Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AD1-082

Bakers Pond – Ivor 115kV
43.3 MW Capacity / 68 MW Energy

March / 2018

Introduction

This Feasibility Study has been prepared in accordance with the PJM Open Access Transmission Tariff, 36.2, as well as the Feasibility Study Agreement between the Interconnection Customer (IC), and PJM Interconnection, LLC (PJM), Transmission Provider (TP). The Interconnected Transmission Owner (ITO) is Virginia Electric and Power Company (VEPCO).

Preface

The intent of the Feasibility Study is to determine a plan, with high level estimated cost and construction time estimates, to connect the subject generation to the PJM network at a location specified by the IC. The IC may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the IC may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances a generator interconnection may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the Feasibility Study, but the actual allocation will be deferred until the Impact Study is performed.

The Feasibility Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The IC is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by ITO, the costs may be included in the study.

General

The IC has proposed a solar generating facility located in Waverly, VA (Sussex County). The installed facilities will have a total capability of 68 MW with 43.3 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is 12/31/2019. **This study does not imply an ITO commitment to this in-service date.**

Point of Interconnection

AD1-082 will interconnect with the ITO transmission system at one of the following points of interconnection:

Option 1 will connect via a new three breaker ring bus switching station that connects on the Bakers Pond – Ivor 115kV line

Option 2 will connect via a new three breaker ring bus switching station that connects on the Waverly – Waverly #2 115kV line.

Cost Summary

The AD1-082 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$1,550,000
Direct Connection Network Upgrades	$0
Non Direct Connection Network Upgrades	$1,100,000
Total Costs	**$2,650,000**

In addition, the AD1-082 project may be responsible for a contribution to the following costs:

Description	Total Cost
New System Upgrades	$17,750,000
Previously Identified Upgrades	$0
Total Costs	**$17,750,000**

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

Note: PJM Open Access Transmission Tariff (OATT) section 217.3A outline cost allocation rules. The rules are further clarified in PJM Manual 14A Attachment B. For New System Upgrades, the cost allocation rule differ depending on whether the minimum amount of upgrades to resolve a single reliability criteria violation will cost less than $5,000,000. For upgrades estimated to cost less than $5,000,000 the allocation of costs will not occur outside of the Queue in which the need for the Network Upgrade was identified. Cost allocation within the Queue will be contingent each Queue projects Distribution Factor on the overloaded facility. For upgrades estimated to cost $5,000,000 or greater the allocation of costs will start with the first Queue project to cause the need for the upgrade. Later queue projects will receive cost allocation contingent on their contribution to the violation and are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

The Feasibility Study is used to make a preliminary determination of the type and scope of Attachment Facilities, Local Upgrades, and Network Upgrades that will be necessary to accommodate the Interconnection Request and to provide the Interconnection Customer a preliminary estimate of the time that will be required to construct any necessary facilities and upgrades and the Interconnection Customer's cost responsibility. The System Impact Study provides refined and comprehensive estimates of cost responsibility and construction lead times for new facilities and system upgrades. Facilities Studies will include, commensurate with the degree of engineering specificity as provided in the Facilities Study Agreement, good faith estimates of the cost, determined in accordance with Section 217 of the Tariff,

(a) to be charged to each affected New Service Customer for the Facilities and System Upgrades that are necessary to accommodate this queue project;

(b) the time required to complete detailed design and construction of the facilities and upgrades; and

(c) a description of any site-specific environmental issues or requirements that could reasonably be anticipated to affect the cost or time required to complete construction of such facilities and upgrades.

Attachment Facilities

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

Transmission: Construct approximately one span of 115 kV Attachment line between the generation substation and a new AD1-082 Switching Station. The estimated cost for this work is $1,000,000.

The estimated total cost of the Attachment Facilities is $1,550,000. It is estimated to take 18-24 months to complete this work. These preliminary cost estimates are based on typical engineering costs. A more detailed engineering cost estimates are normally done when the IC provides an exact site plan location for the generation substation during the Facility Study phase. These costs do not include CIAC Tax Gross-up. The single line is shown below in Attachment 1.

Non-Direct Connection Cost Estimate

AB2-161 Substation: Expand the future 115 kV AB2-161 Switching Substation by adding a 115kV circuit breaker and associated equipment for an additional ringbus position. The estimated cost of this work scope is $1,100,000. It is estimated to take 24-36 months to complete this work.

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

System Reinforcement

Replace the ELMONT 500/230 kV transformer #1 increase its line rating to 1134 MVA (normal), 1203 MVA (emergency), and 1365 MVA (load dump). It is estimated to take 24-30 months to engineer and construct. Estimated Cost $17,500,000.

Reconductor 0.14 miles of 1109 ACAR Chesterfield – Basin 230kV line with a conductor which will increase the line rating to approximately 706 MVA (normal), 706 MVA (emergency), and 812 MVA (load dump). It is estimated to take 15-18 months to engineer, permit and construct. Estimated Cost $250,000.

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.

Meteorological Data Reporting Requirement

The solar generation facility shall provide the Transmission Provider with site-specific meteorological data including:

- Temperature (degrees Fahrenheit)
- Atmospheric pressure (hectopascals)
- Irradiance
- Forced outage data

Option One

Network Impacts

The Queue Project AD1-082 was evaluated as a 68.0 MW (Capacity 43.3 MW) injection at the Sadler 115kV substation in the ITO area. Project AD1-082 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-082 was studied with a commercial probability of 53%.

Potential network impacts were as follows:

PJM assessed the impact of the proposed Queue Project as an injection into the ITO, for compliance with NERC Reliability Criteria. The system was assessed using the summer 2021 RTEP case. When performing analysis, ITO Criteria considers a transmission facility overloaded if it exceeds 94% of its emergency rating under single contingency (normal and stressed system conditions). A full listing of the ITO's Planning Criteria and interconnection requirements can be found in the ITO's Facility Connection Requirements which are publicly available at: http://www.dom.com.

The results of these studies evaluate the system under a limited set of operating conditions and do not guarantee the full delivery of the capacity and associated energy of this proposed generation facility under all operating conditions. NERC Planning and Operating Reliability Criteria allow for the re-dispatch of generating units to resolve projected and actual deficiencies in real time and planning studies. Specifically NERC Category C Contingency Conditions (Bus Fault, Tower Line, N-1-1, and Stuck Breaker scenarios) allow for re-dispatch of generating units to resolve potential reliability deficiencies. For ITO Planning Criteria the re-dispatch of generating units for these contingency conditions is allowed as long as the projected loading does not exceed 100% of a facility Load Dump Rating. The results of these studies are discussed in more detail below.

Contingency Descriptions

The following contingencies resulted in overloads:

Contingency Name	Description
DVP_P1-2: LN 106	CONTINGENCY 'DVP_P1-2: LN 106' OPEN BRANCH FROM BUS 314262 TO BUS 314280 CKT 1 /* 3NEWBO_1 115.00 - 3NEWBOHE 115.00 OPEN BRANCH FROM BUS 314273 TO BUS 314280 CKT 1 /* 3BAKRS P 115.00 - 3NEWBOHE 115.00 OPEN BRANCH FROM BUS 314280 TO BUS 314329 CKT 1 /* 3NEWBOHE 115.00 - 3POE 115.00 OPEN BRANCH FROM BUS 313879 TO BUS 314273 CKT 1 /* 3SADL_2 115.00 - 3BAKRS P 115.00 OPEN BUS 314262 /* ISLAND OPEN BUS 314273 /* ISLAND OPEN BUS 314280 /* ISLAND END

Contingency Name	Description
DVP_P1-2: LN 211	CONTINGENCY 'DVP_P1-2: LN 211' OPEN BRANCH FROM BUS 314287 TO BUS 314303 CKT 1 /* 6CHSTF B 230.00 - 6HOPEWLL 230.00 END
DVP_P1-2: LN 217	CONTINGENCY 'DVP_P1-2: LN 217' OPEN BRANCH FROM BUS 314225 TO BUS 314227 CKT 1 /* 6CHARCTY 230.00 - 6LAKESD 230.00 OPEN BRANCH FROM BUS 314225 TO BUS 314228 CKT 1 /* 6CHARCTY 230.00 - 6MESSER 230.00 OPEN BRANCH FROM BUS 314228 TO BUS 314287 CKT 1 /* 6MESSER 230.00 - 6CHSTF B 230.00 OPEN BUS 314225 /* ISLAND OPEN BUS 314228 /* ISLAND END
DVP_P1-2: LN 23-B	CONTINGENCY 'DVP_P1-2: LN 23-B' OPEN BRANCH FROM BUS 314206 TO BUS 314529 CKT 1 /* 3OAKRIDG 115.00 - 3KINGS F 115.00 OPEN BRANCH FROM BUS 314206 TO BUS 314532 CKT Z1 /* 3OAKRIDG 115.00 - 3OAKRI23 115.00 OPEN BRANCH FROM BUS 932590 TO BUS 314532 CKT 1 /* AC2-079 TAP 115.00 - 3OAKRI23 115.00 OPEN BRANCH FROM BUS 314532 TO BUS 314536 CKT 1 /* 3OAKRI23 115.00 - 3SUFFOLK 115.00 OPEN BUS 314206 /* ISLAND OPEN BUS 314261 /* ISLAND OPEN BUS 314529 /* ISLAND OPEN BUS 314532 /* ISLAND END
DVP_P1-2: LN 563	CONTINGENCY 'DVP_P1-2: LN 563' OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 END
DVP_P4-2: H2T557	CONTINGENCY 'DVP_P4-2: H2T557' /* ELMONT OPEN BRANCH FROM BUS 314908 TO BUS 314903 CKT 1 /*ELMONT TO CHICKAHOMINY (LINE 557) OPEN BRANCH FROM BUS 314903 TO BUS 314214 CKT 1 /*CHICKAHOMINY 500-230 (TX#1) OPEN BRANCH FROM BUS 314908 TO BUS 314218 CKT 2 /*ELMONT 500-230 (TX#2) END
DVP_P7-1: LN 212-240_D	CONTINGENCY 'DVP_P7-1: LN 212-240_D' OPEN BRANCH FROM BUS 925330 TO BUS 314538 CKT 2 /* AB2-190 TAP 230.00 - 6SURRY 230.00 OPEN BRANCH FROM BUS 924810 TO BUS 314538 CKT 1 /* AB2-134 TAP 230.00 - 6SURRY 230.00 END

Summer Peak Analysis - 2021

Generator Deliverability

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

None

Multiple Facility Contingency

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

#	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
1	DCTL	DVP_P7-1: LN 212-240_D	DVP - DVP	6BERMUDA-6CHESTF A 230 kV line	314278	314286	1	DC	91.59	92.04	LD	549	5.57	1
2	DCTL	DVP_P7-1: LN 212-240_D	DVP - DVP	6HOPEWLL-6BERMUDA 230 kV line	314303	314278	1	DC	91.59	92.04	LD	549	5.57	2

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 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	DVP_P4-2: H2T557	DVP - DVP	8ELMONT 500/230 kV transformer	314218	314908	1	DC	126.9	127.38	LD	1051	12.99	3
4	N-1	DVP_P1-2: LN 217	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	120.83	121.82	ER	449	5.16	4

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	6BERMUDA-6CHESTF A 230 kV line	Wreck and rebuild the Hopewell - Bermuda – Chesterfield 230kV line #228 of 11 miles increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to	Pending	**$27,425,000**

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
# 2	6HOPEWLL-6BERMUDA 230 kV line	take 44-48 months to engineer, permit, and construct. A VA CPCN is required.		
			Total New Network Upgrades	**$27,425,000**

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	8ELMONT 500/230 kV transformer	Replace the 500-230 kV transformer #1 increase its line rating to 1134 MVA (normal), 1203 MVA (emergency), and 1365 MVA (load dump). It is estimated to take 24-30 months to engineer and construct.	Pending	**$17,500,000**
# 4	6CHESTF B-6BASIN 230 kV line	Reconductor 0.14 miles of 1109 ACAR Chesterfield – Basin 230kV line with a conductor which will increase the line rating to approximately 706 MVA (normal), 706 MVA (emergency), and 812 MVA (load dump). It is estimated to take 15-18 months to engineer, permit and construct.	Pending	**$250,000**
			Total New Network Upgrades	**$17,750,000**

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 Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution
5	N-1	DVP_P1-2: LN 23-B	DVP - DVP	3SADLER 2-3BAKRS P 115 kV line	313879	314273	1	DC	125.32	186.62	ER	111	68
6	N-1	DVP_P1-2: LN 106	DVP - DVP	3SADLER 2-3IVOR106 115 kV line	313879	314528	1	DC	45.08	106.38	ER	111	68
7	N-1	DVP_P1-2: LN 23-B	DVP - DVP	3BAKRS P-3NEWBOHE 115 kV line	314273	314280	1	DC	111.34	172.65	ER	111	68
8	N-1	DVP_P1-2: LN 211	DVP - DVP	6BERMUDA-6CHESTF A 230 kV line	314278	314286	1	DC	122.18	122.37	ER	449	6.72
9	N-1	DVP_P1-2: LN 23-B	DVP - DVP	3NEWBOHE-3POE 115 kV line	314280	314329	1	DC	101.24	162.55	ER	111	68
10	N-1	DVP_P1-2: LN 563	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	154.57	155.25	ER	449	6.7
11	N-1	DVP_P1-2: LN 211	DVP - DVP	6HOPEWLL-6BERMUDA 230 kV line	314303	314278	1	DC	122.18	122.37	ER	449	6.72
12	N-1	DVP_P1-2: LN 106	DVP - DVP	3OAKRI23-3SUFFOLK 115 kV line	314532	314536	1	DC	104.31	165.61	ER	111	68
13	Non	Non	DVP - DVP	3OAKRI23-3SUFFOLK 115 kV line	314532	314536	1	DC	80.49	114.08	NR	111	37.26
14	N-1	DVP_P1-2: LN 106	DVP - DVP	AC2-079 TAP-3OAKRI23 115 kV line	932590	314532	1	DC	125.5	186.8	ER	111	68
15	Non	Non	DVP - DVP	AC2-079 TAP-3OAKRI23 115 kV line	932590	314532	1	DC	101.67	135.27	NR	111	37.26

Light Load Analysis

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

Affected System Analysis & Mitigation

Duke, Progress & TVA Impacts:

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

Option Two

Network Impacts

The Queue Project AD1-082 was evaluated as a 68.0 MW (Capacity 43.3 MW) injection at the Sadler 115kV substation in the ITO area. Project AD1-082 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-082 was studied with a commercial probability of 53%.

Potential network impacts were as follows:

PJM assessed the impact of the proposed Queue Project as an injection into the ITO, for compliance with NERC Reliability Criteria. The system was assessed using the summer 2021 RTEP case. When performing analysis, ITO Criteria considers a transmission facility overloaded if it exceeds 94% of its emergency rating under single contingency (normal and stressed system conditions). A full listing of the ITO's Planning Criteria and interconnection requirements can be found in the ITO's Facility Connection Requirements which are publicly available at: http://www.dom.com.

The results of these studies evaluate the system under a limited set of operating conditions and do not guarantee the full delivery of the capacity and associated energy of this proposed generation facility under all operating conditions. NERC Planning and Operating Reliability Criteria allow for the re-dispatch of generating units to resolve projected and actual deficiencies in real time and planning studies. Specifically NERC Category C Contingency Conditions (Bus Fault, Tower Line, N-1-1, and Stuck Breaker scenarios) allow for re-dispatch of generating units to resolve potential reliability deficiencies. For ITO Planning Criteria the re-dispatch of generating units for these contingency conditions is allowed as long as the projected loading does not exceed 100% of a facility Load Dump Rating. The results of these studies are discussed in more detail below.

Contingency Descriptions

The following contingencies resulted in overloads:

Contingency Name	Description
DVP_P1-2: LN 15-A	CONTINGENCY 'DVP_P1-2: LN 15-A' OPEN BRANCH FROM BUS 314292 TO BUS 932580 CKT 1 /* 3DISPUTN 115.00 - AC2-078 TAP 115.00 OPEN BRANCH FROM BUS 314292 TO BUS 314329 CKT 1 /* 3DISPUTN 115.00 - 3POE 115.00 OPEN BUS 314292 /* ISLAND END
DVP_P1-2: LN 15-C	CONTINGENCY 'DVP_P1-2: LN 15-C' OPEN BRANCH FROM BUS 314347 TO BUS 314351 CKT 1 /* 3WAKEFLD 115.00 - 3WAVERLY 115.00 OPEN BRANCH FROM BUS 934570 TO BUS 314351 CKT 1 /* AD1-082 TAP 115.00 - 3WAVERLY 115.00 OPEN BRANCH FROM BUS 313878 TO BUS 314347 CKT 1 /* 3SADL_1 115.00 - 3WAKEFLD 115.00 OPEN BUS 314347 /* ISLAND OPEN BUS 314351 /* ISLAND END

Contingency Name	Description
DVP_P1-2: LN 211	CONTINGENCY 'DVP_P1-2: LN 211' OPEN BRANCH FROM BUS 314287 TO BUS 314303 CKT 1 /* 6CHSTF B 230.00 - 6HOPEWLL 230.00 END
DVP_P1-2: LN 217	CONTINGENCY 'DVP_P1-2: LN 217' OPEN BRANCH FROM BUS 314225 TO BUS 314227 CKT 1 /* 6CHARCTY 230.00 - 6LAKESD 230.00 OPEN BRANCH FROM BUS 314225 TO BUS 314228 CKT 1 /* 6CHARCTY 230.00 - 6MESSER 230.00 OPEN BRANCH FROM BUS 314228 TO BUS 314287 CKT 1 /* 6MESSER 230.00 - 6CHSTF B 230.00 OPEN BUS 314225 /* ISLAND OPEN BUS 314228 /* ISLAND END
DVP_P1-2: LN 563	CONTINGENCY 'DVP_P1-2: LN 563' OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 END
DVP_P4-2: H2T557	CONTINGENCY 'DVP_P4-2: H2T557' /* ELMONT OPEN BRANCH FROM BUS 314908 TO BUS 314903 CKT 1 /*ELMONT TO CHICKAHOMINY (LINE 557) OPEN BRANCH FROM BUS 314903 TO BUS 314214 CKT 1 /*CHICKAHOMINY 500-230 (TX#1) OPEN BRANCH FROM BUS 314908 TO BUS 314218 CKT 2 /*ELMONT 500-230 (TX#2) END

Summer Peak Analysis - 2021

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	Cir.	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Ref
1	Non	Non	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	99.93	100.05	NR	2442	7.97	5

Multiple Facility Contingency

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

None

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	Facility Description	Bus	Cir.	Power	Loading %	Rating	MW	Ref

	Type	Name	Area		From	To		Flow	Initial	Final	Type	MVA	Contribution	
2	LFFB	DVP_P4-2: H2T557	DVP - DVP	8ELMONT 500/230 kV transformer	314218	314908	1	DC	126.57	127.08	LD	1051	13.78	6
3	N-1	DVP_P1-2: LN 211	DVP - DVP	6BERMUDA-6CHESTF A 230 kV line	314278	314286	1	DC	105.58	106.65	ER	449	4.8	7
4	N-1	DVP_P1-2: LN 563	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	128.86	129.99	ER	449	5.05	8
5	N-1	DVP_P1-2: LN 217	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	120.41	121.56	ER	449	6.37	
6	N-1	DVP_P1-2: LN 211	DVP - DVP	6HOPEWLL-6BERMUDA 230 kV line	314303	314278	1	DC	105.58	106.65	ER	449	4.8	9

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 Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution
7	N-1	DVP_P1-2: LN 211	DVP - DVP	6BERMUDA-6CHESTF A 230 kV line	314278	314286	1	DC	131.08	131.83	ER	449	7.54
8	N-1	DVP_P1-2: LN 563	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	154.54	156.33	ER	449	7.93
9	N-1	DVP_P1-2: LN 15-C	DVP - DVP	3DISPUTN-3POE 115 kV line	314292	314329	1	DC	41.29	102.6	ER	111	68
10	N-1	DVP_P1-2: LN 211	DVP - DVP	6HOPEWLL-6BERMUDA 230 kV line	314303	314278	1	DC	131.08	131.83	ER	449	7.54
11	N-1	DVP_P1-2: LN 15-A	DVP - DVP	3WAVERLY-3WAKEFLD 115 kV line	314351	314347	1	DC	40.3	101.6	ER	111	68
12	N-1	DVP_P1-2: LN 15-C	DVP - DVP	AC2-078 TAP-3DISPUTN 115 kV line	932580	314292	1	DC	45.35	106.65	ER	111	68
13	N-1	DVP_P1-2: LN 15-A	DVP - DVP	AD1-082 TAP-3WAVERLY 115 kV line	934570	314351	1	DC	45.35	106.65	ER	111	68

Light Load Analysis

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

Affected System Analysis & Mitigation

Duke, Progress & TVA Impacts:

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

Attachment 1.

Flowgate Appendices

Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to 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 6BERMUDA-6CHESTF A 230 kV line (from bus 314278 to bus 314286 ckt 1) loads from 91.59% to 92.04% (**DC power flow**) of its load dump rating (549 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 212-240_D'. This project contributes approximately 5.57 MW to the thermal violation.

CONTINGENCY 'DVP_P7-1: LN 212-240_D'
OPEN BRANCH FROM BUS 925330 TO BUS 314538 CKT 2 /* AB2-190 TAP 230.00 - 6SURRY 230.00
OPEN BRANCH FROM BUS 924810 TO BUS 314538 CKT 1 /* AB2-134 TAP 230.00 - 6SURRY 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315065	*1CHESTF6*	*20.42*
315074	*1HOPCGN1*	*20.52*
315075	*1HOPCGN2*	*20.26*
315077	*1HOPHCF1*	*6.49*
315078	*1HOPHCF2*	*6.49*
315079	*1HOPHCF3*	*6.49*
315080	*1HOPHCF4*	*9.85*
315076	*1HOPPOLC*	*4.62*
315073	*1STONECA*	*17.02*
314315	*3LOCKS E*	*0.65*
932581	*AC2-078 C*	*2.99*
932582	*AC2-078 E*	*4.88*
934011	*AD1-025 C O1*	*41.76*
934012	*AD1-025 E O1*	*24.74*
934071	*AD1-034 C O1*	*4.18*
934072	*AD1-034 E O1*	*2.71*
934571	*AD1-082 C O1*	*3.55*
934572	*AD1-082 E O1*	*2.02*
935161	*AD1-151 C O1*	*39.9*
935162	*AD1-151 E O1*	*26.6*
935211	*AD1-156 C*	*1.39*
935212	*AD1-156 E*	*0.93*
LTF	*CARR*	*0.06*
LTF	*CBM-S1*	*0.9*
LTF	*CBM-S2*	*2.08*

LTF	*CBM-W1*	*1.53*
LTF	*CBM-W2*	*4.7*
LTF	*CIN*	*0.35*
LTF	*CPLE*	*0.68*
LTF	*G-007*	*0.26*
LTF	*IPL*	*0.22*
LTF	*LGEE*	*0.08*
LTF	*MEC*	*0.88*
LTF	*MECS*	*0.25*
LTF	*O-066*	*0.88*
LTF	*RENSSELAER*	*0.05*
LTF	*ROSETON*	*0.35*
292791	*U1-032 E*	*8.87*
LTF	*WEC*	*0.1*
914231	*Y2-077*	*2.61*
924811	*AB2-134 C O1*	*31.83*
924812	*AB2-134 E O1*	*31.3*
925051	*AB2-160 C O1*	*2.83*
925052	*AB2-160 E O1*	*4.62*
925061	*AB2-161 C O1*	*1.56*
925062	*AB2-161 E O1*	*2.54*
925331	*AB2-190 C*	*49.65*
925332	*AB2-190 E*	*21.28*
927221	*AC1-216 C O1*	*24.29*
927222	*AC1-216 E O1*	*19.11*

Appendix 2

(DVP - DVP) The 6HOPEWLL-6BERMUDA 230 kV line (from bus 314303 to bus 314278 ckt 1) loads from 91.59% to 92.04% (**DC power flow**) of its load dump rating (549 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 212-240_D'. This project contributes approximately 5.57 MW to the thermal violation.

CONTINGENCY 'DVP_P7-1: LN 212-240_D'
OPEN BRANCH FROM BUS 925330 TO BUS 314538 CKT 2 /* AB2-190 TAP 230.00 - 6SURRY 230.00
OPEN BRANCH FROM BUS 924810 TO BUS 314538 CKT 1 /* AB2-134 TAP 230.00 - 6SURRY 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315065	*1CHESTF6*	*20.42*
315074	*1HOPCGN1*	*20.52*
315075	*1HOPCGN2*	*20.26*
315077	*1HOPHCF1*	*6.49*
315078	*1HOPHCF2*	*6.49*
315079	*1HOPHCF3*	*6.49*
315080	*1HOPHCF4*	*9.85*
315076	*1HOPPOLC*	*4.62*
315073	*1STONECA*	*17.02*
314315	*3LOCKS E*	*0.65*
932581	*AC2-078 C*	*2.99*
932582	*AC2-078 E*	*4.88*
934011	*AD1-025 C O1*	*41.76*
934012	*AD1-025 E O1*	*24.74*
934071	*AD1-034 C O1*	*4.18*
934072	*AD1-034 E O1*	*2.71*
934571	*AD1-082 C O1*	*3.55*
934572	*AD1-082 E O1*	*2.02*
935161	*AD1-151 C O1*	*39.9*
935162	*AD1-151 E O1*	*26.6*
935211	*AD1-156 C*	*1.39*
935212	*AD1-156 E*	*0.93*
LTF	*CARR*	*0.06*
LTF	*CBM-S1*	*0.9*
LTF	*CBM-S2*	*2.08*

LTF	*CBM-W1*	*1.53*
LTF	*CBM-W2*	*4.7*
LTF	*CIN*	*0.35*
LTF	*CPLE*	*0.68*
LTF	*G-007*	*0.26*
LTF	*IPL*	*0.22*
LTF	*LGEE*	*0.08*
LTF	*MEC*	*0.88*
LTF	*MECS*	*0.25*
LTF	*O-066*	*0.88*
LTF	*RENSSELAER*	*0.05*
LTF	*ROSETON*	*0.35*
292791	*U1-032 E*	*8.87*
LTF	*WEC*	*0.1*
914231	*Y2-077*	*2.61*
924811	*AB2-134 C O1*	*31.83*
924812	*AB2-134 E O1*	*31.3*
925051	*AB2-160 C O1*	*2.83*
925052	*AB2-160 E O1*	*4.62*
925061	*AB2-161 C O1*	*1.56*
925062	*AB2-161 E O1*	*2.54*
925331	*AB2-190 C*	*49.65*
925332	*AB2-190 E*	*21.28*
927221	*AC1-216 C O1*	*24.29*
927222	*AC1-216 E O1*	*19.11*

Appendix 3

(DVP - DVP) The 8ELMONT 500/230 kV transformer (from bus 314218 to bus 314908 ckt 1) loads from 126.9% to 127.38% (**DC power flow**) of its load dump rating (1051 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: H2T557'. This project contributes approximately 12.99 MW to the thermal violation.

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

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

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

933712	*AC2-194 E*	*1.59*
933731	*AC2-196 C*	*1.66*
933732	*AC2-196 E*	*1.1*
933991	*AD1-023 C*	*11.29*
933992	*AD1-023 E*	*6.14*
934011	*AD1-025 C O1*	*20.82*
934012	*AD1-025 E O1*	*12.33*
934061	*AD1-033 C O1*	*6.96*
934062	*AD1-033 E O1*	*4.64*
934071	*AD1-034 C O1*	*10.6*
934072	*AD1-034 E O1*	*6.87*
934141	*AD1-041 C O1*	*6.74*
934142	*AD1-041 E O1*	*4.49*
934191	*AD1-046 C*	*4.71*
934192	*AD1-046 E*	*3.14*
934201	*AD1-047 C*	*6.75*
934202	*AD1-047 E*	*4.5*
934211	*AD1-048 C*	*3.82*
934212	*AD1-048 E*	*1.93*
934391	*AD1-063 C*	*2.1*
934392	*AD1-063 E*	*1.4*
934521	*AD1-076 C O1*	*46.88*
934522	*AD1-076 E O1*	*23.87*
934571	*AD1-082 C O1*	*8.27*
934572	*AD1-082 E O1*	*4.72*
934781	*AD1-105 C*	*8.08*
934782	*AD1-105 E*	*5.62*
LTF	*AD1-120*	*5.93*
LTF	*AD1-121*	*5.89*
935111	*AD1-144 C*	*1.68*
935112	*AD1-144 E*	*0.92*
935161	*AD1-151 C O1*	*19.89*
935162	*AD1-151 E O1*	*13.26*
935211	*AD1-156 C*	*2.56*
935212	*AD1-156 E*	*1.71*
LTF	*CARR*	*0.67*
LTF	*CBM-S1*	*3.86*
LTF	*CBM-S2*	*13.84*
LTF	*CBM-W1*	*0.21*

LTF	*CBM-W2*	*17.91*
LTF	*CIN*	*0.13*
LTF	*CLIFTY*	*1.62*
LTF	*CPLE*	*4.75*
LTF	*DEARBORN*	*0.47*
LTF	*G-007*	*2.31*
LTF	*IPL*	*0.06*
LTF	*LGEE*	*0.05*
LTF	*MEC*	*1.99*
LTF	*O-066*	*7.73*
LTF	*RENSSELAER*	*0.53*
LTF	*ROSETON*	*3.84*
292791	*U1-032 E*	*4.87*
297087	*V2-040*	*0.28*
900672	*V4-068 E*	*0.26*
901082	*W1-029E*	*41.82*
LTF	*WEC*	*0.06*
907092	*X1-038 E*	*5.47*
913392	*Y1-086 E*	*1.99*
916042	*Z1-036 E*	*40.84*
916192	*Z1-068 E*	*1.76*
917122	*Z2-027 E*	*0.96*
917592	*Z2-099 E*	*0.38*
918492	*AA1-063AE OP*	*3.35*
918512	*AA1-065 E OP*	*3.74*
918691	*AA1-083*	*1.16*
919152	*AA1-139 E*	*5.92*
919211	*AA1-145*	*19.79*
919732	*AA2-059 E*	*0.5*
LTF	*AA2-074*	*3.23*
920022	*AA2-086 E*	*0.21*
920042	*AA2-088 E*	*9.15*
920691	*AA2-178 C*	*8.43*
920692	*AA2-178 E*	*3.61*
930051	*AB1-013 C*	*2.54*
930052	*AB1-013 E*	*17.02*
930121	*AB1-027 C*	*0.87*
930122	*AB1-027 E*	*1.89*
930861	*AB1-132 C*	*11.78*

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

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

Appendix 4

(DVP - DVP) The 6CHESTF B-6BASIN 230 kV line (from bus 314287 to bus 314276 ckt 1) loads from 120.83% to 121.82% (**DC power flow**) of its emergency rating (449 MVA) for the single line contingency outage of 'DVP_P1-2: LN 217'. This project contributes approximately 5.16 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 217'
OPEN BRANCH FROM BUS 314225 TO BUS 314227 CKT 1 /* 6CHARCTY 230.00 - 6LAKESD 230.00
OPEN BRANCH FROM BUS 314225 TO BUS 314228 CKT 1 /* 6CHARCTY 230.00 - 6MESSER 230.00
OPEN BRANCH FROM BUS 314228 TO BUS 314287 CKT 1 /* 6MESSER 230.00 - 6CHSTF B 230.00
OPEN BUS 314225 /* ISLAND
OPEN BUS 314228 /* ISLAND
END

Bus Number	*Bus Name*	*Full Contribution*
315065	*1CHESTF6*	*46.37*
315139	*1GASTONA*	*1.74*
315141	*1GASTONB*	*1.74*
315119	*1GRAVEL3*	*1.45*
315120	*1GRAVEL4*	*1.46*
315121	*1GRAVEL5*	*1.45*
315122	*1GRAVEL6*	*1.46*
315117	*1GRAVELC*	*0.5*
315074	*1HOPCGN1*	*7.6*
315075	*1HOPCGN2*	*7.5*
315077	*1HOPHCF1*	*2.4*
315078	*1HOPHCF2*	*2.4*
315079	*1HOPHCF3*	*2.4*
315080	*1HOPHCF4*	*3.65*
315076	*1HOPPOLC*	*1.71*
315116	*1SURRY 1*	*14.49*
314314	*3LOCKS*	*0.08*
314315	*3LOCKS E*	*1.06*
932581	*AC2-078 C*	*3.67*
932591	*AC2-079 C*	*3.48*
932631	*AC2-084 C*	*3.3*

933451	*AC2-158 C*	*1.95*
933461	*AC2-159 C*	*2.67*
933471	*AC2-161 C*	*0.97*
933991	*AD1-023 C*	*4.49*
934011	*AD1-025 C O1*	*11.78*
934041	*AD1-029 C*	*4.08*
934071	*AD1-034 C O1*	*6.8*
934201	*AD1-047 C*	*3.96*
934331	*AD1-057 C O1*	*4.03*
934571	*AD1-082 C O1*	*5.16*
935161	*AD1-151 C O1*	*11.25*
935211	*AD1-156 C*	*2.59*
LTF	*CARR*	*0.19*
LTF	*CBM-S1*	*2.55*
LTF	*CBM-S2*	*6.05*
LTF	*CBM-W1*	*4.1*
LTF	*CBM-W2*	*13.19*
LTF	*CIN*	*0.94*
LTF	*CPLE*	*1.99*
LTF	*IPL*	*0.6*
LTF	*LGEE*	*0.21*
LTF	*MEC*	*2.42*
LTF	*MECS*	*0.62*
LTF	*RENSSELAER*	*0.15*
LTF	*ROSETON*	*1.06*
LTF	*WEC*	*0.26*
914231	*Y2-077*	*0.97*
LTF	*AA2-074*	*1.35*
930861	*AB1-132 C*	*6.75*
931231	*AB1-173 C*	*1.11*
931241	*AB1-173AC*	*1.11*
923801	*AB2-015 C O1*	*3.33*
923851	*AB2-025 C*	*0.37*
923911	*AB2-031 C O1*	*1.11*
923991	*AB2-040 C O1*	*3.63*
924381	*AB2-087 C*	*0.21*
924501	*AB2-099 C*	*0.22*
924511	*AB2-100 C*	*7.19*
924811	*AB2-134 C O1*	*8.98*

925051	*AB2-160 C O1*	*4.6*
925061	*AB2-161 C O1*	*2.26*
925171	*AB2-174 C O1*	*3.57*
925331	*AB2-190 C*	*14.*
925821	*AC1-061*	*< 0.01*
926071	*AC1-086 C*	*9.94*
926201	*AC1-098 C*	*2.32*
926211	*AC1-099 C*	*0.78*
926771	*AC1-163 C*	*0.73*
927111	*AC1-206 C*	*6.39*
927141	*AC1-208 C*	*3.54*
927221	*AC1-216 C O1*	*6.85*

Appendix 5

(DVP - DVP) The 8CHCKAHM-8ELMONT 500 kV line (from bus 314903 to bus 314908 ckt 1) loads from 99.93% to 100.05% (**DC power flow**) of its normal rating (2442 MVA) for non-contingency condition. This project contributes approximately 7.97 MW to the thermal violation.

Bus Number	*Bus Name*	*Full Contribution*
315099	*1CHESPKB*	*1.83*
315108	*1ELIZAR1*	*5.39*
315109	*1ELIZAR2*	*5.29*
315110	*1ELIZAR3*	*5.45*
315074	*1HOPCGN1*	*8.26*
315075	*1HOPCGN2*	*8.16*
315233	*1SURRY 2*	*51.58*
315092	*1YORKTN3*	*42.98*
314315	*3LOCKS E*	*1.04*
314421	*6WINCHST*	*0.27*
932041	*AC2-012 C*	*14.26*
932501	*AC2-070 C*	*1.36*
932531	*AC2-073 C*	*3.36*
932581	*AC2-078 C*	*4.01*
932591	*AC2-079 C*	*8.21*
932631	*AC2-084 C*	*8.45*
932701	*AC2-093 C*	*64.83*
932831	*AC2-110 C*	*1.84*
933061	*AC2-130*	*2.6*
933071	*AC2-131 1*	*1.76*
933081	*AC2-131 2*	*0.8*
933111	*AC2-132 1*	*0.93*
933121	*AC2-132 2*	*0.47*
933261	*AC2-137 C*	*2.49*
933271	*AC2-138 C*	*0.83*
933291	*AC2-141 C*	*46.34*
933451	*AC2-158 C*	*6.14*
933461	*AC2-159 C*	*6.75*
933471	*AC2-161 C*	*3.15*
933481	*AC2-162 C*	*1.95*
933711	*AC2-194 C*	*1.43*

933731	*AC2-196 C*	*2.5*
933991	*AD1-023 C*	*15.36*
934011	*AD1-025 C O2*	*19.28*
934041	*AD1-029 C*	*10.46*
934061	*AD1-033 C O2*	*10.49*
934071	*AD1-034 C O2*	*7.*
934141	*AD1-041 C O2*	*7.65*
934201	*AD1-047 C*	*7.37*
934211	*AD1-048 C*	*2.3*
934331	*AD1-057 C O2*	*9.19*
934391	*AD1-063 C*	*2.28*
934521	*AD1-076 C O2*	*60.15*
934571	*AD1-082 C O2*	*7.96*
LTF	*AD1-120*	*7.98*
LTF	*AD1-121*	*7.93*
935111	*AD1-144 C*	*2.36*
935161	*AD1-151 C O2*	*39.9*
935211	*AD1-156 C*	*1.78*
LTF	*CARR*	*0.67*
LTF	*CBM-S1*	*7.01*
LTF	*CBM-S2*	*18.71*
LTF	*CBM-W1*	*8.61*
LTF	*CBM-W2*	*35.38*
LTF	*CIN*	*2.02*
LTF	*CPLE*	*6.21*
LTF	*IPL*	*1.27*
LTF	*LGEE*	*0.45*
LTF	*MEC*	*5.91*
LTF	*MECS*	*0.59*
LTF	*RENSSELAER*	*0.53*
LTF	*ROSETON*	*3.85*
LTF	*WEC*	*0.57*
LTF	*AA2-074*	*4.22*
920691	*AA2-178 C*	*11.79*
930051	*AB1-013 C*	*3.56*
930861	*AB1-132 C*	*13.28*
931231	*AB1-173 C*	*2.07*
931241	*AB1-173AC*	*2.07*
923801	*AB2-015 C O1*	*10.11*

923831	*AB2-022 C*	*3.09*
923841	*AB2-024 C*	*0.7*
923911	*AB2-031 C O1*	*2.06*
923941	*AB2-035 C*	*0.3*
923991	*AB2-040 C O1*	*6.76*
924071	*AB2-051*	*191.88*
924241	*AB2-068 O1*	*587.11*
924381	*AB2-087 C*	*0.61*
924391	*AB2-088 C*	*0.39*
924491	*AB2-098 C*	*0.55*
924501	*AB2-099 C*	*0.63*
924511	*AB2-100 C*	*10.45*
924811	*AB2-134 C O1*	*14.7*
925051	*AB2-160 C O1*	*4.52*
925061	*AB2-161 C O1*	*3.8*
925121	*AB2-169 C*	*7.07*
925171	*AB2-174 C O1*	*6.42*
925281	*AB2-186 C*	*0.79*
925291	*AB2-188 C O1*	*2.91*
925331	*AB2-190 C*	*22.93*
925591	*AC1-034 C*	*6.21*
925861	*AC1-065 C*	*4.6*
926071	*AC1-086 C*	*19.56*
926201	*AC1-098 C*	*5.93*
926211	*AC1-099 C*	*1.99*
926291	*AC1-107*	*886.21*
926741	*AC1-159*	*92.52*
926751	*AC1-161 C*	*46.34*
926771	*AC1-163 C*	*2.09*
926781	*AC1-164 C*	*60.12*
927021	*AC1-189 C*	*8.08*
927111	*AC1-206 C*	*8.99*
927141	*AC1-208 C*	*8.52*
927221	*AC1-216 C O1*	*11.22*

Appendix 6

(DVP - DVP) The 8ELMONT 500/230 kV transformer (from bus 314218 to bus 314908 ckt 1) loads from 126.57% to 127.08% (**DC power flow**) of its load dump rating (1051 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: H2T557'. This project contributes approximately 13.78 MW to the thermal violation.

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

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

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

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

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

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

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

Appendix 7

(DVP - DVP) The 6BERMUDA-6CHESTF A 230 kV line (from bus 314278 to bus 314286 ckt 1) loads from 105.58% to 106.65% (**DC power flow**) of its emergency rating (449 MVA) for the single line contingency outage of 'DVP_P1-2: LN 211'. This project contributes approximately 4.8 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 211'
 OPEN BRANCH FROM BUS 314287 TO BUS 314303 CKT 1 /* 6CHSTF B 230.00 - 6HOPEWLL 230.00
 END

Bus Number	*Bus Name*	*Full Contribution*
315119	*1GRAVEL3*	*3.7*
315120	*1GRAVEL4*	*3.75*
315121	*1GRAVEL5*	*3.7*
315122	*1GRAVEL6*	*3.75*
315117	*1GRAVELC*	*1.28*
315074	*1HOPCGN1*	*24.18*
315075	*1HOPCGN2*	*23.87*
315077	*1HOPHCF1*	*7.65*
315078	*1HOPHCF2*	*7.65*
315079	*1HOPHCF3*	*7.65*
315080	*1HOPHCF4*	*11.6*
315076	*1HOPPOLC*	*5.44*
315116	*1SURRY 1*	*37.1*
932041	*AC2-012 C*	*4.85*
932581	*AC2-078 C*	*2.66*
932591	*AC2-079 C*	*3.3*
933471	*AC2-161 C*	*2.22*
934011	*AD1-025 C O2*	*34.95*
934571	*AD1-082 C O2*	*4.8*
935111	*AD1-144 C*	*0.9*
LTF	*CARR*	*0.15*
LTF	*CBM-S1*	*1.38*
LTF	*CBM-S2*	*3.67*
LTF	*CBM-W1*	*1.65*
LTF	*CBM-W2*	*6.95*
LTF	*CIN*	*0.39*
LTF	*CPLE*	*1.23*

LTF	*IPL*	*0.25*
LTF	*LGEE*	*0.09*
LTF	*MEC*	*1.16*
LTF	*MECS*	*0.09*
LTF	*RENSSELAER*	*0.12*
LTF	*ROSETON*	*0.88*
LTF	*WEC*	*0.11*
914231	*Y2-077*	*3.08*
924071	*AB2-051*	*63.51*
924811	*AB2-134 C O1*	*26.64*
925061	*AB2-161 C O1*	*1.88*
925331	*AB2-190 C*	*41.56*
925691	*AC1-045 C*	*0.18*
926741	*AC1-159*	*30.62*
927221	*AC1-216 C O1*	*20.33*

Appendix 8

(DVP - DVP) The 6CHESTF B-6BASIN 230 kV line (from bus 314287 to bus 314276 ckt 1) loads from 128.86% to 129.99% (**DC power flow**) of its emergency rating (449 MVA) for the single line contingency outage of 'DVP_P1-2: LN 563'. This project contributes approximately 5.05 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 563'
OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00
END

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

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

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

Appendix 9

(DVP - DVP) The 6HOPEWLL-6BERMUDA 230 kV line (from bus 314303 to bus 314278 ckt 1) loads from 105.58% to 106.65% (**DC power flow**) of its emergency rating (449 MVA) for the single line contingency outage of 'DVP_P1-2: LN 211'. This project contributes approximately 4.8 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 211'
 OPEN BRANCH FROM BUS 314287 TO BUS 314303 CKT 1 /* 6CHSTF B 230.00 - 6HOPEWLL 230.00
 END

Bus Number	*Bus Name*	*Full Contribution*
315119	*1GRAVEL3*	*3.7*
315120	*1GRAVEL4*	*3.75*
315121	*1GRAVEL5*	*3.7*
315122	*1GRAVEL6*	*3.75*
315117	*1GRAVELC*	*1.28*
315074	*1HOPCGN1*	*24.18*
315075	*1HOPCGN2*	*23.87*
315077	*1HOPHCF1*	*7.65*
315078	*1HOPHCF2*	*7.65*
315079	*1HOPHCF3*	*7.65*
315080	*1HOPHCF4*	*11.6*
315076	*1HOPPOLC*	*5.44*
315116	*1SURRY 1*	*37.1*
932041	*AC2-012 C*	*4.85*
932581	*AC2-078 C*	*2.66*
932591	*AC2-079 C*	*3.3*
933471	*AC2-161 C*	*2.22*
934011	*AD1-025 C O2*	*34.95*
934571	*AD1-082 C O2*	*4.8*
935111	*AD1-144 C*	*0.9*
LTF	*CARR*	*0.15*
LTF	*CBM-S1*	*1.38*
LTF	*CBM-S2*	*3.67*
LTF	*CBM-W1*	*1.65*
LTF	*CBM-W2*	*6.95*
LTF	*CIN*	*0.39*
LTF	*CPLE*	*1.23*

LTF	*IPL*	*0.25*
LTF	*LGEE*	*0.09*
LTF	*MEC*	*1.16*
LTF	*MECS*	*0.09*
LTF	*RENSSELAER*	*0.12*
LTF	*ROSETON*	*0.88*
LTF	*WEC*	*0.11*
914231	*Y2-077*	*3.08*
924071	*AB2-051*	*63.51*
924811	*AB2-134 C O1*	*26.64*
925061	*AB2-161 C O1*	*1.88*
925331	*AB2-190 C*	*41.56*
925691	*AC1-045 C*	*0.18*
926741	*AC1-159*	*30.62*
927221	*AC1-216 C O1*	*20.33*