

***Generation Interconnection
Feasibility Study Report***

For

***PJM Generation Interconnection Request
Queue Position AD1-025***

***Hopewell – Surry 230kV
94.2 MW Capacity / 150 MW Energy***

February / 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 Spring Grove, VA (Surry County). The installed facilities will have a total capability of 150 MW with 94.2 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is 9/30/2019. **This study does not imply an ITO commitment to this in-service date.**

Point of Interconnection

AD1-025 will interconnect with the ITO transmission system at one of the following points of interconnection:

Option 1 will connect via a new ring bus position in the AB2-134 switching station that connects on the Hopewell – Surry 230kV line # 121

Option 2 will connect via a new three breaker ring bus switching station that connects on the Hopewell - Surry 230kV line # 240.

Cost Summary

The AD1-025 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$1,800,000
Direct Connection Network Upgrades	\$0
Non Direct Connection Network Upgrades	\$1,200,000
Total Costs	\$3,000,000

In addition, the AD1-025 project may be responsible for a contribution to the following costs:

Description	Total Cost
New System Upgrades	\$ 54,925,000
Previously Identified Upgrades	\$224,690,000
Total Costs	\$279,615,000

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 cost allocation rule differ depending on whether the minimum amount of upgrades to resolve a single reliability criteria violation will cost less than \$5,000,000. For upgrades estimated to cost less than \$5,000,000 the allocation of costs will not occur outside of the Queue in which the need for the Network Upgrade was identified. Cost allocation within the Queue will be contingent each Queue projects Distribution Factor on the overloaded facility. For upgrades estimated to cost \$5,000,000 or greater the allocation of costs 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 \$600,000.

Transmission: Build approximately 0.5 miles of 230 kV Line. Estimated Cost \$1,200,000

The estimated total cost of the Attachment Facilities is \$1,800,000. It is estimated to take 30-36 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

None

Non-Direct Connection Cost Estimate

- Substation: Add one 230 kV circuit breaker at AB2-134 Substation to interconnect the proposed AD1-025 Project and associated equipment. The arrangement in the substation will be as shown in Attachment 1. The estimated cost of this work scope is \$1,200,000 and it is estimated to take 24-36 months to complete this work.

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	Wreck and rebuild the Hopewell – Chesterfield 230 kV line #211 of 11 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.	\$27,500,000
# 2 – 4, 8, 11	Wreck and rebuild the Hopewell – Bermuda – Chesterfield 230 kV line #228 of 11 miles 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.	\$27,425,000
# 6	Replace the Elmont 500/230 kV transformer #1 increase its line rating to 1134 MVA (normal), 1203 MVA (emergency), and 1365 MVA (load dump). It is estimated to take 24-30 months to engineer and construct.	\$17,500,000
# 7	Add a second Prince George 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
# 16 - 19	Wreck and rebuild the Elmont - Ladysmith 500kV line #574 (26 miles) to a minimum rating of 4453 MVA. Estimated time 36-48 months to engineer and construct.	\$78,300,000
# 20, 21	Wreck and rebuild the Midlothian – North Anna 500 kV line #576 of 41 miles increase its line rating to 4453 MVA (normal), 4453 MVA (emergency), and 5121 MVA (load dump). It is estimated to take 44-48 months to engineer, permit, and construct. A VA CPCN is required.	\$123,390,000
Total Network Upgrades		\$279,615,000

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

Option One

Network Impacts

The Queue Project AD1-025 was evaluated as a 150.0 MW (Capacity 94.2 MW) injection tapping the Hopewell to Surry 230kV line #212 in the ITO area. Project AD1-025 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-025 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
DVP_P1-2: LN 211	CONTINGENCY 'DVP_P1-2: LN 211' OPEN BRANCH FROM BUS 314287 TO BUS 314303 CKT 1 /* 6CHSTF B 230.00 - 6HOPEWLL 230.00 END
DVP_P1-2: LN 217	CONTINGENCY 'DVP_P1-2: LN 217' OPEN BRANCH FROM BUS 314225 TO BUS 314227 CKT 1 /* 6CHARCTY 230.00 - 6LAKESD 230.00 OPEN BRANCH FROM BUS 314225 TO BUS 314228 CKT 1 /* 6CHARCTY 230.00 - 6MESSER 230.00 OPEN BRANCH FROM BUS 314228 TO BUS 314287 CKT 1 /* 6MESSER 230.00 - 6CHSTF B 230.00 OPEN BUS 314225 /* ISLAND OPEN BUS 314228 /* ISLAND END

Contingency Name	Description
DVP_P1-2: LN 228	CONTINGENCY 'DVP_P1-2: LN 228' OPEN BRANCH FROM BUS 314278 TO BUS 314286 CKT 1 /* 6BERMUDA 230.00 - 6CHSTF A 230.00 OPEN BRANCH FROM BUS 314278 TO BUS 314303 CKT 1 /* 6BERMUDA 230.00 - 6HOPEWLL 230.00 OPEN BUS 314278 /* ISLAND END
DVP_P1-2: LN 557	CONTINGENCY 'DVP_P1-2: LN 557' OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 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
DVP_P1-2: LN 576	CONTINGENCY 'DVP_P1-2: LN 576' OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END
DVP_P1-2: LN 594	CONTINGENCY 'DVP_P1-2: LN 594' OPEN BRANCH FROM BUS 314916 TO BUS 314934 CKT 1 /* 8MORRSVL 500.00 - 8SPOTSYL 500.00 END
DVP_P4-2: 211T2124	CONTINGENCY 'DVP_P4-2: 211T2124' /*_ HOPEWELL OPEN BRANCH FROM BUS 314303 TO BUS 314287 CKT 1 /*L211 HOPEWELL CHESTERFIELD OPEN BRANCH FROM BUS 314303 TO BUS 314269 CKT 1 /*L2124 END
DVP_P4-2: 557T574	CONTINGENCY 'DVP_P4-2: 557T574' /* ELMONT OPEN BRANCH FROM BUS 314908 TO BUS 314903 CKT 1 /*ELMONT TO CHICKAHOMINY (LINE 557) OPEN BRANCH FROM BUS 314903 TO BUS 314214 CKT 1 /*CHICKAHOMINY 500-230 (TX#1) OPEN BRANCH FROM BUS 314911 TO BUS 314908 CKT 1 /*ELMONT TO LADYSMITH (LINE 574) END
DVP_P4-2: 56372	CONTINGENCY 'DVP_P4-2: 56372' /*CARSON OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MIDLOTHIAN 500.00 OPEN BRANCH FROM BUS 314902 TO BUS 314282 CKT 1 /*CARSON 500-230 (TX#1) END

Contingency Name	Description
DVP_P4-2: 563T576	CONTINGENCY 'DVP_P4-2: 563T576' /* MIDLOTHIAN 500 500 KV OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END
DVP_P4-2: 57602	CONTINGENCY 'DVP_P4-2: 57602' /* NORTH ANNA 500 KV OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 1 /* 6NO ANNA 230.00 - 8NO ANNA 500.00 END
DVP_P4-2: G5T228	CONTINGENCY 'DVP_P4-2: G5T228' /* _ CHESTERFIELD OPEN BRANCH FROM BUS 314286 TO BUS 314278 CKT 1 /*L228 CHESTERFIELD BERMUDA OPEN BRANCH FROM BUS 314278 TO BUS 314303 CKT 1 /*L228 BERMUDA HOPEWELL REMOVE MACHINE 5 FROM BUS 315060 /*CHESTERFIELD GEN G5 END
DVP_P4-2: H2T557	CONTINGENCY 'DVP_P4-2: H2T557' /* ELMONT OPEN BRANCH FROM BUS 314908 TO BUS 314903 CKT 1 /*ELMONT TO CHICKAHOMINY (LINE 557) OPEN BRANCH FROM BUS 314903 TO BUS 314214 CKT 1 /*CHICKAHOMINY 500-230 (TX#1) OPEN BRANCH FROM BUS 314908 TO BUS 314218 CKT 2 /*ELMONT 500-230 (TX#2) END
DVP_P4-2: WT576	CONTINGENCY 'DVP_P4-2: WT576' /* NORTH ANNA 500 KV OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 2 /* 6NO ANNA 230.00 - 8NO ANNA 500.00 END
DVP_P7-1: LN 211-228	CONTINGENCY 'DVP_P7-1: LN 211-228' OPEN BRANCH FROM BUS 314287 TO BUS 314303 CKT 1 /* 6CHSTF B 230.00 - 6HOPEWLL 230.00 OPEN BRANCH FROM BUS 314278 TO BUS 314286 CKT 1 /* 6BERMUDA 230.00 - 6CHSTF A 230.00 OPEN BRANCH FROM BUS 314278 TO BUS 314303 CKT 1 /* 6BERMUDA 230.00 - 6HOPEWLL 230.00 OPEN BUS 314278 /* ISLAND END
DVP_P7-1: LN 212-240_D	CONTINGENCY 'DVP_P7-1: LN 212-240_D' OPEN BRANCH FROM BUS 925330 TO BUS 314538 CKT 2 /* AB2-190 TAP 230.00 - 6SURRY 230.00 OPEN BRANCH FROM BUS 924810 TO BUS 314538 CKT 1 /* AB2-134 TAP 230.00 - 6SURRY 230.00 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
	Type	Name			From	To	Circuit		Initial	Final	Type	MVA	
1	N-1	DVP_P1-2: LN 228	DVP - DVP	6HOPEWLL-6CHESTF B 230 kV line	314303	314287	1	DC	90.77	98.99	ER	442	36.31

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	
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA	Contribution	Ref
2	DCTL	DVP_P7-1: LN 212-240_D	DVP - DVP	6BERMUDA-6CHESTF A 230 kV line	314278	314286	1	DC	78.9	91.02	LD	549	66.49	
3	DCTL	DVP_P7-1: LN 212-240_D	DVP - DVP	6HOPEWLL-6BERMUDA 230 kV line	314303	314278	1	DC	78.9	91.02	LD	549	66.49	
4	LFFB	DVP_P4-2: G5T228	DVP - DVP	6HOPEWLL-6CHESTF B 230 kV line	314303	314287	1	DC	92.31	102.88	LD	541	57.82	1

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		
5	N-1	DVP_P1-2: LN 574	DVP - DVP	6FOUR RIVERS-6STJOHN 230 kV line	314212	314150	1	DC	122.58	123.07	ER	749	8.92	2
6	LFFB	DVP_P4-2: H2T557	DVP - DVP	8ELMONT 500/230 kV transformer	314218	314908	1	DC	120.15	121.4	LD	1051	33.15	3
7	DCTL	DVP_P7-1: LN 211-228	DVP - DVP	6PRGEORG 230/115 kV transformer	314269	314291	1	DC	112.1	125.62	LD	220	29.72	4
8	LFFB	DVP_P4-2: 211T2124	DVP - DVP	6BERMUDA-6CHESTF A 230 kV line	314278	314286	1	DC	111.25	114.72	LD	549	63.98	5
9	N-1	DVP_P1-2: LN 563	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	121.95	124.02	ER	449	9.21	6
10	N-1	DVP_P1-2: LN 217	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	115.82	118.07	ER	449	11.78	
11	LFFB	DVP_P4-2: 211T2124	DVP - DVP	6HOPEWLL-6BERMUDA 230 kV line	314303	314278	1	DC	111.25	114.72	LD	549	63.98	7
12	LFFB	DVP_P4-2: 563T576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	117.29	117.85	LD	3144	39.06	8
13	LFFB	DVP_P4-2: 56372	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	114.88	115.39	LD	3144	35.29	

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		
14	LFFB	DVP_P4-2: WT576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	112.65	113.2	LD	3144	38.64	
15	LFFB	DVP_P4-2: 57602	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	112.65	113.2	LD	3144	38.64	
16	N-1	DVP_P1-2: LN 576	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	155.96	156.5	ER	2442	30.48	9
17	N-1	DVP_P1-2: LN 563	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	140.08	140.52	ER	2442	25.24	
18	LFFB	DVP_P4-2: 57602	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	131.37	131.96	LD	3351	48.51	
19	LFFB	DVP_P4-2: WT576	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	131.37	131.96	LD	3351	48.51	
20	N-1	DVP_P1-2: LN 574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	124.6	125.06	ER	2442	24.76	10
21	LFFB	DVP_P4-2: 557T574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	113.27	113.78	LD	3637	41.94	

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	6HOPEWLL-6CHESTF B 230 kV line	Wreck and rebuild the Hopewell – Chesterfield 230 kV line #211 of 11 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	\$27,500,000
# 2	6BERMUDA-6CHESTF A 230 kV line	Wreck and rebuild the Hopewell – Bermuda – Chesterfield 230 kV line #228 of 11 miles 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	\$27,425,000
# 3	6HOPEWLL-6BERMUDA 230 kV line			
# 4	6HOPEWLL-6CHESTF B 230 kV line			
Total New Network Upgrades				\$54,925,000

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
# 5	6FOUR RIVERS-6STJOHN 230 kV line	Replace the 2000A wave trap at Four Rivers and the 230kV line switches at St. Johns Substation for the 256 line	n4692	\$150,000

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
# 6	8ELMONT 500/230 kV transformer	Replace the Elmont 500/230 kV transformer #1 increase its line rating to 1134 MVA (normal), 1203 MVA (emergency), and 1365 MVA (load dump). It is estimated to take 24-30 months to engineer and construct.	Pending	\$17,500,000
# 7	6PRGEORG 230/115 kV transformer	Add a second Prince George 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
# 8	6BERMUDA-6CHESTF A 230 kV line	Wreck and rebuild the Hopewell – Bermuda – Chesterfield 230 kV line #228 of 11 miles 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	\$27,425,000
# 11	6HOPEWLL-6BERMUDA 230 kV line			
# 9, 10	6CHESTF B-6BASIN 230 kV line	Reconductor Chesterfield – Basin 230 kV line #259 for 0.14 miles of 1109 ACAR with a conductor which will increase the line rating to approximately 706 MVA (normal), 706 MVA (emergency), and 812 MVA (load dump). It is estimated to take 15-18 months to engineer, permit and construct.	Pending	\$250,000
#12 – 15	8CHCKAHM-8ELMONT 500 kV line	Replace the Elmont – Chickahominy 500 kV line #557 wave trap in the Chickahominy substation to increase its line rating to 3424 MVA (normal), 3424 MVA (emergency), and 3937 MVA (load dump). It is estimated to take 12-16 months to engineer and construct.	Pending	\$500,000
# 16 – 19	8ELMONT-8LADYSMITH 500 kV line	Wreck and rebuild the Elmont - Ladysmith 500kV line #574 (26 miles) to a minimum rating of 4453 MVA. Estimated time 36-48 months to engineer and construct.	Pending	\$78,300,000
#20, 21	8MDLTHAN-8NO ANNA 500 kV line	Wreck and rebuild the Midlothian – North Anna 500 kV line #576 of 41 miles increase its line rating to 4453 MVA (normal), 4453 MVA (emergency), and 5121 MVA (load dump). It is estimated to take 44-48 months to engineer, permit, and construct. A VA CPCN is required.	Pending	\$123,390,000

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
Total New Network Upgrades				\$253,015,000

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	
22	N-1	DVP_P1-2: LN 574	DVP - DVP	6FOUR RIVERS-6STJOHN 230 kV line	314212	314150	1	DC	120.58	121.29	ER	749	14.2
23	N-1	DVP_P1-2: LN 557	DVP - DVP	6CHARCTY-6LAKESIDE 230 kV line	314225	314227	1	DC	96.53	98.08	ER	984	18.31
24	N-1	DVP_P1-2: LN 211	DVP - DVP	6BERMUDA-6CHESTF A 230 kV line	314278	314286	1	DC	118.65	122.18	ER	449	55.65
25	N-1	DVP_P1-2: LN 563	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	146.13	147.62	ER	449	14.67
26	N-1	DVP_P1-2: LN 211	DVP - DVP	6HOPEWLL-6BERMUDA 230 kV line	314303	314278	1	DC	118.65	122.18	ER	449	55.65
27	N-1	DVP_P1-2: LN 228	DVP - DVP	6HOPEWLL-6CHESTF B 230 kV line	314303	314287	1	DC	112.15	125.1	ER	442	57.82

#	Contingency		Affected Area	Facility Description	Bus		Circuit	Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To			Initial	Final	Type	MVA	
28	N-1	DVP_P1-2: LN 576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	145	145.71	ER	2442	38.64
29	Non	Non	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	115.79	116.35	NR	2442	30.7
30	N-1	DVP_P1-2: LN 594	DVP - DVP	8CHANCE-8BRISTER 500 kV line	314905	314900	1	DC	138.23	138.67	ER	2442	29
31	N-1	DVP_P1-2: LN 576	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	180.13	180.94	ER	2442	48.53
32	Non	Non	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	125.47	125.96	NR	2442	34.08
33	N-1	DVP_P1-2: LN 573	DVP - DVP	8LADYSMITH-8CHANCE 500 kV line	314911	314905	1	DC	124.04	124.49	ER	2738	29.47
34	N-1	DVP_P1-2: LN 594	DVP - DVP	8LADYSMITH-8POSSUM 500 kV line	314911	314922	1	DC	126.25	126.47	ER	2442	24.8
35	N-1	DVP_P1-2: LN 574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	154.83	155.55	ER	2442	39.43
36	Non	Non	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	94.51	95.01	NR	2442	26.74
37	N-1	DVP_P1-2: LN 563	DVP - DVP	8SURRY-8CHCKAHM 500 kV line	314924	314903	1	DC	101.29	101.78	ER	1809	22.08

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).

Option Two

Network Impacts

The Queue Project AD1-025 was evaluated as a 150.0 MW (Capacity 94.2 MW) injection tapping the Hopewell to Surry 230kV line #240 in the ITO area. Project AD1-025 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-025 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
DVP_P1-2: LN 211	CONTINGENCY 'DVP_P1-2: LN 211' OPEN BRANCH FROM BUS 314287 TO BUS 314303 CKT 1 /* 6CHSTF B 230.00 - 6HOPEWLL 230.00 END
DVP_P1-2: LN 217	CONTINGENCY 'DVP_P1-2: LN 217' OPEN BRANCH FROM BUS 314225 TO BUS 314227 CKT 1 /* 6CHARCTY 230.00 - 6LAKESD 230.00 OPEN BRANCH FROM BUS 314225 TO BUS 314228 CKT 1 /* 6CHARCTY 230.00 - 6MESSER 230.00 OPEN BRANCH FROM BUS 314228 TO BUS 314287 CKT 1 /* 6MESSER 230.00 - 6CHSTF B 230.00 OPEN BUS 314225 /* ISLAND OPEN BUS 314228 /* ISLAND END

Contingency Name	Description
DVP_P1-2: LN 228	CONTINGENCY 'DVP_P1-2: LN 228' OPEN BRANCH FROM BUS 314278 TO BUS 314286 CKT 1 /* 6BERMUDA 230.00 - 6CHSTF A 230.00 OPEN BRANCH FROM BUS 314278 TO BUS 314303 CKT 1 /* 6BERMUDA 230.00 - 6HOPEWLL 230.00 OPEN BUS 314278 /* ISLAND END
DVP_P1-2: LN 557	CONTINGENCY 'DVP_P1-2: LN 557' OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00 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
DVP_P1-2: LN 576	CONTINGENCY 'DVP_P1-2: LN 576' OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END
DVP_P1-2: LN 594	CONTINGENCY 'DVP_P1-2: LN 594' OPEN BRANCH FROM BUS 314916 TO BUS 314934 CKT 1 /* 8MORRSVL 500.00 - 8SPOTSYL 500.00 END
DVP_P4-2: 211T2124	CONTINGENCY 'DVP_P4-2: 211T2124' /*_ HOPEWELL OPEN BRANCH FROM BUS 314303 TO BUS 314287 CKT 1 /*L211 HOPEWELL CHESTERFIELD OPEN BRANCH FROM BUS 314303 TO BUS 314269 CKT 1 /*L2124 END
DVP_P4-2: 557T574	CONTINGENCY 'DVP_P4-2: 557T574' /* ELMONT OPEN BRANCH FROM BUS 314908 TO BUS 314903 CKT 1 /*ELMONT TO CHICKAHOMINY (LINE 557) OPEN BRANCH FROM BUS 314903 TO BUS 314214 CKT 1 /*CHICKAHOMINY 500-230 (TX#1) OPEN BRANCH FROM BUS 314911 TO BUS 314908 CKT 1 /*ELMONT TO LADYSMITH (LINE 574) END
DVP_P4-2: 56372	CONTINGENCY 'DVP_P4-2: 56372' /*CARSON OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MIDLOTHIAN 500.00 OPEN BRANCH FROM BUS 314902 TO BUS 314282 CKT 1 /*CARSON 500-230 (TX#1) END

Contingency Name	Description
DVP_P4-2: 563T576	CONTINGENCY 'DVP_P4-2: 563T576' /* MIDLOTHIAN 500 500 KV OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END
DVP_P4-2: 57602	CONTINGENCY 'DVP_P4-2: 57602' /* NORTH ANNA 500 KV OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 1 /* 6NO ANNA 230.00 - 8NO ANNA 500.00 END
DVP_P4-2: G5T228	CONTINGENCY 'DVP_P4-2: G5T228' /* _ CHESTERFIELD OPEN BRANCH FROM BUS 314286 TO BUS 314278 CKT 1 /*L228 CHESTERFIELD BERMUDA OPEN BRANCH FROM BUS 314278 TO BUS 314303 CKT 1 /*L228 BERMUDA HOPEWELL REMOVE MACHINE 5 FROM BUS 315060 /*CHESTERFIELD GEN G5 END
DVP_P4-2: H2T557	CONTINGENCY 'DVP_P4-2: H2T557' /* ELMONT OPEN BRANCH FROM BUS 314908 TO BUS 314903 CKT 1 /*ELMONT TO CHICKAHOMINY (LINE 557) OPEN BRANCH FROM BUS 314903 TO BUS 314214 CKT 1 /*CHICKAHOMINY 500-230 (TX#1) OPEN BRANCH FROM BUS 314908 TO BUS 314218 CKT 2 /*ELMONT 500-230 (TX#2) END
DVP_P4-2: WT576	CONTINGENCY 'DVP_P4-2: WT576' /* NORTH ANNA 500 KV OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 2 /* 6NO ANNA 230.00 - 8NO ANNA 500.00 END
DVP_P7-1: LN 211-228	CONTINGENCY 'DVP_P7-1: LN 211-228' OPEN BRANCH FROM BUS 314287 TO BUS 314303 CKT 1 /* 6CHSTF B 230.00 - 6HOPEWLL 230.00 OPEN BRANCH FROM BUS 314278 TO BUS 314286 CKT 1 /* 6BERMUDA 230.00 - 6CHSTF A 230.00 OPEN BRANCH FROM BUS 314278 TO BUS 314303 CKT 1 /* 6BERMUDA 230.00 - 6HOPEWLL 230.00 OPEN BUS 314278 /* 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		Circuit	Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To			Initial	Final	Type	MVA	
1	N-1	DVP_P1-2: LN 211	DVP - DVP	6BERMUDA-6CHESTF A 230 kV line	314278	314286	1	DC	97.8	105.58	ER	449	34.95
2	N-1	DVP_P1-2: LN 211	DVP - DVP	6HOPEWLL-6BERMUDA 230 kV line	314303	314278	1	DC	97.8	105.58	ER	449	34.95

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		Cir.	Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To			Initial	Final	Type	MVA		
3	LFFB	DVP_P4-2: G5T228	DVP - DVP	6HOPEWLL-6CHESTF B 230 kV line	314303	314287	1	DC	92.31	103	LD	541	57.82	1

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		
4	N-1	DVP_P1-2: LN 574	DVP - DVP	6FOUR RIVERS-6STJOHN 230 kV line	314212	314150	1	DC	122.59	123.09	ER	749	8.92	2
5	LFFB	DVP_P4-2: H2T557	DVP - DVP	8ELMONT 500/230 kV transformer	314218	314908	1	DC	120.16	121.39	LD	1051	33.15	3
6	DCTL	DVP_P7-1: LN 211-228	DVP - DVP	6PRGEORG 230/115 kV transformer	314269	314291	1	DC	112.1	125.62	LD	220	29.72	4
7	LFFB	DVP_P4-2: 211T2124	DVP - DVP	6BERMUDA-6CHESTF A 230 kV line	314278	314286	1	DC	111.25	122.91	LD	549	63.98	5
8	N-1	DVP_P1-2: LN 563	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	121.99	124.06	ER	449	9.21	6
9	N-1	DVP_P1-2: LN 217	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	115.8	117.94	ER	449	11.78	
10	LFFB	DVP_P4-2: 211T2124	DVP - DVP	6HOPEWLL-6BERMUDA 230 kV line	314303	314278	1	DC	111.25	122.91	LD	549	63.98	7
11	LFFB	DVP_P4-2: 563T576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	117.29	117.86	LD	3144	39.06	8
12	LFFB	DVP_P4-2: 56372	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	114.89	115.39	LD	3144	35.29	
13	N-1	DVP_P1-2: LN 576	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	155.98	156.52	ER	2442	30.48	9

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		
14	N-1	DVP_P1-2: LN 563	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	140.1	140.54	ER	2442	25.24	
15	LFFB	DVP_P4-2: 57602	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	131.39	131.98	LD	3351	48.52	
16	LFFB	DVP_P4-2: WT576	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	131.39	131.98	LD	3351	48.52	
17	N-1	DVP_P1-2: LN 574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	124.62	125.08	ER	2442	24.76	10
18	LFFB	DVP_P4-2: 557T574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	113.29	113.8	LD	3637	41.94	

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

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	
19	N-1	DVP_P1-2: LN 574	DVP - DVP	6FOUR RIVERS-6STJOHN 230 kV line	314212	314150	1	DC	120.59	121.31	ER	749	14.2
20	N-1	DVP_P1-2: LN 557	DVP - DVP	6CHARCTY-6LAKESIDE 230 kV line	314225	314227	1	DC	96.53	98.03	ER	984	18.31
21	N-1	DVP_P1-2: LN 211	DVP - DVP	6BERMUDA-6CHESTF A 230 kV line	314278	314286	1	DC	118.67	131.08	ER	449	55.65
22	N-1	DVP_P1-2: LN 563	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	146.16	147.65	ER	449	14.67
23	N-1	DVP_P1-2: LN 211	DVP - DVP	6HOPEWLL-6BERMUDA 230 kV line	314303	314278	1	DC	118.67	131.08	ER	449	55.65
24	N-1	DVP_P1-2: LN 228	DVP - DVP	6HOPEWLL-6CHESTF B 230 kV line	314303	314287	1	DC	112.15	125.24	ER	442	57.82
25	N-1	DVP_P1-2: LN 563	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	144.84	145.51	ER	2442	36.29
26	Non	Non	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	115.72	116.19	NR	2442	30.7
27	N-1	DVP_P1-2: LN 594	DVP - DVP	8CHANCE-8BRISTER 500 kV line	314905	314900	1	DC	138.26	138.7	ER	2442	29
28	N-1	DVP_P1-2: LN 576	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	180.16	180.98	ER	2442	48.54
29	Non	Non	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	125.46	125.91	NR	2442	34.08

#	Contingency		Affected Area	Facility Description	Bus		Circuit	Power Flow	Loading %		Rating		MW Contribution
	Type	Name			From	To			Initial	Final	Type	MVA	
30	N-1	DVP_P1-2: LN 573	DVP - DVP	8LADYSMITH-8CHANCE 500 kV line	314911	314905	1	DC	124.08	124.56	ER	2738	29.47
31	N-1	DVP_P1-2: LN 594	DVP - DVP	8LADYSMITH-8POSSUM 500 kV line	314911	314922	1	DC	126.29	126.47	ER	2442	24.8
32	N-1	DVP_P1-2: LN 574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	154.85	155.57	ER	2442	39.43
33	Non	Non	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	94.52	95.02	NR	2442	26.74
34	N-1	DVP_P1-2: LN 563	DVP - DVP	8SURRY-AD1-151 TAP 500 kV line	314924	935160	1	DC	101.24	101.69	ER	1809	22.08
35	N-1	DVP_P1-2: LN 563	DVP - DVP	AD1-151 TAP-8CHCKAHM 500 kV line	935160	314903	1	DC	101.27	101.73	ER	1809	22.08

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).

Attachment 1.

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 gauge 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 6HOPEWELL-6CHESTERFIELD 230 kV line (from bus 314303 to bus 314287 ckt 1) loads from 92.31% to 102.88% (**DC power flow**) of its load dump rating (541 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: G5T228'. This project contributes approximately 57.82 MW to the thermal violation.

```
CONTINGENCY 'DVP_P4-2: G5T228'                      /*_ CHESTERFIELD
  OPEN BRANCH FROM BUS 314286 TO BUS 314278 CKT 1      /*L228
CHESTERFIELD BERMUDA
  OPEN BRANCH FROM BUS 314278 TO BUS 314303 CKT 1      /*L228 BERMUDA
HOPEWELL
  REMOVE MACHINE 5 FROM BUS 315060                      /*CHESTERFIELD GEN
G5
END
```

Bus Number	Bus Name	Full Contribution
315120	1GRAVEL4	3.94
315121	1GRAVEL5	3.89
315122	1GRAVEL6	3.94
315074	1HOPCGN1	24.99
315075	1HOPCGN2	24.67
315077	1HOPHCF1	7.9
315078	1HOPHCF2	7.9
315079	1HOPHCF3	7.9
315080	1HOPHCF4	11.99
315076	1HOPPOLC	5.63
315073	1STONECA	20.73
315116	1SURRY 1	39.02
932041	AC2-012 C	5.08
932042	AC2-012 E	8.29
933471	AC2-161 C	2.34
933472	AC2-161 E	1.2
934011	AD1-025 C O1	36.31
934012	AD1-025 E O1	21.51
935111	AD1-144 C	0.94
935112	AD1-144 E	0.51
935161	AD1-151 C O1	34.69
935162	AD1-151 E O1	23.13
LTF	CARR	0.14
LTF	CBM-S1	0.61
LTF	CBM-S2	2.19
LTF	CBM-W2	2.77
LTF	CIN	< 0.01

LTF	CLIFTY	0.3
LTF	CPLE	0.76
LTF	DEARBORN	0.09
LTF	G-007	0.52
LTF	LGEE	< 0.01
LTF	MEC	0.29
LTF	O-066	1.73
LTF	RENSSELAER	0.11
LTF	ROSETON	0.81
LTF	TRIMBLE	< 0.01
292791	U1-032 E	10.8
LTF	WEC	< 0.01
914231	Y2-077	3.18
924071	AB2-051	66.52
924811	AB2-134 C O1	27.68
924812	AB2-134 E O1	27.22
925331	AB2-190 C	43.17
925332	AB2-190 E	18.5
925692	AC1-045 E	0.51
926662	AC1-147 E	0.66
926741	AC1-159	32.07
927221	AC1-216 C O1	21.12
927222	AC1-216 E O1	16.61

Appendix 2

(DVP - DVP) The 6FOUR RIVERS-6STJOHN 230 kV line (from bus 314212 to bus 314150 ckt 1) loads from 122.58% to 123.07% (**DC power flow**) of its emergency rating (749 MVA) for the single line contingency outage of 'DVP_P1-2: LN 574'. This project contributes approximately 8.92 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 574'

OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT
500.00 - 8LDYSMTH 500.00
END

Bus Number	Bus Name	Full Contribution
315053	1BELMED1	2.08
315054	1BELMED2	2.08
315055	1BELMED3	1.73
315058	1CHESTF3	2.18
315059	1CHESTF4	3.53
315060	1CHESTF5	7.11
315065	1CHESTF6	14.51
315061	1CHESTG7	2.79
315063	1CHESTG8	2.76
315062	1CHESTS7	1.27
315064	1CHESTS8	1.41
315067	1DARBY 1	2.05
315068	1DARBY 2	2.05
315069	1DARBY 3	2.06
315070	1DARBY 4	2.06
315043	1FOUR RIVERA	6.75
315044	1FOUR RIVERB	5.22
315045	1FOUR RIVERC	6.75
315046	1FOUR RIVERD	5.22
315047	1FOUR RIVERE	5.22
315048	1FOUR RIVERF	6.75
315074	1HOPCGN1	4.73
315075	1HOPCGN2	4.67
315083	1SPRUNCA	6.19
315084	1SPRUNCB	6.19
315085	1SPRUNCC	4.59
315086	1SPRUNCD	4.59
314315	3LOCKS E	0.69
314309	6IRON208	0.33

314236	6NRTHEST	0.15
314250	6ROCKVILLE	0.17
932501	AC2-070 C	1.19
932581	AC2-078 C	2.05
933061	AC2-130	1.42
933071	AC2-131 1	0.96
933081	AC2-131 2	0.44
933111	AC2-132 1	0.51
933121	AC2-132 2	0.26
933261	AC2-137 C	1.27
933481	AC2-162 C	1.71
934011	AD1-025 C O1	8.92
934071	AD1-034 C O1	4.45
934211	AD1-048 C	1.56
LTF	AD1-120	4.
LTF	AD1-121	4.
935161	AD1-151 C O1	8.52
935211	AD1-156 C	1.09
LTF	CARR	0.42
LTF	CBM-S1	5.86
LTF	CBM-S2	9.49
LTF	CBM-W1	13.64
LTF	CBM-W2	31.65
LTF	CIN	3.19
LTF	CPLE	2.81
LTF	IPL	2.04
LTF	LGEE	0.7
LTF	MEC	6.79
LTF	MECS	3.07
LTF	RENSSELAER	0.33
LTF	ROSETON	2.43
297087	V2-040	0.12
LTF	WEC	0.85
918691	AA1-083	1.19
919211	AA1-145	20.15
LTF	AA2-074	1.91
930121	AB1-027 C	0.36
924061	AB2-050	1.19
924241	AB2-068 O1	107.17
924811	AB2-134 C O1	6.8
925051	AB2-160 C O1	3.01
925331	AB2-190 C	10.6
926291	AC1-107	161.76
926411	AC1-112 C	0.28
926551	AC1-134	15.1

926781	AC1-164 C	23.18
927041	AC1-191 C	6.71
927221	AC1-216 C O1	5.19

Appendix 3

(DVP - DVP) The 8ELMONT 500/230 kV transformer (from bus 314218 to bus 314908 ckt 1) loads from 120.15% to 121.4% (**DC power flow**) of its load dump rating (1051 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: H2T557'. This project contributes approximately 33.15 MW to the thermal violation.

```

CONTINGENCY 'DVP_P4-2: H2T557'                                /* ELMONT
  OPEN BRANCH FROM BUS 314908 TO BUS 314903 CKT 1             /*ELMONT TO
CHICKAHOMINY (LINE 557)
  OPEN BRANCH FROM BUS 314903 TO BUS 314214 CKT 1
/*CHICKAHOMINY 500-230 (TX#1)
  OPEN BRANCH FROM BUS 314908 TO BUS 314218 CKT 2             /*ELMONT 500-
230 (TX#2)
END
  
```

Bus Number	Bus Name	Full Contribution
315067	1DARBY 1	4.99
315068	1DARBY 2	4.99
315069	1DARBY 3	5.01
315070	1DARBY 4	5.01
315043	1FOUR RIVERA	6.63
315044	1FOUR RIVERB	5.13
315045	1FOUR RIVERC	6.63
315046	1FOUR RIVERD	5.13
315047	1FOUR RIVERE	5.13
315048	1FOUR RIVERF	6.63
315074	1HOPCGN1	11.28
315075	1HOPCGN2	11.14
315083	1SPRUNCA	14.95
315084	1SPRUNCB	14.95
315085	1SPRUNCC	11.08
315086	1SPRUNCD	11.08
315073	1STONECA	9.36
314566	3CRESWEL	2.11
314572	3EMPORIA	0.36
314315	3LOCKS E	1.65
314617	3TUNIS	0.71
314539	3UNCAMP	2.19
314541	3WATKINS	0.61
314620	6CASHIE	0.72
314229	6MT RD221	1.41

314236	6NRTHEST	0.37
314189	6PAPERMILL	8.82
314594	6PLYMOTH	0.73
314250	6ROCKVILLE	0.4
314256	6ROCKVILLE E	1.15
314648	6SUNBURY	0.81
314651	6WINFALL	1.59
932041	AC2-012 C	9.62
932042	AC2-012 E	15.7
932501	AC2-070 C	2.9
932502	AC2-070 E	1.2
932531	AC2-073 C	3.1
932532	AC2-073 E	1.56
932581	AC2-078 C	4.75
932582	AC2-078 E	7.75
932591	AC2-079 C	6.82
932592	AC2-079 E	11.13
932831	AC2-110 C	1.74
932832	AC2-110 E	2.84
933061	AC2-130	3.48
933071	AC2-131 1	2.36
933081	AC2-131 2	1.07
933111	AC2-132 1	1.24
933121	AC2-132 2	0.63
933261	AC2-137 C	3.16
933262	AC2-137 E	2.05
933271	AC2-138 C	0.87
933272	AC2-138 E	1.09
933291	AC2-141 C	27.16
933292	AC2-141 E	11.59
933451	AC2-158 C	4.63
933452	AC2-158 E	4.63
933471	AC2-161 C	2.47
933472	AC2-161 E	1.27
933481	AC2-162 C	4.17
933482	AC2-162 E	2.15
933711	AC2-194 C	0.98
933712	AC2-194 E	1.59
933731	AC2-196 C	1.66
933732	AC2-196 E	1.1
933991	AD1-023 C	11.29
933992	AD1-023 E	6.14
934011	AD1-025 C O1	20.82
934012	AD1-025 E O1	12.33
934061	AD1-033 C O1	6.96

934062	AD1-033 E O1	4.64
934071	AD1-034 C O1	10.6
934072	AD1-034 E O1	6.87
934141	AD1-041 C O1	6.74
934142	AD1-041 E O1	4.49
934191	AD1-046 C	4.71
934192	AD1-046 E	3.14
934201	AD1-047 C	6.75
934202	AD1-047 E	4.5
934211	AD1-048 C	3.82
934212	AD1-048 E	1.93
934391	AD1-063 C	2.1
934392	AD1-063 E	1.4
934521	AD1-076 C O1	46.88
934522	AD1-076 E O1	23.87
934571	AD1-082 C O1	8.27
934572	AD1-082 E O1	4.72
934781	AD1-105 C	8.08
934782	AD1-105 E	5.62
LTF	AD1-120	5.93
LTF	AD1-121	5.89
935111	AD1-144 C	1.68
935112	AD1-144 E	0.92
935161	AD1-151 C O1	19.89
935162	AD1-151 E O1	13.26
935211	AD1-156 C	2.56
935212	AD1-156 E	1.71
LTF	CARR	0.67
LTF	CBM-S1	3.86
LTF	CBM-S2	13.84
LTF	CBM-W1	0.21
LTF	CBM-W2	17.91
LTF	CIN	0.13
LTF	CLIFTY	1.62
LTF	CPL	4.75
LTF	DEARBORN	0.47
LTF	G-007	2.31
LTF	IPL	0.06
LTF	LGEE	0.05
LTF	MEC	1.99
LTF	O-066	7.73
LTF	RENSSELAER	0.53
LTF	ROSETON	3.84
292791	U1-032 E	4.87
297087	V2-040	0.28

900672	V4-068 E	0.26
901082	W1-029E	41.82
LTF	WEC	0.06
907092	X1-038 E	5.47
913392	Y1-086 E	1.99
916042	Z1-036 E	40.84
916192	Z1-068 E	1.76
917122	Z2-027 E	0.96
917592	Z2-099 E	0.38
918492	AA1-063AE OP	3.35
918512	AA1-065 E OP	3.74
918691	AA1-083	1.16
919152	AA1-139 E	5.92
919211	AA1-145	19.79
919732	AA2-059 E	0.5
LTF	AA2-074	3.23
920022	AA2-086 E	0.21
920042	AA2-088 E	9.15
920691	AA2-178 C	8.43
920692	AA2-178 E	3.61
930051	AB1-013 C	2.54
930052	AB1-013 E	17.02
930121	AB1-027 C	0.87
930122	AB1-027 E	1.89
930861	AB1-132 C	11.78
930862	AB1-132 E	5.05
931231	AB1-173 C	1.9
931232	AB1-173 E	0.89
931241	AB1-173AC	1.9
931242	AB1-173AE	0.89
923801	AB2-015 C O1	7.73
923802	AB2-015 E O1	6.34
923831	AB2-022 C	2.1
923832	AB2-022 E	1.13
923842	AB2-024 E	1.49
923852	AB2-025 E	1.09
923862	AB2-026 E	0.88
923911	AB2-031 C O1	1.88
923912	AB2-031 E O1	0.93
923991	AB2-040 C O1	6.19
923992	AB2-040 E O1	5.06
924061	AB2-050	1.16
924071	AB2-051	128.86
924241	AB2-068 O1	177.95
924381	AB2-087 C	0.48

924382	AB2-087 E	0.22
924501	AB2-099 C	0.49
924502	AB2-099 E	0.21
924511	AB2-100 C	10.48
924512	AB2-100 E	5.16
924811	AB2-134 C O1	15.87
924812	AB2-134 E O1	15.6
925051	AB2-160 C O1	7.18
925052	AB2-160 E O1	11.71
925061	AB2-161 C O1	3.63
925062	AB2-161 E O1	5.92
925171	AB2-174 C O1	5.96
925172	AB2-174 E O1	5.39
925281	AB2-186 C	0.55
925282	AB2-186 E	0.24
925291	AB2-188 C O1	2.08
925292	AB2-188 E O1	0.93
925331	AB2-190 C	24.76
925332	AB2-190 E	10.61
925522	AC1-027 E	1.07
925692	AC1-045 E	0.92
925861	AC1-065 C	4.36
925862	AC1-065 E	7.11
926071	AC1-086 C	17.34
926072	AC1-086 E	7.89
926291	AC1-107	268.61
926411	AC1-112 C	0.68
926412	AC1-112 E	1.93
926441	AC1-115 C	1.01
926442	AC1-115 E	1.64
926472	AC1-118 E	1.07
926551	AC1-134	14.83
926662	AC1-147 E	1.25
926741	AC1-159	62.13
926751	AC1-161 C	27.16
926752	AC1-161 E	11.59
926771	AC1-163 C	1.63
926772	AC1-163 E	0.76
926781	AC1-164 C	58.41
926782	AC1-164 E	26.24
927041	AC1-191 C	17.46
927042	AC1-191 E	8.7
927111	AC1-206 C	9.15
927112	AC1-206 E	4.32
927221	AC1-216 C O1	12.11

927222	AC1-216 E O1	9.53
--------	--------------	------

Appendix 4

(DVP - DVP) The 6PRGEORG 230/115 kV transformer (from bus 314269 to bus 314291 ckt 1) loads from 112.1% to 125.62% (**DC power flow**) of its load dump rating (220 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 211-228'. This project contributes approximately 29.72 MW to the thermal violation.

CONTINGENCY 'DVP_P7-1: LN 211-228'

```

OPEN BRANCH FROM BUS 314287 TO BUS 314303 CKT 1          /* 6CHSTF B
230.00 - 6HOPEWLL 230.00
OPEN BRANCH FROM BUS 314278 TO BUS 314286 CKT 1          /* 6BERMUDA
230.00 - 6CHSTF A 230.00
OPEN BRANCH FROM BUS 314278 TO BUS 314303 CKT 1          /* 6BERMUDA
230.00 - 6HOPEWLL 230.00
OPEN BUS 314278                                           /* ISLAND
END

```

Bus Number	Bus Name	Full Contribution
315120	1GRAVEL4	1.96
315121	1GRAVEL5	1.94
315122	1GRAVEL6	1.96
315074	1HOPCGN1	13.02
315075	1HOPCGN2	12.85
315077	1HOPHCF1	4.12
315078	1HOPHCF2	4.12
315079	1HOPHCF3	4.12
315080	1HOPHCF4	6.25
315076	1HOPPOLC	2.93
315073	1STONECA	10.8
315116	1SURRY 1	19.43
933471	AC2-161 C	1.13
933472	AC2-161 E	0.58
934011	AD1-025 C O1	18.66
934012	AD1-025 E O1	11.06
935161	AD1-151 C O1	17.83
935162	AD1-151 E O1	11.89
LTF	AMIL	0.03
LTF	BAYOU	0.07
LTF	BIG_CAJUN1	0.11
LTF	BIG_CAJUN2	0.22
LTF	BLUEG	0.19
LTF	CALDERWOOD	0.03

LTF	CANNELTON	0.03
LTF	CARR	0.06
LTF	CATAWBA	< 0.01
LTF	CBM-S2	0.03
LTF	CELEVELAND	< 0.01
LTF	CHEOAH	0.03
LTF	CHILHOWEE	0.01
LTF	CHOCTAW	0.07
LTF	CLIFTY	0.82
LTF	COTTONWOOD	0.3
LTF	CPLE	0.04
LTF	DEARBORN	0.11
LTF	EDWARDS	0.06
LTF	ELMERSMITH	0.09
LTF	FARMERCITY	0.03
LTF	G-007	0.18
LTF	GIBSON	0.06
LTF	MORGAN	0.12
LTF	NEWTON	0.14
LTF	O-066	0.62
LTF	PRAIRIE	0.25
LTF	RENSSELAER	0.05
LTF	ROSETON	0.34
LTF	ROWAN	< 0.01
LTF	SANTEETLA	< 0.01
LTF	SMITHLAND	0.02
LTF	TATANKA	0.06
LTF	TILTON	0.07
LTF	TRIMBLE	0.04
LTF	TVA	0.06
292791	U1-032 E	5.62
LTF	UNIONPOWER	0.03
914231	Y2-077	1.66
924811	AB2-134 C O1	14.23
924812	AB2-134 E O1	13.99
925331	AB2-190 C	22.19
925332	AB2-190 E	9.51
927221	AC1-216 C O1	10.86
927222	AC1-216 E O1	8.54

Appendix 5

(DVP - DVP) The 6BERMUDA-6CHESTF A 230 kV line (from bus 314278 to bus 314286 ckt 1) loads from 111.25% to 114.72% (**DC power flow**) of its load dump rating (549 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 211T2124'. This project contributes approximately 63.98 MW to the thermal violation.

```
CONTINGENCY 'DVP_P4-2: 211T2124'                /*_ HOPEWELL
  OPEN BRANCH FROM BUS 314303 TO BUS 314287 CKT 1    /*L211
HOPEWELL CHESTERFIELD
  OPEN BRANCH FROM BUS 314303 TO BUS 314269 CKT 1    /*L2124
END
```

Bus Number	Bus Name	Full Contribution
315120	1GRAVEL4	4.29
315121	1GRAVEL5	4.23
315122	1GRAVEL6	4.28
315074	1HOPCGN1	27.86
315075	1HOPCGN2	27.5
315077	1HOPHCF1	8.81
315078	1HOPHCF2	8.81
315079	1HOPHCF3	8.81
315080	1HOPHCF4	13.37
315076	1HOPPOLC	6.27
315073	1STONECA	23.11
315116	1SURRY 1	42.42
932041	AC2-012 C	5.33
932042	AC2-012 E	8.69
933471	AC2-161 C	2.52
933472	AC2-161 E	1.3
934011	AD1-025 C O1	40.18
934012	AD1-025 E O1	23.8
935111	AD1-144 C	0.97
935112	AD1-144 E	0.53
935161	AD1-151 C O1	38.39
935162	AD1-151 E O1	25.59
LTF	CARR	0.16
LTF	CBM-S1	0.99
LTF	CBM-S2	3.05
LTF	CBM-W1	0.62
LTF	CBM-W2	4.81
LTF	CIN	0.16

LTF	CPLE	1.04
LTF	DEARBORN	0.06
LTF	G-007	0.61
LTF	IPL	0.1
LTF	LGEE	0.04
LTF	MEC	0.67
LTF	O-066	2.05
LTF	RENSSELAER	0.13
LTF	ROSETON	0.93
292791	U1-032 E	12.03
LTF	WEC	0.05
914231	Y2-077	3.54
924811	AB2-134 C O1	30.62
924812	AB2-134 E O1	30.11
925331	AB2-190 C	47.77
925332	AB2-190 E	20.47
925692	AC1-045 E	0.53
926662	AC1-147 E	0.69
927221	AC1-216 C O1	23.37
927222	AC1-216 E O1	18.38

Appendix 6

(DVP - DVP) The 6CHESTF B-6BASIN 230 kV line (from bus 314287 to bus 314276 ckt 1) loads from 121.95% to 124.02% (**DC power flow**) of its emergency rating (449 MVA) for the single line contingency outage of 'DVP_P1-2: LN 563'. This project contributes approximately 9.21 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 563'

OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON
500.00 - 8MDLTHAN 500.00
END

Bus Number	Bus Name	Full Contribution
315065	1CHESTF6	33.33
315131	1EDGECSMA	3.18
315132	1EDGECSMB	3.18
315139	1GASTONA	1.58
315141	1GASTONB	1.58
315119	1GRAVEL3	1.24
315120	1GRAVEL4	1.26
315121	1GRAVEL5	1.24
315122	1GRAVEL6	1.26
315117	1GRAVELC	0.43
315074	1HOPCGN1	5.63
315075	1HOPCGN2	5.56
315077	1HOPHCF1	1.78
315078	1HOPHCF2	1.78
315079	1HOPHCF3	1.78
315080	1HOPHCF4	2.7
315076	1HOPPOLC	1.27
315116	1SURRY 1	12.47
314314	3LOCKS	0.06
314315	3LOCKS E	0.77
932041	AC2-012 C	3.21
932581	AC2-078 C	2.86
932591	AC2-079 C	3.07
932631	AC2-084 C	3.22
932701	AC2-093 C	23.37
933451	AC2-158 C	1.94
933461	AC2-159 C	2.55
933471	AC2-161 C	0.89
933711	AC2-194 C	0.35

933731	AC2-196 C	0.55
933991	AD1-023 C	4.54
934011	AD1-025 C O1	9.21
934041	AD1-029 C	3.98
934061	AD1-033 C O1	2.31
934071	AD1-034 C O1	4.93
934201	AD1-047 C	3.58
934331	AD1-057 C O1	3.86
934521	AD1-076 C O1	18.6
934571	AD1-082 C O1	4.27
935111	AD1-144 C	0.56
935161	AD1-151 C O1	8.8
935211	AD1-156 C	1.97
LTF	CARR	0.2
LTF	CBM-S1	3.34
LTF	CBM-S2	7.3
LTF	CBM-W1	6.1
LTF	CBM-W2	17.57
LTF	CIN	1.4
LTF	CPL	2.35
LTF	IPL	0.89
LTF	LGEE	0.31
LTF	MEC	3.38
LTF	MECS	1.11
LTF	RENSSELAER	0.16
LTF	ROSETON	1.15
LTF	WEC	0.39
914231	Y2-077	0.72
LTF	AA2-074	1.6
920631	AA2-169 C	0.75
920691	AA2-178 C	3.22
930051	AB1-013 C	0.97
930401	AB1-081 C	3.05
930861	AB1-132 C	6.17
931231	AB1-173 C	1.01
931241	AB1-173AC	1.01
923801	AB2-015 C O1	3.22
923831	AB2-022 C	0.73
923851	AB2-025 C	0.31
923911	AB2-031 C O1	1.
923941	AB2-035 C	0.11
923991	AB2-040 C O1	3.28
924071	AB2-051	42.84
924151	AB2-059 C O1	3.6
924381	AB2-087 C	0.21

924391	AB2-088 C	0.15
924491	AB2-098 C	0.19
924501	AB2-099 C	0.22
924511	AB2-100 C	6.19
924811	AB2-134 C O1	7.02
925051	AB2-160 C O1	3.33
925061	AB2-161 C O1	1.87
925121	AB2-169 C	2.2
925171	AB2-174 C O1	3.2
925281	AB2-186 C	0.2
925291	AB2-188 C O1	0.79
925331	AB2-190 C	10.95
925591	AC1-034 C	2.34
925821	AC1-061	< 0.01
926071	AC1-086 C	9.08
926201	AC1-098 C	2.26
926211	AC1-099 C	0.76
926741	AC1-159	20.65
926771	AC1-163 C	0.71
927021	AC1-189 C	2.92
927111	AC1-206 C	5.47
927141	AC1-208 C	3.41
927221	AC1-216 C O1	5.36

Appendix 7

(DVP - DVP) The 6HOPEWELL-6BERMUDA 230 kV line (from bus 314303 to bus 314278 ckt 1) loads from 111.25% to 114.72% (**DC power flow**) of its load dump rating (549 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 211T2124'. This project contributes approximately 63.98 MW to the thermal violation.

```
CONTINGENCY 'DVP_P4-2: 211T2124'                /*_ HOPEWELL
  OPEN BRANCH FROM BUS 314303 TO BUS 314287 CKT 1    /*L211
HOPEWELL CHESTERFIELD
  OPEN BRANCH FROM BUS 314303 TO BUS 314269 CKT 1    /*L2124
END
```

Bus Number	Bus Name	Full Contribution
315120	1GRAVEL4	4.29
315121	1GRAVEL5	4.23
315122	1GRAVEL6	4.28
315074	1HOPCGN1	27.86
315075	1HOPCGN2	27.5
315077	1HOPHCF1	8.81
315078	1HOPHCF2	8.81
315079	1HOPHCF3	8.81
315080	1HOPHCF4	13.37
315076	1HOPPOLC	6.27
315073	1STONECA	23.11
315116	1SURRY 1	42.42
932041	AC2-012 C	5.33
932042	AC2-012 E	8.69
933471	AC2-161 C	2.52
933472	AC2-161 E	1.3
934011	AD1-025 C O1	40.18
934012	AD1-025 E O1	23.8
935111	AD1-144 C	0.97
935112	AD1-144 E	0.53
935161	AD1-151 C O1	38.39
935162	AD1-151 E O1	25.59
LTF	CARR	0.16
LTF	CBM-S1	0.99
LTF	CBM-S2	3.05
LTF	CBM-W1	0.62
LTF	CBM-W2	4.81
LTF	CIN	0.16

LTF	CPLE	1.04
LTF	DEARBORN	0.06
LTF	G-007	0.61
LTF	IPL	0.1
LTF	LGEE	0.04
LTF	MEC	0.67
LTF	O-066	2.05
LTF	RENSSELAER	0.13
LTF	ROSETON	0.93
292791	U1-032 E	12.03
LTF	WEC	0.05
914231	Y2-077	3.54
924811	AB2-134 C O1	30.62
924812	AB2-134 E O1	30.11
925331	AB2-190 C	47.77
925332	AB2-190 E	20.47
925692	AC1-045 E	0.53
926662	AC1-147 E	0.69
927221	AC1-216 C O1	23.37
927222	AC1-216 E O1	18.38

Appendix 8

(DVP - DVP) The 8CHCKAHM-8ELMONT 500 kV line (from bus 314903 to bus 314908 ckt 1) loads from 117.29% to 117.85% (**DC power flow**) of its load dump rating (3144 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 563T576'. This project contributes approximately 39.06 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 563T576' /* MIDLOTHIAN 500 500 KV
 OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON
 500.00 - 8MDLTHAN 500.00
 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN
 500.00 - 8NO ANNA 500.00
 END

Bus Number	Bus Name	Full Contribution
315131	1EDGECEMA	11.78
315132	1EDGECEMB	11.78
315108	1ELIZAR1	7.
315109	1ELIZAR2	6.88
315110	1ELIZAR3	7.09
315074	1HOPCGN1	10.5
315075	1HOPCGN2	10.36
315073	1STONECA	8.71
315233	1SURRY 2	62.92
315092	1YORKTN3	52.2
314557	3BETHELC	1.05
314554	3BTLEBRO	1.02
314566	3CRESWEL	3.96
314572	3EMPORIA	0.55
314578	3HORNRTN	4.49
314582	3KELFORD	1.2
314315	3LOCKS E	1.42
314603	3SCOT NK	4.61
314617	3TUNIS	1.26
314539	3UNCAMP	3.88
314541	3WATKINS	1.08
314620	6CASHIE	1.33
314574	6EVERETS	3.37
314189	6PAPERMILL	10.95
314594	6PLYMOTH	1.37
314648	6SUNBURY	1.55
314421	6WINCHST	0.33

314651	6WINFALL	3.04
932041	AC2-012 C	18.53
932042	AC2-012 E	30.23
932531	AC2-073 C	3.89
932532	AC2-073 E	1.96
932581	AC2-078 C	5.46
932582	AC2-078 E	8.91
932591	AC2-079 C	10.89
932592	AC2-079 E	17.77
932631	AC2-084 C	12.06
932632	AC2-084 E	5.94
932701	AC2-093 C	104.49
932702	AC2-093 E	59.77
932831	AC2-110 C	2.14
932832	AC2-110 E	3.5
933061	AC2-130	3.11
933071	AC2-131 1	2.1
933081	AC2-131 2	0.96
933111	AC2-132 1	1.11
933121	AC2-132 2	0.57
933261	AC2-137 C	2.87
933262	AC2-137 E	1.87
933271	AC2-138 C	0.94
933272	AC2-138 E	1.18
933291	AC2-141 C	59.42
933292	AC2-141 E	25.36
933451	AC2-158 C	8.43
933452	AC2-158 E	8.43
933461	AC2-159 C	9.5
933462	AC2-159 E	9.5
933471	AC2-161 C	4.04
933472	AC2-161 E	2.08
933711	AC2-194 C	1.88
933712	AC2-194 E	3.04
933731	AC2-196 C	3.26
933732	AC2-196 E	2.17
933991	AD1-023 C	20.86
933992	AD1-023 E	11.36
934011	AD1-025 C O1	24.53
934012	AD1-025 E O1	14.53
934041	AD1-029 C	14.92
934042	AD1-029 E	9.83
934061	AD1-033 C O1	13.67
934062	AD1-033 E O1	9.12
934071	AD1-034 C O1	9.11

934072	AD1-034 E O1	5.91
934141	AD1-041 C O1	8.48
934142	AD1-041 E O1	5.65
934201	AD1-047 C	10.68
934202	AD1-047 E	7.12
934211	AD1-048 C	2.72
934212	AD1-048 E	1.37
934231	AD1-050 C	5.54
934232	AD1-050 E	3.03
934331	AD1-057 C O1	13.1
934332	AD1-057 E O1	6.99
934391	AD1-063 C	2.63
934392	AD1-063 E	1.75
934521	AD1-076 C O1	87.15
934522	AD1-076 E O1	44.38
934571	AD1-082 C O1	11.6
934572	AD1-082 E O1	6.62
934611	AD1-087 C O1	10.29
934612	AD1-087 E O1	4.81
LTF	AD1-120	12.89
LTF	AD1-121	12.82
935111	AD1-144 C	3.05
935112	AD1-144 E	1.67
935161	AD1-151 C O1	23.44
935162	AD1-151 E O1	15.62
935171	AD1-152 C O1	9.53
935172	AD1-152 E O1	6.36
935211	AD1-156 C	2.54
935212	AD1-156 E	1.69
LTF	CARR	0.99
LTF	CBM-S1	12.81
LTF	CBM-S2	30.24
LTF	CBM-W1	20.3
LTF	CBM-W2	66.23
LTF	CIN	4.7
LTF	CPL	9.79
LTF	G-007	4.19
LTF	IPL	2.98
LTF	LGEE	1.04
LTF	MEC	12.09
LTF	MECS	2.95
LTF	O-066	14.
LTF	RENSSELAER	0.79
LTF	ROSETON	5.72
292791	U1-032 E	4.54

900672	V4-068 E	0.45
901082	W1-029E	79.92
LTF	WEC	1.3
907092	X1-038 E	9.71
913392	Y1-086 E	3.84
916042	Z1-036 E	77.7
916191	Z1-068 C	0.1
916192	Z1-068 E	3.41
916302	Z1-086 E	13.58
917122	Z2-027 E	1.86
917332	Z2-043 E	1.44
917342	Z2-044 E	0.75
917512	Z2-088 E OP1	5.12
917592	Z2-099 E	0.67
918492	AA1-063AE OP	5.71
918512	AA1-065 E OP	6.76
918532	AA1-067 E	1.01
918562	AA1-072 E	0.24
919152	AA1-139 E	11.57
919692	AA2-053 E	5.19
919702	AA2-057 E	4.68
919732	AA2-059 E	0.94
919822	AA2-068 E	1.38
LTF	AA2-074	6.66
920022	AA2-086 E	0.36
920042	AA2-088 E	16.01
920592	AA2-165 E	0.62
920631	AA2-169 C	2.75
920632	AA2-169 E	1.26
920672	AA2-174 E	0.6
920691	AA2-178 C	15.82
920692	AA2-178 E	6.78
930051	AB1-013 C	4.78
930052	AB1-013 E	31.96
930401	AB1-081 C	11.37
930402	AB1-081 E	4.87
930861	AB1-132 C	19.1
930862	AB1-132 E	8.19
931231	AB1-173 C	3.
931232	AB1-173 E	1.4
931241	AB1-173AC	3.
931242	AB1-173AE	1.4
923801	AB2-015 C O1	13.67
923802	AB2-015 E O1	11.21
923831	AB2-022 C	4.06

923832	AB2-022 E	2.19
923842	AB2-024 E	1.84
923852	AB2-025 E	1.43
923911	AB2-031 C O1	2.98
923912	AB2-031 E O1	1.47
923941	AB2-035 C	0.44
923942	AB2-035 E	0.19
923991	AB2-040 C O1	9.79
923992	AB2-040 E O1	8.01
924071	AB2-051	249.42
924151	AB2-059 C O1	13.4
924152	AB2-059 E O1	6.91
924241	AB2-068 O1	619.77
924381	AB2-087 C	0.85
924382	AB2-087 E	0.4
924391	AB2-088 C	0.57
924392	AB2-088 E	0.27
924401	AB2-089 C	2.51
924402	AB2-089 E	1.29
924491	AB2-098 C	0.79
924492	AB2-098 E	0.34
924501	AB2-099 C	0.88
924502	AB2-099 E	0.38
924511	AB2-100 C	15.26
924512	AB2-100 E	7.52
924811	AB2-134 C O1	18.7
924812	AB2-134 E O1	18.38
925051	AB2-160 C O1	6.17
925052	AB2-160 E O1	10.07
925061	AB2-161 C O1	5.09
925062	AB2-161 E O1	8.31
925121	AB2-169 C	9.76
925122	AB2-169 E	8.76
925171	AB2-174 C O1	9.32
925172	AB2-174 E O1	8.43
925281	AB2-186 C	1.05
925282	AB2-186 E	0.45
925291	AB2-188 C O1	3.9
925292	AB2-188 E O1	1.75
925331	AB2-190 C	29.16
925332	AB2-190 E	12.5
925522	AC1-027 E	2.08
925591	AC1-034 C	9.
925592	AC1-034 E	6.79
925692	AC1-045 E	1.67

925781	AC1-054 C	8.64
925782	AC1-054 E	3.98
925861	AC1-065 C	5.36
925862	AC1-065 E	8.75
926071	AC1-086 C	28.13
926072	AC1-086 E	12.8
926201	AC1-098 C	8.46
926202	AC1-098 E	5.04
926211	AC1-099 C	2.83
926212	AC1-099 E	1.66
926291	AC1-107	935.5
926662	AC1-147 E	2.41
926741	AC1-159	120.26
926751	AC1-161 C	59.42
926752	AC1-161 E	25.36
926771	AC1-163 C	2.89
926772	AC1-163 E	1.35
926781	AC1-164 C	68.07
926782	AC1-164 E	30.58
927021	AC1-189 C	11.6
927022	AC1-189 E	5.78
927111	AC1-206 C	13.15
927112	AC1-206 E	6.22
927141	AC1-208 C	12.24
927142	AC1-208 E	5.43
927221	AC1-216 C O1	14.27
927222	AC1-216 E O1	11.22

Appendix 9

(DVP - DVP) The 8ELMONT-8LADYSMITH 500 kV line (from bus 314908 to bus 314911 ckt 1) loads from 155.96% to 156.5% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'DVP_P1-2: LN 576'. This project contributes approximately 30.48 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 576'

OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN
500.00 - 8NO ANNA 500.00
END

Bus Number	Bus Name	Full Contribution
315058	1CHESTF3	6.41
315059	1CHESTF4	10.39
315060	1CHESTF5	22.04
315061	1CHESTG7	8.64
315063	1CHESTG8	8.54
315062	1CHESTS7	3.93
315064	1CHESTS8	4.38
315067	1DARBY 1	5.62
315068	1DARBY 2	5.63
315069	1DARBY 3	5.65
315070	1DARBY 4	5.65
315074	1HOPCGN1	15.08
315075	1HOPCGN2	14.88
315078	1HOPHCF2	4.77
315079	1HOPHCF3	4.77
315080	1HOPHCF4	7.24
315083	1SPRUNCA	18.62
315084	1SPRUNCB	18.62
315085	1SPRUNCC	13.81
315086	1SPRUNCD	13.81
315233	1SURRY 2	55.09
315092	1YORKTN3	50.67
314315	3LOCKS E	2.22
314309	6IRON208	0.98
314236	6NRTHEST	0.41
314421	6WINCHST	0.32
932041	AC2-012 C	18.08
932501	AC2-070 C	3.15
932531	AC2-073 C	4.17

932581	AC2-078 C	7.15
932591	AC2-079 C	11.82
932631	AC2-084 C	13.79
932701	AC2-093 C	113.43
932831	AC2-110 C	2.34
933061	AC2-130	4.4
933071	AC2-131 1	2.98
933081	AC2-131 2	1.35
933111	AC2-132 1	1.57
933121	AC2-132 2	0.8
933261	AC2-137 C	3.87
933291	AC2-141 C	54.33
933451	AC2-158 C	9.04
933461	AC2-159 C	10.73
933471	AC2-161 C	4.22
933481	AC2-162 C	4.53
933711	AC2-194 C	1.88
933731	AC2-196 C	3.16
933991	AD1-023 C	21.99
934011	AD1-025 C O1	30.48
934041	AD1-029 C	17.06
934061	AD1-033 C O1	13.26
934071	AD1-034 C O1	14.26
934141	AD1-041 C O1	9.1
934201	AD1-047 C	12.81
934211	AD1-048 C	4.49
934391	AD1-063 C	2.82
934521	AD1-076 C O1	91.28
934571	AD1-082 C O1	13.52
LTF	AD1-092	5.99
LTF	AD1-093	10.26
LTF	AD1-094	1.92
LTF	AD1-120	17.84
LTF	AD1-121	17.8
935111	AD1-144 C	3.06
935161	AD1-151 C O1	29.12
935211	AD1-156 C	3.7
LTF	CARR	1.65
LTF	CBM-S1	25.74
LTF	CBM-S2	42.18
LTF	CBM-W1	59.72
LTF	CBM-W2	138.96
LTF	CIN	13.91
LTF	CPLE	12.52
LTF	IPL	8.89

LTF	LGEE	3.04
LTF	MEC	29.72
LTF	MECS	13.46
LTF	RENSSELAER	1.32
LTF	ROSETON	9.56
297087	V2-040	0.27
LTF	WEC	3.73
LTF	Y3-032	8.73
LTF	Z1-043	14.67
LTF	AA2-074	8.52
920691	AA2-178 C	16.3
930051	AB1-013 C	4.92
930121	AB1-027 C	0.94
930861	AB1-132 C	22.44
931231	AB1-173 C	3.6
931241	AB1-173AC	3.6
LTF	AB2-013	8.55
923801	AB2-015 C O1	14.56
923831	AB2-022 C	4.01
923911	AB2-031 C O1	3.58
923991	AB2-040 C O1	11.74
924071	AB2-051	242.92
924241	AB2-068 O1	417.67
924381	AB2-087 C	0.93
924501	AB2-099 C	0.96
924511	AB2-100 C	18.71
924811	AB2-134 C O1	23.23
925051	AB2-160 C O1	9.66
925061	AB2-161 C O1	5.93
925121	AB2-169 C	10.53
925171	AB2-174 C O1	11.24
925281	AB2-186 C	1.06
925291	AB2-188 C O1	4.02
925331	AB2-190 C	36.24
925861	AC1-065 C	5.85
926071	AC1-086 C	33.04
926201	AC1-098 C	9.68
926211	AC1-099 C	3.24
926291	AC1-107	630.45
926411	AC1-112 C	0.73
926741	AC1-159	117.13
926751	AC1-161 C	54.33
926771	AC1-163 C	3.17
926781	AC1-164 C	75.71
927041	AC1-191 C	16.51

927111	AC1-206 C	16.2
927141	AC1-208 C	14.19
927221	AC1-216 C O1	17.73

Appendix 10

(DVP - DVP) The 8MDLTHAN-8NO ANNA 500 kV line (from bus 314914 to bus 314918 ckt 1) loads from 124.6% to 125.06% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'DVP_P1-2: LN 574'. This project contributes approximately 24.76 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 574'

OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT
500.00 - 8LDYSMTH 500.00
END

Bus Number	Bus Name	Full Contribution
315102	1BRUNSWICKG1	16.36
315103	1BRUNSWICKG2	16.36
315104	1BRUNSWICKG3	16.36
315105	1BRUNSWICKS1	33.98
315099	1CHESPKB	2.06
315131	1EDGECEMA	13.32
315132	1EDGECEMB	13.32
315108	1ELIZAR1	6.07
315109	1ELIZAR2	5.97
315110	1ELIZAR3	6.15
315074	1HOPCGN1	11.87
315075	1HOPCGN2	11.72
315083	1SPRUNCA	15.71
315084	1SPRUNCB	15.71
315085	1SPRUNCC	11.64
315086	1SPRUNCD	11.64
314315	3LOCKS E	1.85
932041	AC2-012 C	16.09
932501	AC2-070 C	2.04
932531	AC2-073 C	2.99
932581	AC2-078 C	6.2
932591	AC2-079 C	10.49
932631	AC2-084 C	13.04
932701	AC2-093 C	123.19
932831	AC2-110 C	1.7
933061	AC2-130	3.23
933071	AC2-131 1	2.19
933081	AC2-131 2	0.99
933111	AC2-132 1	1.15

933121	AC2-132 2	0.59
933261	AC2-137 C	2.68
933291	AC2-141 C	48.31
933451	AC2-158 C	8.36
933461	AC2-159 C	10.06
933471	AC2-161 C	3.62
933481	AC2-162 C	2.93
933501	AC2-165 C	16.08
933711	AC2-194 C	1.7
933731	AC2-196 C	2.83
933991	AD1-023 C	20.22
934011	AD1-025 C O1	24.76
934041	AD1-029 C	16.13
934061	AD1-033 C O1	11.87
934071	AD1-034 C O1	11.86
934141	AD1-041 C O1	6.64
934201	AD1-047 C	12.15
934211	AD1-048 C	3.14
934231	AD1-050 C	6.68
934331	AD1-057 C O1	14.69
934391	AD1-063 C	2.02
934521	AD1-076 C O1	83.81
934571	AD1-082 C O1	11.88
934611	AD1-087 C O1	12.89
934621	AD1-088 C O1	21.5
LTF	AD1-092	4.84
LTF	AD1-093	8.29
LTF	AD1-094	1.55
LTF	AD1-120	17.13
LTF	AD1-121	17.08
934911	AD1-123 C	1.45
935111	AD1-144 C	2.69
935161	AD1-151 C O1	23.66
935171	AD1-152 C O1	11.94
935211	AD1-156 C	3.27
935221	AD1-157 C	1.94
935231	AD1-160 C	1.42
LTF	CARR	1.37
LTF	CBM-S1	22.23
LTF	CBM-S2	40.33
LTF	CBM-W1	47.95
LTF	CBM-W2	118.94
LTF	CIN	11.12
LTF	CPL	12.29
LTF	IPL	7.09

LTF	LGEE	2.43
LTF	MEC	24.61
LTF	MECS	10.23
LTF	RENSSELAER	1.1
LTF	ROSETON	7.93
LTF	WEC	3.
LTF	Z1-043	11.83
916191	Z1-068 C	0.08
916301	Z1-086 C	99.51
LTF	AA2-074	8.36
920631	AA2-169 C	3.22
920691	AA2-178 C	14.88
930051	AB1-013 C	4.49
930401	AB1-081 C	12.86
930861	AB1-132 C	21.22
931231	AB1-173 C	3.42
931241	AB1-173AC	3.42
LTF	AB2-013	6.91
923801	AB2-015 C O1	13.29
923831	AB2-022 C	3.61
923911	AB2-031 C O1	3.39
923941	AB2-035 C	0.49
923991	AB2-040 C O1	11.14
924021	AB2-043 C O1	4.25
924071	AB2-051	216.38
924151	AB2-059 C O1	15.15
924161	AB2-060 C O1	12.23
924241	AB2-068 O1	241.09
924301	AB2-077 C O1	2.7
924311	AB2-078 C O1	2.7
924321	AB2-079 C O1	2.7
924381	AB2-087 C	0.86
924391	AB2-088 C	0.63
924401	AB2-089 C	3.03
924411	AB2-090 C	5.36
924491	AB2-098 C	0.83
924501	AB2-099 C	0.89
924511	AB2-100 C	17.74
924811	AB2-134 C O1	18.87
925051	AB2-160 C O1	8.03
925061	AB2-161 C O1	5.21
925121	AB2-169 C	9.78
925171	AB2-174 C O1	10.67
925221	AB2-176 C	2.21
925281	AB2-186 C	0.95

925291	AB2-188 C O1	3.67
925331	AB2-190 C	29.44
925521	AC1-027 C	0.62
925591	AC1-034 C	9.95
925611	AC1-036 C	1.26
925781	AC1-054 C	10.31
925861	AC1-065 C	4.24
926071	AC1-086 C	31.25
926201	AC1-098 C	9.15
926211	AC1-099 C	3.07
926271	AC1-105 C	7.54
926291	AC1-107	363.9
926741	AC1-159	104.33
926751	AC1-161 C	48.31
926761	AC1-162 C	37.21
926771	AC1-163 C	2.95
926781	AC1-164 C	51.59
927021	AC1-189 C	12.57
927111	AC1-206 C	15.37
927141	AC1-208 C	13.46
927221	AC1-216 C O1	14.41

Appendix 1

(DVP - DVP) The 6HOPEWELL-6CHESTERFIELD 230 kV line (from bus 314303 to bus 314287 ckt 1) loads from 92.31% to 103.0% (**DC power flow**) of its load dump rating (541 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: G5T228'. This project contributes approximately 57.82 MW to the thermal violation.

```
CONTINGENCY 'DVP_P4-2: G5T228'                               /*_ CHESTERFIELD
  OPEN BRANCH FROM BUS 314286 TO BUS 314278 CKT 1           /*L228
CHESTERFIELD BERMUDA
  OPEN BRANCH FROM BUS 314278 TO BUS 314303 CKT 1           /*L228 BERMUDA
HOPEWELL
  REMOVE MACHINE 5 FROM BUS 315060                           /*CHESTERFIELD GEN
G5
END
```

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315120	1GRAVEL4	3.94
315121	1GRAVEL5	3.89
315122	1GRAVEL6	3.94
315074	1HOPCGN1	24.99
315075	1HOPCGN2	24.67
315077	1HOPHCF1	7.9
315078	1HOPHCF2	7.9
315079	1HOPHCF3	7.9
315080	1HOPHCF4	11.99
315076	1HOPPOLC	5.63
315073	1STONECA	20.73
315116	1SURRY 1	39.02
932041	AC2-012 C	5.08
932042	AC2-012 E	8.29
933471	AC2-161 C	2.34
933472	AC2-161 E	1.2
934011	AD1-025 C O2	36.31
934012	AD1-025 E O2	21.51
935111	AD1-144 C	0.94
935112	AD1-144 E	0.51
LTF	CARR	0.14
LTF	CBM-S1	0.61
LTF	CBM-S2	2.19

<i>LTF</i>	<i>CBM-W2</i>	<i>2.77</i>
<i>LTF</i>	<i>CIN</i>	<i>< 0.01</i>
<i>LTF</i>	<i>CLIFTY</i>	<i>0.3</i>
<i>LTF</i>	<i>CPL</i>	<i>0.76</i>
<i>LTF</i>	<i>DEARBORN</i>	<i>0.09</i>
<i>LTF</i>	<i>G-007</i>	<i>0.52</i>
<i>LTF</i>	<i>LGEE</i>	<i>< 0.01</i>
<i>LTF</i>	<i>MEC</i>	<i>0.28</i>
<i>LTF</i>	<i>O-066</i>	<i>1.73</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>0.11</i>
<i>LTF</i>	<i>ROSETON</i>	<i>0.81</i>
<i>LTF</i>	<i>TRIMBLE</i>	<i>< 0.01</i>
<i>292791</i>	<i>U1-032 E</i>	<i>10.8</i>
<i>LTF</i>	<i>WEC</i>	<i>< 0.01</i>
<i>914231</i>	<i>Y2-077</i>	<i>3.18</i>
<i>916192</i>	<i>Z1-068 E</i>	<i>0.86</i>
<i>924071</i>	<i>AB2-051</i>	<i>66.52</i>
<i>924811</i>	<i>AB2-134 C O1</i>	<i>27.68</i>
<i>924812</i>	<i>AB2-134 E O1</i>	<i>27.22</i>
<i>925331</i>	<i>AB2-190 C</i>	<i>43.17</i>
<i>925332</i>	<i>AB2-190 E</i>	<i>18.5</i>
<i>925522</i>	<i>AC1-027 E</i>	<i>0.53</i>
<i>925692</i>	<i>AC1-045 E</i>	<i>0.51</i>
<i>926662</i>	<i>AC1-147 E</i>	<i>0.66</i>
<i>926741</i>	<i>AC1-159</i>	<i>32.07</i>
<i>927221</i>	<i>AC1-216 C O1</i>	<i>21.12</i>
<i>927222</i>	<i>AC1-216 E O1</i>	<i>16.61</i>

Appendix 2

(DVP - DVP) The 6FOUR RIVERS-6STJOHN 230 kV line (from bus 314212 to bus 314150 ckt 1) loads from 122.59% to 123.09% (**DC power flow**) of its emergency rating (749 MVA) for the single line contingency outage of 'DVP_P1-2: LN 574'. This project contributes approximately 8.92 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 574'

OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT

500.00 - 8LDYSMTH 500.00

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315053	1BELMED1	2.08
315054	1BELMED2	2.08
315055	1BELMED3	1.73
315058	1CHESTF3	2.18
315059	1CHESTF4	3.53
315060	1CHESTF5	7.11
315065	1CHESTF6	14.51
315061	1CHESTG7	2.79
315063	1CHESTG8	2.76
315062	1CHESTS7	1.27
315064	1CHESTS8	1.41
315067	1DARBY 1	2.05
315068	1DARBY 2	2.05
315069	1DARBY 3	2.06
315070	1DARBY 4	2.06
315043	1FOUR RIVERA	6.75
315044	1FOUR RIVERB	5.22
315045	1FOUR RIVERC	6.75
315046	1FOUR RIVERD	5.22
315047	1FOUR RIVERE	5.22
315048	1FOUR RIVERF	6.75
315074	1HOPCGN1	4.73
315075	1HOPCGN2	4.67
315083	1SPRUNCA	6.19
315084	1SPRUNCB	6.19
315085	1SPRUNCC	4.59
315086	1SPRUNCD	4.59

314315	3LOCKS E	0.69
314309	6IRON208	0.33
314236	6NRTHEST	0.15
314250	6ROCKVILLE	0.17
932501	AC2-070 C	1.19
932581	AC2-078 C	2.05
933061	AC2-130	1.42
933071	AC2-131 1	0.96
933081	AC2-131 2	0.44
933111	AC2-132 1	0.51
933121	AC2-132 2	0.26
933261	AC2-137 C	1.27
933481	AC2-162 C	1.71
934011	AD1-025 C O2	8.92
934141	AD1-041 C O2	2.59
934211	AD1-048 C	1.56
934571	AD1-082 C O2	3.82
LTF	AD1-120	4.
LTF	AD1-121	3.99
935161	AD1-151 C O2	8.28
935211	AD1-156 C	1.09
LTF	CARR	0.42
LTF	CBM-S1	5.86
LTF	CBM-S2	9.49
LTF	CBM-W1	13.64
LTF	CBM-W2	31.65
LTF	CIN	3.19
LTF	CPL	2.81
LTF	IPL	2.04
LTF	LGEE	0.7
LTF	MEC	6.78
LTF	MECS	3.06
LTF	RENSSELAER	0.33
LTF	ROSETON	2.43
297087	V2-040	0.12
LTF	WEC	0.85
918691	AA1-083	1.19
919211	AA1-145	20.15
LTF	AA2-074	1.91

930121	AB1-027 C	0.36
924061	AB2-050	1.19
924241	AB2-068 O1	107.17
924811	AB2-134 C O1	6.8
925051	AB2-160 C O1	3.01
925331	AB2-190 C	10.6
926291	AC1-107	161.76
926411	AC1-112 C	0.28
926551	AC1-134	15.1
926781	AC1-164 C	23.18
927041	AC1-191 C	6.71
927221	AC1-216 C O1	5.19

Appendix 3

(DVP - DVP) The 8ELMONT 500/230 kV transformer (from bus 314218 to bus 314908 ckt 1) loads from 120.16% to 121.39% (**DC power flow**) of its load dump rating (1051 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: H2T557'. This project contributes approximately 33.15 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: H2T557'

/* ELMONT

OPEN BRANCH FROM BUS 314908 TO BUS 314903 CKT 1 /*ELMONT TO
CHICKAHOMINY (LINE 557)

OPEN BRANCH FROM BUS 314903 TO BUS 314214 CKT 1
/*CHICKAHOMINY 500-230 (TX#1)

OPEN BRANCH FROM BUS 314908 TO BUS 314218 CKT 2 /*ELMONT 500-
230 (TX#2)

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315067	1DARBY 1	4.99
315068	1DARBY 2	4.99
315069	1DARBY 3	5.01
315070	1DARBY 4	5.01
315043	1FOUR RIVERA	6.63
315044	1FOUR RIVERB	5.13
315045	1FOUR RIVERC	6.63
315046	1FOUR RIVERD	5.13
315047	1FOUR RIVERE	5.13
315048	1FOUR RIVERF	6.63
315074	1HOPCGN1	11.28
315075	1HOPCGN2	11.14
315083	1SPRUNCA	14.95
315084	1SPRUNCB	14.95
315085	1SPRUNCC	11.08
315086	1SPRUNCD	11.08
315073	1STONECA	9.36
314566	3CRESWEL	2.11
314572	3EMPORIA	0.36
314315	3LOCKS E	1.65
314617	3TUNIS	0.71
314539	3UNCAMP	2.19
314541	3WATKINS	0.61

314620	6CASHIE	0.72
314229	6MT RD221	1.41
314236	6NRTHEST	0.37
314189	6PAPERMILL	8.82
314594	6PLYMOTH	0.73
314250	6ROCKVILLE	0.4
314256	6ROCKVILLE E	1.15
314648	6SUNBURY	0.81
314651	6WINFALL	1.59
932041	AC2-012 C	9.62
932042	AC2-012 E	15.7
932501	AC2-070 C	2.9
932502	AC2-070 E	1.2
932531	AC2-073 C	3.1
932532	AC2-073 E	1.56
932581	AC2-078 C	4.75
932582	AC2-078 E	7.75
932591	AC2-079 C	6.82
932592	AC2-079 E	11.13
932831	AC2-110 C	1.74
932832	AC2-110 E	2.84
933061	AC2-130	3.48
933071	AC2-131 1	2.36
933081	AC2-131 2	1.07
933111	AC2-132 1	1.24
933121	AC2-132 2	0.63
933261	AC2-137 C	3.16
933262	AC2-137 E	2.05
933271	AC2-138 C	0.87
933272	AC2-138 E	1.09
933291	AC2-141 C	27.16
933292	AC2-141 E	11.59
933451	AC2-158 C	4.63
933452	AC2-158 E	4.63
933471	AC2-161 C	2.47
933472	AC2-161 E	1.27
933481	AC2-162 C	4.17
933482	AC2-162 E	2.15
933711	AC2-194 C	0.98

933712	AC2-194 E	1.59
933731	AC2-196 C	1.66
933732	AC2-196 E	1.1
933991	AD1-023 C	11.29
933992	AD1-023 E	6.14
934011	AD1-025 C O2	20.82
934012	AD1-025 E O2	12.33
934061	AD1-033 C O2	6.97
934062	AD1-033 E O2	4.65
934071	AD1-034 C O2	7.83
934072	AD1-034 E O2	5.07
934141	AD1-041 C O2	7.07
934142	AD1-041 E O2	4.71
934191	AD1-046 C	4.71
934192	AD1-046 E	3.14
934201	AD1-047 C	6.75
934202	AD1-047 E	4.5
934211	AD1-048 C	3.82
934212	AD1-048 E	1.93
934391	AD1-063 C	2.1
934392	AD1-063 E	1.4
934521	AD1-076 C O2	44.5
934522	AD1-076 E O2	22.66
934571	AD1-082 C O2	8.78
934572	AD1-082 E O2	5.01
934781	AD1-105 C	8.08
934782	AD1-105 E	5.62
LTF	AD1-120	5.93
LTF	AD1-121	5.89
935111	AD1-144 C	1.68
935112	AD1-144 E	0.92
935161	AD1-151 C O2	15.11
935162	AD1-151 E O2	10.07
935211	AD1-156 C	2.56
935212	AD1-156 E	1.71
LTF	CARR	0.67
LTF	CBM-S1	3.86
LTF	CBM-S2	13.84
LTF	CBM-W1	0.21

<i>LTF</i>	<i>CBM-W2</i>	<i>17.92</i>
<i>LTF</i>	<i>CIN</i>	<i>0.13</i>
<i>LTF</i>	<i>CLIFTY</i>	<i>1.61</i>
<i>LTF</i>	<i>CPL</i>	<i>4.75</i>
<i>LTF</i>	<i>DEARBORN</i>	<i>0.47</i>
<i>LTF</i>	<i>G-007</i>	<i>2.31</i>
<i>LTF</i>	<i>IPL</i>	<i>0.06</i>
<i>LTF</i>	<i>LGEE</i>	<i>0.05</i>
<i>LTF</i>	<i>MEC</i>	<i>1.99</i>
<i>LTF</i>	<i>O-066</i>	<i>7.73</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>0.53</i>
<i>LTF</i>	<i>ROSETON</i>	<i>3.84</i>
<i>292791</i>	<i>U1-032 E</i>	<i>4.87</i>
<i>297087</i>	<i>V2-040</i>	<i>0.28</i>
<i>900672</i>	<i>V4-068 E</i>	<i>0.26</i>
<i>901082</i>	<i>W1-029E</i>	<i>41.82</i>
<i>LTF</i>	<i>WEC</i>	<i>0.06</i>
<i>907092</i>	<i>X1-038 E</i>	<i>5.47</i>
<i>913392</i>	<i>Y1-086 E</i>	<i>1.99</i>
<i>916042</i>	<i>Z1-036 E</i>	<i>40.84</i>
<i>916192</i>	<i>Z1-068 E</i>	<i>1.76</i>
<i>917122</i>	<i>Z2-027 E</i>	<i>0.96</i>
<i>917592</i>	<i>Z2-099 E</i>	<i>0.38</i>
<i>918492</i>	<i>AA1-063AE OP</i>	<i>3.35</i>
<i>918512</i>	<i>AA1-065 E OP</i>	<i>3.74</i>
<i>918691</i>	<i>AA1-083</i>	<i>1.16</i>
<i>919152</i>	<i>AA1-139 E</i>	<i>5.92</i>
<i>919211</i>	<i>AA1-145</i>	<i>19.79</i>
<i>919732</i>	<i>AA2-059 E</i>	<i>0.5</i>
<i>LTF</i>	<i>AA2-074</i>	<i>3.23</i>
<i>920022</i>	<i>AA2-086 E</i>	<i>0.21</i>
<i>920042</i>	<i>AA2-088 E</i>	<i>9.15</i>
<i>920691</i>	<i>AA2-178 C</i>	<i>8.43</i>
<i>920692</i>	<i>AA2-178 E</i>	<i>3.61</i>
<i>930051</i>	<i>AB1-013 C</i>	<i>2.54</i>
<i>930052</i>	<i>AB1-013 E</i>	<i>17.02</i>
<i>930121</i>	<i>AB1-027 C</i>	<i>0.87</i>
<i>930122</i>	<i>AB1-027 E</i>	<i>1.89</i>
<i>930861</i>	<i>AB1-132 C</i>	<i>11.78</i>

930862	AB1-132 E	5.05
931231	AB1-173 C	1.9
931232	AB1-173 E	0.89
931241	AB1-173AC	1.9
931242	AB1-173AE	0.89
923801	AB2-015 C O1	7.73
923802	AB2-015 E O1	6.34
923831	AB2-022 C	2.1
923832	AB2-022 E	1.13
923842	AB2-024 E	1.49
923852	AB2-025 E	1.09
923862	AB2-026 E	0.88
923911	AB2-031 C O1	1.88
923912	AB2-031 E O1	0.93
923991	AB2-040 C O1	6.19
923992	AB2-040 E O1	5.06
924061	AB2-050	1.16
924071	AB2-051	128.86
924241	AB2-068 O1	177.95
924381	AB2-087 C	0.48
924382	AB2-087 E	0.22
924501	AB2-099 C	0.49
924502	AB2-099 E	0.21
924511	AB2-100 C	10.48
924512	AB2-100 E	5.16
924811	AB2-134 C O1	15.87
924812	AB2-134 E O1	15.6
925051	AB2-160 C O1	7.18
925052	AB2-160 E O1	11.71
925061	AB2-161 C O1	3.63
925062	AB2-161 E O1	5.92
925171	AB2-174 C O1	5.96
925172	AB2-174 E O1	5.39
925281	AB2-186 C	0.55
925282	AB2-186 E	0.24
925291	AB2-188 C O1	2.08
925292	AB2-188 E O1	0.93
925331	AB2-190 C	24.76
925332	AB2-190 E	10.61

925522	AC1-027 E	1.07
925692	AC1-045 E	0.92
925861	AC1-065 C	4.36
925862	AC1-065 E	7.11
926071	AC1-086 C	17.34
926072	AC1-086 E	7.89
926291	AC1-107	268.61
926411	AC1-112 C	0.68
926412	AC1-112 E	1.93
926441	AC1-115 C	1.01
926442	AC1-115 E	1.64
926472	AC1-118 E	1.07
926551	AC1-134	14.83
926662	AC1-147 E	1.25
926741	AC1-159	62.13
926751	AC1-161 C	27.16
926752	AC1-161 E	11.59
926771	AC1-163 C	1.63
926772	AC1-163 E	0.76
926781	AC1-164 C	58.41
926782	AC1-164 E	26.24
927041	AC1-191 C	17.46
927042	AC1-191 E	8.7
927111	AC1-206 C	9.15
927112	AC1-206 E	4.32
927221	AC1-216 C O1	12.11
927222	AC1-216 E O1	9.53

Appendix 4

(DVP - DVP) The 6PRGEORG 230/115 kV transformer (from bus 314269 to bus 314291 ckt 1) loads from 112.1% to 125.62% (**DC power flow**) of its load dump rating (220 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 211-228'. This project contributes approximately 29.72 MW to the thermal violation.

CONTINGENCY 'DVP_P7-1: LN 211-228'

OPEN BRANCH FROM BUS 314287 TO BUS 314303 CKT 1 /* 6CHSTF B
230.00 - 6HOPEWLL 230.00
OPEN BRANCH FROM BUS 314278 TO BUS 314286 CKT 1 /* 6BERMUDA
230.00 - 6CHSTF A 230.00
OPEN BRANCH FROM BUS 314278 TO BUS 314303 CKT 1 /* 6BERMUDA
230.00 - 6HOPEWLL 230.00
OPEN BUS 314278 /* ISLAND
END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315120	1GRAVEL4	1.96
315121	1GRAVEL5	1.94
315122	1GRAVEL6	1.96
315074	1HOPCGN1	13.02
315075	1HOPCGN2	12.85
315077	1HOPHCF1	4.12
315078	1HOPHCF2	4.12
315079	1HOPHCF3	4.12
315080	1HOPHCF4	6.25
315076	1HOPPOLC	2.93
315073	1STONECA	10.8
315116	1SURRY 1	19.43
933471	AC2-161 C	1.13
933472	AC2-161 E	0.58
934011	AD1-025 C O2	18.66
934012	AD1-025 E O2	11.06
LTF	AMIL	0.03
LTF	BAYOU	0.07
LTF	BIG_CAJUN1	0.11
LTF	BIG_CAJUN2	0.22
LTF	BLUEG	0.19
LTF	CALDERWOOD	0.03

<i>LTF</i>	<i>CANNELTON</i>	<i>0.03</i>
<i>LTF</i>	<i>CARR</i>	<i>0.06</i>
<i>LTF</i>	<i>CATAWBA</i>	<i>< 0.01</i>
<i>LTF</i>	<i>CBM-S2</i>	<i>0.03</i>
<i>LTF</i>	<i>CELEVELAND</i>	<i>< 0.01</i>
<i>LTF</i>	<i>CHEOAH</i>	<i>0.03</i>
<i>LTF</i>	<i>CHILHOWEE</i>	<i>0.01</i>
<i>LTF</i>	<i>CHOCTAW</i>	<i>0.07</i>
<i>LTF</i>	<i>CLIFTY</i>	<i>0.82</i>
<i>LTF</i>	<i>COTTONWOOD</i>	<i>0.3</i>
<i>LTF</i>	<i>CPL</i>	<i>0.04</i>
<i>LTF</i>	<i>DEARBORN</i>	<i>0.11</i>
<i>LTF</i>	<i>EDWARDS</i>	<i>0.06</i>
<i>LTF</i>	<i>ELMERSMITH</i>	<i>0.09</i>
<i>LTF</i>	<i>FARMERCITY</i>	<i>0.03</i>
<i>LTF</i>	<i>G-007</i>	<i>0.18</i>
<i>LTF</i>	<i>GIBSON</i>	<i>0.06</i>
<i>LTF</i>	<i>MORGAN</i>	<i>0.12</i>
<i>LTF</i>	<i>NEWTON</i>	<i>0.14</i>
<i>LTF</i>	<i>O-066</i>	<i>0.62</i>
<i>LTF</i>	<i>PRAIRIE</i>	<i>0.25</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>0.05</i>
<i>LTF</i>	<i>ROSETON</i>	<i>0.34</i>
<i>LTF</i>	<i>ROWAN</i>	<i>< 0.01</i>
<i>LTF</i>	<i>SANTEETLA</i>	<i>< 0.01</i>
<i>LTF</i>	<i>SMITHLAND</i>	<i>0.02</i>
<i>LTF</i>	<i>TATANKA</i>	<i>0.06</i>
<i>LTF</i>	<i>TILTON</i>	<i>0.07</i>
<i>LTF</i>	<i>TRIMBLE</i>	<i>0.04</i>
<i>LTF</i>	<i>TVA</i>	<i>0.06</i>
<i>292791</i>	<i>U1-032 E</i>	<i>5.62</i>
<i>LTF</i>	<i>UNIONPOWER</i>	<i>0.03</i>
<i>914231</i>	<i>Y2-077</i>	<i>1.66</i>
<i>924811</i>	<i>AB2-134 C O1</i>	<i>14.23</i>
<i>924812</i>	<i>AB2-134 E O1</i>	<i>13.99</i>
<i>925331</i>	<i>AB2-190 C</i>	<i>22.19</i>
<i>925332</i>	<i>AB2-190 E</i>	<i>9.51</i>
<i>927221</i>	<i>AC1-216 C O1</i>	<i>10.86</i>
<i>927222</i>	<i>AC1-216 E O1</i>	<i>8.54</i>

Appendix 5

(DVP - DVP) The 6BERMUDA-6CHESTF A 230 kV line (from bus 314278 to bus 314286 ckt 1) loads from 111.25% to 122.91% (**DC power flow**) of its load dump rating (549 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 211T2124'. This project contributes approximately 63.98 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 211T2124' /*_ HOPEWELL
 OPEN BRANCH FROM BUS 314303 TO BUS 314287 CKT 1 /*L211
 HOPEWELL CHESTERFIELD
 OPEN BRANCH FROM BUS 314303 TO BUS 314269 CKT 1 /*L2124
 END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315120	1GRAVEL4	4.29
315121	1GRAVEL5	4.23
315122	1GRAVEL6	4.28
315074	1HOPCGN1	27.86
315075	1HOPCGN2	27.5
315077	1HOPHCF1	8.81
315078	1HOPHCF2	8.81
315079	1HOPHCF3	8.81
315080	1HOPHCF4	13.37
315076	1HOPPOLC	6.27
315073	1STONECA	23.11
315116	1SURRY 1	42.42
932041	AC2-012 C	5.33
932042	AC2-012 E	8.69
933471	AC2-161 C	2.52
933472	AC2-161 E	1.3
934011	AD1-025 C O2	40.18
934012	AD1-025 E O2	23.8
935111	AD1-144 C	0.97
935112	AD1-144 E	0.53
LTF	CARR	0.16
LTF	CBM-S1	0.99
LTF	CBM-S2	3.05
LTF	CBM-W1	0.62
LTF	CBM-W2	4.81
LTF	CIN	0.16

<i>LTF</i>	<i>CPLE</i>	<i>1.04</i>
<i>LTF</i>	<i>DEARBORN</i>	<i>0.06</i>
<i>LTF</i>	<i>G-007</i>	<i>0.61</i>
<i>LTF</i>	<i>IPL</i>	<i>0.1</i>
<i>LTF</i>	<i>LGEE</i>	<i>0.04</i>
<i>LTF</i>	<i>MEC</i>	<i>0.67</i>
<i>LTF</i>	<i>O-066</i>	<i>2.05</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>0.13</i>
<i>LTF</i>	<i>ROSETON</i>	<i>0.93</i>
<i>292791</i>	<i>U1-032 E</i>	<i>12.03</i>
<i>LTF</i>	<i>WEC</i>	<i>0.05</i>
<i>914231</i>	<i>Y2-077</i>	<i>3.54</i>
<i>924071</i>	<i>AB2-051</i>	<i>69.65</i>
<i>924811</i>	<i>AB2-134 C O1</i>	<i>30.62</i>
<i>924812</i>	<i>AB2-134 E O1</i>	<i>30.11</i>
<i>925331</i>	<i>AB2-190 C</i>	<i>47.77</i>
<i>925332</i>	<i>AB2-190 E</i>	<i>20.47</i>
<i>925692</i>	<i>AC1-045 E</i>	<i>0.53</i>
<i>926662</i>	<i>AC1-147 E</i>	<i>0.69</i>
<i>926741</i>	<i>AC1-159</i>	<i>33.58</i>
<i>927221</i>	<i>AC1-216 C O1</i>	<i>23.37</i>
<i>927222</i>	<i>AC1-216 E O1</i>	<i>18.38</i>

Appendix 6

(DVP - DVP) The 6CHESTF B-6BASIN 230 kV line (from bus 314287 to bus 314276 ckt 1) loads from 121.99% to 124.06% (**DC power flow**) of its emergency rating (449 MVA) for the single line contingency outage of 'DVP_P1-2: LN 563'. This project contributes approximately 9.21 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 563'

OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1

/* 8CARSON

500.00 - 8MDLTHAN 500.00

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315065	1CHESTF6	33.34
315131	1EDGECEMA	3.18
315132	1EDGECEMB	3.18
315139	1GASTONA	1.58
315141	1GASTONB	1.58
315119	1GRAVEL3	1.24
315120	1GRAVEL4	1.26
315121	1GRAVEL5	1.24
315122	1GRAVEL6	1.26
315117	1GRAVELC	0.43
315074	1HOPCGN1	5.63
315075	1HOPCGN2	5.56
315077	1HOPHCF1	1.78
315078	1HOPHCF2	1.78
315079	1HOPHCF3	1.78
315080	1HOPHCF4	2.7
315076	1HOPPOLC	1.27
315116	1SURRY 1	12.47
314314	3LOCKS	0.06
314315	3LOCKS E	0.77
932041	AC2-012 C	3.21
932581	AC2-078 C	2.86
932591	AC2-079 C	3.07
932631	AC2-084 C	3.22
932701	AC2-093 C	23.37
933451	AC2-158 C	1.94
933461	AC2-159 C	2.55

933471	AC2-161 C	0.89
933711	AC2-194 C	0.35
933731	AC2-196 C	0.55
933991	AD1-023 C	4.54
934011	AD1-025 C O2	9.21
934041	AD1-029 C	3.98
934061	AD1-033 C O2	2.31
934071	AD1-034 C O2	5.06
934201	AD1-047 C	3.58
934331	AD1-057 C O2	3.61
934521	AD1-076 C O2	18.25
934571	AD1-082 C O2	5.05
935111	AD1-144 C	0.56
935211	AD1-156 C	1.97
LTF	CARR	0.2
LTF	CBM-S1	3.35
LTF	CBM-S2	7.31
LTF	CBM-W1	6.11
LTF	CBM-W2	17.58
LTF	CIN	1.4
LTF	CPL	2.35
LTF	IPL	0.89
LTF	LGEE	0.31
LTF	MEC	3.38
LTF	MECS	1.12
LTF	RENSSELAER	0.16
LTF	ROSETON	1.14
LTF	WEC	0.39
914231	Y2-077	0.72
LTF	AA2-074	1.6
920631	AA2-169 C	0.75
920691	AA2-178 C	3.22
930051	AB1-013 C	0.97
930401	AB1-081 C	3.05
930861	AB1-132 C	6.17
931231	AB1-173 C	1.01
931241	AB1-173AC	1.01
923801	AB2-015 C O1	3.22
923831	AB2-022 C	0.73

923851	AB2-025 C	0.31
923911	AB2-031 C O1	1.
923941	AB2-035 C	0.11
923991	AB2-040 C O1	3.28
924071	AB2-051	42.84
924151	AB2-059 C O1	3.6
924381	AB2-087 C	0.21
924391	AB2-088 C	0.15
924491	AB2-098 C	0.19
924501	AB2-099 C	0.22
924511	AB2-100 C	6.19
924811	AB2-134 C O1	7.02
925051	AB2-160 C O1	3.33
925061	AB2-161 C O1	1.87
925121	AB2-169 C	2.2
925171	AB2-174 C O1	3.2
925281	AB2-186 C	0.2
925291	AB2-188 C O1	0.79
925331	AB2-190 C	10.95
925591	AC1-034 C	2.34
925821	AC1-061	< 0.01
926071	AC1-086 C	9.08
926201	AC1-098 C	2.26
926211	AC1-099 C	0.76
926741	AC1-159	20.65
926771	AC1-163 C	0.71
927021	AC1-189 C	2.92
927111	AC1-206 C	5.47
927141	AC1-208 C	3.41
927221	AC1-216 C O1	5.36

Appendix 7

(DVP - DVP) The 6HOPEWELL-6BERMUDA 230 kV line (from bus 314303 to bus 314278 ckt 1) loads from 111.25% to 122.91% (**DC power flow**) of its load dump rating (549 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 211T2124'. This project contributes approximately 63.98 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 211T2124' /*_ HOPEWELL
 OPEN BRANCH FROM BUS 314303 TO BUS 314287 CKT 1 /*L211
 HOPEWELL CHESTERFIELD
 OPEN BRANCH FROM BUS 314303 TO BUS 314269 CKT 1 /*L2124
 END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315120	1GRAVEL4	4.29
315121	1GRAVEL5	4.23
315122	1GRAVEL6	4.28
315074	1HOPCGN1	27.86
315075	1HOPCGN2	27.5
315077	1HOPHCF1	8.81
315078	1HOPHCF2	8.81
315079	1HOPHCF3	8.81
315080	1HOPHCF4	13.37
315076	1HOPPOLC	6.27
315073	1STONECA	23.11
315116	1SURRY 1	42.42
932041	AC2-012 C	5.33
932042	AC2-012 E	8.69
933471	AC2-161 C	2.52
933472	AC2-161 E	1.3
934011	AD1-025 C O2	40.18
934012	AD1-025 E O2	23.8
935111	AD1-144 C	0.97
935112	AD1-144 E	0.53
LTF	CARR	0.16
LTF	CBM-S1	0.99
LTF	CBM-S2	3.05
LTF	CBM-W1	0.62
LTF	CBM-W2	4.81
LTF	CIN	0.16

<i>LTF</i>	<i>CPLE</i>	<i>1.04</i>
<i>LTF</i>	<i>DEARBORN</i>	<i>0.06</i>
<i>LTF</i>	<i>G-007</i>	<i>0.61</i>
<i>LTF</i>	<i>IPL</i>	<i>0.1</i>
<i>LTF</i>	<i>LGEE</i>	<i>0.04</i>
<i>LTF</i>	<i>MEC</i>	<i>0.67</i>
<i>LTF</i>	<i>O-066</i>	<i>2.05</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>0.13</i>
<i>LTF</i>	<i>ROSETON</i>	<i>0.93</i>
<i>292791</i>	<i>U1-032 E</i>	<i>12.03</i>
<i>LTF</i>	<i>WEC</i>	<i>0.05</i>
<i>914231</i>	<i>Y2-077</i>	<i>3.54</i>
<i>924071</i>	<i>AB2-051</i>	<i>69.65</i>
<i>924811</i>	<i>AB2-134 C O1</i>	<i>30.62</i>
<i>924812</i>	<i>AB2-134 E O1</i>	<i>30.11</i>
<i>925331</i>	<i>AB2-190 C</i>	<i>47.77</i>
<i>925332</i>	<i>AB2-190 E</i>	<i>20.47</i>
<i>925692</i>	<i>AC1-045 E</i>	<i>0.53</i>
<i>926662</i>	<i>AC1-147 E</i>	<i>0.69</i>
<i>926741</i>	<i>AC1-159</i>	<i>33.58</i>
<i>927221</i>	<i>AC1-216 C O1</i>	<i>23.37</i>
<i>927222</i>	<i>AC1-216 E O1</i>	<i>18.38</i>

Appendix 8

(DVP - DVP) The 8CHCKAHM-8ELMONT 500 kV line (from bus 314903 to bus 314908 ckt 1) loads from 117.29% to 117.86% (**DC power flow**) of its load dump rating (3144 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 563T576'. This project contributes approximately 39.06 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 563T576' /* MIDLOTHIAN 500 500 KV
 OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON
 500.00 - 8MDLTHAN 500.00
 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN
 500.00 - 8NO ANNA 500.00
 END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315131	1EDGECEMA	11.78
315132	1EDGECEMB	11.78
315108	1ELIZAR1	7.
315109	1ELIZAR2	6.88
315110	1ELIZAR3	7.09
315074	1HOPCGN1	10.5
315075	1HOPCGN2	10.36
315073	1STONECA	8.71
315233	1SURRY 2	62.92
315092	1YORKTN3	52.2
314557	3BETHELC	1.05
314554	3BTLEBRO	1.02
314566	3CRESWEL	3.96
314572	3EMPORIA	0.55
314578	3HORNRTN	4.49
314582	3KELFORD	1.2
314315	3LOCKS E	1.42
314603	3SCOT NK	4.61
314617	3TUNIS	1.26
314539	3UNCAMP	3.89
314541	3WATKINS	1.08
314620	6CASHIE	1.33
314574	6EVERETS	3.37
314189	6PAPERMILL	10.95
314594	6PLYMOTH	1.37

314648	6SUNBURY	1.55
314421	6WINCHST	0.33
314651	6WINFALL	3.04
932041	AC2-012 C	18.53
932042	AC2-012 E	30.23
932531	AC2-073 C	3.89
932532	AC2-073 E	1.96
932581	AC2-078 C	5.46
932582	AC2-078 E	8.91
932591	AC2-079 C	10.89
932592	AC2-079 E	17.77
932631	AC2-084 C	12.06
932632	AC2-084 E	5.94
932701	AC2-093 C	104.49
932702	AC2-093 E	59.77
932831	AC2-110 C	2.14
932832	AC2-110 E	3.5
933061	AC2-130	3.11
933071	AC2-131 1	2.1
933081	AC2-131 2	0.96
933111	AC2-132 1	1.11
933121	AC2-132 2	0.57
933261	AC2-137 C	2.87
933262	AC2-137 E	1.87
933271	AC2-138 C	0.94
933272	AC2-138 E	1.18
933291	AC2-141 C	59.42
933292	AC2-141 E	25.36
933451	AC2-158 C	8.43
933452	AC2-158 E	8.43
933461	AC2-159 C	9.5
933462	AC2-159 E	9.5
933471	AC2-161 C	4.04
933472	AC2-161 E	2.08
933711	AC2-194 C	1.88
933712	AC2-194 E	3.04
933731	AC2-196 C	3.26
933732	AC2-196 E	2.17
933991	AD1-023 C	20.86

933992	AD1-023 E	11.36
934011	AD1-025 C O2	24.53
934012	AD1-025 E O2	14.53
934041	AD1-029 C	14.92
934042	AD1-029 E	9.83
934061	AD1-033 C O2	13.67
934062	AD1-033 E O2	9.11
934071	AD1-034 C O2	10.36
934072	AD1-034 E O2	6.71
934141	AD1-041 C O2	8.83
934142	AD1-041 E O2	5.88
934201	AD1-047 C	10.68
934202	AD1-047 E	7.12
934211	AD1-048 C	2.72
934212	AD1-048 E	1.37
934231	AD1-050 C	5.54
934232	AD1-050 E	3.03
934331	AD1-057 C O2	13.27
934332	AD1-057 E O2	7.08
934391	AD1-063 C	2.63
934392	AD1-063 E	1.75
934521	AD1-076 C O2	82.49
934522	AD1-076 E O2	42.
934571	AD1-082 C O2	10.78
934572	AD1-082 E O2	6.15
LTF	AD1-120	12.89
LTF	AD1-121	12.82
935111	AD1-144 C	3.05
935112	AD1-144 E	1.67
935161	AD1-151 C O2	44.22
935162	AD1-151 E O2	29.48
935211	AD1-156 C	2.54
935212	AD1-156 E	1.69
LTF	CARR	0.99
LTF	CBM-S1	12.82
LTF	CBM-S2	30.24
LTF	CBM-W1	20.28
LTF	CBM-W2	66.24
LTF	CIN	4.71

<i>LTF</i>	<i>CPL</i>	9.79
<i>LTF</i>	<i>G-007</i>	4.19
<i>LTF</i>	<i>IPL</i>	2.98
<i>LTF</i>	<i>LGEE</i>	1.04
<i>LTF</i>	<i>MEC</i>	12.09
<i>LTF</i>	<i>MECS</i>	2.95
<i>LTF</i>	<i>O-066</i>	14.
<i>LTF</i>	<i>RENSSELAER</i>	0.79
<i>LTF</i>	<i>ROSETON</i>	5.72
292791	<i>U1-032 E</i>	4.54
900672	<i>V4-068 E</i>	0.45
901082	<i>W1-029E</i>	79.92
<i>LTF</i>	<i>WEC</i>	1.3
907092	<i>X1-038 E</i>	9.71
913392	<i>Y1-086 E</i>	3.84
916042	<i>Z1-036 E</i>	77.7
916191	<i>Z1-068 C</i>	0.1
916192	<i>Z1-068 E</i>	3.41
916302	<i>Z1-086 E</i>	13.58
917122	<i>Z2-027 E</i>	1.86
917332	<i>Z2-043 E</i>	1.44
917342	<i>Z2-044 E</i>	0.75
917512	<i>Z2-088 E OP1</i>	5.12
917592	<i>Z2-099 E</i>	0.67
918492	<i>AA1-063AE OP</i>	5.71
918512	<i>AA1-065 E OP</i>	6.76
918532	<i>AA1-067 E</i>	1.01
918562	<i>AA1-072 E</i>	0.24
919152	<i>AA1-139 E</i>	11.57
919692	<i>AA2-053 E</i>	5.19
919702	<i>AA2-057 E</i>	4.68
919732	<i>AA2-059 E</i>	0.94
919822	<i>AA2-068 E</i>	1.38
<i>LTF</i>	<i>AA2-074</i>	6.66
920022	<i>AA2-086 E</i>	0.36
920042	<i>AA2-088 E</i>	16.01
920592	<i>AA2-165 E</i>	0.62
920631	<i>AA2-169 C</i>	2.75
920632	<i>AA2-169 E</i>	1.26

920672	AA2-174 E	0.6
920691	AA2-178 C	15.82
920692	AA2-178 E	6.78
930051	AB1-013 C	4.78
930052	AB1-013 E	31.96
930401	AB1-081 C	11.37
930402	AB1-081 E	4.87
930861	AB1-132 C	19.1
930862	AB1-132 E	8.19
931231	AB1-173 C	3.
931232	AB1-173 E	1.4
931241	AB1-173AC	3.
931242	AB1-173AE	1.4
923801	AB2-015 C O1	13.67
923802	AB2-015 E O1	11.21
923831	AB2-022 C	4.06
923832	AB2-022 E	2.19
923842	AB2-024 E	1.84
923852	AB2-025 E	1.43
923911	AB2-031 C O1	2.98
923912	AB2-031 E O1	1.47
923941	AB2-035 C	0.44
923942	AB2-035 E	0.19
923991	AB2-040 C O1	9.79
923992	AB2-040 E O1	8.01
924071	AB2-051	249.42
924151	AB2-059 C O1	13.4
924152	AB2-059 E O1	6.91
924241	AB2-068 O1	619.77
924381	AB2-087 C	0.85
924382	AB2-087 E	0.4
924391	AB2-088 C	0.57
924392	AB2-088 E	0.27
924401	AB2-089 C	2.51
924402	AB2-089 E	1.29
924491	AB2-098 C	0.79
924492	AB2-098 E	0.34
924501	AB2-099 C	0.88
924502	AB2-099 E	0.38

924511	AB2-100 C	15.26
924512	AB2-100 E	7.52
924811	AB2-134 C O1	18.7
924812	AB2-134 E O1	18.38
925051	AB2-160 C O1	6.17
925052	AB2-160 E O1	10.07
925061	AB2-161 C O1	5.09
925062	AB2-161 E O1	8.31
925121	AB2-169 C	9.76
925122	AB2-169 E	8.76
925171	AB2-174 C O1	9.32
925172	AB2-174 E O1	8.43
925281	AB2-186 C	1.05
925282	AB2-186 E	0.45
925291	AB2-188 C O1	3.9
925292	AB2-188 E O1	1.75
925331	AB2-190 C	29.16
925332	AB2-190 E	12.5
925522	AC1-027 E	2.08
925591	AC1-034 C	9.
925592	AC1-034 E	6.79
925692	AC1-045 E	1.67
925781	AC1-054 C	8.64
925782	AC1-054 E	3.98
925861	AC1-065 C	5.36
925862	AC1-065 E	8.75
926071	AC1-086 C	28.13
926072	AC1-086 E	12.8
926201	AC1-098 C	8.46
926202	AC1-098 E	5.04
926211	AC1-099 C	2.83
926212	AC1-099 E	1.66
926291	AC1-107	935.5
926662	AC1-147 E	2.41
926741	AC1-159	120.26
926751	AC1-161 C	59.42
926752	AC1-161 E	25.36
926771	AC1-163 C	2.89
926772	AC1-163 E	1.35

926781	AC1-164 C	68.07
926782	AC1-164 E	30.58
927021	AC1-189 C	11.6
927022	AC1-189 E	5.78
927111	AC1-206 C	13.15
927112	AC1-206 E	6.22
927141	AC1-208 C	12.24
927142	AC1-208 E	5.43
927221	AC1-216 C O1	14.27
927222	AC1-216 E O1	11.22

Appendix 9

(DVP - DVP) The 8ELMONT-8LADYSMITH 500 kV line (from bus 314908 to bus 314911 ckt 1) loads from 155.98% to 156.52% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'DVP_P1-2: LN 576'. This project contributes approximately 30.48 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 576'

OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1

/* 8MDLTHAN

500.00 - 8NO ANNA 500.00

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315058	1CHESTF3	6.41
315059	1CHESTF4	10.39
315060	1CHESTF5	22.04
315061	1CHESTG7	8.64
315063	1CHESTG8	8.54
315062	1CHESTS7	3.93
315064	1CHESTS8	4.38
315067	1DARBY 1	5.62
315068	1DARBY 2	5.63
315069	1DARBY 3	5.65
315070	1DARBY 4	5.65
315074	1HOPCGN1	15.08
315075	1HOPCGN2	14.88
315078	1HOPHCF2	4.77
315079	1HOPHCF3	4.77
315080	1HOPHCF4	7.24
315083	1SPRUNCA	18.62
315084	1SPRUNCB	18.62
315085	1SPRUNCC	13.81
315086	1SPRUNCD	13.81
315233	1SURRY 2	55.09
315092	1YORKTN3	50.67
314315	3LOCKS E	2.22
314309	6IRON208	0.98
314236	6NRTHEST	0.41
314421	6WINCHST	0.32
932041	AC2-012 C	18.09

932501	AC2-070 C	3.15
932531	AC2-073 C	4.17
932581	AC2-078 C	7.15
932591	AC2-079 C	11.82
932631	AC2-084 C	13.79
932701	AC2-093 C	113.43
932831	AC2-110 C	2.34
933061	AC2-130	4.4
933071	AC2-131 1	2.98
933081	AC2-131 2	1.35
933111	AC2-132 1	1.57
933121	AC2-132 2	0.8
933261	AC2-137 C	3.87
933291	AC2-141 C	54.33
933451	AC2-158 C	9.04
933461	AC2-159 C	10.73
933471	AC2-161 C	4.22
933481	AC2-162 C	4.53
933711	AC2-194 C	1.88
933731	AC2-196 C	3.16
933991	AD1-023 C	21.99
934011	AD1-025 C O2	30.48
934041	AD1-029 C	17.06
934061	AD1-033 C O2	13.27
934071	AD1-034 C O2	13.15
934141	AD1-041 C O2	9.49
934201	AD1-047 C	12.81
934211	AD1-048 C	4.49
934391	AD1-063 C	2.82
934521	AD1-076 C O2	88.09
934571	AD1-082 C O2	13.56
LTF	AD1-092	5.99
LTF	AD1-093	10.26
LTF	AD1-094	1.92
LTF	AD1-120	17.84
LTF	AD1-121	17.8
935111	AD1-144 C	3.06
935161	AD1-151 C O2	32.95
935211	AD1-156 C	3.7

<i>LTF</i>	<i>CARR</i>	1.65
<i>LTF</i>	<i>CBM-S1</i>	25.74
<i>LTF</i>	<i>CBM-S2</i>	42.19
<i>LTF</i>	<i>CBM-W1</i>	59.72
<i>LTF</i>	<i>CBM-W2</i>	138.99
<i>LTF</i>	<i>CIN</i>	13.92
<i>LTF</i>	<i>CPLE</i>	12.52
<i>LTF</i>	<i>IPL</i>	8.89
<i>LTF</i>	<i>LGEE</i>	3.04
<i>LTF</i>	<i>MEC</i>	29.72
<i>LTF</i>	<i>MECS</i>	13.46
<i>LTF</i>	<i>RENSSELAER</i>	1.32
<i>LTF</i>	<i>ROSETON</i>	9.55
297087	<i>V2-040</i>	0.27
<i>LTF</i>	<i>WEC</i>	3.73
<i>LTF</i>	<i>Y3-032</i>	8.73
<i>LTF</i>	<i>Z1-043</i>	14.67
<i>LTF</i>	<i>AA2-074</i>	8.52
920691	<i>AA2-178 C</i>	16.3
930051	<i>AB1-013 C</i>	4.92
930121	<i>AB1-027 C</i>	0.94
930861	<i>AB1-132 C</i>	22.44
931231	<i>AB1-173 C</i>	3.6
931241	<i>AB1-173AC</i>	3.6
<i>LTF</i>	<i>AB2-013</i>	8.55
923801	<i>AB2-015 C O1</i>	14.56
923831	<i>AB2-022 C</i>	4.01
923911	<i>AB2-031 C O1</i>	3.58
923991	<i>AB2-040 C O1</i>	11.74
924071	<i>AB2-051</i>	242.92
924241	<i>AB2-068 O1</i>	417.68
924381	<i>AB2-087 C</i>	0.93
924501	<i>AB2-099 C</i>	0.96
924511	<i>AB2-100 C</i>	18.71
924811	<i>AB2-134 C O1</i>	23.23
925051	<i>AB2-160 C O1</i>	9.66
925061	<i>AB2-161 C O1</i>	5.93
925121	<i>AB2-169 C</i>	10.53
925171	<i>AB2-174 C O1</i>	11.24

925281	AB2-186 C	1.06
925291	AB2-188 C O1	4.02
925331	AB2-190 C	36.24
925861	AC1-065 C	5.85
926071	AC1-086 C	33.04
926201	AC1-098 C	9.68
926211	AC1-099 C	3.24
926291	AC1-107	630.46
926411	AC1-112 C	0.73
926741	AC1-159	117.13
926751	AC1-161 C	54.33
926771	AC1-163 C	3.17
926781	AC1-164 C	75.71
927041	AC1-191 C	16.51
927111	AC1-206 C	16.2
927141	AC1-208 C	14.19
927221	AC1-216 C O1	17.73

Appendix 10

(DVP - DVP) The 8MDLTHAN-8NO ANNA 500 kV line (from bus 314914 to bus 314918 ckt 1) loads from 124.62% to 125.08% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'DVP_P1-2: LN 574'. This project contributes approximately 24.76 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 574'

OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT

500.00 - 8LDYSMTH 500.00

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315102	1BRUNSWICKG1	16.36
315103	1BRUNSWICKG2	16.36
315104	1BRUNSWICKG3	16.36
315105	1BRUNSWICKS1	33.98
315099	1CHESPKB	2.06
315131	1EDGECEMA	13.32
315132	1EDGECEMB	13.32
315108	1ELIZAR1	6.07
315109	1ELIZAR2	5.97
315110	1ELIZAR3	6.15
315074	1HOPCGN1	11.87
315075	1HOPCGN2	11.72
315083	1SPRUNCA	15.71
315084	1SPRUNCB	15.71
315085	1SPRUNCC	11.64
315086	1SPRUNCD	11.64
314315	3LOCKS E	1.85
932041	AC2-012 C	16.1
932501	AC2-070 C	2.04
932531	AC2-073 C	2.99
932581	AC2-078 C	6.2
932591	AC2-079 C	10.49
932631	AC2-084 C	13.04
932701	AC2-093 C	123.19
932831	AC2-110 C	1.7
933061	AC2-130	3.23
933071	AC2-131 1	2.19

933081	AC2-131 2	0.99
933111	AC2-132 1	1.15
933121	AC2-132 2	0.59
933261	AC2-137 C	2.68
933291	AC2-141 C	48.31
933451	AC2-158 C	8.36
933461	AC2-159 C	10.06
933471	AC2-161 C	3.62
933481	AC2-162 C	2.93
933501	AC2-165 C	16.08
933711	AC2-194 C	1.7
933731	AC2-196 C	2.83
933991	AD1-023 C	20.22
934011	AD1-025 C O2	24.76
934041	AD1-029 C	16.13
934061	AD1-033 C O2	11.87
934071	AD1-034 C O2	12.48
934141	AD1-041 C O2	6.77
934201	AD1-047 C	12.15
934211	AD1-048 C	3.14
934231	AD1-050 C	6.68
934331	AD1-057 C O2	14.64
934391	AD1-063 C	2.02
934521	AD1-076 C O2	81.53
934571	AD1-082 C O2	11.81
934611	AD1-087 C O2	11.55
934621	AD1-088 C O2	19.9
LTF	AD1-092	4.84
LTF	AD1-093	8.29
LTF	AD1-094	1.55
LTF	AD1-120	17.13
LTF	AD1-121	17.08
934911	AD1-123 C	1.45
935111	AD1-144 C	2.69
935161	AD1-151 C O2	22.42
935171	AD1-152 C O2	10.62
935211	AD1-156 C	3.27
935221	AD1-157 C	1.94
935231	AD1-160 C	1.42

<i>LTF</i>	<i>CARR</i>	<i>1.37</i>
<i>LTF</i>	<i>CBM-S1</i>	<i>22.24</i>
<i>LTF</i>	<i>CBM-S2</i>	<i>40.34</i>
<i>LTF</i>	<i>CBM-W1</i>	<i>47.95</i>
<i>LTF</i>	<i>CBM-W2</i>	<i>119.</i>
<i>LTF</i>	<i>CIN</i>	<i>11.13</i>
<i>LTF</i>	<i>CPLE</i>	<i>12.29</i>
<i>LTF</i>	<i>IPL</i>	<i>7.1</i>
<i>LTF</i>	<i>LGEE</i>	<i>2.43</i>
<i>LTF</i>	<i>MEC</i>	<i>24.62</i>
<i>LTF</i>	<i>MECS</i>	<i>10.23</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>1.1</i>
<i>LTF</i>	<i>ROSETON</i>	<i>7.93</i>
<i>LTF</i>	<i>WEC</i>	<i>3.</i>
<i>LTF</i>	<i>Z1-043</i>	<i>11.82</i>
<i>916191</i>	<i>Z1-068 C</i>	<i>0.08</i>
<i>916301</i>	<i>Z1-086 C</i>	<i>99.51</i>
<i>LTF</i>	<i>AA2-074</i>	<i>8.36</i>
<i>920631</i>	<i>AA2-169 C</i>	<i>3.22</i>
<i>920691</i>	<i>AA2-178 C</i>	<i>14.88</i>
<i>930051</i>	<i>AB1-013 C</i>	<i>4.49</i>
<i>930401</i>	<i>AB1-081 C</i>	<i>12.86</i>
<i>930861</i>	<i>AB1-132 C</i>	<i>21.22</i>
<i>931231</i>	<i>AB1-173 C</i>	<i>3.42</i>
<i>931241</i>	<i>AB1-173AC</i>	<i>3.42</i>
<i>LTF</i>	<i>AB2-013</i>	<i>6.91</i>
<i>923801</i>	<i>AB2-015 C O1</i>	<i>13.29</i>
<i>923831</i>	<i>AB2-022 C</i>	<i>3.61</i>
<i>923911</i>	<i>AB2-031 C O1</i>	<i>3.39</i>
<i>923941</i>	<i>AB2-035 C</i>	<i>0.49</i>
<i>923991</i>	<i>AB2-040 C O1</i>	<i>11.14</i>
<i>924021</i>	<i>AB2-043 C O1</i>	<i>4.25</i>
<i>924071</i>	<i>AB2-051</i>	<i>216.39</i>
<i>924151</i>	<i>AB2-059 C O1</i>	<i>15.15</i>
<i>924161</i>	<i>AB2-060 C O1</i>	<i>12.23</i>
<i>924241</i>	<i>AB2-068 O1</i>	<i>241.09</i>
<i>924301</i>	<i>AB2-077 C O1</i>	<i>2.7</i>
<i>924311</i>	<i>AB2-078 C O1</i>	<i>2.7</i>
<i>924321</i>	<i>AB2-079 C O1</i>	<i>2.7</i>

924381	AB2-087 C	0.86
924391	AB2-088 C	0.63
924401	AB2-089 C	3.03
924411	AB2-090 C	5.36
924491	AB2-098 C	0.83
924501	AB2-099 C	0.89
924511	AB2-100 C	17.74
924811	AB2-134 C O1	18.87
925051	AB2-160 C O1	8.03
925061	AB2-161 C O1	5.21
925121	AB2-169 C	9.78
925171	AB2-174 C O1	10.67
925221	AB2-176 C	2.21
925281	AB2-186 C	0.95
925291	AB2-188 C O1	3.67
925331	AB2-190 C	29.44
925521	AC1-027 C	0.62
925591	AC1-034 C	9.95
925611	AC1-036 C	1.26
925781	AC1-054 C	10.31
925861	AC1-065 C	4.24
926071	AC1-086 C	31.25
926201	AC1-098 C	9.15
926211	AC1-099 C	3.07
926271	AC1-105 C	7.54
926291	AC1-107	363.9
926741	AC1-159	104.34
926751	AC1-161 C	48.31
926761	AC1-162 C	37.21
926771	AC1-163 C	2.95
926781	AC1-164 C	51.59
927021	AC1-189 C	12.57
927111	AC1-206 C	15.37
927141	AC1-208 C	13.46
927221	AC1-216 C O1	14.41