

***Generation Interconnection
Feasibility Study Report***

For

***PJM Generation Interconnection Request
Queue Position AC1-159***

***Chesapeake 230kV
759.6 MW Capacity / 745.7 MW Energy***

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 natural gas combined cycle generating facility located in the City of Chesapeake, Virginia. The installed facilities will have a total capability of 1630.2 MW with 1525.1 MW of this output being recognized by PJM as capacity. This queue request is for an additional 745.7 MW with 759.6 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is 1/01/2021. **This study does not imply an ITO commitment to this in-service date.**

Point of Interconnection

AC1-159 will interconnect with the ITO transmission system on the Chesapeake 230kV substation 230kV substation ring bus.

Cost Summary

The AC1-159 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	\$ 600,000
Direct Connection Network Upgrades	\$0
Non Direct Connection Network Upgrades	\$2,200,000
Total Costs	\$2,800,000

In addition, the AC1-159 project may be responsible for a contribution to the following costs:

Description	Total Cost
New System Upgrades	\$45,543,000
Previously Identified Upgrades	\$303,565,000
Total Costs	\$349,108,000

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 \$600,000.

Transmission: Generation developer to build

The estimated total cost of the Attachment Facilities is \$600,000. It is estimated to take 12-14 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.

Non-Direct Connection Cost Estimate

Substation: Add an additional two 230 kV Breakers at Chesapeake 230 kV Switching Station may require substation expansion/re-arrangement. Space constraint may require that GIS be installed to be determined during System Impact Study Phase. The estimated cost of the Direct Connection Network Upgrades is \$2,200,000 and is estimated to take 24-30 months to permit and construct.

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.

New System Reinforcement

Reinforcement: Chesapeake 230/115kV transformer: Add a third 230-115 kV transformer into a new breaker bay with two new 230kV breakers. Estimated cost \$6,500,000 and it is estimated to take 24-30 months.

Reinforcement: Chesapeake – Greenwich 230 kV line: Wreck and rebuild the line as a double circuit structure with 230kV on one side and 115kV on the other side. Estimated cost \$30,000,000 and it is estimated to take 36-48 months to permit (VA CPCN required), engineer and construct.

Reinforcement: Chesapeake – Yadkin 230 kV line: Wreck and rebuild the line as a double circuit structure with 230kV on one side and 115kV on the other side. Estimated cost \$9,000,000 and it is estimated to take 36-48 months to permit (CPCN required), engineer and construct.

Reinforcement: Chickahominy 230kV breaker SC122: Replace Chickahominy 50kA 230kV breaker SC122 with a 63kA breaker. Estimate cost \$430,000 and it is estimated to take 8 months.

Contributions to Previously Identified System Reinforcements

Reinforcement: Yadkin 230kV breaker 210512: Replace Yadkiin 40kA 230kV breaker 210512 with a 50kA breaker. Estimate cost \$300,000 and it is estimated to take 12 months.

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: Rebuild of the Chesterfield-Basin 230kV line. It is estimated to take 44 – 48 months to complete and it is estimated to cost \$18,615,000 to resolve the deficiency.

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 Carson and Midlothian 500kV Substations. This will increase emergency rating by 31% to 3224 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: Ladysmith – Possum Pt 500 kV line #568: replace wave trap at both Ladysmith and Possum Point Substations. This will increase line rating by 12% to 2913 MVA. Estimated cost \$500,000 and it is estimated to 14-16 months to engineer and construct.

Reinforcement: Midlothian – North Anna 500kV: Replace wave trap at both North Anna Substations. This will increase emergency rating by 31% to 3424 MVA. Estimated cost \$250,000 and it is estimated to take 12-16 months to engineer and construct.

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.

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.

Network Impacts

The Queue Project AC1-159 was evaluated as a 759.6 MW (Capacity 759.6 MW) injection at the Chesapeake 230kV substation in the ITO area. Project AC1-159 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC1-159 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
262T2038	CONTINGENCY '262T2038' /* 262T2038 @ GREENWICH OPEN BRANCH FROM BUS 314449 TO BUS 314474 CKT 1 /* CHESAPEAKE - GREENWICH OPEN BRANCH FROM BUS 314474 TO BUS 314494 CKT 1 /* GREENWICH - REEVES AVE END
262T267	CONTINGENCY '262T267' /* 262T267 @ YADKIN OPEN BRANCH FROM BUS 314449 TO BUS 314514 CKT 1 /* 6CHESAPK 230.00 - 6YADKIN 230.00 OPEN BRANCH FROM BUS 314444 TO BUS 314453 CKT 1 /* BOWERS HILL - CHURCHLAND OPEN BRANCH FROM BUS 314444 TO BUS 314514 CKT 1 /* BOWERS HILL - YADKIN 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

Contingency Name	Description
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
CHESA H3TGRE	CONTINGENCY 'CHESA H3TGRE' /* H3TGREENWICH @ CHESAPEAKE OPEN BRANCH FROM BUS 314448 TO BUS 314449 CKT 1 /* CHESAPEAKE 230-115 TX#3 OPEN BRANCH FROM BUS 314449 TO BUS 314474 CKT 1 /* CHESAPEAKE - GREENWICH END
CHESA H3TYAD	CONTINGENCY 'CHESA H3TYAD' /* H3TYADKIN @ CHESAPEAKE OPEN BRANCH FROM BUS 314448 TO BUS 314449 CKT 1 /* CHESAPEAKE 230-115 TX#3 OPEN BRANCH FROM BUS 314449 TO BUS 314514 CKT 1 /* CHESAPEAKE - YADKIN END
CHESA H4TGRE	CONTINGENCY 'CHESA H4TGRE' /* H4TGREENWICH @ CHESAPEAKE OPEN BRANCH FROM BUS 314448 TO BUS 314449 CKT 2 /* CHESAPEAKE 230-115 TX#4 OPEN BRANCH FROM BUS 314449 TO BUS 314474 CKT 1 /* CHESAPEAKE - GREENWICH END
CHESA H4TYAD	CONTINGENCY 'CHESA H4TYAD' /* H4TYADKIN @ CHESAPEAKE OPEN BRANCH FROM BUS 314448 TO BUS 314449 CKT 2 /* CHESAPEAKE 230-115 TX#4 OPEN BRANCH FROM BUS 314449 TO BUS 314514 CKT 1 /* CHESAPEAKE - YADKIN 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 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 262	CONTINGENCY 'LN 262' OPEN BRANCH FROM BUS 314449 TO BUS 314474 CKT 1 /* 6CHESAPK 230.00 - 6GRENWCH 230.00 END
LN 262-2018	CONTINGENCY 'LN 262-2018' OPEN BRANCH FROM BUS 314449 TO BUS 314514 CKT 1 /* 6CHESAPK 230.00 - 6YADKIN 230.00 OPEN BRANCH FROM BUS 314464 TO BUS 314465 CKT 1 /* 6DOZIER 230.00 - 6ELIZ R 230.00 OPEN BRANCH FROM BUS 314464 TO BUS 314474 CKT 1 /* 6DOZIER 230.00 - 6GRENWCH 230.00 OPEN BUS 314464 /* ISLAND END
LN 262-2070	CONTINGENCY 'LN 262-2070' OPEN BRANCH FROM BUS 314449 TO BUS 314514 CKT 1 /* 6CHESAPK 230.00 - 6YADKIN 230.00 OPEN BRANCH FROM BUS 314465 TO BUS 314514 CKT 1 /* 6ELIZ R 230.00 - 6YADKIN 230.00 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 567	CONTINGENCY 'LN 567' OPEN BRANCH FROM BUS 314903 TO BUS 314924 CKT 1 /* 8CHCKAHM 500.00 - 8SURREY 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

Contingency Name	Description
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 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
LN 9036	CONTINGENCY 'LN 9036' OPEN BRANCH FROM BUS 314449 TO BUS 314514 CKT 1 /* 6CHESAPK 230.00 - 6YADKIN 230.00 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		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		
1	N-1	LN 567	DVP - DVP	6SKIFF CREEK-6KINGS M 230 kV line	314209	314386	1	DC	83.03	97.51	ER	442	63.96	
2	N-1	LN 9036	DVP - DVP	6CHESAPK 230/115 kV transformer	314449	314448	1	DC	71.25	127.56	ER	255	143.71	
3	N-1	LN 9036	DVP - DVP	6CHESAPK 230/115 kV transformer	314449	314448	2	DC	70.91	126.92	ER	225	125.84	
4	N-1	LN 9036	DVP - DVP	6CHESAPK-6GRENWCH 230 kV line	314449	314474	1	DC	71.48	153.33	ER	599	490.06	1
5	N-1	LN 262	DVP - DVP	6CHESAPK-6YADKIN 230 kV line	314449	314514	1	DC	44.02	113.53	ER	984	684.12	
6	N-1	LN 557	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	98.19	106.84	ER	2442	211.27	
7	N-1	LN 574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	98.32	107.11	ER	2442	214.76	

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		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		
8	LFFB	CHESA H4TYAD	DVP - DVP	6CHESAPK 230/115 kV transformer	314449	314448	1	DC	96.01	164.41		294	201.01	2
9	DCTL	LN 262-2070	DVP - DVP	6CHESAPK 230/115 kV transformer	314449	314448	1	DC	69.86	122.39		294	154.37	
10	LFFB	262T267	DVP - DVP	6CHESAPK 230/115 kV transformer	314449	314448	1	DC	70.89	119.6		294	143.14	
11	LFFB	CHESA H3TYAD	DVP - DVP	6CHESAPK 230/115 kV transformer	314449	314448	2	DC	99.72	170.72		263	186.59	3
12	DCTL	LN 262-2070	DVP - DVP	6CHESAPK 230/115 kV transformer	314449	314448	2	DC	68.47	119.91		263	135.18	
13	LFFB	262T267	DVP - DVP	6CHESAPK 230/115 kV transformer	314449	314448	2	DC	69.5	117.19		263	125.33	
14	LFFB	CHESA H3TYAD	DVP - DVP	6CHESAPK-6GRENWCH 230 kV line	314449	314474	1	DC	75.12	145.68		812	573.01	
15	LFFB	CHESA H4TYAD	DVP - DVP	6CHESAPK-6GRENWCH 230 kV line	314449	314474	1	DC	72.65	141.44		812	558.59	
16	DCTL	LN 262-2018	DVP - DVP	6CHESAPK-6GRENWCH 230 kV line	314449	314474	1	DC	64.2	122.07		812	469.88	
17	LFFB	CHESA H3TGRE	DVP - DVP	6CHESAPK-6YADKIN 230 kV line	314449	314514	1	DC	54.41	113.59		1204	712.5	4
18	LFFB	CHESA H4TGRE	DVP - DVP	6CHESAPK-6YADKIN 230 kV line	314449	314514	1	DC	52.7	111.5		1204	707.98	
19	LFFB	262T2038	DVP - DVP	6CHESAPK-6YADKIN 230 kV line	314449	314514	1	DC	44.01	100.8		1204	683.82	

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		
20	LFFB	SPOTSHIT 9033	DVP - DVP	8LDYSMTH-8CHANCE 500 kV line	314911	314905	1	DC	98.36	100.3		3351	144.31	

Short Circuit

(Summary of impacted circuit breakers)

New circuit breakers found to be over-duty:

#	Area	Bus No.	Bus	Breaker	Rating Type	Duty Percent Without AC1-159	Duty Percent With AC1-159	Duty Percent Difference
# 21	DVP	1366	CHICKAHOMINY 230.kV	SC122	S	99.88	100.07	0.19

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

#	Area	Bus No.	Bus	Breaker	Rating Type	Duty Percent Without AC1-159	Duty Percent With AC1-159	Duty Percent Difference
# 22	DVP	777	YADKIN 2&4 230.kV	210512	S	108.56	120.51	11.94

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		
23	N-1	LN 557	DVP - DVP	6SKIFF CREEK-6KINGS M 230 kV line	314209	314386	1	DC	137.67	150.42	ER	442	56.34	5
24	DCTL	LN 208-259	DVP - DVP	6CHARCTY-6LAKESD 230 kV line	314225	314227	1	DC	128.63	132.43	LD	459	38.68	6
25	DCTL	LN 208-259	DVP - DVP	6MESSER-6CHARCTY 230 kV line	314228	314225	1	DC	140.39	144.19	LD	459	38.68	7
26	DCTL	LN 208-259	DVP - DVP	6CHSTF B-6MESSER 230 kV line	314287	314228	1	DC	140.55	144.34	LD	459	38.68	8
27	N-1	LN 563	DVP - DVP	6CHSTF B-6BASIN 230 kV line	314287	314276	1	DC	118.5	123.34	LD	449	48.32	9
28	N-1	LN 557	DVP - DVP	6PENNIMAN-6WALR209 230 kV line	314296	314415	1	DC	125.36	138.11	ER	442	56.34	10
29	N-1	LN 557	DVP - DVP	6KINGS M-6PENNIMAN 230 kV line	314386	314296	1	DC	129.23	141.98	ER	442	56.34	11
30	N-1	LN 557	DVP - DVP	6WALR209-6LIGH209 230 kV line	314415	314391	1	DC	109.58	122.33	ER	442	56.34	12
31	N-1	LN 557	DVP - DVP	8CARSON-8MDLTHAN 500 kV line	314902	314914	1	DC	109.9	118.9	ER	2442	219.74	13
32	LFFB	557T574	DVP - DVP	8CARSON-8MDLTHAN 500 kV line	314902	314914	1	DC	109.51	112.72	LD	3144	232.9	
33	LFFB	H2T557	DVP - DVP	8CARSON-8MDLTHAN 500 kV line	314902	314914	1	DC	101.31	104.41	LD	3144	225.33	
34	N-1	LN 576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	113.5	123.72	ER	2442	249.63	14

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		
35	N-1	LN 563	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	109.27	119.03	ER	2442	238.28	
36	LFFB	563T576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	104.36	107.84	LD	3144	249.63	
37	LFFB	WT576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	104.36	107.84	LD	3144	249.62	
38	LFFB	57602	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	104.36	107.84	LD	3144	249.62	
39	N-1	LN 594	DVP - DVP	8CHANCE-8BRISTER 500 kV line	314905	314900	1	DC	114.53	117.09	ER	2442	142.73	15
40	N-1	LN 573	DVP - DVP	8CHANCE-8BRISTER 500 kV line	314905	314900	1	DC	109.29	111.79	ER	2442	140.1	
41	N-1	LN 576	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	138.54	142.96	ER	2442	239.58	16
42	N-1	LN 563	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	125.13	133.55	ER	2442	205.63	
43	LFFB	57602	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	115.09	118.31	LD	3351	239.5	
44	LFFB	WT576	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	115.09	118.31	LD	3351	239.5	
45	LFFB	563T576	DVP - DVP	8ELMONT-8LDYSMTH 500 kV line	314908	314911	1	DC	115.01	118.23	LD	3351	239.58	
46	N-1	LN 573	DVP - DVP	8LDYSMTH-8CHANCE 500 kV line	314911	314905	1	DC	105.6	107.99	ER	2738	144.95	17

#	Contingency		Affected Area	Facility Description	Bus			Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To	Cir.		Initial	Final	Type	MVA		
47	N-1	LN 594	DVP - DVP	8LDYSMTH-8CHANCE 500 kV line	314911	314905	1	DC	103.03	105.28	ER	2738	139.64	
48	N-1	LN 594	DVP - DVP	8LDYSMTH-8POSSUM 500 kV line	314911	314922	1	DC	105.79	108.08	ER	2442	124.73	18
49	N-1	LN 581	DVP - DVP	8LDYSMTH-8POSSUM 500 kV line	314911	314922	1	DC	104.65	106.95	ER	2442	126.52	
50	LFFB	557T574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	112.41	115.7	LD	3144	238.32	19

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

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
# 2, 3, 8 - 13	6CHESAPK 230/115 kV transformer	Add a third 230-115 kV transformer into a new breaker bay with two new 230kV breakers. Estimated time 24-30 months.	Pending	\$6,500,000
# 4, 14 - 16	6CHESAPK-6GRENWCH 230 kV line	Wreck and rebuild the line as a double circuit structure with 230kV on one side and 115kV on the other side. Estimated time 36-48 months to permit (VA CPCN required), engineer and construct.	Pending	\$30,000,000
# 5, 17 - 19	6CHESAPK-6YADKIN 230 kV line	Wreck and rebuild the line as a double circuit structure with 230kV on one side and 115kV on the other side. Estimated time 36-48 months to permit (CPCN required), engineer and construct.	Pending	\$9,000,000
# 6, 7	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
# 20	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
# 21	Chickahominy 230kV breaker SC122	Replace Chickahominy 50kA 230kV breaker SC122 with a 63kA breaker. Estimated time 8 months.	Pending	\$430,000
Total New Network Upgrades				\$124,380,000

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
# 22	Yadkin 230kV breaker 210512	Replace 230kV breaker with a 50kA duty	Pending	\$300,000
# 23	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

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
# 28	6PENNIMAN-6WALR209 230 kV line			
# 29	6KINGS M-6PENNIMAN 230 kV line			
# 24	6CHARCTY-6LAKESD 230 kV line	Rebuild 21.32 miles of the Chesterfield - Lakeside 230kV transmission line by 6/1/2020	b2745	
# 25	6MESSER-6CHARCTY 230 kV line			
# 26	6CHSTF B-6MESSER 230 kV line			
# 27	6CHSTF B-6BASIN 230 kV line	Rebuild of the Chesterfield-Basin 230kV line. Estimated time: 44-48 months.	Pending	\$18,615,000
# 30	6WALR209-6LIGH209 230 kV line	Wreck and rebuild the Lightfoot- Waller 230 kV line to a rating of 1047 MVA. (VA CPCN Required). Estimate time 30 – 36 months.	Pending	\$15,200,000
# 31 – 33	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
# 34 - 38	8CHCKAHM-8ELMONT 500 kV line	Replace wave trap at both Elmont and Chickahomony Substations. This will increase line rating by 22% to 3424 MVA. Estimated time: 14 – 16 months.	Pending	\$500,000
# 39 – 40	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
# 41 - 45	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
# 46 - 47	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

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
# 48 - 49	8LDYSMTH-8POSSUM 500 kV line	Replace wave trap at both Ladysmith and Possum Point Substations. This will increase line rating by 12% to 2913 MVA. Estimated time: 14 – 16 months.	Pending	\$500,000
# 50	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				\$303,565,000

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.

None

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 #AC1-159 interconnection of a 745.7 MW Energy (759.6 MW Capacity) injection into the ITO's Transmission System at Chesapeake 230 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).

Flowgate Appendices

Appendices

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

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

Appendix 1

(DVP - DVP) The 6CHESAPK-6GRENWCH 230 kV line (from bus 314449 to bus 314474 ckt 1) loads from 71.48% to 153.33% (**DC power flow**) of its emergency rating (599 MVA) for the single line contingency outage of 'LN 9036'. This project contributes approximately 490.06 MW to the thermal violation.

CONTINGENCY 'LN 9036'

OPEN BRANCH FROM BUS 314449 TO BUS 314514 CKT 1 /* 6CHESAPK
230.00 - 6YADKIN 230.00

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315098	1CHESPKA	0.72
315099	1CHESPKB	1.8
924071	AB2-051 C OP	493.86
926661	AC1-147 C	3.22
926741	AC1-159 C	490.06

Appendix 2

(DVP - DVP) The 6CHESAPK 230/115 kV transformer (from bus 314449 to bus 314448 ckt 1) loads from 96.01% to 164.41% (**DC power flow**) of its load dump rating (294 MVA) for the line fault with failed breaker contingency outage of 'CHESA H4TYAD'. This project contributes approximately 201.01 MW to the thermal violation.

CONTINGENCY 'CHESA H4TYAD'

/* H4TYADKIN @

CHESAPEAKE

OPEN BRANCH FROM BUS 314448 TO BUS 314449 CKT 2
230-115 TX#4

/* CHESAPEAKE

OPEN BRANCH FROM BUS 314449 TO BUS 314514 CKT 1
YADKIN

/* CHESAPEAKE -

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
924071	AB2-051 C OP	202.57
924072	AB2-051 E OP	27.81
926741	AC1-159 C	201.01

Appendix 3

(DVP - DVP) The 6CHESAPK 230/115 kV transformer (from bus 314449 to bus 314448 ckt 2) loads from 99.72% to 170.72% (**DC power flow**) of its load dump rating (263 MVA) for the line fault with failed breaker contingency outage of 'CHESA H3TYAD'. This project contributes approximately 186.59 MW to the thermal violation.

```
CONTINGENCY 'CHESA H3TYAD'                /* H3TYADKIN @
CHESAPEAKE
  OPEN BRANCH FROM BUS 314448 TO BUS 314449 CKT 1      /* CHESAPEAKE
230-115 TX#3
  OPEN BRANCH FROM BUS 314449 TO BUS 314514 CKT 1      /* CHESAPEAKE -
YADKIN
END
```

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
924071	AB2-051 C OP	188.04
924072	AB2-051 E OP	25.82
926741	AC1-159 C	186.59

Appendix 4

(DVP - DVP) The 6CHESAPK-6YADKIN 230 kV line (from bus 314449 to bus 314514 ckt 1) loads from 54.41% to 113.59% (**DC power flow**) of its load dump rating (1204 MVA) for the line fault with failed breaker contingency outage of 'CHESA H3TGRE'. This project contributes approximately 712.5 MW to the thermal violation.

CONTINGENCY 'CHESA H3TGRE'
CHESAPEAKE

/* H3TGREENWICH @

OPEN BRANCH FROM BUS 314448 TO BUS 314449 CKT 1
230-115 TX#3

/* CHESAPEAKE

OPEN BRANCH FROM BUS 314449 TO BUS 314474 CKT 1
GREENWICH
END

/* CHESAPEAKE -

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
924071	AB2-051 C OP	718.04
924072	AB2-051 E OP	98.58
926661	AC1-147 C	2.93
926662	AC1-147 E	1.72
926741	AC1-159 C	712.5

Appendix 5

(DVP - DVP) The 6SKIFF CREEK-6KINGS M 230 kV line (from bus 314209 to bus 314386 ckt 1) loads from 137.67% to 150.42% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 56.34 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
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

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

Appendix 6

(DVP - DVP) The 6CHARCTY-6LAKESD 230 kV line (from bus 314225 to bus 314227 ckt 1) loads from 128.63% to 132.43% (**DC power flow**) of its load dump rating (459 MVA) for the tower line contingency outage of 'LN 208-259'. This project contributes approximately 38.68 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315065	1CHESTF6	35.89
315077	1HOPHCF1	2.08
315078	1HOPHCF2	2.08
315079	1HOPHCF3	2.08
315080	1HOPHCF4	3.16
315076	1HOPPOLC	1.78
315073	1STONECA	5.66
314784	1WEYRHSB	0.65
314539	3UNCAMP	0.86
314541	3WATKINS	0.24
314229	6MT R221	-0.33
315074	CIR_AB2-152	0.89
315075	CIR_AB2-152	0.87
292791	U1-032 E	2.95
900672	V4-068 E	0.11
901082	W1-029E	13.46
907092	X1-038 E	2.14
913392	Y1-086 E	0.63
914231	Y2-077	0.84
916042	Z1-036 E	13.56
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	1.5
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	2.99
921573	AA1-138 E	1.28
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	0.71
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	0.32
922512	AA2-174 C	0.15
922513	AA2-174 E	0.16
922522	AA2-177 C	6.38
922523	AA2-177 E	2.74
922532	AA2-178 C	2.95
922533	AA2-178 E	1.27
922602	ABI-013 C	0.89
922603	ABI-013 E	5.97
922722	ABI-053 C	0.44
922723	ABI-053 E	0.25
922732	ABI-054 C	2.46

922733	<i>ABI-054 E</i>	<i>1.21</i>
923262	<i>ABI-132 C OP</i>	<i>5.96</i>
923263	<i>ABI-132 E OP</i>	<i>2.55</i>
923572	<i>ABI-173 C OP</i>	<i>0.98</i>
923573	<i>ABI-173 E OP</i>	<i>0.46</i>
923582	<i>ABI-173AC OP</i>	<i>0.98</i>
923583	<i>ABI-173AE OP</i>	<i>0.46</i>
923801	<i>AB2-015 C OP</i>	<i>3.06</i>
923802	<i>AB2-015 E OP</i>	<i>2.51</i>
923831	<i>AB2-022 C</i>	<i>0.66</i>
923832	<i>AB2-022 E</i>	<i>0.35</i>
923851	<i>AB2-025 C</i>	<i>1.62</i>
923852	<i>AB2-025 E</i>	<i>0.73</i>
923911	<i>AB2-031 C OP</i>	<i>0.98</i>
923912	<i>AB2-031 E OP</i>	<i>0.48</i>
923981	<i>AB2-039 C OP</i>	<i>4.91</i>
923982	<i>AB2-039 E OP</i>	<i>3.97</i>
923991	<i>AB2-040 C OP</i>	<i>3.21</i>
923992	<i>AB2-040 E OP</i>	<i>2.62</i>
924071	<i>AB2-051 C OP</i>	<i>38.98</i>
924072	<i>AB2-051 E OP</i>	<i>5.35</i>
924381	<i>AB2-087 C</i>	<i>0.19</i>
924382	<i>AB2-087 E</i>	<i>0.09</i>
924501	<i>AB2-099 C</i>	<i>0.2</i>
924502	<i>AB2-099 E</i>	<i>0.09</i>
924511	<i>AB2-100 C</i>	<i>5.57</i>
924512	<i>AB2-100 E</i>	<i>2.74</i>
924761	<i>AB2-128 C</i>	<i>4.77</i>
924762	<i>AB2-128 E</i>	<i>1.88</i>
924811	<i>AB2-134 C OP</i>	<i>8.18</i>
924812	<i>AB2-134 E OP</i>	<i>10.94</i>
924931	<i>AB2-147 C</i>	<i>1.2</i>
924932	<i>AB2-147 E</i>	<i>1.96</i>
924941	<i>AB2-149 C OP</i>	<i>1.58</i>
924942	<i>AB2-149 E OP</i>	<i>2.58</i>
924951	<i>AB2-150 C OP</i>	<i>1.2</i>
924952	<i>AB2-150 E OP</i>	<i>1.96</i>
924961	<i>AB2-152</i>	<i>2.21</i>
925051	<i>AB2-160 C OP</i>	<i>4.18</i>

925052	AB2-160 E OP	6.82
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	14.59
925332	AB2-190 E	3.65
925361	AC1-007 C OP	0.24
925362	AC1-007 E OP	0.39
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	8.77
926072	AC1-086 E	3.99
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	38.68
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	6.47
927112	AC1-206 E OP	3.06
927141	AC1-208 C	3.25
927142	AC1-208 E	1.44

<i>927221</i>	<i>ACI-216 C OP</i>	<i>6.25</i>
<i>927222</i>	<i>ACI-216 E OP</i>	<i>4.91</i>

Appendix 7

(DVP - DVP) The 6MESSER-6CHARCTY 230 kV line (from bus 314228 to bus 314225 ckt 1) loads from 140.39% to 144.19% (**DC power flow**) of its load dump rating (459 MVA) for the tower line contingency outage of 'LN 208-259'. This project contributes approximately 38.68 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315065	1CHESTF6	35.89
315077	1HOPHCF1	2.08
315078	1HOPHCF2	2.08
315079	1HOPHCF3	2.08
315080	1HOPHCF4	3.16
315076	1HOPPOLC	1.78
315073	1STONECA	5.66
314784	1WEYRHSB	0.65
314539	3UNCAMP	0.86
314541	3WATKINS	0.24
314229	6MT R221	-0.33
315074	CIR_AB2-152	0.89
315075	CIR_AB2-152	0.87
292791	U1-032 E	2.95
900672	V4-068 E	0.11
901082	W1-029E	13.46
907092	X1-038 E	2.14
913392	Y1-086 E	0.63
914231	Y2-077	0.84
916042	Z1-036 E	13.56
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	1.5
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	2.99
921573	AA1-138 E	1.28
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	0.71
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	0.32
922512	AA2-174 C	0.15
922513	AA2-174 E	0.16
922522	AA2-177 C	6.38
922523	AA2-177 E	2.74
922532	AA2-178 C	2.95
922533	AA2-178 E	1.27
922602	ABI-013 C	0.89
922603	ABI-013 E	5.97
922722	ABI-053 C	0.44
922723	ABI-053 E	0.25
922732	ABI-054 C	2.46

922733	<i>ABI-054 E</i>	<i>1.21</i>
923262	<i>ABI-132 C OP</i>	<i>5.96</i>
923263	<i>ABI-132 E OP</i>	<i>2.55</i>
923572	<i>ABI-173 C OP</i>	<i>0.98</i>
923573	<i>ABI-173 E OP</i>	<i>0.46</i>
923582	<i>ABI-173AC OP</i>	<i>0.98</i>
923583	<i>ABI-173AE OP</i>	<i>0.46</i>
923801	<i>AB2-015 C OP</i>	<i>3.06</i>
923802	<i>AB2-015 E OP</i>	<i>2.51</i>
923831	<i>AB2-022 C</i>	<i>0.66</i>
923832	<i>AB2-022 E</i>	<i>0.35</i>
923851	<i>AB2-025 C</i>	<i>1.62</i>
923852	<i>AB2-025 E</i>	<i>0.73</i>
923911	<i>AB2-031 C OP</i>	<i>0.98</i>
923912	<i>AB2-031 E OP</i>	<i>0.48</i>
923981	<i>AB2-039 C OP</i>	<i>4.91</i>
923982	<i>AB2-039 E OP</i>	<i>3.97</i>
923991	<i>AB2-040 C OP</i>	<i>3.21</i>
923992	<i>AB2-040 E OP</i>	<i>2.62</i>
924071	<i>AB2-051 C OP</i>	<i>38.98</i>
924072	<i>AB2-051 E OP</i>	<i>5.35</i>
924381	<i>AB2-087 C</i>	<i>0.19</i>
924382	<i>AB2-087 E</i>	<i>0.09</i>
924501	<i>AB2-099 C</i>	<i>0.2</i>
924502	<i>AB2-099 E</i>	<i>0.09</i>
924511	<i>AB2-100 C</i>	<i>5.57</i>
924512	<i>AB2-100 E</i>	<i>2.74</i>
924761	<i>AB2-128 C</i>	<i>4.77</i>
924762	<i>AB2-128 E</i>	<i>1.88</i>
924811	<i>AB2-134 C OP</i>	<i>8.18</i>
924812	<i>AB2-134 E OP</i>	<i>10.94</i>
924931	<i>AB2-147 C</i>	<i>1.2</i>
924932	<i>AB2-147 E</i>	<i>1.96</i>
924941	<i>AB2-149 C OP</i>	<i>1.58</i>
924942	<i>AB2-149 E OP</i>	<i>2.58</i>
924951	<i>AB2-150 C OP</i>	<i>1.2</i>
924952	<i>AB2-150 E OP</i>	<i>1.96</i>
924961	<i>AB2-152</i>	<i>2.21</i>
925051	<i>AB2-160 C OP</i>	<i>4.18</i>

925052	AB2-160 E OP	6.82
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	14.59
925332	AB2-190 E	3.65
925361	AC1-007 C OP	0.24
925362	AC1-007 E OP	0.39
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	8.77
926072	AC1-086 E	3.99
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	38.68
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	6.47
927112	AC1-206 E OP	3.06
927141	AC1-208 C	3.25
927142	AC1-208 E	1.44

<i>927221</i>	<i>ACI-216 C OP</i>	<i>6.25</i>
<i>927222</i>	<i>ACI-216 E OP</i>	<i>4.91</i>

Appendix 8

(DVP - DVP) The 6CHSTF B-6MESSER 230 kV line (from bus 314287 to bus 314228 ckt 1) loads from 140.55% to 144.34% (**DC power flow**) of its load dump rating (459 MVA) for the tower line contingency outage of 'LN 208-259'. This project contributes approximately 38.68 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315065	1CHESTF6	35.89
315077	1HOPHCF1	2.08
315078	1HOPHCF2	2.08
315079	1HOPHCF3	2.08
315080	1HOPHCF4	3.16
315076	1HOPPOLC	1.78
315073	1STONECA	5.66
314784	1WEYRHSB	0.65
314539	3UNCAMP	0.86
314541	3WATKINS	0.24
314229	6MT R221	-0.33
315074	CIR_AB2-152	0.89
315075	CIR_AB2-152	0.87
292791	U1-032 E	2.95
900672	V4-068 E	0.11
901082	W1-029E	13.46
907092	X1-038 E	2.14
913392	Y1-086 E	0.63
914231	Y2-077	0.84
916042	Z1-036 E	13.56
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	1.5
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	2.99
921573	AA1-138 E	1.28
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	0.71
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	0.32
922512	AA2-174 C	0.15
922513	AA2-174 E	0.16
922522	AA2-177 C	6.38
922523	AA2-177 E	2.74
922532	AA2-178 C	2.95
922533	AA2-178 E	1.27
922602	ABI-013 C	0.89
922603	ABI-013 E	5.97
922722	ABI-053 C	0.44
922723	ABI-053 E	0.25
922732	ABI-054 C	2.46

922733	<i>ABI-054 E</i>	<i>1.21</i>
923262	<i>ABI-132 C OP</i>	<i>5.96</i>
923263	<i>ABI-132 E OP</i>	<i>2.55</i>
923572	<i>ABI-173 C OP</i>	<i>0.98</i>
923573	<i>ABI-173 E OP</i>	<i>0.46</i>
923582	<i>ABI-173AC OP</i>	<i>0.98</i>
923583	<i>ABI-173AE OP</i>	<i>0.46</i>
923801	<i>AB2-015 C OP</i>	<i>3.06</i>
923802	<i>AB2-015 E OP</i>	<i>2.51</i>
923831	<i>AB2-022 C</i>	<i>0.66</i>
923832	<i>AB2-022 E</i>	<i>0.35</i>
923851	<i>AB2-025 C</i>	<i>1.62</i>
923852	<i>AB2-025 E</i>	<i>0.73</i>
923911	<i>AB2-031 C OP</i>	<i>0.98</i>
923912	<i>AB2-031 E OP</i>	<i>0.48</i>
923981	<i>AB2-039 C OP</i>	<i>4.91</i>
923982	<i>AB2-039 E OP</i>	<i>3.97</i>
923991	<i>AB2-040 C OP</i>	<i>3.21</i>
923992	<i>AB2-040 E OP</i>	<i>2.62</i>
924071	<i>AB2-051 C OP</i>	<i>38.98</i>
924072	<i>AB2-051 E OP</i>	<i>5.35</i>
924381	<i>AB2-087 C</i>	<i>0.19</i>
924382	<i>AB2-087 E</i>	<i>0.09</i>
924501	<i>AB2-099 C</i>	<i>0.2</i>
924502	<i>AB2-099 E</i>	<i>0.09</i>
924511	<i>AB2-100 C</i>	<i>5.57</i>
924512	<i>AB2-100 E</i>	<i>2.74</i>
924761	<i>AB2-128 C</i>	<i>4.77</i>
924762	<i>AB2-128 E</i>	<i>1.88</i>
924811	<i>AB2-134 C OP</i>	<i>8.18</i>
924812	<i>AB2-134 E OP</i>	<i>10.94</i>
924931	<i>AB2-147 C</i>	<i>1.2</i>
924932	<i>AB2-147 E</i>	<i>1.96</i>
924941	<i>AB2-149 C OP</i>	<i>1.58</i>
924942	<i>AB2-149 E OP</i>	<i>2.58</i>
924951	<i>AB2-150 C OP</i>	<i>1.2</i>
924952	<i>AB2-150 E OP</i>	<i>1.96</i>
924961	<i>AB2-152</i>	<i>2.21</i>
925051	<i>AB2-160 C OP</i>	<i>4.18</i>

925052	AB2-160 E OP	6.82
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	14.59
925332	AB2-190 E	3.65
925361	AC1-007 C OP	0.24
925362	AC1-007 E OP	0.39
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	8.77
926072	AC1-086 E	3.99
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	38.68
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	6.47
927112	AC1-206 E OP	3.06
927141	AC1-208 C	3.25
927142	AC1-208 E	1.44

<i>927221</i>	<i>ACI-216 C OP</i>	<i>6.25</i>
<i>927222</i>	<i>ACI-216 E OP</i>	<i>4.91</i>

Appendix 9

(DVP - DVP) The 6CHSTF B-6BASIN 230 kV line (from bus 314287 to bus 314276 ckt 1) loads from 118.5% to 123.34% (**DC power flow**) of its emergency rating (449 MVA) for the single line contingency outage of 'LN 563'. This project contributes approximately 48.32 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315065	1CHESTF6	36.2
315141	1GASTONB	1.73
315119	1GRAVEL3	1.38
315120	1GRAVEL4	1.38
315121	1GRAVEL5	1.36
315122	1GRAVEL6	1.39
315117	1GRAVELC	0.47
315077	1HOPHCF1	1.95
315078	1HOPHCF2	1.95
315079	1HOPHCF3	1.95
315080	1HOPHCF4	2.95
315076	1HOPPOLC	1.66
315116	1SURRY 1	14.41
314314	3LOCKS	0.96
315074	CIR_AB2-152	0.83
315075	CIR_AB2-152	0.82
914231	Y2-077	0.78
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	3.52
921552	AA1-134 C	3.61
921562	AA1-135 C	3.65
921572	AA1-138 C	3.7
921582	AA1-139 C	5.28
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	2.78
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	6.99
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	1.13
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	48.69
924151	AB2-059 C OP	4.07
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	6.39
924761	AB2-128 C	5.48
924811	AB2-134 C OP	7.97
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	3.66
925281	AB2-186 C	0.23
925291	AB2-188 C OP	0.9
925331	AB2-190 C	14.22
925361	AC1-007 C OP	0.27
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
925821	AC1-061	0.03
926071	AC1-086 C	10.3
926201	AC1-098 C	2.56
926211	AC1-099 C	0.86
926661	AC1-147 C	0.81
926741	AC1-159 C	48.32
926771	AC1-163 C	0.88
927021	AC1-189 C	3.3
927051	AC1-193 C	1.53
927141	AC1-208 C	3.95
927221	AC1-216 C OP	6.09

Appendix 10

(DVP - DVP) The 6PENNIMAN-6WALR209 230 kV line (from bus 314296 to bus 314415 ckt 1) loads from 125.36% to 138.11% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 56.34 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
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	ABI-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

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

Appendix 11

(DVP - DVP) The 6KINGS M-6PENNIMAN 230 kV line (from bus 314386 to bus 314296 ckt 1) loads from 129.23% to 141.98% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 56.34 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
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

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

Appendix 12

(DVP - DVP) The 6WALR209-6LIGH209 230 kV line (from bus 314415 to bus 314391 ckt 1) loads from 109.58% to 122.33% (**DC power flow**) of its emergency rating (442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 56.34 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
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	ABI-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

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

Appendix 13

(DVP - DVP) The 8CARSON-8MDLTHAN 500 kV line (from bus 314902 to bus 314914 ckt 1) loads from 109.9% to 118.9% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 557'. This project contributes approximately 219.74 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
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	ABI-013 C	4.48
922722	ABI-053 C	1.51
922732	ABI-054 C	10.06
922922	ABI-081 C OP	12.49
923262	ABI-132 C OP	19.95
923572	ABI-173 C OP	3.15
923582	ABI-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 14

(DVP - DVP) The 8CHCKAHM-8ELMONT 500 kV line (from bus 314903 to bus 314908 ckt 1) loads from 113.5% to 123.72% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 576'. This project contributes approximately 249.63 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
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 15

(DVP - DVP) The 8CHANCE-8BRISTER 500 kV line (from bus 314905 to bus 314900 ckt 1) loads from 114.53% to 117.09% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 594'. This project contributes approximately 142.73 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
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	ABI-013 C	2.91
922672	ABI-026 C	2.11
922682	ABI-027 C	2.79
922722	ABI-053 C	1.01
922732	ABI-054 C	6.75
923262	ABI-132 C OP	13.47
923272	ABI-135 C OP	2.75
923572	ABI-173 C OP	2.17
923582	ABI-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

<i>926771</i>	<i>ACI-163 C</i>	<i>2.06</i>
<i>926781</i>	<i>ACI-164 C OP</i>	<i>44.99</i>
<i>927041</i>	<i>ACI-191 C</i>	<i>10.79</i>
<i>927051</i>	<i>ACI-193 C</i>	<i>3.59</i>
<i>927221</i>	<i>ACI-216 C OP</i>	<i>10.49</i>

Appendix 16

(DVP - DVP) The 8ELMONT-8LDYSMTH 500 kV line (from bus 314908 to bus 314911 ckt 1) loads from 138.54% to 142.96% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 576'. This project contributes approximately 239.58 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
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 17

(DVP - DVP) The 8LDYSMTH-8CHANCE 500 kV line (from bus 314911 to bus 314905 ckt 1) loads from 105.6% to 107.99% (**DC power flow**) of its emergency rating (2738 MVA) for the single line contingency outage of 'LN 573'. This project contributes approximately 144.95 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
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

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

Appendix 18

(DVP - DVP) The 8LDYSMTH-8POSSUM 500 kV line (from bus 314911 to bus 314922 ckt 1) loads from 105.79% to 108.08% (**DC power flow**) of its emergency rating (2442 MVA) for the single line contingency outage of 'LN 594'. This project contributes approximately 124.73 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315053	1BELMED1	3.04
315054	1BELMED2	3.04
315055	1BELMED3	2.52
315060	1CHESTF5	10.76
315061	1CHESTG7	4.22
315063	1CHESTG8	4.18
315062	1CHESTS7	1.92
315064	1CHESTS8	2.14
315067	1DARBY 1	2.76
315068	1DARBY 2	2.76
315069	1DARBY 3	2.8
315070	1DARBY 4	2.8
315043	1FRIVERA	3.63
315045	1FRIVERC	3.63
315048	1FRIVERF	3.63
315225	1N ANNA1	41.53
315226	1N ANNA2	40.88
315083	1SPRUNCA	1.86
315084	1SPRUNCB	1.86
315085	1SPRUNCC	1.38
315086	1SPRUNCD	1.38
315091	1YORKTN2	27.38
314309	6IRON208	0.42
314236	6NRTHEST	0.2
314251	6S PUMP	0.92
297087	V2-040	0.13
921092	AA1-049 C	2.21

<i>LTF</i>	<i>AA1-058</i>	<i>0.69</i>
<i>921292</i>	<i>AA1-083</i>	<i>3.38</i>
<i>921532</i>	<i>AA1-132 C</i>	<i>6.81</i>
<i>921542</i>	<i>AA1-133 C</i>	<i>9.11</i>
<i>921552</i>	<i>AA1-134 C</i>	<i>8.92</i>
<i>921572</i>	<i>AA1-138 C</i>	<i>8.78</i>
<i>921582</i>	<i>AA1-139 C</i>	<i>13.66</i>
<i>921622</i>	<i>AA1-145</i>	<i>57.41</i>
<i>921772</i>	<i>AA2-059 C</i>	<i>2.12</i>
<i>LTF</i>	<i>AA2-074</i>	<i>4.71</i>
<i>921982</i>	<i>AA2-088 C</i>	<i>5.67</i>
<i>922522</i>	<i>AA2-177 C</i>	<i>9.32</i>
<i>922532</i>	<i>AA2-178 C</i>	<i>8.51</i>
<i>922602</i>	<i>AB1-013 C</i>	<i>2.57</i>
<i>922682</i>	<i>AB1-027 C</i>	<i>2.4</i>
<i>922732</i>	<i>AB1-054 C</i>	<i>5.99</i>
<i>923272</i>	<i>AB1-135 C OP</i>	<i>2.37</i>
<i>923801</i>	<i>AB2-015 C OP</i>	<i>7.66</i>
<i>923831</i>	<i>AB2-022 C</i>	<i>2.09</i>
<i>923841</i>	<i>AB2-024 C</i>	<i>2.26</i>
<i>923851</i>	<i>AB2-025 C</i>	<i>2.17</i>
<i>923861</i>	<i>AB2-026 C</i>	<i>2.1</i>
<i>923981</i>	<i>AB2-039 C OP</i>	<i>7.66</i>
<i>924061</i>	<i>AB2-050</i>	<i>3.38</i>
<i>924071</i>	<i>AB2-051 C OP</i>	<i>125.7</i>
<i>924241</i>	<i>AB2-068 OP</i>	<i>187.58</i>
<i>924511</i>	<i>AB2-100 C</i>	<i>9.84</i>
<i>924761</i>	<i>AB2-128 C</i>	<i>8.43</i>
<i>924811</i>	<i>AB2-134 C OP</i>	<i>11.95</i>
<i>924941</i>	<i>AB2-149 C OP</i>	<i>3.08</i>
<i>924961</i>	<i>AB2-152</i>	<i>2.51</i>
<i>925051</i>	<i>AB2-160 C OP</i>	<i>5.05</i>
<i>925061</i>	<i>AB2-161 C OP</i>	<i>3.1</i>
<i>925141</i>	<i>AB2-171 C OP</i>	<i>4.33</i>
<i>925281</i>	<i>AB2-186 C</i>	<i>0.55</i>
<i>925291</i>	<i>AB2-188 C OP</i>	<i>2.1</i>
<i>925331</i>	<i>AB2-190 C</i>	<i>21.3</i>
<i>925361</i>	<i>AC1-007 C OP</i>	<i>0.63</i>
<i>925521</i>	<i>AC1-027 C</i>	<i>1.84</i>

925691	ACI-045 C	1.58
925701	ACI-046 C	1.59
925711	ACI-047 C	2.11
925811	ACI-060	2.28
925821	ACI-061	0.03
925841	ACI-063	0.35
925861	ACI-065 C	3.05
926291	ACI-107 OP	283.14
926411	ACI-112 C	1.87
926441	ACI-115 C	0.92
926551	ACI-134	8.44
926661	ACI-147 C	2.07
926731	ACI-158 C	74.59
926741	ACI-159 C	124.73
926751	ACI-161 C OP	27.92
926781	ACI-164 C OP	39.07
927041	ACI-191 C	9.28
927051	ACI-193 C	3.17
927221	ACI-216 C OP	9.12

Appendix 19

(DVP - DVP) The 8MDLTHAN-8NO ANNA 500 kV line (from bus 314914 to bus 314918 ckt 1) loads from 112.41% to 115.7% (**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 238.32 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

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

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

<i>927212</i>	<i>ACI-215 E</i>	<i>7.31</i>
<i>927221</i>	<i>ACI-216 C OP</i>	<i>15.42</i>
<i>927222</i>	<i>ACI-216 E OP</i>	<i>12.13</i>