



**Generation Interconnection
Feasibility Study Report
for
Queue Project AF1-059
BRODNAX-SOUTH HILL 115 KV
100 MW Capacity / 100 MW Energy**

January, 2020

Table of Contents

1	Introduction	4
2	Preface	4
3	General	5
3.1	Point of Interconnection	5
3.2	Cost Summary	5
4	Attachment Facilities	7
5	Direct Connection Cost Estimate	8
6	Non-Direct Connection Cost Estimate	8
7	Schedule	9
8	Transmission Owner Analysis	9
8.1	Power Flow Analysis	9
8.2	Short Circuit Analysis	9
8.3	Stability Analysis	9
9	Interconnection Customer Requirements	9
9.1	System Protection	9
9.2	Compliance Issues and Interconnection Customer Requirements	10
9.3	Power Factor Requirements	10
10	Revenue Metering and SCADA Requirements	10
10.1	PJM Requirements	10
10.1.1	Meteorological Data Reporting Requirement	10
10.2	Dominion Requirements	11
11	Network Impacts	11
11.1	Generation Deliverability	13
11.2	Multiple Facility Contingency	13
11.3	Contribution to Previously Identified Overloads	13
11.4	Potential Congestion due to Local Energy Deliverability	13
11.5	System Reinforcements	15
11.6	Flow Gate Details	16

11.6.1 Contingency Descriptions 16

11.6.2 Index 1..... 20

11.6.3 Index 2..... 24

11.6.4 Index 3..... 27

11.6.5 Index 4..... 30

11.6.6 Index 5..... 32

11.7 Short Circuit..... 36

12 Affected Systems 38

 12.1 Duke Energy Progress..... 38

Attachment 1 39

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.

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.

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.

3 General

The Interconnection Customer (IC), has proposed a solar/storage generating facility located in Mecklenburg County, Virginia.. The installed facilities will have a total capability of 100 MW with 100 MW of this output being recognized by PJM as Capacity. The proposed in-service date for this project is 10/31/2021. This study does not imply a TO commitment to this in-service date.

Queue Number	AF1-059
Project Name	BRODNAX-SOUTH HILL 115 KV
State	Virginia
County	Mecklenburg
Transmission Owner	Dominion
MFO	100
MWE	100
MWC	100
Fuel	Solar; Storage
Basecase Study Year	2023

3.1 Point of Interconnection

AF1-059 “Brodnax-South Hill 115 KV” will interconnect with the Dominion’s transmission system via a new three breaker switching station on the 115 kV line. This is the primary Point of Interconnection (POI) chosen by the IC with the ITO’s transmission system. 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 is no secondary point of interconnection specified for AF1-059.

3.2 Cost Summary

The AF1-059 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 AF1-059 project may be responsible for a contribution to the following costs

Description	Total Cost
System Upgrades	\$36,698,000

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.

Transmission Owner Scope of Work

Dominion assessed the impact of the proposed Queue Project AF1-059. The project was evaluated as a 100 MW Capacity (100 MW Energy) injection at a single line tap between Brodnax 115 kV substation and South Hill 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 AF1-059 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.

4 Attachment Facilities

To accommodate the proposed AF1-059 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
	\$
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.

5 Direct Connection Cost Estimate

To accommodate the proposed AF1-059 Project, Dominion Energy will build a new three breaker 115 kV substation to allow for the proposed interconnection.

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 One.

6 Non-Direct Connection Cost Estimate

To accommodate the proposed AF1-059 Project, Dominion Energy will re-arrange the existing section of the line between Brodnax and South Hill Substations to allow for the proposed interconnection

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 Non-Direct Connection Facility Costs	\$ 1,600,000

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.

7 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.

8 Transmission Owner Analysis

8.1 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.

8.2 Short Circuit Analysis

PJM performed a short circuit analysis and the results were verified by Dominion. The connection of AF1-059 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.

8.3 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.

9 Interconnection Customer Requirements

9.1 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.

9.2 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.

9.3 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.

10 Revenue Metering and SCADA Requirements

10.1 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.

10.1.1 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

10.2 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>.

11 Network Impacts

The Queue Project AF1-059 was evaluated as a 100 MW (Capacity 100 MW) injection tapping the Brodnax to South Hill 115 KV in the Dominion area. Project AF1-059 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AF1-059 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Load Flow

11.1 Generation Deliverability

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

None

11.2 Multiple Facility Contingency

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

None

11.3 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 PROJE CT LOADI NG %	POST PROJE CT LOADI NG %	AC DC	MW IMPA CT
437138 81	2426 31	05EDAN 1	138.0	AEP	2426 20	05DANVL2	138.0	AEP	1	AEP_P4_#11112_05J .FERR 765_A1	breaker	402.0	118.98	119.63	DC	5.77
437138 82	2426 31	05EDAN 1	138.0	AEP	2426 20	05DANVL2	138.0	AEP	1	AEP_P4_#11111_05J .FERR 765_B1	breaker	402.0	117.45	118.12	DC	6.02
437143 58	2426 31	05EDAN 1	138.0	AEP	2426 20	05DANVL2	138.0	AEP	1	AEP_P1-2_#1377	single	402.0	103.69	105.09	DC	6.02
428540 12	3138 45	6HATHA WAY	230.0	DVP	3042 22	6ROCKYMT2 30T	230.0	CPL E	1	DVP_P1-2: LN 2181	single	478.0	103.97	105.41	DC	6.89
428540 07	3145 91	6NASH	230.0	DVP	3042 26	6PA-RMOUNT#4	230.0	CPL E	1	DVP_P1-2: LN 2058	single	478.0	103.43	104.85	DC	6.82
428538 29	3147 02	3KERR	115.0	DVP	3041 02	3GW KING TAP	115.0	CPL E	1	DVP_P4-6: CAROLIN T122	breaker	199.0	127.13	133.65	DC	12.96
428542 11	3147 02	3KERR	115.0	DVP	3041 02	3GW KING TAP	115.0	CPL E	1	DVP_P7-1: LN 22-90-A	tower	199.0	133.08	139.28	DC	12.33
428542 12	3147 02	3KERR	115.0	DVP	3041 02	3GW KING TAP	115.0	CPL E	1	DVP_P7-1: LN 22-90-B	tower	199.0	121.61	127.81	DC	12.33
460112 15	3147 02	3KERR	115.0	DVP	3041 02	3GW KING TAP	115.0	CPL E	1	DVP_P4-2: H2T296	breaker	199.0	122.93	128.55	DC	11.19
428539 75	9272 50	AC1-221 TAP	230.0	DVP	3040 70	6PERSON23 0T	230.0	CPL E	1	DVP_P1-2: LN 570	single	718.0	120.84	122.06	DC	8.87
428539 77	9272 50	AC1-221 TAP	230.0	DVP	3040 70	6PERSON23 0T	230.0	CPL E	1	DVP_P1-2: LN 556-B	single	718.0	112.67	114.67	DC	14.36

11.4 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	CKT ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC DC	MW IMPACT
43714357	242631	05EDAN 1	138.0	AEP	242620	05DANVL2	138.0	AEP	1	AEP_P1-2_#1377	operation	402.0	117.42	118.1	DC	6.02
42854011	313845	6HATHAWAY	230.0	DVP	304222	6ROCKYMT230T	230.0	CPL	1	DVP_P1-2: LN 2181	operation	478.0	134.22	134.87	DC	6.89
42854004	314591	6NASH	230.0	DVP	304226	6PARMOUNT#4	230.0	CPL	1	DVP_P1-2: LN 2058	operation	478.0	135.0	135.65	DC	6.82
43030179	314600	3PLHITP	115.0	DVP	314559	3CAROLNA	115.0	DVP	1	DVP_P1-2: LN 238-B	operation	315.84	89.86	100.69	DC	34.19
46012798	314615	3SKIPERS	115.0	DVP	925170	AB2-174 TAP	115.0	DVP	1	DVP_P1-2: LN 5254	operation	269.78	102.76	107.97	DC	14.04
43030134	314694	3GRIT	115.0	DVP	314712	3OTTER R	115.0	DVP	1	DVP_P1-2: LN 556-B	operation	285.76	109.44	110.34	DC	5.68
42854089	314702	3KERR	115.0	DVP	304102	3GW KING TAP	115.0	CPL	1	DVP_P1-2: LN 296-B	operation	199.0	122.21	127.71	DC	10.94
42854090	314702	3KERR	115.0	DVP	304102	3GW KING TAP	115.0	CPL	1	DVP_P1-2: LN 296-A	operation	199.0	122.21	127.71	DC	10.94
42854094	314702	3KERR	115.0	DVP	304102	3GW KING TAP	115.0	CPL	1	Base Case	operation	199.0	107.81	112.93	DC	10.19
43030118	314712	3OTTER R	115.0	DVP	314666	3ALTVSTA	115.0	DVP	1	DVP_P1-2: LN 556-B	operation	269.78	110.29	111.24	DC	5.68
43030038	924160	AB2-060 TAP	115.0	DVP	314267	3CHASCTY2	115.0	DVP	1	Base Case	operation	247.22	105.59	109.2	DC	8.91
46012735	925170	AB2-174 TAP	115.0	DVP	314572	3EMPORIA	115.0	DVP	1	DVP_P1-3: 6CAROLNA-TX#4	operation	269.78	116.19	119.92	DC	10.06
46012737	925170	AB2-174 TAP	115.0	DVP	314572	3EMPORIA	115.0	DVP	1	Base Case	operation	247.22	100.13	105.07	DC	12.21
42853973	927250	AC1-221 TAP	230.0	DVP	304070	6PERSON230T	230.0	CPL	1	DVP_P1-2: LN 556-B	operation	718.0	140.44	142.43	DC	14.36
43030124	942750	AE2-291 TAP	115.0	DVP	314694	3GRIT	115.0	DVP	1	DVP_P1-2: LN 556-B	operation	285.76	110.14	111.04	DC	5.68

11.5 System Reinforcements

ID	Index	Facility	Upgrade Description	Cost
43713882,43713881, 43714358	1	05EDAN 1 138.0 kV - 05DANVL2 138.0 kV Ckt 1	AEP Work Scope: n6124 (1): PJM Network Upgrade n6124. Increasing the Danville - East Danville 138 kV circuit summer rating to 572/572/572 MVA will still require us to rebuild the line. The network project has a projected in-service date of 06/01/2021. Cost : \$9,000,000	\$9,000,000
42854012	2	6HATHAWAY 230.0 kV - 6ROCKYMT230T 230.0 kV Ckt 1	dom-003 (555) : For DEV portion, rebuild 4.13 miles of 230 kV Line 2058 from Hathaway to Rocky Mount (Duke Energy/Progress substation) with 2-636 ACSR. Cost : \$10,325,000 Time Estimate : 30-36 Months	\$10,325,000
42853977,42853975	5	AC1-221 TAP 230.0 kV - 6PERSON230 T 230.0 kV Ckt 1	dom-006 (558) : For DEV portion, rebuild 2 miles of 230 kV Line 296 from AC1-221 Tap to Persons (Duke Energy/Progress substation) with 2-636 ACSR. Cost : \$3,000,000 Time Estimate : 30-36 Months	\$3,000,000
42854212,42853829, 42854211,46011215	4	3KERR 115.0 kV - 3GW KING TAP 115.0 kV Ckt 1	dom-002 (280) : For DEV portion, rebuild 4.7 miles of 115 kV Line 45 from Kerr Dam to GW King Tap (Duke Energy/Progress substation) with 768 ACSS. Cost : \$6,123,000 Time Estimate : 30-36 Months	\$6,123,000
42854007	3	6NASH 230.0 kV - 6PA- RMOUNT#4 230.0 kV Ckt 1	dom-005 (556) : For DEV portion, rebuild 3.3 miles of 230 kV Line 2181 from Nash to Parmount (Duke Energy/Progress substation) with 2-636 ACSR. Cost : \$8,250,000 Time Estimate : 30-36 Months	\$8,250,000
			TOTAL COST	\$36,698,000

11.6 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.

11.6.1 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 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
AEP_P4_#11111_05J.FERR 765_B1	CONTINGENCY 'AEP_P4_#11111_05J.FERR 765_B1' OPEN BRANCH FROM BUS 242514 TO BUS 242520 CKT 1 / 242514 05J.FERR 765 242520 05J.FERR 500 1 OPEN BRANCH FROM BUS 242514 TO BUS 242684 CKT 2 / 242514 05J.FERR 765 242684 05J.FERR 138 2 OPEN BRANCH FROM BUS 242520 TO BUS 306719 CKT 1 / 242520 05J.FERR 500 306719 8ANTIOCH 500 1 END

Contingency Name	Contingency Definition
DVP_P1-2: LN 2181	CONTINGENCY 'DVP_P1-2: LN 2181' OPEN BUS 304226 /* ISLAND: 6PA-RMOUNT#4115.00 OPEN BRANCH FROM BUS 304226 TO BUS 314591 CKT 1 /* 6PA-RMOUNT#4230.00 - 6NASH 230.00 OPEN BRANCH FROM BUS 313845 TO BUS 314591 CKT 1 /* 6HATHAWAY 230.00 - 6NASH 230.00 OPEN BUS 314591 /* ISLAND: 6NASH 230.00 END
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
AEP_P1-2_#1377	CONTINGENCY 'AEP_P1-2_#1377' OPEN BRANCH FROM BUS 242514 TO BUS 242520 CKT 1 / 242514 05J.FERR 765 242520 05J.FERR 500 1 OPEN BRANCH FROM BUS 242520 TO BUS 306719 CKT 1 / 242520 05J.FERR 500 306719 8ANTIOCH 500 1 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_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

Contingency Name	Contingency Definition
DVP_P1-2: LN 5254	CONTINGENCY 'DVP_P1-2: LN 5254' OPEN BRANCH FROM BUS 314563 TO BUS 924510 CKT 1 /* 6CLUBHSE 230.00 - AB2-100 TAP 230.00 END
Base Case	
DVP_P1-2: LN 2058	CONTINGENCY 'DVP_P1-2: LN 2058' OPEN BRANCH FROM BUS 304222 TO BUS 313845 CKT 1 /* 6ROCKYMT230T230.00 - 6HATHAWAY 230.00 OPEN BRANCH FROM BUS 313844 TO BUS 313845 CKT 2 /* 3HATHAWAY 115.00 - 6HATHAWAY 230.00 END
DVP_P1-2: LN 238-B	CONTINGENCY 'DVP_P1-2: LN 238-B' OPEN BRANCH FROM BUS 940480 TO BUS 314563 CKT 1 /* AE2-033 TAP 230.00 - 6CLUBHSE 230.00 OPEN BRANCH FROM BUS 314562 TO BUS 314563 CKT 1 /* 3CLUBHSE 115.00 - 6CLUBHSE 230.00 END
DVP_P1-2: LN 570	CONTINGENCY 'DVP_P1-2: LN 570' OPEN BRANCH FROM BUS 304183 TO BUS 314935 CKT 1 /* 8WAKE 500 TT500.00 - 8HERITAGE 500.00 END
AEP_P4_#11112_05J.FERR 765_A1	CONTINGENCY 'AEP_P4_#11112_05J.FERR 765_A1' OPEN BRANCH FROM BUS 242511 TO BUS 242514 CKT 1 / 242511 05BROADF 765 242514 05J.FERR 765 1 OPEN BRANCH FROM BUS 242514 TO BUS 242520 CKT 1 / 242514 05J.FERR 765 242520 05J.FERR 500 1 OPEN BRANCH FROM BUS 242520 TO BUS 306719 CKT 1 / 242520 05J.FERR 500 306719 8ANTIOCH 500 1 OPEN BRANCH FROM BUS 242566 TO BUS 242567 CKT ZB / 242566 05BROADF 138 242567 05BROADX 138 ZB 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_P1-3: 6CAROLNA-TX#4	CONTINGENCY 'DVP_P1-3: 6CAROLNA-TX#4' OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* 3CAROLNA 115.00 - 6CAROLNA 230.00 END

Contingency Name	Contingency Definition
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 - 6SEEDGE HILL 230.00 END

11.6.2 Index 1

ID	FROM BUS#	FROM BUS	FROM BUS AREA	TO BUS#	TO BUS	TO BUS AREA	CK T ID	CONT NAME	Type	Rating MVA	PRE PROJECT LOADIN G %	POST PROJECT LOADIN G %	AC D C	MW IMPACT
4371388 1	24263 1	05EDAN1	AEP	24262 0	05DANVL 2	AEP	1	AEP_P4_#11112_05J.FER R 765_A1	breaker	402.0	118.98	119.63	DC	5.77

Bus #	Bus	MW Impact
244012	05PINNACLE	-1.8111
315131	1EDGECSMA (Deactivation : 04/22/19)	3.5417
315132	1EDGECSMB (Deactivation : 04/22/19)	3.5417
917332	Z2-043 E	0.3400
917342	Z2-044 E	0.2123
917512	Z2-088 E OP1	1.3776
918532	AA1-067 E	0.2416
919692	AA2-053 E OP	1.0943
919702	AA2-057 E OP	1.2033
920592	AA2-165 E	0.1654
920672	AA2-174 E OP	0.1265
922922	AB1-081 C OP	3.4143
922923	AB1-081 E OP	1.4633
923262	AB1-132 C OP	4.0434
923263	AB1-132 E OP	1.7329
924021	AB2-043 C O1	0.9885
924022	AB2-043 E O1	0.8839
924151	AB2-059 C OP	4.0241
924152	AB2-059 E OP	2.0730
924161	AB2-060 C OP	2.8276
924162	AB2-060 E OP	1.3306
924301	AB2-077 C O1	0.6329
924302	AB2-077 E O1	0.4219
924311	AB2-078 C O1	0.6329
924312	AB2-078 E O1	0.4219
924321	AB2-079 C O1	0.6329
924322	AB2-079 E O1	0.4219
925121	AB2-169 C	1.8680
925122	AB2-169 E	1.6764
925591	AC1-034 C	2.6065
925592	AC1-034 E	1.9663
925781	AC1-054 C O1	2.4878

Bus #	Bus	MW Impact
925782	AC1-054 E O1	1.1460
926051	AC1-083 C O1	3.9543
926052	AC1-083 E O1	6.4517
926071	AC1-086 C	5.9544
926072	AC1-086 E	2.7100
926201	AC1-098 C	1.9796
926202	AC1-098 E	1.1793
926211	AC1-099 C	0.6634
926212	AC1-099 E	0.3896
926271	AC1-105 C O1	1.9507
926272	AC1-105 E O1	0.9711
927021	AC1-189 C	3.0007
927022	AC1-189 E	1.4947
927141	AC1-208 C	2.9780
927142	AC1-208 E	1.3223
927251	AC1-221 C	1.5613
927252	AC1-221 E	1.5613
927261	AC1-222 C	1.2469
927262	AC1-222 E	1.1870
932631	AC2-084 C	2.8220
932632	AC2-084 E	1.3899
932761	AC2-100 C	3.5932
932762	AC2-100 E	1.7538
933941	AD1-017 C	0.7909
933942	AD1-017 E	1.2903
934311	AD1-055 C	0.8658
934312	AD1-055 E	0.2232
934331	AD1-057 C O1	3.3993
934332	AD1-057 E O1	1.8133
934341	AD1-058 C	3.9140
934342	AD1-058 E	0.9945
934611	AD1-087 C O1	2.7778
934612	AD1-087 E O1	1.3055
934991	AD1-131 C	1.2833
934992	AD1-131 E	0.8555
935171	AD1-152 C O1	2.7605
935172	AD1-152 E O1	1.8404
936161	AD2-022 C O1	10.5666
936162	AD2-022 E O1	6.3400
936171	AD2-023 C O1	6.1638

Bus #	Bus	MW Impact
936172	AD2-023 E O1	3.3461
936261	AD2-033 C	3.7334
936262	AD2-033 E	2.4889
936331	AD2-043 C (Withdrawn : 12/20/2019)	1.6170
936332	AD2-043 E (Withdrawn : 12/20/2019)	1.9134
936361	AD2-046 C O1	3.1372
936362	AD2-046 E O1	1.4426
936481	AD2-063 C O1	4.5196
936482	AD2-063 E O1	2.9880
936701	AD2-089 C (Withdrawn : 12/09/2019)	2.6255
936702	AD2-089 E (Withdrawn : 12/09/2019)	1.7503
937481	AD2-202 C O1	0.7361
937482	AD2-202 E O1	0.4141
938661	AE1-088	0.9580
939181	AE1-148 C O1	3.0781
939182	AE1-148 E O1	2.0520
940081	AE1-250 C	14.0319
940082	AE1-250 E	9.3546
940571	AE2-044 C	0.9048
940572	AE2-044 E	0.3878
940661	AE2-053 O1	1.1400
942451	AE2-258	0.7374
943901	AF1-058 C	0.3726
943902	AF1-058 E	0.2484
943911	AF1-059	2.5989
944141	AF1-082	0.5817
946461	AF1-310 C O1 (Withdrawn : 11/05/2019)	2.9736
946462	AF1-310 E O1 (Withdrawn : 11/05/2019)	4.8516
DUCKCREEK	DUCKCREEK	0.5159
NEWTON	NEWTON	0.3686
CPLE	CPLE	5.5024
G-007A	G-007A	0.4196
VFT	VFT	1.0900
CBM-W2	CBM-W2	5.0532
TVA	TVA	1.9222
COFFEEN	COFFEEN	0.1559
CBM-S2	CBM-S2	36.9631
EDWARDS	EDWARDS	0.1778
CBM-S1	CBM-S1	8.4774
TILTON	TILTON	0.3925
MADISON	MADISON	1.8688

Bus #	Bus	MW Impact
GIBSON	GIBSON	0.2970
BLUEG	BLUEG	1.2378
TRIMBLE	TRIMBLE	0.4157
AA2-074	AA2-074	3.7368

11.6.3 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
42854012	313845	6HATHAWAY	DVP	304222	6ROCKYMT230T	CPL	1	DVP_P1-2: LN 2181	single	478.0	103.97	105.41	DC	6.89

Bus #	Bus	MW Impact
314435	6SAPONY	0.1427
314572	3EMPORIA	0.0402
314574	6EVERETS	0.1811
314582	3KELFORD	0.3088
314589	3MURPHYS	0.0492
314623	3WITAKRS	0.2540
314704	3LAWRENC	0.1369
315115	1S HAMPT1	0.6342
315126	1ROARAP2	0.9589
315128	1ROARAP4	0.9150
315131	1EDGECSMA (Deactivation : 04/22/19)	25.0572
315132	1EDGECSMB (Deactivation : 04/22/19)	25.0572
315136	1ROSEMG1	2.3478
315137	1ROSEMS1	1.4559
315138	1ROSEMG2	1.1003
315139	1GASTONA	2.9075
315141	1GASTONB	2.9075
315292	1DOMTR78	0.6926
315294	1DOMTR10	6.4308
315601	1CONETOE2SOL	2.1801
315602	1HOLLOMANSOL	0.8466
315605	6W1-029WIND	0.2837
315606	3AA2-053SOLA	0.9775
315607	3AA1-063SOLA	0.8796
315608	3AA2-088SOLA	0.5384
315611	6Z1-036WIND	0.3395
315612	3AA2-057SOLA	1.2559
315614	AA2-178 C	0.6337
920591	AA2-165 C	0.1489
920671	AA2-174 C OP	0.0448
922922	AB1-081 C OP	15.1676
923262	AB1-132 C OP	15.9062

Bus #	Bus	MW Impact
923263	AB1-132 E OP	6.8170
923572	AB1-173 C OP	1.6592
923582	AB1-173AC OP	1.6592
923801	AB2-015 C OP	4.0535
923911	AB2-031 C O1	1.6469
923991	AB2-040 C O1	5.4076
924151	AB2-059 C OP	17.8761
924501	AB2-099 C	0.4112
924511	AB2-100 C	8.4949
925121	AB2-169 C	4.1734
925171	AB2-174 C O1	5.0379
925591	AC1-034 C	11.5788
925781	AC1-054 C O1	2.9281
926071	AC1-086 C	23.4238
926201	AC1-098 C	6.2957
926211	AC1-099 C	2.1097
927021	AC1-189 C	12.1912
927141	AC1-208 C	9.6989
932631	AC2-084 C	8.9748
933991	AD1-023 C	7.5866
934201	AD1-047 C	5.8992
934331	AD1-057 C O1	20.1168
934521	AD1-076 C	29.5525
936401	AD2-051 C O1	6.0354
936701	AD2-089 C (Withdrawn : 12/09/2019)	14.3289
936711	AD2-090 C O1	3.8426
937571	AD2-169 C	7.5666
938171	AE1-026 C O1	19.1419
938221	AE1-035 C	1.5163
938661	AE1-088	2.1402
938771	AE1-103 C O1	1.6046
940481	AE2-033 C	7.1805
940491	AE2-034 C	3.9724
940521	AE2-037 C	5.5122
940541	AE2-040 O1	1.3064
940571	AE2-044 C	7.5838
941501	AE2-147 C	4.6899
941541	AE2-151 C	0.7816
942471	AE2-260 C O1	9.8388
942851	AE2-304 C	0.2061

Bus #	Bus	MW Impact
943171	AE2-346 C	0.9870
943911	AF1-059	6.8860
944051	AF1-073 C O1	11.0580
944141	AF1-082	4.8753
944871	AF1-152 C	1.5633
945711	AF1-236 C O1	37.2760
946011	AF1-266	6.0107
946281	AF1-292 C	0.9984
DUCKCREEK	DUCKCREEK	1.3668
NEWTON	NEWTON	1.3485
FARMERCITY	FARMERCITY	0.0773
G-007A	G-007A	0.7576
VFT	VFT	2.0124
PRAIRIE	PRAIRIE	3.6420
COFFEEN	COFFEEN	0.6675
EDWARDS	EDWARDS	0.4067
CHEOAH	CHEOAH	1.1016
TILTON	TILTON	0.7195
GIBSON	GIBSON	0.6514
CALDERWOOD	CALDERWOOD	1.0740
BLUEG	BLUEG	2.0120
TRIMBLE	TRIMBLE	0.6383
CATAWBA	CATAWBA	1.1606

11.6.4 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
42854007	314591	6NASH	DVP	304226	6PA-RMOUNT#4	CPL	1	DVP_P1-2: LN 2058	single	478.0	103.43	104.85	DC	6.82

Bus #	Bus	MW Impact
314435	6SAPONY	0.1449
314572	3EMPORIA	0.0400
314574	6EVERETS	0.1885
314582	3KELFORD	0.2792
314589	3MURPHYS	0.0480
314623	3WITAKRS	0.1790
314704	3LAWRENC	0.1363
315115	1S HAMPT1	0.6209
315126	1ROARAP2	0.9268
315128	1ROARAP4	0.8844
315131	1EDGECSMA (Deactivation : 04/22/19)	26.1916
315132	1EDGECSMB (Deactivation : 04/22/19)	26.1916
315136	1ROSEMG1	2.4140
315137	1ROSEMS1	1.4969
315138	1ROSEMG2	1.1313
315139	1GASTONA	2.9735
315141	1GASTONB	2.9735
315292	1DOMTR78	0.7093
315294	1DOMTR10	6.5856
315601	1CONETOE2SOL	2.2766
315602	1HOLLOMANSOL	0.8563
315605	6W1-029WIND	0.2875
315606	3AA2-053SOLA	0.9462
315607	3AA1-063SOLA	0.8523
315608	3AA2-088SOLA	0.5247
315611	6Z1-036WIND	0.3446
315612	3AA2-057SOLA	0.9239
315614	AA2-178 C	0.6444
920591	AA2-165 C	0.1095
920671	AA2-174 C OP	0.0433
922922	AB1-081 C OP	10.5437
923262	AB1-132 C OP	16.2674

Bus #	Bus	MW Impact
923263	AB1-132 E OP	6.9718
923572	AB1-173 C OP	1.6316
923582	AB1-173AC OP	1.6316
923801	AB2-015 C OP	3.9745
923911	AB2-031 C O1	1.6195
923991	AB2-040 C O1	5.3178
924151	AB2-059 C OP	12.4265
924501	AB2-099 C	0.4009
924511	AB2-100 C	8.6450
925121	AB2-169 C	4.2994
925171	AB2-174 C O1	4.9753
925591	AC1-034 C	8.0490
925781	AC1-054 C O1	2.8120
926071	AC1-086 C	23.9557
926201	AC1-098 C	5.1350
926211	AC1-099 C	1.7208
927021	AC1-189 C	12.7226
927141	AC1-208 C	7.7881
932631	AC2-084 C	7.3202
933991	AD1-023 C	7.7055
934201	AD1-047 C	5.8013
934331	AD1-057 C O1	20.9131
934521	AD1-076 C	30.0720
936401	AD2-051 C O1	6.1067
936701	AD2-089 C (Withdrawn : 12/09/2019)	14.9679
936711	AD2-090 C O1	3.7548
937571	AD2-169 C	7.4088
938171	AE1-026 C O1	19.4249
938221	AE1-035 C	1.5336
938661	AE1-088	2.2048
938771	AE1-103 C O1	1.5765
940481	AE2-033 C	7.2962
940491	AE2-034 C	4.0396
940521	AE2-037 C	5.5951
940541	AE2-040 O1	1.3272
940571	AE2-044 C	5.2718
941501	AE2-147 C	4.7529
941541	AE2-151 C	0.7619
942471	AE2-260 C O1	10.0026
942851	AE2-304 C	0.2091

Bus #	Bus	MW Impact
943171	AE2-346 C	0.9621
943911	AF1-059	6.8230
944051	AF1-073 C O1	11.2524
944141	AF1-082	3.3890
944871	AF1-152 C	1.5843
945711	AF1-236 C O1	37.9059
946011	AF1-266	6.1075
946281	AF1-292 C	0.9980
DUCKCREEK	DUCKCREEK	1.3783
NEWTON	NEWTON	1.3603
FARMERCITY	FARMERCITY	0.0781
G-007A	G-007A	0.7696
VFT	VFT	2.0446
PRAIRIE	PRAIRIE	3.6730
COFFEEN	COFFEEN	0.6733
EDWARDS	EDWARDS	0.4102
CHEOAH	CHEOAH	1.1116
TILTON	TILTON	0.7258
GIBSON	GIBSON	0.6574
CALDERWOOD	CALDERWOOD	1.0840
BLUEG	BLUEG	2.0294
TRIMBLE	TRIMBLE	0.6439
CATAWBA	CATAWBA	1.1715

11.6.5 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
42854211	314702	3KERR	DVP	304102	3GW KING TAP	CPL	1	DVP_P7-1: LN 22-90-A	tower	199.0	133.08	139.28	DC	12.33

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

11.6.6 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
42853975	927250	AC1-221 TAP	DVP	304070	6PERSON230 T	CPL	1	DVP_P1-2: LN 570	single	718.0	120.84	122.06	DC	8.87

Bus #	Bus	MW Impact
313853	3PONTONDP	0.0570
314295	6BIRDNECK	0.0129
314333	6POWHATN	0.1249
314429	3JTRSVLE	0.2280
314491	3PENDLTN	0.0963
314507	3THOMPSN	0.0977
314677	6BUCKING	0.1929
314704	3LAWRENC	0.1015
314947	8GREENSVILLE	23.0274
315098	1CHESPKA	0.1295
315099	1CHESPKB (Deactivation : 05/31/19)	0.9868
315102	1BRUNSWICKG1	3.9336
315103	1BRUNSWICKG2	3.9336
315104	1BRUNSWICKG3	3.9336
315105	1BRUNSWICKS1	8.1721
315108	1ELIZAR1	0.9552
315109	1ELIZAR2	0.9386
315110	1ELIZAR3	0.9674
315153	1CLOVER1	14.3989
315154	1CLOVER2	14.2554
315191	1BEARGRDN G1	1.5614
315192	1BEARGRDN G2	1.5614
315193	1BEARGRDN S1	3.2135
315233	1SURRY 2	7.6012
315260	1GOSPORTA	0.1032
315261	1GOSPORTB	0.1319
315262	1GOSPORTC	0.1119
315266	1PLYWOOD A	1.7461
920291	AA2-127	0.3244
924021	AB2-043 C O1	2.4166
924161	AB2-060 C OP	6.9588

Bus #	Bus	MW Impact
924301	AB2-077 C O1	1.5570
924311	AB2-078 C O1	1.5570
924321	AB2-079 C O1	1.5570
925611	AC1-036 C	0.7279
925831	AC1-062	0.0338
925991	AC1-075 C	7.3467
926021	AC1-080 C	2.4553
926271	AC1-105 C O1	9.4015
926661	AC1-147 C	0.7846
926751	AC1-161 C O1	11.5301
927251	AC1-221 C	9.8772
927261	AC1-222 C	6.5915
932041	AC2-012 C	3.5494
932511	AC2-071 C	1.3618
932761	AC2-100 C	22.7311
933291	AC2-141 C	11.5301
933501	AC2-165 C	3.7688
934061	AD1-033 C	2.5679
934311	AD1-055 C	4.5767
934341	AD1-058 C	24.7606
934611	AD1-087 C O1	15.4053
934621	AD1-088 C	11.6382
934991	AD1-131 C	8.1182
935171	AD1-152 C O1	15.3096
935221	AD1-157 C	1.1478
935231	AD1-160 C	0.8417
936261	AD2-033 C	9.9676
936331	AD2-043 C (Withdrawn : 12/20/2019)	8.5281
936361	AD2-046 C O1	3.9204
936481	AD2-063 C O1	11.5020
937481	AD2-202 C O1	4.0826
938371	AE1-056 C	4.9482
938491	AE1-068 C O1	31.9201
938501	AE1-069 C O1	25.7579
938561	AE1-075 C	0.7846
939181	AE1-148 C O1	4.0187
939371	AE1-168 C	11.4894
939411	AE1-173 C	37.2816
940241	AE2-006	0.3704
940251	AE2-007 O1	60.4847

Bus #	Bus	MW Impact
940471	AE2-031 C	18.0734
940641	AE2-051 C O1	7.4826
940661	AE2-053 O1	1.4884
941031	AE2-094 C	19.7130
941281	AE2-122 C O1	9.7739
941291	AE2-123 C O1	10.0446
941301	AE2-124 C O1	9.1209
941591	AE2-156 O1	6.2430
941791	AE2-182 C	2.2168
942451	AE2-258	1.8028
942461	AE2-259 C O1	7.6440
942751	AE2-291 C O1	9.2075
942761	AE2-292 C O1	11.4643
942931	AE2-313 C	19.5691
943901	AF1-058 C	3.7769
943911	AF1-059	8.8730
944011	AF1-069 C	6.4410
944581	AF1-123 C O1	15.5158
944591	AF1-124 C O1	15.5158
944601	AF1-125 C O1	15.5158
945811	AF1-246 C O1	8.1358
946301	AF1-294 C	3.8283
946461	AF1-310 C O1 (Withdrawn : 11/05/2019)	26.6361
DUCKCREEK	DUCKCREEK	4.2467
NEWTON	NEWTON	4.2056
FARMERCITY	FARMERCITY	0.2430
G-007A	G-007A	2.7284
VFT	VFT	7.2498
AF1-020	AF1-020	18.1800
PRAIRIE	PRAIRIE	11.4504
AC1-131	AC1-131	10.9538
COFFEEN	COFFEEN	2.0828
EDWARDS	EDWARDS	1.2617
CHEOAH	CHEOAH	3.5636
TILTON	TILTON	2.2283
GIBSON	GIBSON	2.0235
CALDERWOOD	CALDERWOOD	3.4696
BLUEG	BLUEG	6.2288
TRIMBLE	TRIMBLE	1.9750
CATAWBA	CATAWBA	3.8616

Short Circuit

11.7 Short Circuit

The following Breakers are overdutied:

None

Affected Systems

12 Affected Systems

12.1 Duke Energy Progress

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

Attachment 1
System Configuration