

**NCUC DOCKET NO. EMP-110, SUB 0  
SUPPLEMENTAL PRE-FILED DIRECT TESTIMONY OF  
DONNA ROBICHAUD  
ON BEHALF OF SUMAC SOLAR LLC**

**ATTACHMENT A**

***Generation Interconnection  
Feasibility Study Report***

***For***

***PJM Generation Interconnection Request  
Queue Position AD1-022 /AD1-023***

***Cashie – Trowbridge 230kV  
77.7 MW Capacity / 120.0 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 two solar generating facilities located in Bertie County, North Carolina. Queue project AD1-022 will have a total installed capability of 80 MW (51.8 MW Capacity) and AD1-023 will have a total installed capability of 40 MW (25.9 MW Capacity).

The AD1-022 and AD1-023 projects are behind the same point of interconnection and were evaluated as a single combined project in this Feasibility Study. The installed AD1-022/AD1-023 facilities will have a total capability of 120 MW, with 77.7 MW of this output being recognized by PJM as capacity. The proposed in-service date for the combined project is June 1, 2019. **This study does not imply an ITO commitment to this in-service date.**

## **Point of Interconnection**

Queue project AD1-022/AD1-023 will interconnect with the ITO transmission system via a new three breaker ring bus that connects the Cashie – Trowbridge 230kV line.

## **Cost Summary**

The AD1-022/AD1-023 project will be responsible for the following costs:

<b>Description</b>	<b>Total Cost</b>
Attachment Facilities	\$ 1,800,000
Direct Connection Network Upgrades	\$ 6,300,000
Non Direct Connection Network Upgrades	\$ 1,000,000
<b>Total Costs</b>	<b>\$ 9,100,000</b>

In addition, the AD1-022/AD1-023 project may be responsible for a contribution to the following costs:

<b>Description</b>	<b>Total Cost</b>
New System Upgrades	\$ 0
Previously Identified Upgrades	\$ 135,990,000
<b>Total Costs</b>	<b>\$ 135,990, 000</b>

## **Cost Allocation**

PJM Open Access Transmission Tariff (OATT) section 217.3A outlines 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. The costs are allocated to the queues that have not closed less than 5 years following the execution of the first Interconnection Service Agreement which identifies the need for this upgrade.

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

- (a) to be charged to each affected New Service Customer for the Facilities and System Upgrades that are necessary to accommodate this queue project;
- (b) the time required to complete detailed design and construction of the facilities and upgrades;  
and
- (c) a description of any site-specific environmental issues or requirements that could reasonably be anticipated to affect the cost or time required to complete construction of such facilities and upgrades.

## **System Reinforcement**

*NEW SYSTEM REINFORCEMENTS		
10	Line #254 AB2-100 Tap – Clubhouse 230 kV: 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 cost \$5,000,000 and 24-28 months to engineer, permit and construct. A VA CPCN is required.	(Costs are captured in Reinforcement for #29)
	<b>Sub Total</b>	<b>\$0</b>
CONTRIBUTIONS TO PREVIOUS SYSTEM REINFORCEMENTS		
20	The limiting element is not on the VEPCO facilities. The external Duke / Progress Energy (i.e. Non-PJM) Transmission Owner will not evaluate this violation until the impact study phase.	\$TBD
21	Elmont 500 – 230 kV Tx#1: replace the 500-230 kV transformer #1 increase its line rating to 1134 MVA (normal), 1203 MVA (emergency), and 1365 MVA (load dump). It is estimated to cost \$17,500,000 and 24-30 months to engineer and construct.	\$17,500,000
22	Line #259 Chesterfield – Basin 230 kV: reconductor 0.14 miles of 1109 ACAR with a conductor which will increase the line rating to approximately 706 MVA (normal), 706 MVA (emergency), and 812 MVA (load dump). It is estimated to cost \$250,000 and 15-18 months to engineer, permit and construct.	\$250,000
23	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.	\$150,000
24	The limiting element is not on the VEPCO facilities. The external Duke / Progress Energy (i.e. Non-PJM) Transmission Owner will not evaluate this violation until the impact study phase.	TBD
25 (15)	Line #2021 Elizabeth City– Shawboro 230 kV: wreck and rebuild the line of 11 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost \$25,700,000 and 44-48 months to engineer, permit and construct. A VA CPCN is required.	\$25,700,000
26	Line #557 Elmont – Chickahominy 500 kV: replace the wave trap in the Chickahominy substation to increase its line rating to 3424 MVA (normal), 3424 MVA (emergency), and 3937 MVA (load dump). It is estimated to cost \$500,000 and 12-16 months to engineer and construct.	\$500,000
27,28	Replace wave trap at Elmont and Ladysmith Substations (n5483). Estimated Cost: \$700,000. Estimated In-Service Date: 03/31/2021. (See additional upgrade below)	\$700,000
27,28	Wreck and rebuild the Elmont - Ladysmith 500kV line # 574 (26 miles) to a minimum rating of 4453 MVA. Estimated time 36-48 months to engineer and construct. Estimated Cost: \$78,300,000.	\$78,300,000
29 (9,10)	Line #254 AB2-100 Tap – Clubhouse 230 kV: 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 cost \$5,000,000 and 24-28 months to engineer, permit and construct. A VA CPCN is required.	\$5,000,000

30	AEP: Total costs for AEP upgrades items 1 – 10 outlined in the “Contributions to Previously Overloaded Facilities” section of this report.	\$7,890,000
	<b>Sub Total</b>	\$135,990,000
	<b>Total Network Upgrades</b>	<b>\$135,990,000</b>

\*Note:

Only New System Reinforcements in which the AD1-022/023 overloads the facility are included above in the table above. Costs for new system reinforcement for which AD1-022/23 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 \$600,000.

Transmission: Construct approximately one span of 230 kV Attachment line between the generation substation and a new AD1-023 Switching Station. The estimated cost for this work is \$1,200,000.

The estimated total cost of the Attachment Facilities is \$1,800,000. 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 1.

## **Direct Connection Cost Estimate**

Substation: Establish the new 230 kV AD1-023 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 \$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**

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 \$1,000,000 and is estimated to take 24-30 months to complete. See Attachment One.

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 AD1-023 (AD1-022 & AD1-023 studied as 1 project, AD1-023) was evaluated as a 120.0 MW (Capacity 77.7 MW) injection tapping Trowbridge to Cashie 230kV line in the ITO area. Project AD1-023 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AD1-023 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
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

Contingency Name	Description
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 2020	CONTINGENCY 'DVP_P1-2: LN 2020'  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 OPEN BUS 314639 /* ISLAND OPEN BUS 913391 /* ISLAND OPEN BUS 913392 /* ISLAND  END
DVP_P1-2: LN 2034-A	CONTINGENCY 'DVP_P1-2: LN 2034-A'  OPEN BRANCH FROM BUS 314569 TO BUS 933450 CKT 1 /* 6EARLEYS 230.00 - AC2-158 TAP 230.00  END

Contingency Name	Description
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 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 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 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

Contingency Name	Description
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 247	CONTINGENCY 'DVP_P1-2: LN 247'  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  END
DVP_P1-2: LN 557	CONTINGENCY 'DVP_P1-2: LN 557'  OPEN BRANCH FROM BUS 314214 TO BUS 314903 CKT 1 /* 6CHCKAHM 230.00 - 8CHCKAHM 500.00 OPEN BRANCH FROM BUS 314903 TO BUS 314908 CKT 1 /* 8CHCKAHM 500.00 - 8ELMONT 500.00  END
DVP_P1-2: LN 563	CONTINGENCY 'DVP_P1-2: LN 563'  OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00  END
DVP_P1-2: LN 574	CONTINGENCY 'DVP_P1-2: LN 574'  OPEN BRANCH FROM BUS 314908 TO BUS 314911 CKT 1 /* 8ELMONT 500.00 - 8LDYSMTH 500.00  END

Contingency Name	Description
DVP_P1-2: LN 576	CONTINGENCY 'DVP_P1-2: LN 576'  OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00  END
DVP_P4-2: 2014T2034	CONTINGENCY 'DVP_P4-2: 2014T2034' /* EARLEYS  OPEN BRANCH FROM BUS 314569 TO BUS 933450 CKT 1 /* 2034 OPEN BRANCH FROM BUS 314569 TO BUS 314574 CKT 1 /* 2014  END
DVP_P4-2: 2020T2144	CONTINGENCY 'DVP_P4-2: 2020T2144' /* WINFALL 230 KV  OPEN BRANCH FROM BUS 313851 TO BUS 314638 CKT 1 /* 6CITYDP2 230.00 - 6ELIZ CT 230.00 OPEN BRANCH FROM BUS 313851 TO BUS 314639 CKT 1 /* 6CITYDP2 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: 6CITYDP2 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: 24682	CONTINGENCY 'DVP_P4-2: 24682' /* 24682 @ SUFFOLK  OPEN BRANCH FROM BUS 314537 TO BUS 314575 CKT 1 /* SUFFOLK - NUCOR TAP

Contingency Name	Description
	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 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
DVP_P4-2: 24742	CONTINGENCY 'DVP_P4-2: 24742' /* SUFFOLK 230 KV  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

Contingency Name	Description
	OPEN BRANCH FROM BUS 314536 TO BUS 314537 CKT 1 /* 3SUFFOLK 115.00 - 6SUFFOLK 230.00 OPEN BRANCH FROM BUS 314537 TO BUS 314928 CKT 1 /* 6SUFFOLK 230.00 - 8SUFFOLK 500.00 REMOVE SWSHUNT FROM BUS 314537  END
DVP_P4-2: 563T576	CONTINGENCY 'DVP_P4-2: 563T576' /* MIDLOTHIAN 500 500 KV  OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /* 8CARSON 500.00 - 8MDLTHAN 500.00 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00  END
DVP_P4-2: 57602	CONTINGENCY 'DVP_P4-2: 57602' /* NORTH ANNA 500 KV  OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 1 /* 6NO ANNA 230.00 - 8NO ANNA 500.00  END
DVP_P4-2: H2T557	CONTINGENCY 'DVP_P4-2: H2T557' /* ELMONT  OPEN BRANCH FROM BUS 314908 TO BUS 314903 CKT 1 /*ELMONT TO CHICKAHOMINY (LINE 557) OPEN BRANCH FROM BUS 314903 TO BUS 314214 CKT 1 /*CHICKAHOMINY 500-230 (TX#1) OPEN BRANCH FROM BUS 314908 TO BUS 314218 CKT 2 /*ELMONT 500-230 (TX#2)  END
DVP_P4-2: WT576	CONTINGENCY 'DVP_P4-2: WT576' /* NORTH ANNA 500 KV  OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /* 8MDLTHAN 500.00 - 8NO ANNA 500.00 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 2 /* 6NO ANNA 230.00 - 8NO ANNA 500.00  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-



Contingency Name	Description
	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)

#	Contingency			Bus		Ckt	Power Flow	Loading %		Rating		MW Contribution	Ref	
	Affected Area	Facility Description												
1	N-1	DVP_P1-2: LN 2181	DVP - CPLE	6MORNSTR- 6ROCKYMT230T 230 kV line	313845	304222	1	DC	92.82	94.75	ER	374	7.23	
2	N-1	DVP_P1-2: LN 2058	DVP - DVP	6MORNSTR-6NASH 230 kV line	313845	314591	1	DC	83.57	85.21	ER	449	7.37	1
3	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6EARLEYS-6NUCO TP 230 kV line	314569	314575	1	DC	75.85	80.72	ER	572	27.83	2
4	N-1	DVP_P1-2: LN 2131_FSA	DVP - DVP	6EARLEYS-6NUCO TP 230 kV line	314569	314575	1	DC	75.16	80.03	ER	572	27.83	
5	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6NUCO TP-6SUFFOLK 230 kV line	314575	314537	1	DC	69.83	74.7	ER	572	27.83	3
6	N-1	DVP_P1-2: LN 2131_FSA	DVP - DVP	6NUCO TP-6SUFFOLK 230 kV line	314575	314537	1	DC	69.12	74	ER	572	27.83	
7	N-1	DVP_P1-2: LN 246	DVP - DVP	6LAKEVEW-AB2-100 TAP 230 kV line	314583	924510	1	DC	86.37	89.26	ER	375	10.79	4
8	N-1	DVP_P1-2: LN 130-A	DVP - DVP	6LAKEVEW-AB2-100 TAP 230 kV line	314583	924510	1	DC	84.61	86.82	ER	375	8.3	
9	N-1	DVP_P1-2: LN 246	DVP - DVP	AB2-100 TAP- 6CLUBHSE 230 kV line	924510	314563	1	DC	97.71	100.6	ER	375	10.79	
10	N-1	DVP_P1-2: LN 130-A	DVP - DVP	AB2-100 TAP- 6CLUBHSE 230 kV line	924510	314563	1	DC	95.16	97.37	ER	375	8.3	

### Multiple Facility Contingency

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

#	Contingency			Bus		Ckt	Power Flow	Loading %		Rating		MW Contribution	Ref	
	Affected Area	Facility Description												
11	LFFB	DVP_P4-2:	DVP - DVP	6SAPONY-6CARSON	314435	314282	1	DC	86.67	88.94		830	18.78	5

		2020T2144		230 kV line										
12	LFFB	DVP_P4-2: 2020T2144	DVP - CPLE	6EVERETS- 6GREENVILE T 230 kV line	314574	304451	1	DC	88.09	93.35	ER	478	25.15	
13	LFFB	DVP_P4-2: 2014T2034	DVP - DVP	3POPLR C-3EVERETS 115 kV line	314596	314573	1	DC	63.01	75.27		239	29.29	6
14	LFFB	DVP_P4-2: 246T2034	DVP - DVP	3POPLR C-3EVERETS 115 kV line	314596	314573	1	DC	56.62	69.43		239	30.63	
15	LFFB	DVP_P4-2: 24742	DVP - DVP	6ELIZ CT-6SHAWBRO 230 kV line	314638	314647	1	DC	80.3	85.4		699	35.65	
16	LFFB	DVP_P4-2: 2014T2034	DVP - DVP	6S HERTFORD- 6WINFALL 230 kV line	314662	314651	1	DC	61.75	71.13		897	84.16	7
17	LFFB	DVP_P4-2: 24682	DVP - DVP	6S HERTFORD- 6WINFALL 230 kV line	314662	314651	1	DC	75.79	81.27		897	49.14	
18	LFFB	DVP_P4-2: 246T2034	DVP - DVP	6S HERTFORD- 6WINFALL 230 kV line	314662	314651	1	DC	62.24	71.44		897	82.53	
19	LFFB	DVP_P4-2: 24682	DVP - DVP	Z1-036 TAP-6S HERTFORD 230 kV line	916040	314662	1	DC	79.88	85.36		897	49.14	8

## **Short Circuit**

*(Summary of impacted circuit breakers)*

New circuit breakers found to be over-duty:

None

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

None

## **Contribution to Previously Identified Overloads**

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

#	Contingency		Affected Area	Facility Description	Bus		Ckt	Power Flow	Loading %		Rating		MW	Ref
											Contribution			
20	DCTL	DVP_P7-1: LN 81-2056	DVP - CPLE	6MORNSTR- 6ROCKYMT230T 230 kV line	313845	304222	1	DC	129.87	131.23	ER	374	11.19	9
21	LFFB	DVP_P4-2: H2T557	DVP - DVP	8ELMONT 500/230 kV transformer	314218	314908	1	DC	119.5	120.15		1051	17.43	10
22	N-1	DVP_P1-2: LN 563	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	121.49	121.95	ER	449	4.54	11
23	LFFB	DVP_P4-2: 246T247	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	113.17	116.21		637	19.28	12
24	DCTL	DVP_P7-1: LN 2058-2181	DVP - CPLE	6EVERETS-6GREENVILE T 230 kV line	314574	304451	1	DC	112.7	117.05	ER	478	20.79	13
25	LFFB	DVP_P4-2: 246T247	DVP - DVP	6ELIZ CT-6SHAWBRO 230 kV line	314638	314647	1	DC	106.72	112.81		699	42.51	14
26	LFFB	DVP_P4-2: 563T576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	116.82	117.29		3144	32.22	15
27	LFFB	DVP_P4-2: 57602	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	130.96	131.37		3351	33.95	16
28	LFFB	DVP_P4-2: WT576	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	130.95	131.37		3351	33.95	
29	LFFB	DVP_P4-2: 246T247	DVP - DVP	AB2-100 TAP-6CLUBHSE 230 kV line	924510	314563	1	DC	114.29	118.33		459	18.45	17
30	LFFB	AEP_P4_#758 9_05J.FERR 765	AEP - AEP	05EDAN 1-05DANVL2 138 kV line	242631	242620	1	DC	107.04	107.73	ER	415	6.33	18

### **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	6MORNSTR-6ROCKYMT230T 230 kV line	The limiting element is not on the VEPCO facilities. The external Duke / Progress Energy (i.e. Non-PJM) Transmission Owner will not evaluate this violation until the impact study phase.	Pending	\$TBD
2	The 6MORNSTR-6NASH 230 kV line	Line #2181 Hathaway – Nash 230 kV: wreck and rebuild the line of 1 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost \$2,250,000 and 30-36 months to engineer, permit, and construct. A VA CPCN is required.	Pending	\$2,250,000
3, 4, 5, 6	6EARLEYS-6NUCO TP 230 kV line	Line #246 Earleys – Nucor TP – Suffolk 230 kV: wreck and rebuild the line of 45 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost \$110,950,000 and 44-48 months to engineer, permit, and construct. A Va CPCN is required.	Pending	\$110,950,000
7, 8	6LAKEVEW-AB2-100 TAP 230 kV line	Line #254 AB2-100 Tap – Lakeview 230 kV: 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 cost \$40,000,000 and 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
9,10 (29)	AB2-100 TAP-6CLUBHSE 230 kV line;	Line #254 AB2-100 Tap – Clubhouse 230 kV: 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 cost \$5,000,000 and 24-28 months to engineer, permit and construct. A VA CPCN is required.	Pending	<b>\$5,000,000</b> <b>(Costs are also captured in Reinforcement for #29)</b>
11	The 6SAPONY-6CARSON 230 kV line	Line #238 Sapony to Carson 230 kV: wreck and rebuild the line of 12 miles to increase its line rating to 1047 MVA (normal), 1047 MVA (emergency), and 1204 MVA (load dump). It is estimated to cost \$29,425,000 and 30-36 months to engineer and construct.	Pending	\$29,425,000
12	The 6EVERETS-6GREENVILE T 230 kV line	The limiting element is not on the VEPCO facilities. The external Duke / Progress Energy (i.e. Non-PJM) Transmission Owner will not evaluate this violation until the impact study phase.	Pending	\$TBD

#	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
13,14	3POPLR C-3EVERETS 115 kV line	Line #25 Pop Chap – Everetts 115 kV: replace relay in Everetts to increase its line rating to 263 MVA (normal), 287 MVA (emergency), and 349 MVA (load dump). It is estimated to cost \$200,000 to 14-16 months to engineer, permit and construct.	Pending	\$200,000
15 (25)	6ELIZ CT-6SHAWBRO 230 kV line	Line #2021 Elizabeth City– Shawboro 230 kV: wreck and rebuild the line of 11 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost \$25,700,000 and 44-48 months to engineer, permit and construct. A VA CPCN is required.	Pending	\$25,700,000
16,17,18, 19	6S HERTFORD-6WINFALL 230 kV; Z1-036 TAP-6S HERTFORD 230 kV line	Line #2131 Z1-036 – Tap S Hertford – Winfall 230 kV: 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 cost \$19,875,000 and 30-36 months to engineer, permit, and construct. A Va CPCN is required.	Pending	\$19,875,000
<b>Total New Network Upgrades</b>				<b>\$233,400,000</b>

### 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
20	6MORNSTR-6ROCKYMT230T 230 kV line	The limiting element is not on the VEPCO facilities. The external Duke / Progress Energy (i.e. Non-PJM) Transmission Owner will not evaluate this violation until the impact study phase.	Pending	\$TBD
21	8ELMONT 500/230 kV transformer	Elmont 500 – 230 kV Tx#1: replace the 500-230 kV transformer #1 increase its line rating to 1134 MVA (normal), 1203 MVA (emergency), and 1365 MVA (load dump). It is estimated to cost \$17,500,000 and 24-30 months to engineer and construct.	Pending	\$17,500,000

#	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
22	6CHESTF B-6BASIN 230 kV line	Line #259 Chesterfield – Basin 230 kV: reconductor 0.14 miles of 1109 ACAR with a conductor which will increase the line rating to approximately 706 MVA (normal), 706 MVA (emergency), and 812 MVA (load dump). It is estimated to cost \$250,000 and 15-18 months to engineer, permit and construct.	Pending	\$250,000
23	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.	Pending	\$150,000
24	6EVERETS-6GREENVILE T 230 kV	The limiting element is not on the VEPCO facilities. The external Duke / Progress Energy (i.e. Non-PJM) Transmission Owner will not evaluate this violation until the impact study phase.	Pending	TBD
25 (15)	6ELIZ CT-6SHAWBRO 230 kV line	Line #2021 Elizabeth City– Shawboro 230 kV: wreck and rebuild the line of 11 miles to increase its line rating to 722 MVA (normal), 722 MVA (emergency), and 830 MVA (load dump). It is estimated to cost \$25,700,000 and 44-48 months to engineer, permit and construct. A VA CPCN is required.	Pending	\$25,700,000
26	8CHCKAHM-8ELMONT 500 kV line	Line #557 Elmont – Chickahominy 500 kV: replace the wave trap in the Chickahominy substation to increase its line rating to 3424 MVA (normal), 3424 MVA (emergency), and 3937 MVA (load dump). It is estimated to cost \$500,000 and 12-16 months to engineer and construct.	Pending	\$500,000
27,28	8ELMONT-8LADYSMITH 500 kV	Replace wave trap at Elmont and Ladysmith Substations (n5483). Estimated Cost: \$700,000. Estimated In-Service Date: 03/31/2021. (See additional upgrade below)	N5483	\$700,000
27,28	8ELMONT-8LADYSMITH 500 kV	Wreck and rebuild the Elmont - Ladysmith 500kV line # 574 (26 miles) to a minimum rating of 4453 MVA. Estimated time 36-48 months to engineer and construct. Estimated Cost: \$78,300,000.	Pending	\$78,300,000
29 (9,10)	AB2-100 TAP-6CLUBHSE 230 kV line	Line #254 AB2-100 Tap – Clubhouse 230 kV: 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 cost \$5,000,000 and 24-28 months to engineer, permit and construct. A VA CPCN is required.	Pending	\$5,000,000

#	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
30	05EDAN 1-05DANVL2 138 kV line	AEP: Limiting Element: AEP Records show ratings S/N : 275 MVA S/E : 361 MVA (1) Switch (1200A) - Danville Sw. CB M - Danville CB M needs to be replaced, Estimated cost: \$1, 000,000.	Pending	\$1, 000,000
30	05EDAN 1-05DANVL2 138 kV line	(2) Sub Cond 1590 AAC 61 Str - Danville Risers - Replace Danville risers, Estimated cost : \$100,000.	Pending	\$100,000
30	05EDAN 1-05DANVL2 138 kV line	3) ACSR ~ 336/556 six wire - conductor section 2 - 2.81 miles of conductor will need to reconductor/rebuild, expected cost of \$4.2 million.	Pending	\$4,200,000
30	05EDAN 1-05DANVL2 138 kV line	4) Relay Thermal limit 1795 Amps - E Danville 1 --- An Engineering study need to be conducted to determine if the relay thermal limit settings can be adjusted to mitigate the overload, Estimated Cost: \$25,000.New relay packages will be required if the settings cannot be adjusted, Estimated cost:\$600,000.	Pending	\$625,000
30	05EDAN 1-05DANVL2 138 kV line	5) Relay Thermal limit 1795 Amps- Danville2 --- An Engineering study need to be conducted to determine if the relay thermal limit settings can be adjusted to mitigate the overload, Estimated Cost: \$25,000.New relay packages will be required if the settings cannot be adjusted, Estimated cost:\$600,000.	Pending	\$625,000
30	05EDAN 1-05DANVL2 138 kV line	6) Relay compliance trip limit 1916 Amps- E Danville(RCTL) --- An Engineering study need to be conducted to determine if the relay compliance trip limits settings can be adjusted to mitigate the overload, Estimated Cost: \$25,000.New relay packages will be required if the settings cannot be adjusted, Estimated cost:\$600,000.	Pending	\$625,000



#	Overloaded Facility	Upgrade Description	Network Upgrade Number	Upgrade Cost
30	05EDAN 1-05DANVL2 138 kV line	7) Relay compliance trip limit 1916 Amps- Danville2 (RCTL) --- An Engineering study need to be conducted to determine if the relay compliance trip limits settings can be adjusted to mitigate the overload, Estimated Cost: \$25,000.New relay packages will be required if the settings cannot be adjusted, Estimated cost:\$600,000.	Pending	\$625,000
30	05EDAN 1-05DANVL2 138 kV line	8) ACSR ~ 1351.5 ~ 45/7 ~ DIPPER - Conductor Section 3 --- 0.03 miles of conductor will need to re-conductor/rebuild , Estimated cost : \$ 0.045 million.	Pending	\$45,000
30	05EDAN 1-05DANVL2 138 kV line	9) ACSR ~ 1351.5 ~ 45/7 ~ DIPPER - Conductor Section 1 --- 0.03 miles of conductor will need to re-conductor/rebuild, Estimated cost: \$ 0.045 million.	Pending	\$45,000
30	05EDAN 1-05DANVL2 138 kV line	10) Breaker (2000A) Non Oil- E. Danville CB L --- East Danville Circuit Breaker L needs to be replaced, estimated cost: \$1,000,000. New Rating: S/N : 351 MVA S/E :474 MVA	Pending	\$1,000,000
30	05EDAN 1-05DANVL2 138 kV line	The estimated construction time for items AEP 1-10 outlined above is 24 to 36 months after signing the interconnection agreement. The total estimated cost for items 1-10 above is \$7,890,000.		In above
<b>Total New Network Upgrades</b>				<b>\$135, 990,000</b>

### **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 Area	Facility Description	Bus	Ckt	Power Flow	Loading %	Rating	MW Contribution				
31	N-1	DVP_P1-2: LN 2181	DVP - CPL	6MORNSTR-6ROCKYMT230T 230 kV line	313845	304222	1	DC	130.41	131.7	ER	374	11.16
32	N-1	DVP_P1-2: LN 2058	DVP - DVP	6MORNSTR-6NASH 230 kV line	313845	314591	1	DC	115.85	116.95	ER	449	11.38
33	N-1	DVP_P1-2: LN 246	DVP - DVP	6MACKEYS-6EDENTON 230 kV line	314203	314637	1	DC	70.91	77.62	ER	731	49.36
34	N-1	DVP_P1-2: LN 557	DVP - DVP	6SKIFF CREEK-6KINGS M 230 kV line	314209	314386	1	DC	134.41	135.09	ER	442	6.63
35	N-1	DVP_P1-2: LN 563	DVP - DVP	6CARSON-6CHRL249 230 kV line	314282	314285	1	DC	96.39	96.84	ER	559	7.32
36	N-1	DVP_P1-2: LN 563	DVP - DVP	6CHESTF B-6BASIN 230 kV line	314287	314276	1	DC	145.42	146.13	ER	449	7.02
37	N-1	DVP_P1-2: LN 557	DVP - DVP	6PENNIMAN-6WALR209 230 kV line	314296	314415	1	DC	123.45	124.13	ER	442	6.63
38	N-1	DVP_P1-2: LN 557	DVP - DVP	6KINGS M-6PENNIMAN 230 kV line	314386	314296	1	DC	126.89	127.57	ER	442	6.63
39	N-1	DVP_P1-2: LN 557	DVP - DVP	6WALR209-6LIGH209 230 kV line	314415	314391	1	DC	109.33	110.01	ER	442	6.63
40	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6SAPONY-6CARSON 230 kV line	314435	314282	1	DC	105.75	108.52	ER	679	18.75
41	N-1	DVP_P1-2: LN 2126	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	109.34	112.47	ER	599	18.77
42	Non	Non	DVP - DVP	6CLUBHSE-6SAPONY 230 kV line	314563	314435	1	DC	99.57	100.49	NR	599	12.13
43	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6EARLEYS-6NUCO TP 230 kV line	314569	314575	1	DC	126.14	133.5	ER	572	42.98
44	Non	Non	DVP - DVP	6EARLEYS-6NUCO TP 230 kV line	314569	314575	1	DC	77.51	81.83	NR	572	24.66
45	N-1	DVP_P1-2: LN 2131A	DVP - CPL	6EVERETS-6GREENVILE T 230 kV line	314574	304451	1	DC	87.92	93.18	ER	478	25.13

46	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6NUCO TP-6SUFFOLK 230 kV line	314575	314537	1	DC	120.12	127.49	ER	572	42.98
47	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6LAKEVEW-AB2-100 TAP 230 kV line	314583	924510	1	DC	125.06	129.84	ER	375	17.93
48	Non	Non	DVP - DVP	6LAKEVEW-AB2-100 TAP 230 kV line	314583	924510	1	DC	98.87	100.29	NR	375	11.76
49	N-1	DVP_P1-2: LN 2058	DVP - CPL	6NASH-6PA-RMOUNT#4 230 kV line	314591	304226	1	DC	105.73	106.78	ER	470	11.38
50	N-1	DVP_P1-2: LN 2034-A	DVP - DVP	3POPLR C-3EVERETS 115 kV line	314596	314573	1	DC	59.99	73.73	ER	225	30.86
51	N-1	DVP_P1-2: LN 2034-A	DVP - DVP	3TRWBRDG2-3POPLR C 115 kV line	314614	314596	1	DC	50.84	61.64	ER	286	30.86
52	N-1	DVP_P1-2: LN 2131A	DVP - DVP	6CASHIE-AC2-158 TAP 230 kV line	314620	933450	1	DC	70.12	86.73	ER	572	94.92
53	N-1	DVP_P1-2: LN 246	DVP - DVP	6EDENTON-ZI-036 TAP 230 kV line	314637	916040	1	DC	67.47	74.2	ER	733	49.35
54	N-1	DVP_P1-2: LN 247	DVP - DVP	6ELIZ CT-6SHAWBRO 230 kV line	314638	314647	1	DC	98.12	104.33	ER	572	35.48
55	N-1	DVP_P1-2: LN 2020	DVP - DVP	6SUNBURY-6SUFFOLK 230 kV line	314648	314537	1	DC	114.89	122.22	ER	449	32.94
56	N-1	DVP_P1-2: LN 2020	DVP - DVP	6WINFALL-W1-029 230 kV line	314651	901080	1	DC	69.4	76.73	ER	449	32.96
57	N-1	DVP_P1-2: LN 246	DVP - DVP	6S HERTFORD-6WINFALL 230 kV line	314662	314651	1	DC	92.36	99.09	ER	733	49.33
58	N-1	DVP_P1-2: LN 576	DVP - DVP	8CHCKAHM-8ELMONT 500 kV line	314903	314908	1	DC	144.43	145	ER	2442	30.62
59	N-1	DVP_P1-2: LN 576	DVP - DVP	8ELMONT-8LADYSMITH 500 kV line	314908	314911	1	DC	179.57	180.13	ER	2442	33.95
60	N-1	DVP_P1-2: LN 574	DVP - DVP	8MDLTHAN-8NO ANNA 500 kV line	314914	314918	1	DC	154.25	154.83	ER	2442	31.23
61	N-1	DVP_P1-2: LN 563	DVP - DVP	8SURRY-8CHCKAHM 500 kV line	314924	314903	1	DC	100.66	101.29	ER	1809	28.04
62	N-1	DVP_P1-2: LN 2020	DVP - DVP	W1-029-6SUNBURY 230 kV line	901080	314648	1	DC	116.46	123.79	ER	449	32.94
63	N-1	DVP_P1-2: LN 246	DVP - DVP	ZI-036 TAP-6S HERTFORD 230 kV line	916040	314662	1	DC	97.37	104.1	ER	733	49.33
64	Non	Non	DVP - DVP	ZI-036 TAP-6S HERTFORD 230 kV line	916040	314662	1	DC	69.13	74.83	NR	733	41.82

65	N-1	DVP_P1-2: LN 246	DVP - DVP	AB2-100 TAP-6CLUBHSE 230 kV line	924510	314563	1	DC	137.85	142.32	ER	375	16.67
66	Non	Non	DVP - DVP	AB2-100 TAP-6CLUBHSE 230 kV line	924510	314563	1	DC	111.23	112.99	NR	375	11.76
67	N-1	DVP_P1-2: LN 2131A	DVP - DVP	AC2-158 TAP-6EARLEYS 230 kV line	933450	314569	1	DC	80.44	97.04	ER	572	94.92
68	N-1	DVP_P1-2: LN 2131A	DVP - DVP	AD1-023 TAP-6CASHIE 230 kV line	933990	314620	1	DC	71.76	88.37	ER	572	94.92
69	N-1	AEP_P1- 2_#1377	AEP - AEP	05EDAN 1-05DANVL2 138 kV line	242631	242620	1	DC	107.01	107.7	ER	415	6.33

### **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 gauge 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 6MORNSTR-6NASH 230 kV line (from bus 313845 to bus 314591 ckt 1) loads from 83.57% to 85.21% (**DC power flow**) of its emergency rating (449 MVA) for the single line contingency outage of 'DVP\_P1-2: LN 2058'. This project contributes approximately 7.37 MW to the thermal violation.

CONTINGENCY 'DVP\_P1-2: LN 2058'

OPEN BRANCH FROM BUS 304222 TO BUS 313845 CKT 1 /\*  
 6ROCKYMT230T230.00 - 6MORNSTR 230.00  
 END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315294	1DOMTR10	1.42
315292	1DOMTR78	0.96
315293	1DOMTR9	0.78
315131	1EDGECEMA	25.16
315132	1EDGECEMB	25.16
315139	1GASTONA	4.12
315141	1GASTONB	4.12
315126	1ROARAP2	1.32
315128	1ROARAP4	1.27
315136	1ROSEMG1	3.44
315138	1ROSEMG2	1.61
315137	1ROSEMS1	2.14
315115	1S HAMPT1	0.91
314704	3LAWRENC	0.21
932631	AC2-084 C	8.57
933451	AC2-158 C	3.5
933461	AC2-159 C	5.08
933711	AC2-194 C	0.35

<i>933991</i>	<i>ADI-023 C</i>	<i>7.37</i>
<i>934041</i>	<i>ADI-029 C</i>	<i>10.6</i>
<i>934201</i>	<i>ADI-047 C</i>	<i>5.87</i>
<i>934231</i>	<i>ADI-050 C</i>	<i>1.62</i>
<i>934331</i>	<i>ADI-057 C OI</i>	<i>20.13</i>
<i>934521</i>	<i>ADI-076 C OI</i>	<i>28.97</i>
<i>LTF</i>	<i>AMIL</i>	<i>0.39</i>
<i>LTF</i>	<i>BAYOU</i>	<i>2.04</i>
<i>LTF</i>	<i>BIG_CAJUN1</i>	<i>3.21</i>
<i>LTF</i>	<i>BIG_CAJUN2</i>	<i>6.46</i>
<i>LTF</i>	<i>BLUEG</i>	<i>2.05</i>
<i>LTF</i>	<i>CALDERWOOD</i>	<i>1.2</i>
<i>LTF</i>	<i>CANNELTON</i>	<i>0.39</i>
<i>LTF</i>	<i>CARR</i>	<i>&lt; 0.01</i>
<i>LTF</i>	<i>CATAWBA</i>	<i>1.18</i>
<i>LTF</i>	<i>CELEVELAND</i>	<i>3.34</i>
<i>LTF</i>	<i>CHEOAH</i>	<i>1.12</i>
<i>LTF</i>	<i>CHILHOWEE</i>	<i>0.39</i>
<i>LTF</i>	<i>CHOCTAW</i>	<i>2.19</i>
<i>LTF</i>	<i>CLIFTY</i>	<i>7.53</i>
<i>LTF</i>	<i>COTTONWOOD</i>	<i>7.98</i>
<i>LTF</i>	<i>DEARBORN</i>	<i>0.75</i>
<i>LTF</i>	<i>EDWARDS</i>	<i>0.63</i>
<i>LTF</i>	<i>ELMERSMITH</i>	<i>1.14</i>
<i>LTF</i>	<i>FARMERCITY</i>	<i>0.49</i>
<i>LTF</i>	<i>G-007A</i>	<i>0.78</i>

<i>LTF</i>	<i>GIBSON</i>	<i>0.72</i>
<i>LTF</i>	<i>HAMLET</i>	<i>4.66</i>
<i>LTF</i>	<i>MORGAN</i>	<i>3.53</i>
<i>LTF</i>	<i>NEWTON</i>	<i>1.73</i>
<i>LTF</i>	<i>O-066A</i>	<i>0.36</i>
<i>LTF</i>	<i>PRAIRIE</i>	<i>3.73</i>
<i>LTF</i>	<i>ROWAN</i>	<i>2.47</i>
<i>LTF</i>	<i>SANTEETLA</i>	<i>0.33</i>
<i>LTF</i>	<i>SMITHLAND</i>	<i>0.33</i>
<i>LTF</i>	<i>TATANKA</i>	<i>0.84</i>
<i>LTF</i>	<i>TILTON</i>	<i>0.75</i>
<i>LTF</i>	<i>TRIMBLE</i>	<i>0.39</i>
<i>LTF</i>	<i>TVA</i>	<i>1.49</i>
<i>LTF</i>	<i>UNIONPOWER</i>	<i>2.14</i>
<i>900671</i>	<i>V4-068 C</i>	<i>0.07</i>
<i>LTF</i>	<i>VFT</i>	<i>2.08</i>
<i>901081</i>	<i>W1-029C</i>	<i>0.41</i>
<i>LTF</i>	<i>X1-078</i>	<i>0.6</i>
<i>913391</i>	<i>Y1-086 C</i>	<i>0.08</i>
<i>916041</i>	<i>Z1-036 C</i>	<i>0.48</i>
<i>917121</i>	<i>Z2-027 C</i>	<i>0.14</i>
<i>917331</i>	<i>Z2-043 C</i>	<i>0.37</i>
<i>917341</i>	<i>Z2-044 C</i>	<i>0.33</i>
<i>917511</i>	<i>Z2-088 C OPI</i>	<i>1.7</i>
<i>917591</i>	<i>Z2-099 C</i>	<i>0.12</i>
<i>918411</i>	<i>AA1-050</i>	<i>1.43</i>



<i>918491</i>	<i>AA1-063AC OP</i>	<i>1.22</i>
<i>918511</i>	<i>AA1-065 C OP</i>	<i>1.18</i>
<i>918531</i>	<i>AA1-067 C</i>	<i>0.25</i>
<i>918561</i>	<i>AA1-072 C</i>	<i>0.06</i>
<i>919691</i>	<i>AA2-053 C</i>	<i>1.35</i>
<i>919701</i>	<i>AA2-057 C</i>	<i>1.62</i>
<i>919731</i>	<i>AA2-059 C</i>	<i>0.09</i>
<i>919821</i>	<i>AA2-068 C</i>	<i>0.46</i>
<i>920021</i>	<i>AA2-086 C</i>	<i>0.06</i>
<i>920041</i>	<i>AA2-088 C</i>	<i>0.75</i>
<i>920591</i>	<i>AA2-165 C</i>	<i>0.22</i>
<i>920631</i>	<i>AA2-169 C</i>	<i>1.08</i>
<i>920671</i>	<i>AA2-174 C</i>	<i>0.06</i>
<i>920691</i>	<i>AA2-178 C</i>	<i>4.42</i>
<i>930051</i>	<i>AB1-013 C</i>	<i>1.33</i>
<i>930401</i>	<i>AB1-081 C</i>	<i>14.54</i>
<i>930861</i>	<i>AB1-132 C</i>	<i>16.04</i>
<i>931231</i>	<i>AB1-173 C</i>	<i>1.65</i>
<i>931241</i>	<i>AB1-173AC</i>	<i>1.65</i>
<i>923801</i>	<i>AB2-015 C OI</i>	<i>4.12</i>
<i>923851</i>	<i>AB2-025 C</i>	<i>0.2</i>
<i>923911</i>	<i>AB2-031 C OI</i>	<i>1.64</i>
<i>923941</i>	<i>AB2-035 C</i>	<i>0.68</i>
<i>923991</i>	<i>AB2-040 C OI</i>	<i>5.38</i>
<i>924151</i>	<i>AB2-059 C OI</i>	<i>17.13</i>
<i>924381</i>	<i>AB2-087 C</i>	<i>0.4</i>

<i>924391</i>	<i>AB2-088 C</i>	<i>0.88</i>
<i>924401</i>	<i>AB2-089 C</i>	<i>0.73</i>
<i>924491</i>	<i>AB2-098 C</i>	<i>0.43</i>
<i>924501</i>	<i>AB2-099 C</i>	<i>0.41</i>
<i>924511</i>	<i>AB2-100 C</i>	<i>8.55</i>
<i>925121</i>	<i>AB2-169 C</i>	<i>4.09</i>
<i>925171</i>	<i>AB2-174 C O1</i>	<i>5.02</i>
<i>925281</i>	<i>AB2-186 C</i>	<i>0.21</i>
<i>925291</i>	<i>AB2-188 C O1</i>	<i>1.09</i>
<i>925591</i>	<i>AC1-034 C</i>	<i>13.94</i>
<i>925781</i>	<i>AC1-054 C</i>	<i>2.86</i>
<i>926071</i>	<i>AC1-086 C</i>	<i>23.63</i>
<i>926201</i>	<i>AC1-098 C</i>	<i>6.01</i>
<i>926211</i>	<i>AC1-099 C</i>	<i>2.01</i>
<i>926771</i>	<i>AC1-163 C</i>	<i>1.34</i>
<i>927021</i>	<i>AC1-189 C</i>	<i>12.37</i>
<i>927111</i>	<i>AC1-206 C</i>	<i>6.91</i>
<i>927141</i>	<i>AC1-208 C</i>	<i>8.88</i>

## Appendix 2

(DVP - DVP) The 6EARLEYS-6NUCO TP 230 kV line (from bus 314569 to bus 314575 ckt 1) loads from 75.85% to 80.72% (**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 27.83 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315294	1DOMTR10	4.77
315292	1DOMTR78	3.23
315293	1DOMTR9	2.63
315131	1EDGECEMA	9.02
315132	1EDGECEMB	9.02
315139	1GASTONA	3.89
315141	1GASTONB	3.89
315159	1KERR 2	0.85
315163	1KERR 6	0.84
315164	1KERR 7	0.84
315126	1ROARAP2	1.58
315128	1ROARAP4	1.52
315136	1ROSEMG1	2.75
315138	1ROSEMG2	1.29
315137	1ROSEMS1	1.7
314704	3LAWRENC	0.23

932631	AC2-084 C	11.32
933451	AC2-158 C	12.21
933461	AC2-159 C	9.55
933991	AD1-023 C	27.83
934041	AD1-029 C	14.
934201	AD1-047 C	6.39
934231	AD1-050 C	2.75
934331	AD1-057 C O1	10.19
934521	AD1-076 C O1	112.89
LTF	AD1-120	4.28
LTF	AD1-121	4.25
LTF	CARR	0.09
LTF	CBM-S1	5.29
LTF	CBM-S2	10.69
LTF	CBM-W1	11.82
LTF	CBM-W2	28.65
LTF	CIN	2.65
LTF	CPL	3.68
LTF	IPL	1.69
LTF	LGEE	0.57
LTF	MEC	5.94
LTF	MECS	2.71
LTF	RENSSELAER	0.07
LTF	ROSETON	0.5
900671	V4-068 C	0.11
LTF	WEC	0.73

916041	Z1-036 C	2.69
917331	Z2-043 C	0.76
917341	Z2-044 C	0.27
917511	Z2-088 C OP1	1.21
917591	Z2-099 C	0.13
918411	AA1-050	1.02
918491	AA1-063AC OP	1.44
918511	AA1-065 C OP	4.02
918531	AA1-067 C	0.52
918561	AA1-072 C	0.11
919691	AA2-053 C	2.02
919701	AA2-057 C	1.49
919731	AA2-059 C	0.47
919821	AA2-068 C	0.5
LTF	AA2-074	2.51
920021	AA2-086 C	0.07
920041	AA2-088 C	0.83
920591	AA2-165 C	0.2
920631	AA2-169 C	1.56
920671	AA2-174 C	0.09
920691	AA2-178 C	19.71
930051	ABI-013 C	5.95
930401	ABI-081 C	8.64
930861	ABI-132 C	15.15
931231	ABI-173 C	1.8
931241	ABI-173AC	1.8

923911	AB2-031 C OI	1.78
923941	AB2-035 C	0.4
923991	AB2-040 C OI	5.86
924151	AB2-059 C OI	10.18
924381	AB2-087 C	1.08
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 OI	5.33
925291	AB2-188 C OI	4.86
925591	AC1-034 C	8.09
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
927111	AC1-206 C	5.79
927141	AC1-208 C	9.96

### Appendix 3

(DVP - DVP) The 6NUCO TP-6SUFFOLK 230 kV line (from bus 314575 to bus 314537 ckt 1) loads from 69.83% to 74.7% (**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 27.83 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315294	1DOMTR10	4.77
315292	1DOMTR78	3.23
315293	1DOMTR9	2.63
315131	1EDGECEMA	9.02
315132	1EDGECEMB	9.02
315139	1GASTONA	3.89
315141	1GASTONB	3.89
315159	1KERR 2	0.85
315163	1KERR 6	0.84
315164	1KERR 7	0.84
315126	1ROARAP2	1.58
315128	1ROARAP4	1.52
315136	1ROSEMG1	2.75
315138	1ROSEMG2	1.29
315137	1ROSEMS1	1.7
314704	3LAWRENC	0.23

932631	AC2-084 C	11.32
933451	AC2-158 C	12.21
933461	AC2-159 C	9.55
933991	AD1-023 C	27.83
934041	AD1-029 C	14.
934201	AD1-047 C	6.39
934231	AD1-050 C	2.75
934331	AD1-057 C O1	10.19
934521	AD1-076 C O1	112.89
LTF	AD1-120	4.28
LTF	AD1-121	4.25
LTF	CARR	0.09
LTF	CBM-S1	5.29
LTF	CBM-S2	10.69
LTF	CBM-W1	11.82
LTF	CBM-W2	28.65
LTF	CIN	2.65
LTF	CPL	3.68
LTF	IPL	1.69
LTF	LGEE	0.57
LTF	MEC	5.94
LTF	MECS	2.71
LTF	RENSSELAER	0.07
LTF	ROSETON	0.5
900671	V4-068 C	0.11
LTF	WEC	0.73



916041	Z1-036 C	2.69
917331	Z2-043 C	0.76
917341	Z2-044 C	0.27
917511	Z2-088 C OP1	1.21
917591	Z2-099 C	0.13
918411	AA1-050	1.02
918491	AA1-063AC OP	1.44
918511	AA1-065 C OP	4.02
918531	AA1-067 C	0.52
918561	AA1-072 C	0.11
919691	AA2-053 C	2.02
919701	AA2-057 C	1.49
919731	AA2-059 C	0.47
919821	AA2-068 C	0.5
LTF	AA2-074	2.51
920021	AA2-086 C	0.07
920041	AA2-088 C	0.83
920591	AA2-165 C	0.2
920631	AA2-169 C	1.56
920671	AA2-174 C	0.09
920691	AA2-178 C	19.71
930051	ABI-013 C	5.95
930401	ABI-081 C	8.64
930861	ABI-132 C	15.15
931231	ABI-173 C	1.8
931241	ABI-173AC	1.8

923911	AB2-031 C OI	1.78
923941	AB2-035 C	0.4
923991	AB2-040 C OI	5.86
924151	AB2-059 C OI	10.18
924381	AB2-087 C	1.08
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 OI	5.33
925291	AB2-188 C OI	4.86
925591	AC1-034 C	8.09
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
927111	AC1-206 C	5.79
927141	AC1-208 C	9.96

## Appendix 4

(DVP - DVP) The 6LAKEVEW-AB2-100 TAP 230 kV line (from bus 314583 to bus 924510 ckt 1) loads from 86.37% to 89.26% (**DC power flow**) of its emergency rating (375 MVA) for the single line contingency outage of 'DVP\_P1-2: LN 246'. This project contributes approximately 10.79 MW to the thermal violation.

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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315294	1DOMTR10	1.91
315292	1DOMTR78	1.29
315293	1DOMTR9	1.06
315131	1EDGECEMA	10.25
315132	1EDGECEMB	10.25
315139	1GASTONA	7.85
315141	1GASTONB	7.85
315159	1KERR 2	0.55
315163	1KERR 6	0.55
315164	1KERR 7	0.55
315126	1ROARAP2	1.59
315128	1ROARAP4	1.53
315136	1ROSEMG1	5.27
315138	1ROSEMG2	2.47

<i>315137</i>	<i>IROSEMSI</i>	<i>3.27</i>
<i>315115</i>	<i>IS HAMPTI</i>	<i>0.87</i>
<i>932631</i>	<i>AC2-084 C</i>	<i>9.07</i>
<i>933451</i>	<i>AC2-158 C</i>	<i>5.83</i>
<i>933461</i>	<i>AC2-159 C</i>	<i>6.88</i>
<i>933991</i>	<i>AD1-023 C</i>	<i>10.79</i>
<i>934041</i>	<i>AD1-029 C</i>	<i>11.22</i>
<i>934231</i>	<i>AD1-050 C</i>	<i>2.06</i>
<i>934331</i>	<i>AD1-057 C O1</i>	<i>15.83</i>
<i>934521</i>	<i>AD1-076 C O1</i>	<i>40.</i>
<i>LTF</i>	<i>AD1-120</i>	<i>3.64</i>
<i>LTF</i>	<i>AD1-121</i>	<i>3.61</i>
<i>LTF</i>	<i>CARR</i>	<i>0.09</i>
<i>LTF</i>	<i>CBM-S1</i>	<i>4.38</i>
<i>LTF</i>	<i>CBM-S2</i>	<i>9.</i>
<i>LTF</i>	<i>CBM-W1</i>	<i>9.53</i>
<i>LTF</i>	<i>CBM-W2</i>	<i>23.61</i>
<i>LTF</i>	<i>CIN</i>	<i>2.14</i>
<i>LTF</i>	<i>CPL</i>	<i>3.08</i>
<i>LTF</i>	<i>IPL</i>	<i>1.36</i>
<i>LTF</i>	<i>LGEE</i>	<i>0.46</i>
<i>LTF</i>	<i>MEC</i>	<i>4.84</i>
<i>LTF</i>	<i>MECS</i>	<i>2.14</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>0.07</i>
<i>LTF</i>	<i>ROSETON</i>	<i>0.53</i>
<i>900671</i>	<i>V4-068 C</i>	<i>0.08</i>

<i>LTF</i>	<i>WEC</i>	<i>0.59</i>
<i>916041</i>	<i>Z1-036 C</i>	<i>0.44</i>
<i>917331</i>	<i>Z2-043 C</i>	<i>0.48</i>
<i>917341</i>	<i>Z2-044 C</i>	<i>0.27</i>
<i>917511</i>	<i>Z2-088 C OPI</i>	<i>0.99</i>
<i>917591</i>	<i>Z2-099 C</i>	<i>0.13</i>
<i>918411</i>	<i>AA1-050</i>	<i>0.84</i>
<i>918491</i>	<i>AA1-063AC OP</i>	<i>1.43</i>
<i>918511</i>	<i>AA1-065 C OP</i>	<i>2.04</i>
<i>918531</i>	<i>AA1-067 C</i>	<i>0.32</i>
<i>918561</i>	<i>AA1-072 C</i>	<i>0.07</i>
<i>919691</i>	<i>AA2-053 C</i>	<i>1.72</i>
<i>919701</i>	<i>AA2-057 C</i>	<i>1.43</i>
<i>919731</i>	<i>AA2-059 C</i>	<i>0.09</i>
<i>919821</i>	<i>AA2-068 C</i>	<i>0.45</i>
<i>LTF</i>	<i>AA2-074</i>	<i>2.1</i>
<i>920021</i>	<i>AA2-086 C</i>	<i>0.07</i>
<i>920041</i>	<i>AA2-088 C</i>	<i>0.82</i>
<i>920591</i>	<i>AA2-165 C</i>	<i>0.19</i>
<i>920631</i>	<i>AA2-169 C</i>	<i>1.34</i>
<i>920671</i>	<i>AA2-174 C</i>	<i>0.08</i>
<i>920691</i>	<i>AA2-178 C</i>	<i>5.4</i>
<i>930051</i>	<i>ABI-013 C</i>	<i>1.63</i>
<i>930401</i>	<i>ABI-081 C</i>	<i>9.31</i>
<i>930861</i>	<i>ABI-132 C</i>	<i>30.54</i>
<i>923801</i>	<i>AB2-015 C OI</i>	<i>3.7</i>

923941	AB2-035 C	0.36
924151	AB2-059 C OI	10.97
924381	AB2-087 C	0.61
924391	AB2-088 C	0.46
924401	AB2-089 C	0.94
924491	AB2-098 C	0.54
924501	AB2-099 C	0.59
925121	AB2-169 C	5.4
925291	AB2-188 C OI	1.33
925591	AC1-034 C	7.23
925781	AC1-054 C	3.61
926071	AC1-086 C	44.98
926201	AC1-098 C	6.36
926211	AC1-099 C	2.13
926771	AC1-163 C	1.96
927021	AC1-189 C	8.69
927141	AC1-208 C	9.18

## Appendix 5

(DVP - DVP) The 6SAPONY-6CARSON 230 kV line (from bus 314435 to bus 314282 ckt 1) loads from 86.67% to 88.94% (**DC power flow**) of its load dump rating (830 MVA) for the line fault with failed breaker contingency outage of 'DVP\_P4-2: 2020T2144'. This project contributes approximately 18.78 MW to the thermal violation.

```

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
  
```

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315131	1EDGECEMA	9.72
315132	1EDGECEMB	9.72
315139	1GASTONA	7.07
315141	1GASTONB	7.07
315126	1ROARAP2	2.51
315128	1ROARAP4	2.41
315136	1ROSEMG1	4.76
315138	1ROSEMG2	2.23
315137	1ROSEMS1	2.95
314557	3BETHEL C	0.79
314554	3BTLEBRO	0.82

314566	3CRESWEL	2.18
314572	3EMPORIA	1.
314578	3HORNRTN	4.97
314582	3KELFORD	0.9
314704	3LAWRENC	0.79
314603	3SCOT NK	3.76
314617	3TUNIS	0.84
314541	3WATKINS	0.46
314620	6CASHIE	0.79
314574	6EVERETS	2.14
314594	6PLYMOTH	0.78
314651	6WINFALL	1.56
932631	AC2-084 C	10.32
932632	AC2-084 E	5.08
933451	AC2-158 C	5.16
933452	AC2-158 E	5.16
933461	AC2-159 C	8.61
933462	AC2-159 E	8.61
933711	AC2-194 C	0.97
933712	AC2-194 E	1.56
933991	AD1-023 C	12.16
933992	AD1-023 E	6.62
934041	AD1-029 C	12.76
934042	AD1-029 E	8.41
934201	AD1-047 C	16.72
934202	AD1-047 E	11.15



934231	AD1-050 C	4.72
934232	AD1-050 E	2.58
934331	AD1-057 C O1	14.55
934332	AD1-057 E O1	7.76
934521	AD1-076 C O1	49.94
934522	AD1-076 E O1	25.43
LTF	AD1-120	3.93
LTF	AD1-121	3.91
LTF	CARR	0.11
LTF	CBM-S1	4.8
LTF	CBM-S2	9.64
LTF	CBM-W1	10.58
LTF	CBM-W2	25.91
LTF	CIN	2.38
LTF	CPLE	3.25
LTF	G-007	0.7
LTF	IPL	1.52
LTF	LGEE	0.51
LTF	MEC	5.35
LTF	MECS	2.38
LTF	O-066	2.34
LTF	RENSSELAER	0.09
LTF	ROSETON	0.65
900671	V4-068 C	0.1
900672	V4-068 E	0.29
LTF	WEC	0.65

916041	Z1-036 C	1.19
916042	Z1-036 E	40.68
917331	Z2-043 C	0.5
917332	Z2-043 E	1.08
917341	Z2-044 C	0.29
917342	Z2-044 E	0.62
917511	Z2-088 C OP1	0.93
917512	Z2-088 E OP1	3.73
917591	Z2-099 C	0.18
917592	Z2-099 E	0.41
918411	AA1-050	0.78
918491	AA1-063AC OP	2.17
918492	AA1-063AE OP	5.21
918511	AA1-065 C OP	1.68
918512	AA1-065 E OP	4.22
918532	AA1-067 E	0.64
918561	AA1-072 C	0.07
918562	AA1-072 E	0.18
919691	AA2-053 C	2.45
919692	AA2-053 E	5.36
919701	AA2-057 C	1.58
919702	AA2-057 E	4.03
919731	AA2-059 C	0.21
919732	AA2-059 E	0.5
919821	AA2-068 C	0.53
919822	AA2-068 E	1.24

<i>LTF</i>	<i>AA2-074</i>	<i>2.21</i>
<i>920021</i>	<i>AA2-086 C</i>	<i>0.1</i>
<i>920022</i>	<i>AA2-086 E</i>	<i>0.22</i>
<i>920041</i>	<i>AA2-088 C</i>	<i>1.14</i>
<i>920042</i>	<i>AA2-088 E</i>	<i>9.49</i>
<i>920591</i>	<i>AA2-165 C</i>	<i>0.22</i>
<i>920592</i>	<i>AA2-165 E</i>	<i>0.53</i>
<i>920631</i>	<i>AA2-169 C</i>	<i>2.6</i>
<i>920632</i>	<i>AA2-169 E</i>	<i>1.19</i>
<i>920671</i>	<i>AA2-174 C</i>	<i>0.11</i>
<i>920672</i>	<i>AA2-174 E</i>	<i>0.62</i>
<i>920691</i>	<i>AA2-178 C</i>	<i>8.72</i>
<i>920692</i>	<i>AA2-178 E</i>	<i>3.74</i>
<i>930051</i>	<i>AB1-013 C</i>	<i>2.63</i>
<i>930052</i>	<i>AB1-013 E</i>	<i>17.61</i>
<i>930401</i>	<i>AB1-081 C</i>	<i>9.2</i>
<i>930402</i>	<i>AB1-081 E</i>	<i>3.94</i>
<i>930861</i>	<i>AB1-132 C</i>	<i>27.5</i>
<i>930862</i>	<i>AB1-132 E</i>	<i>11.79</i>
<i>931231</i>	<i>AB1-173 C</i>	<i>4.7</i>
<i>931232</i>	<i>AB1-173 E</i>	<i>2.19</i>
<i>931241</i>	<i>AB1-173AC</i>	<i>4.7</i>
<i>931242</i>	<i>AB1-173AE</i>	<i>2.19</i>
<i>923851</i>	<i>AB2-025 C</i>	<i>2.01</i>
<i>923852</i>	<i>AB2-025 E</i>	<i>4.59</i>
<i>923911</i>	<i>AB2-031 C O1</i>	<i>4.67</i>

923912	AB2-031 E OI	2.3
923941	AB2-035 C	0.33
923942	AB2-035 E	0.14
923991	AB2-040 C OI	15.33
923992	AB2-040 E OI	12.54
924021	AB2-043 C OI	2.52
924022	AB2-043 E OI	4.14
924151	AB2-059 C OI	10.84
924152	AB2-059 E OI	5.58
924161	AB2-060 C OI	7.16
924162	AB2-060 E OI	3.37
924301	AB2-077 C OI	1.58
924302	AB2-077 E OI	1.05
924311	AB2-078 C OI	1.58
924312	AB2-078 E OI	1.05
924321	AB2-079 C OI	1.58
924322	AB2-079 E OI	1.05
924381	AB2-087 C	0.59
924382	AB2-087 E	0.28
924391	AB2-088 C	0.43
924392	AB2-088 E	0.21
924401	AB2-089 C	2.14
924402	AB2-089 E	1.1
924411	AB2-090 C	3.18
924412	AB2-090 E	1.63
924491	AB2-098 C	0.5

924492	AB2-098 E	0.21
924501	AB2-099 C	0.6
924502	AB2-099 E	0.26
924511	AB2-100 C	34.93
924512	AB2-100 E	17.2
925121	AB2-169 C	5.84
925122	AB2-169 E	5.24
925171	AB2-174 C O1	15.46
925172	AB2-174 E O1	13.98
925221	AB2-176 C	1.31
925222	AB2-176 E	0.56
925281	AB2-186 C	0.54
925282	AB2-186 E	0.23
925291	AB2-188 C O1	2.15
925292	AB2-188 E O1	0.97
925591	AC1-034 C	6.79
925592	AC1-034 E	5.13
925781	AC1-054 C	7.68
925782	AC1-054 E	3.54
926071	AC1-086 C	40.5
926072	AC1-086 E	18.43
926201	AC1-098 C	7.24
926202	AC1-098 E	4.31
926211	AC1-099 C	2.43
926212	AC1-099 E	1.42
926771	AC1-163 C	1.96

<i>926772</i>	<i>ACI-163 E</i>	<i>0.92</i>
<i>927021</i>	<i>ACI-189 C</i>	<i>8.08</i>
<i>927022</i>	<i>ACI-189 E</i>	<i>4.02</i>
<i>927111</i>	<i>ACI-206 C</i>	<i>31.48</i>
<i>927112</i>	<i>ACI-206 E</i>	<i>14.88</i>
<i>927141</i>	<i>ACI-208 C</i>	<i>11.81</i>
<i>927142</i>	<i>ACI-208 E</i>	<i>5.25</i>

## Appendix 6

(DVP - DVP) The 3POPLR C-3EVERETS 115 kV line (from bus 314596 to bus 314573 ckt 1) loads from 63.01% to 75.27% (**DC power flow**) of its load dump rating (239 MVA) for the line fault with failed breaker contingency outage of 'DVP\_P4-2: 2014T2034'. This project contributes approximately 29.29 MW to the thermal violation.

CONTINGENCY 'DVP\_P4-2: 2014T2034'

/\* EARLEYS

OPEN BRANCH FROM BUS 314569 TO BUS 933450 CKT 1

/\* 2034

OPEN BRANCH FROM BUS 314569 TO BUS 314574 CKT 1

/\* 2014

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315294	1DOMTR10	5.01
315292	1DOMTR78	3.39
315293	1DOMTR9	2.76
314566	3CRESWEL	2.76
314620	6CASHIE	1.22
314594	6PLYMOTH	1.18
314648	6SUNBURY	0.34
314651	6WINFALL	1.05
933451	AC2-158 C	7.93
933452	AC2-158 E	7.93
933711	AC2-194 C	0.65
933712	AC2-194 E	1.05
933991	AD1-023 C	18.97
933992	AD1-023 E	10.33
934521	AD1-076 C O1	78.29
934522	AD1-076 E O1	39.86
LTF	AMIL	0.17
LTF	BAYOU	0.91

<i>LTF</i>	<i>BIG_CAJUNI</i>	<i>1.44</i>
<i>LTF</i>	<i>BIG_CAJUN2</i>	<i>2.9</i>
<i>LTF</i>	<i>BLUEG</i>	<i>0.88</i>
<i>LTF</i>	<i>CALDERWOOD</i>	<i>0.53</i>
<i>LTF</i>	<i>CANNELTON</i>	<i>0.17</i>
<i>LTF</i>	<i>CATAWBA</i>	<i>0.52</i>
<i>LTF</i>	<i>CBM-N</i>	<i>&lt; 0.01</i>
<i>LTF</i>	<i>CELEVELAND</i>	<i>1.48</i>
<i>LTF</i>	<i>CHEOAH</i>	<i>0.5</i>
<i>LTF</i>	<i>CHILHOWEE</i>	<i>0.17</i>
<i>LTF</i>	<i>CHOCTAW</i>	<i>0.98</i>
<i>LTF</i>	<i>CLIFTY</i>	<i>3.21</i>
<i>LTF</i>	<i>COTTONWOOD</i>	<i>3.57</i>
<i>LTF</i>	<i>DEARBORN</i>	<i>0.32</i>
<i>LTF</i>	<i>EDWARDS</i>	<i>0.27</i>
<i>LTF</i>	<i>ELMERSMITH</i>	<i>0.5</i>
<i>LTF</i>	<i>FARMERCITY</i>	<i>0.22</i>
<i>LTF</i>	<i>G-007A</i>	<i>0.38</i>
<i>LTF</i>	<i>GIBSON</i>	<i>0.31</i>
<i>LTF</i>	<i>HAMLET</i>	<i>2.18</i>
<i>LTF</i>	<i>MORGAN</i>	<i>1.58</i>
<i>LTF</i>	<i>NEWTON</i>	<i>0.75</i>
<i>LTF</i>	<i>NYISO</i>	<i>0.04</i>
<i>LTF</i>	<i>O-066A</i>	<i>0.17</i>
<i>LTF</i>	<i>PRAIRIE</i>	<i>1.64</i>
<i>LTF</i>	<i>ROWAN</i>	<i>1.05</i>



<i>LTF</i>	<i>SANTEETLA</i>	<i>0.15</i>
<i>LTF</i>	<i>SMITHLAND</i>	<i>0.15</i>
<i>LTF</i>	<i>TATANKA</i>	<i>0.37</i>
<i>LTF</i>	<i>TILTON</i>	<i>0.32</i>
<i>LTF</i>	<i>TRIMBLE</i>	<i>0.17</i>
<i>LTF</i>	<i>TVA</i>	<i>0.66</i>
<i>LTF</i>	<i>UNIONPOWER</i>	<i>0.95</i>
<i>LTF</i>	<i>VFT</i>	<i>1.01</i>
<i>901082</i>	<i>W1-029E</i>	<i>23.47</i>
<i>LTF</i>	<i>X1-078</i>	<i>0.29</i>
<i>913392</i>	<i>Y1-086 E</i>	<i>1.07</i>
<i>916041</i>	<i>Z1-036 C</i>	<i>1.02</i>
<i>916042</i>	<i>Z1-036 E</i>	<i>34.83</i>
<i>917122</i>	<i>Z2-027 E</i>	<i>0.52</i>
<i>919731</i>	<i>AA2-059 C</i>	<i>0.19</i>
<i>919732</i>	<i>AA2-059 E</i>	<i>0.47</i>
<i>920691</i>	<i>AA2-178 C</i>	<i>11.05</i>
<i>920692</i>	<i>AA2-178 E</i>	<i>4.74</i>
<i>930051</i>	<i>AB1-013 C</i>	<i>3.33</i>
<i>930052</i>	<i>AB1-013 E</i>	<i>22.31</i>
<i>923831</i>	<i>AB2-022 C</i>	<i>0.99</i>
<i>923832</i>	<i>AB2-022 E</i>	<i>0.53</i>
<i>925121</i>	<i>AB2-169 C</i>	<i>4.79</i>
<i>925122</i>	<i>AB2-169 E</i>	<i>4.3</i>
<i>925281</i>	<i>AB2-186 C</i>	<i>0.42</i>
<i>925282</i>	<i>AB2-186 E</i>	<i>0.18</i>

<i>925291</i>	<i>AB2-188 C OI</i>	<i>2.72</i>
<i>925292</i>	<i>AB2-188 E OI</i>	<i>1.22</i>

## Appendix 7

(DVP - DVP) The 6S HERTFORD-6WINFALL 230 kV line (from bus 314662 to bus 314651 ckt 1) loads from 61.75% to 71.13% (**DC power flow**) of its load dump rating (897 MVA) for the line fault with failed breaker contingency outage of 'DVP\_P4-2: 2014T2034'. This project contributes approximately 84.16 MW to the thermal violation.

CONTINGENCY 'DVP\_P4-2: 2014T2034'

/\* EARLEYS

OPEN BRANCH FROM BUS 314569 TO BUS 933450 CKT 1

/\* 2034

OPEN BRANCH FROM BUS 314569 TO BUS 314574 CKT 1

/\* 2014

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315294	1DOMTR10	8.39
315292	1DOMTR78	5.67
315293	1DOMTR9	4.63
314557	3BETHELC	0.51
314566	3CRESWEL	10.62
314620	6CASHIE	3.51
314574	6EVERETS	2.63
314594	6PLYMOTH	3.55
933451	AC2-158 C	22.79
933452	AC2-158 E	22.79
933991	AD1-023 C	54.49
933992	AD1-023 E	29.67
934521	AD1-076 C O1	224.91
934522	AD1-076 E O1	114.52
LTF	CARR	0.05
LTF	CBM-S1	2.55
LTF	CBM-S2	5.33
LTF	CBM-W1	5.57

<i>LTF</i>	<i>CBM-W2</i>	<i>13.78</i>
<i>LTF</i>	<i>CIN</i>	<i>1.25</i>
<i>LTF</i>	<i>CPLE</i>	<i>1.89</i>
<i>LTF</i>	<i>G-007</i>	<i>0.32</i>
<i>LTF</i>	<i>IPL</i>	<i>0.79</i>
<i>LTF</i>	<i>LGEE</i>	<i>0.27</i>
<i>LTF</i>	<i>MEC</i>	<i>2.83</i>
<i>LTF</i>	<i>MECS</i>	<i>1.26</i>
<i>LTF</i>	<i>O-066</i>	<i>1.06</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>0.04</i>
<i>LTF</i>	<i>ROSETON</i>	<i>0.27</i>
<i>LTF</i>	<i>WEC</i>	<i>0.34</i>
<i>916041</i>	<i>Z1-036 C</i>	<i>6.4</i>
<i>916042</i>	<i>Z1-036 E</i>	<i>218.56</i>
<i>917511</i>	<i>Z2-088 C OPI</i>	<i>0.7</i>
<i>917512</i>	<i>Z2-088 E OPI</i>	<i>2.81</i>
<i>918411</i>	<i>AA1-050</i>	<i>0.59</i>
<i>918531</i>	<i>AA1-067 C</i>	<i>0.36</i>
<i>918532</i>	<i>AA1-067 E</i>	<i>0.79</i>
<i>919731</i>	<i>AA2-059 C</i>	<i>1.1</i>
<i>919732</i>	<i>AA2-059 E</i>	<i>2.63</i>
<i>920691</i>	<i>AA2-178 C</i>	<i>42.47</i>
<i>920692</i>	<i>AA2-178 E</i>	<i>18.2</i>
<i>930051</i>	<i>AB1-013 C</i>	<i>12.82</i>
<i>930052</i>	<i>AB1-013 E</i>	<i>85.77</i>
<i>923941</i>	<i>AB2-035 C</i>	<i>0.22</i>

923942	AB2-035 E	0.09
924391	AB2-088 C	0.28
924392	AB2-088 E	0.13
924491	AB2-098 C	0.61
924492	AB2-098 E	0.26
925121	AB2-169 C	18.
925122	AB2-169 E	16.15
925281	AB2-186 C	2.98
925282	AB2-186 E	1.28
925291	AB2-188 C OI	10.47
925292	AB2-188 E OI	4.7
925591	AC1-034 C	4.38
925592	AC1-034 E	3.3
927021	AC1-189 C	7.26
927022	AC1-189 E	3.62

## Appendix 8

(DVP - DVP) The Z1-036 TAP-6S HERTFORD 230 kV line (from bus 916040 to bus 314662 ckt 1) loads from 79.88% to 85.36% (**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 49.14 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315294	1DOMTR10	5.68
315292	1DOMTR78	3.84
315293	1DOMTR9	3.13
315131	1EDGECEMA	6.42
315132	1EDGECEMB	6.42
315139	1GASTONA	2.57
315141	1GASTONB	2.57
315136	1ROSEMG1	1.83
315138	1ROSEMG2	0.86
315137	1ROSEMS1	1.14
314557	3BETHEL	0.69
314554	3BTLEBRO	0.54
314566	3CRESWEL	7.79
314578	3HORNRTN	2.19

<i>314582</i>	<i>3KELFORD</i>	<i>0.9</i>
<i>314603</i>	<i>3SCOT NK</i>	<i>3.1</i>
<i>314617</i>	<i>3TUNIS</i>	<i>0.8</i>
<i>314620</i>	<i>6CASHIE</i>	<i>1.83</i>
<i>314574</i>	<i>6EVERETS</i>	<i>2.87</i>
<i>314594</i>	<i>6PLYMOTH</i>	<i>2.34</i>
<i>932631</i>	<i>AC2-084 C</i>	<i>7.52</i>
<i>932632</i>	<i>AC2-084 E</i>	<i>3.7</i>
<i>933451</i>	<i>AC2-158 C</i>	<i>9.34</i>
<i>933452</i>	<i>AC2-158 E</i>	<i>9.34</i>
<i>933461</i>	<i>AC2-159 C</i>	<i>6.2</i>
<i>933462</i>	<i>AC2-159 E</i>	<i>6.2</i>
<i>933991</i>	<i>AD1-023 C</i>	<i>31.82</i>
<i>933992</i>	<i>AD1-023 E</i>	<i>17.32</i>
<i>934041</i>	<i>AD1-029 C</i>	<i>9.3</i>
<i>934042</i>	<i>AD1-029 E</i>	<i>6.13</i>
<i>934331</i>	<i>AD1-057 C O1</i>	<i>7.</i>
<i>934332</i>	<i>AD1-057 E O1</i>	<i>3.74</i>
<i>934521</i>	<i>AD1-076 C O1</i>	<i>145.11</i>
<i>934522</i>	<i>AD1-076 E O1</i>	<i>73.89</i>
<i>LTF</i>	<i>CARR</i>	<i>0.06</i>
<i>LTF</i>	<i>CBM-S1</i>	<i>3.81</i>
<i>LTF</i>	<i>CBM-S2</i>	<i>7.76</i>
<i>LTF</i>	<i>CBM-W1</i>	<i>8.48</i>
<i>LTF</i>	<i>CBM-W2</i>	<i>20.64</i>
<i>LTF</i>	<i>CIN</i>	<i>1.9</i>

<i>LTF</i>	<i>CPLE</i>	2.68
<i>LTF</i>	<i>G-007</i>	0.47
<i>LTF</i>	<i>IPL</i>	1.21
<i>LTF</i>	<i>LGEE</i>	0.41
<i>LTF</i>	<i>MEC</i>	4.27
<i>LTF</i>	<i>MECS</i>	1.94
<i>LTF</i>	<i>O-066</i>	1.55
<i>LTF</i>	<i>RENSSELAER</i>	0.05
<i>LTF</i>	<i>ROSETON</i>	0.38
900671	<i>V4-068 C</i>	0.07
900672	<i>V4-068 E</i>	0.21
<i>LTF</i>	<i>WEC</i>	0.52
916041	<i>Z1-036 C</i>	5.35
916042	<i>Z1-036 E</i>	182.46
917331	<i>Z2-043 C</i>	0.49
917332	<i>Z2-043 E</i>	1.08
917341	<i>Z2-044 C</i>	0.19
917342	<i>Z2-044 E</i>	0.41
917511	<i>Z2-088 C OP1</i>	0.89
917512	<i>Z2-088 E OP1</i>	3.58
918411	<i>AA1-050</i>	0.75
918511	<i>AA1-065 C OP</i>	2.57
918512	<i>AA1-065 E OP</i>	6.44
918531	<i>AA1-067 C</i>	0.39
918532	<i>AA1-067 E</i>	0.86
918561	<i>AA1-072 C</i>	0.07



918562	AA1-072 E	0.18
919691	AA2-053 C	1.32
919692	AA2-053 E	2.9
919701	AA2-057 C	1.02
919702	AA2-057 E	2.6
919731	AA2-059 C	0.9
919732	AA2-059 E	2.15
919821	AA2-068 C	0.34
919822	AA2-068 E	0.79
LTF	AA2-074	1.83
920591	AA2-165 C	0.14
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

924381	AB2-087 C	0.69
924382	AB2-087 E	0.33
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 OI	7.68
925292	AB2-188 E OI	3.45
925591	AC1-034 C	5.93
925592	AC1-034 E	4.47
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 9

(DVP - CPLE) The 6MORNSTR-6ROCKYMT230T 230 kV line (from bus 313845 to bus 304222 ckt 1) loads from 129.87% to 131.23% (**DC power flow**) of its emergency rating (374 MVA) for the tower line contingency outage of 'DVP\_P7-1: LN 81-2056'. This project contributes approximately 11.19 MW to the thermal violation.

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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315131	1EDGECEMA	24.8
315132	1EDGECEMB	24.8
315139	1GASTONA	4.01
315141	1GASTONB	4.01
315126	1ROARAP2	1.22
315128	1ROARAP4	1.18
315136	1ROSEMG1	3.36
315138	1ROSEMG2	1.57
315137	1ROSEMS1	2.09
314557	3BETHEL C	1.61

<i>314554</i>	<i>3BTLEBRO</i>	<i>1.08</i>
<i>314566</i>	<i>3CRESWEL</i>	<i>1.09</i>
<i>314572</i>	<i>3EMPORIA</i>	<i>0.27</i>
<i>314582</i>	<i>3KELFORD</i>	<i>0.7</i>
<i>314603</i>	<i>3SCOT NK</i>	<i>3.23</i>
<i>314617</i>	<i>3TUNIS</i>	<i>0.55</i>
<i>314541</i>	<i>3WATKINS</i>	<i>0.33</i>
<i>314620</i>	<i>6CASHIE</i>	<i>0.49</i>
<i>314574</i>	<i>6EVERETS</i>	<i>1.81</i>
<i>314594</i>	<i>6PLYMOTH</i>	<i>0.44</i>
<i>932631</i>	<i>AC2-084 C</i>	<i>9.38</i>
<i>932632</i>	<i>AC2-084 E</i>	<i>4.62</i>
<i>933451</i>	<i>AC2-158 C</i>	<i>3.44</i>
<i>933452</i>	<i>AC2-158 E</i>	<i>3.44</i>
<i>933461</i>	<i>AC2-159 C</i>	<i>4.87</i>
<i>933462</i>	<i>AC2-159 E</i>	<i>4.87</i>
<i>933991</i>	<i>AD1-023 C</i>	<i>7.25</i>
<i>933992</i>	<i>AD1-023 E</i>	<i>3.95</i>
<i>934041</i>	<i>AD1-029 C</i>	<i>11.6</i>
<i>934042</i>	<i>AD1-029 E</i>	<i>7.65</i>
<i>934201</i>	<i>AD1-047 C</i>	<i>5.53</i>
<i>934202</i>	<i>AD1-047 E</i>	<i>3.69</i>
<i>934331</i>	<i>AD1-057 C O1</i>	<i>19.78</i>
<i>934332</i>	<i>AD1-057 E O1</i>	<i>10.55</i>
<i>934521</i>	<i>AD1-076 C O1</i>	<i>28.49</i>
<i>934522</i>	<i>AD1-076 E O1</i>	<i>14.51</i>

<i>LTF</i>	<i>AMIL</i>	<i>0.38</i>
<i>LTF</i>	<i>BAYOU</i>	<i>1.98</i>
<i>LTF</i>	<i>BIG_CAJUN1</i>	<i>3.12</i>
<i>LTF</i>	<i>BIG_CAJUN2</i>	<i>6.28</i>
<i>LTF</i>	<i>BLUEG</i>	<i>1.99</i>
<i>LTF</i>	<i>CALDERWOOD</i>	<i>1.17</i>
<i>LTF</i>	<i>CANNELTON</i>	<i>0.38</i>
<i>LTF</i>	<i>CARR</i>	<i>&lt; 0.01</i>
<i>LTF</i>	<i>CATAWBA</i>	<i>1.14</i>
<i>LTF</i>	<i>CELEVELAND</i>	<i>3.25</i>
<i>LTF</i>	<i>CHEOAH</i>	<i>1.09</i>
<i>LTF</i>	<i>CHILHOWEE</i>	<i>0.38</i>
<i>LTF</i>	<i>CHOCTAW</i>	<i>2.13</i>
<i>LTF</i>	<i>CLIFTY</i>	<i>7.32</i>
<i>LTF</i>	<i>COTTONWOOD</i>	<i>7.76</i>
<i>LTF</i>	<i>DEARBORN</i>	<i>0.72</i>
<i>LTF</i>	<i>EDWARDS</i>	<i>0.61</i>
<i>LTF</i>	<i>ELMERSMITH</i>	<i>1.11</i>
<i>LTF</i>	<i>FARMERCITY</i>	<i>0.48</i>
<i>LTF</i>	<i>G-007A</i>	<i>0.76</i>
<i>LTF</i>	<i>GIBSON</i>	<i>0.69</i>
<i>LTF</i>	<i>HAMLET</i>	<i>4.52</i>
<i>LTF</i>	<i>MORGAN</i>	<i>3.43</i>
<i>LTF</i>	<i>NEWTON</i>	<i>1.68</i>
<i>LTF</i>	<i>O-066A</i>	<i>0.35</i>
<i>LTF</i>	<i>PRAIRIE</i>	<i>3.62</i>

<i>LTF</i>	<i>ROWAN</i>	<i>2.4</i>
<i>LTF</i>	<i>SANTEETLA</i>	<i>0.32</i>
<i>LTF</i>	<i>SMITHLAND</i>	<i>0.32</i>
<i>LTF</i>	<i>TATANKA</i>	<i>0.82</i>
<i>LTF</i>	<i>TILTON</i>	<i>0.73</i>
<i>LTF</i>	<i>TRIMBLE</i>	<i>0.38</i>
<i>LTF</i>	<i>TVA</i>	<i>1.45</i>
<i>LTF</i>	<i>UNIONPOWER</i>	<i>2.08</i>
<i>900671</i>	<i>V4-068 C</i>	<i>0.07</i>
<i>900672</i>	<i>V4-068 E</i>	<i>0.18</i>
<i>LTF</i>	<i>VFT</i>	<i>2.03</i>
<i>LTF</i>	<i>X1-078</i>	<i>0.59</i>
<i>917331</i>	<i>Z2-043 C</i>	<i>0.38</i>
<i>917332</i>	<i>Z2-043 E</i>	<i>0.84</i>
<i>917341</i>	<i>Z2-044 C</i>	<i>0.34</i>
<i>917342</i>	<i>Z2-044 E</i>	<i>0.75</i>
<i>917511</i>	<i>Z2-088 C OP1</i>	<i>1.68</i>
<i>917512</i>	<i>Z2-088 E OP1</i>	<i>6.74</i>
<i>917592</i>	<i>Z2-099 E</i>	<i>0.25</i>
<i>918411</i>	<i>AA1-050</i>	<i>1.41</i>
<i>918491</i>	<i>AA1-063AC OP</i>	<i>1.14</i>
<i>918492</i>	<i>AA1-063AE OP</i>	<i>2.74</i>
<i>918511</i>	<i>AA1-065 C OP</i>	<i>1.16</i>
<i>918512</i>	<i>AA1-065 E OP</i>	<i>2.92</i>
<i>918531</i>	<i>AA1-067 C</i>	<i>0.25</i>
<i>918532</i>	<i>AA1-067 E</i>	<i>0.54</i>

918561	AA1-072 C	0.06
918562	AA1-072 E	0.14
919691	AA2-053 C	1.27
919692	AA2-053 E	2.78
919701	AA2-057 C	1.72
919702	AA2-057 E	4.39
919821	AA2-068 C	0.51
919822	AA2-068 E	1.19
920022	AA2-086 E	0.14
920042	AA2-088 E	5.93
920591	AA2-165 C	0.23
920592	AA2-165 E	0.58
920671	AA2-174 C	0.06
920672	AA2-174 E	0.32
920691	AA2-178 C	4.34
920692	AA2-178 E	1.86
930051	AB1-013 C	1.31
930052	AB1-013 E	8.77
930401	AB1-081 C	14.55
930402	AB1-081 E	6.23
930861	AB1-132 C	15.61
930862	AB1-132 E	6.69
931231	AB1-173 C	1.56
931232	AB1-173 E	0.73
931241	AB1-173AC	1.56
931242	AB1-173AE	0.73

923801	AB2-015 C OI	3.93
923802	AB2-015 E OI	3.23
923911	AB2-031 C OI	1.54
923912	AB2-031 E OI	0.76
923941	AB2-035 C	0.68
923942	AB2-035 E	0.29
923991	AB2-040 C OI	5.07
923992	AB2-040 E OI	4.15
924151	AB2-059 C OI	17.14
924152	AB2-059 E OI	8.83
924381	AB2-087 C	0.4
924382	AB2-087 E	0.19
924391	AB2-088 C	0.87
924392	AB2-088 E	0.42
924491	AB2-098 C	0.42
924492	AB2-098 E	0.18
924501	AB2-099 C	0.4
924502	AB2-099 E	0.17
924511	AB2-100 C	8.29
924512	AB2-100 E	4.08
925121	AB2-169 C	4.03
925122	AB2-169 E	3.62
925171	AB2-174 C OI	4.74
925172	AB2-174 E OI	4.29
925291	AB2-188 C OI	1.07
925292	AB2-188 E OI	0.48



<i>925591</i>	<i>ACI-034 C</i>	<i>13.75</i>
<i>925592</i>	<i>ACI-034 E</i>	<i>10.37</i>
<i>926071</i>	<i>ACI-086 C</i>	<i>22.99</i>
<i>926072</i>	<i>ACI-086 E</i>	<i>10.47</i>
<i>926201</i>	<i>ACI-098 C</i>	<i>6.58</i>
<i>926202</i>	<i>ACI-098 E</i>	<i>3.92</i>
<i>926211</i>	<i>ACI-099 C</i>	<i>2.2</i>
<i>926212</i>	<i>ACI-099 E</i>	<i>1.29</i>
<i>926771</i>	<i>ACI-163 C</i>	<i>1.32</i>
<i>926772</i>	<i>ACI-163 E</i>	<i>0.62</i>
<i>927021</i>	<i>ACI-189 C</i>	<i>12.21</i>
<i>927022</i>	<i>ACI-189 E</i>	<i>6.08</i>
<i>927111</i>	<i>ACI-206 C</i>	<i>6.69</i>
<i>927112</i>	<i>ACI-206 E</i>	<i>3.16</i>
<i>927141</i>	<i>ACI-208 C</i>	<i>10.44</i>
<i>927142</i>	<i>ACI-208 E</i>	<i>4.63</i>

## Appendix 10

(DVP - DVP) The 8ELMONT 500/230 kV transformer (from bus 314218 to bus 314908 ckt 1) loads from 119.5% to 120.15% (**DC power flow**) of its load dump rating (1051 MVA) for the line fault with failed breaker contingency outage of 'DVP\_P4-2: H2T557'. This project contributes approximately 17.43 MW to the thermal violation.

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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315067	1DARBY 1	4.99
315068	1DARBY 2	4.99
315069	1DARBY 3	5.01
315070	1DARBY 4	5.01
315043	1FOUR RIVERA	6.63
315044	1FOUR RIVERB	5.13
315045	1FOUR RIVERC	6.63
315046	1FOUR RIVERD	5.13
315047	1FOUR RIVERE	5.13
315048	1FOUR RIVERF	6.63
315074	1HOPCGN1	11.28
315075	1HOPCGN2	11.14
315083	1SPRUNCA	14.95
315084	1SPRUNCB	14.95
315085	1SPRUNCC	11.08

315086	1SPRUNCD	11.08
315073	1STONECA	9.36
314566	3CRESWEL	2.11
314572	3EMPORIA	0.36
314315	3LOCKS E	1.65
314617	3TUNIS	0.71
314539	3UNCAMP	2.19
314541	3WATKINS	0.61
314620	6CASHIE	0.72
314229	6MT RD221	1.41
314236	6NRTHEST	0.37
314189	6PAPERMILL	8.82
314594	6PLYMOTH	0.73
314250	6ROCKVILLE	0.4
314256	6ROCKVILLE E	1.15
314648	6SUNBURY	0.81
314651	6WINFALL	1.59
932041	AC2-012 C	9.62
932042	AC2-012 E	15.7
932501	AC2-070 C	2.9
932502	AC2-070 E	1.2
932531	AC2-073 C	3.1
932532	AC2-073 E	1.56
932581	AC2-078 C	4.75
932582	AC2-078 E	7.75
932591	AC2-079 C	6.82

932592	AC2-079 E	11.13
932831	AC2-110 C	1.74
932832	AC2-110 E	2.84
933061	AC2-130	3.48
933071	AC2-131 1	2.36
933081	AC2-131 2	1.07
933111	AC2-132 1	1.24
933121	AC2-132 2	0.63
933261	AC2-137 C	3.16
933262	AC2-137 E	2.05
933271	AC2-138 C	0.87
933272	AC2-138 E	1.09
933291	AC2-141 C	27.16
933292	AC2-141 E	11.59
933451	AC2-158 C	4.63
933452	AC2-158 E	4.63
933471	AC2-161 C	2.47
933472	AC2-161 E	1.27
933481	AC2-162 C	4.17
933482	AC2-162 E	2.15
933711	AC2-194 C	0.98
933712	AC2-194 E	1.59
933731	AC2-196 C	1.66
933732	AC2-196 E	1.1
933991	AD1-023 C	11.29
933992	AD1-023 E	6.14

934011	AD1-025 C OI	20.82
934012	AD1-025 E OI	12.33
934061	AD1-033 C OI	6.96
934062	AD1-033 E OI	4.64
934071	AD1-034 C OI	10.6
934072	AD1-034 E OI	6.87
934141	AD1-041 C OI	6.74
934142	AD1-041 E OI	4.49
934191	AD1-046 C	4.71
934192	AD1-046 E	3.14
934201	AD1-047 C	6.75
934202	AD1-047 E	4.5
934211	AD1-048 C	3.82
934212	AD1-048 E	1.93
934391	AD1-063 C	2.1
934392	AD1-063 E	1.4
934521	AD1-076 C OI	46.88
934522	AD1-076 E OI	23.87
934571	AD1-082 C OI	8.27
934572	AD1-082 E OI	4.72
934781	AD1-105 C	8.08
934782	AD1-105 E	5.62
LTF	AD1-120	5.93
LTF	AD1-121	5.89
935111	AD1-144 C	1.68
935112	AD1-144 E	0.92

935161	AD1-151 C O1	19.89
935162	AD1-151 E O1	13.26
935211	AD1-156 C	2.56
935212	AD1-156 E	1.71
LTF	CARR	0.67
LTF	CBM-S1	3.86
LTF	CBM-S2	13.84
LTF	CBM-W1	0.21
LTF	CBM-W2	17.91
LTF	CIN	0.13
LTF	CLIFTY	1.62
LTF	CPL	4.75
LTF	DEARBORN	0.47
LTF	G-007	2.31
LTF	IPL	0.06
LTF	LGEE	0.05
LTF	MEC	1.99
LTF	O-066	7.73
LTF	RENSSELAER	0.53
LTF	ROSETON	3.84
292791	U1-032 E	4.87
297087	V2-040	0.28
900672	V4-068 E	0.26
901082	W1-029E	41.82
LTF	WEC	0.06
907092	X1-038 E	5.47

913392	Y1-086 E	1.99
916042	Z1-036 E	40.84
916192	Z1-068 E	1.76
917122	Z2-027 E	0.96
917592	Z2-099 E	0.38
918492	AA1-063AE OP	3.35
918512	AA1-065 E OP	3.74
918691	AA1-083	1.16
919152	AA1-139 E	5.92
919211	AA1-145	19.79
919732	AA2-059 E	0.5
LTF	AA2-074	3.23
920022	AA2-086 E	0.21
920042	AA2-088 E	9.15
920691	AA2-178 C	8.43
920692	AA2-178 E	3.61
930051	AB1-013 C	2.54
930052	AB1-013 E	17.02
930121	AB1-027 C	0.87
930122	AB1-027 E	1.89
930861	AB1-132 C	11.78
930862	AB1-132 E	5.05
931231	AB1-173 C	1.9
931232	AB1-173 E	0.89
931241	AB1-173AC	1.9
931242	AB1-173AE	0.89

923801	AB2-015 C OI	7.73
923802	AB2-015 E OI	6.34
923831	AB2-022 C	2.1
923832	AB2-022 E	1.13
923842	AB2-024 E	1.49
923852	AB2-025 E	1.09
923862	AB2-026 E	0.88
923911	AB2-031 C OI	1.88
923912	AB2-031 E OI	0.93
923991	AB2-040 C OI	6.19
923992	AB2-040 E OI	5.06
924061	AB2-050	1.16
924071	AB2-051	128.86
924241	AB2-068 OI	177.95
924381	AB2-087 C	0.48
924382	AB2-087 E	0.22
924501	AB2-099 C	0.49
924502	AB2-099 E	0.21
924511	AB2-100 C	10.48
924512	AB2-100 E	5.16
924811	AB2-134 C OI	15.87
924812	AB2-134 E OI	15.6
925051	AB2-160 C OI	7.18
925052	AB2-160 E OI	11.71
925061	AB2-161 C OI	3.63
925062	AB2-161 E OI	5.92



925171	AB2-174 C O1	5.96
925172	AB2-174 E O1	5.39
925281	AB2-186 C	0.55
925282	AB2-186 E	0.24
925291	AB2-188 C O1	2.08
925292	AB2-188 E O1	0.93
925331	AB2-190 C	24.76
925332	AB2-190 E	10.61
925522	AC1-027 E	1.07
925692	AC1-045 E	0.92
925861	AC1-065 C	4.36
925862	AC1-065 E	7.11
926071	AC1-086 C	17.34
926072	AC1-086 E	7.89
926291	AC1-107	268.61
926411	AC1-112 C	0.68
926412	AC1-112 E	1.93
926441	AC1-115 C	1.01
926442	AC1-115 E	1.64
926472	AC1-118 E	1.07
926551	AC1-134	14.83
926662	AC1-147 E	1.25
926741	AC1-159	62.13
926751	AC1-161 C	27.16
926752	AC1-161 E	11.59
926771	AC1-163 C	1.63

<i>926772</i>	<i>ACI-163 E</i>	<i>0.76</i>
<i>926781</i>	<i>ACI-164 C</i>	<i>58.41</i>
<i>926782</i>	<i>ACI-164 E</i>	<i>26.24</i>
<i>927041</i>	<i>ACI-191 C</i>	<i>17.46</i>
<i>927042</i>	<i>ACI-191 E</i>	<i>8.7</i>
<i>927111</i>	<i>ACI-206 C</i>	<i>9.15</i>
<i>927112</i>	<i>ACI-206 E</i>	<i>4.32</i>
<i>927221</i>	<i>ACI-216 C O1</i>	<i>12.11</i>
<i>927222</i>	<i>ACI-216 E O1</i>	<i>9.53</i>

## Appendix 11

(DVP - DVP) The 6CHESTF B-6BASIN 230 kV line (from bus 314287 to bus 314276 ckt 1) loads from 121.49% to 121.95% (**DC power flow**) of its emergency rating (449 MVA) for the single line contingency outage of 'DVP\_P1-2: LN 563'. This project contributes approximately 4.54 MW to the thermal violation.

CONTINGENCY 'DVP\_P1-2: LN 563'

OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1

/\* 8CARSON

500.00 - 8MDLTHAN 500.00

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315065	1CHESTF6	33.33
315131	1EDGECSMA	3.18
315132	1EDGECSMB	3.18
315139	1GASTONA	1.58
315141	1GASTONB	1.58
315119	1GRAVEL3	1.24
315120	1GRAVEL4	1.26
315121	1GRAVEL5	1.24
315122	1GRAVEL6	1.26
315117	1GRAVELC	0.43
315074	1HOPCGN1	5.63
315075	1HOPCGN2	5.56
315077	1HOPHCF1	1.78
315078	1HOPHCF2	1.78
315079	1HOPHCF3	1.78
315080	1HOPHCF4	2.7
315076	1HOPPOLC	1.27
315116	1SURRY 1	12.47

<i>314314</i>	<i>3LOCKS</i>	<i>0.06</i>
<i>314315</i>	<i>3LOCKS E</i>	<i>0.77</i>
<i>932041</i>	<i>AC2-012 C</i>	<i>3.21</i>
<i>932581</i>	<i>AC2-078 C</i>	<i>2.86</i>
<i>932591</i>	<i>AC2-079 C</i>	<i>3.07</i>
<i>932631</i>	<i>AC2-084 C</i>	<i>3.22</i>
<i>932701</i>	<i>AC2-093 C</i>	<i>23.37</i>
<i>933451</i>	<i>AC2-158 C</i>	<i>1.94</i>
<i>933461</i>	<i>AC2-159 C</i>	<i>2.55</i>
<i>933471</i>	<i>AC2-161 C</i>	<i>0.89</i>
<i>933711</i>	<i>AC2-194 C</i>	<i>0.35</i>
<i>933731</i>	<i>AC2-196 C</i>	<i>0.55</i>
<i>933991</i>	<i>AD1-023 C</i>	<i>4.54</i>
<i>934011</i>	<i>AD1-025 C OI</i>	<i>9.21</i>
<i>934041</i>	<i>AD1-029 C</i>	<i>3.98</i>
<i>934061</i>	<i>AD1-033 C OI</i>	<i>2.31</i>
<i>934071</i>	<i>AD1-034 C OI</i>	<i>4.93</i>
<i>934201</i>	<i>AD1-047 C</i>	<i>3.58</i>
<i>934331</i>	<i>AD1-057 C OI</i>	<i>3.86</i>
<i>934521</i>	<i>AD1-076 C OI</i>	<i>18.6</i>
<i>934571</i>	<i>AD1-082 C OI</i>	<i>4.27</i>
<i>935111</i>	<i>AD1-144 C</i>	<i>0.56</i>
<i>935161</i>	<i>AD1-151 C OI</i>	<i>8.8</i>
<i>935211</i>	<i>AD1-156 C</i>	<i>1.97</i>
<i>LTF</i>	<i>CARR</i>	<i>0.2</i>
<i>LTF</i>	<i>CBM-SI</i>	<i>3.34</i>

<i>LTF</i>	<i>CBM-S2</i>	<i>7.3</i>
<i>LTF</i>	<i>CBM-W1</i>	<i>6.1</i>
<i>LTF</i>	<i>CBM-W2</i>	<i>17.57</i>
<i>LTF</i>	<i>CIN</i>	<i>1.4</i>
<i>LTF</i>	<i>CPLE</i>	<i>2.35</i>
<i>LTF</i>	<i>IPL</i>	<i>0.89</i>
<i>LTF</i>	<i>LGEE</i>	<i>0.31</i>
<i>LTF</i>	<i>MEC</i>	<i>3.38</i>
<i>LTF</i>	<i>MECS</i>	<i>1.11</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>0.16</i>
<i>LTF</i>	<i>ROSETON</i>	<i>1.15</i>
<i>LTF</i>	<i>WEC</i>	<i>0.39</i>
<i>914231</i>	<i>Y2-077</i>	<i>0.72</i>
<i>LTF</i>	<i>AA2-074</i>	<i>1.6</i>
<i>920631</i>	<i>AA2-169 C</i>	<i>0.75</i>
<i>920691</i>	<i>AA2-178 C</i>	<i>3.22</i>
<i>930051</i>	<i>AB1-013 C</i>	<i>0.97</i>
<i>930401</i>	<i>AB1-081 C</i>	<i>3.05</i>
<i>930861</i>	<i>AB1-132 C</i>	<i>6.17</i>
<i>931231</i>	<i>AB1-173 C</i>	<i>1.01</i>
<i>931241</i>	<i>AB1-173AC</i>	<i>1.01</i>
<i>923801</i>	<i>AB2-015 C OI</i>	<i>3.22</i>
<i>923831</i>	<i>AB2-022 C</i>	<i>0.73</i>
<i>923851</i>	<i>AB2-025 C</i>	<i>0.31</i>
<i>923911</i>	<i>AB2-031 C OI</i>	<i>1.</i>
<i>923941</i>	<i>AB2-035 C</i>	<i>0.11</i>

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

<i>927221</i>	<i>ACI-216 C OI</i>	<i>5.36</i>
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## Appendix 12

(DVP - DVP) The 6CLUBHSE-6SAPONY 230 kV line (from bus 314563 to bus 314435 ckt 1) loads from 113.17% to 116.21% (**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 19.28 MW to the thermal violation.

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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
  
```

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315131	1EDGECEMA	10.81
315132	1EDGECEMB	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 OI	8.45
934521	AD1-076 C OI	47.2
934522	AD1-076 E OI	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	CPL	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 OPI	1.07
917512	Z2-088 E OPI	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 OI	6.23
924161	AB2-060 C OI	7.59
924162	AB2-060 E OI	3.57
924301	AB2-077 C OI	1.68
924302	AB2-077 E OI	1.12
924311	AB2-078 C OI	1.68
924312	AB2-078 E OI	1.12
924321	AB2-079 C OI	1.68
924322	AB2-079 E OI	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 OI	16.16

925172	AB2-174 E OI	14.62
925221	AB2-176 C	1.39
925222	AB2-176 E	0.59
925291	AB2-188 C OI	1.67
925292	AB2-188 E OI	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 13

(DVP - CPLE) The 6EVERETS-6GREENVILE T 230 kV line (from bus 314574 to bus 304451 ckt 1) loads from 112.7% to 117.05% (**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 20.79 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315294	1DOMTR10	3.12
315292	1DOMTR78	2.11
315293	1DOMTR9	1.72
315131	1EDGECEMA	9.28
315132	1EDGECEMB	9.28
315136	1ROSEMG1	1.98
315138	1ROSEMG2	0.93
315137	1ROSEMS1	1.23
314557	3BETHEL	1.14
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	6.16
932632	AC2-084 E	3.04
933451	AC2-158 C	5.87
933452	AC2-158 E	5.87
933461	AC2-159 C	5.22
933462	AC2-159 E	5.22
933711	AC2-194 C	0.6
933712	AC2-194 E	0.97
933991	AD1-023 C	13.46
933992	AD1-023 E	7.33
934041	AD1-029 C	7.62
934042	AD1-029 E	5.02
934201	AD1-047 C	4.28
934202	AD1-047 E	2.86
934331	AD1-057 C O1	8.8
934332	AD1-057 E O1	4.69
934521	AD1-076 C O1	54.73



934522	AD1-076 E O1	27.87
LTF	AMIL	0.48
LTF	BAYOU	2.64
LTF	BIG_CAJUN1	4.17
LTF	BIG_CAJUN2	8.39
LTF	BLUEG	2.5
LTF	CALDERWOOD	1.54
LTF	CANNELTON	0.48
LTF	CATAWBA	1.51
LTF	CBM-N	< 0.01
LTF	CELEVELAND	4.27
LTF	CHEOAH	1.44
LTF	CHILHOWEE	0.5
LTF	CHOCTAW	2.84
LTF	CLIFTY	9.05
LTF	COTTONWOOD	10.33
LTF	DEARBORN	0.9
LTF	EDWARDS	0.78
LTF	ELMERSMITH	1.42
LTF	FARMERCITY	0.62
LTF	G-007A	1.03
LTF	GIBSON	0.88
LTF	HAMLET	6.47
LTF	MORGAN	4.57
LTF	NEWTON	2.15
LTF	NYISO	0.09

<i>LTF</i>	<i>O-066A</i>	<i>0.47</i>
<i>LTF</i>	<i>PRAIRIE</i>	<i>4.69</i>
<i>LTF</i>	<i>ROWAN</i>	<i>2.99</i>
<i>LTF</i>	<i>SANTEETLA</i>	<i>0.43</i>
<i>LTF</i>	<i>SMITHLAND</i>	<i>0.42</i>
<i>LTF</i>	<i>TATANKA</i>	<i>1.05</i>
<i>LTF</i>	<i>TILTON</i>	<i>0.92</i>
<i>LTF</i>	<i>TRIMBLE</i>	<i>0.47</i>
<i>LTF</i>	<i>TVA</i>	<i>1.92</i>
<i>LTF</i>	<i>UNIONPOWER</i>	<i>2.74</i>
<i>900672</i>	<i>V4-068 E</i>	<i>0.21</i>
<i>LTF</i>	<i>VFT</i>	<i>2.75</i>
<i>901082</i>	<i>W1-029E</i>	<i>23.36</i>
<i>907092</i>	<i>X1-038 E</i>	<i>2.96</i>
<i>LTF</i>	<i>X1-078</i>	<i>0.8</i>
<i>913392</i>	<i>Y1-086 E</i>	<i>1.05</i>
<i>916042</i>	<i>Z1-036 E</i>	<i>29.11</i>
<i>917122</i>	<i>Z2-027 E</i>	<i>0.51</i>
<i>917331</i>	<i>Z2-043 C</i>	<i>0.39</i>
<i>917332</i>	<i>Z2-043 E</i>	<i>0.86</i>
<i>917342</i>	<i>Z2-044 E</i>	<i>0.33</i>
<i>917511</i>	<i>Z2-088 C OPI</i>	<i>1.52</i>
<i>917512</i>	<i>Z2-088 E OPI</i>	<i>6.13</i>
<i>917592</i>	<i>Z2-099 E</i>	<i>0.26</i>
<i>918411</i>	<i>AA1-050</i>	<i>1.28</i>
<i>918492</i>	<i>AA1-063AE OP</i>	<i>2.44</i>

<i>918511</i>	<i>AA1-065 C OP</i>	<i>1.93</i>
<i>918512</i>	<i>AA1-065 E OP</i>	<i>4.84</i>
<i>918531</i>	<i>AA1-067 C</i>	<i>0.74</i>
<i>918532</i>	<i>AA1-067 E</i>	<i>1.62</i>
<i>918561</i>	<i>AA1-072 C</i>	<i>0.06</i>
<i>918562</i>	<i>AA1-072 E</i>	<i>0.14</i>
<i>919692</i>	<i>AA2-053 E</i>	<i>2.58</i>
<i>919702</i>	<i>AA2-057 E</i>	<i>2.12</i>
<i>919732</i>	<i>AA2-059 E</i>	<i>0.38</i>
<i>919822</i>	<i>AA2-068 E</i>	<i>0.66</i>
<i>920022</i>	<i>AA2-086 E</i>	<i>0.14</i>
<i>920042</i>	<i>AA2-088 E</i>	<i>6.24</i>
<i>920592</i>	<i>AA2-165 E</i>	<i>0.28</i>
<i>920672</i>	<i>AA2-174 E</i>	<i>0.3</i>
<i>920691</i>	<i>AA2-178 C</i>	<i>8.16</i>
<i>920692</i>	<i>AA2-178 E</i>	<i>3.5</i>
<i>930051</i>	<i>AB1-013 C</i>	<i>2.46</i>
<i>930052</i>	<i>AB1-013 E</i>	<i>16.47</i>
<i>930401</i>	<i>AB1-081 C</i>	<i>5.63</i>
<i>930402</i>	<i>AB1-081 E</i>	<i>2.41</i>
<i>930861</i>	<i>AB1-132 C</i>	<i>10.35</i>
<i>930862</i>	<i>AB1-132 E</i>	<i>4.44</i>
<i>931231</i>	<i>AB1-173 C</i>	<i>1.2</i>
<i>931232</i>	<i>AB1-173 E</i>	<i>0.56</i>
<i>931241</i>	<i>AB1-173AC</i>	<i>1.2</i>
<i>931242</i>	<i>AB1-173AE</i>	<i>0.56</i>

923801	AB2-015 C O1	4.39
923802	AB2-015 E O1	3.6
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	3.21
924151	AB2-059 C O1	6.64
924152	AB2-059 E O1	3.42
924381	AB2-087 C	0.54
924382	AB2-087 E	0.26
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	10.01
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 OI	2.01
925292	AB2-188 E OI	0.9
925591	ACI-034 C	9.79
925592	ACI-034 E	7.38
926071	ACI-086 C	15.25
926072	ACI-086 E	6.94
926201	ACI-098 C	4.32
926202	ACI-098 E	2.58
926211	ACI-099 C	1.45
926212	ACI-099 E	0.85
LTF	ACI-133	22.49
926771	ACI-163 C	1.74
926772	ACI-163 E	0.81
927021	ACI-189 C	15.45
927022	ACI-189 E	7.7
927111	ACI-206 C	4.78
927112	ACI-206 E	2.26
927141	ACI-208 C	5.74
927142	ACI-208 E	2.55

## Appendix 14

(DVP - DVP) The 6ELIZ CT-6SHAWBRO 230 kV line (from bus 314638 to bus 314647 ckt 1) loads from 106.72% to 112.81% (**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 42.51 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
  
```

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315294	1DOMTR10	4.91
315292	1DOMTR78	3.32
315293	1DOMTR9	2.71
315139	1GASTONA	2.23
315141	1GASTONB	2.23
315136	1ROSEMG1	1.59
315138	1ROSEMG2	0.74
315137	1ROSEMS1	0.98
314557	3BETHELC	0.6
314566	3CRESWEL	6.73
314582	3KELFORD	0.78

<i>314603</i>	<i>3SCOT NK</i>	<i>2.7</i>
<i>314617</i>	<i>3TUNIS</i>	<i>0.7</i>
<i>314620</i>	<i>6CASHIE</i>	<i>1.59</i>
<i>314574</i>	<i>6EVERETS</i>	<i>2.49</i>
<i>314594</i>	<i>6PLYMOTH</i>	<i>2.03</i>
<i>314651</i>	<i>6WINFALL</i>	<i>6.57</i>
<i>932631</i>	<i>AC2-084 C</i>	<i>6.53</i>
<i>932632</i>	<i>AC2-084 E</i>	<i>3.22</i>
<i>933451</i>	<i>AC2-158 C</i>	<i>8.08</i>
<i>933452</i>	<i>AC2-158 E</i>	<i>8.08</i>
<i>933461</i>	<i>AC2-159 C</i>	<i>5.4</i>
<i>933462</i>	<i>AC2-159 E</i>	<i>5.4</i>
<i>933711</i>	<i>AC2-194 C</i>	<i>4.07</i>
<i>933712</i>	<i>AC2-194 E</i>	<i>6.57</i>
<i>933991</i>	<i>AD1-023 C</i>	<i>27.52</i>
<i>933992</i>	<i>AD1-023 E</i>	<i>14.98</i>
<i>934041</i>	<i>AD1-029 C</i>	<i>8.08</i>
<i>934042</i>	<i>AD1-029 E</i>	<i>5.32</i>
<i>934521</i>	<i>AD1-076 C O1</i>	<i>125.48</i>
<i>934522</i>	<i>AD1-076 E O1</i>	<i>63.89</i>
<i>LTF</i>	<i>CARR</i>	<i>0.07</i>
<i>LTF</i>	<i>CBM-S1</i>	<i>3.23</i>
<i>LTF</i>	<i>CBM-S2</i>	<i>6.64</i>
<i>LTF</i>	<i>CBM-W1</i>	<i>7.05</i>
<i>LTF</i>	<i>CBM-W2</i>	<i>17.41</i>
<i>LTF</i>	<i>CIN</i>	<i>1.58</i>

<i>LTF</i>	<i>CPLE</i>	<i>2.31</i>
<i>LTF</i>	<i>G-007</i>	<i>0.43</i>
<i>LTF</i>	<i>IPL</i>	<i>1.01</i>
<i>LTF</i>	<i>LGEE</i>	<i>0.34</i>
<i>LTF</i>	<i>MEC</i>	<i>3.58</i>
<i>LTF</i>	<i>MECS</i>	<i>1.59</i>
<i>LTF</i>	<i>O-066</i>	<i>1.43</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>0.05</i>
<i>LTF</i>	<i>ROSETON</i>	<i>0.38</i>
<i>900671</i>	<i>V4-068 C</i>	<i>0.07</i>
<i>900672</i>	<i>V4-068 E</i>	<i>0.18</i>
<i>901081</i>	<i>W1-029C</i>	<i>5.03</i>
<i>901082</i>	<i>W1-029E</i>	<i>171.41</i>
<i>LTF</i>	<i>WEC</i>	<i>0.44</i>
<i>913391</i>	<i>Y1-086 C</i>	<i>1.08</i>
<i>913392</i>	<i>Y1-086 E</i>	<i>8.99</i>
<i>916041</i>	<i>Z1-036 C</i>	<i>4.62</i>
<i>916042</i>	<i>Z1-036 E</i>	<i>157.7</i>
<i>917121</i>	<i>Z2-027 C</i>	<i>1.99</i>
<i>917122</i>	<i>Z2-027 E</i>	<i>4.35</i>
<i>917331</i>	<i>Z2-043 C</i>	<i>0.43</i>
<i>917332</i>	<i>Z2-043 E</i>	<i>0.94</i>
<i>917511</i>	<i>Z2-088 C OPI</i>	<i>0.77</i>
<i>917512</i>	<i>Z2-088 E OPI</i>	<i>3.1</i>
<i>918411</i>	<i>AA1-050</i>	<i>0.65</i>
<i>918511</i>	<i>AA1-065 C OP</i>	<i>2.22</i>



<i>918512</i>	<i>AA1-065 E OP</i>	<i>5.58</i>
<i>918531</i>	<i>AA1-067 C</i>	<i>0.34</i>
<i>918532</i>	<i>AA1-067 E</i>	<i>0.75</i>
<i>918561</i>	<i>AA1-072 C</i>	<i>0.06</i>
<i>918562</i>	<i>AA1-072 E</i>	<i>0.16</i>
<i>919691</i>	<i>AA2-053 C</i>	<i>1.15</i>
<i>919692</i>	<i>AA2-053 E</i>	<i>2.52</i>
<i>919701</i>	<i>AA2-057 C</i>	<i>0.89</i>
<i>919702</i>	<i>AA2-057 E</i>	<i>2.26</i>
<i>919731</i>	<i>AA2-059 C</i>	<i>0.77</i>
<i>919732</i>	<i>AA2-059 E</i>	<i>1.86</i>
<i>919821</i>	<i>AA2-068 C</i>	<i>0.29</i>
<i>919822</i>	<i>AA2-068 E</i>	<i>0.69</i>
<i>LTF</i>	<i>AA2-074</i>	<i>1.57</i>
<i>920591</i>	<i>AA2-165 C</i>	<i>0.12</i>
<i>920592</i>	<i>AA2-165 E</i>	<i>0.3</i>
<i>920671</i>	<i>AA2-174 C</i>	<i>0.05</i>
<i>920672</i>	<i>AA2-174 E</i>	<i>0.29</i>
<i>920691</i>	<i>AA2-178 C</i>	<i>26.93</i>
<i>920692</i>	<i>AA2-178 E</i>	<i>11.54</i>
<i>930051</i>	<i>ABI-013 C</i>	<i>8.13</i>
<i>930052</i>	<i>ABI-013 E</i>	<i>54.39</i>
<i>930861</i>	<i>ABI-132 C</i>	<i>8.68</i>
<i>930862</i>	<i>ABI-132 E</i>	<i>3.72</i>
<i>923831</i>	<i>AB2-022 C</i>	<i>9.92</i>
<i>923832</i>	<i>AB2-022 E</i>	<i>5.34</i>

923941	AB2-035 C	0.25
923942	AB2-035 E	0.11
924381	AB2-087 C	0.6
924382	AB2-087 E	0.28
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 OI	6.64
925292	AB2-188 E OI	2.98
925591	AC1-034 C	5.13
925592	AC1-034 E	3.87
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

<i>927021</i>	<i>ACI-189 C</i>	<i>7.54</i>
<i>927022</i>	<i>ACI-189 E</i>	<i>3.75</i>
<i>927141</i>	<i>ACI-208 C</i>	<i>5.8</i>
<i>927142</i>	<i>ACI-208 E</i>	<i>2.58</i>

## Appendix 15

(DVP - DVP) The 8CHCKAHM-8ELMONT 500 kV line (from bus 314903 to bus 314908 ckt 1) loads from 116.82% to 117.29% (**DC power flow**) of its load dump rating (3144 MVA) for the line fault with failed breaker contingency outage of 'DVP\_P4-2: 563T576'. This project contributes approximately 32.22 MW to the thermal violation.

CONTINGENCY 'DVP\_P4-2: 563T576' /\* MIDLOTHIAN 500 500 KV  
 OPEN BRANCH FROM BUS 314902 TO BUS 314914 CKT 1 /\* 8CARSON  
 500.00 - 8MDLTHAN 500.00  
 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /\* 8MDLTHAN  
 500.00 - 8NO ANNA 500.00  
 END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315131	1EDGECEMA	11.78
315132	1EDGECEMB	11.78
315108	1ELIZAR1	7.
315109	1ELIZAR2	6.88
315110	1ELIZAR3	7.09
315074	1HOPCGN1	10.5
315075	1HOPCGN2	10.36
315073	1STONECA	8.71
315233	1SURRY 2	62.92
315092	1YORKTN3	52.2
314557	3BETHEL C	1.05
314554	3BTLEBRO	1.02
314566	3CRESWEL	3.96
314572	3EMPORIA	0.55
314578	3HORNRTN	4.49
314582	3KELFORD	1.2
314315	3LOCKS E	1.42

<i>314603</i>	<i>3SCOT NK</i>	<i>4.61</i>
<i>314617</i>	<i>3TUNIS</i>	<i>1.26</i>
<i>314539</i>	<i>3UNCAMP</i>	<i>3.88</i>
<i>314541</i>	<i>3WATKINS</i>	<i>1.08</i>
<i>314620</i>	<i>6CASHIE</i>	<i>1.33</i>
<i>314574</i>	<i>6EVERETS</i>	<i>3.37</i>
<i>314189</i>	<i>6PAPERMILL</i>	<i>10.95</i>
<i>314594</i>	<i>6PLYMOTH</i>	<i>1.37</i>
<i>314648</i>	<i>6SUNBURY</i>	<i>1.55</i>
<i>314421</i>	<i>6WINCHST</i>	<i>0.33</i>
<i>314651</i>	<i>6WINFALL</i>	<i>3.04</i>
<i>932041</i>	<i>AC2-012 C</i>	<i>18.53</i>
<i>932042</i>	<i>AC2-012 E</i>	<i>30.23</i>
<i>932531</i>	<i>AC2-073 C</i>	<i>3.89</i>
<i>932532</i>	<i>AC2-073 E</i>	<i>1.96</i>
<i>932581</i>	<i>AC2-078 C</i>	<i>5.46</i>
<i>932582</i>	<i>AC2-078 E</i>	<i>8.91</i>
<i>932591</i>	<i>AC2-079 C</i>	<i>10.89</i>
<i>932592</i>	<i>AC2-079 E</i>	<i>17.77</i>
<i>932631</i>	<i>AC2-084 C</i>	<i>12.06</i>
<i>932632</i>	<i>AC2-084 E</i>	<i>5.94</i>
<i>932701</i>	<i>AC2-093 C</i>	<i>104.49</i>
<i>932702</i>	<i>AC2-093 E</i>	<i>59.77</i>
<i>932831</i>	<i>AC2-110 C</i>	<i>2.14</i>
<i>932832</i>	<i>AC2-110 E</i>	<i>3.5</i>
<i>933061</i>	<i>AC2-130</i>	<i>3.11</i>

933071	AC2-131 1	2.1
933081	AC2-131 2	0.96
933111	AC2-132 1	1.11
933121	AC2-132 2	0.57
933261	AC2-137 C	2.87
933262	AC2-137 E	1.87
933271	AC2-138 C	0.94
933272	AC2-138 E	1.18
933291	AC2-141 C	59.42
933292	AC2-141 E	25.36
933451	AC2-158 C	8.43
933452	AC2-158 E	8.43
933461	AC2-159 C	9.5
933462	AC2-159 E	9.5
933471	AC2-161 C	4.04
933472	AC2-161 E	2.08
933711	AC2-194 C	1.88
933712	AC2-194 E	3.04
933731	AC2-196 C	3.26
933732	AC2-196 E	2.17
933991	AD1-023 C	20.86
933992	AD1-023 E	11.36
934011	AD1-025 C OI	24.53
934012	AD1-025 E OI	14.53
934041	AD1-029 C	14.92
934042	AD1-029 E	9.83

934061	AD1-033 C OI	13.67
934062	AD1-033 E OI	9.12
934071	AD1-034 C OI	9.11
934072	AD1-034 E OI	5.91
934141	AD1-041 C OI	8.48
934142	AD1-041 E OI	5.65
934201	AD1-047 C	10.68
934202	AD1-047 E	7.12
934211	AD1-048 C	2.72
934212	AD1-048 E	1.37
934231	AD1-050 C	5.54
934232	AD1-050 E	3.03
934331	AD1-057 C OI	13.1
934332	AD1-057 E OI	6.99
934391	AD1-063 C	2.63
934392	AD1-063 E	1.75
934521	AD1-076 C OI	87.15
934522	AD1-076 E OI	44.38
934571	AD1-082 C OI	11.6
934572	AD1-082 E OI	6.62
934611	AD1-087 C OI	10.29
934612	AD1-087 E OI	4.81
LTF	AD1-120	12.89
LTF	AD1-121	12.82
935111	AD1-144 C	3.05
935112	AD1-144 E	1.67

935161	AD1-151 C OI	23.44
935162	AD1-151 E OI	15.62
935171	AD1-152 C OI	9.53
935172	AD1-152 E OI	6.36
935211	AD1-156 C	2.54
935212	AD1-156 E	1.69
LTF	CARR	0.99
LTF	CBM-S1	12.81
LTF	CBM-S2	30.24
LTF	CBM-W1	20.3
LTF	CBM-W2	66.23
LTF	CIN	4.7
LTF	CPLE	9.79
LTF	G-007	4.19
LTF	IPL	2.98
LTF	LGEE	1.04
LTF	MEC	12.09
LTF	MECS	2.95
LTF	O-066	14.
LTF	RENSSELAER	0.79
LTF	ROSETON	5.72
292791	U1-032 E	4.54
900672	V4-068 E	0.45
901082	W1-029E	79.92
LTF	WEC	1.3
907092	X1-038 E	9.71



913392	<i>Y1-086 E</i>	3.84
916042	<i>Z1-036 E</i>	77.7
916191	<i>Z1-068 C</i>	0.1
916192	<i>Z1-068 E</i>	3.41
916302	<i>Z1-086 E</i>	13.58
917122	<i>Z2-027 E</i>	1.86
917332	<i>Z2-043 E</i>	1.44
917342	<i>Z2-044 E</i>	0.75
917512	<i>Z2-088 E OP1</i>	5.12
917592	<i>Z2-099 E</i>	0.67
918492	<i>AA1-063AE OP</i>	5.71
918512	<i>AA1-065 E OP</i>	6.76
918532	<i>AA1-067 E</i>	1.01
918562	<i>AA1-072 E</i>	0.24
919152	<i>AA1-139 E</i>	11.57
919692	<i>AA2-053 E</i>	5.19
919702	<i>AA2-057 E</i>	4.68
919732	<i>AA2-059 E</i>	0.94
919822	<i>AA2-068 E</i>	1.38
<i>LTF</i>	<i>AA2-074</i>	6.66
920022	<i>AA2-086 E</i>	0.36
920042	<i>AA2-088 E</i>	16.01
920592	<i>AA2-165 E</i>	0.62
920631	<i>AA2-169 C</i>	2.75
920632	<i>AA2-169 E</i>	1.26
920672	<i>AA2-174 E</i>	0.6

920691	AA2-178 C	15.82
920692	AA2-178 E	6.78
930051	ABI-013 C	4.78
930052	ABI-013 E	31.96
930401	ABI-081 C	11.37
930402	ABI-081 E	4.87
930861	ABI-132 C	19.1
930862	ABI-132 E	8.19
931231	ABI-173 C	3.
931232	ABI-173 E	1.4
931241	ABI-173AC	3.
931242	ABI-173AE	1.4
923801	AB2-015 C O1	13.67
923802	AB2-015 E O1	11.21
923831	AB2-022 C	4.06
923832	AB2-022 E	2.19
923842	AB2-024 E	1.84
923852	AB2-025 E	1.43
923911	AB2-031 C O1	2.98
923912	AB2-031 E O1	1.47
923941	AB2-035 C	0.44
923942	AB2-035 E	0.19
923991	AB2-040 C O1	9.79
923992	AB2-040 E O1	8.01
924071	AB2-051	249.42
924151	AB2-059 C O1	13.4

924152	AB2-059 E OI	6.91
924241	AB2-068 OI	619.77
924381	AB2-087 C	0.85
924382	AB2-087 E	0.4
924391	AB2-088 C	0.57
924392	AB2-088 E	0.27
924401	AB2-089 C	2.51
924402	AB2-089 E	1.29
924491	AB2-098 C	0.79
924492	AB2-098 E	0.34
924501	AB2-099 C	0.88
924502	AB2-099 E	0.38
924511	AB2-100 C	15.26
924512	AB2-100 E	7.52
924811	AB2-134 C OI	18.7
924812	AB2-134 E OI	18.38
925051	AB2-160 C OI	6.17
925052	AB2-160 E OI	10.07
925061	AB2-161 C OI	5.09
925062	AB2-161 E OI	8.31
925121	AB2-169 C	9.76
925122	AB2-169 E	8.76
925171	AB2-174 C OI	9.32
925172	AB2-174 E OI	8.43
925281	AB2-186 C	1.05
925282	AB2-186 E	0.45

925291	AB2-188 C OI	3.9
925292	AB2-188 E OI	1.75
925331	AB2-190 C	29.16
925332	AB2-190 E	12.5
925522	ACI-027 E	2.08
925591	ACI-034 C	9.
925592	ACI-034 E	6.79
925692	ACI-045 E	1.67
925781	ACI-054 C	8.64
925782	ACI-054 E	3.98
925861	ACI-065 C	5.36
925862	ACI-065 E	8.75
926071	ACI-086 C	28.13
926072	ACI-086 E	12.8
926201	ACI-098 C	8.46
926202	ACI-098 E	5.04
926211	ACI-099 C	2.83
926212	ACI-099 E	1.66
926291	ACI-107	935.5
926662	ACI-147 E	2.41
926741	ACI-159	120.26
926751	ACI-161 C	59.42
926752	ACI-161 E	25.36
926771	ACI-163 C	2.89
926772	ACI-163 E	1.35
926781	ACI-164 C	68.07

<i>926782</i>	<i>ACI-164 E</i>	<i>30.58</i>
<i>927021</i>	<i>ACI-189 C</i>	<i>11.6</i>
<i>927022</i>	<i>ACI-189 E</i>	<i>5.78</i>
<i>927111</i>	<i>ACI-206 C</i>	<i>13.15</i>
<i>927112</i>	<i>ACI-206 E</i>	<i>6.22</i>
<i>927141</i>	<i>ACI-208 C</i>	<i>12.24</i>
<i>927142</i>	<i>ACI-208 E</i>	<i>5.43</i>
<i>927221</i>	<i>ACI-216 C OI</i>	<i>14.27</i>
<i>927222</i>	<i>ACI-216 E OI</i>	<i>11.22</i>

## Appendix 16

(DVP - DVP) The 8ELMONT-8LADYSMITH 500 kV line (from bus 314908 to bus 314911 ckt 1) loads from 130.96% to 131.37% (**DC power flow**) of its load dump rating (3351 MVA) for the line fault with failed breaker contingency outage of 'DVP\_P4-2: 57602'. This project contributes approximately 33.95 MW to the thermal violation.

CONTINGENCY 'DVP\_P4-2: 57602' /\* NORTH ANNA 500 KV  
 OPEN BRANCH FROM BUS 314914 TO BUS 314918 CKT 1 /\* 8MDLTHAN  
 500.00 - 8NO ANNA 500.00  
 OPEN BRANCH FROM BUS 314232 TO BUS 314918 CKT 1 /\* 6NO ANNA  
 230.00 - 8NO ANNA 500.00  
 END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315060	1CHESTF5	22.03
315061	1CHESTG7	8.63
315063	1CHESTG8	8.53
315062	1CHESTS7	3.92
315064	1CHESTS8	4.38
315067	1DARBY 1	5.62
315068	1DARBY 2	5.62
315069	1DARBY 3	5.64
315070	1DARBY 4	5.65
315074	1HOPCGN1	15.07
315075	1HOPCGN2	14.88
315083	1SPRUNCA	18.62
315084	1SPRUNCB	18.62
315085	1SPRUNCC	13.8
315086	1SPRUNCD	13.8
315073	1STONECA	12.5
315233	1SURRY 2	55.07

314566	3CRESWEL	4.07
314572	3EMPORIA	0.67
314578	3HORNRTN	5.24
314582	3KELFORD	1.34
314315	3LOCKS E	2.22
314603	3SCOT NK	5.22
314617	3TUNIS	1.38
314539	3UNCAMP	4.11
314541	3WATKINS	1.16
314620	6CASHIE	1.41
314229	6MT RD221	1.36
314236	6NRTHEST	0.41
314189	6PAPERMILL	11.8
314594	6PLYMOTH	1.43
314256	6ROCKVILLE E	1.3
314648	6SUNBURY	1.54
314651	6WINFALL	3.04
932041	AC2-012 C	18.08
932042	AC2-012 E	29.5
932501	AC2-070 C	3.15
932502	AC2-070 E	1.3
932531	AC2-073 C	4.17
932532	AC2-073 E	2.1
932581	AC2-078 C	7.15
932582	AC2-078 E	11.67
932591	AC2-079 C	11.82

932592	AC2-079 E	19.28
932631	AC2-084 C	13.79
932632	AC2-084 E	6.79
932701	AC2-093 C	113.44
932702	AC2-093 E	64.88
932831	AC2-110 C	2.34
932832	AC2-110 E	3.81
933061	AC2-130	4.4
933071	AC2-131 1	2.98
933081	AC2-131 2	1.35
933111	AC2-132 1	1.56
933121	AC2-132 2	0.8
933261	AC2-137 C	3.87
933262	AC2-137 E	2.51
933291	AC2-141 C	54.31
933292	AC2-141 E	23.18
933451	AC2-158 C	9.04
933452	AC2-158 E	9.04
933461	AC2-159 C	10.73
933462	AC2-159 E	10.73
933471	AC2-161 C	4.22
933472	AC2-161 E	2.17
933481	AC2-162 C	4.52
933482	AC2-162 E	2.33
933711	AC2-194 C	1.88
933712	AC2-194 E	3.04



933731	AC2-196 C	3.16
933732	AC2-196 E	2.1
933991	AD1-023 C	21.98
933992	AD1-023 E	11.97
934011	AD1-025 C OI	30.47
934012	AD1-025 E OI	18.05
934041	AD1-029 C	17.06
934042	AD1-029 E	11.25
934061	AD1-033 C OI	13.26
934062	AD1-033 E OI	8.84
934071	AD1-034 C OI	14.26
934072	AD1-034 E OI	9.24
934141	AD1-041 C OI	9.09
934142	AD1-041 E OI	6.06
934201	AD1-047 C	12.81
934202	AD1-047 E	8.54
934211	AD1-048 C	4.48
934212	AD1-048 E	2.26
934391	AD1-063 C	2.82
934392	AD1-063 E	1.88
934521	AD1-076 C OI	91.27
934522	AD1-076 E OI	46.48
934571	AD1-082 C OI	13.51
934572	AD1-082 E OI	7.71
LTF	AD1-092	6.
LTF	AD1-093	10.28

<i>LTF</i>	<i>ADI-094</i>	<i>1.92</i>
<i>LTF</i>	<i>ADI-120</i>	<i>17.85</i>
<i>LTF</i>	<i>ADI-121</i>	<i>17.81</i>
<i>935111</i>	<i>ADI-144 C</i>	<i>3.05</i>
<i>935112</i>	<i>ADI-144 E</i>	<i>1.67</i>
<i>935161</i>	<i>ADI-151 C O1</i>	<i>29.11</i>
<i>935162</i>	<i>ADI-151 E O1</i>	<i>19.41</i>
<i>935211</i>	<i>ADI-156 C</i>	<i>3.7</i>
<i>935212</i>	<i>ADI-156 E</i>	<i>2.47</i>
<i>LTF</i>	<i>CARR</i>	<i>1.66</i>
<i>LTF</i>	<i>CBM-S1</i>	<i>25.77</i>
<i>LTF</i>	<i>CBM-S2</i>	<i>42.21</i>
<i>LTF</i>	<i>CBM-W1</i>	<i>59.82</i>
<i>LTF</i>	<i>CBM-W2</i>	<i>139.14</i>
<i>LTF</i>	<i>CIN</i>	<i>13.94</i>
<i>LTF</i>	<i>CPLE</i>	<i>12.52</i>
<i>LTF</i>	<i>G-007</i>	<i>8.9</i>
<i>LTF</i>	<i>IPL</i>	<i>8.9</i>
<i>LTF</i>	<i>LGEE</i>	<i>3.05</i>
<i>LTF</i>	<i>MEC</i>	<i>29.76</i>
<i>LTF</i>	<i>MECS</i>	<i>13.49</i>
<i>LTF</i>	<i>O-066</i>	<i>29.66</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>1.32</i>
<i>LTF</i>	<i>ROSETON</i>	<i>9.57</i>
<i>292791</i>	<i>U1-032 E</i>	<i>6.51</i>
<i>297087</i>	<i>V2-040</i>	<i>0.27</i>

900672	V4-068 E	0.49
901082	W1-029E	79.71
LTF	WEC	3.74
907092	X1-038 E	10.28
913392	Y1-086 E	3.8
LTF	Y3-032	8.75
916042	Z1-036 E	78.36
LTF	Z1-043	14.7
916192	Z1-068 E	3.32
916302	Z1-086 E	14.37
917122	Z2-027 E	1.84
917332	Z2-043 E	1.6
917592	Z2-099 E	0.73
918492	AA1-063AE OP	6.49
918512	AA1-065 E OP	7.3
918562	AA1-072 E	0.27
919152	AA1-139 E	11.28
919692	AA2-053 E	5.97
919732	AA2-059 E	0.95
919822	AA2-068 E	1.6
LTF	AA2-074	8.52
920022	AA2-086 E	0.39
920042	AA2-088 E	17.47
920672	AA2-174 E	0.69
920691	AA2-178 C	16.3
920692	AA2-178 E	6.99

930051	ABI-013 C	4.92
930052	ABI-013 E	32.92
930121	ABI-027 C	0.94
930122	ABI-027 E	2.06
930861	ABI-132 C	22.44
930862	ABI-132 E	9.62
931231	ABI-173 C	3.6
931232	ABI-173 E	1.68
931241	ABI-173AC	3.6
931242	ABI-173AE	1.68
<i>LTF</i>	AB2-013	8.57
923801	AB2-015 C O1	14.56
923802	AB2-015 E O1	11.94
923831	AB2-022 C	4.01
923832	AB2-022 E	2.16
923842	AB2-024 E	1.99
923852	AB2-025 E	1.82
923862	AB2-026 E	1.58
923911	AB2-031 C O1	3.58
923912	AB2-031 E O1	1.76
923991	AB2-040 C O1	11.74
923992	AB2-040 E O1	9.61
924071	AB2-051	242.85
924241	AB2-068 O1	417.43
924381	AB2-087 C	0.93
924382	AB2-087 E	0.44

924501	AB2-099 C	0.96
924502	AB2-099 E	0.41
924511	AB2-100 C	18.71
924512	AB2-100 E	9.21
924811	AB2-134 C O1	23.22
924812	AB2-134 E O1	22.83
925051	AB2-160 C O1	9.65
925052	AB2-160 E O1	15.75
925061	AB2-161 C O1	5.93
925062	AB2-161 E O1	9.67
925121	AB2-169 C	10.53
925122	AB2-169 E	9.45
925171	AB2-174 C O1	11.24
925172	AB2-174 E O1	10.17
925281	AB2-186 C	1.06
925282	AB2-186 E	0.45
925291	AB2-188 C O1	4.02
925292	AB2-188 E O1	1.8
925331	AB2-190 C	36.22
925332	AB2-190 E	15.52
925522	AC1-027 E	2.02
925692	AC1-045 E	1.67
925861	AC1-065 C	5.84
925862	AC1-065 E	9.53
926071	AC1-086 C	33.04
926072	AC1-086 E	15.04

926201	ACI-098 C	9.68
926202	ACI-098 E	5.76
926211	ACI-099 C	3.24
926212	ACI-099 E	1.9
926291	ACI-107	630.08
926411	ACI-112 C	0.73
926412	ACI-112 E	2.09
926662	ACI-147 E	2.35
926741	ACI-159	117.09
926751	ACI-161 C	54.31
926752	ACI-161 E	23.18
926771	ACI-163 C	3.17
926772	ACI-163 E	1.48
926781	ACI-164 C	75.67
926782	ACI-164 E	34.
927041	ACI-191 C	16.5
927042	ACI-191 E	8.22
927111	ACI-206 C	16.2
927112	ACI-206 E	7.66
927141	ACI-208 C	14.19
927142	ACI-208 E	6.3
927221	ACI-216 C OI	17.72
927222	ACI-216 E OI	13.94

## Appendix 17

(DVP - DVP) The AB2-100 TAP-6CLUBHSE 230 kV line (from bus 924510 to bus 314563 ckt 1) loads from 114.29% to 118.33% (**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 18.45 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
315294	1DOMTR10	2.12
315131	1EDGECEMA	10.48
315132	1EDGECEMB	10.48
315139	1GASTONA	7.94
315141	1GASTONB	7.94
315126	1ROARAP2	1.63
315128	1ROARAP4	1.57
315136	1ROSEMG1	5.33
315138	1ROSEMG2	2.5
315137	1ROSEMS1	3.31
314557	3BETHELC	0.87

314554	3BTLEBRO	0.84
314566	3CRESWEL	1.64
314578	3HORNRTN	3.35
314582	3KELFORD	0.91
314603	3SCOT NK	3.55
314617	3TUNIS	0.81
314620	6CASHIE	0.83
314574	6EVERETS	2.43
314594	6PLYMOTH	0.69
932631	AC2-084 C	9.33
932632	AC2-084 E	4.6
933451	AC2-158 C	6.16
933452	AC2-158 E	6.16
933461	AC2-159 C	7.09
933462	AC2-159 E	7.09
933991	AD1-023 C	11.95
933992	AD1-023 E	6.5
934041	AD1-029 C	11.54
934042	AD1-029 E	7.61
934331	AD1-057 C OI	16.08
934332	AD1-057 E OI	8.58
934521	AD1-076 C OI	45.28
934522	AD1-076 E OI	23.05
LTF	AD1-120	3.75
LTF	AD1-121	3.72
LTF	CARR	0.09



<i>LTF</i>	<i>CBM-S1</i>	<i>4.51</i>
<i>LTF</i>	<i>CBM-S2</i>	<i>9.28</i>
<i>LTF</i>	<i>CBM-W1</i>	<i>9.82</i>
<i>LTF</i>	<i>CBM-W2</i>	<i>24.32</i>
<i>LTF</i>	<i>CIN</i>	<i>2.2</i>
<i>LTF</i>	<i>CPLE</i>	<i>3.18</i>
<i>LTF</i>	<i>G-007</i>	<i>0.61</i>
<i>LTF</i>	<i>IPL</i>	<i>1.4</i>
<i>LTF</i>	<i>LGEE</i>	<i>0.47</i>
<i>LTF</i>	<i>MEC</i>	<i>4.99</i>
<i>LTF</i>	<i>MECS</i>	<i>2.2</i>
<i>LTF</i>	<i>O-066</i>	<i>2.02</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>0.08</i>
<i>LTF</i>	<i>ROSETON</i>	<i>0.55</i>
<i>900672</i>	<i>V4-068 E</i>	<i>0.24</i>
<i>LTF</i>	<i>WEC</i>	<i>0.61</i>
<i>917331</i>	<i>Z2-043 C</i>	<i>0.5</i>
<i>917332</i>	<i>Z2-043 E</i>	<i>1.1</i>
<i>917341</i>	<i>Z2-044 C</i>	<i>0.28</i>
<i>917342</i>	<i>Z2-044 E</i>	<i>0.61</i>
<i>917511</i>	<i>Z2-088 C OP1</i>	<i>1.02</i>
<i>917512</i>	<i>Z2-088 E OP1</i>	<i>4.12</i>
<i>917592</i>	<i>Z2-099 E</i>	<i>0.3</i>
<i>918411</i>	<i>AAI-050</i>	<i>0.86</i>
<i>918491</i>	<i>AAI-063AC OP</i>	<i>1.46</i>
<i>918492</i>	<i>AAI-063AE OP</i>	<i>3.51</i>

918511	AA1-065 C OP	2.13
918512	AA1-065 E OP	5.34
918531	AA1-067 C	0.33
918532	AA1-067 E	0.73
918561	AA1-072 C	0.08
918562	AA1-072 E	0.18
919691	AA2-053 C	1.76
919692	AA2-053 E	3.86
919701	AA2-057 C	1.46
919702	AA2-057 E	3.73
919732	AA2-059 E	0.29
919821	AA2-068 C	0.46
919822	AA2-068 E	1.08
LTF	AA2-074	2.16
920022	AA2-086 E	0.16
920042	AA2-088 E	6.95
920591	AA2-165 C	0.2
920592	AA2-165 E	0.49
920631	AA2-169 C	1.37
920632	AA2-169 E	0.63
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	ABI-013 C	1.97
930052	ABI-013 E	13.21

930401	ABI-081 C	9.53
930402	ABI-081 E	4.08
930861	ABI-132 C	30.89
930862	ABI-132 E	13.24
923941	AB2-035 C	0.37
923942	AB2-035 E	0.16
924151	AB2-059 C OI	11.23
924152	AB2-059 E OI	5.78
924381	AB2-087 C	0.64
924382	AB2-087 E	0.3
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	42.69
924512	AB2-100 E	21.03
925121	AB2-169 C	5.87
925122	AB2-169 E	5.27
925291	AB2-188 C OI	1.61
925292	AB2-188 E OI	0.72
925591	AC1-034 C	7.44
925592	AC1-034 E	5.62
926071	AC1-086 C	45.49
926072	AC1-086 E	20.7

<i>926201</i>	<i>ACI-098 C</i>	<i>6.55</i>
<i>926202</i>	<i>ACI-098 E</i>	<i>3.9</i>
<i>926211</i>	<i>ACI-099 C</i>	<i>2.19</i>
<i>926212</i>	<i>ACI-099 E</i>	<i>1.29</i>
<i>926771</i>	<i>ACI-163 C</i>	<i>2.03</i>
<i>926772</i>	<i>ACI-163 E</i>	<i>0.95</i>
<i>927021</i>	<i>ACI-189 C</i>	<i>9.</i>
<i>927022</i>	<i>ACI-189 E</i>	<i>4.48</i>
<i>927141</i>	<i>ACI-208 C</i>	<i>9.41</i>
<i>927142</i>	<i>ACI-208 E</i>	<i>4.18</i>

## Appendix 18

(AEP - AEP) The 05EDAN 1-05DANVL2 138 kV line (from bus 242631 to bus 242620 ckt 1) loads from 107.04% to 107.73% (**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 6.33 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
244012	05PINNACLE	-2.08
315131	1EDGECEMA	4.25
315132	1EDGECEMB	4.25
314557	3BETHEL C	0.35
314554	3BTLEBRO	0.37
314572	3EMPORIA	0.14
314578	3HORNRTN	1.21
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	3.42
932632	AC2-084 E	1.68

932701	AC2-093 C	24.4
932702	AC2-093 E	13.96
932761	AC2-100 C	3.66
932762	AC2-100 E	1.79
932821	AC2-107 C	3.48
932822	AC2-107 E	1.63
933451	AC2-158 C	1.78
933452	AC2-158 E	1.78
933461	AC2-159 C	2.33
933462	AC2-159 E	2.33
933941	AD1-017 C	0.84
933942	AD1-017 E	1.36
933991	AD1-023 C	4.1
933992	AD1-023 E	2.23
934041	AD1-029 C	4.23
934042	AD1-029 E	2.79
934201	AD1-047 C	2.75
934202	AD1-047 E	1.83
934231	AD1-050 C	2.01
934232	AD1-050 E	1.1
934311	AD1-055 C	1.07
934312	AD1-055 E	0.28
934331	AD1-057 C OI	4.1
934332	AD1-057 E OI	2.19
934341	AD1-058 C	3.99
934342	AD1-058 E	1.01

934521	AD1-076 C OI	16.71
934522	AD1-076 E OI	8.51
934611	AD1-087 C OI	3.62
934612	AD1-087 E OI	1.69
934621	AD1-088 C OI	4.63
934622	AD1-088 E OI	2.17
LTF	AD1-120	7.55
LTF	AD1-121	7.6
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 OI	3.36
935172	AD1-152 E OI	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
LTF	AMIL	0.17
LTF	BLUEG	2.07
LTF	CANNELTON	0.27
LTF	CARR	0.06
LTF	CBM-S1	1.13
LTF	CBM-S2	16.92
LTF	CBM-W2	2.91
LTF	CLIFTY	10.78

<i>LTF</i>	<i>CPLE</i>	<i>5.57</i>
<i>LTF</i>	<i>DEARBORN</i>	<i>0.98</i>
<i>LTF</i>	<i>EDWARDS</i>	<i>0.45</i>
<i>LTF</i>	<i>ELMERSMITH</i>	<i>0.71</i>
<i>LTF</i>	<i>FARMERCITY</i>	<i>0.12</i>
<i>LTF</i>	<i>G-007A</i>	<i>0.79</i>
<i>LTF</i>	<i>GIBSON</i>	<i>0.59</i>
<i>LTF</i>	<i>NEWTON</i>	<i>0.97</i>
<i>LTF</i>	<i>O-066A</i>	<i>0.36</i>
<i>LTF</i>	<i>PRAIRIE</i>	<i>0.86</i>
<i>LTF</i>	<i>RENSSELAER</i>	<i>0.05</i>
<i>LTF</i>	<i>ROSETON</i>	<i>0.35</i>
<i>LTF</i>	<i>SMITHLAND</i>	<i>&lt; 0.01</i>
<i>LTF</i>	<i>TATANKA</i>	<i>0.34</i>
<i>LTF</i>	<i>TILTON</i>	<i>0.61</i>
<i>LTF</i>	<i>TRIMBLE</i>	<i>0.41</i>
<i>900672</i>	<i>V4-068 E</i>	<i>0.1</i>
<i>LTF</i>	<i>VFT</i>	<i>2.09</i>
<i>LTF</i>	<i>X1-078</i>	<i>0.61</i>
<i>917332</i>	<i>Z2-043 E</i>	<i>0.36</i>
<i>917342</i>	<i>Z2-044 E</i>	<i>0.25</i>
<i>917512</i>	<i>Z2-088 E OP1</i>	<i>1.66</i>
<i>917592</i>	<i>Z2-099 E</i>	<i>0.14</i>
<i>918492</i>	<i>AA1-063AE OP</i>	<i>1.37</i>
<i>918512</i>	<i>AA1-065 E OP</i>	<i>1.46</i>
<i>918532</i>	<i>AA1-067 E</i>	<i>0.29</i>



918562	AA1-072 E	0.06
919692	AA2-053 E	1.33
919702	AA2-057 E	1.51
919822	AA2-068 E	0.41
LTF	AA2-074	3.79
920022	AA2-086 E	0.07
920042	AA2-088 E	3.27
920592	AA2-165 E	0.2
920631	AA2-169 C	0.91
920632	AA2-169 E	0.42
920672	AA2-174 E	0.15
930401	AB1-081 C	4.09
930402	AB1-081 E	1.75
930861	AB1-132 C	4.93
930862	AB1-132 E	2.11
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	1.21

924022	AB2-043 E OI	1.99
924151	AB2-059 C OI	4.82
924152	AB2-059 E OI	2.48
924161	AB2-060 C OI	3.48
924162	AB2-060 E OI	1.64
924301	AB2-077 C OI	0.78
924302	AB2-077 E OI	0.52
924311	AB2-078 C OI	0.78
924312	AB2-078 E OI	0.52
924321	AB2-079 C OI	0.78
924322	AB2-079 E OI	0.52
924381	AB2-087 C	0.19
924382	AB2-087 E	0.09
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	0.78
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	3.5
924512	AB2-100 E	1.72
925121	AB2-169 C	2.26

925122	AB2-169 E	2.03
925171	AB2-174 C OI	2.38
925172	AB2-174 E OI	2.15
925221	AB2-176 C	0.63
925222	AB2-176 E	0.27
925591	AC1-034 C	3.01
925592	AC1-034 E	2.27
925611	AC1-036 C	0.33
925612	AC1-036 E	0.54
925781	AC1-054 C	3.03
925782	AC1-054 E	1.4
925991	AC1-075 C	1.96
925992	AC1-075 E	1.11
926021	AC1-080 C	0.65
926022	AC1-080 E	0.37
926051	AC1-083 C	4.18
926052	AC1-083 E	6.82
926071	AC1-086 C	7.26
926072	AC1-086 E	3.31
926201	AC1-098 C	2.4
926202	AC1-098 E	1.43
926211	AC1-099 C	0.8
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	ACI-163 E	0.3
927021	ACI-189 C	3.63
927022	ACI-189 E	1.81
927111	ACI-206 C	2.97
927112	ACI-206 E	1.4
927141	ACI-208 C	3.54
927142	ACI-208 E	1.57
927251	ACI-221 C	1.59
927252	ACI-221 E	1.59
927261	ACI-222 C	1.54
927262	ACI-222 E	1.46

