



**Generation Interconnection
Feasibility Study Report
for
Queue Project AF1-294
JETERSVILLE-PONTON 115 KV
30 MW Capacity / 50 MW Energy**

January, 2020

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1 Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between, 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 feasibility study is to determine a plan, with ballpark cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer. The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances, a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. Cost allocation rules for network upgrades can be found in PJM Manual 14A, Attachment B. 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 impact study is performed.

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.

PJM utilizes manufacturer models to ensure the performance of turbines is properly captured during the simulations performed for stability verification and, where applicable, for compliance with low voltage ride through requirements. Turbine manufacturers provide such models to their customers. The list of manufacturer models PJM has already validated is contained in Attachment B of Manual 14G. Manufacturer models may be updated from time to time, for various reasons such as to reflect changes to the control systems or to more accurately represent the capabilities turbines and controls which are currently available in the field. Additionally, as new turbine models are developed, turbine manufacturers provide such new models which must be used in the conduct of these studies. PJM needs adequate time to evaluate the new models in order to reduce delays to the System Impact Study process timeline for the Interconnection Customer as well as other Interconnection Customers in the study group. Therefore, PJM will require that any Interconnection Customer with a new manufacturer model must supply that model to PJM, along with a \$10,000 fully refundable deposit, no later than three (3) months prior to the starting date of the System Impact Study (See Section 4.3 for starting dates) for the Interconnection Request which shall specify the use of the new model.

The Interconnection Customer will be required to submit a completed dynamic model study request form (Attachment B-1 of Manual 14G) in order to document the request for the study.

The Feasibility 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.

3 General

The Interconnection Customer (IC), has proposed a solar generating facility located in Amelia County, Virginia. The installed facilities will have a total capability of 50 MW with 30 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 12/01/2022. This study does not imply a TO commitment to this in-service date.

Queue Number	AF1-294
Project Name	JETERSVILLE-PONTON 115 KV
State	Virginia
County	Amelia
Transmission Owner	Dominion
MFO	50
MWE	50
MWC	30
Fuel	Solar
Basecase Study Year	2023

3.1 Point of Interconnection

AF1-294 will interconnect with the Dominion transmission system at a new 115 kV three breaker ring bus substation tapping the Jetersville to Ponton 115 kV line. This is the primary Point of Interconnection (POI) chosen by the IC. The IC is responsible for securing right-of-way, permits and constructing the proposed attachment line from the solar facility site to the proposed new substation. Attachment 1 shows a one-line diagram of the proposed interconnection facilities. The IC may not install any facilities on Dominion’s right-of-way without first obtaining the necessary approval from Dominion Energy.

There was no secondary point of interconnection specified for AF1-294.

3.2 Cost Summary

The AF1-294 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$ 1,700,000
Direct Connection Network Upgrade	\$ 5,500,000
Non Direct Connection Network Upgrades	\$ 1,600,000
Total Costs	\$ 8,800,000

In addition, the AF1-294 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	\$ 417,893,000

Cost allocations for these upgrades will be provided in the System Impact Study Report.

The Feasibility Study is used to make a preliminary determination of the type and scope of Attachment Facilities, Local Upgrades, and Network Upgrades that will be necessary to accommodate the Interconnection Request and to provide the Interconnection Customer a preliminary estimate of the time that will be required to construct any necessary facilities and upgrades and the Interconnection Customer's cost responsibility. The System Impact Study provides refined and comprehensive estimates of cost responsibility and construction lead times for new facilities and system upgrades. Facilities Studies will include, commensurate with the degree of engineering specificity as provided in the Facilities Study Agreement, good faith estimates of the cost, determined in accordance with Section 217 of the Tariff,

- (a) to be charged to each affected New Service Customer for the Facilities and System Upgrades that are necessary to accommodate this queue project;
- (b) the time required to complete detailed design and construction of the facilities and upgrades; and
- (c) a description of any site-specific environmental issues or requirements that could reasonably be anticipated to affect the cost or time required to complete construction of such facilities and upgrades.

4 Transmission Owner Scope of Work

Dominion assessed the impact of the proposed Queue Project AF1-294. The project was evaluated as a 30 MW Capacity (50 MW Energy) injection at a single line tap between Jetersville 115 kV substation and Ponton 115 kV substation in the Dominion Transmission System, for compliance with NERC Reliability Criteria on Dominion Transmission System. The system was assessed using the summer 2023 AF1 case provided to Dominion by PJM. When performing a generation analysis, Dominion's main analysis will be load flow study results under

single contingency (both normal and stressed system conditions). Dominion Criteria considers a transmission facility overloaded if it exceeds 94% of its emergency rating under normal and stressed system conditions. A full listing of Dominion’s Planning Criteria and interconnection requirements can be found in the Company’s Facility Connection Requirements which are publicly available at: <http://www.dominionenergy.com>.

The results of these studies evaluate the system under a limited set of operating conditions and do not guarantee the full delivery of the capacity and associated energy of this proposed generation facility under all operating conditions. NERC Planning and Operating Reliability Criteria allow for the re-dispatch of generating units to resolve projected and actual deficiencies in real time and planning studies. Specifically, in Planning Studies, NERC Planning Event 3 and 6 Contingency Conditions (Loss of generator, transmission circuit, transformer, shunt device, or Single Pole of a DC line followed by the loss of a generator, transmission circuit, transformer, shunt device or single pole of a DC line) allow for re-dispatch of generating units to resolve potential reliability deficiencies. For Dominion Planning Criteria the re-dispatch of generating units for these contingency conditions is allowed as long as the projected loading does not exceed 100% of a facility Load Dump Rating.

The required Attachment Facilities, Direct Connection and Non-Direct Connection work for the interconnection of the AF1-294 generation project to the Dominion Transmission System is detailed in the following sections. The associated one-line with the generation project attachment facilities and primary direct and non-direct connection are shown in Attachment 1.

Note that the ITO findings were made from a conceptual review of this project. A more detailed review of the connection facilities and their cost will be identified in a future study phases. Further note that the cost estimate data contained in this document should be considered high level estimates since it was produced without a detailed engineering review. The applicant will be responsible for the actual cost of construction. ITO herein reserves the right to return to any issues in this document and, upon appropriate justification, request additional monies to complete any reinforcements to the transmission systems.

5 Attachment Facilities

To accommodate the proposed AF1-294 Project, Dominion Energy will install one span of overhead 115 kV line to the point of interconnection (“POI”) including 115 kV interconnection metering.

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 (Metering)	\$ 500,000
Transmission (One span)	\$ 1,200,000

Description	Total Cost
Total Attachment Facility Costs	\$ 1,700,000

It is estimated to take 18-24 months to complete this work upon execution of an Interconnection Construction Service Agreement (ICSA). 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. See Attachment 1.

6 Direct Connection Cost Estimate

To accommodate the proposed AF1-294 Project, Dominion Energy will build a new three breaker 115 kV Switching Station.

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	\$ 5,500,000
Total Direct Connection Facility Costs	\$5,500,000

It is estimated to take 24-30 months to complete this work upon execution of an Interconnection Construction Service Agreement (ICSA). 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. See Attachment 1.

7 Non-Direct Connection Cost Estimate

To accommodate the proposed AF1-294 Project, Dominion Energy will re-arrange the existing section of the line between Jeterville and Ponton 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 (one span)	\$ 1,600,000
Total Direct Connection Facility Costs	\$1,600,000

It is estimated to take 24-30 months to complete this work upon execution of an Interconnection Construction Service Agreement (ICSA). 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. See Attachment 1.

Remote Terminal Work: 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.

8 Schedule

The schedule for the required Network Impact Reinforcements will be more clearly identified in future study phases. The estimate elapsed time to complete each of the required reinforcements is identified in the "System Reinforcements" section of the report.

9 Transmission Owner Analysis

9.1 Power Flow Analysis

PJM performed a power flow analysis of the transmission system using a 2023 summer peak load flow model and the results were verified by Dominion. Additionally, Dominion performed an analysis of its transmission system and no further deficiencies were identified.

9.2 Short Circuit Analysis

PJM performed a short circuit analysis and the results were verified by Dominion. The connection of AF1-249 project to the system does not result in any newly overdutied circuit breakers on the Dominion transmission system and does not have a significant fault current contribution to existing overdutied circuit breakers

9.3 Stability Analysis

PJM will complete a dynamic stability analysis, if necessary, as part of the System Impact Study. The results of this analysis will be reviewed by Dominion. Should stability concerns be identified in PJM's study, Dominion will develop appropriate system reinforcement(s) and included the estimated cost of any reinforcement(s) in Dominion's System Impact Study report.

10 Interconnection Customer Requirements

10.1 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:

<https://www.dominionenergy.com/company/moving-energy/electric-transmission-access>. 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.

10.2 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: <https://www.dominionenergy.com/company/moving-energy/electric-transmission-access>. 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:

<https://www.dominionenergy.com/company/moving-energy/electric-transmission-access>.

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.

10.3 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.

11 Revenue Metering and SCADA Requirements

11.1 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.

11.1.1 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

11.2 Dominion Requirements

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

12 Network Impacts

The Queue Project AF1-294 was evaluated as a 50.0 MW (Capacity 30.0 MW) injection tapping the Jetersville to Ponton 115 kV line in the Dominion area. Project AF1-294 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-294 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

12.1 Generation Deliverability

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
43252475	314701	3LONEPN	115.0	DVP	314707	3MORAN	115.0	DVP	1	DVP_P1-2: LN 98-C	single	203.98	91.62	106.32	DC	30.0
43252481	314707	3MORAN	115.0	DVP	314691	3FARMVIL	115.0	DVP	1	DVP_P1-2: LN 98-C	single	203.98	89.31	104.02	DC	30.0
42959277	314936	8RAWLINGS	500.0	DVP	940470	AE2-031 TAP	500.0	DVP	1	DVP_P1-2: LN 585-A	single	4070.2	99.89	100.02	DC	5.1

12.2 Multiple Facility Contingency

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

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
43252175	924160	AB2-060 TAP	115.0	DVP	314267	3CHASCTY2	115.0	DVP	1	DVP_P4-2: 1T158	breaker	349.0	97.93	112.25	DC	50.0

12.3 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)

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
42958949	314702	3KERR	115.0	DVP	304102	3GW KING TAP	115.0	CPLE	1	DVP_P4-6: CAROLINT122	breaker	199.0	133.65	136.68	DC	6.04
42959331	314702	3KERR	115.0	DVP	304102	3GW KING TAP	115.0	CPLE	1	DVP_P7-1: LN 22-90-A	tower	199.0	139.28	142.28	DC	5.97
42959332	314702	3KERR	115.0	DVP	304102	3GW KING TAP	115.0	CPLE	1	DVP_P7-1: LN 22-90-B	tower	199.0	127.81	130.81	DC	5.97
46434715	314702	3KERR	115.0	DVP	304102	3GW KING TAP	115.0	CPLE	1	DVP_P4-2: H2T296	breaker	199.0	128.74	129.87	DC	4.99

12.4 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.

ID	FROM BUS#	FROM BUS	kV	FROM BUS AREA	TO BUS#	TO BUS	kV	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPAC T
43252638	314694	3GRIT	115.0	DVP	314712	3OTTER R	115.0	DVP	1	DVP_P1-2: LN 556-B	operatio n	285.76	111.63	112.12	DC	3.1
43252473	314701	3LONEP N	115.0	DVP	314707	3MORAN	115.0	DVP	1	DVP_P1-2: LN 98-C	operatio n	203.98	159.07	183.58	DC	50.0
42959209	314702	3KERR	115.0	DVP	304102	3GW KING TAP	115.0	CPLE	1	DVP_P1-2: LN 296-B	operatio n	199.0	127.9	129.01	DC	4.89
42959210	314702	3KERR	115.0	DVP	304102	3GW KING TAP	115.0	CPLE	1	DVP_P1-2: LN 296-A	operatio n	199.0	127.9	129.01	DC	4.89
42959214	314702	3KERR	115.0	DVP	304102	3GW KING TAP	115.0	CPLE	1	Base Case	operatio n	199.0	113.11	114.1	DC	4.38
43252479	314707	3MORAN	115.0	DVP	314691	3FARMVIL	115.0	DVP	1	DVP_P1-2: LN 98-C	operatio n	203.98	156.76	181.27	DC	50.0
43252622	314712	3OTTER R	115.0	DVP	314666	3ALTVSTA	115.0	DVP	1	DVP_P1-2: LN 556-B	operatio n	269.78	112.61	113.13	DC	3.1
43252685	314726	3WILLIS	115.0	DVP	314691	3FARMVIL	115.0	DVP	1	DVP_P1-2: LN 158	operatio n	205.86	98.61	101.98	DC	6.93
43252541	924160	AB2-060 TAP	115.0	DVP	314267	3CHASCTY2	115.0	DVP	1	DVP_P1-2: LN 158	operatio n	269.78	120.35	138.88	DC	50.0
43252542	924160	AB2-060 TAP	115.0	DVP	314267	3CHASCTY2	115.0	DVP	1	Base Case	operatio n	247.22	109.2	118.2	DC	22.27
42959093	927250	AC1-221 TAP	230.0	DVP	304070	6PERSON23 OT	230.0	CPLE	1	DVP_P1-2: LN 556-B	operatio n	718.0	149.62	151.24	DC	11.71
42959099	927250	AC1-221 TAP	230.0	DVP	304070	6PERSON23 OT	230.0	CPLE	1	Base Case	operatio n	542.0	99.89	101.03	DC	6.18
43252673	936260	AD2-033 TAP	115.0	DVP	924160	AB2-060 TAP	115.0	DVP	1	DVP_P1-2: LN 158	operatio n	269.78	90.69	109.23	DC	50.0
43252628	942750	AE2-291 TAP	115.0	DVP	314694	3GRIT	115.0	DVP	1	DVP_P1-2: LN 556-B	operatio n	285.76	112.33	112.82	DC	3.1

12.5 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
43252175	4	AB2-060 TAP 115.0 kV - 3CHASCTY2 115.0 kV Ckt 1	dom-151 : Replace circuit breaker switch at Chase City Project Type : FAC Cost : \$200,000 Time Estimate : 30-36 Months	\$200,000
43252481	2	3MORAN 115.0 kV - 3FARMVIL 115.0 kV Ckt 1	dom-179 : Rebuild 5.3 miles of 115 kV Line 158 from Farmville to Moran DP with 636 ACSR. Project Type : FAC Cost : \$6,890,000 Time Estimate : 30-36 Months	\$6,890,000
43252475	1	3LONEPN 115.0 kV - 3MORAN 115.0 kV Ckt 1	dom-178 : Reconnector 7.8 miles of 115 kV Line 158 from Lone Pine to Moran DP with 768 ACSS. Project Type : FAC Cost : \$4,680,000 Time Estimate : 30-36 Months	\$4,680,000
42959277	3	8RAWLINGS 500.0 kV - AE2-031 TAP 500.0 kV Ckt 1	dom-183 : Build new 500 kV Line from Rawlings to Morrisville Substation 110 miles. Project Type : CON Cost : \$400,000,000 Time Estimate : 60-72 Months	\$400,000,000
42958949,46434715, 42959331,42959332	5	3KERR 115.0 kV - 3GW KING TAP 115.0 kV Ckt 1	dom-002 : For DEV portion, rebuild 4.7 miles of 115 kV Line 45 from Kerr Dam to GW King Tap with 768 ACSS. Project Type : FAC Cost : \$6,123,000 Time Estimate : 30-36 Months	\$6,123,000
			TOTAL COST	\$417,893,000

12.6 Flow Gate Details

The following indices contain additional information about each flowgate presented in the body of the report. For each index, 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.

12.6.1 Contingency Descriptions

Contingency Name	Contingency Definition
DVP_P4-6: CAROLIN T122	CONTINGENCY 'DVP_P4-6: CAROLIN T122' /* CAROLINA 115 KV OPEN BRANCH FROM BUS 314559 TO BUS 315126 CKT 1 /* 3CAROLNA 115.00 - 1ROARAP2 14.400 OPEN BRANCH FROM BUS 314559 TO BUS 315128 CKT 1 /* 3CAROLNA 115.00 - 1ROARAP4 14.400 OPEN BUS 315126 /* ISLAND: 1ROARAP2 14.400 OPEN BUS 315128 /* ISLAND: 1ROARAP4 14.400 OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* 3CAROLNA 115.00 - 3EATON F 115.00 OPEN BRANCH FROM BUS 313722 TO BUS 314559 CKT 1 /* 3OCCONEECHEE115.00 - 3CAROLNA 115.00 OPEN BRANCH FROM BUS 314259 TO BUS 314559 CKT Z1 /* 3CAROL56_1 115.00 - 3CAROLNA 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314578 CKT 1 /* 3CAROLNA 115.00 - 3HORNRTN 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314585 CKT 1 /* 3CAROLNA 115.00 - 3L GASTN 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* 3CAROLNA 115.00 - 3PLHITP 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* 3CAROLNA 115.00 - 6CAROLNA 230.00 OPEN BUS 314559 /* 3CAROLNA 115.00 KV END
DVP_P1-2: LN 296-B	CONTINGENCY 'DVP_P1-2: LN 296-B' OPEN BRANCH FROM BUS 927250 TO BUS 314697 CKT 1 /* AC1-221 TAP T230.00 - 6SEDGE HILL 230.00 END
DVP_P1-2: LN 556-B	CONTINGENCY 'DVP_P1-2: LN 556-B' OPEN BRANCH FROM BUS 945810 TO BUS 314936 CKT 1 /* AF1-246 TAP 500.00 - 8RAWLINGS 500.00 END
DVP_P1-2: LN 585-A	CONTINGENCY 'DVP_P1-2: LN 585-A' OPEN BRANCH FROM BUS 314902 TO BUS 941030 CKT 1 /* 8CARSON 500.00 - AE2-094 TAP 500.00 END

Contingency Name	Contingency Definition
DVP_P4-2: 1T158	CONTINGENCY 'DVP_P4-2: 1T158' /* LONE PINE 230 KV OPEN BRANCH FROM BUS 314426 TO BUS 314701 CKT 1 /* 3FT PKET 115.00 - 3LONEPN 115.00 OPEN BUS 314426 /* ISLAND: 3FT PKET 115.00 OPEN BRANCH FROM BUS 314519 TO BUS 314701 CKT 1 /* 3LONEPINE_1 115.00 - 3LONEPN 115.00 OPEN BRANCH FROM BUS 314691 TO BUS 314707 CKT 1 /* 3FARMVIL 115.00 - 3MORAN 115.00 OPEN BRANCH FROM BUS 314701 TO BUS 314707 CKT 1 /* 3LONEPN 115.00 - 3MORAN 115.00 OPEN BUS 314519 /* ISLAND: 3LONEPINE_1 115.00 OPEN BUS 314707 /* ISLAND: 3MORAN 115.00 END
DVP_P7-1: LN 22-90-A	CONTINGENCY 'DVP_P7-1: LN 22-90-A' OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* 3CAROLNA 115.00 - 3EATON F 115.00 OPEN BRANCH FROM BUS 314571 TO BUS 925780 CKT 1 /* 3EATON F 115.00 - AC1-054 TAP 115.00 OPEN BUS 314571 /* ISLAND: 3EATON F 115.00 OPEN BRANCH FROM BUS 314265 TO BUS 314584 CKT 1 /* 3FIVEFORKSDP115.00 - 3LITTLTN 115.00 OPEN BRANCH FROM BUS 314265 TO BUS 314673 CKT 1 /* 3FIVEFORKSDP115.00 - 3PALMERSPRNG115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314585 CKT 1 /* 3CAROLNA 115.00 - 3L GASTN 115.00 OPEN BRANCH FROM BUS 314584 TO BUS 314585 CKT 1 /* 3LITTLTN 115.00 - 3L GASTN 115.00 OPEN BUS 314265 /* ISLAND: 3FIVEFORKSDP115.00 OPEN BUS 314584 /* ISLAND: 3LITTLTN 115.00 OPEN BUS 314585 /* ISLAND: 3L GASTN 115.00 END
DVP_P1-2: LN 98-C	CONTINGENCY 'DVP_P1-2: LN 98-C' OPEN BRANCH FROM BUS 924160 TO BUS 314267 CKT 1 /* AB2-060 TAP 115.00 - 3CHASCTY2 115.00 END
DVP_P7-1: LN 22-90-B	CONTINGENCY 'DVP_P7-1: LN 22-90-B' OPEN BRANCH FROM BUS 925780 TO BUS 314702 CKT 1 /* AC1-054 TAP 115.00 - 3KERR 115.00 OPEN BRANCH FROM BUS 314265 TO BUS 314584 CKT 1 /* 3FIVEFORKSDP115.00 - 3LITTLTN 115.00 OPEN BRANCH FROM BUS 314265 TO BUS 314673 CKT 1 /* 3FIVEFORKSDP115.00 - 3PALMERSPRNG115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314585 CKT 1 /* 3CAROLNA 115.00 - 3L GASTN 115.00 OPEN BRANCH FROM BUS 314584 TO BUS 314585 CKT 1 /* 3LITTLTN 115.00 - 3L GASTN 115.00 OPEN BUS 314265 /* ISLAND: 3FIVEFORKSDP115.00 OPEN BUS 314584 /* ISLAND: 3LITTLTN 115.00 OPEN BUS 314585 /* ISLAND: 3L GASTN 115.00 END
Base Case	

Contingency Name	Contingency Definition
DVP_P4-2: H2T296	CONTINGENCY 'DVP_P4-2: H2T296' /* SEDGE HILL 230 KV OPEN BRANCH FROM BUS 927250 TO BUS 314697 CKT 1 /* AC1-221 TAP T230.00 - 6SEEDGE HILL 230.00 OPEN BRANCH FROM BUS 314696 TO BUS 314697 CKT 2 /* 3SEEDGE HILL 115.00 - 6SEEDGE HILL 230.00 END
DVP_P1-2: LN 296-A	CONTINGENCY 'DVP_P1-2: LN 296-A' OPEN BRANCH FROM BUS 304070 TO BUS 927250 CKT 1 /* 6PERSON230 T230.00 - AC1-221 TAP 230.00 END
DVP_P1-2: LN 158	CONTINGENCY 'DVP_P1-2: LN 158' OPEN BRANCH FROM BUS 314519 TO BUS 314701 CKT 1 /* 3LONEPINE_1 115.00 - 3LONEPN 115.00 OPEN BRANCH FROM BUS 314691 TO BUS 314707 CKT 1 /* 3FARMVIL 115.00 - 3MORAN 115.00 OPEN BRANCH FROM BUS 314701 TO BUS 314707 CKT 1 /* 3LONEPN 115.00 - 3MORAN 115.00 OPEN BUS 314519 /* ISLAND: 3LONEPINE_1 115.00 OPEN BUS 314707 /* ISLAND: 3MORAN 115.00 END

12.6.2 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC/DC	MW IMPACT
43252475	314701	3LONEPN	DVP	314707	3MORAN	DVP	1	DVP_P1-2: LN 98-C	single	203.98	91.62	106.32	DC	30.0

Bus #	Bus	MW Impact
313853	3PONTONDP	0.4466
314429	3JTRSVLE	1.7865
924161	AB2-060 C OP	54.3946
925831	AC1-062	0.2652
936261	AD2-033 C	77.9922
939371	AE1-168 C	89.9910
946301	AF1-294 C	29.9970
DUCKCREEK	DUCKCREEK	0.0115
NEWTON	NEWTON	0.0107
FARMERCITY	FARMERCITY	0.0006
NY	NY	0.0055
PRAIRIE	PRAIRIE	0.0258
COFFEEN	COFFEEN	0.0053
EDWARDS	EDWARDS	0.0035
CHEOAH	CHEOAH	0.0050
TILTON	TILTON	0.0063
GIBSON	GIBSON	0.0055
CALDERWOOD	CALDERWOOD	0.0050
BLUEG	BLUEG	0.0174
TRIMBLE	TRIMBLE	0.0056
CATAWBA	CATAWBA	0.0035

12.6.3 Index 2

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC/DC	MW IMPACT
43252481	314707	3MORAN	DVP	314691	3FARMVIL	DVP	1	DVP_P1-2: LN 98-C	single	203.98	89.31	104.02	DC	30.0

Bus #	Bus	MW Impact
313853	3PONTONDP	0.4466
314429	3JTRSVLE	1.7865
924161	AB2-060 C OP	54.3946
925831	AC1-062	0.2652
936261	AD2-033 C	77.9922
939371	AE1-168 C	89.9910
946301	AF1-294 C	29.9970
DUCKCREEK	DUCKCREEK	0.0115
NEWTON	NEWTON	0.0107
FARMERCITY	FARMERCITY	0.0006
NY	NY	0.0055
PRAIRIE	PRAIRIE	0.0258
COFFEEN	COFFEEN	0.0053
EDWARDS	EDWARDS	0.0035
CHEOAH	CHEOAH	0.0050
TILTON	TILTON	0.0063
GIBSON	GIBSON	0.0055
CALDERWOOD	CALDERWOOD	0.0050
BLUEG	BLUEG	0.0174
TRIMBLE	TRIMBLE	0.0056
CATAWBA	CATAWBA	0.0035

12.6.4 Index 3

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
42959277	314936	8RAWLINGS	DVP	940470	AE2-031 TAP	DVP	1	DVP_P1-2: LN 585-A	single	4070.2	99.89	100.02	DC	5.1

Bus #	Bus	MW Impact
246844	05SMG2	2.9211
246845	05SMG3	1.6579
246846	05SMG4	2.9211
246847	05SMG5	1.1046
247284	05LEESVG	0.8393
313853	3PONTONDP	0.0759
314429	3JTRSVLE	0.3036
314947	8GREENSVILLE	134.4648
315102	1BRUNSWICKG1	22.3569
315103	1BRUNSWICKG2	22.3569
315104	1BRUNSWICKG3	22.3569
315105	1BRUNSWICKS1	46.4463
315153	1CLOVER1	28.2154
315154	1CLOVER2	27.9342
315156	1HALLBR1	1.0084
315158	1KERR 1	0.3162
315159	1KERR 2	0.8854
315160	1KERR 3	0.8854
315161	1KERR 4	0.8854
315162	1KERR 5	0.8854
315163	1KERR 6	0.8854
315164	1KERR 7	0.8854
315266	1PLYWOOD A	1.7080
919841	AA2-070	0.5368
923831	AB2-022 C	-1.6983
924021	AB2-043 C O1	3.1718
924161	AB2-060 C OP	9.1370
924301	AB2-077 C O1	2.0444
924311	AB2-078 C O1	2.0444
924321	AB2-079 C O1	2.0444
925611	AC1-036 C	0.9629

Bus #	Bus	MW Impact
925661	AC1-042 C	2.0418
925781	AC1-054 C O1	5.2167
925831	AC1-062	0.0451
925861	AC1-065 C	-2.4012
925991	AC1-075 C	8.4241
926021	AC1-080 C	2.8154
926051	AC1-083 C O1	5.2717
926271	AC1-105 C O1	9.0866
926461	AC1-117 C	0.9783
926641	AC1-145 C	2.4307
926661	AC1-147 C	-1.9115
927251	AC1-221 C	4.0242
927261	AC1-222 C	6.3376
932761	AC2-100 C	9.2612
932831	AC2-110 C	-0.9605
933941	AD1-017 C	1.0543
934311	AD1-055 C	4.4003
934341	AD1-058 C	10.0881
934611	AD1-087 C O1	19.4630
934621	AD1-088 C	19.1445
934991	AD1-131 C	3.3076
935111	AD1-144 C	-1.3523
935171	AD1-152 C O1	19.3421
935211	AD1-156 C	-1.6568
935221	AD1-157 C	1.5320
935231	AD1-160 C	1.1235
936151	AD2-021	-0.1571
936161	AD2-022 C O1	13.4034
936171	AD2-023 C O1	7.8186
936261	AD2-033 C	13.1648
936301	AD2-039 C	-0.9605
936331	AD2-043 C (Withdrawn : 12/20/2019)	8.2392
936361	AD2-046 C O1	8.4206
936481	AD2-063 C O1	15.1425
937251	AD2-164	-3.7982
937481	AD2-202 C O1	5.1579
937541	AD2-215 C	-1.3662
938371	AE1-056 C	6.6045
938491	AE1-068 C O1	190.3547
938501	AE1-069 C O1	150.4095

Bus #	Bus	MW Impact
938741	AE1-100 C O1	5.5945
938931	AE1-121 O1	64.4902
939181	AE1-148 C O1	8.3371
939371	AE1-168 C	15.2640
939941	AE1-230 C	0.9211
940081	AE1-250 C	14.1993
940241	AE2-006	0.4899
940601	AE2-047 C O1	4.6131
940661	AE2-053 O1	3.0878
941031	AE2-094 C	122.4428
941431	AE2-140 C O1	16.9021
941671	AE2-166 C	6.9509
941791	AE2-182 C	3.6466
941801	AE2-185 C	4.6055
941821	AE2-187 C	4.6055
942321	AE2-245	0.8895
942451	AE2-258	2.3663
942461	AE2-259 C O1	10.2684
942671	AE2-283 C	5.0660
942751	AE2-291 C O1	11.9634
942761	AE2-292 C O1	14.8956
943811	AF1-049 C O1	11.8807
943901	AF1-058 C	3.5119
944011	AF1-069 C	40.0066
945081	AF1-173	1.7846
945811	AF1-246 C O1	21.6094
946301	AF1-294 C	5.0976
946461	AF1-310 C O1 (Withdrawn : 11/05/2019)	52.1949
LGEE	LGEE	2.9421
CPLE	CPLE	14.6641
WEC	WEC	1.5586
CBM-W2	CBM-W2	61.5806
NY	NY	1.9145
CBM-W1	CBM-W1	58.1715
TVA	TVA	12.9444
CBM-S2	CBM-S2	104.7972
CBM-S1	CBM-S1	72.3007
MADISON	MADISON	3.5099
MEC	MEC	9.3830
AA2-074	AA2-074	9.9972

12.6.5 Index 4

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
43252175	924160	AB2-060 TAP	DVP	314267	3CHASCTY2	DVP	1	DVP_P4-2: 1T158	breaker	349.0	97.93	112.25	DC	50.0

Bus #	Bus	MW Impact
313853	3PONTONDP	0.4466
314429	3JTRSVLE	1.7865
924161	AB2-060 C OP	54.3946
924162	AB2-060 E OP	25.5974
925831	AC1-062	0.2652
936261	AD2-033 C	77.9922
936262	AD2-033 E	51.9948
939371	AE1-168 C	89.9910
939372	AE1-168 E	59.9940
946301	AF1-294 C	29.9970
946302	AF1-294 E	19.9980
DUCKCREEK	DUCKCREEK	0.0115
NEWTON	NEWTON	0.0107
FARMERCITY	FARMERCITY	0.0006
NY	NY	0.0055
PRAIRIE	PRAIRIE	0.0258
O-066	O-066	0.0672
COFFEEN	COFFEEN	0.0053
EDWARDS	EDWARDS	0.0035
CHEOAH	CHEOAH	0.0050
TILTON	TILTON	0.0063
G-007	G-007	0.0104
GIBSON	GIBSON	0.0055
CALDERWOOD	CALDERWOOD	0.0050
BLUEG	BLUEG	0.0174
TRIMBLE	TRIMBLE	0.0056
CATAWBA	CATAWBA	0.0035

12.6.6 Index 5

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADING %	POST PROJECT LOADING %	AC DC	MW IMPACT
42959331	314702	3KERR	DVP	304102	3GW KING TAP	CPL	1	DVP_P7-1: LN 22-90-A	tower	199.0	139.28	142.28	DC	5.97

Bus #	Bus	MW Impact
313853	3PONTONDP	0.0533
314429	3JTRSVLE	0.2133
315158	1KERR 1	0.7319
315159	1KERR 2	2.0493
315160	1KERR 3	2.0493
315161	1KERR 4	2.0493
315162	1KERR 5	2.0493
315163	1KERR 6	2.0493
315164	1KERR 7	2.0493
924021	AB2-043 C O1	3.6779
924022	AB2-043 E O1	3.2887
924161	AB2-060 C OP	10.4535
924162	AB2-060 E OP	4.9193
924301	AB2-077 C O1	2.3771
924302	AB2-077 E O1	1.5847
924311	AB2-078 C O1	2.3771
924312	AB2-078 E O1	1.5847
924321	AB2-079 C O1	2.3771
924322	AB2-079 E O1	1.5847
925611	AC1-036 C	0.8793
925612	AC1-036 E	1.4347
925781	AC1-054 C O1	15.5554
925782	AC1-054 E O1	7.1660
925831	AC1-062	0.0317
926271	AC1-105 C O1	2.4430
926272	AC1-105 E O1	1.2161
935221	AD1-157 C	0.9678
935222	AD1-157 E	0.6452
935231	AD1-160 C	0.7097
935232	AD1-160 E	0.9785
936261	AD2-033 C	12.6017

Bus #	Bus	MW Impact
936262	AD2-033 E	8.4011
936361	AD2-046 C O1	17.8275
936362	AD2-046 E O1	8.1981
936481	AD2-063 C O1	16.1154
936482	AD2-063 E O1	10.6541
938371	AE1-056 C	4.1722
938372	AE1-056 E	2.2796
939181	AE1-148 C O1	17.2082
939182	AE1-148 E O1	11.4721
939371	AE1-168 C	11.8206
939372	AE1-168 E	7.8804
940241	AE2-006	0.4474
940661	AE2-053 O1	6.3734
942451	AE2-258	2.7439
942461	AE2-259 C O1	3.7842
942462	AE2-259 E O1	2.5228
943901	AF1-058 C	0.3011
943902	AF1-058 E	0.2007
943911	AF1-059	12.3260
946301	AF1-294 C	3.5820
946302	AF1-294 E	2.3880
DUCKCREEK	DUCKCREEK	0.4491
NEWTON	NEWTON	0.4448
FARMERCITY	FARMERCITY	0.0258
G-007A	G-007A	0.1462
VFT	VFT	0.3870
PRAIRIE	PRAIRIE	1.2140
COFFEEN	COFFEEN	0.2204
EDWARDS	EDWARDS	0.1333
CHEOAH	CHEOAH	0.3804
TILTON	TILTON	0.2350
GIBSON	GIBSON	0.2135
CALDERWOOD	CALDERWOOD	0.3698
BLUEG	BLUEG	0.6545
TRIMBLE	TRIMBLE	0.2070
CATAWBA	CATAWBA	0.4186

Short Circuit

12.7 Short Circuit

The following Breakers are overdutied:

None

Affected Systems

13 Affected Systems

13.1 Duke Energy Progress

Duke Energy Progress Impacts to be determined during later study phases (as applicable).

Attachment 1
System Configuration