



**NORTH CAROLINA  
PUBLIC STAFF  
UTILITIES COMMISSION**

June 29, 2022

Ms. A. Shonta Dunston, Chief Clerk  
North Carolina Utilities Commission  
4325 Mail Service Center  
Raleigh, North Carolina 27699-4300

Re: Docket No. EMP-119, Sub 0 – Macadamia Solar, LLC  
CPCN to Construct a 484-MW Solar Facility in Washington County,  
North Carolina

Docket No. EMP-119, Sub 1 – Macadamia Solar, LLC  
CEPCN to Construct a Transmission Line in Washington County,  
North Carolina

Dear Ms. Dunston:

In connection with the above-referenced dockets, I transmit herewith for filing on behalf of the Public Staff the supplemental testimony and exhibit of Jay B. Lucas, Manager, Electric Section – Operations and Planning, Energy Division. By copy of this letter, I am forwarding a copy to all parties of record by electronic delivery.

Sincerely,

Electronically submitted  
s/ William E. H. Creech  
Staff Attorney  
[zeke.creech@psncuc.nc.gov](mailto:zeke.creech@psncuc.nc.gov)

Attachment

c: Nadia L. Luhr  
Parties of Record

Executive Director  
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BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. EMP-119, SUB 0 )  
)  
In the Matter of )  
Application of Macadamia Solar, LLC )  
for a Certificate of Public Convenience )  
and Necessity to Construct a 484-MW )  
Solar Facility in Washington County, )  
North Carolina ) SUPPLEMENTAL  
) TESTIMONY OF  
) JAY B. LUCAS  
DOCKET NO. EMP-119, SUB 1 ) PUBLIC STAFF – NORTH  
) CAROLINA UTILITIES  
) COMMISSION  
In the Matter of )  
Application of Macadamia Solar, LLC )  
for a Certificate of Environmental )  
Compatibility and Public Convenience )  
and Necessity to Construct a )  
Transmission Line in Washington )  
County, North Carolina )

1 **Q. PLEASE STATE YOUR NAME AND ADDRESS.**

2 A. My name is Jay B. Lucas. My business address is 430 North  
3 Salisbury Street, Raleigh, North Carolina.

4 **Q. BRIEFLY STATE YOUR QUALIFICATIONS AND DUTIES.**

5 A. My qualifications and duties are included in Appendix A.

6 **Q. WHAT IS YOUR POSITION WITH THE PUBLIC STAFF?**

7 A. I am the Manager of the Electric Section – Operations and Planning  
8 in the Public Staff's Energy Division.

9 **Q. WHAT IS THE PURPOSE OF YOUR SUPPLEMENTAL**  
10 **TESTIMONY IN THIS PROCEEDING?**

11 A. The purpose of my testimony is to make recommendations to the  
12 North Carolina Utilities Commission (Commission) on the  
13 applications filed by Macadamia Solar, LLC (Macadamia or  
14 Applicant) for a certificate of public convenience and necessity  
15 (CPCN) to construct a 484-megawatt AC (MW<sub>AC</sub>) solar photovoltaic  
16 generating facility (the Facility) (CPCN Application) and for a  
17 certificate of environmental compatibility and public convenience and  
18 necessity (CECPCN) to construct a transmission tie line  
19 (Transmission Line) (CECPCN Application) in Washington County,  
20 North Carolina.

1 More specifically, my supplemental testimony responds to the  
2 supplemental testimony filed by the Applicant's witnesses Donna  
3 Robichaud and Amanda Corll on May 25, 2022.

4 **Background**

5 **Q. PLEASE PROVIDE A BRIEF HISTORY OF THE CPCN**  
6 **APPLICATION FOR THE FACILITY.**

7 A. On August 30 and 31, 2021, Macadamia filed the CPCN Application,  
8 required attachments and schedules, direct testimony and  
9 attachments of Donna Robichaud, and direct testimony of Kara  
10 Price. The Facility will ultimately interconnect to a substation owned  
11 by Virginia Electric and Power Company, d/b/a Dominion Energy  
12 North Carolina (DENC). Because DENC is part of PJM  
13 Interconnection, L.L.C. (PJM), the Applicant is required to enter into  
14 an interconnection service agreement with both DENC and PJM. The  
15 Facility has PJM queue numbers AD1-074 (300 MW<sub>AC</sub>), AD1-075 (75  
16 MW<sub>AC</sub>), and AD1-076 (109 MW<sub>AC</sub>).

17 On September 9, 2021, the Public Staff filed a Notice of  
18 Completeness.

19 On September 24, 2021, the Commission issued its Order  
20 Consolidating Dockets, Scheduling Hearings, Requiring Filing of  
21 Testimony, Establishing Procedural Guidelines, and Requiring

1 Public Notice (September 24 Order). The September 24 Order  
2 required the Applicant to respond to a series of questions regarding  
3 system upgrades and related costs, interconnection studies, and the  
4 Applicant's plans for selling energy and capacity from the Facility.

5 The questions in the September 24 Order are similar to those asked  
6 by the Commission in previous electric merchant power proceedings.  
7 Witness Robichaud provided answers to these questions in her  
8 supplemental testimony filed on October 20, 2021.

9 On November 23, 2021, I filed testimony recommending that the  
10 Commission hold this docket in abeyance until PJM released its  
11 retooling of PJM cluster AD1 and Duke Energy Progress, LLC (DEP),  
12 completes its study of the retooling and develops a revised affected  
13 system study, if necessary.

14 On December 10, 2021, the Applicant filed the rebuttal testimony of  
15 witnesses Robichaud, Corll, and Sami Abdulsalam. However, on  
16 January 4, 2022, the Applicant filed a Consent Motion to Continue  
17 Hearing, and on January 5, 2022, the Commission issued its Order  
18 Granting Consent Motion to Continue Hearing.

19 **Q. PLEASE PROVIDE A BRIEF HISTORY OF THE CECPCN**  
20 **APPLICATION FOR THE TRANSMISSION LINE.**

1 A. On September 13, 2021, Macadamia filed the CECPCN Application,  
2 required schedules, direct testimony of Donna Robichaud, direct  
3 testimony of Kara Price, direct testimony and attachments of  
4 Amanda Corll, and direct testimony and attachments of Robert  
5 Turnbull. The Facility will interconnect to the 6.53-mile 230-kV  
6 Transmission Line, which will interconnect to the Trowbridge  
7 substation owned by DENC. It will be supported by H-frame  
8 structures at the Facility site and supported by steel monopoles  
9 outside of the site. The corridor will be 100 feet wide.

10 The environmental report required by Commission Rule R8-62(c)(4)  
11 is in Schedule 6 to the CECPCN Application.

12 **Q. PLEASE PROVIDE A BRIEF SUMMARY OF THE APPLICANT'S**  
13 **TESTIMONY FILED ON MAY 25, 2022.**

14 A. On May 25, 2022, the Applicant filed the second supplemental  
15 testimony of witness Robichaud and the supplemental testimony of  
16 witness Corll.

17 Witness Robichaud provided a summary of the following: (1) PJM's  
18 System Impact Studies for the Facility, with the latest version  
19 released in May 2022; (2) DEP's affected system studies for PJM  
20 cluster AD1; and (3) PJM's queue reform proposal, which is  
21 "intended to eliminate speculative projects, including readiness  
22 payments, increased study fees, additional demonstrations of site

1 control, and withdrawal penalties.” In her testimony, witness  
2 Robichaud stated, “Macadamia Solar is seeking to negotiate an  
3 Affected System Operating Agreement with DEP to fund the DEP  
4 Upgrade, **without** reimbursement from DEP ratepayers.”<sup>1</sup>  
5 (emphasis in original)

6 In her supplemental testimony, witness Corll stated that the Applicant  
7 has settled on a final route for the Transmission Line and is  
8 negotiating with two landowners to obtain final easements. The  
9 architectural and archaeological study for the Transmission Line is  
10 under review by the State Historic Preservation Office.

11 **Affected System Upgrades**

12 **Q. WHAT HAS DEP PROVIDED REGARDING THE EFFECT OF PJM**  
13 **CLUSTER AD1 ON ITS SYSTEM?**

14 A. In 2021, DEP released two versions of its Affected System Study  
15 Report for PJM cluster AD1. However, because of PJM’s queue  
16 reform and PJM’s development of a revised System Impact Study in  
17 May 2022, DEP released a revised affected system study report for  
18 PJM cluster AD1 on June 8, 2022.

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<sup>1</sup> Witness Robichaud’s May 25, 2022 testimony was filed before DEP’s June 8, 2022 release of its revised affected system study report for PJM cluster AD1, which indicated that Macadamia would not be responsible for any affected system upgrade costs on the DEP system.

1 **Q. PLEASE DESCRIBE DEP'S AFFECTED SYSTEM STUDY**  
 2 **REPORT RELEASED ON JUNE 8, 2022.**

3 A. The report is attached as **Lucas Exhibit 1** and contains the table  
 4 below on page 4:

Overloaded Transmission Facility	Contributing Requests	Upgrade Description	Upgrade Cost	Time to Complete (months)
Rocky Mount – Battleboro (DVP) 115kV line	AD1-022 AD1-056/057	Reconductor 8.54 miles	\$31 M	30
Rocky Mount – Battleboro (DVP) 115kV line	AD1-022 AD1-056/057	PJM project to reconfigure 115kV lines	-	-
Greenville – Everetts (DVP) 230kV line	AD1-022 AD1-056/057 AD1-074/075/076	Rebuild 1.87 miles of aging double circuit 230kV towers, ISD 6/1/2027	\$19 M*	36*
Greenville – Everetts (DVP) 230kV line	AD1-022 AD1-056/057 AD1-074/075/076	Reconductor 1.87 miles of one side of double circuit 230kV line plus terminal equipment	\$0.35 M*	36*

5 \* Transmission Planning or Class 5 estimates

6 The Rocky Mount-Battleboro line upgrade listed above is planned for  
 7 PJM cluster AC1, and DEP does not attribute this upgrade to PJM  
 8 cluster AD1. The Greenville-Everetts line has aging components that  
 9 DEP plans to replace in 2027 at an expense of \$19 million, which is  
 10 not attributable to any projects interconnecting in PJM. The cost of  
 11 the incremental reconductoring of this line is \$350,000, and is  
 12 attributable to Sumac Solar, LLC (Sumac), Docket No. EMP-110,  
 13 Sub 0, which is assigned PJM queue number AD1-022. Sumac is the



1 first project in cluster AD1 to trigger these incremental upgrades in  
2 DEP; therefore, Macadamia will not be responsible for any affected  
3 system upgrade costs on the DEP system.

4 The relatively low cost of the reconductoring is due to the fact that  
5 the reconductoring is a small incremental increase to the planned  
6 rebuild and only a small portion of this line is located in DEP. The  
7 remaining portion is in PJM. Completion of these affected system  
8 upgrades by DEP will allow the Facility to interconnect without  
9 adverse impacts on DEP's transmission system.

10 **Q. DID DUKE ENERGY CHANGE ITS PROCESS FOR AFFECTED**  
11 **SYSTEM REVIEW AND COST RECOVERY?**

12 A. Yes. On October 1, 2020, Duke Energy revised its Affected System  
13 Operating Agreement (ASOA) template to assign the costs of  
14 affected system network upgrades directly to the interconnection  
15 customer, eliminating its prior policy of reimbursing the  
16 interconnection customer for the affected system costs.<sup>2</sup> However,  
17 the Federal Energy Regulatory Commission (FERC) has rejected a  
18 recently-filed ASOA containing this revision, as described more fully  
19 below.

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<sup>2</sup> See Docket No. E-100, Sub 170, Duke Energy Initial Comments filed on October 7, 2020, at 4 (Section 6.1 of the "Affected System Operating Agreement template" for Duke Companies (DEP, DEC, and DEF) effective October 1, 2020, states "The Affected System Network Upgrades shall be solely funded by Customer.").

1 Q. PLEASE DESCRIBE THE PUBLIC STAFF'S CONCERNS  
2 REGARDING REIMBURSEMENT FOR AFFECTED SYSTEM  
3 COSTS.

4 A. On May 21, 2021, American Beech Solar, LLC (American Beech),  
5 Docket No. EMP-108, Sub 0, entered into an ASOA with DEP in  
6 which American Beech agreed to pay DEP's costs for construction  
7 of network upgrades without reimbursement. On October 1, 2021,  
8 FERC issued an order rejecting the ASOA between DEP and  
9 American Beech. In doing so, it stated:<sup>3</sup>

10 . . . our evaluation of an ASOA that does not require  
11 the affected system operator to reimburse the  
12 interconnection customer for network upgrade costs  
13 turns on a fact-specific analysis of whether the filing  
14 party has shown that a deviation from the Order No.  
15 2003 reimbursement requirement is necessary or is  
16 otherwise just and reasonable. As discussed above,  
17 having conducted that analysis based on the specific  
18 facts and record presented in this case, we find that  
19 DEP has not demonstrated that the DEP ASOA is just  
20 and reasonable.

21 FERC could similarly reject future ASOAs in which merchant facilities  
22 like Macadamia agree to pay the costs of affected system upgrades  
23 without reimbursement. If such ASOAs are rejected, the upgrades  
24 could ultimately be funded by DEP's customers. Here, however,  
25 based on DEP's June 8, 2022, revised affected system study, the

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<sup>3</sup> Order Rejecting Affected System Operator Agreement, Docket No. ER21-1955-002, 177 FERC ¶ 61,001, at 15 (Oct. 1, 2021).

1 Facility will not be assigned any costs for affected system upgrades  
2 on the DEP system.

3 **Conclusions**

4 **Q. WHAT HAS THE PUBLIC STAFF CONCLUDED REGARDING**  
5 **AFFECTED SYSTEM UPGRADES NECESSARY TO**  
6 **INTERCONNECT THE FACILITY?**

7 A. The Public Staff has concluded that the Facility will not be  
8 responsible for any affected system upgrade costs.

9 **Recommendations**

10 **Q. WHAT IS THE PUBLIC STAFF'S RECOMMENDATION ON**  
11 **MACADAMIA'S CPCN APPLICATION FOR THE FACILITY?**

12 A. The Public Staff has reviewed the application, the testimony, and  
13 other evidence in the record and obtained through discovery. The  
14 Public Staff recommends that the Commission approve the CPCN  
15 Application subject to the following conditions:

- 16 1. The Applicant shall construct and operate the Facility in strict  
17 accordance with applicable laws and regulations, including any local  
18 zoning and environmental permitting requirements.
- 19 2. The CPCN shall be subject to Commission Rule R8-63(e) and all  
20 orders, rules and regulations as are now or may hereafter be lawfully  
21 made by the Commission.

- 1           3. The Applicant shall file with the Commission in this docket any  
2           significant revisions in the cost estimates for the construction of the  
3           Facility itself, interconnection facilities, network upgrades, or affected  
4           system upgrades, or any other significant change in costs, within 30  
5           days of becoming aware of such revisions.
- 6           4. The Applicant shall file a copy of any executed Affected System  
7           Operating Agreement with the Commission at the same time such  
8           filing is made at the Federal Energy Regulatory Commission (at least  
9           61 days prior to commencing construction on the upgrades).
- 10          5. If at any time the Applicant seeks reimbursement for any  
11          interconnection facilities, network upgrade costs, affected system  
12          costs, or other costs required to allow energization and operation of  
13          the Facility, the Applicant shall notify the Commission no later than  
14          60 days before seeking reimbursement.

15

16   **Q.    WHAT IS THE PUBLIC STAFF'S RECOMMENDATION ON**  
17   **MACADAMIA'S CECPCN APPLICATION FOR THE**  
18   **TRANSMISSION LINE?**

19   A.    The Public Staff recommends that the Commission approve the  
20   CECPCN application after the Applicant resolves all outstanding  
21   issues with the State Historic Preservation Office.

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

23   A.    Yes, it does.

**QUALIFICATIONS AND EXPERIENCE**

JAY B. LUCAS

I graduated from the Virginia Military Institute in 1985, earning a Bachelor of Science Degree in Civil Engineering. Afterwards, I served for four years as an engineer in the U. S. Air Force performing many civil and environmental engineering tasks. I left the Air Force in 1989 and attended the Virginia Polytechnic Institute and State University (Virginia Tech), earning a Master of Science degree in Environmental Engineering. After completing my graduate degree, I worked for an engineering consulting firm and worked for the North Carolina Department of Environmental Quality in its water quality programs. Since joining the Public Staff in January 2000, I have worked on utility cost recovery, renewable energy program management, customer complaints, and other aspects of utility regulation. Since September 2020, I have been the Manager of the Electric Section – Operations and Planning in the Public Staff’s Energy Division. I am a licensed Professional Engineer in North Carolina.



# Generator Interconnection Affected System Study Report

PJM Interconnection Cluster AD1

Revision 2



June 8, 2022  
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 AD1. Cluster AD1 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:

Queue #	MW	Interconnection Substation or Transmission Line
AD1-022	120	Cashie-Trowbridge 230 kV
AD1-056/057	94	Hornertown-Hathaway 230 kV
AD1-074/075/076	484	Trowbridge 230 kV

This Revision 2 follows the PJM retooling revisions of 12/2021 – 5/2022. The PJM retooling and this DEP report assume that reconductoring of the Rocky Mount – Battleboro 115kV line is the next upgrade to address overloading of this line. The schedule and funding of this reconductor project are not yet finalized.

The PJM 115kV reconfiguration project at Hathaway and Battleboro is confirmed as the next upgrade after the reconductor to address loading on the Rocky Mount – Battleboro 115kV line. The phase shifter option for the Rocky Mount – Battleboro 115kV line is removed from this report.

This report also considers the withdrawal of PJM queue # AD1-023.

## 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 issues on the DEP system. Based on study results for 2021 summer, Table 1 shows thermal facility loadings:

**Table 1: Power Flow Results**

<b>Overloaded Transmission Facility</b>	<b>Loading %</b>	<b>Contingency</b>
Rocky Mount – Battleboro (DVP) 115kV line, 164 MVA	239.31	DVP_P7-1: LN 2058-2181: Rocky Mount-Hathaway (DVP) 230kV East and West lines Common Tower Outage
Greenville – Everetts (DVP) 230kV line, 478 MVA (DEP: 485 MVA)	118.77 (117.06)*	DVP_P7-1: LN 2058-2181: Rocky Mount-Hathaway (DVP) 230kV East and West lines Common Tower Outage

\* DEP requires upgrades for loadings above 95%

Interconnection requests contributing to the overloaded facilities are shown in Table 2.

**Table 2: Upgrades and Contributing Requests**

<b>Overloaded Transmission Facility</b>	<b>Contributing Requests</b>	<b>Upgrade Description</b>	<b>Upgrade Cost</b>	<b>Time to Complete (months)</b>
Rocky Mount – Battleboro (DVP) 115kV line	AD1-022 AD1-056/057	Reconductor 8.54 miles	\$31 M	30
Rocky Mount – Battleboro (DVP) 115kV line	AD1-022 AD1-056/057	PJM project to reconfigure 115kV lines	-	-
Greenville – Everetts (DVP) 230kV line	AD1-022 AD1-056/057 AD1-074/075/076	Rebuild 1.87 miles of aging double circuit 230kV towers, ISD 6/1/2027	\$19 M*	36*
Greenville – Everetts (DVP) 230kV line	AD1-022 AD1-056/057 AD1-074/075/076	Reconductor 1.87 miles of one side of double circuit 230kV line plus terminal equipment	\$0.35 M*	36*

\* Transmission Planning or Class 5 estimates

The DEP portion of the Greenville-Everetts 230kV line (1.87 miles) is tentatively scheduled to be rebuilt by 6/1/2027 due to age and condition, but that in-service date is subject to change depending upon DEP’s construction sequencing priorities for its transmission plan. Reconductoring the line to higher capacity can only be performed during or after the condition-based rebuild. If a generator developer would like an earlier or firm in-service date, the Interconnection Customer would be responsible for paying expediting costs of the rebuild, plus the larger conductor cost.

**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 AD1 cluster. Power flow analysis found overloading issues that must be mitigated. Required upgrades and assigned costs are listed below.

<b>AD1-022 Assigned and Contingent Upgrades</b>	<b>Assigned Cost</b>
Reconductor Rocky Mount-Battleboro 115kV line	\$0
PJM project to reconfigure 115kV lines at Hathaway and Battleboro	-
Rebuild aging towers including Greenville-Everetts 230kV line	\$0
Reconductor Greenville-Everetts 230kV line (DEP portion)	\$350,000
<b>Total for AD1-022</b>	<b>\$350,000</b>

<b>AD1-056/057 Assigned and Contingent Upgrades</b>	<b>Assigned Cost</b>
Reconductor Rocky Mount-Battleboro 115kV line	\$0
PJM project to reconfigure 115kV lines at Hathaway and Battleboro	-
Rebuild aging towers including Greenville-Everetts 230kV line	\$0
Reconductor Greenville-Everetts 230kV line (DEP portion)	\$0
<b>Total for AD1-056/057</b>	<b>\$0</b>

<b>AD1-074/075/076 Assigned and Contingent Upgrades</b>	<b>Assigned Cost</b>
Rebuild aging towers including Greenville-Everetts 230kV line	\$0
Reconductor Greenville-Everetts 230kV line	\$0
<b>Total for AD1-074/075/076</b>	<b>\$0</b>

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

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