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August 17, 2020

**VIA ELECTRONIC FILING**

Kimberley Campbell  
Chief Clerk  
North Carolina Utilities Commission  
430 N. Salisbury Street  
Raleigh, North Carolina 27603

Re: Edgecombe Solar LLC  
Prefiled Supplemental Testimony of Ryan Van Portfliet  
NCUC Docket: EMP-101, Sub 0

Dear Chief Clerk:

Attached for filing is the prefiled supplemental testimony of Ryan Van Portfliet, which is being provided in response to the *Motion of the Public Staff for an Order Requiring the Filing of Supplemental Testimony* filed on July 29, 2020 in the above-referenced docket.

Thank you for your assistance with this matter. Please let me know if you have any questions.

Sincerely,

/s/ Katherine E. Ross

Attachments

**PREFILED SUPPLEMENTAL TESTIMONY OF  
RYAN VAN PORTFLIET  
ON BEHALF OF EDGECOMBE SOLAR LLC**

**NCUC DOCKET NO. EMP-101 SUB 0**

**INTRODUCTION**

**Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.**

A. My name is Ryan Van Portfliet. I am a Manager of Renewable Development at Invenergy LLC. My business address is One South Wacker Drive, Suite 1800, Chicago, Illinois 60606.

**Q. ARE YOU THE SAME RYAN VAN PORTFLIET WHO CAUSED TO BE FILED PREFILED DIRECT TESTIMONY IN THIS MATTER ON OCTOBER 5, 2018?**

A. I am.

**Q. WHAT IS THE PURPOSE OF THIS SUPPLEMENTAL TESTIMONY?**

A. My testimony is intended to provide additional information requested by the Public Staff in their July 29, 2020 *Motion for an Order Requiring the Filing of Supplemental Testimony*. Additionally, my testimony is intended to provide information in response to questions raised by the Commission in its June 22, 2020 *Order Requiring Additional Testimony* in the Matter of the Application of American Beech Solar, LLC (“American Beech”) for a Certificate of Public Convenience and Necessity to Construct a 110-MW Solar Facility in Halifax County, Docket No. EMP-108, Sub 0 (the “American Beech Docket”) and questions raised by the Public Staff in the *Supplemental Testimony of Jay B. Lucas*, filed, on July 22, 2020, in the same Docket.

**Q. WHY DO YOU ADDRESS QUESTIONS RAISED IN THE AMERICAN BEECH DOCKET RELATED TO ITS APPLICATION FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY?**

A. The American Beech and Edgcombe Solar facilities are similarly situated. Both facilities are (i) in the PJM AC1 cluster, (ii) similar in size, and (iii) identified as contributing to the same impacts identified in the Affected System Study completed by Duke Energy Progress (“DEP”). My testimony also references supplemental testimony from another similarly situated

facility in the PJM AC1 cluster, Halifax County Solar LLC (“Halifax”). Furthermore, the Public Staff’s motion requested that Edgecombe Solar’s supplemental testimony discuss the other projects in the AC1 cluster.

**Q. HAS THE COMMISSION ENTERED AN ORDER REQUIRING THE FILING OF SUPPLEMENTAL TESTIMONY?**

A. No, I am voluntarily providing this supplemental testimony because time is of the essence. As discussed further in my testimony, the output of the Edgecombe Solar facility (the “Facility”) is fully committed under an executed Power Purchase Agreement (“PPA”) and it is critical for Edgecombe Solar LLC (“Edgecombe Solar” or the “Applicant”) to receive its CPCN and continue construction in order to meet contractual obligations for Commercial Operation.

**Q. PLEASE DESCRIBE ALL PJM INTERCONNECTION STUDIES RECEIVED FOR THE PROPOSED FACILITY.**

A. Edgecombe Solar has a 75-MW<sub>AC</sub> queue position in the PJM Interconnection, L.L.C. (“PJM”) queue (Queue Position AC1-034). PJM conducts system impact studies for interconnection requests in clusters, with two clusters being studied every year. Edgecombe Solar’s queue position was studied in the AC1 cluster. Edgecombe Solar has received the following studies:

- Feasibility Study Report for PJM Interconnection Request – Queue Position AC1-034 (May 2017), attached hereto as Attachment A (Confidential)
- Generation Interconnection System Impact Study Report for PJM Interconnection Request – Queue Position AC1-034 (May 2018); attached hereto as Attachment B (Confidential)
- Revised Generation Interconnection System Impact Study Report for PJM Interconnection Request – Queue Position AC1-034 (May 2020) (the “SIS”), attached hereto as Attachment C (Confidential)
- Generation Interconnection Facility Study Report for PJM Interconnection Request – Queue Position AC1-034 (June 2020), attached hereto as Attachment D (Confidential)

- Interconnection Service Agreement between PJM Interconnection, L.L.C., Edgecombe Solar LLC and Virginia Electric Power Company – Queue Position AC1-034 (the “ISA”), attached hereto as Attachment E (Confidential)<sup>1</sup>

The ISA provides the terms and conditions under which the Facility will interconnect. The Direct and Non-Direct Connection Network Upgrade charges for the Facility are \$7,304,118 and the Facility charges are \$534,716, for a total cost of \$7,838,834. Edgecombe Solar will fund the entire cost of these upgrades and will not receive reimbursement for these costs from PJM, Dominion Energy North Carolina (“Dominion”), or Dominion’s ratepayers.

**Q. WERE ANY OTHER STUDIES DONE ON THE FACILITY IN ADDITION TO THE ABOVE-REFERENCED PJM INTERCONNECTION STUDIES?**

A. Yes. DEP completed an Affected System Study for the facilities in the PJM AC1 cluster. In May, 2020 DEP issued an Affected System Study Report (“ASSR”) outlining its findings. Attachment F.

**Q. DID THE ASSR IDENTIFY ANY DEP SYSTEM THAT IS OR WILL BE AFFECTED BY THE INTERCONNECTION OF THE FACILITY? IF YES, EXPLAIN THE IMPACT AND BASIS.**

A. Yes. The ASSR identifies that power flow from the five facilities in the AC1 cluster would contribute to an overload on the DEP Battleboro – Rocky Mount 115 kV line, which is just on the DEP side of the “seam” between DEP’s service territory and Dominion / PJM. The ASSR estimated a cost of \$23,204,593 to complete the reconductering of the line (the “DEP Upgrade”) with a completion date of December 31, 2022.

It is the Applicant’s understanding that PJM and DEP previously identified a potential overload on this DEP line in connection with the PJM AB2 cluster. The SIS states that the overload on this line was “initially caused by prior Queue positions with additional contribution to overloading by this Facility.” Attachment C, at p. 11. This concern is also reflected in an Affected System Study conducted by DEP for the AB2 cluster in December, 2016, which identified an overload on the Rocky Mount-Battleboro 115 kV line and estimated that it would cost approximately \$15 million to complete the DEP Upgrade. Attachment G, at p. 5. The Applicant does not know whether the results of that study remain valid as to the AB2 cluster facilities.

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<sup>1</sup> As of the date of filing, the Interconnection Service Agreement has been partially executed by Edgecombe Solar LLC. It is expected to be fully executed imminently.

However, even if the DEP Upgrade was not already required by prior-queued facilities, neither Edgecombe Solar nor any other single facility in the AC1, AC2, or AD1 cluster would be the “first to cause” the need for the DEP Upgrade. If the DEP Upgrade is constructed, responsibility would be allocated among the facilities in the AC1 cluster, and possibly to additional facilities in the AC2 and/or subsequent clusters. For the avoidance of doubt, Edgecombe Solar has not been “assigned” the cost of the DEP Upgrade and is not obligated to construct it.

**Q. IS EDGECOMBE SOLAR AWARE OF WHETHER THE COSTS FOR THE DEP UPGRADE TO DEP’S SYSTEM WILL BE BORNE BY DEP RATEPAYERS?**

A. No. The Applicant is unaware how the costs of the DEP Upgrade would be allocated.<sup>2</sup> The Applicant has had no discussions with DEP about their plans to recover the costs if the DEP Upgrade is constructed. To the best of the Applicant’s knowledge, any such recovery would be sought during a future DEP general rate case.

**Q. THE PUBLIC STAFF REQUESTED THAT EDGECOMBE SOLAR PROVIDE TESTIMONY ADDRESSING AN ANALYSIS OF ITS LEVELIZED COST OF TRANSMISSION (“LCOT”). PLEASE CALCULATE THE LCOT FOR THE DEP UPGRADE.**

A. Edgecombe Solar confirmed with Jay Lucas that the LCOT formula used by the Public Staff is:

$$LCOT = \left[ \frac{C \cdot r}{1 - (1+r)^{-n}} \right] \div [K * CF * 8760]$$

Using that formula, Edgecombe Solar calculated an LCOT of \$6.00 for the DEP Upgrade, if all costs were borne solely by the Facility. As discussed below, it is highly likely that one or more of the other facilities in the AC1 cluster will be constructed and share in the allocation of costs for the DEP Upgrade, thus reducing the LCOT for any one facility. Details of the calculations and assumptions are included in Attachment H.

**Q. THE PUBLIC STAFF REQUESTED THAT EDGECOMBE SOLAR PROVIDE TESTIMONY ON THE OTHER PROJECTS INCLUDED IN THE AC1**

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<sup>2</sup> In the recent proceedings for the Friesian Holdings, LLC facility, the Public Staff stated that DEP would have allocated 60% of the cost of the upgrades to North Carolina retail customers, 10% to South Carolina retail customers, and 30% to transmission customers. Docket No. EMP-105 Sub 0, Pre-Hearing Brief of the Public Staff (Aug. 26, 2019) at 10. The Applicant does not know whether the DEP Upgrade would be subject to a similar allocation of costs.

## CLUSTER AND THE APPLICANT’S LCOT ANALYSIS. HOW DOES THE EDGECOMBE SOLAR LCOT COMPARE TO THE OTHER FACILITIES?

A. The Edgcombe Solar LCOT is in line with the LCOT calculated by the Public Staff for the American Beech facility. Additionally, the Edgcombe Solar LCOT is orders of magnitude below the LCOT the Public Staff calculated for the Friesian Holdings, LLC (“Friesian”) facility.

Edgcombe Solar is in agreement with the Public Staff’s LCOT of \$0.90/MWh for the AC1 cluster for the purposes of this testimony.<sup>3</sup> For convenience of comparison, below is a table of certain relevant LCOTs:

	Calculating Party	LCOT (\$/MWh)	Notes
<b>AC1 Cluster (5 projects)<sup>4</sup></b>	Public Staff	\$0.90	As calculated in the American Beech Docket
<b>Edgcombe Solar</b>	Edgcombe Solar	\$6.00	Edgcombe Solar only
<b>American Beech<sup>5</sup></b>	Public Staff <sup>6</sup>	\$5.58	American Beech only
<b>Halifax<sup>7</sup></b>	Halifax	\$1.82	AC1 cluster, excluding the facilities associated with AC1-086 and AC1-189 (due to their CPCN application status)
	Halifax	\$1.00	AC1 cluster (excluding the facilities associated with AC1-086 and AC1-189), but adding the projects in the AD1 cluster which have identified impacts to the Rocky Mount-Battleboro 115 kV line and thus need the DEP Upgrade
<b>Friesian</b>	Public Staff	\$62.94	The Commission accepted the calculated LCOT value put forth by the Public Staff <sup>8</sup>

<sup>3</sup> Edgcombe Solar calculated an LCOT of \$0.91/MWh for the combined AC1 cluster facilities using the formula discussed in this testimony, but accepts the Public Staff’s LCOT of \$0.90/MWh and believes the \$0.01 difference is immaterial to the discussion.

<sup>4</sup> *Supplemental Testimony of Jay B. Lucas Public Staff – North Carolina Utilities Commission*, filed on July 22, 2020 in Docket No. EMP-108, Sub 0, at 11.

<sup>5</sup> American Beech filed its LCOT confidentially, and therefore this data point is not included in the chart.

<sup>6</sup> *Id.*

<sup>7</sup> Halifax calculated an LCOT of \$0.97/MWh for the combined AC1 cluster facilities, but in its testimony proposed that the Public Staff’s LCOT of \$0.90/MWh be deemed most accurate. The remaining data is from *Affidavit of Christopher Killenberg*, filed on August 3, 2020 in Docket No. EMP-107, Sub 0, at 3-4.

<sup>8</sup> *Order Denying Certificate of Public Convenience and Necessity for Merchant Generating Facility*, issued on June 11, 2020 in Docket No. EMP-105, Sub 0, at 23.

**Q. IS THE EDGECOMBE SOLAR LCOT IN THE RANGE OF THE AVERAGE SHOWN IN THE 2019 LAWRENCE BERKELEY NATIONAL LABORATORY INTERCONNECTION COST STUDY (THE “LBNL STUDY”)?**

A. Yes. The Edgecombe Solar LCOT compares favorably to the PJM, MISO, and EIA benchmarks the Public Staff has referenced from the LBNL Study. In the Public Staff’s supplemental testimony of Jay Lucas in the American Beech Docket, Mr. Lucas compares the LCOT calculated for the combined facilities in the AC1 queue and the individual LCOT for the American Beech facility to the benchmark LCOT figures provided in the LBNL Study. Below is Table 1 from the Public Staff’s prefiled testimony in the American Beech Docket, which provides the comparison.

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**Lucas Table 1**

<b><u>Project</u></b>	<b><u>Original AC1 Cluster</u></b> (a)	<b><u>Facility Only</u></b> (a)	<b><u>MISO (Solar)</u></b> (b)	<b><u>PJM (Solar)</u></b> (c)	<b><u>EIA (Solar)</u></b> (d)
Nameplate (MW <sub>AC</sub> )	495	80	3,277	10,057	2,187
Network Upgrades (\$M)	\$ 23.2	\$ 23.2	\$ 180	\$ 1,170	\$ 220
Network Upgrades (\$/kW)	\$ 47	\$ 290	\$ 56	\$ 116	\$ 103
LCOT (\$/MWh)	\$ 0.90	\$ 5.58	\$ 1.56	\$ 3.22	\$ 2.21

**Notes**

- (a) For the Original AC1 Cluster and the Facility, the figures only include costs in the Facility’s Phase I that are known at this time and could possibly be borne by DEP’s customers.
- (b) From Table 2 of the LBNL Study, representing 33 solar projects totaling 3,277 MW.
- (c) From Table 3 of the LBNL Study, representing 134 solar projects totaling 10,057 MW.
- (d) From Table 4 of the LBNL Study, representing 304 solar projects totaling 2,187 MW.

If the costs of the DEP Upgrade were allocated among the projects in the entire AC1 cluster, the LCOT would be below the average for those projects reviewed in the LBNL Study. Even if not all of the projects in the AC1 cluster will be constructed, the Public Staff concluded that “[o]verall, the estimated costs currently known for the Facility are close to the range of costs presented in the LBNL Study, especially if at least one other project is constructed.” The Public Staff recommended that the Commission grant a CPCN to American Beech.

**Q. HOW HAS THE COMMISSION CONSIDERED A FACILITY’S LCOT IN PREVIOUS DOCKETS?**

A. In the Commission’s *Order Denying Certificate of Public Convenience and Necessity for Merchant Generating Facility*, issued on June 11, 2020 in Docket No. EMP-105, Sub 0, related to the Friesian solar facility, the Commission found that the use of the LCOT

“provides a benchmark as to the reasonableness of the transmission network upgrade cost associated with interconnecting a proposed new generation facility.”

**Q. DOES EDGECOMBE SOLAR’S INDIVIDUAL LCOT PROVIDE A TRUE BENCHMARK OF THE REASONABLENESS OF THE DEP UPGRADE?**

A. No. Unlike in the matter of the Friesian facility where the transmission costs were identified for upgrades required for that specific facility to interconnect, when considering the LCOT for the DEP Rocky Mount-Battleboro 115 kV line, all of the facilities in the AC1 cluster must be considered. Furthermore, to provide a truly accurate picture, the analysis should include not only the AC1 facilities, but also facilities in the AC2 cluster, the AD1 cluster, and facilities with prior queue positions that originally caused the overload on the Rocky Mount-Battleboro 115 kV line, and facilities in subsequent clusters (to the extent they have been identified) that would rely on this DEP Upgrade.<sup>9</sup> If the entire universe of facilities that benefit from the DEP Upgrade were considered, the LCOT would likely be significantly lower than the \$0.90 MWh calculated for the combined facilities in the AC1 queue.

**Q. IN THE AMERICAN BEECH DOCKET, MR. LUCAS EXPRESSED THAT “UNNEEDED UPGRADES DO NOT SERVE THE USING AND CONSUMING PUBLIC” AND THAT “A LARGE AMOUNT OF INTERCONNECTION COSTS FOR A SOLAR FACILITY COULD BE BORNE BY RATEPAYERS WITHOUT PROVIDING THEM WITH ANY SIGNIFICANT BENEFIT.” PLEASE ADDRESS THESE CONCERNS.**

A. I agree these are appropriate concerns. However, I disagree that the DEP Upgrade is “unnneeded.” PJM has identified an existing overload on the Rocky Mount-Battleboro 115 kV line under certain contingency conditions, and many facilities in the AC1 and later clusters will rely on this DEP Upgrade. There are many benefits to the public to the development of solar. The fact that DEP will not be purchasing the output of the Facility does not mean that there are no benefits to ratepayers or to the citizens of North Carolina. Merchant plants often sell to customers other than the interconnecting utility, but the Commission has never concluded that this means they provide no benefit to the public or to ratepayers. For example, the NTE Kings Mountain and NTE Reidsville combined-cycle natural gas plants approved by the Commission in docket nos.

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<sup>9</sup> Mr. Lucas notes in his testimony in the American Beech Docket that Sweetleaf Solar LLC, a proposed 94MW facility being studied in the AD1 cluster and is seeking a CPCN in Docket No. EMP-111 Sub 0, might also rely on the proposed DEP Upgrade. Per the Halifax testimony, Sumac Solar LLC, a proposed 120MW facility being studied in the AD1 cluster and is seeking a CPCN in Docket No. EMP-110 Sub 0, might also rely on the proposed DEP Upgrade.

EMP-76 Sub 0 and EMP-92 Sub 0, respectively, interconnected to the Duke Energy Carolinas (“DEC”) transmission grid, incurring significant upgrade costs that would be reimbursed by ratepayers. They sold their output to wholesale customers other than DEC. In both instances, the Commission concluded that the applicant had demonstrated a need for the facility and did not conclude that there were no benefits to ratepayers.

**Q. IF THIS LINE WERE A DOMINION FACILITY, DO YOU BELIEVE THE DEP UPGRADE WOULD BE CONSIDERED A NEEDED UPGRADE?**

A. Yes. As discussed above, the DEP Upgrade is near the seam between DEP’s service territory and Dominion’s service territory. Based on discussions with PJM, it is Edgecombe Solar’s understanding that, if the DEP Upgrade were on the Dominion side of the seam (i.e. in PJM), the DEP Upgrade would be considered a baseline upgrade needed to address reliability issues.

PJM Manual 14-B: PJM Region Transmission Planning Process (Revision 46, Effective date August 28, 2019) focuses on the process for planning baseline expansion facilities. Baseline Reliability Analyses “ensure the security and adequacy of the Transmission System to serve all existing and projected long term firm transmission use including existing and projected native load growth as well as long term firm transmission service.” PJM Manual 14-B § 1.4.1.1. The analyses include thermal analysis, and stability, load deliverability, and generator deliverability testimony. *Id.* The tests entail single and multiple contingency testing for violation of established NERC reliability criteria regarding stability, thermal line loadings and voltage limits. *Id.* When near-term base cases are created, the intent is to create a baseline system without any criteria violations to be used in the interconnection queue studies. PJM Manual 14-B § 2.1.2.

The overload in the SIS is listed under the “Contributions to Previously Identified Overloads” section. Attachment C. This implies that this thermal violation exists in the baseline system and is not the result of Edgecombe Solar or the subsequent AC1 queue positions. However, the Battleboro-Rocky Mount 115 kV line itself is not under PJM’s operational control, and therefore cannot be considered for baseline mitigation. PJM Manual 14-B § 1.1.

It may also be that improving this transmission tie line between DEP and Dominion would have other system benefits, such as facilitating lower-cost reserve sharing or delivery of firm capacity from PJM to DEP.

**Q. CAN EDGECOMBE SOLAR ACHIEVE COMMERCIAL OPERATION WITHOUT THE COMPLETION OF THE DEP UPGRADE?**

A. Yes. Edgecombe Solar has been deemed deliverable by PJM through calendar year 2024, or May 31, 2024, even in the event the upgrade to DEP's Rocky Mount-Battleboro 115 kV line is not complete before Edgecombe Solar's commercial operation date, which is scheduled for December 31, 2022.

**Q. DOES THE FACILITY PROPOSE TO SELL ITS ENERGY AND CAPACITY TO A DISTRIBUTION UTILITY REGULATED BY THE COMMISSION?**

A. No.

**Q. DOES THE FACILITY PROPOSE TO SELL ITS ENERGY AND CAPACITY TO A DISTRIBUTION UTILITY NOT REGULATED BY THE COMMISSION BUT SERVING RETAIL CUSTOMERS IN NORTH CAROLINA?**

A. No.

**Q. DOES THE FACILITY PROPOSE TO SELL ITS ENERGY AND CAPACITY TO A PURCHASER WHO IS SUBJECT TO A STATUTORY OR REGULATORY MANDATE WITH RESPECT TO ITS ENERGY SOURCING?**

A. No.

**Q. ARE THERE ANY PPA AGREEMENTS, REC SALE CONTRACTS, OR CONTRACTS FOR COMPENSATION FOR ENVIRONMENTAL ATTRIBUTES FOR THE OUTPUT OF THIS FACILITY?**

A. Yes. Edgecombe Solar has a fully-executed PPA for the entirety of the facility's output, as well as the Renewable Energy Credits generated by the Facility. The counterparty to Edgecombe Solar's PPA is a Fortune 100 Commercial and Industrial company with electrical load in North Carolina.

**Q. WHAT IS THE STATUS OF DEVELOPMENT OF THE FACILITY?**

A. Edgecombe Solar started limited construction in December, 2019 pursuant to the Commission's Order Allowing Limited Construction issued December 2, 2019. Edgecombe Solar has obtained a special use permit from Edgecombe County, and a stormwater permit and erosion and sedimentation plan approval from the North Carolina Department of Environmental Quality. Over the past eighteen months, Edgecombe Solar performed extensive archeological studies and worked with the State Historic Preservation Office. On July 24, 2020, the State Environmental

Review Clearinghouse filed final comments and stated that “no further State Clearinghouse review action” was required.

**Q. WOULD EDGECOMBE SOLAR CONSENT TO HAVING ITS CPCN INCLUDE THE SAME CONDITIONS RECOMMENDED BY THE PUBLIC STAFF IN JAY LUCAS’S PREFILED TESTIMONY IN THE AMERICAN BEECH DOCKET?**

A. Yes. The Public Staff recommended that the Commission grant a CPCN to American Beech with the following conditions:

1. The Applicant shall construct and operate the Facility in strict accordance with applicable laws and regulations, including any local zoning and environmental permitting requirements;

2. The CPCN shall be subject to Commission Rule R8-63(e) and all orders, rules and regulations as are now or may hereafter be lawfully made by the Commission;

3. The Applicant shall file with the Commission in this docket a progress report on the construction of the Facility on an annual basis; and

4. The Applicant shall file with the Commission in this docket any revisions in the cost estimates for the construction of the Facility or Network Upgrades within 30 days of becoming aware of such revisions.

These four conditions are within reason, and Edgecombe Solar has no objection to these conditions being placed on its CPCN. As previously stated, time is of the essence for the receipt of the CPCN and we respectfully request that the Commission issue the CPCN without delay.

**Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

A. Yes.

**PREFILED SUPPLEMENTAL TESTIMONY OF  
RYAN VAN PORTFLIET  
ON BEHALF OF EDGECOMBE SOLAR LLC**

**NCUC DOCKET NO. EMP-101 SUB 0**

**ATTACHMENTS**

- A. Feasibility Study Report for PJM Interconnection Request – Queue Position AC1-034 (May 2017) [CONFIDENTIAL]
- B. Generation Interconnection System Impact Study Report for PJM Interconnection Request – Queue Position AC1-034 (May 2018) [CONFIDENTIAL]
- C. Revised Generation Interconnection System Impact Study Report for PJM Interconnection Request – Queue Position AC1-034 (May 2020) [CONFIDENTIAL]
- D. Generation Interconnection Facility Study Report for PJM Interconnection Request – Queue Position AC1-034 (June 2020) [CONFIDENTIAL]
- E. Interconnection Service Agreement Among PJM Interconnection, L.L.C. and Edgecombe Solar LLC and Virginia Electric and Power Company (PJM Queue # AC1-034) (August 2020) [CONFIDENTIAL]
- F. Generator Interconnection Affected System Study Report, PJM Interconnection Cluster AC1 (May 2020)
- G. Generator Interconnection Affected System Study Report, PJM Interconnection Cluster AB2 (Dec. 2016)
- H. Edgecombe Solar’s LCOT calculations and assumptions [CONFIDENTIAL]

### **CERTIFICATE OF SERVICE**

I certify that I have served a copy of the foregoing Prefiled Supplemental Testimony on all parties of record in accordance with Commission Rule R1-39, by United States mail, postage prepaid, first class by hand delivery, or by means of facsimile or electronic delivery upon agreement of the receiving party.

This the 17<sup>th</sup> day of August, 2020.

/s/ \_\_\_\_\_  
Katherine Ross

# **Generator Interconnection Affected System Study Report**

**PJM Interconnection Cluster AC1**



**May 6, 2020**  
**Duke Energy Progress**  
**Transmission Department**

## **PURPOSE**

The purpose of this study was to determine under what conditions the DEP transmission system can accommodate PJM's interconnection cluster AC1. Cluster AC1 includes generation throughout the PJM interconnection, but only those with an impact on the DEP system were included in this study. The size and in-service dates of the projects vary. The following PJM queue requests are included in this analysis:

AC1-034  
AC1-086  
AC1-098/099  
AC1-189  
AC1-208

## **ASSUMPTIONS**

The following affected system study results are from a PJM power-flow model that reflects specific conditions of the system at points in time consistent with the generator interconnection requests being evaluated. The cases include the most recent information for load, generation additions, transmission additions, interchange, and other pertinent data necessary for analysis. Future years may include transmission, generation, and interchange modifications that are not budgeted for and for which no firm commitments have been made. Further, DEP retains the right to make modifications to power-flow cases as needed if additional information is available or if specific scenarios necessitate changes. For the systems surrounding the study area, data is based on the ERAG MMWG model. The suitability of the model for use by others is the sole responsibility of the user. Prior queued generator interconnection requests were considered in this analysis.

The results of this analysis are based on the Interconnection Customer's queue requests including generation equipment data provided. If the facilities' technical data or interconnection points to the transmission system change, the results of this analysis may need to be reevaluated.

## RESULTS

### **Power Flow Analysis Results**

Facilities that may require upgrade within the first three to five years following the in-service date are identified. Based on projected load growth on the DEP transmission system, facilities of concern are those with post-contingency loadings of 95% or greater of their thermal rating and low voltage of 0.92 pu and below, for the requested in-service year. The identification of these facilities is crucial due to the construction lead times necessary for certain system upgrades. This process will ensure that appropriate focus is given to these problem areas to investigate whether construction of upgrade projects is achievable to accommodate the requested interconnection service.

Contingency analysis study results show that interconnection of these generation facilities result in the following thermal issue on the DEP system. Based on study results for 2020 summer, Table 1 shows thermal facility loadings:

**Table 1: Power Flow Thermal Results**

<b>Transmission Facility</b>	<b>Loading %</b>	<b>Contingency</b>
Rocky Mount – Battleboro (DVP) 115 kV Line	160	Rocky Mount-Hathaway (DVP) Double Circuit 230 kV Lines

### **Estimate of Resolutions for Power Flow Impacts**

The DEP Rocky Mount-Battleboro 115 kV Line will need to be reconductored with 1590 ACSR conductor or equivalent. All ancillary equipment, including any breakers, wave traps, and CT ratios at both ends of the line will need to be uprated to 2000A or greater.

#### **Reconductor**

*Description:* Reconductor/rebuild 8.5 miles of the DEP Rocky Mount-Battleboro 115 kV Line to 1590 ACSR conductor or equivalent  
*Estimated Cost:* \$21,980,250 (DEP cost only)

#### **Line Equipment upgrades**

*Description:* Upgrade any ancillary line equipment at both the DEP and DVP ends of the line to 2000A or greater to enable the full conductor rating.  
*Estimated Cost:* \$658,377 (DEP cost only)

*NC Utility Tax(2.5%):* \$565,966

Total Power-flow Cost Estimate: **\$23,204,593 (DEP cost only)**

*Estimated Schedule:* 12/31/2022

## SUMMARY

This Generator Interconnection Affected System Study assessed the impact on the Duke Energy Progress system of new generation facilities interconnecting to the Dominion transmission system as part of the PJM AC1 cluster. Power flow analysis found an overloading issue that must be mitigated. A full reconductor/rebuild of the Rocky Mount-Battleboro 115 kV Line will be necessary. Estimates are that the Rocky Mount-Battleboro 115 kV Line can be upgraded by December 31, 2022 if a written agreement to proceed is obtained by July 4, 2020.

Power-flow	\$23,204,593
Stability	\$0
Short Circuit	\$0
<u>Interconnection</u>	<u>\$0</u>
Total Estimate	\$23,204,593

Study Completed by: William Quaintance  
Bill Quaintance, PE, Duke Energy Progress

Reviewed by: Mark Byrd  
Mark Byrd, PE, Duke Energy Progress

# **Generator Interconnection Affected System Study Report**

**PJM Interconnection Cluster AB2**



**December 22, 2016  
Duke Energy Progress  
Transmission Department**

## PURPOSE

The purpose of this study was to determine under what conditions the DEP transmission system can accommodate PJM's interconnection cluster AB2. Cluster AB2 includes generation throughout the PJM interconnection, but only those with an impact on the DEP system were included in this study. The size and in-service dates of the projects varies. The projects identified by PJM as potentially affecting DEP's CPLE control area are as follows:

- AB2-005 is a 148 MW Network Long Term Firm request from the Choctaw plant in TVA to PJM
- AB2-015 is a solar facility connected at the Franklin 115kV substation in DVP; 107 MW total facility capability, 62 MW capacity, 107 MW energy
- AB2-022 is a solar facility connected at the Elizabeth City 230kV substation in DVP; 20 MW total facility capability, 13 MW capacity, 20 MW energy
- AB2-025 is a solar facility connected at the Sapony 230kV substation in DVP; 20 MW total facility capability, 13.8 MW capacity, 20 MW energy
- AB2-031 is a solar facility connected as a tap of the Brink-Trego 115kV line in DVP; 20 MW total facility capability, 13.4 MW capacity, 20 MW energy
- AB2-035 is a solar facility connected at the Bethel Carolina 115kV substation in DVP; 3 MW total facility capability, 2.1 MW capacity, 3 MW energy
- AB2-039 is a solar facility connected as a tap of the Bakers Pond-Ivor 115kV line in DVP; 100 MW total facility capability, 55 MW capacity, 100 MW energy
- AB2-040 is a solar facility connected at the Brink 115kV substation in DVP; 80 MW total facility capability, 45.6 MW capacity, 80 MW energy
- AB2-042 is a solar facility connected as a tap of the Surry-Smithfield 230kV line in DVP; 160 MW total facility capability, 89 MW capacity, 160 MW energy
- AB2-043 is a solar facility connected at the Buckingham 230kV substation in DVP; 49.9 MW total facility capability, 18.9 MW capacity, 49.9 MW energy
- AB2-051 is a natural gas facility connected at the Chesapeake 230kV substation in DVP; 884.5 MW total facility capability, 765.5 MW capacity, 884.5 MW energy
- AB2-059 is a solar facility connected at the Benson 115kV substation in DVP; 100 MW total facility capability, 66 MW capacity, 100 MW energy
- AB2-060 is a solar facility connected at the Gary Tap 115kV substation in DVP; 80 MW total facility capability, 54.4 MW capacity, 80 MW energy
- AB2-069 is a solar facility connected as a tap of the Kerr-Boydton 115kV line in DVP; 80 MW total facility capability, 54.4 MW capacity, 80 MW energy
- AB2-075 is a 42 MW Network Long Term Firm request from the Santeeelah plant in TVA to PJM
- AB2-076 is a 51 MW Network Long Term Firm request from the Chilhowee plant in TVA to PJM
- AB2-077 is a solar facility connected at the Black Branch 115kV substation in DVP; 20 MW total facility capability, 12 MW capacity, 20 MW energy
- AB2-078 is a solar facility connected at the Black Branch 115kV substation in DVP; 20 MW total facility capability, 12 MW capacity, 20 MW energy
- AB2-079 is a solar facility connected at the Black Branch 115kV substation in DVP; 20 MW total facility capability, 12 MW capacity, 20 MW energy

- AB2-087 is a solar facility connected at the Earleys 115kV substation in DVP; 5 MW total facility capability, 3.4 MW capacity, 5 MW energy
- AB2-088 is a solar facility connected at the Tarboro 115kV substation in DVP; 4 MW total facility capability, 2.7 MW capacity, 4 MW energy
- AB2-089 is a solar facility connected at the Beechwood 115kV substation in DVP; 20 MW total facility capability, 13.2 MW capacity, 20 MW energy
- AB2-090 is a solar facility connected at the Chase City 115kV substation in DVP; 36 MW total facility capability, 23.8 MW capacity, 36 MW energy
- AB2-098 is a solar facility connected at the Everetts 230kV substation in DVP; 5 MW total facility capability, 3.5 MW capacity, 5 MW energy
- AB2-099 is a solar facility connected at the Ahoskie 115kV substation in DVP; 5 MW total facility capability, 3.5 MW capacity, 5 MW energy
- AB2-100 is a solar facility connected as a tap of the Clubhouse-Lakeview 230kV line in DVP; 100 MW total facility capability, 67 MW capacity, 100 MW energy
- AB2-128 is a solar facility connected as a tap of the Clubhouse-Lakeview 230kV line in DVP; 100 MW total facility capability, 67 MW capacity, 100 MW energy
- AB2-145 is a natural gas facility connected at the Axton 765kV substation in AEP; 572 MW total facility capability, 572 MW capacity, 572 MW energy
- AB2-146 is a natural gas facility connected at the Axton 138kV substation in AEP; 382 MW total facility capability, 382 MW capacity, 382 MW energy
- AB2-147 is a solar facility connected as a tap of the Clubhouse-Freeman 115kV line in DVP; 40 MW total facility capability, 15.2 MW capacity, 40 MW energy
- AB2-149 is a solar facility connected as a tap of the Oak Ridge-Ivor 115kV line in DVP; 50 MW total facility capability, 19 MW capacity, 50 MW energy
- AB2-150 is a solar facility connected as a tap of the Clubhouse-Freeman 115kV line in DVP; 40 MW total facility capability, 15.2 MW capacity, 40 MW energy
- AB2-161 is a solar facility connected as a tap of the Bakers Pond-Ivor 115kV line in DVP; 50 MW total facility capability, 19 MW capacity, 50 MW energy
- AB2-169 is a solar facility connected at the Pantego 115kV substation in DVP; 74 MW total facility capability, 39 MW capacity, 74MW energy
- AB2-171 is a solar facility connected at the South Hampton 115kV substation in DVP; 75 MW total facility capability, 28.5 MW capacity, 75MW energy
- AB2-174 is a solar facility connected as a tap of the Trego-Emporia 115kV line in DVP; 80 MW total facility capability, 42 MW capacity, 80MW energy
- AB2-176 is a solar facility connected at the Chase City 115kV substation in DVP; 14 MW total facility capability, 9.8 MW capacity, 14MW energy
- AB2-186 is a solar facility connected at the Edenton 230kV substation in DVP; 5 MW total facility capability, 3.5 MW capacity, 5MW energy
- AB2-188 is a solar facility connected at the Creswell 115kV substation in DVP; 20 MW total facility capability, 13.8 MW capacity, 20MW energy

## ASSUMPTIONS

The following affected system study results are from a PJM power-flow model that reflects specific conditions of the system at points in time consistent with the generator interconnection requests being evaluated. The cases include the most recent information for load, generation additions, transmission additions, interchange, and other pertinent data necessary for analysis. Future years may include transmission, generation, and interchange modifications that are not budgeted for and for which no firm commitments have been made. Further, DEP retains the right to make modifications to power-flow cases as needed if additional information is available or if specific scenarios necessitate changes. For the systems surrounding the study area, data is based on the ERAG MMWG model. The suitability of the model for use by others is the sole responsibility of the user. Prior queued generator interconnection requests were considered in this analysis.

The results of this analysis are based on the Interconnection Customer's queue requests including generation equipment data provided. If the facilities' technical data or interconnection points to the transmission system change, the results of this analysis may need to be reevaluated.

## RESULTS

### Power Flow Analysis Results

Facilities that may require upgrade within the first three to five years following the in-service date are identified. Based on projected load growth on the DEP transmission system, facilities of concern are those with post-contingency loadings of 95% or greater of their thermal rating and low voltage of 0.92 pu and below, for the requested in-service year. The identification of these facilities is crucial due to the construction lead times necessary for certain system upgrades. This process will ensure that appropriate focus is given to these problem areas to investigate whether construction of upgrade projects is achievable to accommodate the requested interconnection service.

Contingency analysis study results show that interconnection of these generation facilities result in the following thermal issue on the DEP system. Based on study results for 2018 summer, Table 1 shows thermal facility loadings for this request:

**Table 1: Power Flow Thermal Results**

<b>Transmission Facility</b>	<b>Loading %</b>	<b>Contingency</b>
Rocky Mount – Battleboro (DVP) 115 kV Line	120.1*	Rocky Mount-Hathaway (DVP) Double Circuit 230 kV Lines

The impact of each AB2 project on the limiting line has not yet been determined.

\*The percentage loading is based on the new rating for this line that is planned to be in effect by 12/15/2017.

### **Estimate of Resolutions for Power Flow Impacts**

The DEP Rocky Mount-Battleboro 115 kV Line will need to be reconducted with 1590 ACSR conductor or equivalent. All ancillary equipment, including any breakers, wave traps, and CT ratios at both ends of the line will need to be updated to 2000A or greater.

#### **Reconductor**

*Description:* Reconductor/rebuild 8.5 miles of the DEP Rocky Mount-Battleboro 115 kV Line to 1590 ACSR or equivalent  
*Estimated Cost:* \$13,000,000 (DEP cost only)

#### **Line Equipment upgrades**

*Description:* Upgrade any ancillary line equipment at both the DEP and DVP ends of the line to 2000A or greater to enable the full conductor rating.  
*Estimated Cost:* \$2,000,000 (DEP cost only)

Total Power-flow Cost Estimate: **\$15,000,000 (DEP cost only)**

*Estimated Schedule:* 6/1/2020

### **Short Circuit Analysis**

Short circuit analysis was not performed, but it may need to be performed at a later date.

## SUMMARY

This Generator Interconnection Affected Study assesses the impact of interconnecting new Dominion generation facilities on the Duke Energy Progress system. Power flow analysis found an overloading issue that must be mitigated. A full reconductor/rebuild of the Rocky Mount-Battleboro 115 kV Line will be necessary, requiring cooperation with DVP. Estimates are that the Rocky Mount-Battleboro 115 kV Line can be upgraded by June 1, 2020 if a written agreement to proceed is obtained in the spring of 2017.

Power-flow	\$15,000,000
Stability	\$0
Short Circuit	\$0
<u>Interconnection</u>	<u>\$0</u>
Total Estimate	\$15,000,000

Study Completed by:



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Reviewed by:



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