

**STATE OF NORTH CAROLINA  
UTILITIES COMMISSION  
RALEIGH**

DOCKET NO. E-100, SUB 101

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

In the Matter of		
Petition for Approval of Revisions to	)	ORDER REQUIRING COMMENTS
Generator Interconnection Standards	)	AND FILINGS REGARDING RISKS
	)	POSED BY INVERTER-BASED
	)	RESOURCES

BY THE COMMISSION: In September of 2021, the North American Electric Reliability Corporation (NERC) published a Joint NERC and Texas RE<sup>1</sup> Staff Report entitled “Odessa Disturbance” that analyzed two disturbances that occurred on the bulk power system in Texas during the summer of 2021 (the Joint Report).<sup>2</sup> The larger of the two disturbances occurred near Odessa, Texas on May 9, 2021. As detailed in the Joint Report, a failed surge arrester triggered a 345-kV fault that caused voltage in the area to drop. While system voltage recovered quickly and customers were not impacted, several inverter-based generators (solar and wind) connected to the bulk power system reduced their output for a significant period of time, not because of the fault itself, but because of “inverter-level or feeder-level tripping or control behavior within the resources.” According to the Joint Report, there was a power production reduction of 1,112 MW of solar generation and 36 MW of wind generation lasting as long as five minutes at some facilities.

The Joint Report explains further that on June 26, 2021, another 345-kV fault occurred 40 miles north of Odessa, Texas due to the failure of an H-frame transmission structure. As a result of the fault, several solar resources reduced their power output by about 518 MW. Two solar facilities were involved in both the May and June events. The Joint Report notes that during these events, voltage at the solar plants’ points of interconnection remained in compliance with NERC’s standards. Nonetheless, the plants’ inverters tripped, apparently because of “equipment protections set by the inverter manufacturer that are hard-coded into the inverter and not made available to nor modifiable by the plant owner/operator.”

The Joint Report states that four similar disturbances involving inverter-based resources occurred in California in 2016, 2017, 2018, and 2020. In response, NERC published disturbance reports, industry alerts, and guidelines for reliably integrating

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<sup>1</sup> Texas RE is short for Texas Reliability Entity. It is the regional electric reliability council under NERC that is tasked with compliance, monitoring, and enforcement of NERC’s reliability standards for most of Texas.

<sup>2</sup> See [https://www.nerc.com/pa/rrm/ea/Documents/Odessa\\_Disturbance\\_Report.pdf](https://www.nerc.com/pa/rrm/ea/Documents/Odessa_Disturbance_Report.pdf).

inverter-based resources into the bulk power system.<sup>3</sup> The Joint Report states that despite these efforts, the electric industry is not sufficiently implementing those guidelines and that further action is needed to address gaps in the performance of inverter-based resources. The Joint Report recommends improvements to NERC's reliability standards to address systemic issues with inverter-based resources. The Joint Report also recommends significant updates and improvements to the generator interconnection agreements that are subject to the jurisdiction of the Federal Energy Regulatory Commission (FERC). Significantly, the Joint Report states:

All the performance issues identified in this report and all past NERC disturbance reports involving solar PV resources should have been identified during interconnection studies and addressed as a mitigating measure prior to the resource being interconnected. All forms of tripping or abnormal performance can be modeled in EMT [electro-magnetic transient] simulations and should be studied during the interconnection study process. However, these studies are not widely conducted . . . . Therefore, these performance issues are going unnoticed until after the time of interconnection . . . . [T]he [utility has a] limited capability to address these abnormal performance issues after the interconnection agreements have been signed . . . . [T]hese issues should have been studied prior to interconnection and are a result of insufficient studies conducted at the time of interconnection. EMT models should be provided for all newly interconnecting inverter-based resources and EMT studies should be conducted to ensure that performance requirements (once established) are sufficiently met.

During the disturbances that NERC has documented, other generators were able to quickly bridge the gap in power output that unexpectedly occurred when inverter-based resources dropped offline, and customers saw no impacts. However, it is critical to determine whether these issues exist in North Carolina and, if so, address them in the interest of maintaining the reliability of the electric system.

Therefore, the Commission will require the electric utilities to file comments on these questions:

- 1) Do North Carolina's state-jurisdictional generation interconnection standards and agreements adequately address the issue of generator ride-through, EMT modeling, and the on-going monitoring of inverter-based resources?
- 2) Are generators providing accurate EMT models of their inverters during the interconnection process so that the subsequent utility interconnection studies are accurate predictors of the inverters' behavior after interconnection?

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<sup>3</sup> See [https://www.nerc.com/comm/PC\\_Reliability\\_Guidelines\\_DL/Inverter-Based\\_Resource\\_Performance\\_Guideline.pdf](https://www.nerc.com/comm/PC_Reliability_Guidelines_DL/Inverter-Based_Resource_Performance_Guideline.pdf) and [https://www.nerc.com/comm/PC\\_Reliability\\_Guidelines\\_DL/Reliability\\_Guideline\\_IBR\\_Interconnection\\_Requirements\\_Improvements.pdf](https://www.nerc.com/comm/PC_Reliability_Guidelines_DL/Reliability_Guideline_IBR_Interconnection_Requirements_Improvements.pdf)

3) Should electric utilities be required to adopt the NERC guidelines that were cited earlier in this order, and should the Commission make them part of the NC Interconnection Procedures?

4) Should electric utilities be required to monitor for the impacts of system faults on inverter-based resources?

As discussed in the Commission's October 8, 2021 Order Clarifying Generator Interconnection Standards, Requesting Comments, and Requiring Filing of Remediation Information (October 8, 2021 Order), on August 2, 2021, Duke Energy Carolinas, LLC (DEC) and Duke Energy Progress, LLC (DEP, together with DEC, Duke) entered into a Memorandum of Agreement (MOA) with Strata Solar, LLC (Strata) that created a framework for Strata to develop a self-administered compliance program to inspect its solar facilities. The October 8, 2021 Order requires all Interconnection Customers with Uninspected Facilities to work with Duke to develop self-inspection programs similar to the one detailed in the Strata MOA. As explained in Duke's August 5, 2021 reply comments, that MOA includes a provision by which Duke and Strata will develop a distributed energy resource inverter and interconnection devices functional settings compliance document to establish minimum acceptable standards for the functional settings aspects of the self-inspection program. Given the multiple electric disturbances that have been documented by NERC and the Joint Report's recommendations, the Commission finds good cause to require Duke to file a copy of the functional settings compliance document by December 15, 2021, along with its analysis of whether the document is consistent with the recommendations in the Joint Report, and whether it is sufficient to ensure appropriate performance by generators.

Finally, where the Joint Report identifies issues for those inverter-based generators interconnected to the transmission system, IEEE Standard 1547 may provide a roadmap for addressing some of the same issues identified in the Joint Report for those inverter-based generators that are interconnected to the distribution system. Pursuant to the Commission's March 2, 2021 Order Requiring Reports and Scheduling Presentation, Duke and Dominion Energy North Carolina (DENC) are required to annually file information about the status of their IEEE Standard 1547 implementation efforts in Docket No. E-100, Sub 101B. The Commission directs Duke and DENC to discuss their plans for implementing those portions of IEEE Standard 1547 that address generator ride-through capabilities and inverter settings in their next annual IEEE Standard 1547 report that is due March 15, 2022. The Public Staff shall review the IEEE Standard 1547 report submissions and provide comments to the Commission on or before April 14, 2022.

IT IS, THEREFORE, ORDERED as follows:

1. That DEC, DEP, and DENC shall file responses to the questions in this Order on or before December 15, 2021;

2. That DEC and DEP shall file a copy of the functional settings compliance document as required by the Strata MOA on or before December 15, 2021, along with

their analysis of whether the document is consistent with the recommendations in the Joint Report, and whether it is sufficient to ensure appropriate performance by generators;

3. That all parties may file comments on the responses of DEC, DEP, and DENC to the questions set forth herein, and on the DEC and DEP analysis of the functional settings compliance document by January 19, 2022;

4. That DEC, DEP, and DENC shall discuss their plans for implementing those portions of IEEE Standard 1547 that address generator ride-through capabilities and inverter settings in their next annual IEEE Standard 1547 report that is due March 15, 2022; and

5. That the Public Staff shall review and file comments on the March 15, 2022 IEEE Standard 1547 filings that address generator ride-through capabilities and inverter settings on or before April 14, 2022. Other interested parties may also file comments on the March 15, 2022 IEEE Standard 1547 filings on or before April 14, 2022.

ISSUED BY ORDER OF THE COMMISSION.

This the 22nd day of November, 2021.

NORTH CAROLINA UTILITIES COMMISSION

A handwritten signature in black ink, appearing to read "Joann R. Snyder". The signature is written in a cursive, flowing style.

Joann R. Snyder, Deputy Clerk