Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AD1-050

Beechwood DP – Palmer Springs 115kV 29.1 MW Capacity / 45 MW Energy

February 2018

Introduction

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

Preface

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

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

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

General

The IC has proposed a hybrid Solar and battery generating facility located in Mecklenburg County, Virginia. The installed facilities will have a total capability of 45 MW with 29.1 MW of this output being recognized by PJM as capacity. The proposed in-service date for this project is December 1, 2019. **This study does not imply an ITO commitment to this in-service date.**

Point of Interconnection

AD1-050 will interconnect with the ITO transmission system via a new breaker switching station that connects the Beechwood DP – Palmer Springs 115kV line. Palmer Springs is a three breaker ring bus supplemental project S0920, with a target in-service date of December 2017.

Cost Summary

The AD1-050 project will be responsible for the following costs

Description	Total Cost
Attachment Facilities	$ 2,550,000
Direct Connection Network Upgrades	$ 0
Non Direct Connection Network Upgrades	$ 1,800,000
Total Costs	**$ 3,350,000**

In addition, the AD1-050 project may be responsible for a contribution to the following costs:

Description	Total Cost
New System Upgrades	$ 72,000,000
Previously Identified Upgrades	$ 52,455,000
Total Costs	**$ 124,455,000**

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, determined in accordance with Section 217 of the Tariff,

(a) the costs 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.

System Reinforcement

Violation #	Upgrade Description	Upgrade Cost
	***NEW SYSTEM REINFORCEMENTS**	
1	Wreck and rebuild the line of 14 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost $36,000,000 and 30-36 months to engineer, permit, and construct.	$36,000,000
2	The limiting element is not on the VEPCO facilities. The external Duke / Progress Energy (i.e. Non-PJM) Transmission Owner will evaluate this violation during the System Impact Study phase	TBD
3,4,5 (36)	Line #81 AC1-208 Tap – South Justice 115 kV: wreck and rebuild the line of 22 miles to increase its line rating to 262 MVA (normal), 287 MVA (emergency), and 349 MVA (load dump). It is estimated to cost $11,800,000 and 32-38 months to engineer, permit, and construct.	(included in "Previous System Reinforcement" $)
6	Line #2056 AD1-057 – Morning Star 230 kV: wreck and rebuild the line of 15 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost $36,000,000 and 30-36 months to engineer, permit, and construct.	$36,000,000
	Sub Total	**$72,000,000**
	CONTRIBUTIONS TO PREVIOUS SYSTEM REINFORCEMENTS	
7-11,27-31	Line #1001 Chestnut – Whitakers – Battleboro 115 kV: wreck and rebuild the line of 9 miles to increase its line rating to 262 MVA (normal), 287 MVA (emergency), and 349 MVA (load dump). It is estimated to cost $18,520,000 and 30-36 months to engineer, permit, and construct.	$18,520,000
12-16,22-25	Line #1024 South Justice – Cox DP – Chestnut 115 kV: wreck and rebuild the line of 6.5 miles to increase its line rating to 262 MVA (normal), 287 MVA (emergency), and 349 MVA (load dump). It is estimated to cost $12,860,000 and 30-36 months to engineer, permit, and construct.	$12,860,000
17,20	Clubhouse 230 – 115 kV Tx#1: replace the 230-115 kV transformer #1 increase its line rating to 276.8 MVA (normal), 292.4 MVA (emergency), and 328.7 MVA (load dump). It is estimated to cost $5,500,000 and 14-16 months to engineer and construct.	$5,500,000
18,19	Line #238 Clubhouse to Sapony 230 kV: replace wave trap at Clubhouse Substation to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost $150,000 and 12-16 months to engineer and construct.	Cost allocated to AB2-Queue
26	Line #2141 Lakeview – Carolina 230 kV: wreck and rebuild the line of 1.5 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost $3,625,000 and 30-36 months to engineer, permit, and construct. A VA CPCN is required.	$3,625,000
32-35	Line #54 Earleys – Aulander - Woodland 115 kV: wreck and rebuild the line of 10 miles to increase its line rating to 262 MVA (normal), 287 MVA (emergency), and 349 MVA (load dump). It is estimated to cost $19,480,000 and 30-36 months to engineer, permit and construct.	$19,480,00
36 (3)	Line #81 AC1-208 Tap – South Justice 115 kV: wreck and rebuild the line of 22 miles to increase its line rating to 262 MVA (normal), 287 MVA (emergency), and 349 MVA (load dump). It is estimated to cost $11,800,000 and 32-38 months to engineer, permit, and construct.	$11,800,000
	Sub Total	**$52,305,000**
	Total Network Upgrades	**$124,305,000**

*Note:
For New System Reinforcements, only violations in which the AD1-050 overloads the facility are included in the table above. Costs for New System Reinforcement for which AD1-050 is not the first project to overload the facility are included, for reference, in the later part of this report. Cost allocation will be provided in the Impact Study.

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 the proposed AB2-089 Switching Station. The estimated cost for this work is $1,000,000.

Interconnection Substation: Add an additional 115 kV circuit breaker at the proposed AB2-089 Switching Substation. The estimated cost of this work scope is $1,000,000.

The estimated total cost of the Attachment Facilities is $2,550,000. It is estimated to take 24-36 months to complete this work upon execution of an Interconnection Construction Service Agreement (ICSA). 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.

Direct Connection Cost Estimate

None.

Non-Direct Connection Cost Estimate

Transmission: Install transmission structure in-line with transmission line to allow the proposed interconnection switching station to be interconnected with the transmission system. Estimated cost is $800,000 dollars and is estimated to take 24-30 months to complete.

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

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

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

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

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

Revenue Metering and SCADA Requirements

PJM Requirements

The IC will be required to install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for IC's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Sections 24.1 and 24.2.

Meteorological Data Reporting Requirement

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

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

Network Impacts

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.

The Queue Project AD1-050 was evaluated as a 45.0 MW (Capacity 29.1 MW) injection at the Beechwood 115kV substation in the VAP area. Project AD1-050 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-050 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
DVP_P1-2: LN 130-A	CONTINGENCY 'DVP_P1-2: LN 130-A' OPEN BRANCH FROM BUS 314562 TO BUS 314570 CKT 1 /* 3CLUBHSE 115.00 - 3METCATP 115.00 OPEN BRANCH FROM BUS 314570 TO BUS 314572 CKT 1 /* 3METCATP 115.00 - 3EMPORIA 115.00 OPEN BRANCH FROM BUS 314570 TO BUS 314588 CKT 1 /* 3METCATP 115.00 - 3METCALF 115.00 OPEN BRANCH FROM BUS 314572 TO BUS 925170 CKT 1 /* 3EMPORIA 115.00 - AB2-174 TAP 115.00 OPEN BRANCH FROM BUS 314572 TO BUS 314863 CKT 1 /* 3EMPORIA 115.00 - 3EMPOR_1 115.00

Contingency Name	Description
	OPEN BUS 314570 /* ISLAND OPEN BUS 314572 /* ISLAND OPEN BUS 314588 /* ISLAND END
DVP_P1-2: LN 2126	CONTINGENCY 'DVP_P1-2: LN 2126' OPEN BRANCH FROM BUS 314203 TO BUS 314594 CKT 1 /* 6MACKEYS 230.00 - 6PLYMOTH 230.00 OPEN BRANCH FROM BUS 314594 TO BUS 314616 CKT 1 /* 6PLYMOTH 230.00 - 6TRWBRDG 230.00 OPEN BUS 314594 /* ISLAND END
DVP_P1-2: LN 2131A	CONTINGENCY 'DVP_P1-2: LN 2131A' OPEN BRANCH FROM BUS 314662 TO BUS 916040 CKT 1 /* 6S HERTFORD 230.00 - Z1-036 TAP 230.00 OPEN BRANCH FROM BUS 314651 TO BUS 314662 CKT 1 /* 6WINFALL 230.00 - 6S HERTFORD 230.00 OPEN BUS 314662 /* ISLAND END
DVP_P1-2: LN 238	CONTINGENCY 'DVP_P1-2: LN 238' OPEN BRANCH FROM BUS 314282 TO BUS 314435 CKT 1 /* 6CARSON 230.00 - 6SAPONY 230.00 OPEN BRANCH FROM BUS 314435 TO BUS 314563 CKT 1 /* 6SAPONY 230.00 - 6CLUBHSE 230.00 OPEN BRANCH FROM BUS 314562 TO BUS 314563 CKT 1 /* 3CLUBHSE 115.00 - 6CLUBHSE 230.00 OPEN BUS 314435 /* ISLAND END

Contingency Name	Description
DVP_P1-3: 3CAROLNA-6CAROLNA	CONTINGENCY 'DVP_P1-3: 3CAROLNA-6CAROLNA' OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 END
DVP_P4-2: 101002	CONTINGENCY 'DVP_P4-2: 101002' /* CAROLINA 115 KV OPEN BRANCH FROM BUS 313723 TO BUS 314259 CKT 1 /* 3PECAN 115.00 - 3CAROL56_1 115.00 OPEN BRANCH FROM BUS 314259 TO BUS 314559 CKT Z1 /* 3CAROL56_1 115.00 - 3CAROLNA 115.00 OPEN BRANCH FROM BUS 314259 TO BUS 314835 CKT 1 /* 3CAROL56_1 115.00 - 3CAROL_1 115.00 OPEN BUS 314259 /* ISLAND: 3CAROL56_1 115.00 OPEN BUS 314835 /* ISLAND: 3CAROL_1 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* 3CAROLNA 115.00 - 3EATON F 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* 3CAROLNA 115.00 - AA2-053 TAP 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* 3CAROLNA 115.00 - 3PLHITP 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* 3CAROLNA 115.00 - 6CAROLNA 230.00 END
DVP_P4-2: 13002	CONTINGENCY 'DVP_P4-2: 13002' /* CAROLINA OPEN BUS 314600 /* LINE 130 OPEN BUS 314595 /* LINE 130 OPEN BUS 314612 /* LINE 130 OPEN BUS 314615 /* LINE 130 OPEN BUS 314572 /* LINE 130 OPEN BUS 314863 /* LINE 130 OPEN BUS 314570 /* LINE 130

Contingency Name	Description
	OPEN BUS 314588 /* LINE 130 OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* TX. #4 OPEN BRANCH FROM BUS 314559 TO BUS 314259 CKT Z1 /* LINE 56 OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* LINE 54 OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* LINE 22 DECREASE BUS 314559 LOAD BY 100 PERCENT /* REMOVE ALL LOAD AT CAROLINA END
DVP_P4-2: 2202	CONTINGENCY 'DVP_P4-2: 2202' /* CAROLINA OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* LINE 22 OPEN BRANCH FROM BUS 314571 TO BUS 925780 CKT 1 /* LINE 22 OPEN BRANCH FROM BUS 314559 TO BUS 314259 CKT Z1 /* LINE 56 OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* LINE 54 OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* LINE 130 OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* TX. #4 DECREASE BUS 314559 LOAD BY 100 PERCENT /* REMOVE ALL LOAD AT CAROLINA END
DVP_P4-2: 239T2141	CONTINGENCY 'DVP_P4-2: 239T2141' /* LAKEVIEW OPEN BRANCH FROM BUS 314583 TO BUS 314579 CKT 1 /* 239 OPEN BRANCH FROM BUS 314579 TO BUS 314605 CKT 1 /* 2057 OPEN BRANCH FROM BUS 314583 TO BUS 314561 CKT 1 /*

Contingency Name	Description
	2141 END
DVP_P4-2: 246T2034	CONTINGENCY 'DVP_P4-2: 246T2034' /* EARLEYS OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* 246 OPEN BRANCH FROM BUS 314575 TO BUS 314537 CKT 1 /* 246 OPEN BRANCH FROM BUS 314575 TO BUS 314590 CKT 1 /* 246 - NUCOR OPEN BRANCH FROM BUS 314569 TO BUS 933450 CKT 1 /* 2034 END
DVP_P4-2: 246T247	CONTINGENCY 'DVP_P4-2: 246T247' /* SUFFOLK 230 KV OPEN BRANCH FROM BUS 314537 TO BUS 314575 CKT 1 /* 6SUFFOLK 230.00 - 6NUCO TP 230.00 OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* 6EARLEYS 230.00 - 6NUCO TP 230.00 OPEN BRANCH FROM BUS 314575 TO BUS 314590 CKT 1 /* 6NUCO TP 230.00 - 6NUCOR 230.00 OPEN BUS 314575 /* ISLAND: 6NUCO TP 230.00 OPEN BUS 314590 /* ISLAND: 6NUCOR 230.00 OPEN BRANCH FROM BUS 314537 TO BUS 314648 CKT 1 /* 6SUFFOLK 230.00 - 6SUNBURY 230.00 OPEN BRANCH FROM BUS 314648 TO BUS 901080 CKT 1 /* 6SUNBURY 230.00 - W1-029 230.00 OPEN BUS 314648 /* ISLAND: 6SUNBURY 230.00 END

Contingency Name	Description
DVP_P4-2: 5402	CONTINGENCY 'DVP_P4-2: 5402' /* CAROLINA OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* LINE 54 OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* LINE 22 OPEN BRANCH FROM BUS 314559 TO BUS 314259 CKT Z1 /* LINE 56 OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* LINE 130 OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* TX. #4 DECREASE BUS 314559 LOAD BY 100 PERCENT /* REMOVE ALL LOAD AT CAROLINA END
DVP_P4-2: 5602	CONTINGENCY 'DVP_P4-2: 5602' /* CAROLINA 115 KV OPEN BRANCH FROM BUS 313723 TO BUS 314604 CKT 1 /* 3PECAN 115.00 - 3SEABORD 115.00 OPEN BRANCH FROM BUS 314558 TO BUS 314587 CKT 1 /* 3BOYKINS 115.00 - 3MARGTSV 115.00 OPEN BRANCH FROM BUS 314587 TO BUS 314604 CKT 1 /* 3MARGTSV 115.00 - 3SEABORD 115.00 OPEN BUS 314587 /* ISLAND: 3MARGTSV 115.00 OPEN BUS 314604 /* ISLAND: 3SEABORD 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* 3CAROLNA 115.00 - 3EATON F 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* 3CAROLNA 115.00 - AA2-053 TAP 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* 3CAROLNA 115.00 - 3PLHITP 115.00 OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* 3CAROLNA 115.00 - 6CAROLNA 230.00 END

Contingency Name	Description
DVP_P4-5: T122C	CONTINGENCY 'DVP_P4-5: T122C' /* CAROLINA OPEN BUS 314559 /* CAROLINA 115KV BUS OPEN BUS 315126 /* ROANOKE RAPIDS GEN 1 AND 2 OPEN BUS 315128 /* ROANOKE RAPIDS GEN 3 AND 4 OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* TX. #4 END
DVP_P7-1: LN 54-2012_C	CONTINGENCY 'DVP_P7-1: LN 54-2012_C' OPEN BRANCH FROM BUS 314568 TO BUS 314625 CKT 1 /* 3EARLEYS 115.00 - 3AULANDR 115.00 OPEN BRANCH FROM BUS 933460 TO BUS 314626 CKT 1 /* AC2-159 TAP 115.00 - 3WOODLND 115.00 OPEN BRANCH FROM BUS 314625 TO BUS 314626 CKT 1 /* 3AULANDR 115.00 - 3WOODLND 115.00 OPEN BUS 314625 /* ISLAND OPEN BUS 314626 /* ISLAND OPEN BRANCH FROM BUS 314266 TO BUS 314569 CKT 1 /* 6NORTHAMPTON230.00 - 6EARLEYS 230.00 OPEN BRANCH FROM BUS 314266 TO BUS 314599 CKT 1 /* 6NORTHAMPTON230.00 - 6ROA VAL 230.00 OPEN BUS 314266 /* ISLAND END
DVP_P7-1: LN 56-2012	CONTINGENCY 'DVP_P7-1: LN 56-2012' OPEN BRANCH FROM BUS 313723 TO BUS 314604 CKT 1 /* 3PECAN 115.00 - 3SEABORD 115.00 OPEN BRANCH FROM BUS 314558 TO BUS 314587 CKT 1 /* 3BOYKINS 115.00 - 3MARGTSV 115.00 OPEN BRANCH FROM BUS 314587 TO BUS 314604 CKT 1 /* 3MARGTSV 115.00 - 3SEABORD 115.00 OPEN BUS 314587 /* ISLAND: 3MARGTSV 115.00

Contingency Name	Description
	OPEN BUS 314604 /* ISLAND: 3SEABORD 115.00 OPEN BRANCH FROM BUS 314266 TO BUS 314569 CKT 1 /* 6NORTHAMPTON230.00 - 6EARLEYS 230.00 OPEN BRANCH FROM BUS 314266 TO BUS 314599 CKT 1 /* 6NORTHAMPTON230.00 - 6ROA VAL 230.00 OPEN BUS 314266 /* ISLAND: 6NORTHAMPTON230.00 END
DVP_P7-1: LN 56-2060	CONTINGENCY 'DVP_P7-1: LN 56-2060' OPEN BRANCH FROM BUS 313723 TO BUS 314604 CKT 1 /* 3PECAN 115.00 - 3SEABORD 115.00 OPEN BRANCH FROM BUS 314558 TO BUS 314587 CKT 1 /* 3BOYKINS 115.00 - 3MARGTSV 115.00 OPEN BRANCH FROM BUS 314587 TO BUS 314604 CKT 1 /* 3MARGTSV 115.00 - 3SEABORD 115.00 OPEN BUS 314587 /* ISLAND: 3MARGTSV 115.00 OPEN BUS 314604 /* ISLAND: 3SEABORD 115.00 OPEN BRANCH FROM BUS 314561 TO BUS 314599 CKT 1 /* 6CAROLNA 230.00 - 6ROA VAL 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 54-2012_C	DVP - DVP	6HORNRTN-AD1-057 TAP 230 kV line	314579	934330	1	DC	99.89	100.22	LD	541	4.01	1
2	LFFB	DVP_P4-5: T122C	DVP - CPLE	3KERR-3GW KING TAP 115 kV line	314702	304102	1	DC	98.08	106	ER	199	15.76	2
3	LFFB	DVP_P4-2: 2202	DVP - DVP	AC1-208 TAP-3SO JUSTICE 115 kV line	927140	313858	1	DC	98.59	102.9	LD	202	8.71	
4	LFFB	DVP_P4-2: 13002	DVP - DVP	AC1-208 TAP-3SO JUSTICE 115 kV line	927140	313858	1	DC	97.75	102.06	LD	202	8.71	
5	LFFB	DVP_P4-2: 5402	DVP - DVP	AC1-208 TAP-3SO JUSTICE 115 kV line	927140	313858	1	DC	97.6	101.91	LD	202	8.71	
6	DCTL	DVP_P7-1: LN 54-2012_C	DVP - DVP	AD1-057 TAP-6MORNSTR 230 kV line	934330	313845	1	DC	99.81	100.14	LD	541	4.01	3

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				Bus			Power	Loading %		Rating		MW	
	Type	Name	Affected Area	Facility Description	From	To	Ckt	Flow	Initial	Final	Type	MVA	Contribution	Ref
7	LFFB	DVP_P4-2: 5602	DVP - DVP	3CHESTNUT-3WITAKRS 115 kV line	313719	314623	1	DC	180.86	184.21		174	5.84	4
8	LFFB	DVP_P4-2: 2202	DVP - DVP	3CHESTNUT-3WITAKRS 115 kV line	313719	314623	1	DC	173.55	176.91		174	5.85	
9	LFFB	DVP_P4-2: 13002	DVP - DVP	3CHESTNUT-3WITAKRS 115 kV line	313719	314623	1	DC	172.92	176.28		174	5.85	
10	LFFB	DVP_P4-2: 5402	DVP - DVP	3CHESTNUT-3WITAKRS 115 kV line	313719	314623	1	DC	172.8	176.16		174	5.85	
11	LFFB	DVP_P4-2: 101002	DVP - DVP	3CHESTNUT-3WITAKRS 115 kV line	313719	314623	1	DC	164.64	168		174	5.85	
12	LFFB	DVP_P4-2: 5602	DVP - DVP	3SO JUSTICE-3COX DP 115 kV line	313858	314577	1	DC	129.75	132.42		202	5.85	5
13	LFFB	DVP_P4-2: 2202	DVP - DVP	3SO JUSTICE-3COX DP 115 kV line	313858	314577	1	DC	125.39	128.29		202	5.86	
14	LFFB	DVP_P4-2: 13002	DVP - DVP	3SO JUSTICE-3COX DP 115 kV line	313858	314577	1	DC	124.85	127.75		202	5.86	
15	LFFB	DVP_P4-2: 5402	DVP - DVP	3SO JUSTICE-3COX DP 115 kV line	313858	314577	1	DC	124.75	127.65		202	5.86	
16	LFFB	DVP_P4-2: 101002	DVP - DVP	3SO JUSTICE-3COX DP 115 kV line	313858	314577	1	DC	117.72	120.62		202	5.86	
17	LFFB	DVP_P4-5: T122C	DVP - DVP	6CLUBHSE 230/115 kV transformer	314562	314563	1	DC	130.75	131.93		209	5.48	6
18	LFFB	DVP_P4-2: 246T247	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	124.64	125.88		637	7.86	7
19	LFFB	DVP_P4-2: 246T2034	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	127.34	128.65		637	8.3	

#	Contingency		Affected Area	Facility Description	Bus		Ckt	Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To			Initial	Final	Type	MVA		
20	LFFB	DVP_P4-2: 239T2141	DVP - DVP	6CLUBHSE 230/115 kV transformer	314563	314562	1	DC	109.32	111.96		209	5.52	8
21	LFFB	DVP_P4-2: 5602	DVP - DVP	3COX DP-3CHESTNUT 115 kV line	314577	313719	1	DC	144.48	147.58		174	5.85	9
22	LFFB	DVP_P4-2: 2202	DVP - DVP	3COX DP-3CHESTNUT 115 kV line	314577	313719	1	DC	139.42	142.79		174	5.86	
23	LFFB	DVP_P4-2: 13002	DVP - DVP	3COX DP-3CHESTNUT 115 kV line	314577	313719	1	DC	138.79	142.16		174	5.86	
24	LFFB	DVP_P4-2: 5402	DVP - DVP	3COX DP-3CHESTNUT 115 kV line	314577	313719	1	DC	138.68	142.04		174	5.86	
25	LFFB	DVP_P4-2: 101002	DVP - DVP	3COX DP-3CHESTNUT 115 kV line	314577	313719	1	DC	130.52	133.88		174	5.86	
26	N-1	DVP_P1-2: LN 238	DVP - DVP	6LAKEVEW-6CAROLNA 230 kV line	314583	314561	1	DC	132.06	133.16	ER	375	4.09	10
27	LFFB	DVP_P4-2: 5602	DVP - DVP	3WITAKRS-3BTLEBRO 115 kV line	314623	314554	1	DC	183.19	186.55		174	5.84	11
28	LFFB	DVP_P4-2: 2202	DVP - DVP	3WITAKRS-3BTLEBRO 115 kV line	314623	314554	1	DC	175.87	179.22		174	5.84	
29	LFFB	DVP_P4-2: 13002	DVP - DVP	3WITAKRS-3BTLEBRO 115 kV line	314623	314554	1	DC	175.23	178.59		174	5.84	
30	LFFB	DVP_P4-2: 5402	DVP - DVP	3WITAKRS-3BTLEBRO 115 kV line	314623	314554	1	DC	175.12	178.48		174	5.84	
31	LFFB	DVP_P4-2: 101002	DVP - DVP	3WITAKRS-3BTLEBRO 115 kV line	314623	314554	1	DC	166.96	170.32		174	5.84	
32	DCTL	DVP_P7-1: LN 56-2060	DVP - DVP	3AULANDR-3EARLEYS 115 kV line	314625	314568	1	DC	123.68	124.62		136	2.85	12
33	DCTL	DVP_P7-1: LN 56-2012	DVP - DVP	3AULANDR-3EARLEYS 115 kV line	314625	314568	1	DC	123.01	123.96		136	2.85	
34	DCTL	DVP_P7-1: LN 56-2060	DVP - DVP	3WOODLND-3AULANDR 115 kV line	314626	314625	1	DC	128.82	129.77		136	2.85	13
35	DCTL	DVP_P7-1: LN 56-2012	DVP - DVP	3WOODLND-3AULANDR 115 kV line	314626	314625	1	DC	128.16	129.11		136	2.85	

#	Contingency		Affected Area	Facility Description	Bus		Ckt	Power Flow	Loading %		Rating		MW Contribution	Ref
	Type	Name			From	To			Initial	Final	Type	MVA		
36	LFFB	DVP_P4-2: 5602	DVP - DVP	AC1-208 TAP-3SO JUSTICE 115 kV line	927140	313858	1	DC	102.22	106.53		202	8.7	14

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)

#	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
1	6HORNRTN-AD1-057 TAP 230 kV line	Wreck and rebuild the line of 14 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost $36,000,000 and 30-36 months to engineer, permit, and construct.	Pending	$36,000,000
2	3KERR-3GW KING TAP 115 kV	The limiting element is not on the VEPCO facilities. The external Duke / Progress Energy (i.e. Non-PJM) Transmission Owner will evaluate this violation during the System Impact Study phase	Pending	TBD
3,4,5 (36)	AC1-208 TAP-3SO JUSTICE 115 kV	Line #81 AC1-208 Tap – South Justice 115 kV: wreck and rebuild the line of 22 miles to increase its line rating to 262 MVA (normal), 287 MVA (emergency), and 349 MVA (load dump). It is estimated to cost $11,800,000 and 32-38 months to engineer, permit, and construct.	Pending	$11,800,000

#	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
6	AD1-057 TAP-6MORNSTR 230 kV line	Line #2056 AD1-057 – Morning Star 230 kV: wreck and rebuild the line of 15 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost $36,000,000 and 30-36 months to engineer, permit, and construct.	Pending	$36,000,000
			Total New Network Upgrades	**$83,800,000**

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 %

#	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
7-11,27-31	3CHESTNUT-3WITAKRS 115 kV; 3WITAKRS-3BTLEBRO 115 kV line	Line #1001 Chestnut – Whitakers – Battleboro 115 kV: wreck and rebuild the line of 9 miles to increase its line rating to 262 MVA (normal), 287 MVA (emergency), and 349 MVA (load dump). It is estimated to cost $18,520,000 and 30-36 months to engineer, permit, and construct.	Pending	$18,520,000
12-16,22-25	3SO JUSTICE-3COX DP 115 kV line	Line #1024 South Justice – Cox DP – Chestnut 115 kV: wreck and rebuild the line of 6.5 miles to increase its line rating to 262 MVA (normal), 287 MVA (emergency), and 349 MVA (load dump). It is estimated to cost $12,860,000 and 30-36 months to engineer, permit, and construct.	Pending	$12,860,000
17,20	6CLUBHSE 230/115 kV transformer	Clubhouse 230 – 115 kV Tx#1: replace the 230-115 kV transformer #1 increase its line rating to 276.8 MVA (normal), 292.4 MVA (emergency), and 328.7 MVA (load dump). It is estimated to cost $5,500,000 and 14-16 months to engineer and construct.	Pending	$5,500,000

#	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
18,19	6CLUBHSE-6SAPONY 230 kV line	Line #238 Clubhouse to Sapony 230 kV: replace wave trap at Clubhouse Substation to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost $150,000 and 12-16 months to engineer and construct. *Note: This cost is not included in the System Reinforcement Summary total in the earlier part of this report because the cost of the upgrade is Less than $5, 000,000. It is assumed that costs will be shared by projects in the earlier AB2-Queue in which the upgrade was initiated.*	Pending	$150,000
26	6LAKEVEW-6CAROLNA 230 kV line	Line #2141 Lakeview – Carolina 230 kV: wreck and rebuild the line of 1.5 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost $3,625,000 and 30-36 months to engineer, permit, and construct. A VA CPCN is required.	Pending	$3,625,000
32-35	3AULANDR-3EARLEYS 115 kV line	Line #54 Earleys – Aulander - Woodland 115 kV: wreck and rebuild the line of 10 miles to increase its line rating to 262 MVA (normal), 287 MVA (emergency), and 349 MVA (load dump). It is estimated to cost $19,480,000 and 30-36 months to engineer, permit and construct.	Pending	$19,480,00
			Total New Network Upgrades	**$52,455,000**

Potential Congestion due to Local Energy Deliverability

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The IC can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Note: Only the most severely overloaded conditions are listed below. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed which shall study all overload conditions associated with the overloaded element(s) identified.

	Contingency		Affected		Bus			Power	Loading %		Rating		MW
#	Type	Name	Area	Facility Description	From	To	Cir.	Flow	Initial	Final	Type	MVA	Contribution
37	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6SAPONY-6CARSON 230 kV line	314435	314282	1	DC	115.75	116.83	ER	679	7.3

#	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
38	N-1	DVP_P1-2: LN 130-A	DVP - DVP	6CAROLNA 230/115 kV transformer	314559	314561	1	DC	149.1	152.81	ER	240	8.9
39	Non	Non	DVP - DVP	6CAROLNA 230/115 kV transformer	314559	314561	1	DC	105.06	108.57	NR	227	7.93
40	N-1	DVP_P1-3: 3CAROLNA-6CAROLNA	DVP - DVP	6CLUBHSE 230/115 kV transformer	314562	314563	1	DC	130	133.63	ER	183	6.67
41	N-1	DVP_P1-2: LN 2126	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	120.67	121.89	ER	599	7.3
42	Non	Non	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	108.33	109.5	NR	599	7.02
43	N-1	DVP_P1-2: LN 238	DVP - DVP	6LAKEVEW-6CAROLNA 230 kV line	314583	314561	1	DC	160.41	160.99	ER	375	4.09
44	Non	Non	DVP - DVP	6LAKEVEW-6CAROLNA 230 kV line	314583	314561	1	DC	104.82	106.26	NR	352	5.06
45	N-1	DVP_P1-3: 3CAROLNA-6CAROLNA	DVP - DVP	3AULANDR-3EARLEYS 115 kV line	314625	314568	1	DC	115.89	117.22	ER	111	3.27
46	N-1	DVP_P1-3: 3CAROLNA-6CAROLNA	DVP - DVP	3WOODLND-3AULANDR 115 kV line	314626	314625	1	DC	122.2	123.53	ER	111	3.27
47	N-1	DVP_P1-3: 3CAROLNA-6CAROLNA	DVP - DVP	AC1-208 TAP-3SO JUSTICE 115 kV line	927140	313858	1	DC	108.66	109.72	ER	165	3.87

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).

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.

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 6HORNRTN-AD1-057 TAP 230 kV line (from bus 314579 to bus 934330 ckt 1) loads from 99.89% to 100.22% (**DC power flow**) of its load dump rating (541 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 54-2012_C'. This project contributes approximately 4.01 MW to the thermal violation.

```
CONTINGENCY 'DVP_P7-1: LN 54-2012_C'
  OPEN BRANCH FROM BUS 314568 TO BUS 314625 CKT 1              /* 3EARLEYS
115.00 - 3AULANDR 115.00
  OPEN BRANCH FROM BUS 933460 TO BUS 314626 CKT 1              /* AC2-159 TAP
115.00 - 3WOODLND 115.00
  OPEN BRANCH FROM BUS 314625 TO BUS 314626 CKT 1              /* 3AULANDR
115.00 - 3WOODLND 115.00
  OPEN BUS 314625                                 /* ISLAND
  OPEN BUS 314626                                 /* ISLAND
  OPEN BRANCH FROM BUS 314266 TO BUS 314569 CKT 1              /*
6NORTHAMPTON230.00 - 6EARLEYS 230.00
  OPEN BRANCH FROM BUS 314266 TO BUS 314599 CKT 1              /*
6NORTHAMPTON230.00 - 6ROA VAL 230.00
  OPEN BUS 314266                                 /* ISLAND
  END
```

Bus Number	*Bus Name*	*Full Contribution*
315139	*1GASTONA*	*7.77*
315141	*1GASTONB*	*7.77*
315126	*1ROARAP2*	*1.84*
315128	*1ROARAP4*	*1.77*
315136	*1ROSEMG1*	*6.4*
315138	*1ROSEMG2*	*3.*
315137	*1ROSEMS1*	*3.97*
314572	*3EMPORIA*	*0.47*
314578	*3HORNRTN*	*3.18*
314704	*3LAWRENC*	*0.35*
933461	*AC2-159 C*	*7.55*

933462	*AC2-159 E*	*7.55*
934201	*AD1-047 C*	*8.99*
934202	*AD1-047 E*	*6.*
934231	*AD1-050 C*	*2.59*
934232	*AD1-050 E*	*1.42*
LTF	*AMIL*	*0.32*
LTF	*BAYOU*	*1.72*
LTF	*BIG_CAJUN1*	*2.71*
LTF	*BIG_CAJUN2*	*5.46*
LTF	*BLUEG*	*1.68*
LTF	*CALDERWOOD*	*1.01*
LTF	*CANNELTON*	*0.32*
LTF	*CARR*	*< 0.01*
LTF	*CATAWBA*	*0.99*
LTF	*CELEVELAND*	*2.81*
LTF	*CHEOAH*	*0.94*
LTF	*CHILHOWEE*	*0.33*
LTF	*CHOCTAW*	*1.85*
LTF	*CLIFTY*	*6.13*
LTF	*COTTONWOOD*	*6.73*
LTF	*DEARBORN*	*0.61*
LTF	*EDWARDS*	*0.52*
LTF	*ELMERSMITH*	*0.94*
LTF	*FARMERCITY*	*0.41*
LTF	*G-007A*	*0.6*
LTF	*GIBSON*	*0.59*

LTF	*HAMLET*	*4.08*
LTF	*MORGAN*	*2.98*
LTF	*NEWTON*	*1.43*
LTF	*O-066A*	*0.27*
LTF	*PRAIRIE*	*3.1*
LTF	*RENSSELAER*	*< 0.01*
LTF	*ROSETON*	*0.02*
LTF	*ROWAN*	*2.02*
LTF	*SANTEETLA*	*0.28*
LTF	*SMITHLAND*	*0.27*
LTF	*TATANKA*	*0.7*
LTF	*TILTON*	*0.61*
LTF	*TRIMBLE*	*0.32*
LTF	*TVA*	*1.25*
LTF	*UNIONPOWER*	*1.8*
LTF	*VFT*	*1.59*
LTF	*X1-078*	*0.46*
917592	*Z2-099 E*	*0.22*
918491	*AA1-063AC OP*	*1.47*
918492	*AA1-063AE OP*	*3.53*
919691	*AA2-053 C*	*1.94*
919692	*AA2-053 E*	*4.24*
920022	*AA2-086 E*	*0.12*
920042	*AA2-088 E*	*5.09*
920631	*AA2-169 C*	*1.61*
920632	*AA2-169 E*	*0.74*

920671	*AA2-174 C*	*0.09*
920672	*AA2-174 E*	*0.49*
930861	*AB1-132 C*	*30.22*
930862	*AB1-132 E*	*12.95*
931231	*AB1-173 C*	*2.53*
931232	*AB1-173 E*	*1.18*
931241	*AB1-173AC*	*2.53*
931242	*AB1-173AE*	*1.18*
923851	*AB2-025 C*	*0.33*
923852	*AB2-025 E*	*0.76*
923911	*AB2-031 C O1*	*2.51*
923912	*AB2-031 E O1*	*1.24*
923991	*AB2-040 C O1*	*8.24*
923992	*AB2-040 E O1*	*6.75*
924401	*AB2-089 C*	*1.18*
924402	*AB2-089 E*	*0.61*
924511	*AB2-100 C*	*15.31*
924512	*AB2-100 E*	*7.54*
925171	*AB2-174 C O1*	*7.86*
925172	*AB2-174 E O1*	*7.11*
925781	*AC1-054 C*	*4.45*
925782	*AC1-054 E*	*2.05*
926071	*AC1-086 C*	*44.5*
926072	*AC1-086 E*	*20.25*
927111	*AC1-206 C*	*12.24*
927112	*AC1-206 E*	*5.79*

Appendix 2

(DVP - CPLE) The 3KERR-3GW KING TAP 115 kV line (from bus 314702 to bus 304102 ckt 1) loads from 98.08% to 106.0% (**DC power flow**) of its emergency rating (199 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-5: T122C'. This project contributes approximately 15.76 MW to the thermal violation.

```
CONTINGENCY 'DVP_P4-5: T122C'                          /* CAROLINA
  OPEN BUS 314559                                  /* CAROLINA 115KV BUS
  OPEN BUS 315126                                  /* ROANOKE RAPIDS GEN 1 AND 2
  OPEN BUS 315128                                  /* ROANOKE RAPIDS GEN 3 AND 4
  OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1          /* TX. #4
  END
```

Bus Number	*Bus Name*	*Full Contribution*
315159	*1KERR 2*	*3.64*
315163	*1KERR 6*	*3.59*
315164	*1KERR 7*	*3.59*
934231	*AD1-050 C*	*10.19*
934232	*AD1-050 E*	*5.57*
935221	*AD1-157 C*	*1.02*
935222	*AD1-157 E*	*0.68*
935231	*AD1-160 C*	*0.75*
935232	*AD1-160 E*	*1.03*
LTF	*AMIL*	*0.13*
LTF	*BAYOU*	*0.72*
LTF	*BIG_CAJUN1*	*1.14*
LTF	*BIG_CAJUN2*	*2.28*
LTF	*BLUEG*	*0.7*
LTF	*CALDERWOOD*	*0.43*
LTF	*CANNELTON*	*0.13*
LTF	*CARR*	*0.02*

LTF	*CATAWBA*	*0.43*
LTF	*CELEVELAND*	*1.23*
LTF	*CHEOAH*	*0.4*
LTF	*CHILHOWEE*	*0.14*
LTF	*CHOCTAW*	*0.77*
LTF	*CLIFTY*	*2.54*
LTF	*COTTONWOOD*	*2.82*
LTF	*DEARBORN*	*0.26*
LTF	*EDWARDS*	*0.22*
LTF	*ELMERSMITH*	*0.39*
LTF	*FARMERCITY*	*0.17*
LTF	*G-007A*	*0.1*
LTF	*GIBSON*	*0.25*
LTF	*HAMLET*	*1.67*
LTF	*MORGAN*	*1.25*
LTF	*NEWTON*	*0.6*
LTF	*O-066A*	*0.04*
LTF	*PRAIRIE*	*1.3*
LTF	*RENSSELAER*	*0.01*
LTF	*ROSETON*	*0.1*
LTF	*ROWAN*	*0.93*
LTF	*SANTEETLA*	*0.12*
LTF	*SMITHLAND*	*0.12*
LTF	*TATANKA*	*0.29*
LTF	*TILTON*	*0.26*
LTF	*TRIMBLE*	*0.13*

LTF	*TVA*	*0.52*
LTF	*UNIONPOWER*	*0.78*
LTF	*VFT*	*0.26*
LTF	*X1-078*	*0.08*
920631	*AA2-169 C*	*4.8*
920632	*AA2-169 E*	*2.21*
924021	*AB2-043 C O1*	*3.7*
924022	*AB2-043 E O1*	*6.06*
924161	*AB2-060 C O1*	*10.51*
924162	*AB2-060 E O1*	*4.94*
924301	*AB2-077 C O1*	*2.38*
924302	*AB2-077 E O1*	*1.59*
924311	*AB2-078 C O1*	*2.38*
924312	*AB2-078 E O1*	*1.59*
924321	*AB2-079 C O1*	*2.38*
924322	*AB2-079 E O1*	*1.59*
924401	*AB2-089 C*	*4.62*
924402	*AB2-089 E*	*2.38*
924411	*AB2-090 C*	*4.65*
924412	*AB2-090 E*	*2.39*
925221	*AB2-176 C*	*1.92*
925222	*AB2-176 E*	*0.82*
925611	*AC1-036 C*	*0.9*
925612	*AC1-036 E*	*1.47*
925781	*AC1-054 C*	*15.59*
925782	*AC1-054 E*	*7.18*

926271	*AC1-105 C*	*2.92*
926272	*AC1-105 E*	*1.46*

Appendix 3

(DVP - DVP) The AD1-057 TAP-6MORNSTR 230 kV line (from bus 934330 to bus 313845 ckt 1) loads from 99.81% to 100.14% (**DC power flow**) of its load dump rating (541 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 54-2012_C'. This project contributes approximately 4.01 MW to the thermal violation.

```
CONTINGENCY 'DVP_P7-1: LN 54-2012_C'
  OPEN BRANCH FROM BUS 314568 TO BUS 314625 CKT 1              /* 3EARLEYS
115.00 - 3AULANDR 115.00
  OPEN BRANCH FROM BUS 933460 TO BUS 314626 CKT 1              /* AC2-159 TAP
115.00 - 3WOODLND 115.00
  OPEN BRANCH FROM BUS 314625 TO BUS 314626 CKT 1              /* 3AULANDR
115.00 - 3WOODLND 115.00
  OPEN BUS 314625                                 /* ISLAND
  OPEN BUS 314626                                 /* ISLAND
  OPEN BRANCH FROM BUS 314266 TO BUS 314569 CKT 1              /*
6NORTHAMPTON230.00 - 6EARLEYS 230.00
  OPEN BRANCH FROM BUS 314266 TO BUS 314599 CKT 1              /*
6NORTHAMPTON230.00 - 6ROA VAL 230.00
  OPEN BUS 314266                                 /* ISLAND
  END
```

Bus Number	*Bus Name*	*Full Contribution*
315139	*1GASTONA*	*7.77*
315141	*1GASTONB*	*7.77*
315126	*1ROARAP2*	*1.84*
315128	*1ROARAP4*	*1.77*
315136	*1ROSEMG1*	*6.4*
315138	*1ROSEMG2*	*3.*
315137	*1ROSEMS1*	*3.97*
314572	*3EMPORIA*	*0.47*
314578	*3HORNRTN*	*3.18*
314704	*3LAWRENC*	*0.35*
933461	*AC2-159 C*	*7.55*

933462	*AC2-159 E*	*7.55*
934201	*AD1-047 C*	*8.99*
934202	*AD1-047 E*	*6.*
934231	*AD1-050 C*	*2.59*
934232	*AD1-050 E*	*1.42*
934331	*AD1-057 C O1*	*36.48*
934332	*AD1-057 E O1*	*19.46*
LTF	*AMIL*	*0.32*
LTF	*BAYOU*	*1.72*
LTF	*BIG_CAJUN1*	*2.71*
LTF	*BIG_CAJUN2*	*5.46*
LTF	*BLUEG*	*1.68*
LTF	*CALDERWOOD*	*1.01*
LTF	*CANNELTON*	*0.32*
LTF	*CARR*	*< 0.01*
LTF	*CATAWBA*	*0.99*
LTF	*CELEVELAND*	*2.81*
LTF	*CHEOAH*	*0.94*
LTF	*CHILHOWEE*	*0.33*
LTF	*CHOCTAW*	*1.85*
LTF	*CLIFTY*	*6.13*
LTF	*COTTONWOOD*	*6.73*
LTF	*DEARBORN*	*0.61*
LTF	*EDWARDS*	*0.52*
LTF	*ELMERSMITH*	*0.94*
LTF	*FARMERCITY*	*0.41*

LTF	*G-007A*	*0.6*
LTF	*GIBSON*	*0.59*
LTF	*HAMLET*	*4.08*
LTF	*MORGAN*	*2.98*
LTF	*NEWTON*	*1.43*
LTF	*O-066A*	*0.27*
LTF	*PRAIRIE*	*3.1*
LTF	*RENSSELAER*	*< 0.01*
LTF	*ROSETON*	*0.02*
LTF	*ROWAN*	*2.02*
LTF	*SANTEETLA*	*0.28*
LTF	*SMITHLAND*	*0.27*
LTF	*TATANKA*	*0.7*
LTF	*TILTON*	*0.61*
LTF	*TRIMBLE*	*0.32*
LTF	*TVA*	*1.25*
LTF	*UNIONPOWER*	*1.8*
LTF	*VFT*	*1.59*
LTF	*X1-078*	*0.46*
917592	*Z2-099 E*	*0.22*
918491	*AA1-063AC OP*	*1.47*
918492	*AA1-063AE OP*	*3.53*
919691	*AA2-053 C*	*1.94*
919692	*AA2-053 E*	*4.24*
920022	*AA2-086 E*	*0.12*
920042	*AA2-088 E*	*5.09*

920631	*AA2-169 C*	*1.61*
920632	*AA2-169 E*	*0.74*
920671	*AA2-174 C*	*0.09*
920672	*AA2-174 E*	*0.49*
930861	*AB1-132 C*	*30.22*
930862	*AB1-132 E*	*12.95*
931231	*AB1-173 C*	*2.53*
931232	*AB1-173 E*	*1.18*
931241	*AB1-173AC*	*2.53*
931242	*AB1-173AE*	*1.18*
923851	*AB2-025 C*	*0.33*
923852	*AB2-025 E*	*0.76*
923911	*AB2-031 C O1*	*2.51*
923912	*AB2-031 E O1*	*1.24*
923991	*AB2-040 C O1*	*8.24*
923992	*AB2-040 E O1*	*6.75*
924401	*AB2-089 C*	*1.18*
924402	*AB2-089 E*	*0.61*
924511	*AB2-100 C*	*15.31*
924512	*AB2-100 E*	*7.54*
925171	*AB2-174 C O1*	*7.86*
925172	*AB2-174 E O1*	*7.11*
925781	*AC1-054 C*	*4.45*
925782	*AC1-054 E*	*2.05*
926071	*AC1-086 C*	*44.5*
926072	*AC1-086 E*	*20.25*

927111	*AC1-206 C*	*12.24*
927112	*AC1-206 E*	*5.79*

Appendix 4

(DVP - DVP) The 3CHESTNUT-3WITAKRS 115 kV line (from bus 313719 to bus 314623 ckt 1) loads from 180.86% to 184.21% (**DC power flow**) of its load dump rating (174 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 5602'. This project contributes approximately 5.84 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 5602' /* CAROLINA 115 KV
OPEN BRANCH FROM BUS 313723 TO BUS 314604 CKT 1 /* 3PECAN 115.00 - 3SEABORD 115.00
OPEN BRANCH FROM BUS 314558 TO BUS 314587 CKT 1 /* 3BOYKINS 115.00 - 3MARGTSV 115.00
OPEN BRANCH FROM BUS 314587 TO BUS 314604 CKT 1 /* 3MARGTSV 115.00 - 3SEABORD 115.00
OPEN BUS 314587 /* ISLAND: 3MARGTSV 115.00
OPEN BUS 314604 /* ISLAND: 3SEABORD 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* 3CAROLNA 115.00 - 3EATON F 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* 3CAROLNA 115.00 - AA2-053 TAP 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* 3CAROLNA 115.00 - 3PLHITP 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* 3CAROLNA 115.00 - 6CAROLNA 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315126	*1ROARAP2*	*3.85*
315128	*1ROARAP4*	*3.7*
314578	*3HORNRTN*	*8.39*
314582	*3KELFORD*	*1.13*
314603	*3SCOT NK*	*7.6*
932631	*AC2-084 C*	*25.35*
932632	*AC2-084 E*	*12.48*
934041	*AD1-029 C*	*31.35*
934042	*AD1-029 E*	*20.67*
934231	*AD1-050 C*	*3.78*

934232	*AD1-050 E*	*2.06*
LTF	*AMIL*	*0.07*
LTF	*BAYOU*	*0.38*
LTF	*BIG_CAJUN1*	*0.59*
LTF	*BIG_CAJUN2*	*1.19*
LTF	*BLUEG*	*0.39*
LTF	*CALDERWOOD*	*0.22*
LTF	*CANNELTON*	*0.07*
LTF	*CARR*	*0.02*
LTF	*CATAWBA*	*0.21*
LTF	*CELEVELAND*	*0.59*
LTF	*CHEOAH*	*0.2*
LTF	*CHILHOWEE*	*0.07*
LTF	*CHOCTAW*	*0.4*
LTF	*CLIFTY*	*1.44*
LTF	*COTTONWOOD*	*1.48*
LTF	*DEARBORN*	*0.15*
LTF	*EDWARDS*	*0.12*
LTF	*ELMERSMITH*	*0.22*
LTF	*FARMERCITY*	*0.09*
LTF	*G-007*	*0.02*
LTF	*GIBSON*	*0.14*
LTF	*HAMLET*	*0.89*
LTF	*MORGAN*	*0.65*
LTF	*NEWTON*	*0.33*
LTF	*O-066*	*0.06*

LTF	*PRAIRIE*	*0.7*
LTF	*RENSSELAER*	*0.02*
LTF	*ROSETON*	*0.12*
LTF	*ROWAN*	*0.42*
LTF	*SANTEETLA*	*0.06*
LTF	*SMITHLAND*	*0.06*
LTF	*TATANKA*	*0.16*
LTF	*TILTON*	*0.14*
LTF	*TRIMBLE*	*0.07*
LTF	*TVA*	*0.27*
LTF	*UNIONPOWER*	*0.38*
917331	*Z2-043 C*	*0.62*
917332	*Z2-043 E*	*1.35*
918491	*AA1-063AC OP*	*3.94*
918492	*AA1-063AE OP*	*9.47*
918561	*AA1-072 C*	*0.09*
918562	*AA1-072 E*	*0.23*
919701	*AA2-057 C*	*5.99*
919702	*AA2-057 E*	*15.26*
919821	*AA2-068 C*	*1.52*
919822	*AA2-068 E*	*3.57*
920591	*AA2-165 C*	*0.82*
920592	*AA2-165 E*	*2.01*
920631	*AA2-169 C*	*2.82*
920632	*AA2-169 E*	*1.3*
924401	*AB2-089 C*	*1.71*

924402	*AB2-089 E*	*0.88*
926201	*AC1-098 C*	*17.78*
926202	*AC1-098 E*	*10.59*
926211	*AC1-099 C*	*5.96*
926212	*AC1-099 E*	*3.5*
927141	*AC1-208 C*	*28.79*
927142	*AC1-208 E*	*12.78*

Appendix 5

(DVP - DVP) The 3SO JUSTICE-3COX DP 115 kV line (from bus 313858 to bus 314577 ckt 1) loads from 129.75% to 132.42% (**DC power flow**) of its load dump rating (202 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 5602'. This project contributes approximately 5.85 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 5602' /* CAROLINA 115 KV
OPEN BRANCH FROM BUS 313723 TO BUS 314604 CKT 1 /* 3PECAN 115.00 - 3SEABORD 115.00
OPEN BRANCH FROM BUS 314558 TO BUS 314587 CKT 1 /* 3BOYKINS 115.00 - 3MARGTSV 115.00
OPEN BRANCH FROM BUS 314587 TO BUS 314604 CKT 1 /* 3MARGTSV 115.00 - 3SEABORD 115.00
OPEN BUS 314587 /* ISLAND: 3MARGTSV 115.00
OPEN BUS 314604 /* ISLAND: 3SEABORD 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* 3CAROLNA 115.00 - 3EATON F 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* 3CAROLNA 115.00 - AA2-053 TAP 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* 3CAROLNA 115.00 - 3PLHITP 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* 3CAROLNA 115.00 - 6CAROLNA 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315126	*1ROARAP2*	*3.85*
315128	*1ROARAP4*	*3.71*
314578	*3HORNRTN*	*8.39*
314582	*3KELFORD*	*1.13*
314603	*3SCOT NK*	*7.6*
932631	*AC2-084 C*	*25.36*
932632	*AC2-084 E*	*12.49*
934041	*AD1-029 C*	*31.37*
934042	*AD1-029 E*	*20.68*
934231	*AD1-050 C*	*3.78*

934232	*AD1-050 E*	*2.07*
LTF	*AMIL*	*0.07*
LTF	*BAYOU*	*0.35*
LTF	*BIG_CAJUN1*	*0.55*
LTF	*BIG_CAJUN2*	*1.11*
LTF	*BLUEG*	*0.34*
LTF	*CALDERWOOD*	*0.2*
LTF	*CANNELTON*	*0.07*
LTF	*CARR*	*0.01*
LTF	*CATAWBA*	*0.2*
LTF	*CELEVELAND*	*0.57*
LTF	*CHEOAH*	*0.19*
LTF	*CHILHOWEE*	*0.07*
LTF	*CHOCTAW*	*0.38*
LTF	*CLIFTY*	*1.26*
LTF	*COTTONWOOD*	*1.37*
LTF	*DEARBORN*	*0.13*
LTF	*EDWARDS*	*0.11*
LTF	*ELMERSMITH*	*0.19*
LTF	*FARMERCITY*	*0.08*
LTF	*G-007A*	*0.02*
LTF	*GIBSON*	*0.12*
LTF	*HAMLET*	*0.86*
LTF	*MORGAN*	*0.61*
LTF	*NEWTON*	*0.29*
LTF	*O-066A*	*< 0.01*

LTF	*PRAIRIE*	*0.64*
LTF	*RENSSELAER*	*< 0.01*
LTF	*ROSETON*	*0.07*
LTF	*ROWAN*	*0.4*
LTF	*SANTEETLA*	*0.06*
LTF	*SMITHLAND*	*0.06*
LTF	*TATANKA*	*0.14*
LTF	*TILTON*	*0.13*
LTF	*TRIMBLE*	*0.07*
LTF	*TVA*	*0.25*
LTF	*UNIONPOWER*	*0.36*
LTF	*VFT*	*0.05*
LTF	*X1-078*	*0.02*
917331	*Z2-043 C*	*0.62*
917332	*Z2-043 E*	*1.35*
918491	*AA1-063AC OP*	*3.95*
918492	*AA1-063AE OP*	*9.48*
918561	*AA1-072 C*	*0.09*
918562	*AA1-072 E*	*0.23*
919821	*AA2-068 C*	*1.52*
919822	*AA2-068 E*	*3.57*
920631	*AA2-169 C*	*2.83*
920632	*AA2-169 E*	*1.3*
924401	*AB2-089 C*	*1.72*
924402	*AB2-089 E*	*0.88*
926201	*AC1-098 C*	*17.79*

926202	*AC1-098 E*	*10.6*
926211	*AC1-099 C*	*5.96*
926212	*AC1-099 E*	*3.5*
927141	*AC1-208 C*	*28.81*
927142	*AC1-208 E*	*12.79*

Appendix 6

(DVP - DVP) The 6CLUBHSE 230/115 kV transformer (from bus 314562 to bus 314563 ckt 1) loads from 130.75% to 131.93% (**DC power flow**) of its load dump rating (209 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-5: T122C'. This project contributes approximately 5.48 MW to the thermal violation.

```
CONTINGENCY 'DVP_P4-5: T122C'                          /* CAROLINA
  OPEN BUS 314559                                      /* CAROLINA 115KV BUS
  OPEN BUS 315126                                      /* ROANOKE RAPIDS GEN 1 AND 2
  OPEN BUS 315128                                      /* ROANOKE RAPIDS GEN 3 AND 4
  OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1      /* TX. #4
  END
```

Bus Number	*Bus Name*	*Full Contribution*
315159	*1KERR 2*	*1.27*
315164	*1KERR 7*	*1.25*
314572	*3EMPORIA*	*1.99*
314704	*3LAWRENC*	*1.44*
934201	*AD1-047 C*	*38.11*
934202	*AD1-047 E*	*25.41*
934231	*AD1-050 C*	*3.55*
934232	*AD1-050 E*	*1.94*
LTF	*CARR*	*0.01*
LTF	*CBM-S1*	*0.61*
LTF	*CBM-S2*	*0.82*
LTF	*CBM-W1*	*1.65*
LTF	*CBM-W2*	*3.36*
LTF	*CIN*	*0.38*
LTF	*CPLE*	*0.21*
LTF	*G-007*	*0.11*
LTF	*IPL*	*0.24*

LTF	*LGEE*	*0.08*
LTF	*MEC*	*0.77*
LTF	*MECS*	*0.42*
LTF	*O-066*	*0.36*
LTF	*RENSSELAER*	*0.01*
LTF	*ROSETON*	*0.08*
LTF	*WEC*	*0.1*
920631	*AA2-169 C*	*1.67*
920632	*AA2-169 E*	*0.77*
931231	*AB1-173 C*	*10.72*
931232	*AB1-173 E*	*5.*
931241	*AB1-173AC*	*10.72*
931242	*AB1-173AE*	*5.*
923911	*AB2-031 C O1*	*10.64*
923912	*AB2-031 E O1*	*5.24*
923991	*AB2-040 C O1*	*34.94*
923992	*AB2-040 E O1*	*28.59*
924021	*AB2-043 C O1*	*3.16*
924022	*AB2-043 E O1*	*5.18*
924161	*AB2-060 C O1*	*8.96*
924162	*AB2-060 E O1*	*4.22*
924301	*AB2-077 C O1*	*1.94*
924302	*AB2-077 E O1*	*1.29*
924311	*AB2-078 C O1*	*1.94*
924312	*AB2-078 E O1*	*1.29*
924321	*AB2-079 C O1*	*1.94*

924322	*AB2-079 E O1*	*1.29*
924401	*AB2-089 C*	*1.61*
924402	*AB2-089 E*	*0.83*
924411	*AB2-090 C*	*3.97*
924412	*AB2-090 E*	*2.04*
925171	*AB2-174 C O1*	*33.35*
925172	*AB2-174 E O1*	*30.17*
925221	*AB2-176 C*	*1.64*
925222	*AB2-176 E*	*0.7*
925611	*AC1-036 C*	*0.76*
925612	*AC1-036 E*	*1.25*
925781	*AC1-054 C*	*5.42*
925782	*AC1-054 E*	*2.5*

Appendix 7

(DVP - DVP) The 6CLUBHSE-6SAPONY 230 kV line (from bus 314563 to bus 314435 ckt 1) loads from 124.64% to 125.88% (**DC power flow**) of its load dump rating (637 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 246T247'. This project contributes approximately 7.86 MW to the thermal violation.

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

Bus Number	*Bus Name*	*Full Contribution*
315131	*1EDGECMA*	*10.81*
315132	*1EDGECMB*	*10.81*
315139	*1GASTONA*	*7.59*
315141	*1GASTONB*	*7.59*
315126	*1ROARAP2*	*2.72*
315128	*1ROARAP4*	*2.61*
315136	*1ROSEMG1*	*5.12*
315138	*1ROSEMG2*	*2.4*
315137	*1ROSEMS1*	*3.18*
314557	*3BETHELC*	*0.9*
314554	*3BTLEBRO*	*0.91*

314566	*3CRESWEL*	*1.69*
314572	*3EMPORIA*	*1.04*
314578	*3HORNRTN*	*5.4*
314582	*3KELFORD*	*1.09*
314704	*3LAWRENC*	*0.82*
314603	*3SCOT NK*	*4.39*
314617	*3TUNIS*	*1.*
314541	*3WATKINS*	*0.48*
314620	*6CASHIE*	*0.87*
314574	*6EVERETS*	*2.55*
314594	*6PLYMOTH*	*0.72*
932631	*AC2-084 C*	*11.81*
932632	*AC2-084 E*	*5.82*
933451	*AC2-158 C*	*6.47*
933452	*AC2-158 E*	*6.47*
933461	*AC2-159 C*	*9.91*
933462	*AC2-159 E*	*9.91*
933991	*AD1-023 C*	*12.49*
933992	*AD1-023 E*	*6.8*
934041	*AD1-029 C*	*14.61*
934042	*AD1-029 E*	*9.63*
934201	*AD1-047 C*	*17.56*
934202	*AD1-047 E*	*11.71*
934231	*AD1-050 C*	*5.08*
934232	*AD1-050 E*	*2.78*
934331	*AD1-057 C O1*	*15.84*

934332	*AD1-057 E O1*	*8.45*
934521	*AD1-076 C O1*	*47.2*
934522	*AD1-076 E O1*	*24.03*
LTF	*AD1-120*	*4.44*
LTF	*AD1-121*	*4.42*
LTF	*CARR*	*0.12*
LTF	*CBM-S1*	*5.44*
LTF	*CBM-S2*	*10.91*
LTF	*CBM-W1*	*12.05*
LTF	*CBM-W2*	*29.4*
LTF	*CIN*	*2.71*
LTF	*CPLE*	*3.68*
LTF	*G-007*	*0.77*
LTF	*IPL*	*1.73*
LTF	*LGEE*	*0.58*
LTF	*MEC*	*6.08*
LTF	*MECS*	*2.73*
LTF	*O-066*	*2.57*
LTF	*RENSSELAER*	*0.1*
LTF	*ROSETON*	*0.69*
900671	*V4-068 C*	*0.12*
900672	*V4-068 E*	*0.33*
LTF	*WEC*	*0.74*
917331	*Z2-043 C*	*0.6*
917332	*Z2-043 E*	*1.31*
917341	*Z2-044 C*	*0.32*

917342	*Z2-044 E*	*0.7*
917511	*Z2-088 C OP1*	*1.07*
917512	*Z2-088 E OP1*	*4.29*
917591	*Z2-099 C*	*0.2*
917592	*Z2-099 E*	*0.44*
918411	*AA1-050*	*0.9*
918491	*AA1-063AC OP*	*2.35*
918492	*AA1-063AE OP*	*5.65*
918511	*AA1-065 C OP*	*2.24*
918512	*AA1-065 E OP*	*5.62*
918531	*AA1-067 C*	*0.35*
918532	*AA1-067 E*	*0.76*
918561	*AA1-072 C*	*0.09*
918562	*AA1-072 E*	*0.22*
919691	*AA2-053 C*	*2.72*
919692	*AA2-053 E*	*5.95*
919701	*AA2-057 C*	*1.77*
919702	*AA2-057 E*	*4.52*
919821	*AA2-068 C*	*0.6*
919822	*AA2-068 E*	*1.39*
LTF	*AA2-074*	*2.51*
920021	*AA2-086 C*	*0.1*
920022	*AA2-086 E*	*0.24*
920041	*AA2-088 C*	*1.24*
920042	*AA2-088 E*	*10.3*
920591	*AA2-165 C*	*0.24*

920592	*AA2-165 E*	*0.6*
920631	*AA2-169 C*	*2.8*
920632	*AA2-169 E*	*1.29*
920671	*AA2-174 C*	*0.12*
920672	*AA2-174 E*	*0.69*
920691	*AA2-178 C*	*6.77*
920692	*AA2-178 E*	*2.9*
930051	*AB1-013 C*	*2.04*
930052	*AB1-013 E*	*13.68*
930401	*AB1-081 C*	*10.25*
930402	*AB1-081 E*	*4.39*
930861	*AB1-132 C*	*29.52*
930862	*AB1-132 E*	*12.65*
931231	*AB1-173 C*	*4.94*
931232	*AB1-173 E*	*2.31*
931241	*AB1-173AC*	*4.94*
931242	*AB1-173AE*	*2.31*
923911	*AB2-031 C O1*	*4.9*
923912	*AB2-031 E O1*	*2.42*
923941	*AB2-035 C*	*0.38*
923942	*AB2-035 E*	*0.16*
923991	*AB2-040 C O1*	*16.1*
923992	*AB2-040 E O1*	*13.17*
924021	*AB2-043 C O1*	*2.68*
924022	*AB2-043 E O1*	*4.39*
924151	*AB2-059 C O1*	*12.09*

924152	*AB2-059 E O1*	*6.23*
924161	*AB2-060 C O1*	*7.59*
924162	*AB2-060 E O1*	*3.57*
924301	*AB2-077 C O1*	*1.68*
924302	*AB2-077 E O1*	*1.12*
924311	*AB2-078 C O1*	*1.68*
924312	*AB2-078 E O1*	*1.12*
924321	*AB2-079 C O1*	*1.68*
924322	*AB2-079 E O1*	*1.12*
924381	*AB2-087 C*	*0.74*
924382	*AB2-087 E*	*0.35*
924391	*AB2-088 C*	*0.49*
924392	*AB2-088 E*	*0.23*
924401	*AB2-089 C*	*2.31*
924402	*AB2-089 E*	*1.19*
924411	*AB2-090 C*	*3.37*
924412	*AB2-090 E*	*1.73*
924491	*AB2-098 C*	*0.59*
924492	*AB2-098 E*	*0.26*
924501	*AB2-099 C*	*0.73*
924502	*AB2-099 E*	*0.31*
924511	*AB2-100 C*	*35.91*
924512	*AB2-100 E*	*17.68*
925121	*AB2-169 C*	*6.15*
925122	*AB2-169 E*	*5.52*
925171	*AB2-174 C O1*	*16.16*

925172	*AB2-174 E O1*	*14.62*
925221	*AB2-176 C*	*1.39*
925222	*AB2-176 E*	*0.59*
925291	*AB2-188 C O1*	*1.67*
925292	*AB2-188 E O1*	*0.75*
925591	*AC1-034 C*	*7.73*
925592	*AC1-034 E*	*5.83*
925781	*AC1-054 C*	*8.28*
925782	*AC1-054 E*	*3.81*
926071	*AC1-086 C*	*43.47*
926072	*AC1-086 E*	*19.78*
926201	*AC1-098 C*	*8.29*
926202	*AC1-098 E*	*4.94*
926211	*AC1-099 C*	*2.78*
926212	*AC1-099 E*	*1.63*
926771	*AC1-163 C*	*2.41*
926772	*AC1-163 E*	*1.13*
927021	*AC1-189 C*	*9.39*
927022	*AC1-189 E*	*4.68*
927111	*AC1-206 C*	*32.26*
927112	*AC1-206 E*	*15.25*
927141	*AC1-208 C*	*13.11*
927142	*AC1-208 E*	*5.82*

Appendix 8

(DVP - DVP) The 6CLUBHSE 230/115 kV transformer (from bus 314563 to bus 314562 ckt 1) loads from 109.32% to 111.96% (**DC power flow**) of its load dump rating (209 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 239T2141'. This project contributes approximately 5.52 MW to the thermal violation.

```
CONTINGENCY 'DVP_P4-2: 239T2141'                    /* LAKEVIEW
  OPEN BRANCH FROM BUS 314583 TO BUS 314579 CKT 1   /* 239
  OPEN BRANCH FROM BUS 314579 TO BUS 314605 CKT 1   /* 2057
  OPEN BRANCH FROM BUS 314583 TO BUS 314561 CKT 1   /* 2141
  END
```

Bus Number	*Bus Name*	*Full Contribution*
315139	*1GASTONA*	*4.6*
315141	*1GASTONB*	*4.6*
314541	*3WATKINS*	*-0.27*
934043	*AD1-029 BAT*	*9.45*
934233	*AD1-050 BAT*	*5.52*
LTF	*AMIL*	*0.13*
LTF	*BAYOU*	*0.69*
LTF	*BIG_CAJUN1*	*1.09*
LTF	*BIG_CAJUN2*	*2.18*
LTF	*BLUEG*	*0.69*
LTF	*CALDERWOOD*	*0.41*
LTF	*CANNELTON*	*0.13*
LTF	*CATAWBA*	*0.39*
LTF	*CBM-N*	*0.02*
LTF	*CELEVELAND*	*1.12*
LTF	*CHEOAH*	*0.38*
LTF	*CHILHOWEE*	*0.13*

LTF	*CHOCTAW*	*0.74*
LTF	*CLIFTY*	*2.53*
LTF	*COTTONWOOD*	*2.7*
LTF	*DEARBORN*	*0.23*
LTF	*EDWARDS*	*0.21*
LTF	*ELMERSMITH*	*0.39*
LTF	*FARMERCITY*	*0.17*
LTF	*G-007A*	*0.55*
LTF	*GIBSON*	*0.24*
LTF	*HAMLET*	*1.52*
LTF	*MORGAN*	*1.2*
LTF	*NEWTON*	*0.58*
LTF	*NYISO*	*0.28*
LTF	*O-066A*	*0.26*
LTF	*PRAIRIE*	*1.25*
LTF	*ROWAN*	*0.83*
LTF	*SANTEETLA*	*0.11*
LTF	*SMITHLAND*	*0.11*
LTF	*TATANKA*	*0.28*
LTF	*TILTON*	*0.25*
LTF	*TRIMBLE*	*0.13*
LTF	*TVA*	*0.51*
LTF	*UNIONPOWER*	*0.72*
LTF	*VFT*	*1.48*
LTF	*X1-078*	*0.42*
930861	*AB1-132 C*	*17.9*

930862	*AB1-132 E*	*7.67*
923851	*AB2-025 C*	*0.33*
923852	*AB2-025 E*	*0.75*
924511	*AB2-100 C*	*14.28*
924512	*AB2-100 E*	*7.03*
926071	*AC1-086 C*	*26.37*
926072	*AC1-086 E*	*12.*
927111	*AC1-206 C*	*12.3*
927112	*AC1-206 E*	*5.82*

Appendix 9

(DVP - DVP) The 3COX DP-3CHESTNUT 115 kV line (from bus 314577 to bus 313719 ckt 1) loads from 144.48% to 147.58% (**DC power flow**) of its load dump rating (174 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 5602'. This project contributes approximately 5.85 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 5602' /* CAROLINA 115 KV
OPEN BRANCH FROM BUS 313723 TO BUS 314604 CKT 1 /* 3PECAN 115.00 - 3SEABORD 115.00
OPEN BRANCH FROM BUS 314558 TO BUS 314587 CKT 1 /* 3BOYKINS 115.00 - 3MARGTSV 115.00
OPEN BRANCH FROM BUS 314587 TO BUS 314604 CKT 1 /* 3MARGTSV 115.00 - 3SEABORD 115.00
OPEN BUS 314587 /* ISLAND: 3MARGTSV 115.00
OPEN BUS 314604 /* ISLAND: 3SEABORD 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* 3CAROLNA 115.00 - 3EATON F 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* 3CAROLNA 115.00 - AA2-053 TAP 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* 3CAROLNA 115.00 - 3PLHITP 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* 3CAROLNA 115.00 - 6CAROLNA 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315126	*1ROARAP2*	*3.85*
315128	*1ROARAP4*	*3.71*
314578	*3HORNRTN*	*8.39*
314582	*3KELFORD*	*1.13*
314603	*3SCOT NK*	*7.6*
932631	*AC2-084 C*	*25.36*
932632	*AC2-084 E*	*12.49*
934041	*AD1-029 C*	*31.37*
934042	*AD1-029 E*	*20.68*
934231	*AD1-050 C*	*3.78*

934232	*AD1-050 E*	*2.07*
LTF	*AMIL*	*0.07*
LTF	*BAYOU*	*0.35*
LTF	*BIG_CAJUN1*	*0.55*
LTF	*BIG_CAJUN2*	*1.11*
LTF	*BLUEG*	*0.34*
LTF	*CALDERWOOD*	*0.2*
LTF	*CANNELTON*	*0.07*
LTF	*CARR*	*0.01*
LTF	*CATAWBA*	*0.2*
LTF	*CELEVELAND*	*0.57*
LTF	*CHEOAH*	*0.19*
LTF	*CHILHOWEE*	*0.07*
LTF	*CHOCTAW*	*0.38*
LTF	*CLIFTY*	*1.26*
LTF	*COTTONWOOD*	*1.37*
LTF	*DEARBORN*	*0.13*
LTF	*EDWARDS*	*0.11*
LTF	*ELMERSMITH*	*0.19*
LTF	*FARMERCITY*	*0.08*
LTF	*G-007A*	*0.02*
LTF	*GIBSON*	*0.12*
LTF	*HAMLET*	*0.86*
LTF	*MORGAN*	*0.61*
LTF	*NEWTON*	*0.29*
LTF	*O-066A*	*< 0.01*

LTF	*PRAIRIE*	*0.64*
LTF	*RENSSELAER*	*< 0.01*
LTF	*ROSETON*	*0.07*
LTF	*ROWAN*	*0.4*
LTF	*SANTEETLA*	*0.06*
LTF	*SMITHLAND*	*0.06*
LTF	*TATANKA*	*0.14*
LTF	*TILTON*	*0.13*
LTF	*TRIMBLE*	*0.07*
LTF	*TVA*	*0.25*
LTF	*UNIONPOWER*	*0.36*
LTF	*VFT*	*0.05*
LTF	*X1-078*	*0.02*
917331	*Z2-043 C*	*0.62*
917332	*Z2-043 E*	*1.35*
918491	*AA1-063AC OP*	*3.95*
918492	*AA1-063AE OP*	*9.48*
918561	*AA1-072 C*	*0.09*
918562	*AA1-072 E*	*0.23*
919821	*AA2-068 C*	*1.52*
919822	*AA2-068 E*	*3.57*
920631	*AA2-169 C*	*2.83*
920632	*AA2-169 E*	*1.3*
924401	*AB2-089 C*	*1.72*
924402	*AB2-089 E*	*0.88*
926201	*AC1-098 C*	*17.79*

926202	*AC1-098 E*	*10.6*
926211	*AC1-099 C*	*5.96*
926212	*AC1-099 E*	*3.5*
927141	*AC1-208 C*	*28.81*
927142	*AC1-208 E*	*12.79*

Appendix 10

(DVP - DVP) The 6LAKEVEW-6CAROLNA 230 kV line (from bus 314583 to bus 314561 ckt 1) loads from 132.06% to 133.16% (**DC power flow**) of its emergency rating (375 MVA) for the single line contingency outage of 'DVP_P1-2: LN 238'. This project contributes approximately 4.09 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 238'
OPEN BRANCH FROM BUS 314282 TO BUS 314435 CKT 1 /* 6CARSON 230.00 - 6SAPONY 230.00
OPEN BRANCH FROM BUS 314435 TO BUS 314563 CKT 1 /* 6SAPONY 230.00 - 6CLUBHSE 230.00
OPEN BRANCH FROM BUS 314562 TO BUS 314563 CKT 1 /* 3CLUBHSE 115.00 - 6CLUBHSE 230.00
OPEN BUS 314435 /* ISLAND
END

Bus Number	*Bus Name*	*Full Contribution*
315131	*1EDGECMA*	*10.66*
315132	*1EDGECMB*	*10.66*
315139	*1GASTONA*	*13.27*
315141	*1GASTONB*	*13.27*
315136	*1ROSEMG1*	*8.68*
315138	*1ROSEMG2*	*4.06*
315137	*1ROSEMS1*	*5.38*
934233	*AD1-050 BAT*	*4.1*
934331	*AD1-057 C O1*	*22.8*
LTF	*CARR*	*0.05*
LTF	*CBM-S1*	*2.65*
LTF	*CBM-S2*	*5.43*
LTF	*CBM-W1*	*5.77*
LTF	*CBM-W2*	*14.28*
LTF	*CIN*	*1.29*

LTF	*CPLE*	*1.83*
LTF	*IPL*	*0.82*
LTF	*LGEE*	*0.28*
LTF	*MEC*	*2.93*
LTF	*MECS*	*1.3*
LTF	*RENSSELAER*	*0.04*
LTF	*ROSETON*	*0.26*
LTF	*WEC*	*0.36*
917341	*Z2-044 C*	*0.14*
917511	*Z2-088 C OP1*	*0.61*
918411	*AA1-050*	*0.51*
930401	*AB1-081 C*	*7.83*
930861	*AB1-132 C*	*51.61*
923941	*AB2-035 C*	*0.26*
924151	*AB2-059 C O1*	*9.23*
924391	*AB2-088 C*	*0.34*
924511	*AB2-100 C*	*41.17*
925591	*AC1-034 C*	*5.32*
926071	*AC1-086 C*	*76.01*
927021	*AC1-189 C*	*3.86*
927111	*AC1-206 C*	*35.46*

Appendix 11

(DVP - DVP) The 3WITAKRS-3BTLEBRO 115 kV line (from bus 314623 to bus 314554 ckt 1) loads from 183.19% to 186.55% (**DC power flow**) of its load dump rating (174 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 5602'. This project contributes approximately 5.84 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 5602' /* CAROLINA 115 KV
OPEN BRANCH FROM BUS 313723 TO BUS 314604 CKT 1 /* 3PECAN 115.00 - 3SEABORD 115.00
OPEN BRANCH FROM BUS 314558 TO BUS 314587 CKT 1 /* 3BOYKINS 115.00 - 3MARGTSV 115.00
OPEN BRANCH FROM BUS 314587 TO BUS 314604 CKT 1 /* 3MARGTSV 115.00 - 3SEABORD 115.00
OPEN BUS 314587 /* ISLAND: 3MARGTSV 115.00
OPEN BUS 314604 /* ISLAND: 3SEABORD 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* 3CAROLNA 115.00 - 3EATON F 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* 3CAROLNA 115.00 - AA2-053 TAP 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* 3CAROLNA 115.00 - 3PLHITP 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* 3CAROLNA 115.00 - 6CAROLNA 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315126	*1ROARAP2*	*3.85*
315128	*1ROARAP4*	*3.7*
314578	*3HORNRTN*	*8.39*
314582	*3KELFORD*	*1.12*
314603	*3SCOT NK*	*7.59*
932631	*AC2-084 C*	*25.34*
932632	*AC2-084 E*	*12.48*
934041	*AD1-029 C*	*31.35*
934042	*AD1-029 E*	*20.66*
934231	*AD1-050 C*	*3.78*

934232	*AD1-050 E*	*2.06*
LTF	*AMIL*	*0.07*
LTF	*BAYOU*	*0.38*
LTF	*BIG_CAJUN1*	*0.6*
LTF	*BIG_CAJUN2*	*1.21*
LTF	*BLUEG*	*0.4*
LTF	*CALDERWOOD*	*0.22*
LTF	*CANNELTON*	*0.07*
LTF	*CARR*	*0.02*
LTF	*CATAWBA*	*0.21*
LTF	*CELEVELAND*	*0.6*
LTF	*CHEOAH*	*0.21*
LTF	*CHILHOWEE*	*0.07*
LTF	*CHOCTAW*	*0.41*
LTF	*CLIFTY*	*1.48*
LTF	*COTTONWOOD*	*1.5*
LTF	*DEARBORN*	*0.16*
LTF	*EDWARDS*	*0.12*
LTF	*ELMERSMITH*	*0.22*
LTF	*FARMERCITY*	*0.09*
LTF	*G-007*	*0.02*
LTF	*GIBSON*	*0.14*
LTF	*HAMLET*	*0.89*
LTF	*MORGAN*	*0.66*
LTF	*NEWTON*	*0.33*
LTF	*O-066*	*0.08*

LTF	*PRAIRIE*	*0.71*
LTF	*RENSSELAER*	*0.02*
LTF	*ROSETON*	*0.13*
LTF	*ROWAN*	*0.42*
LTF	*SANTEETLA*	*0.06*
LTF	*SMITHLAND*	*0.06*
LTF	*TATANKA*	*0.16*
LTF	*TILTON*	*0.15*
LTF	*TRIMBLE*	*0.08*
LTF	*TVA*	*0.28*
LTF	*UNIONPOWER*	*0.39*
917331	*Z2-043 C*	*0.62*
917332	*Z2-043 E*	*1.35*
917341	*Z2-044 C*	*1.29*
917342	*Z2-044 E*	*2.82*
918491	*AA1-063AC OP*	*3.94*
918492	*AA1-063AE OP*	*9.47*
918561	*AA1-072 C*	*0.09*
918562	*AA1-072 E*	*0.23*
919701	*AA2-057 C*	*5.99*
919702	*AA2-057 E*	*15.26*
919821	*AA2-068 C*	*1.52*
919822	*AA2-068 E*	*3.57*
920591	*AA2-165 C*	*0.82*
920592	*AA2-165 E*	*2.01*
920631	*AA2-169 C*	*2.82*

920632	*AA2-169 E*	*1.3*
924401	*AB2-089 C*	*1.71*
924402	*AB2-089 E*	*0.88*
926201	*AC1-098 C*	*17.78*
926202	*AC1-098 E*	*10.59*
926211	*AC1-099 C*	*5.96*
926212	*AC1-099 E*	*3.5*
927141	*AC1-208 C*	*28.79*
927142	*AC1-208 E*	*12.78*

Appendix 12

(DVP - DVP) The 3AULANDR-3EARLEYS 115 kV line (from bus 314625 to bus 314568 ckt 1) loads from 123.68% to 124.62% (**DC power flow**) of its load dump rating (136 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 56-2060'. This project contributes approximately 2.85 MW to the thermal violation.

CONTINGENCY 'DVP_P7-1: LN 56-2060'
OPEN BRANCH FROM BUS 313723 TO BUS 314604 CKT 1 /* 3PECAN 115.00 - 3SEABORD 115.00
OPEN BRANCH FROM BUS 314558 TO BUS 314587 CKT 1 /* 3BOYKINS 115.00 - 3MARGTSV 115.00
OPEN BRANCH FROM BUS 314587 TO BUS 314604 CKT 1 /* 3MARGTSV 115.00 - 3SEABORD 115.00
OPEN BUS 314587 /* ISLAND: 3MARGTSV 115.00
OPEN BUS 314604 /* ISLAND: 3SEABORD 115.00
OPEN BRANCH FROM BUS 314561 TO BUS 314599 CKT 1 /* 6CAROLNA 230.00 - 6ROA VAL 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315126	*1ROARAP2*	*1.24*
315128	*1ROARAP4*	*1.19*
314572	*3EMPORIA*	*0.17*
314578	*3HORNRTN*	*2.25*
314541	*3WATKINS*	*-0.22*
933461	*AC2-159 C*	*19.61*
933462	*AC2-159 E*	*19.61*
934201	*AD1-047 C*	*4.31*
934202	*AD1-047 E*	*2.87*
934231	*AD1-050 C*	*1.84*
934232	*AD1-050 E*	*1.01*
LTF	*CARR*	*0.01*
LTF	*CBM-S1*	*0.27*

LTF	*CBM-S2*	*0.46*
LTF	*CBM-W1*	*0.61*
LTF	*CBM-W2*	*1.45*
LTF	*CIN*	*0.14*
LTF	*CPLE*	*0.12*
LTF	*G-007*	*0.07*
LTF	*IPL*	*0.09*
LTF	*LGEE*	*0.03*
LTF	*MEC*	*0.3*
LTF	*MECS*	*0.14*
LTF	*O-066*	*0.22*
LTF	*RENSSELAER*	*< 0.01*
LTF	*ROSETON*	*0.07*
LTF	*WEC*	*0.04*
918491	*AA1-063AC OP*	*1.27*
918492	*AA1-063AE OP*	*3.06*
919691	*AA2-053 C*	*2.99*
919692	*AA2-053 E*	*6.54*
920631	*AA2-169 C*	*1.12*
920632	*AA2-169 E*	*0.51*
920671	*AA2-174 C*	*0.14*
920672	*AA2-174 E*	*0.76*
930861	*AB1-132 C*	*4.59*
930862	*AB1-132 E*	*1.97*
931231	*AB1-173 C*	*1.21*
931232	*AB1-173 E*	*0.57*

931241	*AB1-173AC*	*1.21*
931242	*AB1-173AE*	*0.57*
923911	*AB2-031 C O1*	*1.2*
923912	*AB2-031 E O1*	*0.59*
923991	*AB2-040 C O1*	*3.95*
923992	*AB2-040 E O1*	*3.23*
924401	*AB2-089 C*	*0.83*
924402	*AB2-089 E*	*0.43*
925171	*AB2-174 C O1*	*3.43*
925172	*AB2-174 E O1*	*3.11*
925781	*AC1-054 C*	*3.13*
925782	*AC1-054 E*	*1.44*
926071	*AC1-086 C*	*6.76*
926072	*AC1-086 E*	*3.08*
927141	*AC1-208 C*	*2.9*
927142	*AC1-208 E*	*1.29*

Appendix 13

(DVP - DVP) The 3WOODLND-3AULANDR 115 kV line (from bus 314626 to bus 314625 ckt 1) loads from 128.82% to 129.77% (**DC power flow**) of its load dump rating (136 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 56-2060'. This project contributes approximately 2.85 MW to the thermal violation.

CONTINGENCY 'DVP_P7-1: LN 56-2060'
OPEN BRANCH FROM BUS 313723 TO BUS 314604 CKT 1 /* 3PECAN 115.00 - 3SEABORD 115.00
OPEN BRANCH FROM BUS 314558 TO BUS 314587 CKT 1 /* 3BOYKINS 115.00 - 3MARGTSV 115.00
OPEN BRANCH FROM BUS 314587 TO BUS 314604 CKT 1 /* 3MARGTSV 115.00 - 3SEABORD 115.00
OPEN BUS 314587 /* ISLAND: 3MARGTSV 115.00
OPEN BUS 314604 /* ISLAND: 3SEABORD 115.00
OPEN BRANCH FROM BUS 314561 TO BUS 314599 CKT 1 /* 6CAROLNA 230.00 - 6ROA VAL 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315126	*1ROARAP2*	*1.24*
315128	*1ROARAP4*	*1.19*
314572	*3EMPORIA*	*0.17*
314578	*3HORNRTN*	*2.25*
314541	*3WATKINS*	*-0.22*
933461	*AC2-159 C*	*19.61*
933462	*AC2-159 E*	*19.61*
934201	*AD1-047 C*	*4.31*
934202	*AD1-047 E*	*2.87*
934231	*AD1-050 C*	*1.84*
934232	*AD1-050 E*	*1.01*
LTF	*CARR*	*0.01*
LTF	*CBM-S1*	*0.27*

LTF	*CBM-S2*	*0.46*
LTF	*CBM-W1*	*0.61*
LTF	*CBM-W2*	*1.45*
LTF	*CIN*	*0.14*
LTF	*CPLE*	*0.12*
LTF	*G-007*	*0.07*
LTF	*IPL*	*0.09*
LTF	*LGEE*	*0.03*
LTF	*MEC*	*0.3*
LTF	*MECS*	*0.14*
LTF	*O-066*	*0.22*
LTF	*RENSSELAER*	*< 0.01*
LTF	*ROSETON*	*0.07*
LTF	*WEC*	*0.04*
918491	*AA1-063AC OP*	*1.27*
918492	*AA1-063AE OP*	*3.06*
919691	*AA2-053 C*	*2.99*
919692	*AA2-053 E*	*6.54*
920631	*AA2-169 C*	*1.12*
920632	*AA2-169 E*	*0.51*
920671	*AA2-174 C*	*0.14*
920672	*AA2-174 E*	*0.76*
930861	*AB1-132 C*	*4.59*
930862	*AB1-132 E*	*1.97*
931231	*AB1-173 C*	*1.21*
931232	*AB1-173 E*	*0.57*

931241	*AB1-173AC*	*1.21*
931242	*AB1-173AE*	*0.57*
923911	*AB2-031 C O1*	*1.2*
923912	*AB2-031 E O1*	*0.59*
923991	*AB2-040 C O1*	*3.95*
923992	*AB2-040 E O1*	*3.23*
924401	*AB2-089 C*	*0.83*
924402	*AB2-089 E*	*0.43*
925171	*AB2-174 C O1*	*3.43*
925172	*AB2-174 E O1*	*3.11*
925781	*AC1-054 C*	*3.13*
925782	*AC1-054 E*	*1.44*
926071	*AC1-086 C*	*6.76*
926072	*AC1-086 E*	*3.08*
927141	*AC1-208 C*	*2.9*
927142	*AC1-208 E*	*1.29*

Appendix 14

(DVP - DVP) The AC1-208 TAP-3SO JUSTICE 115 kV line (from bus 927140 to bus 313858 ckt 1) loads from 102.22% to 106.53% (**DC power flow**) of its load dump rating (202 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 5602'. This project contributes approximately 8.7 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 5602' /* CAROLINA 115 KV
OPEN BRANCH FROM BUS 313723 TO BUS 314604 CKT 1 /* 3PECAN 115.00 - 3SEABORD 115.00
OPEN BRANCH FROM BUS 314558 TO BUS 314587 CKT 1 /* 3BOYKINS 115.00 - 3MARGTSV 115.00
OPEN BRANCH FROM BUS 314587 TO BUS 314604 CKT 1 /* 3MARGTSV 115.00 - 3SEABORD 115.00
OPEN BUS 314587 /* ISLAND: 3MARGTSV 115.00
OPEN BUS 314604 /* ISLAND: 3SEABORD 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314571 CKT 1 /* 3CAROLNA 115.00 - 3EATON F 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 919690 CKT 1 /* 3CAROLNA 115.00 - AA2-053 TAP 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314600 CKT 1 /* 3CAROLNA 115.00 - 3PLHITP 115.00
OPEN BRANCH FROM BUS 314559 TO BUS 314561 CKT 1 /* 3CAROLNA 115.00 - 6CAROLNA 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315159	*1KERR 2*	*1.26*
315164	*1KERR 7*	*1.24*
315126	*1ROARAP2*	*5.61*
315128	*1ROARAP4*	*5.4*
314578	*3HORNRTN*	*12.21*
934043	*AD1-029 BAT*	*16.6*
934231	*AD1-050 C*	*5.62*
934232	*AD1-050 E*	*3.07*
LTF	*AMIL*	*0.01*
LTF	*BAYOU*	*0.07*

LTF	*BIG_CAJUN1*	*0.11*
LTF	*BIG_CAJUN2*	*0.21*
LTF	*BLUEG*	*0.06*
LTF	*CALDERWOOD*	*0.04*
LTF	*CANNELTON*	*0.01*
LTF	*CARR*	*0.02*
LTF	*CATAWBA*	*0.04*
LTF	*CELEVELAND*	*0.1*
LTF	*CHEOAH*	*0.03*
LTF	*CHILHOWEE*	*0.01*
LTF	*CHOCTAW*	*0.07*
LTF	*CLIFTY*	*0.23*
LTF	*COTTONWOOD*	*0.27*
LTF	*DEARBORN*	*0.03*
LTF	*EDWARDS*	*0.02*
LTF	*ELMERSMITH*	*0.04*
LTF	*FARMERCITY*	*0.02*
LTF	*G-007*	*0.07*
LTF	*GIBSON*	*0.02*
LTF	*HAMLET*	*0.22*
LTF	*MORGAN*	*0.11*
LTF	*NEWTON*	*0.06*
LTF	*O-066*	*0.25*
LTF	*PRAIRIE*	*0.12*
LTF	*RENSSELAER*	*0.02*
LTF	*ROSETON*	*0.12*

LTF	*ROWAN*	*0.05*
LTF	*SANTEETLA*	*0.01*
LTF	*SMITHLAND*	*0.01*
LTF	*TATANKA*	*0.03*
LTF	*TILTON*	*0.02*
LTF	*TRIMBLE*	*0.01*
LTF	*TVA*	*0.05*
LTF	*UNIONPOWER*	*0.07*
918491	*AA1-063AC OP*	*5.75*
918492	*AA1-063AE OP*	*13.8*
920631	*AA2-169 C*	*4.15*
920632	*AA2-169 E*	*1.91*
924401	*AB2-089 C*	*2.55*
924402	*AB2-089 E*	*1.31*
925781	*AC1-054 C*	*5.37*
925782	*AC1-054 E*	*2.47*
927141	*AC1-208 C*	*41.85*
927142	*AC1-208 E*	*18.58*