

***Generation Interconnection
Feasibility Study Report***

For

***PJM Generation Interconnection Request
Queue Position AD2-033***

***Chase City – Lunenburg 115kV
78 MW Capacity / 130 MW Energy***

August / 2018

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).

Preface

The intent of the Feasibility Study is to determine a plan, with high level estimated cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the IC. The IC may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the IC 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. 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 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 IC is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by ITO, the costs may be included in the study.

General

The IC has proposed a solar generating facility located in East of Chase City in Lunenburg County, VA. The installed facilities will have a total capability of 130 MW with 78 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is 10/31/2020. **This study does not imply an ITO commitment to this in-service date.**

Point of Interconnection

AD2-033 will interconnect with the ITO transmission system will connect via a new three breaker ring bus switching station that connects on the Chase City – Lunenburg 115kV line.

Cost Summary

The AD2-033 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$1,550,000
Direct Connection Network Upgrades	\$5,500,000
Non Direct Connection Network Upgrades	\$ 800,000
Total Costs	\$7,850,000

In addition, the AD2-033 project may be responsible for a contribution to the following costs:

Description	Total Cost
New System Upgrades	\$ 67,400,000
Previously Identified Upgrades	\$ 50,235,011
Total Costs	\$117,635,011

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

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. For New System Upgrades, 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.

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.

Attachment Facilities

Generation Substation: Install metering and associated protection equipment. Estimated Cost \$550,000.

Transmission: Construct approximately one span of 115 kV Attachment line between the generation substation and a new AD2-033 Switching Station. The estimated cost for this work is \$1,000,000.

The estimated total cost of the Attachment Facilities is \$1,550,000. 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. These costs do not include CIAC Tax Gross-up. The single line is shown below in Attachment 1.

Direct Connection Cost Estimate

Substation: Establish the new 115 kV AD2-033 Switching Substation (interconnection substation). The estimated cost of this work scope is \$5,500,000. It is estimated to take 24-36 months to complete this work.

Non-Direct Connection Cost Estimate

Transmission: 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 \$800,000 and is estimated to take 24-30 months to complete.

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.

System Reinforcement

Violation #	Upgrade Description	Upgrade Cost
# 1	Uprate the Bremono – Mt Eagle 230kV line of 26 miles to increase its line rating to 1047 MVA (normal), 1047 MVA (emergency), and 1204 MVA (load dump). It is estimated to take 44-48 months to engineer, permit and construct. A VA CPCN is required.	\$15,400,000
# 2	Wreck and rebuild the North Anna – Ladysmith 500kV line # 575 of 15 miles to increase its line rating to 4453 MVA (normal), 4453 MVA (emergency), and 5121 MVA (load dump). It is estimated to take 36-42 months to engineer, permit, and construct. A VA CPCN is required.	\$52,000,000
# 3	The AC1-221 Tap – Person 230kV line is a joint tie line between the Dominion Energy and Duke/Progress transmission systems. The Dominion portion of this tie line is rated at 904MVA (normal), 904MVA (Emergency) and 1105 MVA (normal). The Dominion portion of this line is not overloaded. An affected systems study will need to be completed with Duke/Progress to determine upgrades required to resolve this violation.	
# 4, 5, 20	The Kerr Dam – Henderson 115kV line is a joint tie line between the Dominion Energy and Duke/Progress transmission systems. The Dominion portion can be resolved by an upgrading the conductor to 125°C M.O.T an increase in rating to 270MVA. Estimated to take 24-30 months. An affected systems study will need to be completed with Duke/Progress to determine upgrades required on the Duke/Progress system.	\$3,000,000
# 6, 7	Wreck and rebuild the Carson – Chaparal – Locks 230 kV line #249 of 10 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to take 44-48 months to engineer, permit and construct. A VA CPCN is required.	\$25,875,011
# 8 - 10	Add a second Carolina 230/115 kV transformer to increase its rating to 276.8 MVA (normal), 292.4 MVA (emergency), and 328.7 MVA (load dump). Estimated to take 24-30 months to engineer and construct.	\$5,500,000
# 11 - 15	Replace the Clubhouse 230/115 kV transformer #1 increase its line rating to 276.8 MVA (normal), 292.4 MVA (emergency), and 328.7 MVA (load dump). It is estimated to take 14-16 months to engineer and construct.	\$5,500,000
# 16 - 19	Replace wave trap at Clubhouse Substation to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to take 12-16 months to engineer and construct.	\$150,000

Violation #	Upgrade Description	Upgrade Cost
# 21	Reconductor the Bremono – Bremoe 230kV line of 1miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to take 30-36 months to engineer, permit, and construct. A Va CPCN is required.	\$2,500,000
# 22 - 23	1. Replace Switch (1200 A), estimated cost \$400,000. 2. Replace line risers (Limiting Element: Sub Cond 1590 AAC 61 Str.), estimated cost \$100,000. 3. Rebuild / Reconductor 3.16 miles of conductor (Limiting Element: 336/556 Six Wire ACSR), estimated cost \$4.72 million. 4. Conduct an engineering study to determine if Relay - CT Thermal limit settings can be adjusted to mitigate the overload (Estimated Cost \$25,000), if not, a new relay package will be required (Estimated Cost: \$600,000). (Limiting Element: Relay Thermal Limit 1795 Amps - East Danville) 5. Conduct an engineering study to determine if Relay - CT Thermal limit settings can be adjusted to mitigate the overload (Estimated Cost \$25,000), if not, a new relay package will be required (Estimated Cost: \$600,000). (Limiting Element: Relay Thermal Limit 1795 Amps - Danville) 6. Conduct an engineering study to determine if Relay - CT Compliance Trip limit settings can be adjusted to mitigate the overload (Estimated Cost \$25,000), if not, a new relay package will be required (Estimated Cost: \$600,000). (Limiting Element: Relay Compliance Trip Limit 1916 Amps - East Danville) 7. Conduct an engineering study to determine if Relay - CT Compliance Trip limit settings can be adjusted to mitigate the overload (Estimated Cost \$25,000), if not, a new relay package will be required (Estimated Cost: \$600,000). (Limiting Element: Relay Compliance Trip Limit 1916 Amps - Danville) 8. Rebuild / Reconductor 0.03 miles of conductor (Limiting Element: 1351.5 ACSR 45/7 DIPPER) Near East Danville, estimated cost \$0.045 million. 9. Rebuild / Reconductor 0.03 miles of conductor (Limiting Element: 1351.5 ACSR 45/7 DIPPER) Near Danville, estimated cost \$0.045 million. An approximate construction time would be 24 to 36 months	\$7,710,000
Total Network Upgrades		\$117,635,011

Interconnection Customer Requirements

ITO's Facility Connection Requirements as posted on PJM's website

<http://www.pjm.com/~media/planning/plan-standards/private-dominion/facility-connection-requirements1.ashx>

An Interconnection Customer entering the New Services Queue on or after October 1, 2012 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.

Voltage Ride Through Requirements - The Customer Facility shall be designed to remain in service (not trip) for voltages and times as specified for the Eastern Interconnection in Attachment 1 of NERC Reliability Standard PRC-024-1, and successor Reliability Standards, for both high and low voltage conditions, irrespective of generator size, subject to the permissive trip exceptions established in PRC-024-1 (and successor Reliability Standards).

Frequency Ride Through Requirements - The Customer Facility shall be designed to remain in service (not trip) for frequencies and times as specified in Attachment 2 of NERC Reliability Standard PRC-024-1, and successor Reliability Standards, for both high and low frequency condition, irrespective of generator size, subject to the permissive trip exceptions established in PRC-024-1 (and successor Reliability Standards).

Reactive Power - The Generation Interconnection Customer shall design its non-synchronous Customer Facility with the ability to maintain a power factor of at least 0.95 leading to 0.95 lagging measured at the generator's terminals.

Revenue Metering and SCADA Requirements

PJM Requirements

The IC 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 Sections 24.1 and 24.2.

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

Network Impacts

The Queue Project AD2-033 was evaluated as a 130.0 MW (Capacity 78.0 MW) injection tapping AB2-060 Tap to Lunenburg 115kV line in the ITO area. Project AD2-033 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-033 was studied with a commercial probability of 53%. Potential network impacts were as follows:

PJM assessed the impact of the proposed Queue Project as an injection into the ITO, for compliance with NERC Reliability Criteria. The system was assessed using the summer 2021 RTEP case. When performing analysis, ITO Criteria considers a transmission facility overloaded if it exceeds 94% of its emergency rating under single contingency (normal and stressed system conditions). A full listing of the ITO's Planning Criteria and interconnection requirements can be found in the ITO's Facility Connection Requirements which are publicly available at: <http://www.dom.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 NERC Category C Contingency Conditions (Bus Fault, Tower Line, N-1-1, and Stuck Breaker scenarios) allow for re-dispatch of generating units to resolve potential reliability deficiencies. For ITO 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 results of these studies are discussed in more detail below.

Contingency Descriptions

The following contingencies resulted in overloads:

Contingency Name	Description
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
AEP_P4_#7589_05J.FERR 765	CONTINGENCY 'AEP_P4_#7589_05J.FERR 765' 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	Description
DVP_P1-2: LN 2027-A	CONTINGENCY 'DVP_P1-2: LN 2027-A' OPEN BRANCH FROM BUS 314310 TO BUS 314322 CKT 1 /* 6JUDES F 230.00 - 6MDLTHAN 230.00 OPEN BRANCH FROM BUS 314310 TO BUS 314333 CKT 1 /* 6JUDES F 230.00 - 6POWHATN 230.00 OPEN BRANCH FROM BUS 314333 TO BUS 933500 CKT 1 /* 6POWHATN 230.00 - AC2-165 TAP 230.00 OPEN BUS 314310 /* ISLAND OPEN BUS 314333 /* ISLAND END
DVP_P1-2: LN 2131A	CONTINGENCY 'DVP_P1-2: LN 2131A' OPEN BRANCH FROM BUS 314662 TO BUS 916040 CKT 1 /* 6S HERTFORD 230.00 - Z1-036 TAP 230.00 OPEN BRANCH FROM BUS 314651 TO BUS 314662 CKT 1 /* 6WINFALL 230.00 - 6S HERTFORD 230.00 OPEN BUS 314662 /* ISLAND END
DVP_P1-2: LN 246	CONTINGENCY 'DVP_P1-2: LN 246' OPEN BRANCH FROM BUS 314537 TO BUS 314575 CKT 1 /* 6SUFFOLK 230.00 - 6NUCO TP 230.00 OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* 6EARLEYS 230.00 - 6NUCO TP 230.00 OPEN BRANCH FROM BUS 314575 TO BUS 314590 CKT 1 /* 6NUCO TP 230.00 - 6NUCOR 230.00 OPEN BUS 314575 /* ISLAND OPEN BUS 314590 /* ISLAND END
DVP_P1-2: LN 556	CONTINGENCY 'DVP_P1-2: LN 556' OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 1 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 2 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 3 /* 6CLOVER 230.00 - 8CLOVER 500.00 OPEN BRANCH FROM BUS 314906 TO BUS 314936 CKT 1 /* 8CLOVER 500.00 - 8RAWLINGS 500.00 OPEN BUS 314906 /* ISLAND END
DVP_P1-2: LN 563	CONTINGENCY 'DVP_P1-2: LN 563' OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 END
DVP_P1-2: LN 573	CONTINGENCY 'DVP_P1-2: LN 573' OPEN BRANCH FROM BUS 314918 TO BUS 314934 CKT 1 /* 8NO ANNA 500.00 - 8SPOTSYL 500.00 END
DVP_P1-2: LN 574	CONTINGENCY 'DVP_P1-2: LN 574' OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT 500.00 - 8LDYSMTH 500.00 END

Contingency Name	Description
DVP_P1-2: LN 68	CONTINGENCY 'DVP_P1-2: LN 68' OPEN BRANCH FROM BUS 314527 TO BUS 314536 CKT 1 /* 3HOLLAND 115.00 - 3SUFFOLK 115.00 OPEN BRANCH FROM BUS 314527 TO BUS 314539 CKT 1 /* 3HOLLAND 115.00 - 3UNCAMP 115.00 OPEN BUS 314527 /* ISLAND END
DVP_P1-3: 3CAROLNA-6CAROLNA	CONTINGENCY 'DVP_P1-3: 3CAROLNA-6CAROLNA' OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 END
DVP_P4-2: 101002	CONTINGENCY 'DVP_P4-2: 101002' /* CAROLINA 115 KV OPEN BRANCH FROM BUS 313723 TO BUS 314259 CKT 1 /* 3PECAN 115.00 - 3CAROL56_1 115.00 OPEN BRANCH FROM BUS 314259 TO BUS 314559 CKT Z1 /* 3CAROL56_1 115.00 - 3CAROLNA 115.00 OPEN BRANCH FROM BUS 314259 TO BUS 314835 CKT 1 /* 3CAROL56_1 115.00 - 3CAROL_1 115.00 OPEN BUS 314259 /* ISLAND: 3CAROL56_1 115.00 OPEN BUS 314835 /* ISLAND: 3CAROL_1 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* 3CAROLNA 115.00 - 3EATON F 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* 3CAROLNA 115.00 - AA2-053 TAP 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 END
DVP_P4-2: 14852	CONTINGENCY 'DVP_P4-2: 14852' /* CLUBHOUSE OPEN BUS 314562 /* CLUBHOUSE 115KV BUS OPEN BUS 314325 /* LINE 148 OPEN BUS 314312 /* LINE 148 END
DVP_P4-2: 2202	CONTINGENCY 'DVP_P4-2: 2202' /* CAROLINA OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* LINE 22 OPEN BRANCH FROM BUS 314571 TO BUS 925780 CKT 1 /* LINE 22 OPEN BRANCH FROM BUS 314559 TO BUS 314259 CKT Z1 /* LINE 56 OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* LINE 54 OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* LINE 130 OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* TX. #4 DECREASE BUS 314559 LOAD BY 100 PERCENT /* REMOVE ALL LOAD AT CAROLINA END

Contingency Name	Description
DVP_P4-2: 24662	CONTINGENCY 'DVP_P4-2: 24662' /* EARLEYS OPEN BRANCH FROM BUS 314568 TO BUS 314569 CKT 1 /* TX. #3 OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* 246 OPEN BRANCH FROM BUS 314575 TO BUS 314537 CKT 1 /* 246 OPEN BRANCH FROM BUS 314575 TO BUS 314590 CKT 1 /* 246 - NUCOR END
DVP_P4-2: 24682	CONTINGENCY 'DVP_P4-2: 24682' /* 24682 @ SUFFOLK OPEN BRANCH FROM BUS 314537 TO BUS 314575 CKT 1 /* SUFFOLK - NUCOR TAP OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* NUCOR TAP - EARLEYS OPEN BRANCH FROM BUS 314536 TO BUS 314537 CKT 2 /* SUFFOLK 230-115 TX#5 OPEN BRANCH FROM BUS 314928 TO BUS 314537 CKT 2 /* SUFFOLK 500-230 TX#8 END
DVP_P4-2: 246T2034	CONTINGENCY 'DVP_P4-2: 246T2034' /* EARLEYS OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* 246 OPEN BRANCH FROM BUS 314575 TO BUS 314537 CKT 1 /* 246 OPEN BRANCH FROM BUS 314575 TO BUS 314590 CKT 1 /* 246 - NUCOR OPEN BRANCH FROM BUS 314569 TO BUS 314620 CKT 1 /* 2034 OPEN BRANCH FROM BUS 314620 TO BUS 933990 CKT 1 /* 2034 END
DVP_P4-2: 246T247	CONTINGENCY 'DVP_P4-2: 246T247' /* SUFFOLK 230 KV OPEN BRANCH FROM BUS 314537 TO BUS 314575 CKT 1 /* 6SUFFOLK 230.00 - 6NUCO TP 230.00 OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* 6EARLEYS 230.00 - 6NUCO TP 230.00 OPEN BRANCH FROM BUS 314575 TO BUS 314590 CKT 1 /* 6NUCO TP 230.00 - 6NUCOR 230.00 OPEN BUS 314575 /* ISLAND: 6NUCO TP 230.00 OPEN BUS 314590 /* ISLAND: 6NUCOR 230.00 OPEN BRANCH FROM BUS 314537 TO BUS 314648 CKT 1 /* 6SUFFOLK 230.00 - 6SUNBURY 230.00 OPEN BRANCH FROM BUS 314648 TO BUS 901080 CKT 1 /* 6SUNBURY 230.00 - W1-029 230.00 OPEN BUS 314648 /* ISLAND: 6SUNBURY 230.00 END

Contingency Name	Description
DVP_P4-2: 5402	CONTINGENCY 'DVP_P4-2: 5402' /* CAROLINA OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* LINE 54 OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* LINE 22 OPEN BRANCH FROM BUS 314559 TO BUS 314259 CKT Z1 /* LINE 56 OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* LINE 130 OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* TX. #4 DECREASE BUS 314559 LOAD BY 100 PERCENT /* REMOVE ALL LOAD AT CAROLINA END
DVP_P4-2: 5602	CONTINGENCY 'DVP_P4-2: 5602' /* CAROLINA 115 KV OPEN BRANCH FROM BUS 313723 TO BUS 314604 CKT 1 /* 3PECAN 115.00 - 3SEABORD 115.00 OPEN BRANCH FROM BUS 314558 TO BUS 314587 CKT 1 /* 3BOYKINS 115.00 - 3MARGTSV 115.00 OPEN BRANCH FROM BUS 314587 TO BUS 314604 CKT 1 /* 3MARGTSV 115.00 - 3SEABORD 115.00 OPEN BUS 314587 /* ISLAND: 3MARGTSV 115.00 OPEN BUS 314604 /* ISLAND: 3SEABORD 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* 3CAROLNA 115.00 - 3EATON F 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* 3CAROLNA 115.00 - AA2-053 TAP 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 END
DVP_P4-2: 562T563	CONTINGENCY 'DVP_P4-2: 562T563' /*CARSON OPEN BRANCH FROM BUS 314902 TO BUS 314923 CKT 1 /*CARSON TO MIDLOTHIAN OPEN BRANCH FROM BUS 314914 TO BUS 314902 CKT 1 /*CARSON 500.00 - 8SEPTA 500.00 END
DVP_P4-2: 7152	CONTINGENCY 'DVP_P4-2: 7152' /* CLUBHOUSE OPEN BUS 314562 /* CLUBHOUSE 115KV BUS OPEN BUS 314565 /* LINE 71 OPEN BUS 314850 /* LINE 71 OPEN BUS 314693 /* LINE 71 OPEN BUS 314704 /* LINE 71 OPEN BUS 314676 /* LINE 71 OPEN BUS 314782 /* LINE 132 OPEN BUS 314786 /* LINE 132 OPEN BUS 314787 /* LINE 50 OPEN BUS 314782 /* LINE 50 OPEN BUS 314785 /* LINE 50 OPEN BUS 314516 /* LINE 71 OPEN BUS 314675 /* LINE 71 END

Contingency Name	Description
DVP_P4-3: L152	CONTINGENCY 'DVP_P4-3: L152' /* CLUBHOUSE OPEN BUS 314562 /* CLUBHOUSE 115KV BUS END
DVP_P4-5: T122C	CONTINGENCY 'DVP_P4-5: T122C' /* CAROLINA OPEN BUS 314559 /* CAROLINA 115KV BUS OPEN BUS 315126 /* ROANOKE RAPIDS GEN 1 AND 2 OPEN BUS 315128 /* ROANOKE RAPIDS GEN 3 AND 4 OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* TX. #4 END
DVP_P7-1: LN 22-90_B	CONTINGENCY 'DVP_P7-1: LN 22-90_B' 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 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 - 3BCHWD90 115.00 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 BRANCH FROM BUS 314672 TO BUS 314673 CKT 1 /* 3BEECHWD 115.00 - 3BCHWD90 115.00 OPEN BRANCH FROM BUS 314673 TO BUS 314702 CKT 1 /* 3BCHWD90 115.00 - 3KERR 115.00 OPEN BUS 314265 /* ISLAND OPEN BUS 314584 /* ISLAND OPEN BUS 314585 /* ISLAND OPEN BUS 314672 /* ISLAND OPEN BUS 314673 /* ISLAND END

Summer Peak Analysis - 2021

Generator Deliverability

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

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		
1	N-1	DVP_P1-2: LN 2027-A	DVP - DVP	6BREMODIST-6MTEAGLE 230 kV line	313867	314765	1	DC	98.31	100.25	ER	662	12.83	1
2	N-1	DVP_P1-2: LN 573	DVP - DVP	8NO ANNA-8LADYSMITH 500 kV line	314918	314911	1	DC	99.99	100.15	ER	3219	10.6	2
3	N-1	DVP_P1-2: LN 556	DVP - CPLE	AC1-221 TAP-6PERSON230 T 230 kV line	927250	304070	1	DC	99.03	101.36	ER	718	17.87	3

Multiple Facility Contingency

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

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To	Circuit		Initial	Final	Type	MVA	
4	DCTL	DVP_P7-1: LN 22-90_B	DVP - CPLE	3KERR-3GW KING TAP 115 kV line	314702	304102	1	DC	99.36	104.43	ER	199	22.37
5	LFFB	DVP_P4-2: 2202	DVP - CPLE	3KERR-3GW KING TAP 115 kV line	314702	304102	1	DC	97.92	102.41	ER	199	19.83

Short Circuit

(Summary of impacted circuit breakers)

New circuit breakers found to be over-duty:

None

Contributions to previously identified circuit breakers found to be over-duty:

None

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)

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		
6	LFFB	DVP_P4-2: 562T563	DVP - DVP	6CARSON-6CHRL249 230 kV line	314282	314285	1	DC	118.85	119.47	LDR	684	9.07	4
7	LFFB	DVP_P4-2: 562T563	DVP - DVP	6CHRL249-6LOCKS 230 kV line	314285	314316	1	DC	116.06	116.67	LDR	684	9.07	5
8	LFFB	DVP_P4-2: 7152	DVP - DVP	6CAROLNA 230/115 kV transformer	314559	314561	1	DC	108.01	109.89	LDR	289	12.03	6
9	LFFB	DVP_P4-2: 14852	DVP - DVP	6CAROLNA 230/115 kV transformer	314559	314561	1	DC	107.09	108.97	LDR	289	12.02	
10	LFFB	DVP_P4-3: L152	DVP - DVP	6CAROLNA 230/115 kV transformer	314559	314561	1	DC	107.09	108.97	LDR	289	12.02	
11	LFFB	DVP_P4-5: T122C	DVP - DVP	6CLUBHSE 230/115 kV transformer	314562	314563	1	DC	131.93	141.17	LDR	209	19.27	7
12	LFFB	DVP_P4-2: 2202	DVP - DVP	6CLUBHSE 230/115 kV transformer	314562	314563	1	DC	125.23	135	LDR	209	18.21	
13	LFFB	DVP_P4-2: 5602	DVP - DVP	6CLUBHSE 230/115 kV transformer	314562	314563	1	DC	124.68	134.45	LDR	209	18.2	
14	LFFB	DVP_P4-2: 5402	DVP - DVP	6CLUBHSE 230/115 kV transformer	314562	314563	1	DC	124.42	134.19	LDR	209	18.21	

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		
15	LFFB	DVP_P4-2: 101002	DVP - DVP	6CLUBHSE 230/115 kV transformer	314562	314563	1	DC	123.7	133.47	LDR	209	18.21	
16	LFFB	DVP_P4-2: 246T247	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	123.7	124.86	LDR	637	16.22	8
17	LFFB	DVP_P4-2: 246T2034	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	117.07	118.4	LDR	637	16.94	
18	LFFB	DVP_P4-2: 24662	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	117.15	118.3	LDR	637	16.07	
19	LFFB	DVP_P4-2: 24682	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	117.07	118.22	LDR	637	16.09	
20	LFFB	DVP_P4-5: T122C	DVP - CPLE	3KERR-3GW KING TAP 115 kV line	314702	304102	1	DC	100.5	105.56	ER	199	22.63	9
21	N-1	DVP_P1-2: LN 2027-A	DVP - DVP	6BREMO-6BREMODIST 230 kV line	314747	313867	1	DC	100.43	102.37	ER	662	12.83	10
22	LFFB	AEP_P4_#7 589_05J.FE RR 765	AEP - AEP	05EDAN 1-05DANVL2 138 kV line	242631	242620	1	DC	133.95	134.81	ER	415	7.92	11
23	N-1	AEP_P1-2_#1377	AEP - AEP	05EDAN 1-05DANVL2 138 kV line	242631	242620	1	DC	111.34	111.86	ER	415	4.75	

Steady-State Voltage Requirements

(Summary of the VAR requirements based upon the results of the steady-state voltage studies)

To be determined during Impact Study

Stability and Reactive Power Requirement for Low Voltage Ride Through

(Summary of the VAR requirements based upon the results of the dynamic studies)

To be determined during Impact Study

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
# 1	6BREMIST-6MTEAGLE 230 kV line	Upgrade the Brems – Mt Eagle 230kV line of 26 miles to increase its line rating to 1047 MVA (normal), 1047 MVA (emergency), and 1204 MVA (load dump). It is estimated to take 44-48 months to engineer, permit and construct. A VA CPCN is required.	Pending	\$15,400,000
# 2	8NO ANNA-8LADYSMITH 500 kV line	Wreck and rebuild the North Anna – Ladysmith 500kV line # 575 of 15 miles to increase its line rating to 4453 MVA (normal), 4453 MVA (emergency), and 5121 MVA (load dump). It is estimated to take 36-42 months to engineer, permit, and construct. A VA CPCN is required.	Pending	\$52,000,000
# 3	AC1-221 TAP-6PERSON230 T 230 kV line	The AC1-221 Tap – Person 230kV line is a joint tie line between the Dominion Energy and Duke/Progress transmission systems. The Dominion portion of this tie line is rated at 904MVA (normal), 904MVA (Emergency) and 1105 MVA (normal). The Dominion portion of this line is not overloaded. An affected systems study will need to be completed with Duke/Progress to determine upgrades required to resolve this violation.	NA	
# 4, 5	3KERR-3GW KING TAP 115 kV line	The Kerr Dam – Henderson 115kV line is a joint tie line between the Dominion Energy and Duke/Progress transmission systems. The Dominion portion can be resolved by an upgrading the conductor to 125°C M.O.T an increase in rating to 270MVA. Estimated to take 24-30 months. An affected systems study will need to be completed with Duke/Progress to determine upgrades required on the Duke/Progress system.	Pending	\$3,000,000

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
			Total New Network Upgrades	\$70,400,000

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
# 6	6CARSON-6CHRL249 230 kV line	Wreck and rebuild the Carson – Chaparal – Locks 230 kV line #249 of 10 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to take 44-48 months to engineer, permit and construct. A VA CPCN is required.	Pending	\$25,875,011
# 7	6CHRL249-6LOCKS 230 kV line			
# 8 - 10	6CAROLNA 230/115 kV transformer	Add a second Carolina 230/115 kV transformer to increase its rating to 276.8 MVA (normal), 292.4 MVA (emergency), and 328.7 MVA (load dump). Estimated to take 24-30 months to engineer and construct.	Pending	\$5,500,000
# 11 - 15	6CLUBHSE 230/115 kV transformer	Replace the Clubhouse 230/115 kV transformer #1 increase its line rating to 276.8 MVA (normal), 292.4 MVA (emergency), and 328.7 MVA (load dump). It is estimated to take 14-16 months to engineer and construct.	Pending	\$5,500,000
# 16 - 19	6CLUBHSE- 6SAPONY 230 kV line	Replace wave trap at Clubhouse Substation to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to take 12-16 months to engineer and construct.	Pending	\$150,000

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
# 20	3KERR-3GW KING TAP 115 kV line	The Kerr Dam – Henderson 115kV line is a joint tie line between the Dominion Energy and Duke/Progress transmission systems. The Dominion portion can be resolved by an upgrading the conductor to 125°C M.O.T an increase in rating to 270MVA. Estimated to take 24-30 months. An affected systems study will need to be completed with Duke/Progress to determine upgrades required on the Duke/Progress system.	Pending	\$3,000,000
# 21	6BREMO-6BREMODIST 230 kV line	Reconductor the Bremo – Bremoe 230kV line of 1miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to take 30-36 months to engineer, permit, and construct. A Va CPCN is required.	Pending	\$2,500,000

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
# 22 - 23	05EDAN 1-05DANVL2 138 kV line	10. Replace Switch (1200 A), estimated cost \$400,000. 11. Replace line risers (Limiting Element: Sub Cond 1590 AAC 61 Str.), estimated cost \$100,000. 12. Rebuild / Reconductor 3.16 miles of conductor (Limiting Element: 336/556 Six Wire ACSR), estimated cost \$4.72 million. 13. Conduct an engineering study to determine if Relay - CT Thermal limit settings can be adjusted to mitigate the overload (Estimated Cost \$25,000), if not, a new relay package will be required (Estimated Cost: \$600,000). (Limiting Element: Relay Thermal Limit 1795 Amps - East Danville) 14. Conduct an engineering study to determine if Relay - CT Thermal limit settings can be adjusted to mitigate the overload (Estimated Cost \$25,000), if not, a new relay package will be required (Estimated Cost: \$600,000). (Limiting Element: Relay Thermal Limit 1795 Amps - Danville) 15. Conduct an engineering study to determine if Relay - CT Compliance Trip limit settings can be adjusted to mitigate the overload (Estimated Cost \$25,000), if not, a new relay package will be required (Estimated Cost: \$600,000). (Limiting Element: Relay Compliance Trip Limit 1916 Amps - East Danville) 16. Conduct an engineering study to determine if Relay - CT Compliance Trip limit settings can be adjusted to mitigate the overload (Estimated Cost \$25,000), if not, a new relay package will be required (Estimated Cost: \$600,000). (Limiting Element: Relay Compliance Trip Limit 1916 Amps - Danville) 17. Rebuild / Reconductor 0.03 miles of conductor (Limiting Element: 1351.5 ACSR 45/7 DIPPER) Near East Danville, estimated cost \$0.045 million. 18. Rebuild / Reconductor 0.03 miles of conductor (Limiting Element: 1351.5 ACSR 45/7 DIPPER) Near Danville, estimated cost \$0.045 million. An approximate construction time would be 24 to 36 months	Pending	\$7,710,000

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
Total New Network Upgrades				\$50,235,011

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 IC 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.

#	Contingency		Affected Area	Facility Description	Bus		Circuit	Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To			Initial	Final	Type	MVA	
24	N-1	DVP_P1-2: LN 2027-A	DVP - DVP	6BREMODIST-6MTEAGLE 230 kV line	313867	314765	1	DC	105.7	107.17	ER	662	21.39
25	N-1	DVP_P1-2: LN 563	DVP - DVP	6CARSON-6CHRL249 230 kV line	314282	314285	1	DC	109.02	109.65	ER	559	7.89
26	N-1	DVP_P1-2: LN 563	DVP - DVP	6CHRL249-6LOCKS 230 kV line	314285	314316	1	DC	105.6	106.24	ER	559	7.89
27	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6SAPONY-6CARSON 230 kV line	314435	314282	1	DC	117.88	118.9	ER	679	15.3
28	N-1	DVP_P1-2: LN 68	DVP - DVP	6CAROLNA 230/115 kV transformer	314559	314561	1	DC	114.58	116.59	ER	240	10.69

#	Contingency		Affected Area	Facility Description	Bus		Circuit	Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To			Initial	Final	Type	MVA	
29	N-1	DVP_P1-3: 3CAROLN A- 6CAROLN A	DVP - DVP	6CLUBHSE 230/115 kV transformer	314562	314563	1	DC	128.1	132.44	ER	183	17.55
30	Non	Non	DVP - DVP	6CLUBHSE 230/115 kV transformer	314562	314563	1	DC	94.61	103.05	NR	177	14.91
31	N-1	DVP_P1-2: LN 246	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	124.53	125.75	ER	599	16.06
32	Non	Non	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	105.42	106.62	NR	599	14.85
33	N-1	DVP_P1-2: LN 556	DVP - DVP	6HALIFAX-AC1-221 TAP 230 kV line	314697	927250	1	DC	115	116.81	ER	675	29.78
34	N-1	DVP_P1-2: LN 2027-A	DVP - DVP	6BREMO-6BREMOTIST 230 kV line	314747	313867	1	DC	107.81	109.29	ER	662	21.39
35	N-1	DVP_P1-2: LN 2027-A	DVP - DVP	6MTEAGLE-6CHARLVL 230 kV line	314765	314749	1	DC	102.32	103.8	ER	662	21.38
36	N-1	DVP_P1-2: LN 574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	174.29	174.83	ER	2442	28.93
37	N-1	DVP_P1-2: LN 556	DVP - CPLE	AC1-221 TAP-6PERSON230 T 230 kV line	927250	304070	1	DC	122.28	124	ER	718	29.78
38	N-1	AEP_P1- 2_#1377	AEP - AEP	05EDAN 1-05DANVL2 138 kV line	242631	242620	1	DC	133.93	134.79	ER	415	7.92
39	Non	Non	AEP - AEP	05EDAN 1-05DANVL2 138 kV line	242631	242620	1	DC	109.7	110.78	NR	275	6.59

Light Load Analysis

Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

Affected System Analysis & Mitigation

Duke, Progress & TVA Impacts:

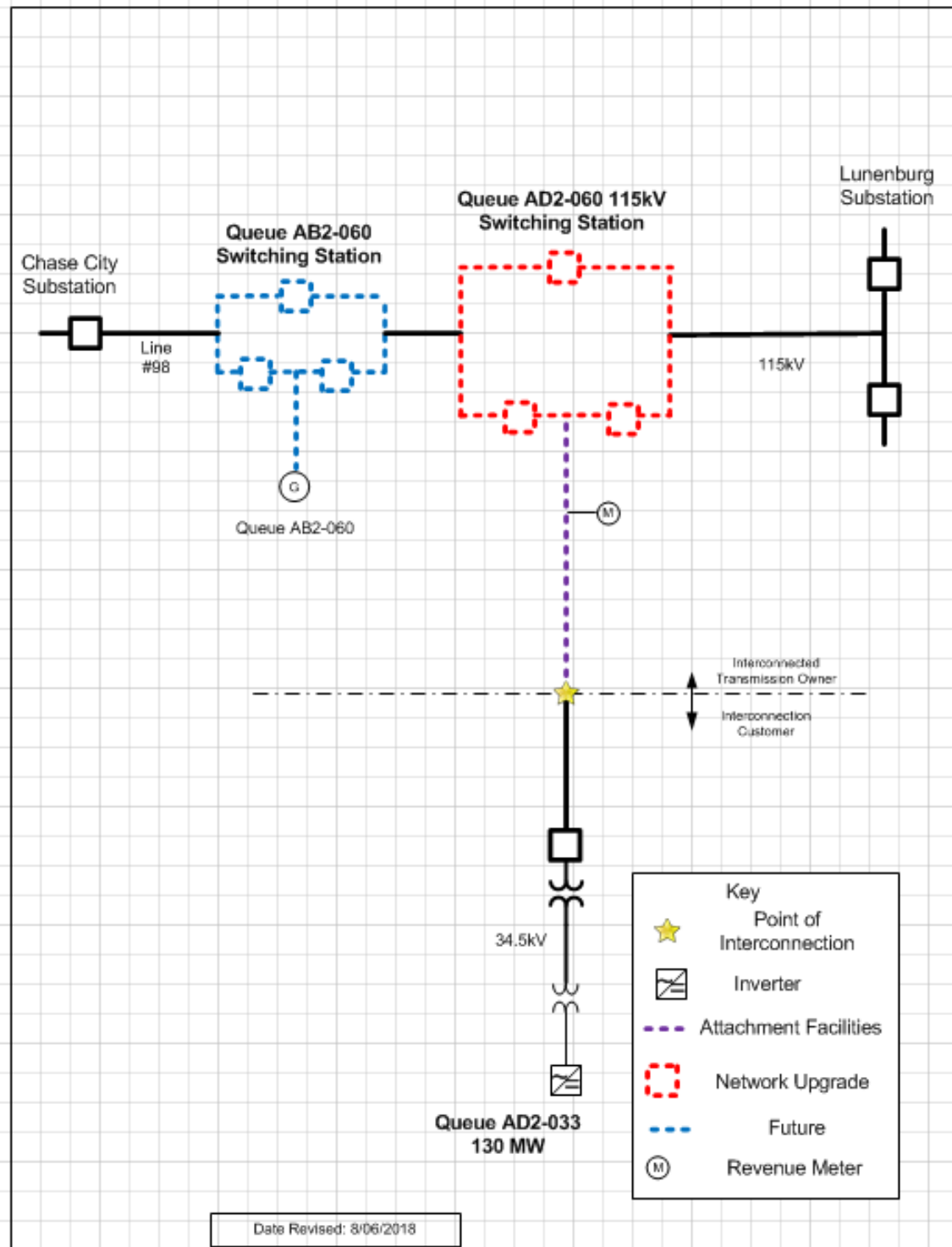
Duke Carolina, Progress, & TVA Impacts to be determined during later study phases (as applicable).

The Feasibility Study identified issues on joint tie lines between The AC1-221 Tap – Person 230kV line is a joint tie line between the Dominion Energy and Duke/Progress transmission systems. It is expected that an Affected System Study will be required with Duke / Progress to determine the upgrade necessary to the:

- AC1-221 Tap – Person 230kV line
- Kerr – King tap 115kV line

Attachment 1.

System Configuration



Attachment 2.

Flowgate Appendices

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. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. When a flowgate is identified in multiple analysis the appendix is presented for only the analysis with the greatest overload.

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.

Appendix 1

(DVP - DVP) The 6BREMIST-6MTEAGLE 230 kV line (from bus 313867 to bus 314765 ckt 1) loads from 98.31% to 100.25% (**DC power flow**) of its emergency rating (662 MVA) for the single line contingency outage of 'DVP_P1-2: LN 2027-A'. This project contributes approximately 12.83 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 2027-A'

OPEN BRANCH FROM BUS 314310 TO BUS 314322 CKT 1 /* 6JUDES F 230.00
- 6MDLTHAN 230.00

OPEN BRANCH FROM BUS 314310 TO BUS 314333 CKT 1 /* 6JUDES F 230.00
- 6POWHATN 230.00

OPEN BRANCH FROM BUS 314333 TO BUS 933500 CKT 1 /* 6POWHATN
230.00 - AC2-165 TAP 230.00

OPEN BUS 314310 /* ISLAND

OPEN BUS 314333 /* ISLAND

END

Bus Number	Bus Name	Full Contribution
315191	1BEARGRDN G1	16.52
315192	1BEARGRDN G2	16.52
315193	1BEARGRDN S1	33.99
315170	1BREMO 3	5.89
315171	1BREMO 4	12.95
315150	1BUGGS 1	1.41
315151	1BUGGS 2	1.41
315153	1CLOVER1	8.48
315154	1CLOVER2	8.37
315159	1KERR 2	0.97
315164	1KERR 7	0.95
314429	3JTRSVLE	0.7
932511	AC2-071 C	6.18
933501	AC2-165 C	37.77
934231	AD1-050 C	2.48
934311	AD1-055 C	1.26
934611	AD1-087 C O1	4.23
934621	AD1-088 C	14.54
934911	AD1-123 C	0.55
935171	AD1-152 C O1	4.21
935221	AD1-157 C	2.32
935231	AD1-160 C	1.7
936261	AD2-033 C	12.83
936361	AD2-046 C O1	5.4
936481	AD2-063 C O1	14.22

936651	AD2-082 C	2.61
937461	AD2-200 C	1.84
937481	AD2-202 C O1	1.17
LTF	CARR	0.24
LTF	CBM-S1	2.47
LTF	CBM-S2	6.48
LTF	CBM-W1	2.91
LTF	CBM-W2	12.38
LTF	CIN	0.7
LTF	CPL	2.12
LTF	DEARBORN	< 0.01
LTF	IPL	0.44
LTF	LGEE	0.16
LTF	MEC	2.05
LTF	MECS	0.13
LTF	RENSSELAER	0.19
LTF	ROSETON	1.4
LTF	WEC	0.2
LTF	AA2-074	1.44
920291	AA2-127	3.62
924021	AB2-043 C O1	2.48
924031	AB2-045 C	1.23
924161	AB2-060 C O1	7.35
924301	AB2-077 C O1	1.54
924311	AB2-078 C O1	1.54
924321	AB2-079 C O1	1.54
924401	AB2-089 C	1.13
924411	AB2-090 C	3.13
925221	AB2-176 C	1.29
925611	AC1-036 C	1.08
925781	AC1-054 C	3.61
925831	AC1-062	0.09
926271	AC1-105 C	3.17
926761	AC1-162 C	47.87
927261	AC1-222 C	1.81

Appendix 2

(DVP - DVP) The 8NO ANNA-8LADYSMITH 500 kV line (from bus 314918 to bus 314911 ckt 1) loads from 99.99% to 100.15% (**DC power flow**) of its emergency rating (3219 MVA) for the single line contingency outage of 'DVP_P1-2: LN 573'. This project contributes approximately 10.6 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 573'

OPEN BRANCH FROM BUS 314918 TO BUS 314934 CKT 1 /* 8NO ANNA
500.00 - 8SPOTSYL 500.00
END

Bus Number	Bus Name	Full Contribution
315102	1BRUNSWICKG1	10.21
315103	1BRUNSWICKG2	10.21
315104	1BRUNSWICKG3	10.21
315105	1BRUNSWICKS1	21.2
315153	1CLOVER1	14.46
315154	1CLOVER2	14.27
315131	1EDGECEMA	7.4
315132	1EDGECEMB	7.4
315108	1ELIZAR1	3.05
315109	1ELIZAR2	3.
315110	1ELIZAR3	3.09
315172	1LOISA A	3.53
315173	1LOISA B	3.55
315174	1LOISA C	3.55
315175	1LOISA D	3.55
315176	1LOISA E	7.23
315225	1N ANNA1	128.8
315226	1N ANNA2	128.73
315177	1S ANNAG1	2.27
315179	1S ANNAG2	2.27
315178	1S ANNAS1	1.17
315180	1S ANNAS2	1.17
315083	1SPRUNCA	7.26
315084	1SPRUNCB	7.26
315085	1SPRUNCC	5.38
315086	1SPRUNCD	5.38
314315	3LOCKS E	0.84
314643	3O INLET	0.42
932041	AC2-012 C	8.06

932511	AC2-071 C	1.84
932581	AC2-078 C	2.98
932591	AC2-079 C	4.44
932631	AC2-084 C	7.11
932701	AC2-093 C	75.97
932761	AC2-100 C	4.06
933291	AC2-141 C	24.18
933471	AC2-161 C	1.72
933501	AC2-165 C	11.
933731	AC2-196 C	1.43
933991	AD1-023 C	10.61
934061	AD1-033 C O1	5.99
934201	AD1-047 C	6.67
934231	AD1-050 C	3.85
934311	AD1-055 C	2.01
934331	AD1-057 C O1	8.08
934341	AD1-058 C	4.43
934521	AD1-076 C O1	43.85
934571	AD1-082 C O1	5.84
934611	AD1-087 C O1	7.41
934621	AD1-088 C	11.88
LTF	AD1-120	9.67
LTF	AD1-121	9.63
934911	AD1-123 C	0.88
934991	AD1-131 C	1.45
935111	AD1-144 C	1.32
935171	AD1-152 C O1	7.37
935211	AD1-156 C	1.61
935221	AD1-157 C	1.25
935231	AD1-160 C	0.92
936261	AD2-033 C	10.6
936331	AD2-043 C	3.76
936361	AD2-046 C O1	7.24
936391	AD2-049 C	1.21
936401	AD2-051 C O1	7.1
936481	AD2-063 C O1	12.22
936531	AD2-068 C	4.17
936651	AD2-082 C	1.4
936661	AD2-085 C	2.66
936701	AD2-089 C	5.77
936711	AD2-090 C O1	5.79
LTF	AD2-099	7.1
937221	AD2-160 C O1	4.67
937441	AD2-195 C	7.52
937461	AD2-200 C	1.5

937481	AD2-202 C O1	2.04
937541	AD2-215 C	1.34
LTF	CARR	1.07
LTF	CBM-S1	10.93
LTF	CBM-S2	22.63
LTF	CBM-W1	19.5
LTF	CBM-W2	57.17
LTF	CIN	4.61
LTF	CPL	7.05
LTF	IPL	2.93
LTF	LGEE	1.02
LTF	MEC	10.97
LTF	MECS	3.25
LTF	RENSSELAER	0.85
LTF	ROSETON	6.15
LTF	WEC	1.25
916191	Z1-068 C	0.04
916301	Z1-086 C	62.16
919151	AA1-139 C	2.35
LTF	AA2-074	4.8
920691	AA2-178 C	7.72
930051	AB1-013 C	2.33
930401	AB1-081 C	7.15
930861	AB1-132 C	11.54
931231	AB1-173 C	1.88
931241	AB1-173AC	1.88
923801	AB2-015 C O1	6.91
923831	AB2-022 C	1.83
923851	AB2-025 C	0.41
923861	AB2-026 C	0.49
923911	AB2-031 C O1	1.86
923941	AB2-035 C	0.27
923991	AB2-040 C O1	6.12
924021	AB2-043 C O1	2.55
924071	AB2-051	108.43
924151	AB2-059 C O1	8.42
924161	AB2-060 C O1	7.34
924301	AB2-077 C O1	1.62
924311	AB2-078 C O1	1.62
924321	AB2-079 C O1	1.62
924391	AB2-088 C	0.35
924401	AB2-089 C	1.75
924411	AB2-090 C	3.21
924491	AB2-098 C	0.45
924501	AB2-099 C	0.48

924511	AB2-100 C	9.63
925021	AB2-158 C	25.05
925051	AB2-160 C O1	3.63
925061	AB2-161 C O1	2.56
925121	AB2-169 C	5.21
925171	AB2-174 C O1	5.86
925221	AB2-176 C	1.32
925281	AB2-186 C	0.49
925291	AB2-188 C O1	1.9
925521	AC1-027 C	0.31
925591	AC1-034 C	5.46
925611	AC1-036 C	0.78
925781	AC1-054 C	5.91
926071	AC1-086 C	16.99
926201	AC1-098 C	4.99
926211	AC1-099 C	1.67
926271	AC1-105 C	4.53
926741	AC1-159	52.28
926751	AC1-161 C	24.18
926761	AC1-162 C	25.45
926771	AC1-163 C	1.57
927021	AC1-189 C	6.88
927141	AC1-208 C	7.38
927251	AC1-221 C	1.77
927261	AC1-222 C	2.89

Appendix 3

(DVP - CPLE) The AC1-221 TAP-6PERSON230 T 230 kV line (from bus 927250 to bus 304070 ckt 1) loads from 99.03% to 101.36% (**DC power flow**) of its emergency rating (718 MVA) for the single line contingency outage of 'DVP_P1-2: LN 556'. This project contributes approximately 17.87 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 556'

OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 1 /* 6CLOVER
230.00 - 8CLOVER 500.00

OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 2 /* 6CLOVER
230.00 - 8CLOVER 500.00

OPEN BRANCH FROM BUS 314686 TO BUS 314906 CKT 3 /* 6CLOVER
230.00 - 8CLOVER 500.00

OPEN BRANCH FROM BUS 314906 TO BUS 314936 CKT 1 /* 8CLOVER
500.00 - 8RAWLINGS 500.00

OPEN BUS 314906 /* ISLAND

END

Bus Number	Bus Name	Full Contribution
315150	1BUGGS 1	3.47
315151	1BUGGS 2	3.47
315153	1CLOVER1	44.94
315154	1CLOVER2	44.35
315159	1KERR 2	1.5
315164	1KERR 7	1.47
315266	1PLYWOOD A	3.94
314429	3JTRSVLE	0.65
932511	AC2-071 C	2.43
932761	AC2-100 C	26.96
932821	AC2-107 C	21.09
934311	AD1-055 C	6.99
934341	AD1-058 C	29.37
934611	AD1-087 C O1	26.88
934621	AD1-088 C	31.78
934911	AD1-123 C	3.15
934991	AD1-131 C	9.63
935171	AD1-152 C O1	26.71
935221	AD1-157 C	2.12
935231	AD1-160 C	1.56
936261	AD2-033 C	17.87
936331	AD2-043 C	13.03

936361	AD2-046 C O1	8.54
936481	AD2-063 C O1	20.57
936651	AD2-082 C	2.38
937461	AD2-200 C	4.01
937481	AD2-202 C O1	7.4
LTF	AMIL	0.47
LTF	BAYOU	2.65
LTF	BIG_CAJUN1	4.19
LTF	BIG_CAJUN2	8.43
LTF	BLUEG	2.36
LTF	CALDERWOOD	1.59
LTF	CANNELTON	0.46
LTF	CARR	0.05
LTF	CATAWBA	1.71
LTF	CELEVELAND	4.85
LTF	CHEOAH	1.49
LTF	CHILHOWEE	0.52
LTF	CHOCTAW	2.86
LTF	CLIFTY	8.32
LTF	COTTONWOOD	10.35
LTF	DEARBORN	0.85
LTF	EDWARDS	0.75
LTF	ELMERSMITH	1.36
LTF	FARMERCITY	0.61
LTF	G-007A	0.33
LTF	GIBSON	0.84
LTF	HAMLET	6.43
LTF	MORGAN	4.61
LTF	NEWTON	2.07
LTF	O-066A	0.15
LTF	PRAIRIE	4.58
LTF	RENSSELAER	0.04
LTF	ROSETON	0.28
LTF	ROWAN	3.78
LTF	SANTEETLA	0.45
LTF	SMITHLAND	0.41
LTF	TATANKA	1.02
LTF	TILTON	0.87
LTF	TRIMBLE	0.45
LTF	TVA	1.92
LTF	UNIONPOWER	3.01
LTF	VFT	0.86
924021	AB2-043 C O1	4.28
924031	AB2-045 C	0.49
924161	AB2-060 C O1	12.35

924301	AB2-077 C O1	2.76
924311	AB2-078 C O1	2.76
924321	AB2-079 C O1	2.76
924411	AB2-090 C	5.39
925221	AB2-176 C	2.22
925611	AC1-036 C	1.32
925831	AC1-062	0.09
925991	AC1-075 C	11.86
926021	AC1-080 C	3.96
926271	AC1-105 C	14.47
926761	AC1-162 C	56.65
927251	AC1-221 C	11.71
927261	AC1-222 C	10.06

Appendix 4

(DVP - DVP) The 6CARSON-6CHRL249 230 kV line (from bus 314282 to bus 314285 ckt 1) loads from 118.85% to 119.47% (**DC power flow**) of its load dump rating (684 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 562T563'. This project contributes approximately 9.07 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 562T563'

/*CARSON

OPEN BRANCH FROM BUS 314902 TO BUS 314923 CKT 1

/*CARSON TO

MIDLOTHIAN

OPEN BRANCH FROM BUS 314914 TO BUS 314902 CKT 1

/*CARSON 500.00

- 8SEPTA 500.00

END

Bus Number	Bus Name	Full Contribution
315105	1BRUNSWICKS1	11.28
315131	1EDGECEMA	4.76
315132	1EDGECEMB	4.76
315139	1GASTONA	2.47
315141	1GASTONB	2.47
315136	1ROSEMG1	1.71
315138	1ROSEMG2	0.8
315137	1ROSEMS1	1.06
315073	1STONECA	-2.58
314557	3BETHELC	0.39
314554	3BTLEBRO	0.41
314572	3EMPORIA	0.33
314578	3HORNRTN	1.92
314582	3KELFORD	0.39
314704	3LAWRENC	0.28
314603	3SCOT NK	1.62
314617	3TUNIS	0.36
314541	3WATKINS	0.24
314620	6CASHIE	0.31
314574	6EVERETS	1.06
314594	6PLYMOTH	0.28
932631	AC2-084 C	4.46
932632	AC2-084 E	2.2
932701	AC2-093 C	40.57
932702	AC2-093 E	23.21
932761	AC2-100 C	2.16
932762	AC2-100 E	1.05

933991	AD1-023 C	4.58
933992	AD1-023 E	2.49
934201	AD1-047 C	5.74
934202	AD1-047 E	3.82
934231	AD1-050 C	2.37
934232	AD1-050 E	1.3
934311	AD1-055 C	1.03
934312	AD1-055 E	0.27
934331	AD1-057 C O1	5.88
934332	AD1-057 E O1	3.14
934341	AD1-058 C	2.35
934342	AD1-058 E	0.6
934521	AD1-076 C O1	18.08
934522	AD1-076 E O1	9.21
934611	AD1-087 C O1	3.7
934612	AD1-087 E O1	1.74
934621	AD1-088 C	4.87
934622	AD1-088 E	2.29
LTF	AD1-120	5.26
LTF	AD1-121	5.24
934911	AD1-123 C	0.45
934912	AD1-123 E	0.23
934991	AD1-131 C	0.77
934992	AD1-131 E	0.51
935171	AD1-152 C O1	3.68
935172	AD1-152 E O1	2.45
935211	AD1-156 C	1.
935212	AD1-156 E	0.67
936171	AD2-023 C O1	1.94
936172	AD2-023 E O1	1.05
936261	AD2-033 C	5.44
936262	AD2-033 E	3.63
936331	AD2-043 C	1.93
936332	AD2-043 E	2.28
936361	AD2-046 C O1	4.27
936362	AD2-046 E O1	1.96
936401	AD2-051 C O1	3.85
936402	AD2-051 E O1	1.65
936481	AD2-063 C O1	6.38
936482	AD2-063 E O1	4.25
936531	AD2-068 C	2.3
936532	AD2-068 E	1.19
936701	AD2-089 C	3.51
936702	AD2-089 E	2.34
936711	AD2-090 C O1	2.62

936712	AD2-090 E O1	1.75
LTF	AD2-099	3.89
937441	AD2-195 C	3.4
937442	AD2-195 E	1.47
937461	AD2-200 C	0.62
937462	AD2-200 E	0.29
937481	AD2-202 C O1	1.02
937482	AD2-202 E O1	0.51
LTF	CARR	0.17
LTF	CBM-S1	6.32
LTF	CBM-S2	12.36
LTF	CBM-W1	13.65
LTF	CBM-W2	34.06
LTF	CIN	3.08
LTF	CPL	3.87
LTF	G-007	1.04
LTF	IPL	1.96
LTF	LGEE	0.66
LTF	MEC	6.97
LTF	MECS	3.01
LTF	O-066	3.47
LTF	RENSSELAER	0.14
LTF	ROSETON	1.01
292791	U1-032 E	-1.34
900672	V4-068 E	0.13
LTF	WEC	0.84
916301	Z1-086 C	33.09
916302	Z1-086 E	5.26
917332	Z2-043 E	0.46
917342	Z2-044 E	0.3
917512	Z2-088 E OP1	1.84
918492	AA1-063AE OP	2.09
918512	AA1-065 E OP	1.82
918532	AA1-067 E	0.32
918562	AA1-072 E	0.08
919692	AA2-053 E	2.08
919702	AA2-057 E	1.84
LTF	AA2-074	2.63
920042	AA2-088 E	4.33
920592	AA2-165 E	0.24
920672	AA2-174 E	0.24
930401	AB1-081 C	4.55
930402	AB1-081 E	1.95
930861	AB1-132 C	9.57
930862	AB1-132 E	4.1

931231	AB1-173 C	1.61
931232	AB1-173 E	0.75
931241	AB1-173AC	1.61
931242	AB1-173AE	0.75
923801	AB2-015 C O1	2.87
923802	AB2-015 E O1	2.35
923851	AB2-025 C	0.57
923852	AB2-025 E	1.3
923911	AB2-031 C O1	1.6
923912	AB2-031 E O1	0.79
923941	AB2-035 C	0.16
923942	AB2-035 E	0.07
923991	AB2-040 C O1	5.26
923992	AB2-040 E O1	4.3
924021	AB2-043 C O1	1.43
924022	AB2-043 E O1	2.34
924151	AB2-059 C O1	5.37
924152	AB2-059 E O1	2.76
924161	AB2-060 C O1	4.07
924162	AB2-060 E O1	1.92
924301	AB2-077 C O1	0.91
924302	AB2-077 E O1	0.6
924311	AB2-078 C O1	0.91
924312	AB2-078 E O1	0.6
924321	AB2-079 C O1	0.91
924322	AB2-079 E O1	0.6
924391	AB2-088 C	0.21
924392	AB2-088 E	0.1
924401	AB2-089 C	1.08
924402	AB2-089 E	0.55
924411	AB2-090 C	1.8
924412	AB2-090 E	0.92
924491	AB2-098 C	0.25
924492	AB2-098 E	0.11
924501	AB2-099 C	0.26
924502	AB2-099 E	0.11
924511	AB2-100 C	10.65
924512	AB2-100 E	5.25
925121	AB2-169 C	2.45
925122	AB2-169 E	2.2
925171	AB2-174 C O1	5.21
925172	AB2-174 E O1	4.72
925221	AB2-176 C	0.74
925222	AB2-176 E	0.32
925591	AC1-034 C	3.48

925592	AC1-034 E	2.62
925611	AC1-036 C	0.37
925612	AC1-036 E	0.61
925781	AC1-054 C	3.71
925782	AC1-054 E	1.71
926071	AC1-086 C	14.1
926072	AC1-086 E	6.42
926201	AC1-098 C	3.13
926202	AC1-098 E	1.86
926211	AC1-099 C	1.05
926212	AC1-099 E	0.62
926271	AC1-105 C	2.38
926272	AC1-105 E	1.19
926771	AC1-163 C	0.84
926772	AC1-163 E	0.39
927021	AC1-189 C	3.98
927022	AC1-189 E	1.98
927141	AC1-208 C	4.92
927142	AC1-208 E	2.19
927251	AC1-221 C	0.94
927252	AC1-221 E	0.94
927261	AC1-222 C	1.48
927262	AC1-222 E	1.41

Appendix 5

(DVP - DVP) The 6CHRL249-6LOCKS 230 kV line (from bus 314285 to bus 314316 ckt 1) loads from 116.06% to 116.67% (**DC power flow**) of its load dump rating (684 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 562T563'. This project contributes approximately 9.07 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 562T563'

/*CARSON

OPEN BRANCH FROM BUS 314902 TO BUS 314923 CKT 1

/*CARSON TO

MIDLOTHIAN

OPEN BRANCH FROM BUS 314914 TO BUS 314902 CKT 1

/*CARSON 500.00

- 8SEPTA 500.00

END

Bus Number	Bus Name	Full Contribution
315105	1BRUNSWICKS1	11.28
315131	1EDGECEMA	4.76
315132	1EDGECEMB	4.76
315139	1GASTONA	2.47
315141	1GASTONB	2.47
315136	1ROSEMG1	1.71
315138	1ROSEMG2	0.8
315137	1ROSEMS1	1.06
315073	1STONECA	-2.58
314557	3BETHELC	0.39
314554	3BTLEBRO	0.41
314572	3EMPORIA	0.33
314578	3HORNRTN	1.92
314582	3KELFORD	0.39
314704	3LAWRENC	0.28
314603	3SCOT NK	1.62
314617	3TUNIS	0.36
314541	3WATKINS	0.24
314620	6CASHIE	0.31
314574	6EVERETS	1.06
314594	6PLYMOTH	0.28
932631	AC2-084 C	4.46
932632	AC2-084 E	2.2
932701	AC2-093 C	40.57
932702	AC2-093 E	23.21
932761	AC2-100 C	2.16
932762	AC2-100 E	1.05

933991	AD1-023 C	4.58
933992	AD1-023 E	2.49
934201	AD1-047 C	5.74
934202	AD1-047 E	3.82
934231	AD1-050 C	2.37
934232	AD1-050 E	1.3
934311	AD1-055 C	1.03
934312	AD1-055 E	0.27
934331	AD1-057 C O1	5.88
934332	AD1-057 E O1	3.14
934341	AD1-058 C	2.35
934342	AD1-058 E	0.6
934521	AD1-076 C O1	18.08
934522	AD1-076 E O1	9.21
934611	AD1-087 C O1	3.7
934612	AD1-087 E O1	1.74
934621	AD1-088 C	4.87
934622	AD1-088 E	2.29
LTF	AD1-120	5.26
LTF	AD1-121	5.24
934911	AD1-123 C	0.45
934912	AD1-123 E	0.23
934991	AD1-131 C	0.77
934992	AD1-131 E	0.51
935171	AD1-152 C O1	3.68
935172	AD1-152 E O1	2.45
935211	AD1-156 C	1.
935212	AD1-156 E	0.67
936171	AD2-023 C O1	1.94
936172	AD2-023 E O1	1.05
936261	AD2-033 C	5.44
936262	AD2-033 E	3.63
936331	AD2-043 C	1.93
936332	AD2-043 E	2.28
936361	AD2-046 C O1	4.27
936362	AD2-046 E O1	1.96
936401	AD2-051 C O1	3.85
936402	AD2-051 E O1	1.65
936481	AD2-063 C O1	6.38
936482	AD2-063 E O1	4.25
936531	AD2-068 C	2.3
936532	AD2-068 E	1.19
936701	AD2-089 C	3.51
936702	AD2-089 E	2.34
936711	AD2-090 C O1	2.62

936712	AD2-090 E O1	1.75
LTF	AD2-099	3.89
937441	AD2-195 C	3.4
937442	AD2-195 E	1.47
937461	AD2-200 C	0.62
937462	AD2-200 E	0.29
937481	AD2-202 C O1	1.02
937482	AD2-202 E O1	0.51
LTF	CARR	0.17
LTF	CBM-S1	6.32
LTF	CBM-S2	12.36
LTF	CBM-W1	13.65
LTF	CBM-W2	34.06
LTF	CIN	3.08
LTF	CPL	3.87
LTF	G-007	1.04
LTF	IPL	1.96
LTF	LGEE	0.66
LTF	MEC	6.97
LTF	MECS	3.01
LTF	O-066	3.47
LTF	RENSSELAER	0.14
LTF	ROSETON	1.01
292791	U1-032 E	-1.34
900672	V4-068 E	0.13
LTF	WEC	0.84
916301	Z1-086 C	33.09
916302	Z1-086 E	5.26
917332	Z2-043 E	0.46
917342	Z2-044 E	0.3
917512	Z2-088 E OP1	1.84
918492	AA1-063AE OP	2.09
918512	AA1-065 E OP	1.82
918532	AA1-067 E	0.32
918562	AA1-072 E	0.08
919692	AA2-053 E	2.08
919702	AA2-057 E	1.84
LTF	AA2-074	2.63
920042	AA2-088 E	4.33
920592	AA2-165 E	0.24
920672	AA2-174 E	0.24
930401	AB1-081 C	4.55
930402	AB1-081 E	1.95
930861	AB1-132 C	9.57
930862	AB1-132 E	4.1

931231	AB1-173 C	1.61
931232	AB1-173 E	0.75
931241	AB1-173AC	1.61
931242	AB1-173AE	0.75
923801	AB2-015 C O1	2.87
923802	AB2-015 E O1	2.35
923851	AB2-025 C	0.57
923852	AB2-025 E	1.3
923911	AB2-031 C O1	1.6
923912	AB2-031 E O1	0.79
923941	AB2-035 C	0.16
923942	AB2-035 E	0.07
923991	AB2-040 C O1	5.26
923992	AB2-040 E O1	4.3
924021	AB2-043 C O1	1.43
924022	AB2-043 E O1	2.34
924151	AB2-059 C O1	5.37
924152	AB2-059 E O1	2.76
924161	AB2-060 C O1	4.07
924162	AB2-060 E O1	1.92
924301	AB2-077 C O1	0.91
924302	AB2-077 E O1	0.6
924311	AB2-078 C O1	0.91
924312	AB2-078 E O1	0.6
924321	AB2-079 C O1	0.91
924322	AB2-079 E O1	0.6
924391	AB2-088 C	0.21
924392	AB2-088 E	0.1
924401	AB2-089 C	1.08
924402	AB2-089 E	0.55
924411	AB2-090 C	1.8
924412	AB2-090 E	0.92
924491	AB2-098 C	0.25
924492	AB2-098 E	0.11
924501	AB2-099 C	0.26
924502	AB2-099 E	0.11
924511	AB2-100 C	10.65
924512	AB2-100 E	5.25
925121	AB2-169 C	2.45
925122	AB2-169 E	2.2
925171	AB2-174 C O1	5.21
925172	AB2-174 E O1	4.72
925221	AB2-176 C	0.74
925222	AB2-176 E	0.32
925591	AC1-034 C	3.48

925592	AC1-034 E	2.62
925611	AC1-036 C	0.37
925612	AC1-036 E	0.61
925781	AC1-054 C	3.71
925782	AC1-054 E	1.71
926071	AC1-086 C	14.1
926072	AC1-086 E	6.42
926201	AC1-098 C	3.13
926202	AC1-098 E	1.86
926211	AC1-099 C	1.05
926212	AC1-099 E	0.62
926271	AC1-105 C	2.38
926272	AC1-105 E	1.19
926771	AC1-163 C	0.84
926772	AC1-163 E	0.39
927021	AC1-189 C	3.98
927022	AC1-189 E	1.98
927141	AC1-208 C	4.92
927142	AC1-208 E	2.19
927251	AC1-221 C	0.94
927252	AC1-221 E	0.94
927261	AC1-222 C	1.48
927262	AC1-222 E	1.41

Appendix 6

(DVP - DVP) The 6CAROLNA 230/115 kV transformer (from bus 314559 to bus 314561 ckt 1) loads from 108.01% to 109.89% (**DC power flow**) of its load dump rating (289 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 7152'. This project contributes approximately 12.03 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 7152'

/* CLUBHOUSE

OPEN BUS 314562

/* CLUBHOUSE 115KV BUS

OPEN BUS 314565

/* LINE 71

OPEN BUS 314850

/* LINE 71

OPEN BUS 314693

/* LINE 71

OPEN BUS 314704

/* LINE 71

OPEN BUS 314676

/* LINE 71

OPEN BUS 314782

/* LINE 132

OPEN BUS 314786

/* LINE 132

OPEN BUS 314787

/* LINE 50

OPEN BUS 314782

/* LINE 50

OPEN BUS 314785

/* LINE 50

OPEN BUS 314516

/* LINE 71

OPEN BUS 314675

/* LINE 71

END

Bus Number	Bus Name	Full Contribution
315159	1KERR 2	1.73
315164	1KERR 7	1.71
315126	1ROARAP2	4.38
315128	1ROARAP4	4.22
315115	1S HAMPT1	1.74
314572	3EMPORIA	1.12
314578	3HORNRTN	8.17
314582	3KELFORD	0.51
314603	3SCOT NK	2.69
314617	3TUNIS	0.63
314539	3UNCAMP	1.86
314541	3WATKINS	0.65
932631	AC2-084 C	8.22
932632	AC2-084 E	4.05
934201	AD1-047 C	21.51
934202	AD1-047 E	14.34
934231	AD1-050 C	6.14

934232	AD1-050 E	3.36
936261	AD2-033 C	7.22
936262	AD2-033 E	4.81
936361	AD2-046 C O1	8.59
936362	AD2-046 E O1	3.95
936481	AD2-063 C O1	8.53
936482	AD2-063 E O1	5.69
936711	AD2-090 C O1	7.41
936712	AD2-090 E O1	4.94
LTF	CARR	0.03
LTF	CBM-S1	0.33
LTF	CBM-S2	0.51
LTF	CBM-W1	0.75
LTF	CBM-W2	1.77
LTF	CIN	0.18
LTF	CPLE	0.12
LTF	G-007	0.13
LTF	IPL	0.12
LTF	LGEE	0.04
LTF	MEC	0.38
LTF	MECS	0.16
LTF	O-066	0.45
LTF	RENSSELAER	0.02
LTF	ROSETON	0.16
900671	V4-068 C	0.11
900672	V4-068 E	0.31
LTF	WEC	0.05
907092	X1-038 E	4.64
917332	Z2-043 E	0.62
918491	AA1-063AC OP	3.58
918492	AA1-063AE OP	8.59
918562	AA1-072 E	0.1
919691	AA2-053 C	3.76
919692	AA2-053 E	8.2
919702	AA2-057 E	2.35
920041	AA2-088 C	1.61
920042	AA2-088 E	13.36
920592	AA2-165 E	0.31
920671	AA2-174 C	0.17
920672	AA2-174 E	0.95
930861	AB1-132 C	-13.28
931231	AB1-173 C	6.05
931232	AB1-173 E	2.82
931241	AB1-173AC	6.05
931242	AB1-173AE	2.82

923801	AB2-015 C O1	7.5
923802	AB2-015 E O1	6.15
923911	AB2-031 C O1	6.01
923912	AB2-031 E O1	2.96
923991	AB2-040 C O1	19.72
923992	AB2-040 E O1	16.13
924021	AB2-043 C O1	1.97
924022	AB2-043 E O1	3.23
924161	AB2-060 C O1	5.59
924162	AB2-060 E O1	2.63
924301	AB2-077 C O1	1.26
924302	AB2-077 E O1	0.84
924311	AB2-078 C O1	1.26
924312	AB2-078 E O1	0.84
924321	AB2-079 C O1	1.26
924322	AB2-079 E O1	0.84
924401	AB2-089 C	2.79
924402	AB2-089 E	1.44
924411	AB2-090 C	2.48
924412	AB2-090 E	1.27
924501	AB2-099 C	0.34
924502	AB2-099 E	0.14
925171	AB2-174 C O1	18.82
925172	AB2-174 E O1	17.03
925221	AB2-176 C	1.02
925222	AB2-176 E	0.44
925781	AC1-054 C	10.55
925782	AC1-054 E	4.86
926201	AC1-098 C	5.77
926202	AC1-098 E	3.44
926211	AC1-099 C	1.93
926212	AC1-099 E	1.14
926771	AC1-163 C	1.11
926772	AC1-163 E	0.52
927141	AC1-208 C	13.69
927142	AC1-208 E	6.08

Appendix 7

(DVP - DVP) The 6CLUBHSE 230/115 kV transformer (from bus 314562 to bus 314563 ckt 1) loads from 131.93% to 141.17% (**DC power flow**) of its load dump rating (209 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-5: T122C'. This project contributes approximately 19.27 MW to the thermal violation.

CONTINGENCY 'DVP_P4-5: T122C'

/* CAROLINA

OPEN BUS 314559

/* CAROLINA 115KV BUS

OPEN BUS 315126

/* ROANOKE RAPIDS GEN 1 AND 2

OPEN BUS 315128

/* ROANOKE RAPIDS GEN 3 AND 4

OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1

/* TX. #4

END

Bus Number	Bus Name	Full Contribution
315159	1KERR 2	1.27
315164	1KERR 7	1.25
314572	3EMPORIA	1.99
314704	3LAWRENC	1.44
934201	AD1-047 C	38.11
934202	AD1-047 E	25.41
934231	AD1-050 C	3.55
934232	AD1-050 E	1.94
936261	AD2-033 C	11.56
936262	AD2-033 E	7.71
936361	AD2-046 C O1	7.05
936362	AD2-046 E O1	3.24
936481	AD2-063 C O1	13.68
936482	AD2-063 E O1	9.12
LTF	CARR	0.01
LTF	CBM-S1	0.61
LTF	CBM-S2	0.82
LTF	CBM-W1	1.64
LTF	CBM-W2	3.36
LTF	CIN	0.38
LTF	CPLE	0.21
LTF	G-007	0.11
LTF	IPL	0.24
LTF	LGEE	0.08
LTF	MEC	0.76
LTF	MECS	0.42
LTF	O-066	0.37

LTF	RENSSELAER	0.01
LTF	ROSETON	0.08
LTF	WEC	0.1
931231	AB1-173 C	10.72
931232	AB1-173 E	5.
931241	AB1-173AC	10.72
931242	AB1-173AE	5.
923911	AB2-031 C O1	10.64
923912	AB2-031 E O1	5.24
923991	AB2-040 C O1	34.94
923992	AB2-040 E O1	28.59
924021	AB2-043 C O1	3.16
924022	AB2-043 E O1	5.18
924161	AB2-060 C O1	8.96
924162	AB2-060 E O1	4.22
924301	AB2-077 C O1	1.94
924302	AB2-077 E O1	1.29
924311	AB2-078 C O1	1.94
924312	AB2-078 E O1	1.29
924321	AB2-079 C O1	1.94
924322	AB2-079 E O1	1.29
924401	AB2-089 C	1.61
924402	AB2-089 E	0.83
924411	AB2-090 C	3.97
924412	AB2-090 E	2.04
925171	AB2-174 C O1	33.35
925172	AB2-174 E O1	30.17
925221	AB2-176 C	1.64
925222	AB2-176 E	0.7
925611	AC1-036 C	0.76
925612	AC1-036 E	1.25
925781	AC1-054 C	5.42
925782	AC1-054 E	2.5

Appendix 8

(DVP - DVP) The 6CLUBHSE-6SAPONY 230 kV line (from bus 314563 to bus 314435 ckt 1) loads from 123.7% to 124.86% (**DC power flow**) of its load dump rating (637 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 246T247'. This project contributes approximately 16.22 MW to the thermal violation.

```
CONTINGENCY 'DVP_P4-2: 246T247'                                /* SUFFOLK 230 KV
  OPEN BRANCH FROM BUS 314537 TO BUS 314575 CKT 1              /* 6SUFFOLK
230.00 - 6NUCO TP 230.00
  OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1              /* 6EARLEYS
230.00 - 6NUCO TP 230.00
  OPEN BRANCH FROM BUS 314575 TO BUS 314590 CKT 1              /* 6NUCO TP
230.00 - 6NUCOR 230.00
  OPEN BUS 314575                                                /* ISLAND: 6NUCO TP 230.00
  OPEN BUS 314590                                                /* ISLAND: 6NUCOR 230.00
  OPEN BRANCH FROM BUS 314537 TO BUS 314648 CKT 1              /* 6SUFFOLK
230.00 - 6SUNBURY 230.00
  OPEN BRANCH FROM BUS 314648 TO BUS 901080 CKT 1              /* 6SUNBURY
230.00 - W1-029 230.00
  OPEN BUS 314648                                                /* ISLAND: 6SUNBURY 230.00
END
```

Bus Number	Bus Name	Full Contribution
315131	1EDGECEMA	10.81
315132	1EDGECEMB	10.81
315139	1GASTONA	7.61
315141	1GASTONB	7.61
315126	1ROARAP2	2.72
315128	1ROARAP4	2.62
315136	1ROSEMG1	5.14
315138	1ROSEMG2	2.41
315137	1ROSEMS1	3.19
314557	3BETHELC	0.9
314554	3BTLEBRO	0.91
314566	3CRESWEL	1.69
314572	3EMPORIA	1.04
314578	3HORNRTN	5.4
314582	3KELFORD	1.09
314704	3LAWRENC	0.82
314603	3SCOT NK	4.39

314617	3TUNIS	1.
314541	3WATKINS	0.48
314620	6CASHIE	0.87
314574	6EVERETS	2.55
314594	6PLYMOTH	0.72
932631	AC2-084 C	11.81
932632	AC2-084 E	5.82
933991	AD1-023 C	12.49
933992	AD1-023 E	6.8
934201	AD1-047 C	17.57
934202	AD1-047 E	11.71
934231	AD1-050 C	5.08
934232	AD1-050 E	2.78
934331	AD1-057 C O1	15.84
934332	AD1-057 E O1	8.45
934521	AD1-076 C O1	47.21
934522	AD1-076 E O1	24.04
LTF	AD1-120	4.44
LTF	AD1-121	4.42
936261	AD2-033 C	9.73
936262	AD2-033 E	6.49
936361	AD2-046 C O1	8.38
936362	AD2-046 E O1	3.85
936401	AD2-051 C O1	11.34
936402	AD2-051 E O1	4.87
936481	AD2-063 C O1	11.53
936482	AD2-063 E O1	7.69
936531	AD2-068 C	4.92
936532	AD2-068 E	2.53
936701	AD2-089 C	8.13
936702	AD2-089 E	5.42
936711	AD2-090 C O1	5.56
936712	AD2-090 E O1	3.71
LTF	AD2-099	3.35
937441	AD2-195 C	8.63
937442	AD2-195 E	3.72
LTF	CARR	0.11
LTF	CBM-S1	5.45
LTF	CBM-S2	10.91
LTF	CBM-W1	12.08
LTF	CBM-W2	29.5
LTF	CIN	2.72
LTF	CPL	3.68
LTF	G-007	0.77
LTF	IPL	1.73

LTF	LGEE	0.59
LTF	MEC	6.09
LTF	MECS	2.74
LTF	O-066	2.56
LTF	RENSSELAER	0.09
LTF	ROSETON	0.66
900671	V4-068 C	0.12
900672	V4-068 E	0.33
LTF	WEC	0.75
917331	Z2-043 C	0.6
917332	Z2-043 E	1.31
917341	Z2-044 C	0.32
917342	Z2-044 E	0.7
917511	Z2-088 C OP1	1.07
917512	Z2-088 E OP1	4.29
918411	AA1-050	0.9
918491	AA1-063AC OP	2.36
918492	AA1-063AE OP	5.65
918511	AA1-065 C OP	2.25
918512	AA1-065 E OP	5.62
918531	AA1-067 C	0.35
918532	AA1-067 E	0.77
918561	AA1-072 C	0.09
918562	AA1-072 E	0.22
919691	AA2-053 C	2.73
919692	AA2-053 E	5.95
919701	AA2-057 C	1.78
919702	AA2-057 E	4.52
LTF	AA2-074	2.51
920041	AA2-088 C	1.24
920042	AA2-088 E	10.3
920591	AA2-165 C	0.24
920592	AA2-165 E	0.6
920671	AA2-174 C	0.13
920672	AA2-174 E	0.69
920691	AA2-178 C	6.77
920692	AA2-178 E	2.9
930051	AB1-013 C	2.04
930052	AB1-013 E	13.68
930401	AB1-081 C	10.25
930402	AB1-081 E	4.39
930861	AB1-132 C	29.52
930862	AB1-132 E	12.65
931231	AB1-173 C	4.94
931232	AB1-173 E	2.31

931241	AB1-173AC	4.94
931242	AB1-173AE	2.31
923801	AB2-015 C O1	5.48
923802	AB2-015 E O1	4.49
923911	AB2-031 C O1	4.9
923912	AB2-031 E O1	2.42
923941	AB2-035 C	0.38
923942	AB2-035 E	0.16
923991	AB2-040 C O1	16.1
923992	AB2-040 E O1	13.17
924021	AB2-043 C O1	2.68
924022	AB2-043 E O1	4.39
924151	AB2-059 C O1	12.09
924152	AB2-059 E O1	6.23
924161	AB2-060 C O1	7.59
924162	AB2-060 E O1	3.57
924301	AB2-077 C O1	1.68
924302	AB2-077 E O1	1.12
924311	AB2-078 C O1	1.68
924312	AB2-078 E O1	1.12
924321	AB2-079 C O1	1.68
924322	AB2-079 E O1	1.12
924391	AB2-088 C	0.49
924392	AB2-088 E	0.24
924401	AB2-089 C	2.31
924402	AB2-089 E	1.19
924411	AB2-090 C	3.37
924412	AB2-090 E	1.73
924491	AB2-098 C	0.6
924492	AB2-098 E	0.26
924501	AB2-099 C	0.73
924502	AB2-099 E	0.31
924511	AB2-100 C	35.91
924512	AB2-100 E	17.69
925121	AB2-169 C	6.15
925122	AB2-169 E	5.52
925171	AB2-174 C O1	16.16
925172	AB2-174 E O1	14.62
925221	AB2-176 C	1.39
925222	AB2-176 E	0.59
925291	AB2-188 C O1	1.67
925292	AB2-188 E O1	0.75
925591	AC1-034 C	7.83
925592	AC1-034 E	5.91
925611	AC1-036 C	0.64

925612	AC1-036 E	1.04
925781	AC1-054 C	8.28
925782	AC1-054 E	3.81
926071	AC1-086 C	43.47
926072	AC1-086 E	19.79
926201	AC1-098 C	8.29
926202	AC1-098 E	4.94
926211	AC1-099 C	2.78
926212	AC1-099 E	1.63
926771	AC1-163 C	2.41
926772	AC1-163 E	1.13
927021	AC1-189 C	9.39
927022	AC1-189 E	4.68
927141	AC1-208 C	13.11
927142	AC1-208 E	5.82

Appendix 9

(DVP - CPLE) The 3KERR-3GW KING TAP 115 kV line (from bus 314702 to bus 304102 ckt 1) loads from 100.5% to 105.56% (**DC power flow**) of its emergency rating (199 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-5: T122C'. This project contributes approximately 22.63 MW to the thermal violation.

CONTINGENCY 'DVP_P4-5: T122C'

/* CAROLINA

OPEN BUS 314559

/* CAROLINA 115KV BUS

OPEN BUS 315126

/* ROANOKE RAPIDS GEN 1 AND 2

OPEN BUS 315128

/* ROANOKE RAPIDS GEN 3 AND 4

OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1

/* TX. #4

END

Bus Number	Bus Name	Full Contribution
315159	1KERR 2	3.65
315163	1KERR 6	3.6
315164	1KERR 7	3.6
934231	AD1-050 C	10.19
934232	AD1-050 E	5.57
935221	AD1-157 C	1.02
935222	AD1-157 E	0.68
935231	AD1-160 C	0.75
935232	AD1-160 E	1.03
936261	AD2-033 C	13.58
936262	AD2-033 E	9.05
936361	AD2-046 C O1	17.92
936362	AD2-046 E O1	8.24
936481	AD2-063 C O1	16.05
936482	AD2-063 E O1	10.7
936651	AD2-082 C	1.15
936652	AD2-082 E	0.56
LTF	AMIL	0.13
LTF	BAYOU	0.72
LTF	BIG_CAJUN1	1.14
LTF	BIG_CAJUN2	2.28
LTF	BLUEG	0.7
LTF	CALDERWOOD	0.43
LTF	CANNELTON	0.13
LTF	CARR	0.02
LTF	CATAWBA	0.43
LTF	CELEVELAND	1.23

LTF	CHEOAH	0.4
LTF	CHILHOWEE	0.14
LTF	CHOCTAW	0.77
LTF	CLIFTY	2.54
LTF	COTTONWOOD	2.82
LTF	DEARBORN	0.26
LTF	EDWARDS	0.22
LTF	ELMERSMITH	0.39
LTF	FARMERCITY	0.17
LTF	G-007A	0.1
LTF	GIBSON	0.25
LTF	HAMLET	1.67
LTF	MORGAN	1.25
LTF	NEWTON	0.6
LTF	O-066A	0.04
LTF	PRAIRIE	1.3
LTF	RENSSELAER	0.01
LTF	ROSETON	0.1
LTF	ROWAN	0.93
LTF	SANTEETLA	0.12
LTF	SMITHLAND	0.12
LTF	TATANKA	0.29
LTF	TILTON	0.26
LTF	TRIMBLE	0.13
LTF	TVA	0.52
LTF	UNIONPOWER	0.78
LTF	VFT	0.26
924021	AB2-043 C O1	3.7
924022	AB2-043 E O1	6.06
924161	AB2-060 C O1	10.51
924162	AB2-060 E O1	4.94
924301	AB2-077 C O1	2.38
924302	AB2-077 E O1	1.59
924311	AB2-078 C O1	2.38
924312	AB2-078 E O1	1.59
924321	AB2-079 C O1	2.38
924322	AB2-079 E O1	1.59
924401	AB2-089 C	4.62
924402	AB2-089 E	2.38
924411	AB2-090 C	4.65
924412	AB2-090 E	2.39
925221	AB2-176 C	1.92
925222	AB2-176 E	0.82
925611	AC1-036 C	0.9
925612	AC1-036 E	1.47

925781	AC1-054 C	15.59
925782	AC1-054 E	7.18
926271	AC1-105 C	2.92
926272	AC1-105 E	1.46

Appendix 10

(DVP - DVP) The 6BREMO-6BREMOMDIST 230 kV line (from bus 314747 to bus 313867 ckt 1) loads from 100.43% to 102.37% (**DC power flow**) of its emergency rating (662 MVA) for the single line contingency outage of 'DVP_P1-2: LN 2027-A'. This project contributes approximately 12.83 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 2027-A'

OPEN BRANCH FROM BUS 314310 TO BUS 314322 CKT 1 /* 6JUDES F 230.00
- 6MDLTHAN 230.00

OPEN BRANCH FROM BUS 314310 TO BUS 314333 CKT 1 /* 6JUDES F 230.00
- 6POWHATN 230.00

OPEN BRANCH FROM BUS 314333 TO BUS 933500 CKT 1 /* 6POWHATN
230.00 - AC2-165 TAP 230.00

OPEN BUS 314310 /* ISLAND

OPEN BUS 314333 /* ISLAND

END

Bus Number	Bus Name	Full Contribution
315191	1BEARGRDN G1	16.52
315192	1BEARGRDN G2	16.52
315193	1BEARGRDN S1	33.99
315170	1BREMO 3	5.89
315171	1BREMO 4	12.95
315150	1BUGGS 1	1.41
315151	1BUGGS 2	1.41
315153	1CLOVER1	8.48
315154	1CLOVER2	8.37
315159	1KERR 2	0.97
315164	1KERR 7	0.95
314429	3JTRSVLE	0.7
932511	AC2-071 C	6.18
933501	AC2-165 C	37.77
934231	AD1-050 C	2.48
934311	AD1-055 C	1.26
934611	AD1-087 C O1	4.23
934621	AD1-088 C	14.54
934911	AD1-123 C	0.55
935171	AD1-152 C O1	4.21
935221	AD1-157 C	2.32
935231	AD1-160 C	1.7
936261	AD2-033 C	12.83

936361	AD2-046 C O1	5.4
936481	AD2-063 C O1	14.22
936651	AD2-082 C	2.61
937461	AD2-200 C	1.84
937481	AD2-202 C O1	1.17
LTF	CARR	0.24
LTF	CBM-S1	2.47
LTF	CBM-S2	6.48
LTF	CBM-W1	2.91
LTF	CBM-W2	12.38
LTF	CIN	0.7
LTF	CPLE	2.12
LTF	DEARBORN	< 0.01
LTF	IPL	0.44
LTF	LGEE	0.16
LTF	MEC	2.05
LTF	MECS	0.13
LTF	RENSSELAER	0.19
LTF	ROSETON	1.4
LTF	WEC	0.2
LTF	AA2-074	1.44
920291	AA2-127	3.62
924021	AB2-043 C O1	2.48
924031	AB2-045 C	1.23
924161	AB2-060 C O1	7.35
924301	AB2-077 C O1	1.54
924311	AB2-078 C O1	1.54
924321	AB2-079 C O1	1.54
924401	AB2-089 C	1.13
924411	AB2-090 C	3.13
925221	AB2-176 C	1.29
925611	AC1-036 C	1.08
925781	AC1-054 C	3.61
925831	AC1-062	0.09
926271	AC1-105 C	3.17
926761	AC1-162 C	47.87
927261	AC1-222 C	1.81

Appendix 11

(AEP - AEP) The 05EDAN 1-05DANVL2 138 kV line (from bus 242631 to bus 242620 ckt 1) loads from 133.95% to 134.81% (**DC power flow**) of its emergency rating (415 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#7589_05J.FERR 765'. This project contributes approximately 7.92 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#7589_05J.FERR 765'

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

Bus Number	Bus Name	Full Contribution
244012	05PINNACLE	-2.08
315131	1EDGECEMA	4.25
315132	1EDGECEMB	4.25
314557	3BETHEL C	0.35
314554	3BTLEBRO	0.37
314572	3EMPORIA	0.14
314578	3HORNRTN	1.21
314582	3KELFORD	0.3
314603	3SCOT NK	1.24
314617	3TUNIS	0.28
314620	6CASHIE	0.27
314574	6EVERETS	0.98
314594	6PLYMOTH	0.26
932631	AC2-084 C	3.42
932632	AC2-084 E	1.68
932701	AC2-093 C	24.41
932702	AC2-093 E	13.96
932761	AC2-100 C	3.66
932762	AC2-100 E	1.79
932821	AC2-107 C	3.48
932822	AC2-107 E	1.63
933941	AD1-017 C	0.84
933942	AD1-017 E	1.36
933991	AD1-023 C	4.1
933992	AD1-023 E	2.23

934201	AD1-047 C	2.75
934202	AD1-047 E	1.83
934231	AD1-050 C	2.01
934232	AD1-050 E	1.1
934311	AD1-055 C	1.07
934312	AD1-055 E	0.28
934331	AD1-057 C O1	4.1
934332	AD1-057 E O1	2.19
934341	AD1-058 C	3.99
934342	AD1-058 E	1.01
934521	AD1-076 C O1	16.71
934522	AD1-076 E O1	8.51
934611	AD1-087 C O1	3.38
934612	AD1-087 E O1	1.59
934621	AD1-088 C	4.
934622	AD1-088 E	1.88
LTF	AD1-120	7.55
LTF	AD1-121	7.6
934911	AD1-123 C	0.47
934912	AD1-123 E	0.24
934991	AD1-131 C	1.31
934992	AD1-131 E	0.87
935171	AD1-152 C O1	3.36
935172	AD1-152 E O1	2.24
935221	AD1-157 C	0.46
935222	AD1-157 E	0.31
935231	AD1-160 C	0.34
935232	AD1-160 E	0.47
936161	AD2-022 C O1	10.77
936162	AD2-022 E O1	6.46
936171	AD2-023 C O1	6.2
936172	AD2-023 E O1	3.36
936261	AD2-033 C	4.75
936262	AD2-033 E	3.17
936331	AD2-043 C	2.
936332	AD2-043 E	2.36
936361	AD2-046 C O1	3.83
936362	AD2-046 E O1	1.76
936401	AD2-051 C O1	2.96
936402	AD2-051 E O1	1.27
936481	AD2-063 C O1	5.54
936482	AD2-063 E O1	3.69
936531	AD2-068 C	2.28
936532	AD2-068 E	1.17
936641	AD2-081 C	2.55

936642	AD2-081 E	1.15
936651	AD2-082 C	0.52
936652	AD2-082 E	0.25
936701	AD2-089 C	3.17
936702	AD2-089 E	2.11
936711	AD2-090 C O1	2.12
936712	AD2-090 E O1	1.42
LTF	AD2-099	4.98
937441	AD2-195 C	3.14
937442	AD2-195 E	1.35
937461	AD2-200 C	0.5
937462	AD2-200 E	0.24
937481	AD2-202 C O1	0.93
937482	AD2-202 E O1	0.47
LTF	AMIL	0.17
LTF	BLUEG	2.07
LTF	CANNELTON	0.27
LTF	CARR	0.07
LTF	CBM-S1	1.13
LTF	CBM-S2	16.92
LTF	CBM-W2	3.07
LTF	CLIFTY	10.77
LTF	CPL	5.57
LTF	DEARBORN	0.98
LTF	EDWARDS	0.45
LTF	ELMERSMITH	0.71
LTF	FARMERCITY	0.12
LTF	G-007A	0.79
LTF	GIBSON	0.59
LTF	NEWTON	0.97
LTF	O-066A	0.36
LTF	PRAIRIE	0.86
LTF	RENSSELAER	0.05
LTF	ROSETON	0.38
LTF	SMITHLAND	< 0.01
LTF	TATANKA	0.34
LTF	TILTON	0.61
LTF	TRIMBLE	0.41
900672	V4-068 E	0.1
LTF	VFT	2.1
917332	Z2-043 E	0.36
917342	Z2-044 E	0.25
917512	Z2-088 E OP1	1.66
918492	AA1-063AE OP	1.37
918512	AA1-065 E OP	1.46

918532	AA1-067 E	0.29
918562	AA1-072 E	0.06
919692	AA2-053 E	1.33
919702	AA2-057 E	1.51
LTF	AA2-074	3.79
920042	AA2-088 E	3.27
920592	AA2-165 E	0.2
920672	AA2-174 E	0.15
930401	AB1-081 C	4.09
930402	AB1-081 E	1.75
930861	AB1-132 C	4.93
930862	AB1-132 E	2.11
931231	AB1-173 C	0.77
931232	AB1-173 E	0.36
931241	AB1-173AC	0.77
931242	AB1-173AE	0.36
923911	AB2-031 C O1	0.77
923912	AB2-031 E O1	0.38
923941	AB2-035 C	0.15
923942	AB2-035 E	0.06
923991	AB2-040 C O1	2.52
923992	AB2-040 E O1	2.06
924021	AB2-043 C O1	1.21
924022	AB2-043 E O1	1.99
924151	AB2-059 C O1	4.82
924152	AB2-059 E O1	2.49
924161	AB2-060 C O1	3.48
924162	AB2-060 E O1	1.64
924301	AB2-077 C O1	0.78
924302	AB2-077 E O1	0.52
924311	AB2-078 C O1	0.78
924312	AB2-078 E O1	0.52
924321	AB2-079 C O1	0.78
924322	AB2-079 E O1	0.52
924391	AB2-088 C	0.19
924392	AB2-088 E	0.09
924401	AB2-089 C	0.91
924402	AB2-089 E	0.47
924411	AB2-090 C	1.53
924412	AB2-090 E	0.78
924491	AB2-098 C	0.23
924492	AB2-098 E	0.1
924501	AB2-099 C	0.2
924502	AB2-099 E	0.08
924511	AB2-100 C	3.5

924512	AB2-100 E	1.72
925121	AB2-169 C	2.26
925122	AB2-169 E	2.03
925171	AB2-174 C O1	2.38
925172	AB2-174 E O1	2.15
925221	AB2-176 C	0.63
925222	AB2-176 E	0.27
925591	AC1-034 C	3.12
925592	AC1-034 E	2.36
925611	AC1-036 C	0.33
925612	AC1-036 E	0.54
925781	AC1-054 C	3.03
925782	AC1-054 E	1.4
925991	AC1-075 C	1.96
925992	AC1-075 E	1.11
926021	AC1-080 C	0.65
926022	AC1-080 E	0.37
926051	AC1-083 C	4.18
926052	AC1-083 E	6.82
926071	AC1-086 C	7.26
926072	AC1-086 E	3.31
926201	AC1-098 C	2.4
926202	AC1-098 E	1.43
926211	AC1-099 C	0.8
926212	AC1-099 E	0.47
926271	AC1-105 C	2.39
926272	AC1-105 E	1.19
926771	AC1-163 C	0.65
926772	AC1-163 E	0.3
927021	AC1-189 C	3.63
927022	AC1-189 E	1.81
927141	AC1-208 C	3.54
927142	AC1-208 E	1.57
927251	AC1-221 C	1.59
927252	AC1-221 E	1.59
927261	AC1-222 C	1.54
927262	AC1-222 E	1.46