

TAC RECOMMENDATION OPPOSITION

NOGRR Number	245	NOGRR Title	Inverter-Based Resource (IBR) Ride-Through Requirements
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Date	June 10, 2024
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Market Segment	Independent Generators

Comments

Invenergy Energy Management LLC (“Invenergy”) submits this TAC Recommendation Opposition pursuant to Section 8.1 of the ERCOT Board Policies and Procedures urging the ERCOT Board of Directors (“Board”) to reject the TAC-approved version of NOGRR 245 adopted at the June 7, 2024 TAC meeting.

Invenergy is an ERCOT Member for the Independent Generator segment with affiliates that are Inverter-Based Resources (“IBR”) with a Standard Generation Interconnection Agreements executed before August 1, 2024. As such, Invenergy is exposed to the risks imposed by the TAC-approved version of NOGRR 245, including but not limited to the risks and potential costs imposed by Section 2.12.1 Exemptions and Extensions Process.

Executive Summary

It is critical to consider the context of this NOGRR. In 2022, the Institute of Electrical and Electronics Engineers (“IEEE”) adopted a set of recommended technical specifications for new generation resources that rely on inverters to deliver power to the transmission grid. NERC has identified a need to codify these standards so that new inverter-based resources (“IBRs”) coming onto the grid will be obligated to design according to these standards. Application of these standards to new IBRs that come on to the grid will greatly increase the reliability of the grid. Invenergy asserts that there is a sense of urgency to get the standards in place and effective for new IBRs. Invenergy urges the Board to ensure that the new ride-through standards for new IBRs do not have the unintended consequences of harming reliability by eliminating existing generation and harming future investment in infrastructure in the ERCOT market.

On June 6, 2024, Invenergy, NextEra Energy Resources LLC, Southern Power Company, Avangrid Renewables LLC, and Clearway Renew LLC (collectively, “Joint

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Commenters”) submitted [comments](#) on NOGRR 245. Invenergy recommends that the Board adopt the version of NOGRR 245 as proposed in the Joint Commenters’ June 6, 2024 Comments, which would provide the ERCOT grid with significant and immediate reliability benefits that meet the concerns presented to the ERCOT Board¹ during consideration of the original TAC Report (March 27, 2024) recommending approval of NOGRR 245, including:

- Meeting or exceeding IEEE 2800 Standards for all new IBRs;
- Ensuring that the reliability of the ERCOT Transmission Grid is enhanced through immediate, clear, and implementable standards;
- Requiring existing IBRs and certain Wind Generation Resources (“WGRs”) that are not inverter-based (i.e., Type 1 and Type 2 WGRs) (collectively “IBRs/WGRs”) to begin work immediately to implement all software and system controls to maximize their ride-through performance;
- Eliminating a very cumbersome and vague exemption and extension process;
- Providing certainty for investors to continue operating and investing in existing IBRs/WGRs; and
- Avoiding legal challenges associated with regulatory overreach and potential takings.

In fact, TAC directives from the [May 31, 2024 Special TAC Meeting](#) and the [Joint Commenters’ June 6, 2024 Comments](#) meet the following shared objectives for NOGRR 245:

- Applies IEEE 2800 standards to all new IBRs;
- Mandates all existing IBRs/WGRs to maximize their ride-through performance through software and system controls;
- Simplifies NOGRR 245 by decoupling hardware modifications for existing IBRs/WGRs to allow for a more streamlined NOGRR to quickly implement software modifications on all (new and existing) IBRs/WGRs; and
- Requires updated modeling for all existing IBRs/WGRs.

However, TAC’s June 7, 2024 approval of [ERCOT's June 5, 2024 Comments](#) (Note: The TAC Report from that meeting is not yet available.) attempts to defer the issues of what, if any, hardware changes to existing IBRs/WGRs might be required by placing these standards in a “grey box.” However, the use of the grey box does not accomplish that purpose. The grey box simply indicates that hardware changes contemplated by ERCOT would be required unless a new NOGRR modifies such requirement before the grey box becomes effective on March 1, 2025 – less than a year from now.

The current TAC-approved version of NOGRR 245 suffers from fatal flaws. It imposes arbitrary costs on existing generation resources and unlawfully gives ERCOT, in its sole and unfettered discretion, authority to indefinitely shutter existing operational

¹ Discussion regarding the remand of the original TAC Report was to request further consideration of ERCOT Staff’s reliability concerns. Attachment A demonstrates how the Invenergy approach addresses each of these reliability concerns.

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IBRs/WGRs. The new NOGRR 245 language would apply standards for failure to meet new frequency (“FRT”) and voltage ride-through (“VRT”) (collectively “FRT/VRT”) standards in violation of the Public Utility Regulatory Act (“PURA”), rules of the Public Utility Commission of Texas (“PUCT”), other state law, and without any reasoned justification or showing that the IBR adversely affects the ERCOT Transmission Grid.

Invenergy has grave concerns that TAC’s June 7, 2024 approval of [ERCOT's June 5, 2024 Comments](#) proposes overly-broad retroactive application of new standards to all existing IBRs/WGRs that are delivering power to the ERCOT Transmission Grid today, and have been delivering reliably for years. As drafted, unless a unit-specific exemption is granted, new performance standards (and therefore, potentially new compliance investigations, enforcement actions and penalties) would apply to all existing IBRs/WGRs—even though ERCOT is aware that some of these IBRs/WGRs have no (and are not expected to ever have a) technically feasible modification available that would allow them to comply with the ride-through standards proposed in NOGRR 245.² TAC’s June 7, 2024 approval of [ERCOT's June 5, 2024 Comments](#) does allow for an exemption process for existing IBRs/WGRs; however, those exemptions are subject to a standard that ERCOT admits is undefined and impossible to anticipate at this time.

The approach in TAC’s June 7, 2024 approval of [ERCOT's June 5, 2024 Comments](#) is an ill-advised departure from established ERCOT precedent on the implementation of new FRT/VRT standards on existing IBRs/WGRs. In 2008 and 2014 as technology has evolved, ERCOT adopted similar enhancements to the applicable ride-through standards for new IBRs.³ There, the ERCOT adopted exemptions for the existing IBRs/WGRs that allowed them to continue operating under the standards that were in existence based on executed Interconnection Agreements. These exemptions remain in the Nodal Operating Guide today. There is no reasoned justification for a departure from this precedent.

Invenergy recommends that the Board adopt [Joint Commenters' June 6, 2024 Comments](#), which would adopt the most stringent VRT standards in the country for new and existing IBRs/WGRs while remaining consistent with PURA, PUCT Rules, and other state law. In the alternative, Invenergy recommends that the Board remand the TAC-approved version back to TAC to consider the issues described below.

Reasonable Balance, Serious & Good Faith Commitment to FRT/VRT Upgrades

The Joint Commenters’ June 6 Comments strike a reasonable balance between ERCOT’s desire to increase FRT/VRT Ride-Through capabilities among IBRs/WGRs and

² See ERCOT’s Presentation of its own Exemption Process indicating that even where technically feasible modifications are unavailable, existing resources would not be granted an exemption and would be reported to the ERM, included as Attachment B for reference.

³ See [OGRR208, VRT Requirement](#) (Nov. 1, 2008) (ERCOT Board required comprehensive study before requiring existing IBRs to retrofit to meet new VRT requirements); [NOGRR043, Synchronization with OGRR208, VRT Requirement](#) (Dec. 1, 2010); [NOGRR062, Require VRT Capability for IRRs](#) (May 1, 2011) (applicable to new IRRs), [NOGRR124, Additional VRT Requirement for IRRs](#) (May 1, 2015); (exemptions for IBRs with IAs pre-2014). See also *infra*, FN4.

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the generation industry's need for a regulatory environment that (1) supports reasonable, investment-backed expectations for the competitive marketplace, and (2) eschews new rules that would unnecessarily require uneconomic physical modifications (e.g., turbine replacements) on existing Generation Resources without a reasoned justification or any study justifying the reliability need for such a harsh outcome.

The Joint Commenters' June 6, 2024 NOGRR 245 Comments should be adopted because they present a serious and good faith commitment to FRT/VRT upgrades that:

- Require immediate implementation of FRT/VRT standards consistent with IEEE 2800 for new IBRs;
- Require all IBRs to make all available software updates (including firmware, settings, parameters, etc.) to maximize ride-through capabilities to the greatest extent the equipment allows using prudent engineering judgment and Good Utility Practice, in a timely manner to support ERCOT system reliability;
- Decouple software and hardware modification considerations so that (1) software maximization for all IBRs/WGRs can be implemented quickly, and (2) hardware fixes for existing IBRs/WGRs can be prudently considered in a future NOGRR;
- Require existing IBRs/WGRs to (1) perform significant analyses and modeling in coordination with Original Equipment Manufacturers ("OEMs"), and (2) provide ERCOT with robust documentation of current FRT/VRT capabilities and plans to maximize that capability; and
- Establish a clear compliance process for IBRs/WGRs that fail to meet performance requirements or provide ERCOT with required modeling and reporting information.

As a matter of policy and law, regulatory requirements imposing requirements for investment in physical modifications on existing Generation Resources should not be mandated if the need is not analytically justified. Further, as ERCOT has acknowledged in TAC meetings and workshops since the April 2024 Board remand, ERCOT does not have sufficient information to perform any study to determine any remaining system reliability risk from existing IBRs/WGRs with current VRT exemptions or that that cannot meet new FRT/VRT requirements after software updates or maximizing their current equipment ride-through capabilities.⁴ Historically, the ERCOT Board has emphasized the seriousness of justifying the reliability need prior to requiring Generation Resources to make costly hardware modifications, and has directed independent consultants to undertake reliability studies prior to implementing rules that would require uneconomic

⁴ [TAC Workshop \(May 10, 2024\)](#); [TAC Meeting \(May 22, 2024\)](#); [TAC Special Meeting \(May 31, 2024\)](#); [TAC Special Meeting \(Jun. 7, 2024\)](#).

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physical modifications on existing Generation Resources.⁵ At best, mandates for existing IBRs/WGRs to invest in new physical modifications are premature in the absence of evidence-based support.⁶ Accordingly, Invenergy urges the Board to adopt the version of NOGRR 245 set forth in the [Joint Commenters' June 6, 2024 Comments](#).

Legal and Policy Problems with the TAC-Approved Version of NOGRR 245

The Board should consider the policy and legal problems with the current TAC-approved version of NOGRR 245. Texas law imposes limits on ERCOT's authority to (a) impose unjustified costs on existing Generation Resources, or (b) deny exemptions from new requirements on existing Generation Resources that are beyond the unit's/facility's technical capabilities absent an *actual* reliability risk to the ERCOT System. While Market Participants must comply with reliability standards, state statute mandates that "[n]o operational criteria, protocols or other requirements established by [ERCOT] may adversely affect or impede any manufacturing or other internal process operation associated with an industrial generation facility, *except to the minimum extent necessary to assure reliability of the transmission network.*"⁷ The PUCT's Rules related to Oversight of Market Participants, 16 TAC § 25.503(f)(2)(C) and (3) also acknowledge exemptions from Protocol requirements where compliance is not technically feasible or would create damage to the equipment.⁸

Throughout this process, ERCOT has acknowledged that it has made no assessment of reliability risk associated with existing IBRs/WGRs that are unable to meet

⁵ For example, in 2008, TAC initially approved Operating Guide Revision Request ("[OGRR](#)") [208, VRT Requirement](#), which would have required WGRs to undertake physical/hardware modifications to meet new VRT requirements. While studies had not been completed to justify such retrofits, TAC voted for the requirements because "A [Market Participant] stated that the reliability of the ERCOT grid had to be taken into consideration... the low VRT requirement was a large part of successful system planning and would in turn support the reliability of the ERCOT grid... [and] compliance for WGRs [with SGIAs] between January 1, 2003 and November 1, 2008 was not required until 2015 and [] if issues did come up, the Operating Guide standards could be changed" (see [Oct. 2, 2008 TAC Report](#)).

Ultimately however, the Board disagreed that imposing VRT requirements (and physical/hardware modifications) on certain WGRs without clearly identifying a reliability need was sufficient. Accordingly, the Board issued a directive for an independent consultant to conduct a study to determine whether there were any ERCOT System reliability risks related to existing WGRs with SGIAs before Nov. 1, 2008, that could not comply with ERCOT's VRT requirements (see [Nov. 7, 2008 Board Report](#)).

On June 18, 2010, the [Independent VRT Study](#) was presented to ROS, which found that "the results of the study **DO NOT indicate a need to modify the ERCOT VRT requirements**" for pre-2008 SGIAWGRs. Further, on July 20, 2010, ERCOT Staff informed the Board that "...**additional** protective relaying and **VRT requirements**... for pre-November 2008 wind generators not needed" (see [Jul. 20, 2010 ERCOT Presentation \(D. Woodfin\)](#), slide 7).

⁶ Similarly, no analysis of potential effects on reserve margins or resource adequacy effects have been performed to ensure that the grid maintains adequate generation in light of the possible removal of gigawatts from the grid as a result of NOGRR 245.

⁷ Tex. Util. Code § 39.151(l) (emphasis added). See also, 16 TAC § 25.361(f).

⁸ See 16 TAC §§ 25.503(f)(2)(C) and (f)(3).

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the new FRT/VRT standards.⁹ Nor has ERCOT studied system or local reliability risks considering that under Joint Commenter's version of NOGRR 245, new IBRs would have to comply with IEEE 2800 standards and existing IBRs/WGRs would be required to implement software updates and maximize their ride-through capabilities within the bounds of Good Utility Practice and sound engineering judgment. ERCOT also concedes that its cost caps in its proposed rule are arbitrary and not based on any meaningful analysis of actual market costs of referenced hardware.¹⁰

In short, the TAC-approved version of NOGRR 245 would impose costly new requirements on existing Generation Resources to make hardware upgrades without any reasoned justification. It would give ERCOT disconnection authority beyond current PUC rules that specify the terms and conditions of transmission service and require that, when interruptions occur, the utility must establish service within the shortest possible time.¹¹ It would also interfere with reasonable investment-backed expectations and the regulation's economic impact would devalue existing generation resources in violation of state and federal takings law, including the Private Property Rights Preservation Act, Tex. Gov.'t Code chapter 2007. In summary, the TAC-approved NOGRR 245 runs afoul of PURA, PUCT Rules, and other state and federal law.

The June 7, 2024 TAC-Approved Version of NOGRR 245 Has Fatal Flaws and Language That Creates Unintended Consequences

If the ERCOT Board does not adopt the [Joint Commenters' June 6, 2024 Comments](#), the Board should make the changes identified below. The Board has the authority to make any modifications to a TAC-recommended Revision Request it deems appropriate, and may accomplish this by: (a) remanding TAC's June 7, 2024 approval of [ERCOT's June 5, 2024 Comments](#) (i.e., the Jun. 7, 2024 TAC Report, not yet published) to TAC with instructions to make the changes identified below; or (b) making the following modifications at the June 7, 2024 TAC Report at the June 17, 2024 ERCOT Board Reliability and Markets (R&M) Committee Meeting or the June 18, 2024 ERCOT Board Meeting:

1. Define Maximization.

ERCOT's language in the TAC-approved NOGRR 245 requires "maximization up to equipment limitations." This language does not sufficiently define maximization, leaving either (1) risk of non-compliance for applying sound engineering judgment, or (2) risk of equipment damage or degradation.

The TAC-approved version should clearly: (1) specify that maximization requirements in NOGRR 245 apply only to software-based upgrades and are subject to Good Utility Practice as defined in the PUCT's Rules; and (2) acknowledge a Market

⁹ *Supra* at FN2.

¹⁰ ERCOT offered a 50% cost threshold as a "placeholder" with no quantitative basis at the May 22, 2024 TAC meeting. The newly-approved 40% threshold similarly has no quantitative basis.

¹¹ 16 TAC §§ 25.52(b)(1); 25.195(e); 25.200(c)-(d); 25.503(j).

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Participant's right and duty to protect its equipment from damage as specified in 16 Tex. Admin. Code § 25.503(f).

2. **Decouple hardware and exemption language for consideration in a new NOGRR by removing language in the June 7, 2024 TAC Report. (Section 2.12.1)**

- Hardware (2.12.1(4)(c))

TAC proposed to “grey box” the language in this section and defer implementation of the language until March 1, 2025. Delaying implementation of the language does not cure the legal error of imposing arbitrary costs associated with hardware on existing IBRs/WGRs absent a reliability justification and will not obviate the need for judicial appeal of the invalid rule.

Invenergy requests that Section 2.12.1(4)(c) be stricken and the issue of any required hardware modifications for existing IBRs/WGRs be bifurcated from this NOGRR entirely and addressed after ERCOT has studied the reliability need for such requirements after taking into account the reliability improvements realized through maximization and other ERCOT System improvements.

Invenergy also notes that the cost threshold (40% of full in-kind replacement) is not well defined, arbitrary and only introduced on June 5, 2024. ERCOT has done no meaningful analysis of the cost/benefit for this criteria or research of actual costs and may be deemed a regulatory taking under state and federal law.

- Factors for Denying Exemptions (2.12.1; 2.12.1(4)(a)(vi); 2.12.1(4)(c); 2.12.1(4)(c)(ii))

Section 2.12.1 of the NOGRR gives ERCOT sole discretion to deny an exemption request for an existing resource. The reliability criteria for determining exemptions are arbitrary and open-ended.

Reference to ERCOT's “sole discretion” should be deleted. Any ERCOT decision to deny an exemption request should be supported with logic and evidence sufficient to survive review by the PUCT or others; it should not be ERCOT's “sole determination” without basic safeguards. In addition, ERCOT has insufficiently defined how the studies will be conducted using the information and models submitted to ERCOT for consideration of exemptions. The lack of clarity of what specific tests will be conducted, how they will be conducted, and how ERCOT will evaluate the results is extremely concerning – particularly since this addition to the rules was added so recently and has not been fully vetted or explained to stakeholders. The “reliability override” leaves open-ended and significant compliance risk on Resource Entities because any rejection of an exemption would result in extremely costly hardware upgrades (up to entire inverter/turbine replacement).

Other factors that ERCOT lists as criteria are also inapt, ill-defined, and unachievable for certain existing IBRs/WGRs. For example, Section 2.12.1(4)(c)(ii) allows

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ERCOT to deny an exemption if it believes there could be a loss of 500 MW generating capacity, which is arbitrarily tied to a NERC-reportable event threshold. This is a reporting threshold, and minimizing ERCOT's reporting obligations, should not be the grounds for establishing a mandatory and enforceable performance requirement. Invenergy recommends that consideration of a more relevant ERCOT reliability metric, such as the Most Severe Single Contingency.

Section 2.12.1(4)(c) specifies that ERCOT could deny an exemption for "safety of or damage to neighboring equipment," yet the modeling criteria is ambiguous.

Section 2.12.1(4)(a)(vi), which specifies that ERCOT can deny an exemption for phase angle jump ("PAJ") or rate-of change-of-frequency ("RoCoF") tripping during faults provides no consideration for PAJ and RoCoF tripping protections. Certain existing IBRs are unable to disable PAJ and RoCoF protection schemes and distinguish between fault and non-fault conditions, and such IBRs have no path to an exemption.

- Retroactive Revocation of Exemptions (2.12.1(8)(iii))

Section 2.12.1(8)(iii) allows ERCOT to unilaterally determine that a new modification for a Resource is available in the market and not "cost prohibitive" and would require Resources with existing exemptions to submit a plan to implement the modification.

Invenergy requests that Section 2.12.1(8)(iii) be stricken as it interferes with investment-backed expectations and ERCOT, which does not own generation, is not in a position to know what is or is not cost prohibitive.

- OEM officer certificate (2.12.1(3)(a))

Invenergy requests elimination of the requirement to obtain a third-party OEM officer certificate in Section 2.12.1(3)(a). This is not wholly within a Resource Entity's control. Consequently, it is not certain that even the most diligent Resource Entity will be able to reliably and consistently acquire an OEM certificate as contemplated by the provision.

3. Modify dynamic reactive power support language for frequency and voltage events. (Sections 2.6.2.1(5), 2.9.1.1(5), and 2.9.1.2(5))

As written, an IBR cannot reduce its active power output any time within the FRT/VRT curves unless the reduction is performed to provide frequency response. This is a vast oversimplification as it disallows an IBR's natural dynamic response to a fault event. If a fault occurs near an IBR, its active power output will inherently drop during the fault as it naturally responds to the change in voltage condition. It will recover that within required time (i.e., one (1) second), but that is a natural reduction in active power. This contradiction leaves Resource Entities non-compliant for correct dynamic response to faults. Therefore, Sections 2.6.2.1(5), 2.9.1.1(5), and 2.9.1.2(5) should be appropriately modified to account for inherent dynamic responses or deleted.

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4. **Modify or delete reference(s) to “...ride-through required for any level of instantaneous voltage.” (Sections 2.9.1.1 and 2.9.1.2)**

The language in Sections 2.9.1.1(1) and 2.9.1.2(4) override Table C requirements and inappropriately uses “any” to define a performance requirement. Without further technical detail (which ERCOT never provided), there is no clear need for this excessive requirement. This has not been adequately vetted with Resource Entities, OEMs, and directly conflicts with IEEE 2800-2022. Accordingly, the specified language should be appropriately modified or deleted.

5. **Make additional clarifying edits. (Sections 2.6.2.1, 2.9.1.1 and 2.9.1.2)**

- “Output” (2.6.2.1(5); 2.9.1.1(5); 2.9.1.2(5))

Invenergy notes that where the term “output” is solely used, it does not adequately defined as active power, reactive power, or apparent power. This leaves significant uncertainty and confusion regarding implementation and exposes Resource Entities to unnecessary compliance exposure. Therefore, the term “output” in Sections 2.6.2.1(5), 2.9.1.1(5), and 2.9.1.2(5) should be modified to “active power output.”

- “Root-mean square voltage” (2.9.1.1(1); 2.9.1.2(1))

The VRT tables in Section 2.9.1 use the term “root-mean square voltage.” This term should be adequately clarified to specify whether these are phase voltage quantities or some other quantity, as they are in Table C.

6. **Delete certain language regarding required actions following a potential performance failure. (Section 2.13(5)(a))**

Section 2.13(5)(a) requires actions by the Resource Entity following failure of one of its IBRs/WGRs to return performance to its maximum capability, even if the “maximum capability” is above the required criteria for the IBR/WGR. This requirement provides no consideration for cost or initial error submitting maximum capability. Invenergy requests that this provision be deleted. Alternatively, Resource Entities should be given the ability to update documented maximized capability.

Conclusion

Invenergy appreciates the Board’s consideration of its concerns. In the interest of judicial economy and achieving the benefits of improved FRT/VRT capabilities for the ERCOT system as soon as possible, Invenergy urges the Board to either adopt [Joint Commenters’ June 6, 2024 Comments](#) or make the edits proposed herein.

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ATTACHMENT A

Alignment with ERCOT Key Issues

Major Outstanding Issues

1. Software/parameterization language does not maximize to full capability of equipment
2. Exemption process:
 - A. Does not allow ERCOT to assess reliability risk and costs
 - B. Allows exemptions for unknown/unverified issues and for phase angle jump/RoCoF uncertainty
 - C. Criteria for solution being cost prohibitive is unclear, subjective, not easily quantifiable nor repeatable and may vary greatly based on technology, unique characteristics or plant age
 - D. Does not ensure maintaining performance requirements until exemption approved
 - E. Does not allow ERCOT sufficient time to acknowledge/review exemptions or appeals
 - F. Allows multiple passes of exemptions and after-performance-failure or later-discovered issues to get exemptions - effectively lowering requirements over time
3. Performance failure mitigation not required for new IBRs
4. Moving 6/1/23 date to 6/1/24 (or beyond) delays 22 - 24 GW of new, modern, and more capable IBRs from having to meet new requirements with no technical/justifiable reliability reason
5. Lowers VRT curve for new IBRs below legacy .25 pu

Joint Commenter Language	Additional Notes
Requires ALL resources to maximize capabilities using software/parameterization to the greatest extent equipment allows.	New Section 2.11 clearly defines maximization and related requirements.
Eliminates exemptions and associated complexities of defining reliability and cost metrics. Streamlines process for limited extensions, includes ERCOT approval and allows more time.	Preserves a path for future NOGRR to address physical modifications in a more informed manner.
Obligates ALL resources to implement mitigation plans upon determination of performance failure.	Section 2.14 explicitly requires implementation.
Per TAC guidance, new date adjusted to align with PUC approval. Maximization requirement for ALL resources addresses 22-24 GW.	Overwhelming majority of GWs are solar or storage with modern capabilities.
Maintains consistency with IEEE 2800-2022.	



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ATTACHMENT B

Exemption Process - ERCOT Can Support

Exemption process must give ERCOT flexibility to grant/deny based on reliability

- Scenario 1: Not technically feasible **or** technically feasible (high cost) solution w/ acceptable reliability risk
 - **Exemption granted**
 - ERCOT creates GTC or implements restrictions
- Scenario 2: Technically feasible (low cost) solution w/ acceptable reliability risk
 - **No exemption** (report to ERM if solution not implemented)
 - ERCOT creates GTC or implements restrictions until solution implemented
- Scenario 3: No technically feasible solution, unacceptable reliability risk
 - **No exemption** (report to ERM)
 - ERCOT creates GTC or implements restrictions
- Scenario 4: Technically feasible (high or low cost) solution w/ unacceptable reliability risk
 - **No exemption** (report to ERM if solution not implemented)
 - ERCOT creates GTC or implements restrictions until solution implemented
- Scenario 5: Unknown capability or Phase Angle / RoCoF
 - **No exemption** for unknown capability or Phase Angle/RoCoF

Scenario	Technically Feasible?	Cost	Acceptable Reliability Risk?	Exemption Granted?	Report to ERM?	Create GTC if possible or Implement Restrictions?
1	Yes	High	Yes	Yes	No	Yes
2	Yes	Low	Yes	No	Yes, if solution not implemented	Yes
3	No		No	No	Yes	Yes
4	Yes	High/Low	No	No	Yes	Yes
5	Unknown	Unknown	Unknown	No	No, still subject to reqs	NA