

**STATE OF NORTH CAROLINA
UTILITIES COMMISSION
RALEIGH**

DOCKET NO. E-100, SUB 101

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

In the Matter of)	PUBLIC STAFF'S COMMENTS
Petition for Approval of Revisions to)	ON RISKS POSED BY
Generator Interconnection Standards)	INVERTER-BASED
)	RESOURCES

NOW COMES THE PUBLIC STAFF – North Carolina Utilities Commission, by and through its Executive Director, Christopher J. Ayers, pursuant to the Commission's November 22, 2021 Order Requiring Comments and Filings Regarding Risks Posed By Inverter-Based Resources (November 22 Order) and its December 15, 2021 Order Granting Extension of Time to File Comments and Filings Regarding Risks Posed by Inverter-Based Resources in this docket, and respectfully submits the following comments.

Background

1. In May and June of 2021, two disturbances on 345-kV transmission lines in the vicinity of Odessa, Texas, caused some solar and wind inverter-based resources (IBRs) to reduce power output for a significant period of time. While other generation sources were able to prevent loss of load, this loss of power output by IBRs has the potential to cause loss of load in the future as well.

2. In September of 2021, the North American Electric Reliability Corporation (NERC) published a Joint NERC and Texas Reliability Entity Staff

Report titled “Odessa Disturbance” that analyzed these disturbances (the Joint Report). The Joint Report states that the electric industry is not sufficiently implementing NERC’s guidelines regarding electromagnetic transient (EMT) studies, and that further action is needed to address gaps in the performance of IBRs.

3. Page 23 of the Joint Report states, “EMT studies should be required as part of the interconnection study process to ensure that all resources can reliably operate once connected to the bulk power system (BPS) prior to the resource being interconnected. Resources that experience abnormal performance once connected should be subject to performance validation against the submitted models.”

4. Page 24 of the Joint Report states, “EMT models are expected to be the most accurate representation of a resource for use in detailed reliability studies. Assessments demonstrate that EMT models are lacking key protection and control functions within the models and that they are unable to demonstrate the response of the equipment in the field, and this poses significant reliability risks (particularly in areas of rapidly growing penetrations of inverter-based resources).”

5. Page 29 of the Joint Report recommends significant updates and improvements to the generator interconnection agreements that are subject to the jurisdiction of the Federal Energy Regulatory Commission (FERC).

6. Pages 29 through 31 of the Joint Report recommend that generator owners and transmission owners adopt NERC standards, but also, that these

standards need to be improved. The Joint Report does not provide a schedule for NERC to improve its standards.

7. Page 31 of the Joint Report lists many recommendations for the Electric Reliability Council of Texas, but not for any other regulatory body.

8. In the November 22 Order, the Commission stated, “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” and required the electric public utilities¹ to answer the following 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?
- 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?

¹ In North Carolina, the electric public utilities are Duke Energy Carolinas, LLC, Duke Energy Progress, LLC (collectively, Duke Energy or the Companies), and Dominion Energy North Carolina (DENC).

9. Duke Energy and DENC filed their responses to the Commission's questions on December 22, 2021. The two responses are different from each other because Duke Energy and DENC have different capacity limits on state-jurisdiction generators. The capacity limit is 80 MW for Duke Energy but only 20 MW for DENC. Therefore, state-jurisdiction generators in DENC are more likely to be connected at distribution level, not transmission level, and not immediately affect the BPS. Duke Energy's 80 MW limit is based on the definition of a "small power production facility" in Title 16 of the United States Code, Chapter 796(17). However, FERC Order 688 issued on October 20, 2006, reduced the small power production facility cap to 20 MW for facilities in PJM and in other independent system operators. DENC is in PJM.

Duke Energy Response

10. Duke Energy focused on state-jurisdiction transmission connected generators and stated that the risks identified in the Joint Report are increasingly present on its systems and that Good Utility Practice in the interconnection and operation of inverter based resource(s) (IBRs) is critical to system reliability. Duke Energy will have over 6 gigawatts of IBRs interconnected by 2024 and most of them were built before the guidelines presented in the November 22 Order were well known and accepted by the industry.

11. Duke Energy stated that the IEEE 1547-2018 implementation process should address potential problems on its distribution systems but IEEE

1547-2018 is not a utility standard. Duke Energy will use the Interconnection Technical Standards Review Group (TSRG), which includes developers who use IBR technologies, to implement changes to the interconnection and operation of IBRs. Duke Energy monitors its systems and intends to add EPRI's openXDA software to monitor IBRs and plans to update Appendix 5 and Article 2.2.1 of the North Carolina Interconnection Agreement (NCIA) to better implement inverter control settings.

12. Duke Energy stated that generators are not providing EMT models in the interconnection study process, but it can require existing IBRs to comply with any new standards.

13. Duke Energy currently performs some modeling to determine transient stability issues for new interconnection requests per the recent revisions to the North Carolina Interconnection Procedures (NCIP) and believes this modeling is sufficient. However, Duke Energy believes EMT modeling, which is more complex, may be necessary but has not determined if it is necessary for all IBRs. Duke Energy stated EMT modeling will affect the cost and timing of interconnections and its implementation requires additional research.

14. Duke Energy requires that IBRs comply with NERC reliability standard PRC-024; however, the Joint Report concluded that this standard is not sufficient to protect the BPS.

15. Duke Energy supports a Commission ruling that NERC Standard FAC-001 is part of the "rules and procedures pertaining to the parallel operation of the Generating Facility in the applicable control area" in Section 1.6 of the NCIA.

This NERC standard requires transmission owners to document, update, and make available all interconnection requirements.

16. Duke Energy stated that it is currently monitoring its systems for faults on all generators, including IBRs. NERC is advising that IBRs be evaluated during parallel operation and assessed for response to nearby faults.

17. Duke Energy mentioned IEEE Standard P2800 for the Interconnection and Interoperability of IBRs, which will set technical minimum requirements for the interconnection, capability, and lifetime performance of IBRs and will include voltage and frequency ride-through. Florida Power & Light has adopted some components of IEEE Standard P2800.

DENC Response

18. DENC stated that the current NCIP and NCIA adequately address generator ride through, modeling, and monitoring of IBRs for its distribution system. The NCIP requires data on short circuit and voltage requirements. DENC currently models distribution interconnections using steady state software and monitors IBRs at the point of interconnection and at substations that have interconnected IBRs. However, DENC stated that EMT modeling would be unlikely to add any benefit, and instead recommended that the NCUC require continued maintenance of the current models.

19. DENC does not believe that ride-through should be required at the distribution level but could be implemented at its discretion.

20. DENC does not believe that monitoring for system faults is necessary for distribution level interconnections because these faults cannot contribute to widespread EMTs on the BPS.

Public Staff Comments

21. The Joint Report found that the industry has not followed the current NERC standards and that the current ride-through standards are not effectively addressing the reliability gap of IBRs tripping during a transmission disturbance. Therefore, the Public Staff believes that Duke Energy should ensure that itself and its Interconnection Customers are correctly following current NERC standards. The TSRG should review EMT modeling and the planned revisions to IEEE Standard P2800 and discuss their implementation for all state jurisdictional projects.

22. As described in items 2 through 4 above, the EMT models are necessary to prevent improper IBR tripping, but these models need improvement.

23. The Public Staff believes that Duke Energy has taken steps to protect its system from EMTs.

24. On January 10, 2022, the Public Staff met with members of the SERC Reliability Corporation (SERC) to discuss their evaluation of IBRs. The SERC staff members confirmed Duke Energy's conclusion that problems similar to those described in the Joint Report could occur in North Carolina. They also recommended that the Commission continue its requirement that IEEE Standard 1547 be part of the NCIP. SERC has created the Variable Energy Resources

Working Group to study the effects of increased IBRs on power quality and grid reliability.

25. The Public Staff has corresponded with members of IEEE who are developing an update to IEEE Standard P2800. The expected publication of the updated standard is in April or May of 2022.

WHEREFORE, the Public Staff prays:

1. That the Commission require Duke Energy to bring before the TSRG the revised IEEE Standard P2800 after its release and the potential for effective EMT modeling for IBRs;

2. That after receipt of the information in item 1 above, the Commission request comments on the extent to which the information should become part of the NCIP and NCIA;

3. That the Commission require Duke Energy to bring before the TSRG all relevant NERC standards after their release to determine the extent to which these standards should become part of the NCIP and NCIA; and

4. That the Commission grant such other and further relief as the Commission may deem just and proper.

This the 26th day of January, 2022.

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CERTIFICATE OF SERVICE

I certify that a copy of these Comments has been served on all parties of record or their attorneys, or both, by United States mail, first class or better; by hand delivery; or by means of facsimile or electronic delivery upon agreement of the receiving party.

This the 26th day of January, 2022.

Electronically submitted
s/ Robert B. Josey