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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 | July 28, 2023 |

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| Submitter’s Information | |
| Name | Judd Messer, Texas Vice President |
| E-mail Address | Judd.Messer@poweralliance.org |
| Company | Advanced Power Alliance |
| Phone Number | 254-230-0620 |
| Cell Number |  |
| Market Segment | Independent Generators |

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| Comments |

The Advanced Power Alliance (APA) appreciates ERCOT’s focus on ensuring and maintaining reliability and supports ERCOT’s objective to prevent the unexpected tripping of Generation Resources.

The core issue for which APA seeks relief on behalf of its members is that in Nodal Operating Guide Revision Request (NOGRR) 245, ERCOT has proposed new operational requirements and compliance timelines for Inverter-Based Resources (IBRs) with limited or no ability of many IBRs to attain compliance. Significant uncertainty exists regarding the availability of technically feasible and commercially proven solutions to retrofit either existing or new IBRs in the development phase to meet the proposed requirements and timelines.

Original Equipment Manufacturers (“OEMs”) are the primary[[1]](#footnote-1) entities capable of designing and developing retrofits that can reliably be integrated into existing IBRs and provide necessary capability improvements to reach compliance with NOGRR245. OEMs have indicated that they will prioritize newer models, but it will take time to understand the proposed requirements, years to develop solutions, and is impossible to meet ERCOT’s NOGRR245 proposed compliance timeline for most, if not all, existing IBRs. ERCOT states that it will prohibit IBRs from operating in the market for failure to meet the proposed compliance timeline which will lead to significant system-wide reliability concerns.

IBRs account for more than 50,000 MW of installed capacity in the ERCOT Region. It is unclear at this time how much of this supply can be retrofitted to comply with ERCOT’s proposed requirements because OEMs are still working to interpret the requirements of NOGRR245 so that they can then design and develop technical solutions necessary to reach compliance. It is also unclear what reliability risks ERCOT may face if a significant portion of the affected supply is forced offline. APA urges ERCOT to remove the IBR compliance timeline obligations in NOGRR245 until OEMs can provide a realistic development timeframe for retrofits and ERCOT can perform a reliability analysis of impacted capacity.

One potential solution is for ERCOT to set a timeline for OEMs to provide updates regarding retrofit development status, after which ERCOT would revisit the timeline for IBR compliance. APA member companies have invested nearly $100 billion in the ERCOT Region. With this much capacity and investment at risk, it is important that ERCOT apply reasonably achievable compliance timelines to avoid unintended consequences such as forcing billions of dollars of much needed capacity out of the market which will increase costs for Texas consumers, impair investor collateral, and threaten existing contractual obligations.

There have been two Odessa disturbance events in the ERCOT Region; neither of which was caused by IBRs. In general, IBRs are designed to go offline during a fault to protect equipment from damage. IBRs on the ERCOT System today have all been designed to comply with existing ERCOT standards. The design of these existing IBRs were approved by ERCOT before they were allowed to operate on the grid. However, ERCOT’s NOGRR245 requires significant changes to IBRs in order to allow them to “ride through” faults on the transmission system. This requires substantial changes to the design of IBRs, changes that are not easily accomplished as evidenced by OEM comments.

In their filed comments, OEMs highlight the technical complexity of creating solutions for retrofitting existing IBRs and the need for more time to evaluate and develop appropriate solutions.  APA estimates that there are approximately 8,000-15,000 MW of existing IBRs that may never be able to meet the requirements of NOGRR245; the reality is this number may be significantly higher and will not be known with greater certainty until OEMs are given more time to study the capabilities of existing IBR equipment and the feasibility of completing retrofits. APA strongly recommends that ERCOT continue to allow good cause exemptions for IBRs that cannot be retrofitted.

APA supports any reasonable measures that will lead to increased stability and reliability on the grid. We recommend that ERCOT take a more holistic view of grid stability and fast track all possible transmission solutions as a bridge while OEMs develop the necessary retrofits for IBR compliance. This includes the installation of synchronous condensers, static synchronous compensator (STATCOM) dynamic reactive devices, and allowing the use of grid forming technologies as described more fully in these comments. Together, these technologies can provide the additional voltage support that ERCOT has indicated is urgently needed while OEMs continue to develop ERCOT’s preferred path of IBR retrofits.

To harmonize and improve the technical capabilities of IBRs, the Institute of Electrical and Electronics Engineers (IEEE) developed 2800-2022 – IEEE Standard for Interconnection and Interoperability of Inverter-Based Resources (IBRs) Interconnecting with Associated Transmission Electric Power Systems (“IEEE 2800-2022 standard”) as a consensus-based performance standard that is intended to help equipment manufacturers, project developers, transmission planners, and power grid operators improve the quality of inverter and facility performance to enhance the stability of the power grid. The IEEE 2800-2022 standard defines performance specifications for IBRs based on state-of-the-art IBR capabilities, and although it gives authorities governing interconnection requirements (“AGIRs”) latitude on implementation, it was not designed to apply to legacy IBR capabilities as ERCOT is proposing. However, approval of the IEEE 2800-2022 standard does not mean every OEM vendor is able to instantly design retrofits for IBRs to meet the requirements. Quite the contrary, as OEMs have filed multiple sets of comments indicating the complexity of complying with ERCOT’s proposed requirements and have noted that for some IBRs, OEMs may never be able to develop solutions. OEMs, like other entities and stakeholders, are still working to assess the impact of the IEEE 2800-2022 standard while ERCOT rushes to impose deadlines on IBRs without a realistic pathway for attaining compliance.

The North American Electric Reliability Corporation (NERC), the entity vested with nationwide authority over reliability standards, identified several challenges OEMs are facing with designing equipment to meet requirements of the IEEE 2800-2022 standard including: difficulty in reading and interpreting the standard, confusion around plant requirements versus individual supplemental device conformance, protective relay design and relay settings of IBR plants, and challenges in testing and verification.[[2]](#footnote-2)  NERC states in its report that OEMs prefer to wait until the second version of the IEEE 2800-2022 standard, IEEE P2800.2 - Recommended Practice for Test and Verification Procedures for Inverter-based Resources (IBRs) Interconnecting with Bulk Power Systems (“IEEE P2800.2 standard”), is adopted because various criteria in IEEE 2800-2022 standard is unclear. The IEEE P2800.2 standard is used to define recommended practices for test and verification procedures that should be used to confirm plant-level conformance with IEEE 2800-2022 standard.[[3]](#footnote-3)

Further, the risk of having to re-design and re-test can cost millions of dollars for wind turbines and can create longer timeframes to deliver a conformity assessment due to the multiple iterations required.[[4]](#footnote-4) Testing and certification guidelines and rules add additional levels of clarity in how rules are to be understood and how compliance with them can be proven. Testing at the IBR unit level is one part of the full IBR plant level compliance. Without IEEE P2800.2 standard, it is unclear what IBR unit level data is needed or how it will be used in other parts of the plant level evaluation and modeling process.[[5]](#footnote-5) As such, APA urges ERCOT to remove from NOGRR245 the IBR compliance timelines until the IEEE P2800.2 standard is adopted in order to provide appropriate design and compliance criteria to the OEMs tasked with developing and implementing IBR solutions and retrofits.

Significantly, IEEE and NERC have not suggested retrofitting IBRs to meet the IEEE 2800-2022 standard as ERCOT has proposed. NERC recognizes that it will take years for OEMs to develop solutions to meet the IEEE 2800-2022 standard performance specifications and has neither imposed an unattainable compliance timeline on IBRs nor threatened IBRs with expulsion from the market if they cannot be retrofitted to meet the standard.[[6]](#footnote-6) ERCOT is the only known entity imposing such extreme measures. Restricting or prohibiting the operation of IBR facilities will have the major unintended consequence of creating a less reliable and more expensive grid with fewer low-cost Generation Resources to meet surging demand and provide downward pressure on rising prices. With a significant number of Resources at risk for permanent expulsion from the market, ERCOT needs to demonstrate how it will monitor reliability capability in Real-Time and determine how limitations on Resources will be determined and communicated.

As such, APA recommends that ERCOT correct its Impact Analysis of NOGRR245 to reflect the changes to grid operations and practices that will be necessary when NOGRR245 is adopted. In the Impact Analysis, under the category of ERCOT “Grid Operations and Practices,” ERCOT states: “No impacts to ERCOT grid operations and practices.” However, given that there are limited to no available retrofits for IBRs to attain compliance with NOGRR245 within ERCOT’s proposed compliance timeline, and there are more than 50,000 MW of IBR capacity at risk for being shuttered, APA believes that ERCOT needs to update its Impact Analysis to reflect these grid operation changes and practices.

If ERCOT ultimately prohibits IBRs from operating in the market, there is significant risk of insufficient supply to meet demand. As ERCOT CEO Pablo Vegas stated during a discussion on July 25, “[ERCOT is] in a place now where we are dependent upon renewables to meet demand.”[[7]](#footnote-7) It is an imprudent risk to the overall reliability of the grid for ERCOT to continue on the path of prohibiting Resources from operating in the market, particularly given the increasing demand from consumers for supply. APA strongly urges ERCOT to apply NOGRR245 only on a prospective basis.

Prohibiting IBRs from operating in the market will also upend contracts such as Power Purchase Agreements, eliminate associated landowner royalty payments, and negatively impact local taxing authority revenue. The Texas Constitution prohibits the Legislature from enacting any law impairing the obligations of contracts and, similarly, retroactive application of regulations that impair existing contracts is generally disfavored. ERCOT’s retroactive application of its newly proposed standards is untenable and outside the bounds of Good Utility Practices. Accordingly, APA urges ERCOT to remove the retroactive application of NOGRR245.

NOGRR245 will have far-reaching impacts on Texas consumers and given the magnitude of the proposed operational changes and practices, ERCOT should model the system-wide reliability and cost impacts of NOGRR245 and provide both the analysis and underlying assumptions to the market. According to a study released in early 2023, IBRs saved Texas consumers $11.6 billion in calendar year 2022 alone.[[8]](#footnote-8) This number would have been higher but for $2.8 billion in real-time congestion costs, a 33% increase over 2021.[[9]](#footnote-9) Consumers will undoubtably pay more for electricity if a significant number of IBRs are forced out of the market. During the high demand of the Summer of 2023, there have been days when IBRs have provided as much as one-third of the supply to serve Texas consumers. This raises a bona fide reliability concern and reflects a substantial change to ERCOT operations and practices that ERCOT has failed to capture in its Impact Analysis. ERCOT has a duty to provide the accurate impacts of all Revision Requests and APA requests that ERCOT update its Impact Analysis for NOGRR245.

Additionally, the proposed language in NOGRR245 removes relevant grandfathering provisions from paragraphs 1(a) and (b) of Nodal Operating Guides Section 2.9.1, Voltage Ride-Through Requirements for Intermittent Renewable Resources Connected to the ERCOT Transmission Grid. This is another substantial change to ERCOT operations and practices that should be reflected in ERCOT’s Impact Analysis if ERCOT chooses to move forward with retroactive application of NOGRR245. APA urges ERCOT to continue to honor grandfathering provisions that will allow Resources to remain in the market while OEMs develop solutions for retrofitting, or else update the Impact Analysis to accurately reflect the operational and practices changes that will be necessary when a significant number of Resources are expelled from the market.

In the alternative, if ERCOT intends to move forward with retroactive application of ERCOT’s newly proposed requirements, then APA urges ERCOT to align its NOGRR245 compliance deadlines with realistic dates by which OEMs deem they can develop, test, and implement solutions to retrofit existing Resources to meet ERCOT’s newly proposed requirements because OEMs are the primary entity that can design solutions and retrofit IBRs.

Furthermore, some solar and storage OEMs have indicated that they can respond more quickly than wind turbine OEMs. Similarly, some wind turbine OEMs have described a more viable path forward for more recently developed technology than older models. As such, APA strongly urges ERCOT to provide a schedule for compliance obligations according to when OEM solutions are available to account for the vastly different characteristics of each Resource at each unique facility. If the goal is to have as many compliant facilities as quickly as possible, a schedule for compliance based on the availability of necessary components is far more practical and reduces the likelihood of reliability issues borne out of non-compliance.

Significant reliability concerns endure if ERCOT simply ignores the fact that time will be needed to design, test, manufacture, ship and install the equipment necessary for compliance. Comments from the OEMs have made clear that current timelines are unrealistic, even without consideration of real-world supply chain and labor constraints. As an example, Siemens Gamesa indicated that it could take as long as four years to develop a new turbine to meet NOGRR245 requirements. ERCOT staff’s suggested timelines are even more impractical when considering that facilities are designed, and equipment is purchased, far in advance of execution of Standard Generation Interconnection Agreements (SGIAs). APA urges ERCOT to refrain from imposing compliance timelines for IBRs without OEM input and until there is clarity regarding IBR solutions.

At a minimum, ERCOT should conduct a comprehensive study to fully understand the problem they are trying to solve and whether the solution they are proposing is an appropriate remedy. For example, there are less costly, more expedient, and currently available solutions such as synchronous condensers along with other transmission grid and substation improvements. Given that ERCOT has deemed NOGRR245 urgent and that there are no near-term retrofit solutions for IBRs, ERCOT should expedite the construction of the six synchronous condensers recently recommended by ERCOT[[10]](#footnote-10) and move forward with 345 kV line additions currently planned and under study in West Texas for oil & gas Load while OEMs continue to develop solutions for existing Resources. These additional facilities will further strengthen the grid, improving ride-through capability.

Additionally, grid-forming inverters with a firm energy source behind them may be able to replace many of the capabilities historically provided by synchronous devices providing ride-through capability and system stability. Strategic placement of grid-forming resources is needed to support a robust system and increase reliability. Significant amounts of storage are currently requesting interconnection in ERCOT. There is a window of opportunity to build a fleet of grid-forming inverter technology on currently proposed projects to support high IBR penetration. Energy Systems Integration Group (“ESIG”) held a workshop titled “Special Topic Workshop: Grid-Forming IBRs” that provides a vast amount of information on the subject.

APA believes that given ERCOT’s reliability concerns and its stated urgency with NOGRR245, ERCOT should expedite all available transmission solutions to improve the reliability and resiliency of the grid including co-located grid forming inverter resources, synchronous condensers and static synchronous compensator (STATCOM) dynamic reactive devices while OEMs continue to work on developing solutions to retrofit existing Resources.

APA recommends ERCOT continue working with IBRs and OEMs to identify a set of requirements for Resources that is based on timelines OEMs indicate they can meet. Creating a comprehensive approach to address these issues as described above will help ensure greater reliability along with continued performance of available and new capacity to serve the ever-growing demand in the ERCOT Region.

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| Revised Cover Page Language |

None

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| Revised Proposed Guide Language |

None

1. The exception being for those IBRs whose OEM is no longer in service. [↑](#footnote-ref-1)
2. North American Electric Reliability Corporation (NERC), *IEEE 2800 OEM Readiness*, pg 11. [↑](#footnote-ref-2)
3. Id. [↑](#footnote-ref-3)
4. Id. [↑](#footnote-ref-4)
5. Id at 13. [↑](#footnote-ref-5)
6. Id. [↑](#footnote-ref-6)
7. DiNatale, Sara. San Antonio Express News. *Without Wind and Solar Power, ERCOT CEO Says, This Summer’s Grid Story Could Be Much Different.* July 25, 2023. [↑](#footnote-ref-7)
8. Rhodes, Joshua D. *The Impact of Renewables in ERCOT (2022 Q4 Update)*. October 2022. [↑](#footnote-ref-8)
9. *ERCOT Wholesale Electricity Market Monthly Report* (January 2023). [↑](#footnote-ref-9)
10. See “*Assessment of Synchronous Condensers to Strengthen West Texas System*” presented at the Regional Planning Group meeting on June 13, 2023. [↑](#footnote-ref-10)