximize the capability within the physical equipment limitations are required and do not qualify for an exemption. For any IBR, Type 1 WGR or Type 2 WGR with a documented exemption, the documented maximum capabilities not meeting paragraphs (1) through (9), above, will become the new performance requirements until the exemption is removed. Mitigation plans where a Resource Entity or IE for an IBR, Type 1 WGR, or Type 2 WGR installs supplemental dynamic reactive devices or batteries that can provide sufficient leading and lagging dynamic Reactive Power to meet all Reactive Power requirements and the applicable ride-through requirements are allowed.



(12) If an IBR, Type 1 WGR or Type 2 WGR fails to perform in accordance with the voltage ride-through requirements, the Resource Entity shall investigate the event and report to ERCOT the cause of the Resource’s failure. The Resource Entity shall, as part of its investigation: (i) perform model validation; (ii) within 90 days of the failure, provide to ERCOT a mitigation plan to meet the applicable voltage ride-through requirements as soon as practicable but no longer than 12 months from the date the mitigation plan is submitted unless ERCOT allows a longer timeframe; and (iii) timely implement the mitigation plan. All impacted TSPs shall provide available information to ERCOT to assist with event analysis.

(13) In its sole discretion, ERCOT, in fulfilling its duties as the Independent Organization, and North American Electric Reliability Corporation (NERC) Reliability Coordinator and Transmission Operator, may restrict or not permit to operate any IBR, Type 1 WGR or Type 2 WGR that has one or more performance failures in complying with the applicable voltage ride-through requirements. ERCOT shall assess the risk of a performance failure to determine whether to implement restrictions. If the assessment determines the cause of the performance failure cannot be mitigated (i.e., fully implemented corrective actions) within 90 calendar days, the greatest real power loss was greater than 20 MW, and if any one of the below criteria is met, ERCOT may impose restrictions on the IBR, Type 1 WGR or Type 2 WGR, or portions thereof, that experienced or has the potential to experience a performance failure:

(a) The actual or potential severity of the event on the ERCOT System is greater than the most severe single contingency using the Resource’s nameplate capacity;

(b) The location of the performance failure did affect or has the potential to materially affect known stability limits on the ERCOT System;

(c) The IBR, Type 1 WGR or Type 2 WGR experienced more than one failure in the prior 36 calendar months; or

(d) If the potential performance failure presents an imminent safety or equipment risk to the ERCOT System.

(14) The QSE for each IBR, Type 1 WGR or Type 2 WGR not permitted to operate shall reflect in its COP and Real-Time telemetry, a Resource Status of OFF, OUT, or EMR in accordance with Protocol Sections 3.9.1, Current Operating Plan (COP) Criteria and 6.5.5.1, Changes in Resource Status, as appropriate. If the Resource Entity can implement modifications to resolve the technical limitation(s) or performance failure(s), it shall submit to ERCOT a report and supporting documentation containing:

(a) The current technical limitation(s) and voltage ride-through capability in a format similar to Table A in paragraph (1) above or in an alternative format appropriate for the technical limitation(s);

(b) The proposed modifications and voltage ride-through capability allowing the IBR, Type 1 WGR or Type 2 WGR to comply with the applicable voltage ride-through requirements in a format similar to Table A in paragraph (1) above or in an alternative format appropriate for the technical limitation(s); and

(c) A schedule for implementing those modifications.

(15) In its sole discretion, ERCOT may accept the proposed modification plan from paragraph (14) above. ERCOT may allow the Resource to operate at reduced output prior to implementing an accepted modification plan if the reduced output allows the Resource to comply with the applicable ride-through requirements. Upon completion of an accepted modification plan, ERCOT will remove the restriction(s) unless the IBR, Type 1 WGR or Type 2 WGR experiences additional unresolved technical limitation(s) or performance failure(s). ERCOT may temporarily lift operational restrictions for any IBR, Type 1 WGR or Type 2 WGR to prevent or mitigate an actual or anticipated emergency condition. During such instances, ERCOT shall inform each affected QSE that it has lifted the restriction(s) temporarily and the start time and proposed end time for lifting the restrictions. Each QSE shall update the COP, Outage Scheduler, and Real-Time telemetry to appropriately reflect the availability and capability of the IBR, Type 1 WGR or Type 2 WGR during the timeframe for which ERCOT lifted the restriction(s). Each Resource Entity shall update its models and any information in the RIOO system as needed to reflect the changes.

(16) If the Resource Entity or IE does not agree with ERCOT’s decision in paragraph (13) or (15) above, it may appeal the 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 purposes of such an appeal, the Resource Entity or IE is not required to comply with Protocol Section 20, Alternative Dispute Resolution Procedure and Procedure for Return of Settlement Funds.

***2.11******Exemptions and Extensions***

***2.11.1 Exemptions***

(1) If a Resource Entity or Interconnecting Entity (IE) for an Inverter-Based Resource (IBR), Type 1 Wind-powered Generation Resource (WGR) or Type 2 WGR requests an exemption from fully meeting the frequency ride-through or voltage ride-through requirements as described in: (i) paragraph (8) of Section 2.6.2.1, Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs); (ii) paragraphs (5), (7), or (9) of Section 2.9.1, Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs); or (iii) paragraph (11) of Section 2.9.1.2, Legacy Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs), it shall submit supporting documentation to ERCOT through the Resource Integration and Ongoing Operations (RIOO) system, unless ERCOT specifies otherwise. The information must demonstrate to ERCOT’s satisfaction the Resource Entity or IE has maximized the applicable ride-through capability with all technically feasible upgrades and accurately represented all limitations in models provided to ERCOT. ERCOT will not grant an exemption that, in its opinion, materially lowers the frequency ride-through or voltage ride-through requirements below those in effect on December 31, 2023.  The Resource Entity or IE shall, at a minimum, submit to ERCOT the following information: (i) documentation describing the technical limitation, including a letter signed by an officer or executive of the original equipment manufacturer, or subsequent inverter/turbine vendor support company if the original equipment manufacturer is no longer in business or an engineering consulting firm, verifying the need for an exemption; (ii) documentation describing any technically feasible modifications that were or will be implemented; (iii) documentation describing any available technically feasible modifications that the Resource Entity is declining to implement due to a lack of commensurate reliability improvement relative to the implementation cost; (iv) a model accurately representing all technical limitations; (v) a description of any limitation that cannot be accurately represented in a model; (vi) data and information identified in paragraphs (a) through (d) below; and (vii) any other data or information ERCOT reasonably deems necessary to evaluate whether to grant the exemption.

(a) If a Resource Entity or IE requests an exemption as described in paragraph (8) of Section 2.6.2.1, it shall also provide to ERCOT the current frequency ride-through capability and predicted post-modification frequency ride-through capability that represents the new alternative performance requirements in a format similar to the table in paragraph (1) of Section 2.6.2.1.

(b) If a Resource Entity or IE for an IBR requests an exemption as described in paragraph (5) of Section 2.9.1, it shall provide its actual or reasonably anticipated Commercial Operations Date.

(c) If a Resource Entity or IE for a Type 3 WGR requests an exemption as described in paragraph (7) or (9) of Section 2.9.1, it shall provide to ERCOT documented evidence of technical infeasibility from its original equipment manufacturer, or subsequent inverter/turbine vendor support company if the original equipment manufacturer is no longer in business, and evidence: (i) it maximized its voltage ride-through capability with the best converter upgrade available along with any subsequent modifications, and (ii) demonstrating it substantially meets the low voltage ride-through curve ranges of Table 11 of the IEEE 2800-2022 standard.

(d) If a Resource Entity or IE for an IBR requests an exemption from fully meeting the voltage ride-through requirements as described in paragraph (11) of Section 2.9.1.2, it shall provide to ERCOT the current voltage ride-through capability and predicted post-modification voltage ride-through capability representing the new alternative performance requirements in a format similar to Table A in paragraph (1) of Section 2.9.1.2.

(2) Any technical exemption will expire: (i) when the Resource Entity or IE 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 or (ii) when ERCOT and the Resource Entity or IE learn the technical limitation no longer exists and sufficient time has lapsed to implement a solution.

(3) For IBRs, Type 1 WGRs and Type 2 WGRs with a Standard Generation Interconnection Agreement (SGIA) dated before June 1, 2023, ERCOT shall not grant any exemption to fully meeting the performance requirements that:

(a) In ERCOT’s opinion, creates an unacceptable reliability risk to the ERCOT System;

(b) Allows for an IBR, Type 1 WGR, or Type 2 WGR (or its associated IBR unit or wind turbines) to trip for a phase angle jump, rate-of-change-of-frequency or multiple excursions during fault conditions unless otherwise specifically allowed in the Protocols or these Operating Guides;

(c) Is intended to address unknown, uncertain or unvalidated limitations due to a lack of information or validation from the original equipment manufacturer;

(d) In ERCOT’s opinion, allows materially less performance than the frequency ride-through or voltage ride-through requirements in effect on April 1, 2024;

(e) For IBRs, Type 1 WGRs and Type 2 WGRs with an SGIA executed on or before January 16, 2014, for which in ERCOT’s opinion, the Resource Entity or IE can implement an available technically feasible solution that provides substantial improvement to fully meeting the performance requirements at a reasonable cost to the Resource Entity on a per inverter or turbine/converter basis (e.g., 20% of the cost to replace it with a new, in kind, inverter or turbine/converter); or

(f) For IBRs, Type 1 WGRs and Type 2 WGRs with an SGIA executed after January 16, 2014 and before June 1, 2023:

(i) For which, in ERCOT’s opinion, the Resource Entity or IE can implement an available technically feasible solution that provides a material improvement to fully meeting the performance requirements at a reasonable cost to the Resource Entity on a per inverter or turbine/converter basis (e.g., 20% of the cost to replace it with a new, in kind, inverter or turbine/converter); or

(ii) For which, in ERCOT’s opinion, the Resource Entity or IE can implement an available technically feasible solution that provides a substantial improvement to reliability up to a more significant cost to the Resource Entity on a per inverter or turbine/converter basis (e.g., 50% of the cost to replace it with a new, in kind, inverter or turbine/converter).

(4) The Resource Entity or IE with a documented exemption shall submit through the RIOO system, unless ERCOT specifies otherwise, all information required by ERCOT to document the exemption including, without limitation, frequency protection setpoints, voltage protection set points, k factor, attestations, model validation reports, and any other information needed to represent the limitation.

(5) ERCOT may review any approved exemption with a Resource Entity if a new technically feasible solution becomes available. The Resource Entity shall provide any requested information identified in paragraph (1) above as part of the review process.

***2.11.2 Extensions***

(1) If a Resource Entity or IE for an IBR, Type 1 WGR or Type 2 WGR requests an extension pursuant to: (i) paragraph (7) of Section 2.6.2.1, Frequency Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs); (ii) paragraph (6) of Section 2.9.1, Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs); (iii) paragraphs (9) and (10) of Section 2.9.1.1, Preferred Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs); or (iv) paragraph (10) of Section 2.9.1.2, Legacy Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-Powered Generation Resources (WGRs), it shall submit documentation to ERCOT through the RIOO system, unless ERCOT specifies otherwise, demonstrating to ERCOT’s satisfaction the Resource Entity or IE has made best efforts to meet the original required timelines, maximized its ride-through capability during the extension period and accurately represented the current ride-through capabilities in models provided to ERCOT.  The Resource Entity or IE shall, at a minimum, submit the following information: (i) documentation describing the justification for the extension, including a letter signed by an officer or executive of the Resource Entity or IE explaining why it could not timely comply with the requirements; (ii) proposed modifications to meet the applicable ride-through requirements; (iii) a schedule for implementing such modifications to comply with the applicable requirements; (iv) the current and potential future ride-through capability, including any associated adjustments to improve ride-through capability as of June 1, 2023 in a format similar to the table associated with the ride-through requirement; (v) a model accurately representing all technical limitations; (vi) a description of any limitation it cannot accurately represent in a model; and (vii) any other data or information ERCOT reasonably deems necessary to evaluate granting the extension.

(2) Any temporary extensions shall be minimized and not extend beyond:

(a) December 31, 2027 for extensions for paragraph (7) of Section 2.6.2.1 and paragraph (10) of Section 2.9.1.2; or

(b) December 31, 2028 or 24 months after the Resource’s Commercial Operations Date, whichever is earlier for extensions for paragraph (6) of Section 2.9.1 and paragraphs (9) and (10) of Section 2.9.1.1.

(3) ERCOT may not grant any temporary extensions for voltage ride-through performance requirements that do not meet the voltage ride-through performance requirements in Table A in paragraph (1) of Section 2.9.1.2.

***2.11.3 Actions on Exemption and Extension Requests***

(1) As soon as practicable after receiving the information in support of an exemption or extension request or review, ERCOT will inform the Resource Entity or IE if it finds the supporting information acceptable:

(a) If ERCOT finds the information unacceptable, it shall provide its reason(s) in writing; or

(b) If ERCOT finds the information acceptable, it shall grant the requested exemption or extension in writing.

(2) If the Resource Entity or IE does not agree with ERCOT’s decision in paragraph (1), above, it may appeal the 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 purposes of such an appeal, the Resource Entity or IE is not required to comply with Protocol Section 20, Alternative Dispute Resolution Procedure and Procedure for Return of Settlement Funds.