



**NORTH CAROLINA
PUBLIC STAFF
UTILITIES COMMISSION**

November 23, 2021

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 testimony and exhibits of Jay B. Lucas, Manager, Electric Section – Operations and Planning, Energy Division.

By copy of this letter, I am forwarding a copy of the public version to all parties of record by electronic delivery. The confidential version will be provided to those parties that have entered into a confidentiality agreement.

Sincerely,

Electronically submitted
s/ Reita D. Coxton
Staff Attorney
reita.coxton@psncuc.nc.gov

Attachments

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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)

DOCKET NO. EMP-119, SUB 1)

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)

TESTIMONY OF
JAY B. LUCAS
PUBLIC STAFF – NORTH
CAROLINA UTILITIES
COMMISSION

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. EMP-119, SUB 0

DOCKET NO. EMP-119, SUB 1

Testimony of Jay B. Lucas

On Behalf of the Public Staff

North Carolina Utilities Commission

November 23, 2021

1 **Q. PLEASE STATE YOUR NAME AND ADDRESS FOR THE**
2 **RECORD.**

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

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

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

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

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

1 **Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS**
2 **PROCEEDING?**

3 A. The purpose of my testimony is to make recommendations to the
4 North Carolina Utilities Commission (Commission) on the
5 applications filed by Macadamia Solar, LLC (Macadamia or
6 Applicant) for a certificate of public convenience and necessity
7 (CPCN) to construct a 484-megawatt AC (MW_{AC}) solar photovoltaic
8 electric generating facility (the Facility) (CPCN Application) and for a
9 certificate of environmental compatibility and public convenience and
10 necessity (CECPCN) to construct a transmission tie line
11 (Transmission Line) (CECPCN Application) in Washington County,
12 North Carolina.

13 My testimony also responds to matters raised in the Commission's
14 Order Consolidating Dockets, Scheduling Hearings, Requiring Filing
15 of Testimony, Establishing Procedural Guidelines, and Requiring
16 Public Notice issued on September 24, 2021.

17 **I. Background**

18 **Q. PLEASE PROVIDE A BRIEF HISTORY OF THE CPCN**
19 **APPLICATION FOR THE FACILITY.**

20 A. On August 30 and 31, 2021, Macadamia filed the CPCN Application,
21 required attachments and schedules, direct testimony and
22 attachments of Donna Robichaud, and direct testimony of Kara

1 Price. The Facility will ultimately interconnect to a substation owned
2 by Virginia Electric and Power Company, d/b/a Dominion Energy
3 North Carolina (DENC). Because DENC is part of PJM
4 Interconnection, LLC (PJM), the Applicant is required to enter into an
5 interconnection service agreement with both entities. The Facility
6 has PJM queue numbers AD1-074 (300 MW_{AC}), AD1-075 (75
7 MW_{AC}), and AD1-076 (109 MW_{AC}).

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

10 On September 24, 2021, the Commission issued its Order
11 Consolidating Dockets, Scheduling Hearings, Requiring Filing of
12 Testimony, Establishing Procedural Guidelines, and Requiring
13 Public Notice (September 24 Order). The September 24 Order
14 required the Applicant to respond to the following questions:

- 15 1. Are there any network upgrades to DENC's or any affected
16 system's transmission system required to accommodate the
17 operation of the Applicant's proposed facility? If so, provide
18 the amount of network upgrades on DENC's or any affected
19 system's transmission system, if any, required to
20 accommodate the operation of the Applicant's proposed
21 facility.
- 22 2. If there are any required system upgrades, does the Applicant
23 have Levelized Cost of Transmission (LCOT) information for
24 the system upgrades? If so, provide the LCOT information for
25 any required transmission system upgrades or modifications.
- 26 3. Is there any interconnection study available for the proposed
27 facility? If so, provide any interconnection study received for

- 1 the proposed facility. If the Applicant has not received a study,
2 provide a date by when the study is expected to be completed.
- 3 4. Is the Applicant aware of any system other than the studied
4 system that is or will be affected by the interconnection? If yes,
5 explain the impact and basis.
- 6 5. Is the Applicant proposing to sell energy and capacity from the
7 facility to a distribution facility regulated by the Commission?
8 If so, provide a discussion of how the facility's output conforms
9 to or varies from the regulated utility's most recent integrated
10 resource plan (IRP).
- 11 6. Is the Applicant proposing to sell energy and capacity from the
12 proposed facility to a purchaser who is subject to a statutory
13 or regulatory mandate with respect to its energy sourcing
14 (e.g., a REPS requirement or Virginia's new statutory
15 mandate for renewables)? If so, explain how, if at all, the
16 proposed facility will assist or enable compliance with that
17 mandate. In addition, provide any contracts that support that
18 compliance.
- 19 7. Does the Applicant have a Power Purchase Agreement
20 (PPA), REC sale contracts or contracts for compensation for
21 environmental attributes for the output of the proposed
22 facility? If so, provide any PPA agreements, REC sale
23 contracts, or contracts for compensation for environmental
24 attributes for the output of the facility.

25 The questions above are similar to those asked by the Commission
26 in previous electric merchant power proceedings. Witness
27 Robichaud provided answers to these questions in her direct
28 testimony filed on August 31, 2021, and her supplemental testimony
29 filed on October 20, 2021.

1 **Q. PLEASE PROVIDE A BRIEF HISTORY OF THE CECPCN**
2 **APPLICATION FOR THE TRANSMISSION LINE.**

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

12 At the time of its application, Macadamia had secured approximately
13 90 percent of the necessary easements for the Transmission Line.
14 Witness Amanda Corll describes the unsecured sections on pages 5
15 and 6 of her direct testimony. The environmental report required by
16 Commission Rule R8-62(c)(4) is in Schedule 6 to the CECPCN
17 Application.

18 **Q. PLEASE DESCRIBE THE STATEMENT OF NEED PROVIDED BY**
19 **THE APPLICANT FOR THE FACILITY.**

20 A. Witness Robichaud provided a statement of need for the Facility on
21 pages 17 and 18 of her direct testimony in support of the CPCN
22 Application. Exhibit 3 of the CPCN Application elaborates on the why

1 the Facility is needed. As a result of the Facility's interconnection with
2 DENC, the Facility has access to several offtake opportunities in PJM
3 for renewable energy, renewable energy credits, and ancillary
4 services. The Applicant is working with a contractor to own, operate,
5 and secure the power purchase agreements. According to Exhibit 3
6 of the CPCN Application (located on pages 14 through 18 of the
7 CPCN Application filing),

8 Macadamia Solar and its collaborator on this Facility,
9 Geenex Solar, expect the Facility to benefit North
10 Carolina and its surrounding region by satisfying a
11 growing demand for renewable power in the region,
12 and by providing economic development and other
13 benefits in Washington County. . . . The Applicant
14 anticipates contracting the sale of energy, capacity,
15 and Renewable Energy Credits ("RECs") through PJM.
16 . . . There are several opportunities to sell the output
17 (i.e., offtake) and services from the Facility into PJM,
18 including (1) the PJM Interconnection wholesale
19 market; (2) ancillary services sales under the PJM
20 tariffs; and (3) Corporate Agreements.

21 **II. Potential Affected System Upgrades**

22 **Q. WHAT HAS PJM STATED ABOUT AFFECTED SYSTEMS?**

23 A. In December 2019, PJM released a System Impact Study (SIS) for
24 the Facility. The SIS is filed as Attachment B to Witness Robichaud's
25 direct testimony in support of the CPCN Application. According to
26 pages 28 and 35 of the SIS,

27 A potential constraint was identified by PJM on the
28 Duke Energy/Progress (DEP) portion of the Everetts -
29 Greenville 230 kV line. There are no mitigations
30 currently planned for the DEP portion of this overload.

1 The Queue Project AD1-074/075/076 may be subject
2 to operational restriction if real-time system reliability
3 issues occur. Additionally, if a baseline Network
4 Upgrade project is identified on the Everetts -
5 Greenville 230 kV line prior to the execution of the
6 Queue Project's final agreements, the Queue Project
7 may require this upgrade to be in-service to be
8 deliverable to the PJM system. If Queue Project AD1-
9 074/075/076 comes into service prior to completion of
10 the baseline Network Upgrade, Queue Project AD1-
11 074/075/076 will need an interim deliverability study.

12 Potential constraints were identified by PJM on the
13 following Dominion – Duke Energy/Progress (DEP) tie
14 lines. There are no mitigations currently planned for the
15 DEP portions of these overloads. The Queue Project
16 AD1-074/AD1-075/AD1-076 may be subject to
17 operational restriction if real-time system reliability
18 issues occur. The following facilities were identified in
19 this report:

20 Everetts – Greenville 230 kV line

21 Rocky Mt. – Hathaway 230 kV line

22 **Q. WHAT HAS DEP STATED ABOUT AFFECTED SYSTEMS?**

23 A. On September 9, 2021, DEP released its Affected System Study
24 Report – Revision 1 for PJM cluster AD1, which is attached as **Lucas**
25 **Exhibit 1**. In this report, DEP indicates that the Facility will not create
26 a need for affected system upgrades so long as DEP completes the
27 upgrades from an earlier queued project, Sumac Solar, LLC,¹ which
28 is assigned PJM queue number AD1-022/023. The future of those
29 upgrades is currently unclear because the Commission granted
30 stays in the CPCN application dockets for Sumac Solar, LLC, and

¹ Docket No. EMP-110, Sub 0.

1 another project in PJM's AD1 cluster, Sweetleaf Solar, LLC.² If DEP
2 does not build the upgrades needed for Sumac Solar, LLC, the
3 Facility will cause approximately \$10 million of affected system
4 upgrades on the Everetts-Greenville 230-kV line.

5 PJM is retooling its analysis of PJM cluster AD1, and projects to be
6 finished in January 2022. This retooling could require DEP to restudy
7 the effects of cluster AD1 on its transmission system.

8 **Q. PLEASE DESCRIBE DEP'S PREVIOUS PROCESS FOR**
9 **AFFECTED SYSTEM REVIEW AND COST RECOVERY.**

10 A. In the past, if one or more generators caused affected system costs,
11 the generators would be responsible for these network upgrade
12 costs, consistent with the Joint Open Access Transmission Tariff
13 (OATT) of Duke Energy Carolinas, LLC (DEC), Duke Energy Florida,
14 LLC (DEF), and DEP (collectively, Duke). However, pursuant to the
15 previous Duke OATT, upon commercial operation, the generators
16 that paid for the network upgrades would be entitled to receive
17 repayment from DEP of the entire balance of the network upgrade
18 cost plus interest, even if the upgrade was not needed to serve
19 customer load. Following repayment, DEP would seek recovery of
20 those costs from its wholesale and retail customers.

² Docket No. EMP-111, Sub 0.

1 **Q. PLEASE DESCRIBE DEP'S CURRENT PROCESS FOR**
2 **AFFECTED SYSTEM REVIEW AND COST RECOVERY.**

3 A. On October 1, 2020, Duke revised its Affected System Operating
4 Agreement (ASOA) template to assign the costs of affected system
5 network upgrades directly to the interconnection customer,
6 eliminating its prior policy of reimbursing the interconnection
7 customer for the affected system costs.³

8 **Q. DOES THE PUBLIC STAFF HAVE ANY CONCERNS REGARDING**
9 **REIMBURSEMENT FOR AFFECTED SYSTEM COSTS?**

10 A. Yes.

11 (1) On May 21, 2021, American Beech Solar, LLC (American
12 Beech), entered into an ASOA with DEP pursuant to which
13 American Beech agreed to pay DEP's costs for construction
14 of network upgrades without reimbursement for such costs.
15 The Commission docket number for American Beech's
16 pending CPCN application is EMP-108, Sub 0. On October 1,
17 2021, the Federal Energy Regulatory Commission (FERC)
18 issued an order rejecting the ASOA between DEP and
19 American Beech. In doing so, it stated:⁴

³ 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.").

⁴ Order Rejecting Affected System Operator Agreement, Docket No. ER21-1955-002, 177 FERC ¶ 61,001, at 15 (Oct. 1, 2021).

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

13 If FERC similarly rejects future ASOAs in which
14 merchant facilities agree to pay costs of network
15 upgrades without reimbursement, or if DEP returns to
16 its policy of reimbursement, such upgrades could
17 ultimately be funded by DEP's customers. Currently,
18 DENC has approximately 7,500 MW⁵ of generation in
19 the PJM interconnection queue. This large amount of
20 capacity could trigger hundreds of millions of dollars in
21 affected system upgrades.

22 (2) An affected system such as DEP could build network
23 upgrades that go unused for extended periods of time
24 because some interconnection projects withdraw from the
25 interconnection queue late in the review process. For
26 example, over the past five years, approximately 4,300 MW
27 of proposed capacity entered PJM's North Carolina

⁵ This number includes a 1,210 MW solar project in Tyrrell County, North Carolina, that I describe more thoroughly below.

- 1 interconnection queue, but later withdrew. Over 3,700 MW of
2 that capacity was solar.
- 3 (3) If network upgrades on DEP's transmission system are
4 necessitated by the Facility, the upgrades could soon be
5 inadequate due to the needs of future facilities in PJM's North
6 Carolina queue. Because of future clusters, upgrades to
7 accommodate the Facility could soon need to be replaced
8 with even greater transmission assets long before the end of
9 their normal service life (40 to 60 years). As such, a large part
10 of the approximately \$10 million spent to upgrade the
11 Everetts-Greenville line, costs which would ultimately be
12 borne by DEP customers, could be wasted. For example, PJM
13 queue number AF1-236 is a proposed solar project in Tyrrell
14 County, North Carolina, that will affect the Everetts-Greenville
15 line. The project's capacity is 1,210 MW, which is two and a
16 half times larger than Macadamia's capacity. PJM expects the
17 project to be in service on September 30, 2024; however, DEP
18 has not yet completed an affected system study for PJM
19 cluster AF1.
- 20 (4) PJM's retooling could require DEP to re-evaluate the effect of
21 cluster AD1 on its transmission system and develop a new
22 affected system study.

1 **III. Network Upgrade Analysis**

2 **Q. DID WITNESS ROBICHAUD PROVIDE LCOT CALCULATIONS**
3 **FOR PJM NETWORK UPGRADES IN HER DIRECT TESTIMONY?**

4 A. Yes, Attachment D of witness Robichaud direct testimony filed on
5 August 31, 2021, provided an analysis of the Facility's LCOT for
6 various network upgrade scenarios based on the Facility's August
7 2019 System Impact Study and DEP's projected affected system
8 upgrades.

9 **Q. WHAT IS THE PUBLIC STAFF'S OPINION ON WITNESS**
10 **ROBICHAUD'S LCOT CALCULATION?**

11 A. The Public Staff does not disagree with witness Robichaud's LCOT
12 calculation; however, I recommend an LCOT calculation that uses
13 the average capacity factor of the Facility over its entire service life,
14 rather than the capacity factor during the first year of operation. Using
15 the average capacity factor results in a LCOT that is about 9% higher
16 than that developed by witness Robichaud. I have concerns about
17 use of the LCOT that I describe more fully below.

18 **Q. PLEASE DESCRIBE YOUR CONCERNS ABOUT USE OF THE**
19 **LCOT.**

20 A. On June 11, 2020, the Commission issued an *Order Denying*
21 *Application for a Certificate of Public Convenience and Necessity for*
22 *a Merchant Generating Facility* requested by Friesian Holdings, LLC

1 (Friesian), in Docket No. EMP-105, Sub 0. In that order, the
2 Commission found that, “[t]he use of the levelized cost of
3 transmission (LCOT) provides a benchmark as to the
4 reasonableness of the transmission network upgrade cost
5 associated with interconnecting a proposed new generating facility.”

6 However, Finding of Fact No. 11 in the Commission’s order in the
7 Friesian case stated, “[i]t is appropriate for the Commission to
8 consider the total construction costs of a facility, including the cost to
9 interconnect and to construct any necessary transmission network
10 upgrades, when determining the public convenience and necessity
11 of a proposed new generating facility.”

12 As noted in the concurring opinion to the Commission’s September
13 2, 2020 *Order on Reconsideration* in Docket No. EMP-107, Sub 0
14 (Halifax Order on Reconsideration), a properly-calculated LCOT may
15 be used as a benchmark to consider the overall costs of transmission
16 needed to interconnect a solar facility, but it is just one factor to be
17 considered in determining whether to grant a CPCN to a merchant
18 generating facility:⁶

19 Prior to the Federal Energy Regulatory Commission’s
20 open access transmission rule, Order No. 888, and the
21 formation of regional transmission organizations, the

⁶ Order on Reconsideration, *Application of Halifax County Solar, LLC, for a Certificate of Public Convenience and Necessity to Construct an 80-MW Solar Facility in Halifax County, North Carolina*, No. EMP-107, Sub 0, at 2 (Mitchell, C., concurring) (N.C.U.C. September 2, 2020).

1 Commission would not approve siting of a true
2 merchant plant. When the Commission adopted Rule
3 R8-63 and opened the door for the construction of
4 merchant generating facilities, it was assumed that the
5 developer of a facility would bear all of the financial risk
6 and that no costs would be imposed upon retail
7 ratepayers other than those costs that would flow from
8 the purchase of power from the facility by a utility under
9 least cost principles. When that is still the case, the
10 LCOT analysis is less important. Whatever costs are
11 caused are borne by the developer and recovered
12 through the sale of power, which is bounded either by
13 such least costs principles if in a traditional bilateral
14 wholesale power market such as most of this State or
15 by the market clearing price in a restructured market,
16 such as PJM. When that is not the case, it is the
17 Commission's role and obligation to protect retail
18 ratepayers from unreasonable costs.

19 Furthermore, LCOT calculations can vary greatly depending on
20 chosen inputs, as shown in **Confidential Lucas Exhibits 2 and 3**.

21 Altering the inputs to the calculations can yield LCOTs ranging from
22 \$3.87 to \$7.29 per MWh for witness Robichaud's Scenario (a) for
23 PJM costs in the SIS and from \$0.29 to \$0.55 per MWh for the
24 Scenario (b3) in Macadamia's response to Public Staff Data Request
25 2-7. Scenario (b3) is shown in **Confidential Lucas Exhibit 4**.

26 Therefore, while the LCOT can be a useful benchmark, it should only
27 be considered as one factor in determining whether to grant a CPCN.

28 **Q. DO YOU HAVE CONCERNS ABOUT APPLYING THE LCOT TO**
29 **THE COSTS OF AFFECTED SYSTEM UPGRADES?**

30 A. Yes.

- 1 (1) Even if the LCOT range is low for all or parts of PJM's North
2 Carolina queue capacity of 7,500 MW, the cumulative
3 capacity could still trigger hundreds of millions of dollars' worth
4 of affected system upgrades that DEP's customers would
5 have to fund. Furthermore, DEP's customers are currently
6 receiving reliable electric service without the upgrades.
- 7 (2) The LCOT calculation provides the ratio of the cost of
8 transmission needed to interconnect a generator to the
9 amount of energy the generator creates. The \$10 million cost
10 for DEP's transmission upgrades could be funded by DEP's
11 customers; however, they will not receive the energy. The
12 benefit of the transmission upgrade to DEP's customers, if
13 any, is very limited.

14 **Q. WHAT DOES WITNESS ROBICHAUD STATE ON PAGE 12 OF**
15 **HER DIRECT TESTIMONY SUPPORTING THE CPCEN**
16 **APPLICATION REGARDING THE BENEFITS OF AFFECTED**
17 **SYSTEM UPGRADES TO DEP'S RATEPAYERS?**

18 A. On page 12 of her direct testimony, witness Robichaud states the
19 following:

20 A gas pipeline outage could cause operational issues
21 for approximately 3000 MW of existing natural gas
22 generation in DEP's territory if a sufficient amount of
23 backup fuel oil is not stored at the generating sites.
24 During an extreme emergency, DEP ratepayers could
25 receive energy from generators in PJM through tie-
26 lines if they are sufficiently sized. PJM is the largest

1 market in the country with approximately 180,000 MW
2 of capacity available and approximately 45,000 MW of
3 reserve margin. This compares to approximately
4 13,500 MW of generation in DEP's territory. Increasing
5 capacity of tie-lines is an important tool for enhancing
6 resiliency for extreme events. Other benefits
7 ratepayers could realize is a reduction in reserve
8 margin by tapping into neighboring systems.

9 **Q. DO YOU HAVE CONCERNS REGARDING WITNESS**
10 **ROBICHAUD'S CLAIMS OF BENEFITS TO DEP'S**
11 **RATEPAYERS?**

12 A. Yes. First, DEP and PJM currently have six transmission tie lines
13 between their two balancing authorities (BAs). These tie lines consist
14 of one 500-kV line, four 230-kV lines, and two 115-kV lines. Two of
15 the 230-kV tie lines are double circuit. Witness Robichaud has not
16 provided any evidence that these existing tie lines are insufficient for
17 reliability.

18 Second, these tie lines are segments of a transmission line between
19 two substations. Upgrading two tie lines is not sufficient to shift 3,000
20 MW of capacity between two BAs. Connecting central generators in
21 one BA to customer load in another BA for the purpose of mitigating
22 a large-scale natural gas outage would require improving many
23 segments of a transmission line, not just the tie lines. The
24 transmission improvements described in DEP's Affected System
25 Study Report for PJM cluster AD1 are planned to prevent the output

1 of several solar facilities from overloading DEP's transmission
2 system, nothing else.

3 Third, DENC is heavily dependent on four large combined cycle
4 plants and other smaller plants that use natural gas. A large-scale
5 natural gas outage would most likely reduce the ability of Dominion
6 Energy to operate its natural gas fired generators and simultaneously
7 meet its own needs and DEP's needs.

8 Fourth, witness Robichaud mentions the possibility of using affected
9 system upgrades to reduce DEP's reserve margin. Review of an
10 electric utility's Integrated Resource Plan is the proper proceeding to
11 consider changing a utility's reserve margin, not the review of a
12 CPCN application.

13 **Q. DOES THE PUBLIC STAFF HAVE CONCERNS ABOUT THE**
14 **FACILITY'S RELATION TO OTHER MERCHANT POWER**
15 **GENERATORS IN DENC'S SERVICE TERRITORY?**

16 A. Yes. The continued increase in non-utility generation seeking to be
17 constructed and interconnected in North Carolina raises questions
18 about the costs and long-range needs for the generation. Frequently,
19 this generation is not intended to serve the citizens of North Carolina.
20 As I stated above, the amount of capacity in PJM's interconnection
21 queue for North Carolina is over 7,500 MW and is large compared to
22 the 1,863 MW of capacity that has been recently reviewed by, or is

1 pending before, the Commission. **Lucas Exhibit 5** provides a
2 summary of recent merchant power proceedings including two in
3 DEP's North Carolina service territory.

4 As of December 31, 2020, there was over 2,700 MW of solar capacity
5 operating in DEP's North Carolina service territory, and DEP's
6 interconnection queue for North Carolina had over 3,200 MW of
7 pending solar capacity.⁷

8 **IV. Timing**

9 **Q. DOES THE CLUSTER STUDY REVIEW PERIOD AFFECT THE**
10 **PUBLIC STAFF'S RECOMMENDATIONS?**

11 A. Yes, because it creates an environment where the Public Staff may
12 be required to make a recommendation on whether a CPCN
13 application should be approved without a clear picture of the
14 proposed project's impact. In order to make a fully-informed
15 recommendation on a CPCN application, the Public Staff should,
16 ideally, know and understand the cost of any necessary upgrades,
17 the way those upgrades affect DEP's ability to provide safe and
18 reliable electric service, and the amount of upgrade costs that might,
19 ultimately, be borne by the using and consuming public. This
20 information is not always available when the Public Staff makes its

⁷ DEP's 2020 Small Generator Interconnection Consolidated Annual Report filed on March 31, 2021, in Docket No. E-100, Sub 113B.

1 recommendation to the Commission because the development of
2 cluster studies and accurate cost estimates for network upgrades
3 can take years to complete.

4 Notwithstanding the foregoing, the cluster study review period's
5 impact on the Public Staff's recommendations in CPCN proceedings
6 varies; it may significantly impact the Public Staff's recommendation
7 in some cases and have minimal impact in others.

8 The CPCN application for Timbermill Wind, LLC (Timbermill Wind),
9 in Docket No. EMP-118, Sub 0, is an example of a situation where
10 the review period has minimal impact. The Public Staff
11 recommended issuance of the CPCN for the facility in that docket,
12 subject to the conditions recommended in the Testimony of Public
13 Staff Witness Jeff T. Thomas filed in that docket on September 29,
14 2021, because the project was in PJM cluster Z and approximately
15 99.87% of the MW capacity in that cluster has already been
16 reviewed. The likelihood of the Timbermill Wind project causing
17 affected system upgrades in the future is, therefore, extremely
18 remote.

19 The same cannot be said for Macadamia's Facility; it is in PJM
20 cluster AD. PJM is still actively reviewing 29% of the MW capacity in
21 that cluster and also plans to retool cluster AD1. Given the foregoing,
22 Macadamia's Facility has a much higher likelihood of causing

1 affected system upgrades in the future. A matrix of the PJM cluster
2 opening dates is attached as **Lucas Exhibit 6**.

3 **Q. DO FERC'S RULINGS AFFECT THE PUBLIC STAFF'S**
4 **RECOMMENDATIONS?**

5 A. Yes, the Public Staff's recommendations in electric merchant power
6 proceedings have evolved and become more nuanced as a result of
7 the FERC filings and rulings discussed above. This is evident by
8 comparing the Public Staff's approach in the proceeding for the
9 CPCN application for Oak Trail Solar, LLC (Oak Trail), in Docket No.
10 EMP-114, Sub 0, with the approach taken in more recent dockets. In
11 Docket No. EMP-114, Sub 0, the Public Staff recommended
12 issuance of the CPCN with the conditions listed in the testimony of
13 witness Evan Lawrence filed on March 22, 2021. These
14 recommendations were made with the understanding that DEP's
15 customers would not pay affected system costs per the Duke OATT
16 issued on October 1, 2020. FERC's rejection of the American Beech
17 ASOA discussed above puts who will pay for affected system
18 upgrade costs in the future in serious doubt. The Public Staff's
19 recommendations in subsequent filings in this, and other, dockets
20 have evolved to reflect that uncertainty.

1 **V. Recommendations**

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

4 A. The Public Staff has reviewed the application, the direct testimony of
5 witnesses Robichaud and Price, and other evidence in the record
6 and obtained through discovery. The Public Staff recommends that
7 the Commission hold the record in this docket open until after the
8 following:

- 9 i. PJM releases its retooling of PJM cluster AD1, which is
10 currently scheduled to occur in January 2022; and
11 ii. DEP completes its study of the retooling and develops a
12 revised affected system study, if necessary.

13 The Public Staff requests that, upon the completion of items i. and ii.
14 above, the Commission issue an order requiring the Applicant to file
15 supplemental testimony addressing the new studies by PJM and
16 DEP, and allowing the Public Staff to file supplemental testimony.

17 In the alternative, the Public Staff recommends that the Commission
18 approve the CPCN Application subject to the following conditions:

- 19 i. That the Applicant shall notify the Commission of any
20 significant change to the cost estimates for the construction of
21 the Facility itself, interconnection facilities, network upgrades,

- 1 or affected system costs within 30 days of becoming aware of
2 such revisions;
- 3 ii. That the Applicant file a copy of any executed Affected
4 System Operating Agreement (ASOA) with the Commission
5 at the same time such filing is made at FERC (at least 61 days
6 prior to commencing construction on the upgrades);
- 7 iii. If at any time the Applicant seeks to be reimbursed for any
8 interconnection facilities, network upgrade costs, affected
9 system costs, or other costs required to allow energization
10 and operation of the facility, the Applicant shall notify the
11 Commission; and
- 12 iv. The three conditions above shall cease after commercial
13 operation if no reimbursement of costs to the Applicant have
14 been paid or agreed to via a legally binding agreement or
15 contract. If reimbursement does occur, the conditions will
16 cease upon the completion of full reimbursement of costs to
17 the Applicant. The Applicant shall file in this docket the total
18 amount reimbursed by DEP and the end date of the
19 agreement or contract.

1 Q. WHAT IS THE PUBLIC STAFF'S RECOMMENDATION ON
2 MACADAMIA'S CECPCN APPLICATION FOR THE
3 TRANSMISSION LINE?

4 A. The Public Staff recommends that the Commission require the
5 Applicant to file a revision to its CECPCN application and file
6 supplemental testimony to support its request for a CECPCN after it
7 acquires all necessary easements and finalizes the route for the
8 Transmission Line.

9 Q. DOES THIS CONCLUDE YOUR TESTIMONY?

10 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 1



September 9, 2021
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
AD1-022/023	120	Cashie-Trowbridge 230 kV
AD1-056/057	94	Hornertown-Hathaway 230 kV
AD1-074/075/076	484	Trowbridge 230 kV

This Revision 1 removes the upgrade of the Rocky Mount – Hathaway 230kV lines, based on information from PJM impact study reports.

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

Overloaded Transmission Facility	Loading %	Contingency
Rocky Mount – Battleboro (DVP) 115kV line	235.0	DVP_P7-1: LN 2058-2181: Rocky Mount-Hathaway (DVP) 230kV East and West lines Common Tower Outage
Greenville – Everetts (DVP) 230kV line	124.08	DVP_P7-1: LN 2058-2181: Rocky Mount-Hathaway (DVP) 230kV East and West lines Common Tower Outage

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

Table 2: Upgrades and Contributing Requests

Overloaded Transmission Facility	Contributing Requests	Upgrade Description	Upgrade Cost	Time to Complete
Rocky Mount – Battleboro (DVP) 115kV line	AD1-022/023 AD1-056/057	Reconductor 8.54 miles	\$31.3 M	30 months
Rocky Mount – Battleboro (DVP) 115kV line	AD1-022/023 AD1-056/057	Build new 115kV Phase Shifter Station	\$25 M*	36 months*
Rocky Mount – Battleboro (DVP) 115kV line	AD1-022/023 AD1-056/057	PJM potential project to reconfigure 115kV lines	-	-
Greenville – Everetts (DVP) 230kV line	AD1-022/023 AD1-056/057 AD1-074/075/076	Reconductor 1.87 miles of one side of double circuit 230kV line plus terminal equipment	\$10 M*	24 months*

* Transmission Planning level estimates

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. Some of the identified upgrades are Contingent Upgrades assigned to earlier queued requests. Power flow analysis found overloading issues that must be mitigated. Required upgrades and assigned costs are listed below.

AD1-022/023 Assigned and Contingent Upgrades	Assigned Cost
Reconductor Rocky Mount-Battleboro 115kV line	\$0
Construct Phase Shifter Station in Rocky Mount-Battleboro 115kV line, or PJM potential project to reconfigure 115kV lines	\$25,000,000 or \$0
Reconductor Greenville-Everetts 230kV line	\$10,000,000
Total for AD1-022/023	-

AD1-056/057 Assigned and Contingent Upgrades	Assigned Cost
Reconductor Rocky Mount-Battleboro 115kV line	\$0
Construct Phase Shifter Station in Rocky Mount-Battleboro 115kV line	\$0
Reconductor Greenville-Everetts 230kV line	\$0
Total for AD1-056/057	\$0

AD1-074/075/076 Assigned and Contingent Upgrades	Assigned Cost
Reconductor Greenville-Everetts 230kV line	\$0
Total for AD1-074/075/076	\$0

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

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

Docket No. EMP-119, Subs 0 and 1

Confidential Pages

Confidential Lucas Exhibit 2

Confidential Lucas Exhibit 3

Confidential Lucas Exhibit 4

Public Staff's Testimony of
Jay B. Lucas

Recent Electric Merchant Plant (EMP) Dockets								
EMP-	Sub	Applicant	MW	App Filed	Type	Status	County	PJM Queue
119	1	Macadamia Solar, LLC	transm.	09-13-21	CEPCN	Open	Washington	transmission
119	0	Macadamia Solar, LLC	484	08-30-21	CPCN	Open	Washington	AD1-074,75,76
118	1	Timbermill Wind, LLC	transm.	06-14-21	CEPCN	Open	Chowan	transmission
118	0	Timbermill Wind, LLC	189	06-14-21	CPCN	Open	Chowan	Z1-036
117	0	Shawboro East Ridge Solar, LLC	150	06-22-21	CPCN	Open	Currituck	AE1-072
116	0	Juno Solar, LLC	275	07-12-21	CPCN	Open	Richmond	in DEP, not PJM
115	0	Cherry Solar, LLC	180	11-13-20	CPCN	Open	Northampton	AC1-086
114	0	Oak Trail Solar, LLC	100	09-17-20	CPCN	Approved	Currituck	AD2-160 and AE2-253
113	0	not used					not used	
112	1	Oak Solar, LLC	transm.	10-28-21	CEPCN	Open	Northampton	transmission
112	0	Oak Solar, LLC	120	07-15-20	CPCN	Approved	Northampton	AB1-132
111	0	Sweetleaf Solar, LLC	94	06-02-20	CPCN	Stayed	Halifax	AD1-056 (60 MW) AD1-057 (34 MW)
110	0	Sumac Solar, LLC	120	04-16-20	CPCN	Stayed	Bertie	AD1-022 (80 MW) AD1-023 (40 MW)
109	0	Camden Solar, LLC	20	04-01-20	CPCN	Approved	Camden	AB2-022
108	0	American Beech Solar, LLC	110	01-28-20	CPCN	Needs more filings	Halifax	AC1-098/099 (80 MW) AC2-083/084 (30 MW)
107	0	Halifax County Solar, LLC	80	08-30-19	CPCN	Approved	Halifax	AC1-208
106	0	not used					not used	
105	0	Friesian Holdings, LLC	70	05-15-19	CPCN	Denied	Scotland	in DEP, not PJM
104	0	Fern Solar, LLC	100	11-27-18	CPCN	Approved	Edgecombe	AB2-059
103	0	Albemarle Beach Solar, LLC	80	09-21-15	CPCN	Stayed	Washington	AA2-178
102	2	Pitt Solar, LLC (Phase 2)	70	09-28-21	CPCN	Open	Pitt	AF2-080
102	1	Pitt Solar, LLC (Phase 1)	80	08-10-20	CPCN	Open	Pitt	AC1-189
102	0	Bethel NC 11 Solar, LLC	80	10-04-18	CPCN	Withdrawn	Pitt	Withdrawn
101	0	Edgecombe Solar, LLC	75	10-05-18	CPCN	Approved	Edgecombe	AC1-034

Lucas Exhibit 5

PJM Cluster Opening Dates

Number	Opening Month	Year
Z 1	April	2013
Z 2	October	2013
AA 1	April	2014
AA 2	October	2014
AB 1	April	2015
AB 2	October	2015
AC 1	April	2016
AC 2	October	2016
AD 1	April	2017
AD 2	October	2017
AE 1	April	2018
AE 2	October	2018
AF 1	April	2019
AF 2	October	2019
AG 1	April	2020
AG 2	October	2020
AH 1	April	2021
AH 2	October	2021