Generation Interconnection Feasibility Study Report

For

PJM Generation Interconnection Request Queue Position AD2-089

Anaconda-Tar River 115 kV 45 MW Capacity / 75 MW Energy

July / 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 Edgecombe County, North Carolina (Edgecombe County). The installed facilities will have a total capability of **75 MW** with **45 MW** of this output being recognized by PJM as capacity. The proposed in-service date for this project is **12/31/2020**. **This study does not imply an ITO commitment to this in-service date.**

Point of Interconnection (POI)

AD2-089 will interconnect with the ITO transmission system via a tap off of the Anaconda-Tar River 115 kV line. The tap will be 0.5 miles from Anaconda Substation and 1 mile from Tar River Substation on the east side of the N.O. switch near Anaconda. Refer to **Attachment 1**. No secondary POI was analyzed.

Cost Summary

The AD2-089 project will be responsible for the following costs:

Description	Total Cost
Attachment Facilities	$1,550,000
Direct Connection Network Upgrades	$6,300,000
Non Direct Connection Network Upgrades[1]	$ 0
Total Costs	**$7,850,000**

In addition, the AD2-089 project may be responsible for a contribution to the following costs:

Description	Total Cost
New System Upgrades	$ 0
Previously Identified Upgrades	$184,860,000
Total Costs	**$184,860,000**

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. The allocation of costs for a network upgrade 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

[1] See the Non-Direct Connection Cost Estimate section. Remote terminal work will be determined in the Facilities Study phase.

(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.

Transmission Owner Scope of Work

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 AD2-089 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 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. See Attachment One.

Direct Connection Cost Estimate

Substation: Establish the new 115 kV AD2-089 Switching Substation (interconnection substation). The arrangement in the substation will be as shown below on Dominion Attachment One: One-Line Diagram. The estimated cost of this work scope is $5,500,000.

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. See Attachment One.

The total estimated cost to complete the Direct Connection Network Facilities is $6,300,000. It is estimated to take 24-36 months to complete this work upon execution of an Interconnection Construction Service Agreement.

Non-Direct Connection Cost Estimate

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

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

The Queue Project AD2-089 was evaluated as a 75.0 MW (Capacity 45.0 MW) injection at the tap of the Anaconda - Tarr River 115 kV line in the VAP area. Project AD2-089 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD2-089 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
"313845	No Data
"314288	No Data
AEP_P1-2_#1377	CONTINGENCY 'AEP_P1-2_#1377' OPEN BRANCH FROM BUS 242514 TO BUS 242520 CKT 1 / 242514 05J.FERR 765 242520 05J.FERR 500 1 OPEN BRANCH FROM BUS 242520 TO BUS 306719 CKT 1 / 242520 05J.FERR 500 306719 8ANTIOCH 500 1 END
AEP_P4_#7589_05J.FERR 765	CONTINGENCY 'AEP_P4_#7589_05J.FERR 765' OPEN BRANCH FROM BUS 242514 TO BUS 242520 CKT 1 / 242514 05J.FERR 765 242520 05J.FERR 500 1 OPEN BRANCH FROM BUS 242514 TO BUS 242684 CKT 2 / 242514 05J.FERR 765 242684 05J.FERR 138 2 OPEN BRANCH FROM BUS 242520 TO BUS 306719 CKT 1 / 242520 05J.FERR 500 306719 8ANTIOCH 500 1 END
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 OPEN BUS 314570 /* ISLAND OPEN BUS 314572 /* ISLAND

	OPEN BUS 314588 /* ISLAND END
DVP_P1-2: LN 2058	CONTINGENCY 'DVP_P1-2: LN 2058' OPEN BRANCH FROM BUS 304222 TO BUS 313845 CKT 1 /* 6ROCKYMT230T230.00 - 6MORNSTR 230.00 END
DVP_P1-2: LN 2131_FSA	CONTINGENCY 'DVP_P1-2: LN 2131_FSA' OPEN BRANCH FROM BUS 314203 TO BUS 314637 CKT 1 /* 6MACKEYS 230.00 - 6EDENTON 230.00 OPEN BRANCH FROM BUS 314637 TO BUS 916040 CKT 1 /* 6EDENTON 230.00 - Z1-036 TAP 230.00 OPEN BRANCH FROM BUS 314662 TO BUS 916040 CKT 1 /* ADDED BY JT FOR FULL FSA TAP REMOVAL OPEN BUS 314637 /* 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 2141	CONTINGENCY 'DVP_P1-2: LN 2141' OPEN BRANCH FROM BUS 314561 TO BUS 314583 CKT 1 /* 6CAROLNA 230.00 - 6LAKEVEW 230.00

	END
DVP_P1-2: LN 2181	CONTINGENCY 'DVP_P1-2: LN 2181' OPEN BUS 304226 /* ISLAND: 6PA-RMOUNT#4115.00 OPEN BRANCH FROM BUS 304226 TO BUS 314591 CKT 1 /* 6PA-RMOUNT#4230.00 - 6NASH 230.00 OPEN BRANCH FROM BUS 313845 TO BUS 314591 CKT 1 /* 6HATHAWAY 230.00 - 6NASH 230.00 OPEN BUS 314591 /* ISLAND: 6NASH 230.00 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
DVP_P1-2: LN 246	CONTINGENCY 'DVP_P1-2: LN 246' 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 OPEN BUS 314590 /* ISLAND END

DVP_P1-2: LN 254-A	CONTINGENCY 'DVP_P1-2: LN 254-A' OPEN BRANCH FROM BUS 314563 TO BUS 924510 CKT 1 /* 6CLUBHSE 230.00 - AB2-100 TAP 230.00 END
DVP_P4-2: 2020T2144	CONTINGENCY 'DVP_P4-2: 2020T2144' /* WINFALL 230 KV OPEN BRANCH FROM BUS 313851 TO BUS 314638 CKT 1 /* 6ECITYDP2 230.00 - 6ELIZ CT 230.00 OPEN BRANCH FROM BUS 313851 TO BUS 314639 CKT 1 /* 6ECITYDP2 230.00 - 6TANGLEW 230.00 OPEN BRANCH FROM BUS 314639 TO BUS 314651 CKT 1 /* 6TANGLEW 230.00 - 6WINFALL 230.00 OPEN BUS 313851 /* ISLAND: 6ECITYDP2 230.00 OPEN BUS 314639 /* ISLAND: 6TANGLEW 230.00 OPEN BUS 913391 /* ISLAND: Y1-086 C 230.00 OPEN BUS 913392 /* ISLAND: Y1-086 E 230.00 OPEN BUS 917121 /* ISLAND: Z2-027 C 230.00 OPEN BUS 917122 /* ISLAND: Z2-027 E 230.00 OPEN BRANCH FROM BUS 314651 TO BUS 901080 CKT 1 /* 6WINFALL 230.00 - W1-029 230.00 END
DVP_P4-2: 24662	CONTINGENCY 'DVP_P4-2: 24662' /* EARLEYS OPEN BRANCH FROM BUS 314568 TO BUS 314569 CKT 1 /* TX. #3 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 END

DVP_P4-2: 24682	CONTINGENCY 'DVP_P4-2: 24682' /* 24682 @ SUFFOLK OPEN BRANCH FROM BUS 314537 TO BUS 314575 CKT 1 /* SUFFOLK - NUCOR TAP OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* NUCOR TAP - EARLEYS OPEN BRANCH FROM BUS 314536 TO BUS 314537 CKT 2 /* SUFFOLK 230-115 TX#5 OPEN BRANCH FROM BUS 314928 TO BUS 314537 CKT 2 /* SUFFOLK 500-230 TX#8 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 314620 CKT 1 /* 2034 OPEN BRANCH FROM BUS 314620 TO BUS 933990 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
DVP_P7-1: LN 2058-2181	CONTINGENCY 'DVP_P7-1: LN 2058-2181' OPEN BRANCH FROM BUS 304222 TO BUS 313845 CKT 1 /* 6ROCKYMT230T230.00 - 6HATHAWAY 230.00 OPEN BUS 304226 /* ISLAND: 6PA-RMOUNT#4115.00 OPEN BRANCH FROM BUS 304226 TO BUS 314591 CKT 1 /* 6PA-RMOUNT#4230.00 - 6NASH 230.00 OPEN BRANCH FROM BUS 313845 TO BUS 314591 CKT 1 /* 6HATHAWAY 230.00 - 6NASH 230.00 OPEN BUS 314591 /* ISLAND: 6NASH 230.00 END
DVP_P7-1: LN 81-2056	CONTINGENCY 'DVP_P7-1: LN 81-2056' OPEN BRANCH FROM BUS 314559 TO BUS 314578 CKT 1 /* 3CAROLNA 115.00 - 3HORNRTN 115.00 OPEN BRANCH FROM BUS 314578 TO BUS 314598 CKT 1 /* 3HORNRTN 115.00 - 3ROAN DP 115.00 OPEN BRANCH FROM BUS 314598 TO BUS 314628 CKT 1 /* 3ROAN DP 115.00 - 3DARLINGT DP115.00 OPEN BUS 314578 /* ISLAND: 3HORNRTN 115.00 OPEN BUS 314598 /* ISLAND: 3ROAN DP 115.00 OPEN BRANCH FROM BUS 304226 TO BUS 314591 CKT 1 /* 6PA-RMOUNT#4230.00 - 6NASH 230.00 OPEN BRANCH FROM BUS 313845 TO BUS 314591 CKT 1 /* 6MORNSTR 230.00 - 6NASH 230.00

	OPEN BRANCH FROM BUS 304226 TO BUS 304222 CKT 1 /* 6PA-RMOUNT#4230.00 - 6ROCKYMT230T OPEN BUS 304226 /* ISLAND OPEN BUS 314591 /* ISLAND: 6NASH 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)

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)

Overload Number	Type	Contingency Name	Affected Area	Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Flowgate Appendix
1	N-1	"313845	DVP - CPLE	6MORNSTR-6ROCKYMT230T 230 kV line	313845	304222	1	DC	105.3	109.15	ER	374	14.39	1
2	N-1	DVP_P1-2: LN 2181	DVP - CPLE	6MORNSTR-6ROCKYMT230T 230 kV line	313845	304222	1	DC	101.5	105.35	ER	374	14.39	
3	DCTL	DVP_P7-1: LN 2058-2181	DVP - CPLE	3BTLEBRO-3ROCKYMT115T 115 kV line	314554	304223	1	DC	419.24	433.61	ER	93	13.14	2
4	DCTL	DVP_P7-1: LN 81-2056	DVP - CPLE	3BTLEBRO-3ROCKYMT115T 115 kV	314554	304223	1	DC	205.05	207.24	ER	93	4.52	

				line										
5	N-1	"313845	DVP - CPLE	3BTLEBRO-3ROCKYMT115T 115 kV line	314554	304223	1	DC	130.32	132.91	ER	93	2.41	
6	N-1	DVP_P1-2: LN 2181	DVP - CPLE	3BTLEBRO-3ROCKYMT115T 115 kV line	314554	304223	1	DC	129.46	132.05	ER	93	2.41	
7	LFFB	DVP_P4-2: 246T247	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	133.25	135.39		637	13.55	3
8	LFFB	DVP_P4-2: 246T2034	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	128.01	130.51		637	14.38	
9	LFFB	DVP_P4-2: 24662	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	126.53	128.61		637	13.15	
10	LFFB	DVP_P4-2: 24682	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	126.44	128.52		637	13.19	
11	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6EARLEYS-6NUCO TP 230 kV line	314569	314575	1	DC	102.84	104.33	ER	572	8.51	4
12	N-1	DVP_P1-2: LN 2131_FSA	DVP - DVP	6EARLEYS-6NUCO TP 230 kV line	314569	314575	1	DC	102.58	104.07	ER	572	8.51	
13	DCTL	DVP_P7-1: LN 2058-2181	DVP - DVP	6EVERETS-AD2-068 TAP 230 kV line	314574	936530	1	DC	127.94	131.48		485	17.18	5
14	N-1	DVP_P1-2: LN 254-A	DVP - DVP	6LAKEVEW-6CAROLNA 230 kV line	314583	314561	1	DC	133.23	134.79	ER	375	5.87	6
15	N-1	DVP_P1-2: LN 238	DVP - DVP	6LAKEVEW-6CAROLNA 230 kV line	314583	314561	1	DC	131.55	133.04	ER	375	5.59	
16	LFFB	DVP_P4-2: 246T247	DVP - DVP	6LAKEVEW-AB2-100 TAP 230 kV line	314583	924510	1	DC	127.88	130.73		459	13.05	7
17	N-1	DVP_P1-2: LN 246	DVP - DVP	6LAKEVEW-AB2-100 TAP 230 kV line	314583	924510	1	DC	107.7	109.73	ER	375	7.61	
18	N-1	DVP_P1-2: LN 2141	DVP - DVP	6LAKEVEW-AB2-100 TAP 230 kV line	314583	924510	1	DC	107.7	109.63	ER	375	7.19	
19	LFFB	DVP_P4-2: 246T247	DVP - DVP	6ELIZ CT-6SHAWBRO 230 kV line	314638	314647	1	DC	134.93	136.22		699	9	8
20	LFFB	DVP_P4-2: 24682	DVP - DVP	6S HERTFORD-6WINFALL 230 kV line	314662	314651	1	DC	107.32	108.48		897	10.4	9
21	LFFB	DVP_P4-2: 24682	DVP - DVP	Z1-036 TAP-6S HERTFORD 230 kV line	916040	314662	1	DC	108.68	109.84		897	10.4	10
22	LFFB	DVP_P4-2: 246T247	DVP - DVP	AB2-100 TAP-6CLUBHSE 230 kV line	924510	314563	1	DC	141.69	144.54		459	13.05	11
23	N-1	DVP_P1-2: LN 246	DVP - DVP	AB2-100 TAP-6CLUBHSE 230 kV line	924510	314563	1	DC	119.03	121.07	ER	375	7.61	
24	N-1	DVP_P1-2: LN 2141	DVP - DVP	AB2-100 TAP-6CLUBHSE 230 kV line	924510	314563	1	DC	120.77	122.7	ER	375	7.19	
25	DCTL	DVP_P7-1: LN 2058-2181	DVP - CPLE	AD2-068 TAP-6GREENVILE T 230 kV line	936530	304451	1	DC	135.19	138.78	ER	478	17.18	12
26	LFFB	DVP_P4-2: 2020T2144	DVP - CPLE	AD2-068 TAP-6GREENVILE T 230 kV line	936530	304451	1	DC	115.32	117.06	ER	478	11.5	
27	LFFB	AEP_P4_#7589_05J.FERR 765	AEP - AEP	05EDAN 1-05DANVL2 138 kV line	242631	242620	1	DC	136.58	137.15	ER	415	5.29	13

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)

None

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
1, 2	6MORNSTR-6ROCKYMT230T 230 kV line	DVP / CPLE: This line is a joint tie line between the Dominion Energy and Duke/Progress transmission systems. An affected systems study will need to be completed with Duke/Progress to determine impacts what needs to be done by both parties to increase the rating of this transmission line. This violation will be evaluated in the System Impact Study phase.	-	-
3, 4, 5, 6	3BTLEBRO-3ROCKYMT115T 115 kV	Same reinforcement as for Violations 1 and 2.	-	-
7, 8, 9, 10	6CLUBHSE-6SAPONY 230 kV line	DVP: 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 take 12-16 months to engineer and construct.	Pending	**$150,000**
11, 12	6EARLEYS-6NUCO TP 230 kV line	DVP: Wreck and rebuild the line of 14 miles to increase its line rating to 1047 MVA (normal), 1047 MVA (emergency), and 1204 MVA (load dump). It is estimated to take 30-36 months to engineer, permit, and construct. A SCC and a Va CPCN is required.	Pending	**$37,800,000**
13	6EVERETS-AD2-068 TAP 230 kV line	DVP: Wreck and rebuild the line of 18 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to take 44-48 months to engineer, permit, and construct. A Va CPCN is required. A certificate from the NC PUC will most likely be required.	Pending	**$45,000,000**
14, 15	6LAKEVEW-6CAROLNA 230 kV line	DVP: 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 take 30-36 months to engineer, permit, and construct. A Va CPCN is required.	Pending	**$3,625,000**

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
16, 17, 18	6LAKEVEW-AB2-100 TAP 230 kV line	DVP: Wreck and rebuild the line of 16 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to take 44-48 months to engineer, permit, and construct. A Va CPCN is required. A certificate from the NC PUC will most likely be required.	Pending	**$40,000,000**
19	6ELIZ CT-6SHAWBRO 230 kV line	DVP: Wreck and rebuild the line of 8 miles to increase its line rating to 1047 MVA (normal), 1047 MVA (emergency), and 1204 MVA (load dump). It is estimated to take 30-36 months to engineer, permit, and construct. A Va CPCN is required.	Pending	**$25,700,000**
20	6S HERTFORD-6WINFALL 230 kV line	DVP: Wreck and rebuild the line of 8 miles to increase its line rating to 1047 MVA (normal), 1047 MVA (emergency), and 1204 MVA (load dump). It is estimated to take 30-36 months to engineer, permit, and construct. A Va CPCN is required.	Pending	**$19,875,000**
21	Z1-036 TAP-6S HERTFORD 230 kV line	Same reinforcement as for Violation 20 above.	-	-
22, 23, 24	AB2-100 TAP-6CLUBHSE 230 kV line	DVP: Wreck and rebuild the AB2-100 TAP-Clubhouse 230kV line of 2 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to take 24-28 months to engineer, permit and construct. A Va CPCN is required.	Pending	**$5,000,000**
25, 26	AD2-068 TAP-6GREENVILE T 230 kV line	DVP / CPLE: This line is a joint tie line between the Dominion Energy and Duke/Progress transmission systems. An affected systems study will need to be completed with Duke/Progress to determine impacts what needs to be done by both parties to increase the rating of this transmission line. This violation will be evaluated in the System Impact Study phase.	-	-

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
27	05EDAN 1-05DANVL2 138 kV line	AEP: 1. Replace Switch (1200 A), estimated cost $400,000. 2. Replace line risers (Limiting Element: Sub Cond 1590 AAC 61 Str.), estimated cost $100,000. 3. Rebuild / Reconductor 3.16 miles of conductor (Limiting Element: 336/556 Six Wire ACSR), estimated cost $4.72 million. 4. Conduct an engineering study to determine if Relay - CT Thermal limit settings can be adjusted to mitigate the overload (Estimated Cost $25,000), if not, a new relay package will be required (Estimated Cost: $600,000). (Limiting Element: Relay Thermal Limit 1795 Amps - East Danville) 5. Conduct an engineering study to determine if Relay - CT Thermal limit settings can be adjusted to mitigate the overload (Estimated Cost $25,000), if not, a new relay package will be required (Estimated Cost: $600,000). (Limiting Element: Relay Thermal Limit 1795 Amps - Danville) 6. Conduct an engineering study to determine if Relay - CT Compliance Trip limit settings can be adjusted to mitigate the overload (Estimated Cost $25,000), if not, a new relay package will be required (Estimated Cost: $600,000). (Limiting Element: Relay Compliance Trip Limit 1916 Amps - East Danville) 7. Conduct an engineering study to determine if Relay - CT Compliance Trip limit settings can be adjusted to mitigate the overload (Estimated Cost $25,000), if not, a new relay package will be required (Estimated Cost: $600,000). (Limiting Element: Relay Compliance Trip Limit 1916 Amps - Danville) 8. Rebuild / Reconductor 0.03 miles of conductor (Limiting Element: 1351.5 ACSR 45/7 DIPPER) Near East Danville, estimated cost $0.045 million. 9. Rebuild / Reconductor 0.03 miles of conductor (Limiting Element: 1351.5 ACSR 45/7 DIPPER) Near Danville, estimated cost $0.045 million. An approximate construction time would be 24 to 36 months after signing an interconnection agreement	Pending	**$7,710,000**

Violation #	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
			Total Previous Network Upgrades (This project may have a contribution towards these reinforcements)	**$184,860,000**

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.

Overload Number	Contingency Type	Contingency Name	Affected Area	Bus Facility Description	Bus From	Bus To	Circuit	Power Flow	Loading % Initial	Loading % Final	Rating Type	Rating MVA	MW Contribution	Flowgate Appendix
28	N-1	"313845	DVP - CPLE	6MORNSTR-6ROCKYMT230T 230 kV line	313845	304222	1	DC	146.04	152.46	ER	374	23.98	
29	N-1	DVP_P1-2: LN 2058	DVP - DVP	6MORNSTR-6NASH 230 kV line	313845	314591	1	DC	125.85	131.3	ER	449	24.46	
30	N-1	DVP_P1-2: LN 246	DVP - DVP	6MACKEYS-6EDENTON 230 kV line	314203	314637	1	DC	107.51	108.94	ER	731	10.44	
31	N-1	"314288	DVP - DVP	6CHRL249-6LOCKS 230 kV line	314285	314316	1	DC	99.84	100.27	ER	559	5.33	
32	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6SAPONY-6CARSON 230 kV line	314435	314282	1	DC	125.91	127.67	ER	679	11.91	
33	N-1	"313845	DVP - CPLE	3BTLEBRO-3ROCKYMT115T 115 kV line	314554	304223	1	DC	182.22	184.17	ER	93	4.02	
34	N-1	DVP_P1-2: LN 246	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	134.49	136.71	ER	599	13.16	
35	Non	Non	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	114.4	116.34	NR	599	10.79	
36	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6EARLEYS-6NUCO TP 230 kV line	314569	314575	1	DC	165.63	167.94	ER	572	14.18	

37	Non	Non	DVP - DVP	6EARLEYS-6NUCO TP 230 kV line	314569	314575	1	DC	98.15	100.09	NR	572	11.09	
38	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6EVERETS-AD2-068 TAP 230 kV line	314574	936530	1	DC	118.95	120.31	ER	449	11.49	
39	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6NUCO TP-6SUFFOLK 230 kV line	314575	314537	1	DC	159.61	161.93	ER	572	14.18	
40	N-1	DVP_P1-2: LN 254-A	DVP - DVP	6LAKEVEW-6CAROLNA 230 kV line	314583	314561	1	DC	161.38	163.12	ER	375	9.78	
41	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6LAKEVEW-AB2-100 TAP 230 kV line	314583	924510	1	DC	156.11	159.2	ER	375	11.52	
42	Non	Non	DVP - DVP	6LAKEVEW-AB2-100 TAP 230 kV line	314583	924510	1	DC	119.76	122.56	NR	375	10.48	
43	N-1	DVP_P1-2: LN 2058	DVP - CPLE	6NASH-6PA-RMOUNT#4 230 kV line	314591	304226	1	DC	115.29	120.5	ER	470	24.46	
44	N-1	DVP_P1-2: LN 246	DVP - DVP	6EDENTON-Z1-036 TAP 230 kV line	314637	916040	1	DC	103.09	104.51	ER	733	10.44	
45	N-1	DVP_P1-2: LN 246	DVP - DVP	6S HERTFORD-6WINFALL 230 kV line	314662	314651	1	DC	131.08	132.5	ER	733	10.43	
46	N-1	DVP_P1-2: LN 246	DVP - DVP	Z1-036 TAP-6S HERTFORD 230 kV line	916040	314662	1	DC	132.72	134.15	ER	733	10.43	
47	N-1	DVP_P1-2: LN 130-A	DVP - DVP	AB2-100 TAP-6CLUBHSE 230 kV line	924510	314563	1	DC	167.71	170.69	ER	375	11.15	
48	Non	Non	DVP - DVP	AB2-100 TAP-6CLUBHSE 230 kV line	924510	314563	1	DC	135.24	138.04	NR	375	10.48	
49	N-1	DVP_P1-2: LN 2131A	DVP - CPLE	AD2-068 TAP-6GREENVILE T 230 kV line	936530	304451	1	DC	115.71	117.31	ER	478	11.49	
50	Non	Non	DVP - DVP	AD2-089 TAP-3TARRTP 115 kV line	936700	314548	1	DC	2.22	116.86	NR	63	75	
51	N-1	AEP_P1-2_#1377	AEP - AEP	05EDAN 1-05DANVL2 138 kV line	242631	242620	1	DC	136.55	137.13	ER	415	5.29	
52	Non	Non	AEP - AEP	05EDAN 1-05DANVL2 138 kV line	242631	242620	1	DC	112.29	112.98	NR	275	4.2	

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.

System Configuration

Attachment 2.

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 - CPLE) The 6MORNSTR-6ROCKYMT230T 230 kV line (from bus 313845 to bus 304222 ckt 1) loads from 105.3% to 109.15% (**DC power flow**) of its emergency rating (374 MVA) for the single line contingency outage of "'313845'. This project contributes approximately 14.39 MW to the thermal violation.

CONTINGENCY '313845' 6MORNSTR 230 314591 6NASH 230 1
OPEN BRANCH FROM BUS 313845 TO BUS 314591 CKT 1
END

Bus Number	*Bus Name*	*Full Contribution*
315294	*1DOMTR10*	*1.32*
315292	*1DOMTR78*	*0.89*
315293	*1DOMTR9*	*0.73*
315131	*1EDGECMA*	*24.67*
315132	*1EDGECMB*	*24.67*
315139	*1GASTONA*	*3.83*
315141	*1GASTONB*	*3.83*
315126	*1ROARAP2*	*1.23*
315128	*1ROARAP4*	*1.18*
315136	*1ROSEMG1*	*3.2*
315138	*1ROSEMG2*	*1.5*
315137	*1ROSEMS1*	*1.98*
315115	*1S HAMPT1*	*0.84*
314704	*3LAWRENC*	*0.19*
932631	*AC2-084 C*	*8.41*
933991	*AD1-023 C*	*7.23*
934201	*AD1-047 C*	*5.76*
934231	*AD1-050 C*	*1.59*
934331	*AD1-057 C O1*	*19.74*

934521	*AD1-076 C O1*	*28.43*
936401	*AD2-051 C O1*	*6.11*
936701	*AD2-089 C*	*14.39*
936711	*AD2-090 C O1*	*3.7*
937441	*AD2-195 C*	*5.5*
LTF	*AMIL*	*0.38*
LTF	*BAYOU*	*1.99*
LTF	*BIG_CAJUN1*	*3.13*
LTF	*BIG_CAJUN2*	*6.3*
LTF	*BLUEG*	*1.99*
LTF	*CALDERWOOD*	*1.17*
LTF	*CANNELTON*	*0.38*
LTF	*CATAWBA*	*1.15*
LTF	*CELEVELAND*	*3.27*
LTF	*CHEOAH*	*1.1*
LTF	*CHILHOWEE*	*0.38*
LTF	*CHOCTAW*	*2.13*
LTF	*CLIFTY*	*7.31*
LTF	*COTTONWOOD*	*7.78*
LTF	*DEARBORN*	*0.72*
LTF	*EDWARDS*	*0.61*
LTF	*ELMERSMITH*	*1.11*
LTF	*FARMERCITY*	*0.48*
LTF	*G-007A*	*0.79*
LTF	*GIBSON*	*0.69*
LTF	*HAMLET*	*4.55*

LTF	*MORGAN*	*3.44*
LTF	*NEWTON*	*1.68*
LTF	*PRAIRIE*	*3.63*
LTF	*ROWAN*	*2.41*
LTF	*SANTEETLA*	*0.33*
LTF	*SMITHLAND*	*0.32*
LTF	*TATANKA*	*0.82*
LTF	*TILTON*	*0.73*
LTF	*TRIMBLE*	*0.38*
LTF	*TVA*	*1.45*
LTF	*UNIONPOWER*	*2.09*
900671	*V4-068 C*	*0.06*
LTF	*VFT*	*2.1*
901081	*W1-029C*	*0.38*
913391	*Y1-086 C*	*0.07*
916041	*Z1-036 C*	*0.45*
917121	*Z2-027 C*	*0.13*
917331	*Z2-043 C*	*0.34*
917341	*Z2-044 C*	*0.31*
917511	*Z2-088 C OP1*	*1.58*
918411	*AA1-050*	*1.33*
918491	*AA1-063AC OP*	*1.13*
918511	*AA1-065 C OP*	*1.1*
918531	*AA1-067 C*	*0.23*
918561	*AA1-072 C*	*0.05*
919691	*AA2-053 C*	*1.26*

919701	*AA2-057 C*	*1.5*
920041	*AA2-088 C*	*0.7*
920591	*AA2-165 C*	*0.21*
920671	*AA2-174 C*	*0.06*
920691	*AA2-178 C*	*4.34*
930051	*AB1-013 C*	*1.31*
930401	*AB1-081 C*	*14.26*
930861	*AB1-132 C*	*15.74*
931231	*AB1-173 C*	*1.62*
931241	*AB1-173AC*	*1.62*
923801	*AB2-015 C O1*	*4.04*
923851	*AB2-025 C*	*0.19*
923911	*AB2-031 C O1*	*1.61*
923941	*AB2-035 C*	*0.67*
923991	*AB2-040 C O1*	*5.28*
924151	*AB2-059 C O1*	*16.8*
924391	*AB2-088 C*	*0.86*
924401	*AB2-089 C*	*0.72*
924491	*AB2-098 C*	*0.42*
924501	*AB2-099 C*	*0.4*
924511	*AB2-100 C*	*8.39*
925121	*AB2-169 C*	*4.01*
925171	*AB2-174 C O1*	*4.92*
925281	*AB2-186 C*	*0.21*
925291	*AB2-188 C O1*	*1.07*
925591	*AC1-034 C*	*10.88*

925781	*AC1-054 C*	*2.81*
926071	*AC1-086 C*	*23.17*
926201	*AC1-098 C*	*5.9*
926211	*AC1-099 C*	*1.98*
926771	*AC1-163 C*	*1.31*
927021	*AC1-189 C*	*12.14*
927141	*AC1-208 C*	*8.71*

Appendix 2

(DVP - CPLE) The 3BTLEBRO-3ROCKYMT115T 115 kV line (from bus 314554 to bus 304223 ckt 1) loads from 419.24% to 433.61% (**DC power flow**) of its emergency rating (93 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 2058-2181'. This project contributes approximately 13.14 MW to the thermal violation.

CONTINGENCY 'DVP_P7-1: LN 2058-2181'
OPEN BRANCH FROM BUS 304222 TO BUS 313845 CKT 1 /* 6ROCKYMT230T230.00 - 6HATHAWAY 230.00
OPEN BUS 304226 /* ISLAND: 6PA-RMOUNT#4115.00
OPEN BRANCH FROM BUS 304226 TO BUS 314591 CKT 1 /* 6PA-RMOUNT#4230.00 - 6NASH 230.00
OPEN BRANCH FROM BUS 313845 TO BUS 314591 CKT 1 /* 6HATHAWAY 230.00 - 6NASH 230.00
OPEN BUS 314591 /* ISLAND: 6NASH 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315131	*1EDGECMA*	*13.41*
315132	*1EDGECMB*	*13.41*
315139	*1GASTONA*	*2.36*
315141	*1GASTONB*	*2.36*
315126	*1ROARAP2*	*0.98*
315128	*1ROARAP4*	*0.95*
315136	*1ROSEMG1*	*1.92*
315138	*1ROSEMG2*	*0.9*
315137	*1ROSEMS1*	*1.19*
314557	*3BETHELC*	*0.88*
314554	*3BTLEBRO*	*1.96*
314572	*3EMPORIA*	*0.2*
314578	*3HORNRTN*	*2.51*
314582	*3KELFORD*	*0.69*

314603	*3SCOT NK*	*3.67*
314617	*3TUNIS*	*0.44*
314541	*3WATKINS*	*0.26*
314620	*6CASHIE*	*0.32*
314574	*6EVERETS*	*1.04*
932631	*AC2-084 C*	*11.33*
932632	*AC2-084 E*	*5.58*
934201	*AD1-047 C*	*4.29*
934202	*AD1-047 E*	*2.86*
934331	*AD1-057 C O1*	*11.1*
934332	*AD1-057 E O1*	*5.92*
936401	*AD2-051 C O1*	*4.83*
936402	*AD2-051 E O1*	*2.07*
936701	*AD2-089 C*	*7.89*
936702	*AD2-089 E*	*5.26*
936711	*AD2-090 C O1*	*2.85*
936712	*AD2-090 E O1*	*1.9*
LTF	*AMIL*	*0.25*
LTF	*BAYOU*	*1.34*
LTF	*BIG_CAJUN1*	*2.12*
LTF	*BIG_CAJUN2*	*4.26*
LTF	*BLUEG*	*1.34*
LTF	*CALDERWOOD*	*0.79*
LTF	*CANNELTON*	*0.25*
LTF	*CARR*	*< 0.01*
LTF	*CATAWBA*	*0.78*

LTF	*CELEVELAND*	*2.21*
LTF	*CHEOAH*	*0.74*
LTF	*CHILHOWEE*	*0.26*
LTF	*CHOCTAW*	*1.44*
LTF	*CLIFTY*	*4.9*
LTF	*COTTONWOOD*	*5.26*
LTF	*DEARBORN*	*0.48*
LTF	*EDWARDS*	*0.41*
LTF	*ELMERSMITH*	*0.75*
LTF	*FARMERCITY*	*0.32*
LTF	*G-007A*	*0.51*
LTF	*GIBSON*	*0.47*
LTF	*HAMLET*	*3.13*
LTF	*MORGAN*	*2.33*
LTF	*NEWTON*	*1.13*
LTF	*PRAIRIE*	*2.45*
LTF	*RENSSELAER*	*< 0.01*
LTF	*ROSETON*	*< 0.01*
LTF	*ROWAN*	*1.62*
LTF	*SANTEETLA*	*0.22*
LTF	*SMITHLAND*	*0.22*
LTF	*TATANKA*	*0.55*
LTF	*TILTON*	*0.49*
LTF	*TRIMBLE*	*0.25*
LTF	*TVA*	*0.98*
LTF	*UNIONPOWER*	*1.41*

900672	*V4-068 E*	*0.15*
LTF	*VFT*	*1.35*
917331	*Z2-043 C*	*0.36*
917332	*Z2-043 E*	*0.82*
917341	*Z2-044 C*	*0.54*
917342	*Z2-044 E*	*1.25*
917511	*Z2-088 C OP1*	*0.87*
917512	*Z2-088 E OP1*	*3.69*
918411	*AA1-050*	*0.73*
918492	*AA1-063AE OP*	*2.28*
918512	*AA1-065 E OP*	*1.94*
918532	*AA1-067 E*	*0.31*
918561	*AA1-072 C*	*0.05*
918562	*AA1-072 E*	*0.14*
919691	*AA2-053 C*	*1.01*
919692	*AA2-053 E*	*2.32*
919701	*AA2-057 C*	*2.47*
919702	*AA2-057 E*	*6.64*
920042	*AA2-088 E*	*4.77*
920591	*AA2-165 C*	*0.34*
920592	*AA2-165 E*	*0.87*
920671	*AA2-174 C*	*0.05*
920672	*AA2-174 E*	*0.27*
930401	*AB1-081 C*	*20.04*
930402	*AB1-081 E*	*8.59*
930861	*AB1-132 C*	*9.71*

930862	*AB1-132 E*	*4.16*
931231	*AB1-173 C*	*1.21*
931232	*AB1-173 E*	*0.56*
931241	*AB1-173AC*	*1.21*
931242	*AB1-173AE*	*0.56*
923911	*AB2-031 C O1*	*1.2*
923912	*AB2-031 E O1*	*0.59*
923941	*AB2-035 C*	*0.37*
923942	*AB2-035 E*	*0.16*
923991	*AB2-040 C O1*	*3.93*
923992	*AB2-040 E O1*	*3.22*
924151	*AB2-059 C O1*	*23.62*
924152	*AB2-059 E O1*	*12.17*
924391	*AB2-088 C*	*0.47*
924392	*AB2-088 E*	*0.23*
924491	*AB2-098 C*	*0.24*
924492	*AB2-098 E*	*0.1*
924501	*AB2-099 C*	*0.31*
924502	*AB2-099 E*	*0.13*
924511	*AB2-100 C*	*5.31*
924512	*AB2-100 E*	*2.62*
925171	*AB2-174 C O1*	*3.6*
925172	*AB2-174 E O1*	*3.26*
925591	*AC1-034 C*	*15.3*
925592	*AC1-034 E*	*11.54*
926071	*AC1-086 C*	*14.3*

926072	*AC1-086 E*	*6.51*
926201	*AC1-098 C*	*7.95*
926202	*AC1-098 E*	*4.74*
926211	*AC1-099 C*	*2.66*
926212	*AC1-099 E*	*1.56*
LTF	*AC1-133*	*9.34*
926771	*AC1-163 C*	*1.04*
926772	*AC1-163 E*	*0.48*
927021	*AC1-189 C*	*6.74*
927022	*AC1-189 E*	*3.36*
927141	*AC1-208 C*	*11.27*
927142	*AC1-208 E*	*5.*

Appendix 3

(DVP - DVP) The 6CLUBHSE-6SAPONY 230 kV line (from bus 314563 to bus 314435 ckt 1) loads from 133.25% to 135.39% (**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 13.55 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*
315150	*1BUGGS 1*	*8.64*
315151	*1BUGGS 2*	*8.64*
315131	*1EDGECMA*	*10.81*
315132	*1EDGECMB*	*10.81*
315139	*1GASTONA*	*7.18*
315141	*1GASTONB*	*7.18*
315126	*1ROARAP2*	*2.57*
315128	*1ROARAP4*	*2.47*
315136	*1ROSEMG1*	*4.85*
315138	*1ROSEMG2*	*2.27*
315137	*1ROSEMS1*	*3.01*

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*	*0.78*
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*
933991	*AD1-023 C*	*12.48*
933992	*AD1-023 E*	*6.8*
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*	*47.19*
934522	*AD1-076 E O1*	*24.03*
LTF	*AD1-120*	*4.44*

LTF	*AD1-121*	*4.42*
936261	*AD2-033 C*	*9.73*
936262	*AD2-033 E*	*6.49*
936361	*AD2-046 C O1*	*8.38*
936362	*AD2-046 E O1*	*3.85*
936401	*AD2-051 C O1*	*11.34*
936402	*AD2-051 E O1*	*4.87*
936481	*AD2-063 C O1*	*11.53*
936482	*AD2-063 E O1*	*7.68*
936531	*AD2-068 C*	*4.92*
936532	*AD2-068 E*	*2.53*
936701	*AD2-089 C*	*8.13*
936702	*AD2-089 E*	*5.42*
936711	*AD2-090 C O1*	*5.56*
936712	*AD2-090 E O1*	*3.71*
LTF	*AD2-099*	*3.35*
937441	*AD2-195 C*	*8.63*
937442	*AD2-195 E*	*3.72*
LTF	*CARR*	*0.12*
LTF	*CBM-S1*	*5.43*
LTF	*CBM-S2*	*10.9*
LTF	*CBM-W1*	*12.02*
LTF	*CBM-W2*	*29.4*
LTF	*CIN*	*2.7*
LTF	*CPLE*	*3.68*
LTF	*G-007*	*0.77*

LTF	*IPL*	*1.72*
LTF	*LGEE*	*0.58*
LTF	*MEC*	*6.07*
LTF	*MECS*	*2.72*
LTF	*O-066*	*4.92*
LTF	*RENSSELAER*	*0.09*
LTF	*ROSETON*	*0.68*
900671	*V4-068 C*	*0.11*
900672	*V4-068 E*	*0.33*
LTF	*WEC*	*0.74*
917331	*Z2-043 C*	*0.57*
917332	*Z2-043 E*	*1.31*
917341	*Z2-044 C*	*0.3*
917342	*Z2-044 E*	*0.7*
917511	*Z2-088 C OP1*	*1.01*
917512	*Z2-088 E OP1*	*4.28*
918411	*AA1-050*	*0.85*
918491	*AA1-063AC OP*	*2.23*
918492	*AA1-063AE OP*	*5.65*
918511	*AA1-065 C OP*	*2.12*
918512	*AA1-065 E OP*	*5.62*
918531	*AA1-067 C*	*0.33*
918532	*AA1-067 E*	*0.76*
918561	*AA1-072 C*	*0.09*
918562	*AA1-072 E*	*0.22*
919691	*AA2-053 C*	*2.58*

919692	*AA2-053 E*	*5.95*
919701	*AA2-057 C*	*1.68*
919702	*AA2-057 E*	*4.51*
LTF	*AA2-074*	*2.5*
920041	*AA2-088 C*	*1.17*
920042	*AA2-088 E*	*10.3*
920591	*AA2-165 C*	*0.23*
920592	*AA2-165 E*	*0.6*
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*	*13.67*
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*
923801	*AB2-015 C O1*	*5.47*
923802	*AB2-015 E O1*	*4.49*
923911	*AB2-031 C O1*	*4.9*
923912	*AB2-031 E O1*	*2.41*

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*	*2.67*
924022	*AB2-043 E O1*	*4.39*
924151	*AB2-059 C O1*	*12.08*
924152	*AB2-059 E O1*	*6.22*
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*
924391	*AB2-088 C*	*0.49*
924392	*AB2-088 E*	*0.23*
924401	*AB2-089 C*	*2.3*
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*	*0.25*
924501	*AB2-099 C*	*0.73*
924502	*AB2-099 E*	*0.31*

924511	*AB2-100 C*	*35.9*
924512	*AB2-100 E*	*17.68*
925121	*AB2-169 C*	*6.14*
925122	*AB2-169 E*	*5.51*
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*	*7.83*
925592	*AC1-034 E*	*5.9*
925611	*AC1-036 C*	*0.64*
925612	*AC1-036 E*	*1.04*
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*	*8.28*
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*	*9.38*
927022	*AC1-189 E*	*4.67*

927141	*AC1-208 C*	*13.11*
927142	*AC1-208 E*	*5.82*

Appendix 4

(DVP - DVP) The 6EARLEYS-6NUCO TP 230 kV line (from bus 314569 to bus 314575 ckt 1) loads from 102.84% to 104.33% (**DC power flow**) of its emergency rating (572 MVA) for the single line contingency outage of 'DVP_P1-2: LN 2131A'. This project contributes approximately 8.51 MW to the thermal violation.

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

Bus Number	*Bus Name*	*Full Contribution*
315294	*1DOMTR10*	*4.52*
315292	*1DOMTR78*	*3.05*
315293	*1DOMTR9*	*2.49*
315131	*1EDGECMA*	*9.02*
315132	*1EDGECMB*	*9.02*
315139	*1GASTONA*	*3.69*
315141	*1GASTONB*	*3.69*
315159	*1KERR 2*	*0.81*
315163	*1KERR 6*	*0.79*
315164	*1KERR 7*	*0.79*
315126	*1ROARAP2*	*1.5*
315128	*1ROARAP4*	*1.44*
315136	*1ROSEMG1*	*2.6*
315138	*1ROSEMG2*	*1.22*
315137	*1ROSEMS1*	*1.61*
314704	*3LAWRENC*	*0.21*

932631	*AC2-084 C*	*11.32*
933991	*AD1-023 C*	*27.83*
934201	*AD1-047 C*	*6.39*
934231	*AD1-050 C*	*2.75*
934331	*AD1-057 C O1*	*10.19*
934521	*AD1-076 C O1*	*112.88*
LTF	*AD1-120*	*4.28*
LTF	*AD1-121*	*4.24*
936401	*AD2-051 C O1*	*16.62*
936531	*AD2-068 C*	*6.81*
936701	*AD2-089 C*	*8.51*
LTF	*AD2-099*	*3.34*
937441	*AD2-195 C*	*17.93*
LTF	*CARR*	*0.08*
LTF	*CBM-S1*	*5.28*
LTF	*CBM-S2*	*10.69*
LTF	*CBM-W1*	*11.81*
LTF	*CBM-W2*	*28.66*
LTF	*CIN*	*2.64*
LTF	*CPLE*	*3.68*
LTF	*IPL*	*1.69*
LTF	*LGEE*	*0.57*
LTF	*MEC*	*5.93*
LTF	*MECS*	*2.71*
LTF	*RENSSELAER*	*0.07*
LTF	*ROSETON*	*0.48*

900671	*V4-068 C*	*0.11*
LTF	*WEC*	*0.73*
916041	*Z1-036 C*	*2.55*
917331	*Z2-043 C*	*0.72*
917341	*Z2-044 C*	*0.26*
917511	*Z2-088 C OP1*	*1.14*
918411	*AA1-050*	*0.96*
918491	*AA1-063AC OP*	*1.36*
918511	*AA1-065 C OP*	*3.8*
918531	*AA1-067 C*	*0.49*
918561	*AA1-072 C*	*0.11*
919691	*AA2-053 C*	*1.91*
919701	*AA2-057 C*	*1.42*
LTF	*AA2-074*	*2.51*
920041	*AA2-088 C*	*0.79*
920591	*AA2-165 C*	*0.19*
920671	*AA2-174 C*	*0.09*
920691	*AA2-178 C*	*19.71*
930051	*AB1-013 C*	*5.95*
930401	*AB1-081 C*	*8.64*
930861	*AB1-132 C*	*15.15*
931231	*AB1-173 C*	*1.8*
931241	*AB1-173AC*	*1.8*
923911	*AB2-031 C O1*	*1.78*
923941	*AB2-035 C*	*0.4*
923991	*AB2-040 C O1*	*5.86*

924151	*AB2-059 C O1*	*10.18*
924391	*AB2-088 C*	*0.51*
924401	*AB2-089 C*	*1.25*
924491	*AB2-098 C*	*0.88*
924501	*AB2-099 C*	*0.99*
924511	*AB2-100 C*	*7.31*
925121	*AB2-169 C*	*11.96*
925171	*AB2-174 C O1*	*5.33*
925291	*AB2-188 C O1*	*4.86*
925591	*AC1-034 C*	*6.59*
925781	*AC1-054 C*	*4.54*
926071	*AC1-086 C*	*22.31*
926201	*AC1-098 C*	*7.94*
926211	*AC1-099 C*	*2.66*
926771	*AC1-163 C*	*3.28*
927021	*AC1-189 C*	*11.67*
927141	*AC1-208 C*	*9.96*

Appendix 5

(DVP - DVP) The 6EVERETS-AD2-068 TAP 230 kV line (from bus 314574 to bus 936530 ckt 1) loads from 127.94% to 131.48% (**DC power flow**) of its load dump rating (485 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 2058-2181'. This project contributes approximately 17.18 MW to the thermal violation.

CONTINGENCY 'DVP_P7-1: LN 2058-2181'
OPEN BRANCH FROM BUS 304222 TO BUS 313845 CKT 1 /* 6ROCKYMT230T230.00 - 6HATHAWAY 230.00
OPEN BUS 304226 /* ISLAND: 6PA-RMOUNT#4115.00
OPEN BRANCH FROM BUS 304226 TO BUS 314591 CKT 1 /* 6PA-RMOUNT#4230.00 - 6NASH 230.00
OPEN BRANCH FROM BUS 313845 TO BUS 314591 CKT 1 /* 6HATHAWAY 230.00 - 6NASH 230.00
OPEN BUS 314591 /* ISLAND: 6NASH 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315294	*1DOMTR10*	*2.96*
315292	*1DOMTR78*	*2.*
315293	*1DOMTR9*	*1.63*
315131	*1EDGECMA*	*9.28*
315132	*1EDGECMB*	*9.28*
315136	*1ROSEMG1*	*1.88*
315138	*1ROSEMG2*	*0.88*
315137	*1ROSEMS1*	*1.17*
314557	*3BETHELC*	*1.15*
314554	*3BTLEBRO*	*0.43*
314566	*3CRESWEL*	*2.04*
314572	*3EMPORIA*	*0.21*
314578	*3HORNRTN*	*2.04*
314582	*3KELFORD*	*0.72*

314603	*3SCOT NK*	*2.51*
314617	*3TUNIS*	*0.7*
314539	*3UNCAMP*	*1.18*
314541	*3WATKINS*	*0.36*
314620	*6CASHIE*	*0.88*
314574	*6EVERETS*	*5.39*
314594	*6PLYMOTH*	*0.83*
314648	*6SUNBURY*	*0.4*
314651	*6WINFALL*	*0.97*
932631	*AC2-084 C*	*6.17*
932632	*AC2-084 E*	*3.04*
933991	*AD1-023 C*	*13.47*
933992	*AD1-023 E*	*7.33*
934201	*AD1-047 C*	*4.29*
934202	*AD1-047 E*	*2.86*
934331	*AD1-057 C O1*	*8.81*
934332	*AD1-057 E O1*	*4.7*
934521	*AD1-076 C O1*	*54.77*
934522	*AD1-076 E O1*	*27.89*
936401	*AD2-051 C O1*	*8.4*
936402	*AD2-051 E O1*	*3.61*
936701	*AD2-089 C*	*10.31*
936702	*AD2-089 E*	*6.87*
936711	*AD2-090 C O1*	*3.91*
936712	*AD2-090 E O1*	*2.61*
937441	*AD2-195 C*	*12.87*

937442	*AD2-195 E*	*5.55*
LTF	*AMIL*	*0.48*
LTF	*BAYOU*	*2.63*
LTF	*BIG_CAJUN1*	*4.15*
LTF	*BIG_CAJUN2*	*8.36*
LTF	*BLUEG*	*2.48*
LTF	*CALDERWOOD*	*1.54*
LTF	*CANNELTON*	*0.48*
LTF	*CATAWBA*	*1.5*
LTF	*CBM-N*	*< 0.01*
LTF	*CELEVELAND*	*4.26*
LTF	*CHEOAH*	*1.43*
LTF	*CHILHOWEE*	*0.5*
LTF	*CHOCTAW*	*2.83*
LTF	*CLIFTY*	*8.97*
LTF	*COTTONWOOD*	*10.28*
LTF	*DEARBORN*	*0.89*
LTF	*EDWARDS*	*0.77*
LTF	*ELMERSMITH*	*1.41*
LTF	*FARMERCITY*	*0.62*
LTF	*G-007A*	*1.06*
LTF	*GIBSON*	*0.87*
LTF	*HAMLET*	*6.46*
LTF	*MORGAN*	*4.55*
LTF	*NEWTON*	*2.14*
LTF	*NYISO*	*0.09*

LTF	*PRAIRIE*	*4.66*
LTF	*ROWAN*	*2.98*
LTF	*SANTEETLA*	*0.43*
LTF	*SMITHLAND*	*0.42*
LTF	*TATANKA*	*1.04*
LTF	*TILTON*	*0.91*
LTF	*TRIMBLE*	*0.47*
LTF	*TVA*	*1.91*
LTF	*UNIONPOWER*	*2.73*
900672	*V4-068 E*	*0.21*
LTF	*VFT*	*2.82*
901082	*W1-029E*	*23.4*
907092	*X1-038 E*	*2.96*
913392	*Y1-086 E*	*1.05*
916042	*Z1-036 E*	*29.14*
917122	*Z2-027 E*	*0.51*
917331	*Z2-043 C*	*0.37*
917332	*Z2-043 E*	*0.86*
917342	*Z2-044 E*	*0.33*
917511	*Z2-088 C OP1*	*1.44*
917512	*Z2-088 E OP1*	*6.13*
918411	*AA1-050*	*1.22*
918492	*AA1-063AE OP*	*2.44*
918511	*AA1-065 C OP*	*1.83*
918512	*AA1-065 E OP*	*4.84*
918531	*AA1-067 C*	*0.7*

918532	*AA1-067 E*	*1.62*
918561	*AA1-072 C*	*0.06*
918562	*AA1-072 E*	*0.14*
919692	*AA2-053 E*	*2.58*
919702	*AA2-057 E*	*2.12*
920042	*AA2-088 E*	*6.25*
920592	*AA2-165 E*	*0.28*
920672	*AA2-174 E*	*0.3*
920691	*AA2-178 C*	*8.16*
920692	*AA2-178 E*	*3.5*
930051	*AB1-013 C*	*2.46*
930052	*AB1-013 E*	*16.48*
930401	*AB1-081 C*	*5.64*
930402	*AB1-081 E*	*2.42*
930861	*AB1-132 C*	*10.36*
930862	*AB1-132 E*	*4.44*
931231	*AB1-173 C*	*1.21*
931232	*AB1-173 E*	*0.56*
931241	*AB1-173AC*	*1.21*
931242	*AB1-173AE*	*0.56*
923801	*AB2-015 C O1*	*4.4*
923802	*AB2-015 E O1*	*3.61*
923831	*AB2-022 C*	*1.02*
923832	*AB2-022 E*	*0.55*
923911	*AB2-031 C O1*	*1.2*
923912	*AB2-031 E O1*	*0.59*

923941	*AB2-035 C*	*0.48*
923942	*AB2-035 E*	*0.21*
923991	*AB2-040 C O1*	*3.93*
923992	*AB2-040 E O1*	*3.22*
924151	*AB2-059 C O1*	*6.65*
924152	*AB2-059 E O1*	*3.42*
924391	*AB2-088 C*	*0.62*
924392	*AB2-088 E*	*0.3*
924491	*AB2-098 C*	*1.26*
924492	*AB2-098 E*	*0.54*
924501	*AB2-099 C*	*0.53*
924502	*AB2-099 E*	*0.23*
924511	*AB2-100 C*	*5.85*
924512	*AB2-100 E*	*2.88*
925121	*AB2-169 C*	*10.02*
925122	*AB2-169 E*	*8.99*
925171	*AB2-174 C O1*	*3.64*
925172	*AB2-174 E O1*	*3.29*
925281	*AB2-186 C*	*0.37*
925282	*AB2-186 E*	*0.16*
925291	*AB2-188 C O1*	*2.01*
925292	*AB2-188 E O1*	*0.9*
925591	*AC1-034 C*	*4.3*
925592	*AC1-034 E*	*3.25*
926071	*AC1-086 C*	*15.26*
926072	*AC1-086 E*	*6.95*

926201	*AC1-098 C*	*4.33*
926202	*AC1-098 E*	*2.58*
926211	*AC1-099 C*	*1.45*
926212	*AC1-099 E*	*0.85*
LTF	*AC1-133*	*22.45*
926771	*AC1-163 C*	*1.74*
926772	*AC1-163 E*	*0.81*
927021	*AC1-189 C*	*15.46*
927022	*AC1-189 E*	*7.7*
927141	*AC1-208 C*	*5.75*
927142	*AC1-208 E*	*2.55*

Appendix 6

(DVP - DVP) The 6LAKEVEW-6CAROLNA 230 kV line (from bus 314583 to bus 314561 ckt 1) loads from 133.23% to 134.79% (**DC power flow**) of its emergency rating (375 MVA) for the single line contingency outage of 'DVP_P1-2: LN 254-A'. This project contributes approximately 5.87 MW to the thermal violation.

CONTINGENCY 'DVP_P1-2: LN 254-A'
OPEN BRANCH FROM BUS 314563 TO BUS 924510 CKT 1 /* 6CLUBHSE 230.00 - AB2-100 TAP 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315131	*1EDGECMA*	*11.03*
315132	*1EDGECMB*	*11.03*
315139	*1GASTONA*	*12.78*
315141	*1GASTONB*	*12.78*
315136	*1ROSEMG1*	*8.37*
315138	*1ROSEMG2*	*3.92*
315137	*1ROSEMS1*	*5.19*
934331	*AD1-057 C O1*	*23.31*
936701	*AD2-089 C*	*5.87*
LTF	*CARR*	*0.05*
LTF	*CBM-S1*	*2.87*
LTF	*CBM-S2*	*5.9*
LTF	*CBM-W1*	*6.26*
LTF	*CBM-W2*	*15.53*
LTF	*CIN*	*1.4*
LTF	*CPLE*	*1.98*
LTF	*IPL*	*0.89*
LTF	*LGEE*	*0.3*

LTF	*MEC*	*3.17*
LTF	*MECS*	*1.4*
LTF	*RENSSELAER*	*0.04*
LTF	*ROSETON*	*0.31*
LTF	*WEC*	*0.39*
917341	*Z2-044 C*	*0.14*
917511	*Z2-088 C OP1*	*0.61*
918411	*AA1-050*	*0.51*
930401	*AB1-081 C*	*8.22*
930861	*AB1-132 C*	*52.51*
923941	*AB2-035 C*	*0.27*
924151	*AB2-059 C O1*	*9.69*
924391	*AB2-088 C*	*0.35*
924511	*AB2-100 C*	*41.88*
925591	*AC1-034 C*	*6.28*
926071	*AC1-086 C*	*77.32*
927021	*AC1-189 C*	*4.16*

Appendix 7

(DVP - DVP) The 6LAKEVEW-AB2-100 TAP 230 kV line (from bus 314583 to bus 924510 ckt 1) loads from 127.88% to 130.73% (**DC power flow**) of its load dump rating (459 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 246T247'. This project contributes approximately 13.05 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*
315294	*1DOMTR10*	*2.01*
315131	*1EDGECMA*	*10.47*
315132	*1EDGECMB*	*10.47*
315139	*1GASTONA*	*7.52*
315141	*1GASTONB*	*7.52*
315126	*1ROARAP2*	*1.54*
315128	*1ROARAP4*	*1.48*
315136	*1ROSEMG1*	*5.05*
315138	*1ROSEMG2*	*2.36*
315137	*1ROSEMS1*	*3.13*
314557	*3BETHELC*	*0.87*

314554	*3BTLEBRO*	*0.84*
314566	*3CRESWEL*	*1.63*
314578	*3HORNRTN*	*3.35*
314582	*3KELFORD*	*0.91*
314603	*3SCOT NK*	*3.54*
314617	*3TUNIS*	*0.81*
314541	*3WATKINS*	*0.32*
314620	*6CASHIE*	*0.83*
314574	*6EVERETS*	*2.43*
314594	*6PLYMOTH*	*0.69*
932631	*AC2-084 C*	*9.33*
932632	*AC2-084 E*	*4.59*
933991	*AD1-023 C*	*11.94*
933992	*AD1-023 E*	*6.5*
934331	*AD1-057 C O1*	*16.07*
934332	*AD1-057 E O1*	*8.57*
934521	*AD1-076 C O1*	*45.25*
934522	*AD1-076 E O1*	*23.04*
LTF	*AD1-120*	*3.74*
LTF	*AD1-121*	*3.71*
936401	*AD2-051 C O1*	*9.84*
936402	*AD2-051 E O1*	*4.22*
936531	*AD2-068 C*	*4.66*
936532	*AD2-068 E*	*2.4*
936701	*AD2-089 C*	*7.83*
936702	*AD2-089 E*	*5.22*

936711	*AD2-090 C O1*	*3.74*
936712	*AD2-090 E O1*	*2.49*
LTF	*AD2-099*	*2.89*
937441	*AD2-195 C*	*8.25*
937442	*AD2-195 E*	*3.56*
LTF	*CARR*	*0.09*
LTF	*CBM-S1*	*4.48*
LTF	*CBM-S2*	*9.25*
LTF	*CBM-W1*	*9.73*
LTF	*CBM-W2*	*24.21*
LTF	*CIN*	*2.18*
LTF	*CPLE*	*3.17*
LTF	*G-007*	*0.62*
LTF	*IPL*	*1.39*
LTF	*LGEE*	*0.47*
LTF	*MEC*	*4.95*
LTF	*MECS*	*2.17*
LTF	*O-066*	*3.92*
LTF	*RENSSELAER*	*0.08*
LTF	*ROSETON*	*0.55*
900672	*V4-068 E*	*0.24*
LTF	*WEC*	*0.6*
916042	*Z1-036 E*	*21.78*
917331	*Z2-043 C*	*0.48*
917332	*Z2-043 E*	*1.1*
917341	*Z2-044 C*	*0.26*

917342	*Z2-044 E*	*0.61*
917511	*Z2-088 C OP1*	*0.97*
917512	*Z2-088 E OP1*	*4.12*
918411	*AA1-050*	*0.82*
918491	*AA1-063AC OP*	*1.38*
918492	*AA1-063AE OP*	*3.51*
918511	*AA1-065 C OP*	*2.01*
918512	*AA1-065 E OP*	*5.34*
918531	*AA1-067 C*	*0.32*
918532	*AA1-067 E*	*0.73*
918561	*AA1-072 C*	*0.07*
918562	*AA1-072 E*	*0.18*
919691	*AA2-053 C*	*1.67*
919692	*AA2-053 E*	*3.86*
919701	*AA2-057 C*	*1.39*
919702	*AA2-057 E*	*3.73*
LTF	*AA2-074*	*2.16*
920042	*AA2-088 E*	*6.94*
920591	*AA2-165 C*	*0.19*
920592	*AA2-165 E*	*0.49*
920671	*AA2-174 C*	*0.08*
920672	*AA2-174 E*	*0.45*
920691	*AA2-178 C*	*6.54*
920692	*AA2-178 E*	*2.8*
930051	*AB1-013 C*	*1.97*
930052	*AB1-013 E*	*13.2*

930401	*AB1-081 C*	*9.52*
930402	*AB1-081 E*	*4.08*
930861	*AB1-132 C*	*30.89*
930862	*AB1-132 E*	*13.24*
923941	*AB2-035 C*	*0.37*
923942	*AB2-035 E*	*0.16*
924151	*AB2-059 C O1*	*11.22*
924152	*AB2-059 E O1*	*5.78*
924391	*AB2-088 C*	*0.47*
924392	*AB2-088 E*	*0.23*
924491	*AB2-098 C*	*0.57*
924492	*AB2-098 E*	*0.24*
924501	*AB2-099 C*	*0.61*
924502	*AB2-099 E*	*0.26*
925121	*AB2-169 C*	*5.87*
925122	*AB2-169 E*	*5.27*
925281	*AB2-186 C*	*0.27*
925282	*AB2-186 E*	*0.12*
925291	*AB2-188 C O1*	*1.61*
925292	*AB2-188 E O1*	*0.72*
925591	*AC1-034 C*	*7.27*
925592	*AC1-034 E*	*5.48*
925781	*AC1-054 C*	*3.7*
925782	*AC1-054 E*	*1.71*
926071	*AC1-086 C*	*45.48*
926072	*AC1-086 E*	*20.7*

926201	*AC1-098 C*	*6.54*
926202	*AC1-098 E*	*3.9*
926211	*AC1-099 C*	*2.19*
926212	*AC1-099 E*	*1.29*
926771	*AC1-163 C*	*2.03*
926772	*AC1-163 E*	*0.95*
927021	*AC1-189 C*	*8.99*
927022	*AC1-189 E*	*4.48*
927141	*AC1-208 C*	*9.4*
927142	*AC1-208 E*	*4.18*

Appendix 8

(DVP - DVP) The 6ELIZ CT-6SHAWBRO 230 kV line (from bus 314638 to bus 314647 ckt 1) loads from 134.93% to 136.22% (**DC power flow**) of its load dump rating (699 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 246T247'. This project contributes approximately 9.0 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*
315294	*1DOMTR10*	*4.65*
315292	*1DOMTR78*	*3.14*
315293	*1DOMTR9*	*2.57*
315139	*1GASTONA*	*2.11*
315141	*1GASTONB*	*2.11*
315136	*1ROSEMG1*	*1.5*
315138	*1ROSEMG2*	*0.7*
315137	*1ROSEMS1*	*0.93*
314557	*3BETHELC*	*0.6*
314566	*3CRESWEL*	*6.73*
314582	*3KELFORD*	*0.78*

314603	*3SCOT NK*	*2.7*
314617	*3TUNIS*	*0.7*
314620	*6CASHIE*	*1.59*
314574	*6EVERETS*	*2.49*
314594	*6PLYMOTH*	*2.03*
314651	*6WINFALL*	*6.57*
932631	*AC2-084 C*	*6.53*
932632	*AC2-084 E*	*3.22*
933991	*AD1-023 C*	*27.52*
933992	*AD1-023 E*	*14.98*
934521	*AD1-076 C O1*	*125.48*
934522	*AD1-076 E O1*	*63.89*
936401	*AD2-051 C O1*	*9.28*
936402	*AD2-051 E O1*	*3.99*
936531	*AD2-068 C*	*4.44*
936532	*AD2-068 E*	*2.29*
936701	*AD2-089 C*	*5.4*
936702	*AD2-089 E*	*3.6*
937441	*AD2-195 C*	*17.9*
937442	*AD2-195 E*	*7.72*
LTF	*CARR*	*0.06*
LTF	*CBM-S1*	*3.22*
LTF	*CBM-S2*	*6.64*
LTF	*CBM-W1*	*7.05*
LTF	*CBM-W2*	*17.42*
LTF	*CIN*	*1.58*

LTF	*CPLE*	*2.3*
LTF	*G-007*	*0.43*
LTF	*IPL*	*1.01*
LTF	*LGEE*	*0.34*
LTF	*MEC*	*3.58*
LTF	*MECS*	*1.59*
LTF	*O-066*	*2.73*
LTF	*RENSSELAER*	*0.05*
LTF	*ROSETON*	*0.37*
900671	*V4-068 C*	*0.06*
900672	*V4-068 E*	*0.18*
901081	*W1-029C*	*4.76*
901082	*W1-029E*	*171.41*
LTF	*WEC*	*0.43*
913391	*Y1-086 C*	*1.02*
913392	*Y1-086 E*	*8.99*
916041	*Z1-036 C*	*4.38*
916042	*Z1-036 E*	*157.7*
917121	*Z2-027 C*	*1.89*
917122	*Z2-027 E*	*4.35*
917331	*Z2-043 C*	*0.41*
917332	*Z2-043 E*	*0.94*
917511	*Z2-088 C OP1*	*0.73*
917512	*Z2-088 E OP1*	*3.1*
918411	*AA1-050*	*0.62*
918511	*AA1-065 C OP*	*2.11*

918512	*AA1-065 E OP*	*5.58*
918531	*AA1-067 C*	*0.32*
918532	*AA1-067 E*	*0.75*
918561	*AA1-072 C*	*0.06*
918562	*AA1-072 E*	*0.16*
919691	*AA2-053 C*	*1.09*
919692	*AA2-053 E*	*2.52*
919701	*AA2-057 C*	*0.84*
919702	*AA2-057 E*	*2.26*
LTF	*AA2-074*	*1.57*
920591	*AA2-165 C*	*0.11*
920592	*AA2-165 E*	*0.3*
920671	*AA2-174 C*	*0.05*
920672	*AA2-174 E*	*0.29*
920691	*AA2-178 C*	*26.93*
920692	*AA2-178 E*	*11.54*
930051	*AB1-013 C*	*8.13*
930052	*AB1-013 E*	*54.39*
930861	*AB1-132 C*	*8.68*
930862	*AB1-132 E*	*3.72*
923831	*AB2-022 C*	*9.92*
923832	*AB2-022 E*	*5.34*
923941	*AB2-035 C*	*0.25*
923942	*AB2-035 E*	*0.11*
924391	*AB2-088 C*	*0.32*
924392	*AB2-088 E*	*0.16*

924491	*AB2-098 C*	*0.58*
924492	*AB2-098 E*	*0.25*
924501	*AB2-099 C*	*0.56*
924502	*AB2-099 E*	*0.24*
925121	*AB2-169 C*	*11.25*
925122	*AB2-169 E*	*10.1*
925281	*AB2-186 C*	*2.19*
925282	*AB2-186 E*	*0.94*
925291	*AB2-188 C O1*	*6.64*
925292	*AB2-188 E O1*	*2.98*
926071	*AC1-086 C*	*12.79*
926072	*AC1-086 E*	*5.82*
926201	*AC1-098 C*	*4.58*
926202	*AC1-098 E*	*2.73*
926211	*AC1-099 C*	*1.54*
926212	*AC1-099 E*	*0.9*
926771	*AC1-163 C*	*1.84*
926772	*AC1-163 E*	*0.86*
927021	*AC1-189 C*	*7.54*
927022	*AC1-189 E*	*3.75*
927141	*AC1-208 C*	*5.8*
927142	*AC1-208 E*	*2.58*

Appendix 9

(DVP - DVP) The 6S HERTFORD-6WINFALL 230 kV line (from bus 314662 to bus 314651 ckt 1) loads from 107.32% to 108.48% (**DC power flow**) of its load dump rating (897 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 24682'. This project contributes approximately 10.4 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 24682' /* 24682 @ SUFFOLK
OPEN BRANCH FROM BUS 314537 TO BUS 314575 CKT 1 /* SUFFOLK - NUCOR TAP
OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* NUCOR TAP - EARLEYS
OPEN BRANCH FROM BUS 314536 TO BUS 314537 CKT 2 /* SUFFOLK 230-115 TX#5
OPEN BRANCH FROM BUS 314928 TO BUS 314537 CKT 2 /* SUFFOLK 500-230 TX#8
END

Bus Number	*Bus Name*	*Full Contribution*
315294	*1DOMTR10*	*5.38*
315292	*1DOMTR78*	*3.64*
315293	*1DOMTR9*	*2.97*
315131	*1EDGECMA*	*6.42*
315132	*1EDGECMB*	*6.42*
315139	*1GASTONA*	*2.44*
315141	*1GASTONB*	*2.44*
315136	*1ROSEMG1*	*1.73*
315138	*1ROSEMG2*	*0.81*
315137	*1ROSEMS1*	*1.07*
314557	*3BETHELC*	*0.69*
314554	*3BTLEBRO*	*0.54*
314566	*3CRESWEL*	*7.79*
314578	*3HORNRTN*	*2.19*

314582	*3KELFORD*	*0.9*
314603	*3SCOT NK*	*3.1*
314617	*3TUNIS*	*0.8*
314620	*6CASHIE*	*1.83*
314574	*6EVERETS*	*2.87*
314594	*6PLYMOTH*	*2.34*
932631	*AC2-084 C*	*7.52*
932632	*AC2-084 E*	*3.7*
933991	*AD1-023 C*	*31.82*
933992	*AD1-023 E*	*17.32*
934331	*AD1-057 C O1*	*7.*
934332	*AD1-057 E O1*	*3.74*
934521	*AD1-076 C O1*	*145.1*
934522	*AD1-076 E O1*	*73.89*
936401	*AD2-051 C O1*	*10.69*
936402	*AD2-051 E O1*	*4.59*
936531	*AD2-068 C*	*5.13*
936532	*AD2-068 E*	*2.65*
936701	*AD2-089 C*	*6.24*
936702	*AD2-089 E*	*4.16*
LTF	*AD2-099*	*2.43*
937441	*AD2-195 C*	*20.7*
937442	*AD2-195 E*	*8.92*
LTF	*CARR*	*0.06*
LTF	*CBM-S1*	*3.82*
LTF	*CBM-S2*	*7.76*

LTF	*CBM-W1*	*8.49*
LTF	*CBM-W2*	*20.69*
LTF	*CIN*	*1.9*
LTF	*CPLE*	*2.68*
LTF	*G-007*	*0.47*
LTF	*IPL*	*1.21*
LTF	*LGEE*	*0.41*
LTF	*MEC*	*4.27*
LTF	*MECS*	*1.94*
LTF	*O-066*	*2.95*
LTF	*RENSSELAER*	*0.05*
LTF	*ROSETON*	*0.36*
900671	*V4-068 C*	*0.07*
900672	*V4-068 E*	*0.21*
LTF	*WEC*	*0.52*
916041	*Z1-036 C*	*5.06*
916042	*Z1-036 E*	*182.46*
917331	*Z2-043 C*	*0.47*
917332	*Z2-043 E*	*1.08*
917341	*Z2-044 C*	*0.18*
917342	*Z2-044 E*	*0.41*
917511	*Z2-088 C OP1*	*0.84*
917512	*Z2-088 E OP1*	*3.58*
918411	*AA1-050*	*0.71*
918511	*AA1-065 C OP*	*2.43*
918512	*AA1-065 E OP*	*6.44*

918531	*AA1-067 C*	*0.37*
918532	*AA1-067 E*	*0.86*
918561	*AA1-072 C*	*0.07*
918562	*AA1-072 E*	*0.18*
919691	*AA2-053 C*	*1.25*
919692	*AA2-053 E*	*2.9*
919701	*AA2-057 C*	*0.97*
919702	*AA2-057 E*	*2.6*
LTF	*AA2-074*	*1.83*
920591	*AA2-165 C*	*0.13*
920592	*AA2-165 E*	*0.34*
920671	*AA2-174 C*	*0.06*
920672	*AA2-174 E*	*0.33*
920691	*AA2-178 C*	*31.15*
920692	*AA2-178 E*	*13.35*
930051	*AB1-013 C*	*9.4*
930052	*AB1-013 E*	*62.92*
930401	*AB1-081 C*	*6.09*
930402	*AB1-081 E*	*2.61*
930861	*AB1-132 C*	*10.01*
930862	*AB1-132 E*	*4.29*
923941	*AB2-035 C*	*0.29*
923942	*AB2-035 E*	*0.12*
924151	*AB2-059 C O1*	*7.18*
924152	*AB2-059 E O1*	*3.7*
924391	*AB2-088 C*	*0.37*

924392	*AB2-088 E*	*0.18*
924491	*AB2-098 C*	*0.67*
924492	*AB2-098 E*	*0.29*
924501	*AB2-099 C*	*0.64*
924502	*AB2-099 E*	*0.27*
925121	*AB2-169 C*	*13.01*
925122	*AB2-169 E*	*11.67*
925281	*AB2-186 C*	*2.54*
925282	*AB2-186 E*	*1.09*
925291	*AB2-188 C O1*	*7.68*
925292	*AB2-188 E O1*	*3.45*
925591	*AC1-034 C*	*4.65*
925592	*AC1-034 E*	*3.51*
926071	*AC1-086 C*	*14.73*
926072	*AC1-086 E*	*6.71*
926201	*AC1-098 C*	*5.27*
926202	*AC1-098 E*	*3.14*
926211	*AC1-099 C*	*1.77*
926212	*AC1-099 E*	*1.04*
926771	*AC1-163 C*	*2.11*
926772	*AC1-163 E*	*0.99*
927021	*AC1-189 C*	*8.71*
927022	*AC1-189 E*	*4.34*
927141	*AC1-208 C*	*6.67*
927142	*AC1-208 E*	*2.96*

Appendix 10

(DVP - DVP) The Z1-036 TAP-6S HERTFORD 230 kV line (from bus 916040 to bus 314662 ckt 1) loads from 108.68% to 109.84% (**DC power flow**) of its load dump rating (897 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 24682'. This project contributes approximately 10.4 MW to the thermal violation.

CONTINGENCY 'DVP_P4-2: 24682' /* 24682 @ SUFFOLK
OPEN BRANCH FROM BUS 314537 TO BUS 314575 CKT 1 /* SUFFOLK - NUCOR TAP
OPEN BRANCH FROM BUS 314569 TO BUS 314575 CKT 1 /* NUCOR TAP - EARLEYS
OPEN BRANCH FROM BUS 314536 TO BUS 314537 CKT 2 /* SUFFOLK 230-115 TX#5
OPEN BRANCH FROM BUS 314928 TO BUS 314537 CKT 2 /* SUFFOLK 500-230 TX#8
END

Bus Number	*Bus Name*	*Full Contribution*
315294	*1DOMTR10*	*5.38*
315292	*1DOMTR78*	*3.64*
315293	*1DOMTR9*	*2.97*
315131	*1EDGECMA*	*6.42*
315132	*1EDGECMB*	*6.42*
315139	*1GASTONA*	*2.44*
315141	*1GASTONB*	*2.44*
315136	*1ROSEMG1*	*1.73*
315138	*1ROSEMG2*	*0.81*
315137	*1ROSEMS1*	*1.07*
314557	*3BETHELC*	*0.69*
314554	*3BTLEBRO*	*0.54*
314566	*3CRESWEL*	*7.79*
314578	*3HORNRTN*	*2.19*

314582	*3KELFORD*	*0.9*
314603	*3SCOT NK*	*3.1*
314617	*3TUNIS*	*0.8*
314620	*6CASHIE*	*1.83*
314574	*6EVERETS*	*2.87*
314594	*6PLYMOTH*	*2.34*
932631	*AC2-084 C*	*7.52*
932632	*AC2-084 E*	*3.7*
933991	*AD1-023 C*	*31.82*
933992	*AD1-023 E*	*17.32*
934331	*AD1-057 C O1*	*7.*
934332	*AD1-057 E O1*	*3.74*
934521	*AD1-076 C O1*	*145.1*
934522	*AD1-076 E O1*	*73.89*
936401	*AD2-051 C O1*	*10.69*
936402	*AD2-051 E O1*	*4.59*
936531	*AD2-068 C*	*5.13*
936532	*AD2-068 E*	*2.65*
936701	*AD2-089 C*	*6.24*
936702	*AD2-089 E*	*4.16*
LTF	*AD2-099*	*2.43*
937441	*AD2-195 C*	*20.7*
937442	*AD2-195 E*	*8.92*
LTF	*CARR*	*0.06*
LTF	*CBM-S1*	*3.82*
LTF	*CBM-S2*	*7.76*

LTF	*CBM-W1*	*8.49*
LTF	*CBM-W2*	*20.69*
LTF	*CIN*	*1.9*
LTF	*CPLE*	*2.68*
LTF	*G-007*	*0.47*
LTF	*IPL*	*1.21*
LTF	*LGEE*	*0.41*
LTF	*MEC*	*4.27*
LTF	*MECS*	*1.94*
LTF	*O-066*	*2.95*
LTF	*RENSSELAER*	*0.05*
LTF	*ROSETON*	*0.36*
900671	*V4-068 C*	*0.07*
900672	*V4-068 E*	*0.21*
LTF	*WEC*	*0.52*
916041	*Z1-036 C*	*5.06*
916042	*Z1-036 E*	*182.46*
917331	*Z2-043 C*	*0.47*
917332	*Z2-043 E*	*1.08*
917341	*Z2-044 C*	*0.18*
917342	*Z2-044 E*	*0.41*
917511	*Z2-088 C OP1*	*0.84*
917512	*Z2-088 E OP1*	*3.58*
918411	*AA1-050*	*0.71*
918511	*AA1-065 C OP*	*2.43*
918512	*AA1-065 E OP*	*6.44*

918531	*AA1-067 C*	*0.37*
918532	*AA1-067 E*	*0.86*
918561	*AA1-072 C*	*0.07*
918562	*AA1-072 E*	*0.18*
919691	*AA2-053 C*	*1.25*
919692	*AA2-053 E*	*2.9*
919701	*AA2-057 C*	*0.97*
919702	*AA2-057 E*	*2.6*
LTF	*AA2-074*	*1.83*
920591	*AA2-165 C*	*0.13*
920592	*AA2-165 E*	*0.34*
920671	*AA2-174 C*	*0.06*
920672	*AA2-174 E*	*0.33*
920691	*AA2-178 C*	*31.15*
920692	*AA2-178 E*	*13.35*
930051	*AB1-013 C*	*9.4*
930052	*AB1-013 E*	*62.92*
930401	*AB1-081 C*	*6.09*
930402	*AB1-081 E*	*2.61*
930861	*AB1-132 C*	*10.01*
930862	*AB1-132 E*	*4.29*
923941	*AB2-035 C*	*0.29*
923942	*AB2-035 E*	*0.12*
924151	*AB2-059 C O1*	*7.18*
924152	*AB2-059 E O1*	*3.7*
924391	*AB2-088 C*	*0.37*

924392	*AB2-088 E*	*0.18*
924491	*AB2-098 C*	*0.67*
924492	*AB2-098 E*	*0.29*
924501	*AB2-099 C*	*0.64*
924502	*AB2-099 E*	*0.27*
925121	*AB2-169 C*	*13.01*
925122	*AB2-169 E*	*11.67*
925291	*AB2-188 C O1*	*7.68*
925292	*AB2-188 E O1*	*3.45*
925591	*AC1-034 C*	*4.65*
925592	*AC1-034 E*	*3.51*
926071	*AC1-086 C*	*14.73*
926072	*AC1-086 E*	*6.71*
926201	*AC1-098 C*	*5.27*
926202	*AC1-098 E*	*3.14*
926211	*AC1-099 C*	*1.77*
926212	*AC1-099 E*	*1.04*
926771	*AC1-163 C*	*2.11*
926772	*AC1-163 E*	*0.99*
927021	*AC1-189 C*	*8.71*
927022	*AC1-189 E*	*4.34*
927141	*AC1-208 C*	*6.67*
927142	*AC1-208 E*	*2.96*

Appendix 11

(DVP - DVP) The AB2-100 TAP-6CLUBHSE 230 kV line (from bus 924510 to bus 314563 ckt 1) loads from 141.69% to 144.54% (**DC power flow**) of its load dump rating (459 MVA) for the line fault with failed breaker contingency outage of 'DVP_P4-2: 246T247'. This project contributes approximately 13.05 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*
315294	*1DOMTR10*	*2.01*
315131	*1EDGECMA*	*10.47*
315132	*1EDGECMB*	*10.47*
315139	*1GASTONA*	*7.52*
315141	*1GASTONB*	*7.52*
315126	*1ROARAP2*	*1.54*
315128	*1ROARAP4*	*1.48*
315136	*1ROSEMG1*	*5.05*
315138	*1ROSEMG2*	*2.36*
315137	*1ROSEMS1*	*3.13*
314557	*3BETHELC*	*0.87*

314554	*3BTLEBRO*	*0.84*
314566	*3CRESWEL*	*1.63*
314578	*3HORNRTN*	*3.35*
314582	*3KELFORD*	*0.91*
314603	*3SCOT NK*	*3.54*
314617	*3TUNIS*	*0.81*
314541	*3WATKINS*	*0.32*
314620	*6CASHIE*	*0.83*
314574	*6EVERETS*	*2.43*
314594	*6PLYMOTH*	*0.69*
932631	*AC2-084 C*	*9.33*
932632	*AC2-084 E*	*4.59*
933991	*AD1-023 C*	*11.94*
933992	*AD1-023 E*	*6.5*
934331	*AD1-057 C O1*	*16.07*
934332	*AD1-057 E O1*	*8.57*
934521	*AD1-076 C O1*	*45.25*
934522	*AD1-076 E O1*	*23.04*
LTF	*AD1-120*	*3.74*
LTF	*AD1-121*	*3.71*
936401	*AD2-051 C O1*	*9.84*
936402	*AD2-051 E O1*	*4.22*
936531	*AD2-068 C*	*4.66*
936532	*AD2-068 E*	*2.4*
936701	*AD2-089 C*	*7.83*
936702	*AD2-089 E*	*5.22*

936711	*AD2-090 C O1*	*3.74*
936712	*AD2-090 E O1*	*2.49*
LTF	*AD2-099*	*2.89*
937441	*AD2-195 C*	*8.25*
937442	*AD2-195 E*	*3.56*
LTF	*CARR*	*0.09*
LTF	*CBM-S1*	*4.48*
LTF	*CBM-S2*	*9.25*
LTF	*CBM-W1*	*9.73*
LTF	*CBM-W2*	*24.21*
LTF	*CIN*	*2.18*
LTF	*CPLE*	*3.17*
LTF	*G-007*	*0.62*
LTF	*IPL*	*1.39*
LTF	*LGEE*	*0.47*
LTF	*MEC*	*4.95*
LTF	*MECS*	*2.17*
LTF	*O-066*	*3.92*
LTF	*RENSSELAER*	*0.08*
LTF	*ROSETON*	*0.55*
900672	*V4-068 E*	*0.24*
LTF	*WEC*	*0.6*
916042	*Z1-036 E*	*21.78*
917331	*Z2-043 C*	*0.48*
917332	*Z2-043 E*	*1.1*
917341	*Z2-044 C*	*0.26*

917342	*Z2-044 E*	*0.61*
917511	*Z2-088 C OP1*	*0.97*
917512	*Z2-088 E OP1*	*4.12*
918411	*AA1-050*	*0.82*
918491	*AA1-063AC OP*	*1.38*
918492	*AA1-063AE OP*	*3.51*
918511	*AA1-065 C OP*	*2.01*
918512	*AA1-065 E OP*	*5.34*
918531	*AA1-067 C*	*0.32*
918532	*AA1-067 E*	*0.73*
918561	*AA1-072 C*	*0.07*
918562	*AA1-072 E*	*0.18*
919691	*AA2-053 C*	*1.67*
919692	*AA2-053 E*	*3.86*
919701	*AA2-057 C*	*1.39*
919702	*AA2-057 E*	*3.73*
LTF	*AA2-074*	*2.16*
920042	*AA2-088 E*	*6.94*
920591	*AA2-165 C*	*0.19*
920592	*AA2-165 E*	*0.49*
920671	*AA2-174 C*	*0.08*
920672	*AA2-174 E*	*0.45*
920691	*AA2-178 C*	*6.54*
920692	*AA2-178 E*	*2.8*
930051	*AB1-013 C*	*1.97*
930052	*AB1-013 E*	*13.2*

930401	*AB1-081 C*	*9.52*
930402	*AB1-081 E*	*4.08*
930861	*AB1-132 C*	*30.89*
930862	*AB1-132 E*	*13.24*
923941	*AB2-035 C*	*0.37*
923942	*AB2-035 E*	*0.16*
924151	*AB2-059 C O1*	*11.22*
924152	*AB2-059 E O1*	*5.78*
924391	*AB2-088 C*	*0.47*
924392	*AB2-088 E*	*0.23*
924491	*AB2-098 C*	*0.57*
924492	*AB2-098 E*	*0.24*
924501	*AB2-099 C*	*0.61*
924502	*AB2-099 E*	*0.26*
924511	*AB2-100 C*	*42.68*
924512	*AB2-100 E*	*21.02*
925121	*AB2-169 C*	*5.87*
925122	*AB2-169 E*	*5.27*
925291	*AB2-188 C O1*	*1.61*
925292	*AB2-188 E O1*	*0.72*
925591	*AC1-034 C*	*7.27*
925592	*AC1-034 E*	*5.48*
925781	*AC1-054 C*	*3.7*
925782	*AC1-054 E*	*1.71*
926071	*AC1-086 C*	*45.48*
926072	*AC1-086 E*	*20.7*

926201	*AC1-098 C*	*6.54*
926202	*AC1-098 E*	*3.9*
926211	*AC1-099 C*	*2.19*
926212	*AC1-099 E*	*1.29*
926771	*AC1-163 C*	*2.03*
926772	*AC1-163 E*	*0.95*
927021	*AC1-189 C*	*8.99*
927022	*AC1-189 E*	*4.48*
927141	*AC1-208 C*	*9.4*
927142	*AC1-208 E*	*4.18*

Appendix 12

(DVP - CPLE) The AD2-068 TAP-6GREENVILE T 230 kV line (from bus 936530 to bus 304451 ckt 1) loads from 135.19% to 138.78% (**DC power flow**) of its emergency rating (478 MVA) for the tower line contingency outage of 'DVP_P7-1: LN 2058-2181'. This project contributes approximately 17.18 MW to the thermal violation.

CONTINGENCY 'DVP_P7-1: LN 2058-2181'
OPEN BRANCH FROM BUS 304222 TO BUS 313845 CKT 1 /* 6ROCKYMT230T230.00 - 6HATHAWAY 230.00
OPEN BUS 304226 /* ISLAND: 6PA-RMOUNT#4115.00
OPEN BRANCH FROM BUS 304226 TO BUS 314591 CKT 1 /* 6PA-RMOUNT#4230.00 - 6NASH 230.00
OPEN BRANCH FROM BUS 313845 TO BUS 314591 CKT 1 /* 6HATHAWAY 230.00 - 6NASH 230.00
OPEN BUS 314591 /* ISLAND: 6NASH 230.00
END

Bus Number	*Bus Name*	*Full Contribution*
315294	*1DOMTR10*	*2.96*
315292	*1DOMTR78*	*2.*
315293	*1DOMTR9*	*1.63*
315131	*1EDGECMA*	*9.28*
315132	*1EDGECMB*	*9.28*
315136	*1ROSEMG1*	*1.88*
315138	*1ROSEMG2*	*0.88*
315137	*1ROSEMS1*	*1.17*
314557	*3BETHELC*	*1.15*
314554	*3BTLEBRO*	*0.43*
314566	*3CRESWEL*	*2.04*
314572	*3EMPORIA*	*0.21*
314578	*3HORNRTN*	*2.04*
314582	*3KELFORD*	*0.72*

314603	*3SCOT NK*	*2.51*
314617	*3TUNIS*	*0.7*
314539	*3UNCAMP*	*1.18*
314541	*3WATKINS*	*0.36*
314620	*6CASHIE*	*0.88*
314574	*6EVERETS*	*5.39*
314594	*6PLYMOTH*	*0.83*
314648	*6SUNBURY*	*0.4*
314651	*6WINFALL*	*0.97*
932631	*AC2-084 C*	*6.17*
932632	*AC2-084 E*	*3.04*
933991	*AD1-023 C*	*13.47*
933992	*AD1-023 E*	*7.33*
934201	*AD1-047 C*	*4.29*
934202	*AD1-047 E*	*2.86*
934331	*AD1-057 C O1*	*8.81*
934332	*AD1-057 E O1*	*4.7*
934521	*AD1-076 C O1*	*54.77*
934522	*AD1-076 E O1*	*27.89*
936401	*AD2-051 C O1*	*8.4*
936402	*AD2-051 E O1*	*3.61*
936531	*AD2-068 C*	*17.02*
936532	*AD2-068 E*	*8.77*
936701	*AD2-089 C*	*10.31*
936702	*AD2-089 E*	*6.87*
936711	*AD2-090 C O1*	*3.91*

936712	*AD2-090 E O1*	*2.61*
937441	*AD2-195 C*	*12.87*
937442	*AD2-195 E*	*5.55*
LTF	*AMIL*	*0.48*
LTF	*BAYOU*	*2.63*
LTF	*BIG_CAJUN1*	*4.15*
LTF	*BIG_CAJUN2*	*8.36*
LTF	*BLUEG*	*2.48*
LTF	*CALDERWOOD*	*1.54*
LTF	*CANNELTON*	*0.48*
LTF	*CATAWBA*	*1.5*
LTF	*CBM-N*	*< 0.01*
LTF	*CELEVELAND*	*4.26*
LTF	*CHEOAH*	*1.43*
LTF	*CHILHOWEE*	*0.5*
LTF	*CHOCTAW*	*2.83*
LTF	*CLIFTY*	*8.97*
LTF	*COTTONWOOD*	*10.28*
LTF	*DEARBORN*	*0.89*
LTF	*EDWARDS*	*0.77*
LTF	*ELMERSMITH*	*1.41*
LTF	*FARMERCITY*	*0.62*
LTF	*G-007A*	*1.06*
LTF	*GIBSON*	*0.87*
LTF	*HAMLET*	*6.46*
LTF	*MORGAN*	*4.55*

LTF	*NEWTON*	*2.14*
LTF	*NYISO*	*0.09*
LTF	*PRAIRIE*	*4.66*
LTF	*ROWAN*	*2.98*
LTF	*SANTEETLA*	*0.43*
LTF	*SMITHLAND*	*0.42*
LTF	*TATANKA*	*1.04*
LTF	*TILTON*	*0.91*
LTF	*TRIMBLE*	*0.47*
LTF	*TVA*	*1.91*
LTF	*UNIONPOWER*	*2.73*
900672	*V4-068 E*	*0.21*
LTF	*VFT*	*2.82*
901082	*W1-029E*	*23.4*
907092	*X1-038 E*	*2.96*
913392	*Y1-086 E*	*1.05*
916042	*Z1-036 E*	*29.14*
917122	*Z2-027 E*	*0.51*
917331	*Z2-043 C*	*0.37*
917332	*Z2-043 E*	*0.86*
917342	*Z2-044 E*	*0.33*
917511	*Z2-088 C OP1*	*1.44*
917512	*Z2-088 E OP1*	*6.13*
918411	*AA1-050*	*1.22*
918492	*AA1-063AE OP*	*2.44*
918511	*AA1-065 C OP*	*1.83*

918512	*AA1-065 E OP*	*4.84*
918531	*AA1-067 C*	*0.7*
918532	*AA1-067 E*	*1.62*
918561	*AA1-072 C*	*0.06*
918562	*AA1-072 E*	*0.14*
919692	*AA2-053 E*	*2.58*
919702	*AA2-057 E*	*2.12*
920042	*AA2-088 E*	*6.25*
920592	*AA2-165 E*	*0.28*
920672	*AA2-174 E*	*0.3*
920691	*AA2-178 C*	*8.16*
920692	*AA2-178 E*	*3.5*
930051	*AB1-013 C*	*2.46*
930052	*AB1-013 E*	*16.48*
930401	*AB1-081 C*	*5.64*
930402	*AB1-081 E*	*2.42*
930861	*AB1-132 C*	*10.36*
930862	*AB1-132 E*	*4.44*
931231	*AB1-173 C*	*1.21*
931232	*AB1-173 E*	*0.56*
931241	*AB1-173AC*	*1.21*
931242	*AB1-173AE*	*0.56*
923801	*AB2-015 C O1*	*4.4*
923802	*AB2-015 E O1*	*3.61*
923831	*AB2-022 C*	*1.02*
923832	*AB2-022 E*	*0.55*

923911	*AB2-031 C O1*	*1.2*
923912	*AB2-031 E O1*	*0.59*
923941	*AB2-035 C*	*0.48*
923942	*AB2-035 E*	*0.21*
923991	*AB2-040 C O1*	*3.93*
923992	*AB2-040 E O1*	*3.22*
924151	*AB2-059 C O1*	*6.65*
924152	*AB2-059 E O1*	*3.42*
924391	*AB2-088 C*	*0.62*
924392	*AB2-088 E*	*0.3*
924491	*AB2-098 C*	*1.26*
924492	*AB2-098 E*	*0.54*
924501	*AB2-099 C*	*0.53*
924502	*AB2-099 E*	*0.23*
924511	*AB2-100 C*	*5.85*
924512	*AB2-100 E*	*2.88*
925121	*AB2-169 C*	*10.02*
925122	*AB2-169 E*	*8.99*
925171	*AB2-174 C O1*	*3.64*
925172	*AB2-174 E O1*	*3.29*
925281	*AB2-186 C*	*0.37*
925282	*AB2-186 E*	*0.16*
925291	*AB2-188 C O1*	*2.01*
925292	*AB2-188 E O1*	*0.9*
925591	*AC1-034 C*	*4.3*
925592	*AC1-034 E*	*3.25*

926071	*AC1-086 C*	*15.26*
926072	*AC1-086 E*	*6.95*
926201	*AC1-098 C*	*4.33*
926202	*AC1-098 E*	*2.58*
926211	*AC1-099 C*	*1.45*
926212	*AC1-099 E*	*0.85*
LTF	*AC1-133*	*22.45*
926771	*AC1-163 C*	*1.74*
926772	*AC1-163 E*	*0.81*
927021	*AC1-189 C*	*15.46*
927022	*AC1-189 E*	*7.7*
927141	*AC1-208 C*	*5.75*
927142	*AC1-208 E*	*2.55*

Appendix 13

(AEP - AEP) The 05EDAN 1-05DANVL2 138 kV line (from bus 242631 to bus 242620 ckt 1) loads from 136.58% to 137.15% (**DC power flow**) of its emergency rating (415 MVA) for the line fault with failed breaker contingency outage of 'AEP_P4_#7589_05J.FERR 765'. This project contributes approximately 5.29 MW to the thermal violation.

CONTINGENCY 'AEP_P4_#7589_05J.FERR 765'
OPEN BRANCH FROM BUS 242514 TO BUS 242520 CKT 1 / 242514 05J.FERR 765 242520 05J.FERR 500 1
OPEN BRANCH FROM BUS 242514 TO BUS 242684 CKT 2 / 242514 05J.FERR 765 242684 05J.FERR 138 2
OPEN BRANCH FROM BUS 242520 TO BUS 306719 CKT 1 / 242520 05J.FERR 500 306719 8ANTIOCH 500 1
END

Bus Number	*Bus Name*	*Full Contribution*
244012	*05PINNACLE*	*-2.08*
315150	*1BUGGS 1*	*4.75*
315151	*1BUGGS 2*	*4.75*
315131	*1EDGECMA*	*4.26*
315132	*1EDGECMB*	*4.26*
314557	*3BETHELC*	*0.35*
314554	*3BTLEBRO*	*0.37*
314572	*3EMPORIA*	*0.14*
314578	*3HORNRTN*	*1.22*
314582	*3KELFORD*	*0.3*
314603	*3SCOT NK*	*1.24*
314617	*3TUNIS*	*0.28*
314620	*6CASHIE*	*0.27*
314574	*6EVERETS*	*0.98*
314594	*6PLYMOTH*	*0.26*

932631	*AC2-084 C*	*3.43*
932632	*AC2-084 E*	*1.69*
932701	*AC2-093 C*	*24.45*
932702	*AC2-093 E*	*13.99*
932761	*AC2-100 C*	*3.67*
932762	*AC2-100 E*	*1.79*
932821	*AC2-107 C*	*3.49*
932822	*AC2-107 E*	*1.63*
933941	*AD1-017 C*	*0.84*
933942	*AD1-017 E*	*1.37*
933991	*AD1-023 C*	*4.11*
933992	*AD1-023 E*	*2.24*
934201	*AD1-047 C*	*2.75*
934202	*AD1-047 E*	*1.83*
934231	*AD1-050 C*	*2.02*
934232	*AD1-050 E*	*1.1*
934311	*AD1-055 C*	*1.07*
934312	*AD1-055 E*	*0.28*
934331	*AD1-057 C O1*	*4.11*
934332	*AD1-057 E O1*	*2.19*
934341	*AD1-058 C*	*3.99*
934342	*AD1-058 E*	*1.01*
934521	*AD1-076 C O1*	*16.75*
934522	*AD1-076 E O1*	*8.53*
934611	*AD1-087 C O1*	*3.38*
934612	*AD1-087 E O1*	*1.59*

934621	*AD1-088 C*	*4.01*
934622	*AD1-088 E*	*1.88*
LTF	*AD1-120*	*7.56*
LTF	*AD1-121*	*7.62*
934911	*AD1-123 C*	*0.47*
934912	*AD1-123 E*	*0.24*
934991	*AD1-131 C*	*1.31*
934992	*AD1-131 E*	*0.87*
935171	*AD1-152 C O1*	*3.36*
935172	*AD1-152 E O1*	*2.24*
935221	*AD1-157 C*	*0.46*
935222	*AD1-157 E*	*0.31*
935231	*AD1-160 C*	*0.34*
935232	*AD1-160 E*	*0.47*
936161	*AD2-022 C O1*	*10.78*
936162	*AD2-022 E O1*	*6.47*
936171	*AD2-023 C O1*	*6.2*
936172	*AD2-023 E O1*	*3.37*
936261	*AD2-033 C*	*4.76*
936262	*AD2-033 E*	*3.17*
936331	*AD2-043 C*	*2.*
936332	*AD2-043 E*	*2.37*
936361	*AD2-046 C O1*	*3.84*
936362	*AD2-046 E O1*	*1.76*
936401	*AD2-051 C O1*	*2.97*
936402	*AD2-051 E O1*	*1.27*

936481	*AD2-063 C O1*	*5.55*
936482	*AD2-063 E O1*	*3.7*
936531	*AD2-068 C*	*2.28*
936532	*AD2-068 E*	*1.17*
936641	*AD2-081 C*	*2.56*
936642	*AD2-081 E*	*1.15*
936651	*AD2-082 C*	*0.52*
936652	*AD2-082 E*	*0.25*
936701	*AD2-089 C*	*3.17*
936702	*AD2-089 E*	*2.12*
936711	*AD2-090 C O1*	*2.13*
936712	*AD2-090 E O1*	*1.42*
LTF	*AD2-099*	*4.99*
937441	*AD2-195 C*	*3.15*
937442	*AD2-195 E*	*1.36*
937461	*AD2-200 C*	*0.51*
937462	*AD2-200 E*	*0.24*
937481	*AD2-202 C O1*	*0.93*
937482	*AD2-202 E O1*	*0.47*
LTF	*AMIL*	*0.17*
LTF	*BLUEG*	*2.05*
LTF	*CANNELTON*	*0.27*
LTF	*CARR*	*0.07*
LTF	*CBM-S1*	*1.16*
LTF	*CBM-S2*	*16.95*
LTF	*CBM-W2*	*3.27*

LTF	*CLIFTY*	*10.69*
LTF	*CPLE*	*5.58*
LTF	*DEARBORN*	*0.97*
LTF	*EDWARDS*	*0.44*
LTF	*ELMERSMITH*	*0.7*
LTF	*FARMERCITY*	*0.12*
LTF	*G-007A*	*0.82*
LTF	*GIBSON*	*0.58*
LTF	*NEWTON*	*0.95*
LTF	*PRAIRIE*	*0.83*
LTF	*RENSSELAER*	*0.05*
LTF	*ROSETON*	*0.36*
LTF	*TATANKA*	*0.33*
LTF	*TILTON*	*0.6*
LTF	*TRIMBLE*	*0.4*
900672	*V4-068 E*	*0.1*
LTF	*VFT*	*2.17*
917332	*Z2-043 E*	*0.36*
917342	*Z2-044 E*	*0.26*
917512	*Z2-088 E OP1*	*1.67*
918492	*AA1-063AE OP*	*1.37*
918512	*AA1-065 E OP*	*1.46*
918532	*AA1-067 E*	*0.29*
918562	*AA1-072 E*	*0.06*
919692	*AA2-053 E*	*1.33*
919702	*AA2-057 E*	*1.51*

LTF	*AA2-074*	*3.79*
920042	*AA2-088 E*	*3.28*
920592	*AA2-165 E*	*0.2*
920672	*AA2-174 E*	*0.15*
930401	*AB1-081 C*	*4.1*
930402	*AB1-081 E*	*1.76*
930861	*AB1-132 C*	*4.94*
930862	*AB1-132 E*	*2.12*
931231	*AB1-173 C*	*0.77*
931232	*AB1-173 E*	*0.36*
931241	*AB1-173AC*	*0.77*
931242	*AB1-173AE*	*0.36*
923911	*AB2-031 C O1*	*0.77*
923912	*AB2-031 E O1*	*0.38*
923941	*AB2-035 C*	*0.15*
923942	*AB2-035 E*	*0.06*
923991	*AB2-040 C O1*	*2.52*
923992	*AB2-040 E O1*	*2.06*
924021	*AB2-043 C O1*	*1.22*
924022	*AB2-043 E O1*	*2.*
924151	*AB2-059 C O1*	*4.83*
924152	*AB2-059 E O1*	*2.49*
924161	*AB2-060 C O1*	*3.48*
924162	*AB2-060 E O1*	*1.64*
924301	*AB2-077 C O1*	*0.78*
924302	*AB2-077 E O1*	*0.52*

924311	*AB2-078 C O1*	*0.78*
924312	*AB2-078 E O1*	*0.52*
924321	*AB2-079 C O1*	*0.78*
924322	*AB2-079 E O1*	*0.52*
924391	*AB2-088 C*	*0.19*
924392	*AB2-088 E*	*0.09*
924401	*AB2-089 C*	*0.91*
924402	*AB2-089 E*	*0.47*
924411	*AB2-090 C*	*1.53*
924412	*AB2-090 E*	*0.79*
924491	*AB2-098 C*	*0.23*
924492	*AB2-098 E*	*0.1*
924501	*AB2-099 C*	*0.2*
924502	*AB2-099 E*	*0.08*
924511	*AB2-100 C*	*3.51*
924512	*AB2-100 E*	*1.73*
925121	*AB2-169 C*	*2.27*
925122	*AB2-169 E*	*2.03*
925171	*AB2-174 C O1*	*2.38*
925172	*AB2-174 E O1*	*2.16*
925221	*AB2-176 C*	*0.63*
925222	*AB2-176 E*	*0.27*
925591	*AC1-034 C*	*3.13*
925592	*AC1-034 E*	*2.36*
925611	*AC1-036 C*	*0.33*
925612	*AC1-036 E*	*0.54*

925781	*AC1-054 C*	*3.04*
925782	*AC1-054 E*	*1.4*
925991	*AC1-075 C*	*1.96*
925992	*AC1-075 E*	*1.11*
926021	*AC1-080 C*	*0.66*
926022	*AC1-080 E*	*0.37*
926051	*AC1-083 C*	*4.18*
926052	*AC1-083 E*	*6.83*
926071	*AC1-086 C*	*7.28*
926072	*AC1-086 E*	*3.31*
926201	*AC1-098 C*	*2.4*
926202	*AC1-098 E*	*1.43*
926211	*AC1-099 C*	*0.81*
926212	*AC1-099 E*	*0.47*
926271	*AC1-105 C*	*2.39*
926272	*AC1-105 E*	*1.19*
926771	*AC1-163 C*	*0.65*
926772	*AC1-163 E*	*0.3*
927021	*AC1-189 C*	*3.63*
927022	*AC1-189 E*	*1.81*
927141	*AC1-208 C*	*3.55*
927142	*AC1-208 E*	*1.58*
927251	*AC1-221 C*	*1.59*
927252	*AC1-221 E*	*1.59*
927261	*AC1-222 C*	*1.54*
927262	*AC1-222 E*	*1.47*