Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AC1-161

Septa 500kV
168.2 MW Capacity / 240 MW Energy

Revised May / 2017

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 Isle of Wight County, VA. The installed facilities will have a total capability of 240 MW with 168.2 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is 10/01/2019. **This study does not imply an ITO commitment to this in-service date.**

Point of Interconnection

AC1-161 will interconnect with the ITO transmission system at one of the following points of interconnection:

Option 1 will connect into Septa 500kV substation.

Option 2 will connect via a new three breaker ring bus switching station that connects on the Smithfield – Surry 230kV line # 223.

Cost Summary

The AC1-161 interconnection request will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$2,200,000
Direct Connection Network Upgrades	$1,500,000
Non Direct Connection Network Upgrades	$1,500,000
Total Costs	**$5,200,000**

In addition, the AC1-161 project may be responsible for a contribution to the following costs:

Description	Total Cost
New System Upgrades	$0
Previously Identified Upgrades	$255,650,000
Total Costs	**$255,650,000**

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.

Attachment Facilities

Generation Substation: Install metering and associated protection equipment. Estimated Cost $700,000.

Transmission: Build 0.5 miles of 500 kV Line. Estimated Cost $1,500,000.

The estimated total cost of the Attachment Facilities is $2,200,000. It is estimated to take 18-24 months to permit (VA CPCN required) and complete this work. These preliminary cost estimates are based on typical engineering costs. A more detailed engineering cost estimates are normally done when the IC provides an exact site plan location for the generation substation during the Facility Study phase. These costs do not include CIAC Tax Gross-up. The single line is shown below in Attachment 1.

Direct Connection Cost Estimate

Substation: Add an additional 500 kV Breaker at Septa 500 kV Switching Station may require substation expansion/re-arrangement. Estimated cost $1,500,000 and is estimated to take 30-34 months to permit and construct.

Non-Direct Connection Cost Estimate

Transmission: rearrange existing lines, Estimated Cost $1,500,000.

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

Contribution to Previously Identified System Reinforcements

Reinforcement: Skiffes Creek – Kingsmill – Pennimann – Waller 230 kV line # 209: wreck and rebuild the line to a rating of 1047 MVA. Estimated cost $28,200,000 and it is estimated to take 30-36 months to permit (VA CPCN required), engineer and construct.

Reinforcement: Lightfoot– Waller 230 kV line # 2113: wreck and rebuild the line to a rating of 1047 MVA. Estimated cost $15,200,000 and it is estimated to take 30-36 months to permit (VA CPCN required), engineer and construct.

Reinforcement: Carson - Midlothian 500 kV: replace wave trap at both North Anna Substations. This will increase emergency rating by 31% to 2403 MVA. Estimated cost $500,000 and it is estimated to 12-16 months to engineer and construct.

Reinforcement: Elmont – Chickahominy 500 kV line #557 : replace wave trap at both Elmont and Chickahominy Substations. This will increase line rating by 22% to 3424 MVA. Estimated cost $500,000 and it is estimated to 14-16 months to engineer and construct.

Reinforcement: Brister - Chance 500kV: Wreck and rebuild the line since overload exceeds conductor rating of 2913 MVA by 3.1% to new line rating of 4300 MVA. It is estimated to cost $73,000,000 and it is estimate to take 36-48 months to engineer, permit and construct.

Reinforcement: Elmont – Ladysmith 500kV: Wreck and rebuild the existing line since overload exceeds conductor rating of 2913 MVA by 3.1% new line rating 4300 MVA. VA CPCN is required. Estimated cost is $88,000,000 and it is estimated to take 36 – 48 months to engineer, permit and construct.

Reinforcement: Ladysmith – Chancellor 500kV line #581: Wreck and rebuild the existing line since overload exceeds conductor rating of 2913 MVA by 3.1% new line rating 4300 MVA. A Virginia CPCN is required. It is estimated to cost $50,000,000 and it is estimate to take 36-48 months to engineer, permit and construct.

Reinforcement: Midlothian – North Anna 500 kV line #576: replace wave trap at both North Anna Substations. This will increase emergency rating by 31% to 2403 MVA. Estimated cost $250,000 and it is estimated to 12-16 months to engineer and construct.

Outage scheduling and coordination will impact the actual completion dates for the various identified network upgrades.

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.

Option One

Network Impacts

The Queue Project AC1-161 was evaluated as a 240.0 MW (Capacity 168.2 MW) injection at the Septa 500kV substation in the ITO area. Project AC1-161 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC1-161 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Contingency Descriptions

The following contingencies resulted in overloads:

Contingency Name	Description
57602	CONTINGENCY '57602' /*NORTH ANNA OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /*MIDLOTHIAN TO NORTH ANNA (LINE 576) OPEN BRANCH FROM BUS 314914 TO BUS 314322 CKT 1 /*MIDLOTHIAN 500-230 (TX#2) OPEN BRANCH FROM BUS 314918 TO BUS 314232 CKT 1 /*NORTH ANNA 500-230 (TX#5) END
557T574	CONTINGENCY '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
563T576	CONTINGENCY '563T576' /*MIDLOTHIAN OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /*MIDLOTHIAN TO NORTH ANNA (LINE 576) OPEN BRANCH FROM BUS 314914 TO BUS 314322 CKT 1 /*MIDLOTHIAN 500-230 (TX#2) OPEN BRANCH FROM BUS 314914 TO BUS 314902 CKT 1 /*MIDLOTHIAN TO CARSON (LINE 563) END
H2T557	CONTINGENCY '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

Contingency Name	Description
LN 557	CONTINGENCY '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
LN 563	CONTINGENCY 'LN 563' OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 END
LN 567	CONTINGENCY 'LN 567' OPEN BRANCH FROM BUS 314903 TO BUS 314924 CKT 1 /* 8CHCKAHM 500.00 - 8SURRY 500.00 END
LN 573	CONTINGENCY 'LN 573' OPEN BRANCH FROM BUS 314918 TO BUS 314934 CKT 1 /* 8NO ANNA 500.00 - 8SPOTSYL 500.00 END
LN 574	CONTINGENCY 'LN 574' OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT 500.00 - 8LDYSMTH 500.00 END
LN 576	CONTINGENCY 'LN 576' OPEN BRANCH FROM BUS 314322 TO BUS 314914 CKT 1 /* 6MDLTHAN 230.00 - 8MDLTHAN 500.00 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END
LN 594	CONTINGENCY 'LN 594' OPEN BRANCH FROM BUS 314916 TO BUS 314934 CKT 1 /* 8MORRSVL 500.00 - 8SPOTSYL 500.00 END
SPOTSH1T9033	CONTINGENCY 'SPOTSH1T9033' /*SPOTSYLVANIA OPEN BRANCH FROM BUS 314934 TO BUS 314916 CKT 1 /*SPOTSYLVANIA TO MORRISVILLE (LINE 9033) OPEN BRANCH FROM BUS 314934 TO BUS 314755 CKT 1 /*SPOTSYLVANIA 500/115 (TX#1) END
WT576	CONTINGENCY 'WT576' /*NORTH ANNA OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /*MIDLOTHIAN TO NORTH ANNA (LINE 576) OPEN BRANCH FROM BUS 314914 TO BUS 314322 CKT 1 /*MIDLOTHIAN 500-230 (TX#2) OPEN BRANCH FROM BUS 314918 TO BUS 314232 CKT 2 /*NORTH ANNA 500-230 (TX#6) END

Summer Peak Analysis - 2020

Generator Deliverability

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

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution
1	N-1	LN 567	DVP - DVP	6SKIFF CREEK-6KINGS M 230 kV line	314209	314386	1	DC	97.51	101.08	ER	442	15.75

Multiple Facility Contingency

(Double Circuit Tower Line contingencies were studied for the full energy output. The contingencies of Line with Failed Breaker and Bus Fault will be performed for the Impact Study.)

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution
2	LFFB	H2T557	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	99.01	101.27	LD	3144	73.82

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		Bus			Power	Loading %		Rating		MW	
#	Type	Name	Area	Facility Description	From	To	Cir.	Flow	Initial	Final	Type	MVA	Contribution	Ref
3	N-1	LN 557	DVP - DVP	6SKIFF CREEK-6KINGS M 230 kV line	314209	314386	1	DC	150.42	153.61	ER	442	14.1	1
4	N-1	LN 557	DVP - DVP	6PENNIMAN-6WALR209 230 kV line	314296	314415	1	DC	138.11	141.3	ER	442	14.1	2
5	N-1	LN 557	DVP - DVP	6KINGS M-6PENNIMAN 230 kV line	314386	314296	1	DC	141.98	145.17	ER	442	14.1	3
6	N-1	LN 557	DVP - DVP	6WALR209-6LIGH209 230 kV line	314415	314391	1	DC	122.33	125.52	ER	442	14.1	4
7	N-1	LN 557	DVP - DVP	8CARSON-8MDLTHAN 500 kV line	314902	314914	1	DC	118.9	121.05	ER	2442	52.59	5
8	LFFB	557T574	DVP - DVP	8CARSON-8MDLTHAN 500 kV line	314902	314914	1	DC	112.72	115.14	LD	3144	78.92	
9	LFFB	H2T557	DVP - DVP	8CARSON-8MDLTHAN 500 kV line	314902	314914	1	DC	104.41	106.76	ER	3144	76.74	
10	N-1	LN 576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	123.72	126.17	ER	2442	59.77	6
11	N-1	LN 563	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	119.03	121.38	ER	2442	57.37	
12	LFFB	563T576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	107.84	110.49	LD	3144	85.29	
13	LFFB	WT576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	107.84	110.49	LD	3144	85.28	

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Cir.	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Ref
14	LFFB	57602	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	107.84	110.49	LD	3144	85.28	
15	N-1	LN 594	DVP - DVP	8CHANCE-8BRISTER 500 kV line	314905	314900	1	DC	117.09	117.66	ER	2442	31.97	7
16	N-1	LN 573	DVP - DVP	8CHANCE-8BRISTER 500 kV line	314905	314900	1	DC	111.79	112.35	ER	2442	31.39	
17	N-1	LN 576	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	142.96	143.95	ER	2442	53.99	8
18	N-1	LN 563	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	133.55	135.47	ER	2442	46.82	
19	LFFB	57602	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	118.31	119.35	ER	3351	77.01	
20	LFFB	WT576	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	118.31	119.34	LD	3351	77.01	
21	LFFB	563T576	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	118.23	119.27	LD	3351	77.04	
22	N-1	LN 573	DVP - DVP	8LDYSMTH-8CHANCE 500 kV line	314911	314905	1	DC	107.99	108.52	ER	2738	32.47	9
23	N-1	LN 594	DVP - DVP	8LDYSMTH-8CHANCE 500 kV line	314911	314905	1	DC	105.28	105.78	ER	2738	31.28	
24	LFFB	SPOTSH1T 9033	DVP - DVP	8LDYSMTH-8CHANCE 500 kV line	314911	314905	1	DC	100.3	100.92	LD	3351	46.13	
25	LFFB	557T574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	115.7	118.08	LD	3144	77.6	10

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Cir.	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Ref
26	N-1	LN 557	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	106.84	108.84	ER	2442	48.79	
27	N-1	LN 574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	107.11	109.09	ER	2442	48.27	

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	6SKIFF CREEK-6KINGS M 230 kV line	Wreck and rebuild the Skiffes Creek – Kingsmill – Pennimann – Waller 230 kV line to a rating of 1047 MVA. (Va CPCN Required). Estimated time: 30 – 36 months.	Pending	$28,200,000
# 2	8MDLTHAN-8NO ANNA 500 kV line	Replace wave trap at both North Anna Substations. This will increase emergency rating by 31% to 3424 MVA. Estimated time 12 – 16 months.	Pending	$250,000
			Total New Network Upgrades	**$28,450,000**

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
# 3	6SKIFF CREEK-6KINGS M 230 kV line	Wreck and rebuild the Skiffes Creek – Kingsmill – Pennimann – Waller 230 kV line to a rating of 1047 MVA. (Va CPCN Required). Estimated time: 30 – 36 months.	Pending	$28,200,000
# 4	6PENNIMAN-6WALR209 230 kV line	Wreck and rebuild the Skiffes Creek – Kingsmill – Pennimann – Waller 230 kV line to a rating of 1047 MVA. (Va CPCN Required). Estimated time: 30 – 36 months.		
# 5	6KINGS M-6PENNIMAN 230 kV line	Wreck and rebuild the Skiffes Creek – Kingsmill – Pennimann – Waller 230 kV line to a rating of 1047 MVA. (VA CPCN required). Estimated time: 30 – 36 months.		
# 6	6WALR209-6LIGH209 230 kV line	Wreck and rebuild the Lightfoot– Waller 230 kV line to a rating of 1047 MVA. (VA CPCN required). Estimated time: 30 – 36 months.	Pending	$15,200,000
# 7 - 10	8CARSON-8MDLTHAN 500 kV line	Replace wave trap at both Carson and Midlothian 500kV Substations. This will increase emergency rating by 31% to 3424 MVA. Estimated time: 12 – 16 months.	Pending	$500,000
# 11- 14	8CHCKAHM-8ELMONT 500 kV line	Replace wave trap at both Elmont and Chickahominy Substations. This will increase line rating by 22% to 3424 MVA. Estimated time: 14 – 16 months.	Pending	$500,000
# 15, 16	8CHANCE-8BRISTER 500 kV line	Rebuild the existing line since overload exceeds conductor rating of 2913 MVA by 3.1% new line rating 4300 MVA. (VA CPCN is required). Estimated time: 36 – 48 months.	Pending	$73,000,000
# 17 - 21	8ELMONT-8LDYSMTH 500 kV line	Wreck and rebuild the existing line since overload exceeds conductor rating of 2913 MVA by 3.1% new line rating 4300 MVA. (VA CPCN is required). Estimated time: 36 – 48 months.	Pending	$88,000,000
# 22 – 24	8LDYSMTH-8CHANCE 500 kV line	Wreck and rebuild the existing line since overload exceeds conductor rating of 2913 MVA by 3.1% new line rating 4300 MVA. (VA CPCN is required). Estimated time: 36 – 48 months.	Pending	$50,000,000
# 25 - 27	8MDLTHAN-8NO ANNA 500 kV line	Replace wave trap at both North Anna Substations. This will increase emergency rating by 31% to 3424 MVA. Estimated time: 12 – 16 months.	Pending	$250,000
			Total New Network Upgrades	**$255,650,000**

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		Bus			Power	Loading %		Rating		MW
#	Type	Name	Area	Facility Description	From	To	Circuit	Flow	Initial	Final	Type	MVA	Contribution
28	N-1	LN 557	DVP - DVP	6SKIFF CREEK-6KINGS M 230 kV line	314209	314386	1	DC	127.35	129.4	ER	442	20.12
29	N-1	LN 557	DVP - DVP	6PENNIMAN-6WALR209 230 kV line	314296	314415	1	DC	115.04	117.09	ER	442	20.12
30	N-1	LN 557	DVP - DVP	6KINGS M-6PENNIMAN 230 kV line	314386	314296	1	DC	118.91	120.96	ER	442	20.12
31	N-1	LN 557	DVP - DVP	6WALR209-6LIGH209 230 kV line	314415	314391	1	DC	99.26	101.32	ER	442	20.12
32	N-1	LN 557	DVP - DVP	8CARSON-8MDLTHAN 500 kV line	314902	314914	1	DC	132.81	135.76	ER	2442	75.04
33	N-1	LN 576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	138.82	142.22	ER	2442	85.29
34	N-1	LN 594	DVP - DVP	8CHANCE-8BRISTER 500 kV line	314905	314900	1	DC	131.23	132.08	ER	2442	45.62
35	N-1	LN 576	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	162.22	163.64	ER	2442	77.04
36	N-1	LN 573	DVP - DVP	8LDYSMTH-8CHANCE 500 kV line	314911	314905	1	DC	118.45	119.21	ER	2738	46.33

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution
37	N-1	LN 574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	129.73	132.55	ER	2442	68.88
38	N-1	LN 594	DVP - DVP	8NO ANNA-8LDYSMTH 500 kV line	314918	314911	1	DC	102.12	102.58	ER	3219	32.69
39	N-1	LN 576	DVP - DVP	8SURRY-8CHCKAHM 500 kV line	314924	314903	1	DC	99.55	104.17	ER	1809	83.55

Light Load Analysis

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

ITO Analysis

ITO assessed the impact of the proposed Queue Project #AC1-161 interconnection of a 240 MW Energy (168.2 MW Capacity) injection into the ITO's Transmission System at Septa 500 kV switching station, for compliance with NERC Reliability Criteria on ITO's Transmission System. The system was assessed using the summer 2020 RTEP case provided to ITO by PJM. When performing a generation analysis, ITO's main analysis will be load flow study results under single contingency (both normal and stressed system conditions). ITO Criteria considers a transmission facility overloaded if it exceeds 94% of its emergency rating under normal and stressed system conditions. A full listing of 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's 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.

As part of its generation impact analysis, the ITO routinely evaluates the impact that a proposed new generation resource will have under maximum generation conditions, stress system conditions and import/export system conditions (greater than 20 MW). The results of these studies are discussed in more detail below.

Category B Analysis (Single Contingency):

1. System Normal – No deficiencies identified

2. Critical System Condition (No Surry 230 kV Unit) – No deficiencies identified.

Category C Analysis: (Multiple Facility Analysis)

1. Bus Fault - No deficiencies identified
2. Line Stuck Breaker - No deficiencies identified
3. Tower Line – No deficiencies identified

The import and export conditions into and out of the ITO System are evaluated with any new interconnection greater than 20 MW, any new facility that is interconnected with the ITO System should not significantly decrement FCITC between utilities. These studies will be performed during the System Impact Study.

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 AC1-161 was evaluated as a 240.0 MW (Capacity 168.2 MW) injection tapping the Surry-Smithfield 230kV line in the ITO area. Project AC1-161 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC1-161 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Contingency Descriptions

The following contingencies resulted in overloads:

Contingency Name	Description
57602	CONTINGENCY '57602' /*NORTH ANNA OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /*MIDLOTHIAN TO NORTH ANNA (LINE 576) OPEN BRANCH FROM BUS 314914 TO BUS 314322 CKT 1 /*MIDLOTHIAN 500-230 (TX#2) OPEN BRANCH FROM BUS 314918 TO BUS 314232 CKT 1 /*NORTH ANNA 500-230 (TX#5) END
557T574	CONTINGENCY '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
562T563	CONTINGENCY '562T563' /*CARSON OPEN BRANCH FROM BUS 314902 TO BUS 314923 CKT 1 /*CARSON TO MIDLOTHIAN OPEN BRANCH FROM BUS 314914 TO BUS 314902 CKT 1 /*CARSON 500.00 - 8SEPTA 500.00 END
563T576	CONTINGENCY '563T576' /*MIDLOTHIAN OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /*MIDLOTHIAN TO NORTH ANNA (LINE 576) OPEN BRANCH FROM BUS 314914 TO BUS 314322 CKT 1 /*MIDLOTHIAN 500-230 (TX#2) OPEN BRANCH FROM BUS 314914 TO BUS 314902 CKT 1 /*MIDLOTHIAN TO CARSON (LINE 563) END

Contingency Name	Description
BASIN 230 B#2	CONTINGENCY 'BASIN 230 B#2' /* OPEN BRANCH FROM BUS 314276 TO BUS 314339 CKT 1 OPEN BRANCH FROM BUS 314276 TO BUS 314287 CKT 1 OPEN BRANCH FROM BUS 314276 TO BUS 314274 CKT 2 END
H2T557	CONTINGENCY '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
LN 208-259	CONTINGENCY 'LN 208-259' OPEN BRANCH FROM BUS 314286 TO BUS 314309 CKT 1 /* 6CHSTF A 230.00 - 6IRON208 230.00 OPEN BRANCH FROM BUS 314309 TO BUS 314338 CKT 1 /* 6IRON208 230.00 - 6SOUWEST 230.00 OPEN BUS 314309 /* ISLAND OPEN BRANCH FROM BUS 314276 TO BUS 314287 CKT 1 /* 6BASIN 230.00 - 6CHSTF B 230.00 END
LN 211	CONTINGENCY '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
LN 211-228	CONTINGENCY '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

Contingency Name	Description
LN 217	CONTINGENCY '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
LN 259	CONTINGENCY 'LN 259-2065' OPEN BRANCH FROM BUS 314276 TO BUS 314287 CKT 1 /* 6BASIN 230.00 - 6CHSTF B 230.00 OPEN BRANCH FROM BUS 314276 TO BUS 314339 CKT 1 /* 6BASIN 230.00 - 6SPRUNCE 230.00 END
LN 259-2065	CONTINGENCY 'LN 259-2065' OPEN BRANCH FROM BUS 314276 TO BUS 314287 CKT 1 /* 6BASIN 230.00 - 6CHSTF B 230.00 OPEN BRANCH FROM BUS 314276 TO BUS 314339 CKT 1 /* 6BASIN 230.00 - 6SPRUNCE 230.00 END
LN 552	CONTINGENCY 'LN 552' OPEN BRANCH FROM BUS 314135 TO BUS 314905 CKT 1 /* 3CHANCE 115.00 - 8CHANCE 500.00 OPEN BRANCH FROM BUS 314900 TO BUS 314905 CKT 1 /* 8BRISTER 500.00 - 8CHANCE 500.00 END
LN 557	CONTINGENCY '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
LN 563	CONTINGENCY 'LN 563' OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 END
LN 573	CONTINGENCY 'LN 573' OPEN BRANCH FROM BUS 314918 TO BUS 314934 CKT 1 /* 8NO ANNA 500.00 - 8SPOTSYL 500.00 END
LN 574	CONTINGENCY 'LN 574' OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT 500.00 - 8LDYSMTH 500.00 END

Contingency Name	Description
LN 576	CONTINGENCY 'LN 576' OPEN BRANCH FROM BUS 314322 TO BUS 314914 CKT 1 /* 6MDLTHAN 230.00 - 8MDLTHAN 500.00 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 END
LN 581	CONTINGENCY 'LN 581' OPEN BRANCH FROM BUS 314135 TO BUS 314905 CKT 2 /* 3CHANCE 115.00 - 8CHANCE 500.00 OPEN BRANCH FROM BUS 314905 TO BUS 314911 CKT 1 /* 8CHANCE 500.00 - 8LDYSMTH 500.00 END
LN 594	CONTINGENCY 'LN 594' OPEN BRANCH FROM BUS 314916 TO BUS 314934 CKT 1 /* 8MORRSVL 500.00 - 8SPOTSYL 500.00 END
T672B	CONTINGENCY 'T672B' /*_ BASIN OPEN BRANCH FROM BUS 314276 TO BUS 314260 CKT 1 /*L284 BASIN VARINA OPEN BRANCH FROM BUS 314275 TO BUS 314276 CKT 1 /*L2055 BASIN BELLMEADE REMOVE MACHINE 1 FROM BUS 315053 /*BELMEADE GEN CT-1 REMOVE MACHINE 2 FROM BUS 315054 /*BELMEADE GEN CT-2 REMOVE MACHINE 3 FROM BUS 315055 /*BELMEADE GEN ST OPEN BRANCH FROM BUS 314274 TO BUS 314276 CKT 1 /*BASIN TX5 OPEN BRANCH FROM BUS 314274 TO BUS 314276 CKT 2 /*BASIN TX6 OPEN BRANCH FROM BUS 314276 TO BUS 314287 CKT 1 /*L259 BASIN CHESTERFIELD OPEN BRANCH FROM BUS 314276 TO BUS 314339 CKT 1 /*L2065 BASIN SPRUANCE NUG END
WT576	CONTINGENCY 'WT576' /*NORTH ANNA OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /*MIDLOTHIAN TO NORTH ANNA (LINE 576) OPEN BRANCH FROM BUS 314914 TO BUS 314322 CKT 1 /*MIDLOTHIAN 500-230 (TX#2) OPEN BRANCH FROM BUS 314918 TO BUS 314232 CKT 2 /*NORTH ANNA 500-230 (TX#6) END

Contingency Name	Description
T672B	CONTINGENCY 'T672B' /*_ BASIN OPEN BRANCH FROM BUS 314276 TO BUS 314260 CKT 1 /*L284 BASIN VARINA OPEN BRANCH FROM BUS 314275 TO BUS 314276 CKT 1 /*L2055 BASIN BELLMEADE REMOVE MACHINE 1 FROM BUS 315053 /*BELMEADE GEN CT-1 REMOVE MACHINE 2 FROM BUS 315054 /*BELMEADE GEN CT-2 REMOVE MACHINE 3 FROM BUS 315055 /*BELMEADE GEN ST OPEN BRANCH FROM BUS 314274 TO BUS 314276 CKT 1 /*BASIN TX5 OPEN BRANCH FROM BUS 314274 TO BUS 314276 CKT 2 /*BASIN TX6 OPEN BRANCH FROM BUS 314276 TO BUS 314287 CKT 1 /*L259 BASIN CHESTERFIELD OPEN BRANCH FROM BUS 314276 TO BUS 314339 CKT 1 /*L2065 BASIN SPRUANCE NUG END
WT576	CONTINGENCY 'WT576' /*NORTH ANNA OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /*MIDLOTHIAN TO NORTH ANNA (LINE 576) OPEN BRANCH FROM BUS 314914 TO BUS 314322 CKT 1 /*MIDLOTHIAN 500-230 (TX#2) OPEN BRANCH FROM BUS 314918 TO BUS 314232 CKT 2 /*NORTH ANNA 500-230 (TX#6) END

Summer Peak Analysis - 2020

Generator Deliverability

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

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution
1	N-1	LN 563	DVP - DVP	6CHSTF A-6IRON208 230 kV line	314286	314309	1	DC	97.33	99.04	ER	664	11.35
2	N-1	LN 557	DVP - DVP	8CARSON-8MDLTHAN 500 kV line	314902	314914	1	DC	98.23	98.97	ER	2442	40.09

Multiple Facility Contingency

(Double Circuit Tower Line contingencies were studied for the full energy output. The contingencies of Line with Failed Breaker and Bus Fault will be performed for the Impact Study.)

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Cir.	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Ref
3	LFFB	H2T557	DVP - DVP	8ELMONT 500/230 kV transformer	314218	314908	1	DC	96.07	98.02		1051	45.44	11
4	LFFB	T672B	DVP - DVP	6CHARCTY-6LAKESD 230 kV line	314225	314227	1	DC	99.89	101.48		459	16.15	
5	LFFB	562T563	DVP - DVP	6CHARCTY-6LAKESD 230 kV line	314225	314227	1	DC	99.44	100.77		459	13.58	
6	DCTL	LN 259-2065	DVP - DVP	6CHARCTY-6LAKESD 230 kV line	314225	314227	1	DC	98.46	100.03		459	16.03	
7	BUS	BASIN 230 B#2	DVP - DVP	6CHARCTY-6LAKESD 230 kV line	314225	314227	1	DC	98.24	99.81		459	16.06	

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		Bus			Power	Loading %		Rating		MW	
#	Type	Name	Area	Facility Description	From	To	Cir.	Flow	Initial	Final	Type	MVA	Contribution	Ref
8	N-1	LN 557	DVP - DVP	6SKIFF CREEK-6KINGS M 230 kV line	314209	314386	1	DC	114.73	115.83	ER	442	10.79	12
9	N-1	LN 574	DVP - DVP	6FRRIVER-6STJOHN 230 kV line	314212	314150	1	DC	102.86	103.71	ER	749	14.19	13
10	DCTL	LN 208-259	DVP - DVP	6CHARCTY-6LAKESD 230 kV line	314225	314227	1	DC	131.85	133.62	LD	459	17.99	14
11	N-1	LN 259	DVP - DVP	6CHARCTY-6LAKESD 230 kV line	314225	314227	1	DC	109.48	110.84	ER	375	11.32	
12	N-1	LN 576	DVP - DVP	6CHARCTY-6LAKESD 230 kV line	314225	314227	1	DC	106.35	107.6	ER	375	10.38	
13	DCTL	LN 208-259	DVP - DVP	6MESSER-6CHARCTY 230 kV line	314228	314225	1	DC	143.6	145.36	LD	459	17.99	15
14	N-1	LN 259	DVP - DVP	6MESSER-6CHARCTY 230 kV line	314228	314225	1	DC	123.85	125.21	ER	375	11.32	

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Cir.	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Ref
15	N-1	LN 576	DVP - DVP	6MESSER-6CHARCTY 230 kV line	314228	314225	1	DC	120.72	121.97	ER	375	10.38	
16	LFFB	T672B	DVP - DVP	6MESSER-6CHARCTY 230 kV line	314228	314225	1	DC	111.64	113.22	LD	459	16.15	
17	LFFB	562T563	DVP - DVP	6MESSER-6CHARCTY 230 kV line	314228	314225	1	DC	111.18	112.51	LD	459	13.58	
18	DCTL	LN 259-2065	DVP - DVP	6MESSER-6CHARCTY 230 kV line	314228	314225	1	DC	110.2	111.77	LD	459	16.03	
19	BUS	BASIN 230 B#2	DVP - DVP	6MESSER-6CHARCTY 230 kV line	314228	314225	1	DC	109.98	111.56	LD	459	16.06	
20	DCTL	LN 211-228	DVP - DVP	6PRGEORG 230/115 kV transformer	314269	314291	1	DC	115.82	120.76	LD	220	24.1	16
21	N-1	LN 557	DVP - DVP	6CHSTF A-6IRON208 230 kV line	314286	314309	1	DC	103.21	104.07	ER	664	12.61	17
22	DCTL	LN 208-259	DVP - DVP	6CHSTF B-6MESSER 230 kV line	314287	314228	1	DC	143.75	145.52	LD	459	17.99	18
23	N-1	LN 259	DVP - DVP	6CHSTF B-6MESSER 230 kV line	314287	314228	1	DC	124.04	125.4	ER	375	11.32	
24	N-1	LN 576	DVP - DVP	6CHSTF B-6MESSER 230 kV line	314287	314228	1	DC	120.91	122.16	ER	375	10.38	
25	LFFB	T672B	DVP - DVP	6CHSTF B-6MESSER 230 kV line	314287	314228	1	DC	111.77	113.35	LD	459	16.15	
26	LFFB	562T563	DVP - DVP	6CHSTF B-6MESSER 230 kV line	314287	314228	1	DC	111.33	112.67	LD	459	13.58	

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Cir.	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Ref
27	DCTL	LN 259-2065	DVP - DVP	6CHSTF B-6MESSER 230 kV line	314287	314228	1	DC	110.35	111.93	LD	459	16.03	
28	BUS	BASIN 230 B#2	DVP - DVP	6CHSTF B-6MESSER 230 kV line	314287	314228	1	DC	110.13	111.71	LD	459	16.06	
29	N-1	LN 563	DVP - DVP	6CHSTF B-6BASIN 230 kV line	314287	314276	1	DC	122.8	124.15	ER	449	13.5	19
30	N-1	LN 217	DVP - DVP	6CHSTF B-6BASIN 230 kV line	314287	314276	1	DC	101.87	103.21	ER	449	13.37	
31	N-1	LN 557	DVP - DVP	6PENNIMAN-6WALR209 230 kV line	314296	314415	1	DC	102.42	103.52	ER	442	10.79	20
32	N-1	LN 557	DVP - DVP	6KINGS M-6PENNIMAN 230 kV line	314386	314296	1	DC	106.29	107.39	ER	442	10.79	21
33	LFFB	557T574	DVP - DVP	8CARSON-8MDLTHAN 500 kV line	314902	314914	1	DC	100.51	101.4	LD	3144	62.16	22
34	N-1	LN 594	DVP - DVP	8CHANCE-8BRISTER 500 kV line	314905	314900	1	DC	115.68	116.25	ER	2442	31.89	23
35	N-1	LN 573	DVP - DVP	8CHANCE-8BRISTER 500 kV line	314905	314900	1	DC	110.32	110.88	ER	2442	31.31	
36	N-1	LN 576	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	137.58	138.57	ER	2442	53.66	24
37	N-1	LN 563	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	127.18	128.01	ER	2442	45.36	
38	LFFB	WT576	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	114.36	115.39	LD	3351	76.54	

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Cir.	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Ref
39	LFFB	57602	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	114.36	115.39	LD	3351	76.54	
40	LFFB	563T576	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	114.29	115.32	LD	3351	76.57	
41	N-1	LN 573	DVP - DVP	8LDYSMTH-8CHANCE 500 kV line	314911	314905	1	DC	106.65	107.19	ER	2738	32.4	25
42	N-1	LN 594	DVP - DVP	8LDYSMTH-8CHANCE 500 kV line	314911	314905	1	DC	103.96	104.46	ER	2738	31.25	
43	N-1	LN 594	DVP - DVP	8LDYSMTH-8POSSUM 500 kV line	314911	314922	1	DC	106.42	106.93	ER	2442	27.79	26
44	N-1	LN 581	DVP - DVP	8LDYSMTH-8POSSUM 500 kV line	314911	314922	1	DC	105.06	105.57	ER	2442	28.4	
45	LFFB	557T574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	109.17	110.2	LD	3144	71.45	27
46	N-1	LN 574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	106	106.85	ER	2442	45.82	

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		Bus			Power	Loading %		Rating		MW
#	Type	Name	Area	Facility Description	From	To	Circuit	Flow	Initial	Final	Type	MVA	Contribution
44	N-1	LN 557	DVP - DVP	6SKIFF CREEK-6KINGS M 230 kV line	314209	314386	1	DC	110.12	111.59	ER	470	15.36
45	N-1	LN 574	DVP - DVP	6FRRIVER-6STJOHN 230 kV line	314212	314150	1	DC	96.55	97.69	ER	797	20.21
46	N-1	LN 259	DVP - DVP	6CHARCTY-6LAKESD 230 kV line	314225	314227	1	DC	112.47	114.29	ER	399	16.13
47	N-1	LN 259	DVP - DVP	6MESSER-6CHARCTY 230 kV line	314228	314225	1	DC	125.98	127.8	ER	399	16.13
48	N-1	LN 557	DVP - DVP	6NRTHEST-6ELMONT 230 kV line	314236	314218	1	DC	96.67	97.88	ER	722	19.39
49	N-1	LN 259	DVP - DVP	6CHSTF B-6MESSER 230 kV line	314287	314228	1	DC	126.15	127.97	ER	399	16.13
50	N-1	LN 563	DVP - DVP	6CHSTF B-6BASIN 230 kV line	314287	314276	1	DC	144.94	146.75	ER	478	19.22
51	N-1	LN 557	DVP - DVP	6PENNIMAN-6WALR209 230 kV line	314296	314415	1	DC	98.52	99.99	ER	470	15.36
52	N-1	LN 557	DVP - DVP	6KINGS M-6PENNIMAN 230 kV line	314386	314296	1	DC	102.16	103.63	ER	470	15.36

#	Contingency Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution
53	N-1	LN 594	DVP - DVP	8CHANCE-8BRISTER 500 kV line	314905	314900	1	DC	118.81	119.6	ER	2598	45.36
54	N-1	LN 576	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	151.05	152.37	ER	2598	76.34
55	N-1	LN 573	DVP - DVP	8LDYSMTH-8CHANCE 500 kV line	314911	314905	1	DC	107.12	107.83	ER	2913	46.09
56	N-1	LN 574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	130.28	131.41	ER	2598	65.13

Light Load Analysis

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

ITO Analysis

ITO assessed the impact of the proposed Queue Project #AC1-163 interconnection of a 240 MW Energy (168.2 MW Capacity) injection into the ITO's Transmission System at a new interconnection switching station located between Surry – Smithfield 230kV section of Line # 223, for compliance with NERC Reliability Criteria on ITO's Transmission System. The system was assessed using the summer 2020 RTEP case provided to ITO by PJM. When performing a generation analysis, ITO's main analysis will be load flow study results under single contingency (both normal and stressed system conditions). ITO Criteria considers a transmission facility overloaded if it exceeds 94% of its emergency rating under normal and stressed system conditions. A full listing of 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's 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.

As part of its generation impact analysis, the ITO routinely evaluates the impact that a proposed new generation resource will have under maximum generation conditions, stress system conditions and import/export system conditions (greater than 20 MW). The results of these studies are discussed in more detail below.

Category B Analysis (Single Contingency):

1. System Normal – No deficiencies identified
2. Critical System Condition (No Surry 230 kV Unit) – No deficiencies identified.

Category C Analysis: (Multiple Facility Analysis)

1. Bus Fault - No deficiencies identified
2. Line Stuck Breaker - No deficiencies identified
3. Tower Line – No deficiencies identified

The import and export conditions into and out of the ITO System are evaluated with any new interconnection greater than 20 MW, any new facility that is interconnected with the ITO System should not significantly decrement FCITC between utilities. These studies will be performed during the System Impact Study.

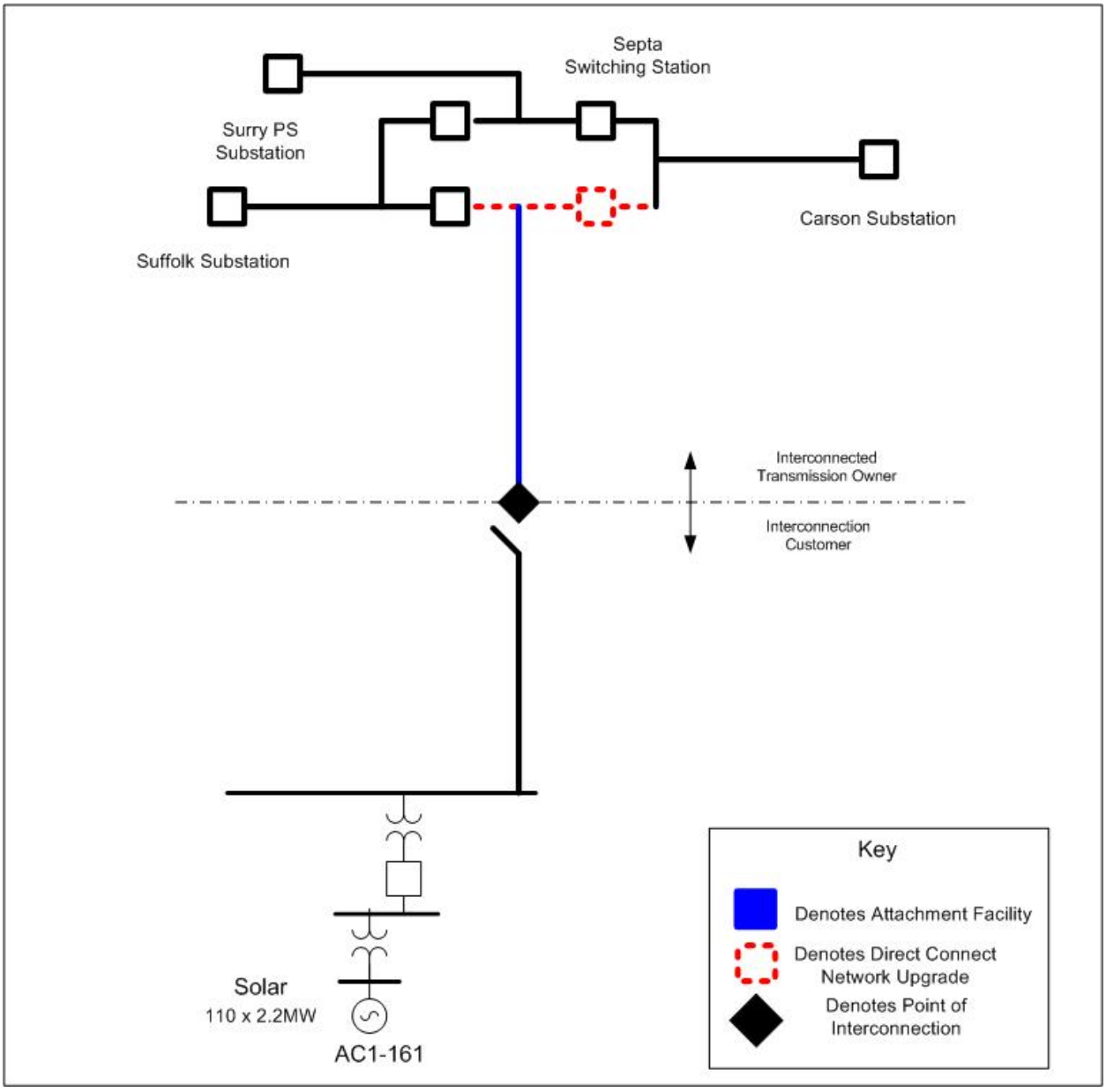
Affected System Analysis & Mitigation

Duke, Progress & TVA Impacts:

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

Attachment 1.

System Configuration



Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact. When a flowgate is identified in multiple analysis the appendix is presented for only the analysis with the greatest overload.

It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Appendix 1

(DVP - DVP) The 6SKIFF CREEK-6KINGS M 230 kV line (from bus 314209 to bus 314386 ckt 1) loads from 150.42% to 153.61% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 14.1 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315099	*1CHESPKB*	*0.52*
315108	*1ELIZAR1*	*1.53*
315109	*1ELIZAR2*	*1.51*
315110	*1ELIZAR3*	*1.55*
315233	*1SURRY 2*	*15.85*
315091	*1YORKTN2*	*23.96*
315092	*1YORKTN3*	*21.8*
314421	*6WINCHST*	*0.12*
916191	*Z1-068 C*	*0.02*
921092	*AA1-049 C*	*0.99*
921532	*AA1-132 C*	*3.05*
921542	*AA1-133 C*	*4.09*
921552	*AA1-134 C*	*3.87*
921572	*AA1-138 C*	*3.66*
921582	*AA1-139 C*	*6.14*
921772	*AA2-059 C*	*0.87*
921982	*AA2-088 C*	*1.9*
922532	*AA2-178 C*	*3.34*
922602	*AB1-013 C*	*1.01*
923801	*AB2-015 C OP*	*2.77*
923831	*AB2-022 C*	*0.92*
924071	*AB2-051 C OP*	*56.78*
924241	*AB2-068 OP*	*103.46*
924941	*AB2-149 C OP*	*1.01*
925121	*AB2-169 C OP*	*1.97*

925141	*AB2-171 C OP*	*1.52*
925281	*AB2-186 C*	*0.23*
925291	*AB2-188 C OP*	*0.82*
925361	*AC1-007 C OP*	*0.26*
925521	*AC1-027 C*	*0.83*
925691	*AC1-045 C*	*0.75*
925701	*AC1-046 C*	*0.72*
925711	*AC1-047 C*	*0.95*
926291	*AC1-107 OP*	*156.16*
926661	*AC1-147 C*	*0.93*
926741	*AC1-159 C*	*56.34*
926751	*AC1-161 C OP*	*14.1*
926781	*AC1-164 C OP*	*21.55*
927051	*AC1-193 C*	*1.12*

Appendix 2

(DVP - DVP) The 6PENNIMAN-6WALR209 230 kV line (from bus 314296 to bus 314415 ckt 1) loads from 138.11% to 141.3% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 14.1 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315099	*1CHESPKB*	*0.52*
315108	*1ELIZAR1*	*1.53*
315109	*1ELIZAR2*	*1.51*
315110	*1ELIZAR3*	*1.55*
315233	*1SURRY 2*	*15.85*
315091	*1YORKTN2*	*23.96*
315092	*1YORKTN3*	*21.8*
314421	*6WINCHST*	*0.12*
916191	*Z1-068 C*	*0.02*
921092	*AA1-049 C*	*0.99*
921532	*AA1-132 C*	*3.05*
921542	*AA1-133 C*	*4.09*
921552	*AA1-134 C*	*3.87*
921572	*AA1-138 C*	*3.66*
921582	*AA1-139 C*	*6.14*
921772	*AA2-059 C*	*0.87*
921982	*AA2-088 C*	*1.9*
922532	*AA2-178 C*	*3.34*
922602	*AB1-013 C*	*1.01*
923801	*AB2-015 C OP*	*2.77*
923831	*AB2-022 C*	*0.92*
924071	*AB2-051 C OP*	*56.78*
924241	*AB2-068 OP*	*103.46*
924941	*AB2-149 C OP*	*1.01*
925121	*AB2-169 C OP*	*1.97*

925141	*AB2-171 C OP*	*1.52*
925281	*AB2-186 C*	*0.23*
925291	*AB2-188 C OP*	*0.82*
925361	*AC1-007 C OP*	*0.26*
925521	*AC1-027 C*	*0.83*
925691	*AC1-045 C*	*0.75*
925701	*AC1-046 C*	*0.72*
925711	*AC1-047 C*	*0.95*
926291	*AC1-107 OP*	*156.16*
926661	*AC1-147 C*	*0.93*
926741	*AC1-159 C*	*56.34*
926751	*AC1-161 C OP*	*14.1*
926781	*AC1-164 C OP*	*21.55*
927051	*AC1-193 C*	*1.12*

Appendix 3

(DVP - DVP) The 6KINGS M-6PENNIMAN 230 kV line (from bus 314386 to bus 314296 ckt 1) loads from 141.98% to 145.17% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 14.1 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315099	*1CHESPKB*	*0.52*
315108	*1ELIZAR1*	*1.53*
315109	*1ELIZAR2*	*1.51*
315110	*1ELIZAR3*	*1.55*
315233	*1SURRY 2*	*15.85*
315091	*1YORKTN2*	*23.96*
315092	*1YORKTN3*	*21.8*
314421	*6WINCHST*	*0.12*
916191	*Z1-068 C*	*0.02*
921092	*AA1-049 C*	*0.99*
921532	*AA1-132 C*	*3.05*
921542	*AA1-133 C*	*4.09*
921552	*AA1-134 C*	*3.87*
921572	*AA1-138 C*	*3.66*
921582	*AA1-139 C*	*6.14*
921772	*AA2-059 C*	*0.87*
921982	*AA2-088 C*	*1.9*
922532	*AA2-178 C*	*3.34*
922602	*AB1-013 C*	*1.01*
923801	*AB2-015 C OP*	*2.77*
923831	*AB2-022 C*	*0.92*
924071	*AB2-051 C OP*	*56.78*
924241	*AB2-068 OP*	*103.46*
924941	*AB2-149 C OP*	*1.01*
925121	*AB2-169 C OP*	*1.97*

925141	*AB2-171 C OP*	*1.52*
925281	*AB2-186 C*	*0.23*
925291	*AB2-188 C OP*	*0.82*
925361	*AC1-007 C OP*	*0.26*
925521	*AC1-027 C*	*0.83*
925691	*AC1-045 C*	*0.75*
925701	*AC1-046 C*	*0.72*
925711	*AC1-047 C*	*0.95*
926291	*AC1-107 OP*	*156.16*
926661	*AC1-147 C*	*0.93*
926741	*AC1-159 C*	*56.34*
926751	*AC1-161 C OP*	*14.1*
926781	*AC1-164 C OP*	*21.55*
927051	*AC1-193 C*	*1.12*

Appendix 4

(DVP - DVP) The 6WALR209-6LIGH209 230 kV line (from bus 314415 to bus 314391 ckt 1) loads from 122.33% to 125.52% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 14.1 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315099	*1CHESPKB*	*0.52*
315108	*1ELIZAR1*	*1.53*
315109	*1ELIZAR2*	*1.51*
315110	*1ELIZAR3*	*1.55*
315233	*1SURRY 2*	*15.85*
315091	*1YORKTN2*	*23.96*
315092	*1YORKTN3*	*21.8*
314421	*6WINCHST*	*0.12*
916191	*Z1-068 C*	*0.02*
921092	*AA1-049 C*	*0.99*
921532	*AA1-132 C*	*3.05*
921542	*AA1-133 C*	*4.09*
921552	*AA1-134 C*	*3.87*
921572	*AA1-138 C*	*3.66*
921582	*AA1-139 C*	*6.14*
921772	*AA2-059 C*	*0.87*
921982	*AA2-088 C*	*1.9*
922532	*AA2-178 C*	*3.34*
922602	*AB1-013 C*	*1.01*
923801	*AB2-015 C OP*	*2.77*
923831	*AB2-022 C*	*0.92*
924071	*AB2-051 C OP*	*56.78*
924241	*AB2-068 OP*	*103.46*
924941	*AB2-149 C OP*	*1.01*
925121	*AB2-169 C OP*	*1.97*

925141	*AB2-171 C OP*	*1.52*
925281	*AB2-186 C*	*0.23*
925291	*AB2-188 C OP*	*0.82*
925361	*AC1-007 C OP*	*0.26*
925521	*AC1-027 C*	*0.83*
925691	*AC1-045 C*	*0.75*
925701	*AC1-046 C*	*0.72*
925711	*AC1-047 C*	*0.95*
926291	*AC1-107 OP*	*156.16*
926661	*AC1-147 C*	*0.93*
926741	*AC1-159 C*	*56.34*
926751	*AC1-161 C OP*	*14.1*
926781	*AC1-164 C OP*	*21.55*
927051	*AC1-193 C*	*1.12*

Appendix 5

(DVP - DVP) The 8CARSON-8MDLTHAN 500 kV line (from bus 314902 to bus 314914 ckt 1) loads from 118.9% to 121.05% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 52.59 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315102	*1BRUNSWICKG1*	*17.73*
315103	*1BRUNSWICKG2*	*17.73*
315104	*1BRUNSWICKG3*	*17.73*
315105	*1BRUNSWICKS1*	*36.84*
315099	*1CHESPKB*	*2.03*
315108	*1ELIZAR1*	*5.98*
315109	*1ELIZAR2*	*5.88*
315110	*1ELIZAR3*	*6.06*
315233	*1SURRY 2*	*48.13*
315091	*1YORKTN2*	*38.41*
916191	*Z1-068 C*	*0.08*
916301	*Z1-086 C*	*108.23*
LTF	*Z2-067*	*27.58*
921092	*AA1-049 C*	*3.92*
LTF	*AA1-058*	*1.22*
921162	*AA1-063AC*	*12.23*
921172	*AA1-064 C*	*15.51*
921182	*AA1-067 C*	*2.46*
921532	*AA1-132 C*	*12.11*
921542	*AA1-133 C*	*16.2*
921552	*AA1-134 C*	*15.68*
921562	*AA1-135 C*	*13.6*
921572	*AA1-138 C*	*15.27*
921582	*AA1-139 C*	*24.3*
921752	*AA2-053 C*	*12.43*

921762	*AA2-057 C*	*10.05*
921772	*AA2-059 C*	*3.72*
921862	*AA2-068 C*	*3.17*
LTF	*AA2-074*	*8.21*
921982	*AA2-088 C*	*9.53*
922442	*AA2-165 C*	*1.37*
922472	*AA2-169 C*	*2.96*
922512	*AA2-174 C*	*0.57*
922522	*AA2-177 C*	*10.18*
922532	*AA2-178 C*	*14.85*
922602	*AB1-013 C*	*4.48*
922722	*AB1-053 C*	*1.51*
922732	*AB1-054 C*	*10.06*
922922	*AB1-081 C OP*	*12.49*
923262	*AB1-132 C OP*	*19.95*
923572	*AB1-173 C OP*	*3.15*
923582	*AB1-173AC OP*	*3.15*
923801	*AB2-015 C OP*	*12.92*
923831	*AB2-022 C*	*3.69*
923851	*AB2-025 C*	*3.4*
923911	*AB2-031 C OP*	*3.13*
923941	*AB2-035 C*	*0.48*
923981	*AB2-039 C OP*	*11.06*
923991	*AB2-040 C OP*	*10.26*
924021	*AB2-043 C OP*	*3.64*
924071	*AB2-051 C OP*	*221.45*
924151	*AB2-059 C OP*	*14.72*
924241	*AB2-068 OP*	*313.95*
924301	*AB2-077 C OP*	*2.32*
924311	*AB2-078 C OP*	*2.32*
924321	*AB2-079 C OP*	*2.32*
924381	*AB2-087 C*	*0.84*
924391	*AB2-088 C*	*0.61*
924401	*AB2-089 C*	*2.75*
924411	*AB2-090 C*	*4.59*
924491	*AB2-098 C*	*0.82*
924501	*AB2-099 C*	*0.87*
924511	*AB2-100 C*	*16.03*
924761	*AB2-128 C*	*13.73*

924811	*AB2-134 C OP*	*13.05*
924931	*AB2-147 C*	*3.52*
924941	*AB2-149 C OP*	*4.83*
924951	*AB2-150 C OP*	*3.52*
925061	*AB2-161 C OP*	*4.47*
925121	*AB2-169 C OP*	*9.71*
925141	*AB2-171 C OP*	*7.29*
925171	*AB2-174 C OP*	*9.79*
925221	*AB2-176 C*	*1.89*
925281	*AB2-186 C*	*0.97*
925291	*AB2-188 C OP*	*3.66*
925331	*AB2-190 C*	*23.27*
925361	*AC1-007 C OP*	*1.*
925521	*AC1-027 C*	*3.24*
925591	*AC1-034 C OP*	*9.7*
925691	*AC1-045 C*	*2.63*
925701	*AC1-046 C*	*2.83*
925711	*AC1-047 C*	*3.75*
925781	*AC1-054 C OP*	*9.41*
926071	*AC1-086 C*	*29.38*
926201	*AC1-098 C*	*8.81*
926211	*AC1-099 C*	*2.95*
926271	*AC1-105 C OP*	*7.02*
926281	*AC1-106*	*3.03*
926291	*AC1-107 OP*	*473.89*
926661	*AC1-147 C*	*3.63*
926741	*AC1-159 C*	*219.74*
926751	*AC1-161 C OP*	*52.59*
926771	*AC1-163 C*	*3.13*
926781	*AC1-164 C OP*	*65.4*
927021	*AC1-189 C*	*12.41*
927051	*AC1-193 C*	*5.34*
927141	*AC1-208 C*	*12.7*
927211	*AC1-215 C*	*12.6*
927221	*AC1-216 C OP*	*9.96*
927251	*AC1-221 C*	*3.98*
927261	*AC1-222 C*	*5.96*

Appendix 6

(DVP - DVP) The 8CHCKAHM-8ELMONT 500 kV line (from bus 314903 to bus 314908 ckt 1) loads from 123.72% to 126.17% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 576'. This project contributes approximately 59.77 MW to the thermal violation.

CONTINGENCY 'LN 576'
 OPEN BRANCH FROM BUS 314322 TO BUS 314914 CKT 1 /* 6MDLTHAN 230.00 - 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*
315099	*1CHESPKB*	*2.31*
315108	*1ELIZAR1*	*6.8*
315109	*1ELIZAR2*	*6.68*
315110	*1ELIZAR3*	*6.88*
315233	*1SURRY 2*	*62.*
315091	*1YORKTN2*	*55.76*
315092	*1YORKTN3*	*50.51*
314421	*6WINCHST*	*0.28*
LTF	*Z2-067*	*22.05*
921092	*AA1-049 C*	*4.39*
LTF	*AA1-058*	*1.05*
921162	*AA1-063AC*	*12.22*
921172	*AA1-064 C*	*12.07*
921182	*AA1-067 C*	*2.38*
921532	*AA1-132 C*	*13.54*
921542	*AA1-133 C*	*18.16*
921552	*AA1-134 C*	*17.35*
921562	*AA1-135 C*	*13.56*
921572	*AA1-138 C*	*16.68*
921582	*AA1-139 C*	*27.24*
921752	*AA2-053 C*	*12.23*
921762	*AA2-057 C*	*9.48*
921772	*AA2-059 C*	*4.02*
921862	*AA2-068 C*	*3.03*
LTF	*AA2-074*	*6.69*

921982	*AA2-088 C*	*9.91*
922442	*AA2-165 C*	*1.29*
922472	*AA2-169 C*	*2.77*
922512	*AA2-174 C*	*0.56*
922522	*AA2-177 C*	*14.87*
922532	*AA2-178 C*	*15.81*
922602	*AB1-013 C*	*4.77*
922722	*AB1-053 C*	*1.45*
922732	*AB1-054 C*	*10.43*
922922	*AB1-081 C OP*	*11.46*
923262	*AB1-132 C OP*	*19.33*
923272	*AB1-135 C OP*	*4.31*
923572	*AB1-173 C OP*	*3.04*
923582	*AB1-173AC OP*	*3.04*
923801	*AB2-015 C OP*	*13.81*
923831	*AB2-022 C*	*4.11*
923841	*AB2-024 C*	*4.1*
923851	*AB2-025 C*	*3.27*
923911	*AB2-031 C OP*	*3.02*
923941	*AB2-035 C*	*0.45*
923981	*AB2-039 C OP*	*12.82*
923991	*AB2-040 C OP*	*9.92*
924071	*AB2-051 C OP*	*251.57*
924151	*AB2-059 C OP*	*13.5*
924241	*AB2-068 OP*	*619.12*
924381	*AB2-087 C*	*0.86*
924391	*AB2-088 C*	*0.57*
924401	*AB2-089 C*	*2.54*
924491	*AB2-098 C*	*0.79*
924501	*AB2-099 C*	*0.89*
924511	*AB2-100 C*	*15.48*
924761	*AB2-128 C*	*13.26*
924811	*AB2-134 C OP*	*19.06*
924931	*AB2-147 C*	*3.38*
924941	*AB2-149 C OP*	*5.5*
924951	*AB2-150 C OP*	*3.38*
924961	*AB2-152*	*3.5*
925051	*AB2-160 C OP*	*6.38*
925061	*AB2-161 C OP*	*5.18*

925121	*AB2-169 C OP*	*9.87*
925141	*AB2-171 C OP*	*7.71*
925171	*AB2-174 C OP*	*9.44*
925281	*AB2-186 C*	*1.06*
925291	*AB2-188 C OP*	*3.9*
925331	*AB2-190 C*	*33.98*
925361	*AC1-007 C OP*	*1.2*
925521	*AC1-027 C*	*3.67*
925591	*AC1-034 C OP*	*9.06*
925691	*AC1-045 C*	*3.08*
925701	*AC1-046 C*	*3.18*
925711	*AC1-047 C*	*4.22*
925781	*AC1-054 C OP*	*8.72*
925811	*AC1-060*	*3.54*
925821	*AC1-061*	*0.04*
925841	*AC1-063*	*0.62*
925861	*AC1-065 C*	*5.37*
926071	*AC1-086 C*	*28.46*
926201	*AC1-098 C*	*8.53*
926211	*AC1-099 C*	*2.86*
926291	*AC1-107 OP*	*934.53*
926591	*AC1-142 C*	*13.6*
926661	*AC1-147 C*	*4.13*
926741	*AC1-159 C*	*249.63*
926751	*AC1-161 C OP*	*59.77*
926771	*AC1-163 C*	*3.19*
926781	*AC1-164 C OP*	*128.96*
927021	*AC1-189 C*	*11.9*
927051	*AC1-193 C*	*5.65*
927141	*AC1-208 C*	*11.94*
927221	*AC1-216 C OP*	*14.55*

Appendix 7

(DVP - DVP) The 8CHANCE-8BRISTER 500 kV line (from bus 314905 to bus 314900 ckt 1) loads from 117.09% to 117.66% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 594'. This project contributes approximately 31.97 MW to the thermal violation.

CONTINGENCY 'LN 594'
OPEN BRANCH FROM BUS 314916 TO BUS 314934 CKT 1 /* 8MORRSVL 500.00 - 8SPOTSYL 500.00
END

Bus Number	*Bus Name*	*Full Contribution*
315053	*1BELMED1*	*3.51*
315054	*1BELMED2*	*3.51*
315055	*1BELMED3*	*2.91*
315067	*1DARBY 1*	*3.2*
315068	*1DARBY 2*	*3.2*
315069	*1DARBY 3*	*3.24*
315070	*1DARBY 4*	*3.24*
315043	*1FRIVERA*	*4.31*
315044	*1FRIVERB*	*3.33*
315045	*1FRIVERC*	*4.31*
315046	*1FRIVERD*	*3.33*
315047	*1FRIVERE*	*3.33*
315048	*1FRIVERF*	*4.31*
315225	*1N ANNA1*	*48.51*
315226	*1N ANNA2*	*47.76*
315083	*1SPRUNCA*	*2.15*
315084	*1SPRUNCB*	*2.15*
315085	*1SPRUNCC*	*1.59*
315086	*1SPRUNCD*	*1.59*
315091	*1YORKTN2*	*31.52*
314309	*6IRON208*	*0.48*
314236	*6NRTHEST*	*0.23*
314251	*6S PUMP*	*1.07*
297087	*V2-040*	*0.15*
LTF	*Z2-067*	*16.76*
921092	*AA1-049 C*	*2.52*
LTF	*AA1-058*	*0.75*

921162	*AA1-063AC*	*8.24*
921172	*AA1-064 C*	*8.21*
921292	*AA1-083*	*4.*
921532	*AA1-132 C*	*7.78*
921542	*AA1-133 C*	*10.41*
921552	*AA1-134 C*	*10.17*
921562	*AA1-135 C*	*8.81*
921572	*AA1-138 C*	*9.98*
921582	*AA1-139 C*	*15.61*
921622	*AA1-145*	*68.05*
921752	*AA2-053 C*	*8.35*
921772	*AA2-059 C*	*2.41*
921862	*AA2-068 C*	*2.08*
LTF	*AA2-074*	*4.98*
921982	*AA2-088 C*	*6.4*
922512	*AA2-174 C*	*0.38*
922522	*AA2-177 C*	*10.72*
922532	*AA2-178 C*	*9.63*
922602	*AB1-013 C*	*2.91*
922672	*AB1-026 C*	*2.11*
922682	*AB1-027 C*	*2.79*
922722	*AB1-053 C*	*1.01*
922732	*AB1-054 C*	*6.75*
923262	*AB1-132 C OP*	*13.47*
923272	*AB1-135 C OP*	*2.75*
923572	*AB1-173 C OP*	*2.17*
923582	*AB1-173AC OP*	*2.17*
923801	*AB2-015 C OP*	*8.68*
923831	*AB2-022 C*	*2.38*
923841	*AB2-024 C*	*2.64*
923851	*AB2-025 C*	*2.47*
923861	*AB2-026 C*	*2.33*
923911	*AB2-031 C OP*	*2.16*
923981	*AB2-039 C OP*	*8.76*
923991	*AB2-040 C OP*	*7.09*
924061	*AB2-050*	*4.*
924071	*AB2-051 C OP*	*143.84*
924241	*AB2-068 OP*	*215.98*
924381	*AB2-087 C*	*0.55*

924501	*AB2-099 C*	*0.57*
924511	*AB2-100 C*	*11.07*
924761	*AB2-128 C*	*9.48*
924811	*AB2-134 C OP*	*13.74*
924931	*AB2-147 C*	*2.47*
924941	*AB2-149 C OP*	*3.52*
924951	*AB2-150 C OP*	*2.47*
924961	*AB2-152*	*2.89*
925051	*AB2-160 C OP*	*5.81*
925061	*AB2-161 C OP*	*3.54*
925121	*AB2-169 C OP*	*6.27*
925141	*AB2-171 C OP*	*4.89*
925171	*AB2-174 C OP*	*6.8*
925281	*AB2-186 C*	*0.63*
925291	*AB2-188 C OP*	*2.37*
925331	*AB2-190 C*	*24.5*
925361	*AC1-007 C OP*	*0.72*
925521	*AC1-027 C*	*2.1*
925691	*AC1-045 C*	*1.81*
925701	*AC1-046 C*	*1.81*
925711	*AC1-047 C*	*2.41*
925811	*AC1-060*	*2.66*
925821	*AC1-061*	*0.04*
925841	*AC1-063*	*0.41*
925861	*AC1-065 C*	*3.57*
926001	*AC1-076 C*	*4.68*
926071	*AC1-086 C*	*19.84*
926201	*AC1-098 C*	*5.78*
926211	*AC1-099 C*	*1.94*
926291	*AC1-107 OP*	*326.*
926411	*AC1-112 C*	*2.17*
926441	*AC1-115 C*	*1.12*
926471	*AC1-118 C*	*1.99*
926551	*AC1-134*	*10.01*
926591	*AC1-142 C*	*9.92*
926661	*AC1-147 C*	*2.37*
926731	*AC1-158 C*	*88.41*
926741	*AC1-159 C*	*142.73*
926751	*AC1-161 C OP*	*31.97*

926771	*AC1-163 C*	*2.06*
926781	*AC1-164 C OP*	*44.99*
927041	*AC1-191 C*	*10.79*
927051	*AC1-193 C*	*3.59*
927221	*AC1-216 C OP*	*10.49*

Appendix 8

(DVP - DVP) The 8ELMONT-8LDYSMTH 500 kV line (from bus 314908 to bus 314911 ckt 1) loads from 142.96% to 143.95% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 576'. This project contributes approximately 53.99 MW to the thermal violation.

CONTINGENCY 'LN 576'
OPEN BRANCH FROM BUS 314322 TO BUS 314914 CKT 1 /* 6MDLTHAN 230.00 - 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*
315058	*1CHESTF3*	*6.16*
315059	*1CHESTF4*	*9.98*
315060	*1CHESTF5*	*21.16*
315061	*1CHESTG7*	*8.29*
315063	*1CHESTG8*	*8.22*
315062	*1CHESTS7*	*3.77*
315064	*1CHESTS8*	*4.21*
315067	*1DARBY 1*	*5.4*
315068	*1DARBY 2*	*5.41*
315069	*1DARBY 3*	*5.48*
315070	*1DARBY 4*	*5.48*
315233	*1SURRY 2*	*53.75*
315091	*1YORKTN2*	*53.71*
315092	*1YORKTN3*	*48.55*
314309	*6IRON208*	*0.81*
314236	*6NRTHEST*	*0.39*
314251	*6S PUMP*	*1.75*
297087	*V2-040*	*0.26*
LTF	*Z2-067*	*28.75*
921092	*AA1-049 C*	*4.23*
LTF	*AA1-058*	*1.25*
921162	*AA1-063AC*	*13.64*
921182	*AA1-067 C*	*2.63*
921532	*AA1-132 C*	*13.05*
921542	*AA1-133 C*	*17.45*

921552	*AA1-134 C*	*17.03*
921562	*AA1-135 C*	*14.68*
921572	*AA1-138 C*	*16.68*
921582	*AA1-139 C*	*26.18*
921752	*AA2-053 C*	*13.8*
921772	*AA2-059 C*	*4.03*
921862	*AA2-068 C*	*3.44*
LTF	*AA2-074*	*8.44*
921982	*AA2-088 C*	*10.63*
922512	*AA2-174 C*	*0.63*
922522	*AA2-177 C*	*18.02*
922532	*AA2-178 C*	*16.1*
922602	*AB1-013 C*	*4.86*
922682	*AB1-027 C*	*4.79*
922722	*AB1-053 C*	*1.67*
922732	*AB1-054 C*	*11.21*
923262	*AB1-132 C OP*	*22.24*
923272	*AB1-135 C OP*	*4.79*
923572	*AB1-173 C OP*	*3.57*
923582	*AB1-173AC OP*	*3.57*
923642	*AB1-181*	*3.49*
923643	*AB1-181 2*	*3.49*
923644	*AB1-181 3*	*3.49*
923801	*AB2-015 C OP*	*14.45*
923831	*AB2-022 C*	*3.99*
923841	*AB2-024 C*	*4.41*
923851	*AB2-025 C*	*4.03*
923861	*AB2-026 C*	*3.55*
923911	*AB2-031 C OP*	*3.55*
923981	*AB2-039 C OP*	*14.57*
923991	*AB2-040 C OP*	*11.65*
924071	*AB2-051 C OP*	*241.44*
924241	*AB2-068 OP*	*416.7*
LTF	*AB2-075*	*4.54*
LTF	*AB2-076*	*5.34*
924381	*AB2-087 C*	*0.92*
924491	*AB2-098 C*	*0.88*
924501	*AB2-099 C*	*0.95*
924511	*AB2-100 C*	*18.19*

924761	*AB2-128 C*	*15.59*
924811	*AB2-134 C OP*	*23.1*
924931	*AB2-147 C*	*4.05*
924941	*AB2-149 C OP*	*5.87*
924951	*AB2-150 C OP*	*4.05*
924961	*AB2-152*	*4.86*
925051	*AB2-160 C OP*	*9.6*
925061	*AB2-161 C OP*	*5.89*
925121	*AB2-169 C OP*	*10.47*
925141	*AB2-171 C OP*	*8.14*
925171	*AB2-174 C OP*	*11.16*
925281	*AB2-186 C*	*1.05*
925291	*AB2-188 C OP*	*3.97*
925331	*AB2-190 C*	*41.18*
925361	*AC1-007 C OP*	*1.21*
925521	*AC1-027 C*	*3.52*
925691	*AC1-045 C*	*3.04*
925701	*AC1-046 C*	*3.05*
925711	*AC1-047 C*	*4.04*
925811	*AC1-060*	*4.44*
925821	*AC1-061*	*0.06*
925841	*AC1-063*	*0.67*
925861	*AC1-065 C*	*5.83*
926071	*AC1-086 C*	*32.75*
926201	*AC1-098 C*	*9.59*
926211	*AC1-099 C*	*3.21*
926291	*AC1-107 OP*	*628.98*
926411	*AC1-112 C*	*3.73*
926661	*AC1-147 C*	*3.97*
926741	*AC1-159 C*	*239.58*
926751	*AC1-161 C OP*	*53.99*
926771	*AC1-163 C*	*3.43*
926781	*AC1-164 C OP*	*86.8*
927041	*AC1-191 C*	*18.31*
927051	*AC1-193 C*	*5.97*
927221	*AC1-216 C OP*	*17.63*

Appendix 9

(DVP - DVP) The 8LDYSMTH-8CHANCE 500 kV line (from bus 314911 to bus 314905 ckt 1) loads from 107.99% to 108.52% (**DC power flow**) of its emergency rating (2738 MVA) for the single line contingency outage of 'LN 573'. This project contributes approximately 32.47 MW to the thermal violation.

CONTINGENCY 'LN 573'
OPEN BRANCH FROM BUS 314918 TO BUS 314934 CKT 1 /* 8NO ANNA 500.00 - 8SPOTSYL 500.00
END

Bus Number	*Bus Name*	*Full Contribution*
315053	*1BELMED1*	*3.57*
315054	*1BELMED2*	*3.57*
315055	*1BELMED3*	*2.96*
315067	*1DARBY 1*	*3.25*
315068	*1DARBY 2*	*3.26*
315069	*1DARBY 3*	*3.3*
315070	*1DARBY 4*	*3.3*
315043	*1FRIVERA*	*4.39*
315044	*1FRIVERB*	*3.4*
315045	*1FRIVERC*	*4.39*
315046	*1FRIVERD*	*3.4*
315047	*1FRIVERE*	*3.4*
315048	*1FRIVERF*	*4.39*
315037	*1LDYSMT1*	*5.69*
315039	*1LDYSMT3*	*6.02*
315040	*1LDYSMT4*	*6.03*
315041	*1LDYSMT5*	*6.05*
315225	*1N ANNA1*	*49.22*
315226	*1N ANNA2*	*48.45*
315083	*1SPRUNCA*	*2.18*
315084	*1SPRUNCB*	*2.18*
315085	*1SPRUNCC*	*1.62*
315086	*1SPRUNCD*	*1.62*
315091	*1YORKTN2*	*32.04*
314309	*6IRON208*	*0.49*
314236	*6NRTHEST*	*0.24*
314251	*6S PUMP*	*1.08*

297087	*V2-040*	*0.15*
LTF	*Z2-067*	*16.9*
921092	*AA1-049 C*	*2.56*
LTF	*AA1-058*	*0.75*
921162	*AA1-063AC*	*8.35*
921172	*AA1-064 C*	*8.31*
921182	*AA1-067 C*	*1.6*
921292	*AA1-083*	*4.08*
921532	*AA1-132 C*	*7.9*
921542	*AA1-133 C*	*10.57*
921552	*AA1-134 C*	*10.32*
921562	*AA1-135 C*	*8.93*
921572	*AA1-138 C*	*10.12*
921582	*AA1-139 C*	*15.85*
921622	*AA1-145*	*69.42*
921752	*AA2-053 C*	*8.45*
921772	*AA2-059 C*	*2.44*
921862	*AA2-068 C*	*2.1*
LTF	*AA2-074*	*5.03*
921982	*AA2-088 C*	*6.48*
922512	*AA2-174 C*	*0.39*
922522	*AA2-177 C*	*10.89*
922532	*AA2-178 C*	*9.77*
922602	*AB1-013 C*	*2.95*
922672	*AB1-026 C*	*2.16*
922682	*AB1-027 C*	*2.84*
922722	*AB1-053 C*	*1.02*
922732	*AB1-054 C*	*6.84*
923262	*AB1-132 C OP*	*13.65*
923272	*AB1-135 C OP*	*2.8*
923572	*AB1-173 C OP*	*2.2*
923582	*AB1-173AC OP*	*2.2*
923801	*AB2-015 C OP*	*8.8*
923831	*AB2-022 C*	*2.42*
923841	*AB2-024 C*	*2.68*
923851	*AB2-025 C*	*2.51*
923861	*AB2-026 C*	*2.33*
923911	*AB2-031 C OP*	*2.18*
923981	*AB2-039 C OP*	*8.9*

923991	*AB2-040 C OP*	*7.17*
924061	*AB2-050*	*4.08*
924071	*AB2-051 C OP*	*146.07*
924241	*AB2-068 OP*	*219.92*
924381	*AB2-087 C*	*0.56*
924491	*AB2-098 C*	*0.53*
924501	*AB2-099 C*	*0.58*
924511	*AB2-100 C*	*11.22*
924761	*AB2-128 C*	*9.61*
924811	*AB2-134 C OP*	*13.97*
924931	*AB2-147 C*	*2.5*
924941	*AB2-149 C OP*	*3.58*
924951	*AB2-150 C OP*	*2.5*
924961	*AB2-152*	*2.94*
925051	*AB2-160 C OP*	*5.9*
925061	*AB2-161 C OP*	*3.6*
925121	*AB2-169 C OP*	*6.36*
925141	*AB2-171 C OP*	*4.96*
925171	*AB2-174 C OP*	*6.88*
925281	*AB2-186 C*	*0.64*
925291	*AB2-188 C OP*	*2.41*
925331	*AB2-190 C*	*24.9*
925361	*AC1-007 C OP*	*0.73*
925521	*AC1-027 C*	*2.13*
925691	*AC1-045 C*	*1.84*
925701	*AC1-046 C*	*1.84*
925711	*AC1-047 C*	*2.45*
925811	*AC1-060*	*2.71*
925821	*AC1-061*	*0.04*
925841	*AC1-063*	*0.42*
925861	*AC1-065 C*	*3.64*
926071	*AC1-086 C*	*20.1*
926201	*AC1-098 C*	*5.85*
926211	*AC1-099 C*	*1.96*
926291	*AC1-107 OP*	*331.95*
926411	*AC1-112 C*	*2.21*
926441	*AC1-115 C*	*1.15*
926471	*AC1-118 C*	*2.04*
926551	*AC1-134*	*10.21*

926591	*AC1-142 C*	*10.11*
926661	*AC1-147 C*	*2.4*
926741	*AC1-159 C*	*144.95*
926751	*AC1-161 C OP*	*32.47*
926771	*AC1-163 C*	*2.09*
926781	*AC1-164 C OP*	*45.81*
927041	*AC1-191 C*	*10.99*
927051	*AC1-193 C*	*3.64*
927141	*AC1-208 C*	*8.42*
927221	*AC1-216 C OP*	*10.66*

Appendix 10

(DVP - DVP) The 8MDLTHAN-8NO ANNA 500 kV line (from bus 314914 to bus 314918 ckt 1) loads from 115.7% to 118.08% (**DC power flow**) of its load dump rating (3144 MVA) for the line fault with failed breaker contingency outage of '557T574'. This project contributes approximately 77.6 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315102	*1BRUNSWICKG1*	*16.69*
315103	*1BRUNSWICKG2*	*16.69*
315104	*1BRUNSWICKG3*	*16.69*
315105	*1BRUNSWICKS1*	*34.68*
315108	*1ELIZAR1*	*6.49*
315109	*1ELIZAR2*	*6.37*
315110	*1ELIZAR3*	*6.57*
315073	*1STONECA*	*10.33*
315233	*1SURRY 2*	*51.44*
314784	*1WEYRHSB*	*3.47*
315091	*1YORKTN2*	*48.12*
314539	*3UNCAMP*	*4.08*
314541	*3WATKINS*	*1.15*
314189	*6PAPERMILL*	*8.9*
292791	*U1-032 E*	*5.38*
900672	*V4-068 E*	*0.49*
901082	*W1-029E*	*79.39*
907092	*X1-038 E*	*10.2*
913392	*Y1-086 E*	*3.79*
916042	*Z1-036 E*	*77.93*
916192	*Z1-068 E*	*3.29*
916301	*Z1-086 C*	*101.56*
916302	*Z1-086 E*	*16.82*

917122	*Z2-027 E*	*1.83*
917332	*Z2-043 E*	*1.62*
917342	*Z2-044 E*	*0.89*
LTF	*Z2-067*	*29.61*
917512	*Z2-088 E OP1*	*12.51*
917592	*Z2-099 E*	*0.73*
921092	*AA1-049 C*	*4.23*
921093	*AA1-049 E*	*1.99*
LTF	*AA1-058*	*1.31*
921162	*AA1-063AC*	*13.84*
921163	*AA1-063AE*	*6.53*
921172	*AA1-064 C*	*15.11*
921173	*AA1-064 E*	*7.11*
918512	*AA1-065 E OP*	*7.32*
921182	*AA1-067 C*	*2.69*
921183	*AA1-067 E*	*1.15*
918562	*AA1-072 E*	*0.27*
921532	*AA1-132 C*	*13.05*
921533	*AA1-132 E*	*5.59*
921542	*AA1-133 C*	*17.45*
921543	*AA1-133 E*	*7.48*
921552	*AA1-134 C*	*17.03*
921553	*AA1-134 E*	*7.3*
921562	*AA1-135 C*	*14.94*
921563	*AA1-135 E*	*6.4*
921572	*AA1-138 C*	*16.71*
921573	*AA1-138 E*	*7.16*
921582	*AA1-139 C*	*26.18*
921583	*AA1-139 E*	*11.22*
921752	*AA2-053 C*	*14.05*
921753	*AA2-053 E*	*6.03*
921762	*AA2-057 C*	*11.13*
921763	*AA2-057 E*	*5.56*
921772	*AA2-059 C*	*4.05*
921773	*AA2-059 E*	*1.86*
921862	*AA2-068 C*	*3.53*
921863	*AA2-068 E*	*1.62*
LTF	*AA2-074*	*8.78*
920022	*AA2-086 E*	*0.39*

921982	*AA2-088 C*	*10.7*
921983	*AA2-088 E*	*17.46*
922442	*AA2-165 C*	*1.52*
922443	*AA2-165 E*	*0.73*
922472	*AA2-169 C*	*3.42*
922473	*AA2-169 E*	*1.57*
922512	*AA2-174 C*	*0.64*
922513	*AA2-174 E*	*0.7*
922522	*AA2-177 C*	*15.76*
922523	*AA2-177 E*	*6.75*
922532	*AA2-178 C*	*16.21*
922533	*AA2-178 E*	*6.95*
922602	*AB1-013 C*	*4.89*
922603	*AB1-013 E*	*32.74*
922722	*AB1-053 C*	*1.71*
922723	*AB1-053 E*	*0.96*
922732	*AB1-054 C*	*11.3*
922733	*AB1-054 E*	*5.56*
922922	*AB1-081 C OP*	*13.69*
922923	*AB1-081 E OP*	*5.87*
923262	*AB1-132 C OP*	*22.66*
923263	*AB1-132 E OP*	*9.71*
923272	*AB1-135 C OP*	*3.4*
923273	*AB1-135 E OP*	*1.46*
923572	*AB1-173 C OP*	*3.64*
923573	*AB1-173 E OP*	*1.7*
923582	*AB1-173AC OP*	*3.64*
923583	*AB1-173AE OP*	*1.7*
923801	*AB2-015 C OP*	*14.47*
923802	*AB2-015 E OP*	*11.87*
923831	*AB2-022 C*	*4.*
923832	*AB2-022 E*	*2.15*
923841	*AB2-024 C*	*3.32*
923842	*AB2-024 E*	*1.49*
923851	*AB2-025 C*	*4.08*
923852	*AB2-025 E*	*1.83*
923861	*AB2-026 C*	*3.73*
923862	*AB2-026 E*	*1.68*
923911	*AB2-031 C OP*	*3.61*

923912	*AB2-031 E OP*	*1.78*
923941	*AB2-035 C*	*0.52*
923942	*AB2-035 E*	*0.22*
923981	*AB2-039 C OP*	*13.92*
923982	*AB2-039 E OP*	*11.26*
923991	*AB2-040 C OP*	*11.87*
923992	*AB2-040 E OP*	*9.71*
924021	*AB2-043 C OP*	*4.48*
924022	*AB2-043 E OP*	*7.34*
924071	*AB2-051 C OP*	*240.18*
924072	*AB2-051 E OP*	*32.98*
924151	*AB2-059 C OP*	*16.13*
924152	*AB2-059 E OP*	*8.31*
924161	*AB2-060 C OP*	*12.55*
924162	*AB2-060 E OP*	*5.9*
924241	*AB2-068 OP*	*335.5*
924301	*AB2-077 C OP*	*2.84*
924302	*AB2-077 E OP*	*1.89*
924311	*AB2-078 C OP*	*2.84*
924312	*AB2-078 E OP*	*1.89*
924321	*AB2-079 C OP*	*2.84*
924322	*AB2-079 E OP*	*1.89*
924381	*AB2-087 C*	*0.93*
924382	*AB2-087 E*	*0.44*
924391	*AB2-088 C*	*0.67*
924392	*AB2-088 E*	*0.32*
924401	*AB2-089 C*	*3.21*
924402	*AB2-089 E*	*1.65*
924411	*AB2-090 C*	*5.64*
924412	*AB2-090 E*	*2.89*
924491	*AB2-098 C*	*0.9*
924492	*AB2-098 E*	*0.38*
924501	*AB2-099 C*	*0.97*
924502	*AB2-099 E*	*0.41*
924511	*AB2-100 C*	*18.51*
924512	*AB2-100 E*	*9.12*
924761	*AB2-128 C*	*15.86*
924762	*AB2-128 E*	*6.24*
924811	*AB2-134 C OP*	*20.21*

924812	*AB2-134 E OP*	*27.02*
924931	*AB2-147 C*	*4.13*
924932	*AB2-147 E*	*6.74*
924941	*AB2-149 C OP*	*5.71*
924942	*AB2-149 E OP*	*9.32*
924951	*AB2-150 C OP*	*4.13*
924952	*AB2-150 E OP*	*6.74*
924961	*AB2-152*	*4.04*
925051	*AB2-160 C OP*	*8.36*
925052	*AB2-160 E OP*	*13.63*
925061	*AB2-161 C OP*	*5.63*
925062	*AB2-161 E OP*	*9.18*
925121	*AB2-169 C OP*	*10.62*
925122	*AB2-169 E OP*	*9.53*
925141	*AB2-171 C OP*	*8.17*
925142	*AB2-171 E OP*	*13.33*
925171	*AB2-174 C OP*	*11.37*
925172	*AB2-174 E OP*	*10.29*
925221	*AB2-176 C*	*2.32*
925222	*AB2-176 E*	*0.99*
925281	*AB2-186 C*	*1.05*
925282	*AB2-186 E*	*0.45*
925291	*AB2-188 C OP*	*3.99*
925292	*AB2-188 E OP*	*1.79*
925331	*AB2-190 C*	*36.02*
925332	*AB2-190 E*	*9.01*
925361	*AC1-007 C OP*	*1.16*
925362	*AC1-007 E OP*	*1.89*
925521	*AC1-027 C*	*3.51*
925522	*AC1-027 E*	*2.01*
925591	*AC1-034 C OP*	*10.62*
925592	*AC1-034 E OP*	*8.01*
925611	*AC1-036 C*	*1.32*
925612	*AC1-036 E*	*2.15*
925691	*AC1-045 C*	*2.96*
925692	*AC1-045 E*	*1.62*
925701	*AC1-046 C*	*3.04*
925702	*AC1-046 E*	*1.66*
925711	*AC1-047 C*	*4.04*

925712	*AC1-047 E*	*2.22*
925781	*AC1-054 C OP*	*10.93*
925782	*AC1-054 E OP*	*5.04*
925811	*AC1-060*	*3.37*
925821	*AC1-061*	*0.06*
925831	*AC1-062*	*0.43*
925841	*AC1-063*	*0.52*
925861	*AC1-065 C*	*4.51*
925862	*AC1-065 E*	*7.36*
926071	*AC1-086 C*	*33.37*
926072	*AC1-086 E*	*15.19*
926201	*AC1-098 C*	*9.8*
926202	*AC1-098 E*	*5.84*
926211	*AC1-099 C*	*3.28*
926212	*AC1-099 E*	*1.93*
926271	*AC1-105 C OP*	*7.93*
926272	*AC1-105 E OP*	*3.95*
926281	*AC1-106*	*3.72*
926291	*AC1-107 OP*	*506.42*
926661	*AC1-147 C*	*3.95*
926662	*AC1-147 E*	*2.32*
926741	*AC1-159 C*	*238.32*
926751	*AC1-161 C OP*	*54.39*
926752	*AC1-161 E OP*	*23.22*
926761	*AC1-162 C*	*38.38*
926762	*AC1-162 E*	*16.38*
926771	*AC1-163 C*	*3.48*
926772	*AC1-163 E*	*1.63*
926781	*AC1-164 C OP*	*69.89*
926782	*AC1-164 E OP*	*31.4*
927021	*AC1-189 C*	*13.57*
927022	*AC1-189 E*	*6.76*
927051	*AC1-193 C*	*5.99*
927052	*AC1-193 E*	*9.77*
927111	*AC1-206 C OP*	*19.2*
927112	*AC1-206 E OP*	*9.08*
927141	*AC1-208 C*	*14.15*
927142	*AC1-208 E*	*6.28*
927211	*AC1-215 C*	*16.11*

927212	*AC1-215 E*	*7.31*
927221	*AC1-216 C OP*	*15.42*
927222	*AC1-216 E OP*	*12.13*

Appendix 11

(DVP - DVP) The 8ELMONT 500/230 kV transformer (from bus 314218 to bus 314908 ckt 1) loads from 96.07% to 98.02% (**DC power flow**) of its load dump rating (1051 MVA) for the line fault with failed breaker contingency outage of 'H2T557'. This project contributes approximately 45.44 MW to the thermal violation.

CONTINGENCY '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*	*4.87*
315068	*1DARBY 2*	*4.87*
315069	*1DARBY 3*	*4.93*
315070	*1DARBY 4*	*4.93*
315043	*1FRIVERA*	*6.55*
315044	*1FRIVERB*	*5.07*
315045	*1FRIVERC*	*6.55*
315046	*1FRIVERD*	*5.07*
315047	*1FRIVERE*	*5.07*
315048	*1FRIVERF*	*6.55*
315073	*1STONECA*	*9.14*
314784	*1WEYRHSB*	*1.71*
315091	*1YORKTN2*	*31.74*
314539	*3UNCAMP*	*2.15*
314541	*3WATKINS*	*0.6*
314229	*6MT R221*	*1.42*
314236	*6NRTHEST*	*0.36*
314189	*6PAPERMILL*	*8.79*
314251	*6S PUMP*	*1.65*
315074	*CIR_AB2-152*	*11.02*
315075	*CIR_AB2-152*	*10.88*
292791	*U1-032 E*	*4.76*
297087	*V2-040*	*0.27*
900672	*V4-068 E*	*0.25*
901082	*W1-029E*	*41.21*
907092	*X1-038 E*	*5.37*
913392	*Y1-086 E*	*1.96*

916042	*Z1-036 E*	*40.01*
916192	*Z1-068 E*	*1.73*
917122	*Z2-027 E*	*0.95*
917592	*Z2-099 E*	*0.37*
921092	*AA1-049 C*	*2.19*
921093	*AA1-049 E*	*1.03*
921162	*AA1-063AC*	*6.94*
921163	*AA1-063AE*	*3.27*
918512	*AA1-065 E OP*	*3.65*
921292	*AA1-083*	*6.*
921532	*AA1-132 C*	*6.77*
921533	*AA1-132 E*	*2.9*
921542	*AA1-133 C*	*9.06*
921543	*AA1-133 E*	*3.88*
921552	*AA1-134 C*	*8.84*
921553	*AA1-134 E*	*3.79*
921572	*AA1-138 C*	*8.66*
921573	*AA1-138 E*	*3.71*
921582	*AA1-139 C*	*13.6*
921583	*AA1-139 E*	*5.83*
921622	*AA1-145*	*102.06*
921772	*AA2-059 C*	*2.07*
921773	*AA2-059 E*	*0.95*
920022	*AA2-086 E*	*0.2*
921982	*AA2-088 C*	*5.49*
921983	*AA2-088 E*	*8.96*
922522	*AA2-177 C*	*12.12*
922523	*AA2-177 E*	*5.19*
922532	*AA2-178 C*	*8.21*
922533	*AA2-178 E*	*3.52*
922602	*AB1-013 C*	*2.48*
922603	*AB1-013 E*	*16.58*
922672	*AB1-026 C*	*2.22*
922673	*AB1-026 E*	*0.95*
922682	*AB1-027 C*	*4.44*
922683	*AB1-027 E*	*1.9*
922722	*AB1-053 C*	*0.85*
922723	*AB1-053 E*	*0.48*
922732	*AB1-054 C*	*5.79*
922733	*AB1-054 E*	*2.85*
923262	*AB1-132 C OP*	*11.47*
923263	*AB1-132 E OP*	*4.92*
923272	*AB1-135 C OP*	*3.7*
923273	*AB1-135 E OP*	*1.58*
923572	*AB1-173 C OP*	*1.85*

923573	*AB1-173 E OP*	*0.86*
923582	*AB1-173AC OP*	*1.85*
923583	*AB1-173AE OP*	*0.86*
923801	*AB2-015 C OP*	*7.57*
923802	*AB2-015 E OP*	*6.21*
923831	*AB2-022 C*	*2.07*
923832	*AB2-022 E*	*1.11*
923841	*AB2-024 C*	*3.3*
923842	*AB2-024 E*	*1.48*
923851	*AB2-025 C*	*2.36*
923852	*AB2-025 E*	*1.06*
923861	*AB2-026 C*	*1.94*
923862	*AB2-026 E*	*0.87*
923911	*AB2-031 C OP*	*1.84*
923912	*AB2-031 E OP*	*0.9*
923981	*AB2-039 C OP*	*8.77*
923982	*AB2-039 E OP*	*7.09*
923991	*AB2-040 C OP*	*6.03*
923992	*AB2-040 E OP*	*4.93*
924061	*AB2-050*	*6.*
924071	*AB2-051 C OP*	*126.81*
924072	*AB2-051 E OP*	*17.41*
924241	*AB2-068 OP*	*175.54*
924381	*AB2-087 C*	*0.47*
924382	*AB2-087 E*	*0.22*
924501	*AB2-099 C*	*0.48*
924502	*AB2-099 E*	*0.21*
924511	*AB2-100 C*	*9.74*
924512	*AB2-100 E*	*4.8*
924761	*AB2-128 C*	*8.34*
924762	*AB2-128 E*	*3.28*
924811	*AB2-134 C OP*	*15.54*
924812	*AB2-134 E OP*	*20.78*
924931	*AB2-147 C*	*2.13*
924932	*AB2-147 E*	*3.48*
924941	*AB2-149 C OP*	*3.35*
924942	*AB2-149 E OP*	*5.46*
924951	*AB2-150 C OP*	*2.13*
924952	*AB2-150 E OP*	*3.48*
924961	*AB2-152*	*3.57*
925051	*AB2-160 C OP*	*7.*
925052	*AB2-160 E OP*	*11.42*
925061	*AB2-161 C OP*	*3.55*
925062	*AB2-161 E OP*	*5.78*
925141	*AB2-171 C OP*	*4.24*

925142	*AB2-171 E OP*	*6.92*
925171	*AB2-174 C OP*	*5.82*
925172	*AB2-174 E OP*	*5.26*
925281	*AB2-186 C*	*0.53*
925282	*AB2-186 E*	*0.23*
925291	*AB2-188 C OP*	*2.02*
925292	*AB2-188 E OP*	*0.91*
925331	*AB2-190 C*	*27.7*
925332	*AB2-190 E*	*6.93*
925361	*AC1-007 C OP*	*0.68*
925362	*AC1-007 E OP*	*1.11*
925521	*AC1-027 C*	*1.84*
925522	*AC1-027 E*	*1.05*
925691	*AC1-045 C*	*1.65*
925692	*AC1-045 E*	*0.9*
925701	*AC1-046 C*	*1.58*
925702	*AC1-046 E*	*0.86*
925711	*AC1-047 C*	*2.1*
925712	*AC1-047 E*	*1.16*
925811	*AC1-060*	*3.44*
925821	*AC1-061*	*0.05*
925841	*AC1-063*	*0.5*
925861	*AC1-065 C*	*4.34*
925862	*AC1-065 E*	*7.08*
926071	*AC1-086 C*	*16.89*
926072	*AC1-086 E*	*7.69*
926291	*AC1-107 OP*	*422.4*
926411	*AC1-112 C*	*3.46*
926412	*AC1-112 E*	*1.94*
926441	*AC1-115 C*	*1.03*
926442	*AC1-115 E*	*1.66*
926471	*AC1-118 C*	*2.09*
926472	*AC1-118 E*	*1.08*
926551	*AC1-134*	*15.01*
926591	*AC1-142 C*	*11.37*
926592	*AC1-142 E*	*8.58*
926661	*AC1-147 C*	*2.09*
926662	*AC1-147 E*	*1.23*
926741	*AC1-159 C*	*125.84*
926751	*AC1-161 C OP*	*31.85*
926752	*AC1-161 E OP*	*13.59*
926771	*AC1-163 C*	*1.74*
926772	*AC1-163 E*	*0.81*
926781	*AC1-164 C OP*	*58.29*
926782	*AC1-164 E OP*	*26.19*

927041	*AC1-191 C*	*17.62*
927042	*AC1-191 E*	*8.78*
927051	*AC1-193 C*	*3.11*
927052	*AC1-193 E*	*5.08*
927111	*AC1-206 C OP*	*9.6*
927112	*AC1-206 E OP*	*4.54*
927221	*AC1-216 C OP*	*9.08*
927222	*AC1-216 E OP*	*7.14*

Appendix 12

(DVP - DVP) The 6SKIFF CREEK-6KINGS M 230 kV line (from bus 314209 to bus 314386 ckt 1) loads from 114.73% to 115.83% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 10.79 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315099	*1CHESPKB*	*0.53*
315108	*1ELIZAR1*	*1.56*
315109	*1ELIZAR2*	*1.53*
315110	*1ELIZAR3*	*1.58*
315233	*1SURRY 2*	*16.08*
315091	*1YORKTN2*	*23.96*
315092	*1YORKTN3*	*22.11*
314421	*6WINCHST*	*0.12*
916191	*Z1-068 C*	*0.02*
921092	*AA1-049 C*	*0.99*
921532	*AA1-132 C*	*3.05*
921542	*AA1-133 C*	*4.09*
921552	*AA1-134 C*	*3.87*
921572	*AA1-138 C*	*3.66*
921582	*AA1-139 C*	*6.14*
921772	*AA2-059 C*	*0.87*
921982	*AA2-088 C*	*1.9*
922532	*AA2-178 C*	*3.34*
922602	*AB1-013 C*	*1.01*
923801	*AB2-015 C OP*	*2.77*
923831	*AB2-022 C*	*0.92*
924071	*AB2-051 C OP*	*56.77*
924241	*AB2-068 OP*	*103.46*
924941	*AB2-149 C OP*	*1.01*
925121	*AB2-169 C OP*	*1.97*
925141	*AB2-171 C OP*	*1.52*
925281	*AB2-186 C*	*0.22*

925291	*AB2-188 C OP*	*0.82*
925361	*AC1-007 C OP*	*0.33*
925521	*AC1-027 C*	*0.83*
925691	*AC1-045 C*	*0.75*
925701	*AC1-046 C*	*0.72*
925711	*AC1-047 C*	*0.95*
926661	*AC1-147 C*	*0.93*
926741	*AC1-159 C*	*56.33*
926751	*AC1-161 C OP*	*10.79*
927051	*AC1-193 C*	*1.12*
927221	*AC1-216 C OP*	*5.35*

Appendix 13

(DVP - DVP) The 6FRRIVER-6STJOHN 230 kV line (from bus 314212 to bus 314150 ckt 1) loads from 102.86% to 103.71% (**DC power flow**) of its emergency rating (749 MVA) for the single line contingency outage of 'LN 574'. This project contributes approximately 14.19 MW to the thermal violation.

CONTINGENCY '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*	*2.01*
315054	*1BELMED2*	*2.01*
315055	*1BELMED3*	*1.67*
315058	*1CHESTF3*	*2.11*
315059	*1CHESTF4*	*3.43*
315060	*1CHESTF5*	*6.91*
315061	*1CHESTG7*	*2.71*
315063	*1CHESTG8*	*2.69*
315062	*1CHESTS7*	*1.23*
315064	*1CHESTS8*	*1.37*
315067	*1DARBY 1*	*2.*
315068	*1DARBY 2*	*2.01*
315069	*1DARBY 3*	*2.03*
315070	*1DARBY 4*	*2.03*
315043	*1FRIVERA*	*6.62*
315044	*1FRIVERB*	*5.12*
315045	*1FRIVERC*	*6.62*
315046	*1FRIVERD*	*5.12*
315047	*1FRIVERE*	*5.12*
315048	*1FRIVERF*	*6.62*
315091	*1YORKTN2*	*14.*
314309	*6IRON208*	*0.28*
314236	*6NRTHEST*	*0.15*
314251	*6S PUMP*	*0.69*
315074	*CIR_AB2-152*	*4.64*
315075	*CIR_AB2-152*	*4.58*
297087	*V2-040*	*0.11*
921292	*AA1-083*	*6.06*
921622	*AA1-145*	*103.09*

922522	*AA2-177 C*	*5.21*
922682	*AB1-027 C*	*1.82*
923272	*AB1-135 C OP*	*1.47*
923841	*AB2-024 C*	*1.23*
923981	*AB2-039 C OP*	*3.9*
924061	*AB2-050*	*6.06*
924241	*AB2-068 OP*	*107.62*
924811	*AB2-134 C OP*	*6.68*
924961	*AB2-152*	*1.5*
925051	*AB2-160 C OP*	*2.95*
925061	*AB2-161 C OP*	*1.58*
925331	*AB2-190 C*	*11.92*
925811	*AC1-060*	*1.33*
925821	*AC1-061*	*0.02*
926291	*AC1-107 OP*	*168.1*
926411	*AC1-112 C*	*1.42*
926551	*AC1-134*	*15.16*
926751	*AC1-161 C OP*	*14.19*
926781	*AC1-164 C OP*	*23.2*
927041	*AC1-191 C*	*6.75*
927221	*AC1-216 C OP*	*5.*

Appendix 14

(DVP - DVP) The 6CHARCTY-6LAKESD 230 kV line (from bus 314225 to bus 314227 ckt 1) loads from 131.85% to 133.62% (**DC power flow**) of its load dump rating (459 MVA) for the tower line contingency outage of 'LN 208-259'. This project contributes approximately 17.99 MW to the thermal violation.

CONTINGENCY 'LN 208-259'
 OPEN BRANCH FROM BUS 314286 TO BUS 314309 CKT 1 /* 6CHSTF A 230.00 - 6IRON208 230.00
 OPEN BRANCH FROM BUS 314309 TO BUS 314338 CKT 1 /* 6IRON208 230.00 - 6SOUWEST 230.00
 OPEN BUS 314309 /* ISLAND
 OPEN BRANCH FROM BUS 314276 TO BUS 314287 CKT 1 /* 6BASIN 230.00 - 6CHSTF B 230.00
 END

Bus Number	*Bus Name*	*Full Contribution*
315065	*1CHESTF6*	*36.4*
315077	*1HOPHCF1*	*2.11*
315078	*1HOPHCF2*	*2.11*
315079	*1HOPHCF3*	*2.11*
315080	*1HOPHCF4*	*3.2*
315076	*1HOPPOLC*	*1.8*
315073	*1STONECA*	*5.67*
314784	*1WEYRHSB*	*0.65*
314539	*3UNCAMP*	*0.86*
314541	*3WATKINS*	*0.25*
314229	*6MT R221*	*-0.33*
315074	*CIR_AB2-152*	*6.83*
315075	*CIR_AB2-152*	*6.74*
292791	*U1-032 E*	*2.95*
900672	*V4-068 E*	*0.11*
901082	*W1-029E*	*13.48*
907092	*X1-038 E*	*2.15*
913392	*Y1-086 E*	*0.63*
914231	*Y2-077*	*0.85*
916042	*Z1-036 E*	*13.58*
916192	*Z1-068 E*	*0.53*
917122	*Z2-027 E*	*0.31*
917332	*Z2-043 E*	*0.34*
917342	*Z2-044 E*	*0.18*

917592	*Z2-099 E*	*0.16*
921162	*AA1-063AC*	*3.19*
921163	*AA1-063AE*	*1.51*
918512	*AA1-065 E OP*	*1.48*
918562	*AA1-072 E*	*0.06*
921552	*AA1-134 C*	*2.89*
921553	*AA1-134 E*	*1.24*
921562	*AA1-135 C*	*2.95*
921563	*AA1-135 E*	*1.26*
921572	*AA1-138 C*	*3.*
921573	*AA1-138 E*	*1.29*
921752	*AA2-053 C*	*3.25*
921753	*AA2-053 E*	*1.4*
921762	*AA2-057 C*	*2.34*
921763	*AA2-057 E*	*1.17*
921772	*AA2-059 C*	*0.72*
921773	*AA2-059 E*	*0.33*
921862	*AA2-068 C*	*0.76*
921863	*AA2-068 E*	*0.35*
920022	*AA2-086 E*	*0.09*
921982	*AA2-088 C*	*2.33*
921983	*AA2-088 E*	*3.8*
922442	*AA2-165 C*	*0.32*
922443	*AA2-165 E*	*0.15*
922472	*AA2-169 C*	*0.71*
922473	*AA2-169 E*	*0.33*
922512	*AA2-174 C*	*0.15*
922513	*AA2-174 E*	*0.16*
922522	*AA2-177 C*	*6.39*
922523	*AA2-177 E*	*2.74*
922532	*AA2-178 C*	*2.96*
922533	*AA2-178 E*	*1.27*
922602	*AB1-013 C*	*0.89*
922603	*AB1-013 E*	*5.97*
922722	*AB1-053 C*	*0.44*
922723	*AB1-053 E*	*0.25*
922732	*AB1-054 C*	*2.47*
922733	*AB1-054 E*	*1.21*
923262	*AB1-132 C OP*	*5.96*
923263	*AB1-132 E OP*	*2.56*
923572	*AB1-173 C OP*	*0.98*
923573	*AB1-173 E OP*	*0.46*
923582	*AB1-173AC OP*	*0.98*
923583	*AB1-173AE OP*	*0.46*
923801	*AB2-015 C OP*	*3.06*

923802	*AB2-015 E OP*	*2.51*
923831	*AB2-022 C*	*0.66*
923832	*AB2-022 E*	*0.35*
923851	*AB2-025 C*	*1.62*
923852	*AB2-025 E*	*0.73*
923911	*AB2-031 C OP*	*0.98*
923912	*AB2-031 E OP*	*0.48*
923981	*AB2-039 C OP*	*4.92*
923982	*AB2-039 E OP*	*3.98*
923991	*AB2-040 C OP*	*3.21*
923992	*AB2-040 E OP*	*2.63*
924071	*AB2-051 C OP*	*39.04*
924072	*AB2-051 E OP*	*5.36*
924381	*AB2-087 C*	*0.19*
924382	*AB2-087 E*	*0.09*
924501	*AB2-099 C*	*0.2*
924502	*AB2-099 E*	*0.09*
924511	*AB2-100 C*	*5.57*
924512	*AB2-100 E*	*2.74*
924761	*AB2-128 C*	*4.77*
924762	*AB2-128 E*	*1.88*
924811	*AB2-134 C OP*	*8.19*
924812	*AB2-134 E OP*	*10.95*
924931	*AB2-147 C*	*1.2*
924932	*AB2-147 E*	*1.96*
924941	*AB2-149 C OP*	*1.58*
924942	*AB2-149 E OP*	*2.59*
924951	*AB2-150 C OP*	*1.2*
924952	*AB2-150 E OP*	*1.96*
924961	*AB2-152*	*2.21*
925051	*AB2-160 C OP*	*4.18*
925052	*AB2-160 E OP*	*6.83*
925061	*AB2-161 C OP*	*1.99*
925062	*AB2-161 E OP*	*3.24*
925121	*AB2-169 C OP*	*2.01*
925122	*AB2-169 E OP*	*1.81*
925141	*AB2-171 C OP*	*1.75*
925142	*AB2-171 E OP*	*2.85*
925171	*AB2-174 C OP*	*3.17*
925172	*AB2-174 E OP*	*2.87*
925281	*AB2-186 C*	*0.18*
925282	*AB2-186 E*	*0.08*
925291	*AB2-188 C OP*	*0.73*
925292	*AB2-188 E OP*	*0.33*
925331	*AB2-190 C*	*14.6*

925332	*AB2-190 E*	*3.65*
925361	*AC1-007 C OP*	*0.22*
925362	*AC1-007 E OP*	*0.36*
925521	*AC1-027 C*	*0.57*
925522	*AC1-027 E*	*0.32*
925691	*AC1-045 C*	*0.53*
925692	*AC1-045 E*	*0.29*
925821	*AC1-061*	*0.03*
926071	*AC1-086 C*	*8.78*
926072	*AC1-086 E*	*4.*
926201	*AC1-098 C*	*2.1*
926202	*AC1-098 E*	*1.25*
926211	*AC1-099 C*	*0.7*
926212	*AC1-099 E*	*0.41*
926661	*AC1-147 C*	*0.65*
926662	*AC1-147 E*	*0.38*
926741	*AC1-159 C*	*38.74*
926751	*AC1-161 C OP*	*12.61*
926752	*AC1-161 E OP*	*5.38*
926771	*AC1-163 C*	*0.73*
926772	*AC1-163 E*	*0.34*
927051	*AC1-193 C*	*1.28*
927052	*AC1-193 E*	*2.09*
927111	*AC1-206 C OP*	*5.45*
927112	*AC1-206 E OP*	*2.58*
927141	*AC1-208 C*	*2.89*
927142	*AC1-208 E*	*1.28*

Appendix 15

(DVP - DVP) The 6MESSER-6CHARCTY 230 kV line (from bus 314228 to bus 314225 ckt 1) loads from 143.6% to 145.36% (**DC power flow**) of its load dump rating (459 MVA) for the tower line contingency outage of 'LN 208-259'. This project contributes approximately 17.99 MW to the thermal violation.

CONTINGENCY 'LN 208-259'
OPEN BRANCH FROM BUS 314286 TO BUS 314309 CKT 1 /* 6CHSTF A 230.00 - 6IRON208 230.00
OPEN BRANCH FROM BUS 314309 TO BUS 314338 CKT 1 /* 6IRON208 230.00 - 6SOUWEST 230.00
OPEN BUS 314309 /* ISLAND
OPEN BRANCH FROM BUS 314276 TO BUS 314287 CKT 1 /* 6BASIN 230.00 - 6CHSTF B 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315065	*1CHESTF6*	*36.4*
315077	*1HOPHCF1*	*2.11*
315078	*1HOPHCF2*	*2.11*
315079	*1HOPHCF3*	*2.11*
315080	*1HOPHCF4*	*3.2*
315076	*1HOPPOLC*	*1.8*
315073	*1STONECA*	*5.67*
314784	*1WEYRHSB*	*0.65*
314539	*3UNCAMP*	*0.86*
314541	*3WATKINS*	*0.25*
314229	*6MT R221*	*-0.33*
315074	*CIR_AB2-152*	*6.83*
315075	*CIR_AB2-152*	*6.74*
292791	*U1-032 E*	*2.95*
900672	*V4-068 E*	*0.11*
901082	*W1-029E*	*13.48*
907092	*X1-038 E*	*2.15*
913392	*Y1-086 E*	*0.63*
914231	*Y2-077*	*0.85*
916042	*Z1-036 E*	*13.58*
916192	*Z1-068 E*	*0.53*
917122	*Z2-027 E*	*0.31*
917332	*Z2-043 E*	*0.34*
917342	*Z2-044 E*	*0.18*

917592	*Z2-099 E*	*0.16*
921162	*AA1-063AC*	*3.19*
921163	*AA1-063AE*	*1.51*
918512	*AA1-065 E OP*	*1.48*
918562	*AA1-072 E*	*0.06*
921552	*AA1-134 C*	*2.89*
921553	*AA1-134 E*	*1.24*
921562	*AA1-135 C*	*2.95*
921563	*AA1-135 E*	*1.26*
921572	*AA1-138 C*	*3.*
921573	*AA1-138 E*	*1.29*
921752	*AA2-053 C*	*3.25*
921753	*AA2-053 E*	*1.4*
921762	*AA2-057 C*	*2.34*
921763	*AA2-057 E*	*1.17*
921772	*AA2-059 C*	*0.72*
921773	*AA2-059 E*	*0.33*
921862	*AA2-068 C*	*0.76*
921863	*AA2-068 E*	*0.35*
920022	*AA2-086 E*	*0.09*
921982	*AA2-088 C*	*2.33*
921983	*AA2-088 E*	*3.8*
922442	*AA2-165 C*	*0.32*
922443	*AA2-165 E*	*0.15*
922472	*AA2-169 C*	*0.71*
922473	*AA2-169 E*	*0.33*
922512	*AA2-174 C*	*0.15*
922513	*AA2-174 E*	*0.16*
922522	*AA2-177 C*	*6.39*
922523	*AA2-177 E*	*2.74*
922532	*AA2-178 C*	*2.96*
922533	*AA2-178 E*	*1.27*
922602	*AB1-013 C*	*0.89*
922603	*AB1-013 E*	*5.97*
922722	*AB1-053 C*	*0.44*
922723	*AB1-053 E*	*0.25*
922732	*AB1-054 C*	*2.47*
922733	*AB1-054 E*	*1.21*
923262	*AB1-132 C OP*	*5.96*
923263	*AB1-132 E OP*	*2.56*
923572	*AB1-173 C OP*	*0.98*
923573	*AB1-173 E OP*	*0.46*
923582	*AB1-173AC OP*	*0.98*
923583	*AB1-173AE OP*	*0.46*
923801	*AB2-015 C OP*	*3.06*

923802	*AB2-015 E OP*	*2.51*
923831	*AB2-022 C*	*0.66*
923832	*AB2-022 E*	*0.35*
923851	*AB2-025 C*	*1.62*
923852	*AB2-025 E*	*0.73*
923911	*AB2-031 C OP*	*0.98*
923912	*AB2-031 E OP*	*0.48*
923981	*AB2-039 C OP*	*4.92*
923982	*AB2-039 E OP*	*3.98*
923991	*AB2-040 C OP*	*3.21*
923992	*AB2-040 E OP*	*2.63*
924071	*AB2-051 C OP*	*39.04*
924072	*AB2-051 E OP*	*5.36*
924381	*AB2-087 C*	*0.19*
924382	*AB2-087 E*	*0.09*
924501	*AB2-099 C*	*0.2*
924502	*AB2-099 E*	*0.09*
924511	*AB2-100 C*	*5.57*
924512	*AB2-100 E*	*2.74*
924761	*AB2-128 C*	*4.77*
924762	*AB2-128 E*	*1.88*
924811	*AB2-134 C OP*	*8.19*
924812	*AB2-134 E OP*	*10.95*
924931	*AB2-147 C*	*1.2*
924932	*AB2-147 E*	*1.96*
924941	*AB2-149 C OP*	*1.58*
924942	*AB2-149 E OP*	*2.59*
924951	*AB2-150 C OP*	*1.2*
924952	*AB2-150 E OP*	*1.96*
924961	*AB2-152*	*2.21*
925051	*AB2-160 C OP*	*4.18*
925052	*AB2-160 E OP*	*6.83*
925061	*AB2-161 C OP*	*1.99*
925062	*AB2-161 E OP*	*3.24*
925121	*AB2-169 C OP*	*2.01*
925122	*AB2-169 E OP*	*1.81*
925141	*AB2-171 C OP*	*1.75*
925142	*AB2-171 E OP*	*2.85*
925171	*AB2-174 C OP*	*3.17*
925172	*AB2-174 E OP*	*2.87*
925281	*AB2-186 C*	*0.18*
925282	*AB2-186 E*	*0.08*
925291	*AB2-188 C OP*	*0.73*
925292	*AB2-188 E OP*	*0.33*
925331	*AB2-190 C*	*14.6*

925332	*AB2-190 E*	*3.65*
925361	*AC1-007 C OP*	*0.22*
925362	*AC1-007 E OP*	*0.36*
925521	*AC1-027 C*	*0.57*
925522	*AC1-027 E*	*0.32*
925691	*AC1-045 C*	*0.53*
925692	*AC1-045 E*	*0.29*
925821	*AC1-061*	*0.03*
926071	*AC1-086 C*	*8.78*
926072	*AC1-086 E*	*4.*
926201	*AC1-098 C*	*2.1*
926202	*AC1-098 E*	*1.25*
926211	*AC1-099 C*	*0.7*
926212	*AC1-099 E*	*0.41*
926661	*AC1-147 C*	*0.65*
926662	*AC1-147 E*	*0.38*
926741	*AC1-159 C*	*38.74*
926751	*AC1-161 C OP*	*12.61*
926752	*AC1-161 E OP*	*5.38*
926771	*AC1-163 C*	*0.73*
926772	*AC1-163 E*	*0.34*
927051	*AC1-193 C*	*1.28*
927052	*AC1-193 E*	*2.09*
927111	*AC1-206 C OP*	*5.45*
927112	*AC1-206 E OP*	*2.58*
927141	*AC1-208 C*	*2.89*
927142	*AC1-208 E*	*1.28*

Appendix 16

(DVP - DVP) The 6PRGEORG 230/115 kV transformer (from bus 314269 to bus 314291 ckt 1) loads from 115.82% to 120.76% (**DC power flow**) of its load dump rating (220 MVA) for the tower line contingency outage of 'LN 211-228'. This project contributes approximately 24.1 MW to the thermal violation.

CONTINGENCY '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*
315119	*1GRAVEL3*	*1.91*
315120	*1GRAVEL4*	*1.92*
315122	*1GRAVEL6*	*1.93*
315077	*1HOPHCF1*	*4.02*
315078	*1HOPHCF2*	*4.02*
315079	*1HOPHCF3*	*4.02*
315080	*1HOPHCF4*	*6.11*
315076	*1HOPPOLC*	*3.44*
315073	*1STONECA*	*10.81*
315116	*1SURRY 1*	*20.01*
315074	*CIR_AB2-152*	*13.03*
315075	*CIR_AB2-152*	*12.87*
292791	*U1-032 E*	*5.63*
914231	*Y2-077*	*1.62*
922522	*AA2-177 C*	*11.11*
922523	*AA2-177 E*	*4.76*
924811	*AB2-134 C OP*	*14.24*
924812	*AB2-134 E OP*	*19.04*
924961	*AB2-152*	*4.22*
925331	*AB2-190 C*	*25.38*
925332	*AB2-190 E*	*6.35*
925361	*AC1-007 C OP*	*0.2*
925362	*AC1-007 E OP*	*0.33*
926751	*AC1-161 C OP*	*16.89*

926752	*AC1-161 E OP*	*7.21*

Appendix 17

(DVP - DVP) The 6CHSTF A-6IRON208 230 kV line (from bus 314286 to bus 314309 ckt 1) loads from 103.21% to 104.07% (**DC power flow**) of its emergency rating (664 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 12.61 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315060	*1CHESTF5*	*15.65*
315061	*1CHESTG7*	*6.13*
315063	*1CHESTG8*	*6.08*
315062	*1CHESTS7*	*2.79*
315064	*1CHESTS8*	*3.11*
315077	*1HOPHCF1*	*1.76*
315078	*1HOPHCF2*	*1.76*
315079	*1HOPHCF3*	*1.76*
315080	*1HOPHCF4*	*2.67*
315076	*1HOPPOLC*	*1.5*
315091	*1YORKTN2*	*11.67*
314184	*3SHACKLE*	*0.34*
315074	*CIR_AB2-152*	*5.7*
315075	*CIR_AB2-152*	*5.63*
914231	*Y2-077*	*0.71*
921092	*AA1-049 C*	*0.69*
921532	*AA1-132 C*	*2.13*
921542	*AA1-133 C*	*2.85*
921582	*AA1-139 C*	*4.28*
922522	*AA2-177 C*	*5.69*
922672	*AB1-026 C*	*0.71*
923272	*AB1-135 C OP*	*1.62*
923841	*AB2-024 C*	*1.35*
923981	*AB2-039 C OP*	*2.61*
924071	*AB2-051 C OP*	*41.07*
924241	*AB2-068 OP*	*54.72*
924811	*AB2-134 C OP*	*7.29*

924941	*AB2-149 C OP*	*1.02*
924961	*AB2-152*	*1.85*
925051	*AB2-160 C OP*	*1.68*
925061	*AB2-161 C OP*	*1.06*
925331	*AB2-190 C*	*13.*
925361	*AC1-007 C OP*	*0.24*
925521	*AC1-027 C*	*0.59*
925691	*AC1-045 C*	*0.56*
925701	*AC1-046 C*	*0.5*
925711	*AC1-047 C*	*0.66*
925811	*AC1-060*	*1.16*
925821	*AC1-061*	*0.01*
925841	*AC1-063*	*0.19*
925861	*AC1-065 C*	*1.67*
926291	*AC1-107 OP*	*185.33*
926471	*AC1-118 C*	*0.67*
926591	*AC1-142 C*	*4.21*
926661	*AC1-147 C*	*0.68*
926741	*AC1-159 C*	*40.75*
926751	*AC1-161 C OP*	*12.61*
926781	*AC1-164 C OP*	*25.58*
927221	*AC1-216 C OP*	*2.83*

Appendix 18

(DVP - DVP) The 6CHSTF B-6MESSER 230 kV line (from bus 314287 to bus 314228 ckt 1) loads from 143.75% to 145.52% (**DC power flow**) of its load dump rating (459 MVA) for the tower line contingency outage of 'LN 208-259'. This project contributes approximately 17.99 MW to the thermal violation.

CONTINGENCY 'LN 208-259'
 OPEN BRANCH FROM BUS 314286 TO BUS 314309 CKT 1 /* 6CHSTF A 230.00 - 6IRON208 230.00
 OPEN BRANCH FROM BUS 314309 TO BUS 314338 CKT 1 /* 6IRON208 230.00 - 6SOUWEST 230.00
 OPEN BUS 314309 /* ISLAND
 OPEN BRANCH FROM BUS 314276 TO BUS 314287 CKT 1 /* 6BASIN 230.00 - 6CHSTF B 230.00
 END

Bus Number	*Bus Name*	*Full Contribution*
315065	*1CHESTF6*	*36.4*
315077	*1HOPHCF1*	*2.11*
315078	*1HOPHCF2*	*2.11*
315079	*1HOPHCF3*	*2.11*
315080	*1HOPHCF4*	*3.2*
315076	*1HOPPOLC*	*1.8*
315073	*1STONECA*	*5.67*
314784	*1WEYRHSB*	*0.65*
314539	*3UNCAMP*	*0.86*
314541	*3WATKINS*	*0.25*
314229	*6MT R221*	*-0.33*
315074	*CIR_AB2-152*	*6.83*
315075	*CIR_AB2-152*	*6.74*
292791	*U1-032 E*	*2.95*
900672	*V4-068 E*	*0.11*
901082	*W1-029E*	*13.48*
907092	*X1-038 E*	*2.15*
913392	*Y1-086 E*	*0.63*
914231	*Y2-077*	*0.85*
916042	*Z1-036 E*	*13.58*
916192	*Z1-068 E*	*0.53*
917122	*Z2-027 E*	*0.31*
917332	*Z2-043 E*	*0.34*
917342	*Z2-044 E*	*0.18*

917592	*Z2-099 E*	*0.16*
921162	*AA1-063AC*	*3.19*
921163	*AA1-063AE*	*1.51*
918512	*AA1-065 E OP*	*1.48*
918562	*AA1-072 E*	*0.06*
921552	*AA1-134 C*	*2.89*
921553	*AA1-134 E*	*1.24*
921562	*AA1-135 C*	*2.95*
921563	*AA1-135 E*	*1.26*
921572	*AA1-138 C*	*3.*
921573	*AA1-138 E*	*1.29*
921752	*AA2-053 C*	*3.25*
921753	*AA2-053 E*	*1.4*
921762	*AA2-057 C*	*2.34*
921763	*AA2-057 E*	*1.17*
921772	*AA2-059 C*	*0.72*
921773	*AA2-059 E*	*0.33*
921862	*AA2-068 C*	*0.76*
921863	*AA2-068 E*	*0.35*
920022	*AA2-086 E*	*0.09*
921982	*AA2-088 C*	*2.33*
921983	*AA2-088 E*	*3.8*
922442	*AA2-165 C*	*0.32*
922443	*AA2-165 E*	*0.15*
922472	*AA2-169 C*	*0.71*
922473	*AA2-169 E*	*0.33*
922512	*AA2-174 C*	*0.15*
922513	*AA2-174 E*	*0.16*
922522	*AA2-177 C*	*6.39*
922523	*AA2-177 E*	*2.74*
922532	*AA2-178 C*	*2.96*
922533	*AA2-178 E*	*1.27*
922602	*AB1-013 C*	*0.89*
922603	*AB1-013 E*	*5.97*
922722	*AB1-053 C*	*0.44*
922723	*AB1-053 E*	*0.25*
922732	*AB1-054 C*	*2.47*
922733	*AB1-054 E*	*1.21*
923262	*AB1-132 C OP*	*5.96*
923263	*AB1-132 E OP*	*2.56*
923572	*AB1-173 C OP*	*0.98*
923573	*AB1-173 E OP*	*0.46*
923582	*AB1-173AC OP*	*0.98*
923583	*AB1-173AE OP*	*0.46*
923801	*AB2-015 C OP*	*3.06*

923802	*AB2-015 E OP*	*2.51*
923831	*AB2-022 C*	*0.66*
923832	*AB2-022 E*	*0.35*
923851	*AB2-025 C*	*1.62*
923852	*AB2-025 E*	*0.73*
923911	*AB2-031 C OP*	*0.98*
923912	*AB2-031 E OP*	*0.48*
923981	*AB2-039 C OP*	*4.92*
923982	*AB2-039 E OP*	*3.98*
923991	*AB2-040 C OP*	*3.21*
923992	*AB2-040 E OP*	*2.63*
924071	*AB2-051 C OP*	*39.04*
924072	*AB2-051 E OP*	*5.36*
924381	*AB2-087 C*	*0.19*
924382	*AB2-087 E*	*0.09*
924501	*AB2-099 C*	*0.2*
924502	*AB2-099 E*	*0.09*
924511	*AB2-100 C*	*5.57*
924512	*AB2-100 E*	*2.74*
924761	*AB2-128 C*	*4.77*
924762	*AB2-128 E*	*1.88*
924811	*AB2-134 C OP*	*8.19*
924812	*AB2-134 E OP*	*10.95*
924931	*AB2-147 C*	*1.2*
924932	*AB2-147 E*	*1.96*
924941	*AB2-149 C OP*	*1.58*
924942	*AB2-149 E OP*	*2.59*
924951	*AB2-150 C OP*	*1.2*
924952	*AB2-150 E OP*	*1.96*
924961	*AB2-152*	*2.21*
925051	*AB2-160 C OP*	*4.18*
925052	*AB2-160 E OP*	*6.83*
925061	*AB2-161 C OP*	*1.99*
925062	*AB2-161 E OP*	*3.24*
925121	*AB2-169 C OP*	*2.01*
925122	*AB2-169 E OP*	*1.81*
925141	*AB2-171 C OP*	*1.75*
925142	*AB2-171 E OP*	*2.85*
925171	*AB2-174 C OP*	*3.17*
925172	*AB2-174 E OP*	*2.87*
925281	*AB2-186 C*	*0.18*
925282	*AB2-186 E*	*0.08*
925291	*AB2-188 C OP*	*0.73*
925292	*AB2-188 E OP*	*0.33*
925331	*AB2-190 C*	*14.6*

925332	*AB2-190 E*	*3.65*
925361	*AC1-007 C OP*	*0.22*
925362	*AC1-007 E OP*	*0.36*
925521	*AC1-027 C*	*0.57*
925522	*AC1-027 E*	*0.32*
925691	*AC1-045 C*	*0.53*
925692	*AC1-045 E*	*0.29*
925821	*AC1-061*	*0.03*
926071	*AC1-086 C*	*8.78*
926072	*AC1-086 E*	*4.*
926201	*AC1-098 C*	*2.1*
926202	*AC1-098 E*	*1.25*
926211	*AC1-099 C*	*0.7*
926212	*AC1-099 E*	*0.41*
926661	*AC1-147 C*	*0.65*
926662	*AC1-147 E*	*0.38*
926741	*AC1-159 C*	*38.74*
926751	*AC1-161 C OP*	*12.61*
926752	*AC1-161 E OP*	*5.38*
926771	*AC1-163 C*	*0.73*
926772	*AC1-163 E*	*0.34*
927051	*AC1-193 C*	*1.28*
927052	*AC1-193 E*	*2.09*
927111	*AC1-206 C OP*	*5.45*
927112	*AC1-206 E OP*	*2.58*
927141	*AC1-208 C*	*2.89*
927142	*AC1-208 E*	*1.28*

Appendix 19

(DVP - DVP) The 6CHSTF B-6BASIN 230 kV line (from bus 314287 to bus 314276 ckt 1) loads from 122.8% to 124.15% (**DC power flow**) of its emergency rating (449 MVA) for the single line contingency outage of 'LN 563'. This project contributes approximately 13.5 MW to the thermal violation.

CONTINGENCY '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*	*36.72*
315141	*1GASTONB*	*1.76*
315119	*1GRAVEL3*	*1.4*
315120	*1GRAVEL4*	*1.41*
315121	*1GRAVEL5*	*1.38*
315122	*1GRAVEL6*	*1.41*
315117	*1GRAVELC*	*0.48*
315077	*1HOPHCF1*	*1.97*
315078	*1HOPHCF2*	*1.97*
315079	*1HOPHCF3*	*1.97*
315080	*1HOPHCF4*	*3.*
315076	*1HOPPOLC*	*1.69*
315116	*1SURRY 1*	*14.62*
314314	*3LOCKS*	*0.96*
315074	*CIR_AB2-152*	*6.4*
315075	*CIR_AB2-152*	*6.31*
914231	*Y2-077*	*0.79*
921092	*AA1-049 C*	*0.86*
921162	*AA1-063AC*	*3.8*
921182	*AA1-067 C*	*0.65*
921532	*AA1-132 C*	*2.65*
921542	*AA1-133 C*	*3.53*
921552	*AA1-134 C*	*3.61*
921562	*AA1-135 C*	*3.65*
921572	*AA1-138 C*	*3.7*
921582	*AA1-139 C*	*5.29*
921752	*AA2-053 C*	*3.88*
921762	*AA2-057 C*	*2.89*
921772	*AA2-059 C*	*0.89*

921862	*AA2-068 C*	*0.93*
921982	*AA2-088 C*	*2.79*
922442	*AA2-165 C*	*0.39*
922472	*AA2-169 C*	*0.86*
922512	*AA2-174 C*	*0.18*
922522	*AA2-177 C*	*6.22*
922532	*AA2-178 C*	*3.67*
922602	*AB1-013 C*	*1.11*
922722	*AB1-053 C*	*0.52*
922732	*AB1-054 C*	*2.95*
922922	*AB1-081 C OP*	*3.46*
923262	*AB1-132 C OP*	*7.*
923572	*AB1-173 C OP*	*1.14*
923582	*AB1-173AC OP*	*1.14*
923801	*AB2-015 C OP*	*3.66*
923831	*AB2-022 C*	*0.83*
923851	*AB2-025 C*	*1.79*
923911	*AB2-031 C OP*	*1.14*
923941	*AB2-035 C*	*0.13*
923981	*AB2-039 C OP*	*5.27*
923991	*AB2-040 C OP*	*3.73*
924071	*AB2-051 C OP*	*48.75*
924151	*AB2-059 C OP*	*4.08*
924381	*AB2-087 C*	*0.24*
924391	*AB2-088 C*	*0.17*
924491	*AB2-098 C*	*0.22*
924501	*AB2-099 C*	*0.25*
924511	*AB2-100 C*	*6.4*
924761	*AB2-128 C*	*5.48*
924811	*AB2-134 C OP*	*7.98*
924931	*AB2-147 C*	*1.38*
924941	*AB2-149 C OP*	*1.77*
924951	*AB2-150 C OP*	*1.38*
924961	*AB2-152*	*2.07*
925051	*AB2-160 C OP*	*3.86*
925061	*AB2-161 C OP*	*2.13*
925121	*AB2-169 C OP*	*2.51*
925141	*AB2-171 C OP*	*2.09*
925171	*AB2-174 C OP*	*3.67*
925281	*AB2-186 C*	*0.23*
925291	*AB2-188 C OP*	*0.9*
925331	*AB2-190 C*	*14.23*
925361	*AC1-007 C OP*	*0.25*
925521	*AC1-027 C*	*0.71*
925591	*AC1-034 C OP*	*2.65*

925691	*AC1-045 C*	*0.64*
925701	*AC1-046 C*	*0.61*
925711	*AC1-047 C*	*0.81*
925781	*AC1-054 C OP*	*2.67*
925821	*AC1-061*	*0.03*
926071	*AC1-086 C*	*10.31*
926201	*AC1-098 C*	*2.56*
926211	*AC1-099 C*	*0.86*
926661	*AC1-147 C*	*0.81*
926741	*AC1-159 C*	*48.37*
926751	*AC1-161 C OP*	*13.5*
926771	*AC1-163 C*	*0.88*
927021	*AC1-189 C*	*3.31*
927051	*AC1-193 C*	*1.53*
927141	*AC1-208 C*	*3.58*

Appendix 20

(DVP - DVP) The 6PENNIMAN-6WALR209 230 kV line (from bus 314296 to bus 314415 ckt 1) loads from 102.42% to 103.52% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 10.79 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315099	*1CHESPKB*	*0.53*
315108	*1ELIZAR1*	*1.56*
315109	*1ELIZAR2*	*1.53*
315110	*1ELIZAR3*	*1.58*
315233	*1SURRY 2*	*16.08*
315091	*1YORKTN2*	*23.96*
315092	*1YORKTN3*	*22.11*
314421	*6WINCHST*	*0.12*
916191	*Z1-068 C*	*0.02*
921092	*AA1-049 C*	*0.99*
921532	*AA1-132 C*	*3.05*
921542	*AA1-133 C*	*4.09*
921552	*AA1-134 C*	*3.87*
921572	*AA1-138 C*	*3.66*
921582	*AA1-139 C*	*6.14*
921772	*AA2-059 C*	*0.87*
921982	*AA2-088 C*	*1.9*
922532	*AA2-178 C*	*3.34*
922602	*AB1-013 C*	*1.01*
923801	*AB2-015 C OP*	*2.77*
923831	*AB2-022 C*	*0.92*
924071	*AB2-051 C OP*	*56.77*
924241	*AB2-068 OP*	*103.46*
924941	*AB2-149 C OP*	*1.01*
925121	*AB2-169 C OP*	*1.97*
925141	*AB2-171 C OP*	*1.52*
925281	*AB2-186 C*	*0.22*

925291	*AB2-188 C OP*	*0.82*
925361	*AC1-007 C OP*	*0.33*
925521	*AC1-027 C*	*0.83*
925691	*AC1-045 C*	*0.75*
925701	*AC1-046 C*	*0.72*
925711	*AC1-047 C*	*0.95*
926661	*AC1-147 C*	*0.93*
926741	*AC1-159 C*	*56.33*
926751	*AC1-161 C OP*	*10.79*
927051	*AC1-193 C*	*1.12*
927221	*AC1-216 C OP*	*5.35*

Appendix 21

(DVP - DVP) The 6KINGS M-6PENNIMAN 230 kV line (from bus 314386 to bus 314296 ckt 1) loads from 106.29% to 107.39% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 10.79 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315099	*1CHESPKB*	*0.53*
315108	*1ELIZAR1*	*1.56*
315109	*1ELIZAR2*	*1.53*
315110	*1ELIZAR3*	*1.58*
315233	*1SURRY 2*	*16.08*
315091	*1YORKTN2*	*23.96*
315092	*1YORKTN3*	*22.11*
314421	*6WINCHST*	*0.12*
916191	*Z1-068 C*	*0.02*
921092	*AA1-049 C*	*0.99*
921532	*AA1-132 C*	*3.05*
921542	*AA1-133 C*	*4.09*
921552	*AA1-134 C*	*3.87*
921572	*AA1-138 C*	*3.66*
921582	*AA1-139 C*	*6.14*
921772	*AA2-059 C*	*0.87*
921982	*AA2-088 C*	*1.9*
922532	*AA2-178 C*	*3.34*
922602	*AB1-013 C*	*1.01*
923801	*AB2-015 C OP*	*2.77*
923831	*AB2-022 C*	*0.92*
924071	*AB2-051 C OP*	*56.77*
924241	*AB2-068 OP*	*103.46*
924941	*AB2-149 C OP*	*1.01*
925121	*AB2-169 C OP*	*1.97*
925141	*AB2-171 C OP*	*1.52*
925281	*AB2-186 C*	*0.22*

925291	*AB2-188 C OP*	*0.82*
925361	*AC1-007 C OP*	*0.33*
925521	*AC1-027 C*	*0.83*
925691	*AC1-045 C*	*0.75*
925701	*AC1-046 C*	*0.72*
925711	*AC1-047 C*	*0.95*
926661	*AC1-147 C*	*0.93*
926741	*AC1-159 C*	*56.33*
926751	*AC1-161 C OP*	*10.79*
927051	*AC1-193 C*	*1.12*
927221	*AC1-216 C OP*	*5.35*

Appendix 22

(DVP - DVP) The 8CARSON-8MDLTHAN 500 kV line (from bus 314902 to bus 314914 ckt 1) loads from 100.51% to 101.4% (**DC power flow**) of its load dump rating (3144 MVA) for the line fault with failed breaker contingency outage of '557T574'. This project contributes approximately 62.16 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315102	*1BRUNSWICKG1*	*18.63*
315103	*1BRUNSWICKG2*	*18.63*
315104	*1BRUNSWICKG3*	*18.63*
315105	*1BRUNSWICKS1*	*38.71*
315108	*1ELIZAR1*	*6.43*
315109	*1ELIZAR2*	*6.32*
315110	*1ELIZAR3*	*6.51*
315233	*1SURRY 2*	*51.63*
314784	*1WEYRHSB*	*3.37*
315091	*1YORKTN2*	*41.85*
314539	*3UNCAMP*	*3.89*
314541	*3WATKINS*	*1.1*
900672	*V4-068 E*	*0.47*
901082	*W1-029E*	*77.53*
907092	*X1-038 E*	*9.72*
913392	*Y1-086 E*	*3.71*
916042	*Z1-036 E*	*76.04*
916191	*Z1-068 C*	*0.09*
916192	*Z1-068 E*	*3.23*
916301	*Z1-086 C*	*113.67*
916302	*Z1-086 E*	*18.56*
917122	*Z2-027 E*	*1.8*
917332	*Z2-043 E*	*1.55*
917342	*Z2-044 E*	*0.86*
LTF	*Z2-067*	*29.5*

917512	*Z2-088 E OP1*	*12.18*
917592	*Z2-099 E*	*0.69*
921092	*AA1-049 C*	*4.15*
921093	*AA1-049 E*	*1.95*
LTF	*AA1-058*	*1.3*
921162	*AA1-063AC*	*13.06*
921163	*AA1-063AE*	*6.16*
921172	*AA1-064 C*	*16.19*
921173	*AA1-064 E*	*7.62*
918512	*AA1-065 E OP*	*7.07*
921182	*AA1-067 C*	*2.62*
921183	*AA1-067 E*	*1.12*
918562	*AA1-072 E*	*0.26*
921532	*AA1-132 C*	*12.82*
921533	*AA1-132 E*	*5.5*
921542	*AA1-133 C*	*17.16*
921543	*AA1-133 E*	*7.35*
921552	*AA1-134 C*	*16.63*
921553	*AA1-134 E*	*7.13*
921562	*AA1-135 C*	*14.48*
921563	*AA1-135 E*	*6.2*
921572	*AA1-138 C*	*16.22*
921573	*AA1-138 E*	*6.95*
921582	*AA1-139 C*	*25.74*
921583	*AA1-139 E*	*11.03*
921752	*AA2-053 C*	*13.27*
921753	*AA2-053 E*	*5.7*
921762	*AA2-057 C*	*10.71*
921763	*AA2-057 E*	*5.36*
921772	*AA2-059 C*	*3.94*
921773	*AA2-059 E*	*1.81*
921862	*AA2-068 C*	*3.38*
921863	*AA2-068 E*	*1.55*
LTF	*AA2-074*	*8.75*
920022	*AA2-086 E*	*0.37*
921982	*AA2-088 C*	*10.17*
921983	*AA2-088 E*	*16.59*
922442	*AA2-165 C*	*1.46*
922443	*AA2-165 E*	*0.71*
922472	*AA2-169 C*	*3.17*
922473	*AA2-169 E*	*1.46*
922512	*AA2-174 C*	*0.61*
922513	*AA2-174 E*	*0.66*
922522	*AA2-177 C*	*11.55*
922523	*AA2-177 E*	*4.95*

922532	*AA2-178 C*	*15.77*
922533	*AA2-178 E*	*6.76*
922602	*AB1-013 C*	*4.76*
922603	*AB1-013 E*	*31.85*
922722	*AB1-053 C*	*1.61*
922723	*AB1-053 E*	*0.91*
922732	*AB1-054 C*	*10.73*
922733	*AB1-054 E*	*5.29*
922922	*AB1-081 C OP*	*13.3*
922923	*AB1-081 E OP*	*5.7*
923262	*AB1-132 C OP*	*21.34*
923263	*AB1-132 E OP*	*9.14*
923572	*AB1-173 C OP*	*3.37*
923573	*AB1-173 E OP*	*1.57*
923582	*AB1-173AC OP*	*3.37*
923583	*AB1-173AE OP*	*1.57*
923801	*AB2-015 C OP*	*13.78*
923802	*AB2-015 E OP*	*11.3*
923831	*AB2-022 C*	*3.92*
923832	*AB2-022 E*	*2.11*
923851	*AB2-025 C*	*3.66*
923852	*AB2-025 E*	*1.64*
923911	*AB2-031 C OP*	*3.35*
923912	*AB2-031 E OP*	*1.65*
923941	*AB2-035 C*	*0.51*
923942	*AB2-035 E*	*0.22*
923981	*AB2-039 C OP*	*12.03*
923982	*AB2-039 E OP*	*9.72*
923991	*AB2-040 C OP*	*11.*
923992	*AB2-040 E OP*	*9.*
924021	*AB2-043 C OP*	*3.92*
924022	*AB2-043 E OP*	*6.43*
924071	*AB2-051 C OP*	*234.79*
924072	*AB2-051 E OP*	*32.24*
924151	*AB2-059 C OP*	*15.68*
924152	*AB2-059 E OP*	*8.08*
924241	*AB2-068 OP*	*332.15*
924301	*AB2-077 C OP*	*2.5*
924302	*AB2-077 E OP*	*1.67*
924311	*AB2-078 C OP*	*2.5*
924312	*AB2-078 E OP*	*1.67*
924321	*AB2-079 C OP*	*2.5*
924322	*AB2-079 E OP*	*1.67*
924381	*AB2-087 C*	*0.9*
924382	*AB2-087 E*	*0.42*

924391	*AB2-088 C*	*0.65*
924392	*AB2-088 E*	*0.31*
924401	*AB2-089 C*	*2.95*
924402	*AB2-089 E*	*1.52*
924411	*AB2-090 C*	*4.94*
924412	*AB2-090 E*	*2.53*
924491	*AB2-098 C*	*0.87*
924492	*AB2-098 E*	*0.37*
924501	*AB2-099 C*	*0.93*
924502	*AB2-099 E*	*0.4*
924511	*AB2-100 C*	*17.17*
924512	*AB2-100 E*	*8.46*
924761	*AB2-128 C*	*14.71*
924762	*AB2-128 E*	*5.79*
924811	*AB2-134 C OP*	*14.81*
924812	*AB2-134 E OP*	*19.8*
924931	*AB2-147 C*	*3.78*
924932	*AB2-147 E*	*6.17*
924941	*AB2-149 C OP*	*5.19*
924942	*AB2-149 E OP*	*8.47*
924951	*AB2-150 C OP*	*3.78*
924952	*AB2-150 E OP*	*6.17*
925061	*AB2-161 C OP*	*4.86*
925062	*AB2-161 E OP*	*7.93*
925121	*AB2-169 C OP*	*10.33*
925122	*AB2-169 E OP*	*9.27*
925141	*AB2-171 C OP*	*7.77*
925142	*AB2-171 E OP*	*12.68*
925171	*AB2-174 C OP*	*10.5*
925172	*AB2-174 E OP*	*9.5*
925221	*AB2-176 C*	*2.03*
925222	*AB2-176 E*	*0.87*
925281	*AB2-186 C*	*1.01*
925282	*AB2-186 E*	*0.43*
925291	*AB2-188 C OP*	*3.89*
925292	*AB2-188 E OP*	*1.75*
925331	*AB2-190 C*	*26.4*
925332	*AB2-190 E*	*6.6*
925361	*AC1-007 C OP*	*1.04*
925362	*AC1-007 E OP*	*1.7*
925521	*AC1-027 C*	*3.44*
925522	*AC1-027 E*	*1.96*
925591	*AC1-034 C OP*	*10.15*
925592	*AC1-034 E OP*	*7.66*
925691	*AC1-045 C*	*2.81*

925692	*AC1-045 E*	*1.53*
925701	*AC1-046 C*	*3.*
925702	*AC1-046 E*	*1.64*
925711	*AC1-047 C*	*3.98*
925712	*AC1-047 E*	*2.19*
925781	*AC1-054 C OP*	*10.12*
925782	*AC1-054 E OP*	*4.66*
926071	*AC1-086 C*	*31.42*
926072	*AC1-086 E*	*14.3*
926201	*AC1-098 C*	*9.4*
926202	*AC1-098 E*	*5.6*
926211	*AC1-099 C*	*3.15*
926212	*AC1-099 E*	*1.85*
926271	*AC1-105 C OP*	*8.94*
926272	*AC1-105 E OP*	*4.45*
926281	*AC1-106*	*3.26*
926661	*AC1-147 C*	*3.85*
926662	*AC1-147 E*	*2.26*
926741	*AC1-159 C*	*232.98*
926751	*AC1-161 C OP*	*43.56*
926752	*AC1-161 E OP*	*18.6*
926771	*AC1-163 C*	*3.33*
926772	*AC1-163 E*	*1.56*
927021	*AC1-189 C*	*13.21*
927022	*AC1-189 E*	*6.58*
927051	*AC1-193 C*	*5.7*
927052	*AC1-193 E*	*9.3*
927111	*AC1-206 C OP*	*16.96*
927112	*AC1-206 E OP*	*8.02*
927141	*AC1-208 C*	*13.4*
927142	*AC1-208 E*	*5.95*
927211	*AC1-215 C*	*13.62*
927212	*AC1-215 E*	*6.18*
927221	*AC1-216 C OP*	*17.18*
927222	*AC1-216 E OP*	*13.51*
927251	*AC1-221 C*	*4.23*
927252	*AC1-221 E*	*2.27*
927261	*AC1-222 C*	*6.37*
927262	*AC1-222 E*	*3.09*

Appendix 23

(DVP - DVP) The 8CHANCE-8BRISTER 500 kV line (from bus 314905 to bus 314900 ckt 1) loads from 115.68% to 116.25% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 594'. This project contributes approximately 31.89 MW to the thermal violation.

CONTINGENCY 'LN 594'
OPEN BRANCH FROM BUS 314916 TO BUS 314934 CKT 1 /* 8MORRSVL 500.00 - 8SPOTSYL 500.00
END

Bus Number	*Bus Name*	*Full Contribution*
315053	*1BELMED1*	*3.56*
315054	*1BELMED2*	*3.56*
315055	*1BELMED3*	*2.96*
315067	*1DARBY 1*	*3.24*
315068	*1DARBY 2*	*3.25*
315069	*1DARBY 3*	*3.29*
315070	*1DARBY 4*	*3.29*
315043	*1FRIVERA*	*4.37*
315044	*1FRIVERB*	*3.38*
315045	*1FRIVERC*	*4.37*
315046	*1FRIVERD*	*3.38*
315047	*1FRIVERE*	*3.38*
315048	*1FRIVERF*	*4.37*
315225	*1N ANNA1*	*49.21*
315226	*1N ANNA2*	*48.45*
315083	*1SPRUNCA*	*2.18*
315084	*1SPRUNCB*	*2.18*
315085	*1SPRUNCC*	*1.62*
315086	*1SPRUNCD*	*1.62*
315091	*1YORKTN2*	*31.54*
314309	*6IRON208*	*0.49*
314236	*6NRTHEST*	*0.24*
314251	*6S PUMP*	*1.07*
315074	*CIR_AB2-152*	*8.94*
315075	*CIR_AB2-152*	*8.82*
297087	*V2-040*	*0.15*
LTF	*Z2-067*	*16.78*
921092	*AA1-049 C*	*2.52*
LTF	*AA1-058*	*0.75*

921162	*AA1-063AC*	*8.25*
921172	*AA1-064 C*	*8.22*
921182	*AA1-067 C*	*1.58*
921292	*AA1-083*	*4.01*
921532	*AA1-132 C*	*7.79*
921542	*AA1-133 C*	*10.41*
921552	*AA1-134 C*	*10.17*
921562	*AA1-135 C*	*8.82*
921572	*AA1-138 C*	*9.98*
921582	*AA1-139 C*	*15.62*
921622	*AA1-145*	*68.09*
921752	*AA2-053 C*	*8.35*
921772	*AA2-059 C*	*2.41*
921862	*AA2-068 C*	*2.08*
LTF	*AA2-074*	*4.99*
921982	*AA2-088 C*	*6.4*
922512	*AA2-174 C*	*0.38*
922522	*AA2-177 C*	*10.72*
922532	*AA2-178 C*	*9.64*
922602	*AB1-013 C*	*2.91*
922672	*AB1-026 C*	*2.11*
922682	*AB1-027 C*	*2.79*
922722	*AB1-053 C*	*1.01*
922732	*AB1-054 C*	*6.75*
923262	*AB1-132 C OP*	*13.48*
923272	*AB1-135 C OP*	*2.75*
923572	*AB1-173 C OP*	*2.18*
923582	*AB1-173AC OP*	*2.18*
923801	*AB2-015 C OP*	*8.68*
923831	*AB2-022 C*	*2.38*
923841	*AB2-024 C*	*2.64*
923851	*AB2-025 C*	*2.47*
923861	*AB2-026 C*	*2.33*
923911	*AB2-031 C OP*	*2.16*
923981	*AB2-039 C OP*	*8.77*
923991	*AB2-040 C OP*	*7.09*
924061	*AB2-050*	*4.01*
924071	*AB2-051 C OP*	*143.92*
924241	*AB2-068 OP*	*216.09*
924381	*AB2-087 C*	*0.55*
924491	*AB2-098 C*	*0.53*
924501	*AB2-099 C*	*0.57*
924511	*AB2-100 C*	*11.08*
924761	*AB2-128 C*	*9.49*
924811	*AB2-134 C OP*	*13.75*

924931	*AB2-147 C*	*2.48*
924941	*AB2-149 C OP*	*3.52*
924951	*AB2-150 C OP*	*2.48*
924961	*AB2-152*	*2.9*
925051	*AB2-160 C OP*	*5.81*
925061	*AB2-161 C OP*	*3.55*
925121	*AB2-169 C OP*	*6.28*
925141	*AB2-171 C OP*	*4.9*
925171	*AB2-174 C OP*	*6.8*
925281	*AB2-186 C*	*0.62*
925291	*AB2-188 C OP*	*2.38*
925331	*AB2-190 C*	*24.51*
925361	*AC1-007 C OP*	*0.71*
925521	*AC1-027 C*	*2.1*
925691	*AC1-045 C*	*1.81*
925701	*AC1-046 C*	*1.82*
925711	*AC1-047 C*	*2.41*
925811	*AC1-060*	*2.66*
925821	*AC1-061*	*0.04*
925841	*AC1-063*	*0.41*
925861	*AC1-065 C*	*3.58*
926001	*AC1-076 C*	*4.69*
926071	*AC1-086 C*	*19.86*
926201	*AC1-098 C*	*5.78*
926211	*AC1-099 C*	*1.94*
926291	*AC1-107 OP*	*314.58*
926411	*AC1-112 C*	*2.17*
926441	*AC1-115 C*	*1.12*
926471	*AC1-118 C*	*1.99*
926551	*AC1-134*	*10.01*
926591	*AC1-142 C*	*9.93*
926661	*AC1-147 C*	*2.37*
926731	*AC1-158 C*	*88.45*
926741	*AC1-159 C*	*142.81*
926751	*AC1-161 C OP*	*31.89*
926771	*AC1-163 C*	*2.07*
926781	*AC1-164 C OP*	*43.41*
927041	*AC1-191 C*	*10.24*
927051	*AC1-193 C*	*3.59*
927221	*AC1-216 C OP*	*10.85*

Appendix 24

(DVP - DVP) The 8ELMONT-8LDYSMTH 500 kV line (from bus 314908 to bus 314911 ckt 1) loads from 137.58% to 138.57% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 576'. This project contributes approximately 53.66 MW to the thermal violation.

CONTINGENCY 'LN 576'
 OPEN BRANCH FROM BUS 314322 TO BUS 314914 CKT 1 /* 6MDLTHAN 230.00 - 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*
315058	*1CHESTF3*	*6.24*
315059	*1CHESTF4*	*10.12*
315060	*1CHESTF5*	*21.46*
315061	*1CHESTG7*	*8.41*
315063	*1CHESTG8*	*8.34*
315062	*1CHESTS7*	*3.82*
315064	*1CHESTS8*	*4.27*
315067	*1DARBY 1*	*5.48*
315068	*1DARBY 2*	*5.49*
315069	*1DARBY 3*	*5.56*
315070	*1DARBY 4*	*5.56*
315233	*1SURRY 2*	*54.53*
315091	*1YORKTN2*	*53.74*
315092	*1YORKTN3*	*49.25*
314309	*6IRON208*	*0.82*
314236	*6NRTHEST*	*0.4*
314251	*6S PUMP*	*1.76*
315074	*CIR_AB2-152*	*15.*
315075	*CIR_AB2-152*	*14.81*
297087	*V2-040*	*0.26*
LTF	*Z2-067*	*28.78*
921092	*AA1-049 C*	*4.23*
LTF	*AA1-058*	*1.25*
921162	*AA1-063AC*	*13.65*
921182	*AA1-067 C*	*2.63*
921532	*AA1-132 C*	*13.06*
921542	*AA1-133 C*	*17.46*

921552	*AA1-134 C*	*17.04*
921562	*AA1-135 C*	*14.69*
921572	*AA1-138 C*	*16.69*
921582	*AA1-139 C*	*26.2*
921752	*AA2-053 C*	*13.81*
921772	*AA2-059 C*	*4.03*
921862	*AA2-068 C*	*3.45*
LTF	*AA2-074*	*8.45*
921982	*AA2-088 C*	*10.63*
922512	*AA2-174 C*	*0.63*
922522	*AA2-177 C*	*18.03*
922532	*AA2-178 C*	*16.11*
922602	*AB1-013 C*	*4.86*
922682	*AB1-027 C*	*4.8*
922722	*AB1-053 C*	*1.67*
922732	*AB1-054 C*	*11.22*
923262	*AB1-132 C OP*	*22.25*
923272	*AB1-135 C OP*	*4.79*
923572	*AB1-173 C OP*	*3.58*
923582	*AB1-173AC OP*	*3.58*
923801	*AB2-015 C OP*	*14.46*
923831	*AB2-022 C*	*3.99*
923841	*AB2-024 C*	*4.41*
923851	*AB2-025 C*	*4.03*
923861	*AB2-026 C*	*3.55*
923911	*AB2-031 C OP*	*3.55*
923981	*AB2-039 C OP*	*14.58*
923991	*AB2-040 C OP*	*11.65*
924071	*AB2-051 C OP*	*241.58*
924241	*AB2-068 OP*	*416.9*
LTF	*AB2-075*	*4.54*
LTF	*AB2-076*	*5.35*
924381	*AB2-087 C*	*0.92*
924491	*AB2-098 C*	*0.88*
924501	*AB2-099 C*	*0.95*
924511	*AB2-100 C*	*18.21*
924761	*AB2-128 C*	*15.6*
924811	*AB2-134 C OP*	*23.11*
924931	*AB2-147 C*	*4.05*
924941	*AB2-149 C OP*	*5.88*
924951	*AB2-150 C OP*	*4.05*
924961	*AB2-152*	*4.86*
925051	*AB2-160 C OP*	*9.6*
925061	*AB2-161 C OP*	*5.89*
925121	*AB2-169 C OP*	*10.48*

925141	*AB2-171 C OP*	*8.15*
925171	*AB2-174 C OP*	*11.17*
925281	*AB2-186 C*	*1.03*
925291	*AB2-188 C OP*	*3.97*
925331	*AB2-190 C*	*41.2*
925361	*AC1-007 C OP*	*1.2*
925521	*AC1-027 C*	*3.52*
925691	*AC1-045 C*	*3.04*
925701	*AC1-046 C*	*3.05*
925711	*AC1-047 C*	*4.04*
925811	*AC1-060*	*4.44*
925821	*AC1-061*	*0.06*
925841	*AC1-063*	*0.68*
925861	*AC1-065 C*	*5.83*
926071	*AC1-086 C*	*32.77*
926201	*AC1-098 C*	*9.6*
926211	*AC1-099 C*	*3.22*
926291	*AC1-107 OP*	*547.55*
926411	*AC1-112 C*	*3.74*
926661	*AC1-147 C*	*3.98*
926741	*AC1-159 C*	*239.72*
926751	*AC1-161 C OP*	*53.66*
926771	*AC1-163 C*	*3.44*
926781	*AC1-164 C OP*	*75.56*
927041	*AC1-191 C*	*16.46*
927051	*AC1-193 C*	*5.97*
927221	*AC1-216 C OP*	*19.85*

Appendix 25

(DVP - DVP) The 8LDYSMTH-8CHANCE 500 kV line (from bus 314911 to bus 314905 ckt 1) loads from 106.65% to 107.19% (**DC power flow**) of its emergency rating (2738 MVA) for the single line contingency outage of 'LN 573'. This project contributes approximately 32.4 MW to the thermal violation.

CONTINGENCY 'LN 573'
OPEN BRANCH FROM BUS 314918 TO BUS 314934 CKT 1 /* 8NO ANNA 500.00 - 8SPOTSYL 500.00
END

Bus Number	*Bus Name*	*Full Contribution*
315053	*1BELMED1*	*3.62*
315054	*1BELMED2*	*3.62*
315055	*1BELMED3*	*3.*
315067	*1DARBY 1*	*3.3*
315068	*1DARBY 2*	*3.3*
315069	*1DARBY 3*	*3.35*
315070	*1DARBY 4*	*3.35*
315043	*1FRIVERA*	*4.46*
315044	*1FRIVERB*	*3.45*
315045	*1FRIVERC*	*4.46*
315046	*1FRIVERD*	*3.45*
315047	*1FRIVERE*	*3.45*
315048	*1FRIVERF*	*4.46*
315037	*1LDYSMT1*	*5.77*
315039	*1LDYSMT3*	*6.1*
315040	*1LDYSMT4*	*6.11*
315041	*1LDYSMT5*	*6.13*
315225	*1N ANNA1*	*49.92*
315226	*1N ANNA2*	*49.15*
315083	*1SPRUNCA*	*2.22*
315084	*1SPRUNCB*	*2.22*
315085	*1SPRUNCC*	*1.64*
315086	*1SPRUNCD*	*1.64*
315091	*1YORKTN2*	*32.06*
314309	*6IRON208*	*0.5*
314236	*6NRTHEST*	*0.24*
314251	*6S PUMP*	*1.09*
315074	*CIR_AB2-152*	*9.08*
315075	*CIR_AB2-152*	*8.97*

297087	*V2-040*	*0.16*
LTF	*Z2-067*	*16.92*
921092	*AA1-049 C*	*2.56*
LTF	*AA1-058*	*0.75*
921162	*AA1-063AC*	*8.35*
921172	*AA1-064 C*	*8.32*
921182	*AA1-067 C*	*1.6*
921292	*AA1-083*	*4.09*
921532	*AA1-132 C*	*7.91*
921542	*AA1-133 C*	*10.57*
921552	*AA1-134 C*	*10.32*
921562	*AA1-135 C*	*8.93*
921572	*AA1-138 C*	*10.13*
921582	*AA1-139 C*	*15.86*
921622	*AA1-145*	*69.46*
921752	*AA2-053 C*	*8.46*
921772	*AA2-059 C*	*2.45*
921862	*AA2-068 C*	*2.1*
LTF	*AA2-074*	*5.03*
921982	*AA2-088 C*	*6.49*
922512	*AA2-174 C*	*0.39*
922522	*AA2-177 C*	*10.9*
922532	*AA2-178 C*	*9.78*
922602	*AB1-013 C*	*2.95*
922672	*AB1-026 C*	*2.16*
922682	*AB1-027 C*	*2.84*
922722	*AB1-053 C*	*1.03*
922732	*AB1-054 C*	*6.85*
923262	*AB1-132 C OP*	*13.66*
923272	*AB1-135 C OP*	*2.8*
923572	*AB1-173 C OP*	*2.2*
923582	*AB1-173AC OP*	*2.2*
923801	*AB2-015 C OP*	*8.81*
923831	*AB2-022 C*	*2.42*
923841	*AB2-024 C*	*2.68*
923851	*AB2-025 C*	*2.51*
923861	*AB2-026 C*	*2.34*
923911	*AB2-031 C OP*	*2.19*
923981	*AB2-039 C OP*	*8.91*
923991	*AB2-040 C OP*	*7.18*
924061	*AB2-050*	*4.09*
924071	*AB2-051 C OP*	*146.16*
924241	*AB2-068 OP*	*220.03*
924381	*AB2-087 C*	*0.56*
924491	*AB2-098 C*	*0.53*

924501	*AB2-099 C*	*0.58*
924511	*AB2-100 C*	*11.23*
924761	*AB2-128 C*	*9.62*
924811	*AB2-134 C OP*	*13.97*
924931	*AB2-147 C*	*2.51*
924941	*AB2-149 C OP*	*3.58*
924951	*AB2-150 C OP*	*2.51*
924961	*AB2-152*	*2.94*
925051	*AB2-160 C OP*	*5.9*
925061	*AB2-161 C OP*	*3.6*
925121	*AB2-169 C OP*	*6.36*
925141	*AB2-171 C OP*	*4.96*
925171	*AB2-174 C OP*	*6.89*
925281	*AB2-186 C*	*0.62*
925291	*AB2-188 C OP*	*2.41*
925331	*AB2-190 C*	*24.91*
925361	*AC1-007 C OP*	*0.73*
925521	*AC1-027 C*	*2.13*
925691	*AC1-045 C*	*1.84*
925701	*AC1-046 C*	*1.84*
925711	*AC1-047 C*	*2.45*
925811	*AC1-060*	*2.71*
925821	*AC1-061*	*0.04*
925841	*AC1-063*	*0.42*
925861	*AC1-065 C*	*3.64*
926071	*AC1-086 C*	*20.11*
926201	*AC1-098 C*	*5.86*
926211	*AC1-099 C*	*1.96*
926291	*AC1-107 OP*	*320.1*
926411	*AC1-112 C*	*2.21*
926441	*AC1-115 C*	*1.15*
926471	*AC1-118 C*	*2.04*
926551	*AC1-134*	*10.22*
926591	*AC1-142 C*	*10.12*
926661	*AC1-147 C*	*2.41*
926741	*AC1-159 C*	*145.03*
926751	*AC1-161 C OP*	*32.4*
926771	*AC1-163 C*	*2.09*
926781	*AC1-164 C OP*	*44.17*
927041	*AC1-191 C*	*10.43*
927051	*AC1-193 C*	*3.64*
927221	*AC1-216 C OP*	*11.03*

Appendix 26

(DVP - DVP) The 8LDYSMTH-8POSSUM 500 kV line (from bus 314911 to bus 314922 ckt 1) loads from 106.42% to 106.93% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 594'. This project contributes approximately 27.79 MW to the thermal violation.

CONTINGENCY 'LN 594'
OPEN BRANCH FROM BUS 314916 TO BUS 314934 CKT 1 /* 8MORRSVL 500.00 - 8SPOTSYL 500.00
END

Bus Number	*Bus Name*	*Full Contribution*
315053	*1BELMED1*	*3.08*
315054	*1BELMED2*	*3.08*
315055	*1BELMED3*	*2.56*
315060	*1CHESTF5*	*10.92*
315061	*1CHESTG7*	*4.28*
315063	*1CHESTG8*	*4.24*
315062	*1CHESTS7*	*1.95*
315064	*1CHESTS8*	*2.17*
315067	*1DARBY 1*	*2.8*
315068	*1DARBY 2*	*2.8*
315069	*1DARBY 3*	*2.84*
315070	*1DARBY 4*	*2.84*
315043	*1FRIVERA*	*3.69*
315045	*1FRIVERC*	*3.69*
315048	*1FRIVERF*	*3.69*
315225	*1N ANNA1*	*42.12*
315226	*1N ANNA2*	*41.47*
315083	*1SPRUNCA*	*1.89*
315084	*1SPRUNCB*	*1.89*
315085	*1SPRUNCC*	*1.4*
315086	*1SPRUNCD*	*1.4*
315091	*1YORKTN2*	*27.39*
314309	*6IRON208*	*0.42*
314236	*6NRTHEST*	*0.2*
314251	*6S PUMP*	*0.92*
315074	*CIR_AB2-152*	*7.76*
315075	*CIR_AB2-152*	*7.65*
297087	*V2-040*	*0.13*
921092	*AA1-049 C*	*2.21*

LTF	*AA1-058*	*0.69*
921292	*AA1-083*	*3.38*
921532	*AA1-132 C*	*6.82*
921542	*AA1-133 C*	*9.11*
921552	*AA1-134 C*	*8.93*
921572	*AA1-138 C*	*8.78*
921582	*AA1-139 C*	*13.67*
921622	*AA1-145*	*57.45*
921772	*AA2-059 C*	*2.12*
LTF	*AA2-074*	*4.72*
921982	*AA2-088 C*	*5.67*
922522	*AA2-177 C*	*9.32*
922532	*AA2-178 C*	*8.52*
922602	*AB1-013 C*	*2.57*
922682	*AB1-027 C*	*2.4*
922732	*AB1-054 C*	*5.99*
923272	*AB1-135 C OP*	*2.38*
923801	*AB2-015 C OP*	*7.67*
923831	*AB2-022 C*	*2.09*
923841	*AB2-024 C*	*2.26*
923851	*AB2-025 C*	*2.18*
923861	*AB2-026 C*	*2.1*
923981	*AB2-039 C OP*	*7.66*
924061	*AB2-050*	*3.38*
924071	*AB2-051 C OP*	*125.76*
924241	*AB2-068 OP*	*187.68*
924511	*AB2-100 C*	*9.85*
924761	*AB2-128 C*	*8.44*
924811	*AB2-134 C OP*	*11.95*
924941	*AB2-149 C OP*	*3.08*
924961	*AB2-152*	*2.51*
925051	*AB2-160 C OP*	*5.05*
925061	*AB2-161 C OP*	*3.1*
925141	*AB2-171 C OP*	*4.33*
925281	*AB2-186 C*	*0.54*
925291	*AB2-188 C OP*	*2.1*
925331	*AB2-190 C*	*21.31*
925361	*AC1-007 C OP*	*0.62*
925521	*AC1-027 C*	*1.84*
925691	*AC1-045 C*	*1.58*
925701	*AC1-046 C*	*1.59*
925711	*AC1-047 C*	*2.11*
925811	*AC1-060*	*2.29*
925821	*AC1-061*	*0.03*
925841	*AC1-063*	*0.35*

925861	*AC1-065 C*	*3.05*
926291	*AC1-107 OP*	*271.46*
926411	*AC1-112 C*	*1.87*
926441	*AC1-115 C*	*0.92*
926551	*AC1-134*	*8.45*
926661	*AC1-147 C*	*2.07*
926731	*AC1-158 C*	*74.62*
926741	*AC1-159 C*	*124.79*
926751	*AC1-161 C OP*	*27.79*
926781	*AC1-164 C OP*	*37.46*
927041	*AC1-191 C*	*8.67*
927051	*AC1-193 C*	*3.17*
927221	*AC1-216 C OP*	*9.44*

Appendix 27

(DVP - DVP) The 8MDLTHAN-8NO ANNA 500 kV line (from bus 314914 to bus 314918 ckt 1) loads from 109.17% to 110.2% (**DC power flow**) of its load dump rating (3144 MVA) for the line fault with failed breaker contingency outage of '557T574'. This project contributes approximately 71.45 MW to the thermal violation.

CONTINGENCY '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

Bus Number	*Bus Name*	*Full Contribution*
315102	*1BRUNSWICKG1*	*16.93*
315103	*1BRUNSWICKG2*	*16.93*
315104	*1BRUNSWICKG3*	*16.93*
315105	*1BRUNSWICKS1*	*35.18*
315108	*1ELIZAR1*	*6.58*
315109	*1ELIZAR2*	*6.47*
315110	*1ELIZAR3*	*6.67*
315073	*1STONECA*	*10.34*
315233	*1SURRY 2*	*52.18*
314784	*1WEYRHSB*	*3.47*
315091	*1YORKTN2*	*48.15*
314539	*3UNCAMP*	*4.08*
314541	*3WATKINS*	*1.15*
314189	*6PAPERMILL*	*8.9*
315074	*CIR_AB2-152*	*12.47*
315075	*CIR_AB2-152*	*12.31*
292791	*U1-032 E*	*5.39*
900672	*V4-068 E*	*0.49*
901082	*W1-029E*	*79.43*
907092	*X1-038 E*	*10.21*
913392	*Y1-086 E*	*3.79*
916042	*Z1-036 E*	*77.97*
916192	*Z1-068 E*	*3.29*
916301	*Z1-086 C*	*103.02*
916302	*Z1-086 E*	*16.82*

917122	*Z2-027 E*	*1.84*
917332	*Z2-043 E*	*1.62*
917342	*Z2-044 E*	*0.89*
LTF	*Z2-067*	*29.63*
917512	*Z2-088 E OP1*	*12.52*
917592	*Z2-099 E*	*0.73*
921092	*AA1-049 C*	*4.23*
921093	*AA1-049 E*	*1.99*
LTF	*AA1-058*	*1.31*
921162	*AA1-063AC*	*13.85*
921163	*AA1-063AE*	*6.53*
921172	*AA1-064 C*	*15.11*
921173	*AA1-064 E*	*7.11*
918512	*AA1-065 E OP*	*7.33*
921182	*AA1-067 C*	*2.69*
921183	*AA1-067 E*	*1.15*
918562	*AA1-072 E*	*0.27*
921532	*AA1-132 C*	*13.06*
921533	*AA1-132 E*	*5.6*
921542	*AA1-133 C*	*17.46*
921543	*AA1-133 E*	*7.48*
921552	*AA1-134 C*	*17.04*
921553	*AA1-134 E*	*7.3*
921562	*AA1-135 C*	*14.95*
921563	*AA1-135 E*	*6.41*
921572	*AA1-138 C*	*16.71*
921573	*AA1-138 E*	*7.16*
921582	*AA1-139 C*	*26.19*
921583	*AA1-139 E*	*11.23*
921752	*AA2-053 C*	*14.06*
921753	*AA2-053 E*	*6.04*
921762	*AA2-057 C*	*11.13*
921763	*AA2-057 E*	*5.57*
921772	*AA2-059 C*	*4.05*
921773	*AA2-059 E*	*1.86*
921862	*AA2-068 C*	*3.53*
921863	*AA2-068 E*	*1.62*
LTF	*AA2-074*	*8.79*
920022	*AA2-086 E*	*0.39*
921982	*AA2-088 C*	*10.71*
921983	*AA2-088 E*	*17.47*
922442	*AA2-165 C*	*1.52*
922443	*AA2-165 E*	*0.73*
922472	*AA2-169 C*	*3.42*
922473	*AA2-169 E*	*1.57*

922512	*AA2-174 C*	*0.64*
922513	*AA2-174 E*	*0.7*
922522	*AA2-177 C*	*15.77*
922523	*AA2-177 E*	*6.76*
922532	*AA2-178 C*	*16.22*
922533	*AA2-178 E*	*6.95*
922602	*AB1-013 C*	*4.89*
922603	*AB1-013 E*	*32.76*
922722	*AB1-053 C*	*1.71*
922723	*AB1-053 E*	*0.96*
922732	*AB1-054 C*	*11.3*
922733	*AB1-054 E*	*5.57*
922922	*AB1-081 C OP*	*13.7*
922923	*AB1-081 E OP*	*5.87*
923262	*AB1-132 C OP*	*22.68*
923263	*AB1-132 E OP*	*9.72*
923272	*AB1-135 C OP*	*3.4*
923273	*AB1-135 E OP*	*1.46*
923572	*AB1-173 C OP*	*3.64*
923573	*AB1-173 E OP*	*1.7*
923582	*AB1-173AC OP*	*3.64*
923583	*AB1-173AE OP*	*1.7*
923801	*AB2-015 C OP*	*14.48*
923802	*AB2-015 E OP*	*11.87*
923831	*AB2-022 C*	*4.*
923832	*AB2-022 E*	*2.15*
923841	*AB2-024 C*	*3.33*
923842	*AB2-024 E*	*1.49*
923851	*AB2-025 C*	*4.08*
923852	*AB2-025 E*	*1.83*
923861	*AB2-026 C*	*3.73*
923862	*AB2-026 E*	*1.68*
923911	*AB2-031 C OP*	*3.62*
923912	*AB2-031 E OP*	*1.78*
923941	*AB2-035 C*	*0.52*
923942	*AB2-035 E*	*0.22*
923981	*AB2-039 C OP*	*13.93*
923982	*AB2-039 E OP*	*11.26*
923991	*AB2-040 C OP*	*11.88*
923992	*AB2-040 E OP*	*9.72*
924021	*AB2-043 C OP*	*4.48*
924022	*AB2-043 E OP*	*7.35*
924071	*AB2-051 C OP*	*240.29*
924072	*AB2-051 E OP*	*32.99*
924151	*AB2-059 C OP*	*16.14*

924152	*AB2-059 E OP*	*8.32*
924161	*AB2-060 C OP*	*12.56*
924162	*AB2-060 E OP*	*5.91*
924241	*AB2-068 OP*	*335.66*
924301	*AB2-077 C OP*	*2.84*
924302	*AB2-077 E OP*	*1.9*
924311	*AB2-078 C OP*	*2.84*
924312	*AB2-078 E OP*	*1.9*
924321	*AB2-079 C OP*	*2.84*
924322	*AB2-079 E OP*	*1.9*
924381	*AB2-087 C*	*0.94*
924382	*AB2-087 E*	*0.44*
924391	*AB2-088 C*	*0.67*
924392	*AB2-088 E*	*0.32*
924401	*AB2-089 C*	*3.21*
924402	*AB2-089 E*	*1.65*
924411	*AB2-090 C*	*5.64*
924412	*AB2-090 E*	*2.89*
924491	*AB2-098 C*	*0.9*
924492	*AB2-098 E*	*0.38*
924501	*AB2-099 C*	*0.97*
924502	*AB2-099 E*	*0.41*
924511	*AB2-100 C*	*18.52*
924512	*AB2-100 E*	*9.12*
924761	*AB2-128 C*	*15.87*
924762	*AB2-128 E*	*6.25*
924811	*AB2-134 C OP*	*20.22*
924812	*AB2-134 E OP*	*27.03*
924931	*AB2-147 C*	*4.13*
924932	*AB2-147 E*	*6.74*
924941	*AB2-149 C OP*	*5.71*
924942	*AB2-149 E OP*	*9.32*
924951	*AB2-150 C OP*	*4.13*
924952	*AB2-150 E OP*	*6.74*
924961	*AB2-152*	*4.04*
925051	*AB2-160 C OP*	*8.36*
925052	*AB2-160 E OP*	*13.64*
925061	*AB2-161 C OP*	*5.63*
925062	*AB2-161 E OP*	*9.19*
925121	*AB2-169 C OP*	*10.63*
925122	*AB2-169 E OP*	*9.54*
925141	*AB2-171 C OP*	*8.17*
925142	*AB2-171 E OP*	*13.33*
925171	*AB2-174 C OP*	*11.38*
925172	*AB2-174 E OP*	*10.3*

925221	*AB2-176 C*	*2.32*
925222	*AB2-176 E*	*1.*
925281	*AB2-186 C*	*1.03*
925282	*AB2-186 E*	*0.44*
925291	*AB2-188 C OP*	*4.*
925292	*AB2-188 E OP*	*1.8*
925331	*AB2-190 C*	*36.04*
925332	*AB2-190 E*	*9.01*
925361	*AC1-007 C OP*	*1.14*
925362	*AC1-007 E OP*	*1.87*
925521	*AC1-027 C*	*3.51*
925522	*AC1-027 E*	*2.01*
925591	*AC1-034 C OP*	*10.45*
925592	*AC1-034 E OP*	*7.88*
925611	*AC1-036 C*	*1.32*
925612	*AC1-036 E*	*2.15*
925691	*AC1-045 C*	*2.97*
925692	*AC1-045 E*	*1.62*
925701	*AC1-046 C*	*3.05*
925702	*AC1-046 E*	*1.66*
925711	*AC1-047 C*	*4.04*
925712	*AC1-047 E*	*2.22*
925781	*AC1-054 C OP*	*10.97*
925782	*AC1-054 E OP*	*5.06*
925811	*AC1-060*	*3.37*
925821	*AC1-061*	*0.06*
925831	*AC1-062*	*0.43*
925841	*AC1-063*	*0.52*
925861	*AC1-065 C*	*4.52*
925862	*AC1-065 E*	*7.37*
926071	*AC1-086 C*	*33.39*
926072	*AC1-086 E*	*15.2*
926201	*AC1-098 C*	*9.81*
926202	*AC1-098 E*	*5.84*
926211	*AC1-099 C*	*3.29*
926212	*AC1-099 E*	*1.93*
926271	*AC1-105 C OP*	*8.94*
926272	*AC1-105 E OP*	*4.45*
926281	*AC1-106*	*3.72*
926291	*AC1-107 OP*	*389.1*
926661	*AC1-147 C*	*3.95*
926662	*AC1-147 E*	*2.32*
926741	*AC1-159 C*	*238.44*
926751	*AC1-161 C OP*	*50.07*
926752	*AC1-161 E OP*	*21.37*

926761	*AC1-162 C*	*38.4*
926762	*AC1-162 E*	*16.39*
926771	*AC1-163 C*	*3.48*
926772	*AC1-163 E*	*1.63*
926781	*AC1-164 C OP*	*53.7*
926782	*AC1-164 E OP*	*24.12*
927021	*AC1-189 C*	*13.58*
927022	*AC1-189 E*	*6.77*
927051	*AC1-193 C*	*5.99*
927052	*AC1-193 E*	*9.78*
927111	*AC1-206 C OP*	*18.52*
927112	*AC1-206 E OP*	*8.76*
927141	*AC1-208 C*	*13.89*
927142	*AC1-208 E*	*6.17*
927211	*AC1-215 C*	*16.12*
927212	*AC1-215 E*	*7.31*
927221	*AC1-216 C OP*	*17.36*
927222	*AC1-216 E OP*	*13.65*
927251	*AC1-221 C*	*4.27*
927252	*AC1-221 E*	*2.29*