STATE OF NORTH CAROLINA UTILITIES COMMISSION RALEIGH, NORTH CAROLINA **DOCKET NO. EMP 117 Sub 0**

In the Matter of Application of Shawboro East Ridge Solar, LLC for a Certificate of Public Convenience and Necessity to Construct a 150-MW Solar Facility in Currituck County, North Carolina MOTION FOR LEAVE TO SUBMIT ADDITIONAL SUPPLEMENTAL TESTIMONY

NOW COMES Shawboro East Ridge Solar, LLC, ("Shawboro" or the "Applicant"), by and through its undersigned counsel, and respectfully moves this Commission for leave to file additional supplemental testimony to provide the Commission with the retooled PJM System Impact Study and a recalculation of the project LCOT, all as discussed in the reply testimony of Ms. Linda Nwadike filed in this proceeding on November 4, 2021. The new PJM study, which was not released by PJM until January, 2022, represents the most recent study by PJM of the upgrade costs associated with PJM interconnection queue AE-1, which includes the proposed resource that is the subject of the application in this docket. Good cause exists to grant the Applicant leave to supplement the previously filed reply testimony by including within the record the most recent System Impact Study and the recalculated LCOT based on that study.

WHEREFORE, the Applicant respectfully prays that the Commission grant the Applicant leave to file the additional supplemental testimony of Ms. Linda Nwadike attached to this motion, and deem such additional testimony to have been filed and served on the date of said order allowing supplementation.

Respectfully submitted this 3rd day of February, 2022.

Joseph W. Eason Nelson Mullins Riley & Scarborough LLP GlenŁake One, Suite 200 4140 Parklake Avenue Raleigh, North Carolina 27612 Tel: (919) 329-3800 joe.eason@nelsonmullins.com Attorneys for the Applicant

CERTIFICATE OF SERVICE

The undersigned certifies that the foregoing Motion for Leave to Submit Additional Supplemental Testimony, together with the testimony and two (2) exhibits attached thereto, was filed and served on February 3, 2022, and was served this day upon the following by electronic mail:

Christopher Ayers, Esq. Executive Director-NC Public Staff Chris.Ayers@psncuc.nc.gov

Energy Division NC Public Staff EnergyDivision@psncuc.gov

Nadia Luhr NC Public Staff-Legal Division Nadia.Luhr@psncuc.nc.gov

This the 3rd day of February, 2022.

Joseph W. Eason

2

PUBLIC - REDACTED

BEFORE THE

NORTH CAROLINA UTILITIES COMMISSION

RALEIGH, NORTH CAROLINA

SHAWBORO EAST RIDGE SOLAR, LLC

DOCKET NO. EMP-117 Sub 0

ADDITIONAL SUPPLEMENTAL TESTIMONY

OF

LINDA NWADIKE

February <u>3</u>, 2022

1		INTRODUCTION
2	Q.	WHAT IS THE PURPOSE OF THE THIS ADDITIONAL SUPPLEMENTAL TESTIMONY YOU ARE
3		SUBMITTING TODAY IN THIS DOCKET?
4	Α.	The purpose of this additional supplemental testimony is to provide an updated system
5		impact study to the Commission due to the PJM retooling of the AE1 queue System
6		Impact Study performed in November 2021 - January 2022, as stated in my reply
7		testimony dated November 4, 2021.
8		
9	Q.	ARE THERE ANY MAJOR CHANGES TO THE RESULTS OF THE SYSTEM IMPACT STUDIES
10		DUE TO THE PJM RETOOLING PERFORMED IN NOVEMBER 2021 -JANUARY 2022?
11	A.	Yes, the estimated cost of the PJM system upgrades has decreased tremendously from
12		\$30,812,444 to \$2,328,614, as shown in the revised system impact study attached as
13		Exhibit A. Additionally, due to the decreased PJM system upgrade costs, the levelized
14		cost of transmission has decreased from \$ 1 to \$ 1 (as shown in the attached
15		Exhibit B).
16		
17		Therefore, as stated in my reply testimony dated November 4, Shawboro Solar does not
18		believe this docket should remain open pending a revised DEP affected system study,
19		because the timeline to complete that study is unknown, and a study may not be
20		necessary in light of the update of the PJM system impact study. Therefore, the Applicant
21		respectfully suggests that since PJM has completed and released its retool of the AE1
22		queue System Impact Study, the Commission has the information needed to reach a

- $1 \hspace{1.5cm}$ decision, and accordingly the Applicant's application should be reviewed and ruled upon
- 2 by this Commission.

3 Q. DOES THAT CONCLUDE YOUR SUPPLEMENTAL TESTIMONY?

4 A. Yes

Testimony of Linda Nwadike Docket EMP-117, Sub 0 Page 3

1								
2	STATE OF NORTH CAROLINA							
4	COUNTY OF IREDELL							
567	VERIFICATION							
8	I, Linda Nwadike, being first duly sworn, depose and say that I am duly authorized to act							
9	on behalf of Shawboro East Ridge Solar, LLC as Director of Permitting and Community Relations							
10	for SunEnergy1, LLC, the parent, and an affiliate of the Petitioner; that I have read the foregoing							
11	Pre-Filed additional Testimony, and that the same is true and accurate to my personal							
12	knowledge and belief except where otherwise indicated, and in those instances, I believe my							
13	answers to be true.							
14	This <u>2</u> day of February 2022.							
15	en tr							
16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	Linda Nwadike SunEnergy1, LLC Sworn to and subscribed to before me this Z day of February 2022. Additional Andrew Andrew (Sean & F. S.M.I.T.H.M. Notary Public (Signature) Shelby F. Smithwick Notary Public (Printed) My Commission Expires: 3/27/23							

EXHIBIT A

AE1-072 Shawboro -System Impact Study Rev 1 January 2022



Generation Interconnection System Impact Study Report for Queue Project AE1-072 SHAWBORO – SLIGO 230KV 98.6 MW Capacity / 150 MW Energy

Revision 1, January 2022

August, 2019

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1 Introduction

This System Impact Study (SIS) has been prepared in accordance with the PJM Open Access Transmission Tariff, 205, as well as the Feasibility Study Agreement between Shawboro East Ridge Solar, LLC, the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is Virginia Electric and Power Company (VEPCO).

2 Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the Feasibility Study, but the actual allocation will be deferred until the System Impact Study is performed.

The System Impact Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

The Interconnection Customer seeking to interconnect a wind or solar generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per Schedule H to the Interconnection Service Agreement and Section 8 of Manual 14D.

An Interconnection Customer with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

3 Revision 1 Summary- January 2022

This revision is being issued to incorporate results of a re-tool that was performed.

4 General

The IC has proposed a solar generating facility located in Currituck County, Virginia. The installed facilities will have a capability of 150 MW with 98.6 MW of this output being recognized by PJM as Capacity. The proposed in-service date for the AE1-072 project is 12/30/2019. This study does not imply an ITO commitment to either in-service date.

Queue Number	AE1-072					
Project Name	SHAWBORO – SLIGO 230KV					
Interconnection Customer	Shawboro East Ridge Solar, LLC					
State	Virginia					
County	Currituck					
Transmission Owner	Dominion					
MFO	150					
MWE	150					
MWC	98.6					
Fuel	Solar					
Basecase Study Year	2022					

4.1 Point of Interconnection

AE1-072 will interconnect with the ITO transmission system via a new three breaker ring bus switching station that connects on the Shawboro to Sligo 230 kV line # 269. See one line in **Attachment 1**.

4.2 Cost Summary

The AE1-072 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$ 1,800,000
Direct Connection Network Upgrade	\$ 6,300,000
Non Direct Connection Network Upgrades	\$ 1,000,000
Total Costs	\$ 9,100,000

In addition, the AE1-072 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	\$ 2,328,614

Note: PJM Open Access Transmission Tariff (OATT) section 217.3A outline cost allocation rules. The rules are further clarified in PJM Manual 14A Attachment B. The allocation of costs for a network upgrade will start with the first Queue project to cause the need for the upgrade. Later queue projects will receive cost allocation contingent on their contribution to the violation and are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

5 Transmission Owner Scope of Work

5.1 Attachment Facilities

<u>Generation Substation</u>: Install metering and associated protection equipment. Estimated Cost is \$600,000. <u>Transmission</u>: Construct approximately one span of 230 kV Attachment line between the generation substation and a new AE1-072 Switching Station. The estimated cost for this work is \$1,200,000. The estimated total cost of the Attachment Facilities is \$1,800,000. It is estimated to take 18-24 months to complete this work. These preliminary cost estimates are based on typical engineering costs. A more detailed engineering cost estimates are normally done when the IC provides an exact site plan location for the generation substation during the Facility Study phase. The total preliminary cost estimate for the Attachment work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Substation	\$ 600,000
Transmission	\$ 1,200,000
Total Attachment Facility Costs	\$ 1,800,000

5.2 Direct Connection Cost Estimate

<u>Substation</u>: Establish the new 230 kV AE1-072 Switching Substation (interconnection substation). The estimated cost of this work scope is \$6,300,000. It is estimated to take 24-36 months to complete this work. The total preliminary cost estimate for the Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Substation	\$ 6,300,000
Total Direct Connection Facility Costs	\$ 6,300,000

5.3 Non-Direct Connection Cost Estimate

<u>Transmission</u>: Install transmission structure in-line with transmission line to allow the proposed interconnection switching station to be interconnected with the transmission system. Estimated cost is \$1,000,000 and is estimated to take 24-30 months to complete.

<u>Remote Terminal Work:</u> During the Facilities Study, ITO's System Protection Engineering Department will review transmission line protection as well as anti-islanding required to accommodate the new generation and interconnection substation. System Protection Engineering will determine the minimal acceptable protection requirements to reliably interconnect the proposed generating facility with the transmission system. The review is based on maintaining system reliability by reviewing ITO's protection requirements with the known transmission system configuration which includes generating facilities in the area. This review may determine that transmission line protection and communication upgrades are required at remote substations.

The total preliminary cost estimate for the Non-Direct Connection work is given in the table below. These costs do not include CIAC Tax Gross-up.

Description	Total Cost
Transmission	\$ 1,000,000
Remote Terminal Work	TBD in the Facilities Study
Total Non-Direct Connection Facility Costs	\$ 1,000,000

6 Interconnection Customer Requirements

6.1 System Protection

The IC must design its Customer Facilities in accordance with all applicable standards, including the standards in Dominion's "Dominion Energy Electric Transmission Generator Interconnection Requirements" documented in Dominion's Facility Interconnection Requirements "Exhibit C" located at: <u>https://www.dominionenergy.com/company/moving-energy/electric-transmission-access</u>. Preliminary Protection requirements will be provided as part of the Facilities Study. Detailed Protection Requirements will be provided once the project enters the construction phase.

6.2 Compliance Issues and Interconnection Customer Requirements

The proposed Customer Facilities must be designed in accordance with Dominion's "Dominion's Facility Interconnection Requirements" document located at: <u>https://www.dominionenergy.com/company/moving-energy/electric-transmission-access</u>. In particular, the IC is responsible for the following:

- 1. The purchase and installation of a fully rated protection device (circuit breaker, circuit switcher, fuse) to protect the IC's GSU transformer(s).
- 2. The purchase and installation of the minimum required Dominion generation interconnection relaying and control facilities as described in the System Protection noted above. This includes over/under voltage protection, over/under frequency protection, and zero sequence voltage protection relays.
- 3. The purchase and installation of supervisory control and data acquisition ("SCADA") equipment to provide information in a compatible format to the Dominion Transmission System Control Center.
- 4. Compliance with the Dominion and PJM generator power factor and voltage control requirements.

The GSU(s) associated with the IC queue request shall meet the grounding requirements as noted in Dominion's "Dominion's Facility Interconnection Requirements" document located at: <u>https://www.dominionenergy.com/company/moving-energy/electric-transmission-access</u>.

The IC will also be required to meet all PJM, SERC, and NERC reliability criteria and operating procedures for standards compliance. For example, the IC will need to properly locate and report the over and under voltage and over and under frequency system protection elements for its units as well as the submission of the generator model and protection data required to satisfy the PJM and SERC audits. Failure to comply with

these requirements may result in a disconnection of service if the violation is found to compromise the reliability of the Dominion system.

6.3 Power Factor Requirements

The IC shall design its non-synchronous Customer Facility with the ability to maintain a power factor of at least 0.95 leading (absorbing VARs) to 0.95 lagging (supplying VARs) measured at the high-side of the facility substation transformer(s) connected to the Dominion transmission system.

7 Revenue Metering and SCADA Requirements

7.1 PJM Requirements

The Interconnection Customer will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 8 of Attachment O.

7.1.1 Meteorological Data Reporting Requirement

The solar generation facility shall provide the Transmission Provider with site-specific meteorological data including:

- Temperature (degrees Fahrenheit)
- Atmospheric pressure (hectopascals)
- Irradiance
- Forced outage data

7.2 Dominion Requirements

See Section 3.4.6 "Metering and Telecommunications" of Dominion's "Dominion's Facility Interconnection Requirements" document located at: <u>https://www.dominionenergy.com/company/moving-energy/electric-transmission-access</u>.

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8 Network Impacts

The Queue Project AE1-072 was evaluated as a 150.0 MW (Capacity 98.6 MW) injection at Shawboro – Sligo 230kV line #269 in the Dominion area. Project AE1-072 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AE1-072 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Load Flow

9 Generation Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

10 Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

None

11 Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

	Туре	Name	Affected Area	Facility Description	From Bus	To Bus	Cir cu it	Pow er Flow	Initial %	Final %	Туре	MV A	MW Contribut ion	Appen dix
		DVP_P7-1: LN	DVP -	6EVERETS-6GREENVILE T										
1	DCTL	2058-2181	CPLE	230 kV line	314574	304451	1	AC	138.43%	140.25	ER	478	10.23	1
		DVP_P4-2:	DVP -	3POPLR C-3EVERETS 115 kV							Load			
2	LFFB	246T2034	DVP	line	314596	314573	1	AC	112.78%	115.71	Dump	239	8.4	2

12 Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

													MW	
	Тур		Affecte		From		Circui	Power			Тур	MV	Contributio	Appendi
	е	Name	d Area	Facility Description	Bus	To Bus	t	Flow	Initial %	Final %	е	Α	n	x
		DVP P1-2: LN	DVP-											
3	N-1	563	DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	AC	114.88%	116.03%	ER	664	8.82	
		'DVP_P1-2:		6EVERETS-6GREENVILE T 230										
4	N-1	LN 570		kV line	314574	304451	1	AC	120.07%	121.86%	ER	478	10.09	
			DVP -	6EVERETS-6GREENVILE T										
5	Non	Non	CPLE	230 kV line	314574	304451	1	AC	103.97%	105.49%	NR	478	8.52	
		DVP_P1-2:	DVP -	8CHANCE-8BRISTER 500 kV								244		
6	N-1	LN 594	DVP	line	314905	314900	1	AC	106.58%	107.61%	ER	2	29.13	
		DVP_P1-2:	DVP -	8ELMONT-8LADYSMITH 500								244		
7	N-1	LN 576	DVP	kV line	314908	314911	1	AC	121.61%	123.3%	ER	2	47.89	
		DVP_P1-2:	DVP -	8MDLTHAN-8NO ANNA 500 kV								244		
8	N-1	LN 574	DVP	line	314914	314918	1	AC	120.08%	121.58%	ER	2	42.76	

13 System Reinforcements

Violation #	Overloaded Facility	Upgrade Description			Network Upgrade Number	Upgrade Cost	AE1-072 Allocation	
		DVP:Project Id: n6144Project Description: Rebuild 20.5 miles of Dominion230 kV Line#218 Everetts –Greenville.Type: FACTotal Cost: \$30,750,000Time Estimate: 30-36 MonthNew Rating:Rate A: 1047.0 MVARate B: 1047.0 MVARate C: 1204.0 MVACost Allocation Table is :QueueMWCost (%)						
1	6GREENVILE T	AD1-023	15.1	11.18%	\$3,437,153	n6144 \$30,750,00	\$30,750,000	0 \$2,328,614
	250 KV IIIC	AD1-057	82.64	61 17%	\$3,075,227			
		AD1-070	13.61	10.07%	\$3.097.990			
		AE1-072	10.23	7.57%	\$2,328,614			
		Duke Energy / CPLE : Note for Duke Energy/Progress Portion Upgrade: This is tie line between Dominion and Duke Energy. A potential constraint was identified by PJM on the Duke Energy/Progress (DEP) portion of the Everetts - Greenville 230 kV line. There are no mitigations currently planned for the DEP portion of this overload. The Oware Project AE1 072 may be subject to						
		operational res	striction if rea	al-time system	m reliability			
2	The 3POPLR C- 3EVERETS 115 kV line	issues occur. DVP Project Id: n6141 Project Description: Replace relays at Everetts substation on the Poplar Chapel – Everetts 115 kV line # 25. Cost : \$500,000 New Rating: Rate A: 300 MVA Rate B: 300 MVA Rate C: 345 MVA Times Estimate: 14-16 months As per PJM cost allocation criteria project AE1-072 does not have cost responsibility for this upgrade Note 1: As changes to the interconnection process occur			n6141	\$500,000	\$0	

service prior to completion of the upgrade, Queue Project AE1-072 will need an interim study. Total Cost (\$)	\$31,250,000	\$2,328,614
Note 2: Although Queue Project AE1-072 may not have cost responsibility for this upgrade, Queue Project AE1- 072 may need this upgrade in-service to be deliverable to the PJM system. If Queue Project AE1-072 comes into		
such as prior queued projects withdrawing from the queue, reducing in size, etc, Queue Project AE1-072 could become the driver and could be responsible for the upgrade		

14 Flow Gate Details

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

14.1 Contingency Descriptions

Contingency Name	Description		
DVP_P1-2: LN 574	CONTINGENCY 'DVP_P1-2: LN 574' OPEN BRANCH FROM BUS 314908 TO BUS 31 END	4911 CKT 1	/* 8ELMONT 500.00 - 8LADYSMITH 500.00
DVP_P1-2: LN 576	CONTINGENCY 'DVP_P1-2: LN 576' OPEN BRANCH FROM BUS 314914 TO BUS 31 END	4918 CKT 1	/* 8MDLTHAN 500.00 - 8NO ANNA 500.00
DVP_P1-2: LN 594	CONTINGENCY 'DVP_P1-2: LN 594' OPEN BRANCH FROM BUS 314916 TO BUS 31 END	14934 CKT 1	/* 8MORRSVL 500.00 - 8SPOTSYL 500.00
DVP_P4-2: 246T2034	CONTINGENCY 'DVP_P4-2: 246T2034' OPEN BRANCH FROM BUS 314537 TO BUS 91 230.00 OPEN BRANCH FROM BUS 314569 TO BUS 31 OPEN BRANCH FROM BUS 314575 TO BUS 31 OPEN BRANCH FROM BUS 314575 TO BUS 91 OPEN BUS 314575 OPEN BUS 314590 OPEN BUS 919140 OPEN BRANCH FROM BUS 314569 TO BUS 31 OPEN BRANCH FROM BUS 314569 TO BUS 31	/* EARL 19140 CKT 1 14575 CKT 1 14590 CKT 1 19140 CKT 1 19140 CKT 1 1/* ISLAND: 6NUCO 1/* ISLAND: 6NUCO 1/* ISLAND: AA1-13 14620 CKT 1	EYS 230 KV /* 6SUFFOLK 230.00 - AA1-138 TAP /* 6EARLEYS 230.00 - 6NUCO TP 230.00 /* 6NUCO TP 230.00 - 6NUCOR 230.00 /* 6NUCO TP 230.00 - AA1-138 TAP 230.00 PTP 230.00 PTP 230.00 8 TAP 230.00 /* 6EARLEYS 230.00 - 6CASHIE 230.00 /* AD1-023 TAP 230.00 - 6CASHIE 230.00
	OPEN BUS 314620	/* ISLAND: 6CASH	IE 230.00

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DVP_P7-1: LN 2058-2181	CONTINGENCY 'DVP_P7-1: LN 2058-2181'		
	OPEN BRANCH FROM BUS 304222 TO BUS 31 230.00	13845 CKT 1	/* 6ROCKYMT230T230.00 - 6HATHAWAY
	OPEN BUS 304226	/* ISLAND: 6PA-RI	MOUNT#4115.00
	OPEN BRANCH FROM BUS 304226 TO BUS 37	14591 CKT 1	/* 6PA-RMOUNT#4230.00 - 6NASH 230.00
	OPEN BRANCH FROM BUS 313845 TO BUS 37	14591 CKT 1	/* 6HATHAWAY 230.00 - 6NASH 230.00
	OPEN BUS 314591	/* ISLAND: 6NASH	1 230.00
	END		

15 Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. All New Service Queue Requests, through the end of the Queue under study, that are contributors to a flowgate will be listed in the Appendices. Please note that there may be contributors that are subsequently queued after the queue under study that are not listed in the Appendices. Although this information is not used "as is" for cost allocation purposes, it can be used to gage the impact of other projects/generators.

It should be noted the project/generator MW contributions presented in the body of the report and appendices sections are full contributions, whereas the loading percentages reported in the body of the report, take into consideration the commercial probability of each project as well as the ramping impact of "Adder" contributions.

15.1 Appendix 1

(DVP - CPLE) The 6EVERETS-6GREENVILE T 230 kV line (from bus 314574 to bus 304451 ckt 1) loads from 138.43% to 140.25% (AC power flow) of its emergency rating (478 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 2058-2181'. This project contributes approximately 10.23 MW to the thermal violation.

CONTINGENCY 'DVP_P7-1: LN 2058-2181'

 OPEN BRANCH FROM BUS 304222 TO BUS 313845 CKT 1
 /* 6ROCKYMT2

 230.00
 OPEN BUS 304226
 /* ISLAND: 6PA-RMOUNT#4115.00

 OPEN BRANCH FROM BUS 304226 TO BUS 314591 CKT 1
 /* 6PA-RMOUNT

 OPEN BRANCH FROM BUS 313845 TO BUS 314591 CKT 1
 /* 6HATHAWA

 4591 CKT 1
 /* 6PA-RMOUNT#4230.00 - 6NASH 230.00

 4591 CKT 1
 /* 6HATHAWAY 230.00 - 6NASH 230.00

 /* ISLAND: 6NASH 230.00

/* 6ROCKYMT230T230.00 - 6HATHAWAY

END

OPEN BUS 314591

Bus Number	Bus Name	Full Contribution
315294	1DOMTR10	2.82
315292	1DOMTR78	1.9
315293	1DOMTR9	1.55
315131	1EDGECMA	7.39
315132	1EDGECMB	7.39
315136	1ROSEMG1	1.82
315138	1ROSEMG2	0.85
315137	1ROSEMS1	1.13
314557	3BETHELC	1.06
314554	<i>3BTLEBRO</i>	0.38
314566	3CRESWEL	2.23
314572	3EMPORIA	0.22
314578	3HORNRTN	2.15
314582	3KELFORD	3.34
314589	3MURPHYS	0.08
314603	3SCOT NK	2.7
314617	3TUNIS	0.78
314539	<i>3UNCAMP</i>	1.27
314541	3WATKINS	0.39
314623	3WITAKRS	0.72
314620	6CASHIE	0.97
314574	6EVERETS	8.23
314594	6PLYMOTH	0.9
314648	6SUNBURY	0.42
314651	6WINFALL	0.99
932631	AC2-084 C	4.84
932632	AC2-084 E	2.38
933991	AD1-023 C	14.79

933992	AD1-023 E	8.05
934331	AD1-057 C O1	8.52
934332	AD1-057 E O1	4.54
934521	AD1-076 C	58.91
934522	AD1-076 E	29.99
936401	AD2-051 C O1	10.85
936402	AD2-051 E O1	4.66
938221	AE1-035 C	2.8
938222	AE1-035 E	1.38
938531	AE1-072 C O1	6.72
938532	AE1-072 E O1	3.5
938771	AE1-103 C O1	1.85
938772	AE1-103 E O1	2.56
LTF	BLUEG	7.68
LTF	CALDERWOOD	1.65
LTF	CANNELTON	0.53
LTF	CATAWBA	1.62
LTF	CBM-N	0.24
LTF	CELEVELAND	< 0.01
	/* 35% REVERSE 4479079	
	4642907	
LTF	СНЕОАН	1.54
LTF	COFFEEN	0.91
LTF	COTTONWOOD	5.57
LTF	DUCKCREEK	1.86
LTF	EDWARDS	0.83
LTF	FARMERCITY	0.66
LTF	G-007A	1.1
LTF	GIBSON	0.33
LTF	HAMLET	3.46
LTF	NEWTON	2.36
LTF	NYISO	1.04
LTF	PRAIRIE	5.01
LTF	SMITHLAND	0.45
LTF	ΤΑΤΑΝΚΑ	1.12
LTF	TILTON	0.97
LTF	TRIMBLE	0.84
LTF	TVA	4.65
LTF	UNIONPOWER	2.3
900672	V4-068 E	0.24
LTF	VFT	2.92
901082	W1-029 E	24.78

907092	X1-038 E	3.18
913392	Y1-086 E	1.01
916041	Z1-036 C	4.62
916042	Z1-036 E	30.92
917122	Z2-027 E	0.53
917331	Z2-043 C	0.39
917332	Z2-043 E	0.95
917342	Z2-044 E	0.31
917511	Z2-088 C OP1	2.64
917512	Z2-088 E OP1	6.42
918491	AA1-063AC OP	1.23
918492	AA1-063AE OP	3.29
918511	AA1-065 C OP	1.98
918512	AA1-065 E OP	5.53
918531	AA1-067 C	0.6
918532	AA1-067 E	1.45
918561	AA1-072 C	0.06
918562	AA1-072 E	0.16
919152	AA1-139 E	2.34
919692	AA2-053 E	2.79
919702	AA2-057 E	2.06
920042	AA2-088 E OP	6.82
920592	AA2-165 E	0.27
920672	AA2-174 E	0.32
920691	AA2-178 C	1.57
920692	AA2-178 E	3.83
930402	AB1-081 E O1	2.19
930861	AB1-132 C O1	10.79
930862	AB1-132 E O1	4.62
931232	AB1-173 E	0.59
931242	AB1-173AE	0.59
923801	AB2-015 C 01	4.72
923802	AB2-015 E O1	3.87
923832	AB2-022 E	0.57
923911	AB2-031 C 01	1.26
923912	AB2-031 E 01	0.62
923991	AB2-040 C 01	4.15
923992	AB2-040 E O1	3.39
924152	AB2-059 E 01	3.1
924501	AB2-099 C	0.59
924502	AB2-099 E	0.25
924511	AB2-100 C	6.11

924512	AB2-100 E	3.01
925121	AB2-169 C	1.72
925122	AB2-169 E	8.75
925171	AB2-174 C O1	3.84
925172	AB2-174 E O1	3.47
925591	AC1-034 C	3.9
925592	AC1-034 E	2.94
926071	AC1-086 C	15.89
926072	AC1-086 E	7.23
926201	AC1-098 C	4.53
926202	AC1-098 E	2.7
926211	AC1-099 C	1.52
926212	AC1-099 E	0.89
LTF	AC1-131	6.16
927021	AC1-189 C	15.24
927022	AC1-189 E	7.59
927141	AC1-208 C	5.88
927142	AC1-208 E	2.61

15.2 Appendix 2

(DVP - DVP) The 3POPLR C-3EVERETS 115 kV line (from bus 314596 to bus 314573 ckt 1) loads from 112.78% to 115.71% (AC power flow) of its load dump rating (239 MVA) for the line fault with failed breaker contingency outage of 'DVP P4-2: 246T2034'. This project contributes approximately 8.4 MW to the thermal violation.

CONTINGENCY 'DVP P4-2: 246T2034'

OPEN BRANCH FROM BUS 314537 TO BUS 919140 CKT 1 OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 OPEN BRANCH FROM BUS 314575 TO BUS 314590 CKT 1 OPEN BRANCH FROM BUS 314575 TO BUS 919140 CKT 1 **OPEN BUS 314575 OPEN BUS 314590** /* ISLAND: 6NUCOR 230.00 **OPEN BUS 919140** OPEN BRANCH FROM BUS 314569 TO BUS 314620 CKT 1 OPEN BRANCH FROM BUS 933990 TO BUS 314620 CKT 1

/* CONTINGENCY LINE ADDED FOR AE1 BUILD

/* EARLEYS 230 KV

- /* 6SUFFOLK 230.00 AA1-138 TAP 230.00 /* 6EARLEYS 230.00 - 6NUCO TP 230.00 /* 6NUCO TP 230.00 - 6NUCOR 230.00
- /* 6NUCO TP 230.00 AA1-138 TAP 230.00
- /* ISLAND: 6NUCO TP 230.00

/* ISLAND: AA1-138 TAP 230.00

/* ISLAND: 6CASHIE 230.00

/* 6EARLEYS 230.00 - 6CASHIE 230.00

/* AD1-023 TAP 230.00 - 6CASHIE 230.00

OPEN BUS 314620 END

Bus Number	Bus Name	Full Contribution
315294	1DOMTR10	4.95
315292	1DOMTR78	3.34
315293	1DOMTR9	2.73
314566	3CRESWEL	3.19
314594	6PLYMOTH	1.34
314648	6SUNBURY	0.35
314651	6WINFALL	1.09
933991	AD1-023 C	21.45
933992	AD1-023 E	11.68
934521	AD1-076 C	88.52
934522	AD1-076 E	45.07
938531	AE1-072 C O1	5.52
938532	AE1-072 E O1	2.88
LTF	BLUEG	2.28
LTF	CALDERWOOD	0.48
LTF	CANNELTON	0.16
LTF	CATAWBA	0.47
LTF	CBM-N	0.09
LTF	CHEOAH	0.45
LTF	COFFEEN	0.27
LTF	COTTONWOOD	1.62
LTF	DUCKCREEK	0.55

LTF	EDWARDS	0.24
LTF	FARMERCITY	0.2
LTF	G-007A	0.38
LTF	GIBSON	0.1
LTF	HAMLET	0.98
LTF	NEWTON	0.7
LTF	NYISO	0.37
LTF	PRAIRIE	1.47
LTF	SMITHLAND	0.13
LTF	TATANKA	0.33
LTF	TILTON	0.29
LTF	TRIMBLE	0.25
LTF	TVA	1.36
LTF	UNIONPOWER	0.67
LTF	VFT	1.01
901082	W1-029 E	25.84
913392	Y1-086 E	0.97
916041	Z1-036 C	5.73
916042	Z1-036 E	38.41
917122	Z2-027 E	0.53
919152	AA1-139 E	1.83
920691	AA2-178 C	2.25
920692	AA2-178 E	5.48
923832	AB2-022 E	0.55
925121	AB2-169 C	0.93
925122	AB2-169 E	4.73
925591	AC1-034 C	-2.23

16 Affected Systems

16.1 Duke Energy Progress

Enter into an Affected System Facilities Study agreement with Duke / Progress Energy (DEP) to determine how to mitigate the Line #218 Everetts – Greenville 115kV overload. The upgrade will likely be a complete reconductor, probably replacing some structures. The estimated cost is \$8.5 million and is anticipated to require 36 months to complete

17 Short Circuit

The following Breakers are overduty

None

18 Stability

The project Stability Study will be complete as part of the Facilities Study.

System Configuration Queue AE1-072 Switching Station Line 230 kV #269 Fentress Shawboro 230/ Substation 34.5 kV Substation ï M Sligo i Interconnected Transmission Owner . ----Interconnection Customer Key Point of ☆ Interconnection ≁= Inverter 34.5kV Existing Facility Solar Attachment Facilities - -Network Upgrade Queue AE1-072 M Revenue Meter Date Revised: 1/29/2019

Attachment 1

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AE1-072: Shawboro - Sligo 230kV

CONFIDENTIAL

EXHIBIT B

LCOT Calculations February 2, 2022