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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** | March 22, 2024 |

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| **Submitter’s Information** | |
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| **Cell Number** | N/A |
| **Market Segment** | Independent Generators |

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| **Comments** |

Joint Commenters appreciate the opportunity to work with ERCOT on Nodal Operating Guide Revision Request (NOGRR) 245. Since the January 2024 TAC meeting, ERCOT and Joint Commenters have met numerous times in an effort to identify and work through issues and solutions associated. While this collaboration has resolved many differences and materially reduced the gap between the parties’ positions, a few outstanding differences remain. These comments (JC Proposal), which are submitted on top of the ERCOT comments filed on January 8, 2024, reflect the parties’ convergence on issues and identify remaining differences.[[1]](#footnote-2) The primary differences in positions relate to the treatment of existing Inverter-Based Resources (IBRs), Type 1 Wind Generation Resources (WGRs), and Type 2 WGRs currently operating on the ERCOT System that are unable to meet certain requirements proposed in NOGRR 245 with available software and settings changes or commercially reasonable hardware modifications.

Joint Commenters agree with the comments made by ERCOT CEO Pablo Vegas at the February 27, 2024 ERCOT Board Meeting:

As we transition to a largely IBR dominated resource mix, the goal in this work that we're doing with TAC is to try to **find the *right balance* between risk mitigation** and the **economic cost** and impact of achieving that risk mitigation.

It's **important that we find that *right balance***, it **has to work for the generators** that are supporting and operating these resources and it **has to work for driving the reliability and the resiliency** that's needed through the changes in these new standards. (emphasis added)

Joint Commenters have carefully crafted language in this JC Proposal to reach a solution that properly ***balances*** risk mitigation with economic, technological, and operational realities. Requirements that are technically infeasible or impracticable to meet (particularly for existing Resources) do not benefit Texas consumers or the ERCOT market, and do not improve grid reliability.

**JC Proposal Summary**

For the reasons provided herein, the JC Proposal finds the right ***balance***; it serves to enhance reliability *and* promote regulatory clarity by: (a) signaling the importance of promptly addressing ride-through performance; (b) creating understandable standards for development of necessary technology and equipment upgrades; (c) requiring implementation of all commercially reasonable upgrades to increase ride-through performance, while providing owners of existing IBRs/WGRs with a reasonable path for evaluating potentially costly hardware upgrades; and (d) providing investors with greater regulatory certainty regarding rules impacting IBRs.

***Expeditious Improvements & Software Upgrades***

The JC Proposal requires prompt implementation of available software and parameter changes to increase ride-through performance. As discussed in more detail below, review of the recent Odessa disturbances identified software and parameter changes as solutions to the inability of certain makes/models of PhotoVoltaic Generation Resources (PVGRs) to ride through the disturbances. Under the JC Proposal, software, firmware, and settings or parameterization modifications are presumed to be commercially reasonable and are required by all IBRs/WGRs unless the Resource Entity and ERCOT mutually agree that pricing of such modifications is unreasonable. Furthermore, Resource Entities have a duty to use best efforts to continuously evaluate and implement such upgrades as they become available.

The requirement to implement software-related changes is an essential component of the JC Proposal because the vast majority of performance issues identified with IBRs involved in the 2021 and 2022 Odessa disturbances (and other PVGRs with the same inverter make/model that were not involved in the Odessa events) are being addressed with software-based modifications, similar to the requirements in the JC Proposal. Following the Odessa disturbances, the causes of performance deficiencies at affected PVGRs were identified, which allowed for the development of non-physical, software-based solutions being deployed. The JC Proposal requirements would have resolved the issues identified in the table below, as related to the 2022 Odessa disturbance.

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| **Equipment Manufacturer** | **PVGRs**  **in**  **ERCOT[[2]](#footnote-3)** | **PVGRs**  **in**  **2022 Odessa Event** | **Deployed Solutions[[3]](#footnote-4)** |
| TMEIC | 32%  (36 facilities) | 65%  (8 facilities) | * 4 systemic issues; all now have software, settings, or firmware solutions * Solutions largely deployed at the 8 Odessa projects. (6 of 8 have all 4 changes made; remaining 2 have 3 out of 4 changes made to-date and plan to deploy remaining changes) * For the 28 projects not involved in Odessa events, solutions are either deployed (11), planned for 2024 (9), or plan is under development (7), except for 1 generator in construction |
| Power Electronics | 22%  (23 facilities) | 29%  (5 facilities) | * 1 systemic issue – has a firmware solution * Some non-systemic, project-specific issues and limitations at the 5 affected facilities * 5 facilities involved in Odessa events appear to be working with ERCOT to maximize capability and document remaining limitations * Outside Odessa, 16 of 18 projects have fixed the systemic issue through a firmware upgrade; ERCOT is following up with remaining 2 facilities |
| KACO | 7%  (8 facilities) | 6%  (4 facilities) | * At the 4 Odessa projects, limited corrective actions identified; 3 of 4 implemented * No data provided on the remaining 4 projects (not involved in previous disturbances) * KACO no longer in service |

***Commercially Reasonable Efforts & Hardware Upgrades***

The JC Proposal also requires the implementation of commercially reasonable hardware modifications on existing IBRs/WGRs. To effectuate this requirement, the JC Proposal requires Resource Entities to evaluate IBR/WGR modifications to maximize ride-through capability. Where physical upgrades or improvements are available and commercially reasonable, the Resource Entity must implement such upgrades or improvements within 24 months, unless ERCOT approves an extension.

***Clear Process Criteria for Exemptions and Extensions***

Joint Commenters appreciate ERCOT’s proposed process for seeking and approving exemptions and extensions and have enhanced that process to provide additional clarity and certainty regarding the process. In so doing, Joint Commenters’ proposal includes timelines, requirements for requesting exemptions/extensions, and an intermediate step to allow a Resource Entity or IE to work with ERCOT to resolve a dispute resulting from ERCOT’s denial of an exemption/extension request prior to requiring the Market Participant to submit a formal complaint with the Commission.

IBRs/WGRs are required to maximize ride-through capability using all available software modifications and commercially reasonable hardware modifications. However, technical and hardware solutions do not exist for certain IBRs/WGRs to meet ERCOT’s proposed ride-through standards. Until such solutions exist and are commercially reasonable to implement, these existing IBRs/WGRs require an alternative to (a) making significant and unprecedented capital investments to retrofit a facility in a manner that is otherwise unjustifiable operationally or commercially, or (b) suspending or retiring. Accordingly, Joint Commenters have proposed an exemption process to account for these limitations. Notably, the JC Proposal avoids creating caps on exemptions, as such limits are unnecessarily restrictive, may serve to imprudently remove megawatts from the grid, and would force ERCOT to make arbitrary determinations regarding exemption eligibility.

On occasion, it may be necessary for Resource Entities or Interconnecting Entities (IEs) of existing or new IBRs/WGRs to request reasonable extensions to implement upgrades to meet NOGRR245 standards. These extensions are based on ERCOT’s suggestions in this NOGRR process. However, the JC Proposal provides that ERCOT may deny a request for an exemption/extension for enumerated reasons. For example, ERCOT may deny an exemption request if: (a) the ride-through capability of the IBR/WGR has not been maximized; (b) available and commercially reasonable modifications have not been made; or (c) the Resource Entity or IE failed to represent the IBR’s/WGR’s limitations.

***Aligned with, but stronger than, Federal Recommendations & ISO Considerations***

The JC Proposal aligns with FERC Order 901, NERC goals, and related proposals in other ISOs. FERC Order No. 901 directs NERC to develop or revise Reliability Standards to address IBR-related ride-through concerns. However, where FERC Order 901 recommends the adoption of a generalized exemption from implementing hardware upgrades, the JC Proposal requires commercially reasonable physical modifications. MISO and ISO-NE are considering the adoption of enhanced ride-through standards for IBRs. Recently, MISO requested FERC approval of such Tariff provisions based on the “need to address the most immediate reliability concerns while also balancing technological limitations.”[[4]](#footnote-5) Similarly, ISO-NE has developed a proposal for implementation of similar performance standards under a three-stage, phased adoption plan.[[5]](#footnote-6) NYSRC has suggested a process for ride-through changes that will apply to new IBRs going through the Interconnection Studies process.[[6]](#footnote-7)

Notably, if approved, the JC Proposal will implement the nation's most aggressive ride-through performance requirements to date, particularly regarding existing IBRs. The JC Proposal is reasonable and meets the goals in Texas by striking a ***balance*** between strengthened grid reliability and real-world technical, economic, and operational constraints.

**ERCOT and JC Agreements and Concessions**

Joint Commenters made several concessions to more closely align with ERCOT’s positions in NOGRR245.

Notable areas of agreement and concessions to align with ERCOT’s position:

* **New IBRs**
  + Ride-through requirements based on IEEE Standard 2800-2022.
* **Existing IBRs**
  + Required to implement available software upgrades(including firmware upgrades, protection and control settings changes, *etc.*).
  + Required to implement available and commercially reasonablehardware upgrades.
* **Ongoing Evaluation Process**
  + Each Resource Entity of an IBR/WGR to evaluate available modifications to maximize frequency and voltage ride-through capability.
* **Annual Reporting Process**
  + Each Resource Entity of an IBR/WGR unable to meet frequency or voltage ride-through requirements must report limitations to ERCOT.
* **Removal of grandfathering provisions** **for existing WGRs**
* **Addition of Exemption, Extension & Appeal Processes**
  + The JC Proposal enhances ERCOT’s proposal by including a means for disputing ERCOT’s initial denial of an exemption/extension request before filing a formal complaint at the Commission.

**Outstanding Differences**

While the JC Proposal incorporates and/or resolves a multitude of the concerns raised by ERCOT Staff in this NOGRR process, a few issues remain where the parties differ.

1. Proper effective date for New IBRs.
2. Unreasonable hardware upgrades for existing IBRs/WGRs.
3. Rate-of-change-of-frequency (ROCOF) and phase angle requirements for existing IBRs should not be higher than those imposed on new and future IBRs.
4. Disconnection of IBRs/WGRs outside of Real-Time reliability emergencies should be addressed at the Commission; not in this NOGRR.

***Effective Date for New IBRs***

Joint Commenters initially proposed an effective date for new IBRs (i.e., IBRs with SGIAs executed on or after June 1, 2026), to accommodate in-flight projects. However, given ERCOT’s concern that such a date would discourage equipment manufacturers from studying and implementing software and hardware modifications to help with ride-through concerns, Joint Commenters propose June 1, 2024, as the effective date for new IBRs. This new date would apply to all IBRs that execute an SGIA on or after June 1, 2024, and avoid the inherent regulatory uncertainty risks associated with implementing retroactive rules.

***Hardware Upgrades for Existing IBRs/WGRs***

Joint Commenters are concerned that ERCOT’s proposal may require existing IBRs/WGRs to install new hardware, without consideration of cost or incremental benefit, to obfuscate disagreement of current ride-through performance requirements. Imposing new, uneconomic hardware modifications on existing Resources would create a significant new regulatory risk that will discourage investment in ERCOT—introducing a new hardware retrofit mandate risks discouraging much needed investment in new capacity.

Further, as described above, the events in Odessa provide evidence that the software and parameter upgrades mandated under the JC Proposal will materially address the ride-through issues at PVGRs. Neither the data nor actual operational experience support creating a new, commercially unreasonable retrofit mandate.

Recently installed equipment is much more capable of meeting existing standards than older equipment, and ERCOT’s expression of concern about 20-30 GW of IBRs not meeting proposed NOGRR 245 standards is misleading. Every IBR/WGR kilowatt of capacity that would qualify as “existing” will be required to install software changes available to improve ride-through capability, and if there is some physical modification required, then that modification *should* be subject to a commercially reasonable approach. Practically, the equipment has been bought and paid for, and has been already installed or is being installed. ERCOT’s claim that investors should have known about these pending regulations years ago is immaterial.

***Rate-of-Change-of-Frequency (ROCOF) and Phase Angle Requirements for Existing IBRs/WGRs***

Currently, the Nodal Operating Guide contains no reference to ROCOF or phase angle. Yet, ERCOT interprets existing rules as more stringent than proposed future rules, putting unjust and unreasonable obligations on existing IBRs/WGRs compared to new IBRs. Accordingly, the JC Proposal offers a pragmatic and risk-based approach, as discussed below.

ERCOT’s proposal would require that an existing IBR/WGR ride through *any* ROCOF and *any* phase angle jump in either a fault or non-fault scenario, as long as the voltage and frequency measured at the POI are within the no-trip zones. Conversely, for new IBRs, ERCOT's proposal references the IEEE 2800-2022 standard, which sets thresholds for ROCOF (5 Hz/second) and phase angle (25-degrees) beyond which the IBR is *not* required to ride-through. In other words, ERCOT’s proposal places a more onerous requirement on IBRs/WGRs interconnected between 2014 and now, than new IBRs using new equipment that have not yet energized.

ERCOT has acknowledged that its proposal poses a risk to existing IBRs. In characterizing NOGRR245 survey results,[[7]](#footnote-8) ERCOT said that for ROCOF, multiple excursions, and phase angle jump, “[t]echnical feasibility for legacy IBRs reflects challenges.”[[8]](#footnote-9) Joint Commenters agree with ERCOT that important technical questions remain about setting the thresholds and measuring values, as is evident from the ongoing discussions in the IEEE P2800.2 working group. This is why IBR owners and OEMs have consistently pointed out the dangers of ERCOT proceeding with certain requirements in NOGRR245 before the associated test standards in P2800.2 are completed. Joint Commenters disagree with ERCOT’s position that until those questions are addressed, existing IBRs/WGRs must perform at a higher standard than new IBRs, and without the prospect of an exemption where no commercially reasonable modification exists.

Instead, the JC Proposal provides a more pragmatic approach to ROCOF, phase angle, and multiple excursions at existing generators. For IBRs that have protection systems installed and activated to trip on any of these items, the IBR should remove or raise limits to the maximum extent commercially reasonable (including non-physical modifications) and, where needed, exemptions can be granted. Additionally, IBRs/WGRs able to differentiate between a fault and non-fault disturbance should attempt to remove limits for a fault, where commercially reasonable. ERCOT’s proposal requires that IBRs not use ROCOF and phase angle values to trip or reduce output during fault conditions. However, certain existing IBRs with protection systems for ROCOF and phase angle values are unable to distinguish between fault and non-fault conditions to appropriately disable the protection. Such IBRs may be able to implement commercially reasonable upgrades to resolve this limitation, but to-date equipment manufacturer feedback generally shows that more time is needed to study, evaluate, and develop solutions for this issue. In the meantime, such IBRs should receive an exemption reflecting this technical limitation. IBRs that do not have protection systems to trip on multiple excursions (or where the limit was removed, above), may have underlying lower-level protection or physical limits. Exemptions should be granted for existing limitations, for which upgrades are not commercially reasonable. Joint Commenters also understand that more technical evaluation of threshold values and measurement methodology for ROCOF, phase angle jump, and multiple excursions is needed and welcome a future NOGRR to further refine such requirements.

***Disconnection: A Policy Determination***

Joint Commenters suggest that ERCOT’s desire to disconnect IBRs/WGRs be addressed by the Commission in a rulemaking. Any existing authority must remain unchanged in this NOGRR. The Commission is uniquely positioned to consider stakeholder and investor interests; avoid the unlawful taking of private property; evaluate regulatory risk associated with future investment in Resources of all technology types; and define ERCOT’s authority under Texas law and NERC Standards to protect the grid.

ERCOT continues to express a desire to insert new language in NOGRR245 to provide ERCOT and Transmission Operators with broad authority to disconnect IBRs/WGRs from the ERCOT Transmission Grid for an indefinite amount of time outside of emergency conditions. ERCOT asserts that it can do so based on “similar” ideas in Nodal Protocol Section 3.15(4)(e) which states, “[w]hen an IRR is operating below 10% of its nameplate capacity and is unable to support voltage at the POIB, ERCOT, the interconnecting TSP, or that TSP’s agent may require an IRR to disconnect from the ERCOT System for purposes of maintaining reliability.” However, the contemplated disconnection under Protocol Section 3.15(4)(e) is based on Real-Time operating conditions—not possible scenarios—and contemplates a temporary disconnection that ends as soon as the transient system condition passes. ERCOT’s proposal contemplates scenarios that may not be transitory, with IBR/WGR disconnection continuing for much longer periods (months or years rather than hours or days), regardless of whether a modification is available or commercially reasonable.

Moreover, ERCOT’s proposal suggests that permanent disconnections may occur for a subset of Resource types (existing Type 1 and Type 2 WGRs and IBRs) in circumstances where ERCOT does not grant an exemption based vague standard of review that could lead to arbitrary decisions. This is a departure from current practice which involves investigation and mitigation measures, if necessary, upon an event where an IBR/WGR does not ride through a voltage disturbance.

If disconnection authority extends to the Transmission Operator, as well as ERCOT, it would directly implicate 16 TAC § 25.272 related to TDSP Code of Conduct because the disconnections would have a direct effect on the competitive wholesale market in which TDSP-affiliated Resources participate. Without specific Commission direction, no entity should be unilaterally authorized to require long-term disconnection of an existing resource.

***Low-Voltage Ride-Through Curve for New IBRs/WGRs***

One technical item excluded from the JC Proposal is ERCOT’s addition of the legacy low-voltage ride-through curve below 0.25 per unit voltage to the preferred low-voltage ride-through curves. While Joint Commenters do not necessarily oppose this change, there has not been sufficient time to solicit technical feedback from equipment manufacturers, as Joint Commenters only recently learned of this proposal.

**Conclusion**

Joint Commenters appreciate the opportunity to comment on NOGRR245 and urge TAC to recommend approval of NOGRR245 as amended by these comments—i.e., the JC Proposal.

Joint Commenters respectfully request that TAC refrain from approving pieces of ERCOT’s proposal and the JC Proposal to resolve the issues in NOGRR245, as doing so may result in logical inconsistencies and unintended gaps.

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| **Revised Cover Page Language** | |
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| 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  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, Commercially Reasonable Efforts (new)  2.12, Ride-Through Reporting Requirements (new)  2.12.1, Initial Frequency Ride-Through Capability Documentation and Reporting Requirements (new)  2.12.2, Initial Voltage Ride-Through Capability Documentation and Reporting Requirements (new)  2.12.3, Use of Initial Reports and Requirements for Recurring Ride-Through Reports (new)  2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions, and Appeals (new)  2.13.1, Exemptions and Extensions (new)  2.13.1.1, Submission of Exemption Requests (new)  2.13.1.2, Submission of Extension Requests (new)  2.13.1.3, Timeline for Submission and Determination of Exemption and Extension Requests (new)  2.13.1.4, Procedure for Appealing an ERCOT Decision to Reject an Exemption or Extension Request (new)  2.13.1.4.1, Appeal Process and Timeline (new)  2.14, Actions Following an Apparent Failure to Ride-through (new) |
| Revision Description | This Nodal Operating Guide Revision Request (NOGRR) replaces the current voltage ride-through requirements for Intermittent Renewable Resources (IRRs) with voltage ride-through requirements for Inverter-Based Resources (IBRs) and Type 1 and Type 2 Wind-powered Generation Resources (WGRs)and provides new frequency ride-through requirements for IBRs and Type 1 and 2 WGRs consistent with or beyond requirements identified in the new 2800-2022 - Institute of Electrical and Electronics Engineers (IEEE) Standard for Interconnection and Interoperability of Inverter-Based Resources (IBRs) Interconnecting with Associated Transmission Electric Power Systems (“IEEE 2800-2022 standard”). |
| Business Case | ERCOT submits this NOGRR based on reliability issues associated with the inability of some IBRs to ride-through system disturbances, and in light of the IEEE 2800-2022 standard. In its recently issued guidance document *Inverter-Based Resource Strategy*, theNorth American Reliability Corporation (NERC) noted it has supported the development of the IEEE 2800-2022 standard (and continues to support the IEEE P2800.2, Recommended Practice for Test and Verification Procedures for Inverter-based Resources (IBRs) Interconnecting with Bulk Power Systems, standards development efforts). Among other things, the document also highlights that:   * New technology can introduce significant risks if not integrated properlywhich could result in high impact and high likelihood events that require substantive action; * Inverter and plant controls and protection systems must support the reliable operation of the bulk power system during system disturbances; * Disturbance reports, alerts, guidelines, and other deliverables have shown that abnormal IBR performance issues pose a significant risk to bulk power system reliability; * Analyzed events identified new performance issues such as momentary cessation, unwarranted inverter or plant-level tripping issues, controller interactions and instabilities, and other critical performance risks that must be mitigated; and * Generation ride-through and provision of essential reliability services is a core principle for reliable operation of the bulk power system.   Consequently, this NOGRR proposes ride-through requirements for IBRs and Type 1 and Type 2 WGRs with specificity consistent with or beyond the IEEE 2800-2022 standard where appropriate (e.g., applying to the Point of Interconnection Bus (POIB) instead of the “Resource Point of Applicability”). The revisions specify the ride-through requirements for IBRs rather than IRRs or Energy Storage Resources (ESRs) because some ESRs may not be IBRs and the IBR attributes create unique ride-through requirements. Additionally, due to Type 1 and 2 WGRs failing to ride through normal system disturbances, ERCOT proposes to apply several of the new requirements to these Resources. Some clarifications included from the IEEE 2800-2022 standard may not require additional “capability” but provide additional specificity for settings that can prevent failures rather than adjustments being made after a failure occurs.  Failure of IBRs to ride-through normal frequency and voltage deviations on the ERCOT System can lead to severe consequences such as instability, cascading outages, or triggering an Under-Frequency Load Shed (UFLS) event which would result in the uncontrolled loss of firm Load. As such, this NOGRR does not propose to grandfather existing IBRs and Type 1 and Type 2 WGRs indefinitely. Rather, this NOGRR proposes that all IBRs and Type 1 and Type 2 WGRs with a Standard Generation Interconnection Agreement (SGIA) executed prior to June 1, 2024 (“existing IBRs”), maximize ride-through capability to meet or exceed the new voltage ride-through profile and the new frequency ride-through profile as soon as practicable with all available and known commercially reasonable upgrades. IBRs and Type 1 and Type 2 WGRs that cannot meet the new ride-through requirements will need to submit a report by February 1, 2025 documenting such and provide a report to give 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. Many of the Odessa related issues have been addressed with software and settings changes, which this NOGRR will require to be implemented. Market Participants in the Inverter Based Resource Task Force (IBRTF) encouraged ERCOT to focus on enhancements adopting portions of the IEEE 2800-2022 standard or NERC Reliability Guidelines that would provide the most reliability benefit in the short-term rather than a holistic approach. As such, additional requirements on IBRs may be necessary based on additional event analyses, lessons learned, recommendations contained in the NERC Odessa 2022 report, IEEE requirements, and NERC Reliability Standard revisions. |

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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 the Resource 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 Resource, then the Resource shall perform such that the automatic removal of the Resource from the ERCOT System meets or exceeds the following requirements:

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

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

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

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

(1) This Section applies to all IBRs and Type 1 and Type 2 Wind-powered Generation Resources (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 or Type 1 WGR or Type 2 WGR to trip for frequency conditions beyond those for which ride-through is required.

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

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

(5) Plant controls or inverter controls of an IBR or 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 IE of an IBR or Type 1 WGR or Type 2 WGR with a Standard Generation Interconnection Agreement (SGIA) executed prior to June 1, 2024, shall ensure the Resource’s frequency ride-through capability is set to the maximum level the equipment allows to meet or exceed the requirements of paragraphs (1) through (5) above as soon as practicable with all available and known commercially reasonable upgrades as set forth in Section 2.11, Commercially Reasonable Efforts.



(7) If an IBR or Type 1 WGR or Type 2 WGR with an SGIA executed prior to June 1, 2024 cannot comply with paragraphs (1) through (5) above by December 31, 2025, the Resource Entity or IE shall, by February 1, 2025 (or later as part of the interconnection process for any project not approved to energize as of February 1, 2025), request an exemption as set forth in Section 2.12, Ride-Through Reporting Requirements.

(8) If an IBR or Type 1 WGR or Type 2 WGR fails to perform in accordance with the applicable frequency ride-through requirements the Resource Entity shall take actions described in Section 2.14, Actions Following an Apparent Failure to Ride-Through.



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

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

|  |  |
| --- | --- |
| **Frequency Range** | **Delay to Trip** |
| 61.8 Hz or above | No time delay required |
| Below 61.8 Hz down to and including 61.6 Hz | Not less than 30 seconds |
| Below 61.6 Hz down to and including 60.6 Hz | Not less than 9 minutes |
| Above 59.4 Hz up to 60.6 Hz | No automatic tripping  (continuous operation) |
| Above 58.4 Hz up 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) This Section shall not affect the Resource Entity’s responsibility to protect equipment from damaging operating conditions. The Resource Entity for an IBR or 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 the Resource’s limitation, including available study results and equipment manufacturer recommendations, and the Resource’s frequency ride-through capability in the format shown in the table in paragraph (2) above.















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

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

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

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

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

(4) Section 2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals, does not apply to exemptions to frequency ride-through requirements for DGRs and DESRs.

**2.9 Voltage Ride-Through Requirements for Generation 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 Generation 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; and

(e) 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.

(2) 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.

(3) 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.

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

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

(6) 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).

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

|  |
| --- |
| ***[NOGRR204: Replace Section 2.9 above with the following upon system implementation of NPRR989:]***  **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 or inverter terminal voltages are within 5% of the rated design voltage and volts per hertz are less than 105% of generator rated design voltage and frequency;  (b) Generator or inverter terminal voltage deviations exceed 5% but are within 10% of the rated design voltage and persist for less than ten seconds;  (c) Generator or inverter volts per hertz conditions are less than 116% of rated design voltage and frequency and last for less than 1.5 seconds; and  (d) A transmission system fault (three-phase, single-phase or phase-to-phase), but not a unit bus fault, is cleared by the protection scheme coordinated between the Resource Entity and the Transmission Service Provider (TSP) on any line connected to the Resource’s Point of Interconnection (POI), provided such lines are not connected to induction generators described in paragraph (12) of Protocol Section 3.15, Voltage Support.  (2) In the case of a unit bus fault or a primary transmission system relay failure, the unit protective relaying may clear the unit independent of the operation of any transmission protective relaying.  (3) During operating conditions listed in paragraph (1) above, each Generation Resource and ESR subject to paragraph (1) shall not, during and following a transient voltage disturbance, cease providing real or reactive current except to the extent needed to provide frequency support or aid in voltage recovery. Each ESR, if it is 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 Generation Resource from the ERCOT System.  (7) A Generation Resource or ESR may be tripped Off-Line or curtailed after the fault clearing period if part of an approved Remedial Action Scheme (RAS).  (8) The Resource Entity of each Generation Resource or ESR shall provide to ERCOT technical documentation of voltage ride-through capability upon request. |

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

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

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

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

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

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

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

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

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

(c) Section 9, Protection.

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

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

(5) If a Type 3 WGR with an original SGIA executed before June 1, 2024, cannot fully meet Table 11 of the IEEE 2800-2022 standard and implements a modification as described in paragraph (1)(c) of Planning Guide Section 5.2.1, for which upgrades to equipment or facilities under a GIM are completed, the Resource Entity may request an exemption from meeting the voltage ride-through requirements in Table 11 of the IEEE 2800-2022 standard consistent with Section 2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals.

(6) If an IBR with an SGIA executed on or after June 1, 2024, cannot meet or exceed the capability and performance requirements in sections 5, 7 and 9 of the IEEE 2800-2022 standard by its synchronization date, the Resource Entity or IE may request a temporary extension to meet or exceed the capability and performance requirements in sections 5, 7, and 9 of the IEEE 2800-2022 standard by submitting an extension request as described by Section 2.13.. During any temporary extension, the Resource Entity or IE shall maximize its ride-through capability within its known equipment limitations 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) An IBR with an SGIA executed on or after June 1, 2024 with a Commercial Operations Date prior to January 1, 2026 may request an exemption from meeting the capability and performance requirements in sections 5, 7 and 9 of the IEEE 2800-2022 standard if the Resource Entity or IE submits an exemption request as described by Section 2.13. ERCOT will not grant an exemption as described by this paragraph that substantially lowers the frequency or voltage ride-through requirements below those in effect on June 1, 2024.

(8) Type 1 and Type 2 WGRs are not required to meet or exceed the capability and performance requirements in sections 5, 7 and 9 of the IEEE 2800-2022 standard but must meet or exceed the capability and performance requirements in Section 2.9.1.2 unless an extension or exemption applies under this Section or Section 2.13.

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

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

(1) This Section applies to all IBRs 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). All IBRs and WGRs 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 |
| V < 0.25 | 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 |
| V < 0.25 | 0.32 |

In the event of multiple excursions, the minimum ride-through time in Tables A or B is a cumulative time over a ten-second time window.

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

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

(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.

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

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

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

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

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

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

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

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

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

Individual voltage deviations begin when the voltage at the POIB drops below the lower limit of the continuous operation range or exceeds the upper limit of the continuous operation range. Individual voltage deviations end when the root-mean-square voltage magnitude at the POIB, for the previous one-cycle period of fundamental frequency, returns to the continuous operation region.

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

(9) A Resource Entity or IE may request an extension for upgrades or retrofits to confirm capability specified in paragraph (7) above by following the extension process set forth in Section 2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals. The Resource Entity or IE shall maximize the rate-of-change-of-frequency, phase angle jump and multiple excursion ride-through capability within known equipment limitations as soon as practicable. Any temporary extensions under this paragraph shall be minimized and not extend beyond December 31, 2028.

(10) A Resource Entity of a Type 3 WGR may seek an extension from meeting the voltage ride-through performance Tables A and C in paragraph (1) above by following the extension process set forth in Section 2.13. During any such extension, the Resource Entity shall ensure the WGR’s voltage ride-through capability is set to the maximum level the equipment allows as soon as practicable.

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

(12) If an IBR fails to perform in accordance with the applicable voltage ride-through requirements, the Resource Entity for the IBR shall take actions described in Section 2.14, Actions Following an Apparent Failure to Ride-Through.

***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 and Type 1 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 IBR, Type 1 WGR or Type 2 WGR 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 protection systems (including, but not limited to protection for over-/under-voltage, rate-of-change of frequency, anti-islanding, and phase angle jump) are installed and activated to trip the IBR or Type 1 WGR or Type 2 WGR, they 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 or Type 1 WGR or Type 2 WGR shall inject electric current when required to ride-through voltage conditions. When the POIB voltage is outside the continuous operating voltage range, an IBR shall continue to deliver pre-disturbance active current unless reduction is needed for voltage support or otherwise specified by ERCOT or the interconnecting TSP. Any necessary reductions in active current to prioritize reactive current shall be relative to the voltage change at the POIB. Typically, more aggressive reductions in active current to allow for additional reactive current (if needed to stay within its current limitations) will occur at lower voltages (e.g., 0.4 p.u. or lower) but settings shall be based on the local needs of the area of the ERCOT System to which the IBR interconnects and ensure sufficient active current is available for protection system sensing. An IBR or Type 1 WGR or Type 2 WGR shall return to its pre-disturbance level of real power injection as soon as possible but no more than one second after POIB voltage recovers to normal operating range. Slower real power injection recovery rates may be allowed if necessary for reliability as documented by the impacted TSP or ERCOT, or if required based on physical limitations of the IBR.

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

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

(7) Any IBR or Type 1 WGR or Type 2 WGR that monitors and actively protects against multiple excursions shall ensure its parameters to ride-through multiple voltage excursions are set to the maximum level the equipment allows to meet or exceed the requirements in paragraph (7) of Section 2.9.1.1, Preferred Voltage Ride-Through Requirements for Transmission-Connected Inverter-Based Resources (IBRs).

(8) An IBR or Type 1 WGR or Type 2 WGR shall not use measurements of quantities such as phase angle jump and rate-of-change-of-frequency to trip or reduce the output of the Resource during fault conditions where the POIB voltage remains within the ride-through profiles specified in paragraph (1) above, unless the Resource has an approved exemption or extension under Section 2.13.

(9) The Resource Entity for each IBR or Type 1 WGR or Type 2 WGR with an SGIA executed prior to June 1, 2024, shall ensure its voltage ride-through capability is set to the maximum level the equipment allows to meet or exceed the requirements of paragraphs (1) through (8) above as soon as practicable with all available and known commercially reasonable upgrades as set forth in Section 2.11, Commercially Reasonable Efforts.

(10) If an IBR or Type 1 WGR or Type 2 WGR with an SGIA executed prior to June 1, 2024 cannot comply with paragraphs (1) through (8) above by December 31, 2025, the Resource Entity shall, by February 1, 2025 (or later as part of the interconnection process for any project not approved to energize as of February 1, 2025), request an exemption under Section 2.13.

(11) If an IBR or Type 1 WGR or Type 2 WGR fails to perform in accordance with the applicable voltage ride-through requirements, the Resource Entity shall take actions described in Section 2.14, Actions Following an Apparent Failure to Ride-Through.







**2.11** **Commercially Reasonable Efforts**

(1) “Commercially reasonable efforts” means that the Resource Entity must evaluate its facilities and available modifications it can make to its equipment, if any, to maximize its frequency and/or voltage ride-through capability up to the frequency and voltage ride-through requirements set forth in 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) and 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).

(a) Technically feasible modifications involving only software, firmware, settings or parameterization changes are presumed to be commercially reasonable unless ERCOT and the Resource Entity agree the pricing is unreasonable for the modification. The Resource Entity shall implement any technically feasible modifications as soon as practicable but no longer than 12 months from the date on which the modification becomes commercially available to be installed and is available to be deployed on the subject equipment, unless a longer timeline is required by an impacted Transmission Service Provider (TSP), or as mutually agreed upon by the Resource Entity and ERCOT. The Resource Entity may request extensions beyond 12 months for circumstances beyond the Resource Entity’s reasonable control and shall provide ERCOT with an updated schedule for when the applicable changes are expected to be completed.

(b) The Resource Entity shall use best efforts to determine if any technically feasible equipment upgrades or improvements that require physical modification are commercially reasonable for the subject equipment. The Resource Entity shall implement any such changes as soon as practicable but no later than 24 months after the modification becomes commercially available to be installed and is available to be deployed on the subject equipment unless a longer timeline is mutually agreed upon by the Resource Entity and ERCOT. The Resource Entity may request extensions beyond 24 months for circumstances beyond the Resource Entity’s reasonable control and shall provide ERCOT with an updated schedule for when the applicable changes are expected to be completed.

(2) In determining whether any equipment upgrades or improvements that require physical modification are commercially reasonable, the Resource Entity may consider factors such as: (i) availability and/or cost of hardware; (ii) whether the improvements are technically feasible; (iii) facility’s depreciated value; (iv) cost of capital; (v) facility’s expected profitability for the remainder of its expected operational life; (vi) whether the improvement would materially enhance its ride through capabilities; and (vii) any other relevant factor.

(3) If ERCOT has a reasonable expectation that other commercially reasonable modifications are available for a particular Resource other than those identified by the Resource Entity, it may provide such information to the Resource Entity unless the information is considered Protected Information, confidential, or ERCOT Critical Energy Infrastructure Information (ECEII). Evidence may include but is not limited to: (i) information obtained about other, similar Resources; (ii) data provided by equipment manufacturers; or (iii) any other information indicating a commercially reasonable compliance solution exists. Nothing herein requires ERCOT to perform a financial analysis regarding what is considered commercially reasonable.

**2.12 Ride-Through Reporting Requirements**

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

(1) The Resource Entity of an Inverter-Based Resource (IBR), Type 1 Wind-powered Generation Resource (WGR), or Type 2 WGR with a Standard Generation Interconnection Agreement (SGIA) executed prior to June 1, 2024 that cannot comply with paragraphs (1) through (5) of 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), by December 31, 2025, shall, by February 1, 2025 (or later for any project that has not been approved to energize as of February 1, 2025), submit to ERCOT via the Resource Integration and Ongoing Operations (RIOO) system, or as otherwise directed by ERCOT, submit a report with supporting information or documentation and request an exemption containing the following, in each case as is available or can be reasonably obtained:

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

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

(c) For known and available technically feasible modifications evaluated by the Resource Entity to meet the applicable ride-through requirements but found commercially unreasonable, the basis for such conclusion. ERCOT will treat all financial and proprietary information provided under this Section or Section 2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals, as Protected Information;

(d) Commercially reasonable modifications that the Resource Entity will implement to maximize the frequency ride-through capability of the IBR, Type 1 WGR or Type 2 WGR to approach or meet the frequency ride-through requirements in paragraphs (1) through (5) of Section 2.6.2.1 to the greatest extent possible;

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

(f) A schedule for implementing the modifications;

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

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

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

(1) The Resource Entity of an IBR or Type 1 WGR or Type 2 WGR with an SGIA executed prior to June 1, 2024, that cannot comply with paragraphs (1) through (8) 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), by December 31, 2025, shall, by February 1, 2025 (or later as part of the interconnection process for any project that has not been approved to energize as of February 1, 2025), submit to ERCOT via the RIOO system, or as otherwise directed by ERCOT, submit a report with supporting information or documentation and request an exemption containing the following, in each case as is available or can be reasonably obtained:

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

(b) Known voltage ride-through limitations of the IBR, Type 1 WGR or Type 2 WGR as compared to the requirements in paragraphs (1) through (8) of Section 2.9.1.2;

(c) For known and available technically feasible modifications evaluated by the Resource Entity to meet the applicable ride-through requirements but found commercially unreasonable, the basis for such conclusion. ERCOT will treat all financial and proprietary information provided under this Section or Section 2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals, as Protected Information;

(d) Commercially reasonable modifications that the Resource Entity will implement to maximize the voltage ride-through capability of the IBR, Type 1 WGR or Type 2 WGR to approach or meet the voltage ride-through requirements in paragraphs (1) through (8) of Section 2.9.1.2, to the greatest extent possible;

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

(f) A schedule for implementing the modifications;

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

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

***2.12.3*** ***Use of Initial Reports and Requirements for Recurring Ride-Through Reports***

(1) The initial reports in Section 2.12.1, Initial Frequency Ride-Through Capability Documentation and Reporting Requirements and 2.12.2, Initial Voltage Ride-Through Capability Documentation and Reporting Requirements, satisfy the requirements for exemption and extension requests in accordance with Section 2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals.

(2) No later than February 1 of each year beginning with February 1, 2026, each Resource Entity of an IBR or Type 1 WGR or Type 2 WGR with an exemption under Section 2.13, as Protected Information, must submit a detailed report as described in paragraph (1) of Section 2.12.1 or paragraph (1) of Section 2.12.2, as applicable, or an attestation signed by an officer or executive with authority to bind the Resource Entity affirming that no material changes have occurred since the Resource Entity’s last report.

**2.13** **Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals**

***2.13.1******Exemptions and Extensions***

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

(2) Subject to the appeal process in this Section, ERCOT may deny a request for an exemption or extension if the Requesting Entity fails to demonstrate, to ERCOT’s reasonable satisfaction:

(a) For an IBR, Type 1 WGR or Type 2 WGR with a Standard Generation Interconnection Agreement (SGIA) executed prior to June 1, 2024, a Type 3 WGR with an original SGIA executed prior to June 1, 2024 that meets the criteria in paragraph (5) of Section 2.9.1, or an IBR, Type 1 WGR or Type 2 WGR seeking an exemption as described in paragraph (7) of Section 2.9.1, the Requesting Entity has:

(i) Maximized the ride-through capability of the IBR, Type 1 WGR or Type 2 WGR with all available commercially reasonable modifications; and

(ii) Represented the limitations of the IBR, Type 1 WGR or Type 2 WGR, which form the basis for the exemption, to the best of the Requesting Entity’s understanding and in accordance with Section 2.13.1.1 Submission of Exemption Requests and Section 2.13.1.2 Submission of Extension Requests.

(b) For an IBR with an SGIA executed on or after June 1, 2024, seeking extensions as contemplated in paragraph (6) of Section 2.9.1, or paragraphs (9) or (10) of Section 2.9.1.1, the Requesting Entity has:

(i) Made best efforts to meet the original required timelines;

(ii) Maximized the IBR’s ride-through capability during the extension period; and

1. Accurately represented the IBR’s current ride-through capabilities in models provided to ERCOT.

(3) ERCOT shall, in good faith, accept equipment manufacturer-documented limitations associated with an exemption or extension request.

(4) Approved exemptions and extensions under this section shall apply only to the extent requested and approved.

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

(6) Exemptions and extensions under this Section take effect immediately upon approval by ERCOT.

(7) Exemptions under Section 2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals, continue until:

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

(ii) ERCOT and the Requesting Entity learn that the technical limitation no longer exists due to a commercially reasonable modification and the Requesting Entity has had sufficient time to implement the solution in accordance with Section 2.11, Commercially Reasonable Efforts.

(8) Extensions under Section 2.13 shall end in accordance with Section 2.13.1.2.

(9) Except for the provisions of Section 2.13.1.1 and Section 2.13.1.2, the deadlines in Section 2.13 may be modified by mutual written agreement of ERCOT and the Requesting Entity (together, “Parties”).

(10) During the pendency of an exemption, extension, or appeal process under Section 2.13, or a related proceeding before the Public Utility Commission of Texas (PUCT) or other Governmental Authority, the IBR, Type 1 WGR or Type 2 WGR that is the subject of the exemption or extension request is required to meet its documented maximum capabilities provided to ERCOT.

(11) In the event the Requesting Entity has exhausted the appeal process or failed to timely appeal relief under Section 2.13, ERCOT may refer to the Reliability Monitor for investigation, any performance failure of the IBR, Type 1 WGR or Type 2 WGR as contemplated Section in 2.14, Actions Following an Apparent Failure to Ride-through relating to frequency or voltage ride-through requirements; provided, however, that no such referral shall occur until the Requesting Entity has exhausted the appeal process in Section 2.13.

(12) All information submitted under Section 2.13 shall be considered Protected Information.

***2.13.1.1 Submission of Exemption Requests***

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

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

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

(c) A Requesting Entity for an IBR with an SGIA executed after June 1, 2024, and with a Commercial Operations Date prior to December 31, 2026, may seek an exemption as described in paragraph (7) of Section 2.9.1.

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

(a) Requesting Entity Name;

(b) Requesting Entity DUNS Number;

(c) IBR/WGR Site Name;

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

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

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

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

(h) Any remaining information required in the reports in Section 2.12, Ride-Through Reporting Requirements, applicable to the request.

(3) A Requesting Entity that submitted a report pursuant to Section 2.12, the report shall also serve as the request for an exemption or extension, as applicable, satisfying the requirements of the preceding paragraph. A Requesting Entity may use the same form of report for future requests.

(4) If a commercially reasonable modification, as defined in Section 2.11, Commercially Reasonable Efforts, becomes available for an IBR, Type 1 WGR or Type 2 WGR with an exemption under Section 2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals, the Resource Entity shall notify ERCOT and implement the modification in accordance with the timelines required by Section 2.11.

***2.13.1.2 Submission of Extension Requests***

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

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

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

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

(a) Requesting Entity Name;

(b) Requesting Entity DUNS Number;

(c) IBR/WGR Site Name;

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

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

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

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

(h) Other information specified in this Section applicable to specific requests.

(3) A Requesting Entity may submit a report pursuant to Section 2.12, Ride-Through Reporting Requirements with the information specified in paragraph (2) above, and such report shall also serve as the request for an extension. A Requesting Entity may use the same form of report for future extension requests.

(4) The Requesting Entity for an IBR with an SGIA executed on or after June 1, 2024, seeking an extension contemplated in paragraph (6) of Section 2.9.1, or paragraphs (9) or (10) of Section 2.9.1.1, shall, at a minimum, submit the following information to ERCOT:

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

(b) A model accurately representing all technical limitations;

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

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

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

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

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

(b) A description of proposed modifications; and

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

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

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

(b) A description of proposed modifications; and

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

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

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

(b) A description of proposed modifications; and

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

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

(1) Not later than ten Business Days of receiving a request for an exemption or extension, ERCOT shall provide the Requesting Entity with written confirmation of receipt and notification that either:

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

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

(i) Identify the missing information; and

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

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

(3) Not later than 180 days of receiving a request for an exemption or extension or as otherwise agreed to in writing by the Parties, ERCOT shall provide the Requesting Entity with written notification that ERCOT has completed its review and ERCOT’s determination that the exemption or extension is:

(a) Approved;

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

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

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

(1) Not later than ten Business Days of receiving written notification of ERCOT’s decision to reject, in full or in part, an exemption or extension request, the Requesting Entity may challenge the rejection using the appeal process set forth herein.

(2) For purposes of appealing an ERCOT decision to reject an exemption or extension request, the Requesting Entity is not required to comply with Protocol Section 20, Alternative Dispute Resolution. Nothing in this procedure for appealing an ERCOT determination to reject an exemption or extension request should limit or restrict the right of the Requesting Entity to file a petition seeking direct relief from the PUCT or other Governmental Authority without first exhausting this procedure or any other ERCOT dispute procedures where actual or threatened action by ERCOT could cause irreparable harm to the Requesting Entity or its impacted IBR(s)/WGR(s), and where such harm cannot be addressed within the time permitted under the process set forth in Section 2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals.

(3) A Requesting Entity that does not submit a notice of appeal to ERCOT within ten Business Days of receiving ERCOT’s notice rejecting the exemption or extension request is deemed to have accepted ERCOT’s decision.

***2.13.1.4.1 Appeal Process and Timeline***

(1) To initiate an appeal of ERCOT’s rejection of an exemption or extension request, the Requesting Entity must submit the following information to the ERCOT Legal Department at [MPRegistration@ercot.com](mailto:MPRegistration@ercot.com):

(a) Requesting Entity Name;

(b) Requesting Entity DUNS Number;

(c) IBR/WGR Site Name;

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

(e) A description of the relief sought;

(f) A detailed description of the grounds for the relief;

(g) Any information or documentation in support of the grounds for relief; and

(h) Designation of a primary dispute representative.

(2) The date on which ERCOT receives the Requesting Entity’s notice of appeal shall be the appeal initiation date.

(3) Not later than three Business Days of the appeal initiation date, ERCOT shall provide the Requesting Entity with written confirmation of receipt and the designation of the ERCOT dispute representative. The ERCOT dispute representative should be an executive-level employee with decision making authority.

(4) Within ten Business Days of the appeal initiation date, the Requesting Entity may request an appeal with ERCOT to provide the Requesting Entity an opportunity to provide any clarification or information supporting the appeal. The appeal must be scheduled to occur at a mutually convenient time within 30 days of the appeal initiation date. The appeal may be in-person or remote.

(5) Within ten Business Days of the appeal meeting, or if an appeal meeting is not requested by the Requesting Entity, then within 30 days of the appeal initiation date, ERCOT will provide the Requesting Entity with notice of its appeal decision, including an explanation of the rationale if ERCOT denies the Requesting Entity’s appeal in whole or part.

(6) If ERCOT denies a Requesting Entity’s appeal of ERCOT’s decision to reject an exemption or extension request, in whole or in part, the Requesting Entity may seek relief from the PUCT pursuant to 16 Texas Administrative Code (TAC) § 22.251. For 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.

**2.14** **Actions Following an Apparent Failure to Ride-through**

(1) Required ride-through performance is defined in 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), and 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). For any Inverter-Based Resource (IBR), Type 1 Wind-powered Generation Resource (WGR) or Type 2 WGR with an approved exemption or extension, the documented maximum ride-through capabilities are the ride-through performance requirements for the duration of the exemption or extension unless otherwise excused by Governmental Authority rules or regulations.

(2) If an IBR, Type 1 WGR or Type 2 WGR does not ride-through in accordance with the applicable ride-through performance requirements (an “Apparent Performance Failure”), the Resource Entity shall, as soon as practicable and to the extent such information is available or can be reasonably obtained:

(a) Investigate the event;

(b) Report to ERCOT the cause of the Apparent Performance Failure via the Resource Integration and Ongoing Operations (RIOO) system (or as otherwise directed by ERCOT); and

(c) Perform model validation.

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

(4) The Resource Entity for an IBR, Type 1 WGR, or Type 2 WGR with a Standard Generation Interconnection Agreement (SGIA) executed prior to June 1, 2024, and which experiences an Apparent Performance Failure shall:

(a) Submit to ERCOT a new exemption or extension request under Section 2.13, Procedures for Frequency and Voltage Ride-Through Exemptions, Extensions and Appeals, or update the information provided in any existing exemption or extension request to reflect new information arising from the Apparent Performance Failure, including, documented limitations that were previously unknown, and any known and available commercially reasonable modifications to mitigate the identified cause of such Apparent Performance Failure; and

(b) Make any such commercially reasonable modifications in accordance with the timelines in Section 2.11, Commercially Reasonable Efforts.

(5) The Resource Entity for an IBR, Type 1 WGR, or Type 2 WGR with an SGIA executed after June 1, 2024, shall provide ERCOT with a mitigation plan to meet the applicable ride-through requirements as soon as practicable but no later than 180 days, unless a longer timeline is mutually agreed upon by the Resource Entity and ERCOT.

1. These comments are jointly authored and represent the give and take as between a diverse set of similarly situated companies in ERCOT. Statements made herein should not be used to represent the position of an individual company in any proceeding unrelated to NOGRR245. [↑](#footnote-ref-2)
2. *See* 2022 Odessa Disturbance, Joint NERC and Texas RE Staff Report (Dec. 2022) available at <https://www.nerc.com/comm/RSTC_Reliability_Guidelines/NERC_2022_Odessa_Disturbance_Report%20(1).pdf>. [↑](#footnote-ref-3)
3. *See* IBRWG Meeting, ERCOT Report: Odessa Events Update & Follow Up Efforts (Mar. 8, 2024), available at <https://www.ercot.com/files/docs/2024/03/06/Odessa%20Update_03082024.pptx>. [↑](#footnote-ref-4)
4. Midcontinent Independent System Operator, Inc., *Inverter-Based Resource Performance Standard*, FERC Docket No. ER24-1179-000 (Feb. 1, 2024). [↑](#footnote-ref-5)
5. ISO New England, Inc., PP5-6 Updates Presentation, Slide 20 (Sept. 19, 2023), available at <https://www.iso-ne.com/static-assets/documents/2023/09/a09_2_pp_5_6.pdf>. [↑](#footnote-ref-6)
6. New York State Reliability Council RR #151- Reliability Rule B.5: Establishing New York Control Area (NYCA) Interconnection Standards for Large IBR Generating Facilities. [↑](#footnote-ref-7)
7. *See* ERCOT Technical Advisory Committee (TAC) meeting, Item. No. 6, ERCOT Presentation (December 4, 2023). [↑](#footnote-ref-8)
8. *See Id.* (OEM responses indicated only 60% of the 67 GW “can comply” with even a 5 Hz/second ROCOF limit. The corresponding figure is 59% for a 25-degree phase angle (slide 24). Joint Commenters acknowledge that the actual number of GW at risk would be lower than these raw figures because ERCOT’s slides also indicate that “most” IBRs do not actively monitor ROCOF and phase angle jump, and "a majority” of “no” responses are due to a lack of information rather than a known limitation.) [↑](#footnote-ref-9)